Fungal Diversity
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Fungal diversity notes 1–110: taxonomic and phylogenetic contributions to fungal species

Jian Kui Liu[1,3] · Kevin D. Hyde[1,2,3] · E. B. Gareth Jones[4,16] · Hiran A. Ariyawansa[2,3] · Darbhe J. Bhat[6,7] · Saranyaphat Boonmee[3] · Sajeewa S. N. Maharachchikumbura[1,2,3] · Eric H. C. McKenzie[5] · Rungtiwa Phookamsak[2,3] · Chayanard Phukhamsakda[2,3] · Belle Damodara Shenoy[25] · Mohamed A. Abdel-Wahab[16,17] · Bart Buyck[8] · Jie Chen[3] · K. W. Thilini Chethana[3,10] · Chonticha Singtripop[2,3] · Dong Qin Dai[2,3] · Yu Cheng Dai[9] · Dinushani A. Daranagama[2,3] · Asha J. Dissanayake[3,10] · Mingkwan Doilom[2,3] · Melvina J. D'souza[2,3] · Xin Lei Fan[11] · Ishani D. Goonasekara[3] · Kazuyuki Hirayama[14] · Sinang Hongsanan[2,3] · Subashini C. Jayasiri[3] · Ruvishika S. Jayawardena[2,3,10] · Samantha C. Karunarathna[2,3] · Wen Jing Li[2,3] · Ausana Mapook[2,3] · Chada Norphanphoun[3] · Ka Lai Pang[22] · Rekhani H. Perera[2,3] · Derek Peršoh[23] · Umpava Pinruan[26] · Indunil C. Senanayake[2,3] · Sayanh Somrithipol[26] · Satinee Suetrong[27] · Kazuaki Tanaka[20] · Kasun M. Thambugala[1,2,3] · Qing Tian[2,3] · Saowaluck Tibpromma[3] · Danushka Udayanga[2,3] · Nalin N. Wijayawardene[2,3,29] · Dhanuska Wanasinghe[2,3] · Komsit Wisitrassameewong[3] · Xiang Yu Zeng[3] · Faten A. Abdel-Aziz[17] · Slavomir Adamčík[18] · Ali H. Bahkali[16] · Nattawut Boonyuen[27] · Timur Bulgakov[35] · Philippe Callac[37] · Putarak Chomnunti[2,3] · Katrin Greiner[12] · Akira Hashimoto[13,20] · Valerie Hofstetter[15] · Ji Chuan Kang[30] · David Lewis[19] · Xing Hong Li[10] · Xing Zhong Liu[36] · Zuo Yi Liu[1] · Misato Matsumura[20] · Peter E. Mortimer[2] · Gerhard Rambold[12] · Emile Randrianjohany[24] · Genki Sato[20] · Veera Sri-Indrasutdhi[27] · Cheng Ming Tian[11] · Annemieke Verbeken[28] · Wolfgang von Brackel[21] · Yong Wang[29] · Ting Chi Wen[30] · Jian Chu Xu[31] · Ji Ye Yan[10] · Rui Lin Zhao[36] · Erio Camporesi[32,33,34]

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✉ Zuo Yi Liu
gzliuzuoyi@163.com

[1] Guizhou Key Laboratory of Agricultural Biotechnology, Guizhou Academy of Agricultural Sciences, Guiyang 550006, Guizhou, China

[2] Key Laboratory for Plant Diversity and Biogeography of East Asia, Kunming Institute of Botany, Chinese Academy of Science, Kunming 650201, Yunnan, China

[3] Institute of Excellence in Fungal Research and School of Science, Mae Fah Luang University, Chiang Rai 57100, Thailand

[4] Department of Botany and Microbiology, King Saudi University, Riyadh, Saudi Arabia

[5] Manaaki Whenua Landcare Research, Private Bag 92170, Auckland, New Zealand

[6] Formerly Department of Botany, Goa University, Goa, India

[7] No. 128/1–J, Azad Housing Society, Curca, Goa Velha, India

[8] Muséum national d'histoire naturelle, Dépt. Systématique et évolution, UMR 7205, 75005 Paris, France

[9] Institute of Microbiology & Beijing Key Laboratory for Forest Pest Control, Beijing Forestry University, PO Box 61, Beijing 100083, China

[10] Institute of Plant and Environment Protection, Beijing Academy of Agriculture and Forestry Sciences, No. 9 of Shu Guang Hua Yuan Zhong Lu, Haidian District, Beijing 10097, China

[11] The Key Laboratory for Silviculture and Conservation of Ministry of Education, Beijing Forestry University, Beijing 100083, China

[12] Mycology, University of Bayreuth, Universitätsstraße 30, 95440 Bayreuth, Germany

[13] The United Graduate School of Agricultural Sciences, Iwate University, 18-8 Ueda 3 chome, Morioka 020-8550, Japan

[14] Apple Experiment Station, Aomori Prefectural Agriculture and Forestry Research Center, 24 Fukutami, Botandaira, Kuroishi, Aomori 036-0332, Japan

Abstract This paper is a compilation of notes on 110 fungal taxa, including one new family, 10 new genera, and 76 new species, representing a wide taxonomic and geographic range. The new family, *Paradictyoarthriniaceae* is introduced based on its distinct lineage in Dothideomycetes and its unique morphology. The family is sister to *Biatriosporaceae* and *Roussoellaceae*. The new genera are *Allophaeosphaeria* (*Phaeosphaeriaceae*), *Amphibambusa* (*Amphisphaeriaceae*), *Brunneomycosphaerella* (*Capnodiales* genera *incertae cedis*), *Chaetocapnodium* (*Capnodiaceae*), *Flammeascoma* (*Anteagloniaceae*), *Multiseptospora* (*Pleosporales* genera *incertae cedis*), *Neogaeumannomyces* (*Magnaporthaceae*), *Palmiascoma* (*Bambusicolaceae*), *Paralecia* (*Squamarinaceae*) and *Sarimanas* (*Melanommataceae*). The newly described species are the *Ascomycota Aliquandostipite manochii*, *Allophaeosphaeria dactylidis*, *A. muriformia*, *Alternaria cesenica*, *Amphibambusa bambusicola*, *Amphisphaeria sorbi*, *Annulohypoxylon thailandicum*, *Atrotorquata spartii*, *Brunneomycosphaerella laburni*, *Byssosphaeria musae*, *Camarosporium aborescentis*, *C. aureum*, *C. frutexensis*, *Chaetocapnodium siamensis*, *Chaetothyrium agathis*, *Colletotrichum sedi*, *Conicomyces pseudotransvaalensis*, *Cytospora berberidis*, *C. sibiraeae*, *Diaporthe thunbergiicola*, *Diatrype palmicola*, *Dictyosporium aquaticum*, *D. meiosporum*, *D. thailandicum*, *Didymella cirsii*, *Dinemasporium nelloi*, *Flammeascoma bambusae*, *Kalmusia italica*, *K. spartii*, *Keissleriella sparticola*, *Lauriomyces synnematicus*, *Leptosphaeria ebuli*, *Lophiostoma pseudodictyosporium*, *L. ravennicum*, *Lophiotrema eburnoides*, *Montagnula graminicola*, *Multiseptospora thailandica*, *Myrothecium macrosporum*, *Natantispora unipolaris*, *Neogaeumannomyces bambusicola*, *Neosetophoma clematidis*, *N. italica*, *Oxydothis atypica*, *Palmiascoma gregariascomum*, *Paraconiothyrium nelloi*, *P. thysanolaenae*, *Paradictyoarthrinium tectonicola*, *Paralecia pratorum*, *Paraphaeosphaeria spartii*, *Pestalotiopsis digitalis*, *P. dracontomelon*, *P. italiana*, *Phaeoisaria pseudoclematidis*, *Phragmocapnias philippinensis*, *Pseudocamarosporium cotinae*, *Pseudocercospora tamarindi*, *Pseudotrichia rubriostiolata*, *P. thailandica*, *Psiloglonium multiseptatum*, *Saagaromyces mangrovei*, *Sarimanas pseudofluviatile*, *S. shirakamiense*, *Tothia spartii*, *Trichomerium siamensis*, *Wojnowicia dactylidicola*, *W. dactylidis* and *W. lonicerae*. The *Basidiomycota Agaricus flavicentrus*, *A. hanthanaensis*, *A. parvibicolor*, *A. sodalis*, *Cantharellus luteostipitatus*, *Lactarius atrobrunneus*, *L. politus*, *Phylloporia dependens* and *Russula cortinarioides* are also introduced.

[15] Department of Plant Protection, Agroscope Changins-Wadenswil Research Station ACW, Rte de Duiller, 1260 Nyon, Switzerland

[16] Department of Botany and Microbiology, College of Science, King Saud University, P.O. Box: 2455, Riyadh 1145, Saudi Arabia

[17] Department of Botany, Faculty of Science, Sohag University, Sohag, Egypt

[18] Institute of Botany, Slovak Academy of Sciences, Dúbravská cesta 9, 84523 Bratislava, Slovakia

[19] Hirosaki University, Bleakwood, 262 CR 3062, Newton, Texas 75966, USA

[20] Faculty of Agriculture and Life Sciences, Hirosaki University, 3 Bunkyo-cho, Hirosaki, Aomori 036-8561, Japan

[21] Institute for Vegetation Studies and Landscape Ecology, Georg-Eger-Str. 1b, 91334 Hemhofen, Germany

[22] Institute of Marine Biology and Center of Excellence for the Oceans, National Taiwan Ocean University, 2 Pei-Ning Road, Keelung 20224, Taiwan, Republic of China

[23] Geobotany, Ruhr-Universität Bochum, Universitätsstraße 150, 44780 Bochum, Germany

[24] Centre National de Recherche sur l'Environnement (CNRE), Lab. de Microbiologie de l'Environnement (LME), BP 1739, Antananarivo, Madagascar

[25] CSIR-National Institute of Oceanography, Dona Paula, Goa 403004, India

[26] Microbe Interaction Laboratory, BIOTEC, National Science and Technology Development Agency (NSTDA), 113 Thailand Science Park, Thanon Phahonyothin, Tombon Khlong Nueng, Amphoe Khlong Luang, Pathum Thani 12120, Thailand

[27] Fungal Biodiversity Laboratory, BIOTEC, National Science and Technology Development Agency (NSTDA), 113 Thailand Science Park, Thanon Phahonyothin, Tombon Khlong Nueng, Amphoe Khlong Luang, Pathum Thani 12120, Thailand

[28] Research Group Mycology, Department of Biology, Gent University, K.L. Ledeganckstraat 35, 9000 Gent, Belgium

[29] Department of Plant Pathology, Agriculture College, Guizhou University, Guiyang 550025, People's Republic of China

[30] The Engineering and Research Center of Southwest Bio-Pharmaceutical Resource, Ministry of Education, Guizhou University, Guiyang, Guizhou Province 550025, People's Republic of China

[31] CAS Key Laboratory of Genome Sciences and Information, Beijing Institute of Genomics, Chinese Academy of Sciences, No. 1 Beichen West Road, Chaoyang District, Beijing 100101, People's Republic of China

[32] A.M.B. Gruppo Micologico Forlivese "Antonio Cicognani", Via Roma 18, Forlì, Italy

[33] A.M.B. Circolo Micologico "Giovanni Carini", C.P. 314, Brescia, Italy

[34] Società per gli Studi Naturalistici della Romagna, C.P. 144, Bagnacavallo (RA), Italy

[35] Academy of Biology and Biotechnology (Department of Biological Sciences), Southern Federal University, Stachki str, 344090 Rostov-na-Donu, Russia

[36] The State Key Lab of Mycology, Institute of Microbiology, Chinese Academic of Science, Beijing 100101, China

[37] Mycology and Food Safety Research Unit, INRA, Bordeaux, France

Epitypifications or reference specimens are designated for *Hapalocystis berkeleyi*, *Meliola tamarindi*, *Pallidocercospora acaciigena*, *Phaeosphaeria musae*, *Plenodomus agnitus*, *Psiloglonium colihuae*, *P. sasicola* and *Zasmidium musae* while notes and/or new sequence data are provided for *Annulohypoxylon leptascum*, *A. nitens*, *A. stygium*, *Biscogniauxia marginata*, *Fasciatispora nypae*, *Hypoxylon fendleri*, *H. monticulosum*, *Leptosphaeria doliolum*, *Microsphaeropsis olivacea*, *Neomicrothyrium*, *Paraleptosphaeria nitschkei*, *Phoma medicaginis* and *Saccotheciaceae*. A full description of each species is provided with light micrographs (or drawings). Molecular data is provided for 90 taxa and used to generate phylogenetic trees to establish a natural classification for species.

Keywords Ascomycota · Basidiomycota · Global Taxonomy Initiative · Phylogeny · Taxonomy

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Introduction

The estimated number of described fungi is 100,000 (including 17,500 lichens), but only approximately 1000 new species are described annually (Kirk et al. 2008). The total number of fungi is however, estimated at between 700,000 to 1.5 million species (Hawksworth 1991, 2001; Schmit and Mueller 2007). The majority of the undescribed fungal species are expected to be discovered in poorly studied areas (Hyde et al. 2001), such as in tropical forests or in under-explored habitats, for example living on or in insects, plants or lichens (Hawksworth and Rossman 1997; Fröhlich and Hyde 1999; Taylor et al. 2000a; Sipman and Aptroot 2001; Lawreya and Diederich 2003; Arnold and Lutzoni 2007). Phylogenetic studies are revealing numerous new genera and species (Alves et al. 2004, 2006; Crous et al. 2006, 2009a, b; Phillips and Alves 2009; Phillips et al. 2008, 2013; de-Gruyter et al. 2010; Liu et al. 2011, 2012; Maharachchikumbura et al. 2012). Before molecular phylogenetics, most fungal species have been described based on their morphology and host associations and thus the number of species is understandably underestimated. Phylogenetic studies have distinctly indicated that numerous morphologically similar taxa may be represented as distinct lineages in different families (e.g. *Botryosphaeriaceae*, Liu et al. 2012; *Phaeosphaeriaceae*, Phookamsak et al. 2014; *Didymosphaeriaceae*, Ariyawansa et al. 2014b). Cryptic species of plant pathogens have been shown to comprise several taxa (e.g. *Colletotrichum* Hyde et al. 2009, Sharma et al. 2014, *Pestalotiopsis*, Maharachchikumbura et al. 2011, 2012, 2014, *Diaporthe*, Udayanga et al. 2011, 2012).

Traditionally, systematic study papers and monographic revisions have just one or a few authors, but the aforementioned collaborative initiatives have initiated a mind-shift with a multi-authored, community-wide classification for the fungal kingdom (Hibbett et al. 2007). In addition, the mycological community has several, regularly updated fundamental resources for species and higher level classification and nomenclature available, such as Myconet (http://www.fieldmuseum.org/myconet), Index Fungorum (http://www.indexfungorum.org) and other CABI Bioscience databases, and the Dictionary of the Fungi (Kirk et al. 2008).

Materials and methods

The phylogenetic analyses were performed based on up to date ex-type, ex-epitype or otherwise authentic sequence data available in GenBank as a concerted effort of multiple contributors listed in the authors section. New and reference species were sequenced based on the genomic DNA which was extracted from the fresh mycelium except for lichenized and lichenicolous fungi and fungi not readily cultivatable, specimens in this case were used for direct extraction of DNA. Gene sequences and genetic markers used for each genus were selected based on the current publications and have commonly been used for each of the genera. The single gene sequence alignments were initially aligned with ClustalX2 and improved in MAFFT V. 7.017 (Katoh et al. 2002) and BioEdit 7.0 (Hall 2004). Individual alignments were then concatenated and used to construct the backbone trees of each group listed. The phylogenetic analyses were performed for maximum parsimony in PAUP v. 4.0b10 (Swofford 2002), maximum likelihood in RAxML 7.4.2 Black Box or RAxMl GUI (Stamatakis 2006; Stamatakis et al. 2008), PhyML 3.0 (Guindon et al. 2010) or Bayesian inference in MrBayes v. 3.1.2 (Huelsenbeck and Ronquist 2001) as specified in the legend of each phylogenetic tree. The trees used to represent each order, family and genus were analyzed by multiple contributors based on the selection of genes in given publications under each description.

Results and discussion

The new species are described below in alphabetical order. They represent a total of 67 genera in 33 families, 17 orders and three classes in the Ascomycota. The individual taxon entries are standardized as far as possible, but reflect in style and content the diversity of participating authors and different groups of fungi.

Contributions to Ascomycota

Sordariomycetes

A recent outline for the Class Sordariomycetes was provided by Lumbsch and Huhndorf (2010), while there is presently no

backbone tree and this is much needed. Below we introduce 20 species in the families *Amphisphaeriaceae*, *Chaetosphaeriaceae*, *Diaporthaceae*, *Diatrypaceae*, *Glomerellaceae*, *Halosphaeriaceae*, *Magnaporthaceae*, *Valsaceae* and *Xylariaceae*.

Amphisphaeriaceae (*sensu lato*)

The family *Amphisphaeriaceae* is an important group of ascomycetes within the order *Xylariales*. It was introduced by Winter (1887) to include *Amphisphaeria* and related genera. *Amphisphaeriaceae* is characterised by immersed ascomata in the host, and dark peridial walls and ascal apices that are usually amyloid (Barr 1975). The family mainly produces appendaged coelomycetous asexual morphs. *Amphisphaeriaceae* is a relatively large and heterogeneous family and is widely distributed throughout tropical and temperate regions (Barr 1975; Kang et al. 1999a, b). Several genera in the family are well known for their ability to produce novel medicinal compounds (Xu et al. 2010, 2014; Maharachchikumbura et al. 2012). Many species of *Amphisphaeriaceae* cause a variety of disease in plants and are often isolated as endophytes or saprobes (Nag Raj 1993; Kang et al. 1998). In the present study, we introduce a new genus and seven new species in the family *Amphisphaeriaceae* based on molecular and morphological characters. In this study we treat *Amphisphaeriaceae* in a wide sense but expect it to be split into smaller family units. A phylogenetic tree for amphisphaeriaceous genera (*sensu lato*) is presented in Fig. 1.

1. *Amphibambusa* D.Q. Dai & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF 550940, *Facesoffungi number*: FoF00447

Etymology: In reference to a new genus in *Amphisphaeriaceae* and its host *Bambusa*.

Type species: *Amphibambusa bambusicola* D.Q. Dai & K.D. Hyde

Saprobic on decaying bamboo culms, forming black circular spots on the host surface. *Ascomata* solitary, scattered, immersed under host epidermis, globose to subglobose, light brown, coriaceous, ostiolate at the centre, surrounded by a small blackened clypeus and ostiolar opening surrounded by white margin. *Peridium* composed of thick-walled, brown to hyaline cells of *textura angularis*. *Hamathecium* composed of filamentous, septate, paraphyses with hyaline, guttulate cells. *Asci* 8-spored, unitunicate, cylindrical, short pedicellate, with a cylindrical, J+, subapical ring. *Ascospores* 2-seriate, fusiform to broad fusiform, 1-septate, deeply constricted at the septum, hyaline, pointed at both ends, with a longitudinally striated wall and surrounded by a gelatinous sheath.

2. *Amphibambusa bambusicola* D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550941, *Facesoffungi number*: FoF00448, Fig. 2

Etymology: In reference to the host *Bambusa* and *cola* meaning loving.

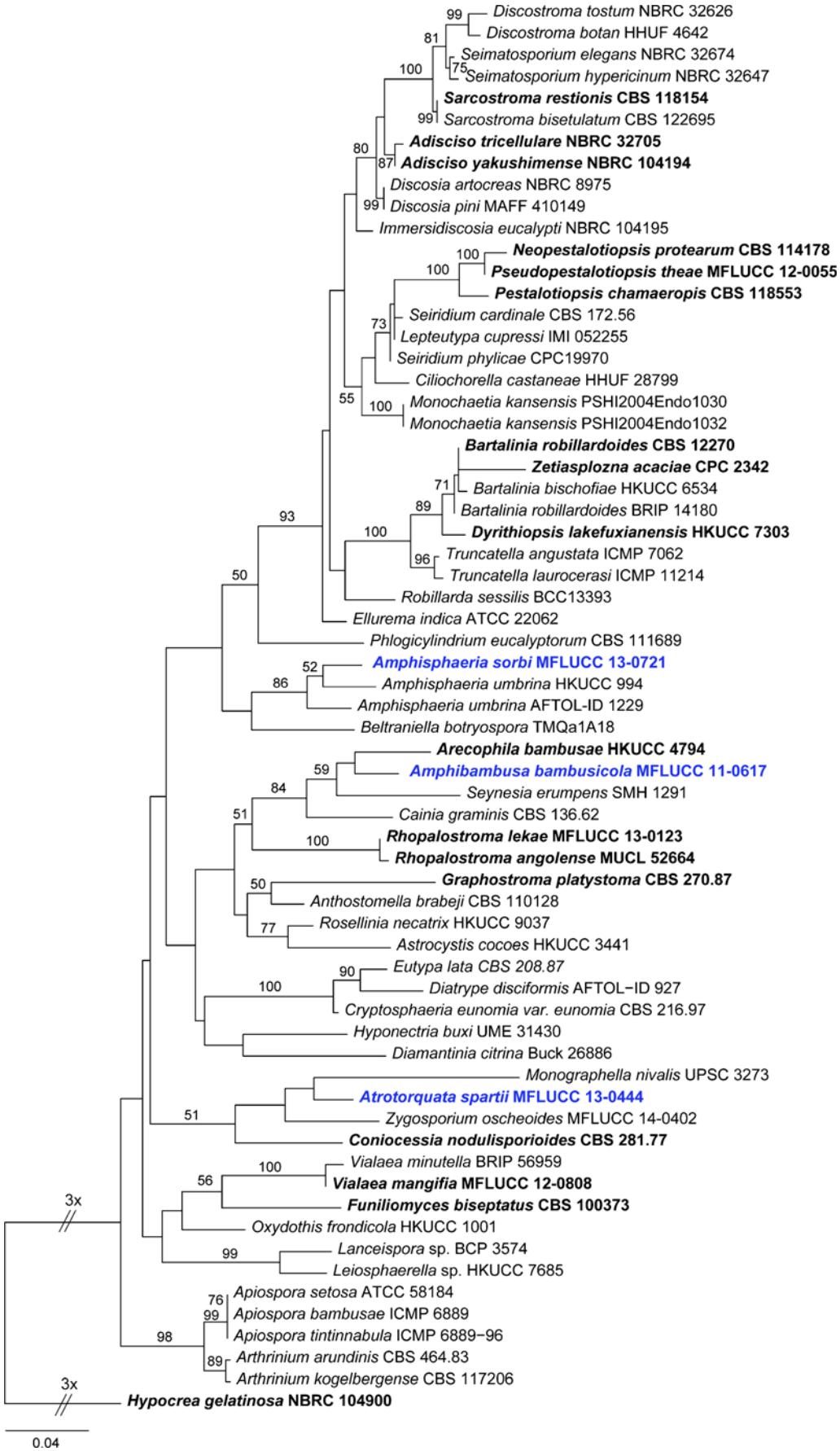
Holotype: MFLU 14–0825

Saprobic on decaying bamboo culms, forming a black circular spot on host surface. **Sexual morph** *Ascomata* 500–800 μm diam., 450–700 μm high, solitary, scattered, immersed under the host epidermis, globose to subglobose, light brown, coriaceous, ostiole at the centre, surrounded by a small blackened clypeus and ostiolar opening surrounded by white margin. *Peridium* laterally 20–30 μm thick, composed of thick-walled, brown to hyaline cells of *textura angularis*. *Hamathecium* composed of long, septate, paraphyses, 6–7 μm wide at the base, 2.5–3 μm wide at the apex, with hyaline, guttulate cells. *Asci* 150–200×17.5–20 μm ($\bar{x}$=180.6×19.1 μm, n=20), 8-spored, unitunicate, cylindrical, short pedicellate, with a cylindrical, J+, subapical ring, 1.5–3 μm high, 2–3.5 μm diam. *Ascospores* 25–27×5.5–6 μm ($\bar{x}$=26.6×5.7 μm, n=20), 2-seriate, fusiform to broad-fusiform, 1-septate, deeply constricted at the septum, hyaline, pointed at both ends, with a longitudinally striated wall and surrounded by 10 μm thick, gelatinous sheath. thick, gelatinous sheath. **Asexual morph** Undetermined

Culture characters: Ascospores germinating on PDA within 36 h and germ tubes produced from upper cells. Colonies growing slowly on PDA, reaching 5 mm in 2 weeks at 28 °C, effuse, velvety to hairy, circular, irregular at the margin, white from above, yellowish from below. Mycelium immersed in the media, composed of branched, septate, smooth-walled, hyaline, hyphae.

Material examined: THAILAND, Chiang Rai, Jiew Santonkok, on dead culm of bamboo, 11 August 2011, Dong-Qin Dai DDQ00104 (MFLU 14–0825, **holotype)**, (**isotype** in KUN, under the code HKAS 83940); ex-type living culture, MFLUCC 11–0617, IMCP. GenBank ITS: KP744433; LSU: KP744474.

Notes: Kang et al. (1999a, b) included ten sexual genera and their pestalotia-like asexual morphs in *Amphisphaeriaceae* (*sensu lato*). *Amphibambusa* is clearly different from other genera of *Amphisphaeriaceae* based on molecular data and morphological characters. This monotypic genus is introduced to accommodate taxa characterized by immersed ascomata surrounded by a small blackened clypeus and ostiolar opening surrounded by a white margin, and cylindrical asci with fusiform ascospores surrounded by wide gelatinous sheath. *Amphibambusa bambusicola* is similar to *Amphisphaeria coronata* in having immersed, black ascomata, cylindrical asci and fusiform ascospores (Saccardo 1925). However, *Amphibambusa bambusicola* is distinct in having wider


Discostroma tostum NBRC 32626
Discostroma botan HHUF 4642
Seimatosporium elegans NBRC 32674
Seimatosporium hypericinum NBRC 32647
Sarcostroma restionis CBS 118154
Sarcostroma bisetulatum CBS 122695
Adisciso tricellulare NBRC 32705
Adisciso yakushimense NBRC 104194
Discosia artocreas NBRC 8975
Discosia pini MAFF 410149
Immersidiscosia eucalypti NBRC 104195
Neopestalotiopsis protearum CBS 114178
Pseudopestalotiopsis theae MFLUCC 12-0055
Pestalotiopsis chamaeropis CBS 118553
Seiridium cardinale CBS 172.56
Lepteutypa cupressi IMI 052255
Seiridium phylicae CPC19970
Ciliochorella castaneae HHUF 28799
Monochaetia kansensis PSHI2004Endo1030
Monochaetia kansensis PSHI2004Endo1032
Bartalinia robillardoides CBS 12270
Zetiasplozna acaciae CPC 2342
Bartalinia bischofiae HKUCC 6534
Bartalinia robillardoides BRIP 14180
Dyrithiopsis lakefuxianensis HKUCC 7303
Truncatella angustata ICMP 7062
Truncatella laurocerasi ICMP 11214
Robillarda sessilis BCC13393
Ellurema indica ATCC 22062
Phlogicylindrium eucalyptorum CBS 111689
Amphisphaeria sorbi MFLUCC 13-0721
Amphisphaeria umbrina HKUCC 994
Amphisphaeria umbrina AFTOL-ID 1229
Beltraniella botryospora TMQa1A18
Arecophila bambusae HKUCC 4794
Amphibambusa bambusicola MFLUCC 11-0617
Seynesia erumpens SMH 1291
Cainia graminis CBS 136.62
Rhopalostroma lekae MFLUCC 13-0123
Rhopalostroma angolense MUCL 52664
Graphostroma platystoma CBS 270.87
Anthostomella brabeji CBS 110128
Rosellinia necatrix HKUCC 9037
Astrocystis cocoes HKUCC 3441
Eutypa lata CBS 208.87
Diatrype disciformis AFTOL-ID 927
Cryptosphaeria eunomia var. eunomia CBS 216.97
Hyponectria buxi UME 31430
Diamantinia citrina Buck 26886
Monographella nivalis UPSC 3273
Atrotorquata spartii MFLUCC 13-0444
Zygosporium oscheoides MFLUCC 14-0402
Coniocessia nodulisporioides CBS 281.77
Vialaea minutella BRIP 56959
Vialaea mangifia MFLUCC 12-0808
Funiliomyces biseptatus CBS 100373
Oxydothis frondicola HKUCC 1001
Lanceispora sp. BCP 3574
Leiosphaerella sp. HKUCC 7685
Apiospora setosa ATCC 58184
Apiospora bambusae ICMP 6889
Apiospora tintinnabula ICMP 6889-96
Arthrinium arundinis CBS 464.83
Arthrinium kogelbergense CBS 117206
Hypocrea gelatinosa NBRC 104900
3x
3x
0.04

◀ **Fig. 1** Phylogram generated from Maximum Likelihood analysis based on LSU gene region of *Amphisphaeraceae* and related taxa in *Xylariales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Hypocrea gelatinosa* NBRC 104900

asci (17.5–20 μm wide versus 7–8 μm) (Saccardo 1913). Our new taxon can also be compared with *Amphisphaeria bambusae* which has ellipsoid, 14–17 × 8–9 μm spores, while the spores in *Amphibambusa bambusicola* are fusiform, 25–27 × 5.5–6 μm.

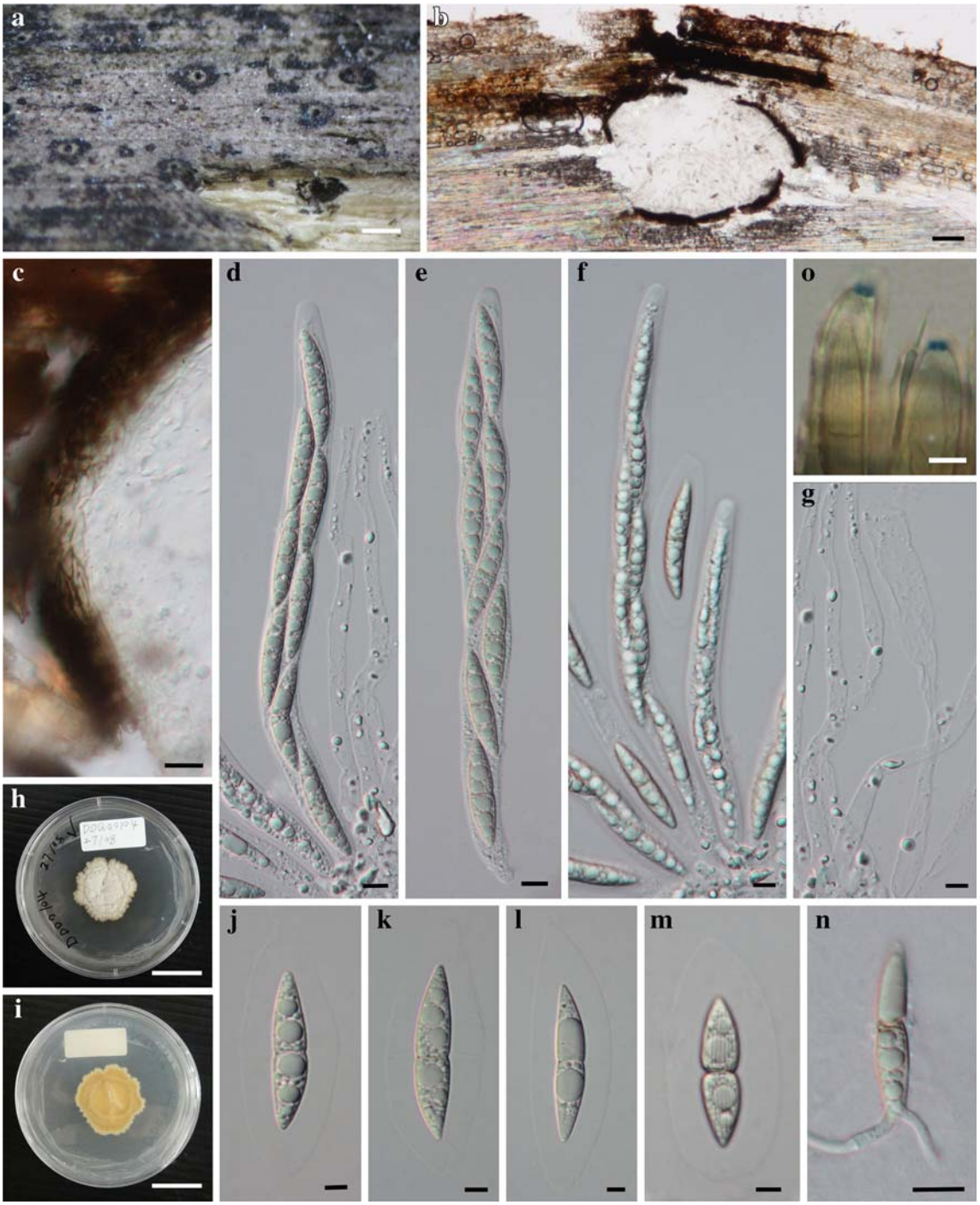


Fig. 2 ***Amphibambusa bambusicola*** (**holotype**) **a** Ascomata immersed in bamboo host **b** Section of ascoma **c** Peridium of ascoma **d**–**f** Asci **g** Paraphyses **j**–**m** Ascospores surrounded by a wide gelatinous sheath **n** Germinating ascospore **h**, **i** Culture on PDA **o** J+, subapical ring staining by Melzer's reagent. Scale bars: a=100 mm, b=100 μm, c–g=10 μm, h, i=25 mm, j–o=5 μm

3. *Amphisphaeria sorbi* Senanayake & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550904, *Facesoffungi number*: FoF00414; Figs. 3 and 4

Etymology: Named after the host genus on which the fungus occurs.

Holotypus: MFLU 14–0797

Saprobic on branch of *Sorbus aucuparia* L. **Sexual morph** *Ascomata* 350–380 μm high × 450–505 μm diam. ($\bar{x}$ = 370 × 482 μm, n = 10), immersed to erumpent, visible as black spots opening through the cracks of host surface, solitary, scattered, globose to subglobose, short papillate, ostiole periphysate, dark brown. *Peridium* 30–35 μm ($\bar{x}$ = 31 μm, n = 15) at the base, 65–70 μm ($\bar{x}$ = 68 μm, n = 15) at the neck, comprising 8–10 layers, inner layer of hyaline cells of *textura angularis*, outer layer of brown cells of *textura angularis*. *Paraphyses* 2–5 μm wide ($\bar{x}$ = 3 μm, n = 10), longer than asci, filamentous, septate, embedded in gelatinous matrix. *Asci* 125–170 × 9–13 μm ($\bar{x}$ = 145 × 11 μm, n = 20), 8-spored, unitunicate, cylindrical, short pedicellate, apically rounded, with a J-, apical apparatus. *Ascospores* 16–24 × 6–8 μm ($\bar{x}$ = 19 × 6.5 μm, n = 20), uniseriate, rarely

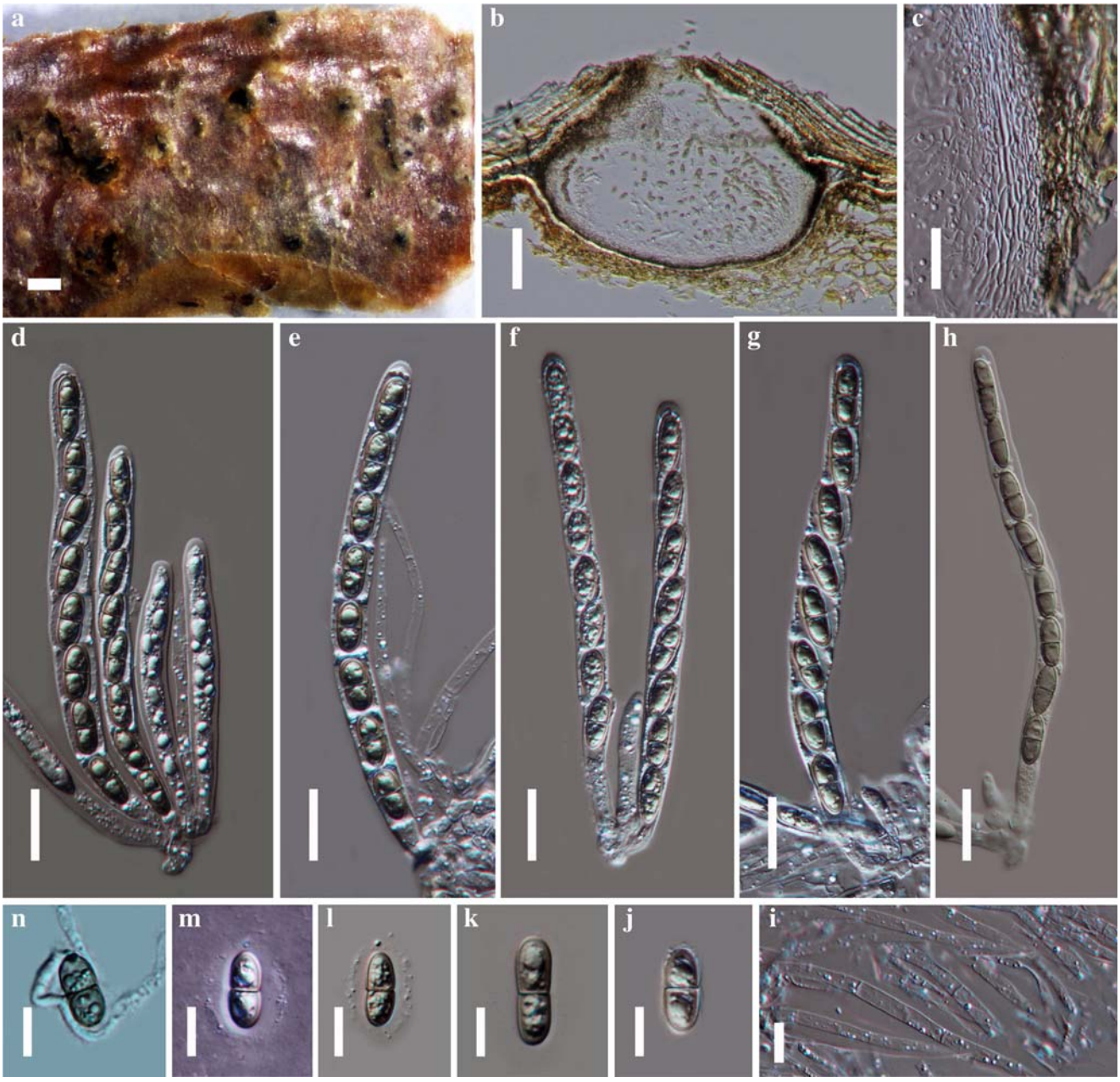


Fig. 3 ***Amphisphaeria sorbi*** (**holotype**) **a** Ascomata on substrate **b** Cross section of ascoma **c** Peridium **d**–**g** Asci in water **h**. Asci in Melzer's reagent **i** Paraphyses **j**–**l** Ascospores **m** Sheath around spore **n** Germinating ascospore. Scale bars: a = 1000 μm, b = 100 μm, c = 50 μm, d-h = 20 μm, i–n = 10 μm

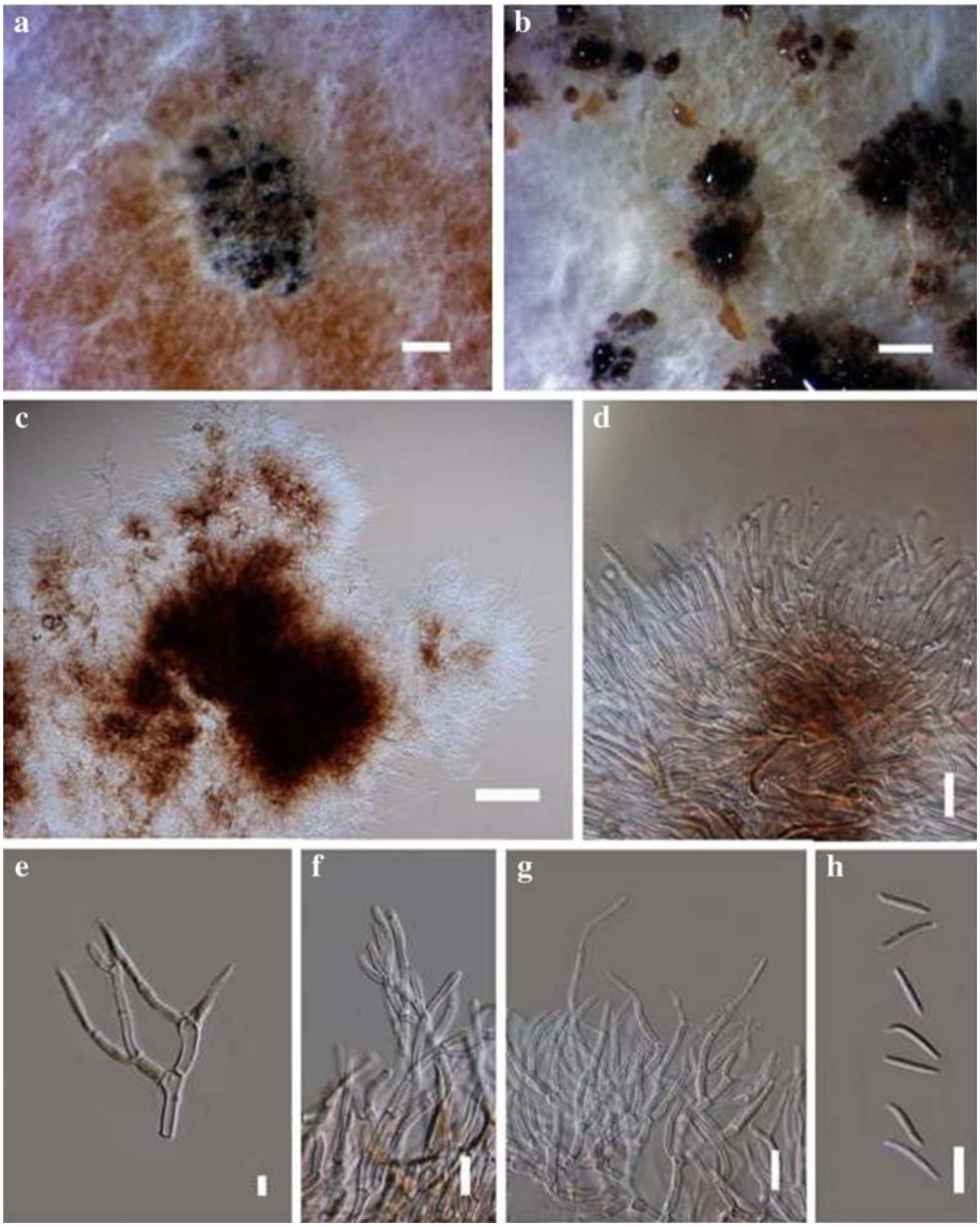


Fig. 4 ***Amphisphaeria sorbi*** (**ex-type culture**) Asexual morph in culture **a**, **b** Conidiomata on MEA **c** Peridium **d**–**g** Conidiophore and conidiogenous cells with attached conidia **h** Conidia. Scale bars: a=500 μm, b=1000 μm, c=100 μm, d–h=10 μm

overlapping uniseriate, ellipsoidal, light brown, one median septate, slightly constricted at the septum, smooth-walled, surrounded by a thick mucilaginous sheath. **Asexual morph** Coelomycete, *Conidiomata* 500–900 μm diam. ($\bar{x}$=800 μm, n=10), superficial on MEA, solitary or aggregated, globose, dark brown. *Peridium* consisting of thick walled, septate, brown mycelium. *Conidiophores* 17–20 μm long, 1.5–2.5 μm ($\bar{x}$=18×2 μm, n=20), arising from peridium, septate, branched, thick walled, hyaline. *Conidiogeneous cell* elongated conical, 0.7–1 μm wide at the apex, 2–2.5 μm wide at the base ($\bar{x}$=1×2 μm, n=20), thin-walled, septate, hyaline, annelidic. *Conidia* 10–12×1–1.5 μm ($\bar{x}$=10×1 μm, n=20), elongate-fusiform, hyaline, smooth-walled.

Culture characters: Colonies on MEA reaching 4 cm diam. after 14 days at 18 °C, white, cottony, flat, low, dense, with slightly wavy margin and few ariell mycelia.

Material examined: ITALY, Trento [TN], Dimaro, Folgarida, on branch of *Sorbus aucuparia* L. (*Rosaceae*), 2 August 2013, E. Camporesi IT 1400 (MFLU 14–0797, **holotype**); ex-type living cultures, MFLUCC 13–0721. GenBank LSU: KP744475.

Notes: *Amphisphaeria* was introduced by Cesati and De Notaris (1863) without designating a generic type (Wang et al 2004). Petrak (1923) proposed *A. umbrina* as the lectotype of the genus. Different studies have listed more than 250 species in *Amphisphaeria* and Wang et al. (2004) accepted 12 species in the genus after examining more than 170 type

specimens. *Amphisphaeria sorbi* shows more similarities to *A. vibratilis*. *Amphisphaeria sorbi* however, differs from *A. vibratilis* in having small perithecia, a peridium with a cell arrangement of *textura angularis*, and wide, non-flexuose paraphyses. The ascus apical apparatus is discoid in *Amphisphaeria sorbi* and has shorter, smooth-walled ascospores without deeply pigmented septa. Molecular analysis of the LSU gene region (Fig. 1) confirms that *Amphisphaeria sorbi* clusters with *A. umbrina* in *Amphisphaeriaceae* with 52 % bootstrap support.

4. *Atrotorquata spartii* Thambugala, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550914, *Facesoffungi number*: FoF00387, Fig. 5

Etymology: In reference to the host genus *Spartium*

Holotype: MFLU 14–0738

Saprobic on *Spartium junceum*. **Sexual morph** *Ascomata* 400–475 μm high × 280–375 μm diam. ($\bar{x}$ = 435 × 337 μm, n = 5), solitary to scattered, or sometimes gregarious, immersed beneath clypeus, dark brown to black, unilocular, globose to subglobose with a central ostiole. *Peridium* 15–32 μm wide,

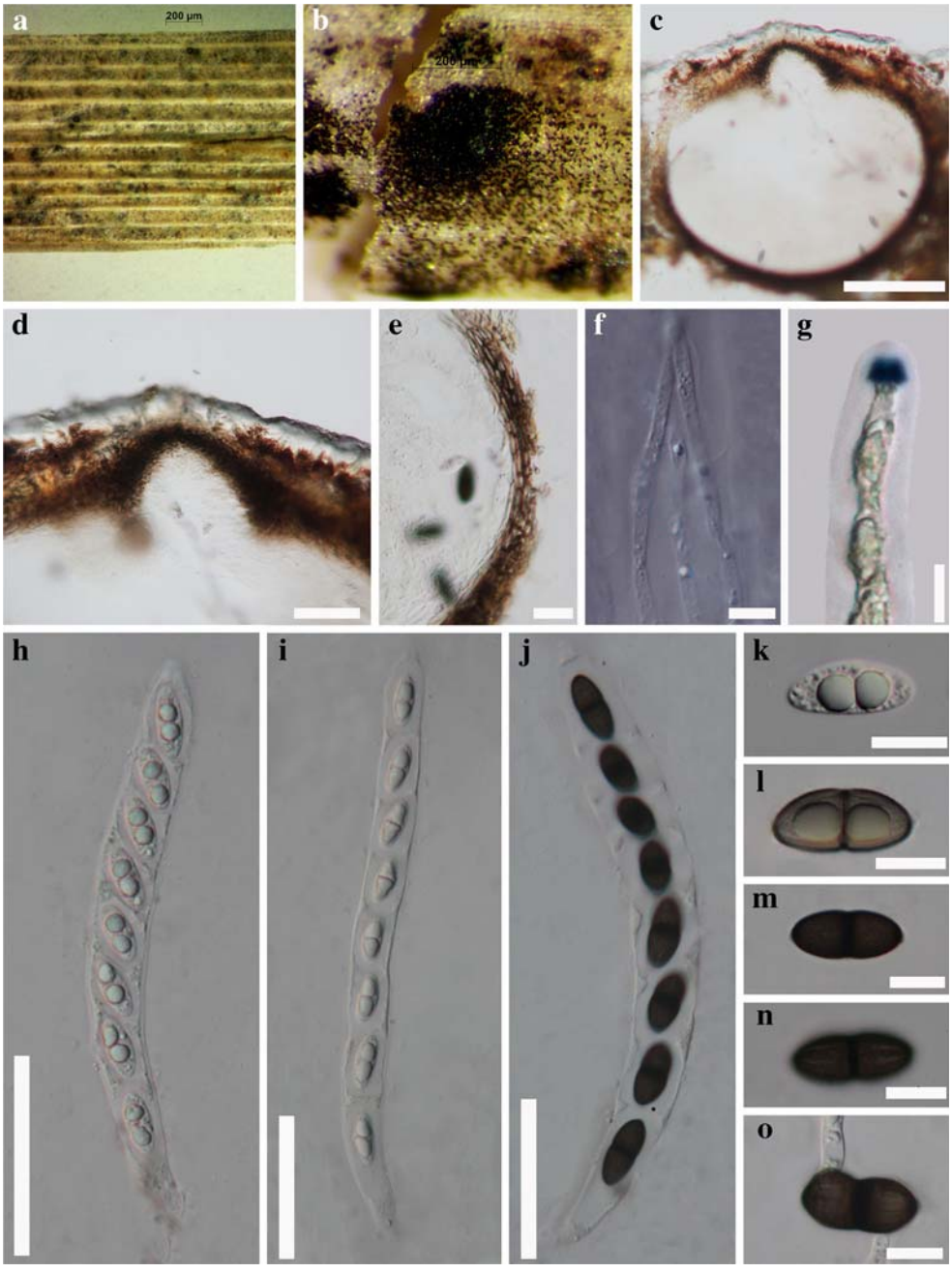


Fig. 5 ***Atrotorquata spartii*** **(holotype) a, b** Appearance of ascomata on host substrate as minute ostiolar dots **c** Section through ascoma **d** Ostiole. **e** Peridium **f** Pseudoparaphyses **g** Ascus in Melzer's reagent showing J+, apical apparatus **h**–**j** Immature and mature unitunicate ascospores **k**–**o** Ascospores. Scale bars: c = 150 μm, d, h–j = 50 μm, e = 20 μm, f, k–o = 10 μm

composed of thick-walled, dark brown to black cells of *textura angularis*. *Hamathecium* comprising 3–4 μm wide, septate, guttulate, hyaline paraphyses, embedded in a gelatinous matrix. *Asci* 160–230×14–24 μm ($\bar{x}$=196×20 μm, *n*=10), 8-spored, unitunicate, cylindric-clavate, straight or curved, short pedicellate, with an apical ring bluing in Melzer's reagent. *Ascospores* 19–23×8.5–9.5 μm ($\bar{x}$=21.2×9 μm, *n*=15), uniseriate, ellipsoid to fusiform, rounded at both sides, hyaline when immature, becoming brown to yellowish-brown when mature, 1-septate, constricted at the septum, guttulate, smooth-walled or striate, surrounded by a mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes arising from both end cells. Colonies growing slow on PDA, reaching a diam. of 20 mm after 30 days at 18 °C, circular, dense, initially white becoming pale white, velvety, radiating towards the entire to slightly undulate edge, non-pigmented.

Material examined: ITALY, Province of Rimini [RN], Pennabilli, on dead branches of *Spartium junceum* L. (*Fabaceae*), 9 October 2012, E. Camporesi, IT 799–1 (MFLU 14–0738 **holotype**), ex-type living cultures, MFLUCC 13–0444. GenBank LSU: KP325443; ITALY, Province of Forlì-Cesena [FC], Fiumicello, Premilcuore, on dead branches of *Spartium junceum* (*Fabaceae*), 29 April 2013, E. Camporesi 799–2 (MFLU 14–0821), living cultures, MFLUCC 13–0445.

Notes: *Atrotorquata* was introduced by Kohlmeyer and Volkmann-Kohlmeyer (1993) as a monotypic genus in order to accommodate *Atrotorquata lineata*. This genus is characterized by ascomata immersed under a clypeus, cylindrical asci with a J+, apical ring and brown, two-celled, ascospores, with 5–7 longitudinal striations at each apex, and surrounded by a mucilaginous sheath (Kang et al. 1999a, b). Kang et al. (1999a, b) placed *Atrotorquata* in *Cainiaceae* based on morphology. Unfortunately, the LSU sequence data for *Atrotorquata lineata* are not publicly available, while the available ITS sequence (AF009807) has not been included in any publication. In our LSU phylogenetic tree, *Atrotorquata spartii* is closely allied to *Monographella nivalis* (UPSC 3273) and clustered outside of the *Cainiaceae*. Based on a megablast search of NCBIs GenBank nucleotide database, the closest hit using the ITS sequence for our second collection MFLU 14–0821/ MFLUCC 13–0445 is *Atrotorquata lineata* (GenBank AF009807; Identities=405/489(83 %). *Atrotorquata lineata* shares similar morphology with *A. spartii* in having immersed, subglobose ascomata, cylindrical asci with a J+, apical ring, and uniseriate, brown, 1-septate ascospores, but differs in having a hyaline clypeus, a light brown to hyaline peridium and ellipsoidal, slightly curved ascospores. Based on both morphology and molecular phylogeny, *A. spartii* is identified as a new species of the genus *Atrotorquata*. Multi-gene phylogenetic analysis of the type species of *Atrotorquata* is required in order to confirm the family placement in this genus.

5. *Oxydothis atypica* Pinruan, ***sp. nov.***

Index Fungorum Number: IF551015, *Facesoffungi number*: FoF00485, Fig. 6

Etymology: *atypica* refers to the differences from the typical ascospore characters.

Holotypus: Pinruan 135 in BBH.

Saprobic on dead leaves of *Licuala longicalycata* Furtado in peat swamp. *Ascomata* 270–275 μm, visible on the host surface as a minute blackened dot with eccentric, periphysate ostiole, immersed, lenticular to subglobose, brown, coriaceous, scattered. *Peridium* 10–12.5 μm wide, comprising 3–6 layers of flattened, brown-walled cells of *textura angularis*, fusing at the outside with the host tissues. *Paraphyses* 8.75 μm wide at the base, hypha-like, tapering to the apex, longer than asci, not embedded in a gelatinous matrix. *Asci* 87.5–95×7.5–8.75 μm, 8-spored, cylindrical, unitunicate, thin-walled, pedicellate, apically rounded, with a J+, cylindrical, subapical ring, 5–5.25 μm high × 2.2–2.5 μm diam. *Ascospores* 42.5–45×5–6.5 μm, overlapping 2-seriate, hyaline, 1-septate, tapering gradually to a point at the apex with a mucilaginous drop and with a long drawn out spine at the base.

Holotypus: THAILAND, Narathiwat Province, Sirindhorn Peat Swamp Forest, on dead leaves of *Licuala longicalycata* (*Arecaceae*), 13 February 2002, U. Pinruan (Pinruan 135 in BBH, **holotype**).

Notes: The characteristic features of *Oxydothis atypica* are immersed ascomata with an eccentric neck, well-developed paraphyses, cylindrical asci with a J+, subapical ring and pointed ascospores (Hyde 1995; Hyde and Alias 2000). This species differs from all species of *Oxydothis* as it has asymmetrical ascospores, with a short pointed apex and a long spine at the base (Hyde 1995; Fröhlich et al. 2000).

Pestalotiopsis

Pestalotiopsis is an appendage-bearing conidial asexual coelomycetous genus in the family *Amphisphaeriaceae* (Barr 1975; Kang et al. 1998) that is common in tropical and temperate ecosystems (Maharachchikumbura et al. 2011, 2012). Species of *Pestalotiopsis* occur commonly as plant pathogens and are often isolated as endophytes or saprobes (Maharachchikumbura et al. 2013). *Pestalotiopsis* represents a fungal group known to produce a wide range of chemically novel, diverse metabolites (Xu et al. 2010, 2014). Maharachchikumbura et al. (2014) segregated two novel genera from *Pestalotiopsis*, namely *Neopestalotiopsis* and *Pseudopestalotiopsis*. In this study, we introduce three new species namely *Pestalotiopsis dracontomelon*, *P. italiana* and *P. digitalis*. The phylogenetic tree is presented in Fig. 7.

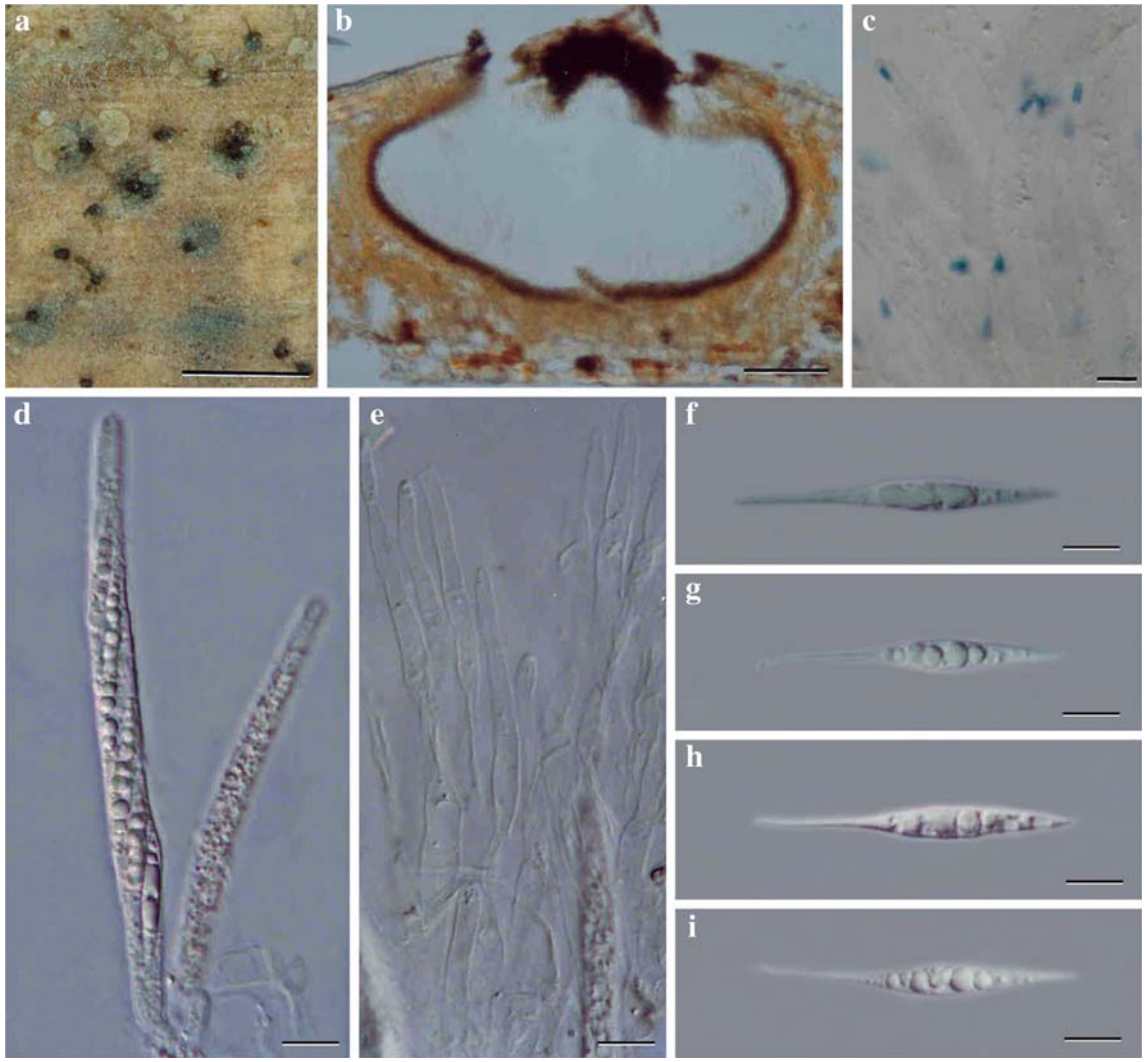


Fig. 6 ***Oxydothis atypica*** **(holotype) a** Colonies on substratum **b** Section of ascoma **c** Asci with J+ ring **d** Asci **e** Paraphyses **f–i** Ascospores. Scale bars a=1000 μm; b=100 μm; c-i=10 μm

6. *Pestalotiopsis digitalis* Maharachch & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550945, *Facesoffungi number*: FoF00459; Fig. 8

Etymology: named after host genus, where it was isolated.

Holotype: MFLU 14–0208

Pathogen on *Digitalis purpurea*. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* pycnidial in culture on PDA, globose, scattered or gregarious and confluent, semi-immersed, dark brown, up to 100 μm diam. *Conidiophores* often reduced to conidiogenous cells. *Conidiogenous cells* discrete ampulliform to lageniform, smooth, thin-walled, hyaline, with 1–2 proliferations, sometimes remain vegetative. *Conidia* 18–22×7–9 μm ($\bar{x}$=20×8.2 μm, n=20), fusiform, straight to slightly curved, 4-septate, basal cell conic to obconic, hyaline or slightly olivaceous, thin- and verruculose, 2–3.5 μm long ($\bar{x}$=2.7 μm), with three median cells, doliform, concolourous, olivaceous, septa and periclinal walls darker than the rest of the cell, together 11–17 μm long ($\bar{x}$=15 μm) second cell from base 3–4.5 μm ($\bar{x}$=4.1 μm); third cell 3–4.5 μm ($\bar{x}$=4.1 μm); fourth cell 3–4.5 μm ($\bar{x}$=4.1 μm); apical cell hyaline, conic, 2–3.5 μm long ($\bar{x}$=2.7 μm); with 1–3 tubular apical appendages (mainly 2), arising from the apex of the apical cell, 8–17 μm long ($\bar{x}$=13 μm); basal appendage 4–7 μm long.

Culture characters: Colonies on PDA attaining 30–40 mm diam. after 7 d at 25 °C, with smooth edge, pale honey-coloured, with dense aerial mycelium on the surface with black, gregarious conidiomata; reverse similar in colour.

Material examined: NEW ZEALAND, on leaf spots of *Digitalis purpurea*, 01 June 1972, J.M. Dingley 7270 (MFLU 14–0208, **holotype**); ex-type living cultures ICMP 5434. GenBank ITS: KP781879; TUB: KP781883.

Notes: *Pestalotiopsis digitalis* forms a sister clade to species including *P. parva* and *P. rosea* (Fig. 7). *Pestalotiopsis*

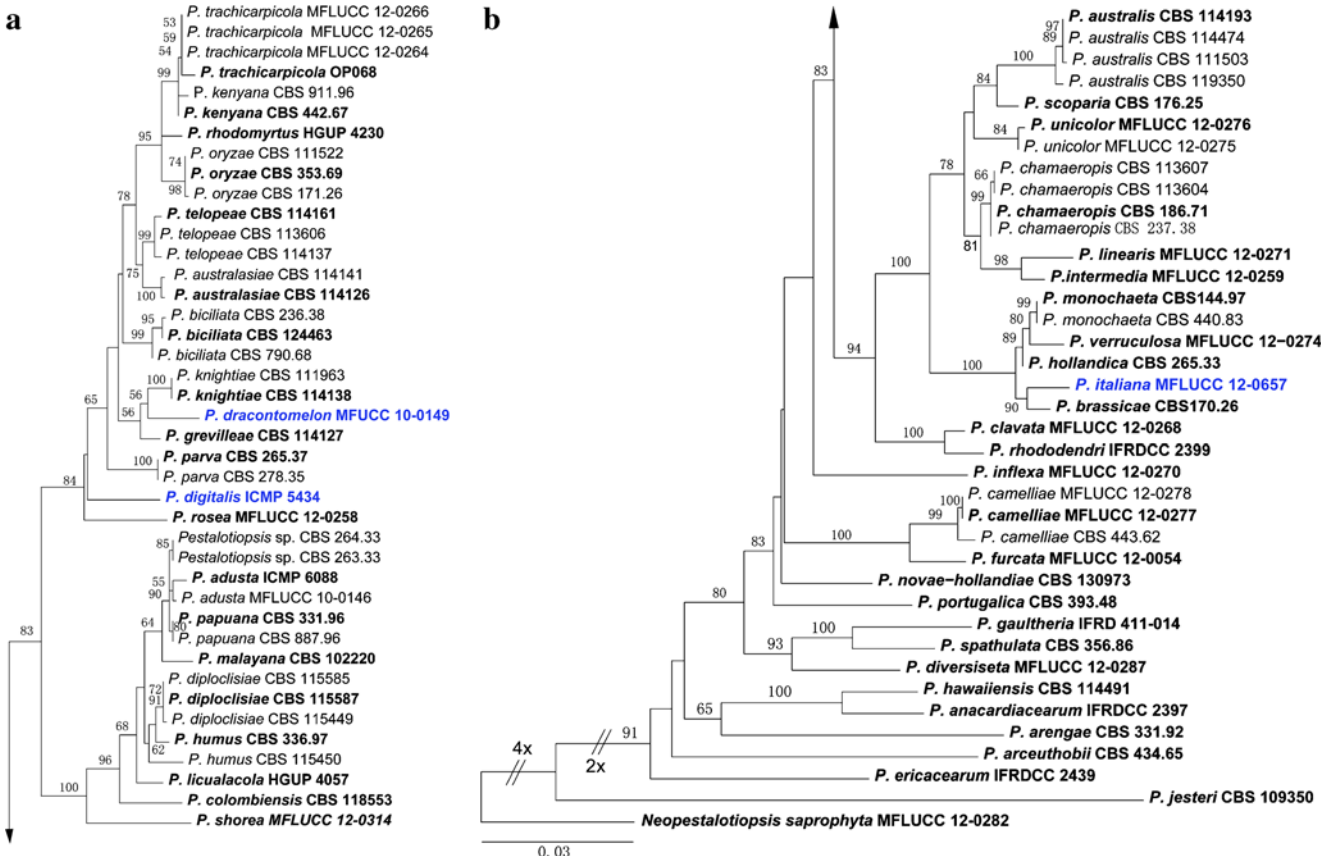


Fig. 7 Phylogram generated from Maximum Likelihood analysis based on combined ITS, β-tubulin and *TEF* gene regions of *Pestalotiopsis*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Neopestalotiopsis saprophyta* MFLUCC 12-0282

rosea differs from *P. dracontomelon* in having distinctly narrow conidia. Furthermore, the reddish colony is unique to *P. rosea* and this reddish colour can be seen even in conidiogenous cells and some conidia. Furthermore, conidia of *P. digitalis* are longer than those of *P. parva*.

7. *Pestalotiopsis dracontomelon* Maharachch. & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550943, *Facesoffungi number*: FoF00457; Fig. 9

Etymology: named after host genus, where it was isolated.

Holotype: MFLU 14–0207

Pathogen on *Dracontomelon*. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* pycnidial in culture on PDA, globose, aggregated or scattered, black, up to 150 μm diam. *Conidiophores* 2–3-septate, sparsely branched at the base, subcylindrical, up to 20 μm long. *Conidiogenous cells* discrete or integrated, cylindrical, percurrently proliferating 1–3 times. *Conidia* 18–23×5.5–7.5 μm ($\bar{x}$=20×6.5 μm, n=20), fusoid, ellipsoid, straight to slightly curved, 4-septate; basal cell conic with a truncate base, hyaline, rugose and thin-walled, 4–5 μm long; three median cells doliform, 13–17 μm long ($\bar{x}$=15 μm), wall verruculose, concolourous, olivaceous, (second cell from the base 3.5–4.5 μm ($\bar{x}$=4); third 3.5–4.5 μm ($\bar{x}$=4 μm); fourth cell 3.5–4.5 μm ($\bar{x}$=4 μm); apical cell 3–4 μm long, hyaline, subcylindrical, rugose and thin-walled; with 2–3 tubular apical appendages, arising from the apical crest, unbranched, filiform, flexuous 11–20 μm long ($\bar{x}$=16 μm); basal appendage single, tubular, unbranched, centric, 2–7 μm long.

Culture characters: Colonies on PDA attaining 40–50 mm diam. after 7 d at 25 °C, with smooth edge, whitish, with sparse aerial mycelium on the surface with black, gregarious conidiomata; reverse similar in colour.

Material examined: THAILAND, Chiang Rai, Nam Tak Huey Mesak Forest Park, on disease leaves of *Dracontomelon dao* Merr. & Rolfe (as *D. mangiferum* Blume), 10 February 2010, S.S.N Maharachchikumbura, SAJ-0011 (MFLU 14–0207, **holotype**); ex-type living culture, MFLUCC 10–0149. GenBank ITS: KP781877; TEF: KP781880.

Notes: *Pestalotiopsis dracontomelon* is a pathogenic species collected from leaves of *Dracontomelon mangifera* from Thailand. This species is a sister taxon to *P. grevilleae* and *P. knightiae* (Fig. 7). It differs from *P. grevilleae* and *P. knightiae* in having smaller conidia.

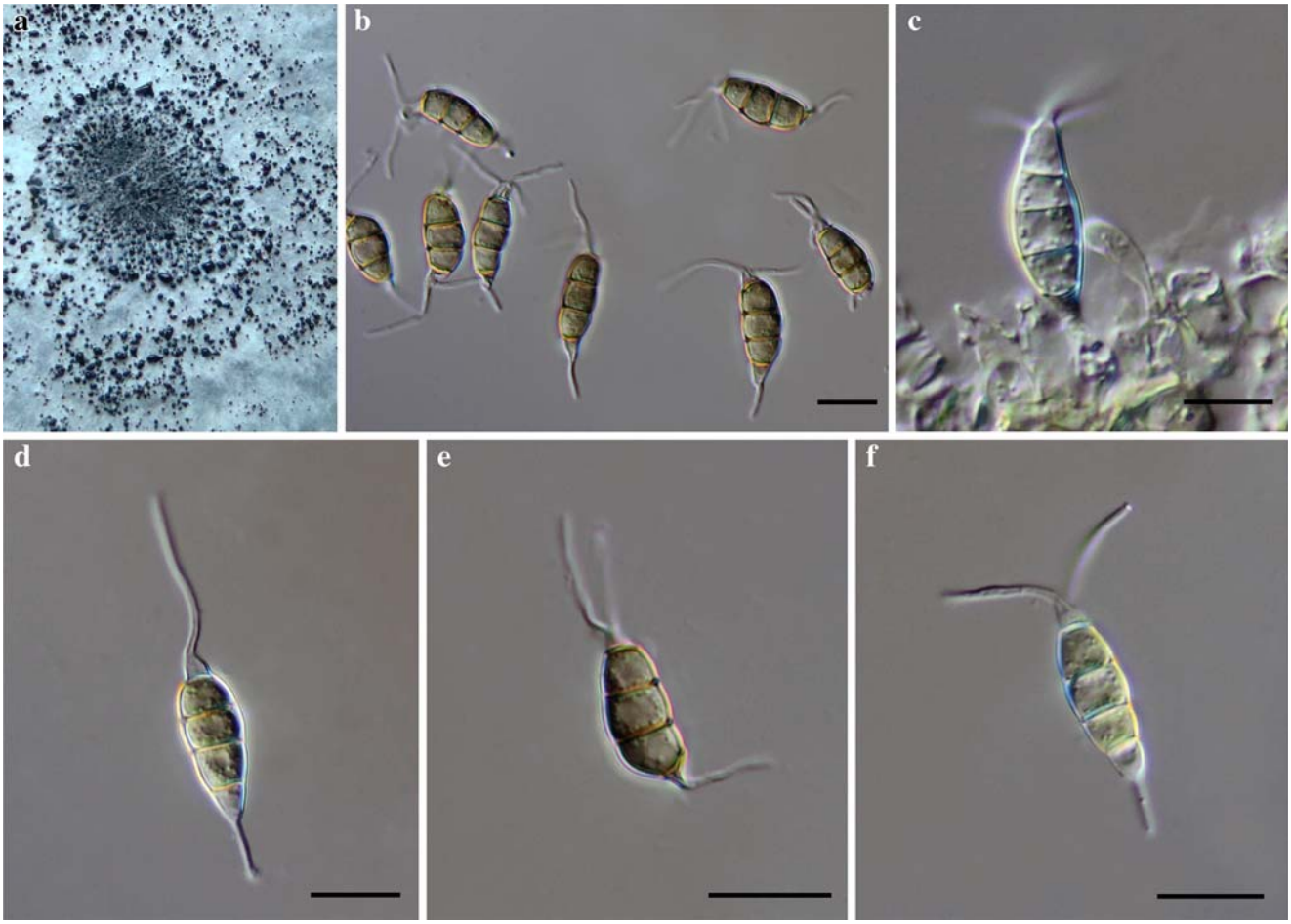


Fig. 8 ***Pestalotiopsis digitalis*** (**holotype**) **a** Conidiomata on PDA **b** Conidia **c** Conidiogenous cells **d**–**f** Conidia. Scale bars: b–g=10 μm

8. *Pestalotiopsis italiana* Maharachch., Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550944, *Facesoffungi number*: FoF00458; Fig. 10

Etymology: named after the country, where it was collected.

Holotype: MFLU 14–0214

Saprobic on *Cupressus glabra*. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* pycnidial in culture on PDA, globose, scattered or gregarious and confluent, semi-immersed, dark brown, up to 200 μm diam. *Conidiophores* septate near the base, branched, subcylindrical. *Conidiogenous cells* discrete, subcylindrical or ampulliform to lageniform, smooth-walled, percurrently proliferating 1–3 times. *Conidia* 26–35×8–11 μm ($\overline{x}$=30×9.6 μm, n=20), ellipsoid, straight to slightly curved, 4-septate, basal cell conic with obtuse end, hyaline, thin-walled and verruculose, 5–7 μm long ($\overline{x}$=6 μm), with three median cells, doliform to cylindrical, with thick verruculose walls, constricted at the septa, concolourous, olivaceous, septa and periclinal walls darker than the rest of the cell, wall rugose, together 18–28 μm long ($\overline{x}$=23 μm) second cell from base 5.5–8.5 μm ($\overline{x}$=6.7 μm); third cell 6–9 μm ($\overline{x}$=7 μm); fourth cell 6–9 μm ($\overline{x}$=7.7 μm); apical cell hyaline, conic to subcylindrical 4–6.5 μm long ($\overline{x}$=4.9 μm); with 2–5 tubular apical appendages (mostly 3–4), arising from the apex of the apical cell (rarely 1 appendage arising from just above the septum separating upper median and apical cell), 20–40 μm long ($\overline{x}$=32 μm); basal appendage present 6–10 μm ($\overline{x}$=7 μm).

Culture characters: Colonies on PDA reaching 50–60 mm diam. after 7 d at 25 °C, with an undulate edge, whitish to pale grey-coloured, with dense aerial mycelium on surface, and black, gregarious conidiomata; reverse similar in colour.

Material examined: ITALY, Province of Forlì-Cesena, Camposonaldo, Santa Sofia, on dead twigs of *Cupressus glabra*, 24 November 2011, E. Camporesi IT051 (MFLU 14–0214, **holotype**); ex-type living culture MFLUCC 12–0657. GenBank ITS: KP781878; TEF: KP781881; TUB: KP781882.

Notes: *Pestalotiopsis italiana* was collected on dead twigs of *Cupressus glabra* in Italy, and forms a sister clade to *P. brassicae* (CBS 170.26), *P. hollandica* (CBS 265.33) and *P. verruculosa* (MFLUCC 12–0274) which were isolated from seeds of *Brassica napus* L. in New Zealand, *Sciadopitys verticillata* (Thunb.) Siebold & Zucc. in the Netherlands and *Rhododendron* sp. in China, respectively.

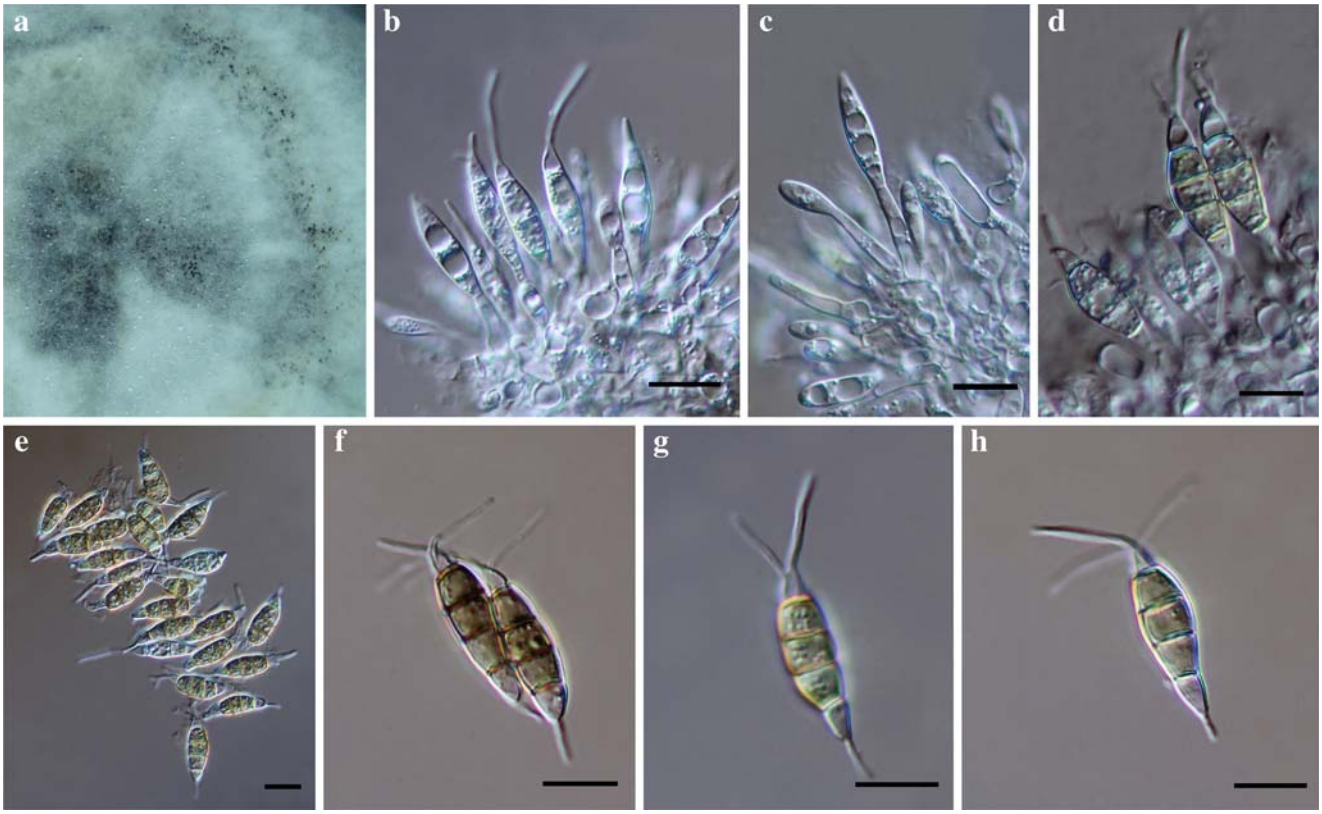


Fig. 9 ***Pestalotiopsis dracontomelon*** (**holotype**) **a** Conidiomata on PDA **b**–**d** Conidiogenous cells **e**–**h** Conidia. Scale bars: b-h=10 μm

Pestalotiopsis italiana overlaps morphologically with *P. verruculosa*. However, in the phylogenetic analyses it formed a distinct lineage apart from *P. verruculosa* (Fig. 7) and geographically they are clearly distinct.

