

Myxomycetes of Hunan Province, China. I

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This work serves as a checklist of the myxomycetes of Hunan Province, China. In addition we report 76 taxa new for Hunan, including the following 13 taxa new to China: *Ceratiomyxa fruticulosa* (F. Muell.) T. Macbr. var. *descendens* Emoto, *Clastoderma microcarpum* (Meyl.) Kowalski, *Colloderma oculatum* (Lippert) G. Lister, *Comatricha ellae* Härk., *Diderma umbilicatum* Pers., *L. pygmaea* (Meyl.) Ing., *L. rugosa* Nann.-Bremek. & Y. Yamam., *Macbrideola argentea* Nann.-Bremek. & Y. Yamam., *M. scintillans* H. C. Gilbert var. *scintillans*, *M. scintillans* var. *verrucosa* (Nann.-Bremek. & Y. Yamam.) Y. Yamam., *Paradiacheopsis fimbriata* var. *penicillata* (Nann.-Bremek. & Y. Yamam.) Y. Yamam., *P. longipes* Hoof & Nann.-Bremek., and *Trichia munda* (Lister) Meyl. The number of myxomycete species reported from Hunan Province is now 90.

Key words: biodiversity, Hunan, myxomycetes, taxonomy

Introduction

This article belongs to an assemblage concerning cryptogams studied co-operatively by the Forestry Department of Hunan Province and by the Division of Systematic Biology of the University of Helsinki. The project began in 1997 with the exploration of the diversity of bryophytes. The first papers have already been published (Rao *et al.* 1997, Koponen *et al.* 2000,

Potemkin 2000). In 1999, fungi (including lichens) and myxomycetes were added. The present article is the first paper of a series dealing with the myxomycetes of Hunan Province in China. For a more detailed description of the project *see* Härkönen (2000).

Hunan Province lies in south-central China between 24°38'–30°08'N and 108°47'–114°15'E and has an area of 211 829 km². The original vegetation type is broad-leaved evergreen forest

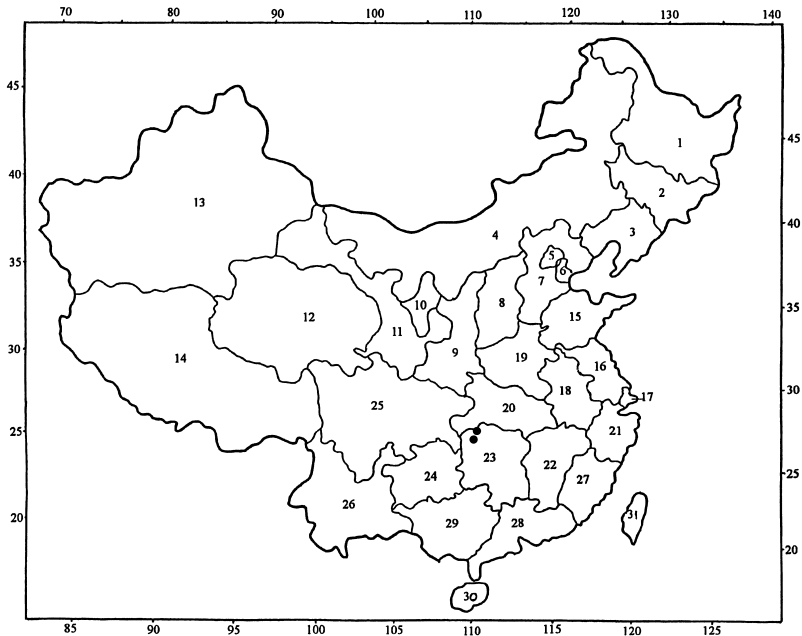


Fig. 1. The provinces of China referred to in the text. Collection sites of myxomycetes in Hunan Province in 1999 marked with dots (upper: Badagongshan National Nature Reserve, Badagongshan-Tianpingshan area, lower: Zhangjiajie National Forest Park in Wulingyuan Global Cultural Heritage Area). — 1: Heilongjiang. — 2: Jilin. — 3: Liaoning. — 4: Inner Mongolia. — 5: Beijing. — 6: Tianjin. — 7: Hebei. — 8: Shanxi. — 9: Shaanxi. — 10: Ningxia. — 11: Gansu. — 12: Qinghai. — 13: Xinjiang. — 14: Xizang (Tibet). — 15: Shandong. — 16: Jiangsu. — 17: Shanghai. — 18: Anhui. — 19: Henan. — 20: Hubei. — 21: Zhejiang. — 22: Jiangxi. — 23: Hunan. — 24: Guizhou. — 25: Sichuan. — 26: Yunnan. — 27: Fujian. — 28: Guangdong. — 29: Guangxi. — 30: Hainan. — 31: Taiwan. Province map from Dai (1999).

(upper limit at 1200–1400 m in the south and 500–800 m in the north), and although mostly replaced by cultivated land, primeval forests still exist (Högmander & Jie 2000). On average, more than half of the area of Hunan is forested and the local authorities have decided to extend the forested area. There is not enough knowledge available about natural resources of Hunan. It has a rich diversity of vascular plants and animals with many endemites. Cryptogams are poorly known but according to the research in progress (Koponen *et al.* 2000, Potemkin 2000) the bryophyte flora is exceptionally rich. The forests of Hunan are among the very few still existing primeval forests within the subtropical or warm temperate vegetation zone in Asia, so there is much to expect also concerning fungi and myxomycetes. For more detailed description of the geography and vegetation of Hunan see Högmander and Jie (2000).

From the literature listed in references we

can say that the myxomycetes of Hunan Province are poorly known. The earliest records seem to originate from the 1930s (Teng & Teng 1933, 1935, 1937). The following sixteen species have been reported from Hunan earlier: *Arcyria cinerea* (Bull.) Pers. (Teng & Teng 1933, 1937, Li & Li 1989, Teng 1996), *A. denudata* (L.) Wettst. (Teng & Teng 1933, 1937, Teng 1996), *Cribraria cancellata* (Batsch) Nann.-Bremek. (reported as *Dictydium cancellatum* (Batsch) T. Macbr. var. *cancellatum* in Teng & Teng 1933, 1937, Teng 1996), *Dictydiaethalium plumbeum* (Schumach.) Rostaf. (Teng & Teng 1935, 1937, Li & Li 1989, Teng 1996), *Diderma spumarioides* (Fr.) Fr. (Teng & Teng 1937, Li & Li 1989, Teng 1996), *Didymium nigripes* (Link) Fr. (Li & Li 1989), *D. iridis* (Ditmar) Fr. (reported as *Didymium nigripes* var. *xanthopus* (Ditmar) Lister in Teng & Teng 1935, 1937, Teng 1996), *Hemitrichia clavata* (Pers.) Rostaf. (Teng & Teng 1933, 1937, Teng 1996), *H.*

Fig. 2. Steep peaks in Zhangjiajie National Forest Park, Hunan Province. The shady valleys between the peaks are good habitats for myxomycetes.



serpula (Scop.) Rostaf. (Teng & Teng 1933, 1937, Teng 1996), *Lycogala exiguum* Morgan (reported as *Lycogala epidendrum* var. *tessellatum* Lister in Teng 1996), *Perichaena chrysoesperma* (Curr.) Lister (reported as *Ophiotheca wrightii* Berk. & Curt. in Teng & Teng 1933, 1937, Teng 1996), *Physarum viride* (Bull.) Pers. (Teng & Teng 1933, 1937, Li & Li 1989, Teng 1996), *Stemonitis splendens* Rostaf. (Teng & Teng 1933, 1937, Teng 1996), *Trichia favoginea* (Batsch) Pers. emend. M. L. Farr (reported as *T. persimilis* P. Karst. in Teng & Teng 1933, 1937, Teng 1996), *T. scabra* Rostaf. (Teng & Teng 1937, Li & Li 1989, Teng 1996), and *Trichia varia* (Pers.) Pers. (Li & Li 1989). Some of the collections listed in the present paper originate from the neighbouring Hubei Province, collecting sites located in the immediate vicinity between the border of the provinces.

Study areas

In September 1999 we visited two nature protection areas in Hunan: Wulingyuan Global Cultural Heritage Area (in Zhangjiajie National Forest Park), and Badagongshan National Nature Reserve (Badagongshan-Tianpingshan area) (Fig. 1). Zhangjiajie National Forest Park (the first national park in China) is located in the north-western part of Hunan province. It is the main

component of Wulingyuan Global Culture Heritage Area (also including the Suoxiyu Nature Reserve and the Tianzishan Nature Reserve), which covers an area of 500 km² between 29°16'25''–29°24'25''N and 110°22'30''–110°41'15''E. The area has not only unique landscape resources like three thousand steep peaks (Fig. 2) and eight hundred clear brooks, but also a high species diversity. There are 1637 vascular plant species in 730 genera and 193 families recorded from Suoxiyu; in Zhangjiajie National Forest Park there is almost the same vegetation as in Suoxiyu. The dominant species of the forest trees mainly belong in the genera *Castanopsis*, *Cinnamomum*, *Cyclobalanopsis*, *Lithocarpus*, and *Machilus*, and the lower layers of the forest are usually dominated by *Fagus*, *Lindera*, *Litsea*, and *Neolitsea* species (Koponen *et al.* 2000).

Badagongshan National Nature Reserve lies in the Sangzhi County of northwestern Hunan and is adjacent to Hefeng County and Xuanen County of Hubei Province in the north and west respectively. Its area is 250 km² between 29°39'18''–29°49'48''N and 109°41'50''–110°09'50''E. There are 1446 species in 631 genera and 168 families of vascular plants reported from Badagongshan (Wu *et al.* 1980, Qi *et al.* 1987). Among them 1403 species belonging to 604 genera and 149 families are seed plants, mainly dominated by species from Rosaceae, Asterace-

ae, Cichoriaceae, Lauraceae, Liliaceae, Poaceae, Saxifragaceae and Ranunculaceae. Furthermore, many relic plants such as *Davidia involucrata*, *Liriodendron chinense*, and *Pseudotaxus chienii* are well conserved in this area. Badagongshan is one of the earliest nature reserves established in China, representing a typical secondary and primeval subtropical evergreen forest with rich wildlife. In 1999, Badagongshan National Nature Reserve became a field station of the University of Helsinki, Finland.

Material and methods

The material was collected in September 1999. The collecting trips to the forests were planned and guided by our Chinese colleagues and the identification of the host trees was made by them, mainly by Mr. Li-Hong Yan. The nomenclature of the trees is mainly according to Wu *et al.* (1980) and Qi *et al.* (1987). We collected specimens of lichens (mostly by Dr. Jouko Rikkinen and Mr. Yan), bryophytes (Mr. Pengcheng Rao), and fungi and myxomycetes (mostly by the present authors). In addition to the field collections, bark of living trees was collected for moist chamber cultures. Two hundred bark cultures (100 from Zhangjiajie, and 100 from Badagongshan) were prepared in Finland during the winter 1999–2000 by the first author. For preparation of the moist chamber cultures *see e.g.* Härkönen (1977a), Stephenson (1989), or Ukkola (1998a). Before wetting, the cultures were studied under the dissecting microscope for occasional pre-existing slime moulds. The cultures were incubated for two months in normal room conditions in diffuse daylight. The cultures prepared with material collected from Zhangjiajie National Forest Park were wetted on 22 October 1999, and those prepared with material from Badagongshan National Nature Reserve on 28 December 1999. The pH of the cultures was measured with pH strips (Merck Universalindicator): initially after 48 h of incubation, and again after eight weeks, before drying. A few of the cultures were incubated for nearly four months, since they contained vigorous phaneroplasmodia that failed to produce fructifications during the two months incubation period. In most of

these cases the plasmodia scleroded (or died) during the four months.

