

## Myxomycetes of Taiwan XIV: Three New Records of Trichiales

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**ABSTRACT:** Three new records in the order Trichiales (Myxomycetes) are described and illustrated by light and scanning electron microscopy. *Arcyria margino-undulata* is characterized by a long-stalked globose sporangia and a calyculus marked by undulate margins. *Hemitrichia velutina* is distinctive in having areolate, globose sporangia and long flexuose capillitial threads bearing long spine at its rounded free ends. *Perichaena vermicularis* var. *microsperma* differs from the variety *vermicularis* in having smaller spores. Specimens of the latter two were obtained from moist-chamber cultures, while specimens of *A. margino-undulata* were either obtained from moist chamber or collected directly from fields.

**KEY WORDS:** *Arcyria*, *Hemitrichia*, *Perichaena*, Myxomycetes, Slime molds, Taiwan, Trichiales.

### INTRODUCTION

Forest habitats in Taiwan are rich in Myxomycetes. Many new records and new species were identified in recent years (Chung and Liu, 1996a, 1996b, 1996c, 1996d, 1997a, 1997b, 1997c, 1997d; Chen, 1997; Chung and Liu, 1998; Liu and Chen, 1998a, 1998b, 1999; Tsai, 1998; Yang, 2000; Liu *et al.*, 2001). Taking the genus *Arcyria* into account, twelve species have been reported, *A. annulifera*, *A. carnea*, *A. cinerea*, *A. denudata*, *A. globosa*, *A. incarnata*, *A. insignis*, *A. leiocarpa*, *A. minuta*, *A. obvelata*, *A. pomiformis* and *A. virescens* (Nakazawa, 1929; Wang *et al.*, 1981; Liu, 1983; Chung and Liu, 1997; Chung *et al.*, 1998). In the genus *Perichaena*, there are five species and one variety: *P. chrysosperma*, *P. corticalis* var. *corticalis*, *P. corticalis* var. *liceoides*, *P. depressa*, *P. minor* and *P. vermicularis* (Nakazawa, 1929; Liu, 1982; Liu and Chung, 1993), while in the genus *Hemitrichia* two species and one variety have been found: *Hemitrichia clavata* var. *clavata*, *H. clavata* var. *calyculata*, *H. serpula* (Nakazawa, 1929; Liu, 1982). In this paper we report three newly recorded taxa of three genera that were collected in central and northern parts of Taiwan.

### MATERIALS AND METHODS

Fruiting bodies of *Arcyria margino-undulata* were either collected from fields or obtained from moist-chamber cultures in the laboratory, while those of *Hemitrichia velutina* and *Perichaena vermicularis* var. *microsperma* were harvested from moist-chamber cultures. Moist-chamber cultures were prepared by placing leaf litter, fallen twigs, or barks of living trees collected from fields into sterilized glass Petri dishes (with a piece of filter paper inside each Petri dish) as described (Gilbert and Martin, 1933; Liu, 1983).

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Specimens were examined morphologically by light and scanning electron microscopy (Hitachi S-800 scanning electron microscope; Wild M3Z KOMBISTEREO light microscope; Nikon HFX-DX light microscope). Specimens were identified by consulting with papers or monographs by Nannanga-Bremekamp and Yamamoto (1983, 1986), Yamamoto and Nannanga-Bremekamp (1995), Martin and Alexopoulos (1969), and Yamamoto (1998).

## RESULTS AND DISCUSSION

***Arcyria margino-undulata*** Nann.-Brem. and Y. Yamam., Proc. Kon. Ned. Akad. Wetensch., C. 86(2): 218. 1983. Figs. 1-4, 15