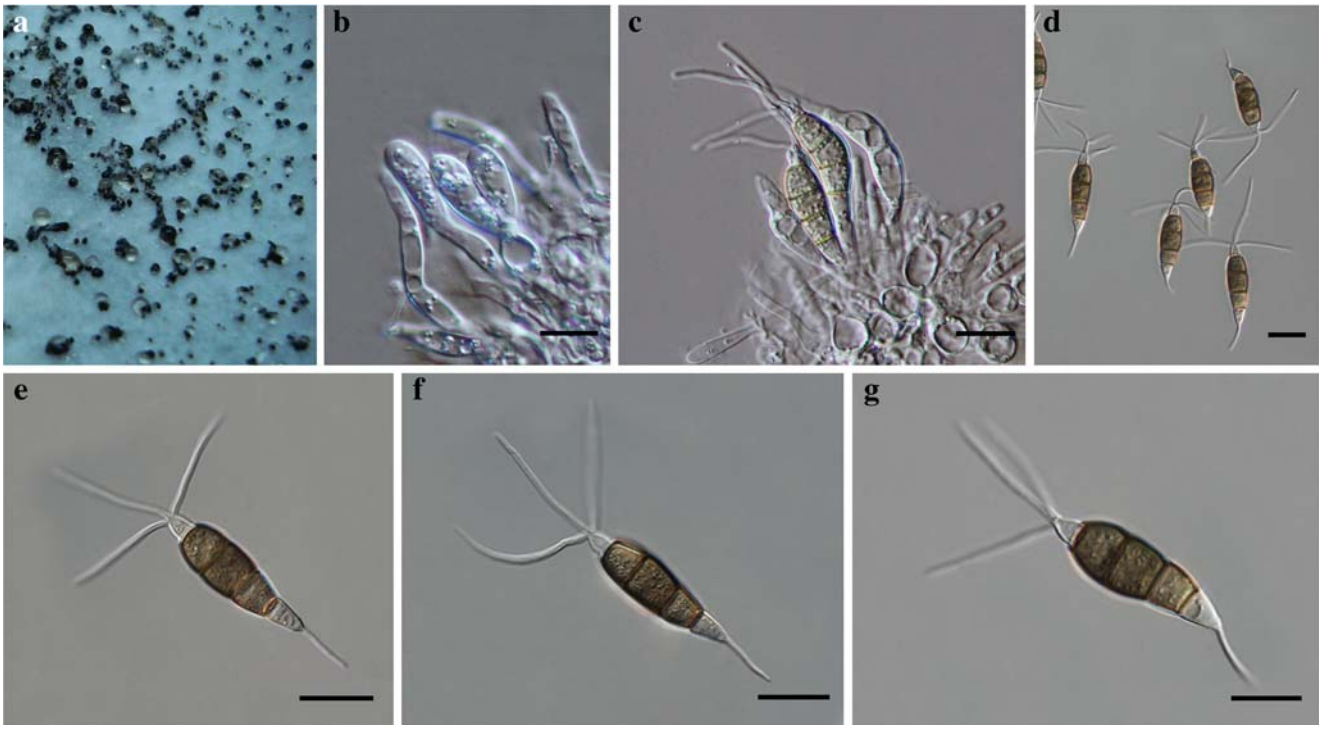


Fig. 10 ***Pestalotiopsis italiana*** (**holotype**) **a** Conidiomata on PDA **b**, **c** Conidiogenous cells **d**–**g** Conidia. Scale bars: b–g=10 μm

Chaetosphaeriaceae

The phylogenetic tree is presented in Fig. 11.

9. *Conicomyces pseudotransvaalensis* A. Hashim., G. Sato & Kaz. Tanaka, ***sp. nov.***

Index Fungorum number: IF551057, *Facesoffungi number*: FoF00486; Fig. 12

Etymology: named after its morphological similarity to *Conicomyces transvaalensis* R.C. Sinclair et al.

Holotype: HHUF 29956

Saprobic on *Machilus japonica* Siebold & Zucc. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* stromatic, synnematous, scattered, superficial, cone-shaped, black to dark brown, setose, up to 780 μm high, 260–360 μm wide at the base, cornuted with a head and a stipe; head slightly swollen, 65–100 μm wide, bearing a concave conidial hymenium; stipe cylindrical or contorted, 30–100 μm wide, composed of rectangular, thin-walled, brown, 1.5–2.5 μm wide cells of *textura porrecta*. *Setae* arising from stroma or stipe, straight or curved, erect, septate, brown but pale at the apex, thick-walled, smooth, unbranched, up to 450 μm long, acute and 2.5–4 μm wide at the apex, 5–7 μm wide at the base. *Conidiophores* arising from inner elements of the stipe, hyaline to pale brown, unbranched or branched, up to 40 μm long. *Conidiogenous cells* phialidic, cylindrical, hyaline to pale brown, smooth, 16–88×2.5–3 μm. *Conidia* 105–170×7.5–10 μm ($\bar{x}$=150.8×8.8 μm, n=50), L/W 12–22.7 ($\bar{x}$=17.4 μm, n=50), claviform, slightly obtuse at the apex, slightly truncate at the base, 15–22-septate, hyaline, smooth-walled, guttulate, bearing an unbranched appendage at the apex; appendage 40–80 μm long ($\bar{x}$=59.8 μm, n=50).

Culture characters: Conidia formed in culture are similar to those on natural substrate.

Material examined: JAPAN, Kagoshima, Yakushima, Yakusugi Land, dead twigs of *Machilus japonica* (*Lauraceae*), 15 March 2007, K. Tanaka & H. Yonezawa, GS 20 (HHUF 29956, **holotype designated here**); ex-type living culture, MAFF 244767. GenBank ITS: LC001710; LSU: LC001708.

Notes: The genus *Conicomyces* was established to accommodate *C. transvaalensis* having synnematous conidiomata and apically appendaged conidia (Sinclair et al. 1983). *Conicomyces* currently contains three described species (Sinclair et al. 1983; Illman and White 1984; Seifert 1999), but no molecular studies have been undertaken for the genus. Morphologically *C. pseudotransvaalensis* is similar to *C. transvaalensis* in having large conidia more than 100 μm long, but the latter has slightly long and slender conidia with more septation (122–200×5.5–7.5 μm, L/W 25, 19–29-septate; Nag Raj 1993). Based on a megablast search, the closest hits to the 28S sequence of *C. pseudotransvaalensis* are *Chaetosphaeria fuegiana* (GenBank EF063574; Identities=729/754 (96.7 %), Gaps 5/754 (0.7 %)), *Chaetosphaeria hebetiseta* (GenBank AF178549; Identities=723/754 (95.9 %), Gaps 5/754 (0.7 %)) and *Chaetosphaeria dilabens* (GenBank AF178557; Identities=720/751 (95.9 %), Gaps=5/751 (0.7 %)). These results clearly indicate that the genus is a member of *Chaetosphaeriaceae* (*Sordariomycetes*), as previously suggested by Hashimoto et al. (2015) based on morphological grounds. In Fig. 11, *C. pseudotransvaalensis* clusters in *Chaetosphaeriaceae* and is related to species of *Chaetosphaeria sensu lato*.

10. *Dinemasporium nelloi* W.J. Li, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550919, *Facesoffungi number*: FoF00424, Fig. 13

Etymology: Named after Nello Camporesi, who collected the sample from which the species was isolated.

Holotypus: MFLU 14–0811

Saprobic on dead stem of *Dactylis glomerata* L., forming conspicuous, rounded to irregular, black, conidiomata. **Sexual morph** Undetermined. **Asexual morph** coelomycetous. *Conidiomata* 100–200 μm high, 250–350 μm diam., pycnidial, superficial, erumpent, cupulate when dry, solitary, scattered or gregarious, black, with stroma cells of *textura angularis* at the base and a lateral excipulum of *textura porrecta* or *textura intricata* of pale to dark brown cells. *Setae* divergent, stiff, brown, smooth-walled, septate, tapering towards an acute apex. *Conidiophores* cylindrical, septate, smooth, thick-walled, hyaline, arising from basal and periclinal wall cells. *Conidiogenous cells* 10–15 μm long×1.5–3.5 μm wide, phialidic, cylindrical, hyaline, smooth-walled, tapering toward the apex. *Conidia* 10–20×2.5–3.5 μm ($\bar{x}$=15×3; n=20), blastic-phialidic, amerosporous, allantoid or lenticular, guttulate, hyaline, smooth-walled, with a single unbranched setula at each end; setula 5–15 μm long×0.5–1.5 μm wide.

Culture characters: Colonies on PDA slow growing, white in the first few days, becoming yellowish, and reaching 20–25 mm diam. after one week, with the middle area becoming pink, whitened at the edge, becoming felt-like after two weeks, dense, aerial, filamentous; reverse brown, pigments produced.

Material examined: ITALY, Province of Forlì-Cesena [FC], Castrocaro Terme, Converselle, on dead stem of *Dactylis glomerata* L. (*Poaceae*), 1 December 2012, E. Camporesi IT-934 (MFLU 14–0811, **holotype**), ex-type living culture, MFLUCC 13–0482. GenBank ITS: KP711358; LSU: KP711363; SSU: KP711368; *ibid*. (KUN! HKAS 83970, **isotype**).

Notes: *Dinemasporium* was introduced by Léveillé (1846) with *D. graminum* (Lib.) Lév. as the type species. This is a comparatively large heterogeneous genus in which 85 taxa have been recorded according to the Index Fungorum (2015). The species of *Dinemasporium* are characterized by

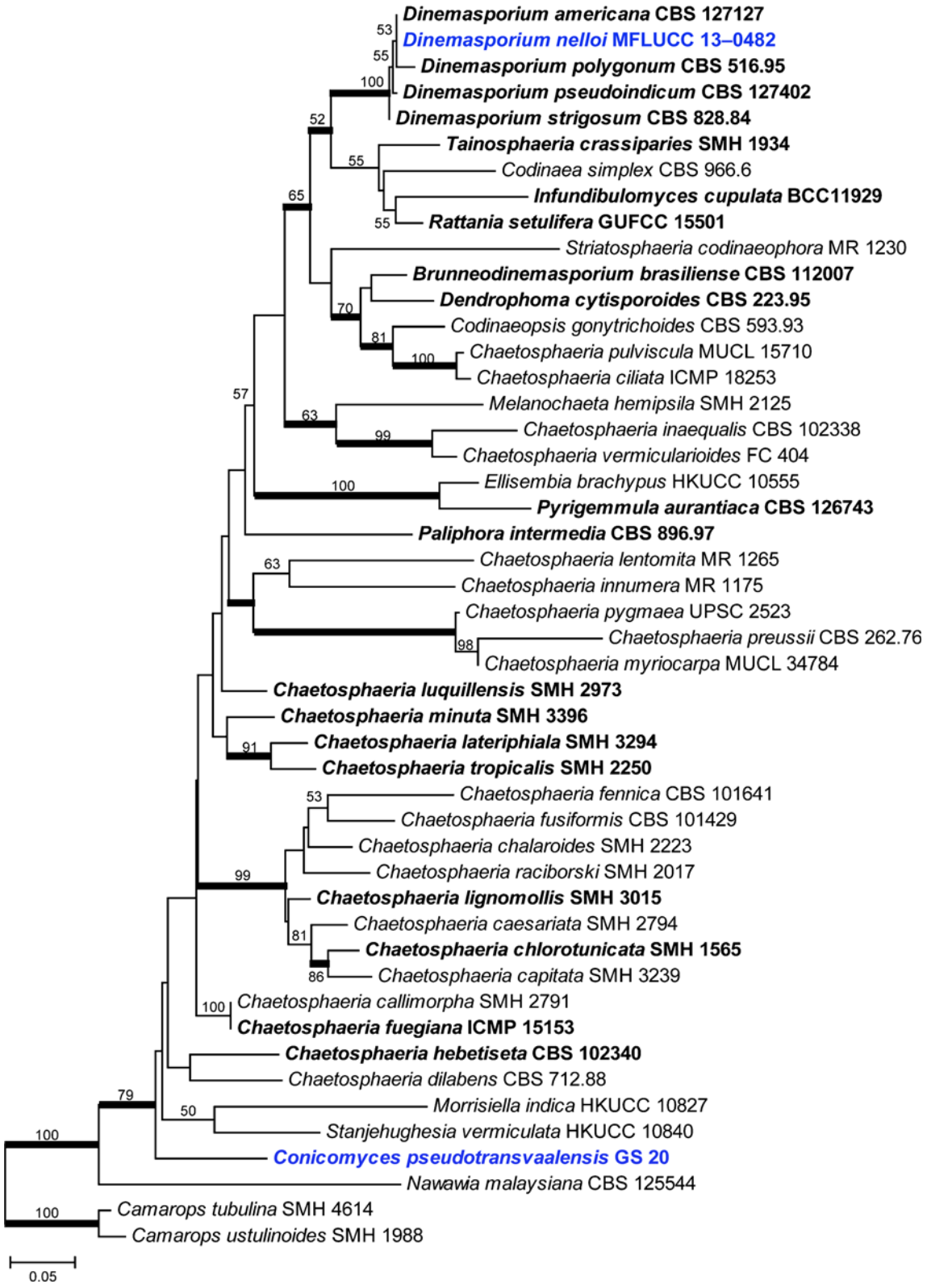


Fig. 11 Phylogram generated from Maximum likelihood (RAxML) analysis based on LSU sequence data. Maximum Likelihood bootstrap support values greater than 50 % are indicated above or below the nodes. The ex-types (reference strains) are in *bold*. New isolates are in *blue*. The tree is rooted with *Camarops tubulina* SMH 4614 and *Camarops ustulinoides* SMH 1988

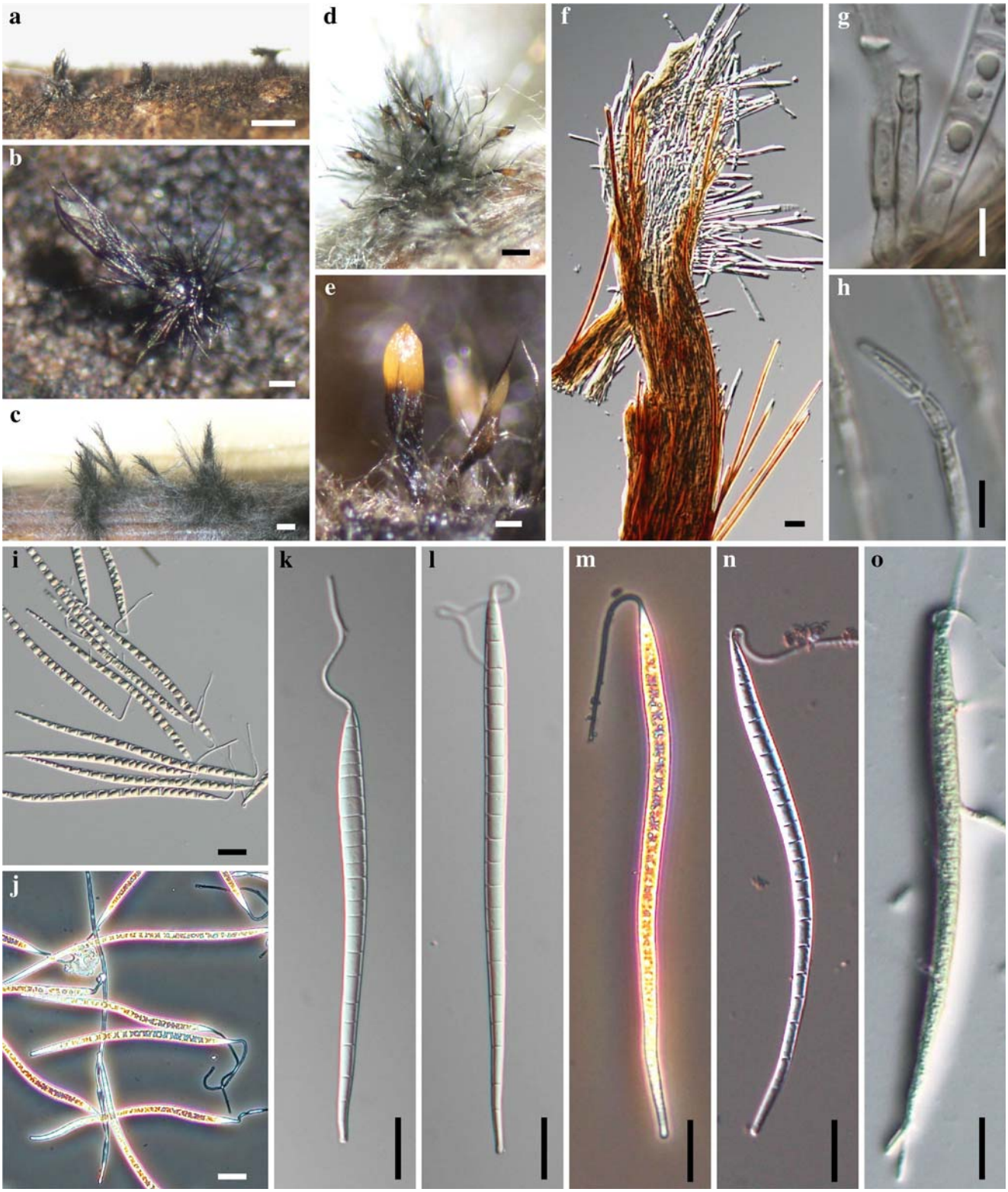


Fig. 12 ***Conicomyces pseudotransvaalensis*** **(holotype)**. **a**, **b** Conidiomata on host surface **c-e** Conidiomata in culture **f** Conidioma in longitudinal section **g, h** Conidiogenous cells **i**–**n** Conidia **o** Germinating conidium a, b, f, h, k, l from HHUF 29956 (holotype); c-e, g, i, j, m–o from MAFF 244767 (ex-type isolate). Scale bars: a, c=500 μm, b, e=100 μm, d=250 μm, f, i–o=20 μm, g, h=5 μm

superficial, cupulate conidiomata with setae; "phialidic" conidiogenous cells; and hyaline, oblong to allantoid conidia with single appendage at each end (Sutton 1980; Nag Raj 1993). *Dinemasporium nelloi* is morphologically similar with

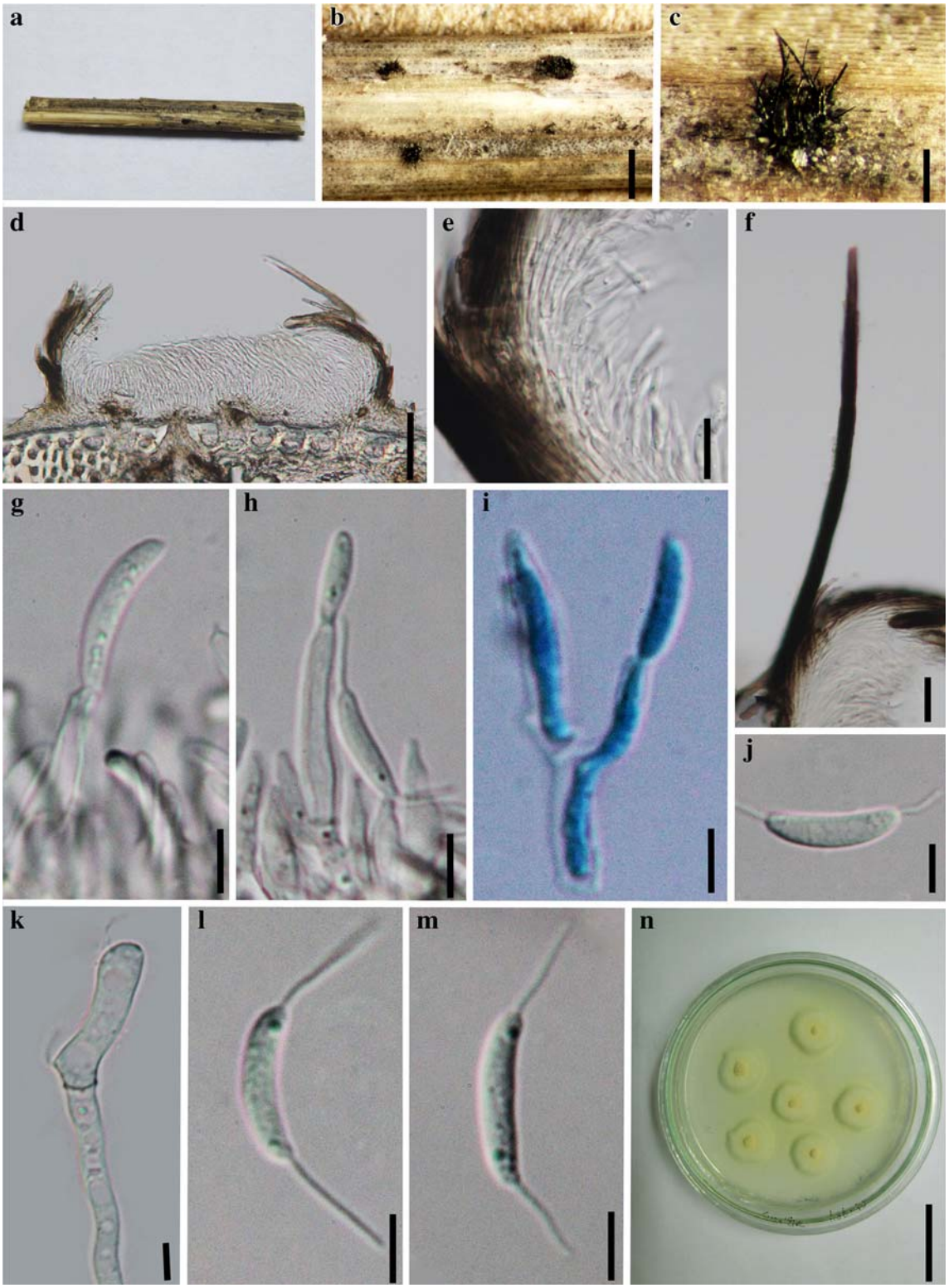


Fig. 13 ***Dinemasporium nelloi*** (**holotype**) **a** Specimen **b**, **c** Black conidiomata on the host surface **d** Vertical section of conidioma **e** Section of peridium **f** Seta **g–i** Conidiogenous cells and developing conidia **j**, **l–m** Conidia **k** Germinated conidia **n** Culture on PDA. Scale bars: b=500 μm, c=100 μm, d=50 μm, e=10 μm, f=20 μm, g–m=5 μm, *n*=25 mm

D. americana, *D. morbidum* and *D. polygonum*. However, *D. nelloi* produces conidia that are much longer than in these species (i.e. (9–)12–13(–16) μm long in *D. americana*, 8–13 μm long in *D. morbidum* and (9–)10–12(–13) μm long in

D. polygonum), although shorter than *D. lanatum* (13–27 μm long) (Nag Raj 1993; Crous et al. 2012). According to the LSU sequence data, *D. nelloi* is distinct from any other species within *Dinemasporium*. Combined with morphological data and molecular data, we introduce the new species, *Dinemasporium nelloi*.

Diaporthaceae

The family *Diaporthaceae* (order *Diaporthales*, class *Sordariomycetes*) includes *Diaporthe*, as the species-richest genus (Wehmeyer 1933; Ueker et al. 1988; Hyde et al. 2014; Udayanga et al. 2014). About 2000 names are listed in *Diaporthe* and the asexual morph *Phomopsis* in the Index Fungorum (2015). In addition, the genera *Mazzantia*, *Ophiodiaporthe* and *Pustulomyces* are known within the family (Castlebury et al. 2002; Fu et al. 2013; Dai et al. 2014a, b). The genus *Mazzantia* is poorly known with little sequence data and few cultures available (Castlebury et al. 2002; Rossman et al. 2007). *Ophiodiaporthe*, has been recently described from China as a monotypic genus comprising the homothallic species *O. cyatheae* Y.M. Ju et al. (Fu et al. 2013). However, the phylogenetic distinctiveness of this genus is uncertain as the analyses revealed a high similarity with *Diaporthe*. A new coelomycetous genus, *Pustulomyces*, was described from decaying bamboo in Thailand which is morphologically similar to *Bambusicola* (*Bambusicolaceae*) (Dai et al. 2014a, b). Lamprecht et al. (2011) recognized coelomycetous fungi with pigmented conidia, *Stenocarpella macrospora* (Earle) B. Sutton, *S. maydis* (Berk.) B. Sutton, and *Phaeocytostroma ambiguum* (Mont.) Petr, causing root and crown rot of maize, to be placed within *Diaporthaceae*. Herein, we introduce a new species, *Diaporthe thunbergiicola* as a new species in the genus *Diaporthe*, contributing to the diversity within the family. The phylogenetic tree is presented in Fig. 14.

11. *Diaporthe thunbergiicola* Udayanga & K.D. Hyde, ***sp. nov.***

Index Fungorum Number: IF551072, *Facesoffungi number*: FoF00472; Fig. 15

Etymology: Referring to the original host association with tropical ornamental vine *Thunbergia laurifolia* Lindl.

Holotype: MFLU 14-0816

Pathogen on leaves of *Thunbergia laurifolia*. **Sexual morph** Undetermined. **Asexual morph** *Pycnidia* on alfalfa twigs on WA: subglobose to ovate, 100–200 μm diam., embedded in tissue, erumpent at maturity, with an elongated, black neck 100–200 μm long, often with a yellowish, conidial cirrus extruding through ostiole; walls parenchymatous, consisting of 3–4 layers of medium brown *textura angularis*. *Conidiophores* hyaline, smooth, unbranched or branched at the basal cell, ampulliform, cylindrical to sub-cylindrical, with larger basal cell 6–14×1–2 μm ($\bar{x}$±SD=11±2×1.5±0.2, n=30). *Conidiogenous cells* phialidic, cylindrical, terminal, slightly tapering towards apex, 0.5–1 μm diam. *Paraphyses* absent. *Alpha conidia* 5.7–7.5×2–3 μm, abundant in culture and on alfalfa twigs, aseptate, hyaline, smooth-walled, ovate to ellipsoidal, biguttulate, base subtruncate ($\bar{x}$±SD=6.6±0.4×2.8±0.1 , n=30). *Beta conidia* undetermined.

Cultural characteristics: In dark at 25 °C for 1 wk, colonies on PDA fast growing, 5±0.2 mm/day (n=8), white, raised, aerial mycelium, reverse yellowish pigmentation developing in centre; stroma not produced in 1 wk old culture.

Holotype: THAILAND, Chiang Mai Province, Doi Suthep Pui herbal garden, on leaves of *Thunbergia laurifolia* (*Acanthaceae*), 10 January 2012, D. Udayanga DPH 114 (MFLU 14–0816, **holotype**), ex-type culture, MFLUCC 12–0033, ICMP. GenBank ITS: KP715097; TEF: KP715098.

Notes: This is the second species described from *Thunbergia laurifolia* in Thailand. Udayanga et al. (2012) described *Diaporthe thunbergii* Udayanga, X.Z. Liu & K.D. Hyde from the same host. Both species were recovered from similar disease symptoms on leaves; however *D. thunbergiicola* has both abundant and distinct alpha and beta conidia. The alpha conidial dimensions overlap with other taxa in the genus, making morphological identification impossible. The fungus was associated with typical leaf spots and in latent phase of yellowing and leaf necrosis. In the phylogenetic analysis, the species was placed within *D. sojae* species complex (Udayanga et al. 2014), mostly consisting of crop and weed associated species. The comparison of ITS and EF1-α sequences revealed that *D. thunbergiicola* is distinct from the sister species *D. ueckerae*, originally reported from *Cucumis melo* L. in Oklahoma, USA. The pair-wise comparison revealed high similarities of the ITS (96 %) and EF1-α sequences (92 %) between the two species. The combined phylogenetic tree (Fig. 14) revealed the placement of *D. thunbergii* and *D. thunbergiicola* compared to a selection of closely related ex-type isolates.

Diatrypaceae

Species of *Diatrypaceae* (*Xylariales*) are widespread inhabitants of dead wood and bark of a broad variety of plants worldwide (Trouillas et al. 2011). They can be recognized by their perithecial ascomata embedded usually in a black stroma, long stalked asci and allantoid ascospores (Glawe and Rogers 1984; Rappaz 1987). Kirk et al (2008) listed 13 genera and more than 220 morphological species in this family. The available phylogenetic studies are those of Acero et al. (2004) and Trouillas et al. (2010, 2011). In this study, we introduce a new species based on both the morphology and phylogeny. The phylogenetic tree is presented in Fig. 16.

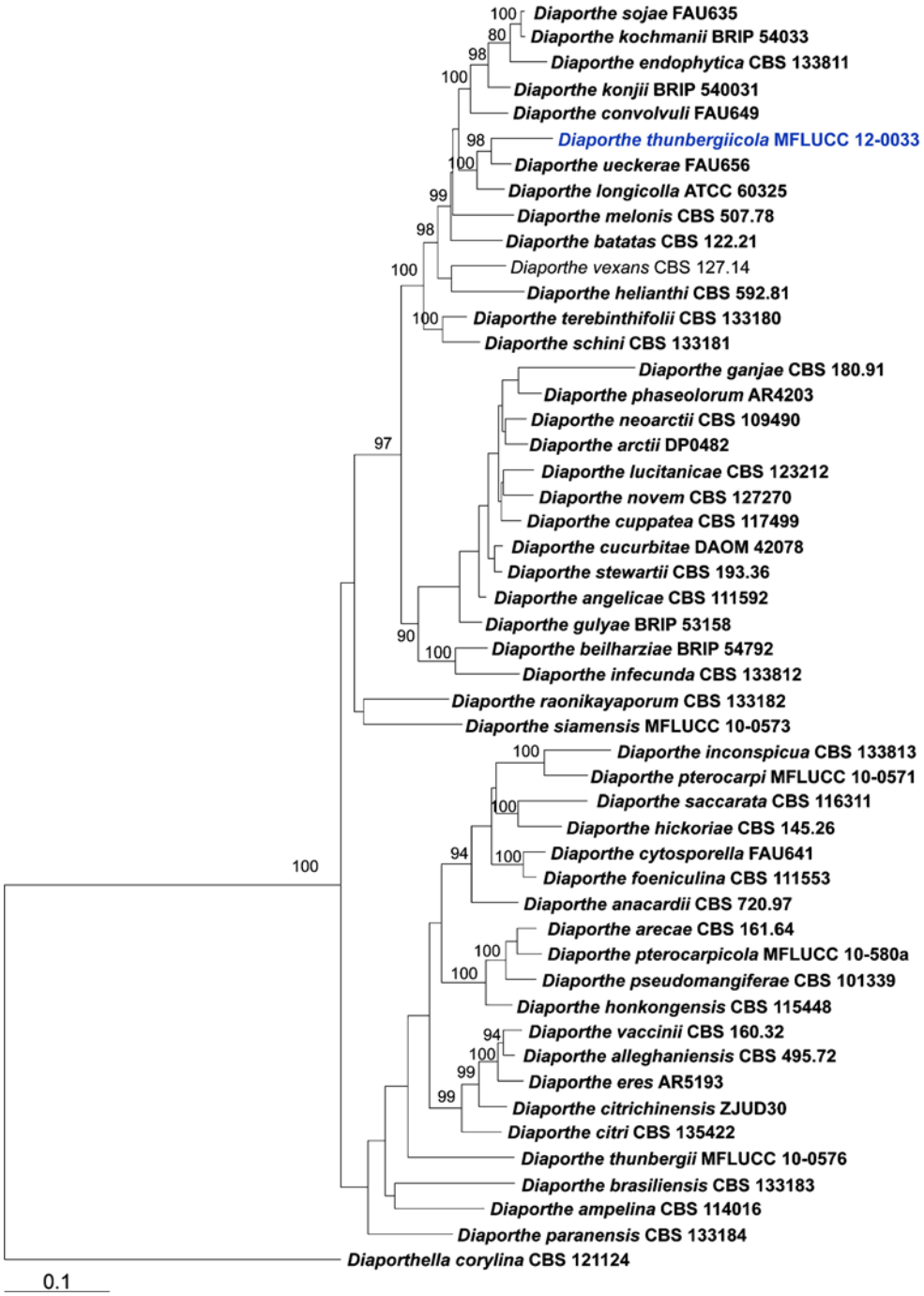


Fig. 14 Phylogram generated from RAxML based on combined alignment of ITS, TEF, β-tubulin and CAL gene regions. Maximum likelihood bootstrap support values greater than 90 % are indicated above or below the nodes. The ex-types are in *bold*; the newly isolate is in *blue*. The tree is rooted with *Diaporthella corylina* CBS 121124

12. *Diatrype palmicola* J.K. Liu & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551017; *Facesoffungi number*: FoF00487, Fig. 17

Etymology: Named after the host on which the fungus was collected.

Holotype: MFLU 15-0040

Saprobic on palm fronds. *Stromata* well-developed, or comprising mostly fungal tissue, often delimited with a black line perceptible in the wood below, bursting through bark or wood and often surrounded by remaining adherent epidermis or wood fragments, discoid to pulvinate or hemisphaerical, generally strongly emerged from the host surface. *Entostroma* poorly developed between ascomata, only present at the level of the neck. **Sexual morph** *Ascomata* immersed in the stromata, with the stromata surface flat or slightly convex. *Ostiole* flattened and circular or subconical. *Asci* 70–110×7–9 *μm*, 8–spored, unitunicate, long pedicellate, clavate, apically rounded to truncate. *Ascospores* (6−)7–8(−9)×1.5–2 *μm*, 2–3

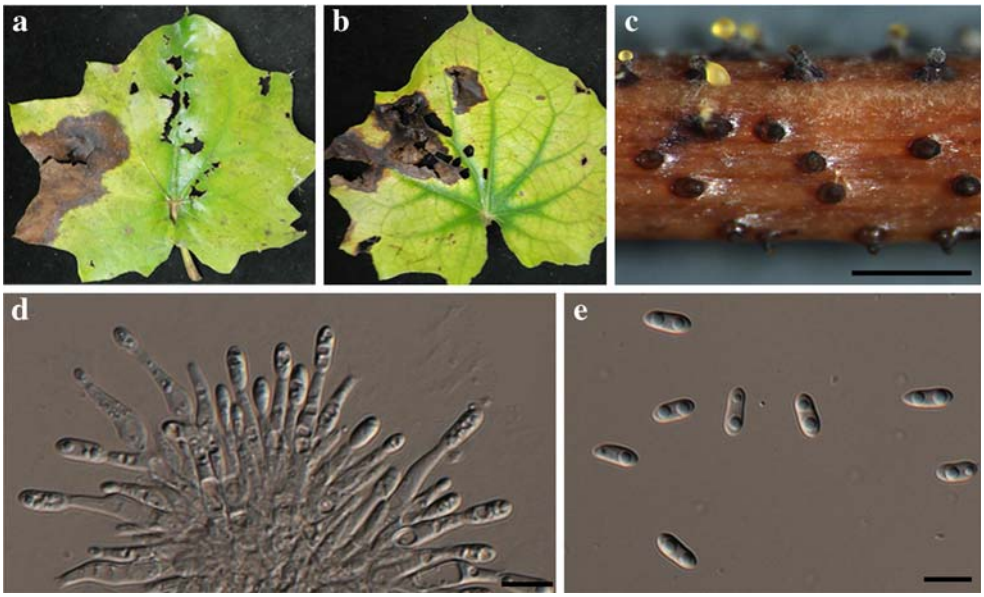


Fig. 15 ***Diaporthe thunbergiicola*** **(holotype) a**, **b** Leaf sports on *Thunbergia laurifolia* **c** Pycnidia on alfalfa stem in WA **d** conidiophores e. alpha conidia. Scale bars: c=1000 *μm*, d, e=8 *μm*

seriate, allantoid, 1–celled, hyaline to subhyaline, rarely pale olivaceous, slightly to moderately curved and smooth-walled.

Material examined: THAILAND, Chiang Rai Province, Muang District, Khun Korn Waterfall, on dead branch of *Caryota urens* L. (*Arecaceae*), 14 March 2010. J.K. Lui, JKA0031 (MFLU 15-0040, **holotype**) ex-type living culture=MFLUCC 11–0018, GenBank ITS: KP744438; LSU: KP744481; SSU: KP753949; *ibid*. on dead branch of *Caryota urens*, 6 September 2010, J.K. Liu, JKA0032 (MFLU 15-0041, **paratype**); living culture, MFLUCC 11–0020, GenBank ITS: KP744439; LSU: KP744482; SSU: KP753950.

Notes: *Diatrype palmicola* has morphological characteristics typical of taxa in the genus *Diatrype*. Four species, namely *D. euterpes*, *D. palmarum*, *D. palmarum* var. *rimosa* and *D. urticaria* are described from palms (Liu et al. 2014). Analyses showed that *D. palmicola* ITS sequences differ from all sequences of taxa of *Diatrype* in GenBank, including the close species *D. favacea* and *D. pulvinata*. The reconstruction generated from ITS sequences showed similar results as previous studies (Acero et al. 2004; Trouillas et al. 2011). This suggests that the current taxonomic scheme for the *Diatrypaceae* may not reflect the true phylogenetic relationship of these fungi. The number of spores per ascus (eight spores versus more than eight spores) has been used traditionally to define genera of *Diatrypaceae* (*Diatrype* vs. *Diatrypella* and *Eutype* vs. *Eutypella*). However the polysporous ascus feature has been shown to be not significant in *Diatrypaceae* based on recent studies (Acero et al. 2004; Vasilyeva and Stephenson 2005; Trouillas et al. 2011; Chacon et al. 2013) and the phylogenies showed that the genera *Cryptovalsa* and *Eutypella*, as well as *Diatrype* and *Diatrypella* have molecular affinities. Until more species are collected, epitypified and sequenced, as well as an increased sampling of taxa included, the understanding of *Diatrypaceae* will remain fragmentary.

13. ***Phaeoisaria pseudoclematidis*** D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550942, *Facesoffungi number*: FoF00452, Figs. 18 and 19

Etymology: In reference to its similarity with *Phaeoisaria clematidis*.

Holotype: MFLU 14–0824

Saprobic on bamboo culms, formed mostly at the nodal region on host surface. *Mycelium* immersed on the substrate, composed of septate, branched, brown hyphae. **Sexual morph** Undetermined. **Asexual morph** *Conidiophores* 50–500×2–3 *μm*, macronematous, synnematous, brown to dark brown, septate, branched, smooth, single conidiophores. *Synnemata* erect, rigid, dark brown, velvety, smooth, composed of compactly and parallels adpressed conidiophores, 200–500 *μm* long, 40–80 *μm* wide at the base, 40–60 *μm* wide in the middle, 20–30 *μm* wide at the apex, with flared conidiogenous cells in the above half. *Conidiogenous cells* 5–20×2–3 *μm* ($\bar{x}$=13.1×2.6 *μm*, *n*=50), terminal, integrated or discrete, short, recurved, ellipsoidal, brown to dark brown, smooth, denticulate, polyblastic, sympodial, each with one to several denticulate conidiogenous loci. *Conidia* 5–8.5×3–4 *μm* ($\bar{x}$=6.7×3.3 *μm*, *n*=50), cylindric-ovate, straight, aseptate, hyaline, smooth-walled, guttulate.

Culture characters: Conidia germinating on PDA within 24 h and germ tubes produced from lower end. Colonies

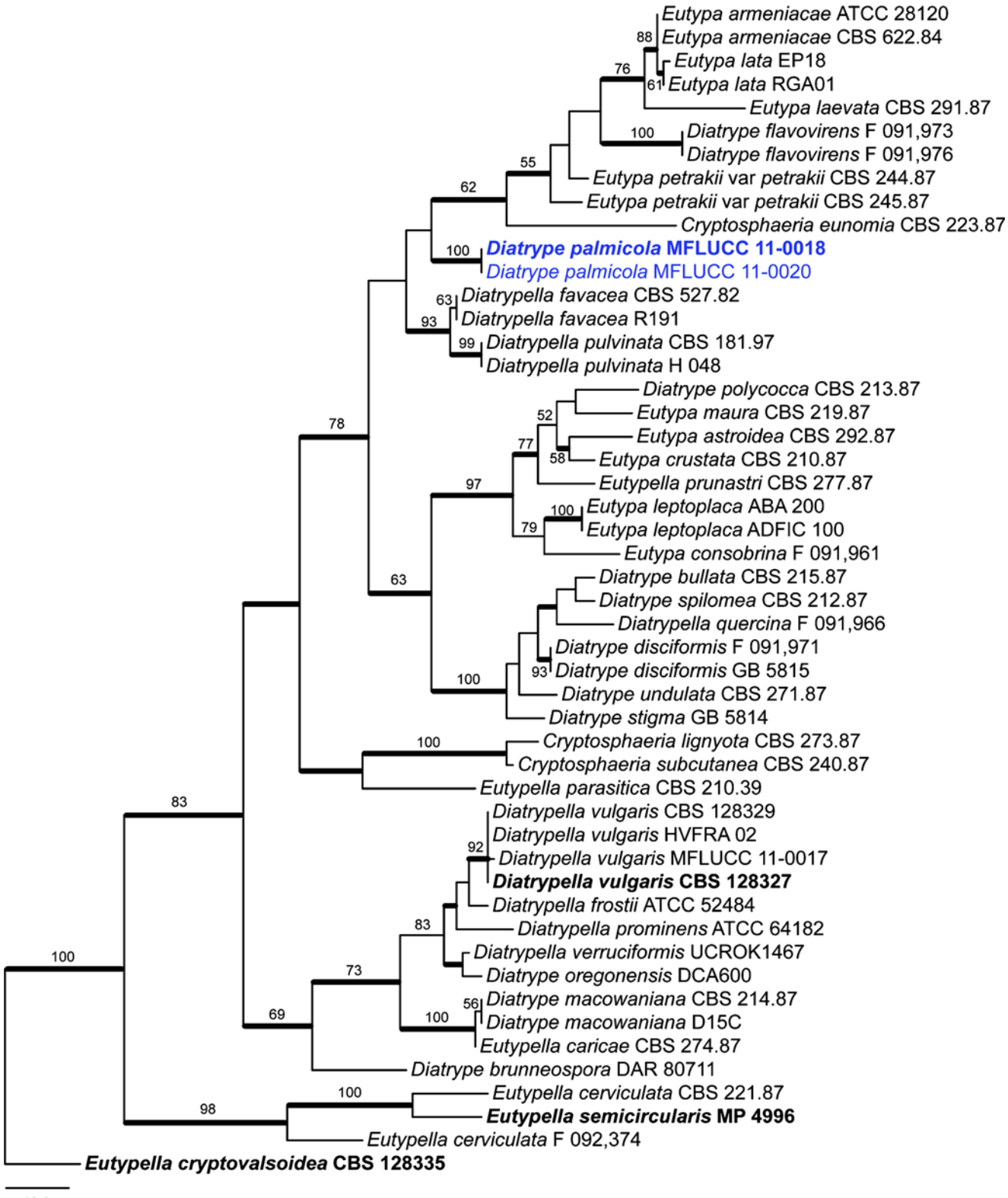


Fig. 16 Phylogram generated from parsimony analysis based on ITS sequence data of *Diatrypaceae*. Parsimony bootstrap support values greater than 50 % are indicated above the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Eutypella cryptovalsoidea* CBS 128335

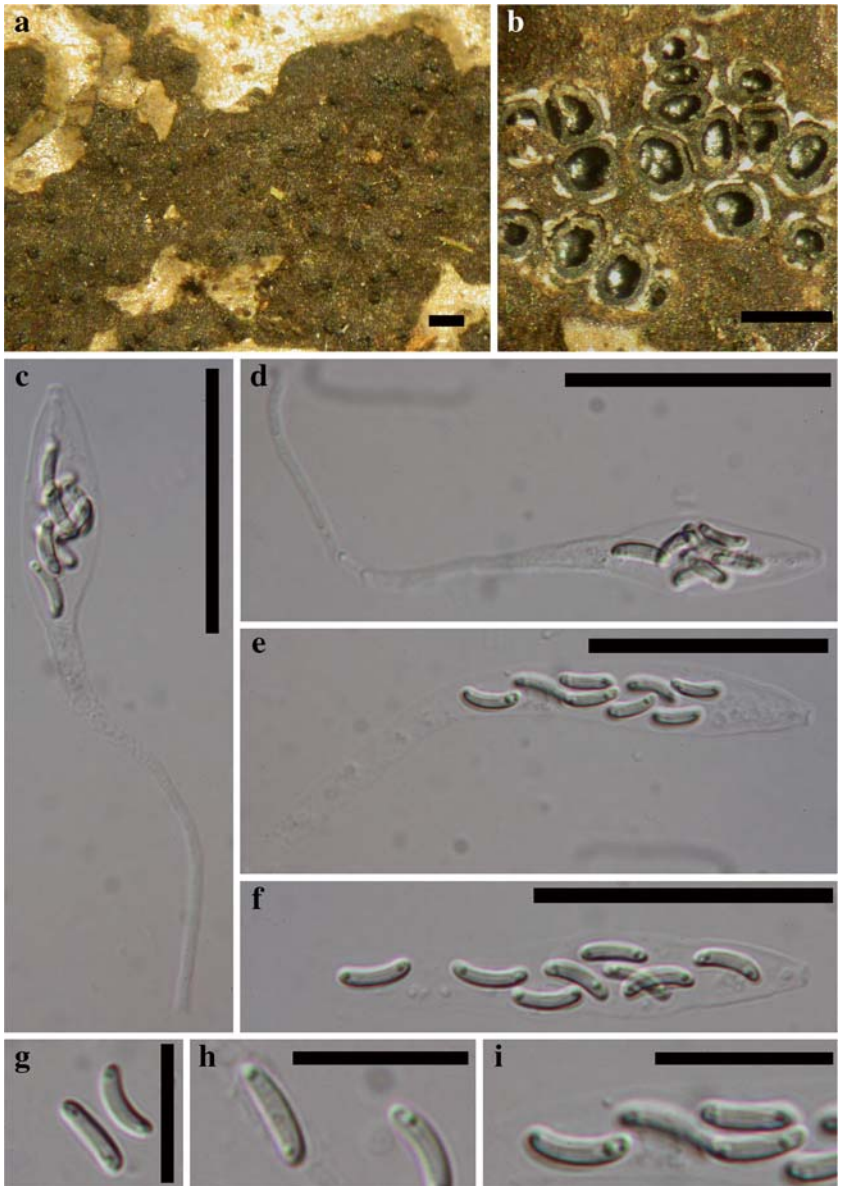


Fig. 17 ***Diatrype palmicola*** **(holotype)**. **a**, **b** Appearance of the stromata on host surface **c**–**f** Asci with long pedicels **g-i** Allantoid ascospores. Scale Bars: **a**, **b**=1 mm. **c**–**f**=30 μm, **g**–**i**= 10 μm

growing slowly on PDA, reaching 3 mm in 2 week at 28 °C, flat, circular, dark brown from forward and the reverse. Mycelium immersed in media, composed of branched, septate, smooth, dark brown hyphae.

Material examined: THAILAND, Chiang Rai, Mae Sae Village, on dead culm of bamboo (*Bambusae*), 14 May 2011, Dong-Qin Dai DDQ 0020 (MFLU 14–0824, **holotype)**, (**isotype** deposit in KUN, under the code of HKAS 83939), living culture, MFLUCC 11–0393=ICMP. GenBank ITS: KP744457; LSU: KP744501; SSU: KP753962.

Notes: *Phaeoisaria* was introduced by Höhnel (1909) for a collection on *Gigantochloa* sp. (*Bambusae*) and is typified by *P. bambusae* Höhn. This genus is characterized by black synnemata with polyblastic, sympodial, denticulate, conidiogenous cells which produce small, hyaline conidia. *Phaeoisaria pseudoclematidis* is different from the type species, *P. bambusae*, in having shorter synnemata (200–500 μm versus 1–1.5 mm), and wider conidia (3–4 μm versus 1.5–2 μm) (Sitzungsberichte et al. 1909, Seifert et al. 2011). *Phaeoisaria bambusae* was originally collected from Indonesia. Our new isolate is similar to *P. clematidis* in morphology. Synnemata of *P. clematidis* are however, more than 800 μm long and conidia narrower than 3 μm (Hughes 1958). *Phaeoisaria* was placed in Pezizomycotina order *incertae sedis*, Ascomycota (Höhnel 1909). Wijayawardene et al. (2012) linked *Phaeoisaria* to *Annulatascaceae* (*Rhamphoria*), *Boliniaceae* and *Diatrypaceae* (*Eutypella*). There are a few new taxa published or recorded in *Phaeoisaria* (Matsushima 1996; Castañeda Ruíz et al. 2002; Mel'nik 2012). In this paper, based on our collection, we

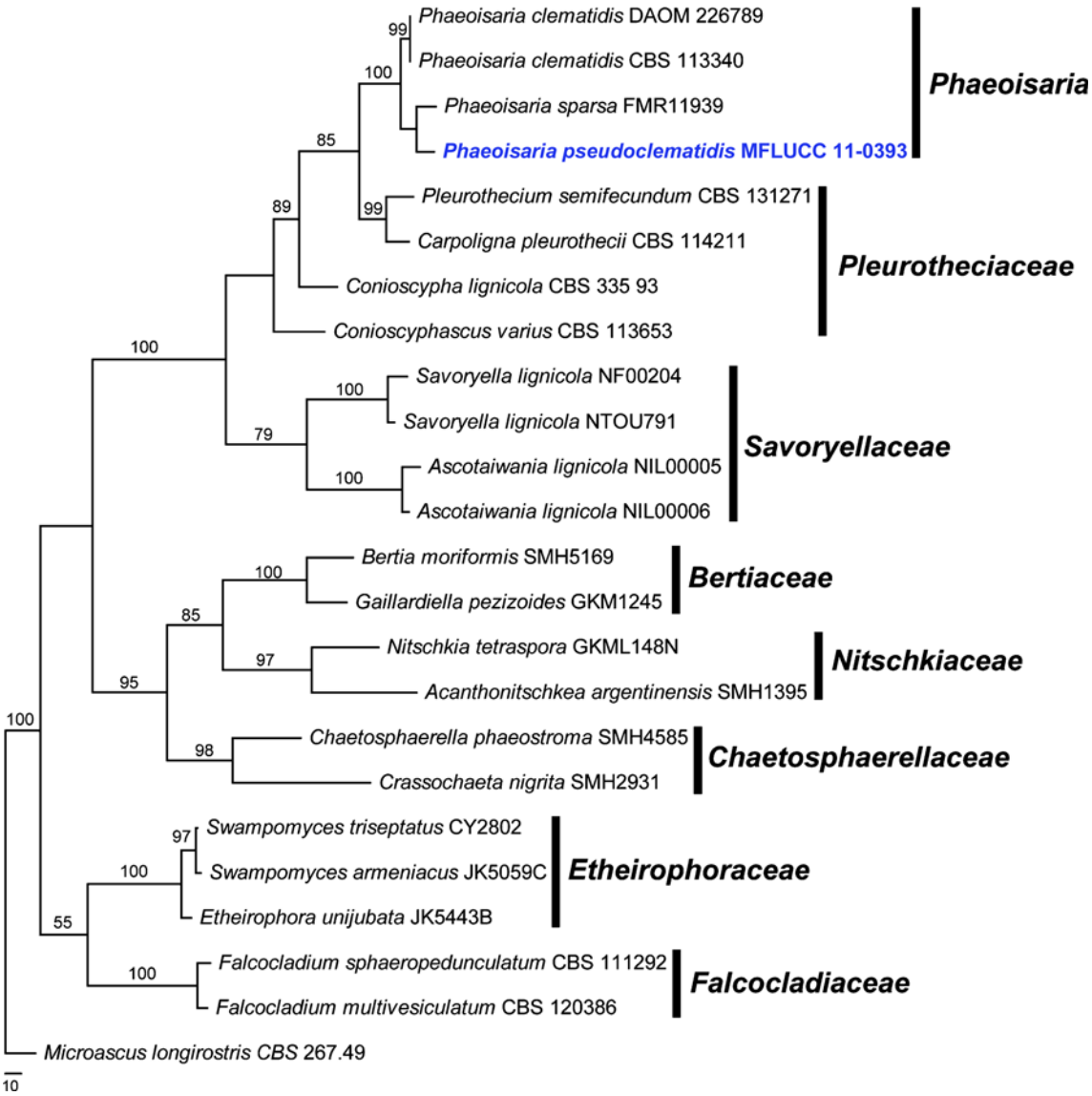


Fig. 18 Phylogram generated from Maximum Parsimony analysis based on LSU sequence data. Parsimony bootstrap support values greater than 50 % are indicated above or below the nodes. The ex-type (reference strains) are in *bold*, the newly new isolates are in *blue*. The tree is rooted with *Microascus longirostris* CBS 267.49

provide the phylogenetic tree to clarify the natural placement of *Phaeoisaria* (Fig. 18) and introduce a new species.

Glomerellaceae

The family name *Glomerellaceae* was introduced by Locquin (1984) and was validated by Seifert and W. Gams in Zhang et al (2006). *Glomerellaceae* is a monotypic family characterized by the *Glomerella* sexual morph and the *Colletotrichum* asexual morph. The first attempts to place *Colletotrichum* within a molecular phylogenetic system using 18S rDNA sequences were by Illingworth et al. (1991) and Berbee and Taylor (1992). Réblová et al. (2011) using ITS, LSU, SSU and RPB2 genes further elucidated the phylogenetic position of *Glomerellaceae*. The phlogenetic tree is presented in Fig. 20.

14. *Colletotrichum sedi* Jayawardena, Bulgakov & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550762, *Facesoffungi number*: FoF00332; Fig. 21

Etymology: Based on the host genus *Sedum*.

Holotypus: MFLU 14–0623.

Saprobic on dead stalks of *Sedum* sp. **Asexual morph** *Conidiomata* 262–410 μm ($\bar{x}$=329 μm, n=10) diam., solitary, acervulus, black, oval. *Setae* abundant, 50–125 μm long, pale to medium brown, smooth-walled, 1–4-septate, base cylindrical, 2.8–6.8 μm diam., apex somewhat acute.

Fig. 19 ***Phaeoisaria pseudoclematidis*** **(holotype) a** Fruiting bodies on bamboo host **b** Apex of synnemata **c** Synnemata **d**, **f** Conidiogenous cells **e** Base of conidiophores **g**, **h** Hyaline conidia **i** Germinating conidia **j**, **k** Cultures on PDA. Scale bars: a= 1 mm, b=30 *μm*, c, e=50 *μm*, d, f=10 *μm*, g–i=5 *μm*. j=1 mm, k= 3 mm

Conidiophores simple, to 37 μm long, hyaline, smooth–walled. *Conidiogenous cells* (7–)10.5–19(–22)×(1–)2.39–5.2(–6) *μm* ($\bar{x}$=14×3.4 *μm*, *n*=20), hyaline, smooth–walled, cyllindrical to slighty inflated, opening 1.2–3.7 *μm* diam., Collarette 0.5–1 *μm* long, periclinal thickening visible, *Conidia* (2–)6.6–10.5(–14)×(1–)2–5(–6) *μm* ($\bar{x}$=7.3×3.6 *μm*, *n*=40) hyaline, smooth-walled or verruculose, aseptate, curved, both sides gradually tapering towards the round to slightly acute apex and truncate base, guttulate.

On PDA Conidiomata solitary or aggregated, acervulus, submerged, black, circular to oval. *Sporulation* abundant. *Setae* 50–120 *μm* long, dark brown up to the tip, opaque, septa difficult to distinguish, 2 to 4-septate, smooth-walled, base cylindrical, straight or±bent, 3–7 *μm* diam., apex acute. *Conidiophores* to 30 μm long, simple, hyaline. *Conidiogenous cells* (5–)8.5–16(–19)×(1–)2.5–5(–6) *μm* ($\bar{x}$=12×3.5 *μm*, *n*=20), hyaline to pale brown, smooth–walled, cyllindrical to slighty inflated, opening 1.2–3.7 *μm* diam., Collarette 0.5–1 *μm* long, periclinal thickening visible. *Conidia* (4–)6–10.3(–14)×(1–)2.3–5.2(–6) *μm* ($\bar{x}$=6.9×3.6 μm, *n*=40) hyaline, curved, both sides gradually tapering towards the round to slightly acute apex and truncate base, guttulate. *Appressoria* (6–)8.5–16.4(–18)×(1–)2.5–4(–5) *μm* ($\bar{x}$=12.5×2.8 *μm*, *n*=

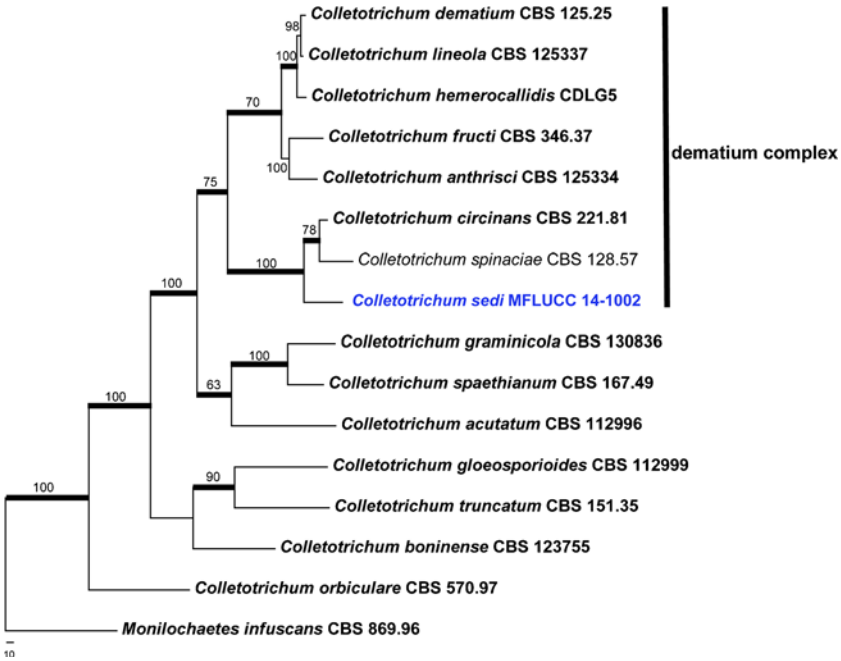


Fig. 20 Phylogram generated from parsimony analysis based on combined ITS, GADPH, CHS, ACT and β-tubulin sequence data of *Colletotrichum*. Parsimony bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Monilochaetes infuscans* CBS 869.96

10) solitary to aggregated, in small groups or short chains, medium to dark brown, smooth-walled, round, oval or irregular. **Sexual morph** Undetermined.

Culture Characters: Colonies on PDA reaching 45 mm in 7 days at 28 °C, flat with entire margin, olivaceous grey aerial mycelium becoming dull green towards the edge with olivaceous grey to iron grey acervuli from forward, reverse grey-olivaceous to dull green, concentric.

Material examined: RUSSIA, Rostov region, Rostov-na-Donu city, Botanical garden of Southern Federal University, flowerbed, on *Sedum* sp. (*Crassulaceae*), 5 March 2014, Timur Bulgakov (T94), (MFLU 14–0623, **holotype**); ex-type living cultures, MFLUCC 14–1002, CGMCC 3.17570. GenBank ITS: KM974758; GADPH: KM974755; ACT: KM974756; CHS: KM974754; β-tubulin: KM974757.

Notes: The genus *Colletotrichum* was introduced by Corda (1831) and subsequently treated by Hyde et al. (2009) and Cai et al. (2009). The most recent treatment is by Hyde et al. (2014) which was based on multi-gene phylogeny. The dematium complex contains the type species of the genus, *Colletotrichum lineola* (Damm et al. 2009; Cannon et al. 2012). *Colletotrichum dematium* is mainly characertized by its curved conidia whch is also a character of the species of the truncatum complex but found to occupy distinct separate clades (Damm et al. 2009; Cannon et al. 2012).

Colletotrichum sedi clusters in the subclade comprising *C. circinans* and *C. spinaciae* within the dematium complex (Fig. 20). *Colletotrichum sedi* forms a separate branch with 100 % bootstrap support and 1.00 Bayesian posterior probability. This species differs from *C. circinans* and *C. spinaceae* in having longer setae (50–125 *μm*) with 1–4-septate, simple conidiophores, solitary to aggregated appressoria, in small groups or short chains and smaller conidia (6.6–10.5×2–5 *μm*).

Halosphaeriaceae

The family *Halosphaeriaceae* was detailed in Jones et al. (2009) and treated is here accordingly. The phylogenetic tree is presented in Fig. 22.

15. *Natantispora unipolaris* K.L. Pang, S.Y. Guo & E.B.G. Jones, ***sp. nov.***

Index Fungorum number: IF551074; *Facesoffungi number*: FoF00564; Fig. 23

Etymology: In reference to the unipolar ascospore appendage.

Holotype: F27870 (National Museum of Natural Science, Taiwan)

Saprobic on dead stems. **Sexual morph** *Ascomata* 78–(124)–158×75–(119)–216 *μm* (*n*=9), light to dark coloured when mature, globose to subglobose, solitary or gregarious, immersed, coriaceous, ostiolate. *Necks* 30–(59)–96 *μm* long (*n*=8), periphysate. *Peridium* 5–33 *μm* (*n*=18), composed of one layer of elongated cells with large lumina, cells of *textura angularis*. *Catenophyses* present, persistent. *Asci* 59–(87)–108×15–(18)–20 *μm* (*n*=8), 8-spored, unitunicate, clavate, thin-walled, persistent, short pedicellate, developing from inner wall of ascoma base, no apical apparatus or retraction of plasmalemma. *Ascospores* 21–(25)–28×6–(8)–8 *μm* (*n*=50), elongate-ellipsoidal, hyaline, 1-septate, not constricted at the septum. Appendages unipolar, initially adpressed to the ascospore wall and extended over the mid-

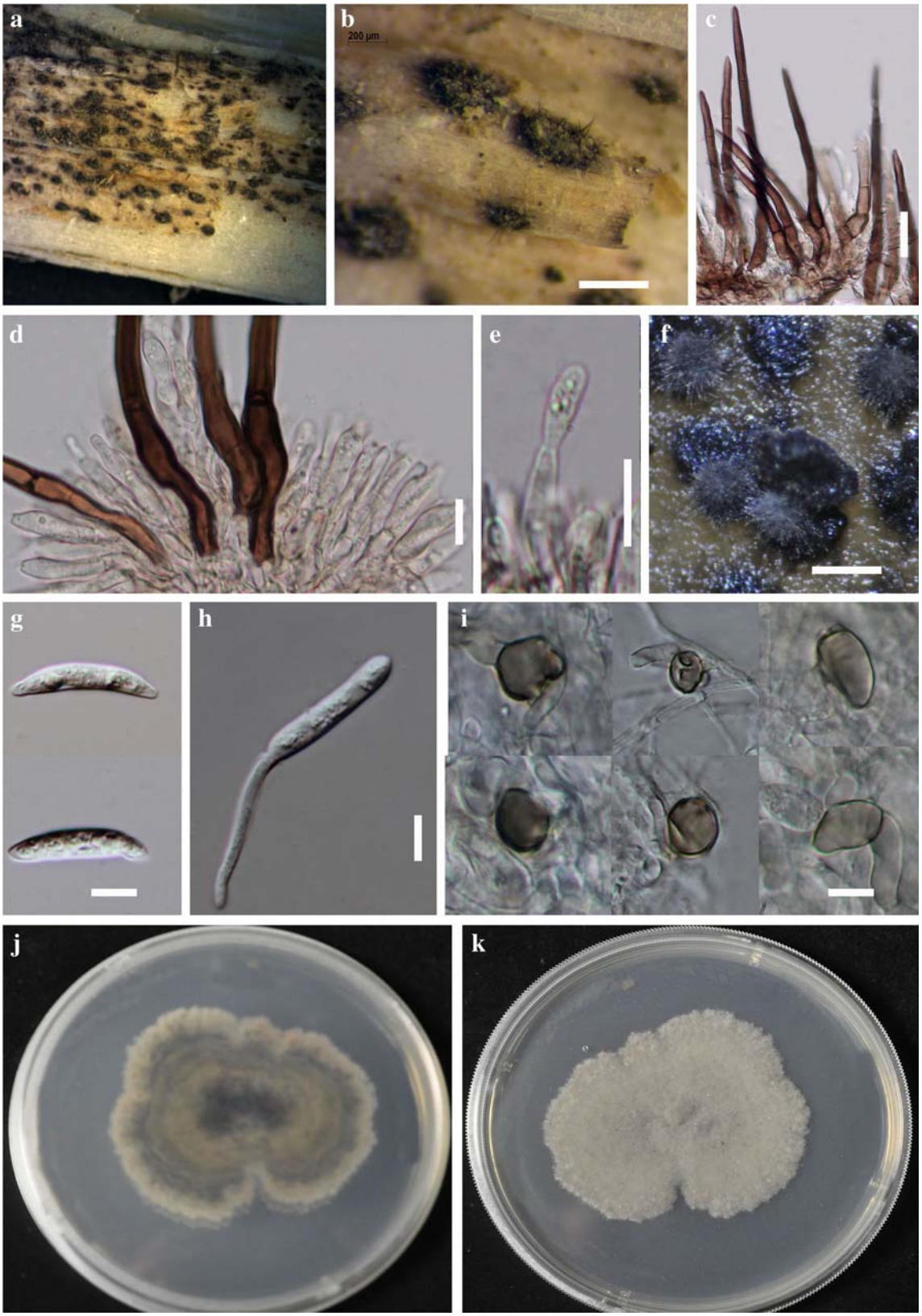


Fig. 21 ***Colletotrichum sedi*** **(holotype) a** Specimen with conidiomata **b** Black acervuli **c** Brown setae **d** Conidiophores with basal parts of setae **e** Hyaline conidiogenous cells **f** Conidiomata on PDA **g** Hyaline conidia **h** Germinating conidium **i** Appressoria **j** Reverse view of the colony **k** Upper view of the colony. Scale bars: b=200 μm, c=20 μm, d=15 μm, e, f=10 μm, g-i=5 μm

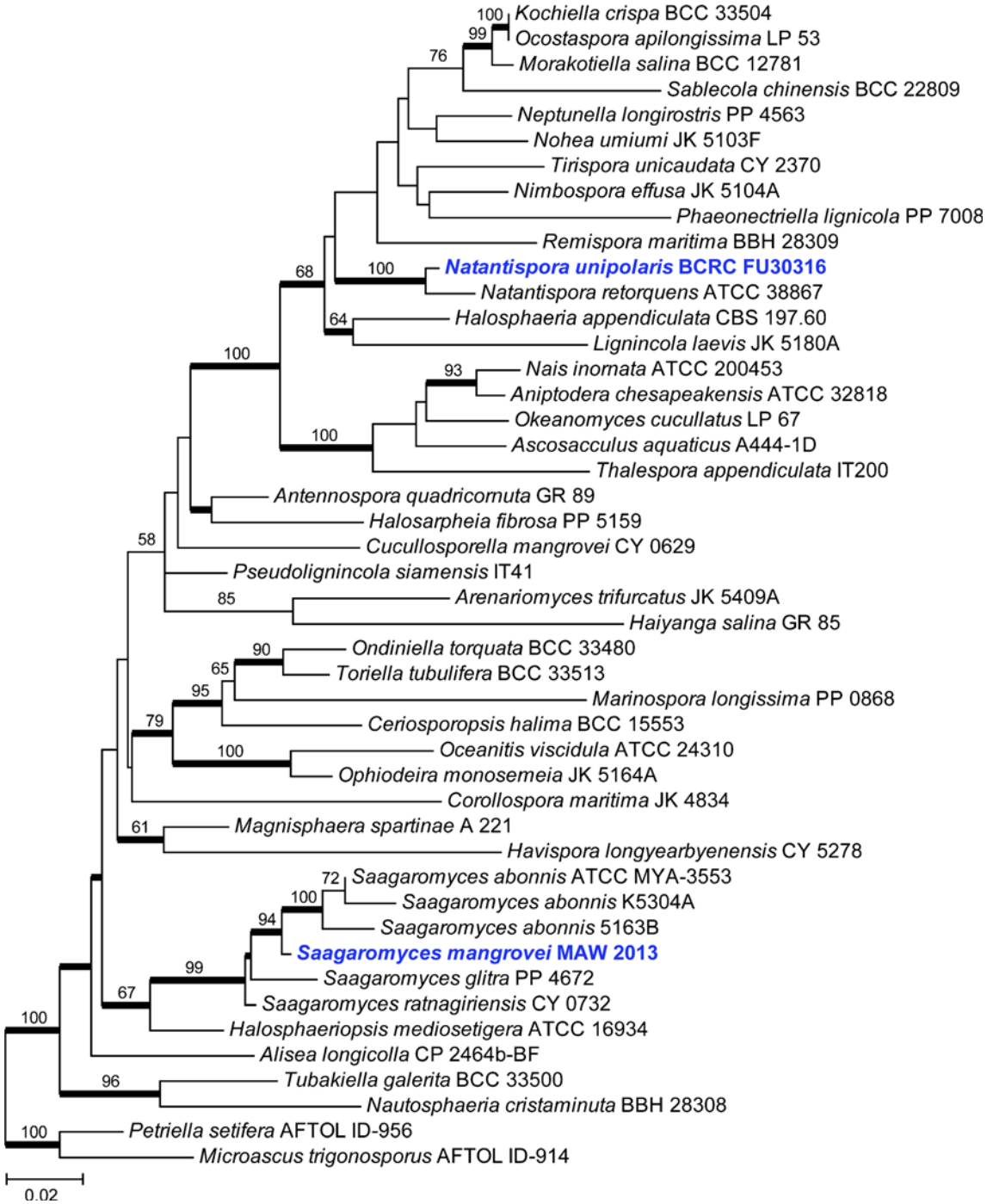


Fig. 22 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined SSU and LSU sequence data of the *Halosphaeriaceae*. Maximum Likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, the branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*, the new isolates are in *blue*. The tree is rooted with *Microascus trigonosporus* AFTOL-ID 914 and *Petriella setifera* AFTOL-ID 956

septum, unravelling immediately in sea water to form a long thin filament. **Asexual morph** Undetermined.

Material examined: TAIWAN, Nankunshen, on a dead stem of *Phragmites australis* (Cav.) Trin. ex Steud. (*Poaceae*), 22 November 2010, Ka-Lai Pang, F27870 (**holotype**, National Museum of Natural Science, Taiwan); ex-type living culture, BCRC FU 30316. GenBank LSU: KM624522; SSU: KM624521.

Notes: *Natantispora unipolaris* forms in a monophyletic clade with *N. retorquens* in the *Halosphaeriaceae* (*Microascales*, *Ascomycota*) with high bootstrap support (Fig. 22). *Natantispora unipolaris* is morphologically very

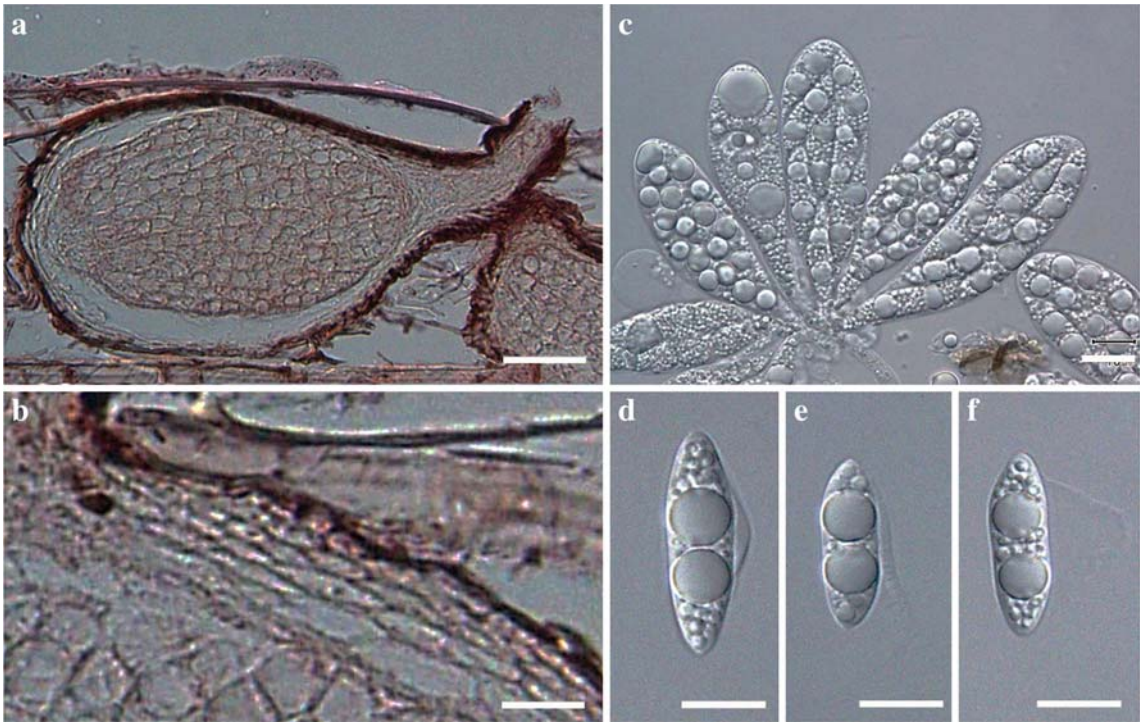


Fig. 23 ***Natantispora unipolaris*** **(holotype)**. **a** Immersed ascoma with neck protruding to the surface **b** One-layered peridium of elongated cells with large lumina **c** Asci at various stages of development **d**–**f** Ascospores with an unfurling appendage at one end. Scale bars: a=30 *μm*, b–f=10 *μm*

similar to the type species *N. retorquens*, including globose to subglobose ascomata, presence of catenophyses, hyaline, elongate-ellipsoidal ascospores with one septum, a polar appendage pad extending over the mid-septum which unfurls to form a long thread (Shearer and Crane 1980). *Natantispora unipolaris* differs in having only one ascospore appendage instead of two in *N. retorquens*; ascomata are smaller with many small oil globules and one large one in each cell. *Tirispora unicaudata* also has a single polar hamate appendage visible when mounted in sea water, but phylogenetically it is distant from *N. unipolaris*.

16. *Saagaromyces mangrovei* Abdel-Wahab, Bahkali & E.B.G. Jones, ***sp. nov.***

Index Fungorum number: IF551073; *Facesoffunginumber*: FoF 00488; Figs. 24 and 25

Etymology: In reference to the habitat where the fungus was first found.

Holotype: CBS H-22126

Saprobic on submerged wood in mangroves. *Ascomata* 370–520 *μm* high, 200–380 *μm* wide, sub-globose, ovate, obpyriform, ellipsoidal, horizontal, yellow-brown to brown, immersed, membranous, ostiolate and papillate. *Peridium* 45–65 *μm* thick, two-layered, forming *textura angularis*, outer stratum 30–42 *μm* thick, 8–15 layers of polygonal yellow brown to brown melanized cells; inner stratum 15–25 *μm* thick, 4–7 layers of elongated polygonal to flattened, hyaline cells, merging with the pseudoparenchyma of the venter. *Necks* lateral bending upward, 260–550 *μm* long, 90–130 *μm* wide, cylindrical, hyaline to yellow brown, ostiolar canal periphysate, periphyses up to 20 *μm* long. *Catenophyses* consisting of chains of cells that are subglobose, ovate to elongated, up to 28 *μm* wide. *Asci* 120–202 ($\bar{x}$=159 *μm*, *n*=20) *μm* long, 25–38 ($\bar{x}$=32 *μm*, *n*=20) *μm* wide, 8-spored, clavate, with narrow long stalks, 40–65 *μm* long, 4–9 *μm* wide, thin-walled, persistent, without an apical apparatus, developing at the base of the ascoma venter on small-celled ascogenous tissue. *Ascospores* 24–32 ($\bar{x}$=29 *μm*, *n*=50) *μm* long (excluding appendages), 10–16 ($\bar{x}$=13 *μm*, *n*=50) *μm* wide (excluding appendages), broadly ellipsoidal, 1-septate, not constricted at the septum, hyaline, thin-walled, with bipolar apical appendages, at first cap-like and stiff, 13–16 *μm* long, 2.5–3 *μm* wide, rapidly unfurling in water into long, thin filaments.

Material examined: Saudi Arabia, Jizan city, Farasan Island, 16° 44′ 22 N 42° 4′ 41 E, on decayed wood of *Avicennia marina* at a mangrove stand, 8 March 2012, M.A. Abdel-Wahab (CBS H-22126 **holotype**); ex-type living culture, MF 1206. GenBank LSU: JX911896; SSU: JX911897.

Notes: Several genera with polar unfurling ascospore appendages were described from marine habitats including: *Aniptodera*, *Ascosacculus*, *Gesasha*, *Halosarpheia*, *Magnisphaera*, *Natantispora*, *Oceanitis* and *Saagaromyces*. Among these, *Saagaromyces* is characterized by hyaline to light brown ascomata; thin-walled, 1-septate, broadly ellipsoidal ascospores and thin-walled, persistent asci. However, the single character that distinguishes the genus is the large

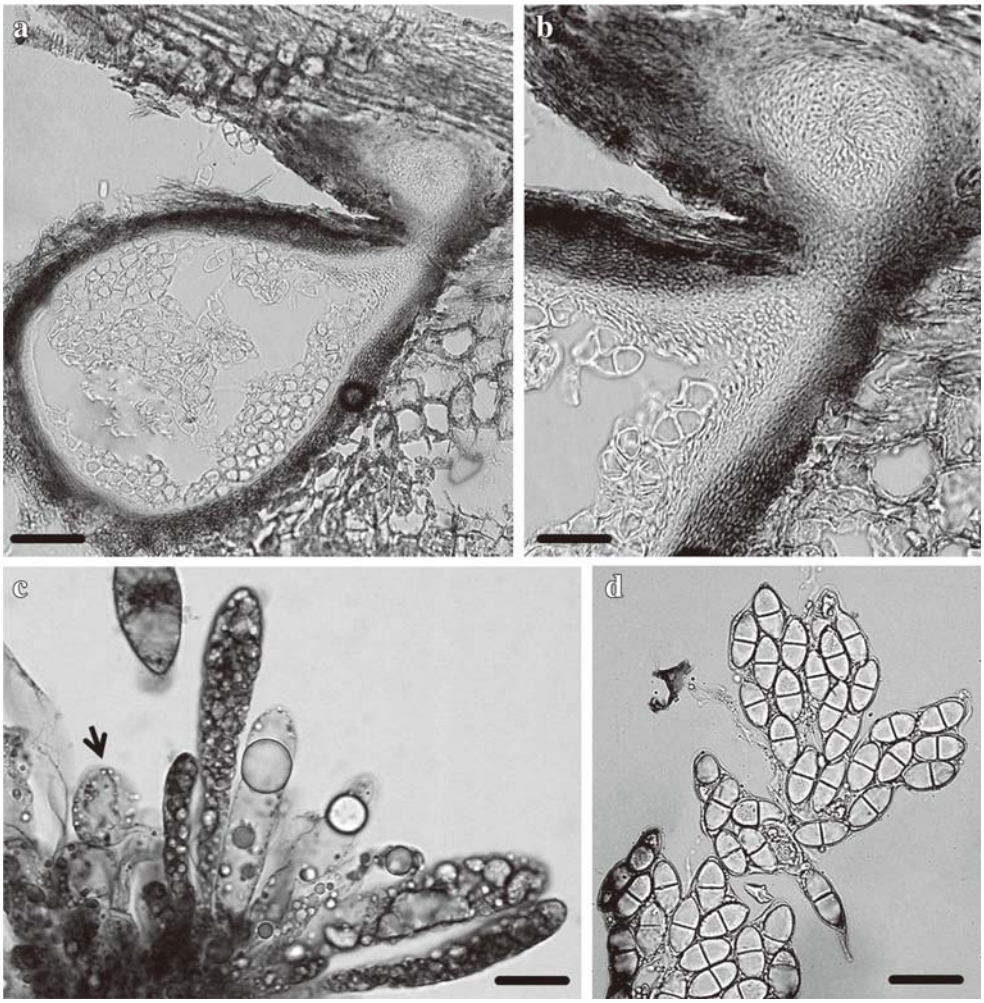


Fig. 24 ***Saagaromyces mangrovei*** **(holotype)**. **a** Vertical section of ascomata **b** Magnified part of the vertical section of the ascomata showing the peridium structure and the periphysate neck **c** Ascomatal squash showing immature asci and catenophyses (*arrowed*) **d** Ascomatal squash showing mature asci. **c**, **d** Stained with toluidine blue. Scale bars: a=50 *μm*, b-d=25 *μm*

hamate polar appendages that are equal to or longer than half of the ascospore length and width (Kohlmeyer 1984; Pang et al. 2003). *Saagaromyces mangrovei* has smaller ascospores and asci than the other described species in the genus.