Collecting localities

The collecting sites we visited in Wulingyuan Global Cultural Heritage Area are described in detail in Koponen *et al.* (2000): numbers 17c, 18a, 80, 81, 82, 83 and 84. Collecting site number 89 in Zhangjiajie, and the collecting sites in Badagongshan National Nature Reserve are listed below. For the sake of consistence the numbers used are those used by the bryologists (Timo Koponen, Pengcheng Rao and Sanna Huttunen) in 1998 for the same area.

Wulingyuan Global Cultural Heritage Area

89. Hunan Province, Zhangjiajie National Forest Park, Huangshizai (Yellow Rock Village), alt. ca. 1000 m.

Badagongshan National Nature Reserve

55c. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan. Secondary original evergreen broad-leaved forest with *Cyclobalanopsis multinervis*, *Carpinus chuniana*, *Sorbus folgneri*, *Stewartia sinensis* etc., alt. ca. 1400–1600 m, 29°47'N, 110°05'E.

55d. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, from Houping to Gongtongwan (the growing site of planted *Davidia involucrata*). Plantations of *Catalpa fargesii*, *Corylus chinensis*, *Reevesia glaucophylla*, *Prunus wilsonii*, *Fagus lucida*, *Cercidiphyllum japonicum*, *Metasequoia glyptostroboides*, and *Larix japonica*, alt. ca. 1400 m, 29°47'N, 110°05'E.

85. Hubei Province. Hefeng Co., Daping Village. *Cryptomeria fortunei* plantation, alt. ca. 1000 m, 29°47'N, 110°06'E.

86a. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, Yuanyangya. *Cryptomeria fortunei* plantation, alt. ca. 1000 m, 29°47'N, 110°06–05'E.

86b. Hunan Province, Sangzhi Co., Badagong-

shan–Tianpingshan, Yuanyangya. *Metasequoia glyptostroboides* plantation mixed with *Idesia polycarpa*, *Prunus serrulatus* var. *pubescens*, *Styrax japonica*, *Litsea veitchiana*, *Cornus controversa*, *Emmenopterys henryi*, *Prunus grayana*, *Photinia beauverdiana*, *Meliosma oldhamii* etc., alt. ca. 1000 m, 29°47'N, 110°06–05'E.

87. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, Miaowan. Secondary original evergreen broad-leaved forest with *Cladrastis platycarpa*, *Cornus controversa*, *Acer amplum*, *Symplocos anomala* etc., alt. ca. 1300–1400 m, 29°46'N, 110°04'E.

88a. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, Jianzuihe, along the brook. Secondary original evergreen broad-leaved forest with *Castanea mollissima*, *Tetracentron sinense*, *Tapiscia sinensis*, *Daphniphyllum macropodum*, *Indocalamus hunanensis* etc., alt. ca. 1450 m, 29°46'N, 110°04'E.

88b. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, Tiejiangyanwu (Blacksmith's Rock House). Secondary original evergreen broad-leaved forest with *Carpinus chuniana*, *Cyclobalanopsis multinervis*, *Tilia hupehensis* etc., alt. 1350–1550 m, 29°46'N, 110°05'E.

90. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, yard of the Research Station, alt. ca. 1400 m.

91. Hunan Province, Sangzhi Co., Badagongshan–Tianpingshan, Shan-Bai-Za. Secondary original evergreen broad-leaved forest with e.g. *Camellia cuspidata*, *Carpinus hupeana*, *Fagus lucida*, *Magnolia officinalis* var. *biloba*, *Lyonia ovalifolia* var. *elliptica*, and *Rhododendron sutchuenense*, alt. ca. 1400 m.

Results

A total of 393 specimens, representing 89 taxa in 28 genera are listed below; of these 143 specimens were collected in the field and 250 developed in moist chamber cultures. This study adds 76 new taxa to Hunan Province, including 13 taxa new to China. The species are listed alphabetically. Numbers, or numbers and letters after species names refer to collecting sites listed in Koponen *et al.* (2000) (numbers 17c,

18a, 80, 81, 82, 83 and 84), or in this paper in pages 4–5 (numbers 55c, 55d, 85, 86a, 86b, 87, 88a, 88b, 89, 90, 91). *MH* in front of a collection number refers to Marja Härkönen, *TU* to Tarja Ukkola, and *JR* to Jouko Rikkinen; *bmc* indicates a specimen developed in moist chamber culture prepared with bark of living trees. The myxomycete specimens were identified according to methods of classical herbarium taxonomy, including examination under dissecting and compound microscopes. The date shown with the specimens grown in moist chamber cultures indicates the date of the development of the specimens. All specimens are deposited at the Botanical Museum of the University of Helsinki (H). Some of these are scanty and exist only as permanent slides. Duplicates of representative specimens have been sent to the Forest Botanical Garden of Hunan Province in Changsha, to serve as the first specimens of the new cryptogam and mycological herbarium.

The species distribution in China (*see* Fig. 1) was checked from the following publications: Lister (1925), Emoto (1931, 1933, 1977), Nakazawa (1931), Skvortzow (1931), Teng (1932a, 1932b, 1932c, 1932d, 1936, 1947, 1996), Teng and Teng (1933, 1935, 1937), Chow (1937), Buchet (1939), Martin and Alexopoulos (1969), Champion and Mitchell (1980), Liu (1980, 1981, 1983a, 1983b, 1989, 1990, 1996), Huang (1981), Huang *et al.* (1981), Zhou and Li (1983), Liao (1986), Ing (1987, 1999), Li (1988), Li and Li (1989, 1990, 1994, 1995), Li, Li and Wang (1989, 1995–1996), Li, Li, Wang and Chen (1990), Chiang and Liu (1991), Li, Chen and Li (1992, 1993), Li, Li and Chen (1992, 1993), Liu and Chung (1993), Neubert *et al.* (1993, 1995), Chen *et al.* (1995), Chung and Liu (1995a, 199b, 1996a, 1996b, 1996c, 1996d, 1996e, 1997a, 1997b, 1997c, 1997d, 1997e, 1998), Wang and Li (1995), Wang *et al.* (1995–1996), Li and Wang (1996), Zang *et al.* (1996), Chung (1997, 1999), Chung, Liu and Leong (1997), Chung and Tzean (1998, 1999, 2000), Chung, Wei and Liu (1998), Chung *et al.* (1998), Chen and Li (1998), Liu and Chen (1998a, 1998b, 1999), Chen (1999), Chen *et al.* (1999), Li (1999), Wang *et al.* (1999), Chen and Li (2000), Yamamoto *et al.* (2000).

We have not checked the identification of

the species mentioned in the literature, but only list the names of provinces from where certain species of myxomycetes have been reported.

Arcyria cinerea (Bull.) Pers. — 17c: *MH 4009*, *MH 4016B*, on decayed wood; *TU 950A*, on well-decayed wood, 17.IX.1999; *TU 1104*, 8.XI.1999, *1146*, 15.XI.1999, *1187*, 26.XI.1999, bmc *Sassafras tzumu*; *TU 1163*, bmc *Metasequoia glyptostroboides*, 18.XI.1999; *TU 1169*, 18.XI.1999, *TU 1191*, 6.XII.1999, bmc *Cryptomeria japonica*. — 18a: *MH 4035*, on well-decayed wood, 23.IX. 1999; *TU 968*, on decayed wood, 23.IX.1999; *TU 1116*, bmc *Cunninghamia lanceolata*, 12.XI.1999. — 55d: *TU 1233*, 10.I.2000, *TU 1268*, 21.I.2000, bmc *Larix japonica*. 80: *TU 944*, on decayed wood, 15.IX.1999; *TU 1092*, bmc *C. lanceolata*, 8.XI.1999; *TU 1190*, bmc *Carya hunanensis*, 6.XII.1999. — 81: *TU 1065*, bmc *Fagus lucida*, 2.XI.1999; *TU 1162*, bmc *Pinus massoniana*, 18.XI.1999. — 82: *TU 1075*, *1147*, bmc *P. massoniana*, 2.XI.1999; *TU 1107*, bmc *C. lanceolata*, 8.XI.1999. — 83: *MH 4029*, on decayed wood, 19.IX.1999; *TU 962*, on decayed wood, 19.IX.1999; *TU 1132*, *1135*, bmc *C. lanceolata*, 12.XI.1999. — 88a: *TU 1001*, on well-decayed wood, 28.IX.1999. 89: *TU 1189*, bmc *P. massoniana*, 3.XII.1999. — 90: *TU 1270*, bmc *Cupressus funebris*, 1.II.2000.

DISTRIBUTION in China: Widely distributed.

Arcyria denudata (L.) Wettst. — 17c: *MH 4027*, on a fallen leaf, 17.IX.1999; *TU 954*, on a rotten stump, 17.IX.1999. — 18a: *TU 970*, on decayed wood, 23.IX.1999. — 55c: *MH 4052*, on a dead polypore growing on a big, decayed trunk lying on the ground; *MH 4055*, on well-decayed wood, 26.IX.1999. — 86a: *TU 979*, on decayed wood, 25.IX.1999.

DISTRIBUTION in China: Widely distributed.

Arcyria major (G. Lister) Ing — 17c: *MH 4008*, on a small twig of a big decayed trunk; *MH 4026*, on a dead twig, 17.IX.1999.

DISTRIBUTION in China: Reported from Guangdong, Guangxi, Hainan, and Macau. New to Hunan.

Arcyria pomiformis (Leers) Rostaf. — 17c: *TU 1192*, bmc *Sassafras tzumu*, 6.XII.1999. —

18a: *TU 1152*, 15.IX.1999, *TU 1117*, 8.XI.1999, bmc *Cunninghamia lanceolata*. — 55d: *TU 1295*, bmc *Larix japonica*, 6.III.2000. — 81: *TU 1059*, bmc *Emmenopterys* sp., 2.XI.1999. — 83: *TU 1053*, bmc *Castanea sequinii*, 27.X.1999.

DISTRIBUTION in China: Reported from Anhui, Fujian (also from Matsu Islands, offshore of Fujian), Heilongjiang, Jiangsu, Jilin, Liaoning, and from Taiwan. New to Hunan.

Badhamia affinis Rostaf. — 91: *MH 4077*, on a big, dead, standing *Cladrastis wilsonii*, 29.IX.1999.

DISTRIBUTION in China: Earlier records from Beijing, Fujian, Guangxi, Hebei, Jiangsu, Jilin, Liaoning, Shanxi, and from Taiwan. New to Hunan.

Badhamia gracilis (T. Macbr.) T. Macbr. — 88a: *MH 4069*, on trunk of a living tree; *TU 996* & *JR*, on bark of a living broad-leaf tree, 28.IX.1999.

DISTRIBUTION in China: Reported from Guangxi Province and from Taiwan. New to Hunan.

Ceratiomyxa fruticulosa (F. Muell.) T. Macbr. var. *fruticulosa* — 17c: *MH 4011*, *4013*, on a big log lying on the ground; *TU 959A*, *960A*, on well-decayed wood, 17.IX.1999; *TU 1200*, bmc *Pterocarya stenoptera*, 27.XII.1999. — 18a: *MH 4038*, on decayed wood, 23.IX.1999. — 80: *MH 4003*, *TU 945*, on decayed wood, 15.IX.1999. — 85: *MH 4046*, on a rotten stump, 25.IX.1999. — 88a: *TU 1289*, bmc *Davidia involucrata*, 15.II.2000.

Two specimens developed in moist chamber culture after 19 days (*TU 1289*) and 37 days (*TU 1200*) of incubation.

DISTRIBUTION in China: Widely distributed in China, but we have found no earlier records from Hunan.

Ceratiomyxa fruticulosa (F. Muell.) T. Macbr. var. *descendens* Emoto — 18a: *MH 4043*, on decayed wood, 23.IX.1999.