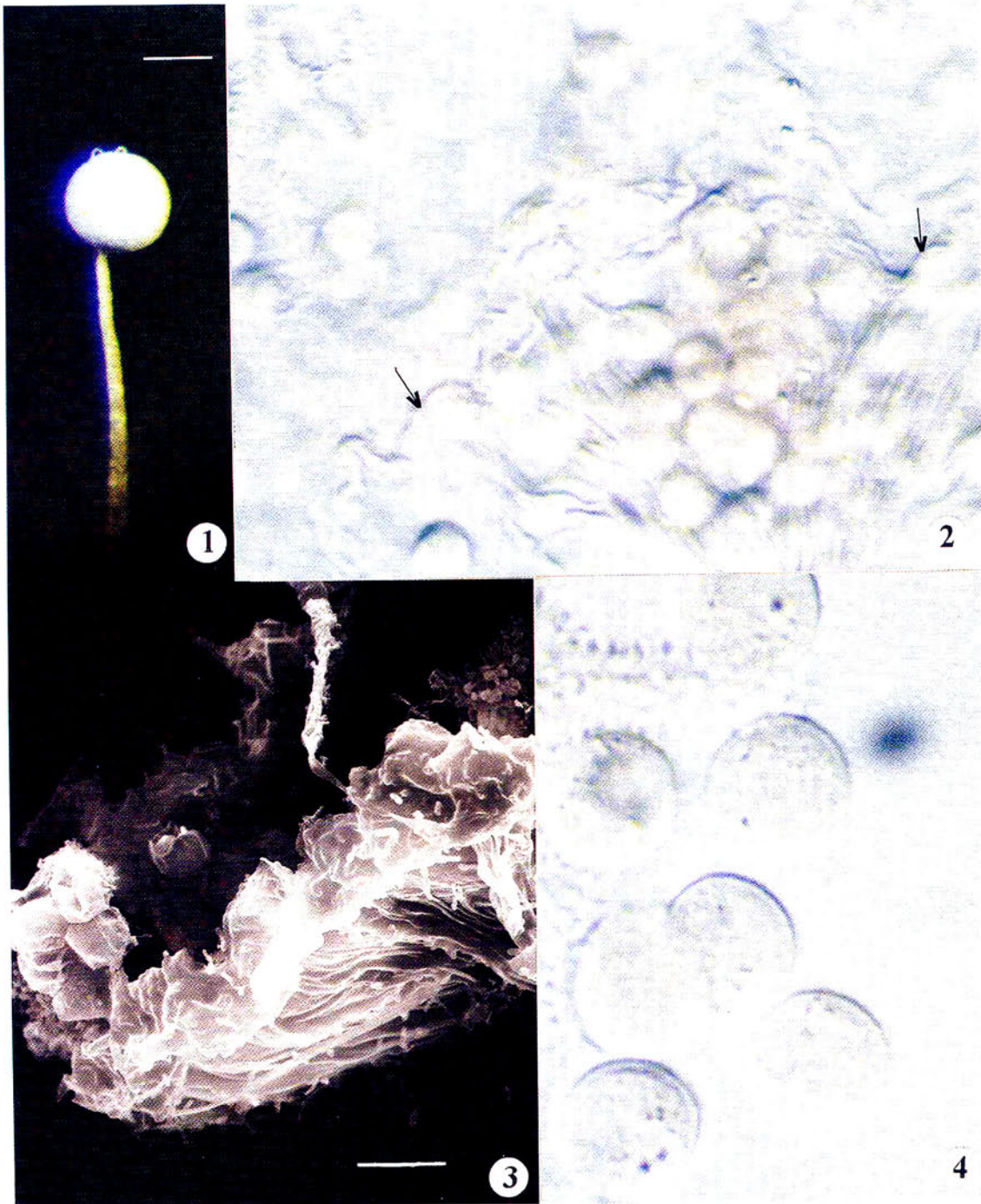
Fructifications sporangiate, scattered to sparsely gregarious, stipitate, 0.46-1.0 mm in total height. Sporangia globose, pale grayish white to pale ochraceous, 0.16-0.37 mm in diameter, erect or nodding on a long stalk. Stalk long, tapering upward, brown to ochraceous below, paler and turning to pale grayish white to silky above, 0.32-0.73 mm long (ca 2/3-3/4 of total height), filled with spore-like cells. Hypothallus membranous, transparent or brownish, discoid. Peridium early fugacious except for the persistent basal calyculus (0.04-0.1 mm in diameter at the widest part). Calyculus undulate along the margins, plicate from the top of stalk, continuous to the undulate margins. Capillitium consisting of colorless and transparent threads, firmly attached to the calyculus, 2.0-3.0  $\mu\text{m}$  in diameter, prominently spinulate, with about 1  $\mu\text{m}$  long spinules. Spores in mass concolorous with the sporangium, pale, nearly transparent and colorless by transmitted light, globose, 6.0-8.2 (-9.0)  $\mu\text{m}$  in diameter, nearly smooth by the margins, with prominent warts of small and large size scattering on the surface. Plasmodium not observed.