Hypocreales

Hypocreales is a diverse order of Sordariomycetes, including more than 2000 species, in about 115 genera which are related to seven families (Lumbsch and Huhndorf 2010). Species of *Hypocreales* are pathogens or saprobes, and are usually characterized by their brightly coloured (often yellow, orange or red), perithecial fruiting bodies, or spore-producing structures. The phylogenetic tree is presented in Fig. 26.

17. ***Myrothecium macrosporum*** D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550939, *Facesoffungi number*: FoF00451, Fig. 27

Etymology: In reference to the big conidia.

Holotype: MFLU 14–0823

Saprobic on decaying bamboo culms, forming dark green, glistening, slimy drops on the centre of white mycelial sporodochia. *Mycelium* partly immersed on the substrate, partly superficial, composed of septate, branched, hyaline, smooth hyphae, 400–600 *μm* diam. *Conidiophores* sporodochial, macronematous, cylindrical, brown to dark brown, septate, branched, straight, smooth, single conidiophores 200–500× 4–5 *μm*. *Conidiogenous cells* phialidic, integrated or discrete, cylindrical, pale brown, smooth, straight. *Conidia* 25–35×2–3 *μm* ($\bar{x}$=29.6×2.7 *μm*, *n*=20), cylindrical, narrow at the apex, truncate at the base, straight to slightly curved, flexuous, 0–3-septate, hyaline, smooth-walled, with guttulate cells.

Culture characters: Conidia germinating on PDA within 24 h and germ tubes developing from both ends. Colonies growing slowly on PDA, reaching 4 mm in 2 week at 28 °C, circular, with irregular edge, hyaline from forward and reverse view. Mycelium superficial to immersed in/on media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Chiang Rai, Mae Sae Village, on dead culm of bamboo (*Bambusae*), 14 May 2011, Dong-Qin Dai, DDQ 00019 (MFLU 14–0823,

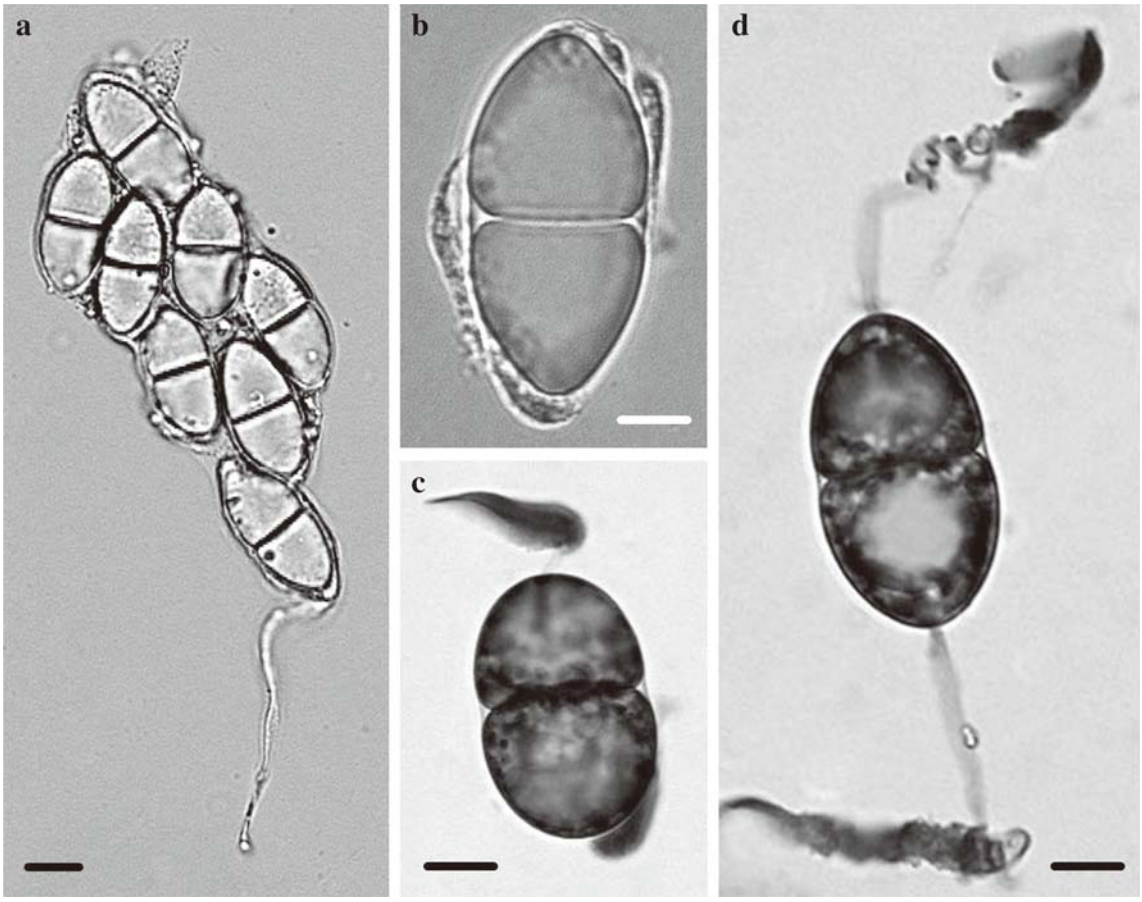


Fig. 25 ***Saagaromyces mangrovei*** **(holotype)**. **a** Mature ascus **b–d** Ascospores with different degrees of uncoiling for polar appendages. **c, d** Stained with toluidine blue. Scale bars: a=10 μm, b–d=5 μm

holotype), isotype in KUN, under the code of HKAS 83938), ex-type living culture at MFLUCC 11–0392. GenBank ITS: KP744448; LSU: KP744491.

Notes: Tulloch (1972) monographed the genus *Myrothecium*, redescribed eight species and added two new species and three new combinations. The genus is typified by *M. inundatum* Tode ex S.F. Gray (Preston 1948). Presently, there are 79 records of *Myrothecium* in Index Fungorum (2015), most of them are saprobes and some are pathogens (Yamazaki et al. 2014). The species concept within the genus *Myrothecium* is rather broad and sometimes controversial, with species having a saprobic, pathogenic or hyperparasitic habitat, sessile or stalked sporodochia to synnematous conidiomata and smooth-walled or striated conidia (Ellis 1971, 1976). The genus awaits revision. Our new species differs from other species of *Myrothecium* by the larger size of its conidia (more than 20 μm long). *Myrothecium macrosporum* is somewhat closely related to *M. prestonii* and *M. setiramosum* in the phylogenetic analysis (Fig. 26). However, *M. prestonii* was isolated from soil and *M. setiramosum* from leaves of *Eugenia glabrata*.

Magnaporthaceae

Magnaporthaceae was introduced by Cannon (1994), and is typified with *Magnaporthe*. This family includes parasites, saprobes and endophytes (Huhndorf et al. 2008). More than 100 species in 12 sexual and seven asexual genera currently are placed in *Magnaporthaceae* (Luo and Zhang 2013). *Magnaporthaceae* is characterized by solitary, immersed, globose to subglobose, perithecial ascomata, with a long, brown to black, smooth neck, which break through the host surface (Luo and Zhang 2013). The phylogenetic tree is presented in Fig. 28.

18. ***Neogaeumannomyces*** D.Q. Dai & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF550936, *Facesoffungi number*: FoF00449

Etymology: In reference to a new genus similar with *Gaeumannomyces* and *neo* meaning new.

Type species: *Neogaeumannomyces bambusicola* D.Q. Dai & K.D. Hyde

Saprobic on decaying bamboo culms, forming dark circular erumpent spots on host surface with ascomatal ostiolar

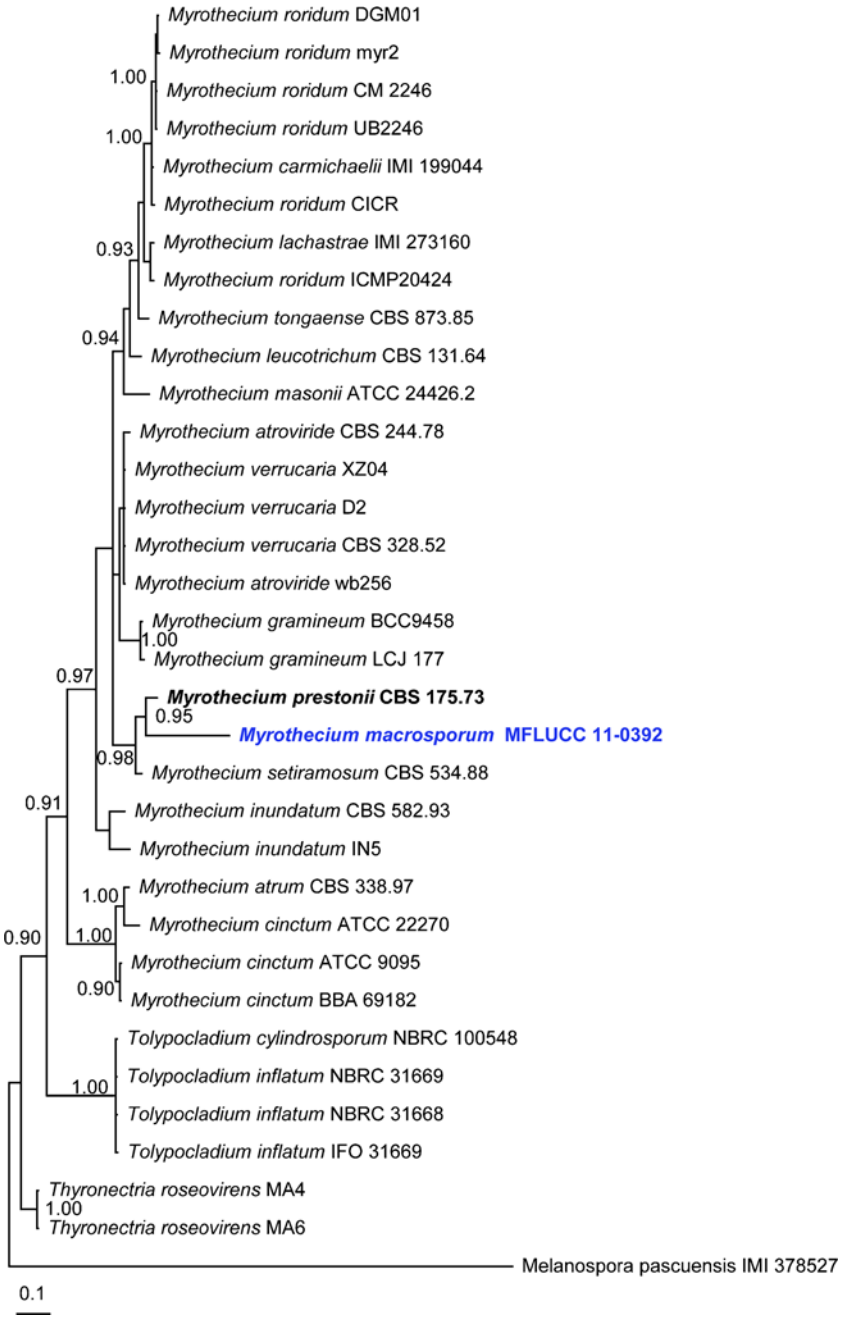


Fig. 26 Phylogram generated from Bayesian analysis based on ITS sequence data. Bayesian posterior probabilities (PP) greater than 0.90 are indicated above or below the nodes. The ex-types (reference strains) are in *bold*, the new isolates are in *blue*. The tree is rooted with *Melanospora pascuensis* IMI 378527

neck on raised areas. **Sexual morph** *Ascomata* perithecial, gregarious, immersed, solitary, globose to subglobose, black, ostiolate. *Ostiolar neck* long, lined with periphyses. *Peridium* comprising host and fungal tissues, with outer layer composed of brown and thick-walled, cells; inner layer composed of hyaline, thin-walled, large cells of *textura angularis*. *Hamathecium* dense, with long, septate, paraphyses intermixed with asci. *Asci* 8-spored, unitunicate, cylindrical, with a short furcate pedicel, with an apical ring. *Ascospores* filiform, curved to sigmoid, filiform to long fusiform, elongate, narrow and curved at the ends, 2–3-septate, distoseptate when mature, guttulate, hyaline, smooth-walled.

19. Neogaeumannomyces bambusicola D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550937, *Facesoffungi number*: FoF00450, Fig. 29

Etymology: In reference to the host *Bambusa* and *cola* meaning loving.

Holotype: MFLU 14–0822

Saprobic on decaying bamboo culms, forming dark circular erumpent spots on host surface with ascomatal ostiolar neck with raised areas. **Sexual morph** *Ascomata* 500–850 μm diam., 350–500 μm high, gregarious, solitary, immersed, globose to subglobose, black, ostiolate, soft.

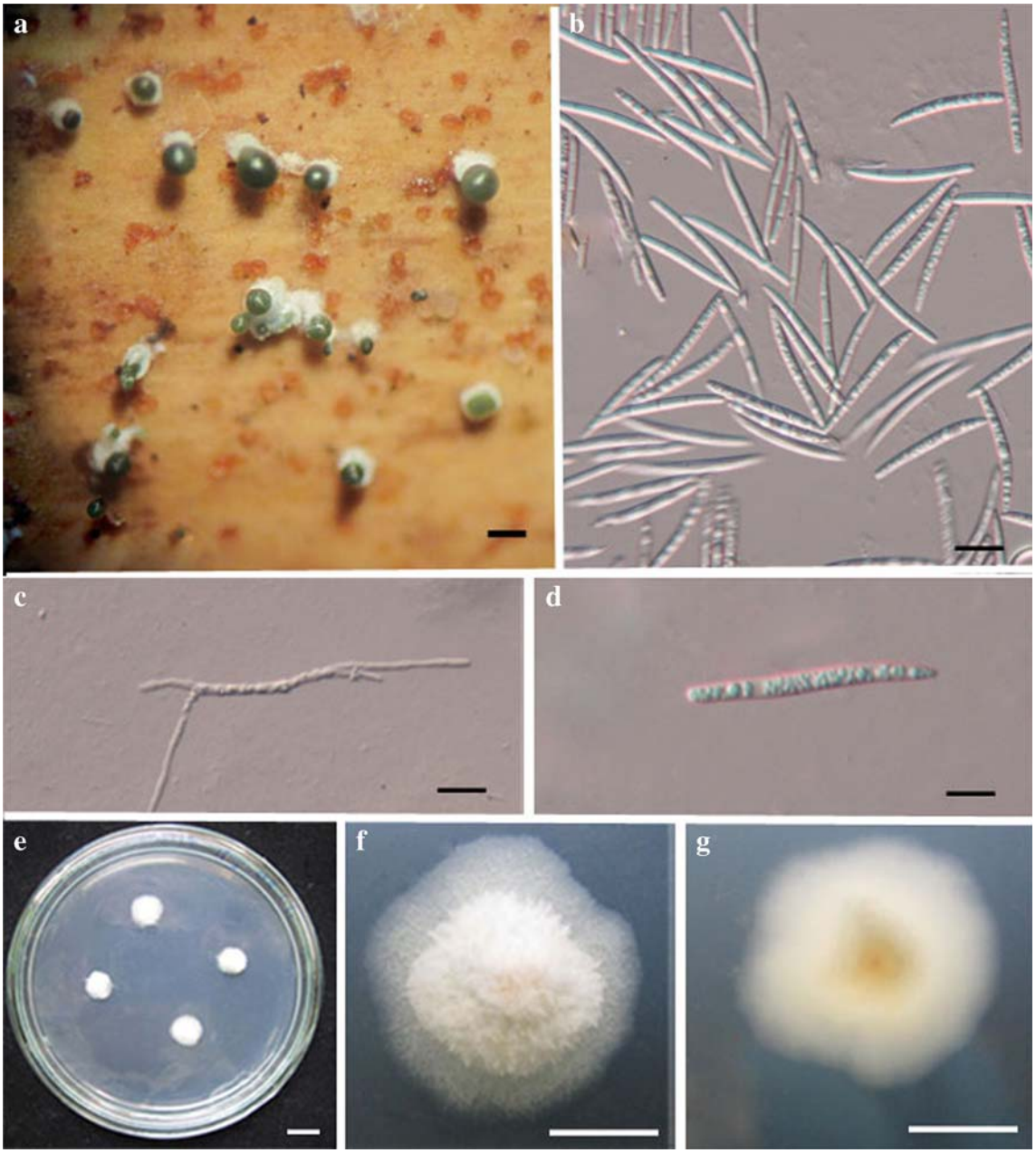


Fig. 27 ***Myrothecium macrosporum*** **(holotype) a** Fruiting bodies on bamboo **b, d** Conidia **c** Germinating conidium **e–g** Cultures on PDA. Scale bars: a=500 μm, b–d=20 μm, e=25 mm, f, g=5 mm

Ostiolar neck 50–80 μm long, forming at the centre of ascomata, raised from the host surface when mature, lined with periphyses. *Peridium* comprising host and fungal tissues, laterally 50–70 μm thick, with outer layer composed of brown and thick-walled, cells; inner layer composed of hyaline, thin-walled, large cells of *textura angularis*, cells 10–25×5–10 μm. *Hamathecium* dense, with long, 5–10 μm wide, septate paraphyses, intermixed with asci. *Asci* 105–110×10–20 μm ($\overline{x}$=107.1×12 μm, n=20), 8-spored, unitunicate, cylindrical, with a short furcate pedicel, with an apical ring. *Ascospores* 85–105×4–5.5 μm ($\overline{x}$=99.5×4.7 μm, n=20), filiform, curved to sigmoid, filiform to long fusiform, elongate, narrow and curved at the ends, 2–3-septate when mature, guttulate, hyaline, smooth-walled. **Asexual morph** Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h with germ tubes produced from both ends. Colonies growing slowly on PDA, reaching 45 mm in 2 weeks at 28 °C, effuse, velvety to hairy, fimbriate at the margin, drift white from forward, dark brown from the reverse. Mycelium superficial and immersed branched, septate, smooth, hyaline and irregular.

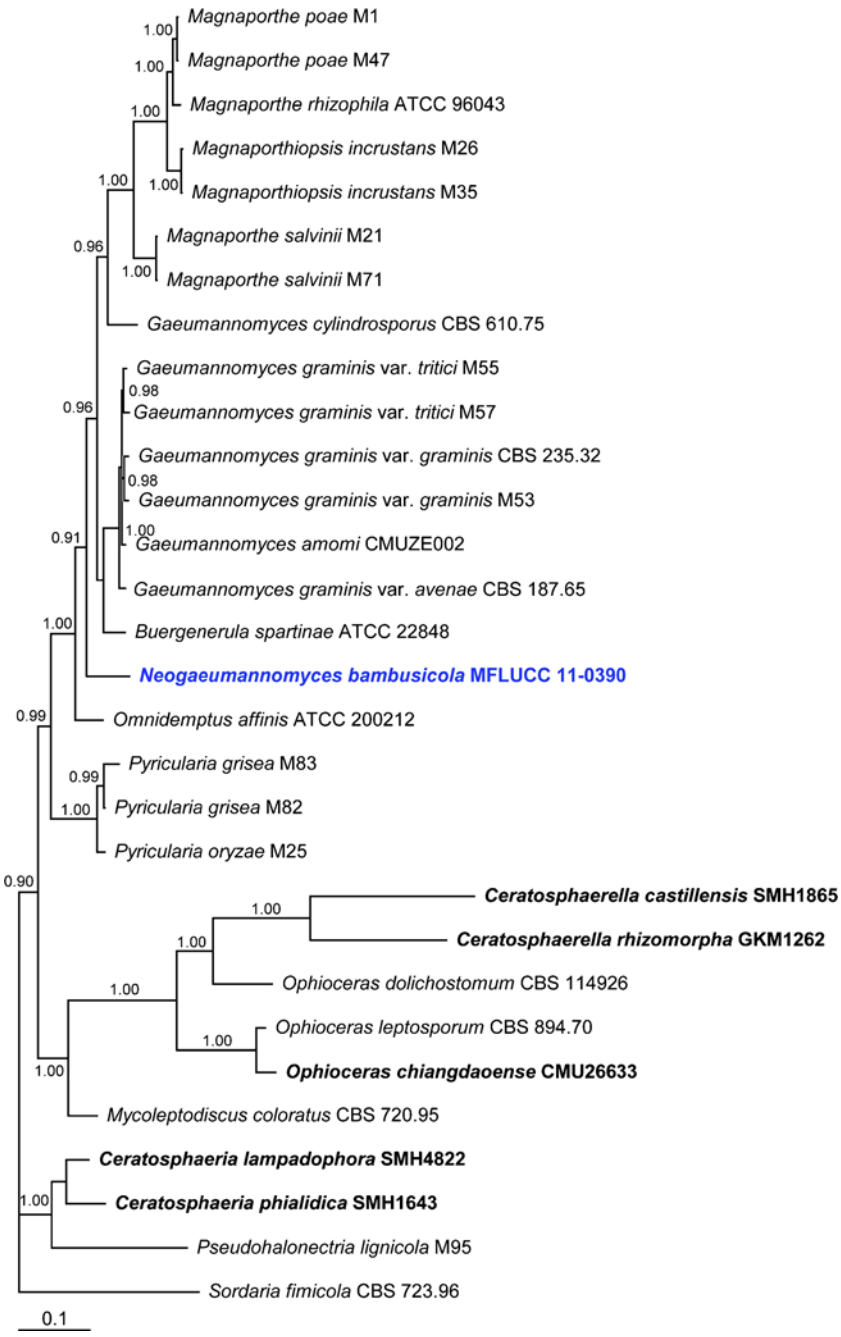
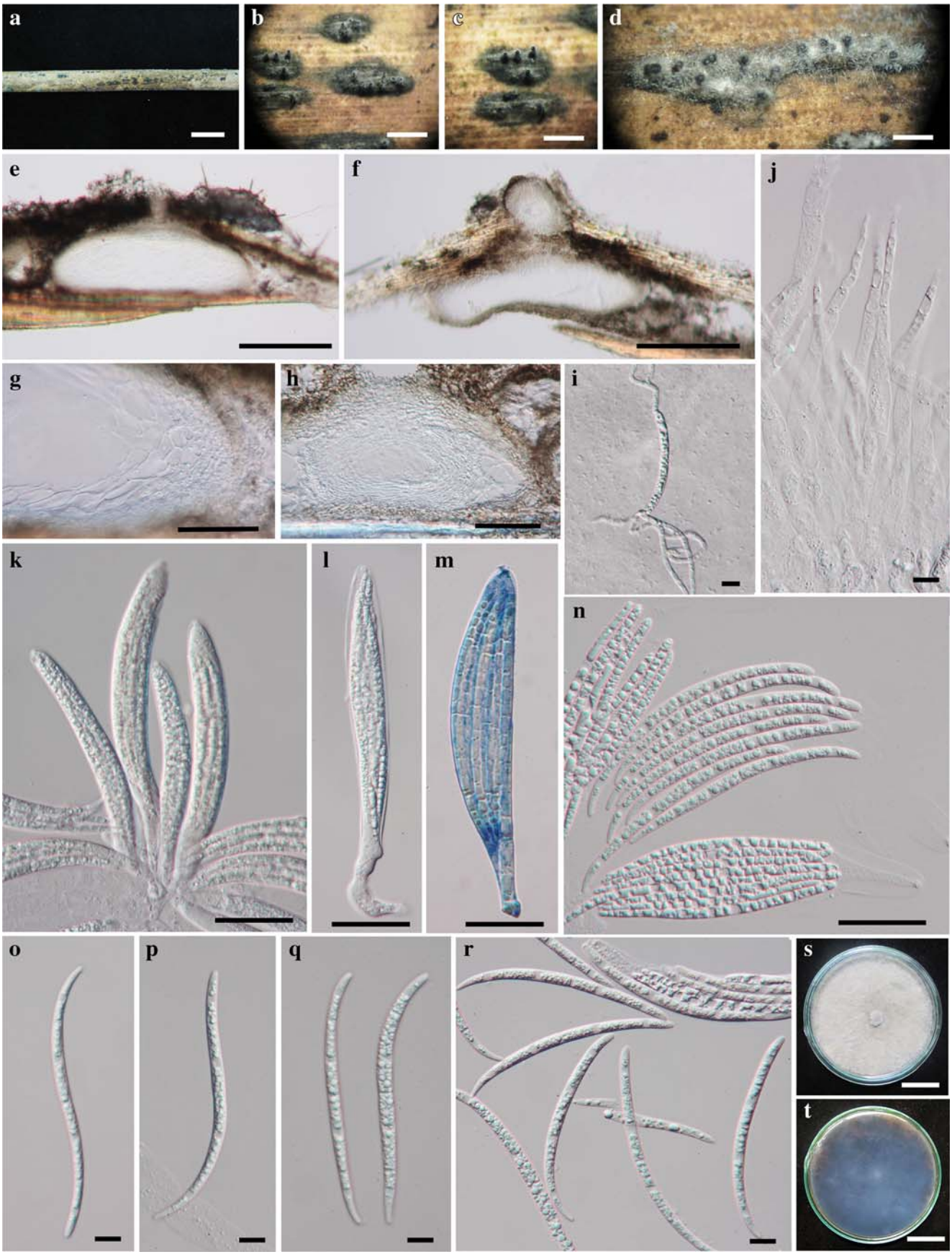


Fig. 28 Phylogram generated from Bayesian analysis based on combined alignment of ITS and LSU gene regions. Bayesian posterior probabilities (PP) greater than 0.90 are indicated above or below the nodes. The ex-types (reference strains) are in *bold*, the new isolates are in *blue*. The tree is rooted with *Sordaria fimicola* CBS 723.96

Material examined: THAILAND, Chiang Rai, Doi Tung, on dead culm of bamboo (*Bambusae*), 4 May 2011, Dong-Qin Dai DDQ 0004 (MFLU 14–0822, **holotype)**, (isotype in KUN, under the code of HKAS), ex-type living culture, MFLUCC 11–0390. GenBank ITS: KP744449; LSU: KP744492; SSU: KP753956.

Notes: The morphology and phylogeny of taxa in the family *Magnaporthaceae* have been studied in detail (Walker 1972; Hirata et al. 2007; Huhndorf et al. 2008; Thongkantha et al. 2009; Wong et al. 2012; Luo and Zhang 2013; Murata et al. 2014). Our new species can be separated from other genera in *Magnaporthaceae* by morphology combined with the phylogenetic analysis (Fig. 28). *Neogaeumannomyces* is similar to *Gaeumannomyces* in having perithecial ascomata with long necks and cylindrical asci producing filiform ascospores (Walker 1972). However, *Neogaeumannomyces* differs in having a mycelial subiculum growing on the host without hyphopodia, whereas *Gaeumannomyces* species produce hyphopodiate mycelia (Walker 1972).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◀ **Fig. 29** ***Neogaeumannomyces bambusicola*** **(holotype) a** Bamboo culm **b**–**d** Fruiting bodies on bamboo host **e**, **f** Sections of ascoma with necks **i** Germinating ascospore **j** Paraphyses **k**–**l** Asci observed in water **m** Asci observed in cotton blue **n**–**r** Ascospores **s**, **t** Cultures on PDA. Scale bars: a=2 mm, b–d=500 μm, e–f=500 μm, g, h=50 μm, i, j, o–r=10 μm, k–n=50 μm, s, t=25 mm

Meliolaceae

Species of *Meliolaceae* are a group of obligate parasitic fungi with approximately 2000 species in 22 genera (Kirk et al. 2008), which are known as black mildews. They are characterized by branched, dark brown, superficial mycelium with phialides and two-celled appressoria; dark brown, superficial ascomata with clavate to globose, 2-4-spored asci and dark brown, 3–4-septate ascospores. Previous studies of this family are mostly based on morphology, as it is difficult to extract DNA directly from the fruiting bodies. Technological progress enabled, phylogenetic studies of the 28S nrDNA region of several species from *Meliolaceae*, showing that *Meliolales* represent a monophyletic order of the Sordariomycetes (Pinho et al. 2012). A recent study carried out by Justavino et al. (2014) indicates co-evolutionary relationships in the speciation of *Meliolales* on their hosts. The phylogenetic tree is presented in Fig. 30.

20. *Meliola tamarindi* Syd. & P. Syd., Annls mycol. 10(1): 79 (1912)

Index Fungorum number: IF247233, *Facesoffungi number*: FoF00489, Fig. 31

Epifoliar pathogen on living leaves. **Sexual morph** *Colonies* epiphyllous, scattered, 1-2 mm diam. *Hyphae* superficial, substraight to crooked, branching opposite at acute to wide angles, closely reticulate, with dark brown mycelial setae. *Appressoria* 20–25×9–12 μm ($\bar{x}$=22×10 μm, n=10), opposite to alternate, straight to curved, two-celled, clavate to spathulate. *Phialides* 20–22(-25)×7–9 μm ($\bar{x}$=22×8 μm, n=5), few mixed with appressoria, alternate to opposite, ampulliform. *Ascomata* 210–240 μm wide ($\bar{x}$=222 μm, n=10) and 170–220 μm high ($\bar{x}$=195 μm, n=10), subdense, superficial on the mycelium, composed of hyaline inner cell and dark brown outer wall with *textura angularis*, globose to subglobose, dark brown, with ostiolate and dark brown setae. *Asci* 65–85×28–40 μm ($\bar{x}$=73×34 μm, n=5), 2-spored, unitunicate, ellipsoid to ovoid, evanescent. *Ascospores* 43–48×19–22 μm ($\bar{x}$=45×20 μm, n=20), ellipsoid to fusiform, hyaline with 2 septa when young state, becoming dark brown with 4 septa when mature, constricted at septa, middle cell slightly longer than others. **Asexual morph** Undetermined.

Material examined: THAILAND, Chiang Rai province, Bandu; on the living leaves of *Tamarindus indica* L. (*Fabaceae*), 10 January 2014, Xiang-Yu Zeng (MFLU 14–0282, **reference specimen designated here**). GenBank LSU: KP744489.

Notes: In Fig. 30, *Meliola tamarindi* clusters with a putatively named strain of *Asteridiella obesa* and four other *Meliola* species. *Asteridiella* sp., *Endomeliola dingleyae* and *Appendiculella* sp. also cluster in *Meliolaceae* (Fig. 30). Our collection of *Meliola tamarindi* has larger spores than in the protologue (43–48×19–22 μm, versus 36–44×13–17 μm (Sydow and Sydow 1912). The addition of reference specimen sequence data for *M. tamarindi* is important for this phylogenetically poorly understood group.

Sydowiellaceae

Sydowiellaceae (*Diaporthales*) is based on *Sydowiella* and its generic type *S. fenestrans* (Duby) Petr. Several fungal genera and their species are accommodated in this family, however they do not have any clear features in common (Rossman et al. 2007). Genera in this family include *Chapeckia*, *Hapalocystis*, *Rossmania*, *Stegophora* and *Sillia*. These taxa are plant

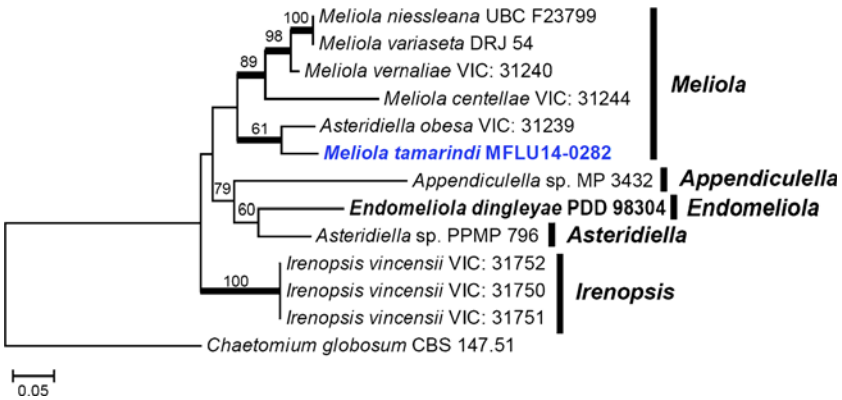


Fig. 30 Phylogram generated from Bayesian analysis based on LSU sequence data of *Meliolaceae*. Parsimony bootstrap support values greater than 50 % are indicated above the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (ex-epitypes, reference strains) are in *bold*, the new isolates are in *blue*. The tree is rooted with *Chaetomium globosum* CBS 147.51

Fig. 31 ***Meliola tamarindi*** (MFLU 14–0282). **a** Host **b** Host leaves **c** Colony on leaf **d** Ascomata **e** Seta **f** Apex of seta **g** Mycelium with phialides and appressoria **h** Cross section of ascoma **I** Peridium, **j**–**o** Immature and mature asci, **p**–**s** Immature and mature ascospores. Scale bars: c-d=200 μm, e=100 μm, h-i=50 μm, f-g, j-s=20 μm.

pathogens and saprobes on herbaceous, dicotyledonous plants and hardwood trees. The phylogenetic tree is presented in Fig. 32.

21. ***Hapalocystis berkeleyi*** Auersw. ex Fuckel, Fungi rhenani exsic., fasc. 6: no. 585 (1863)

Index Fungorum number: IF357284, *Facesoffunginumber*: FoF00413; Figs. 33 and 34

Reference specimen: MFLU14–0798

Saprobic on bark of *Platanus hybrid*. **Sexual morph** *Ascomata* 90–185 μm high × 206–302 μm wide ($\bar{x}$=150 × 245 μm, n=15), immersed, solitary or aggregated, scattered, visible through dark cracks on the host surface, subglobose to globose, ostiolate. *Ostiole* 130–195 μm high × 90–113 μm wide ($\bar{x}$=145 × 105 μm, n=10), short papillate, black, cylindrical, periphysate. *Periphyses* hyaline. *Peridium* 4–16 μm wide ($\bar{x}$=10 μm, n=15) black, thick-walled, 3–5-layered of cells of *textura angularis*. *Paraphyses* 3–7 μm wide, few, septate, hyaline, attached to the base, longer than asci. *Asci* 112–127 × 46–80 μm ($\bar{x}$=121 × 66 μm, n=20) 4 or 8-spored, unitunicate, clavate to fusoid, with a short pedicel, with an inconspicuous flat, refractive ring at the lower end of the thickened apical

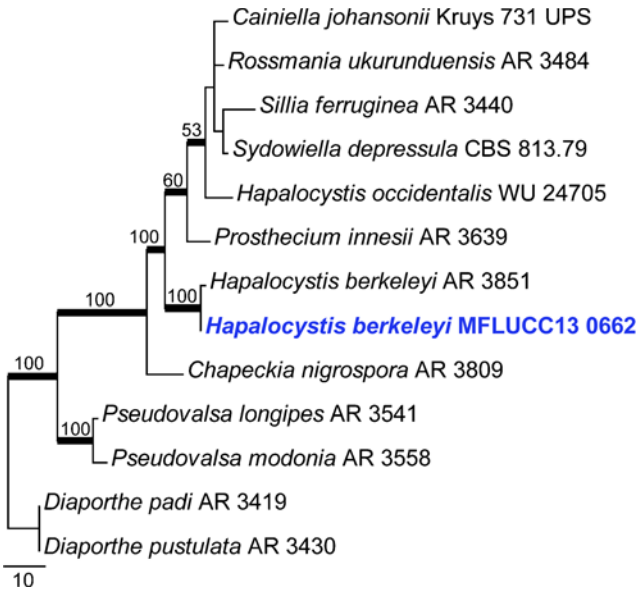


Fig. 32 Phylogram generated from Maximum Parsimony analysis based on LSU sequence data of *Sydowiellaceae*. Parsimony bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in *bold*. The ex-types (ex-epitypes and reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Diaporthe padi* AR 3419 and *D. pustulata* AR 3430

wall, apex narrow and blunted. *Ascospores* 34–42×12–18 *μm* ($\bar{x}$=37×17 *μm*) inequilaterally ellipsoidal, with broadly rounded ends, initially hyaline, dark brown at maturity, (1–)2(–3)-septate, with cells of equal length, thick and smooth-walled, with short, hyaline strap-like appendages situated at both rounded ends with same width as the ascospore. **Asexual morph** *Conidiomata* on MEA 165–195 *μm* diam. ($\bar{x}$= 182 *μm*, *n*=15), pycnidia, superficial, aggregated, 3–5 in one group, globose, orange to brown, *Conidiomatal wall* 7–13 *μm* wide ($\bar{x}$=10 *μm*, *n*=10) small, thick-walled, orange, 5–10 cells layers of *textura angularis*. *Conidiophores* 1.5–2 *μm* high×1–1.5 *μm* wide ($\bar{x}$=2×1.5 *μm*, *n*=10) branched, hyaline, short, few conidiogenous cells arising from one conidiophore, attached to conidiomatal wall. *Conidiogenous cells* 10–14 *μm* long, 5–7 *μm* wide, cylindrical, hyaline, bottle-shaped, septate, ends pointed, phialidic. *Conidia* 0.5–1.5 diam. ($\bar{x}$= 1 *μm*, *n*=20) ellipsoid, one-celled, hyaline, smooth-walled.

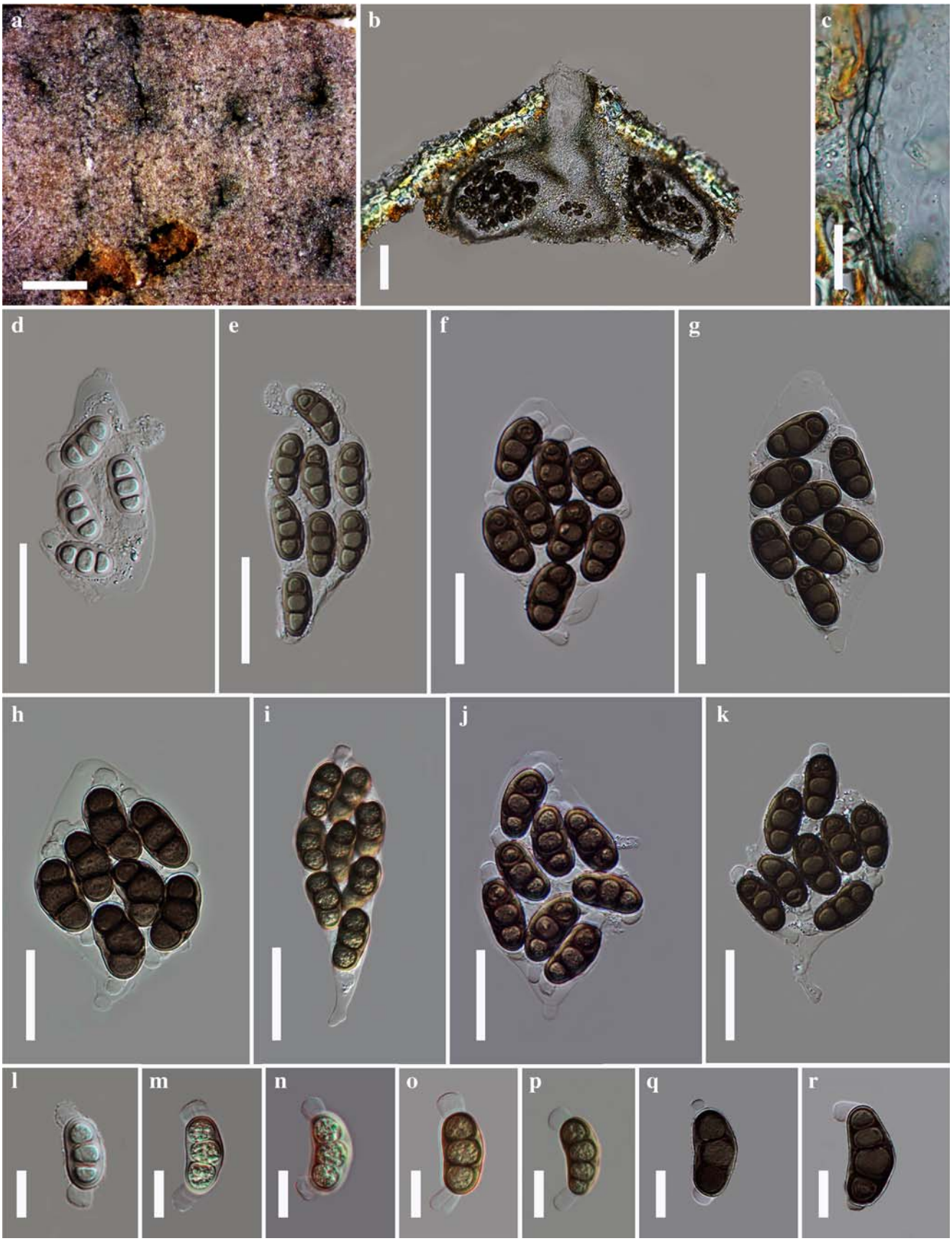
Culture characters: Ascospores germinating on MEA after 2 days at 16 °C forming hyaline, branched germ tubes from end cells. Colonies on MEA reaching 2 cm after 14 days at 25 °C in light, greenishash, effuse, circular, margin entire, surface rough.

Material examined: ITALY, Province of Forlì-Cesena [FC], Modigliana, Montebello, on branch of *Platanus* hybrid, 14 April 2013, E. Camporesi It 1187 (MFLU 14-0798, **reference specimen of *Hapalocystis berkeleyi* designated here**); ex-type living cultures, MFLUCC 13-0662. GenBank LSU: KP744486.

Notes: *Hapalocystis* (*Sydowiellaceae*, *Diaporthales*) is typified by *H. berkeleyi*. LSU gene analysis of diaporthalean fungi showed *Hapalocystis* as a distinct genus in *Sydowiellaceae* (Castlebury et al. 2002). Jaklitsch and Voglmayr (2004) evaluated *Hapalocystis* introducing a new species. *Hapalocystis* comprises *H. occidentalis*, *H. ulmi*, *H. bicaudata*, *H. corticalis* and *H. berkeleyi* (*H. berkeleyi* Auersw. ex Fuckel var. *berkeleyi* and *H. berkeleyi* var. *kickxii* (Westend.) M.E. Barr (Jaklitsch and Voglmayr 2004). The asexual morph of *Hapalocystis* is given as *Stilbospora*, *Hendersonia* or *Dothiorella* (Wehmeyer 1941), or as stilbospora-like (Barr 1978). Glawe (1985) reported a *Phoma*-like asexual morph for *H. berkeleyi* in culture. In this study we observed a phoma-like asexual morph on MEA and we made fresh collections of *Hapalocystis berkeleyi* which is identical to the morphology of type specimen. The type specimen is in good condition (at herbarium K) and hence, we designate this as a reference specimen (Ariyawansa et al. 2014a) and provide molecular data; the asexual morph was also produced in culture. LSU gene analysis of taxa in family *Sydowiellaceae* showed our reference strain of *H. berkeleyi* cluster with other *H. berkeleyi* strains with 100 % bootstrap support (Fig. 32).

Valsaceae

The family *Valsaceae* (*Diaporthales*, *Ascomycota*) was established by Tulasne and Tulanse (1861) and later recognized as family of *Diaporthales* by Barr (1978). It includes important phytopathogens that cause dieback and canker disease on a wide range of plants, causing severe commercial and ecological damage and significant losses worldwide (Adams et al. 2005; Fan et al. 2014). The taxa are characterized by aggregated ascomata surrounded by well-developed entostromata, emerging beaks arranged centrally through a white to black disc, having allantoids ascospores (Castlebury et al. 2002; Rossman et al. 2007). Previously, the *Valsaceae* was restricted to five genera, i.e. *Cytospora* and its segregated sexual morph, i.e. *Leucostoma*, *Valsa*, *Valsella*, and *Valseutypella* (Fries 1823; Saccardo 1884; Spielman 1985; Adams et al. 2002; Castlebury et al. 2002). However, all the genera were recently combined under *Valsa* as subgenera or species (Adams et al. 2005). *Cytospora* (1818) is an older name than *Valsa* (1849) and the asexual morph is more common in nature; therefore, we chose to adopt *Cytospora* and treat *Valsa* as synonym of *Cytospora*. *Cytospora* is characterised by a single or labyrinthine of locules (or diaporthalean-like perithecia), filamentous conidiophores (or clavate to elongate obovoid asci) and allantoid hyaline conidia (or ascospores) (Spielman 1985; Adams et al. 2005). In most conditions, the conidia emerge and spread from fruiting bodies in yellow to red gelatinous tendrils (Adams *et al*. 2005, 2006). *Cytospora* contains 110 species in Kirk et al. (2008). Ex-type sequence data, are however, available for only a very few species rendering identification to species level difficult. Therefore, research into cryptic species and a backbone tree for *Cytospora* is needed as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◀ **Fig. 33** ***Hapalocystis berkeleyi*** (MFLU 14-0798) **a** Ascomata on substrate **b** Cross section of ascomata **c** Peridium **d**–**k** Asci **l**–**r** Ascospores. Scale bars: a=1000 μm, b=100 μm, c=20 μm, d-k=50 μm, *l-r*=20 μm

for other pathogenic genera (Hyde et al. 2014). The phylogenetic trees are presented in Figs. 35 and 36.

22. ***Cytospora berberidis*** C.M. Tian, X.L. Fan & K.D. Hyde, ***sp. nov.***

MycoBank MB811223, *Facesoffungi number*: FOF00491; Fig. 37

Etymology: *berberis* (Lat.), referring to *Berberis dasystachya*, on which the fungus was collected.

Holotype: BJFC-S681.

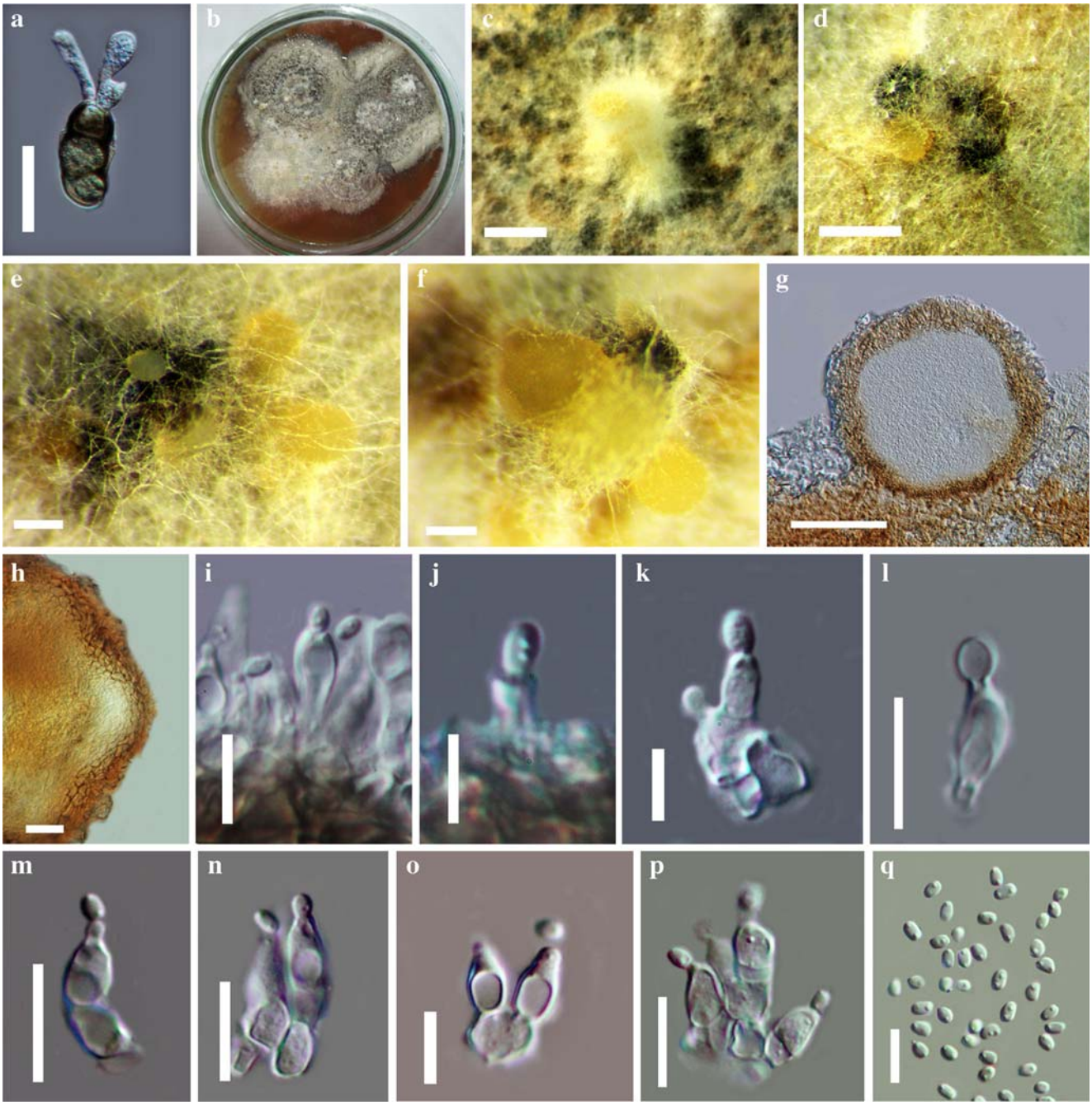

Fig. 34 **"Phoma" like asexual morph of *H. berkeleyi*** (MFLUCC 13-0662)**a** Germinating ascospore **b** Culture on upper surface, growing on MEA **c-f** Conidiomata **g** Cross section of conidiomata **h** Peridium **i**–**p** Conidiophores, conidiogenous cells and conidia **q** Conidia. Scale bars: a=50 μm, c=1000 μm, d-f=500 μm, g=100 μm, h=20 μm, i-p=10 μm, q=5 μm

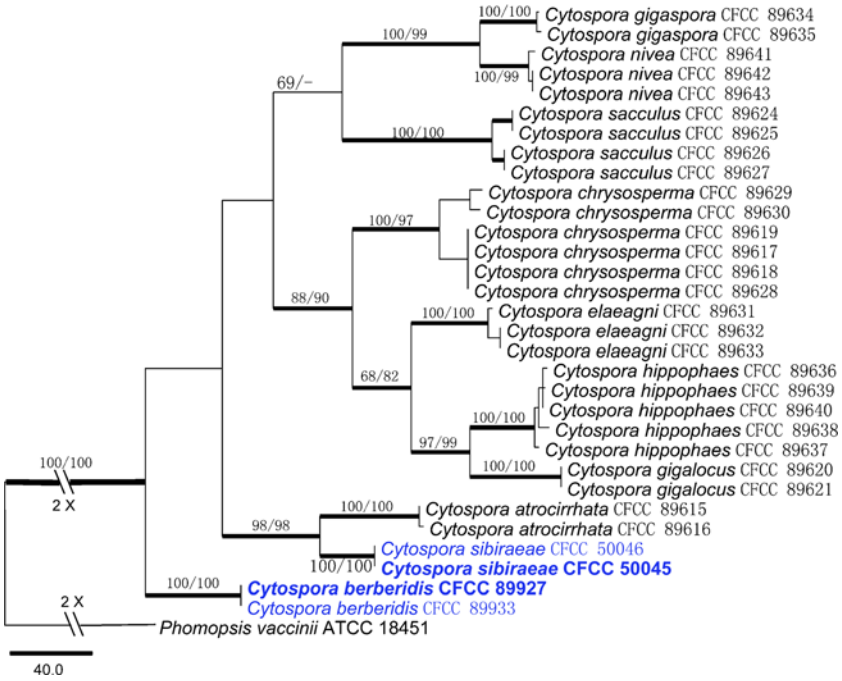

Fig. 35 Phylogram generated from parsimony analysis based on the combined genes of ITS, nrLSU, *RPB2* and ACT gene regions. Bootstrap support values above the branches indicate maximum parsimony bootstrap (MPBP≥50 %) and maximum likelihood bootstrap (MLBP≥ 70 %), and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (ex-epitypes) are in *bold*, the new isolates are in *blue*. The tree is rooted with *Phomopsis vaccinii* ATCC 18451

Pathogen on twigs and branches of *Berberis dasystachya*. **Sexual morph** Undetermined. **Asexual morph** Stromata immersed in bark. *Conidiomata*, erumpent through the surface of bark, discoid, nearly flat, with a solitary undivided locule. *Conceptacle* absent. Disc white to light brown, circular to ovoid, (0.32–)0.36–0.41(–0.47) mm ($\bar{x}$=0.38 mm, n=20), with one ostiole per disc. *Ostiole* in the centre of the disc, at the same level as the disc surface, (12.1–)13.9–18.5(–21.7) mm ($\bar{x}$=16.3 mm, n=20) diam. *Locule* uniloculate, (0.63–)0.69–0.87(–0.91) mm ($\bar{x}$=0.78 μm, n=20) diam. *Conidiophores* hyaline, unbranched or occasionally branched at the bases, (16.4–)17.5–25.5(–26.2) μm ($\bar{x}$=21.7 μm, n=20). *Conidia* hyaline, elongate-allantoid, aguttulate, aseptate, (5.8–)6–6.9(–7.1)×(1.8–)1.9–2.1(–2.2) μm ($\bar{x}$ in 6.5×2 μm, n=50).

Culture characters: Colony white, flat, felty, texture uniform, conidiomata sparse, irregularly distributed.

Material examined: CHINA, Qinghai Province, Huzhu, Jiading, 36°56′12.62″ N, 102°30′11.85″ E, 2324 m asl., on twigs and branches of *Berberis dasystachya* Maximowicz (*Berberidaceae*), 15 August 2012, X.L. Fan (BJFC-S681, **holotype**); ex-type living culture, CFCC 89927. GenBank ITS: KP340985; LSU: KP340989; ACT: KP340997; RPB2: KP340993; *ibid.*, living culture, CFCC 89933. GenBank ITS: KP340986; LSU: KP340990; ACT: KP340998; RPB2: KP340994.

Notes: *Cytospora berberidis* with a single locule, differs from most *Cytospora* species with multi-locules, including type species *C. chrysosperma*. The new species can be distinguished from *C. pruinosa* and *C. atrocirrhata* with single locules by the absence of conceptacles and size of conidia. Molecular analysis also confirms the novelty of the species which forms a single clade with high support (Figs. 35 and 36). This novel species represents the first record of *Cytospora* isolated from *Berberis dasystachya*.

23. ***Cytospora sibiraeae*** C.M. Tian, X.L. Fan & K.D. Hyde, ***sp. nov.***

MycoBank MB811222, *Facesoffungi number*: FOF00490, Fig. 38

Etymology: *sibiraeae* (Lat.), referring to *Sibiraea angustata*, on which the fungus was collected.

Holotype: BJFC-S783.

Pathogen on twigs and branches of *Sibiraea angustata*. **Sexual morph** *Stromata* immersed in bark. *Ascostromata* erumpent through the surface of bark, circular to ovoid, extending to a large circular area, (0.98–)1.15–1.53(–1.71) mm ($\bar{x}$=1.32 mm, n=20) diam., 4–10 locules arranged at one depth in the bark, conceptacles dark. Disc deep grey to black, nearly flat, circular to ovoid, (0.28–)0.32–0.38(–0.41) mm ($\bar{x}$=0.35 mm, n=20) diam. *Ostioles* numerous, dark brown to black, at the same level as the disc, occasionally area below disc a lighter entostroma, (67.2–)71.3–107.1(–126.3) μm ($\bar{x}$=88.2 μm, n=20) diam. *Locules* dark brown, arranged circularly, flask-shaped to sphaerical, (0.22–)0.28–0.35(–0.39) mm ($\bar{x}$=0.34 mm, n=20) diam. *Asci* (36.3–) 41.5–49.9 (–50.1)×(5.2–)6.4–7.8(–9.7) μm ($\bar{x}$ in 45.7×7.4 μm, n=20), 8-spored, free, clavate to elongate-obovoid. Ascospores (7.8–)8.1–13.3 (–13.6)×(1.9–)2.1–2.5(–3.1)

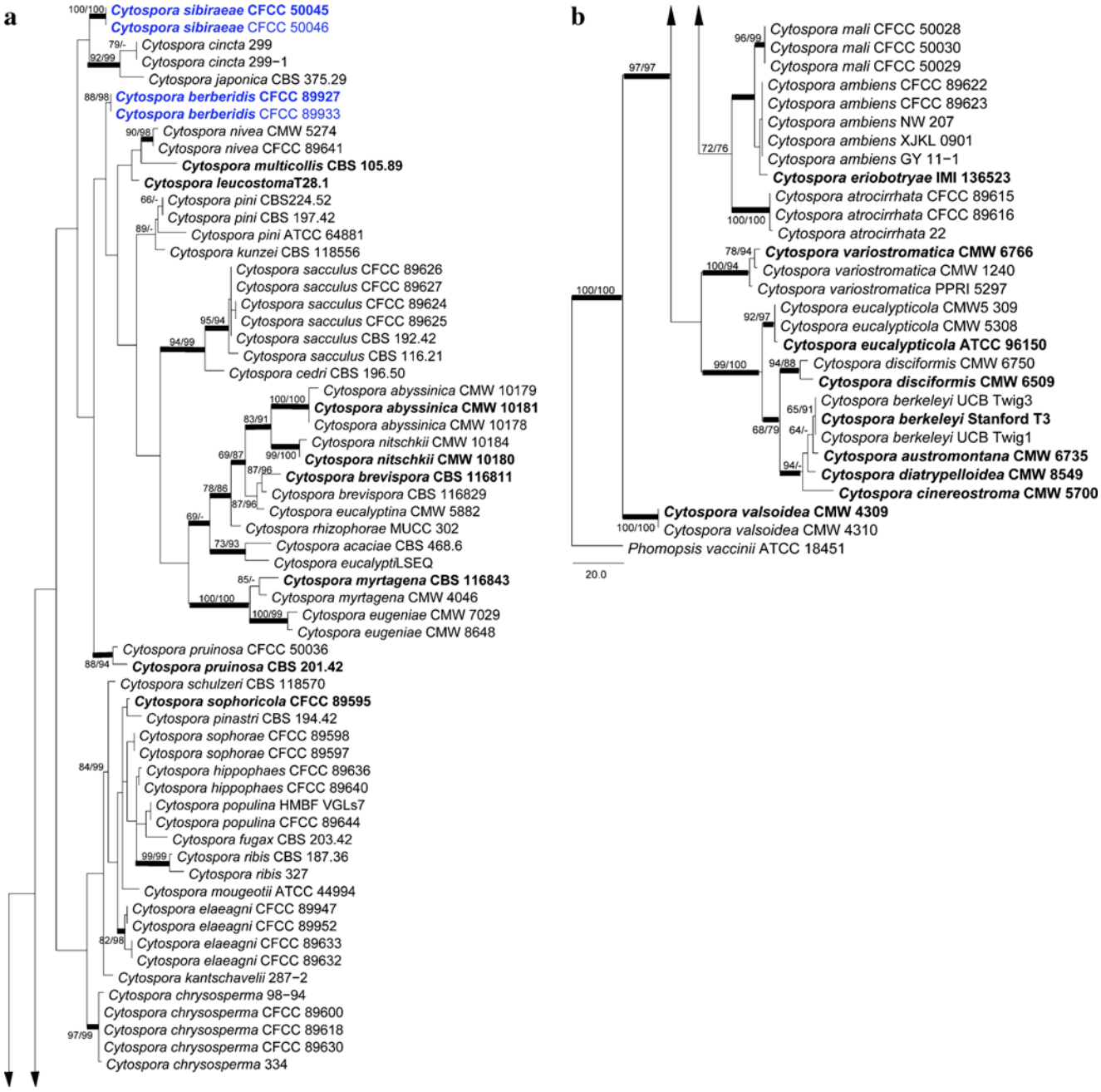

Fig. 36 Phylogram generated from parsimony analysis based on the ITS gene region. Bootstrap support values above the branches indicate maximum parsimony bootstrap (MPBP≥50 %) and maximum likelihood bootstrap (MLBP≥70 %), and branches with Bayesian posterior probabilities greater than 0.95 are given in bold. The ex-types (ex-epitypes) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Phomopsis vaccinii* ATCC 18451

μm ($\bar{x}$ in $11.7 \times 2.3\,\mu m$, $n=50$), biseriate, elongate-allantoid, thin-walled, hyaline, lacking guttules, aseptate. **Asexual morph** Undetermined.

Culture characters: Colony white, flat, felty, texture uniform, conidiomata sparse, irregularly distributed.

Material examined: CHINA, Gansu Province, Gannan, Lintan, 34°31′50.10″ N, 103°08′32.47″ E, 2750 m asl., on twigs and branches of *Sibiraea angustata* (Rehder) Hand.-Mazz. (*Rosaceae*), 8 August 2012, X.L. Fan (BJFC-S783, **holotype**); ex-type living culture, CFCC 50045. GenBank ITS: KP340987; LSU: KP340991; RPB2: KP340995; *ibid.*, living culture, CFCC 50046. GenBank ITS: KP340988; LSU: KP340992; RPB2: KP340996.

Notes: *Cytospora* species with black conceptacles were previously placed in the genus *Leucostoma*. Adams et al. (2005) redefined *Cytospora* using ITS phylogeny and

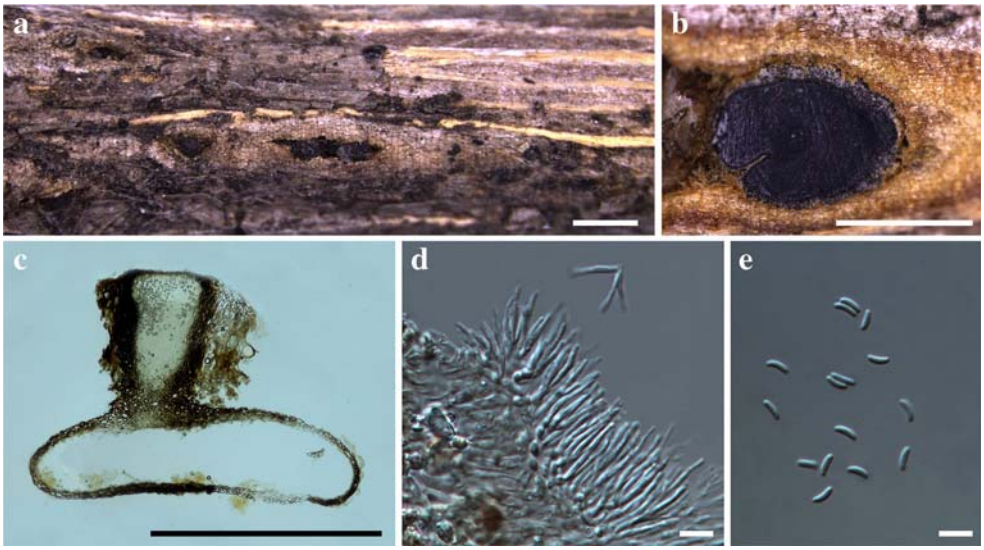

Fig. 37 ***Cytospora berberidis*** **(holotype) a** Habit of conidiomata on a twig **b** Transverse sections through conidiomata **c** Longitudinal sections through conidiomata **d** Conidiophores **e** Conidia. Scale bars: a-c=0.5 mm; d–e=10 μm

combined *Leucostoma* and other sexual morphs (*Valsa*, *Valsella* and *Valseutypella*) under *Valsa*, as subgenera or species with no additional infrageneric rank. *Cytospora sibiraeae* possesses obviously black conceptacles, which are similar to those of *C. nivea* and *C. atrocirrhata*. However the taxon clusters in an individual clade in ITS and multi-gene phylograms (Figs. 38 and 39). Few pathogenic fungi have been reported from *Sibiraea angustata*. This novel species represents the first record of a *Cytospora* isolated from *Sibiraea angustata*.

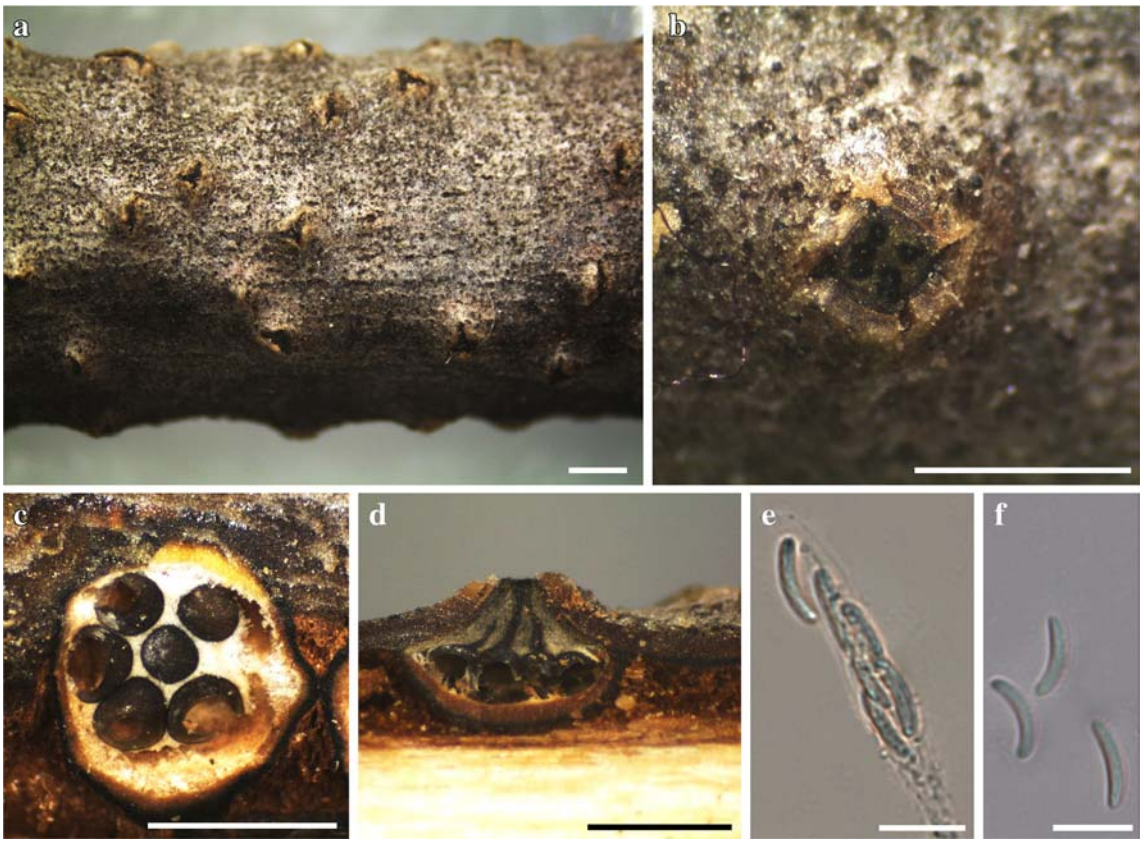

Fig. 38 ***Cytospora sibiraeae*** **(holotype) a** Habit of ascomata on a twig **b** Multi-ostioles on disc **c** Transverse sections through ascomata **d** Longitudinal sections through ascomata **e** ascus **f** ascospores. Scale bars: a–d=1 mm; e–f=10 μm

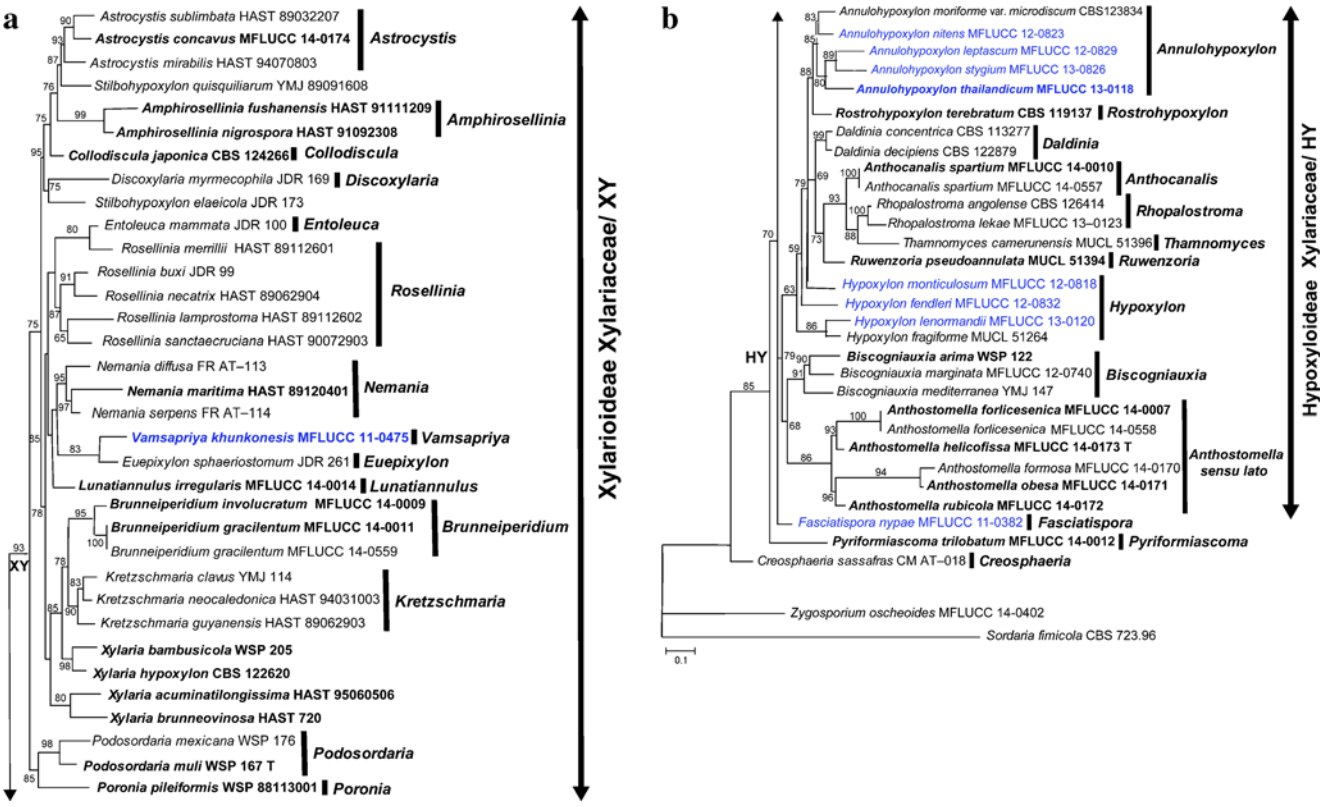

Fig. 39 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined ITS, LSU, *RPB2* and β-tubulin sequenced data of *Xylariaceae*. Maximum Likelihood bootstrap support values greater than 50 % are indicated above or below the nodes. The ex-types (ex-epitypes) are in *bold*. New sequences are in *blue*. The tree is rooted with *Sordaria fimicola* CBS 723.96

Xylariaceae

Phylogenetic analysis of combined gene sequence data (ITS, LSU, RPB2 and β-tubulin) resolve *Xylariaceae* as two major monophyletic groups representing the subfamilies *Xylarioideae* (93 % bootstrap support) and *Hypoxyloideae* (79 % bootstrap support). The *Xylarioideae* clade contains 14 resolved subclades named *Amphirosellinia*, *Astrocystis*, *Brunneiperidium*, *Collodiscula*, *Discoxylaria*, *Entoleuca*, *Euepixylon*, *Lunatiannulus*, *Kretzschmaria*, *Nemania*, *Podosodaria*, *Poronia*, *Rosellinia* and *Vamsapriya*. The *Hypoxyloideae* contains ten well-resolved subclades named *Annulohypoxylon*, *Anthocanalis*, *Anthostomella*, *Biscogniauxia*, *Daldinia*, *Hypoxylon*, *Rhopalostroma*, *Rostrohypoxylon*, *Ruwenzoria* and *Thamnomyces*. *Fasciatispora nypae* K.D. Hyde is placed as a basal group of *Xylariaceae* (70 % bootstrap support) parallel to *Creosphaeria* and *Pyriformiascoma*, but as a singleton. *Annulohypoxylon thailandicum* is a new species introduced here and clustered with other *Annulohypoxylon* species (80 % bootstrap support). The phylogenetic tree is presented in Fig. 39.

25. *Annulohypoxylon leptascum* (Speg.) Y.M. Ju., et al., Mycologia **97**(4): 859 (2005).

Facesoffunginumber: FoF00296, Fig. 40

Isotype: BPI 738677

Saprobic on corticated and decorticated wood. **Sexual morph** *Ascostromata* 0.5–8×0.5–1.2×0.06–0.13 cm ($\bar{x}$=4×0.8×0.08 cm), pulvinate to effuse-pulvinate, with inconspicuous perithecial mounds, surface sepia (63), dark brick (60), or fuscous (103); blackish granules immediately beneath surface and between perithecia, with KOH-extractable pigments greenish-olivaceous (90), dull green (70), or dark green (21); the tissue below the perithecial layer inconspicuous, perithecia 0.3–0.5 diam. × 0.3–0.7 mm high ($\bar{x}$=0.4×0.5 mm), immersed, obovoid to tubular, ostioles conical-papillate, encircled with a convex truncatum-type disc 0.2–0.3 mm ($\bar{x}$=0.3 mm) diam., paraphyses not seen. *Asci* (120–)125–160(–167)×(3.8–)4–5.5(–5.8) *μm* ($\bar{x}$=147×4.5 *μm*, *n*=20), 8-spored, unitunicate, cylindrical, pedicellate, apical ring bluing in Melzer's reagent, discoid, 0.5×1.5–2 *μm* ($\bar{x}$=0.5×1.8 *μm*, *n*=20). *Ascospores* (7.2–)7.5–13.8(–14)×(3.6–)4–6(–6.2) *μm* ($\bar{x}$=9.7×5.5 *μm*, *n*=30), uniseriate, one-celled, ellipsoid, inequilateral, with narrowly rounded ends, pale brown, with straight germ slit much less than spore-length and originating from one end, perispore indehiscent in 10 % KOH, epispore smooth. **Asexual morph** Reported by Ju and Rogers (1996), found on the surface of young stromata on natural substrates, *Conidiogenous structures* periconiella-like, dark brown, coarsely roughened. *Conidiogenous cells* pale


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◀ **Fig. 40** ***Annulohypoxylon leptascum*** (MFLU 13–0118). **a** Stromatal habit in wood **b** Ostioles seen from above **c** Stroma inside view **d** Cross section of the stroma showing perithecia **e** Pigment formation in KOH **f**, **g** Mature ascus in water **h**, **i** Ascospore in water **j** Ascospore showing germ slit **k** Dehiscent perispore in KOH. Scale bars: **a-c**=5 mm, **d**=1 mm, **f**–**k**=10 μm

brown, smooth to finely roughened. *Conidia* hyaline, smooth-walled, ellipsoid.

Culture characters: Colonies on OA at 25–28 °C reaching the edge of 6 cm in 7 days, whitish, velvety to felty, azonate, with diffuse margins, reverse at first yellow green (71) and turning greenish-olivaceous (90) in the centre after 5–7 days.

Material examined: BRAZIL, Apiahy, on wood, 1888, Puiggari (BPI 738677, **isotype**); THAILAND, Chiang Mai, Doi Inthanon, on decaying wood, 3 December 2012, D.A. Daranagama and K.D. Hyde AXL 036 (MFLU 13–0118), living cultures, MFLUCC 12–0829, ICMP).

Notes: *Annulohypoxylon leptascum* and *A. truncatum* are the potential taxa that could be compared with this specimen. Both these taxa share common stromatal characters with KOH extractable pigments. The inconspicuous tissue below the perithecial layer in the specimen is a feature similar to *A. leptascum*. The perithecia are obovoid as in *A. leptascum*. Even with slight deviations in sizes, the asci and ascospores are quite similar to that of *A. leptascum*. The ascus apical ring was however not observed as mentioned in the description of *A. leptascum* (Ju and Rogers 1996). *Annulohypoxylon elevatidiscus* reported in Taiwan and described in Ju et al. (2004) is also a possible match with our specimen. It has similar stromatal characters except for the conspicuous tissue layer beneath perithecia. However, *A. elevatidiscus* has large, sphaerical perithecia compared with this specimen. In addition, the dehiscent perispore in KOH was not observed in this specimen. *Annulohypoxylon leptascum* has so far been reported only from temperate countries and hence recorded for the first time from Thailand with the new molecular data.

26. *Annulohypoxylon nitens* (Ces.) Y.M. Ju & J. D. Rogers, A Revision of the Genus Hypoxylon, p. 220. 1996.

Facesoffungi number: FoF00029, Figs. 41 and 42

Isotype: IMI 339738

Saprobic on corticated and decorticated wood. **Sexual morph** *Ascostromata* 0.5–7×0.25–5×0.07–0.2 cm thick ($\overline{x}$= 4.5×3.5×0.12 cm), glomerate, hemisphaerical to effuse-pulvinate, with perithecial mounds exposing up to 1/4–1/2; when young surface dark brown vinaceous (84), becoming blackish at maturity, with reddish-brown tone, finally shiny black; blackish granules immediately beneath surface, with KOH-extractable pigments, greenish-olivaceous (90), woody tissue below the perithecial layer, blackish, perithecia 0.5–1 mm diam. ($\overline{x}$=0.7 mm), sphaerical, ostioles conical-papillate, encircled with a flattened bovei-type disc, 0.2–0.5 mm diam. ($\overline{x}$=0.4 mm), paraphyses, not seen. *Asci* (105–)110–140(–145)×(3.5–)4–5(–5.2) μm ($\overline{x}$=125×4.2 μm, n=20), 8-spored, unitunicate, cylindrical, pedicellate, apical ring bluing in Melzer's reagent, discoid, 0.5×1–1.5 μm ($\overline{x}$=0.5×1.2 μm). *Ascospores* (6.2–)6.5–10(–10.3)×(2.8–)3–4.5(4.9) μm ($\overline{x}$= 8.4×3.8 μm, n=30), uniseriate, one-celled, ellipsoid-inequilateral, with narrowly rounded ends, light brown to brown, with straight germ slit the entire spore-length, perispore dehiscent in 10 % KOH, epispore smooth. **Asexual morph** Sporulating regions scattered over entire surface of colony, honey (64) to fawn (87). *Conidiogenous structure*: nodulisporium-like, brown, thickened and dense. *Conidiogenous cells* 10–24×2–3 μm ($\overline{x}$=20×1.6 μm, hyaline, smooth-walled. *Conidia* 4–5×2.5–3 μm ($\overline{x}$=4.3×2.7 μm), hyaline, smooth to finely roughened, ellipsoid.

Culture characters: Colonies on OA at 25–28 °C reaching 7 cm in 7 days, averse whitish with black pigments, azonate with diffuse margins, reverse honey (64) or dull green (70), azonate.

Material examined: THAILAND, Chiang Mai, Doi Pui mountain, on decaying wood, 3 November 2012, D.A. Daranagama and K.D. Hyde AXL 030 (MFLU 13–0109), living cultures, MFLUCC 12–0823, ICMP. GenBank ITS: KJ934991; LSU: KJ934992; RPB2: KJ934994.