The variety is easy to recognize. The sporophores of the Chinese specimen are white, cylindrical pegs up to 0.5 mm high with flat, polygonal bases. Spores are totally or almost spherical, 7–8 µm in diameter.

We have found *Ceratiomyxa fruticulosa* var. *descendens* also from Tanzania in the Usambara Mountains (Ukkola 1998b).

DISTRIBUTION in China: We have found no earlier records of this taxon from China, but maybe it has not been separated from the nominate variety.

Clastoderma debaryanum A. Blytt — 17c: *MH 4010B*, on a big log lying on the ground; *TU 950B*, on decayed wood; *TU 957B*, on a big, decayed trunk lying on the ground, 17.IX.1999; *TU 1164*, bmc *Sassafras tzumu*, 18.XI.1999. — 18a: *TU 1184*, bmc *Pinus massoniana*, 26.XI.1999; *TU 1172*, bmc *Cunninghamia lanceolata*, 22.XI.1999. — 55d: *TU 1207*, bmc *Davidia involucrata*, 3.I.2000; *TU 1232*, 10.I.2000, *TU 1243*, 24.I.2000, bmc *Larix japonica*. — 81: *TU 1009*, bmc *Fagus lucida*, 25.X.1999; *TU 1018*, bmc *Emmenopterys* sp., 27.X.1999; *TU 1127*, 8.XI.1999, *TU 1128*, 12.XI.1999, bmc *P. massoniana*. — 83: *TU 1134*, bmc *Ailanthus altissima*, 12.XI.1999. — 84: *TU 1183*, bmc *C. lanceolata*, 26.XI.1999. — 85: *TU 1209*, bmc *Cryptomeria fortunei*, 5.I.2000. — 86b: *TU 1239*, bmc *Rhus chinensis*, 12.I.2000; *TU 1250*, bmc *Cephalotaxus sinensis*, 14.I.2000. — 88b: *TU 995*, on decayed wood, 28.IX.1999. — 89: *TU 1091*, bmc *P. massoniana*, 2.XI.1999. — 90: *TU 1218*, bmc *Cupressus funebris*.

All field collections (*MH 4010B*, *TU 950B*, *957B*, *995*) had smooth or weakly reticulated capillitial platelets, whereas all specimens developed in moist chamber cultures had clearly reticulated platelets, representing the taxon *Clastoderma debaryanum* var. *imperatorium* Emoto. According to Neubert *et al.* (1993) the reticulation or smoothness of the capillitial platelets is an intergrading character. Eliasson and Keller (1996) made SEM studies which show positive correlation among characters distinguishing the var. *imperatorium* from the nominate variety. According to them typical specimens of var. *imperatorium* have fructifications 0.5–0.8 mm tall (var. *debaryanum* 0.8–1.5 mm tall), a distinct, up to 50 µm long columella, and the capillitial platelets are predominantly rectangular. Eliasson and Keller (1996), however, pointed out that specimens intermediate in various characters or with combined characters of the two varieties occur. That is the case in the Chinese material. The sporangia with clearly reticulated capillitial platelets either had a columella up to 42 µm tall, or it was nearly absent;

there was variation even in the same specimen. The shape of the capillitial platelets varied from rounded to rectangular in all specimens.

DISTRIBUTION in China: Reported from Fujian (also from Kinmen and Matsu Islands), Guangdong, Guangxi, Hong Kong, Jilin, Macau, Yunnan, and Taiwan. New to Hunan.

Clastoderma microcarpum (Meyl.) Kowalski — 86b: *TU 1249*; bmc *Prunus grayana*, 14.I.2000.

A scanty specimen, consisting of two sporangia only. The capillitial net is very wide-meshed, laxer than in Mitchell's (1980) drawing made of Meylan's herbarium material. The capillitium resembles that of *Echinostelium cribrarioides* Alexop., except some membranous expansions in the axils of the netted capillitium. All other characters, like stalk structure, fugacious peridium leaving a collar at the apex of the stalk, columella, and spores fit the description of *Clastoderma microcarpum* best (see Kowalski 1975).

DISTRIBUTION in China: We have found no earlier records from China; the holotype of the species (first described as *Comatricha elegans* (Racib.) G. Lister var. *microcarpa* Meyl.) originates from Japan.

Collocladum oculatum (Lippert) G. Lister — 18a: *TU 1086B*, bmc *Cunninghamia lanceolata*, 15.XI.1999. — 55d: *TU 1222*, 7.I.2000, *TU 1242*, 10.II.2000, bmc *Metasequoia glyptostroboides*; *TU 1236*, 3.I.2000, *TU 1267*, 17.II.2000, bmc *Larix japonica*.

DISTRIBUTION in China: We have found no earlier records from China.

Comatricha elegans (Racib.) G. Lister — 17c: *TU 1026*, 27.X.1999, *TU 1070*, 2.XI.1999, bmc *Cryptomeria japonica*; *TU 1051*, 29.X.1999, *TU 1068*, 2.XI.1999, bmc *Sassafras tzumu*. — 18a: *TU 1088*, bmc *Pinus massoniana*, 2.XI.1999; *TU 1138*, bmc *Cunninghamia lanceolata*, 12.XI.1999. — 55b: *TU 1258*, bmc *C. lanceolata*, 17.I.2000. — 80: *TU 1057*, 2.XI.1999, *TU 1094*, 8.XI.1999, bmc *C. lanceolata*. — 81: *TU 1058*, bmc *Cryptomeria fortunei*, 2.XI.1999. — 82: *TU 1010*, bmc *C. lanceolata*, 22.X.1999; *TU 1106A*, bmc *P. massoniana*, 8.XI.1999. — 83: *TU 1013*, bmc *P. massoniana*, 25.X.1999; *TU 1033*, bmc *C. lanceolata*, 27.X.1999. — 84: *TU 1201*, bmc *C. lanceolata*, 27.XII.1999. — 88a: *MH 4065B*, on a big, decayed trunk, 28.IX.1999.

— 90: *TU 1208B*, bmc *Cupressus funebris*, 5.I.2000; *TU 1247*, bmc *Metasequoia glyptostroboides*, 14.I.2000.

DISTRIBUTION in China: Reported from Anhui, Fujian (also from Matsu Islands), Guangxi, and from Taiwan. New to Hunan.

Comatricha ellae Härk. — 81: *TU 1101*, bmc *Cryptomeria japonica*, 8.XI.1999. — 86a: *TU 1252A*, bmc *Cryptomeria fortunei*, 14.II.2000.

These scanty specimens are very similar to those developed in moist chamber cultures prepared with material collected from the East-Usambara Mts., Tanzania (Ukkola 1998b): the columella radiates at the apex to stout, primary branches of the capillitium, and the peridial surface net is nearly complete in the lower parts of the spore case, with free ends at the top. In typical sporangia of *Comatricha ellae*, the columella extends through 1/2–2/3 of the sporangium, and the primary branches of the capillitium are less strong, more or less horizontal and originating from all parts of the columella (Härkönen 1977b, 1978).

DISTRIBUTION in China: We have found no earlier records from China.

Comatricha lurida Lister — 55c: *MH 4057B*, on decayed wood, 26.IX.1999.

A scanty specimen, existing only as a permanent slide.

DISTRIBUTION in China: Reported from Jilin and Taiwan. New to Hunan.

Comatricha nigra (Pers.) Schroet. — 55d: *TU 1282*, bmc *Cunninghamia lanceolata*, 4.II.2000. — 81: *TU 1022*, 27.X.1999, *TU 1060*, 2.XI.1999, bmc *C. lanceolata*; *TU 1045*, bmc *Cryptomeria fortunei*, 29.X.1999. — 82: *TU 1106B*, bmc *Pinus massoniana*, 8.XI.1999. — 83: *TU 1015*, bmc *C. lanceolata*, 25.X.1999. — 90: *TU 1208A*, bmc *Cupressus funebris*, 3.I.2000.

DISTRIBUTION in China: Reported from Fujian (also from Matsu Islands), Guangxi, Hong Kong, Jiangsu, Jilin, Liaoning, and from Taiwan. New to Hunan.

Comatricha tenerrima (M. A. Curtis) G. Lister — 83: *TU 964*, on decayed wood, 19.IX.1999.

DISTRIBUTION in China: Earlier records are from Hong Kong and Taiwan. New to Hunan.

Craterium minutum (Leers) Fr. — 88a: *TU*

1002, on a dead, standing, broad-leaf tree, 28.IX.1999.

DISTRIBUTION in China: Earlier records from Beijing, Hebei, Inner Mongolia, Jiangsu, Jilin, Qinghai, Yunnan, and from Taiwan. New to Hunan.

Cribraria cancellata (Batsch) Nann.-Bremek. — 88a: *MH 4059*, on decayed wood, 28.IX.1999.

The sporangia of the Chinese specimen have small, discoid to very shallow bowl-shaped calycula.

DISTRIBUTION in China: Widely distributed.

Cribraria confusa Nann.-Bremek. & Y. Yamam. — 17c: *TU 1025*, 27.X.1999, *TU 1072*, 2.XI.1999, bmc *Cryptomeria japonica*. — 18a: *TU 1087*, bmc *Cunninghamia lanceolata*, 2.XI.1999. — 55c: *TU 1207*, bmc *Rhododendron fortunei*, 3.I.2000. — 80: *TU 1042*, 1043, bmc *C. lanceolata*, 27.X.1999. — 81: *TU 1020*, bmc *C. japonica*, 27.X.1999; *TU 1021*, bmc *C. lanceolata*, 27.X.1999; *TU 1099*, bmc *Cryptomeria fortunei*, 8.XI.1999. — 82: *TU 1030*, bmc *C. lanceolata*, 27.X.1999. — 83: *TU 1032*, 1035, 1036, 1038, bmc *C. lanceolata*, 27.X.1999. — 84: *TU 1056*, bmc *C. lanceolata*, 29.X.1999.

DISTRIBUTION in China: Earlier records from Fujian (from Matsu Islands) Guangxi, Jilin, Hong Kong, Macau, and Taiwan. New to Hunan.

Cribraria languescens Rex — 17c: *TU 1029*, bmc *Pterocarya stenoptera*, 27.X.1999.

OTHER MATERIAL STUDIED: Type of *Cribraria languescens* Rex: USA. New York State, coll. Rex, ex. herb. H. Wingate, Phila., (BPI 828830).

DISTRIBUTION in China: Reported from Fujian, Jiangsu, Jilin, and from Taiwan. New to Hunan.

Cribraria microcarpa (Schrad.) Pers. — 17c: *MH 4006*, on a rotten stump, 17.IX.1999; *TU 1027*, 27.X.1999, *TU 1178*, 26.XI.1999, bmc *Metasequoia glyptostroboides*; *TU 1050*, 29.X.1999, *TU 1165*, 18.XI.1999, bmc *Sassafras tzumu*. — 18a: *TU 1141*, 12.XI.1999, *TU 1153*, 15.XI.1999, bmc *Cunninghamia lanceolata*; *TU 1154*, 1157, bmc *Pinus massoniana*, 12.XI.1999. — 55c: *TU 1214*, bmc *Rhododendron fortunei*, 5.I.2000. — 81: *TU 1023A*, bmc *Fagus lucida*, 27.X.1999. — 83: *TU 1082*, 2.XI.1999, *TU 1133*, 8.XI.1999, bmc *Ailanthus altissima*. — 84: *TU 1113*, bmc *Carya hunanensis*, 8.XI.1999. — 86a: *TU 1229*, bmc *Cryptomeria fortunei*, 10.I.2000. — 90: *TU*

1206, bmc *Castanea mollissima*, 3.I.2000.

DISTRIBUTION in China: Earlier records from Anhui, Guangxi, Fujian, Hong Kong, Hubei, Jilin, Zhejiang, and from Taiwan. New to Hunan.