**Specimen examined:** Taipei City: Shih-lin, Yangmingshan National Park, CHL B262b, Sept. 26, 1982, on leaf litter; CHL B2293, Sept. 18, 2001 (moist-chamber culture: 8/26-9/18/2001), CHL B2294, Sept. 23, 2001 (moist-chamber culture: 8/26-9/23/2001), on *Miscanthus floridulus*; CHL B2295, Sept. 23, 2001 (moist-chamber culture: 8/26-9/23/2001), on *Pseudosasa japonica*; CHL B2296, Sept. 22, 2001 (moist-chamber culture: 9/3-9/22/2001), on decaying leaves; Taipei County: Shih-ting, Wenshan Botanical Gardens of the National Taiwan Univ., Yang 99-12B3L3, April 7, 2000 (moist-chamber culture: 3/14-4/7/2000), on bark of *Cryptomeria japonica*; Taichung County: Huisun Forest Station, Dec. 20, 1997 (Collected by P.H. Wang) CHL B1359, on fallen leaves.

Distribution: Asia (Japan and Taiwan), North America (West Virginia, USA).

There are slightly differences between our specimens and the type specimen of *Arcyria margino-undulata*. First, the stalk of the type specimen is dark brown, but ours is whitish. Second, the ratio of stalk to total height of fruiting bodies is ca 3/4 ~ 4/5 for the type specimen, and ours is 2/3 ~ 3/4. Therefore, based on the characteristics of the wrinkled margin of calyculus, the smaller size of fruiting bodies with long stalks, and the always globose sporangia, this specimen should belong to *A. margino-undulata*, and it is a new record in Taiwan.

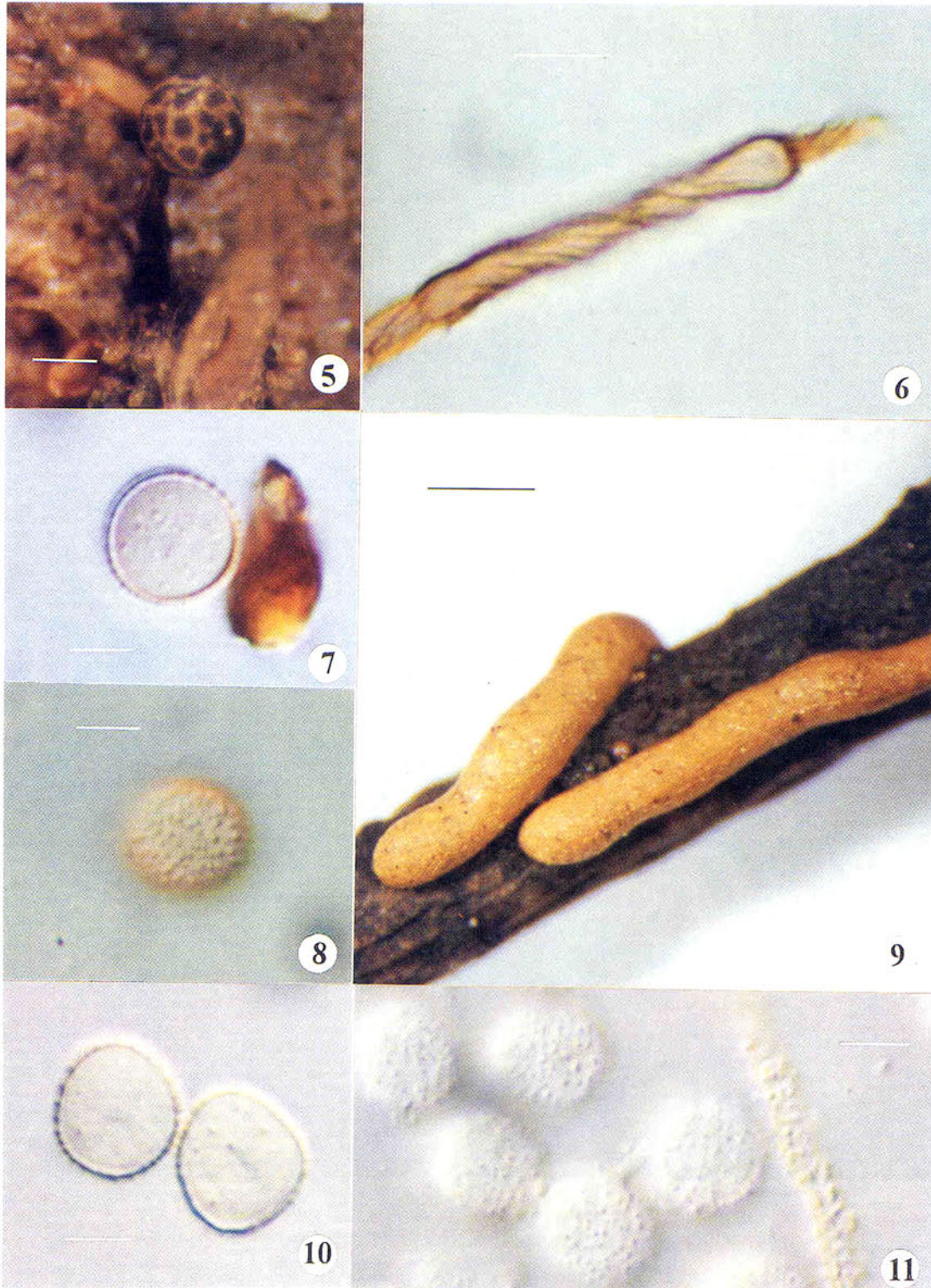
*A. margino-undulata* is very similar to the small fruiting bodies of *A. cinerea* (Bull.) Pers. In *A. cinerea*, the margin of calyculus is smooth, not wrinkled, and its capillitial threads are not decorated with long spines and it is usually found on woody habitats. *A. globosa* Schwein. and *A. afroalpina* Rammeloo are also close to *A. margino-undulata*. *A. globosa* also has concentric wrinkled margin of calyculus, but its calyculus is as deep as a cup-like structure and usually with a small ratio of stalk to the total height. *A. afroalpina* has distinct spinulose spores, but not nearly as smooth (cf. Nannanga-Bremekamp & Yamamoto, 1983).