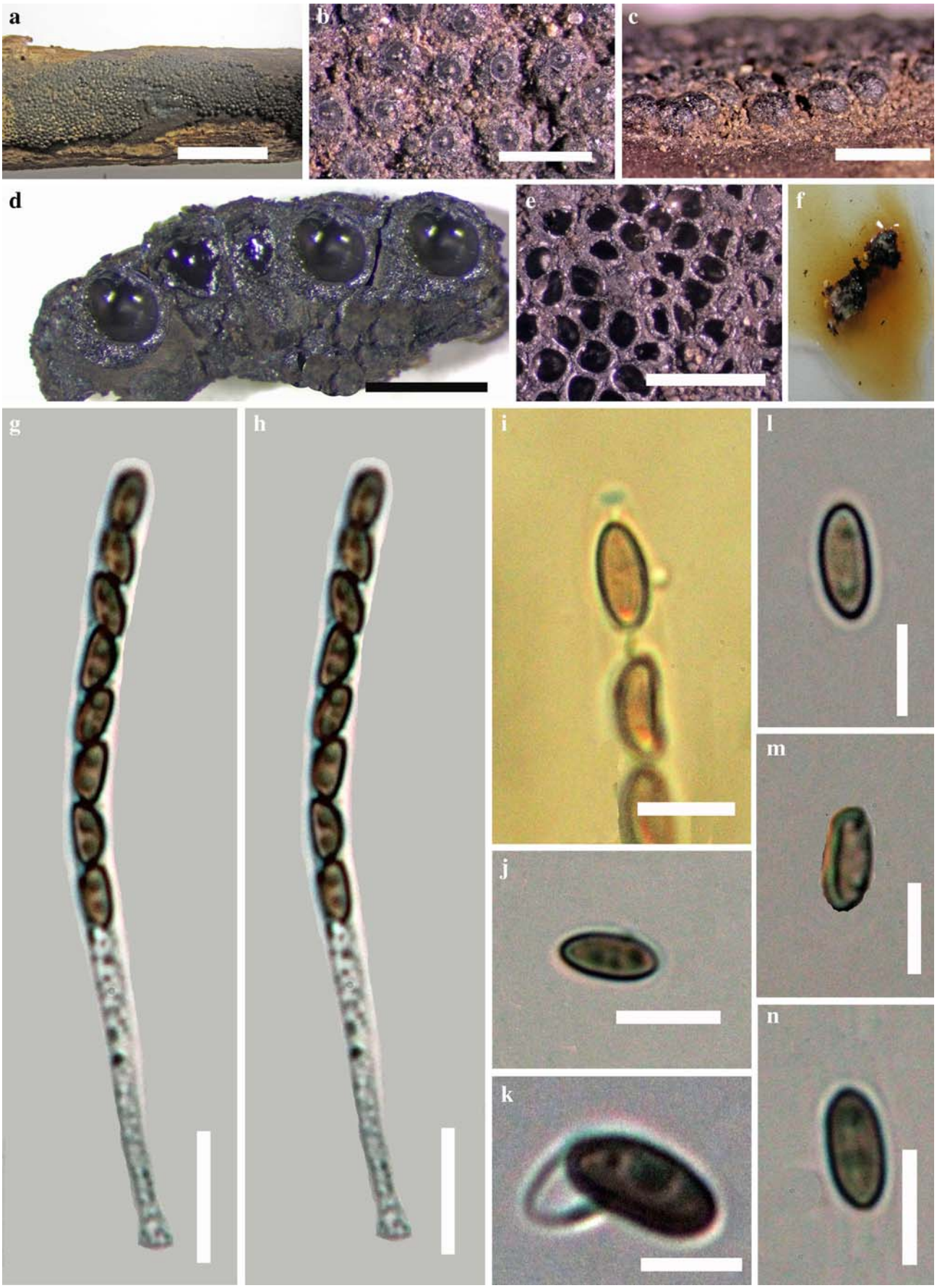
***Notes*:** *Annulohypoxylon nitens* (Ces.) Y.M. Ju et al. and *Hypoxylon truncatum* (Schwein.) Y.M. Ju et al. differ in their stromatal characters in that the former has a *bovei*-type ostiolar disc as well as more effuse stromata. Unlike many other related taxa, *A. nitens* possesses stromata which are thinly covered by fragments of the outermost stromatal layer exposing free perithecial mounds (Ju and Rogers 1996). In identification, these stromatal characters are quite useful. Another striking feature is that *A. nitens* has a dull reddish diffusible colour in the stromata though at maturity; it is black and shiny with woody layer beneath the perithecia (Ju and Rogers 1996). The asexual morph of this species is nodulisporium-like and the conidiophores are likely brown bearing hyaline conidiogenous cells and conidia. Many records of *A. nitens* in GenBank have only ITS and β-tubulin data from authentic strains. We hereby contribute sequences in addition from LSU and RPB2 for molecular analyses.

27. *Annulohypoxylon stygium* (Lév.) Y.M. Ju et al. Mycologia **97**(4): 861 (2005)

Facesoffunginumber: FoF000298, Fig. 43

Isotype: K 42247

Saprobic on decorticated wood. **Sexual morph** *Ascostromata* 1–10×0.5–3×0.04–0.1 cm ($\overline{x}$=6×1.8× 0.08 cm), pulvinate to effuse-pulvinate, with conspicuous perithecial mounds, surface shiny blackish, with reddish-brown tone, dull reddish brown granules immediately beneath surface and between perithecia, with KOH-extractable pigments greenish-olivaceous (90) or dull green (70), the tissue below the perithecial layer inconspicuous, perithecia obovoid,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◀ **Fig. 41** ***Annulohypoxylon nitens*** (MFLU 13–0109) **a** Stromatal habit in wood **b** Ostioles in stroma **c** Stromata from side view **d** Alignment of perithecia in across section **e** Perithecia from above **f** Formation of coloured pigments in KOH **g, h** Mature ascus in water **i** Ascus in Melzer's reagent showing inconspicuous apical apparatus **j**–**l** Ascospores in water **m** Ascospore showing the germ slit **n** Indehiscent perispore in KOH. Scale bars: a-c=5 mm, d, e=1 mm, g- n=10 μm

0.2–0.3×0.3–0.5 mm ($\bar{x}$=0.3×0.4 mm), ostioles papillate, encircled with a convex *truncatum*-type disc 0.1–0.2 mm diam. ($\bar{x}$=0.15 mm). *Asci* (48–)55–90(–97)×(2.8–)3–4(–4.7) μm ($\bar{x}$=73×3.7 μm, n=20), 8-spored, unitunicate, cylindrical, pedicellate, apical ring bluing in Melzer's reagent, discoid, 0.5×1 μm ($\bar{x}$=0.3×0.4 μm, n=2 0). *Ascospores* (5.3–)6–10.5(–10.9)×(2.4–)3–5.5(–5.8) μm ($\bar{x}$=8.3×4.4 μm, n=30), uniseriate, one-celled, ellipsoid-inequilateral, with narrowly rounded ends, light brown, with straight germ slit spore-length on flattened side, perispore dehiscent in 10 % KOH, smooth, epispore smooth. **Asexual morph** Undetermined.

Culture characters: Colonies on OA at 25–28 °C reaching 5 cm in 7 days, from above, at first whitish developing hazel (88) shade in the middle after 5–7 days with the time the hazel shade spreads over the entire plate, azonate with diffuse margins, reverse at first citrine greenish-olivaceous (90) and developing black patches in the centre after 5 days, azonate.

Material examined: SRI LANKA, 1915, T. Petch 4465 (K 42247, **isotype**), THAILAND, Chiang Mai, Doi Inthanon National Park on decaying wood, 3 December 2012, D.A. Daranagama and K.D. Hyde, AXL 034 (MFLU 13–0109), living cultures, MFLUCC 12–0826, ICMP. GenBank ITS: KJ940870; LSU: KJ940869; RPB2: KJ940868.

Notes: *Annulohypoxylon stygium*, A. *nitens* and *A. truncatum* were possible species to accommodate this specimen regarding the stromatal characters. In the latter two species, the asci possess longer stipes, whereas in this specimen, the stipe is short. *Annulohypoxylon nitens* has KOH extractable greenish-olivaceous pigments, whereas in the studied

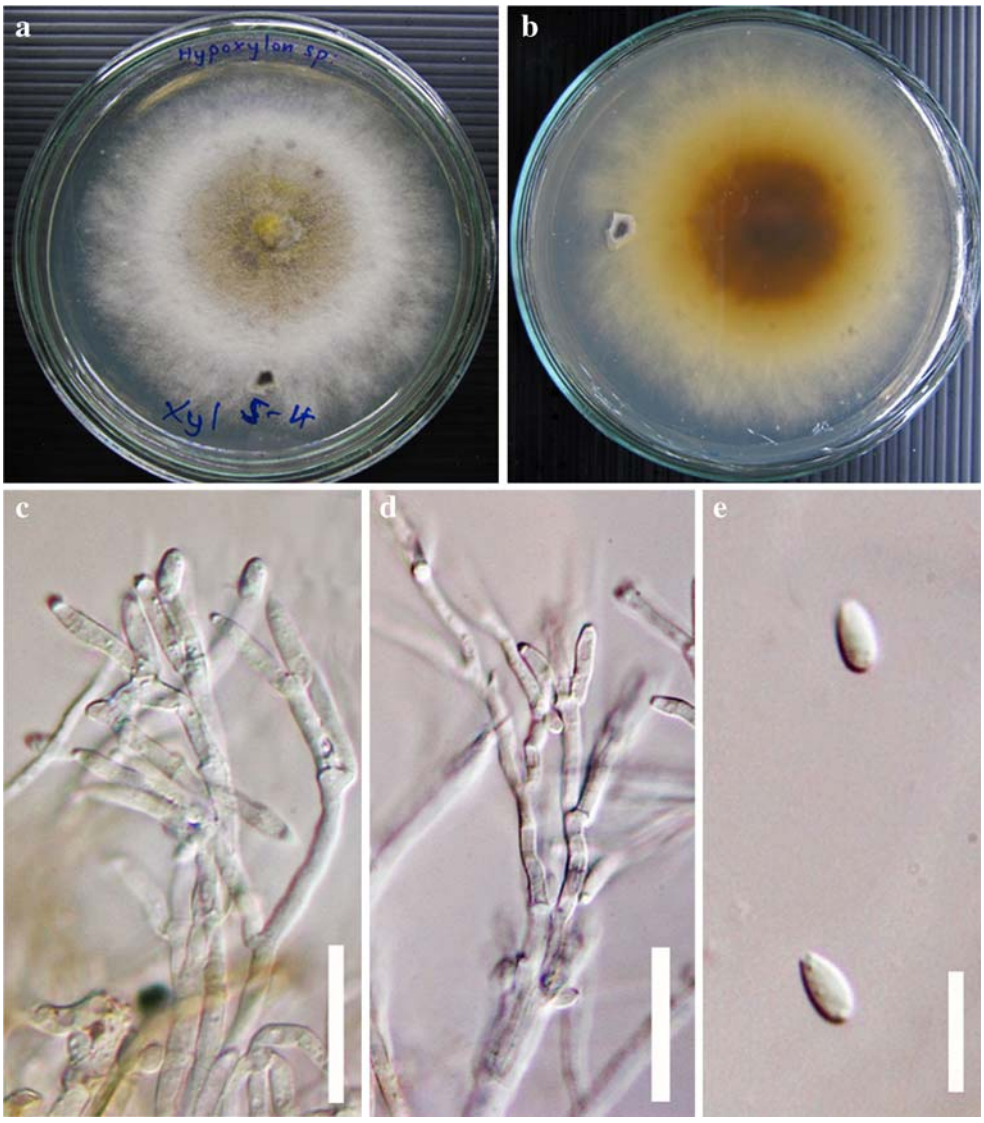
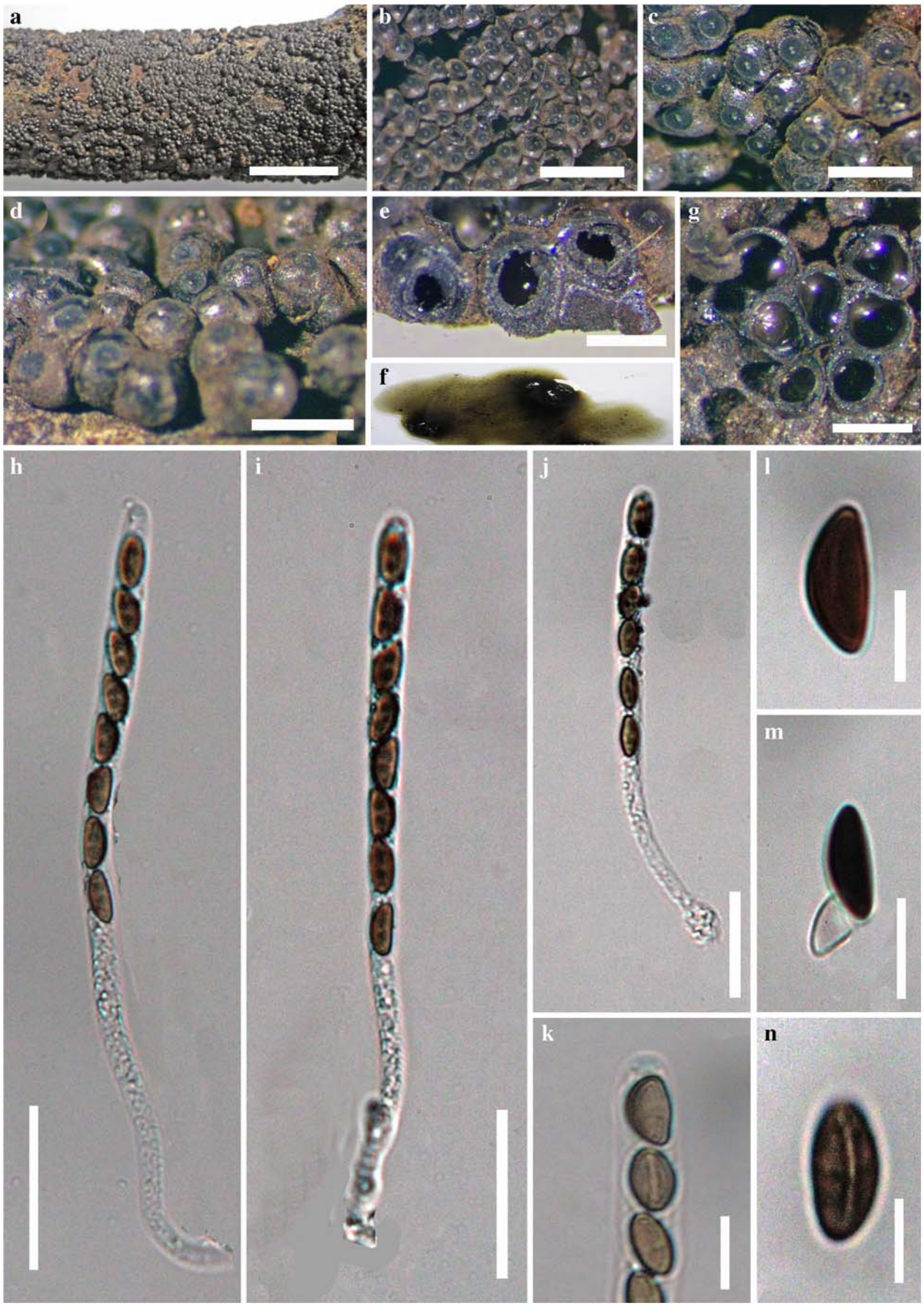


Fig. 42 ***Annulohypoxylon nitens*** on OA after 2 weeks **a** From above white with black pigments **b** From below honey (64) or dull green (70) **c** Conidiogenous structure **d** Conidiogenous cells **e** Conidia. Scale bars: **c**–**d**=10 μm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◀ **Fig. 43** ***Annulohypoxylon stygium*** (MFLU 13–0109) **a** Stromatal habit in wood **b, c** Ostioles seen from above **d** Stroma in side view **e** Cross section of the stroma showing perithecia **f** Pigment formation in KOH **g** Perithecia from above **h-j** Mature ascus in water **k** Ascus in Melzer's reagent showing weakly stained inconspicuous amyloid ascal apical apparatus **l** Ascospore in water **m** Dehiscent perispore in KOH **n** Ascospore showing germ slit. Scale bars: a=1 cm, b-g=0.5 mm, h–n=10 μm

specimen, the pigment is more towards green series. In this specimen, there are more conspicuous, glomerate, perithecial mounds, in contrast to the description given by Ju and Rogers (1996). The majority of the sequences deposited in the GenBank are ITS and a few reliable sequences for β-tubulin. In this study, we provide new LSU and RPB2 sequences from an authentic strain.

27. *Annulohypoxylon thailandicum* Daranagama & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550799, *Facesoffunginumber*: FoF00367, Fig. 44

Etymology: refers to the country, Thailand where the new species was collected.

Holotype: MFLU 13–0441

Saprobic on corticated and decorticated wood, **Sexual morph** *Ascostromata* 0.5–0.7×0.8–1.7×0.8 mm ($\bar{x}$=0.7×1.5×0.8 mm), effuse–pulvinate, with conspicuous perithecial mounds exposing almost completely, sphaerical-hemisphaerical, surface black, carbonaceous, blackish granules immediately beneath surface and between perithecia, with KOH extractable pigments greenish-olivaceous (90), perithecia 0.35–0.5×0.3–0.7 mm ($\bar{x}$=0.4×0.5 mm), immersed, encased in carbonaceous tissue, sphaerical, ostioles coarsely papillate, encircled with a small *truncatum*–type disk, 0.3–0.45 mm diam., paraphyses not seen. *Asci* (76.7–)89–100.8(–107)×(4.1–)4.5–6.5(–6.9) μm ($\bar{x}$=97×5.6 μm), 8-spored, unitunicate, cylindrical, short-pedicellate, with apical ring faintly bluing at base or not bluing in Melzer's reagent, globose, 1.5×2 μm. *Ascospores* (5.8–)6–11.5(12)×(3.2–)4–6.5(6.8) μm ($\bar{x}$=12.5×5.6 μm), uniseriate, one-celled, ellipsoidal inequilaterally with narrowly rounded ends, brown, with a straight germ slit running full length of the spore, epispore smooth, perispore dehiscent in 10 % KOH. **Asexual morph** Undetermined.

Culture characters: Colonies on OA at 25–28 °C reaching 5 cm in 7 days, whitish colonies, azonate with diffuse margins, reverse at first whitish and turning light brown after 3–4 days, developing black pigments after 8–10 days.

Material examined: THAILAND, Chiang Mai, Doi Suthep, on decaying wood, 10 November 2012, D.A. Daranagama and K.D. Hyde AXL 107 (MFLU 13–0441, **holotype)**; ex-type living culture, MFLUCC 13–0118, ICMP. GenBank ITS: KP744434; LSU: KP744476.

***Notes*:** *Annulohypoxylon thailandicum*, with characters such as brown ascospores with a germ slit originating from one end more or less up to the full length of the spore, greenish olivaceous/dull green KOH extractable pigments, dehiscent perispore in 10 % KOH and ostioles encircled with a small disk, can be compared with *A. archeri* or *A. microcarpum*. Both *A. archeri* and *A. microcarpum* have ostiolar disks of around 0.2 mm diam., with conspicuous perithecial mounds with reddish tones and sphaerical perithecia. *A. microcarpum* has rather small perithecia (0.15–0.2 mm diam) and small ascospores (7–8×3–4 μm), whereas *Annulohypoxylon archei* has perithecia of 0.1 mm diam. and ascospores of 9–10.5 μm×4–5 μm (Ju and Rogers 1996). Therefore, *A. archeri* could be morphologically the most simialr taxon. However, the new species has a black surface, larger perithecia and wider ostiolar disks as well as smaller ascospores, as compared to *A. archeri*.

28. *Biscogniauxia marginata* (Fr.: Fr.) Pouzar, Ceska Mykology. 33: 216. 1979.

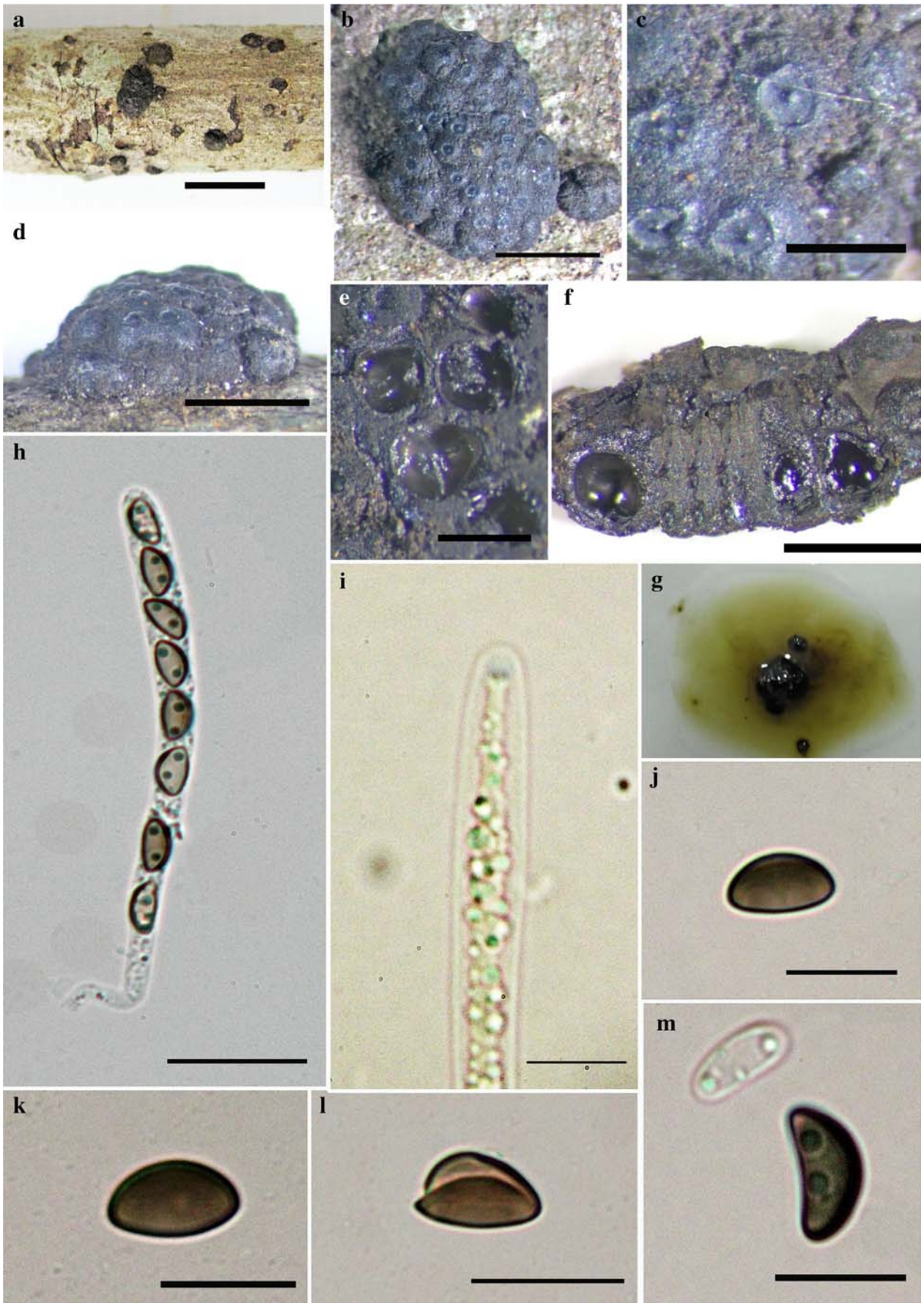
Facesoffunginumber: FoF000299, Figs. 45 and 46

Holotype: UPS: BOT:F-175466

Saprobic on wood. **Sexual morph** *Ascostromata* 3.5–7×2–3 mm ($\bar{x}$=5.6×2.8 mm), raised–discoid, globose, with concave surface, distinct raised margins, outer dehiscing layer, surface black, woody layer immediately beneath the stromatal surface and between perithecia with carbonaceous tissue encasing each ostiole, tissue beneath perithecia comprising with host tissue, carbonaceous, perithecia obovoid, 0.2–0.5×0.5–1 mm ($\bar{x}$=0.4×0.8 mm), thick-walled, light brown inner cell layers, outer cell layers carbonaceous, ostioles slightly umbilicate with punctuate openings, with white residues. paraphyses numerous, between asci, filamentous, septate, 3–5×50 μm or longer ($\bar{x}$=4.4×50 μm). *Asci* (145–)160–200(–204)×(8.3)9–12(12.2) μm ($\bar{x}$=176×13 μm, *n*=20), 8-spored, unitunicate, cylindrical, pedicellate, with apical ring bluing in Melzer's reagent, discoid, 0.5–0.7×1.5–2 μm ($\bar{x}$=0.6×1.7 μm, n–20). *Ascospores* (12.4–)13–16.5(–16.8)×10–13.5 μm ($\bar{x}$=15×11.7 μm, *n*=30), uniseriate, one-celled, globose to subglobose, with broadly rounded ends, dark brown to black, with sigmoid germ slit the entire spore-length, smooth-walled. **Asexual morph** Sporulating regions scattered over entire central part of the colony, brown-vinaceous (84) after 4 weeks. *Conidiogenous structure* nodulisporium-like, arising as roughened masses of hyphae, hyaline. *Conidiogenous cells* 50–60×4–5 μm ($\bar{x}$=56×4.4 μm), hyaline, finely roughened. *Conidia* 6–8×3.5–4 μm ($\bar{x}$=7.2×3.8 μm), hyaline, smooth to finely roughened, ellipsoid.

Culture characters: Colonies on OA at 25–28 °C reaching the edge of 6 cm Petri-dish in 14 days, whitish, velvety to felty, azonate, with diffuse margins, reverse at first straw (46), later developing into dark brown colonies after 3–4 weeks.

Material examined: FRANCE, on wood, 16 April 2012, Erio Gardiennet AXL 001 (MFLU 13–0099), living cultures, MFLUCC 12–0740, ICMP. GenBank ITS: KJ958407; LSU: KJ958408; RPB2: KJ958409.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◀ **Fig. 44** ***Annulohypoxylon thailandicum*** **(holotype) a** Stromatal habit on wood **b** Perforations seen from above **c** Ostioles with ostiolar disks **d** Stromatal surface in side view **e** Perithecia from above **f** Cross section of the stroma showing perithecia **g** Formation of pigments in KOH **h** Mature ascus in water **i** Ascus in Melzer's reagent showing inconspicuous apical apparatus **j, k** Ascospores in water **l** Ascospore with germ slit **m** Dehiscent perispore in 10 % KOH. Scale bars: **a**–**d**=5 mm, **e, f**=1 mm, **h**–**m**=10 μm

Notes: *Biscogniauxia marginata* and *B. baileyi* are similar in their stromatal characters. Both have subglobose ascospores which make them different from many of the other species in the genus. However, *B. marginata* has globose ascospores with a sigmoidal germ slit, while *B. baileyi* has straight germ slit. *Biscogniauxia marginata* has a nodulosporium-like asexual morph as observed here. Callan and Rogers (1986), Petrini and Müller (1986) and Ju and Rogers (1996) mentioned the asexual morph as nodulosporium–like, while Whalley and Edwards (1985) recognised the asexual morph as geniculosporium-like. In GenBank there is only one ITS sequence of belonging to *B. marginata* and we add ITS, LSU, RPB2 and β-tubulin gene data from an authentic specimen.

29. *Fasciatispora nypae* K.D. Hyde., Trans. Mycol. Soc. Japan 32(2): 267 (1991); Fig. 47

Material examined: THAILAND, Tambon Ngao, near Ngao Mangrove Forest Research Centre, Ranong Province, on frond of *Nypa fruticans* Wurmb. (*Arecaceae*), 11 January 2011; Jian-Kui Liu, JKA 0066 (MFLU 15-0042, **reference specimen designated here**), living culture MFLUCC 11-0382. GenBank ITS: JN846716; LSU: KP744484.

Notes: This fungus was collected from *Nypa fruticans*, in Ranong mangroves, Thailand. Due to the paucity of ascomata on the specimen, we were only able to isolate a few ascospores. Thus we provide a reference sequence for the first time for this genus in this study.

30. *Hypoxylon fendleri* Berk. ex Cooke, Grevillea **11**(no. 60): 132 (1883).

Facesoffunginumber: FoF00301, Figs. 48 and 49

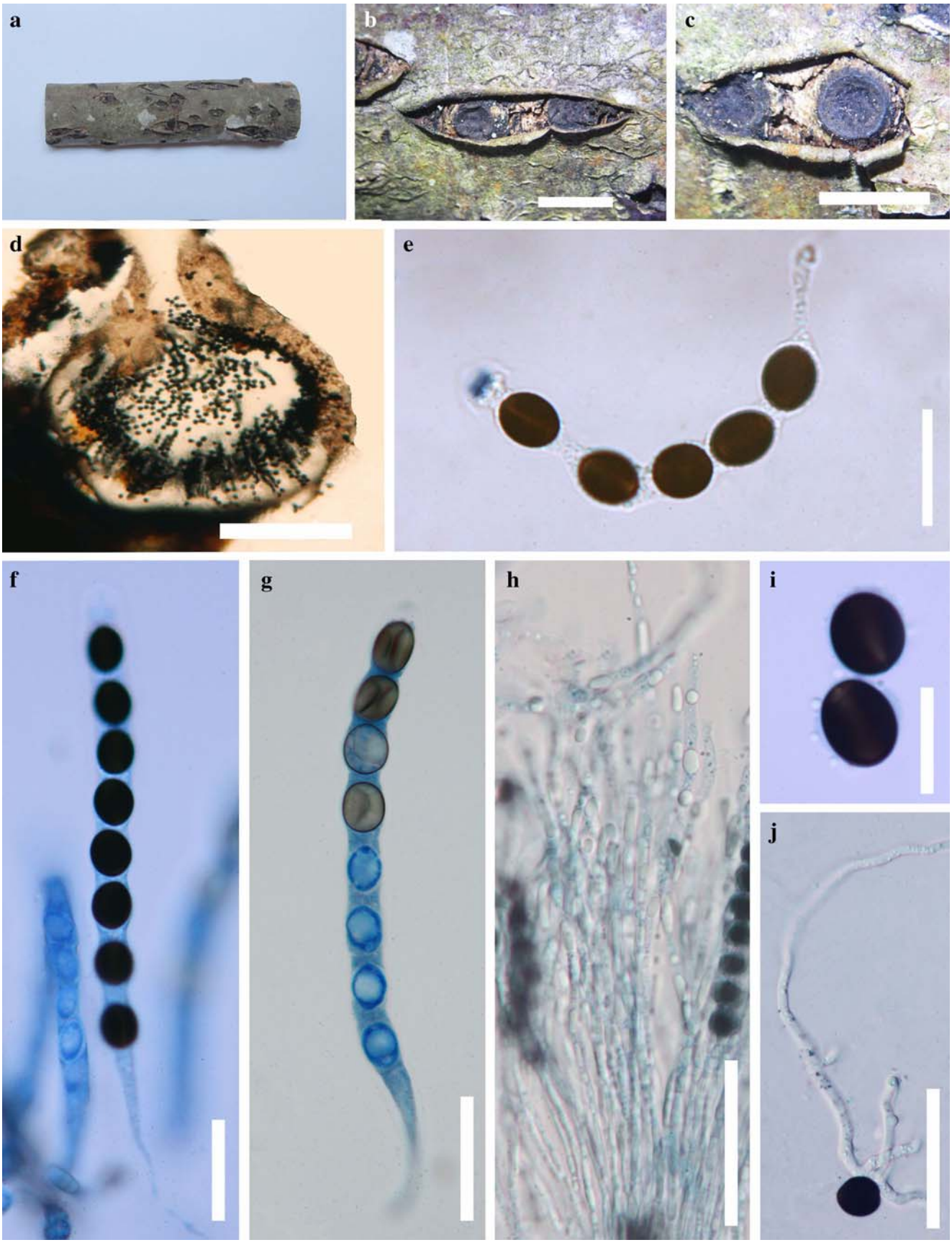
Holotype: K 120974

Saprobic on wood, **Sexual morph** *Ascostromata* 3–7× 0.05–0.08 cm ($\bar{x}$=5.3×0.07 cm), effuse-pulvinate, with inconspicuous to conspicuous perithecial mounds, surface brown vinaceous (84), dark vinaceous (82), dark brick (60), sepia (63) or, less frequently, bay (6); orange red granules immediately beneath surface and between perithecia, with KOH-extractable pigments orange (7), the tissue below the perithecial layer inconspicuous, perithecia obovoid, 0.2–0.4×0.3–0.6 mm ($\bar{x}$=0.3×0.5 mm), paraphyses not seen, ostioles lower than the stromatal surface. *Asci* (98–)100–156(–160)×(6.1–)6.5–10(–10.2) μm ($\bar{x}$=143×8 μm, *n*=20), 8-spored, unitunicate, cylindrical, pedicellate, with discoid apical ring bluing in Melzer's reagent, 0.5–1.2×1.8–2.5 μm ($\bar{x}$= 0.9×2 μm, *n*=20). *Ascospores* (9.5–)10–15(15.3)×(4.6–)5–7(–7.4) μm ($\bar{x}$=14×6 μm, *n*=30), uniseriate, one-celled, ellipsoid-inequilateral, with narrowly rounded ends, brown to dark brown, with sigmoid germ slit spore-length, perispore dehiscent in 10 % KOH, smooth or with inconspicuous coil-like ornamentation, epispore smooth. **Asexual morph** *Conidiogenous structure* nodulisporium-like, arising from brownish, roughened masses. *Conidiogenous cells* hyaline, finely roughened, 10–20×2–3 μm ($\bar{x}$=15×2.4 μm). *Conidia* hyaline, smooth to finely roughened-walled, ellipsoid, 4–6× 2.5–4 μm ($\bar{x}$=5×3.5 μm).

Culture characters: Colonies on OA at 25–28 °C covering 9 cm diam. Petri-dish in 3 wk, at first white, becoming hazel (88) towards the centre, velvety, azonate, with diffuse margins, usually with vinaceous-buff (86) to isabelline (65) pigments diffusing beyond colonies; reverse amber (47) to gray-olivaceous (107). Sporulating regions scattered over entire central of colony, brown-vinaceous (84).

Material examined: VENEZUELA, corticated wood, 1855, A. Fendler (K 120974, **isotype**) THAILAND, Chiang Mai, Doi Suthep, on decaying wood, 10 November 2012, D.A. Daranagama and K.D. Hyde AXL 039 (MFLU 12–0816), living culture, MFLUCC 12–0832. GenBank ITS: KM017563; LSU: KM017565; RPB2: KM017566; Chiang Rai, Doi Mae Saloung, on dead bamboo clumps, 12 December 2012, D.A. Daranagama and K.D. Hyde AXL 055 (MFLU 12–0823), living cultures, MFLUCC 13–0104, ICMP.

Notes: *Hypoxylon fendleri*, *H. trugodes* and *H. crocopeplum* are taxa that share similar stromatal characters. These taxa have a wide distribution in the tropics and subtropics on a variety of host substrates. *Hypoxylon fendleri* is different in having unique vinaceous tone in stromatal extractable pigment colour. *Hypoxylon fendleri* is similar to *H. trugodes*, but differs in its orange extractable stromatal pigments (Ju and Rogers 1996). *Hypoxylon fendleri* is differentiated from *H. crocopeplum* by its vinaceous stromatal surfaces. However, some collections of *H. fendleri* lack vinaceous tones and hence were categorized under *H. crocopeplum* (Ju and Rogers 1996). The asexual morphs of these two taxa are quite different. While the former produces a nodulisporium-like conidial morph, the latter has a virgariella-like asexual morph (Ju and Rogers 1996). *Hypoxylon subcrocopeplum* can also be compared with *H. fendleri*. The sexual morph is similar to *H. crocopeplum* in having almost similar stromatal characters, but the perispore is indehiscent in the former species. *Hypoxylon subcrocopeplum* possesses a nodulisporium-like asexual morph, which is similar to *H. fendleri*. Both *H. fendleri* and *H. subcrocopeplum* have been recorded from New Zealand (Ju and Rogers 1996). Many of sequences from *H. fendleri* deposited in GenBank are from unpublished and unverified strains. In this study, we introduce new sequences including RPB2 from an authentic specimen.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◀ **Fig. 45** ***Biscogniauxia marginata*** (MFLU 13–0099). **a** Habit **b, c** Concave stromatal surface in with carbonaceous tissue **d** Cross section of stromata showing the perithecium and ostiole **e** J+ apical apparatus in Melzer's reagent **f** Mature ascus in Lactophenol Cotton Blue **g** Ascus in Lactophenol Cotton Blue showing sigmoid germ slit **h.** Paraphyses in water **i** Ascospores in water **j** Germinating ascospore. Scale bars: **b, c**= 5 mm, **d**=0.2 mm, **e–h**=20 μm, **i, j**=15 μm

31. ***Hypoxylon lenormandii*** Berk. & M.A. Curtis *apud* Berk., J. Linn. Soc., Bot. 10: 385. 1869.

Facesoffunginumber: FoF 00300, Fig. 50

Holotype: K 42245

Saprobic on decorticated wood. **Sexual morph** *Ascostromata* 0.1–1×0.04–0.1 cm diam. ($\bar{x}$=0.6×0.08 cm), glomerate and effuse-pulvinate, stromata almost single and rosellinoid, connected by very thin stromatal tissue at the base, with very conspicuous perithecial mounds, half or sometimes entire perithecial mounds exposed, surface greyish-sepia (106), fuscous (103), or brown-vinaceous (84), dull orange brown to dark brown granules immediately beneath surface and between perithecia, with KOH extractable pigments hazel (88), fulvous (43), umber (9) or ochreous (44), the tissue below the perithecial layer inconspicuous, perithecia 0.3–0.5 mm diam. ($\bar{x}$=0.4 mm), immersed, sphaerical, ostioles

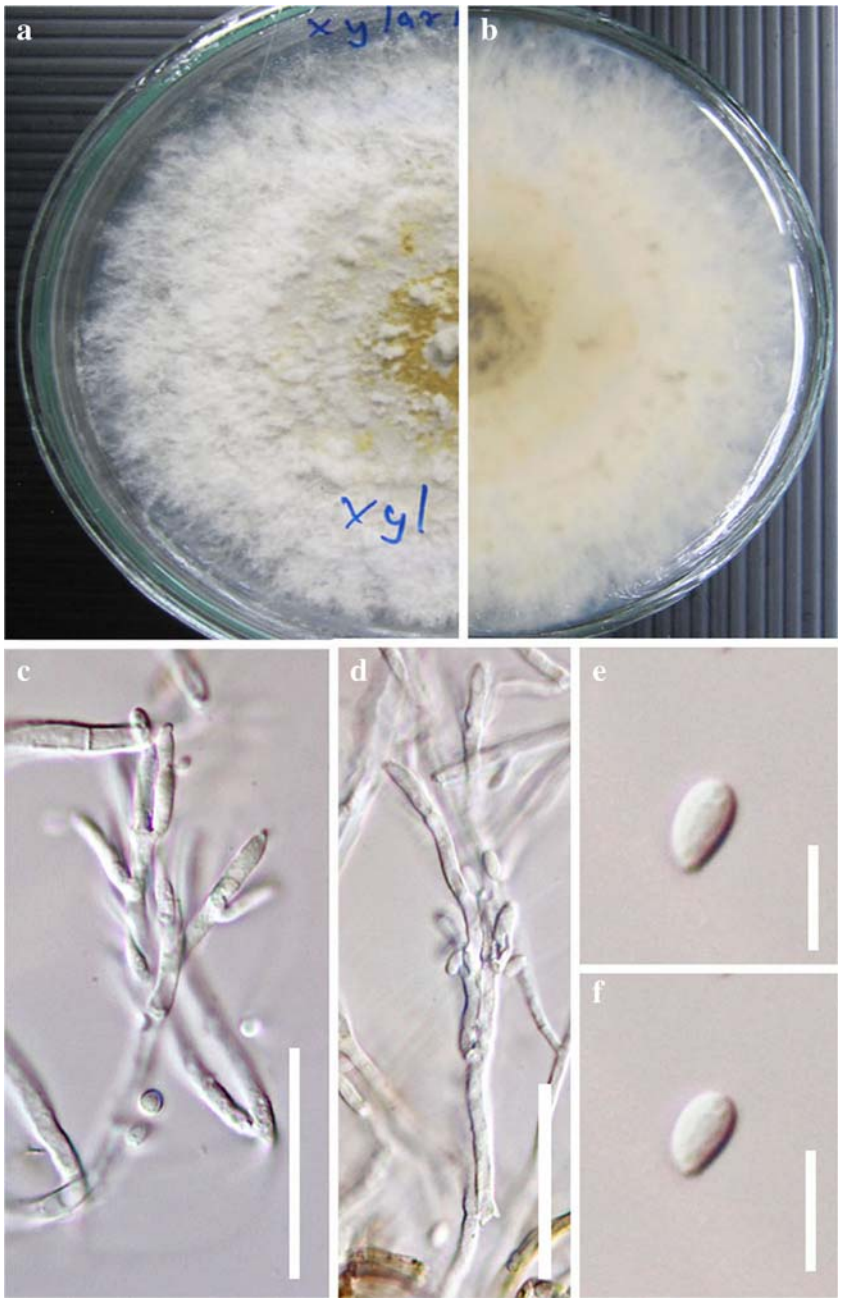


Fig. 46 ***Biscogniauxia marginata*** in MEA after 2 weeks **a** From above – white colony **b** From below – straw (46) **c** Conidiogenous structure **d** Conidiogenous cells **e**, **f** Conidia. Scale bars: c, d=30 μm, e, f=5 μm

Fig. 47 ***Fasciatispora nypae*** (MFLU 15-0042) **a** Acus. **b** Ascospores. **c** Germinating spore. Scale bars: a=30 *μm*, b=10 *μm*

slightly papillate, without apparent disk formation. Paraphyses not seen. *Asci* (120–)122–150(–153)×(5.3–)5.5–8.5(–8.7) *μm* ($\bar{x}$=134×7.1 *μm*), 8-spored, unitunicate, cylindrical, pedicellate, with apical ring not bluing in Melzer's reagent, discoid, 0.2–0.5×2–3 *μm* broad ($\bar{x}$=0.3×2.7 *μm*). *Ascospores* (10.3–)10.5–15(–15.4)×6–8.5 *μm* ($\bar{x}$=13.8×7.6 *μm*), uniseriate, one-celled, ellipsoid-inequilateral, with narrowly rounded ends, brown to dark brown, with straight, to slightly sigmoid germ slit more or less entire spore-length, perispore dehiscent in 10 % KOH, epispore smooth. **Asexual morph** *Conidiogenous structures* nodulisporium-like, hyaline. *Conidiogenous cells* 12–17×3–3.5 *μm* ($\bar{x}$=15×3.3 *μm*), hyaline, smooth. *Conidia* 5.5–7×2.5–3 *μm* ($\bar{x}$=6.2×2.7 *μm*), hyaline, ellipsoid.

Culture characters: Colonies on OA at 25–28 °C reaching the edge of 4 *cm* in 7 days, at first white, becoming hazel (88) to greyish-sepia (106), azonate with diffuse margins, reverse at first fuscous (103) and turning black after 10–12 days. Sporulating regions scattered over the surface of colony particularly at the centre, hazel (88).

Material examined: CUBA, on bark, C. Wright 485 (K 42245, **holotype**); THAILAND, Chiang Mai, Doi Suthep, on decaying wood, 10 November 2012, D.A. Daranagama and K.D. Hyde AXL 104 (MFLU 12–0831), living cultures, MFLUCC 13–0311, ICMP; Chiang Rai, Doi Mae Saloung, on dead bamboo clumps, 12 December 2012, D.A. Daranagama and K.D. Hyde AXL 112 (MFLU 12–0843), living culture, MFLUCC 13–0304; Chiang Rai, Mae Fah Luang University, on decaying wood, 20 December 2012, D.A. Daranagama and K.D. Hyde AXL 115 (MFLU 13–0847), living cultures, MFLUCC 13–0120. GenBank ITS: KM039135; LSU: KM039136; RPB2: KM039137.

***Notes*:** *Hypoxylon lenormandii*, with its glomerate stromata can easily be distinguished from other species, such as *H. undulatum*. Both taxa have very conspicuous stromata, but only *H. lenormandii* has characteristic glomerate stromata, more similar to the Rosellinoid type, which in fact led mycologists to name this fungus several times under *Rosellinia*. *Hypoxylon undulatum* is characterized by the lack of KOH extractable pigments (Ju and Rogers 1996). Therefore, our specimen cannot be placed under *H. undulatum*. *Hypoxylon sublenormandii* described by Suwannasai et al. (2005) from Thailand is similar to *H. lenormandii*. However, the stromatal surface of the new taxon is strongly reddish brown, while *H. lenormandii* is greyish sepia, fuscous or brownvinaceous. In addition, asci (95–110×3.8–5 *μm*) and ascospores of *H. lenormandii* are longer than *H. sublenormandii* (Ju and Rogers 1996, Suwannasai et al. 2005). *Hypoxylon sublenormandii* is so far known only from bamboo, whereas

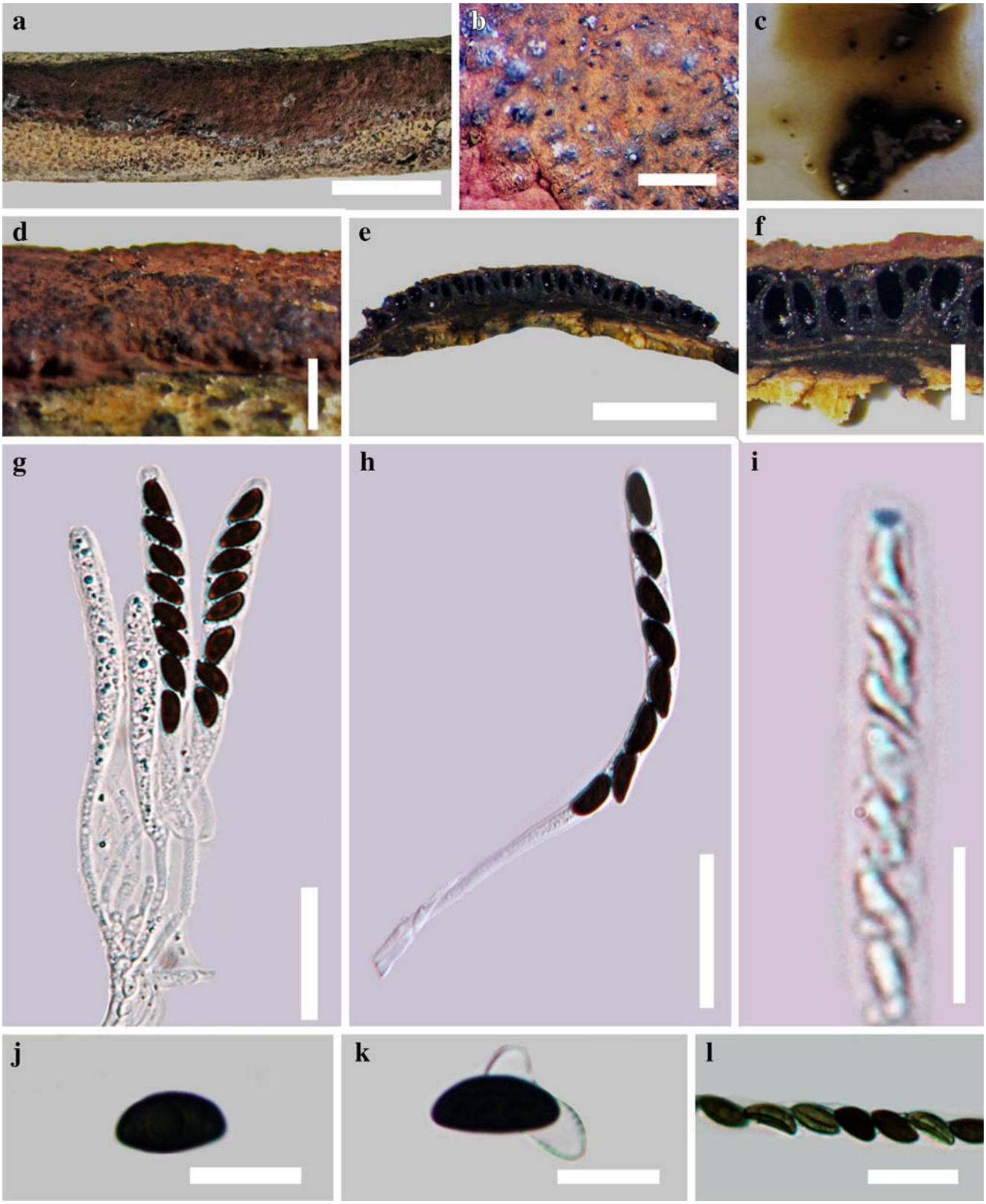


Fig. 48 ***Hypoxylon fendleri*** (MFLU 12–0816) **a** Stromata in wood **b** Surface of stromata with ostioles **c** KOH extractable pigments **d** Side view of stromata **e** Cross section of stroma **f** Perithecia **g** Mature asci and immature asci in cluster **h** Mature asci in water **i** Asci in Melzer's reagent with J+, discoid, apical apparatus **j** Mature ascospore with dehiscent perispore in KOH **H** Mature ascospores in water **i** Mature ascospore with straight germ slit. Scale bars: **a**=1 cm, **b, c**=1 mm, **d, e**=100 μm, **g-k**=10 μm

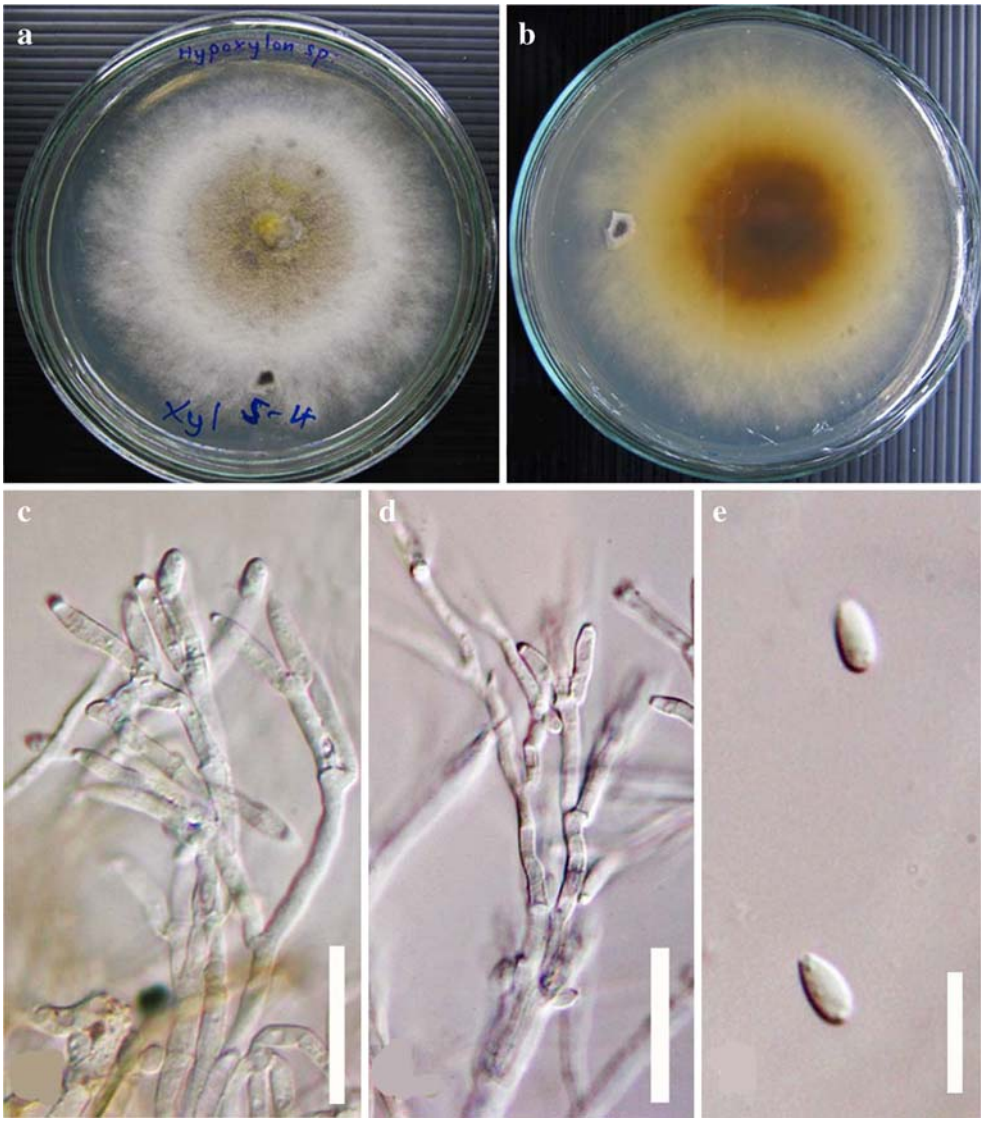


Fig. 49 ***Hypoxylon fendleri*** on OA after 2 weeks **a** From above **b** From below **c, d** Conidiogenous structures **e** Conidia. Scale bars: **c, d**=30 *μm*, **e**=5 *μm*

this specimen is from angiosperm wood. According to Ju and Rogers (1996), *H. lenormandii* can occur both on dicotyledonous and monocotyledonous substrates, indicating a fairly wide host range. According to Ju and Rogers (1996) the details in the description of *H. lenormandii* are compatible with this specimen and its nodulisporium-like asexual morph. We provide new ITS, LSU, RPB2 and β-tubulin gene sequence data from an authenticate strain of *H. lenormandii* which can be used in the future molecular analysis.

32. *Hypoxylon monticulosum* Mont., Syll. Gen. Sp. Crypt., p. 214. 1856.

Facesoffunginumber: FoF 000302, Fig. 51

Holotype: BPI 589948

Saprobic on decorticated wood. **Sexual morph** *Ascostromata* 0.3–5×0.5–2.5×0.5–1 cm ($\bar{x}$=3.2×1.8×0.7 cm), pulvinate to effuse-pulvinate, with conspicuous perithecial mounds, surface rust (39) to sepia (63), blackish, shiny when mature; with blackish, woody to carbonaceous tissue immediately beneath surface and between perithecia, without apparent KOH-extractable pigments; the tissue below the perithecial layer 0.2–0.3 mm thick ($\bar{x}$=0.2 mm), perithecia sphaerical to obovoid, 0.2–0.5×0.3–0.5 mm ($\bar{x}$=0.3×0.4 mm), immersed in carbonaceous tissue, arranged as multi-layers, ostioles papillate, without apparent disk formation, paraphyses not seen. *Asci* (86–)90–130(–132)×(4.6–)5–7(7.3) *μm* ($\bar{x}$=117×6.8 *μm*, *n*=20), 8-spored, unitunicate, cylindrical, pedicellate, with discoid apical ring inconspicuously bluing in Melzer's reagent, 0.5–1.2×1.5–2.5 *μm* ($\bar{x}$=1×2.1 *μm*, *n*=20). *Ascospores* (7.7–)8–12.5(–12.9)×(3.2–)3.5–5(–5.3) *μm* ($\bar{x}$=10.4×4.8 *μm*), uniseriate, one-celled, ellipsoid-inequilateral, with narrowly rounded ends, brown to dark brown, with sigmoid germ slit the entire spore length, perispore dehiscent in 10 % KOH, smooth or with inconspicuous coil-like ornamentation, epispore smooth. **Asexual morph** Undetermined.

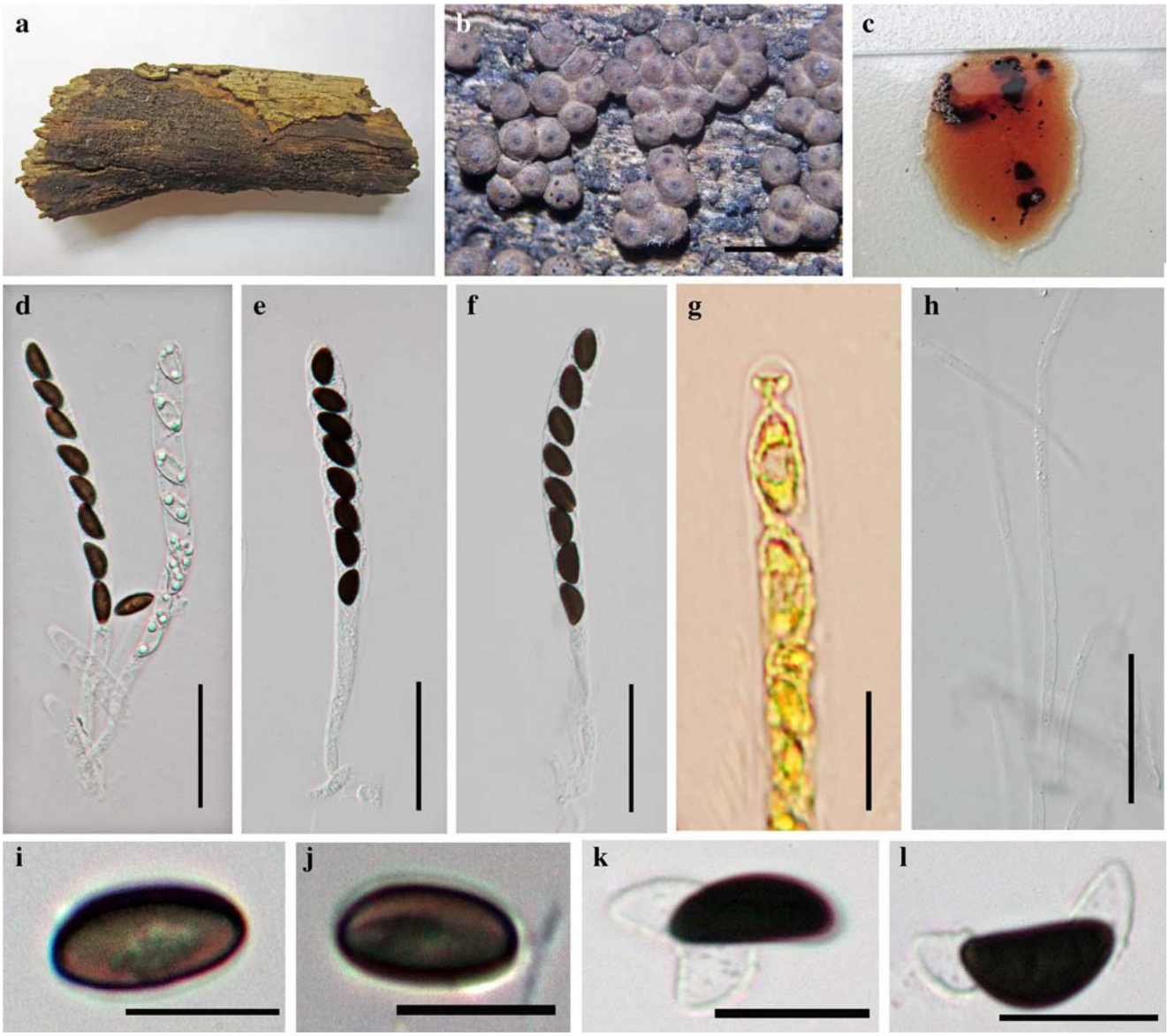


Fig. 50 ***Hypoxylon lenormandii*** (MFLU 12–0831) **a** Stromatal habit on wood **b** Perforations and ostioles seen from above **c** Stroma in side view **d** Cross section of the stroma showing perithecia **e** Perithecia from above **f** Formation of pigments in KOH **g** Mature ascus in water **i** Ascus in Melzer's reagent showing non amyloid ascal apical apparatus **j** Ascospore in water **k** Dehiscent perispore in KOH **l** Ascospore showing germ slit. Scale bars: **a-c**=5 mm, **d, f**=30 μm, **g-l**=10 μm

Culture characters: Colonies on OA at 25–28 °C covering Petri-dish in 3 weeks, at first white, becoming hazel (88) to pale mouse gray (117), cinnamon (62) towards the centre, velvety, azonate, with diffuse margins, usually with vinaceous buff (86) to isabelline (65) pigments diffusing beyond colonies; reverse gray olivaceous (107) or greyish-sepia (106).

Material examined: THAILAND, Chiang Mai, Doi Pui mountain, on decaying wood, 2 December 2012, D.A. Daranagama and K.D. Hyde AXL 111 (MFLU 12–0827), living cultures, MFLUCC 13–0133, ICMP. Chiang Mai, Doi Suthep mountain, on decaying wood, 12 December 2012, D.A. Daranagama and K.D. Hyde AXL 111 (MFLU 12–0848), living cultures, MFLUCC 12-0818. GenBank ITS: KM052716; LSU: KM052717; RPB2: KM052719.

Notes: *Hypoxylon monticulosum*, *H. submonticulosum* and *H. investiens* are quite similar in their morphological characters which resulted in some old collections of *H. investiens* being named as *H. monticulosum* (Ju and Rogers 1996). Besides, the variable stromatal characters in *H. investiens* make it rather difficult to identify. For example, *H. investiens* possesses varying ostiolar characters. *H. monticulosum* and *H. submonticulosum* differ from *H. investiens* in the lack of apparent KOH-extractable

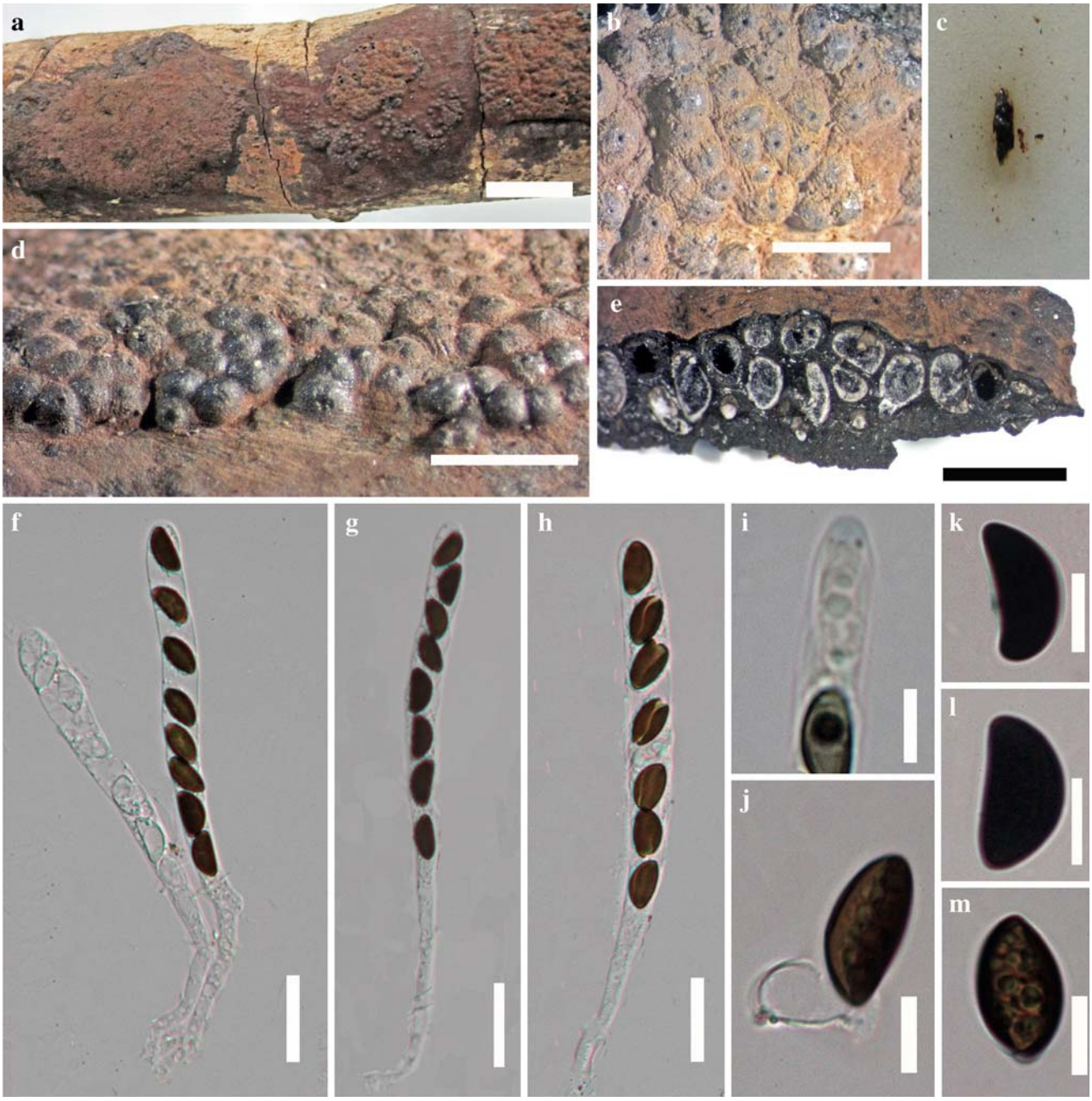


Fig. 51 ***Hypoxylon monticulosum*** (MFLU 12–0827) **a** Stromatal habit in wood **b** Ostioles seen from above **c** Stromata in KOH (note–lack of apparent colour formation) **d** Stroma in side view **e** Cross section of the stroma showing perithecia **f** Mature and immature ascus in water **g** Mature ascus in water **h** Ascospores in ascus showing germ slit **i** Ascus in Melzer's reagent showing inconspicuous ascal apical apparatus **j** Dehiscent perispore in KOH **k, l, m** Ascospore in water. Scale bars: a= 2 cm, b, d, e=1 mm, f-m=10μm

pigments, while the latter has green–olivaceous KOH extractable pigments (Ju and Rogers 1996). However, *H. monticulosum* has been reported to produce purple stromatal pigments when young but at the maturity, the pigments are not observable. *Hypoxylon monticulosum* has a blackish surface on mature stromata and even in the young stromata which sometimes make it different from others, coupled with *Virgariella*-like conidiogenous structures (Ju and Rogers 1996). *Hypoxylon monticulosum* has darker, inequilateral ascospores with dehiscent perispore in KOH as compared to the temperate *H. submonticulosum*. In GenBank there are sequences of *H. monticulosum* but many are from unverified strains. We introduce new ITS, *RPB2*, LSU and β-tubulin gene sequences from an authentic strain.

Dothideomycetes

Recent outlines for the Dothideomycetes were provided by Hyde et al. (2013) and Wijayawardene et al (2014). Below we introduce 44 new species in the families *Anteagloniaceae*, *Bambusicolaceae*, *Capnodiaceae*, *Didymellaceae*, *Didymosphaeriaceae*, *Hysteriaceae*, *Lentitheciaceae*, *Leptosphaeriaceae*, *Lophiostomataceae*, *Lophiostrematace*ae, *Melanommataceae*, *Mycosphaerellaceae*, *Paradictyoarthriniaceae*, *Phaeosphaeriaceae* and *Pleosporaceae*.

Anteagloniaceae K.D. Hyde & A. Mapook., Fungal Diversity **63**: 33 (2013)

Anteagloniaceae was introduced by Hyde et al. (2013) to accommodate a monotypic genus *Anteaglonium*, which had previously been placed in *Hysteriaceae* because of its hysterothecial ascomata (Boehm 2009; Mugambi and Huhndorf 2009; Hyde et al. 2013). Phylogenetic evidence distinguishes *Anteaglonium* from taxa of *Hysteriales* (Mugambi and Huhndorf 2009; Schoch et al. 2009; Zhang et al. 2012a; Hyde et al. 2013). The phylogenetic tree is presented in Fig. 52.

33. *Flammeascoma* Phookamsak & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF550925, *Facesoffungi number*: FoF 00426

Etymology: The generic epithet *Flammeascoma* refers to the reddish-orange pigmented produced at the ascomata apex.

Type species: *Flammeascoma bambusae* Phookamsak & K.D. Hyde

Saprobic on submerged bamboo. **Sexual morph** *Ascostromata* solitary or gregarious, semi-immersed to superficial, dark at the basal region and orange brown at the apex of the ascoma, uni- to bi-loculate, conical to lenticular, with a flattened base, coriaceous, ostiole central, with pore-like opening. *Peridium* thick-walled, of unequal thickness, poorly developed at the base, composed of several layers of brown to dark brown cells, with host cells plus fungal tissue, organised in a *textura epidermoidea*. *Hamathecium* comprising 1–1.8 μm wide, dense, narrow, cellular pseudoparaphyses, embedded in a hyaline gelatinous matrix. *Asci* 8-spored, bitunicate, fissitunicate, clavate to cylindric-clavate, short pedicellate with foot-like pedicel, apically rounded with well-developed ocular chamber. *Ascospores* overlapping 1–2-seriate, didymosporous, fusiform, slightly curved, hyaline, becoming brown when released from asci and geminating, 1-septate, constricted at the septum, surrounded by mucilaginous sheath. **Asexual morph** Undetermined.

Notes: The combined analysis of LSU, SSU and TEF1 genes by maximum likelihood analysis (ML) and maximum parsimony (MP) of 16 taxa from *Anteagloniaceae* and *Lophiotremaceae* (*Pleosporales*), show three clades which are represented by the species in *Anteagloniaceae*, *Lophiotremataceae* and a new genus *Flammeascoma* (Fig. 52). *Flammeascoma* forms a robust clade basal to *Anteagloniaceae*, while the species in *Anteagloniaceae* and *Lophiotremataceae* form a well-resolved clade.

Flammeascoma is monotypic genus introduced to accommodate taxa associated with submerged bamboo and characteristically has orange-brown pigments in the ascostromata. The genus is similar to *Fissuroma* in having coriaceous ascomata, trabeculate pseudoparaphyses and fusiform ascospores. However, *Flammeascoma* differs from *Fissuroma* as the former has a pore-like, orangish, pigmented ostiole, whereas *Fissuroma* has a dark, slit-like opening (Tanaka and Harada 2005; Liu et al. 2011). Based on the phylogenetic evidence, *Flammeascoma* forms a single clade basal to

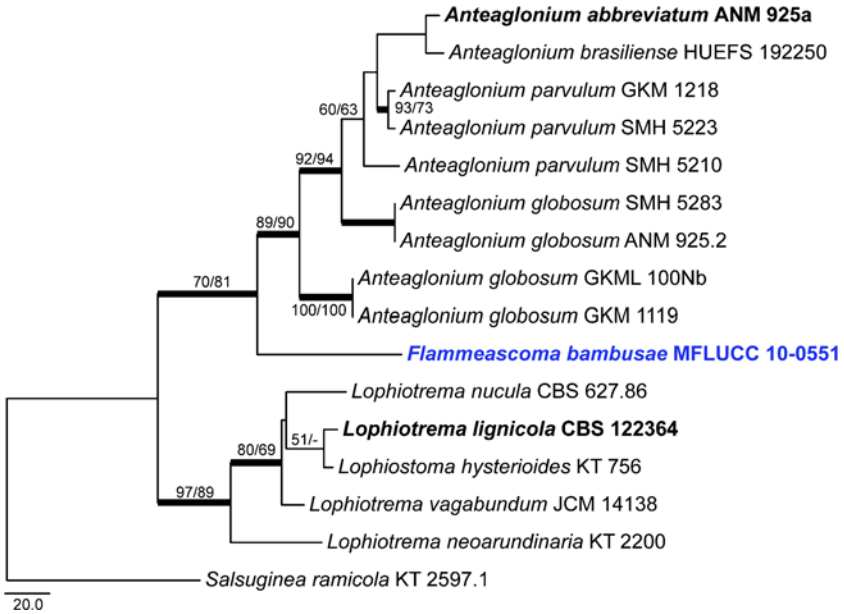


Fig. 52 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU and TEF1 sequence data of *Anteagloniaceae* and *Lophiotremataceae*. Bootstrap support values for maximum likelihood (ML) and maximum parsimony (MP) greater than 50 % are indicated above and below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (ex-epitypes, reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Salsuginea ramicola* KT 2597.1

Anteagloniaceae. *Flammeascoma* differs from *Anteaglonium* which has hysterothecial ascomata and small ascospores, while *Flammeascoma* has pseudothecial ascomata with larger ascospores (Mugambi and Huhndorf 2009; Hyde et al. 2013). We place the *Flammeascoma* in *Anteagloniaceae*.

34. *Flammeascoma bambusae* Phookamsak & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550924, *Facesoffungi number*: FoF 00427, Fig. 53.

Etymology: The specific epithet *bambusae* refers to the host bamboo in reference to the host from which the fungus was isolated.

Holotypus: MFLU 11–0143

Saprobic on submerged bamboo. **Sexual morph** *Ascostromata* 400–630 μm, high, 1000–1400 μm diam.,

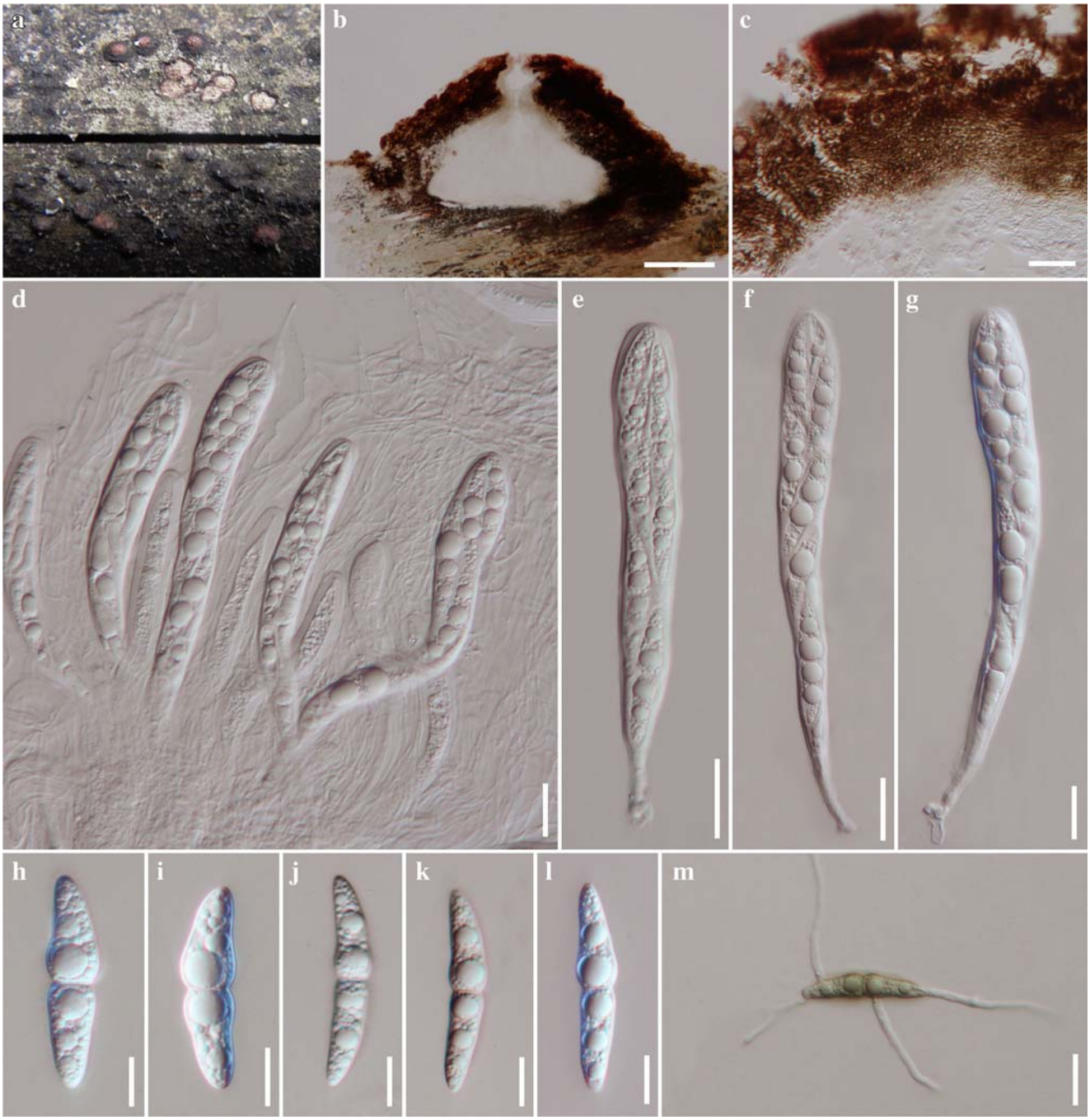


Fig. 53 ***Flammeascoma bambusae*** (**holotype**) **a** Ascostromata visible as black raised structures, orangish at the apex, raised on host surface **b** Section through an ascoma **c** Section through peridium **d** Asci with narrow pseudoparaphyses **e–g** Asci **h–l** Ascospores **m** Spore germination. Scale bars: b=200 μm, **c**=50 μm, d–g, m=20 μm, h–l=5 μm

solitary, gregarious, semi-immersed to superficial, dark at the basal region and orange brown at the apex of the ascoma, uni- to bi-loculate, conical to lenticular, with a flattened base, coriaceous, ostiole central, with pore-like opening. *Peridium* 70–110 μm wide, thick-walled, of unequal thickness, poorly developed at the base, composed of several layers of brown to dark brown cells, with host cells plus fungal tissue, organised in a *textura epidermoidea*. *Hamathecium* comprising 1–1.8 μm wide, dense, narrow pseudoparaphyses, embedded in a hyaline gelatinous matrix. *Asci* (125–)130–160(–175)×(14.5–)15–17(–20) μm ($\bar{x}$=147.7×16.6 μm, n=20), 8-spored, bitunicate, fissitunicate, clavate to cylindric-clavate, short pedicellate with foot-like pedicel, apically rounded with well-developed ocular chamber. *Ascospores* (35–)40–43(–48)×7–9(–10.5) μm ($\bar{x}$=41.9×8.7 μm, n=25), overlapping 1–2-seriate, didymosporous, fusiform, slightly curved, hyaline, becoming brown when released from asci and geminating, 1-septate, constricted at the septa, swollen near the septa, with small and large guttules, wall rough, surrounded by mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA slow growing, 10–20 mm diam. after 4 weeks at 25–30 °C, dark-greenish to black at the margin, grey to dark grey in the centre; reverse dark-greyish to black; medium dense to dense, irregular, slightly raised to low convex or umbonate, dull with undulate edge, hairly to woolly, slightly wavy.

Material examined: THAILAND, Chiang Mai Province, Chom Tong District, Doi Inthanon, on dead stem of submerged bamboo (*Bambusae*), 5 September 2009, R. Phookamsak RP0013 (MFLU 11–0143, **holotype**); ex-type living culture, MFLUCC 10–0551. GenBank ITS: KP744440; SSU: KP753952.

Bambusicolaceae

Bambusicolaceae was introduced by Hyde et al. (2013) to accommodate a monotypic genus *Bambusicola* D.Q. Dai & K.D. Hyde and is typified by *Bambusicola massarinia* D.Q. Dai & K.D. Hyde (Dai et al. 2012; Hyde et al. 2013). Four new species were first introduced in this genus which their morphological characters similar to species in *Massarina sensu lato* (Hirayama et al. 2010; Dai et al. 2012). However, *Bambusicola* differs from *Massarina sensu lato* in its asexual morph. *Bambusicola* formed a distinct clade from *Massarinaceae* and is closely related to *Lentitheciaceae* in *Pleosporales* (Dai et al. 2012; Hyde et al. 2013). The phylogenetic tree is presented in Fig. 54.

35. *Palmiascoma* Phookamsak & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF550926, *Facesoffungi number*: FoF 00428

Etymology: The generic epithet *Palmiascoma* refers to the host from which the fungus was isolated.

Type species: *Palmiascoma gregariascomum* Phookamsak & K.D. Hyde

Saprobic on palms. **Sexual morph** *Ascomata* gregarious, scattered to clusterred, semi-immersed to erumpent, visible as raised, dark spots on the host surface, uni-loculate, conical to subglobose or irregular, glabrous, ostiole central, with minute papilla. *Peridium* composed of several layers, of brown to dark brown, pseudoparenchymatous cells, organized in a *textura angularis*. *Hamathecium* comprising 1–2 μm wide, dense, broad cellular, pseudoparaphyses, with distinct septa, but constricted at the the septa, anastomosing at the apex, embedded in a hyaline gelatinous matrix. *Asci* 8-spored, bitunicate, fissitunicate, clavate, short pedicellate with rounded to obtuse pedicel, apically rounded, with a well-developed ocular chamber. *Ascospores* overlapping 1–2-seriate, didymosporous, clavate to ellipsoidal, slightly curved, pale yellowish when young, becoming brown to dark brown at maturity, 1-septate, echinulate, surrounded by a mucilaginous sheath. **Asexual morph** *Conidiomata* pycnidial, solitary, immersed in agar to superficial, visible as black dots covered by vegetative hyphae, uni- to multi-loculate, globose to subglobose, glabrous, ostiole central, with minute papilla. *Conidiomata walls* composed of several layers of hyaline to dark brown, pseudoparenchymatous cells, outer layers comprising 3–5 cell layers of thick-walled, dark brown to black, organized in a *textura angularis* to *textura prismatica*, inner layers comprising 2–3 layers of thin-walled, hyaline, organized in a *textura angularis*. *Conidiophores* arising from basal cavity of conidiomata, mostly reduced to conidiogenous cells. *Conidiogenous cells* holoblastic, phialidic, discrete, ampulliform to cylindrical, hyaline, aseptate, smooth-walled. *Conidia* solitary, one-celled, oblong to ellipsoidal, with rounded or obtuse ends, initially hyaline, becoming brown at maturity, aseptate, smooth-walled.