Cribraria minutissima Schwein. — 18a: TU 1041, bmc *Pinus massoniana*, 27.X.1999. — 81: TU 1019, bmc *P. massoniana*, 27.X.1999.

DISTRIBUTION in China: Reported from Fujian (also from Matsu Islands), Guangxi, Hong Kong, Hubei, Jilin, and from Taiwan. New to Hunan.

Cribraria mirabilis (Rostaf.) Masee — 18a: MH 4042, on decayed wood, 23.IX.1999.

In the Chinese specimen the stalks are longer (2.5–3 mm), and the general habitus is more delicate than that of a typical *Cribraria mirabilis*. All other characters, however, fit this species best. Zhou and Li (1983) described a new species, *Cribraria enodis* Zhou & Y. Li from Shanxi Province, China. According to Neubert *et al.* (1993) and Yamamoto (1998) this is a synonym of *C. mirabilis*. We checked the type specimen of *C. enodis* (HMAS no. 33568, M) and agree with them.

DISTRIBUTION in China: Reported from Anhui, Shanxi (as *Cribraria enodis*) and Xizang (Tibet). New to Hunan.

OTHER MATERIAL STUDIED: Type of *Cribraria enodis* Zhou & Y. Li: China. Shanxi Province, Taibaishan, coll. Q.-M. Ma & Y.-C. Zong, 22 Jul. 1963, 33°57'N, 107°47'E; Det. C.H. Chow & Yu Li; spec. no HMAS 33568 (M).

Cribraria splendens Schrad. — 91: TU 1005, on well-decayed wood, 29.IX.1999.

DISTRIBUTION in China: Earlier records from Anhui, Jilin, Hubei, and from Taiwan. New to Hunan.

Cribraria violacea Rex — 17c: TU 1078, bmc *Pterocarya stenoptera*, 2.XI.1999. — 55c: TU 1263, bmc *Tapiscia sinensis*, 19.I.2000. — 81: TU 1024, bmc *Castanea* sp., 27.X.1999. — 83: TU 1039, bmc *Carya hunanensis*, 27.X.1999. — 84: TU 1115, bmc unidentified broad-leaf tree, 8.XI.1999. — 86b: TU 1291, bmc *Prunus grayana*, 15.II.2000. — 88a: TU 1205, on bark of living *Symplocos hunanensis* (detected before wetting a moist chamber culture), 28.IX.1999. — 88b: TU 1297, bmc *Pterostyrax psilophylla*, 8.II.2000.

DISTRIBUTION in China: Earlier records from Fujian, Heilongjiang, Hong Kong, Hubei, Jiangsu, Jilin, Sichuan, and from Taiwan. New to Hunan.

Cribraria vulgaris Schrad. — 55c: MH 4054, on well-decayed wood, 26.IX.1999.

DISTRIBUTION in China: Earlier records from Jilin, Sichuan, and from Taiwan. New to Hunan.

Diachea leucopodia (Bull.) Rostaf. — 86b: TU 1284, bmc *Castanea mollissima*, 8.II.2000.

DISTRIBUTION in China: Reported from Beijing, Fujian, Gansu, Guangxi, Hong Kong, Hebei, Jiangsu, Shaanxi, Shanxi and Sichuan, and from Taiwan. New to Hunan.

Dictydiaethalium plumbeum (Schumach.) Rostaf. — 18a: MH 4036, on decayed wood, 23.IX.1999.

DISTRIBUTION in China: Reported from Anhui, Fujian (also from Matsu Islands), Guangxi, Hainan, Heilongjiang, Hubei, Hunan, Jilin, Yunnan, and from Taiwan.

Diderma chondrioderma (de Bary & Rostaf.) G. Lister — 17c: TU 1075, bmc *Sassafras tzumu*, 2.XI.1999; TU 1130A, bmc *Pterocarya stenoptera*, 12.XI.1999. — 18a: TU 1086A, 2.XI.1999, TU 10137, 12.XI.1999, TU 1170, 15.XI.1999, bmc *Cunninghamia lanceolata*; TU 1171, 12.XI.1999, TU 1173, 2.XI.1999, bmc *Pinus massoniana*. — 81: TU 1067, bmc *Betula luminifera*, 2.XI.1999; TU 1119, bmc *Choerospondias axillaris*, 12.XI.1999; TU 1144A, bmc *Quercus glandulifera* var. *brevipetiolata*, 12.XI.1999. — 90: TU 1278, bmc *Metasequoia glyptostroboides*, 4.II.2000.

All Chinese specimens are scanty, and the peridium is limeless or only partially crusted with white calcareous granules.

DISTRIBUTION in China: Reported from Fujian, Hong Kong, Yunnan and Taiwan. New to Hunan.

Diderma effusum (Schwein). Morgan — 80: TU 1193, bmc *Choerospondium axillax*, 18.XI.1999. — 81: TU 1177, bmc *Liquidambar formosana*, 26.XI.1999. — 86b: TU 1248A, bmc *Metasequoia glyptostroboides*, 14.I.2000.

DISTRIBUTION in China: Reported from Beijing, Fujian, Guangxi, Heilongjiang, Hebei, Hong Kong, Jilin, Zhejiang, and Taiwan. New to Hunan.

Diderma hemisphaericum (Bull.) Hornem. — 55d: TU 1265, bmc *Fagus lucida*, 21.II.2000.

DISTRIBUTION in China: Earlier records from Anhui, Fujian, Guangxi, Jiangsu, Jilin, Hebei, Hong Kong, Yunnan, and from Taiwan. New to Hunan.

Diderma platycarpum Nann.-Bremek. var. *berkeleyanum* Nann.-Bremek. — 81: *TU 1283*, bmc *Fagus lucida*, 4.II.2000. — 85: *TU 1292*, bmc *Cryptomeria fortunei*, 28.II.2000.

Variety *berkeleyanum* has smaller spores, 6–7 µm, than the nominate variety (Nannenga-Bremekamp 1991). The plate-like, broadly effused plasmodiocarps of both varieties are paper-thin. The spores of var. *berkeleyanum* resemble those of *Diderma effusum*, and according to Martin and Alexopoulos (1969) it may represent extreme variant of that very variable species.

One specimen (*TU 1292*) needed an incubation time of two months, the other nearly four months, after which the plasmodia sporulated on the lids and sides of the petri dishes.

DISTRIBUTION in China: Reported from Taiwan. New to Hunan. Also the nominate variety has been reported only from Taiwan.

Diderma umbilicatum Pers. — 86b: *TU 1273*, bmc *Metasequoia glyptostroboides*, 1.II.2000.

DISTRIBUTION in China: We have found no earlier records from China, but maybe it has not been separated from the closely related *Diderma radiatum* (L.) Morgan, which has been reported from Xinjiang.

Didymium iridis (Ditmar) Fr. — 55d: *TU 1220*, bmc *Prunus wilsonii*, 7.I.2000. — 88a: *TU 1225*, 3.I.2000, *TU 1245*, 12.I.2000, bmc *Phellodendron chinense*. — 88b: *TU 1235*, bmc *P. chinense*, 10.I.2000.

The *Didymium iridis*-group is a complex one. Two Chinese specimens (*TU 1225*, *1235*) have fairly minutely warted spores with distinct groups of darker wartlets, resembling spores of *Didymium verrucosporum* Welden (Welden 1954). The sporangia of the Chinese specimen, however, are not nodding, but erect or inclined, and the columella is not globose, but depressed-globose or turbinate. The stalks are yellowish red-brown to shiny red-brown. *Didymium bahiense* Gottsb. has similarly ornamented, but larger spores, and a flat pseudocolumella (Gottberger 1968). *Didymium bahiense* var. *microsporium* Hochg., Gottsb. & Nann.-Bremek. has minutely, densely, palely warted spores with groups of darker wartlets, 8–9 µm in diameter (in the Chinese specimens the spores are 8–10 µm), but no true columella (Hochgesand et al.

1989). According to Neubert et al. (1995) *D. iridis* has minutely warted spores with weak or distinct groups of darker wartlets. With some hesitation we have identified the two above mentioned specimens as *D. iridis*.

DISTRIBUTION in China: Reported from Anhui, Fujian, Guangxi, Jiangsu, Jilin, Hainan, Heilongjiang, Hebei, Hunan, Liaoning, Shanxi, Yunnan, and from Taiwan.

Didymium nigripes (Link) Fr. — 17c: *TU 1105*, bmc *Carya hunanensis*, 2.XI.1999.

DISTRIBUTION in China: Reported from Anhui, Beijing, Fujian (also from Matsu Islands), Guangxi, Hainan, Heilongjiang, Hebei, Hunan, Jiangsu, Jilin, Liaoning, Macau, Shaanxi, Shanxi, Yunnan, Zhejiang, and from Taiwan.

Didymium squamulosum (Alb. & Schwein.) Fr. — 55d: *TU 1281*, bmc *Fagus lucida*, 1.II.2000. — 87: *TU 988* & *JR*, *TU 989* & *JR*, *TU 990* & *JR*, on fallen leaves, 27.IX.1999.

DISTRIBUTION in China: Reported from many parts of China, but we have found no earlier records from Hunan.

Echinostelium apitectum K. D. Whitney — 55d: *TU 1231*, bmc *Larix japonica*, 10.I.2000.

DISTRIBUTION in China: Earlier records are from Fujian (from Matsu Islands) and Taiwan. New to Hunan.

Echinostelium minutum de Bary — 18a: *TU 1040*, 25.X.1999, *TU 1155*, 15.XI.1999, bmc *Pinus massoniana*; *TU 1137B*, 12.XI.1999, *TU 1199*, 22.XI.1999, bmc *Cunninghamia lanceolata*. — 55d: *TU 1211*, bmc *Fagus lucida*, 5.I.2000. — 80: *TU 1093*, bmc *C. lanceolata*, 8.XI.1999. — 81: *TU 1064*, bmc *F. lucida*, 2.XI.1999; *TU 1121*, 12.XI.1999, *TU 1122*, 8.XI.1999, bmc *P. massoniana*; *TU 1123*, bmc *C. lanceolata*, 12.XI.1999. — 83: *TU 1034*, bmc *Castanea sequinii*, 26.X.1999. — 88a: *TU 1246*, bmc *Lindera erythrocarpa*, 12.I.2000. — 89: *TU 1168*, bmc *P. massoniana*, 18.XI.1999.

DISTRIBUTION in China: Reported from Fujian (from Kinmen and Matsu Islands), Guangdong, Guangxi, Hainan, Hong Kong, Hubei, Jilin, and Taiwan. New to Hunan.

Enerthenama papillatum (Pers.) Rostaf. — 81: *TU 1143*, bmc *Cunninghamia lanceolata*, 8.XI.1999. — 82: *TU 1052*, bmc *C. lanceolata*, 29.X.1999. — 83: *TU 1004*, on bark of living *C. lanceolata* (detected before wetting of a moist chamber culture; a scanty specimen, existing only as a

permanent slide), 19.IX.1999; *TU 1037*, bmc *C. lanceolata*, 27.X.1999. — 86a: *TU 1240*, bmc *Cryptomeria fortunei*, 12.I.2000.

In the literature the spores of *Enerthenema papillatum* are described as minutely warted, but in the Chinese specimens they are spiny. The size of the spores, however, as well as other characters fit *E. papillatum*. The sporangia are somewhat immature with some irregular-shaped and giant spores.

DISTRIBUTION in China: Reported from Fujian, Hong Kong, Jilin, and Taiwan. New to Hunan.