Figs. 1-4. *Arcyria margino-undulata*. 1. Fruiting body, bar=125  $\mu\text{m}$ ; 2. Undulate margins of calyculus (arrows), bar=25  $\mu\text{m}$ ; 3. SEM of undulate margins of calyculus, bar=7.5  $\mu\text{m}$ ; 4. Spores, optical sections, bar=5  $\mu\text{m}$ .

***Hemitrichia velutina*** Nann.-Brem. & Y. Yamam. Proc. Kon. Ned. Akad. Wetensch., C. 89: 233. 1986. Figs. 5-8, 14

Fructifications sporangiate, scattered or solitary, total height 0.9-1.1 mm. Sporangia globose, 0.25-0.45 mm in diameter, areolate, with chestnut brown patches arranged in a



Figs. 5-8. *Hemitrichia velutina*. 5. Fruiting body, bar=200  $\mu\text{m}$ ; 6. Capillitial thread, showing the long spine at the rounded end, bar=7.5  $\mu\text{m}$ ; 7 & 8. Spores, marginal and surface view, bar=5  $\mu\text{m}$ . Figs. 9-11. *Perichaena vermicularis* var. *microsperma*. 9. Fruiting bodies, bar=500  $\mu\text{m}$ ; 10 & 11. Spores, marginal and surface view, bar=5  $\mu\text{m}$ .

reticulate pattern over the ochraceous yellow background which in most cases displaying as reticulate, narrow bands on the peridium except at the base which remains as a cup at dehiscence. Stalk erect or bending, ca 2/3 of total height (0.61-0.64 mm), dark brown to blackish below, paler above, attenuate upwards, with longitudinal ridges. Hypothallus inconspicuous, membranous and transparent. Peridium double, the outer layer cartilaginous, chestnut brown, in reticulate patches, appearing irregularly roughened under scanning microscope; inner layer membranous, transparent (represented by the reticulate, ochraceous yellow bands of the sporangia), dehiscence along the lines of the exposing inner layer on the upper part. Capillitium ochraceous yellow, tubes long and flexuose, with 3 spiral bands and minute spinules (discernible under oil immersion lens), 3-4  $\mu\text{m}$  in diameter, sparingly branched, free ends few, rounded, bearing a 7-9  $\mu\text{m}$  long spines. Spores ochraceous yellow, pale yellow by transmitted light, globose, subglobose, 8-9  $\mu\text{m}$  in diameter, minutely spinulate or warted. Plasmodium not observed.