Notes: *Palmiascoma* is a monotypic genus associated with palms and produces echinulate, didymospores. The genus is similar to *Didymosphaeria* Fuckel and *Verruculina* Kohlm. & Volkm.-Kohlm. due to its didymosporous, brown and echinulate ascospores (Zhang et al. 2012a). However, they are distinguished based on molecular data (Zhang et al. 2012a; Hyde et al. 2013; Ariyawansa et al. 2014b). *Palmiascoma* differs from *Bambusicola* species, as *Palmiascoma* produces ellipsoidal, dark brown, echinulate ascospores with broad cellular pseudoparaphyses. *Bambusicola* species have fusiform, hyaline, smooth-walled ascospores with narrow cellular pseudoparaphyses (Dai et al. 2012; Hyde et al. 2013).

36. *Palmiascoma gregariascomum* Phookamsak & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550927, *Facesoffungi number*: FoF00429, Fig. 55

Etymology: The specific epithet "*gregariascomum*" refers to the gregarious ascomata on the host.

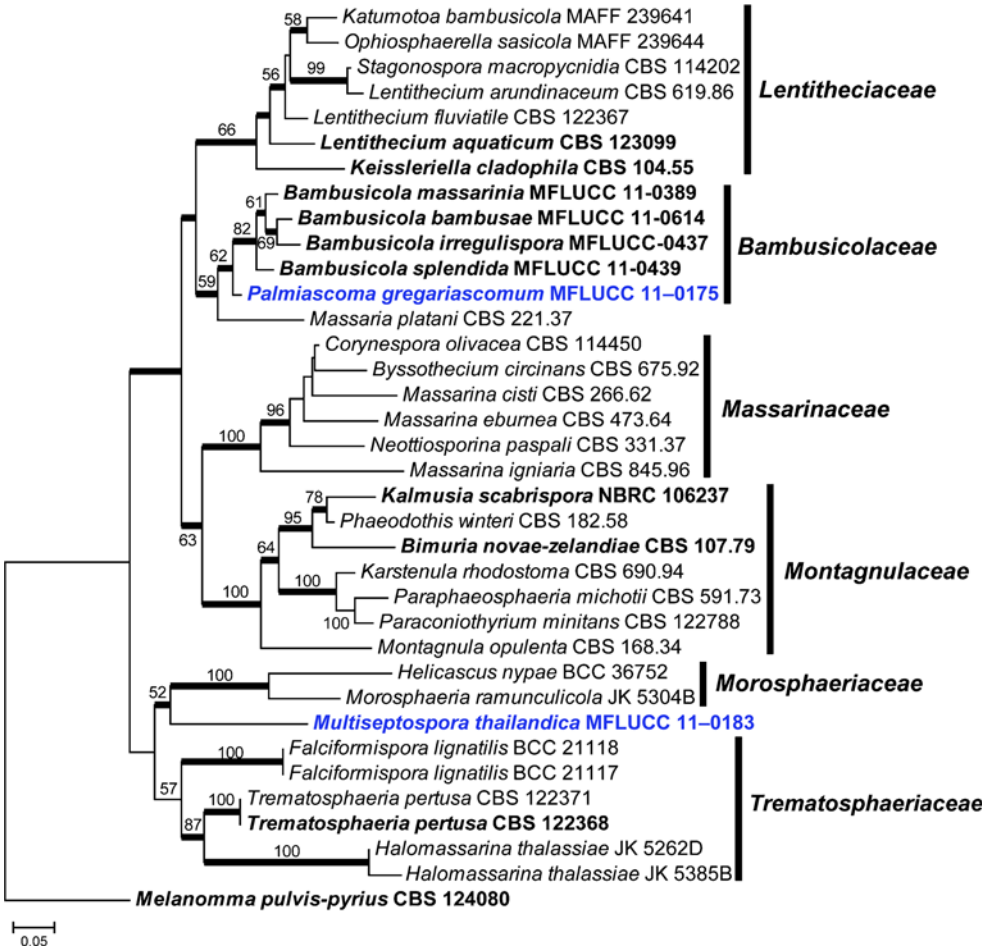


Fig. 54 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU and *RPB2* sequence data of respective families in *Pleosporales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (ex-epitypes) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Melanomma pulvis-pyrius* CBS 124080

Holotypus: MFLU 11–0211

Saprobic on palms. **Sexual morph** *Ascomata* 130–180 *μm* high, 130–250 *μm* diam., gregarious, scattered to clusterred, semi-immersed to erumpent, visible as raised, dark spots on the host surface, uni-loculate, conical to subglobose or irregular, glabrous, ostiole central, with minute papilla. *Peridium* 10–50 *μm* wide, thin to thick walled, of unequal thickness, slightly thick at sides, composed of several layers, of brown to dark brown, pseudoparenchymatous cells, organized in a *textura angularis*. *Hamathecium* comprising 1–2 *μm* wide, dense, broad cellular, pseudoparaphyses, with distinct septa, but constricted at the the septa, anastomosing at the apex, embedded in a hyaline gelatinous matrix. *Asci* (45–)50–60(–67)×7–10 *μm* ($\bar{x}$=53×8.2 *μm*, *n*=25), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate with rounded to obtuse pedicel, apically rounded, with a well-developed ocular chamber. *Ascospores* 11–13×3–4 *μm* ($\bar{x}$=11.9×3.9 *μm*, *n*=30), overlapping 1–2-seriate, didymosporous, clavate to ellipsoidal, slightly curved, pale yellowish when young, becoming brown to dark brown at maturity, 1-septate, not constricted at the septa, wall rough, echinulate, surrounded by a mucilaginous sheath. **Asexual morph** Coelomycetes forming on bamboo pieces on WA or immersed in agar after 12 weeks. *Conidiomata* 210–325 *μm* high, 240–420 *μm* diam., pycnidial, solitary, immersed in agar to superficial, visible as black dots covered by vegetative hyphae, uni- to multi-loculate, globose to subglobose, glabrous, ostiole central, with minute papilla. *Conidiomata walls* 28–60 *μm* wide, thick-walled, of equal thickness, composed of several layers of hyaline to dark brown, pseudoparenchymatous cells, outer layers comprising 3–5 cell layers of thick-walled, dark brown to black, organized in a *textura angularis* to *textura prismatica*, inner layers comprising 2–3 layers of thin-walled, hyaline, organized in a *textura angularis*. *Conidiophores* arising from basal cavity of conidiomata mostly reduced to conidiogenous cells. *Conidiogenous cells* 5–12×2–4 *μm* ($\bar{x}$=7.9×3.1 μm, *n*=30), holoblastic, phialidic, discrete, ampulliform to cylindrical, hyaline, aseptate, smooth-walled. *Conidia* 4–6×2–3 *μm* ($\bar{x}$= 4.7×2.5 *μm*, *n*=30), solitary, one-celled, oblong to ellipsoidal, with rounded or obtuse ends, initially hyaline, becoming brown at maturity, aseptate, smooth-walled.

Culture characters: Colonies on PDA fast growing, 70–80 mm diam. after 4 weeks at 25–30 °C, greenish-grey to grey, forming white tufts on surface, slightly radiating; reverse brown to dark brown at the margin, dark brown to black in the centre; medium dense, circular, flattened to slightly raised,

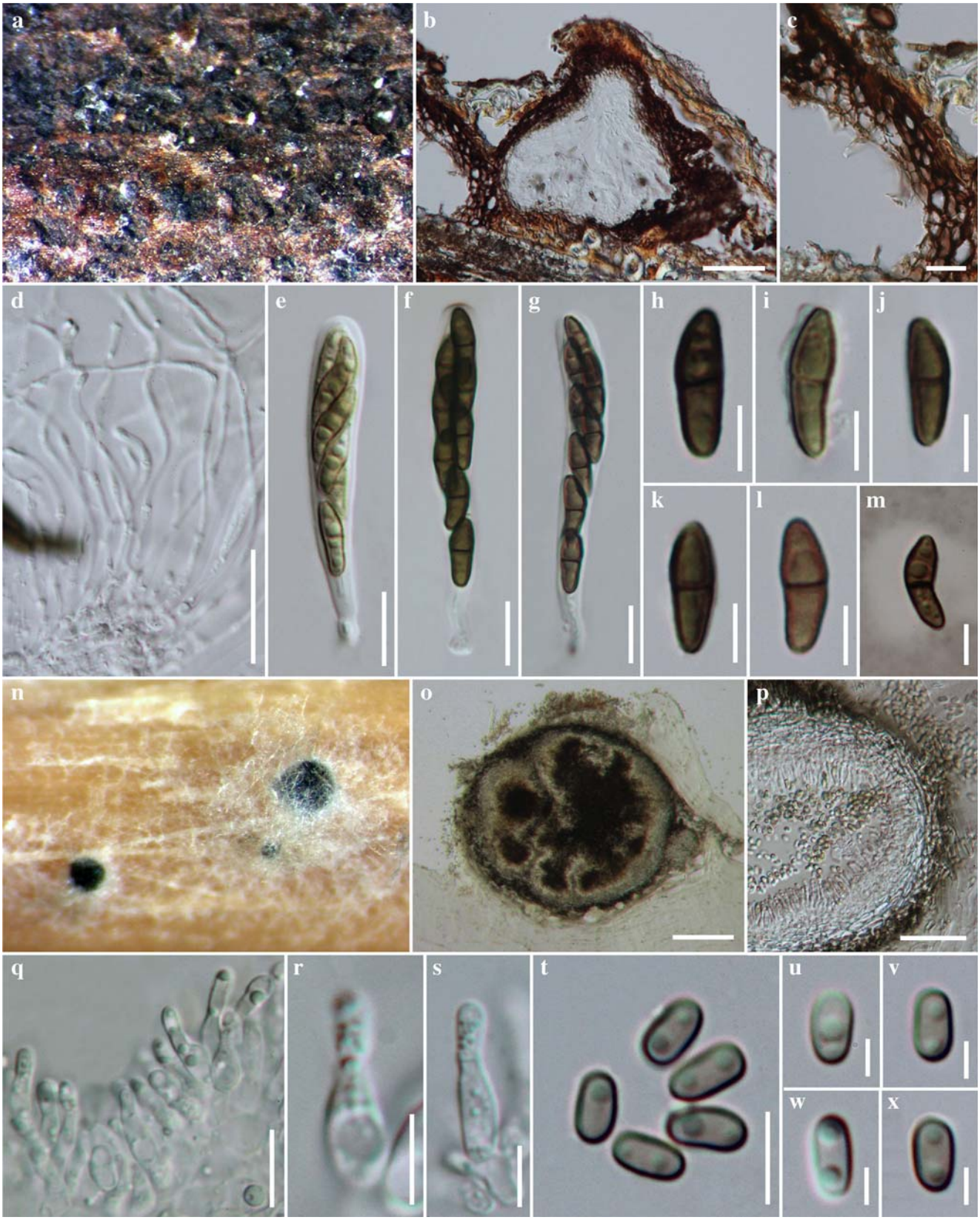


Fig. 55 ***Palmiascoma gregariascomum*** (**holotype**) **a** Appearance of ascomata on host surface **b** Section through an ascoma **c** Section through peridium **d** Pseudoparaphyses **e–g** Asci **h–l** Ascospores **m** Ascospore stained in Indian ink **n** Conidiomata produced on bamboo pieces on WA **o** Section through conidiomata **p** Section through pycnidial wall **q–s** Conidiophores **t–x** Conidia. Scale bars: o=100 μm, b, p=50 μm, c, d=20 μm, e–g, q=10 μm, h–m, r–t=5 μm, u–x=2 μm

dull to rough with entire edge, fairy fluffy to velvety, slightly radially furrowed.

Material examined: THAILAND: Chiang Rai, Muang District, Khun Korn Waterfall, on dead frond of palm, 17 December 2010, R. Phookamsak RP0091 (MFLU 11–0211, **holotype**), ex-type living culture, MFLUCC 11–0175. GenBank ITS: KP744452; LSU: KP744495; SSU: KP753958.

Capnodiaceae

Capnodiaceae was introduced by von Höhnel (1910); the generic type is *Capnodium* Mont. The family *Capnodiaceae* are sooty moulds in the order *Capnodiales* (Batista and Ciferri 1963; Hughes 1972; Crous et al. 2009a, b; Chomnunti et al. 2011; Hyde et al. 2013). Phylogenetic trees for *Capnodiaceae* have been provided by Crous et al. (2009a, b) and Chomnunti et al. (2011). In this study, one new genus and two new species of *Capnodiaceae*, *Capnodium siamensis* and *Phragmocapnias philippinensis* are presented and phylogeneticially analyzed, using a dataset as used in previous studies. The phylogenetic tree is presented in Fig. 56

37. *Chaetocapnodium* Hongsanan & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF550888, *Facesoffungi number*: FoF00399

Etymology: From Greek *Chaeto* (chaítē) meaning hair, *capnodium* is from Greek kapnōdēs meaning smoky or dark.

Type species: *Chaetocapnodium siamensis* Hongsanan & K.D. Hyde

Saprobic on the surface of leaves. *Superficial hyphae* with septa, constricted and dark at the septum. **Sexual morph** *Ascomata* superficial, solitary, subglobose, dark brown to black, with setae. *Setae* short, aseptate, brown. *Peridium* comprising two layers of cells of *textura angularis*, inner layer hyaline, outer layer brown, thickened at the base. *Hamathecium* lacking psuedoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, cylindrical to clavate, short

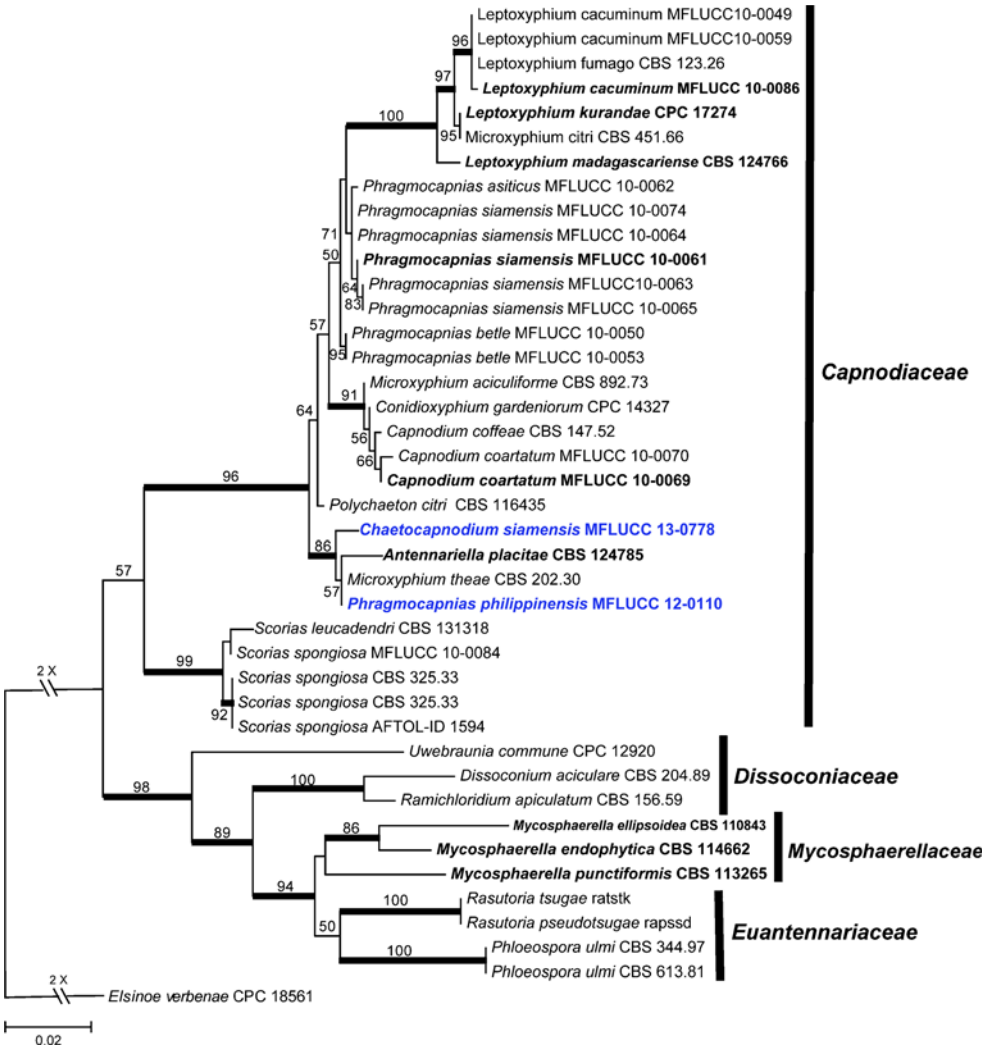


Fig. 56 Phylogram generated from Maximum likelihood (RAxML) analysis based on LSU gene region of Capnodiales. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in bold. The ex-types (ex-epitypes and reference strains) are in bold; the new isolates are in blue. The tree is rooted with *Elsinoe verbenae* CPC 18561

pedicellate or apedicellate. *Ascospores* bi to tri-seriate, oblong to ellipsoid, 3-septate, constricted and dark at the septum, hyaline when immature and brown at maturity, smooth-walled.

Notes: Molecular analyses (LSU gene) of *Chaetocapnodium siamensis* indicate that it is separate from other known genera in *Capnodiaceae* with 86 % ML and 100 % PP support. The morphology of *C. siamensis* is typical of *Capnodiaceae* based on its saprobic habitat as sooty moulds, subglobose to globose, ascomata forming from thalli, with a central ostiole, and bitunicate asci. *Chaetocapnodium siamensis* is most similar to *Capnodium tiliae* based on ascospores shape and septation. However, it is distinct from other genera in *Capnodiaceae* by having short setae at upper part of ascomata and cylindrical to clavate asci. Therefore, *Chaetocapnodium* should be a new genus in *Capnodiaceae*, typified by *C. siamensis*.

38. *Chaetocapnodium siamensis* Hongsanan & K.D. Hyde, ***sp. nov.***

Index Fungorum: IF550889, *Facesoffungi number*: FoF 00397; Fig. 57

Etymology: *siamensis* is *siam* + *ensis* from Latin meaning "of Siam" or "Thailand".

Holotypus: MFLU 14–0747

Saprobic on the upper surface of leaves. *Superficial hyphae* 4–5 μm wide, septate, constricted and dark at the septum. **Sexual morph** *Ascomata* 110–120 μm diam. ($\overline{x}$=116 μm, n=5), superficial, mostly solitary, subglobose, broad at the centre, dark brown, with apical setae. *Setae* 12–17×2–4 μm ($\overline{x}$=15×3 μm, n=5), short, aseptate, brown. *Peridium* 20–25 μm ($\overline{x}$=22 μm, n=5), comprising two layers of cells of *textura angularis*, inner layer hyaline, outer layer brown, thickened at the base. *Hamathecium* lacking pseudoparaphyses. *Asci* 34–41×11–14 μm ($\overline{x}$=38×13 μm, n=5), 8-spored, bitunicate, fissitunicate, cylindrical to clavate, short pedicellate or apedicellate. *Ascospores* 9–15×4–6 μm ($\overline{x}$=12×5 μm, n=10), bi to tri-seriate, oblong to ellipsoid, 3-septate, constricted and dark at the septum, hyaline when immature and brown at maturity, smooth-walled. **Asexual morph** Undetermined.

Material examined: THAILAND, Chiang Rai, Tasud, on leaves of unidentified plant, 17 September 2013, S. Hongsanan SOY3 (MFLU 14–0747, **holotype**); ex-type living culture, MFLUCC 13–0778. GenBank LSU: KP744479.

39. *Phragmocapnias philippinensis* Hongsanan & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550890, *Facesoffungi number*: FoF00398; Fig. 58

Etymology: From Latin *philippinensis* meaning Philippines, because the sample was collected from Philippines.

Holotypus: MFLU 14–0748

Saprobic on the upper surface of living leaves of *Arecaceae*. **Sexual morph** *Superficial hyphae* 2–4 μm wide ($\overline{x}$=3 μm, n=10), septate, slightly constricted and dark at the septum, pale brown to brown. *Ascomata* 97–104 μm diam. ($\overline{x}$=102 μm, n=10), superficial on surface of substrate, solitary or clustered, globose to subglobose, rounded above, attached to the basal hyphae, ostiole present at maturity, thick-walled, brown to greenish, dark brown at the base. *Setae* 5–8 μm diam. ($\overline{x}$=6 μm, n=10), aseptate, developing 3–5 setae at the upper part of ascomata, brown to dark brown, pale brown at the apex. *Peridium* 13–18 μm ($\overline{x}$=16 μm, n=10) comprising cell layers of *textura angularis*, inner layer hyaline, outer layer dark brown or greenish. *Hamathecium* lacking pseudoparaphyses. *Asci* 39–48×12–18 μm ($\overline{x}$=41×15 μm, n=10), 8-spored, bitunicate, fissitunicate, cylindrical when immature, broadly clavate at maturity, short pedicellate or sometimes apedicellate, with small ocular chamber. *Ascospores* 23–27×4–6 μm ($\overline{x}$=26×5 μm, n=10), bi to tri-seriate, cylindrical to clavate, 3–4-septate, constricted at the septum, basal cell narrow and slightly long, hyaline, wall rough, occasionally smooth-walled. **Asexual morph** Undetermined.

Material examined: PHILIPPINES, Laguna, Mount Makiling, on leaves of palm (*Arecaceae*), February 2012, K.D. Hyde HSA14/1 (MFLU 14–0748, **holotype)**; ex-type living culture, MFLUCC 12–0110, CPC 20474). GenBank LSU: KP744503.

Notes: *Phragmocapnias philippinensis* is most similar to *P. betle*, but differs as ascospores have long and narrow basal cells and lack a mucilaginous sheath in *P. philippinensis*, whereas ascospores are slightly rounded at the base and have a mucilaginous sheath in *P. betle* (Chomnunti et al. 2011). Molecular analyses also indicate that *P. philippinensis* is a new species.

Capnodiales* genera *incertae sedis

40. *Brunneomycosphaerella* Dissanayake., J.K. Liu & K.D. Hyde, ***gen. nov***

Index Fungorum number: IF551058, *Facesoffungi number*: FoF00565

Etymology: ***Brunneomycosphaerella***, in reference to the brown spores of a mycospherella-like species.

Type species: *Brunneomycosphaerella laburni* Dissanayake., J. K. Liu & K. D. Hyde

Saprobic on dead branches. **Sexual morph** *Ascostromata* solitary, scattered or gregarious, immersed to erumpent, dark brown to black, uni- to bi-loculate, globose to sub-globose. *Peridium* comprising brown to black-walled cells of *textura angularis*. *Hamathecium* comprising septate, hyaline pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, elongate, cylindrical to slightly clavate at the base, pedicellate, rounded at apex with a canal-like structure, with an ocular chamber. *Ascospores* multi-seriate, dark yellow to brown, 1-

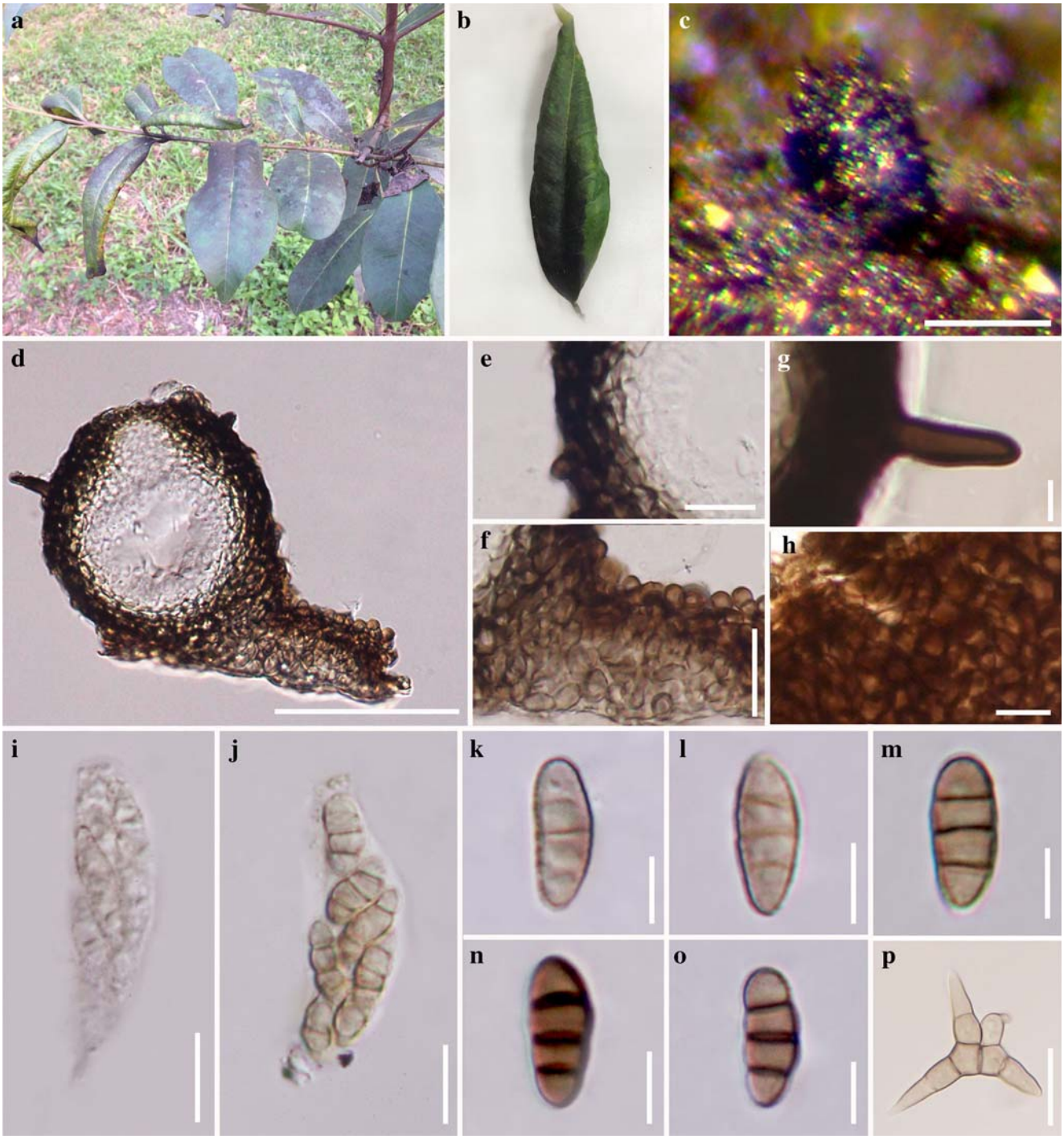
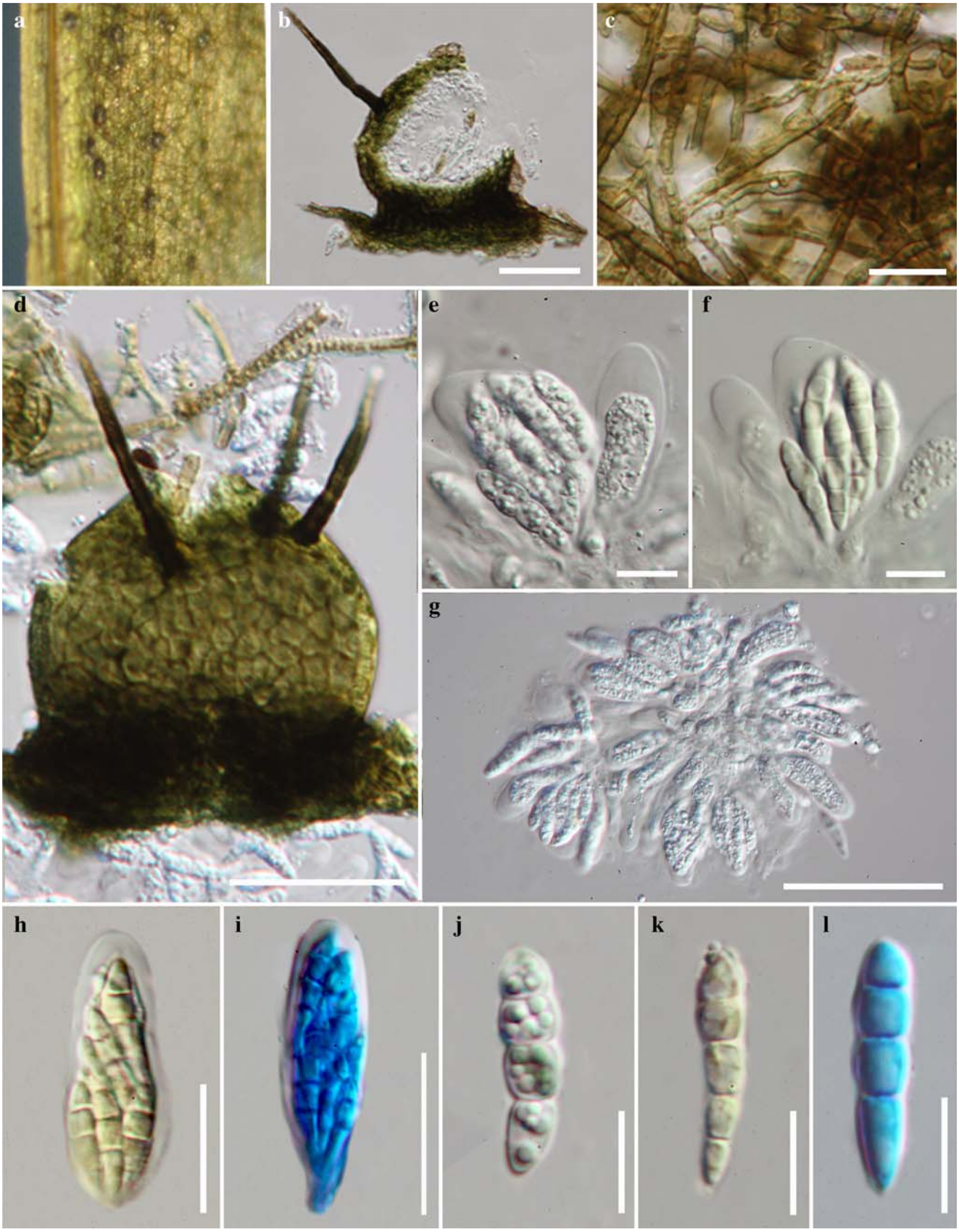


Fig. 57 ***Chaetocapnodium siamensis*** (**holotype**). **a, b** Specimens **c** Ascoma on surface of leaves **d** Section through ascoma **e** Peridium **f** Thallus under ascoma **g** Setae on ascoma **h** Upper wall of ascoma **i** Ascus when immature **j** Ascus at maturity **k, l** Ascospores when immature **m–o** Ascospores at maturity **p** Conidia of possible associated taxa. Scale bars: c, d=100 μm, f, p=20 μm, e, h, i, j=10 μm, g, k, l, m, n, o=5 μm

septate, deeply constricted at the septum, ellipsoidal with broadly rounded ends, with small and large guttules, smooth-walled, lacking a sheath. **Asexual morph** Undetermined.

Notes: Phylogenetic analysis of combined SSU and LSU gene sequence data (Fig. 59) place *Brunneomycosphaerella* in

Fig. 58 ***Phragmocapnias philippinensis*** (**holotype**). **a** Ascomata and hyphae on surface of leaves **b** Section through ascoma **c** Hyphae **d** Ascoma with setae when viewed in squash mount **e, g** Asci **f, h** Asci in Melzer's reagent **i** Asci in cotton blue reagent **j** 3-septate ascospore **k** 4-septate ascospore in Melzer's reagent **l** 3-septate ascospore in cotton blue reagent. Scale bars: b, d=50 μm, c, h, i=20 μm, e, f, j, k, l=10 μm, g=100 μm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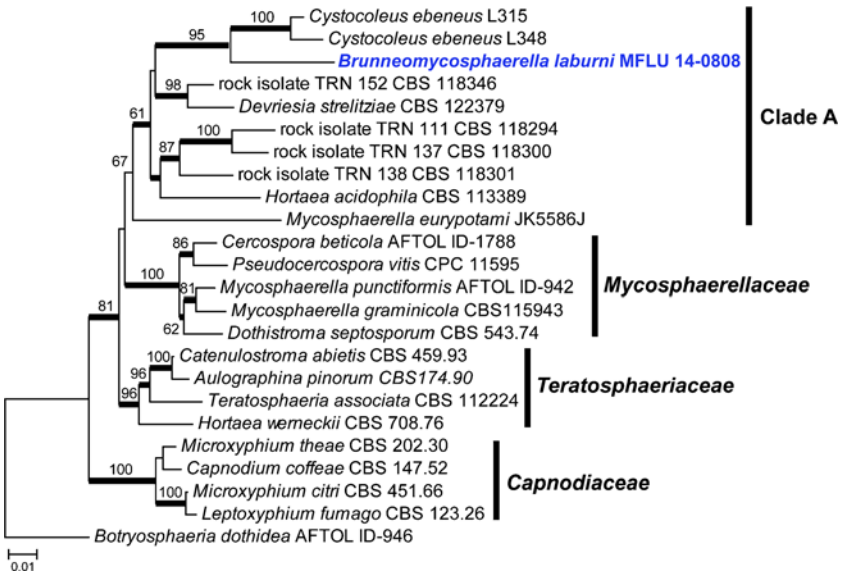


Fig. 59 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and SSU gene region sequence data of related taxa in Capnodiales. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (ex-epitypes and reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Botryosphaeria dothidea* AFTOL ID-946

Clade A in an unresolved group in *Capnodiales* with rock inhabiting fungi (Schoch et al. 2009; Hyde et al. 2013). We therefore introduce a new genus and place it in *Capnodiales*, family *incertae sedis*.

41. *Brunneomycosphaerella laburni* Dissanayake., J.K. Liu & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551059; *Facesoffunginumber*: FoF00566; Fig. 60

Etymology: in reference to its occurrence on *Laburnum*.

Holotypus: MFLU 14-0808

Saprobic on dead branches of *Laburnum anagyroides* Medik. **Sexual morph** *Ascomata* 372–480 μm high × 325–554 μm diam. ($\bar{x}$=435×490 μm), solitary, scattered or gregarious, immersed to erumpent through the epidermis, dark brown to black, uni- to bi-loculate, globose to sub-globose. *Peridium* 10–15 μm wide, comprising several layers of brown to black-walled cells of *textura angularis*. *Hamathecium* comprising septate, hyaline pseudoparaphyses. *Asci* 70–100×45–60 μm ($\bar{x}$=82×50 μm, n=20), 8-spored, bitunicate, fissitunicate, elongate, cylindrical to slightly clavate at the base, pedicellate, rounded at the apex with a canal-like structure, with an ocular chamber. *Ascospores* 18–25×4–5 μm ($\bar{x}$=22×4 μm), multi-seriate, dark yellow to brown, 1-septate, deeply constricted at the septum, ellipsoidal with broadly rounded ends, with small and large guttules, smooth-walled, lacking a sheath. **Asexual morph** Undetermined.

Material examined: ITALY, Province of Forlì-Cesena, Bagno di Romagna, Ridracoli, Santa Sofia, on dead branches of *Laburnum anagyroides* IT 1761 (*Fabaceae*), 10 March 2014, Erio Camporesi (MFLU 14-808, **holotype**). GenBank LSU: KP703171; SSU: KP703172.

Dictyosporaceae

The family *Dictyosporaceae* (Pleosporales) will be introduced in a publication in prep. (Boonmee et al. 2015).

Dictyosporium

The genus *Dictyosporium* was established by Corda (1836) to include species with sporodochia and cheiroid conidia produced on micronematous conidiophores (Corda 1836). The concept of this genus is clear and the species are known to be distributed worldwide (Goh et al. 1999). The genus has been revised by Goh et al. (1999) and a dichotomous key was provided for species (Goh et al. 1999; Cai et al. 2003a; Crous et al. 2009a, b; Whitton et al. 2012). Currently 43 species are accepted in *Dictyosporium* (Whitton et al. 2012). Molecular phylogenetic analyses place *Dictyosporium* within the *Pleosporales* (Tsui et al. 2006; Crous et al. 2009a, b) and a new family, *Dictyosporaceae*, will be introduced by Boonmee et al. (in prep) to accommodate this group. The phylogenetic tree is presented in Fig. 61.

42. *Dictyosporium aquaticum* Abdel-Aziz, ***sp. nov.***

Index Fungorum number: IF551060, *Facesoffungi number*: FoF00552; Figs. 62 and 63

Etymology: From the Latin adjective *aquaticus*, in reference to the freshwater habitat of the fungus.

Holotype: CBS H-21460

Saprobic on submerged wood. **Sexual morph** Undetermined. **Asexual morph** Mycelium superficial and immersed in the substrate, sub-hyaline to yellow brown, 2–3 μm thick. *Sporodochia* on natural substratum superficial, circular, subglobose, elongated to irregular, covering most of the wood surface, dark brown to black, ranging diam. *Conidia* born

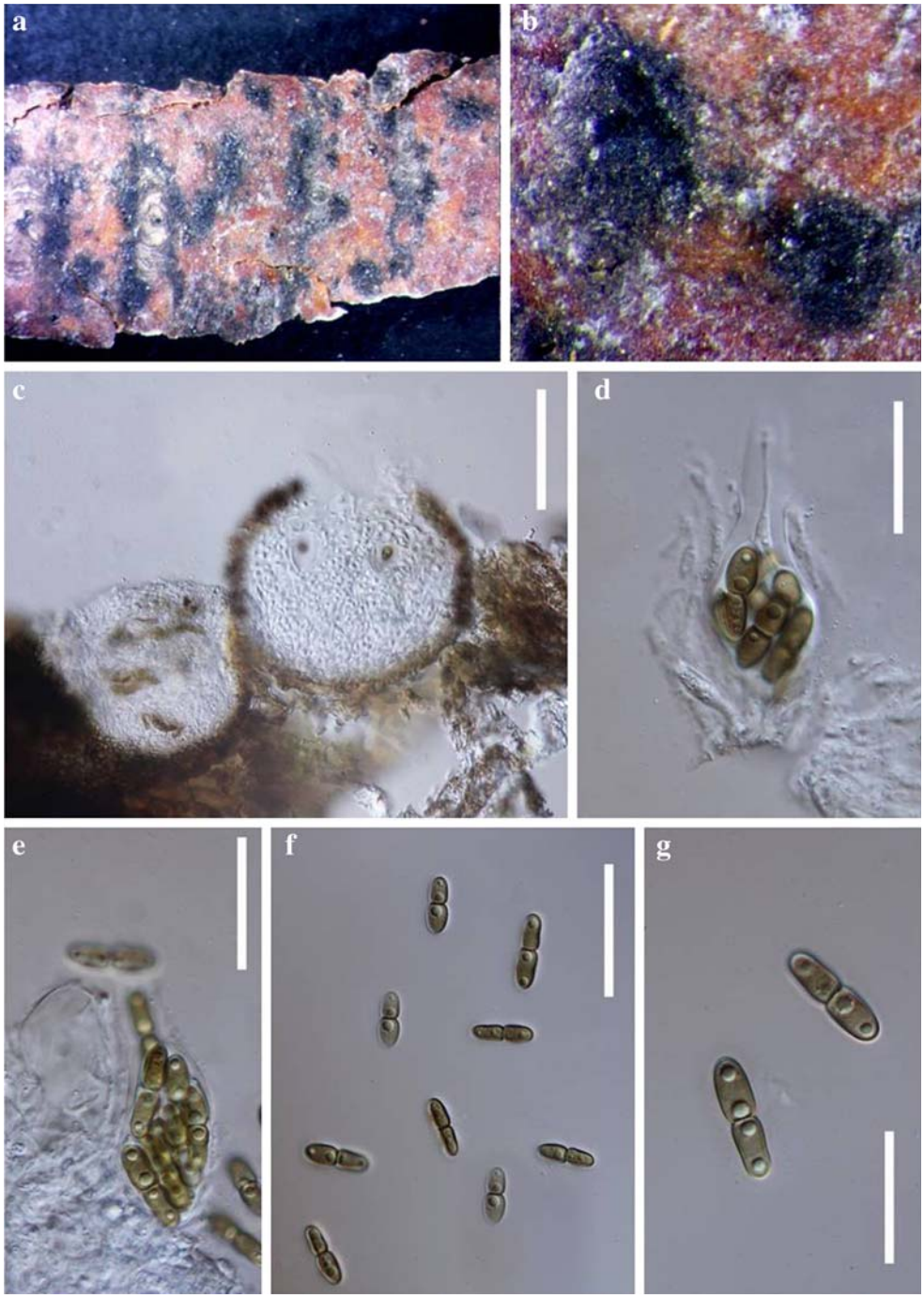


Fig. 60 ***Brunneomycosphaerella laburni*** **(holotype)**. **a, b** Ascostromata on host substrate. **c** Cross section of ascostromata. **d, e** ascus. **f, g** Brown ascospores. Scale bars: c=200 μm, d–f=40 μm, g=20 μm

directly on mycelium or on short lateral, hyaline to yellow brown, one-celled hyphae. *Conidia* 60–85 μm long, 20–30 μm wide, excluding appendage ($\overline{x}$=69×25 μm, n=50), cheiroid when young, become cylindrical or obclavate in frontal view and cylindrical in side view, medium to dark brown, smooth-walled, euseptate, one cell layer thick, cell rows originating from a central basal cell, rows attached along their length, cell rows increase in length from outside to inside, conidial cells are of the same colour and consist of 66 to 82 cells arranged in 5 or 6 rows. *Conidial appendages* 5 to 6 globose to sub-globose, hyaline appendages that are surrounded by thick gelatinous sheath that spreads in water, each appendage is connected to a row.

Culture characters: Colonies on potato dextrose agar at 25 °C 15–20 mm radius after 15 days, white mycelium with dense yellow reverse, and yellow droplets on mycelium and

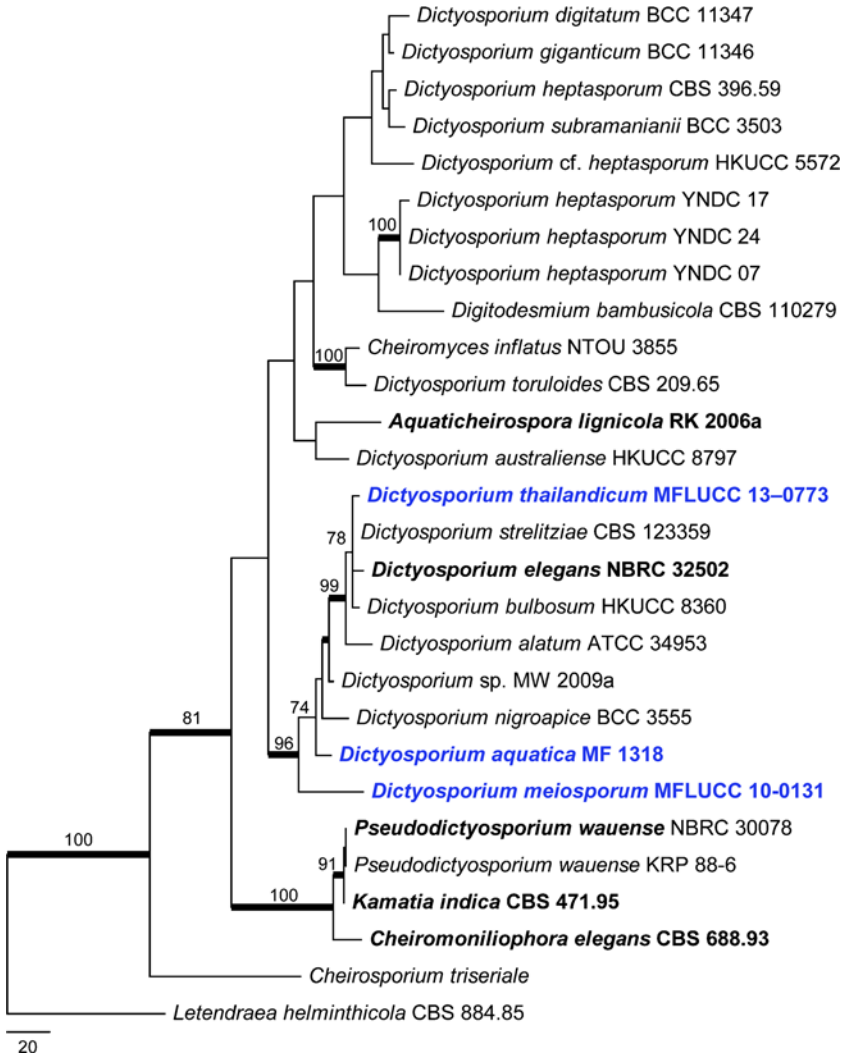


Fig. 61 Phylogram generated from Maximum Parsimony analysis based on combined ITS, SSU and LSU sequence data of cheirosporous and dictyosporious taxa. Parsimony bootstrap support values greater than 70 % are indicated above and below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Letendraea helminthicola* CBS 884.85

sporodochia, sporulating after about 3 weeks. Sporodochial and conidial dimensions are similar to those recorded on natural wood.

Material examined: EGYPT, Sohag, River Nile, on submerged decaying date palm, 14 August 2014, F.A. Abdel-Aziz (CBS H-21460, **holotype**); ex-type living culture, A136. GenBank ITS: KM610236.

Notes: *Dictyosporium aquaticum* is distinguished from the other species described under the genus by the rounded hyaline appendages attached to the apical cell of each conidial cell row. Based on the key provided by Cai et al. (2003b) and Crous et al. (2009a, b), *D. aquatica* is morphologically similar to *D. bulbosum* and *D. strelitziae* in that the three species have rounded apical appendages. The latter two species, however, have smaller conidia and two apical appendages (Goh et al. 1999; Crous et al. 2009a; b). Phylogenetically, *D. aquatica* is closest to *D. stellatum* (conidia 95–140× 30–40 μm; appendages absent), but has smaller conidia than the latter species.

43. *Dictyosporium meiosporum* S. Boonmee & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550896, *Facesoffungi number*: FoF00409, Figs. 64 and 65

Etymology: *meiosporum*, meaning the sexual spore reproduction of this species

Holotypus: MFLU 10–0064

Saprobic on decaying wood. **Sexual morph:** *Ascomata* 281–346 μm high×287.5–388 μm diam., uniloculate, superficial, solitary or scattered, globose to subglobose, dark brown to black,with ostiole, collapsing when dry. *Peridium* 20–28 μm thick, membracenous, composed of cells of *textura angularis*, with compressed, dark brown inner layers, and black outer layers. *Hamathecium* comprising numerous cellular, hyaline pseudoparaphyses. *Asci* 83–135.5×13–17 μm ($\bar{x}$= 101.5×14 μm, n=20), 8-spored, bitunicate, fissitunicate, clavate to cylindrical or saccate, pedicel 7–19 μm long, apically rounded. *Ascospores* 31–39×6–8.5 μm ($\bar{x}$=35×7 μm, n=20), 2–seriate, fusiform, elongated-ellipsoid, clavate, 1-septate,

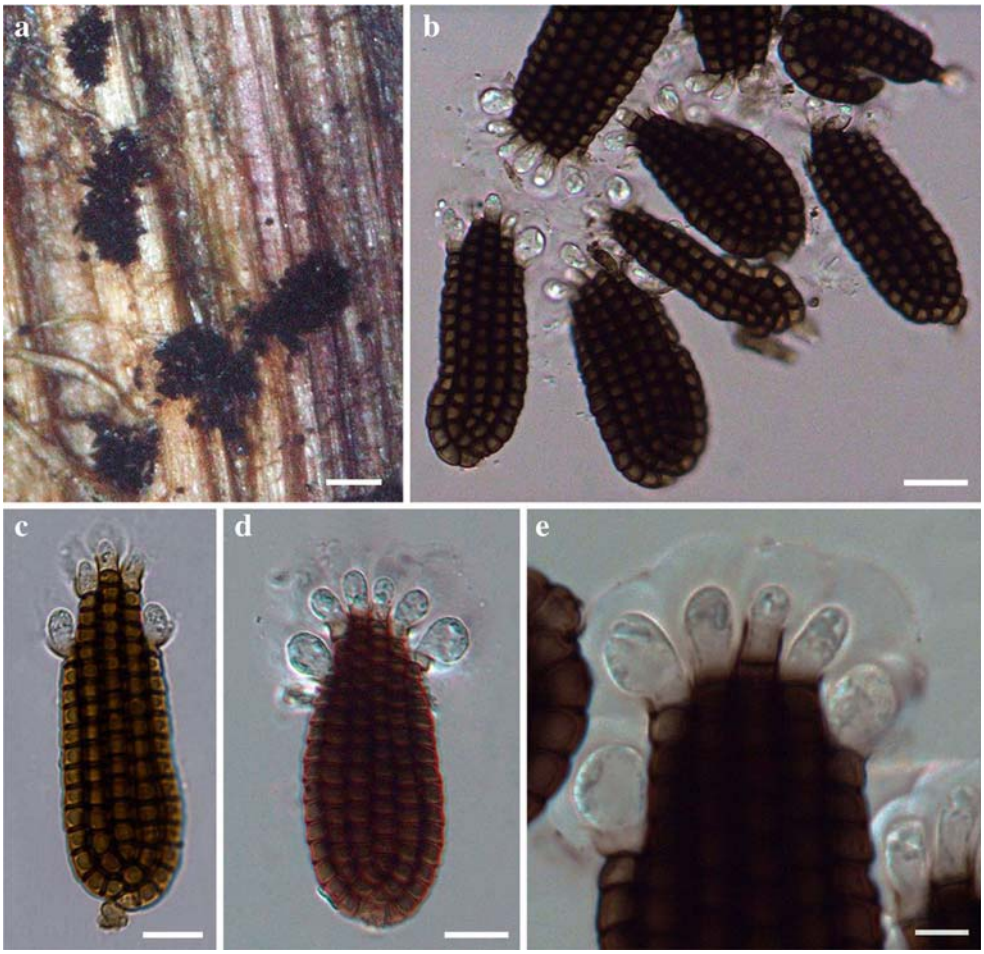


Fig. 62 ***Dictyosporium aquaticum*** **(holotype) a** Sporodochia on wood **b–e** Variously shaped conidia with apical hyaline appendages Scale bars: a=150 *μm*, b=20 *μm*, c, d=10 *μm*, e=5 *μm*

slightly curved, constricted at the septa, hyaline, surrounded by a thin mucilaginous sheath, smooth-walled. **Asexual morph:** hyphomycetous species. *Conidiophores* 14–30 *μm* long, 2–3 *μm* wide ($\bar{x}$=20×2.5 *μm*), septate, light brown, smooth-walled. *Conidiogenous* cells holoblastic, terminal, integrated, dark brown. *Conidia* 17–27.5×6–8.5 *μm* ($\bar{x}$=22×7 *μm*, *n*=20), dark brown, solitary, cheirosporous, with 4 contiguous rows of cells often apically incurved at maturity, each row 1–5-transverse septate, constricted at the septa, smooth-walled.

Culture characters: Ascospores germinating on MEA within 36 h. Colonies on MEA, slow growing, attaining *ca*

Fig. 63 ***Dictyosporium aquaticum*** **(ex-type culture) a** Young conidia at different stages of development **b, c** variously shaped conidia with apical hyaline appendages produced in single spored pure culture. Scale bars: a-c=8 *μm*

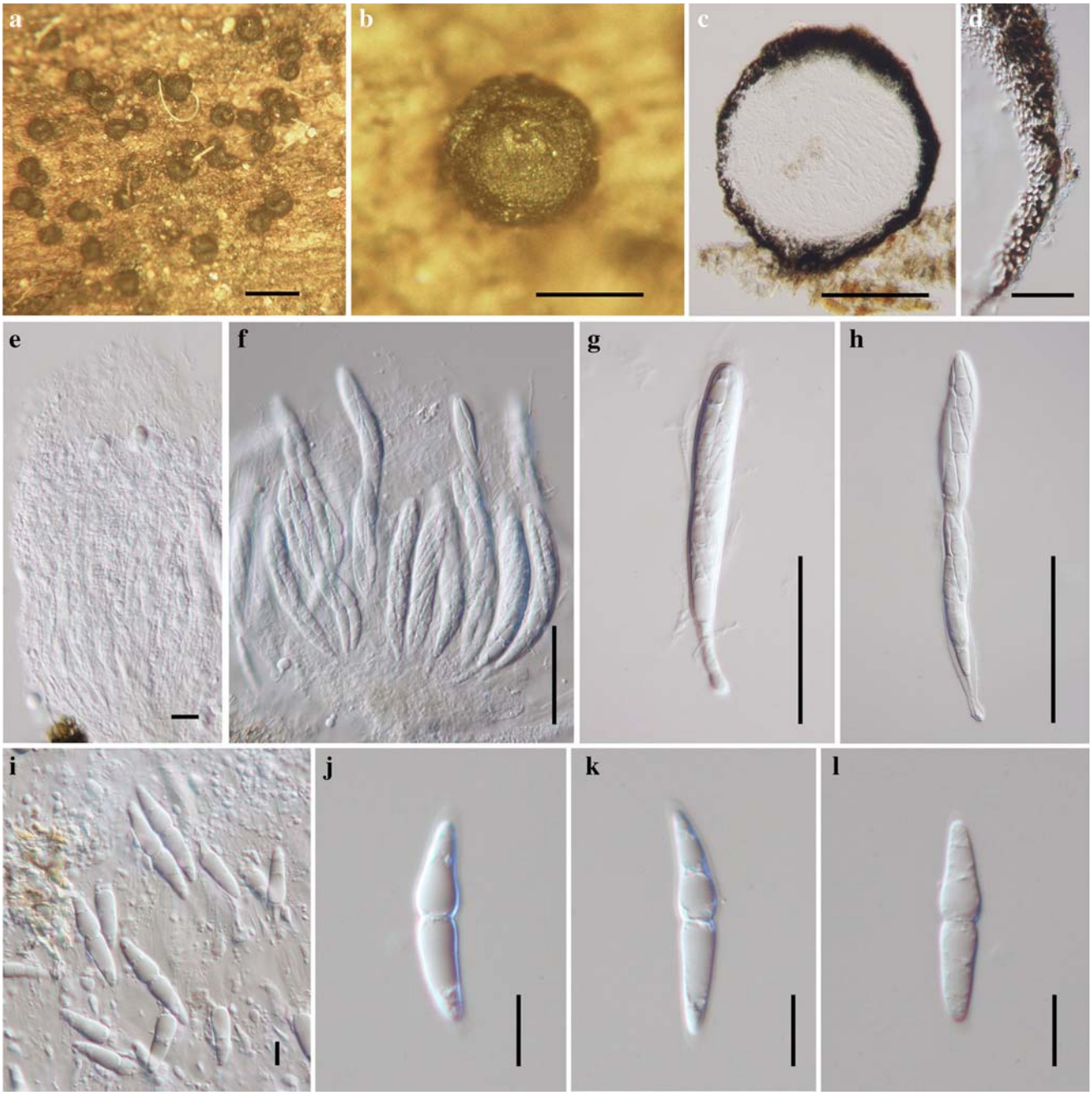


Fig. 64 Sexual morph of *Dictyosporium meiosporum* (holotype) a, b Ascomata occurring superficial on substrate **c** Section through of ascoma **d** Peridium e. Pseudoparaphyses **f–h** Asci **i–l** Ascospores. Scale bars: a=500 μm, b, c=200 μm, d=20 μm, e, i-l=10 μm, f-h=50 μm

4 mm diam. in 7 days at 28 °C. *Mycelium* superficial, primary white to yellow, later becomes dark grey to brown due to development of hyphae and conidiophores.

Material examined: THAILAND, Chiang Rai, Khun Korn waterfall, Chiang Rai, N19°51–54′ E 99°35.39′, 671 msl., on decaying wood of unidentified trees, 13 November 2009, S. Boonmee KK07 (MFLU 10–0064, **holotype**); ex-type living culture, MFLUCC 10-0131, BCC 52296, IFRD 2188. GenBank ITS: KP710944; LSU: KP710945; SSU: KP710946.

Notes: *Dictyosporium meiosporum* is introduced as a new species based on its sexual characteristics and hand-like conidia. Based on sexual morphology, we considered this fungus might be related to *Lophiostomataceae* or *Melanommataceae* in *Pleosporales* (Mugambi and Huhndorf 2009; Zhang et al. 2009a, b, c, 2012a, b; Hyde et al. 2013). *Dictyosporium meiosporum* is characterized by superficial black, ascomata, with an apical ostiole; bitunicate, cylindric-clavate asci and fusiform, elongate-ellipsoid, 1-septate, hyaline ascospores,

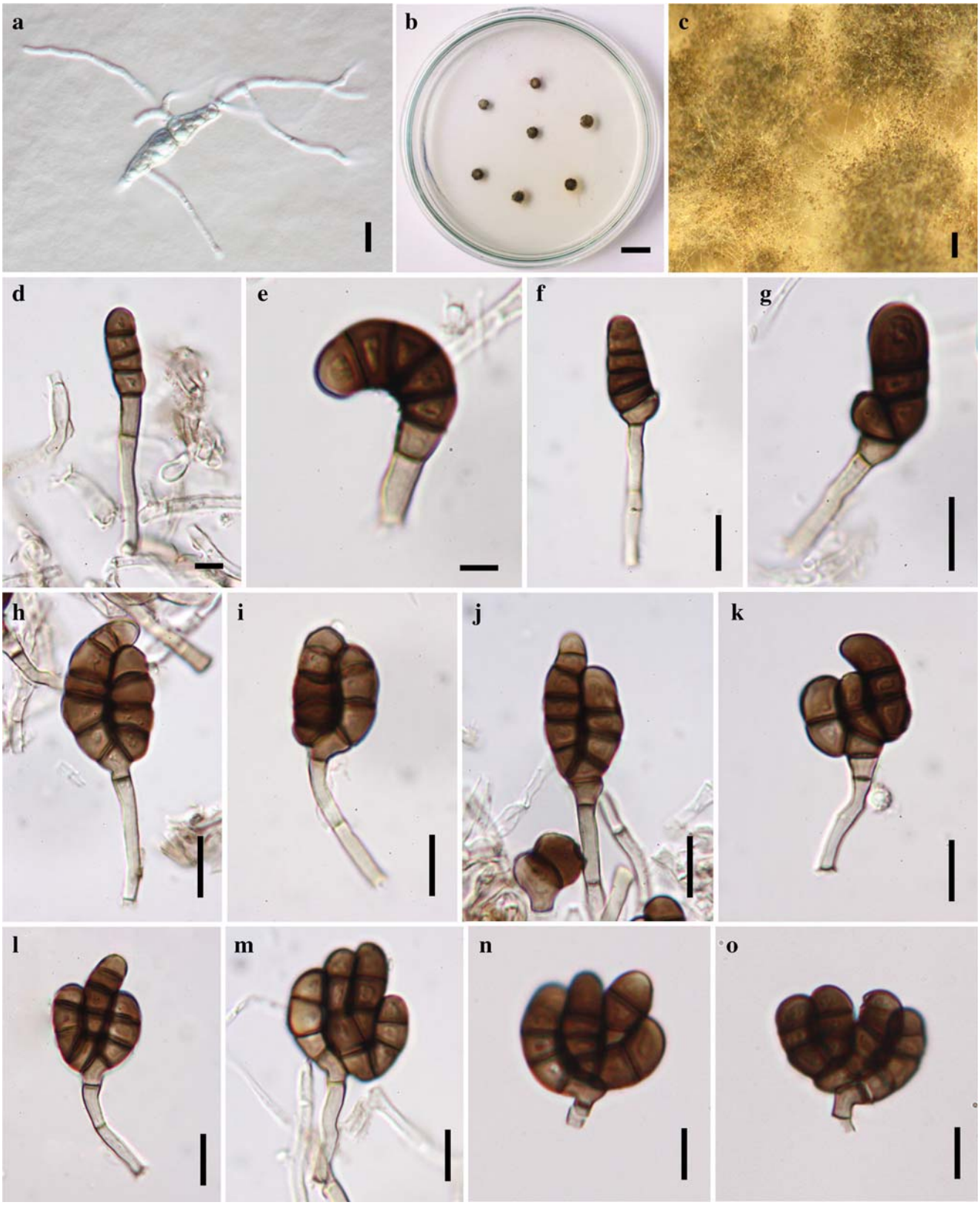


Fig. 65 Asexual morph of *Dictyosporium meiosporum* (ex-type culture) a Ascospore germination **b** Colonies culture on MEA **c** Vegetative hyphae **d–i** Conidiophores **j–o** Conidia with branches apical, dark brown, and several-septate. Note up to 4-conidium on conidiogenous locus. Scale bars: a, f, g-o=10 μm, b=10 mm, c=500 μm, d, e=5 μm

surrounded by a thin mucilaginous sheath. Additionally, the isolates from this taxon produced an asexual morph in culture (Fig. 65). The new species, forms asexual cheirosporous conidia which differ from those of *D. elegans* Corda and other *Dictyosporium* species (Goh et al. 1999; Tsui et al. 2006; Crous et al. 2009a, b; Kirschner et al. 2013), and the two new species introduced in this paper. Molecular data (Fig. 61) confirms that this fungus belongs to *Dictyosporium* but as a distinct species.

45. *Dictyosporium thailandicum* D' souza, D.J. Bhat & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551063, *Facesoffungi number*: FoF 00394, Fig. 66

Etymology: The specific epithet *thailandicum* refers to Thailand the country of origin. *Holotypus*: MFLU 14–0240

Saprobic on submerged wood in flowing stream. Mycelium partly superficial, partly immersed, composed of smooth, septate, branched, light brown 1.5–3.2 μm wide, hyphae. **Asexual morph** *Sporodochia* 350–500 μm wide, black, scattered. *Conidiophores* 6.8–11 × 4.3–10.6 μm, micronematous, mononematous, cylindrical, light brown, smooth-walled. *Conidiogenous cells* 4.2–5 × 5–5.7 μm terminal, integrated. *Conidia* 15.4–34.5 × 14.5–20.6 μm ($\bar{x}$ = 30.6 × 19 μm, n = 50), acrogenous, solitary, dictyoseptate, cheiroid, smooth-walled, complanate, light brown when young, turning dark brown to black at maturity, with 28–32 cells per conidium and 6–9 cells per row, consisting of 5 rows of cells; outer rows shorter than inner rows, with 6–8 cells, with two hyaline, smooth, tubular, elongated appendages in the above half, 20.6–26 × 5.1–6.1 μm.**Sexual morph** Undetermined.

Culture characters: Conidia germinate on water agar (WA) within 24 h. Colonies on PDA, slow growing, covering 9 cm Petri-dish in 2 months at 24–28 °C, yellow to pale brown, sporulating in 45 days.

Material examined: THAILAND. Chiang Rai Province, Mae Fah Luang University stream, on submerged wood, 15 September 2013, M. D'souza, MJD-2 (MFLU 14–0240, **holotype**); ex-type living culture, MFLUCC 13-0773. GenBank ITS: KP716706; LSU: KP716707.

Notes: Morphologically *D. thailandicum* is comparable to *D. alatum* Emden, *D. bulbosum* Tzean & J.L. Chen, *D. elegans* Corda and *D. strelitziae* Crous & A.R. Wood (Table 1). *Dictyosporium thailandicum* is very similar to *D. alatum* in having the same-sized conidia, appendages, shape and rows of cells, but differs in the number of cells per row. *Dictyosporium alatum* has 4–6 cells in a row, whereas *D. thailandicum* has 6–9. Further, the rows of cells in *D. alatum* may vary from 4–7 and, in contrast, *D. thailandicum* has consistently 5 rows of cells except when in culture; *D. thailandicum* may occasionally possess 3 or 4 rows of cells. In our phylogenetic analysis, *D. thailandicum* was nested in a clade together with *D. alatum*, *D. bulbosum*, *D. elegans* and *D. strelitziae* with a strong bootstrap support. *Dictyosporium thailandicum* is phylogenetically close to *D. strelitziae*, but morphologically this species differs from *D. thailandicum* in having longer conidia, and a larger number of cells in the conidium.

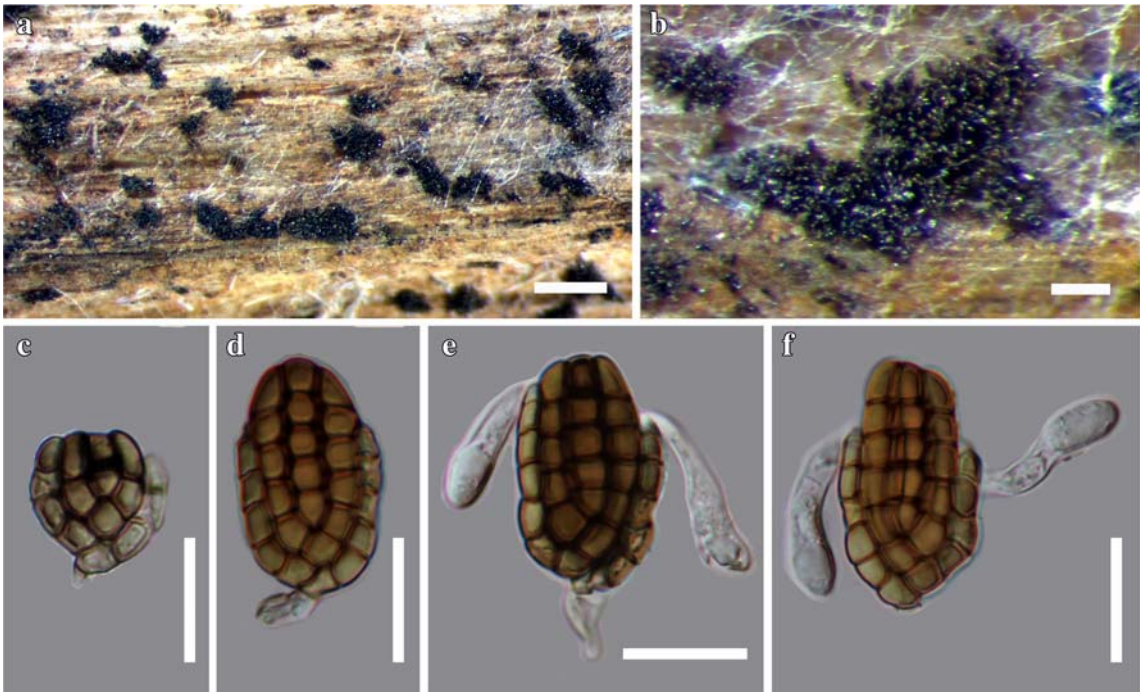


Fig. 66 ***Dictyosporium thailandicum*** **(holotype) a, b** Condiomata on the substrate **c-f** conidia. Scale bars: a = 500 μm, b = 100 μm, c-f = 20 μm

Table 1 Synopsis of *Dictyosporium* species discussed in the paper

Species	Conidial size In μm	Conidial shape	Rows of cells	Total cells in conidium	Cells per row	Special features
D. strelitziae	30–55×20–25	Complanate	(4)-5–(6)	45–56	6–11	Apical cells of outside rows with appendages
D. bulbosum	27–46×11–30	Complanate	(2)-5–(6)	12–48	6–10	Swollen apical appendages
D. elegans	50–80×24–31	Complanate	5–6	51–96	9–13	-
D. alatum	(22)-26–32×15–21	Complanate	(4)-5–(7)	26–37	4–6	2 apical elongate appendages
D. thailandicum	28–38×15–21	Complanate	5	28–32	6–9	2 hyaline elongated appendages

Didymellaceae

The family *Didymellaceae* was introduced by de Gruyter et al. (2009) in order to accommodate the type species *Didymella exigua*, including *Phoma* or phoma-like genera. Zhang et al. (2009) included *Didymellaceae* in the order *Pleosporales* within the suborder *Pleosporineae*. In the most recent study of Hyde et al (2013) included *Ascochyta*, *Boeremia*, *Chaetasbolisia*, *Dactuliochaeta*, *Didymella*, *Epicoccum*, *Leptosphaerulina*, *Macroventuria*, *Microsphaeropsis*, *Monascostroma*, *Phoma*, *Piggotia* and *Pithomyces* in this family based on morphology and phylogenetic analysis. *Ascochyta* and *Phoma* are well known pathogens that are significantly important in quarantine (Kaiser et al. 2008; Aveskamp et al. 2010). A backbone tree is presented in Fig. 67.

45. *Didymella cirsii* Mapook, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550935, *Facesoffungi number*: FoF00441; Fig. 68

Etymology: Name reflects the host genus *Cirsium*, from which this species was isolated.

Holotype: MFLU 14–0023

Saprobic on a dead stem of *Cirsium* sp., noticeable as black dots on host surface. **Sexual morph** *Ascomata* (118–)165–209(–243)×(121–)200–245 μm ($\bar{x}$= 193×209 μm, n=10), immersed or erumpent, solitary or scattered, globose to subglobose, brown to dark brown, without subiculum covering host, *Ostiole* central. *Peridium* (15–)30–34 μm wide, thick, dark brown, comprising dark brown cells of *textura angularis*. *Hamathecium* comprising 1–1.5 μm wide, cylindrical to filiform, pseudoparaphyses. *Asci* (60–)67–88(–109)× 13–16 μm ($\bar{x}$=85×15 μm, n=10), 8-spored, bitunicate, fissitunicate, cylindric-clavate, slightly curved, smooth-walled, apically rounded, short pedicellate, with an ocular chamber (ca. 4–6 μm wide). *Ascospores* 20–26×6–7 μm ($\bar{x}$= 23×7 μm, n=20), 1–2-seriate, overlapping in the ascus, ellipsoid to obovoid, hyaline, 1-septate, constricted at septa, widest at the centre and tapering toward narrow ends, straight or slightly curved, thick and smooth-walled. **Asexual morph** Undetermined.

Culture characters: Ascospores germinating on MEA within 24 hr and germ tubes produced from both ends. Colonies growing on MEA, reaching 20 mm diam. after 5 days at 16–18 °C, flat, margin crenate, white to olivaceous grey, fine mycelium, medium dense to dense, septate, hyaline.

Material examined: ITALY, province of Forlì-Cesena [FC], Fiumicello - Premilcuore, on dead stems of *Cirsium* sp., 5 May 2013, E. Camporesi IT1218 (MFLU 14–0023, **holotype)**, ex-type living culture, MFLUCC 13–0687. GenBank LSU: KP744483; SSU: KP753951.

Notes: *Didymella cirsii* resembles species of *Didymella* (*Didymellaceae*) based on its immersed, erumpent ascomata with one-celled ascospores. It differs from *Didymella applanata* in the size of ascomata, asci and ascospores. Phylogenetic analysis of combined ITS and LSU genes indicated that *Didymella cirsii* belongs in *Didymellaceae* with high bootstrap support (Fig. 67), but as a distinct lineage; thus a new species is proposed.

46. *Microsphaeropsis olivacea* (Bonord.) Höhn., Hedwigia 59: 267 (1917)

Index Fungorum number: IF 438686, *Facesoffungi number*: FoF00400; Figs. 69 and 70

Saprobic on *Sarothamnus scoparius* twig. **Sexual morph** *Ascomata* 390–400×398–405 μm ($\bar{x}$=395× 400 μm, n=5), superficial on the wood, densely crowded, in roundish to oval clusters, breaking through the bark, pyroid to globose, with flattened base, ostiole central and short, basally with some brown, thick-walled. *Peridium* 40–45 μm (n=5), black, distinctly rough, thick, multi-layered, composed of cells of *textura globulosa* to *angularis* with red brown and smooth walls. *Hamathecium* comprising numerous, filiform, thin-walled, septate pseudoparaphyses, longer than the asci. *Asci* 105–142×12–14 μm ($\bar{x}$=130×13 μm, n=5), 8-spored, cylindrical, bitunicate, thick-walled, apically rounded. *Ascospores* 25–29×10–12 μm ($\bar{x}$=26×10 μm, n=5), muriform, ellipsoid, straight, both part of the spore +/-equal in size, end cells conical, immature spores hyaline, mature spores golden-brownish, septa constricted only in the centre, all stages without a gelatinous sheath. **Asexual morph** Coelomycetes species. *Pycnidia* 144 – 160 μm (n=2), globose, white when immature, pigmented gradually with age, brown when mature, with

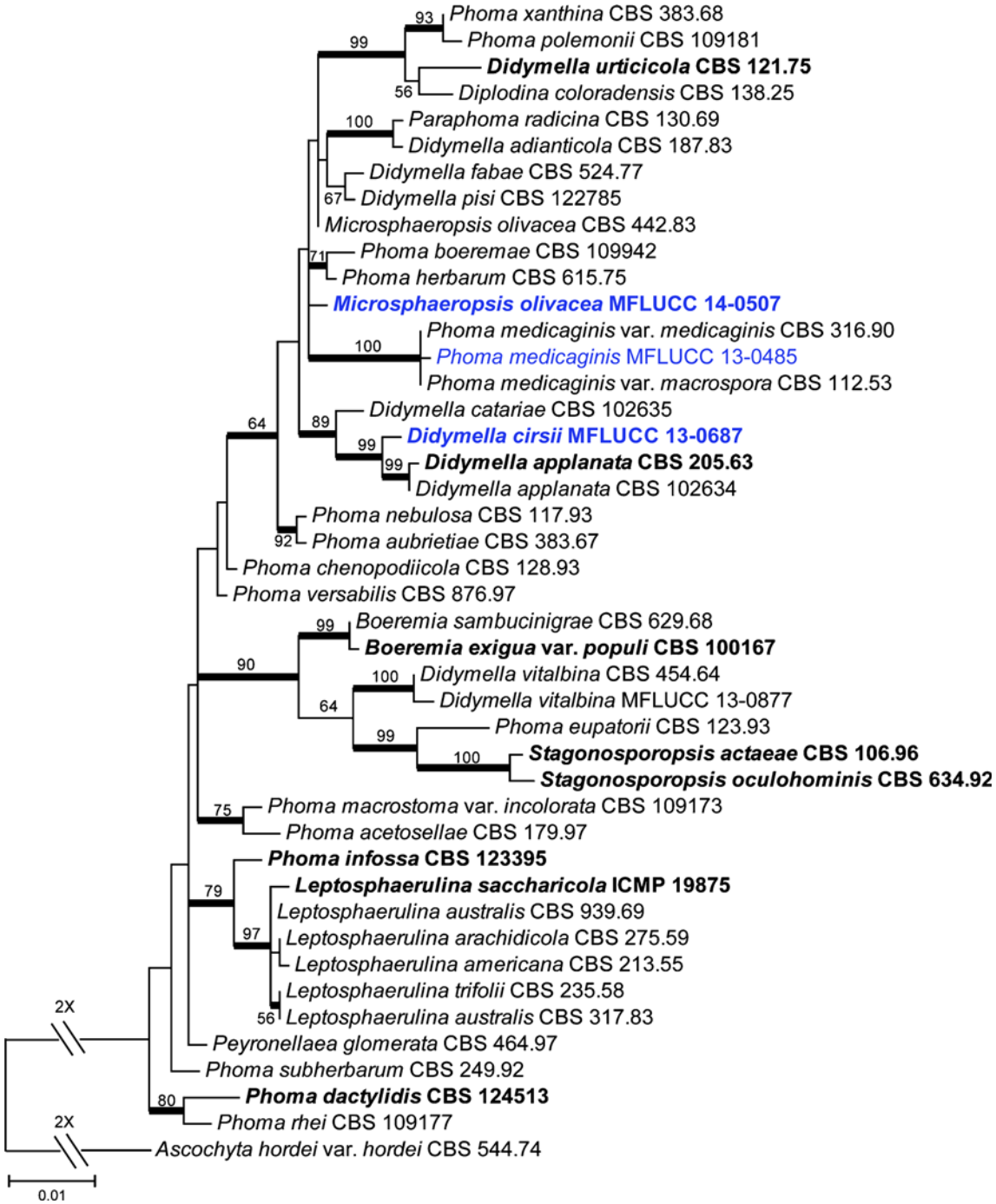


Fig. 67 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and ITS sequence data of *Didymellaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Ascochytahordei* var. *Hordei* CBS 544.74

indistinct apical ostioles: *Peridium* 24–34 *μm* (*n*=2), yellowish brown, of cells of *textura angularis*. *Conidia* 5.8–7(4) *μm* globose, smooth-walled, hyaline initially.

Culture characters: Ascospores germinating on PDA within 30 h and germ tubes produced from sides of the ascospores. Colonies growing on MEA, reaching 5 mm in 7 days at 15 °C, mycelium partly superficial, partly immersed, slightly effuse.

Material examined: GERMANY, on attached corticated *Sarothamnus scoparius* twig, 21 December 2013, R.K. Schumacher (MFLU 14–0819), living cultures, MFLUCC 14–0507. GenBank ITS: KR025859; LSU: KR025863.

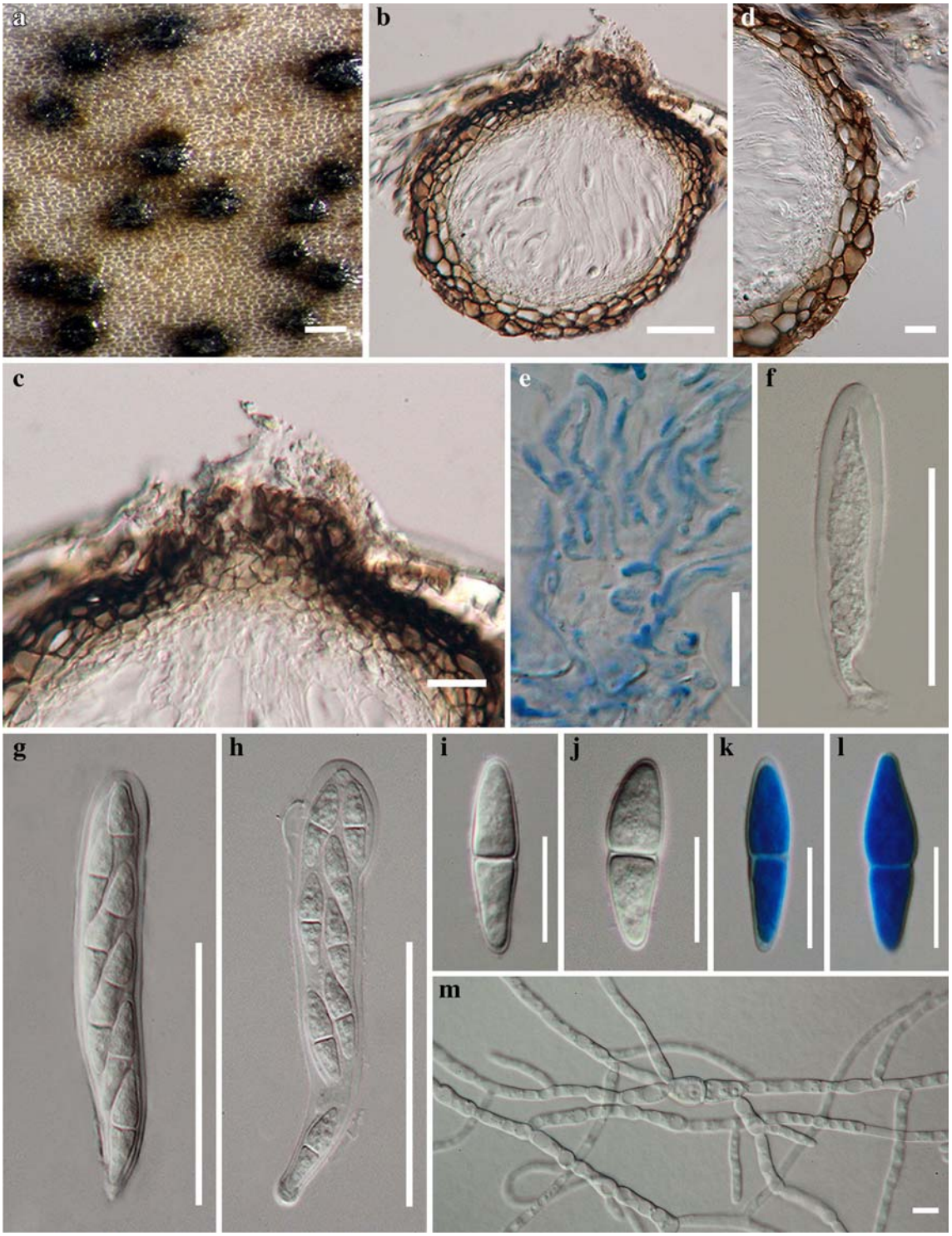


Fig. 68 ***Didymella cirsii*** **(holotype) a** Ascomata **b** Section through of ascoma **c** Ostiole **d** Peridium **e** Pseudoparaphyses **f-h** Immature and mature asci **i-l** Ascospores **M** Germinating ascospores. Scale bars: a=200 μm, b, f-h=50 μm, c-e=20 μm, i-l, m=10 μm

Notes: The genus is similar to *Coniothyrium* but is differs rentiated by the mode of conidiogenous which is phialidic in *Microsphaeropsis* and holoblastic in *Coniothyrium* (Sutton 1980). *Microsphaeropsis* species produce ornamented conidia and are distinguishable from one another by conidial size and morphology. In the phylogenetic tree our sexual morph collection clustered with *Microsphaeropsis olivacea* and thus this is the first report of the sexual morph of this species.