Hemitrichia calyculata (Speg.) M. L. Farr — 17c: *MH 4018A, 4020, 4025, TU 949*, on decayed wood; *TU 957A, 961*, on decayed trunk lying on the ground, 17.IX.1999. — 18a: *TU 967*, on decayed wood, 23.IX.1999. — 55c: *MH 4057A*, on decayed wood; *TU 981*, on decayed trunk lying in the dried bed of a stream, 26.IX.1999. — 86a: *MH 4049*, on decayed part of a living *Prunus*, 25.IX.1999. — 88a: *MH 4061, 4066, 4067*, on decayed wood, 28.IX.1999. — 91: *MH 4073*, on decayed trunk of a broad-leaved tree, 29.IX.1999.

DISTRIBUTION in China: Reported from Fujian, Guangdong, Guangxi, Heilongjiang, Hebei, Hong Kong, Hubei, Inner Mongolia, Jilin, Liaoning, Shaanxi, Shandong, Yunnan, and Taiwan. New to Hunan.

Hemitrichia clavata (Pers.) Rostaf. — 17c: *MH 4015*, on a big log lying on the ground, 17.IX.1999. — 55c: *TU 985, 987*, on decayed trunk lying in bed of a dried stream, 26.IX.1999. — 88b: *TU 994*, on decayed wood; *TU 997, 998*, on a big, decayed trunk, 28.IX.1999.

DISTRIBUTION in China: Widely distributed.

Hemitrichia minor G. Lister var. *pardina* Minakata ex G. Lister — 86b: *TU 1219*, bmc *Rhus chinensis*, 7.I.2000.

DISTRIBUTION in China: Earlier record from Taiwan. The nominate variety has been reported from Jilin, Hong Kong and Xizang (Tibet).

Hemitrichia serpula (Scop.) Rostaf. — 17c: *MH 4022*, on a small twig, 17.IX.1999. — 18a: *MH 4034, 4037*, on decayed trunk lying on the ground; *MH 4040, TU 966*, on decayed wood, 23.IX.1999. — 55c: *MH 4056*, on bark of a dead branch of a living *Prunus pseudocerasus*; *MH*

4058, on loose bark and wood of a big, decayed trunk; *TU 984*, on decayed trunk lying in bed of a dried stream, 26.IX.1999. — 83: *TU 963*, on decayed wood, 19.IX.1999. — 88a: *MH 4070*, on trunk of a living tree, 28.IX.1999. — 91: *MH 4072*, on decayed trunk, 29.IX.1999.

DISTRIBUTION in China: Reported from many parts in China.

Lamproderma arcyrionema Rostaf. — 18a: *MH 4041*, on decayed wood, 23.IX.1999. — 88a: *MH 4071*, on lower surface of a big log, 28.IX.1999.

DISTRIBUTION in China: Earlier records from Guangdong, Guangxi, Hainan, Jilin, and from Taiwan. New to Hunan.

Licea biforis Morgan — 55d: *TU 1241*, bmc *Fagus lucida*, 12.I.2000. — 81: *TU 1126*, bmc *Betula luminifera*, 12.XI.1999.

DISTRIBUTION in China: Reported from Fujian, Heilongjiang, Hubei, and from Taiwan. New to Hunan.

Licea erecta Thind. & Dhillon var. *erecta* — 55d: *TU 1221*, bmc *Fagus lucida*, 7.I.2000. — 86b: *TU 1251*, bmc *Cephalotaxus* sp., 14.I.2000.

DISTRIBUTION in China: Reported from Taiwan. *Licea erecta* var. *erectoides* (Nann.-Bremek. & Y. Yamam.) Y. Yamam. has been reported from Fujian, (from Kinmen Islands), Hong Kong and Taiwan (as a separate species: *Licea erectoides* Nann.-Bremek. & Y. Yamam.).

Licea kleistobolus G. W. Martin — 18a: *TU 1118B*, bmc *Cunninghamia lanceolata*, 8.XI.1999. — 81: *TU 1124*, bmc *C. lanceolata*, 12.XI.1999; *TU 1146*, bmc *Quercus glandulifera* var. *brevipetiolata*, 15.XI.1999. — 85: *TU 1230*, 10.I.2000, *TU 1274*, 1.II.2000, bmc *Cryptomeria fortunei*.

DISTRIBUTION in China: Earlier records from Fujian (from Matsu Islands), Hong Kong, and from Taiwan. New to Hunan.

Licea minima Fr. — 55d: *TU 1259*, bmc *Cunninghamia lanceolata*, 17.I.2000.

DISTRIBUTION in China: Earlier records are from Jilin province and Taiwan. New to Hunan.

Licea operculata (Wingate) G. W. Martin — 17c: *TU 1006*, on bark of living *Metasequoia glyptostroboides* (detected before wetting a moist chamber culture), 17.IX.1999; *TU 1028*, bmc *M. glyptostroboides*, 27.X.1999; *TU 1074*, 2.XI.1999,

TU 1179, bmc *Sassafras tzumu*, 26.XI.1999; TU 1129, bmc *Liriodendron chinense*, 12.XI.1999. — 80: TU 1044, 27.X.1999, TU 1097, 8.XI.1999, bmc *Choerospondias axillaris*. — 81: TU 1023B, bmc *Fagus lucida*, 27.X.1999; TU 1066, bmc *Betula luminifera*, 2.XI.1999. — 84: TU 1084, bmc *Carya hunanensis*, 2.XI.1999; TU 1085, bmc unidentified broad-leaf tree, 2.XI.1999. — 86b: TU 1228, bmc *Cephalotaxus sinensis*, 10.I.2000; TU 1271, bmc *M. glyptostroboides*, 1.II.2000. — 88b: TU 1215, bmc *Cladrastis wilsonii*, 5.I.2000.

DISTRIBUTION in China: Reported from Fujian, Guangxi, Hong Kong, Hubei, and Taiwan. New to Hunan.

Licea parasitica (Zukal) G. W. Martin — 17c: TU 1073, 25.X.1999, TU 1076, 2.XI.1999, bmc *Sassafras tzumu*. — 18a: TU 1118A, 8.XI.1999, TU 1150, 1151, 15.XI.1999, bmc *Cunninghamia lanceolata*; TU 1171B, bmc *Pinus massoniana*, 12.XI.1999. — 55d: TU 1203, on bark of living *Larix japonica* (detected before wetting a moist chamber culture), 26.IX.1999; TU 1212, bmc *L. japonica*, 5.I.2000. — 80: TU 1176, bmc *C. lanceolata*, 19.XI.1999. — 81: TU 1063, bmc *C. lanceolata*, 29.X.1999; TU 1069, bmc *P. massoniana*, 2.XI.1999. — 83: TU 1081, 2.XI.1999, TU 1109, 8.XI.1999, bmc *Ailanthus altissima*; TU 1110, 8.XI.1999, TU 1180, 12.XI.1999, bmc *C. lanceolata*.

DISTRIBUTION in China: Earlier records are from Fujian (from Matsu Islands) and Taiwan. New to Hunan.

Licea pygmaea (Meyl.) Ing — 18a: TU 969B, on decayed wood, 23.IX.1999.

DISTRIBUTION in China: We have found no earlier records from China.

Licea rugosa Nann.-Bremek. & Y. Yamam. — 83: TU 1083, bmc *Castanea mollissima*, 2.XI.1999.

DISTRIBUTION in China: We have found no earlier records from China. The species was described from Japan (Nannenga-Bremekamp & Yamamoto 1987).

Lycogala epidendrum (L.) Fr. — 55c: TU 982, on a decayed trunk lying in bed of a dried stream, 26.IX.1999. 85: TU 1286, bmc *Cryptomeria fortunei*, 8.II.2000; developed in moist chamber culture after 43 days of incubation.

DISTRIBUTION in China: Widely distributed, but we have found no earlier records from Hunan.

Macbrideola argentea Nann.-Bremek. & Y. Yamam. (Figs. 3 and 4) — 18a: TU 1086C, 2.XI.1999, TU 1197, 17.XII.1999, bmc *Cunninghamia lanceolata*. — 81: TU 1048, bmc *Pinus massoniana*, 29.X.1999. — 89: TU 1090, bmc *P. massoniana*, 2.XI.1999.

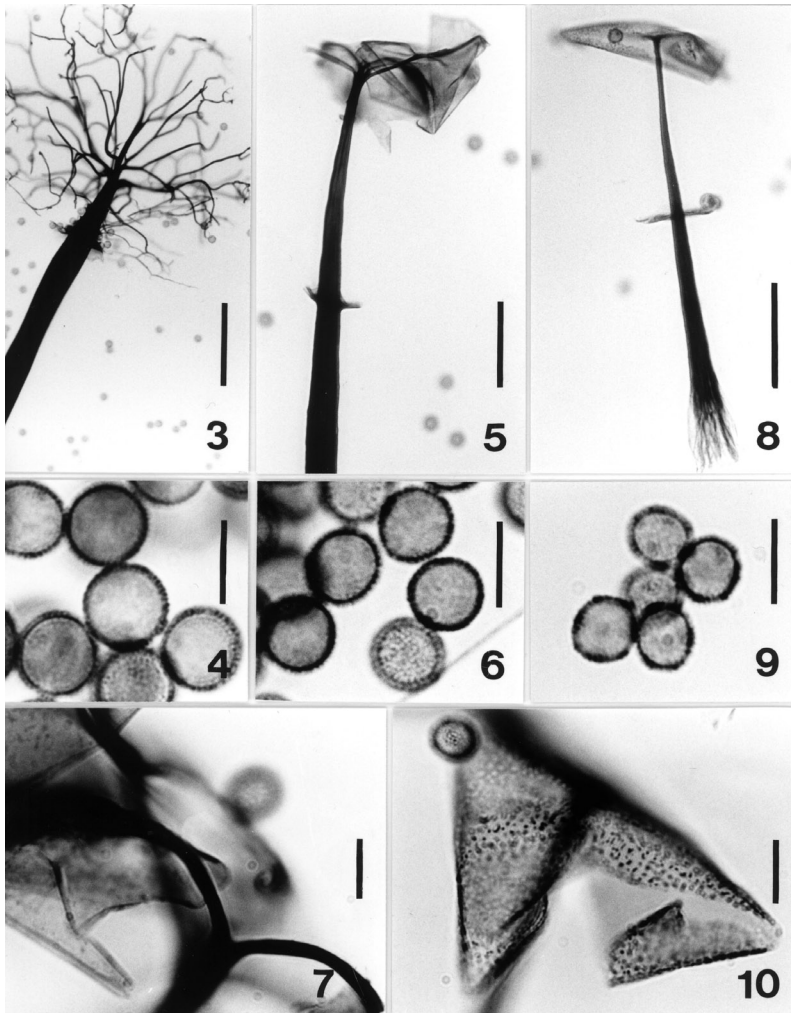
This species has been described from Japan (Nannenga-Bremekamp & Yamamoto 1983). Macroscopically it resembles *Macbrideola scintillans* H. C. Gilbert with shining silvery sporangia and persistent peridium, but the stalks are longer. According to Nannenga-Bremekamp and Yamamoto (1983) it also has some resemblance to *Lamproderma biasperosporum* Kowalski. *Macbrideola argentea* has a fairly lax, delicate, dark capillitium arising from the apex of the columella (Fig. 3). Towards the periphery the capillitial threads branch dichotomously a few times, but have only few anastomoses. The spores are minutely warted, with groups of darker wartlets, resembling the spores of *M. martinii* (Alexop. & Beneke) Alexop. (Fig. 4). *M. martinii* is also a delicate species with a lax (but somewhat scantier) capillitium arising from the tip of the columella, but the sporangia are usually somewhat shorter, and have a totally evanescent peridium. In the original description of *M. argentea* the diameter of the sporotheca is said to be ca. 0.1 mm, the stalk is 3/4–4/5 of the total height (0.5–1.0 mm), and the spores are 7–8.5 µm in diameter (Nannenga-Bremekamp & Yamamoto 1983). In the Chinese specimens the diameter of the sporotheca is up to 0.3 mm, and the spores are 7.5–9 µm.