**Specimen examined:** Taipei County: Shih-ting, Wenshan Botanical Gardens of National Taiwan University, Yang 99-6C3B1. June 12, 1999 (moist chamber culture), on bark of *Cryptomeria japonica*.

Distribution: Asia (Japan, Taiwan).

The distinctive fruiting body and the long flexuose capillitial thread bearing a long spine at its rounded free end are main characteristics based for our identification, although our specimen is shorter in the total height of fruiting bodies than the type species described previously by Nannenga-Bremekamp and Yamamoto (1986). This species resembles *Trichia botrytis* in outer appearance of the sporangia, but the latter is different from *H. velutina* in having a larger fruiting body, and elaters with long, slender, acuminate tips.

**Perichaena vermicularis** (Schw.) Rostaf. var. *microsperma* Y. Yamam. & Nann.-Brem., Proc. Kon. Ned. Akad. Wetensch., C. 98: 323. 1995. Figs. 9-11, 12-13

Fructifications plasmodiocarpous, gregarious, short to elongate, pulvinate or flexuose, 0.29-0.44 mm in diameter, 0.51-2.5 mm long. Peridium thin, of two closely combined layers; the outer layer ochraceous, more or less granular, the inner layer membranous, transparent and papillate; dehiscence irregular. Capillitium consisting of yellow threads, the threads branched, sinuous, rough, with spinules or warts on the surface, with occasional swellings. Spores orange yellow in mass, pale yellow by transmitted light, globose to subglobose, spinulose, 7.5-10.0  $\mu\text{m}$  in diameter. Plasmodium yellow, tinted with orange color.