47. *Phoma medicaginis* Malbr. & Roum., Fungi Selecti Galliaei Exs. 37: no. 3675 (1886)

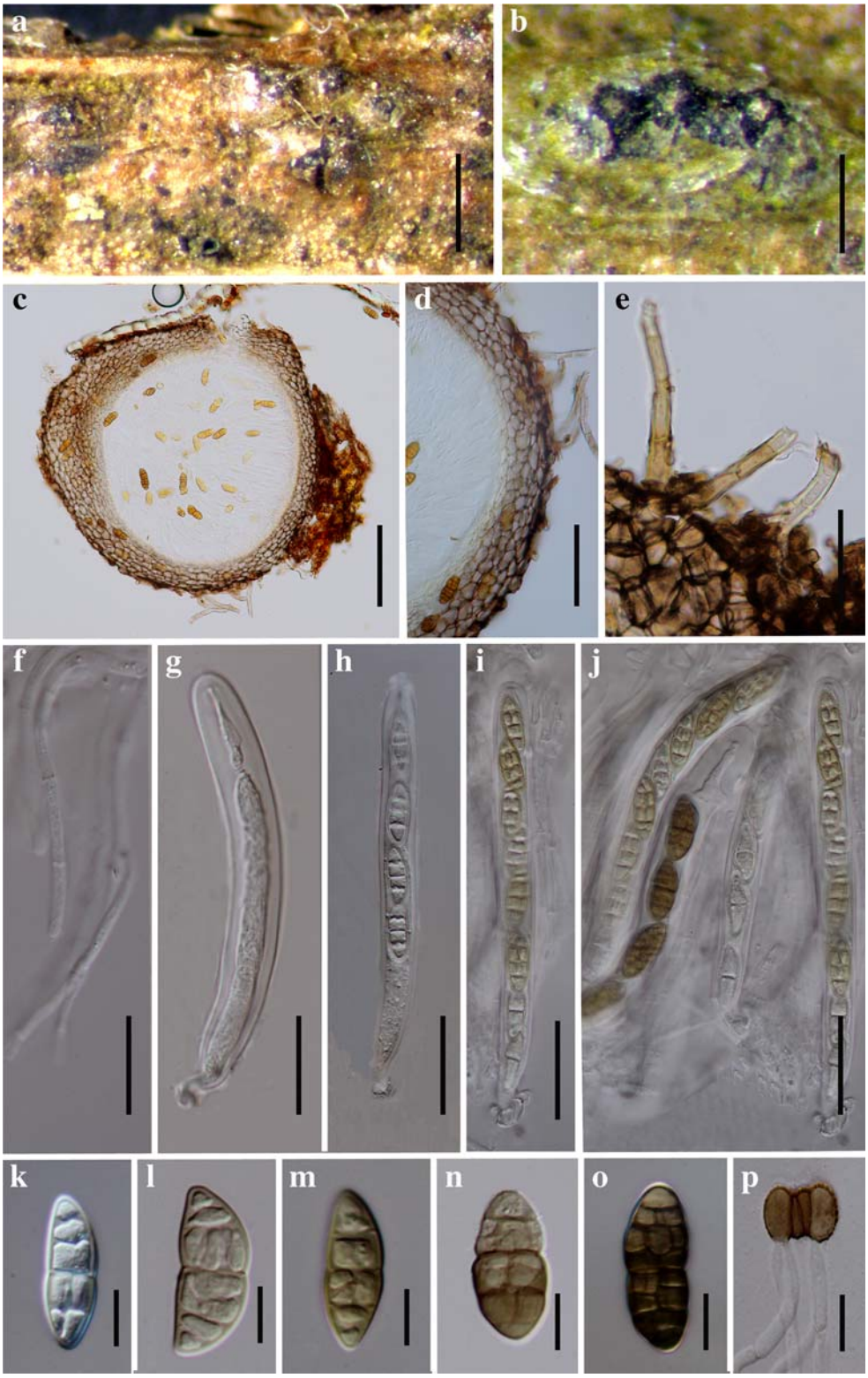


Fig. 69 ***Microsphaeriopsis olivacea*** (MFLU 14–0819) **a**, **b** Ascomata **c** Section through of ascoma **d** Peridium **e** Setae **f** Pseudoparaphyses **g**–**j** Immature and mature asci. **k**–**o** Immature and mature ascospores **p** Germinating ascospore. Scale bars: a=500 μm, b=200 μm, c=100 μm, d=50 μm, e-j=30 μm, k–o=10 μm, p=20 μm

Index Fungorum number: IF 169294, *Facesoffungi number*: FoF00423; Fig. 71

Saprobic on *Scabiosa* sp., forming numerous, conspicuous, rounded to oval, dark brown, conidomata. **Sexual morph** Undetermined. **Asexual morph** coelomycetous. *Conidiomata* 100–150 μm high, 150–250 μm diam., pycnidial, solitary, separate, scattered or gregarious, globose, dark brown, immersed to semi-immersed, unilocular, thin-walled, with a single, papillate, centrally located ostiole. *Peridium* composed of 3–4 wall-layers, 15–30 μm wide, with outer 1–

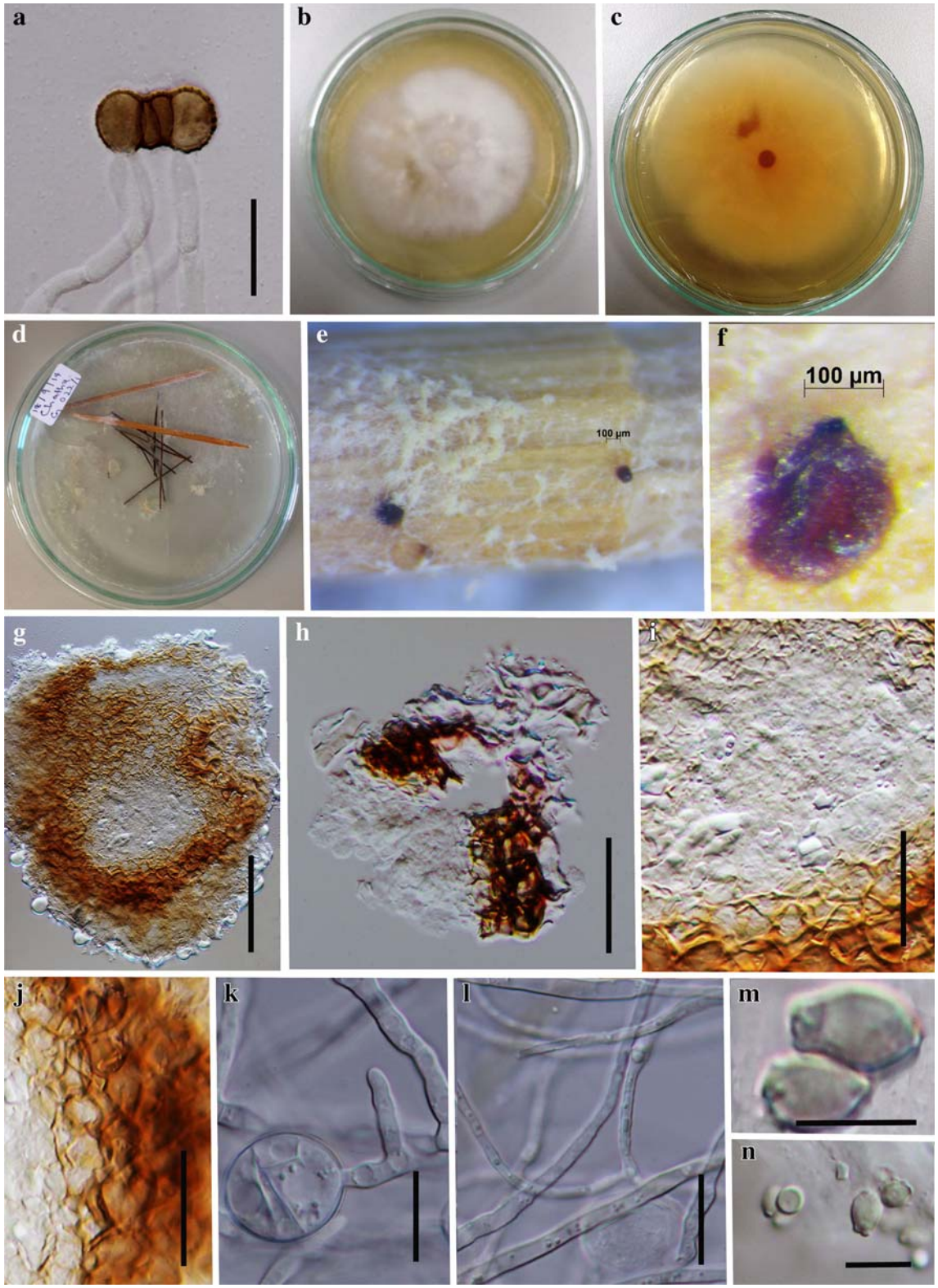


Fig. 70 ***Microsphaeriopsis olivaceae*** **- asexual morph a.** Germinating ascospore **b.** Culture from above **c.** Culture from below **d.** Induced the growth of asexual morph **e.** Conidiomata on toothpick **f.** Close up of conidiomata **g.** Section through conidioma **h.** Ostiole with immature conidiospores **i** Conidioma **j** Peridium **k, l** Arrangement of hyphae **m, n** Conidia. Scale bars: a=20 μm, g=50 μm, h-l=20 μm, m=5 μm, n=10 μm

2-layers dark brown, inner 1–2-layers hyaline, with thin-walled cells *textura angularis*. *Conidiophores* reduced to conidiogenous cells arising from the innermost wall-layer cells of the conidiomata. *Conidiogenous cells* 4–7 μm long×

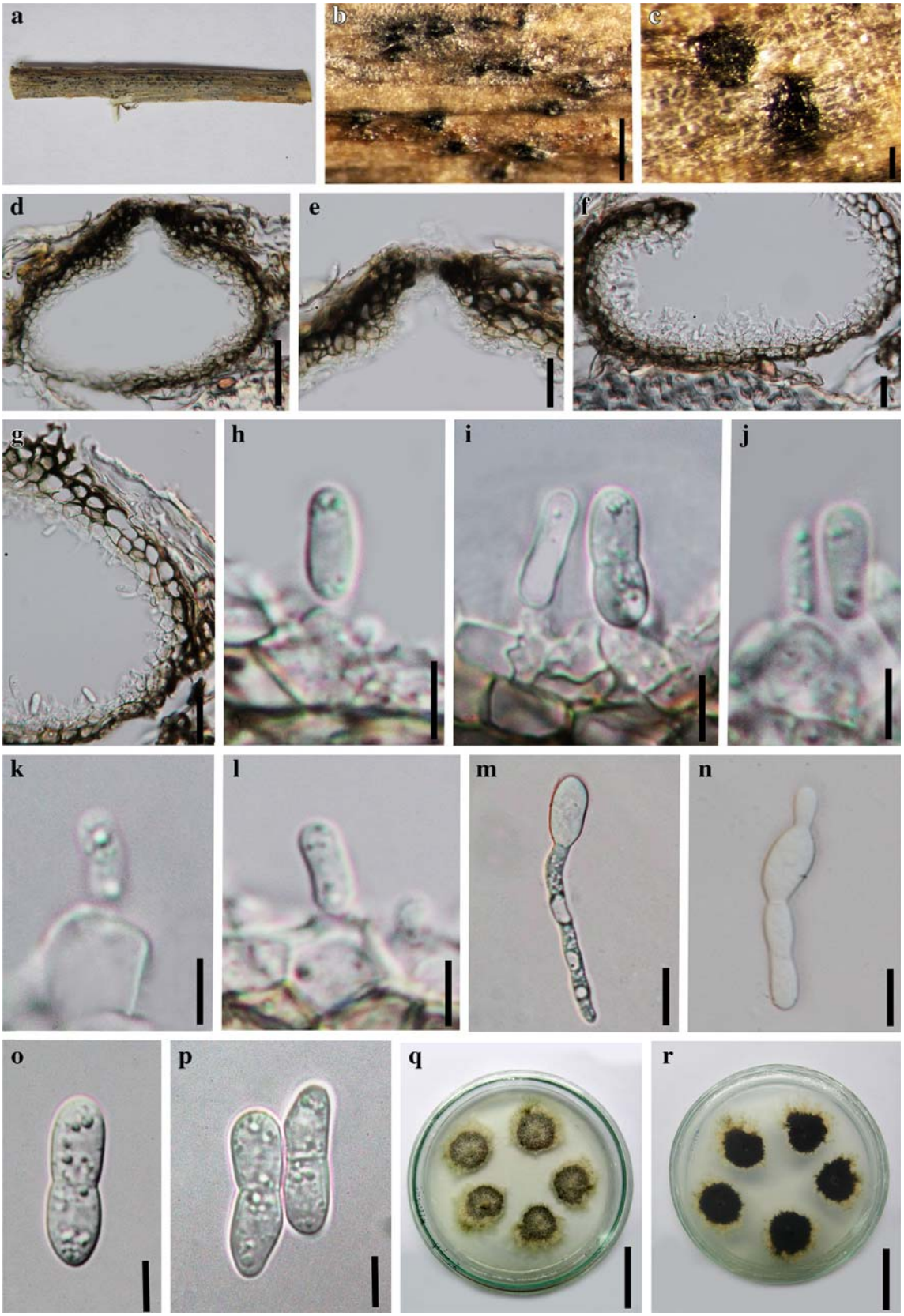


Fig. 71 ***Phoma medicaginis*** (MFLU 14–0812) **a** Specimen. **b, c** Black conidiomata on the host surface. **d** Vertical section of conidioma. **e** Ostiole. **f, g** Section of peridium. **h–l.** Conidiogenous cells and developing conidia. **m, n** Germinated spore. **o, p** Conidia. **q, r** Culture on PDA (note r; reverse). Scale bars: b=500 μm, c=100 μm, d=50 μm, e–g=20 μm, h–k=5 μm, m–n=10 μm, o–p=5 μm, q–r=25 mm

5–8 μm wide, enteroblastic, phialidic, determinate, doliiform and hyaline. *Conidia* 10–20×3.5–5.5 μm wide ($\bar{x}$=15.5×5, *n*=20), ellipsoidal to ovoid, hyaline, straight or slightly curved, 1-septate, constricted at the septum, obtuse at both ends, thin-walled, smooth-walled, guttulate.

Culture characters: Colonies on PDA slow growing, reaching 25 mm diam. after one month at 25–30 °C, circular, grey to black, white at the edge, flattened with dense, filamentous, aerial, fluffy hyphae; reverse black in the middle, white at the edge, without any diffusible pigments.

Material examined: ITALY, Province of Ravenna [RA], Zattaglia, on dead twig of *Scabiosa* sp. (*Caprifoliaceae*), 30 December 2012, E. Camporesi IT-988 (MFLU 14–0812), living culture, MFLUCC 13–0485, ICMP 20794. GenBank ITS: KP711359; LSU: KP711364; SSU: KP711369; *ibid.* (KUN! HKAS 83971).

Notes: *Phoma medicaginis* was introduced by Malbranche & Roumeguère (1886). This species is cosmopolitan with a worldwide distribution and occurs on various hosts such as *Brassica oleracea* L., *Medicago sativa* Lam., *Cicer arietinum* L., *Glycine soja* sensu auct., *Lathyrus odoratus* L. and *Medicago sativa* L. (Sutton 1980; Aveskamp et al. 2010). *Phoma medicaginis* is an economically important pathogen, and most likely a species complex comprising morphologically indistinguishable, but genetically and biologically isolated species (Ellwood et al. 2006; Aveskamp et al. 2008, 2010). In addition, it has been described as an endophyte in the roots of *Taxus globosa* (Rivera-Orduña et al. 2011). The species is characterized by globose, large, pycnidia, with straight or slightly irregular, cylindrical conidia, often becoming 1-septate and variably guttulate (Sutton 1980). Our isolate (MFLUCC 13–0485) is morphologically similar with *Ph. medicaginis*, and the only distinguish morphological character is the dimension of conidia, but it should be noted that this character has proven not be very reliable in coelomycetes (Verkley et al. 2014). Phylogenetic analyses based on the combination of LSU and ITS sequence data coupled with morphological characters showed that the strain (MFLUCC 13–0485) is conspecific with *Phoma medicaginis*. Hence, we provided here a description of this species for further reference.

Didymosphaeriaceae

Munk (1953) introduced the family *Didymosphaeriaceae* typified by the genus *Didymosphaeria*. The family *Didymosphaeriaceae* includes saprobes, endophytes and pathogens associated with a wide variety of substrates worldwide. This family was restudied by Ariyawansa et al. (2014) and *Montagnulaceae* was treated as a synonym. Ariyawansa et al. (2014) included *Alloconiothyrium*, *Bimuria*, *Deniquelata*, *Didymocrea*, *Didymosphaeria*, *Kalmusia*, *Karstenula*, *Letendraea*, *Montagnula*, *Neokalmusia*, *Paraconiothyrium*, *Paraphaeosphaeria*, *Phaeodothis* and *Tremateia* in *Didymosphaeriaceae* based on both morphology and phylogeny. A backbone tree for the family was provided and this is followed here. The phylogenetic tree is presented in Fig. 72.

48. *Kalmusia italica* Thambugala, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550915, *Facesoffungi number*: FoF00388, Figs. 73 and 74

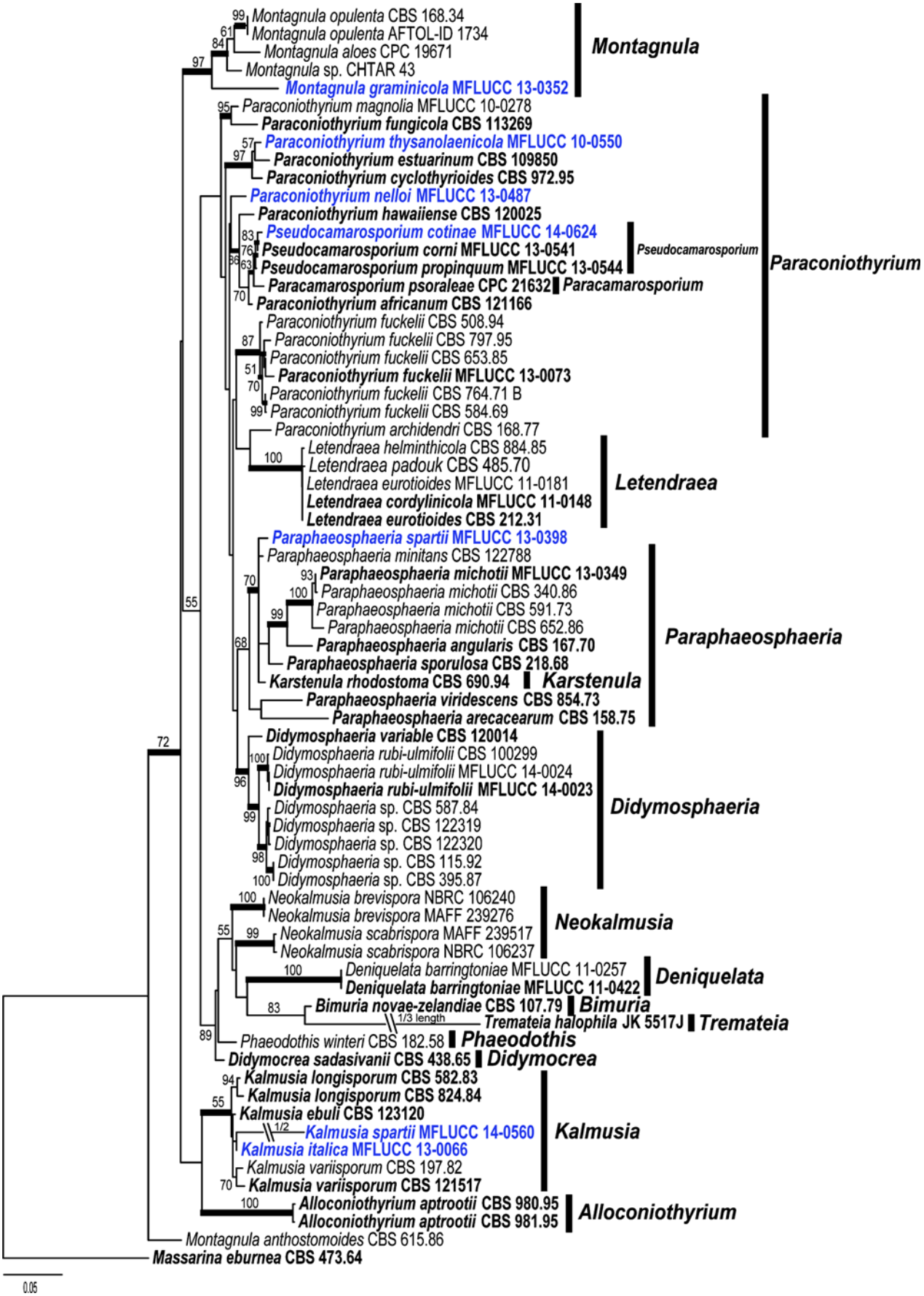
Etymology: in reference to its occurrence in Italy.

Holotype: MFLU 14–0620

Saprobic on branches of *Spartium junceum*. **Sexual morph** *Ascomata* (140–)200–300 μm high×150–280 μm diam. ($\bar{x}$=214×198 μm, *n*=10), gregarious or grouped, immersed to semi-immersed, dark brown to black, uniloculate, globose to subglobose, medium to large sized and coriaceous, fusing with the host tissue, with a central ostiole. *Peridium* 10–20 μm wide, comprising a few layers of dark brown to lightly pigmented cells of *textura angularis*. *Hamathecium* comprising 1–2 μm wide, dense, cellular, hyaline, aseptate, pseudoparaphyses, anastomosing above the asci, embedded in a gelatinous matrix. *Asci* 90–135×14–20 μm ($\bar{x}$=107.5×17.7 μm, *n*=15), 4–8-spored, bitunicate, fissitunicate, cylindro-clavate to clavate, pedicellate, apically rounded with a small ocular chamber. *Ascospores* 21–27×6–8.6 μm ($\bar{x}$=23×7.2 μm, *n*=25), overlapping 1–2-seriate, fusoid to fusoid-ellipsoidal, with broadly to narrowly rounded ends, pale brown to dark yellowish-brown, 3-septate, strongly constricted at the septum, with verruculose ascospore wall surrounded by mucilaginous sheath. **Asexual morph** *Pycnidia* solitary, gregarious or grouped, superficial on PDA, ostiolate. *Pycnidial wall* up to 50–90 μm wide, comprising several layers of pseudoparenchymatous, cells of *textura angularis* and *textura prismatica*, the outer layer composed of thick-walled, dark brown cells, lighter towards the inner layers of hyaline cells. *Conidiogenous cells* 3.4–6.2×2–3.5 μm ($\bar{x}$=4.8×3.1 μm, *n*=20), short cylindric, conidiogenous holoblastic, hyaline, smooth. *Conidia* 1–1.5×2–3.4 μm ($\bar{x}$=1.2×2.9 μm, *n*=25), oblong, ellipsoid-cylindric, aseptate, hyaline to lightly pigmented, smooth-walled.

Culture characters: Ascospores germinating on PDA within 18 h and producing germ tubes from both ends. Colonies growing slowly on PDA MEA, reaching a diam. of 30 mm after 9 d at 25 °C, flat, surface smooth to velvety, with entire edge, white, fairly dense, filamentous; reverse white to pale white, non-pigmented.

Material examined: ITALY, province of Forlì-Cesena [FC], Montebello, Modigliana, on dead branch of *Spartium junceum* L. (*Fabaceae*), 14 October 2012, E. Camporesi, IT 827 (MFLU 14–0620, **holotype**), ex-type living cultures, MFLUCC 13–0066. GenBank ITS: KP325440; LSU: KP325441; SSU: KP325442; *ibid.* (PDD, **isotype**).


Montagnula opulenta CBS 168.34
Montagnula opulenta AFTOL-ID 1734
Montagnula aloes CPC 19671
Montagnula sp. CHTAR 43
Montagnula graminicola MFLUCC 13-0352
Montagnula
Paraconiothyrium magnolia MFLUCC 10-0278
Paraconiothyrium fungicola CBS 113269
Paraconiothyrium thysanolaenicola MFLUCC 10-0550
Paraconiothyrium estuarinum CBS 109850
Paraconiothyrium cyclothyrioides CBS 972.95
Paraconiothyrium nelloi MFLUCC 13-0487
Paraconiothyrium hawaiiense CBS 120025
Pseudocamarosporium cotinae MFLUCC 14-0624
Pseudocamarosporium corni MFLUCC 13-0541
Pseudocamarosporium propinquum MFLUCC 13-0544
Pseudocamarosporium
Paracamarosporium psoraleae CPC 21632
Paracamarosporium
Paraconiothyrium africanum CBS 121166
Paraconiothyrium fuckelii CBS 508.94
Paraconiothyrium fuckelii CBS 797.95
Paraconiothyrium fuckelii CBS 653.85
Paraconiothyrium fuckelii MFLUCC 13-0073
Paraconiothyrium fuckelii CBS 764.71 B
Paraconiothyrium fuckelii CBS 584.69
Paraconiothyrium
Paraconiothyrium archidendri CBS 168.77
Letendraea helminthicola CBS 884.85
Letendraea padouk CBS 485.70
Letendraea eurotioides MFLUCC 11-0181
Letendraea cordylinicola MFLUCC 11-0148
Letendraea eurotioides CBS 212.31
Letendraea
Paraphaeosphaeria spartii MFLUCC 13-0398
Paraphaeosphaeria minitans CBS 122788
Paraphaeosphaeria michotii MFLUCC 13-0349
Paraphaeosphaeria michotii CBS 340.86
Paraphaeosphaeria michotii CBS 591.73
Paraphaeosphaeria michotii CBS 652.86
Paraphaeosphaeria angularis CBS 167.70
Paraphaeosphaeria sporulosa CBS 218.68
Karstenula rhodostoma CBS 690.94
Karstenula
Paraphaeosphaeria viridescens CBS 854.73
Paraphaeosphaeria arecacearum CBS 158.75
Paraphaeosphaeria
Didymosphaeria variable CBS 120014
Didymosphaeria rubi-ulmifolii CBS 100299
Didymosphaeria rubi-ulmifolii MFLUCC 14-0024
Didymosphaeria rubi-ulmifolii MFLUCC 14-0023
Didymosphaeria sp. CBS 587.84
Didymosphaeria sp. CBS 122319
Didymosphaeria sp. CBS 122320
Didymosphaeria sp. CBS 115.92
Didymosphaeria sp. CBS 395.87
Didymosphaeria
Neokalmusia brevispora NBRC 106240
Neokalmusia brevispora MAFF 239276
Neokalmusia scabrispora MAFF 239517
Neokalmusia scabrispora NBRC 106237
Neokalmusia
Deniquelata barringtoniae MFLUCC 11-0257
Deniquelata barringtoniae MFLUCC 11-0422
Deniquelata
Bimuria novae-zelandiae CBS 107.79
Bimuria
1/3 length
Trematosphaeria halophila JK 5517J
Trematosphaeria
Phaeodothis winteri CBS 182.58
Phaeodothis
Didymocrea sadasivanii CBS 438.65
Didymocrea
Kalmusia longisporum CBS 582.83
Kalmusia longisporum CBS 824.84
Kalmusia ebuli CBS 123120
1/2
Kalmusia spartii MFLUCC 14-0560
Kalmusia italica MFLUCC 13-0066
Kalmusia variisporum CBS 197.82
Kalmusia variisporum CBS 121517
Kalmusia
Alloconiothyrium aptrootii CBS 980.95
Alloconiothyrium aptrootii CBS 981.95
Alloconiothyrium
Montagnula anthostomoides CBS 615.86
Massarina eburnea CBS 473.64
0.05

◀ **Fig. 72** Phylogram generated from Maximum likelihood analysis based on combined SSU, LSU, ß- tubulin and ITS sequence data of *Didymosphaeriaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above and below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Massarina eburnea* CBS 473.64

Notes: *Kalmusia* was introduced by Niessl (1872) based on *K. ebuli* Niessl and is characterized by immersed to erumpent ascomata, filiform, delicate, septate pseudoparaphyses, bitunicate, clavate asci with narrowly ovoid to clavate, pale brown, 3-septate ascospores. *Kalmusia* has been reported to have coniothyrium-like, *Cytoplea*, *Microsphaeropsis* and *Paraconiothyrium* asexual morphs (Zhang et al. 2012a; Ariyawansa et al. 2014b; Zhang et al. 2014). *Kalmusia italica* is distinct from *K. ebuli* in having aseptate pseudoparaphyses, asci with short pedicel and a mucilaginous sheath.

49. *Kalmusia spartii* Wanasinghe, Camporesi, E.B.G. Jones & K.D. Hyde, ***sp. nov.***

Index Fungorum Number: IF550895, *Facesoffungi number*: FoF00385; Figs. 75 and 76

Etymology: Named after the host genus from which it was collected, *Spartium*

Holotype: MFLU 14–0751

Saprobic on dead herbaceous branches. **Sexual morph** *Ascomata* 350–450 μm high×250–400 μm diam. ($\overline{x}$=395.3×

Fig. 73 ***Kalmusia italica*** **(holotype) a**, **b** Ascomata on host surface **c** Section through ascomata **d** Peridium **e** Immature ascus **f**, **g** Mature bitunicate asci (note the pseudoparaphyses in g) **h**–**j** Ascospores **k** Germinating ascospore **l** Ascospore stained with Indian ink. Scale bars: c= 200 μm, d=50 μm, e-g=25 μm, h-l=10 μm

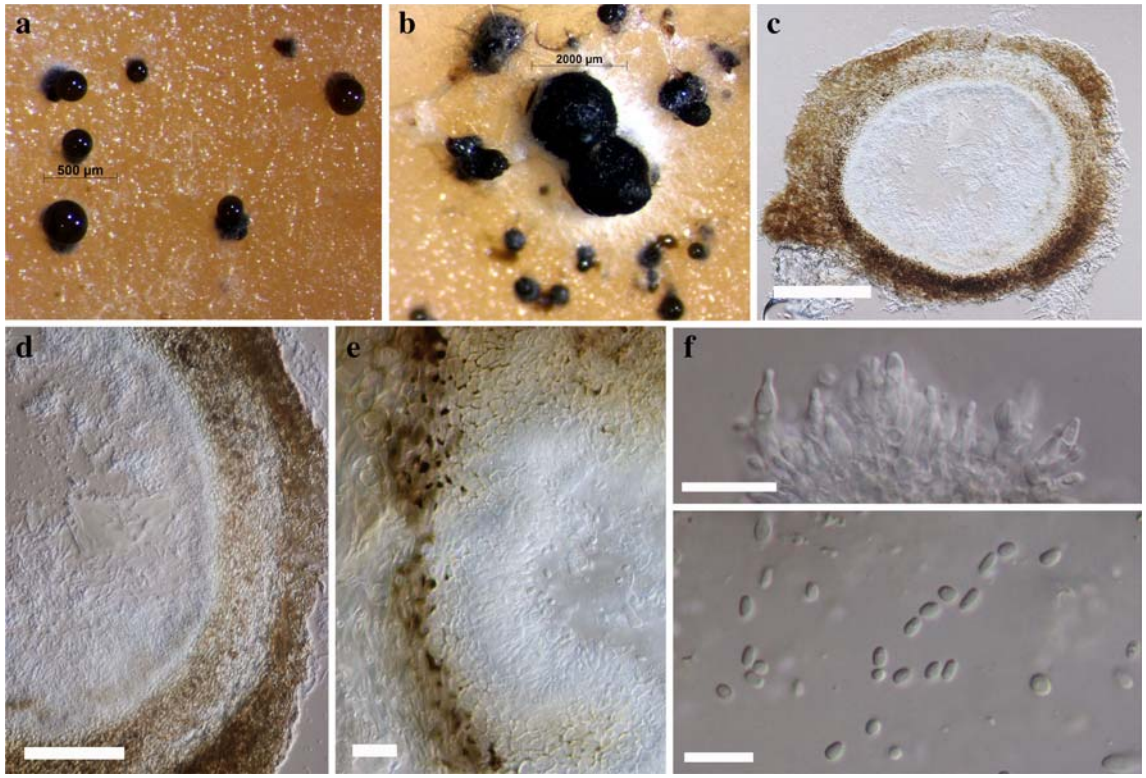


Fig. 74 ***Kalmusia italica*** Asexual morph (**ex-type culture**). **a**, **b** Pycnidia on MEA **c** Section of pycnidia d Pycnidial wall **e**, **f**=Conidiogenous cells and developing conidia **g** Conidia. Scale bars: c=200 μm, d=100 μm, e-f=15 μm, g=10 μm

323.7 μm, n=10), solitary, scattered, immersed to erumpent, globose or subglobose, coriaceous, wall black, with or without papilla, ostiolate. *Ostiole* 150–200 μm high, 90–130 μm diam. ($\bar{x}$=174.3×109 μm, n=10), blackish-brown, smooth, ostiolar canal filled with hyaline cells. *Peridium* 15–30 μm wide at the base, 25–50 μm wide at the sides, thick, 1-layered, composed of small heavily pigmented thick-walled cells of *textura angularis*. *Hamathecium* comprising numerous, 1.9 μm (n= 30) wide, filamentous, branched septate, pseudoparaphyses. *Asci* 110–130×10–16 μm ($\bar{x}$=119.6×13.9 μm, n=40), 8-spored, bitunicate, fissitunicate, clavate, with a long, narrow, furcate pedicel, up to 30–35 µm long, with a minute ocular chamber. *Ascospores* 19–22×5.5–9 μm ($\bar{x}$=20.2×7.6 μm, n= 50), overlapping 1–2-seriate, narrowly ovoid to clavate, 3-distoseptate, constricted at the septa, initially hyaline, becoming yellowish-brown at maturity, narrowly rounded at both ends, smooth-walled, not surrounded by a mucilaginous sheath. **Asexual morph** *Conidiomata* 300–550 μm diam., 200–250 μm high, superficial or immersed in the agar, dark brown to black, clothed with white hyphal projections, simple cavities. *Conidiomatal wall* composed of a 40–50 μm wide outer layer and 10–20 μm wide inner layer of cells of *textura angularis*. *Conidiogenous cells* 5–8×2–4 μm discrete, assembled into protruding masses, or integrated in very compact conidiophores. *Conidia* 2.5–4×1.5–2.5 μm ($\bar{x}$=3.2×1.9 μm, n=20) narrowly ellipsoidal or short-cylindrical, straight or slightly curved, rounded at both ends, one-celled, with one or two small, polar guttules, initially hyaline, becoming light brown, smooth-walled.

Culture characters: Colonies on PDA reaching a diam. of 30–35 mm in 21 d, flat, with undulate to lobate margin, hyaline, covered by thin, felty, white, aerial mycelium, honey-yellow in reverse, sporulation after 8 weeks.

Material examined: ITALY, Forlì-Cesena Province: Castello di Corniolo, Santa Sofia, dead and hanging branches of *Spartium junceum* L. (*Fabaceae*), 15 March 2013, E. Camporesi (MFLU 14–0751, **holotype**); ex-type living culture, MFLUCC 14–0560. GenBank ITS: KP744441; LSU: KP744487; SSU: KP753953.

Notes: Multi-gene phylogenetic analyses indicated that *Kalmusia spartii* belongs to *Didymosphaeriaceae* and grouped together with other *Kalmusia* strains. *Kalmusia spartii* has a similar morphology to *K. ebuli*, but in our phylogenetic tree, *K. ebuli* and *K. spartii* were well resolved (Fig. 72).

51. *Montagnula graminicola* Chethana, Thambugala, Camporesi & K.D. Hyde ***sp. nov.***

Index Fungorum number: IF550763, *Facesoffungi number*: FoF00379; Fig. 77

Etymology: The specific epithet *graminicola* was given after the host family *Graminae* in which the fungus was collected.

Holotypus: MFLU 14–0622

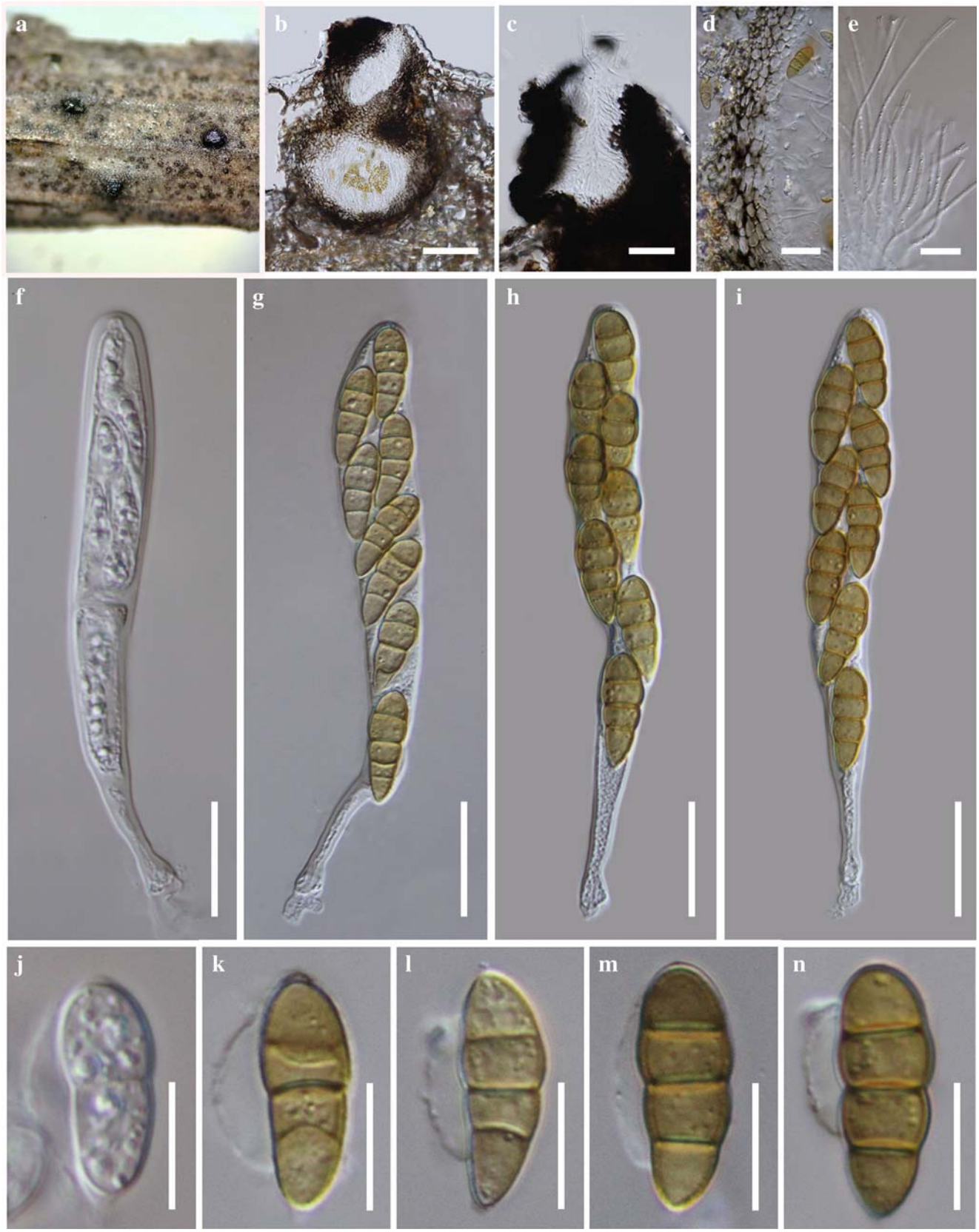


Fig. 75 ***Kalmusia spartii*** **(holotype) a** Ascomata on host substrate **b** Section of ascoma **c** Close up of ostiole **d** Peridium **e** Pseudoparaphyses **f–i** Asci **j–n** Ascospores. Scale bars: b=100 μm, c=50 μm, d–i=20 μm, j–n=10 μm

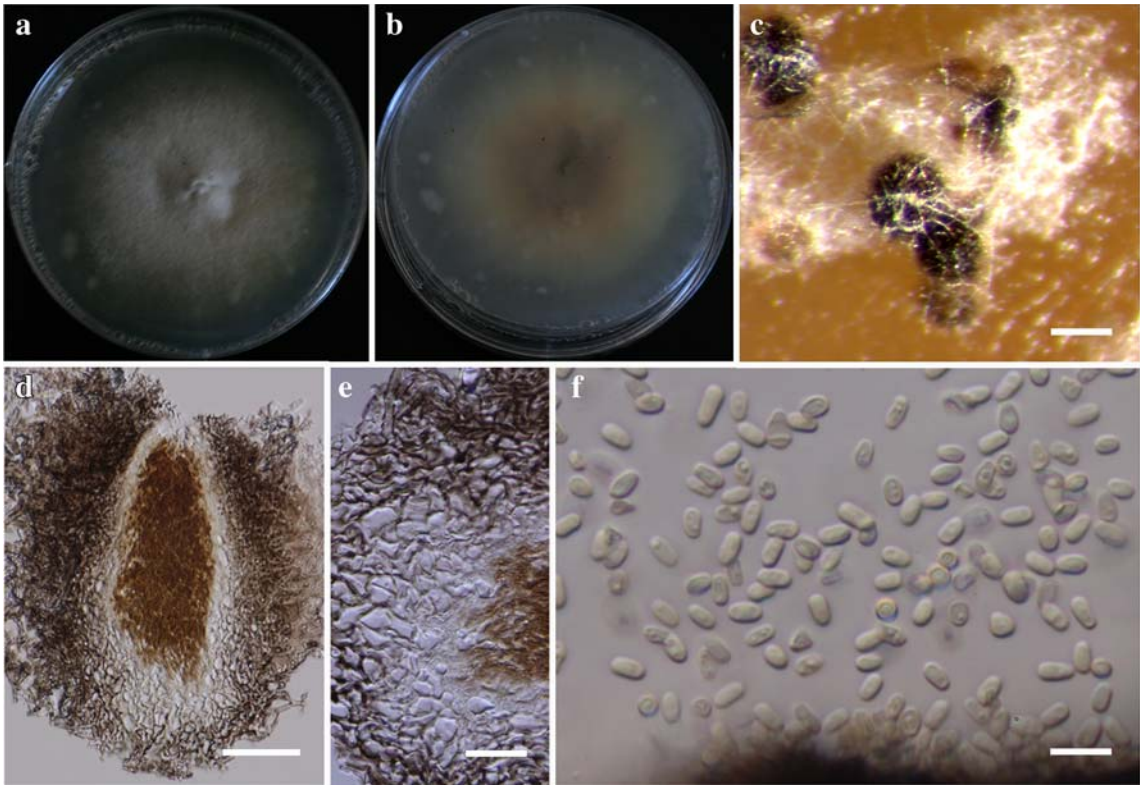


Fig. 76 **Asexual morph of *Kalmusia spartii* (ex-type culture) a**, **b** Colonies on PDA (b from below) **c** conidiomata **d** Longitudinal sections of conidiomata **e** Conidiomatal wall **f** Conidia. Scale bars: c=100 μm, d=50 μm, e=20 μm, f=5 μm

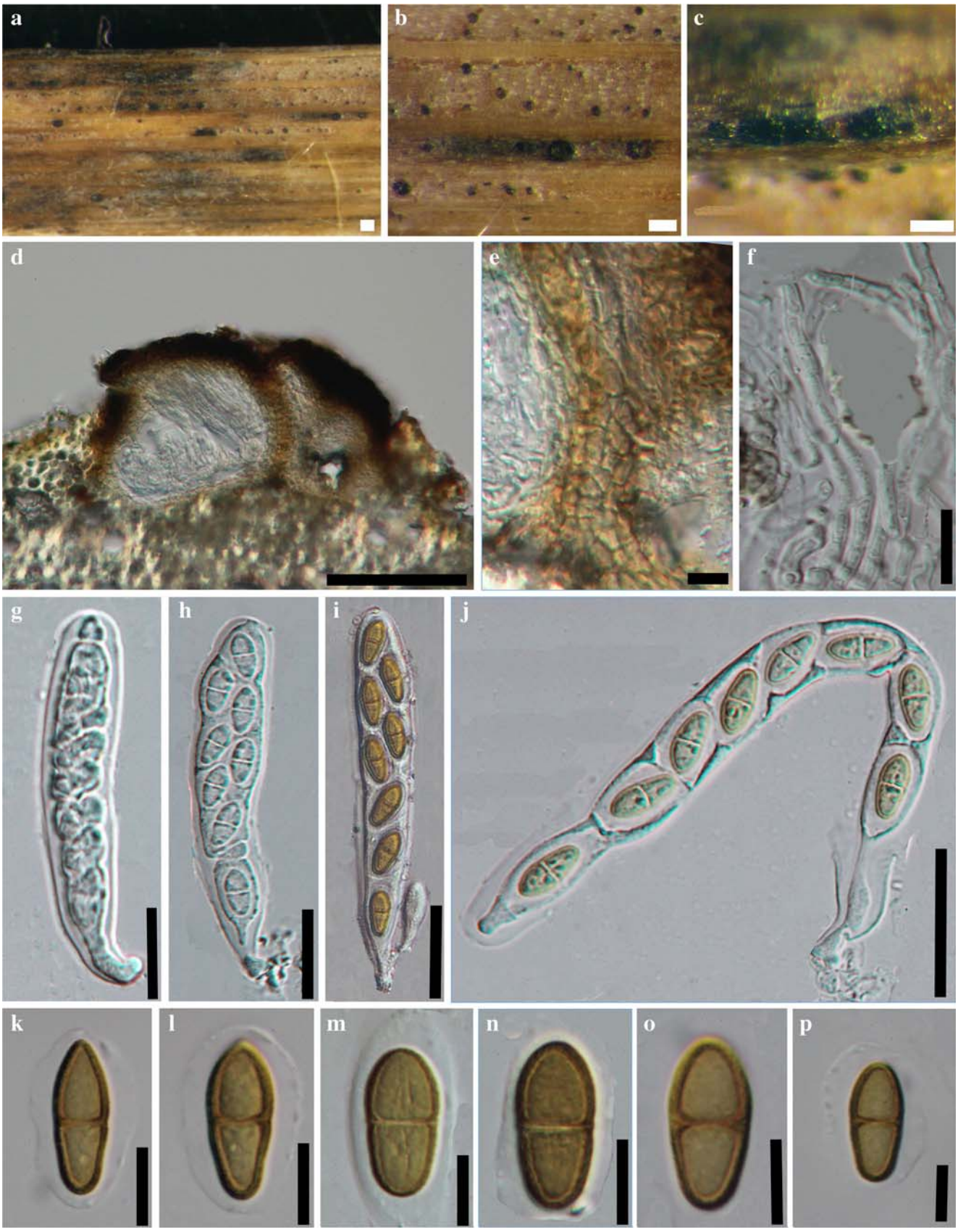
Saprobic on dead stem of grass. **Sexual morph** *Ascomata* 37–117.22 μm diam. ($\bar{x}$=56.67 μm, n=20), pseudothecia, mostly solitary, semi-immersed to erumpent, black, globose to subglobose, coriaceous, with a minutely papillate ostiole. *Peridium* 14.9 μm thick at side walls, up to 16 μm thick near the apex and 9 μm thick at the base, consisting of a 3–4 layers of cells, outer 3–4 layers of thick-walled, dark brown cells of *textura angularis* and 2–3 layers of hyaline to pale brown inner cells. *Hamathecium* comprising 2–3 μm wide, filiform, hyaline, septate, pseudoparaphyses, anastomosing above the asci, embedded in a gelatinous matrix. *Asci* (45–)50–132(–137)×(6–)8–13(–15) μm ($\bar{x}$=81.3×10.10 μm, n=10), 8-spored, bitunicate, fissitunicate, cylindrical to clavate, long pedicellate and apically rounded with a small ocular chamber distinct at immature asci. *Ascospores* (7.8–)9.8–13(–15)×(2.8–)3.8–5.5(–6.5) μm ($\bar{x}$=11.3×4.9 μm, n=25), partially overlapping, biseriate, ellipsoidal, tapering towards the ends, brown, two-celled, septate median, slightly constricted at the septum, wall verruculose, surrounded by a mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Ascospores germinated on water agar within 48 h with 3–4 μm diam. germ tubes. Colonies slow growing on PDA, attaining 6 mm diam. after 14 days at 28 °C, entire edged, white to pale white, dense, cottony mycelium on the surface and reverse pale white colour mycelium.

Material examined: ITALY, Province of Forlì-Cesena [FC], Montebello, Modigliana, on dead stem of grass (*Graminae*), 27 May 2013, E. Camporesi (MFLU 14–0622, **holotype**); ex-type living cultures, MFLUCC 13–0352. GenBank ITS: KM658314; LSU: KM658315; SSU: KM658316.

Notes: *Montagnula* was established by Berlese (1896), with *M. infernalis* and *M. gigantea* based on the presence of hyphal stromatic tissue over the ascomata and long pedicellate asci. *Montagnula infernalis* was selected as the lectotype species and the genus was characterized by immersed to erumpent, globose to subglobose ascomata, bitunicate, cylindro-clavate to clavate, pedicellate asci and reddish-brown to dark yellowish-brown, muriform or phragmosporous ascospores (Ariyawansa et al. 2014b). Leuchtmann (1984) and Aptroot (1995) included some phragmosporous and didymosporous species, making it heterogenous (Hyde et al. 2013; Ariyawansa et al. 2014). Recent phylogenetic analyses have shown the robust clustering of *M. opulenta* with *Bimuria*, *Didymocrea*, *Letendrea*, *Paraphaeosphaeria*, *Didymosphaeria*,

Fig. 77 ***Montagnula graminicola*** **(holotype) a**–**c** Ascomata submersed ▶ in the host tissue **d** Section of the ascoma **e** Section of the peridium cells **f** Pseudoparaphyses **g** Immature asci **h**–**i** Mature asci **j** Fissitunicate nature of the ascus **k**–**p** Brown ascospores with clear sheath. Scale bars: a=200 μm, b, c, d=100 μm, e=5 μm, f=15 μm, g–j=20 μm, k–p=5 μm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Pseudocamarosporium, *Paracamarosporium*, *Paraconiothyrium*, *Tremateia*, *Deniquelata*, *Neokalmusia*, *Phaeodothis*, *Alloconiothyrium* and *Kalmusia* forming the family clade (Zhang et al. 2009a; Hyde et al. 2013; Ariyawansa et al. 2014b; Wijayawardene et al. 2014). Ariyawansa et al. (2014) synonymized *Montagnulaceae* under the older family name *Didymosphaeriaceae*.

In the current study, a new species, *Montagnula graminicola* is introduced in the genus *Montagnula* based on the morphological and phylogenetic evidence. Our new species *Montagnula graminicola* is distinct from *M. infernalis* in having smaller ascomata, and smaller, ellipsoidal, one-celled ascospores with a sheath. *Montagnula graminicola* resembles *M. opulenta*, but differs in having smaller ascomata, and spores with verruculose wall. The phylogenetic analysis provides strong evidence that *M. graminicola* belongs in the genus *Montagnula* (Fig. 72), where it forms a sister clade to *Montagnula opulenta* (CBS 168.34, AFTOL-ID 1734) and *Montagnula aloes* (CPC 19671) with high bootstrap support; thus a new species is proposed.

51. *Paraconiothyrium nelloi* W.J. Li, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550918, *Facesoffungi number*: FoF00422; Fig. 78

Etymology: Named after Camporesi Nello, who collected the sample from which the species was isolated.

Holotypus: MFLU 14–0813

Saprobic on dead stem of *Spartium junceum* L. **Sexual morph** Undetermined. **Asexual morph** coelomycetous. *Conidiomata* 250–350 μm high, 200–300 μm diam., pycnidial, solitary, immersed, globose to obpyriform, unilocular, centrally ostiolate, thick-walled. *Peridium* 15–25 μm wide, 4–5-layered, composed of outer 3–4-layers brown and inner 1–2-layers hyaline, thin-walled cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells, arising from the base and sides of the conidioma. *Conidiogenous cells* 3.5–10 μm long×5–10 μm wide, enteroblastic, phialidic, determinate, ampulliform, lining the inner wall layer of the pycnidium, hyaline, smooth. *Conidia* 6.5–8.5×5–6 μm ($\bar{x}$=7.5×5.5; n=10), globose to obovate, thick-walled, smooth-walled, one-celled, hyaline when young, becoming dark brown at maturity.

Culture characters: Culture on PDA slow growing, reaching 10–15 mm diam. after one week, circular, yellowish in the centre, with whitened edge, after one month, sparse, aerial, filamentous, no pigments produced.

Material examined: ITALY, Province of Forlì-Cesena [FC], Premilcuore, Fiumicello, on dead twig of *Spartium junceum* L. (*Fabaceae*), 13 January 2013, E. Camporesi IT-1008 (MFLU 14–0813, **holotype**), ex-type living culture, MFLUCC 13–0487, ICMP 20796. GenBank ITS: KP711360; LSU: KP711365; SSU: KP711370; *ibid.* (KUN! HKAS 83972, **isotype**).

Notes: *Paraconiothyrium* was introduced by Verkley et al. (2004) to accommodate four species, namely *Parac. estuarinum* (type specie), *Parac. Brasiliense*, *Parac. cyclothyrioides* and *Parac. fungicola*. Subsequently, the genus was expanded to include four more species, viz. *Parac. africanum*, *Parac. babiogorense*, *Parac. hawaiiense* and *Parac. variabile* (Damm et al. 2008; Budziszewska et al. 2011). Presently, *Paraconiothyrium* comprises 21 species (de-Gruyter et al. 2013; Ariyawansa et al. 2014b; Verkley et al. 2014), including *Parac. nelloi* and the sexual species *Parac. thysanolaenicola* described in this paper. The morphological characters of *Paraconiothyrium* are variable. The conidiomata can be eustromatic to pycnidial, the conidiogenous cells are phialidic or annelidic, and the conidia smooth-walled or minutely warted and hyaline to brown at later stages of development (Verkley et al. 2004; Gruyter et al. 2013). The description of *Parac. nelloi* fits well with this generic concept, and *Parac. nelloi* shares similarities with *Parac. fuckelii* in having pycnidial conidiomata with a single ostiole, and subglobose to ellipsoid or obovoid conidia (Gruyter et al. 2013; Verkley et al. 2014). *Parac. nelloi* differs from *Parac. fuckelii* by the conidiogenous cells, which are phialidic in *Parac. nelloi* and annelidic in *Parac. fuckelii*. Combined phylogenetic analyses of ITS, SSU and LSU sequence data (Fig. 72) show that *Parac. nelloi* is distinct from any other species of *Paraconiothyrium*. Based on the morphological characters together with molecular sequence data, *Parac. nelloi* is introduced as a new species.

52. *Paraconiothyrium thysanolaenae* Phookamsak, Chethana & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550930, *Facesoffungi number*: FoF00432; Fig. 79

Etymology: The specific epithet *thysanolaenicola* refers to the host from which the fungus was isolated.

Holotypus: MFLU 11–0142

Saprobic on stems of *Thysanolaena maxima*. **Sexual morph** *Ascostromata* 115–250 μm high, 410–840 μm diam., scattered or clustered, gregarious, immersed to semi-immersed, visible as raised, black structures, longitudinal axis vertical to the host surface. *Locules* 130–200 μm high, 170–300 μm diam., clustered, immersed under pseudoclypeus, uni- to multi-loculate, subglobose to quadrilateral, dark brown to black, ostioles central in each locule, with black, minute papilla. *Peridium* 10–30 μm wide, thin-walled, of equal thickness, composed of 3–5 layers, of brown to dark brown, pseudoparanchymatous cells, arranged in a *textura angularis*. *Hamathecium* of dense, 1–2 μm wide, filamentous, broad cellular, pseudoparaphysese, branched, anastomosing above the asci, embedded in a gelatinous matrix. *Asci* (52–)55–70(–75×6–7(–7.5) μm ($\bar{x}$=65×7 μm, n=25), 8-spored, bitunicate,

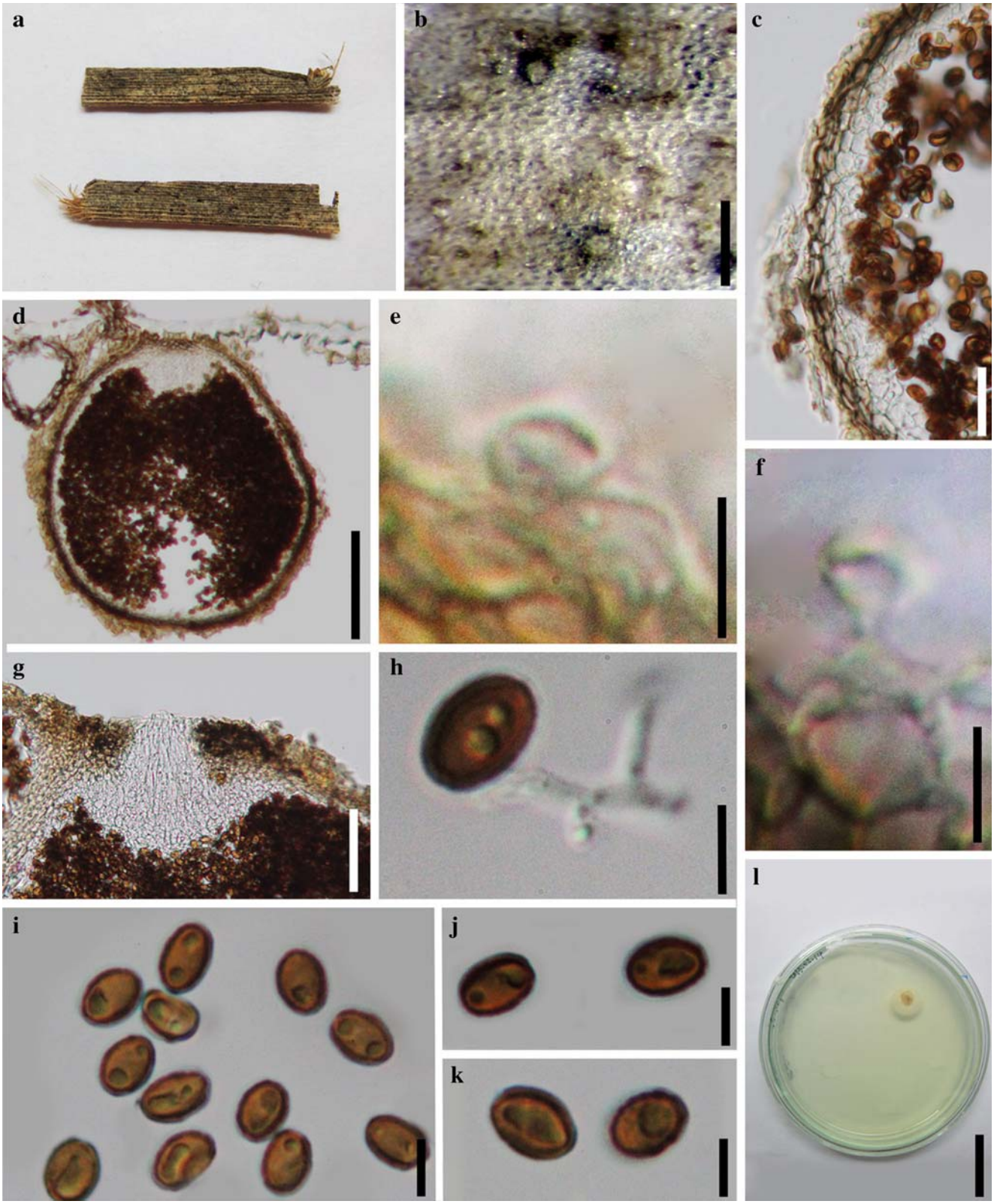


Fig. 78 ***Paraconiothyrium nelloi*** **(holotype) a** Specimen **b** Black conidiomata on the host surface **c** Section of peridium **d** Vertical section of conidiomata **e, f** Conidiogenous cells and developing conidia **g** Ostiole **h** Germinated spore **i–k** Conidia **l** Culture on PDA. Scale bars: b= 200 μm, c=20 μm, e–f=5 μm, g=50 μm, i–k=5 μm, l=25 mm

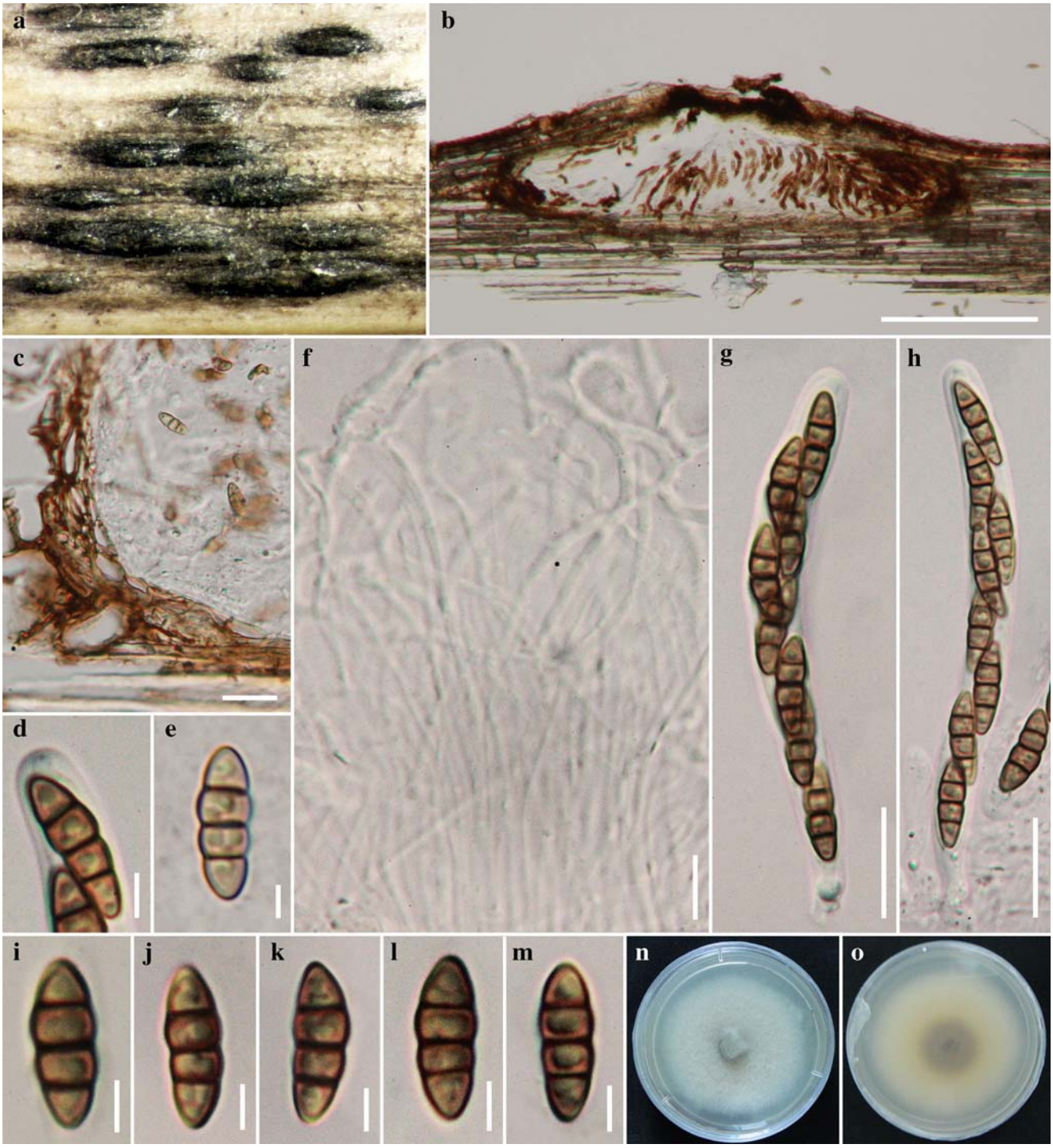
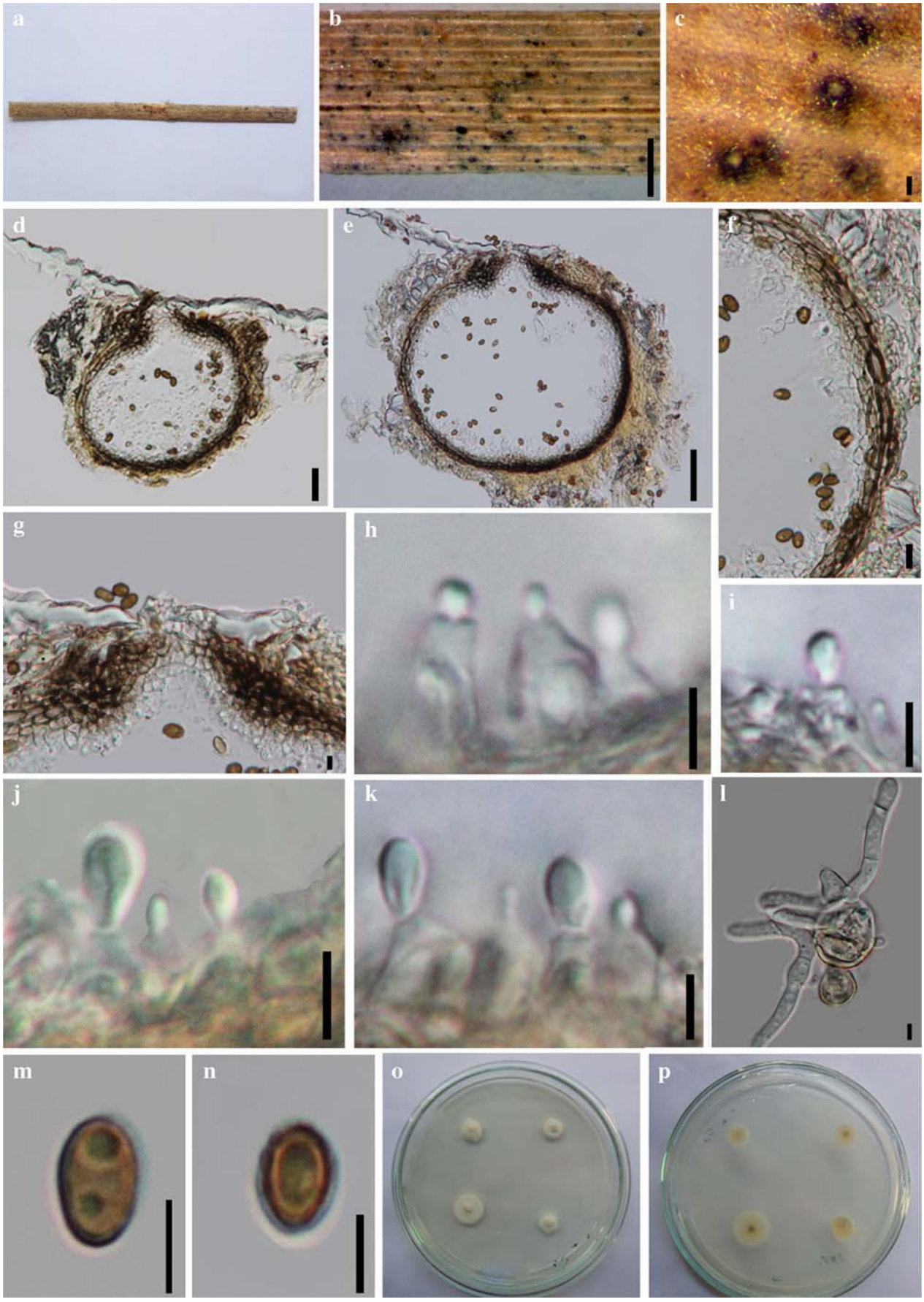


Fig. 79 ***Paraconiothyrium thysanolaenae*** (**holotype**) **a** Black, raised, longitudinal ascostromata on host surface **b** Section of an ascoma **c** Peridium **d** Ocular chamber **e** Ascospore stained in Indian ink **f** Pseudoparaphyses **g-h** Asci **i–m** Ascospores **n–o** Culture characters Scale bars: b=200 μm, c, g, h=20 μm, f=10 μm, d, e, i, j, k, l, m=5 μm

fissitunicate, cylindrical, with short acute or knob-like pedicel, apically rounded with well-developed ocular chamber. *Ascospores* 10.5–12(–13)×3–4 μm ($\overline{x}$=11.7×3.9 μm, n=30), overlapping 1–2-seriate, phragmosporous, fusiform to ellipsoidal, brown to reddish-brown, 3-septate, constricted at the septum. **Asexual morph** Undetermined.

Fig. 80 ***Paraphaeosphaeria spartii*** (**holotype**). **a** Specimen **b–c** Black ▶ conidiomata on host surface **d, e** Vertical section of conidioma **f** Section of peridium **g** Ostiole **h–k** Conidiogenous cells and developing conidia **l** Germinated spore **m–n** Conidia **o. p** Culture on PDA. Scale bars: b=500 μm, c=200 μm, d=100 μm, e=5 μm, f=5 μm, g=10 μm, h–i=5 μm, j–n=5 μm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Culture characters: Colonies on MEA 78–84 mm diam. after 4 weeks at 25–30 °C, cream to orangish-white at the margins, white grey in the centre; reverse white to cream or yellowish-white at the magins, light brown to yellowish-brown at the cantre; medium dense, circular, flattened, smooth, with entire edge, fairly fluffy to flocose, slightly radiating in the lower part, not producing pigments.

Material examined: THAILAND, Chiang Mai, Mae Taeng District, Huai Nam Dung, 8 September 2009, on dead stem of *Thysanolaena maxima* Kuntze (*Poaceae*), R. Phookamsak RP0007 (MFLU 11–0142, **holotype**), ex-type living culture, MFLUCC 10–0550, GenBank ITS: KP744453; LSU: KP744496; SSU: KP753959.

Notes: In this study, we introduce a new sexual species in the genus *Paraconiothyrium*, *Parac. thysanolaenae*, based on the phylogenetic evidence. *Paraconiothyrium thysanolaenae* formed a robust clade with *Parac. estuarinum* and *Parac. cyclothyrioides* in our phylogenetic analyses. However, the species did not produce an asexual morph; thus the asexual morphology of these species is not comparable. Ariyawansa et al. (2014) reported the sexual species of *Parac. fuckelii* and *Parac. magnolia* which have clearly distinguish morphological characters as compared to *Parac. thysanolaenae. Paraconiothyrium thysanolaenae* differs from *P. fuckelii* and *Parac. magnolia* by its ascostromata and mucilaginous sheath surrounding the ascospores. *Paraconiothyrium thysanolaenae* forms pseudostromata with uni- to multilocules and ascospores lack a mucilaginous sheath, while *Parac. fuckelii* and *Parac. magnolia* have uniloculate ascomata.

53. *Paraphaeosphaeria spartii* W.J. Li, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550917, *Facesoffungi number*: FoF00421; Fig. 80

Etymology: Referring to the host, *Spartium*, on which the fungus was found.

Holotypus: MFLU 14–0810

Saprobic on dead stem of *Spartium junceum* L. **Sexual morph** Undetermined. **Asexual morph** coelomycetous. *Conidiomata* 200–300 ($\bar{x}$=250) μm diam., 250–300 ($\bar{x}$=260) μm high, pycnidial, epidermal to subepidermal, scattered, globose to subglobose, unilocular, pale brown, ostiolate, appearing pruinose, thick-walled. *Ostiole* circular, papillate. *Peridium* 10–20 μm wide, composed of 3–4-layers, with outer 1–3-layers brown and inner 1–2-layers hyaline, thin-walled cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells, arising from basal layers of conidioma. *Conidiogenous cells* 2–6 × 3–6.5 ($\bar{x}$=4 × 4.5) μm, enteroblastic, phialidic with an inconspicuous periclinal thickening, cylindrical to subcylindrical, or subcylindrical to ampulliform, integrated, hyaline, smooth-walled. *Conidia* 4–7.5 × 3.5–5 μm ($\bar{x}$=6 × 4, *n*=50), subglobose to ellipsoid or obovoid, hyaline when young, becoming pigmented to pale brown at maturity, smooth-walled, guttulate, aseptate, thin-walled.

Culture characters: Colonies on PDA slow growing, reaching 10–20 diam. after 3 weeks, glabrous and with colourless margin; mycelium immersed, initially colourless, later becoming yellowish aerial mycelium, non sporulating.

Material examined: ITALY, Province of Forlì-Cesena [FC], Santa Sofia, Collina di Pondo. on dead stem of *Spartium junceum* L. (*Fabaceae*), 16 October 2012, E. Camporesi IT-816 (MFLU 14–0810, **holotype**); ex-type living culture, MFLUCC 13–0398, ICMP 20789. GenBank ITS: KP711357; LSU: KP711362; SSU: KP711367; *ibid.* (KUN! HKAS 83969, **isotype**).

Notes: Morphologically, *Paraph. spartii* shares similarities with *Paraph. sporulosa* in having subglobose to ellipsoid or obovoid, aseptate conidia with one large and often also 1–2 additional smaller oil-droplets. *Parac. spartii* can be distinguished from *Paraph. sporulosa* by its conidiogenous cells. *Parap. spartii* has subcylindrical to ampulliform, integrated, phialidic conidiogenous cells, with an inconspicuous periclinal thickening and collarette. *Paraph. sporulosa* has globose to ampulliform, hyaline, discrete, conidiogenous cells with 1–2 percurrent proliferations. Phylogenetically, *Paraph. spartii* is also distinct from any other species within *Paraphaeosphaeria* (Fig. 72)

54. *Pseudocamarosporium cotinae* Norphanphoun, Bulgakov & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550922, *Facesoffungi uumber*: FoF00492; Fig. 81

Etymology: Named after the generic name of host, *Cotinus*

Holotype: MFLU 14–0774

Saprobic on dead herbaceous branches of *Cotinus coggygria*. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* pycnidial, 400–600 μm diam. 370–620 μm high, solitary to gregarious, black, sub-immersed, unilocular, with a papillate ostiole. Pycnidial wall 50–60 μm, multi–layered, with 3–5 outer layers of brown–walled cells of *textura angularis*, with inner most layer thin, hyaline. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* blastic, phialidic, hyaline, smooth, formed from the inner most layer of pycnidium wall. *Conidia* 12–15 × 6–9 μm ($\bar{x}$=13.5 × 7.5 μm, *n*=30) oblong to ellipsoidal, mostly straight, infrequently slightly curved, muriform, with 1–3 transverse septa, with 1–2 longitudinal septa, constricted at the septa, initially hyaline, brown to dark brown at maturity, narrowly rounded at both ends, smooth–walled.

Culture characters: Conidia germinating on MEA within 24 h. Colonies on PDA slow growing, reaching 1 cm diam.

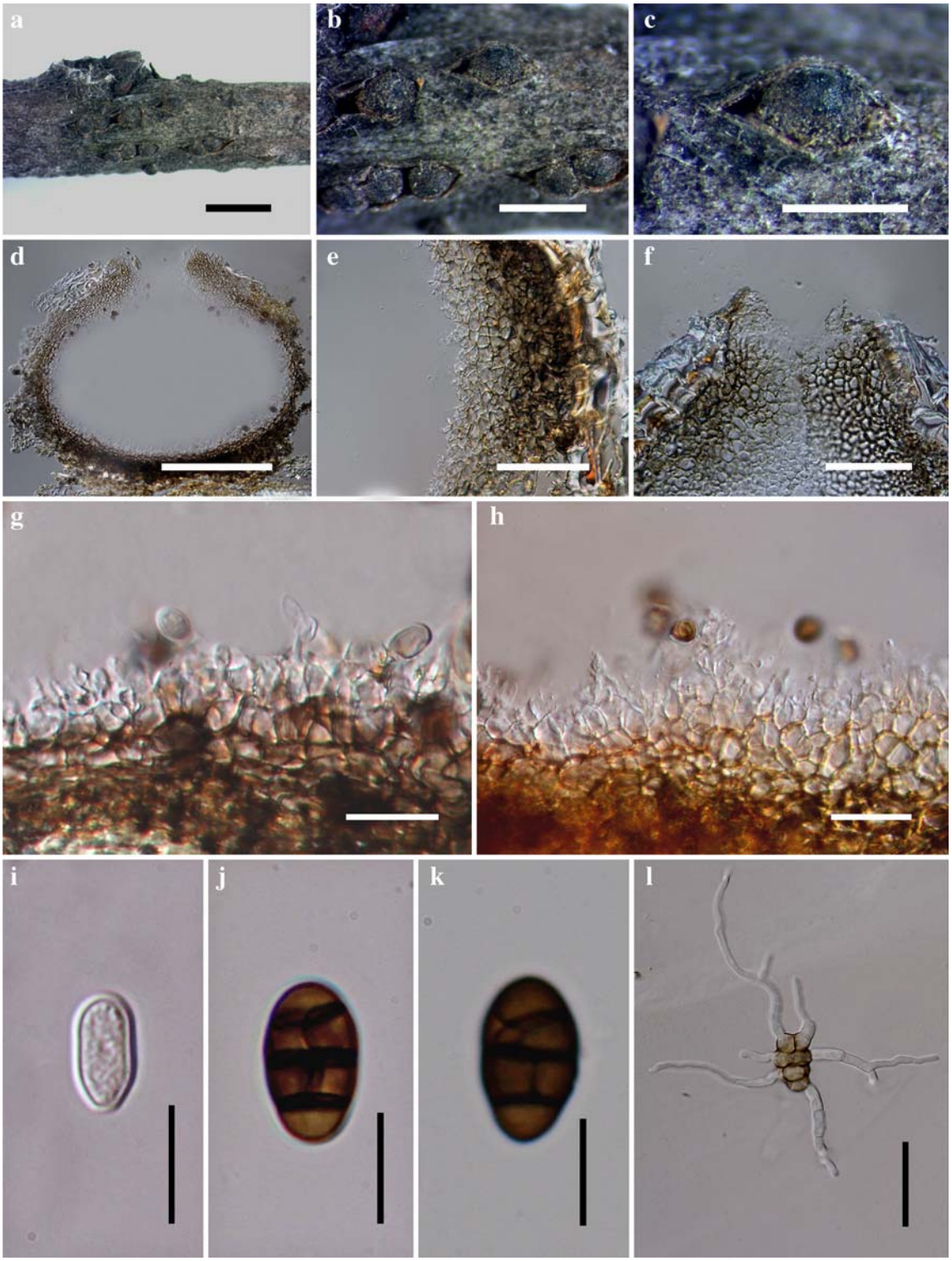


Fig. 81 *Pseudocamarosporium cotinae* (**holotype**) **a** Habit in wood **b** Conidiomata on substrate **c** Single conidioma **d** Cross section conidioma **e** Peridium **f** Apex of conidioma **g, h** Conidiogenous cells with attached conidia **i** Immature conidia **j, k** Mature conidia **l** Germinating conidium. Scale bars: d=200 μm, e, f=50 μm, g, h=20 μm, i-k=10 μm , l=50 μm

after 1 week at 25 °C, later producing dense mycelium, circular with rough margin, white at first, greenish-yellow after 7 days, flat or effuse on the surface, without aerial mycelium. Hyphae septate branched, hyaline, thin.