The holotype of *Macbrideola argentea* grew on bark of living *Cryptomeria japonica* in moist chamber culture, other specimens studied on bark of living *Pinus thunbergii* (Nannenga-Bremekamp & Yamamoto 1983). The Chinese specimens also preferred coniferous trees: *Cunninghamia lanceolata* and *Pinus massoniana*.

DISTRIBUTION in China: We have found no earlier records from China.

Macbrideola scintillans (H. C. Gilbert) var. *scintillans* (Figs. 5–7) — 82: TU 1011, on bark of living *Liquidambar formosana* (detected before wetting a moist chamber culture), 18.IX.1999; TU 1031, bmc *L. formosana*, 27.X.1999.

Both collections originate from the same



Figs. 3–10. Compound microscope photos of some taxa of genus *Macbrideola*. — **3:** *Macbrideola argentea* (TU 1137) the head of a sporangium after the peridium has evanesced, bar = 100 μm . — **4:** *Macbrideola argentea* (TU 1137) some minutely warted spores with clusters of darker warts, bar = 10 μm . — **5:** *Macbrideola scintillans* var. *scintillans* (TU 1101) a sporangium, bar = 50 μm . — **6:** *Macbrideola scintillans* var. *scintillans* (TU 1101) some minutely warted spores, bar = 10 μm . — **7:** *Macbrideola scintillans* var. *scintillans* (TU 1101) head of a sporangium showing parts of delicately ornamented peridium attached to the capillitial threads which split from the apex of the columella, bar = 10 μm . — **8:** *Macbrideola scintillans* var. *verrucosa* (TU 1103) a sporangium, bar = 50 μm . — **9:** *Macbrideola scintillans* var. *verrucosa* (TU 1103) some minutely spiny spores with groups of darker spines, bar = 10 μm . — **10:** *Macbrideola scintillans* var. *verrucosa* (TU 1103) head of a sporangium with remnants of distinctly warted peridium, bar = 10 μm .

moist chamber culture, but are considered as separate specimens, since one (TU 1011) is actually a field collection, and the other developed after five days of incubation.

DISTRIBUTION in China: We have found no earlier records of *Macbrideola scintillans* var. *scintillans* from China.

Macbrideola scintillans var. *verrucosa* (Nann.-Bremek. & Y. Yamam.) Y. Yamam. (Figs. 8–10) — 81: TU 1103, bmc *Castanea* sp., 8. XI.1999. — 83: TU 1112, bmc *Pterocarya stenoptera*, 8. XI.1999.

Originally this taxon was described as a separate species, *Macbrideola verrucosa* Nann.-

Bremek. & Y. Yamam. (Nannenga-Bremekamp & Yamamoto 1983), but Yamamoto (1998) nowadays considers the taxon as a variety of *Macbrideola scintillans*. It differs from the nominate variety in the somewhat longer stalks, distinctly warted peridium (Fig. 10), and minutely spinulose spores, with groups of closely placed spinules (Fig. 9) (Nannenga-Bremekamp & Yamamoto 1983).

DISTRIBUTION in China: No earlier records.

Paradiacheopsis fimbriata (G. Lister & Gran.) Hertel var. ***penicillata*** (Nann.-Bremek. & Y. Yamam.) Y. Yamam. — 81: *TU 1062*, bmc *Cunninghamia lanceolata*, 2.XI.1999.

Originally this taxon was described as a separate species, *Comatricha penicillata* Nann.-Bremek. & Y. Yamam. (Nannenga-Bremekamp & Yamamoto 1983), but Yamamoto (1998) nowadays considers the taxon as a variety of *Paradiacheopsis fimbriata*. It differs from the nominate variety in the columella not ending abruptly, the more brushlike capillitium with less strongly swollen capillitial tips, and in smaller spores, 7–8.5 µm in diameter (Nannenga-Bremekamp & Yamamoto 1983).

DISTRIBUTION in China: We have found no earlier records of var. *penicillata* or the nominate variety from mainland China, var. *fimbriata* has been reported from Taiwan.

Paradiacheopsis longipes Hoof & Nann.-Bremek. — 17c: *TU 1131*, bmc *Sassafras tzumu*, 12.XI.1999. — 18a: *TU 1167B*, bmc *Pinus massoniana*, 29.XI.1999. — 86a: *TU 1252B*, bmc *Cryptomeria fortunei*, 14.I.2000.

DISTRIBUTION in China: New to China.

Paradiacheopsis solitaria (Nann.-Bremek.) Nann.-Bremek. — 17c: *TU 1077*, bmc *Sassafras tzumu*, 2.XI.1999. — 55d: *TU 1244*, bmc *Larix japonica*, 12.I.2000. — 83: *TU 1954*, 29.X.1999, *TU 1111*, 8.XI.1999, bmc *Ailanthus altissima*.

The spores of *Paradiacheopsis solitaria* are minutely warted or spinulose; in the Chinese specimens listed above they are clearly spiny. Other characters fit *P. solitaria* best, although the capillitium in some specimens is scantier than that of a typical *solitaria*. *Paradiacheopsis acanthodes* (Alexop.) Nann.-Bremek., ex Nann.-Bremek. & Y. Yamam., has coarsely spiny

spores and a much scantier capillitium (Martin & Alexopoulos 1969). *Paradiacheopsis cribrata* Nann.-Bremek. has spores with spines about 1 µm long, but the capillitium forms a fragmentary net on the surface of the sporangia (Nannenga-Bremekamp 1991).

DISTRIBUTION in China: The species has been reported (as *Comatricha solitaria* Nann.-Bremek.) from China earlier (Chen et al. 1995), but the province is not mentioned (probably Jilin).

Perichaena chrysosperma (Curr.) Lister — 17c: *TU 1194*, bmc *Pterocarya stenoptera*, 15.XI.1999. — 55d: *TU 1275*, bmc *Fagus lucida*, 1.II.2000; *TU 1296*, bmc *Davidia involucrata*, 28.II.2000. — 80: *TU 1158*, bmc *Choerospondias axillaris*, 15.XI.1999. — 83: *TU 1181*, 1139, bmc *Carya hunanensis*, 12.XI.1999. — 86b: *TU 1290*, bmc *Metasequoia glyptostroboides*, 8.II.2000. — 88b: *TU 1223*, bmc *Cladrastis wilsonii*, 7.I.2000; *TU 1288*, bmc *Pterostyrax psilophylla*, 4.II.2000.

DISTRIBUTION in China: Reported from Fujian, Guangxi, Hainan, Hong Kong, Hunan, Jilin, Shanxi, and from Taiwan.

Perichaena* cf. *chrysosperma (Curr.) Lister — 55c: *TU 1237*, bmc *Tapiscia sinensis*. — 90: *TU 1279*, bmc *Castanea mollissima*, 10.I.2000.

In specimen *TU 1237* the outer peridium is wrinkled and marked by dark lines, forming a reticulate pattern, or is nearly smooth. This is not rare in *Perichaena chrysosperma* (see Martin & Alexopoulos 1969, Ing 1999), and is also shown in some Chinese specimens representing typical *P. chrysosperma*. The other atypical specimen (*TU 1279*) has clearer plates in the peridium, dehiscing along the margins of the plates. The capillitial threads of both specimens are 1.5–2 µm in diameter, with some swellings, ornamented by warts and short spines; spores are minutely spiny, 9–11 µm in diameter. The capillitium of *P. chrysosperma* is usually ornamented with long spines, occasionally with minute spines. *Perichaena tessellata* G. Lister has an outer peridium breaking up into platelets, but in the Chinese specimen the plates are not so distinct, and the general appearance resembles that of *P. chrysosperma*.

Perichaena corticalis (Batsch) Rostaf var. ***corticalis*** — 80: *TU 1008*, on bark of living *Liqui-*

dambar formosana (detected before wetting a moist chamber culture), 15.IX.1999.

A scanty specimen existing only as a permanent slide.

DISTRIBUTION in China: Earlier records from Jilin, Guangxi, and from Taiwan. New to Hunan.

Perichaena depressa Lib. — 55c: *TU 1204*, on bark of living *Cyclobalanopsis multinervis* (detected before wetting a moist chamber culture), 26.IX.1999. — 80: *TU 1198*, bmc an unidentified species of *Styracaceae*, 17.XII.1999.

DISTRIBUTION in China: Earlier records from Fujian, Guangxi, Heilongjiang, Jilin, Liaoning, Yunnan, and from Taiwan. New to Hunan.

Physarella oblonga (Berk. & M. A. Curtis) Morgan — 17c: *TU 955*, on big, decayed trunk lying on the ground, 17.IX.1999.

DISTRIBUTION in China: Earlier records from Beijing, Fujian, Guangdong, Hong Kong, Jilin, and Taiwan. New to Hunan.

Physarum* cf. *auriscalpium Cooke — 86b: *TU 1257*, bmc *Rhus chinensis*, 17.I.2000.

The Chinese specimen has sessile to nearly sessile sporangia and short plamodiocarps, yellow to greenish-yellow in colour when fresh, fading to pale yellowish brown. The peridium is thickly covered with lime scales. Calcareous granules in the capillitium are white to cream-white, fairly small, angular or elongated in shape. The spores are dark brown in mass, fairly pale brown in transmitted light, minutely warted, (7–)8–8.5–9(–10) μm in diameter. According to Martin and Alexopoulos (1969) the spores of *Physarum auriscalpium* are pale to rather dark brown in transmitted light, roughened to minutely warted, (8–)9–12(–13) μm in diameter. *Physarum decipiens* M. A. Curtis has spinulose spores, 10–13 μm in diameter, *P. lakhanpalii* Nann.-Bremek. & Y. Yamam. has spiny, clustered spores, and *P. serpula* Morgan has dark spores with a paler and smoother area, ornamented with minute warts or spines, 10–13 μm in diameter. The Chinese specimen seems to be closest to *P. auriscalpium*, but the spores are too small to fit the description of this species perfectly.

DISTRIBUTION in China: *Physarum auriscalpium* has been reported from China (Chen *et al.* 1995), but the

province is not mentioned (probably Jilin).

Physarum compressum Alb. & Schwein. — 88a: *TU 1298*, bmc *Phellodendron chinense*, 6.III.2000.

DISTRIBUTION in China: Reported from Fujian (also from Matsu Islands), Hainan, Heilongjiang, Hebei, Hong Kong, Jiangsu, Jilin, Liaoning, Macau, Shanxi, and from Taiwan. New to Hunan.

Physarum lakhanpalii Nann.-Bremek. & Y. Yamam. — 83: *TU 1185*, bmc *Liquidambar formosana*, 29.XI.1999.

A scanty specimen existing only as a permanent slide.

DISTRIBUTION in China: Reported from Hong Kong and Taiwan. New to Hunan.

Physarum melleum (Berk. & Broome) Masee — 18a: *TU 972*, on decayed trunk lying on the bottom of a dried stream, 23.IX.1999. — 55d: *TU 1293*, bmc *Fagus lucida*, 15.II.2000. — 83: *TU 1140*, bmc *Carya hunanensis*, 29.X.1999.

DISTRIBUTION in China: Reported from Anhui, Fujian (also from Matsu Islands), Guangxi, Hong Kong, Jiangsu, Sichuan, Yunnan, and from Taiwan. New to Hunan.

Physarum* cf. *nucleatum Rex — 85: *TU 1254*, bmc *Cryptomeria fortunei*, 14.I.2000.

In this scanty specimen (from Hubei Province) the capillitial lime is not aggregated into a central ball. The straw-yellow stalks, peridium thinly covered with white lime granules, the base persisting as a plate, and the pale, small (6–8.5 μm), very minutely warted spores are close to *Physarum nucleatum*.