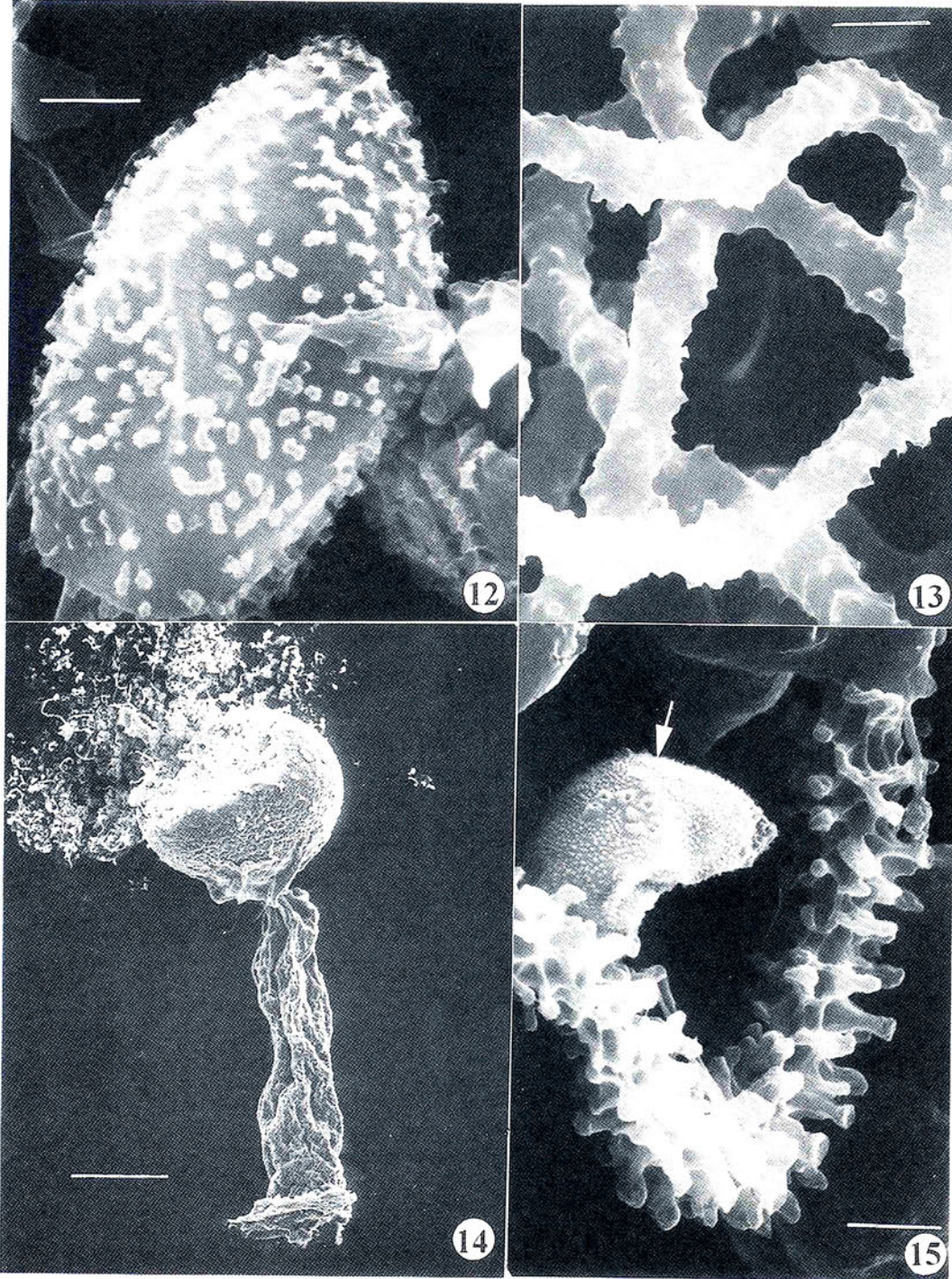
**Specimen examined:** Taipei City: Shih-lin, Yangmingshan National Park; CHL B2289, Mar. 9, 2001 (moist-chamber culture: 2/15-3/9); CHL B2290, June 28, 2001 (moist-chamber culture: 5/31-6/28); CHL B2291, July 13, 2001 (moist-chamber culture: 5/31-7/13); CHL B2292, Sept. 28, 2001 (moist-chamber culture: 8/18-9/28); on fallen twigs and leaves of *Liquidambar formosana*.

Distribution: Japan, Taiwan.

The specimens differ from the type variety *vermicularis* only in having smaller spores (7.5-10  $\mu\text{m}$ ). In the var. *vermicularis*, the spore is larger than 10.0  $\mu\text{m}$  in diameter.

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Figs. 12-13. SEM of *Perichaena vermicularis* var. *microsperma*. 12. Spore, bar=1.25  $\mu\text{m}$ ; 13. Capillitium, bar=3.75  $\mu\text{m}$ ; Fig. 14. Fruiting body of *Hemitrichia velutina*, SEM, bar=150  $\mu\text{m}$ ; Fig. 15. Spore surface markings (arrow) and capillitium of *Arcyria margino-undulata*, SEM, bar=2.15  $\mu\text{m}$ .

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## 台灣黏菌(十四)：團毛黏菌目的三種新紀錄

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## 摘 要

本文描述三個團毛黏菌目的成員，並以光學顯微鏡和掃描式電子顯微鏡的觀察來圖示。其中波狀杯緣團網黏菌 (*Arcyria margino-undulata* Nann.-Brem. and Y. Yamam.) 其子實體由野外採集和濕室培養所得，孢子囊具有以下特徵：長柄、圓頭、杯狀邊緣。鵝絨半團毛黏菌 (*Hemitrichia velutina* Nann.-Brem. & Y. Yamam.) 是採用濕室培養得到，特徵在於其球形的孢子囊，具有網格狀的外表，而細毛體彎曲和游離端圓鈍，且端頂具有一長刺。蟲蓋碗黏菌小孢變種 (*Perichaena vermicularis* var. *microsperma* Y. Yamam. & Nann.-Brem.) 是採用濕室培養得到，其和本種 (*Perichaena vermicularis*) 的差異，在於其孢子較小。

關鍵詞：團網黏菌屬、半團毛黏菌屬、蓋碗黏菌屬、真黏菌綱、黏菌、台灣、團毛黏菌目。

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