Material examined: RUSSIA, Rostov region, Shakhty city, near Grushevsky pond, shelterbelt artificial forest, on dead branches of *Cotinus coggygria* Scop. (*Anacardiaceae*), 18 March 2014, T. Bulgakov (MFLU 14 – 0774, **holotype**); living culture, MFLUCC 14–0624; GenBank ITS: KP744460; LSU: KP744505; SSU: KP753964.

Notes: Wijayawardene *et al.* (2014) introduced *Pseudocamarosporium*, with the type species *P. propinquum*, from *Salix vitellina*, and four other species. *Pseudocamarosporium propinquum* has oblong conidia. Our collection differs from the type in having oblong to ellipsoidal conidia which are narrowly rounded at both ends. The new species also has larger conidiomata than other species of *Pseudocamarosporium*, and also differs in sequence data (Fig. 72). *Pseudocamarosporium cotinae* clusters with *P. corni* (Wijayawardene *et al.* 2014) which provides good evidence that *P. cotinae* belongs in *Pseudocamarosporium*, where it forms a well-resolved clade. Hence we introduce it as a new species.

Hysteriaceae

The family *Hysteriaceae* was introduced by Chevallier (1826) to accommodate Dothideomycete species producing hysterothecial ascomata in *Hysteriales* (Boehm 2009; Boehm et al. 2009a, b; Hyde et al. 2013). The family has been monographed by Zogg (1962) and included six genera *viz. Hysterium*, *Hysterographium*, *Gloniopsis*, *Gloniella*, *Glonium*, *Farlowiella* and *Hysterocarina* with *Hysterium* as the type genus (Boehm et al. 2009b, c; Eriksson 2006). *Actidiographium* was added in *Hysteriaceae* (Boehm et al. 2009a; Hyde et al. 2013). Based on the phylogenetic analyses, Boehm et al. (2009a) removed three genera *viz. Glonium*, *Hysterographium* and *Farlowiella* from *Hysteriaceae* (Hyde et al. 2013). Some species previously accommodated in *Hysterographium* have been transferred to the new genera *Hysterobrevium* and *Oedohysterium* in *Hysteriaceae*, whereas the genus *Farlowiella* was tentatively placed in the Dothideomycetes, genera *incertae sedis* (Hyde et al. 2013). The asexual morphs of *Hysteriaceae* are coelomycetes and hyphomycetes (Lohman 1931, 1933a, b, 1934; Boehm et al. 2009b). *Hysteriaceae* presently composes 12 sexual genera *viz. Actidiographium*, *Coniosporium*, *Gloniella*, *Gloniopsis*, *Hysterobrevium*, *Hysterocarina*, *Sphaeronaema*, *Oedohysterium*, *Ostreichnion*, *Psiloglonium*, *Rhytidhysteron* and *Sphaeronaema* (Hyde et al. 2013). The phylogenetic tree is presented in Fig. 82.

55. *Psiloglonium colihuae* (Lorenzo & Messuti) E. Boehm., Stud. Mycol. **64**: 71 (2009)

≡ *Glonium colihuae* Lorenzo & Messuti, Mycol. Res. 102(9): 1104 (1998)

Index Fungorum number: IF 444903, *Facesoffungi number*: FoF00435; Fig. 83

Saprobic on stems of *Thysanolaena maxima*. **Sexual morph** *Ascomata* 135–195 μm high, 590–970 μm diam., hysterothecial, gregarious, superficial, dark, elongate, shield-shaped, or irregular, rarely furcate, joined at ridges, with central, slit-like opening. *Peridium* 6–20 μm wide, thin-walled, of unequal thickness, poorly developed at the base, carbonaceous, opaque dark and glossy, composed of several cell layers of small, opaque, dark, dull cells arranged in *textura angularis* to *textura globulosa. Hamathecium* composed of 0.8–1.5 μm wide, dense, trabeculate, anastomosing, pseudoparaphyses, embedded in a hyaline to brown gelatinous matrix, slightly swollen at the apex. *Asci* (76–)80–95(–120)×(15–)17–18(20) μm ($\bar{x}$=94.5×18 μm, n=25), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate with obtuse ends, apically rounded with well-developed ocular chamber. *Ascospores* 30–35×4–6 μm ($\bar{x}$=32.9×5.7 μm, n=30), overlapping 1–3-seriate, fusiform with acute ends, hyaline, 1-septate, constricted at the septa, slightly curved, smooth-walled, surrounded by distinct mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA slow growing, 20–24 mm diam. after 4 weeks at 25–30 °C, grey at the magins, dark grey at the centre; reverse dark grey to black; dense, irregular, raised to umbonate, dull, undulate edge with entire magin, velvety, slightly wrinkled, producing reddish pigments in agar.

Material examined: THAILAND, Chiang Mai, Chom Tong District, Doi Inthanon, on dead stem of *Thysanolaena maxima* Kuntze (*Poaceae*), 16 November 2010, R. Phookamsak RP0094 (MFLU 11–0214, **reference specimen designated here**), living culture, MFLUCC 11–0178, GenBank ITS: KP744466; LSU: KP744511.

Notes: *Psiloglonium colihuae* was combined in the genus *Psiloglonium* by Boehm et al. (2009a, b). The species is poorly known and lacks sequence data in GenBank. *Psiloglonium colihuae* is similar to *P. sasicola* in the size of the ascospores, but they differ in having acute ends in *P. colihuae*. *P. colihuae* has slightly larger ascospores (30–43×4–9.8 μm) than *P. sasicola* (N. Amano) E. Boehm & C.L. Schoch (25–32×5–8 μm). Our isolate has the same ascospore size range and acute ends as the type of *P. colihuae*. Therefore we treat our isolate as *P. colihuae* and designate our collection as a reference specimen (*sensu* Ariyawansa et al. 2014a). Based on multi-gene phylogenetic analyses, *P. colihuae* clusters with *P. araucanum* and a new species *P. multiseptatum* Phookamsak & K.D. Hyde, and is phylogenetically distinct from *P. sasicola*.

56. *Psiloglonium multiseptatum* Phookamsak & K.D. Hyde**, *sp. nov.***

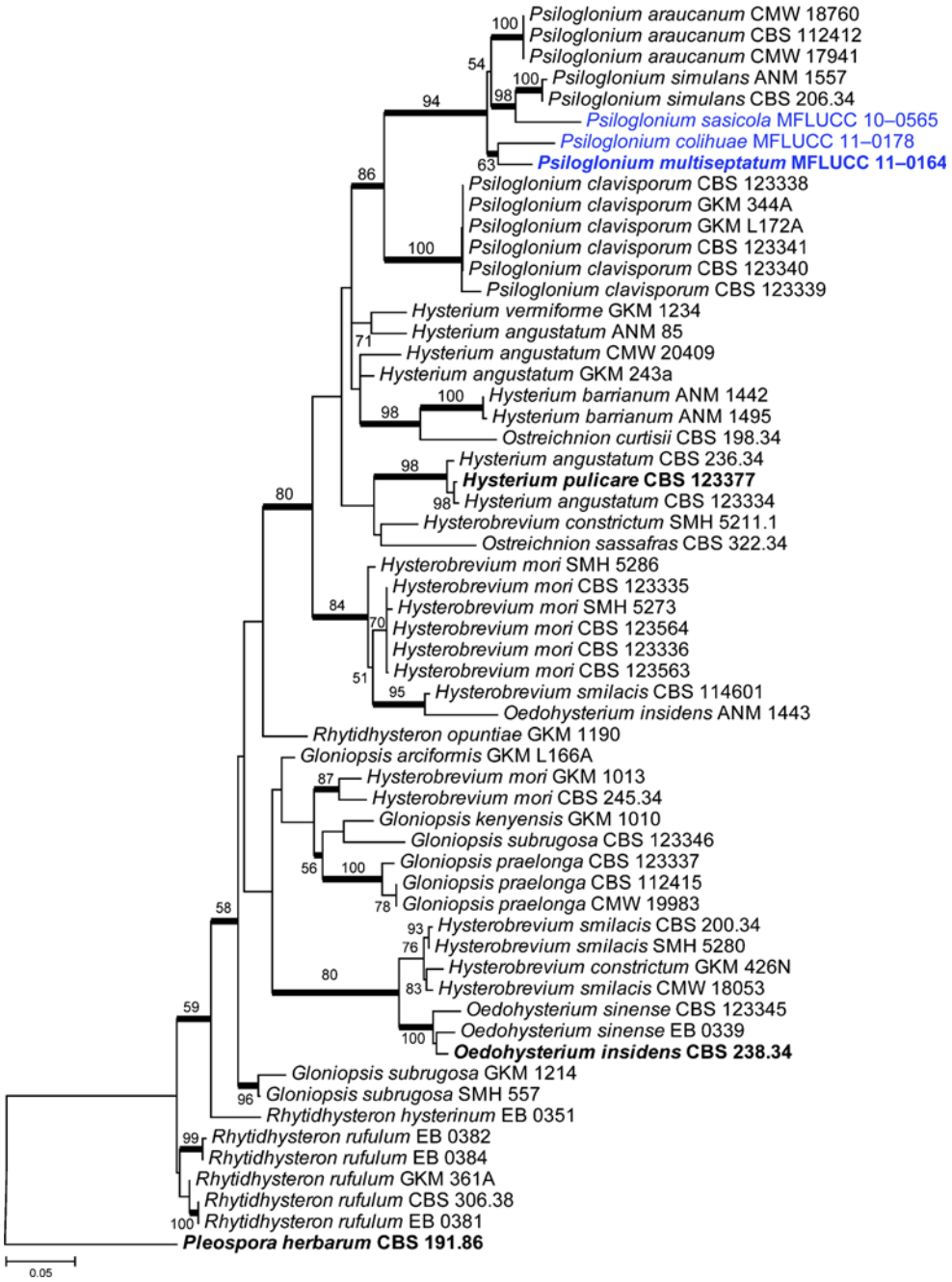


Fig. 82 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, TEF and *RPB2* sequence data. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Pleospora herbarum* CBS 191.86

Index Fungorum number: IF550931, *Facesoffungi number*: FoF00434; Fig. 84

Etymology: The specific epithet *multiseptatum* refers to the septation of the ascospores.

Holotypus: MFLU 11–0200

Saprobic on stem of *Thysanolaena maxima*. **Sexual morph** *Ascomata* 130–265 μm high, 450–1000 μm diam., hysterothecial, solitary to gregarious, scattered, superficial, elongate, cupulate to lenticular, or irregular, joined at the ridges, slightly straight, with central slit-like opening. *Peridium* 4–20 μm wide, thin-walled, of unequal thickness, thick at the base and sides, carbonaceous, composed of several layers of small, opaque, dark cells, arranged in *textura angularis* to *textura globulosa*. *Hamathecium* 0.5–2 μm wide, composed of dense, trabeculate, anastomosing, pseudoparaphyses, embedded in a hyaline to brown gelatinous matrix. *Asci* (86–)90–110(–118)×(19–)22–23(–27) μm ($\bar{x}$= 104.5×22.6 μm, n=25), 8-spored, bitunicate, fissitunicate, cy-

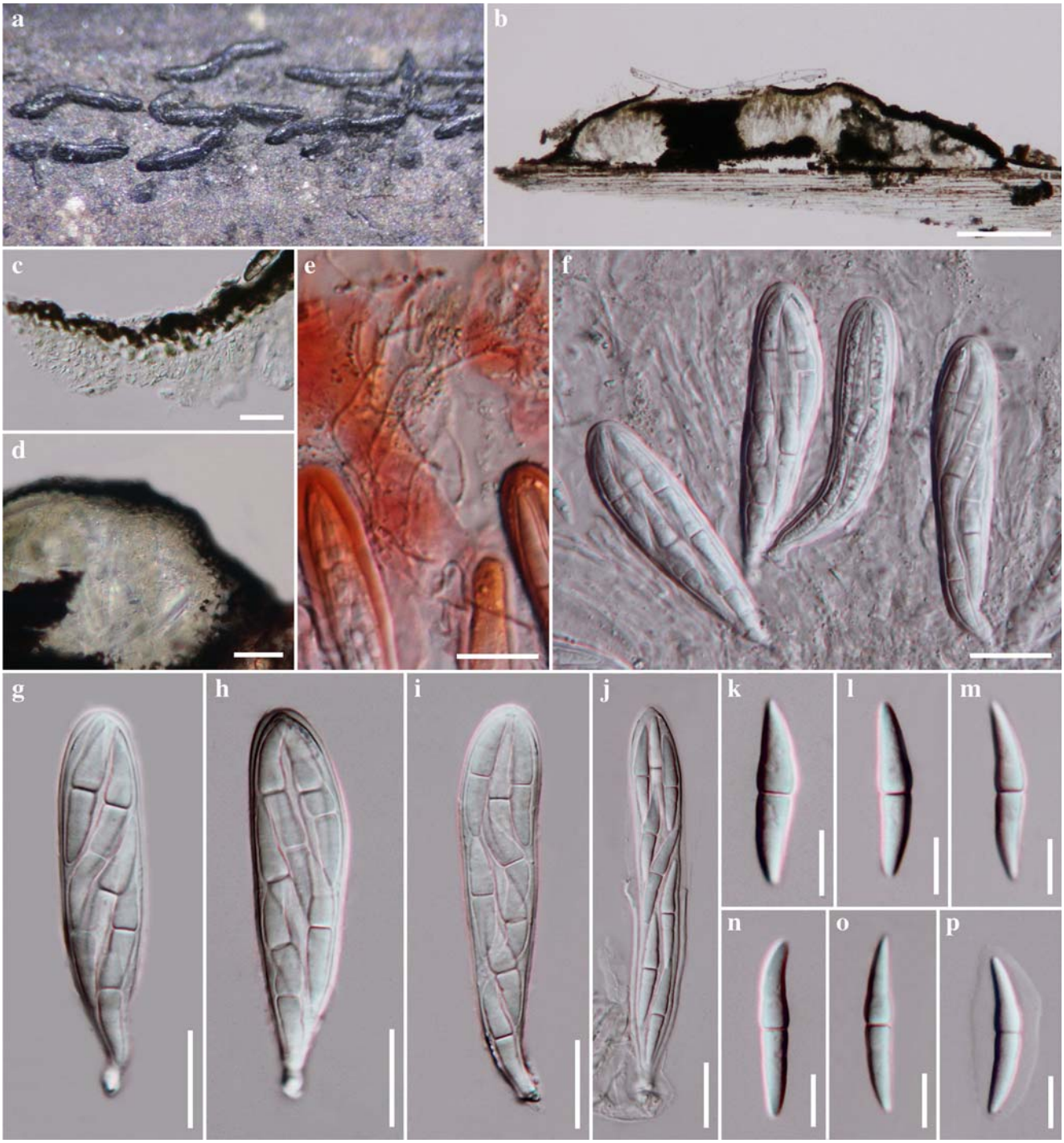


Fig. 83 ***Psiloglonium colihuae*** (MFLU 11–0214) **a** Hysterothecia black, irregular, elongate, lying on host surface. **b** Vertical section through hysterothecia. **c, d** Section through peridium. **e** Pseudoparaphyses stained in congo red reagent. **f** Asci embedded in pseudoparaphyses. **g–j** Asci. **k–p** Ascospores. Scale bars: b=200 μm, d, f–j=20 μm, c, e, k–p=10 μm

lindric-clavate to clavate, subsessile to short pedicellate with furcate pedicel, apically rounded, with indistinct ocular chamber, easily broken in external layer. *Ascospores* (38.5–)46–51(–53)×(6–)7–8(–9) μm ($\bar{x}$=47.6×7.6 μm, n=30), overlapping 2–4-seriate, elongated fusiform, with acute ends, hyaline, 5–7-septate, constricted at the septum, easily separated in to part ascospores, smooth-walled, surrounded by distinct mucilaginous sheath. **Asexual morph** Undetermined.

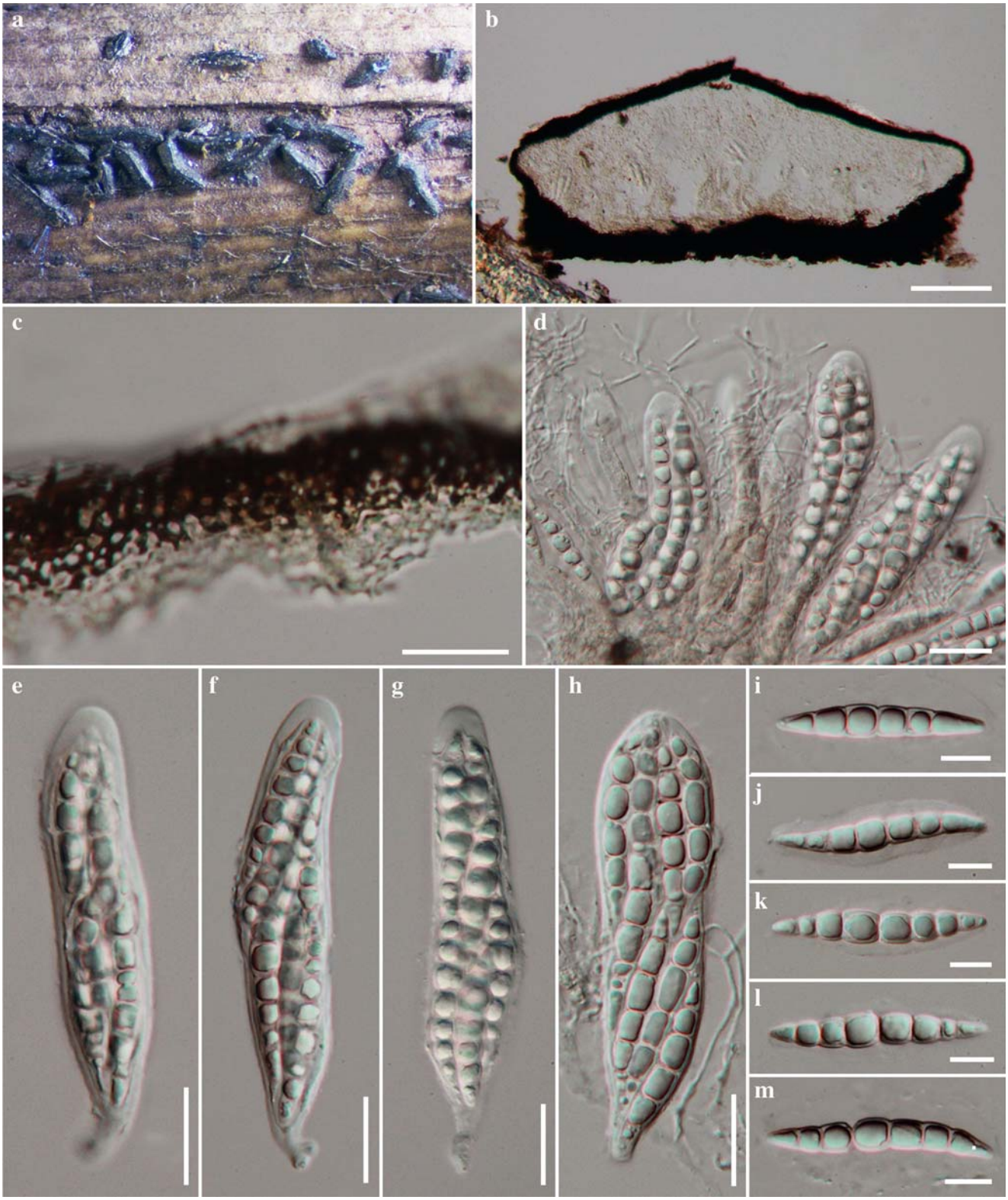


Fig. 84 ***Psiloglonium multiseptatum*** (**holotype**) **a** Hysterothecia on host surface **b** Vertical section through a hysterothecium **c** **P**eridium **d** Asci embedded in pseudoparaphyses **e–h** Asci. **i–m** Ascospores Scale bars: b=100 μm, c–h=20 μm, i–m=10 μm

Culture characters: Colonies on PDA slow growing, 10–15 mm diam. after 4 weeks at 25–30 °C, dark grey to dark greenish at the magins, yellowish in centre; reverse dark grey to black; dense, circular to slightly irregular, raised to low umbonate, dull, undulate edge with entire margin, felty, with hard small granules, standing or tufts of yellowish hyphae, producing dark brown pigments in agar.

Material examined: THAILAND, Chiang Mai Province, Chom Tong District, Doi Inthanon, on dead stem of *Thysanolaena maxima* Kuntze (*Poaceae*), 6 October 2010, R. Phookamsak RP0080 (MFLU 11–0200, **holotype**), ex-

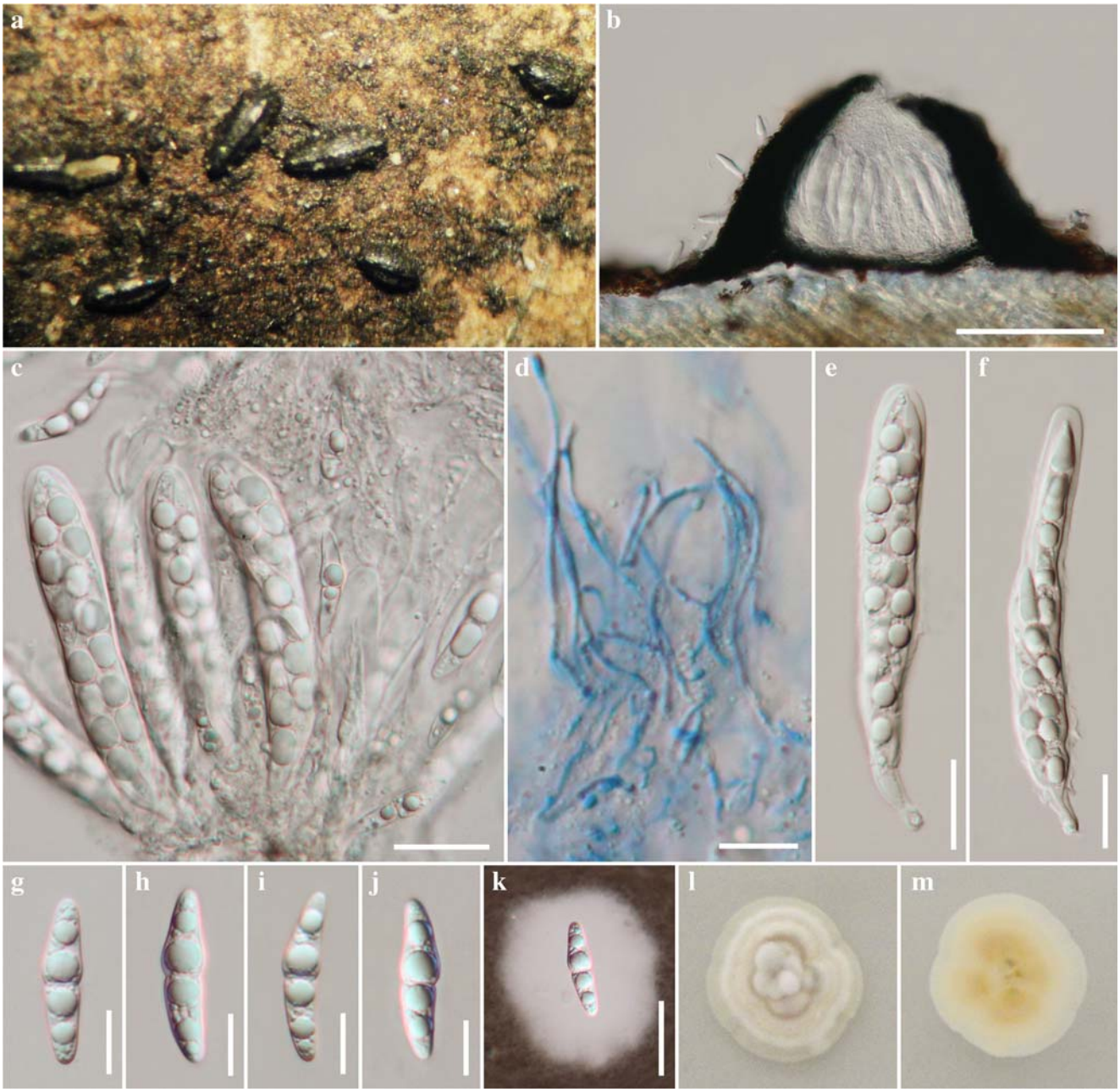


Fig. 85 ***Psiloglonium sasicola*** (MFLU 11–0159) **a** Black elongated ascomata lying on host surface **b** Section through ascoma **c** Asci embedded in pseudoparaphyses **d** Pseudoparaphyses stained by cotton blue **e, f** Asci **g–j** Ascospores **k** Ascospores stained in Indian ink **l–m** Culture characteristic. Scale bars: b=100 μm, c, e, f, k=20 μm, d, g-j=10 μm

type living culture, MFLUCC 11–0164; GenBank LSU: KP744512; SSU: KP753969.

Notes: *Psiloglonium multiseptatum* is introduced to accommodate a gloniella-like species which is similar to *Gloniella bambusae* Zogg and *G. normandina* Rehm in having transseptate ascospores, but differs in the size range. *Psiloglonium multiseptatum* has larger ascospores (46–51×7–8 μm) than *Gloniella bambusae* H. Zogg (30–35×5–8 μm) and *G. normandina* Rehm (22–25×3–3.5 μm) (Rehm 1912; Boehm 2009). Based on multi-gene phylogenetic analyses, *Psiloglonium multiseptatum* groups in a clade with *P. araucanum* and is placed in *Psiloglonium* and not *Gloniella*.

57. *Psiloglonium sasicola* (N. Amano) E. Boehm & C.L. Schoch

≡ *Glonium sasicola* N. Amano, Trans. Mycol. Soc. Japan 24(3): 287 (1983)

Index Fungorum number: IF515322, *Facesoffungi number*: FoF00433; Fig. 85

Saprobic on bamboo. **Sexual morph** *Ascomata* 130–180 μm high, 165–210 μm wide, hysterothecial, solitary to gregarious, scattered, superficial, dark, short to elongate, or irregular, rarely bifurcate, with central, slit-like opening. *Peridium* 20–40 μm wide, thick-walled, of unequal thickness, poorly developed at the base, slightly thick at sides, carbonaceous, opaque dark and glossy. *Hamathecium* 0.5–1.2 μm wide, composed of dense, trabeculate pseudoparaphyses, anastomosing, embedded in a hyaline to pale brown gelatinous matrix, slightly swollen at the apex. *Asci* (74–)80–105(–115)×13–15 μm ($\bar{x}$=92×14.3 μm, n=25), 8-spored, bitunicate, fissitunicate, cylindrical to cylindric-clavate, short pedicellate with knob-like pedicel, apically rounded with well-developed ocular chamber, easily broken in external layer. *Ascospores* (25–)27–30×6–7(–8) μm ($\bar{x}$=28.3×6.8 μm, n=30), overlapping 1–2-seriate, fusiform, with slightly roung ends, hyaline, 1-septate, constricted at the septa, individaully upper cell larger than lower cell, smooth-walled, with small and large guttules, surrounded by wide mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Colonies on MEA slow growing, reaching 30–35 mm diam. after 4 weeks at 25–30 °C, white to cream, or pale yellowish at the magins, pale yellowish at the centre, distinguished from the margin by white embossed hyphae with grey tufts in the centre; slightly radiating; dense, irregular, slightly raised to umbonate, dull with undulate edge, velvety to floccose, zonate in the centre at the lower part, reverse white cream at the margin, yellowish at the centre.

Material examined: THAILAND, Chiang Rai Province, Phan District, Poo Kaeng Waterfall, on dead branch of bamboo (*Bambusae*), 23 May 2010, R. Phookamsak RP0039 (MFLU 11–0159, **reference specimen designated here**), living culture, MFLUCC 10–0565; GenBank: ITS: KP744467; LSU: KP744513.

Notes: *Psiloglonium sasicola* was transferred to *Psiloglonium* by Boehm et al. (2009a, b) due to its didymosporous, fusiform hyaline, 1-septate ascospores with rounded ends, which are surrounded by gelatinous sheath (Boehm 2009; Boehm et al. 2009a, b). *Psiloglonium sasicola* is similar to *P. uspallatense* (Speg.) E. Boehm & C.L. Schoch and *P. ephedrae* (Henn.) E. Boehm & C.L. Schoch, but differs in the size of ascospores (Boehm 2009). Our collection is similar to *P. sasicola* and is from the same host bamboo. This isolate is treated as *P. sasicola* and is designated as a reference specimen (*sensu* Ariyawansa et al. 2014a). *P. sasicola* forms a robust clade in the phylogenetic tree with *P. simulans* (Fig. 82)

Jahnulales

58. *Aliquandostipite manochii* Sri-indr., Boonyuen, Suetrong, K.L. Pang & E.B.G. Jones, ***sp. nov.***

Index Fungorum number: IF550752, *Facesoffungi number*: FoF00493; Fig. 86

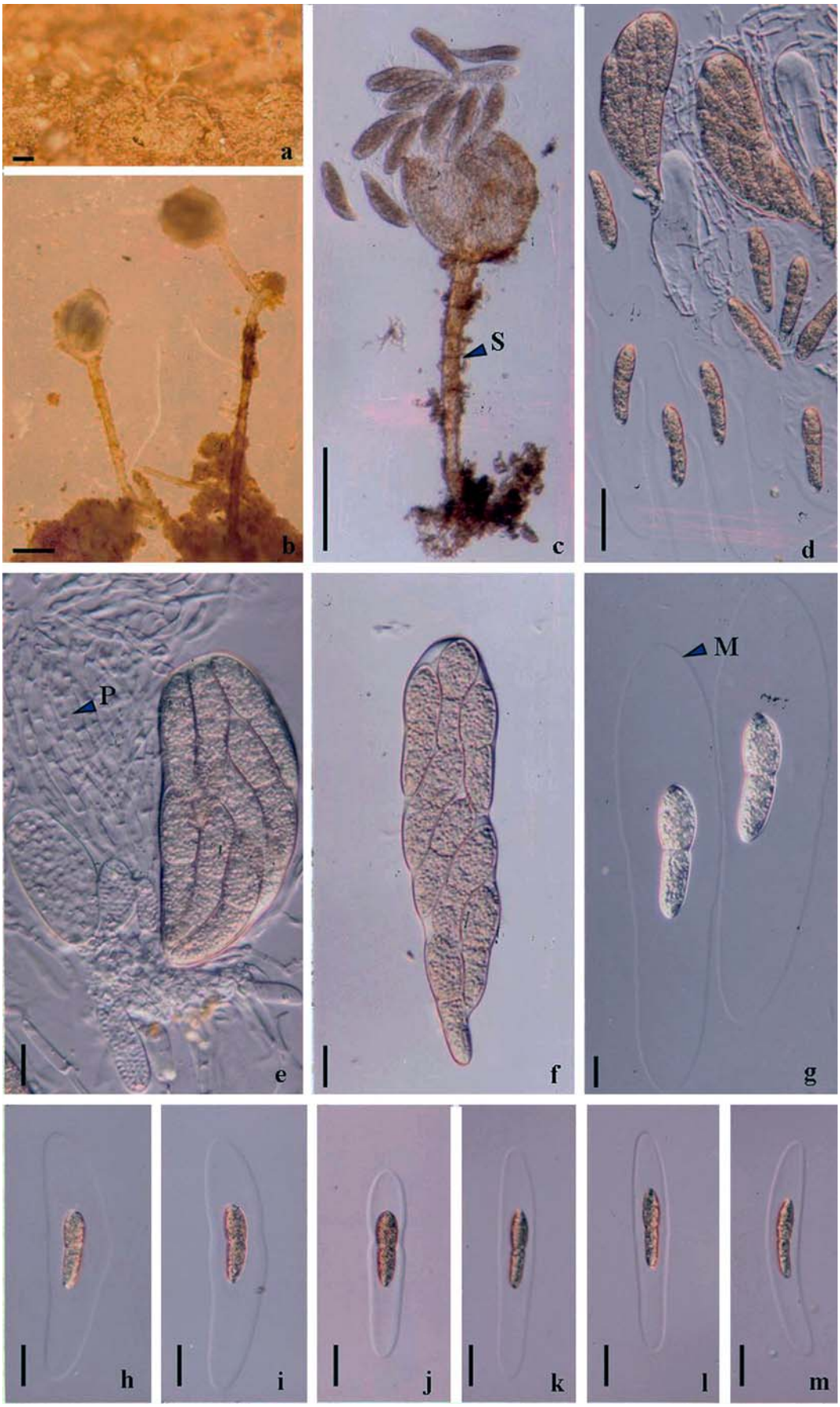
Etymology: "*manochii*" – in honour to Prof. Dr. Leka Manoch as her family name, a Thai distinguished mycologist and a co-chair, IMC10 steering committee, The 10th International Mycological Congress (IMC 2014).

Holotype: BBH 38816

Saprobic on dead wood. **Sexual morph** *Ascomata* 250–310 high×290–320 μm wide, globose to subglobose, gregarious, immersed, superficial with stalk (up to 500 μm long and 25–40 μm wide) or erumpent, shedding wood particles and becoming superficial with base remaining immersed, dark brown to black, coriaceous, ostiolate. Stalk septate 2.5–7.5 μm wide. *Peridium* Undetermined. *Hamathecium* comprising *ca* 2.5–7.5 μm diam., hypha-like, filamentous, hyaline, septate, pseudoparaphyses, unbranched between the asci, branching and anastomosing above. *Asci* 125–200×20–55 μm, 8–spored, obclavate, short pedicellate, bitunicate, fissitunicate, with an ocular chamber and a faint ring. *Ascospores* 50–80×10–17.5 μm, brown, biseriate, 1-septate, light brown, guttulate, ellipsoid–fusiform, minutely verruculose, constricted at the septum, surrounded by a wide mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Ascospores did not germinate on media

Material examined: THAILAND, Nakhon Ratchasima, Khao Yai National Park, Wang Champi Waterfall (Latitude: 14.7117, Longitude: 101.4117, 757 meters above sea level), on submerged wood of an unidentified tree, 3 April 2003, V. Sri-indrasutdhi, N. Boonyuen & S. Sivichai, BBH 38816 (**holotype**).


a
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◀ **Fig. 86** ***Aliquandostipite manochii*** **(holotype)**. **a-c** Immersed and superficial ascomata with septate stalk marked by arrow (S) in the substratum **d-f** Asci which are 8–spored, obclavate, pedicellate, bitunicate, fissitunicate, with an ocular chamber and a faint ring with pseudoparaphyses marked by arrow (P) **g-m** Ascospores with a broad mucilaginous sheath marked by arrow (M), brown, biseriate, 1-septate and ellipsoid-fusiform. Scale bars a=200 μm, b-c=100 μm, d=50 μm, e-f=20 μm, g=15 μm, h-m=30 μm

Notes: A genus in *Aliquandostipitaceae* (*Jahnulales*, *Dothideomycetes*) based on morphological observations as the species did not germinate on standard media. Our new species is morphologically similar to species of *Jahnula*; however, morphological features of *A. manochii* agree with species of *Aliquandostipite* as proposed by Inderbitzin et al. (2001) and Suetrong et al. (2011). It is characterized by the dimorphic ascomata, with a superficial stalk, and the arrangement of spores in the asci, and ascospores with a mucilaginous sheath or pad. Morphologically *A. manochii* is most similar to *A. khaoyaiensis* in having ascospores with a broad gelatinous sheath, but differs in having a branched and anastomosing hamathecium above of the asci, lacking arcicular crystals within the spores, and in ascospore size (Raja et al. 2005; Raja and Shearer 2007).

Lentitheciaceae

Lentitheciaceae was introduced by Zhang et al. (2012a, b) to accommodate massarina-like species in the suborder *Massarineae* (Zhang et al. 2009a, b, c, 2012a, b; Hyde et al. 2013). *Lentitheciaceae* recently included *Katumotoa*, *Keissleriella Tingoldiago*, *Setoseptoria* and *Lentithecium* and is typified by *Lentithecium fluviatile* (Zhang et al. 2012a, b; Hyde et al. 2013; Quaedvlieg et al 2013; Wijayawardene et al. 2014). *Lentitheciaceae* was reported as being saprobic on herbaceous and woody plants and producing coelomycetous asexual morphs. *Setoseptoria* was introduced for stagonospora-like or dendrophoma-like taxa (Quaedvlieg et al 2013). The phylogenetic tree is presented in Fig. 87.

60. *Keissleriella sparticola* Singtripop & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551011, *Facesoffungi number*: FoF00481, Fig. 88

Etymology: The species epithet refers to "*Spartium* sp." the host genus.

Holotypus: MFLU 14–0116

Saprobic on a dead branch of *Spartium junceum*. **Sexual morph** *Ascomata* 134–259 μm high × 130–260 μm diam. ($\bar{x}$= 180×182 μm, n=5), immersed in the host tissue, globose to subglobose, dark brown to black, round, dimidiate, ostiole central. *Ostiole* 47–84 μm high×69–88 μm diam. ($\bar{x}$=60× 81 μm, n=5), papillate, dark brown, smooth, with long, dark brown setae, with about 28–79 μm. *Peridium* 27–44 μm wide, thick, comprising 5–6 layers, outer layer comprising heavily pigmented, thick-walled, brown to dark brown cells of *textura angularis*, inner layer composed of hyaline, thin-walled cells of *textura angularis*. *Hamathecium* comprising numerous, 1.7–3.2 μm wide, filamentous, occasionally branched, septate, hyaline, pseudoparaphyses. *Asci* 104–123×17–23 μm ($\bar{x}$= 116×19 μm, n=7), 8-spored, bitunicate, broadly cylindrical, smooth-walled, with an ocular chamber. *Ascospores* 24–29 μm high×9–11 μm diam. ($\bar{x}$=27×10 μm, n=10), 2–4-overlapping seriate, oval to ellipsoid, with 2 layers, upper part

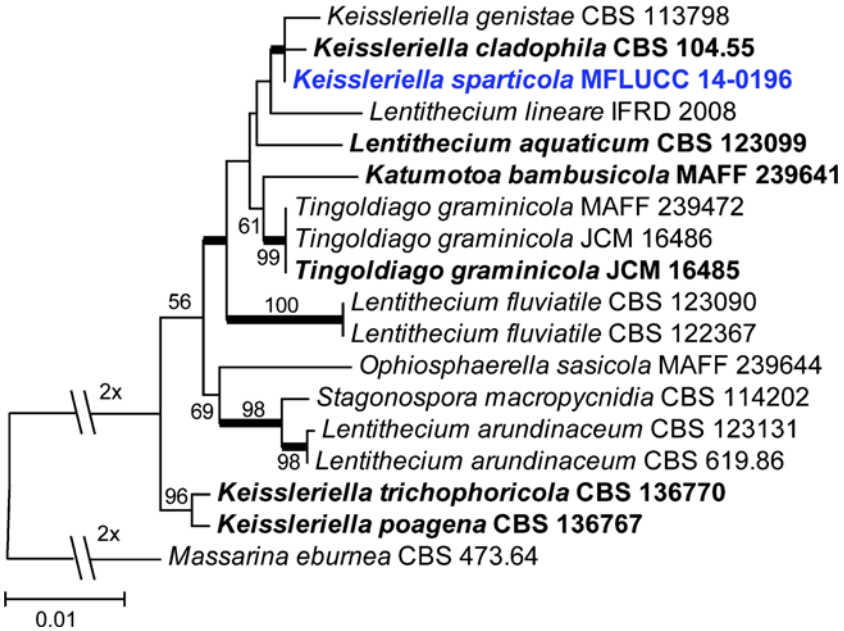


Fig. 87 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and SSU sequence data of *Lentitheciaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in bold. The ex-types (reference strains) are in bold; the new isolates are in blue. The tree is rooted with *Massarina eburnea* CBS 473.64

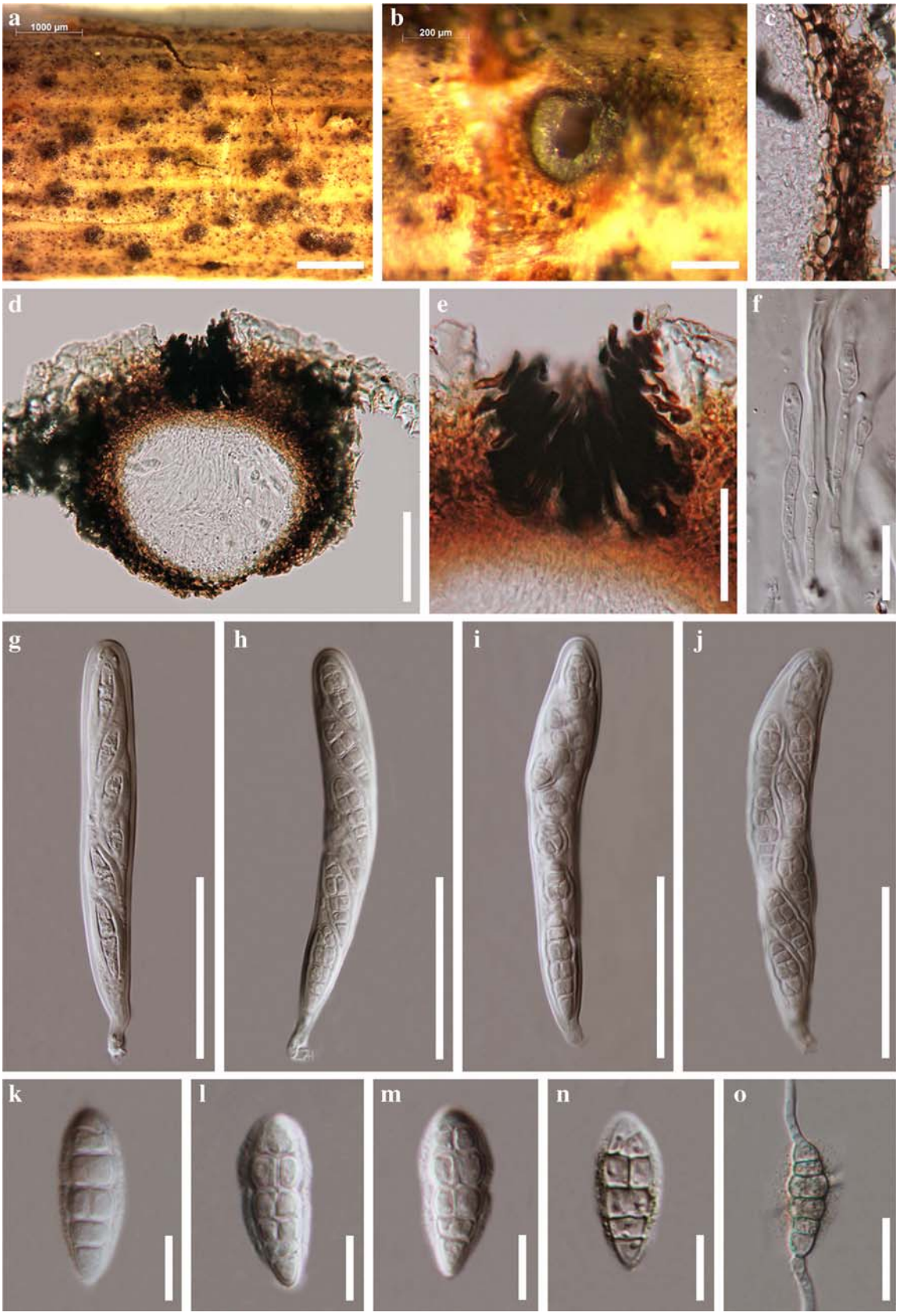


Fig. 88 ***Keissleriella sparticola*** **(holotype) a** Appearance of ascomata on host surface **b** Section of ascoma on host **c** Peridium **d** Vertical section through ascoma **e** Close up of periphyses **f** Pseudoparaphyses **g** Immature ascus **h–j** Mature asci **k–n** Mature ascospores **o** Germinating ascospore. Scale bars: a=1000 μm, b, d, e=200 μm, c=100 μm, g–j=50 μm, f, o=20 μm, k–n=10 μm

Table 2 Synopsis comparing *Keissleriella sparticola* and some related species

Fungus name	Host	Ascomata	Setae	Asci	Ascospore	Original reference
Keissleriella sparticola	On dead branch of *Spartium junceum*	Globose to subglobose, immersed, 134–259×130–260 *μm*	Brown to dark brown setae 28–79 *μm* long	Cylindrical 104–123×17–23 *μm*	Oval to ellipsoid, hyaline to pale yellow, 4–5-septate, with both cross and longitudinal septa, 24–29×9–11 *μm*	This study
K. cladophila	On dry twigs and branches of *Aesculus* spp., *Berberis* spp., *Genista* spp., *Salix* spp., *Sarcothamnus* spp., *Smilax* spp.,	Globose to sub-globose, immersed 300–450 diam.	Dark brown setae 30–45×3–4.5 *μm*	Cylindrical to clavate 70–125×9–12 *μm*	Ellipsoid, hyaline, 1–3-septate, 9–16×4–6 *μm*	Corbaz 1957
K. genistae	On dry twig of *Genista* spp., *Sarcothamnus* spp. (*Leguminosae*)	No data	No data	18–21×5–6 *μm*	Hyaline to brown, 1-septate	Müll & von Arx 1962
K. linearis	On dead stems of *Phragmites australis* (*Poaceae*)	Globose to subglobose, immersed or erumpent, 584–762×369–495 *μm*	Brown to dark brown setae 34–48 *μm* long	Cylindrical 117–124×14–19 *μm*	Ellipsoid to fusiform, hyaline, 1–3-septate, 32–42×8–10 *μm*	Dennis 1964
Lentithecium aquaticum	Submerged wood of *Fraxinus excelsior* (Oleaceae)	Immersed, 130-160×240–320 µm	Absent	Cylindrical 130-190 µm×17-23 µm	Broadly fusiform, hyaline, 1–3 septate, 25–30×8–12 µm	Ying Zhang et al. 2009

wider than the lower part, 4–5-septate, with 1–3 vertical septa, hyaline, becoming yellowish at maturity. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA slow growing, reaching 0.5–1 cm diam. after 1 week at 18 °C, later with dense mycelium, circular, margin smooth, white at first, pinkish-ash after 4 weeks, Hyphae thin, smooth-walled, branched septate, hyaline. Reverse similar.

Material examined: ITALY, Ravenna Province, Monticino, Brisighella, on dead branch of *Spartium junceum* L. (*Fabaceae*), 18 September 2013, E. Camporesi IT 990 (MFLU 14–0116, **holotype).** ex-type culture, MFLUCC 14–0196; GenBank LSU: KP639571.

Notes: *Keissleriella* was introduced by Höhnel (1919) and is typified by *K. aesculi* Sacc (≡ *Pyrenochaeta aesculi* Höhn.). The genus *Keissleriella* is characterized by black setae in the ostiolar canal and hyaline 1 to multi-septate ascospores (Barr 1990). Based on the phylogenetic tree (Fig. 87) the new species of *Keissleriella sparticola* has a close relationship with *Keissleriella cladophila*, *Keissleriella genistae*, *Lentithecium lineare* and *Lentithecium aquaticum*. However our new species differ from these species in host, ascomata, periphyses, asci and/or ascospore characters (Table 2).

Leptosphaeriaceae

The family *Leptosphaeriaceae* which belongs in the order *Pleosporales* was introduced by Barr (1987) and is typified by *Leptosphaeria* Ces. & De Not. (1863), while the familial status of the *Leptosphaeriaceae* is also supported by molecular phylogenetic studies (Schoch et al. 2009; Zhang et al. 2009a, b, c; Hyde et al. 2013). Zhang et al. (2012a, b) included only *Leptosphaeria* and *Neophaeosphaeria* in family *Leptosphaeriaceae*, while Hyde et al. (2013) accepted *Heterospora*, *Leptosphaeria*, *Neophaeosphaeria*, *Paraleptosphaeria*, *Plenodomus* and *Subplenodomus* based on combined analysis of LSU, SSU, RBP2 and TEF1 gene data. Members of this family are saprobes, hemibiotrophs or pathogens on plants, occurring in terrestrial and aquatic habitats (Hyde et al. 2013). *Camarosporium*, *Heterospora*, *Plenodomus* and *Subplenodomus* are accepted asexual morphs of *Leptosphaeriaceae* (de Gruyter et al. 2009; Hyde et al. 2013). The phylogenetic tree is presented in Fig. 89.

61. *Leptosphaeria doliolum* (Pers.) Ces. & De Not. Comm. Soc. crittog. Ital. **1**(4): 234 (1863)

Facesoffunginumber: FoF 00391; Fig. 90

Saprobic on decaying stem of *Urtica dioica* L. **Sexual morph** *Ascomata* 154–211 *μm* high×160–225 *μm* diam. ($\bar{x}$= 177×201 *μm*, *n*=6), superficial, semi-immersed at the base, solitary, scattered, globose to subglobose, apically conical, wider and flattened at the base, carbonaceous, glabrous, black,

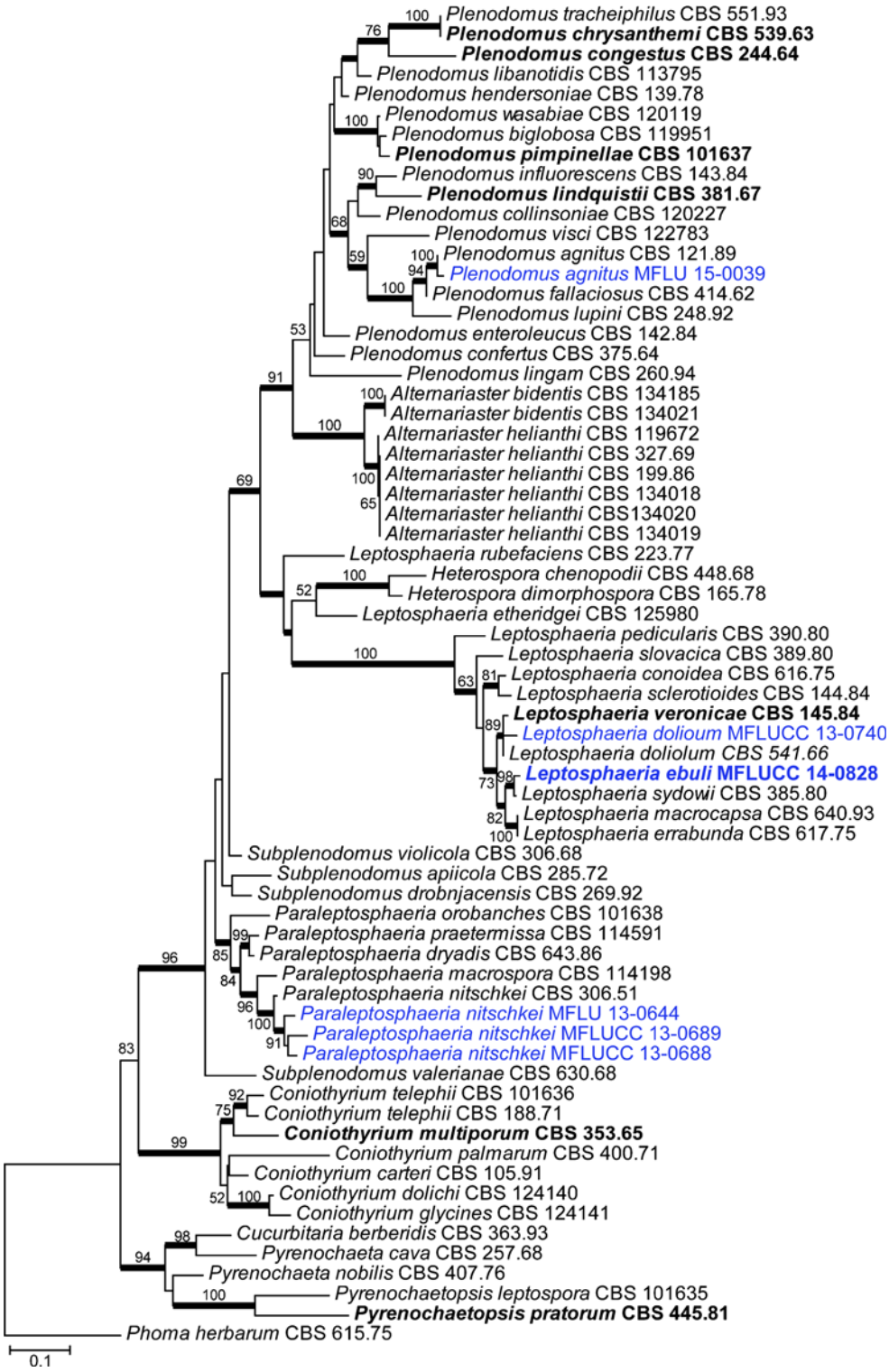


Fig. 89 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and ITS sequence data of *Leptosphaeriaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Phoma herbarum* CBS 615.75

ostiolate, with a shiny papilla. *Peridium* 24–39 μm, thick-walled, multi-layered, comprising cells of *textura angularis*; cells thick-walled at external layers, inner layer of thin-walled cells, surface heavily pigmented. *Hamathecium* comprising numerous, 1–2 μm wide, long cylindrical, cellular, branched, septate, hyaline, pseudoparaphyses, anastomosing above the

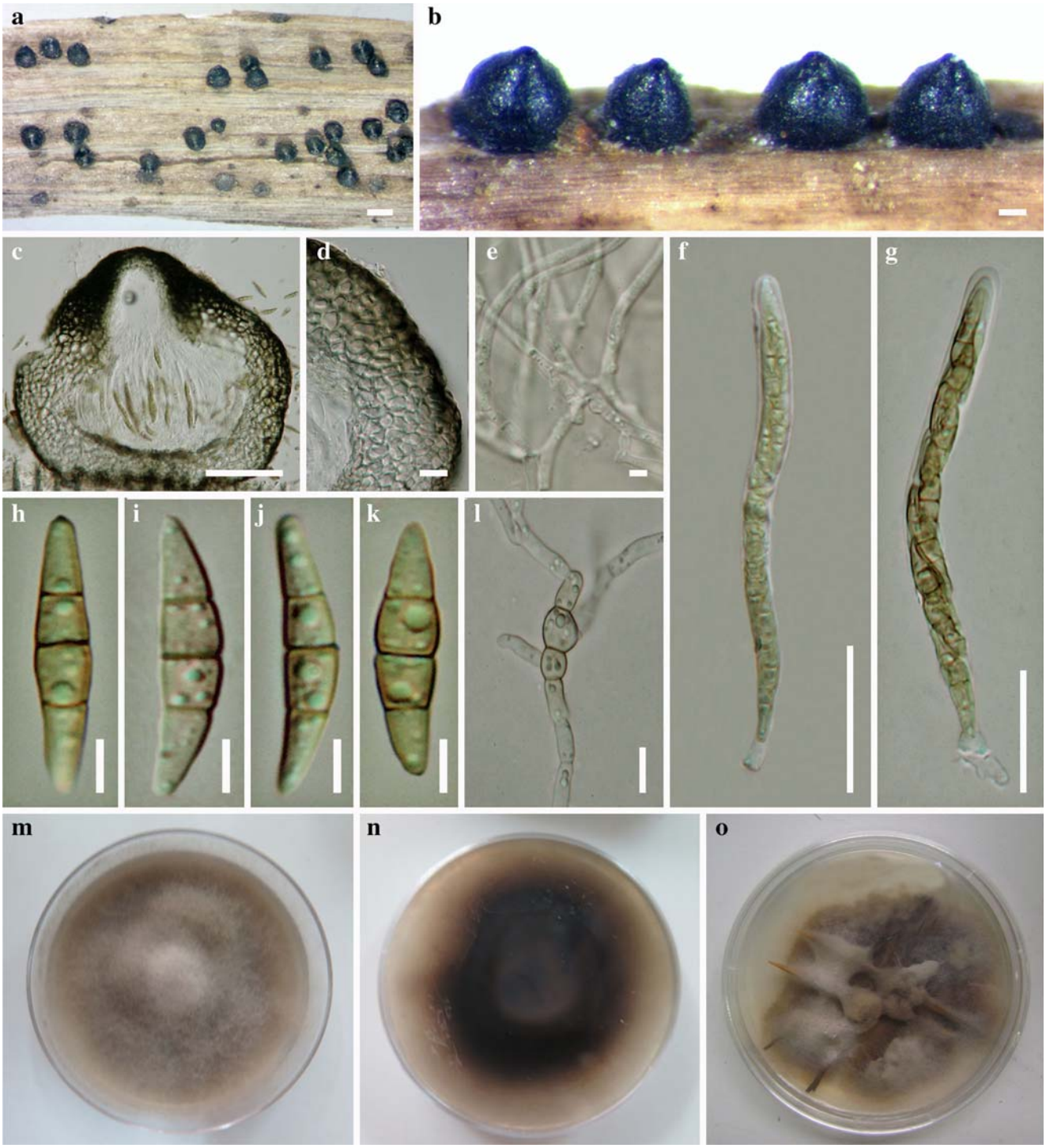


Fig. 90 ***Leptosphaeria doliolum*** (MFLU 14–0565). **a**, **b** Ascomata **c** Cross section of ascoma **d** Section the peridium **e** Pseudoparaphyses **f, g** Asci **h-k** Ascospores **l** Germinating spore **m**, **n** Culture. Scale bars: a=200 μm, b–c=20 μm, d=5 μm, e=2 μm, f–g=10 μm

asci. *Asci* 52–71×4–5 μm ($\bar{x}$=63×4 μm, n=15), 8-spored, bitunicate, fissitunicate, narrowly cylindrical, short pedicellate or apedicellate, rounded at the apex, with a small ocular chamber. *Ascospores* 15–19×2–3 μm ($\bar{x}$=18×3 μm, n=15), overlapping uni-seriate, 3-septate, straight or slightly curved, constricted at the septa, yellowish brown to brown, guttulate,

lacking a mucilaginous sheath, smooth-walled. **Asexual morph** Undetermined.

Culture characters: Ascospores germinate on MEA at 18 °C within 24 h and germ tubes produced from both ends of ascospores. Colonies on MEA fast growing, white-gray. Mycelium septate, branched, hyaline to light brown, and smooth.

Material examined: ITALY, Province of Forlì-Cesena [FC], Monte Fumaiolo, on stems of *Urtica dioica* L. (*Urticaceae*), 3 July 2013, E. Camporesi IT661 (MFLU 14–0565), living culture, MFLUCC 13–0740. GenBank ITS: KP729444; LSU: KP729445.

Notes: *Leptosphaeria* was introduced by Cesati and De Notaris (1863) and included 26 species, with *L. doliolum* (Pers.:Fr.) Ces. & De Not. selected as the lectotype species for the genus (Shearer et al. 1990). Confusion surrounding the type of *L. doliolum* has been discussed in Hyde et al. (2013). Due to the uncertainty of the placement of this genus, several authors have included it under different families, such as *Leptosphaeriaceae* (Barr 1987; Eriksson and Hawksworth 1991) or *Phaeosphaeriaceae* (Eriksson and Hawksworth 1986). Recent studies based on multi-gene analysis showed that *Leptosphaeria* clustered within the order *Pleosporales*, in the family *Leptosphaeriaceae*. Species of *Leptosphaeria* (including the type of *Leptosphaeriaceae*) and *Neophaeosphaeria* form a paraphyletic clade with moderate bootstrap support (Schoch et al. 2009; Zhang et al. 2012a, b). In our study we signify an additional collection for the type of *L. doliolum* to stabilise the placement of the genus in *Leptosphaeriaceae* which is morphologically and phylogenetically identical to the epitypified strain of *L. doliolum* (CBS 541.66).

61. *Leptosphaeria ebuli* Jayasiri, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550958, *Facesoffunginumber*: FoF: 00454; Fig. 91

Etymology: In reference to its occurrence on *Sambucus ebulus*

Holotype: MFLU 14–0820

Saprobic on dead stem of *Sambucus ebulus*. **Sexual morph** *Ascomata* 226–396×241–251 μm (=300×241 μm, *n*=10), solitary or scattered, initially immersed, becoming erumpent to near superficial, globose to subglobose, broadly or narrowly conical, coriaceous, smooth-walled, ostiolate. *Ostiole* usually broadly papillate, darkened at the base, *Peridium* 24–26 μm (=45 μm, *n*=20) wide, comprising two types of cells, outer cells of 1–2 layers of heavily pigmented cells of *textura angularis*, inner layer composed of small, light brown to hyaline cells of *textura angularis*. Hamathecium of septate, long, hyaline, cellular *pseudoparaphyses*, embedded in gelatinous matrix between and above the asci. *Asci* 80–109×8–9 μm (=100×9 μm, *n*=20), 8-spored, bitunicate, fissitunicate, clavate to sub-cylindrical, with a short, broad pedicel, thickened and rounded at apex with a distinct ocular chamber surrounded by a large, distinct, apical ring. *Ascospores* 23–28×4–5 μm ($\bar{x}$=25×5.8 μm, *n*=40), biseriate to overlapping tri-seriate, ellipsoidal with broadly rounded ends, hyaline to light brown when immature, becoming brown to chestnut brown when mature, 3-septate, smooth-walled, lacking a sheath. **Asexual morph** Undetermined.

Culture characters: Ascospores germinated on MEA at 18 °C within 24 h and germ tubes were produced from both ends of ascospores. Colonies on MEA were growing fast (within one week 2 cm diam. colony), white-gray.

Material examined: ITALY, Province of Monte Fumaiolo (FC), on stems of *Sambucus ebulus* L. (*Adoxaceae*), 23 July 2014, E. Camporesi (MFLU 14–0820, **holotype**); ex-type living cultures, MFLUCC 14–0828; GenBank ITS: KP744446; LSU: KP744488; SSU: KP753954.

Notes: *Notes*: Multi-gene phylogenetic analysis (Fig. 89) indicated that *Leptosphaeria ebuli* forms a distinct clade sister to *Leptosphaeria sydowii* clade (BS support 96 %) whichis known as an asexual morph (de Gruyter et al. 2012).The morphological characters of *L. ebuli* is fit with the generic concept of *Leptosphaeria* in having superficial ascomata with a shiny papilla, multi-layered peridium comprising cells of *textura angularis*, cellular pseudoparaphyses and fissitunicate, narrowly cylindrical asci bearing multi septate, yellowish-brown to brown ascospores but differ from the generic type of *L. doliolum* in the shape of the ascomata (globose to subglobose versus conical), width of the ostiole (narrow versus broad) ostiole pore and the size of the ascospores (25× 5.8 μm versus 18×3 μm). Hence we introduced *Leptosphaeria ebuli* in *Leptosphaeria* as new species based on both molecular data coupled with morphology.

62. *Paraleptosphaeria nitschkei* (Rehm ex G. Winter) De-Gruyter et al. Stud. Mycol.**75**: 20 (2012)

Facesoffunginumber: FoF00442; Figs. 92, 93

Saprobic on dead stems of *Petasites* sp. **Sexual morph** *Ascomata* (296–)328–362×(406–)420–423 μm ($\bar{x}$=329×416 μm, *n*=5), superficial, solitary or scattered, subglobose to obpyriform, dark brown, without subiculum covering host. *Ostiolar* neck protruding. *Peridium* (38–)45–56(–64) μm wide, brown to dark brown, comprising dark brown cells of *textura angularis*. *Hamathecium* comprising 0.5–1 μm wide, cylindrical to filiform, pseudoparaphyses. *Asci* (80–)97–102(–107)×9–10 μm ($\bar{x}$=98×9 μm, *n*=10), 8-spored, bitunicate, cylindric-clavate, slightly curved, smooth-walled, apically rounded, short pedicellate, with an ocular chamber (ca. 1–1.5 μm wide). *Ascospores* 27–29(–34)×4.5–6 μm ($\bar{x}$=29×5 μm, *n*=10), 1–2-seriate, overlapping in the ascus, fusiform to inequilateral, hyaline, 3-euseptate, constricted at medium septum, widest at the middle and tapering towards narrow

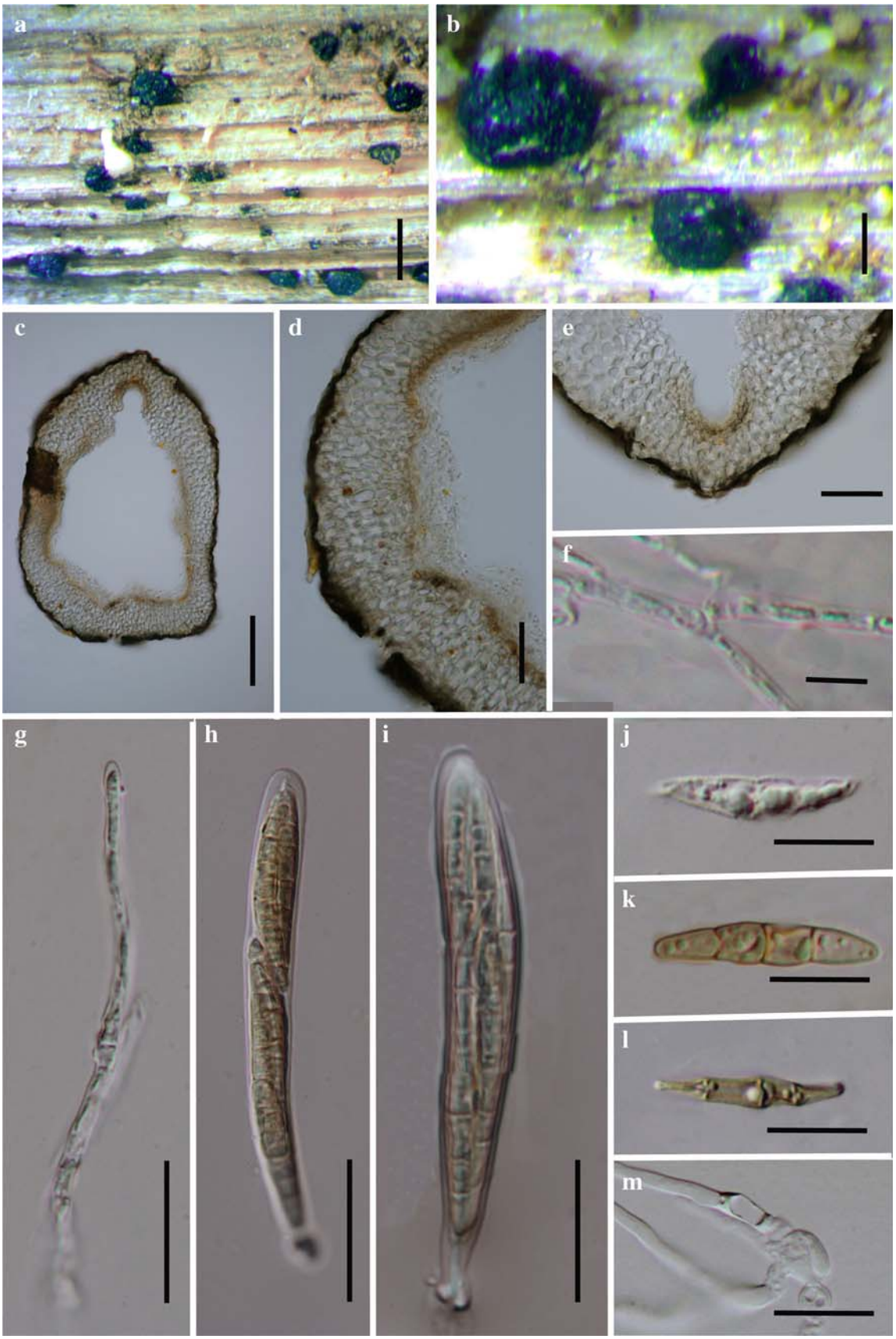
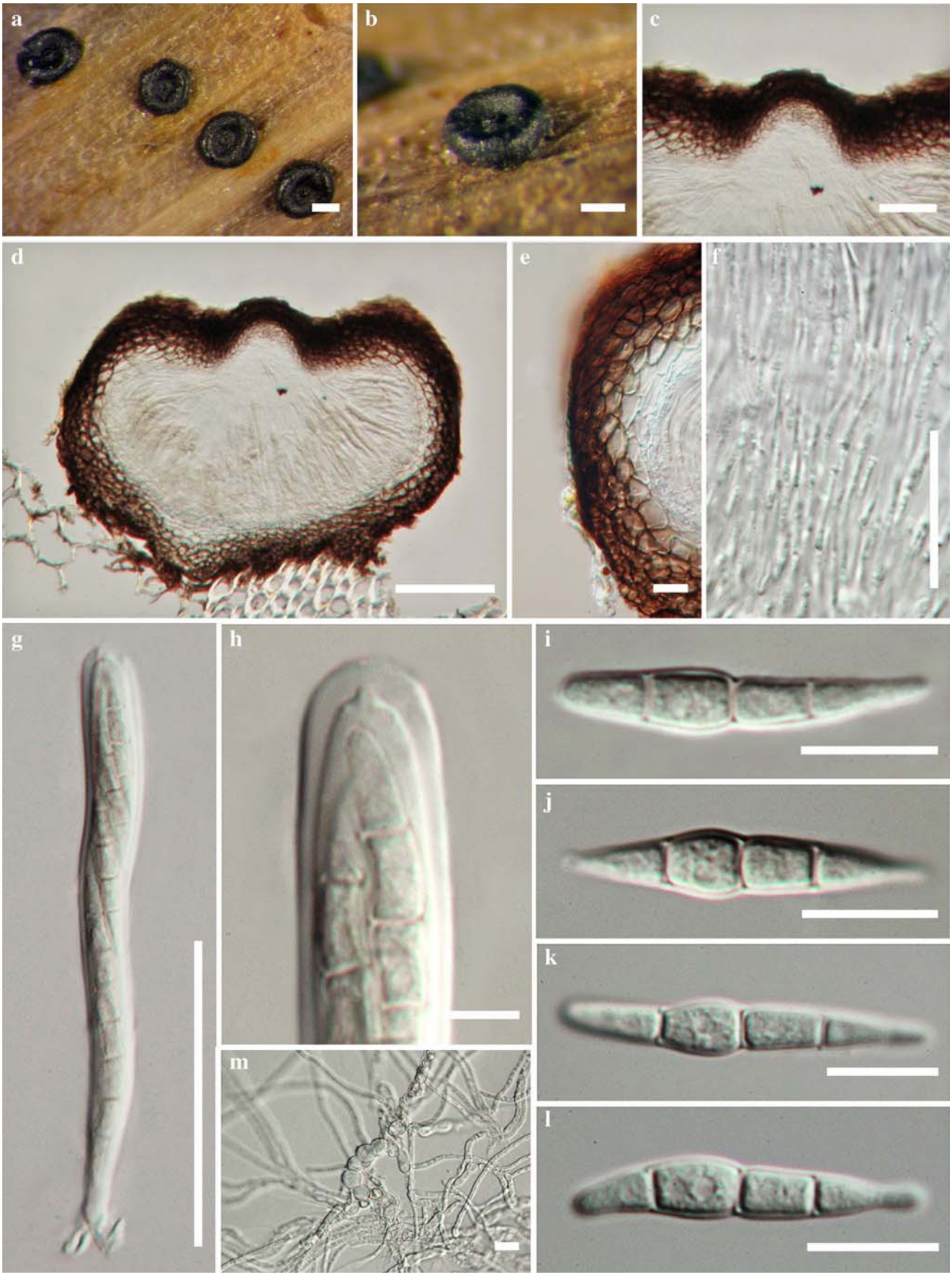


Fig. 91 ***Leptosphaeria ebuli*** **(holotype). a, b** Ascomata **c** Section through the ascoma **d** Peridium **e** Pseudoparaphyses **f** Immature ascus **g, h** Mature asci **j-l** Ascospores. Scale bars: a=500 μm, b=100 μm, c=100 μm, d, f–h=30 μm, e=10 μm, i–l=10 μm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◀ **Fig. 92** ***Paraleptosphaeria nitschkei*** (MFLU 14–0021) **a**, **b** Ascomata **c** Cross section of ascoma **d** Peridium **e** Ostiole **f** Pseudoparaphyses **g**, **h** Asci **i**–**l** Ascospores. Scale bars: a=500 μm, b–c=100 μm, d–e=20 μm, f=2 μm, g–h=20 μm, i–l=5 μm

ends, straight or slightly curved, thick and smooth-walled. **Asexual morph** Coelomycete. *Conidiomata* 435–455(–475)×(276–)300–330 μm ($\bar{x}$=455×305 μm, *n*=5), pycnidial, globose to subglobose, solitary, *peridium* 30–35(–38) μm, thick-walled, scleroplectenchymatous. *Conidiogenous cells* 3–4×5–6 μm, phialidic. *Conidia* 1.5–2×(–12)15–20 μm, hyaline, aseptate, cylindrical to filiform. Undetermined.

Cultural characteristics: *Ascospores* germinating on MEA within 48 hours at 18 °C and germ tubes produced from both ends. *Colonies* growing on MEA, reaching 20 mm diam. after 7 days at room temperature, flat, margin crenated, olivaceous brown.

Material examined: ITALY, Province of Forlì-Cesena [FC], Passo la Calla, Santa Sofia, on stems of *Petasites* sp. (*Asteraceae*), 14 July 2012, E. Camporesi IT563 (MFLU 14–0021, **reference specimen designated here**), living culture, MFLUCC 13-0688; GenBank ITS: KR025860; LSU: KR025864. ITALY, Province of Forlì-Cesena (FC), Monte Falco, on decaying grass stems of *Petasites* sp., 21 May 2013, E. Camporesi IT648 (MFLU 13–0644), DNA was extracted from the fruiting body), GenBank ITS: KP729446; LSU: KP729447.

Notes: *Paraleptosphaeria* is typified by *Paraleptosphaeria nitschkei* (Rehm ex G. Winter) De-Gruyter et al. Munk (1957) recognized *Leptosphaeria* section *Para-Leptosphaeria*, an invalid taxon, as a heterogeneous group. The section was differentiated from *Eu-Leptosphaeria*, which included the generic type species *Leptosphaeria doliolum*. *Leptosphaeria nitschkei* was considered a typical representative of section *Eu-Leptosphaeria* (Müller and von Arx 1950). Gruyter et al. (2013) introduced

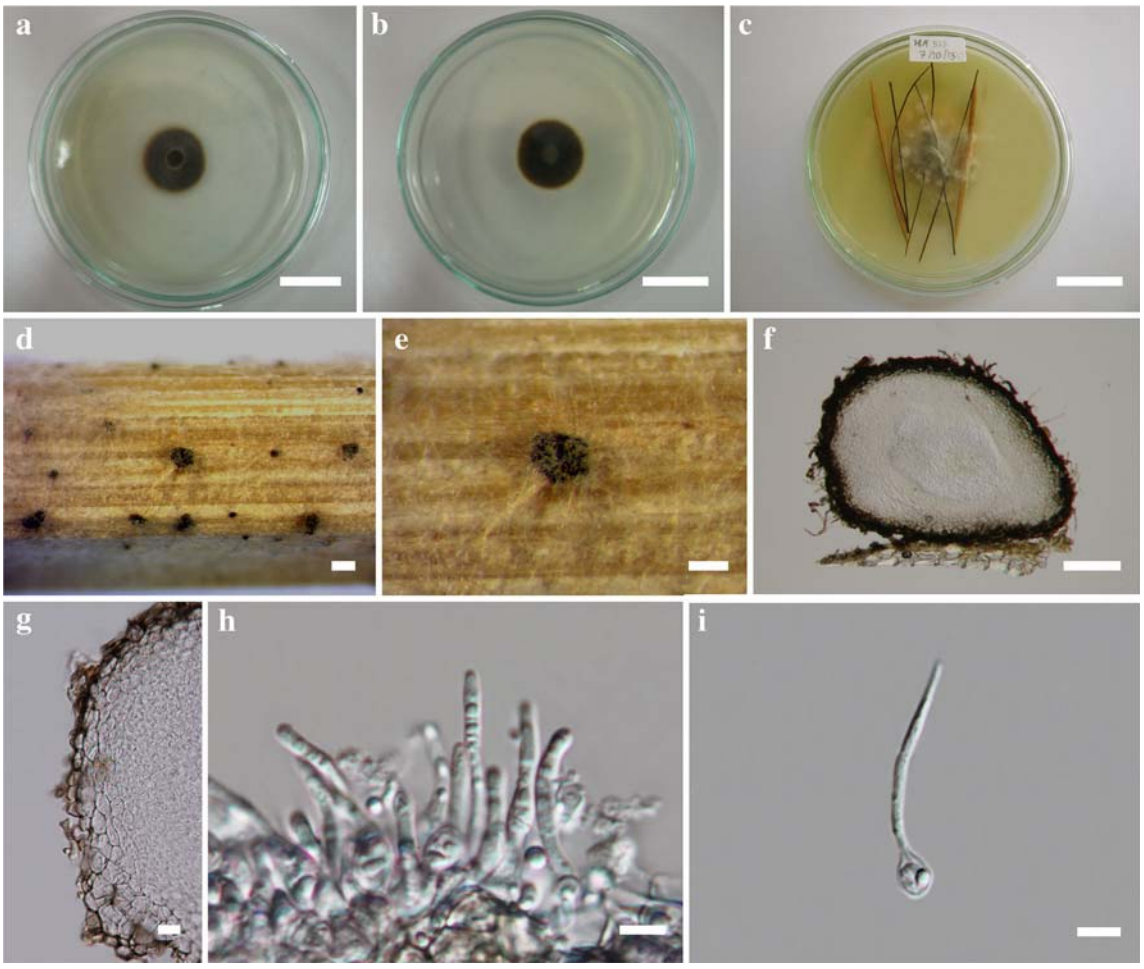


Fig. 93 ***Paraleptosphaeria nitschkei*** - Asexual morph (MFLUCC 13–0688) **a, b** Colonies on MEA media. **c** Asexual test on WA media **d, e** Conidiomata forming on substrate **f** Section through of conidiomata. **g** Peridium wall. **h-i** Conidiogenous cell and conidia. Scale bars: a-c=2 cm, d-e=200 μm, f=100 μm, g=10 μm, h-i=5 μm

Paraleptosphaeria to accommodate *Leptosphaeria nitschkei* and its relatives. The putative strain of *Paraleptosphaeria nitschkei* (holotype) clustered with our newly collected strains from Italy. *Paraleptosphaeria nitschkei* was originally described from Austria, whereas our specimen is from grass stems of *Petasites* sp. in Italy. Even though the morphology and the molecular data of our Italy collection show 100 % identity to the putatively named *Paraleptosphaeria nitschkei*, it would be unwise to epitypify this species with the Italy collection as they are from different continents. We therefore designate our collection as a reference specimen of *P. nitschkei* so that further work on these taxa can be carried out.

63. *Plenodomus agnitus* (Desm.) Gruyter et al., Stud. Mycol. 75: 21 (2012)

Facesoffungi number: FoF00411; Fig. 94
Basionym: *Sphaeria agnita* Desm., Annls Sci. Nat., Bot., sér. 2 15: 18 (1841)
≡*Leptosphaeria agnita* (Desm.) Ces. & De Not., Comm. Soc. crittog. Ital. 1(4): 236 (1863)

Saprobic on dead stems of *Eupatorium cannabinum*. **Sexual morph** *Ascomata* 137–250 *μm* high, 235–453 *μm* diam., solitary, scattered, or in small groups of 1–3, semi-immersed, subglobose to ovoid, with a flattened base, smooth, easily removed from host substrate, black. *Ostiole* papillate, black. *Peridium* 37–107 *μm* ($\bar{x}$=71 *μm*, *n*=10) wide, composed of three layers, externally with a 5–14 *μm* thick layer of dark brown to black, opaque cells, central layer composed of hyaline, small, thick-walled cells of *textura angularis*, inner layer composed of pale brown, *textura prismatica*. *Hamathecium* comprising 1–3 *μm* wide, dense, hyaline, broad, septate, cellular pseudoparaphyses, branching above asci and embedded in gelatinous matrix. *Asci* 66–115×7–10 *μm* ($\bar{x}$=94×9 *μm*, *n*=20), 8-spored, bitunicate, cylindric-subclavate, with a short, furcate pedicel, rounded at the apex. *Ascospores* 26–32×3–6 *μm* ($\bar{x}$=29×4 *μm*, *n*=40), overlapping uniseriate, narrowly fusoid with sharp to narrowly rounded ends, 6–8-septate, constricted at third or fourth septum, upper third or fourth cell enlarged, pale yellowish-ash, smooth-walled. **Asexual morph** Undetermined.