DISTRIBUTION in China: *Physarum nucleatum* has earlier been reported from Fujian, Guangxi, Jiangsu, Liaoning, and from Taiwan.

Physarum nutans Pers. — 17c: *MH 4019*, on decayed wood, 17.IX.1999. — 18a: *TU 969A*, 978, on decayed wood; *TU 976*, on a big *Pinus massoniana* trunk lying on the ground, 23.IX.1999. — 80: *TU 943* & *JR*, on decayed wood, 15.IX.1999. — 82: *TU 1080*, bmc *Pinus massoniana*, 2.XI.1999. — 86a: *MH 4048*, on decayed wood, 25.IX.1999. — 86b: *TU 1272*, bmc *Cephalotaxus* sp., 1.II.2000. — 87: *TU 992* & *JR*, on decayed wood, 27.IX.1999. — 88a: *MH 4064*, on decayed, moss-covered wood; *TU 1000*, on decayed trunk, 28.IX.1999. — 90: *MH 4044* & *JR*, on bark of living *Pinus massoniana*, 24.IX.1999.

DISTRIBUTION in China: Reported from Beijing, Fujian (also from Matsu Islands), Guangdong, Guangxi, Hebei, Hong Kong, Jiangsu, Jilin, Liaoning, Matsu Islands, Sichuan, and from Taiwan. New to Hunan.

Physarum penetrale Rex — 55c: *TU 980*, on decayed trunk lying in bed of a dried stream, 26.IX.1999.

DISTRIBUTION in China: Earlier records are from Fujian and Taiwan. New to Hunan.

Physarum pusillum (Berk. & M. A. Curtis) G. Lister — 80: *TU 1196*, bmc *Styracaceae*, 17.XII.1999. — 81: *TU 1159*, bmc *Choerospondias axillaris*, 18.XI.1999. — 88a: *TU 999*, on moss-covered bark of a living broad-leaf tree, 28.IX.1999.

DISTRIBUTION in China: Reported from Fujian, Guangxi, Heilongjiang, Hebei, Jilin, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang, and from Taiwan. New to Hunan.

Physarum roseum Berk. & Br. — 84: *TU 1166*, bmc *Carya hunanensis*, 18.XI.1999. — 88a: *TU 1277*, bmc *Lindera erythrocarpa*, 1.II.2000.

Physarum roseum is close to *Physarum pulcherrimum* Berk. & Rav., and according to Martin and Alexopoulos (1969) the two species probably should be united. The scanty Chinese material is identified as *P. roseum* on the basis of the following characters: stalks limeless, no columella, calcareous granules in the capillitium angular in shape, lime on the peridium bright purplish red. The spores are dark brown in mass, brown in transmitted light, minutely warted with groups of darker warts, 7–8.5 µm in diameter.

DISTRIBUTION in China: Teng (1996) includes this species in his key of *Physarum* species in China. The portion of his manuscript containing the description and collecting localities of *Physarum roseum* has been lost, so we do not know for sure whether this species has previously been collected from Hunan Province. Emoto (1933) reports it from the present Liaoning Province, Li and Li (1989) from Fujian and Guangdong, Chen (1999) from Guangxi (a neighbouring province to Hunan), and Chung and Tzean (1998), and Chung (1999) from Taiwan.

Physarum tenerum Rex — 17c: *MH 4010A*, on a big log lying on the ground, 17.IX.1999. — 87: *TU 991* & *JR*, on decayed wood, 27.IX.1999.

DISTRIBUTION in China: Earlier records from Guangdong, Hainan, Jiangsu and Jilin, and from Taiwan. New to Hunan.

Physarum viride (Bull.) Pers. — 17c: *MH 4014*, *4017*, on decayed wood; *TU 948*, on decayed twig, 17.IX.1999. — 18a: *TU 975* & *JR*, on decayed trunk lying on the bottom of a dried stream, 23.IX.1999. — 80: *MH 4005*, *TU 942*, on decayed wood, 15.IX.1999. — 83: *MH 4031*, on decayed wood, 19.IX.1999. — 84: *MH 4033*, on decayed trunk lying on the ground, 20.IX.1999. — 91: *MH 4074*, *4075*, on a big log of *Liquidambar formosana*, 29.IX.1999.

Our collections include two colour forms: *aurantium* and *viride*.

DISTRIBUTION in China: Reported from Anhui, Beijing, Fujian, Guangxi, Hainan, Heilongjiang, Hebei, Hong Kong, Hunan, Jilin, Liaoning, Sichuan, Yunnan, Zhejiang, and from Taiwan.

Reticularia splendens Morgan var. *jurana* (Meyl.) Kowalski (*Enteridium splendens* (Morgan) T. Macbr. var. *juranum* (Meyl.) Härk.) — 18a: *MH 4039*, on decayed wood, 23.IX.1999.

Farr (1976) considered *Reticularia* Bull. as a later homonym of *Reticularia* Baumg. (lichens), and proposed its replacement with *Enteridium* Ehrenb., the next available generic name. Lado et al. (1998) have recently further clarified the taxonomical status of *Reticularia* (Bull.), and according to them it was validly published by 1788 and has priority over *Reticularia* Baumg. published in 1790. Lado and Pando (1998) have proposed the conservation of the name *Reticularia* Bull. with a conserved type.

DISTRIBUTION in China: Earlier record from Guangxi. New to Hunan.

Stemonitis axifera (Bull.) T. Macbr. — 17c: *MH 4012*, on well-decayed wood; *MH 4024*, on decayed wood, 17.IX.1999. — 18a: *TU 971*, on decayed trunk lying on the bottom of a dried stream, 23.IX.1999. — 84: *MH 4032*, on decayed trunk lying on the ground, 20.IX.1999.

DISTRIBUTION in China: Reported from many parts in China, but we have found no earlier records from Hunan.

Stemonitis fusca Roth — 17c: *TU 951*, on a rotten stump; *TU 958*, on a big, decayed log lying on the ground, 17.IX.1999.

DISTRIBUTION in China: Reported from many parts in China, but we have found no earlier records from Hunan. Teng (1996) separates var. *rufescens* Lister, which he reports from Anhui, Fujian, Gansu, Hainan, Hebei, Jiang-

su, Qinghai, Shanxi, Sichuan, and Zhejiang.

Stemonitis pallida Wingate — 18a: *TU 973 & JR*, on decayed wood, 23.IX.1999. — 84: *MH 4028B & JR*, on decayed wood, 18.IX.1999.

DISTRIBUTION in China: Earlier records from Fujian, Guangxi, Hainan, Jilin, Liaoning, Xizang (Tibet), Yunnan, and Taiwan. New to Hunan.

Stemonitis smithii T. Macbr. — 55c: *TU 983*, on decayed trunk lying in bed of a dried stream, 26.IX.1999. — 83: *MH 4030*, on decayed wood, 19.IX.1999.

DISTRIBUTION in China: Earlier records from Anhui, Fujian, Guangxi, Heilongjiang, Jilin, Yunnan, and Taiwan. New to Hunan.

Stemonitis splendens Rostaf. — 80: *MH 4004*, on a decaying log lying on the ground; *TU 941*, on decayed wood, 15.IX.1999. — 86a: *MH 4047*, on decayed wood, 25.IX.1999. — 84: *MH 4028A & JR*, on a hard-wood stump, 18.IX.1999.

DISTRIBUTION in China: Widely distributed.

Stemonitopsis gracilis (G. Lister) Nann.-Bremek. — 17c: *MH 4021, TU 952*, on decayed wood, 17.IX.1999. — 80: *MH 4002*, on decayed wood, 15.IX.1999.

DISTRIBUTION in China: Earlier records from Hong Kong, Fujian (from Matsu Islands), and from Taiwan. New to Hunan.

Stemonitopsis typhina (F. H. Wigg.) Nann.-Bremek. — 17c: *MH 4007*, on a big, decayed trunk lying on the ground; *MH 4016A, 4018A*, on decayed wood; *TU 959B, 960B*, on well-decayed wood, 17.IX.1999. — 86a: *MH 4015*, on lower surface of a big trunk lying by a brook, 25.IX.1999.

DISTRIBUTION in China: Reported from Fujian, Guangxi, Hainan, Hebei, Heilongjiang, Hong Kong, Inner Mongolia, Jiangsu, Jilin, Shaanxi, Shanxi, Yunnan, and from Taiwan. New to Hunan.

Symphycarpus flaccidus (Lister) Ing & Nann.-Bremek. — 88a: *MH 4068*, on trunk of a living broad-leaved tree, 28.IX.1999.

DISTRIBUTION in China: Earlier records are from Heilongjiang and Taiwan (reported as *Stemonitis splendens* var. *flaccida* Lister).

Trichia botrytis (J. F. Gmel.) Pers. — 18a: *TU 1195*, bmc *Pinus massoniana*, 17.XII.1999. —

55d: *TU 1287*, bmc *Larix japonica*, 8.II.2000. — 81: *TU 1161*, bmc *P. massoniana*, 18.XI.1999. — 83: *TU 1188*, bmc *Ailanthus altissima*, 3.XII.1999. — 85: *TU 1266*, bmc *Cryptomeria fortunei*, 24.I.2000. — 88b: *MH 4060*, on decayed wood, 28.IX.1999. — 91: *TU 1264*, bmc *C. fortunei*, 19.I.2000.

DISTRIBUTION in China: Reported from Anhui, Fujian, Guangxi, Hubei, Inner Mongolia, Jilin, Liaoning, Sichuan, and from Taiwan. New to Hunan.

Trichia favoginea (Batsch) Pers. emend. M. L. Farr — 18a: *TU 974 & JR*, on decayed trunk lying on the bottom of a dried stream, 23.IX.1999. — 55c: *TU 986*, on decayed trunk lying in bed of a dried stream, 26.IX.1999.

Farr (1958) considers *Trichia affinis* de Bary and *T. persimilis* P. Karst. as synonyms of *T. favoginea* (Batch) Pers., and Martin and Alexopoulos (1969) agree with her, but Neubert *et al.* (1993) and Ing (1999) consider them as separate species. According to Nannenga-Bremekamp (1991) the typical forms are clear enough, and the European specimens are separable to *Trichia affinis*, *T. favoginea* and *T. persimilis*. Nannenga-Bremekamp (1991), however, lists *T. affinis* and *T. persimilis* as synonyms under *T. favoginea*. In the two specimens from Hunan the spore ornamentation suggests *T. favoginea* and *T. affinis*, the spiny capillitium *T. persimilis*. The distribution records listed below include *T. affinis*, *T. favoginea*, and *T. persimilis*.

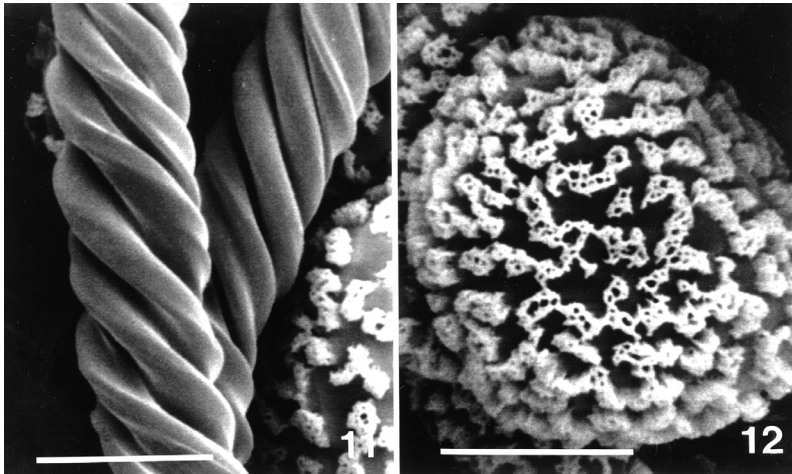
DISTRIBUTION in China: Earlier records from Anhui (as *Trichia favoginea*), Guangxi (*T. favoginea* with notice that some specimens seem to represent *T. affinis* or *T. persimilis*), Heilongjiang (*T. affinis*, *T. favoginea* and *T. persimilis*), Hebei (*T. favoginea* and *T. persimilis*), Hunan (*T. persimilis*), Jiangsu (*T. affinis* and *T. persimilis*), Liaoning (*T. affinis*), Qinghai (*T. affinis*), Shanxi (*T. affinis*), Sichuan (*T. favoginea*), Yunnan (*T. affinis* and as *T. favoginea* var. *persimilis* (P. Karst.) Y. Yamam.), and from Taiwan (*T. affinis* and *T. favoginea*).

Trichia lutescens (Lister) Lister — 88a: *MH 4065A*, on a big, decayed trunk, 28.IX.1999.

A scanty specimen, existing only as a permanent slide.

DISTRIBUTION in China: Earlier records from Hebei and Jilin. New to Hunan.

Trichia munda (Lister) Meyl. — 86b: *TU 1294*, bmc *Castanea mollissima*, 15.II.2000.



Figs. 11 and 12. SEM micrographs of *Trichia* cf. *subretisporum* (TU 1174). — 11: Parts of two smooth capillitial threads and part of a spore, bar = 5 μ m. — 12: One spore, bar = 5 μ m.

This species differs from *Trichia botrytis* in smaller sporangia, shorter tips of the elaters, and deep yellow capillitium and spore-mass. Martin and Alexopoulos (1969) consider it to be a variety of *Trichia botrytis*.

DISTRIBUTION in China: No earlier records from China, but possibly not separated from *Trichia botrytis*.

Trichia subfusca Rex — 81: TU 1145, bmc *Quercus glandulifera* var. *brevipetiolata*, 15.XI.1999.

A scanty specimen existing only as a permanent slide.

DISTRIBUTION in China: Earlier record from Jilin. New to Hunan.

Trichia* cf. *subretisporum T. N. Lakh. & Mukerji (Figs. 11 and 12) — 17c: TU 1174, bmc *Metasequoia gluptostroboides*, 18.XI.1999.

Trichia subretisporum has sessile, subglobose or annulate sporangia, constricted at the base, olivaceous yellow or brownish yellow in colour, the peridium is single, membranous, subcartilaginous in mounts, the capillitial elaters are 7–7.5 μ m in diameter, smooth, bearing a bulbous swelling near the apex but tapering into a slender tip beyond the swelling, the spores are yellow in mass, warted with long warts arranged in lines and in a subreticulate pattern, 9–12 μ m in diameter (Lakhanpal and Mukerji 1979, 1981). The Chinese specimen has sessile to very short stalked, subglobose, ochraceous yellow sporangia with a thin, membranous lower peridium, thicker at the apex. The capillitial threads are 4–5 μ m in diameter without bulbous swellings,

and with fairly short, gradually tapering, slender tips. The spores are 10–11.5 μ m in diameter and ornamented like those of *T. subretisporum* (Figs. 11 and 12). *Trichia lutescens* (Lister) Lister differs from our specimen in having capillitial threads with short, blunt or swollen ends, and with warted, slightly larger spores. The SEM micrographs showing the spores of *T. lutescens* in Neubert *et al.* (1993) show an ornamentation of warts and only a few elongated warts, differing from the ornamentation of the spores of the Chinese specimen (Fig. 12). The spore ornamentation of our specimen resembles that of *Trichia decipiens* (Pers.) T. Macbr. var. *olivacea* Meyl., but this taxon has olive-coloured sporangia with clear stalks enclosing round cells. In the very short stalks of some sporangia of the Chinese specimen there are no such cells. The spores of *Trichia decipiens* var. *decipiens* have a clear reticulation over most of the spore surface (Martin and Alexopoulos 1969, Neubert *et al.* 1993).

DISTRIBUTION in China: We have found no records of *Trichia subretisporum* from China.

Discussion

Number of taxa

This study reports 76 taxa new to Hunan Province, including 13 taxa new to China. The following species, which we did not find during

our expedition, have been reported previously from Hunan: *Diderma spumarioides* (Teng & Teng 1937, Li & Li 1989, Teng 1996), *Lycogala exiguum* (as *L. epidendrum* (L.) Fr. var. *tessellatum* Lister) (Teng 1996), *Trichia scabra* (Teng & Teng 1937, Li & Li 1986, Teng 1996), and *T. varia* (Li & Li 1989). The number of myxomycete species reported from Hunan now totals 90.

The moist chamber cultures produced seven unidentified species of *Licea* which are not listed in this paper. One of these is an abundant specimen representing possibly an undescribed species. Part of this specimen was kindly studied by Mr. Yukinori Yamamoto (Kochi-shi, Japan) since the Chinese species somewhat resembled *Licea kellerii* Nann.-Bremek. & Y. Yamam., described from Japan (Nannenga-Bremekamp and Yamamoto 1983). The Chinese *Licea* species developed only in one moist chamber culture prepared with bark of living *Castanea sequinii* collected from Zhangjiajie (collecting locality 83). The rest of the *Licea* species not listed here are scanty specimens of one to five sporangia. None of these, however, seem to fit any known species. We hope to get more material during the two forthcoming expeditions.

The field collections

Most of our field collections grew on decayed wood, only a few specimens originated from

litter. According to the local people year 1999 was exceptionally dry in the visited areas. It is, however, surprising that we found so few slime moulds on plant debris, since we intensively checked e.g. damp litter lying in the beds of dried streams. The number of taxa collected in the field in Zhangjiajie was 27, the corresponding figure in Badagongshan was 30.

The productivity of moist chamber cultures

The number of developed specimens compared to the number of petri dishes prepared with bark of living trees was high (Table 1). It was exceptionally high in the material collected from Zhangjiajie National Forest Park: 171%. The total productivity was even higher, since the above figure includes only properly developed, mature specimens that were identified to species level. If immature specimens, specimens consisting only of one or two puzzling sporocarps and identified only to genus level, and plasmodia that transformed into sclerotia or died during the two months' incubation period are included, the productivity was as high as 196% for Zhangjiajie. Only 5% of the cultures prepared produced no myxomycete stages.

The productivity of bark cultures prepared with material collected from Badagongshan National Nature Reserve was much lower: 79%,

Table 1. The productivity of 200 moist chamber cultures prepared with bark of living trees collected from China in September 1999. The total productivity includes all stages of myxomycetes (including plasmodia that produced no mature fructifications, immature sporocarps, and specimens identified only to genus level). The number of identified taxa only includes specimens identified to species level; mc means specimens or taxa developed in moist chamber cultures.

| | Zhangjiajie | Badagongshan | Total |
|--|-------------|---------------|-------|
| Total productivity of moist chamber cultures | 196% | 114% | 155% |
| Number of mc-specimens listed in in this paper | 171 | 79 | 250 |
| Number of mc-taxa listed in this paper | 41 | 41 | 54 |
| Number of conifer bark cultivations | 54 | 34 | 88 |
| Total productivity of conifer cultivations | 200% | 144% | 178% |
| Number of identified taxa of conifer bark cultivations | 23 | 24 | 30 |
| Number of broad-leaf tree bark cultivations | 46 | 66 | 112 |
| Total productivity of b-l. bark cultivations | 191% | 98% | 136% |
| Number of identified taxa of broad-leaf tree bark cultivations | 29 | 22 | 41 |
| pH range of conifer bark cultivations | 3.0–5.0 | 3.5–5.0(–6.0) | |
| pH range of broad-leaf tree bark cultivations | 4.0–8.0 | 4.0–8.0 | |

the total productivity (including immature and scanty, puzzling specimens and died or sclerotized plasmodia) being 114%. Twenty-five percent of the cultures prepared produced no myxomycete stages. Since we have made collections in China only once, it is not possible to draw the conclusion, that the forests in Zhangjiajie are richer in corticolous myxomycetes than those of Badagongshan. During our visit there were no significant differences e.g. in rainfall or day temperature between the areas. The nights in Badagongshan, however, were much colder than in Zhangjiajie, because of the higher altitude. In Zhangjiajie we made collections at altitudes of ca. 450 m to 1000 m, in Badagongshan at 1400–1550 metres. In studies in Tanzania (Ukkola 1998c) and Costa Rica (Schnittler & Stephenson 2000) there were similar results in it of corticolous myxomycetes: the abundance decreased with increasing elevation.

Comparison of collecting areas and tree species as substrata of corticolous myxomycetes

In spite of the clear difference in the productivity of moist chamber cultures, there was practically no difference between these areas in species diversity of corticolous myxomycetes: 40 taxa from Zhangjiajie, and 41 from Badagongshan. About half of the taxa identified to species level were the same in both places (28 out of 53). There was much more difference between the species composition on bark of broad-leaved trees (eight identical taxa out of 41) than in bark of coniferous trees (16 identical taxa out of 29). We collected bark from seven coniferous (*Cryptomeria fortunei*, *C. japonica*, *Cunninghamia lanceolata*, *Cupressus funebris*, *Metasequoia glyptostroboides*, *Larix japonica*, *Pinus massoniana*), and from 46 broad-leaved tree species. The conifer tree species from which the bark samples were collected were the same in both places with only two exceptions (bark of *Cupressus funebris* and *Larix japonica* was collected only from Badagongshan), but only a few broad-leaved bark samples were collected from identical tree species in Zhangjiajie and Badagongshan. The trees in Zhangjiajie National

Forest Park are rich in corticolous myxomycetes, but the species diversity from conifers seems to be somewhat lower than that from the broad-leaved trees. In Badagongshan National Nature Reserve the conifers were in general more productive than the angiosperms (as also in Zhangjiajie), and produced also a few more taxa, even though the major part of the moist chamber cultures were prepared with bark of broad-leaved trees (Table 1). There were, however, some angiosperms that were very productive, e.g. one moist chamber culture prepared with bark of living *Fagus lucida* from Badagongshan produced eight different slime mould species.

pH of the substrata

The pH values of the cultures with conifer bark ranged from 3.0 (*Cryptomeria japonica*) to 5.0 (*Metasequoia glyptostroboides* and *Pinus massoniana*), and in one culture to 6.0 (*M. glyptostroboides*) (Table 1). The most common pH value obtained from conifer cultures was between 4.0 and 4.5. *Arcyria cinerea*, *Clastoderma debaryanum*, *Comatricha elegans*, *Cribraria confusa*, *Echinostelium minutum*, and *Licea parasitica* are examples of common myxomycetes on bark of coniferous trees in Hunan Province. The pH values of the cultures with broad-leaved tree bark ranged from 4.0 (*Ailanthus altissima*, *Castanea mollissima*, *Fagus lucida*, and *Sassafras tzumu*) to 8.0 (*Carya hunanensis*, *Fagus lucida*, *Liriodendron chinense*, *Phellodendron chinense*, and *Tapiscia sinensis*), the most common pH value being between 5.0 and 6.5. The species of the order Physarales were more common on bark of broad-leaved trees than on coniferous bark. In some tree species the pH value of the bark varied considerably between different cultures, e.g. in cultures of *Castanea mollissima* (pH 4.0–7.0), *Carya hunanensis* (pH 4.5–8.0), *Fagus lucida* (pH 4.0–8.0), and *Pterocarya stenoptera* (pH 4.5–7.0). The epiphytic lichens and mosses probably partly explain the differences. This matter will be discussed in more detail later, since in September–October 2000 a research group of the Division of Systematic Biology, University of Helsinki began a

joint study of the epiphytich lichens and mosses and corticolous myxomycetes of some selected tree species in Badagongshan National Nature Reserve. The bark morphology and anatomy of the trees will also be investigated.

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