Material examined: GERMANY, Senckenberganlage 25, D-60325 Frankfurt (Main), on dead stem of *Eupatorium cannabinum* L. (*Asteraceae*), 13 November 2013, H.A. Ariyawansa (MFLU 15-0039, **reference specimen designated here**). The DNA was extracted from fruiting body. GenBank ITS: KP744459; LSU: KP744504.

Notes: *Leptosphaeria agnita* was transferred to *Plenodomus agnitus* by de Gruyter et al. (2013) based on the sequence data. The putative strain of *Plenodomus agnitus* (CBS 121.89) clustered with our new collection from Germany, on dead stem of *Eupatorium cannabinum*. Saccardo (1883) originally described

Fig. 94 ***Plenodomus agnitus*** (MFLU 15-0039) **a, b** Ascomata on host substrate **c** Vertical section of ascoma **d** Close up of the peridium **e** Cellular pseudoparaphyses **f, g** Asci **h** Ascus in Melzer's reagent **i** Ascospores in the ascus **j–l** Ascospores. Scale bars: a=1 cm, b=500 *μm*, c=100 *μm*, d=50 *μm*, e–h=20 *μm*, i–l=10 *μm*

Plenodomus agnitus as *Leptosphaeria agnita* and mentioned the different hosts including dry stems of *Eupatorium cannabinum* in France, Germany, Britain, Italy and Netherlands. The ascomata, size of asci and ascospores are typical of *P. agnitus* (Saccardo 1883) and the molecular data is identical to the putatively named CBS 121.89 strain. We therefore designate our collection as a reference specimen (*sensu* Ariyawansa et al. 2014a) of *P. agnitus* to stabilize the application of this name.

Lophiostomataceae

The family *Lophiostomataceae* was established by Nitschke (1869) and is characterized by slit-like ostiolar opening on a laterally compressed papilla, mostly clavate asci, 1- to several-septate and hyaline to dark brown ascospores with terminal appendages or mucilaginous sheaths. (Chesters and Bell 1970; Holm and Holm 1988; Zhang et al. 2012a, b). The genera *Lophiostoma*, *Misturatosphaeria* and *Tumularia* are presently accepted in *Lophiostomataceae* (Hirayama and Tanaka 2011; Zhang et al. 2009a, b, c, 2012a, b; Hyde et al. 2013). The phylogenetic tree is presented in Fig. 95.

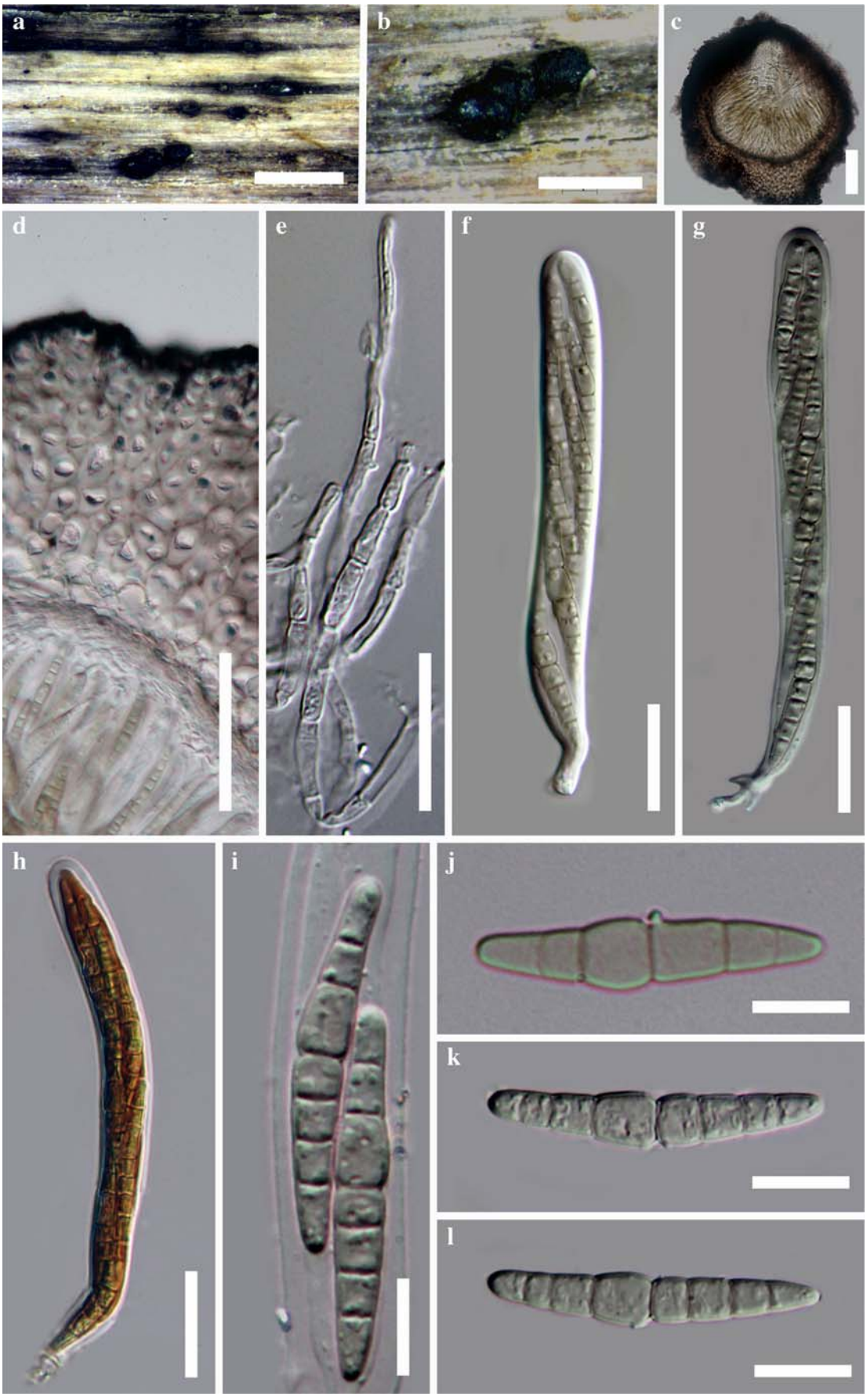
64. *Lophiostoma pseudodictyosporium* Qing Tian, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550887, *Facesoffungi number*: FoF: 00403; Fig. 96

Etymology: In reference to the dictyosporous conidia similarity of the taxon to *Dictyosporium*.

Holotypus: MFLU 14–0737

Saprobic under periderm or semi-immersed in woody plant substrates *Colonies* growing on dead branch of *Spartium junceum*. *Conidiomata* pycnidial, on the upper surface of stem, (130–)155–180 *μm* high×(145–)160–195 *μm* diam. ($\bar{x}$=165×180 *μm*, *n*=10), solitary, scattered, superficial, globose to subglobose, black. *Peridium* thin at the apex, base and sides 12–15 *μm* ($\bar{x}$=13.5 *μm*, *n*=7), a single layer, composed of brown to black thin-walled cells of *textura angularis*. *Conidiogenous cells* (2–)3–4.5 *μm* broad ($\bar{x}$=3.5 *μm*, *n*=10), holoblastic, integrated, smooth, brown, producing a branched conidium at the tip, cup-shaped or doliiform. *Conidia* (8–)10–15 *μm* diam. × 12–26(–32) *μm* high ($\bar{x}$=12.5×23.5 *μm*, *n*=10), uniformly medium brown, complanate, dictyosporous conidia, regularly consisting of 6–8 rows of cells, each rows comprising 5–7 cells, 3–3.5 *μm* wide.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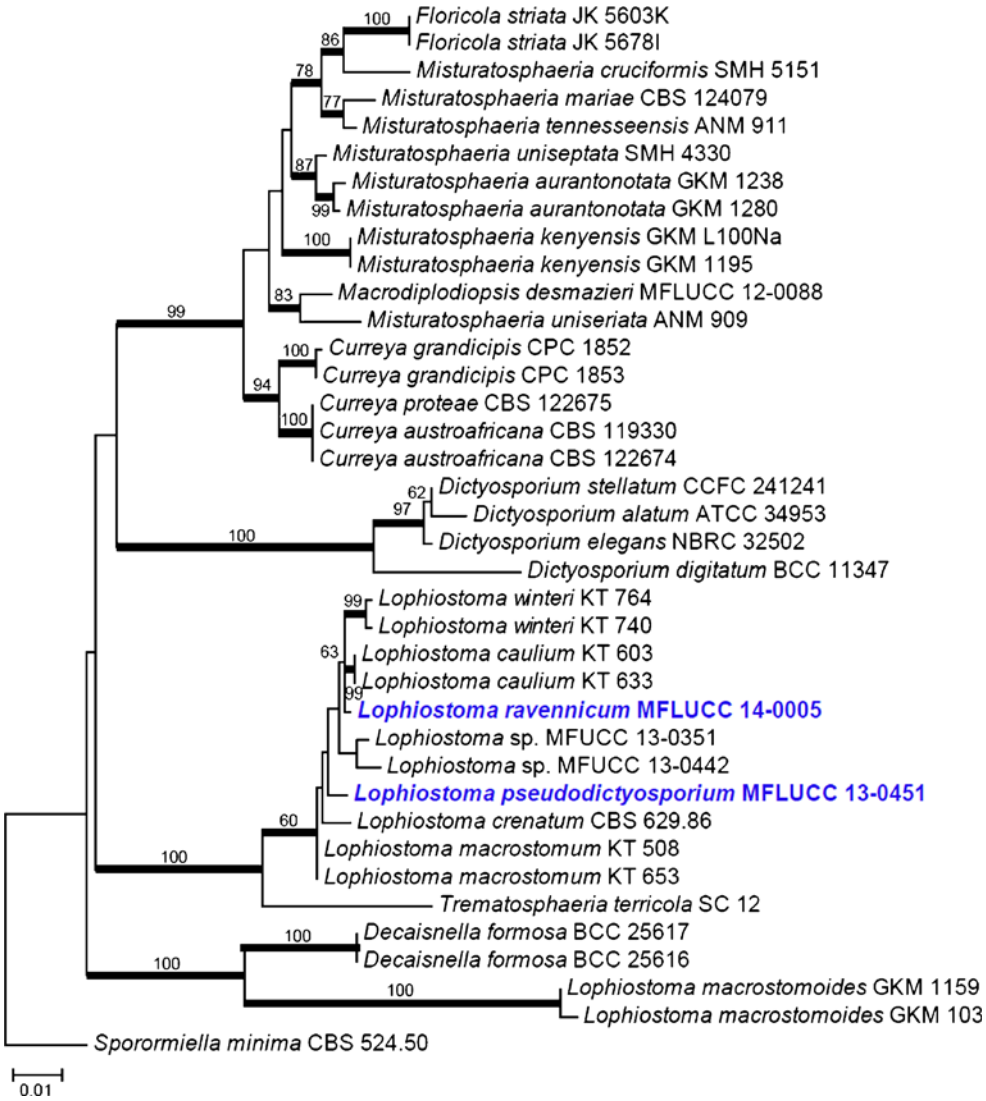


Fig. 95 Phylogram generated from Maximum likelihood (RAxML) analysis based on LSU sequence data of *Lophiostomataceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Sporormiella minima* CBS 524.50

Culture characters: Conidia germinating on PDA within 24 h and germ tubes arising from both ends. Colonies growing slowly on PDA, reaching a diam. of 1 cm after 30 days at 16 °C, velvety, radiating towards the edge. Mycelium initially hyaline and light pink at the margin, after 30 days, dense, filamentous, reverse black, pigments produced.

Material examined: ITALY, Province of Forlì-Cesena [FC], Fiumicello, Premilcuore, on stem of *Spartium junceum* (*Fabaceae*), 6 March 2013, E. Camporesi (MFLU 14–0737, **holotype**); ex-type living culture, MFLUCC 13–0451. GenBank ITS: KR025858; LSU: KR025862.

Notes: *Lophiostoma* is a morphologically well-studied genus (Barr 1990; Chesters and Bell 1970; Holm and Holm 1988; Hyde et al. 2013; Mugambi and Huhndorf 2009; Yuan and Zhao 1994; Zhang et al. 2012a, b). *Lophiostoma* was introduced by Cesati and De Notaris (1863), while Tanaka and Harada (2003a) typified *L. macrostomum* which was characterized by immersed to erumpent ascomata, with a cylindrical or crest-like papilla and slit-like ostiole; this has been regarded as a prominent morphological character of *Lophiostoma macrostomum* (Chesters and Bell 1970; Holm and Holm 1988). Combined gene analysis of LSU and SSU sequence data indicated *Lophiostoma* to be polyphyletic, grouping into two monophyletic clades (Zhang et al. 2009a, b, c; Suetrong et al. 2009). The asexual morph of *Lophiostoma* has rarely been reported. In this study, we introduce an asexual morph taxon, *Lophiostoma pseudodictyosporium*, which is shown to be related to *Lophiostoma* based on analysis of LSU gene sequence data. *Lophistoma dictyosporium* is morphologically similar with the species of *Dictyosporium*, both having brown hand-like conidia. In *Dictyosporium* the conidia form directly on mycelia, while in *Lophiostoma pseudodictyosporium* the conidia form in pycnidia. In the phylogenetic analysis they clustered into different families, therefore, we place the new species, *Lophiostoma pseudodictyosporium* in *Lophiostoma*, *Lophiostomataceae*.

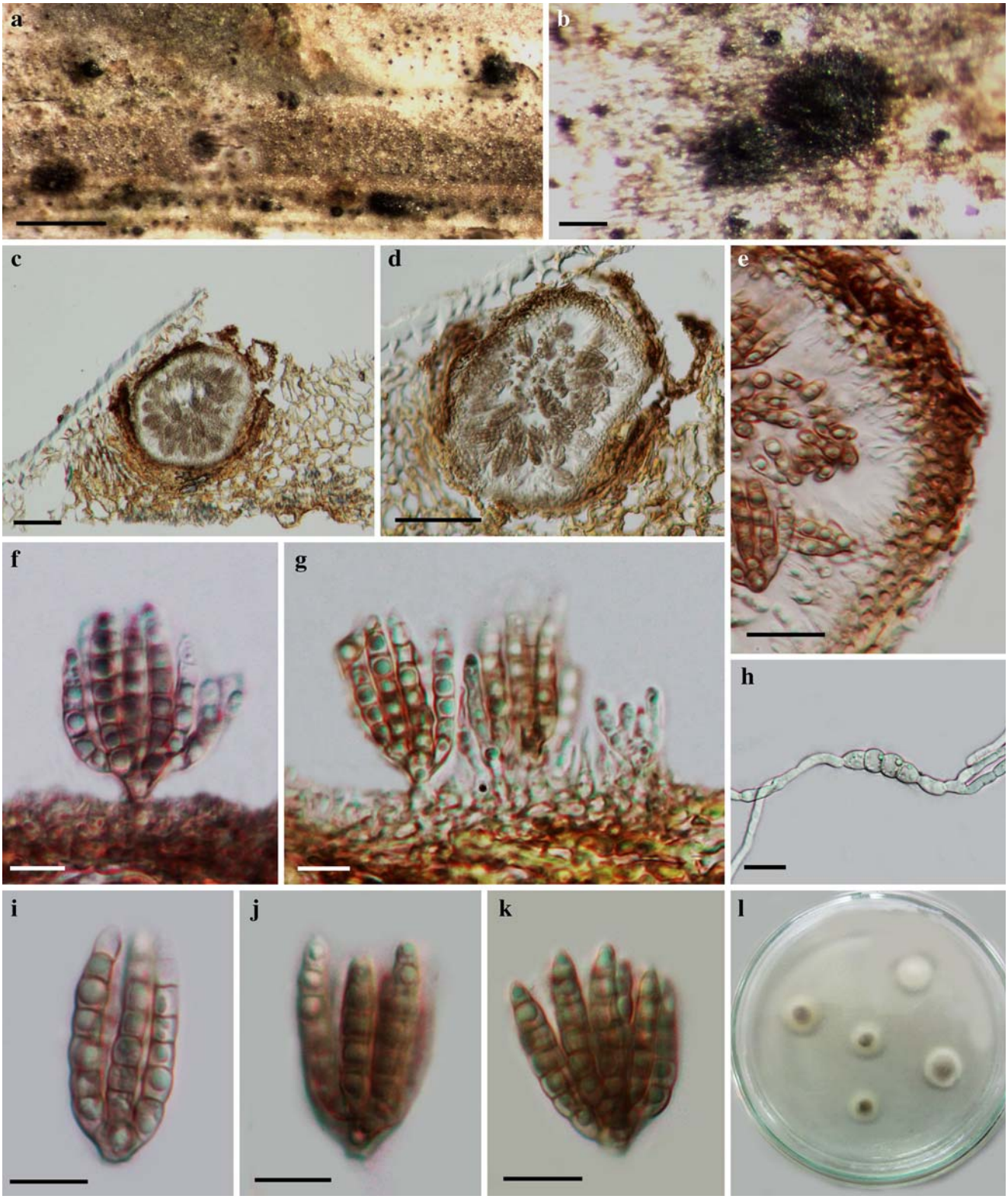


Fig. 96 ***Lophiostoma pseudodictyosporium*** (**holotype**) **a** Specimen material **b** Black conidiomata on the host **c–e** Vertical section of conidioma **f–g** Conidiogenous cells and developing conidia **h** Germinating ascospore **i–k** Conidia **l** Colony on PDA from above. Scale bars: a=500 μm, b=100 μm, c–d=50 μm, e, h=20 μm, f–g, i–k=10 μm

65. ***Lophiostoma ravennicum*** Tibpromma, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550884, *Facesoffungi number*: FoF00389; Fig. 97

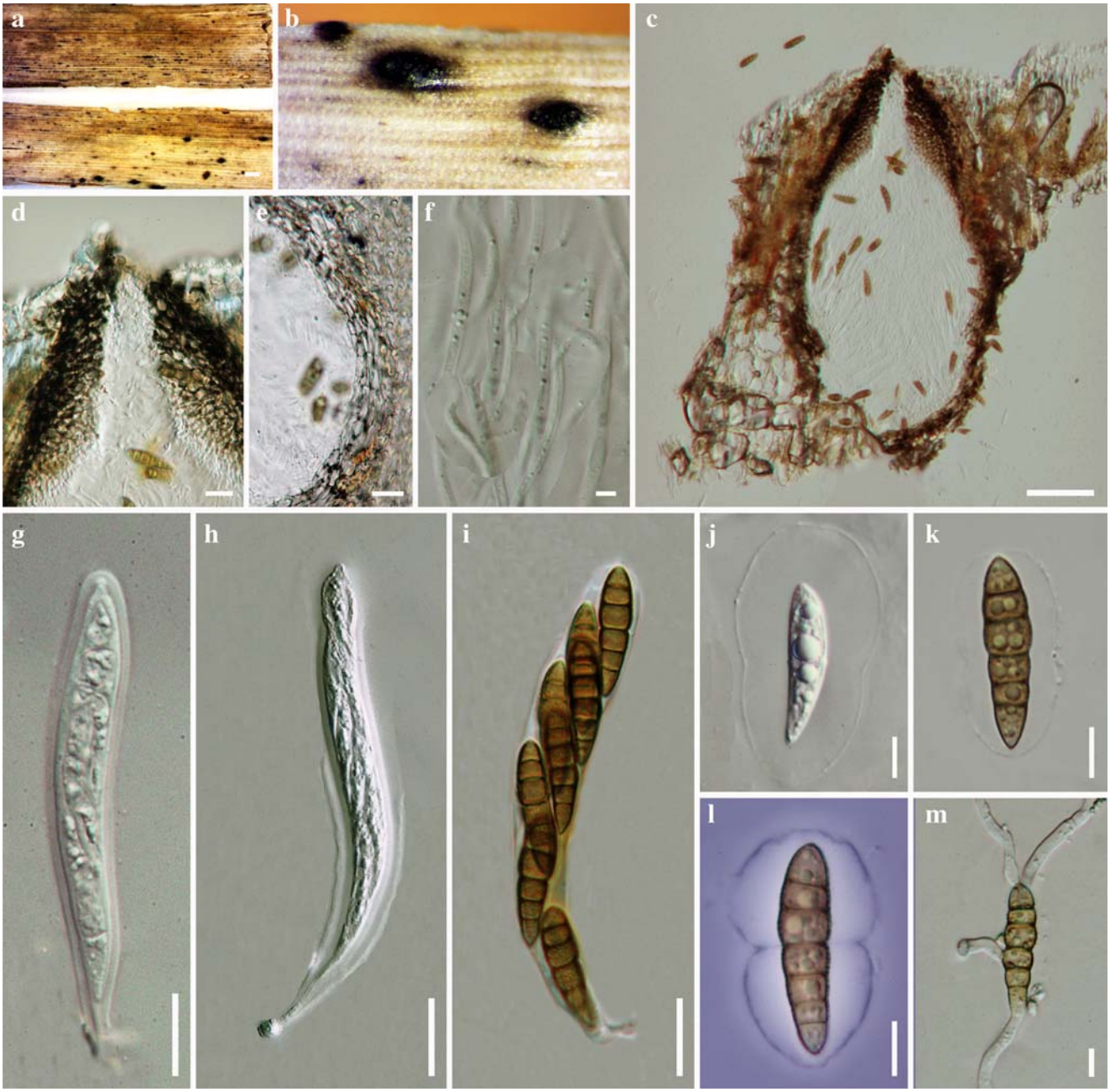


Fig. 97 ***Lophiostoma ravennicum*** **(holotype) a, b** Ascomata **c** Cross section of ascoma **d** Ostiole **e** Peridium **f** Pseudoparaphyses **g–i** Asci. **j–l** Ascospores **m** Germinating ascospore. Scale bars: a=500 μm, b=100 μm, c=50 μm, d-e=10 μm, f=2 μm, g-i=10 μm, j-m=5 μm

Etymology: Refers to the name of the province in Italy where the fungus was collected

Holotype: MFLU 14–0692

Saprobic on decaying grass stems of *Juncus* sp. **Sexual morph** *Ascomata* 211–282 μm high×121–187 μm diam. ($\bar{x}$= 244×158 μm, n=5), superficial, solitary, scattered, black, globose to subglobose, not easy to remove from host, neck long, black. *Peridium* 10–27 μm, 1-layered, composed of small, light brown to dark brown, thin-walled cells of *textura angularis. Hamathecium* comprising numerous, 1.1–1.9 μm wide, long cellular, septate, hyaline, pseudoparaphyses, branching above the asci. *Asci* 55–70×9–11 μm ($\bar{x}$=64× 10 μm, n=10), 8-spored, bitunicate, fissitunicate, narrowly cylindrical, short pedicellate or apedicellate, apically rounded,

with an ocular chamber. *Ascospores* 18–21×4–6 μm ($\bar{x}$=19×5 μm, *n*=15), 1–2-seriate, brown, ellipsoidal-fusiform, narrowly fusoid with rounded ends, or fusiform, usually 6-septate, the cells above central septum often broader than the lower ones, with mucilaginous sheath, smooth-walled. **Asexual morph** Undetermined.

Material examined: ITALY, Ravenna Province, Marina Romea, on stems of *Juncus* sp. (*Juncaceae*), 28 November 2013, E. Camporesi IT 1544 (MFLU 14–0692, **holotype**), ex-type living culture, MFLUCC 14–0005; GenBank ITS: KP698413; LSU: KP698414; SSU: KP698415.

Notes: The molecular data confirms that our strain groups within the genus *Lophiostoma* (Fig. 95). *Lophiostoma ravennicum* however, differs in having ellipsoidal-fusiform, usually 6-septate ascospores, with thick mucilaginous sheath and forms an individual lineage in the phylogenetic tree (Fig. 95).

Lophiotremataceae

The family *Lophiotremataceae* was established by Hirayama and Tanaka (2011) with *Lophiotrema* as the type for lophiostomatoid taxa distinguished from *Lophiostoma*, it forms a well-supported monophyletic group on the dendrogram (Zhang et al. 2009b; Hirayama and Tanaka 2011; Hyde et al. 2013).

66. *Lophiotrema eburnoides* Kaz. Tanaka, A. Hashim. & K. Hiray., ***sp. nov.***

Index Fungorum number: IF551065, *Facesoffunginumber*: FoF 00495; Fig. 98

Etymology: In reference to the ascospore similarity of the taxon to *Massarina eburnea*.

Holotype: HHUF 30079

Saprobic on *Vitis coignetiae*. **Sexual morph** *Ascomata* 240–300 μm high, 150–300 μm diam., scattered, immersed, erumpent at the beak, subglobose in section. *Neck* 40–50 μm high, composed of carbonaceous, black, thick-walled cells, without clypeus, with a slit-like ostiole and periphyses. *Peridium* 5–10 μm thick, composed of 2–4 layers of polygonal to elongate, thin-walled cells (3.5–5×2–3 μm). *Hamathecium* numerous, trabeculate, 1–2 μm wide, septate, branched and anastomosed. *Asci* (125–)138–175×15–20 μm ($\bar{x}$=150×17.9 μm, *n*=27), 8-spored, numerous, bitunicate, fissitunicate, cylindrical, with a short stipe (8–18 μm long, $\bar{x}$=14.1 μm, *n*=19), apically rounded with an ocular chamber. *Ascospores* 30–37×(6–)7–9 μm ($\bar{x}$=32.9×8.3 μm, *n*=42), L/W 3.5–4.5 ($\bar{x}$=4, *n*=42), broadly fusiform with rounded ends, mostly straight to slightly curved, 1(–3)-septate, with a primary septum nearly median (0.49–0.54, $\bar{x}$=0.51, *n*=42), hyaline, smooth-walled, guttulate when young, with an entire gelatinous sheath (3–15 μm wide at sides). **Asexual morph** Undetermined.

Culture characters: Colonies on PDA, pale mouse grey with an entire olivaceous margin; on MEA, olivaceous with white margin, with hyaline exudates on the surface; on CMA, grey olivaceous in the centre. On rice straw agar (RSA: Tanaka and Harada 2003a), numerous ascomata are produced on the surface of rice straw. Ascospores are slightly wider than those on natural specimen, 31–36×9–11 μm ($\bar{x}$=33.2×9.7 μm, *n*=20), L/W 2.9–3.8 ($\bar{x}$=3.4, *n*=20), with a submedian primary septum (0.51–0.56; $\bar{x}$=0.53, *n*=20).

Material examined: JAPAN, Hokkaido, Notsuke, Bekkai, Keneyaushubetsu-river, near Mannen-bashi, on vines of *Vitis coignetiae* (*Vitaceae*), 8 September 2003, K. Tanaka & S. Hatakeyama, KT 1424 (HHUF 30079, **holotype** designated here); ex-type living cultures, JCM 17826, MAFF 242970. GenBank ITS: LC001709; LSU: LC001707; SSU: LC001706.

Notes: Morphological features of this species, such as compressed beak of ascomata with a slit ostiole, cylindrical asci with a short stipe (mostly less than 15 μm long), and 1(–3)-septate ascospores with an entire sheath, agree with the generic concept of the genus *Lophiotrema* recently circumscribed (Hirayama and Tanaka 2011). This species can be distinguished from other taxa in *Lophiotrema* (Tanaka and Harada 2003b; Zhang et al. 2009b) by its relatively large ascospores. A BLAST search of the GenBank database with the 28S and ITS sequences of *L. eburnoides* indicated that it is most close to *L. vagabundum* (GenBank AF383954; Identities=487/491 (99.1 %), Gaps=2/491 (0.4 %)), but the latter species has smaller ascospores (20–26(–29)×4–5.5 μm; Tanaka and Harada 2003b).

Melanommataceae

Melanommataceae is characterized by globose or depressed ascomata, bitunicate and fissitunicate asci, pigmented phragmosporous ascospores as well as the trabeculate pseudoparaphyses (Barr 1990; Sivanesan 1984). Phylogenetic studies of this family have shown it to be well-supported (Liew et al. 2000; Kodsueb et al. 2006a; Kruys et al. 2006; Wang et al. 2007; Hyde et al. 2013; Wijayawardene et al. 2014). The asexual morphs of *Melanommataceae* are mostly coelomycetous and rarely hyphomycetous. The phylogenetic tree is presented in Fig. 99.

67. *Byssosphaeria musae* Phookamsak & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550932, *Facesoffungi number*: FoF00436; Fig. 100

Etymology: The specific epithet *musae* refers to the host.

Holotypus: MFLU 11–0182

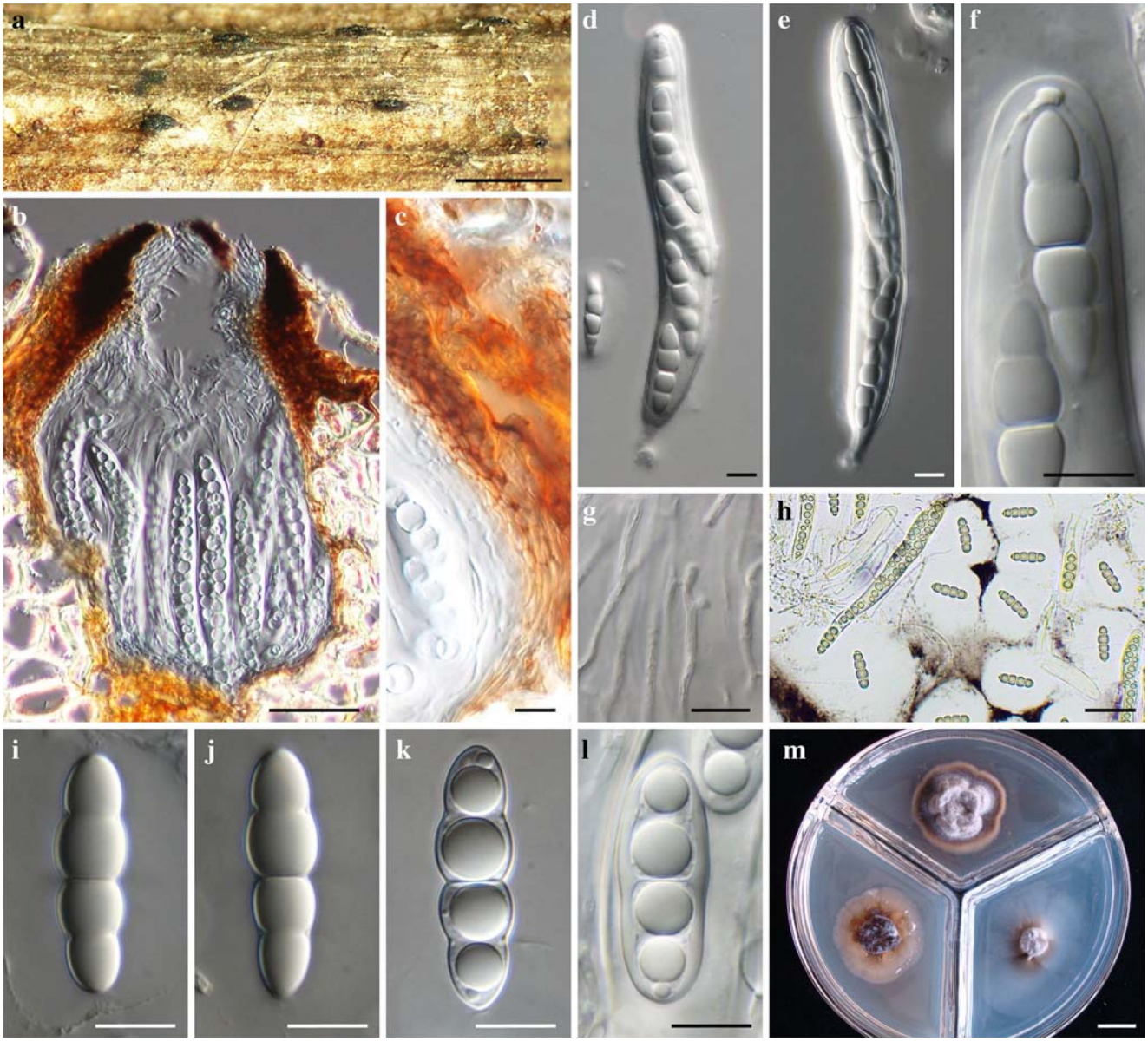


Fig. 98 ***Lophiotrema eburnoides*** (**holotype**). **a** Ascomata on host surface **b** Ascoma in longitudinal section **c** Peridium **d**, **e** Asci **f** Ascus apex **g** Pseudoparaphyses **h** Ascospores in India ink **i**–**l** Ascospores **m** Colonies on PDA (*upper*), MEA (*left*), and CMA (*right*) after 30 d at 20 °C in the dark. a-g, i, j from HHUF 30079 (holotype); h, k–m from JCM 17826=MAFF 242970 (ex-holotype isolate). Scale bars: a=500 μm, b=50 μm, c-g, i-l=10 μm, h=50 μm, m=1 cm

Saprobic on leaf sheath of *Musa* sp. **Sexual morph** *Ascomata* 430–540 μm high, 450–630 μm diam., gregarious, scattered, superficial on subiculum, visible as dark spots on host, orange to yellow around pore, uni-loculate, globose to subglobose, setose, apex rounded, ostiole central, with pore-like opening. *Peridium* 35–80 μm wide, thick-walled, of equal thickness, composed of several layers of dark brown to black cells, arranged in *textura angularis* to *textura prismatica*. *Hamathecium* 0.5–1.7 μm wide, composed of dense, trabeculate, distinctly septate, anastomosing, pseudoparaphyses, embedded in a hyaline gelatinous matrix. *Asci* (120–)125–135(–145)×(11.5–)12–14(–17) μm ($\bar{x}$=132.8×13.7 μm, n=25), 8-spored, bitunicate, fissitunicate, clavate, long pedicellate (40–50 μm long) with knob-like pedicel, apically rounded, with well-developed ocular chamber. *Ascospores* (27–)30–33(–36)×(4–)5–6 μm ($\bar{x}$=32.3×5.9 μm, n=30), overlapping 1–2-seriate, fusiform, with acute ends, hyaline to pale brown when young, becoming light brown at maturity, 1(–3)-septate, not constricted at the septa, slightly curved, smooth-walled, bearing delicate hyaline appendages over ends with wing-like appendages near the central septum. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA fast growing, 80–90 mm diam. after 2 weeks at 25–30 °C, white to

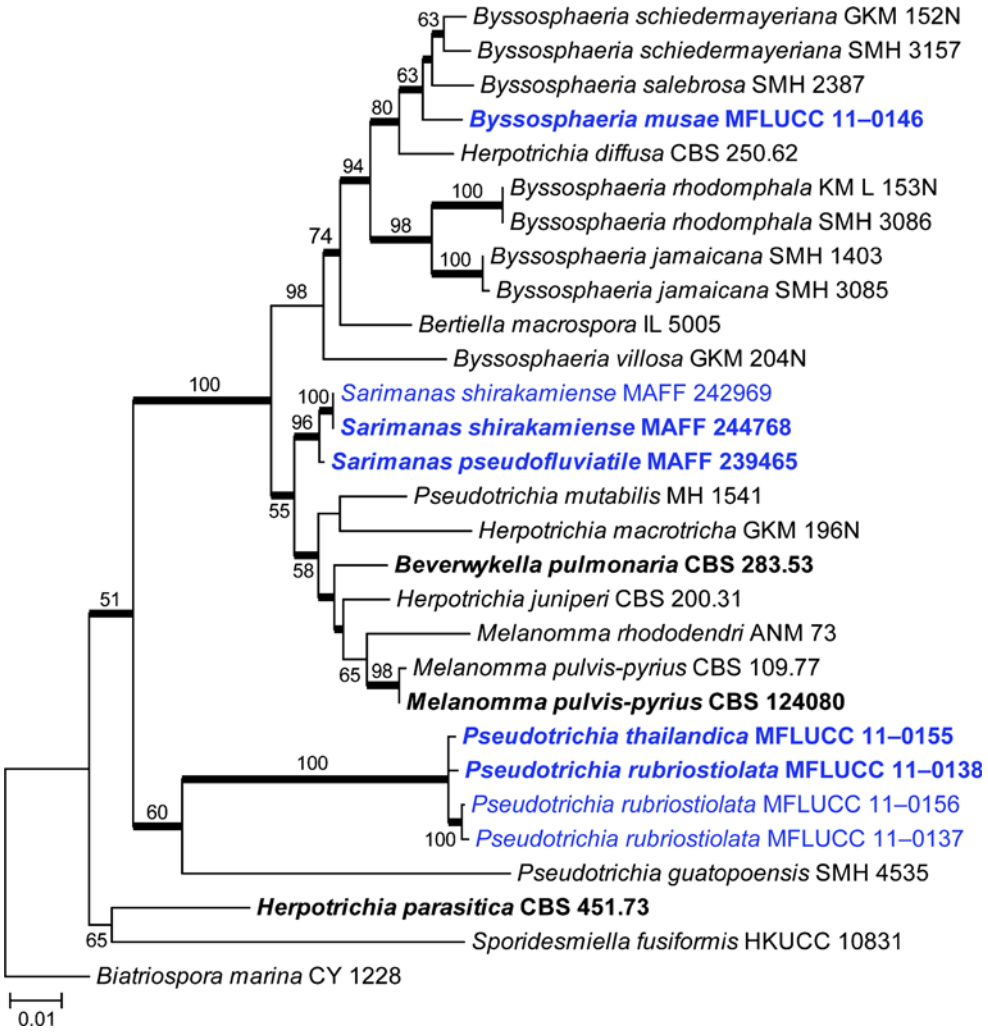


Fig. 99 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU and *TEF1* sequence data of *Melannomataceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Biatriospora marina strain* CY 1228

cream or pale yellowish, intermixed with yellowish to orangish hyphae; reverse cream to white yellowish at the margin, yellowish-brown at the centre, medium dense to dense, irregular, flattened to slightly raised, dull with entire edge, fluffy to feathery, effuse, zonate.

Material examined: THAILAND: Chiang Rai, Muang District, Khun Korn Waterfall, on leaf sheath of *Musa* sp. (*Musaceae*), 5 September 2010, R. Phookamsak RP0062 (MFLU 11–0182, **holotype**); ex-type living culture, MFLUCC 11–0146. GenBank ITS: KP744435; LSU: KP744477; SSU: KP753947.

Notes: *Byssosphaeria musae* is similar to *B. salebrosa* (Cooke & Peck) M.E. Barr and *B. schiedermayeriana* (Fuckel) M.E. Barr (1984; Mugambi and Huhndorf 2009), with ascomata, asci and ascospores having a similar size range, but being smallest in *B. musae* which has smaller ascomata, asci and ascospores than these species. *Byssosphaeria musae* differs from *B. schiedermayeriana* in ascospore appendages, which are present in *B. musae*, but lacking in *B. schiedermayeriana*. Phylogenetic analyses of combined genes (Fig. 99) showed that *Byssosphaeria musae* forms a separate robust clade (77 % MP and 67 % ML) close to *B. schiedermayeriana* and *B. salebrosa*.

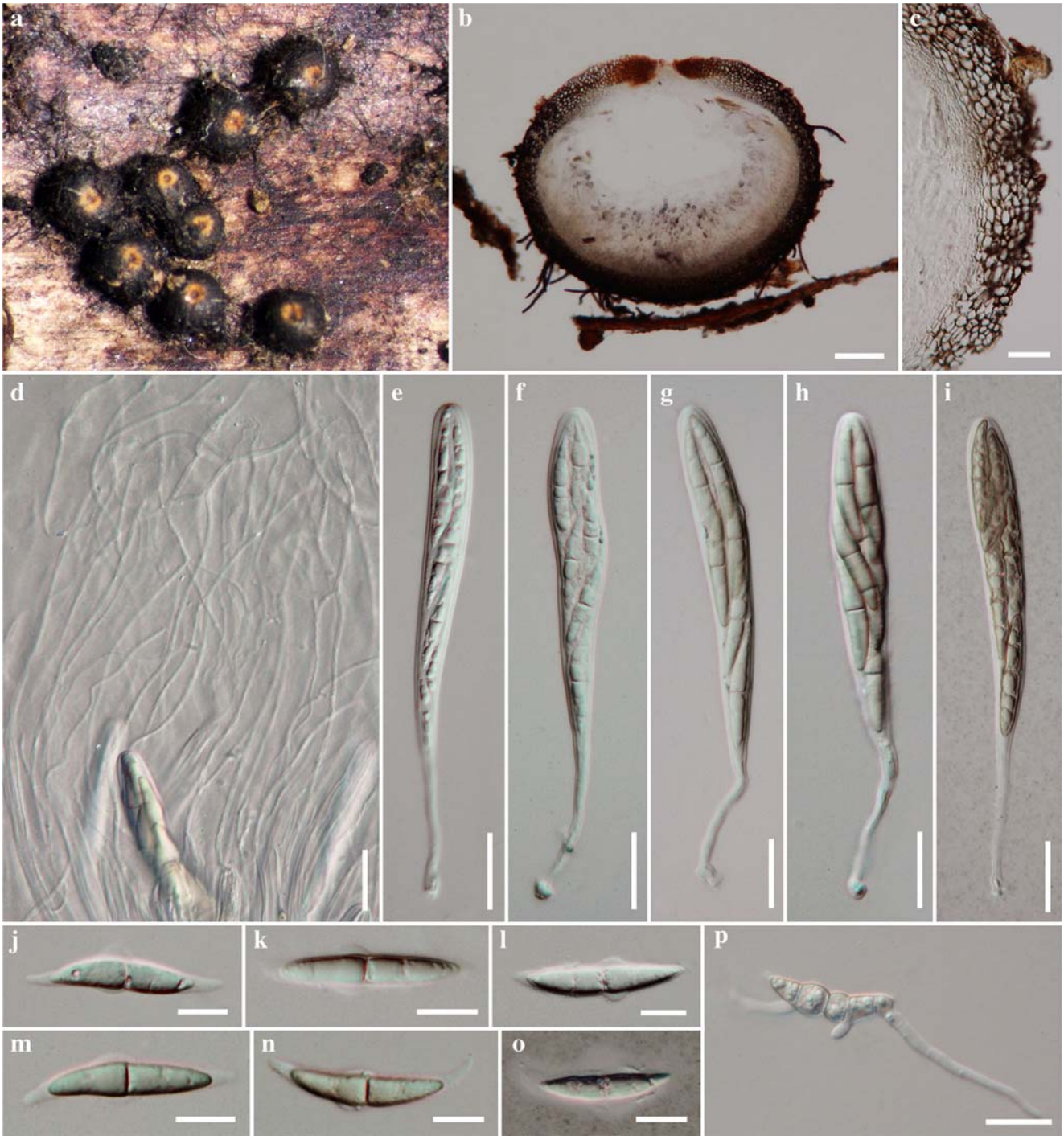


Fig. 100 ***Byssosphaeria musae*** (**holotype**) **a** Ascomata on host surface **b** Section through ascoma **c** **P**eridium **d** Pseudoparaphyses **e**–**i** Asci **j**–**n** Ascospores **o** Ascospore stained in Indian ink. **p** Germinating spore. Scale bars: b=100 μm, c-i, p=20 μm, j-o=10 μm

68. *Pseudotrichia rubriostiolata* Phookamsak & K.D. Hyde**, *sp. nov.***

Index Fungorum number: IF550933, *Facesoffungi number*: FoF00437; Fig. 101

Etymology: The specific epithet *rubriostiolata* refers to the ascomata ostioles with red pigments.

Holotypus: MFLU 11–0174

Saprobic on *Thysanolaena maxima*. **Sexual morph** *Ascomata* 140–220 *μm* high (excluding neck), 150–190 *μm* diam., solitary, scattered, immersed to semi-immersed or erumpent with neck, visible as dark spots, with reddish pigment surrounding the ostiole, uni-loculate, globose to subglobose, glabrous, ostiole central, with short papilla (70–95×70–90 *μm*). *Peridium* 5–20 *μm* wide, thin-walled, of equal thickness, composed of 2–3 layers, brown to dark brown, flattened, pseudoparenchymatous cells, arranged in a *textura angularis. Hamathecium* 1–1.5(–2) *μm* wide, composed of dense, narrow cellular pseudoparaphyses, wall rough, with small guttules, distinctly septate, anastomosing above the asci, embedded in a hyaline gelatinous matrix. *Asci* (55–)70–80(–88)×(13–)15–16(–17) *μm* ($\bar{x}$=75.5×15.4 *μm*, *n*=25), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate with foot-like pedicel, apically rounded with well-developed ocular chamber. *Ascospores* (23.5–)25–27(–29)×4–5(–6) *μm* ($\bar{x}$=26.5×4.5 *μm*, *n*=30), overlapping 1–3-seriate, fusiform, slightly curved, hyaline, becoming light brown when geminated, 1-septate, constricted at the septa, swollen near the septa, smooth-walled, surrounded by distinct mucilaginous sheath. **Asexual morph** forming stromatic fruiting bodies on bamboo pieces on water agar (WA) after 12 weeks. *Conidiomata* 80–205 *μm* high, 80–210 *μm* diam., pycnidial, scattered or clustered, gregarious, semi-immersed to superficial on bamboo pieces, visible as black spots on surface, globose to subglobose or irregular in shape, glabrous, surrounded by vegetative hyphae, ostiole undetectable, becoming reddish to reddish-purple. *Conidiomata walls* 7.5–15.5 *μm* wide, composed of several layers of dark brown to black, pseudoparenchymatous cells, initially arranged in *textura intricata*, becoming *textura angularis. Conidiophores* simple, rarely branched, aseptate, hyaline, mostly reduced to conidiogenous cells. *Conidiogenous cells* 4–16×1.5–2(–3) *μm* ($\bar{x}$=7×1.8 *μm*, *n*=40), enteroblastic, phialidic, single, discrete, determinate, doliiform to cylindrical or ampulliform, hyaline, arising from basal stratum. *Conidia* 2–3.5×1–2 *μm* ($\bar{x}$=3.1×1.6 *μm*, *n*=40), one-celled, oblong or rod-shaped to obovoid, with rounded to obtuse ends, hyaline, smooth-walled.

Culture characters: Colonies on MEA slow growing, reaching 45–50 mm diam. after 4 weeks at 25–30 °C, cream to pale yellowish or pale reddish at the margin, white to cream or pale yellowish at the centre with small reddish droplets and the periphery of raised; reverse cream to white, yellowish or pale reddish at the margin, reddish to blond yellowish at the centre, slightly radiating; medium dense to dense, circular, flattened to slightly raised, dull with entire edge, initially mucoid, becoming velvety to felty, seperating from agar, produced reddish-brown to light brown pigments diffusing in the agar and conidiomata immersed in agar after 8 weeks.

Fig. 101 ***Pseudotrichia rubriostiolata*** **(holotype) a** Ascomata on host surface visible as black raised areas with reddish pigments at the apex **b** Section through an ascoma **c** Section through peridium **d** Asci with pseudoparaphyses stained in Congo red reagent **e**–**g** Asci **h**–**l** Ascospores **m** Germinating spore **n** Pycnidia on bamboo pieces on WA **o** Section through stromatic pycnidia **p** Section though pycnidial walls **q**–**t** Conidiophores **u**–**ac** Conidia. Scale bars: b=50 *μm*, c-g, m=20 *μm*, h-l, p-u=10 *μm*, r-t=2 *μm*, v-ac=1 *μm*, o=100 *μm*

Material examined: THAILAND, Chiang Rai Province, Muang District, Mae Fah Luang University campus grounds, on dead stem of *Thysanolaena maxima* (*Poaceae*), 13 August 2010, R. Phookamsak RP0054 (MFLU 11–0174, **holotype**), ex-type living culture, MFLUCC 11–0138, GenBank ITS: KP744463; SSU: KP744508; *ibid.*, on dead stem of *Thysanolaena maxima*, 13 August2010, R. Phookamsak RP0053 (MFLU 11–0173), living culture, MFLUCC 11–0137. GenBank ITS: KP744462; LSU: KP744507; SSU: KP753966; Phrae Province, Rongkwang District, Maejo University Phrae Campus, on dead stem of *Thysanolaena maxima*, 20 August 2010, R. Phookamsak RP0072 (MFLU 11–0192), living culture, MFLUCC 11–0156. GenBank ITS: KP744464; LSU: KP744509; SSU: KP753967.

Notes: *Pseudotrichia rubriostiolata* clusters together with *P. guatopoensis* in the phylogenetic tree. Morphologically it differs from other *Pseudotrichia* species in the smaller size of its ascomata, asci and ascospores. *P. rubriostiolata* is similar to *P. thailandica*, but in *P. rubriostiolata* the ascomata, asci and ascospores are smaller and the ascospores are slightly constricted at the septum. In *P. thailandica* ascospores are larger and deeply constricted at the septum, and easily separate into two parts. In the phylogenetic analyses, *P. rubriostiolata* forms a clade with *P. thailandica* and *P. guatopoensis* (strain SMH 4535).

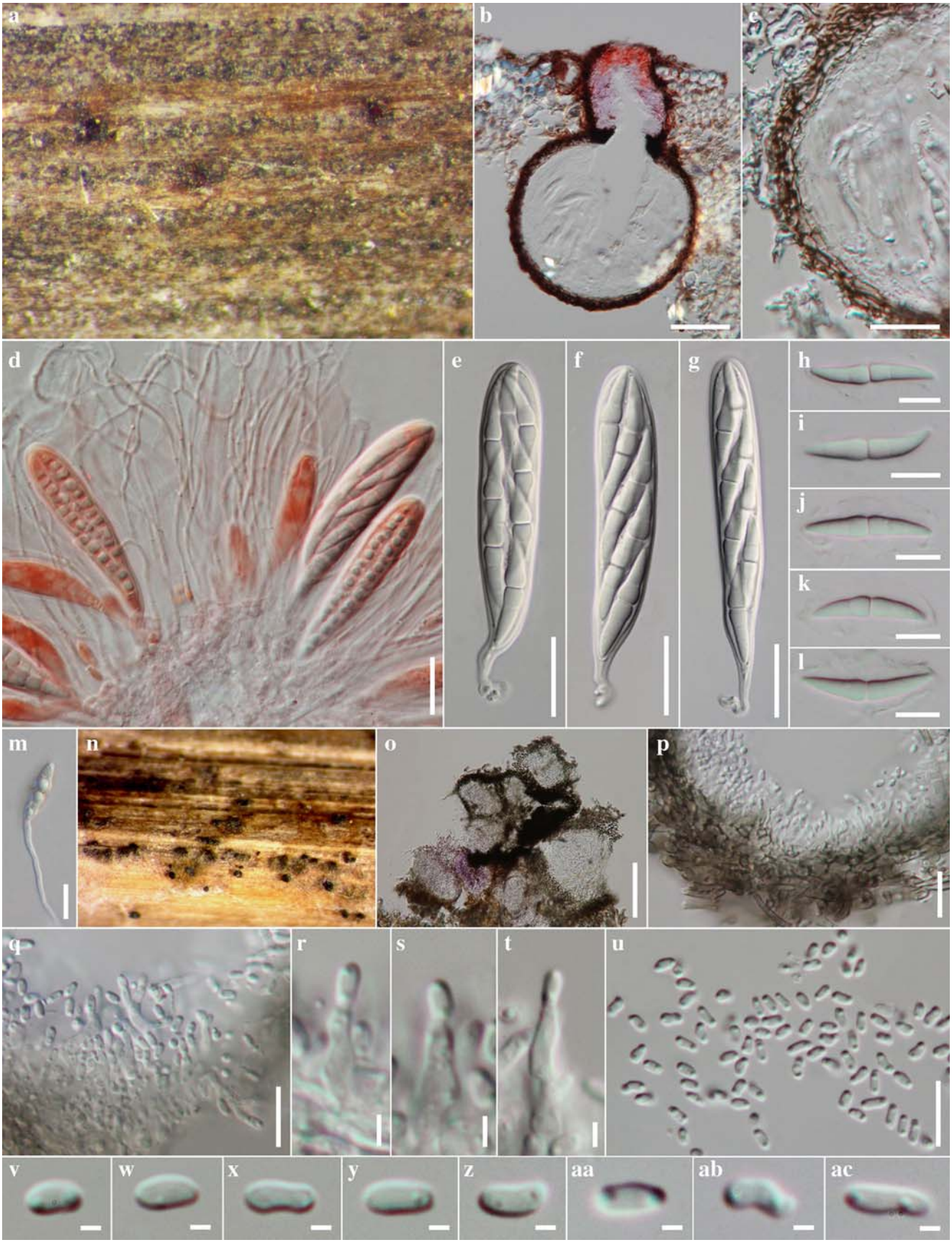
69. *Pseudotrichia thailandica* Phookamsak & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550934, *Facesoffungi number*: FoF 00438; Fig. 102

Etymology: The specific epithet *thailandica* refer to the country in which the fungus was first collected.

Holotypus: MFLU 11–0191

Saprobic on dead stem of *Thysanolaena maxima*. **Sexual morph** *Ascomata* 140–180 *μm* high (including neck), 165–310 *μm* diam., solitary to gregarious, scattered, semi-immersed, visible on host surface as raised, dark spots, with reddish pigment surrounding the ostiole, uni-loculate, rarely bi-loculate, subglobose, glabrous, ostiole oblique, with short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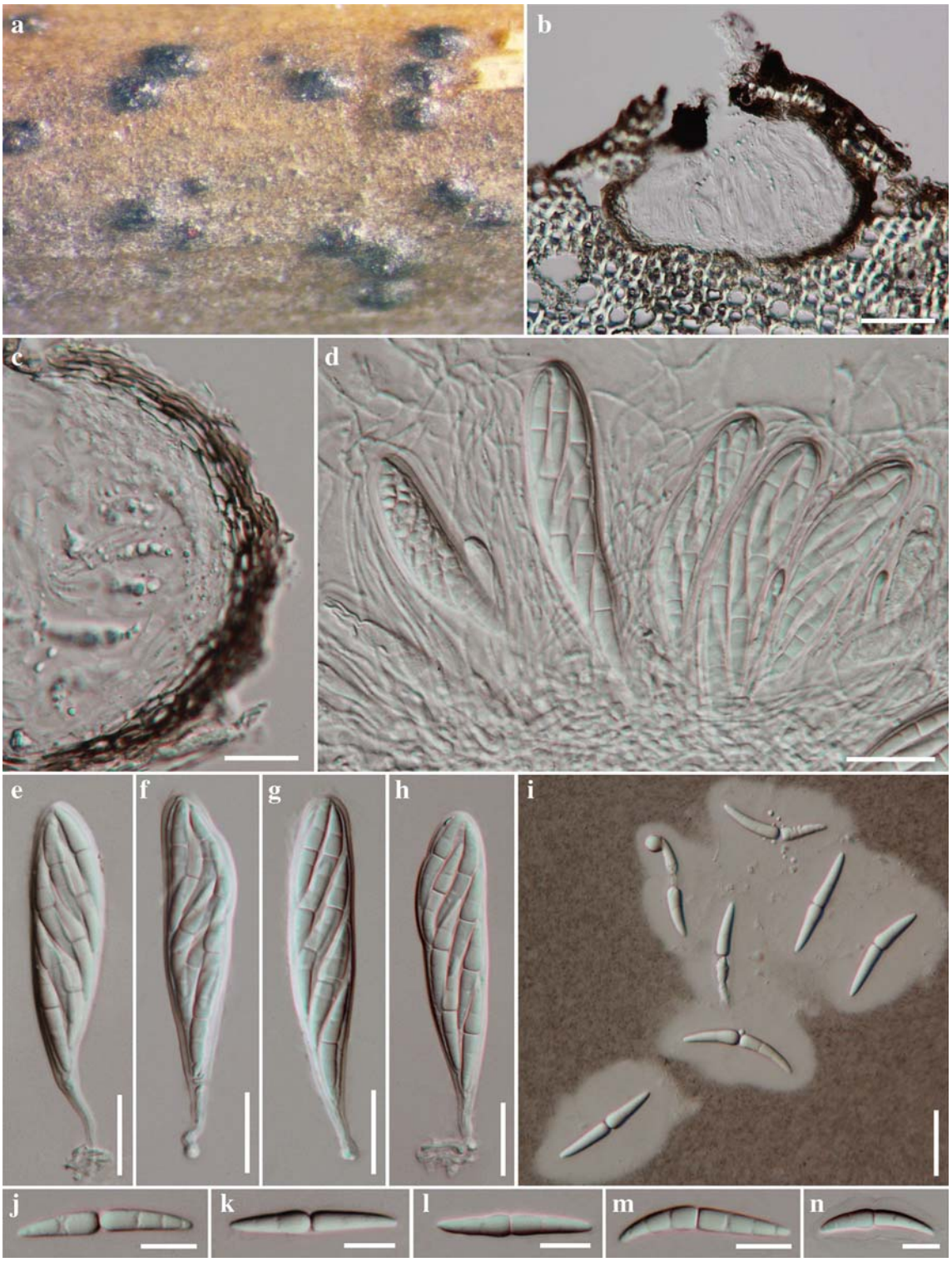


Fig. 102 ***Pseudotrichia thailandica*** **(holotype) a** Ascomata on host surface **b** Section through an ascoma **c** Peridium **d** Asci with pseudoparaphyses **e**–**h** Asci **i** Ascospores in Indian ink. **j**–**n** Ascospores. Scale bars: b=50 μm, c–i=20 μm, j-n=10 μm, o=100 μm

papilla, carbonaceous. *Peridium* 7–22 μm wide, thin-walled, of unequal thickness, slightly thin at the base of ascoma, composed of several layers of brown to dark brown, pseudoparenchymatous cells, outer layer comprising 2–3 layers, flattened, arranged in a *textura prismatica*, inner layer comprising 2–3 layers, arranged in *textura angularis*. *Hamathecium* composed of dense, 0.8–2.5 μm wide, dense, narrow, cellular pseudoparaphyses, wall rough with small guttules, distinctly septate, anastomosing above asci, embedded in a hyaline gelatinous matrix. *Asci* (77.5–)80–100(–115.5)×(14–)16–18(–

20) μm ($\bar{x}$=95.1×17.3 μm, n=25), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate with foot-like or knob-like pedicel, apically rounded, with well-developed ocular chamber. *Ascospores* (27–)28–32(–34.5)×4–5(–6) μm ($\bar{x}$=30×4.7 μm, n=30), overlapping 1–3-seriate, fusiform, slightly curved, hyaline to subhyaline, 1(–5)-septate, constricted at the septa, easily seperated into two part spores, swollen near the septa in the upper cell, smooth-walled, surrounded by a distinct mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA slow growing, reaching 30–35 mm diam. after 4 weeks at 25–30 °C, cream to pale yellowish at the margin, grey to dark grey at the centre, with small black droplets; reverse cream to yellowish-white at the margin, dark greenish at the centre, slighty radiating, forming sectors; medium dense to dense, circular, flattened to slightly raised, dull with undulate edge, mucoid, fairly fluffy at the magins, seperating from agar, felty in the centre with sparse hyphae at the margin.

Material examined: THAILAND: Phrae Province, Rongkwang District, Maejo University Phrae Campus, on dead stem of *Thysanolaena maxima* (*Poaceae*), 20 August 2010, R. Phookamsak RP0071 (MFLU 11–0191, **holotype**), ex-type living culture, MFLUCC 11–0155. GenBank ITS: KP744465; LSU: KP744510; SSU: KP753968.

Notes: *Pseudotrichia thailandica* is similar to *P. rubriostiolata* in having a red pigment in the ostiole. However, *Pseudotrichia thailandica* has larger ascomata, asci and ascospores than *P. rubriostiolata*. These two species form a clade together with *P. guatopoensis* (strain SMH 4535) in the phylogenetic tree (Fig. 99).

70. *Sarimanas* Matsumura, K. Hiray. & Kaz. Tanaka, ***gen. nov.***

Index Fungorum number: IF551052, *Facesoffungi number*: FoF00497

Etymology: An anagram of *Massarina*.

Type species: *Sarimanas shirakamiense*.

Ascomata immersed, scattered or 2–3 gregarious, globose to subglobose, ostiolate. *Neck* short papillate, without clypeus. *Ascomatal wall* composed of polygonal thin-walled cells. *Hamathecium* cellular, numerous, septate. *Asci* fissitunicate, cylindrical to ovoid, with a short stipe. *Ascospores* broadly fusiform with rounded ends, 1-septate, hyaline, smooth-walled, with an entire gelatinous sheath.

71. *Sarimanas pseudofluviatile* Matsumura, K. Hiray. & Kaz. Tanaka, ***sp. nov.***

Index Fungorum number: IF551053, *Facesoffungi number*: FoF00498; Fig. 103

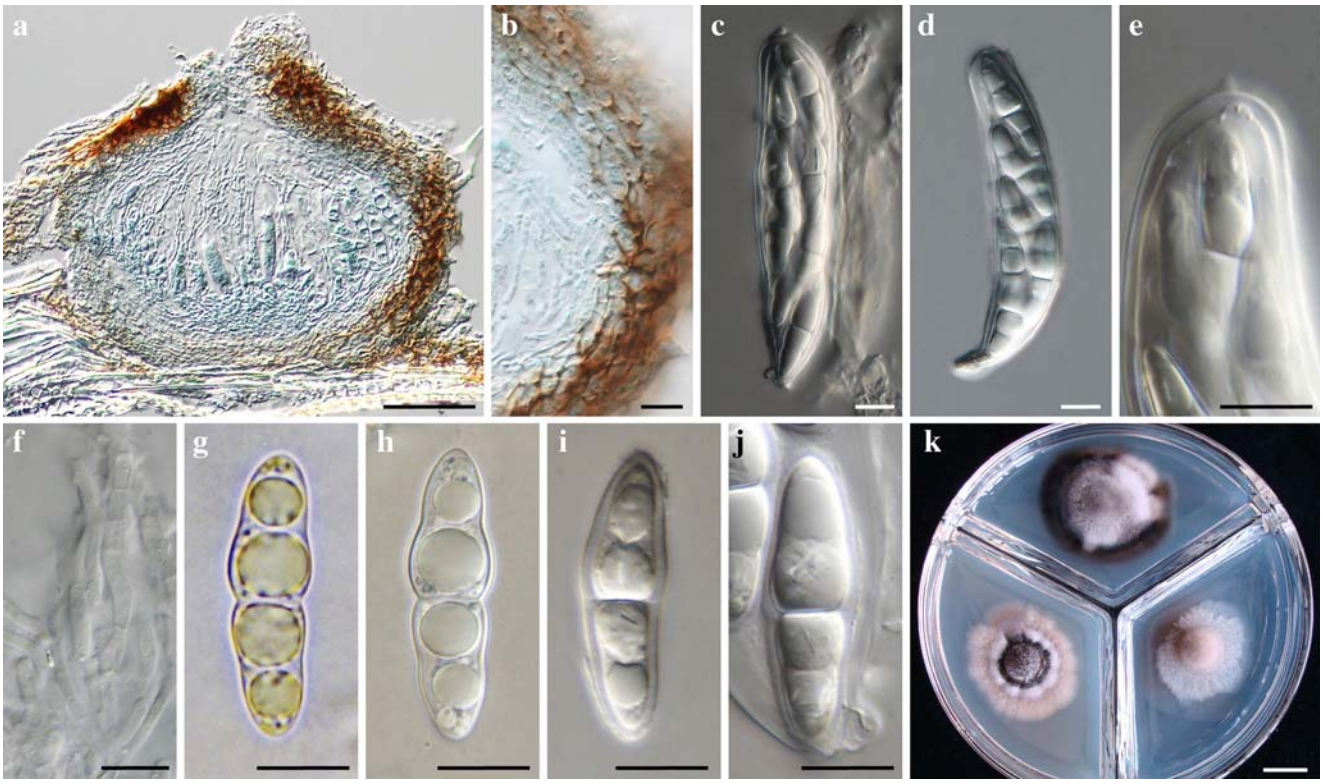


Fig. 103 ***Sarimanas pseudofluviatile*** (**holotype**) **a** Ascoma in longitudinal section **b** Peridium **c, d** Asci **e** Ascus apex **f** Pseudoparaphyses **g–j** Ascospores **k** Colonies on PDA (*upper*), MEA (*left*), and CMA (*right*) after 30 d at 20 °C in the dark. **a–j** from HHUF 27552 (holotype); **k** from MAFF 239465 (ex-type). Scale bars: a=100 μm, b, c–j=10 μm, k=1 cm

Etymology: In reference to the ascospore similarity of the taxon to *Massarina fluviatilis* (= *Lentithecium fluviatile*).

Holotype: HHUF 27552

Saprobic on dead wood. **Sexual morph** *Ascomata* 140–220 *μm* high, 180–320 *μm* diam., globose to subglobose, covered with sparse hyphae, ostiolate. *Neck* 37–50 *μm* long, 50–75 *μm* wide. *Peridium* in surface view *textura prismatica*, in longitudinal section 20–35 *μm* thick at sides, composed of 4–6 layers of polygonal, hyaline to brown, 5–13×5–8 *μm* cells. *Hamathecium* 1.5–2.5 *μm* wide, septate. *Asci* 90–110×18–23.5 *μm* ($\bar{x}$=99×20.2 *μm*, *n*=30), fissitunicate, cylindrical, short pedicellate (5–15 *μm* long; $\bar{x}$=8.8 *μm*, *n*=19), apically rounded with a shallow ocular chamber. *Ascospores* (27–)28.5–33(–36)×(7–)8–10 *μm* ($\bar{x}$=30.6×8.7 *μm*, *n*=100), L/W (3–)3.2–3.9(–4.1) ($\bar{x}$=3.5, *n*=100), broadly fusiform to ellipsoidal with rounded ends, with a septum submedian (0.51–0.55, $\bar{x}$=0.53, *n*=85), hyaline, smooth-walled, with an entire sheath of 2–5 *μm* wide. **Asexual morph** Undetermined.

Culture characters: On RSA, numerous ascomata are formed on the surface of rice straw and the ascospores are similar to those found in nature, measuring 28.5–33×8.5–10 *μm* ($\bar{x}$=30.7×9.3 *μm*, *n*=30). No asexual morph is formed.

Materials examined: JAPAN, Hokkaido, Sapporo Toyohira-river, riverbank, on dead twigs of woody plant, 2 September 2001, K. Tanaka, KT 760 (= HHUF 27552, **holotype** designated here); ex-type living culture=MAFF 239465. GenBank ITS: LC001717; LSU: LC001714; SSU: LC001711; *ibid*., KT 759 (= HHUF 27551, **paratype**).

Notes: This species was reported as *Massarina fluviatilis* by Tanaka and Harada (2003c), but this was obviously a misidentification. We examined the holotype of *M. fluviatilis* (Van Ryckegem 509 in GENT; Van Ryckegem and Aptroot 2001) and found that *M. fluviatilis* on *Phragmites australis* (*Poaceae*) has ascomata composed of thick-walled, slightly larger cells (5–30×2.5–11 *μm*) when compared to those of *S. pseudofluviatile* on woody plants. The ascospores of *M. fluviatilis* are 1–3-septate in sequence 2:1:3, but those are consistently 1-septate in *S. pseudofluviatile*. Zhang et al. (2009b) established a new genus *Lentithecium* using *M. fluviatilis* as the type species, and later placed the genus in *Lentitheciaceae* (Zhang et al. 2009a). In a phylogenetic analysis, *S. pseudofluviatile* deviated from *Lentitheciaceae* and clustered in the clade of *Melanommataceae* together with *S. shirakamiense* (Fig. 99).

72. *Sarimanas shirakamiense* Matsumura, K. Hiray. & Kaz. Tanaka, ***sp. nov.***

Index Fungorum number: IF551054, *Facesoffunginumber*: FoF00497; Fig. 104

Etymology: In reference to the location where the specimen was collected.

Holotype: HHUF 30454

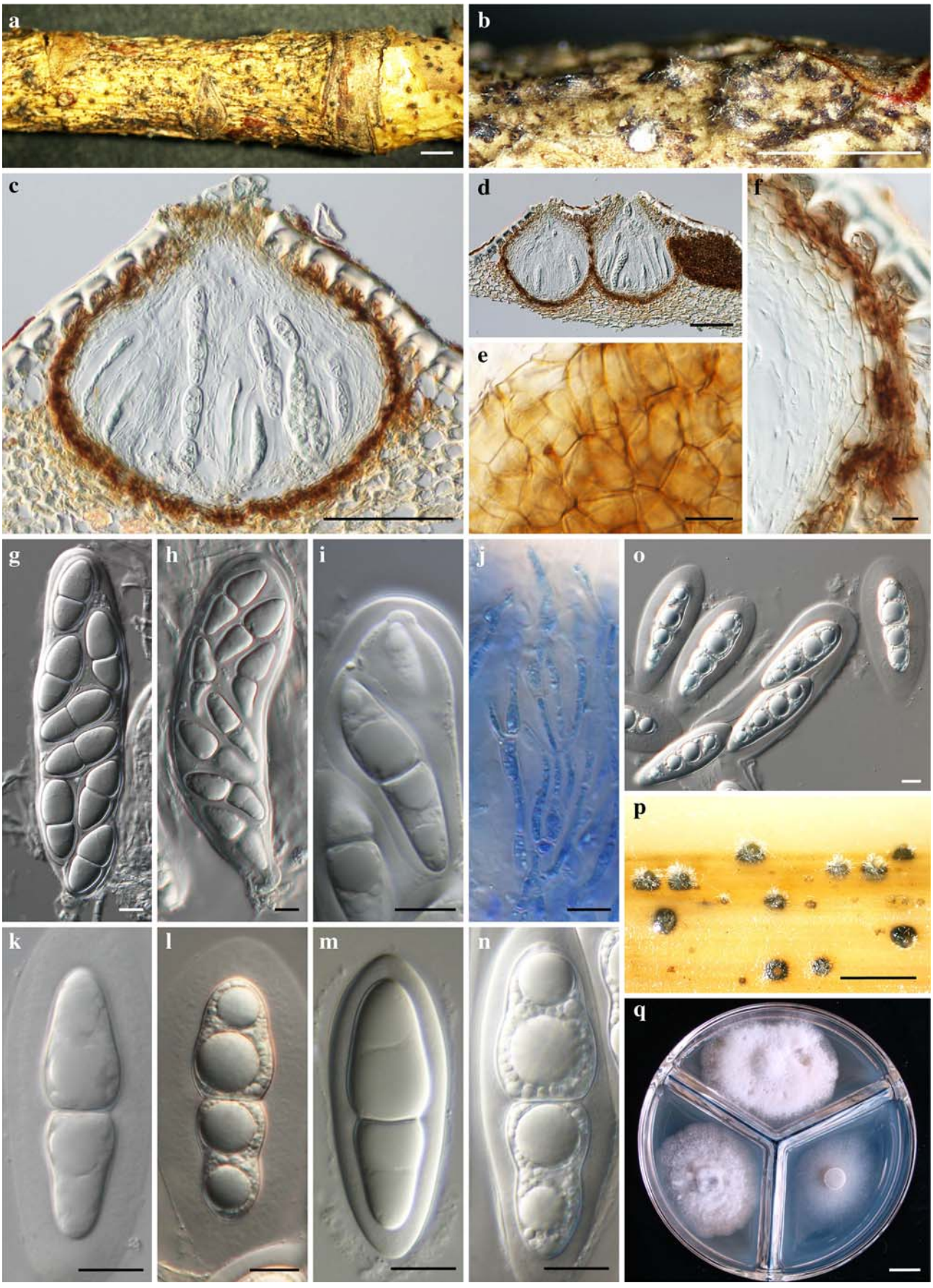
Fig. 104 ***Sarimanas shirakamiense*** **(holotype)**. **a**, **b** Ascomata on host surface **c**, **d** Ascomata in longitudinal section **e** Peridium of surface view **f** Peridium in longitudinal section **g**, **h** Asci **i** Ascus apex **j** Pseudoparaphyses **k**–**n** Ascospores **o** Ascospores with an expanding gelatinous sheath **p** Ascomata on rice straw in culture **q** Colonies on PDA (*upper*), MEA (*left*), and CMA (*right*) after 30 d at 20 °C in the dark. a-g, i, m from HHUF 30081 (paratype); n-q from JCM 17825= MAFF 242969 (ex-paratype); h, j, k from HHUF 30454 (holotype); l from MAFF 244768 (ex-type). Scale bars: a, b=1 mm, c, d=100 *μm*, e–o=10 *μm*, p, q=1 cm

Saprobic on *Swida controversa*. **Sexual morph** *Ascomata* 220–300 *μm* high, 200–320 *μm* diam., mostly scattered, sometimes 2–3 gregarious, immersed, globose in section. *Neck* 30–45 *μm* high, 70–80 *μm* wide, short papillate, without clypeus. *Peridium* uniformly 25–30 *μm* thick, composed of 4–6 layers of polygonal, 10–20×4–8 *μm*, thin-walled cells. *Hamathecium* numerous, cellular, 2–3 *μm* wide, hyaline, septate, branched and anastomosed. *Asci* 95–158(–175)×26.5–52.5 *μm* ($\bar{x}$=133.2×39.6 *μm*, *n*=30), 8-spored, not numerous, bitunicate, fissitunicate, cylindrical to ovoid, with a short pedicel (8.5–20 *μm*) long, apically rounded with an ocular chamber. *Ascospores* (30–)32–51×10–17(–18.5) *μm* ($\bar{x}$=40.3×13.9 *μm*, *n*=60), L/W 2.2–3.8 ($\bar{x}$=2.9, *n*=60), broadly fusiform with rounded ends, mostly straight, thick-walled, with a septum mostly submedian (0.49–0.62; $\bar{x}$=0.53, *n*=60), hyaline, smooth-walled, guttulate when young, with an entire sheath; sheath when fresh condition diffuse, gelatinous, up to 8 *μm* wide, later becoming sharply delimited firm sheath of 2–4 *μm* thick. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA, white, buff pigment produced; on MEA, white to olivaceous grey; on CMA, white to lavender grey. On RSA, numerous ascomata are produced on the surface of rice straw. Ascomata ca. 400 *μm* high, ca. 250 *μm* diam., immersed, globose, with papilla. Asci and ascospores are considerably larger than those on the natural specimen; asci 162–225×34–46.5 *μm* ($\bar{x}$=192.8×38.5 *μm*, *n*=20); ascospores (42.5–)45–51(–53)×(10–)15–17.5 *μm* ($\bar{x}$=47.5×15.4 *μm*, *n*=50), L/W (2.6–) 2.8–3.3(–3.6) ($\bar{x}$=3.1, *n*=50), with a septum mostly submedian (0.48–0.54; $\bar{x}$=0.51, *n*=50).

Material examined: JAPAN, Aomori, Nishimeya, Shirakami Natural Science Park of Hirosaki Univ., on twigs of *Swida controversa* (*Cornaceae*), 3 June 2012, K. Tanaka, KT 3000 (HHUF 30454, **holotype designated here**); ex-type living culture, MAFF 244768. GenBank ITS: LC001718; LSU: LC001715; SSU: LC001712; *ibid*., Aomori, Nishimeya, Seisyu-trail, on dead twigs of woody plant, 29 May 2007, K. Hirayama et al., KH 13 (HHUF 30081, **paratype**); ex-paratype living cultures, JCM 17825, MAFF 242969. GenBank ITS: LC001719; LSU: LC001716; SSU: LC001713.

Notes: A new genus, *Sarimanas*, is established for *S. shirakamiense* and *S. pseudofluviatile* based on their shared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morphological characters, such as globose to subglobose ascomata composed of polygonal thin-walled cells, cylindrical to ovoid asci with a short pedicel, and broadly fusiform, 1-septate, hyaline ascospores with an entire sheath. These morphological features of *Sarimanas* are somewhat similar to those of *Massarina*, but the latter genus has clypeate ascomata and belongs to *Massarinaceae* (Hyde et al. 1999; Zhang et al. 2012). Ascospore morphology of *Sarimanas* superficially resembles to that of *Wettsteinina* in *Pleomassariaceae* (Kodsueb et al. 2006) or *Lentitheciaceae* (Schoch et al. 2009), but the latter genus has ascomata lacking a hamathecium when mature (Zhang et al. 2012a, b). The phylogenetic analysis based on LSU (Fig. 99) suggested that this genus has close affinity to genera in *Melanommataceae*, such as *Aposphaeria* and *Herpotrichia*, but within in this family no genus phenotypically similar to *Sarimanas* is known. *Sarimanas shirakamiense* is similar to *S. pseudofluviatile*, but the asci and ascospores of *S. shirakamiense* are considerably larger than those of the latter (asci 99×20.2 *μm*, ascospores 30.6×8.7 *μm* in average). Sequence differences between these two taxa were found at eight positions in the ITS region, suggesting that they are not conspecific.

Microthyriaceae

73. *Neomicrothyrium* Boonmee, H.X. Wu & K.D. Hyde., Fungal Diversity **51**(1): 217 (2011)

Index Fungorum number: IF 563368.

Type species: ***Neomicrothyrium siamense*** Boonmee, H.X. Wu & K.D. Hyde

Neomicrothyrium siamense Boonmee, H.X. Wu & K.D. Hyde., Fungal Diversity **51**(1): 217 (2011)

Index Fungorum number: IF 563369

Notes: Wu et al. (2011) proposed a new genus *Neomicrothyrium* including a new species *Neomicrothyrium siamense* under *Dothideomycetes* genera *incertae sedis*. Since the publication, Index Fungorum (2015) has indicated that this species is a Nom. Inval., Art. 40.6 and the genus name is also Nom. Inval., Art. 35.1. According to the Melbourne International Code of Nomenclature (ICN) in McNeill et al. (2012), these articles are reported in the errors of typus not assigned. Here we designate and validly publish the type species of *Neomicrothyrium*, *Neomicrothyrium siamense* Boonmee, H.X. Wu & K.D. Hyde.

Mycosphaerellaceae

The family *Mycosphaerellaceae* was introduced by Lindau (1896) with *Mycosphaerella* as the type genus. It was initially placed in the order *Dothideales* (Hawksworth et al. 1995). Kirk et al. (2001) introduced a separate order – *Mycosphaerellales* for the family, but later again it was placed in the order *Capnodiales* by Kirk et al. (2008). This placement of *Mycosphaerellaceae* in Capnodiales has been phylogenetically confirmed in studies by Crous et al. (2007; 2009a, b). The family includes 14 sexual morph-typified genera, namely *Achorodothis*, *Brunneosphaerella*, *Cymadothea*, *Euryachora*, *Gillotia*, *Melanodothis*, *Mycosphaerella*, *Placocrea*, *Polysporella*, *Pseudostigmidium*, *Sphaerellothecium*, *Sphaerulina*, *Stigmidium* and *Wernerella* (Lumbsch and Huhndorf 2010). More than 30 asexual genera linked to the type genus *Mycosphaerella* are also included in the family (Hyde et al. 2013), while further genera have subsequently been added in recent studies (Crous et al. 2013; Quaedvlieg et al. 2013). These asexual genera consist of some of the most common and destructive plant pathogens that affect a wide variety of host plants, especially economically important fruit and vegetable crops, and cereals (Farr et al. 1995; Crous and Braun 2003). The phylogenetic tree is presented in Fig. 105.

74. *Pallidocercospora acaciigena* (Crous & M.J. Wingf.) Crous & M.J. Wingf. Stud. Mycol. **75**: 74 (2012)

≡ *Mycosphaerella acaciigena* Crous & M.J. Wingf., in Crous, Groenewald, Pongpanich, Himaman, Arzanlou & Wingfield, Stud. Mycol. 50(2): 463 (2004)

Index Fungorum number: IF 564821, *Facesoffunginumber*: FoF 00439; Fig. 106

Saprobic on palms. **Sexual morph** *Ascomata* 50–70 *μm* high., scattered, solitary to gregarious, immersed to semi-immersed, with protruding papilla, visible as black spots on host surface, uniloculate, globose to subglobose, glabrous, ostiole central, with minute papilla, obtuse at the apex. *Peridium* 4–10 *μm* wide, thin-walled, of equal thickness, comprising 2–6 layers of brown pseudoparenchymatous cells, arranged in *textura angularis*. *Hamathecium* lacking pseudoparaphyses. *Asci* (27–)30–40(–53)×(5–)6–8(–9) *μm* ($\bar{x}$=36.6×7.2 *μm*, *n*=25), 8-spored, bitunicate, fissitunicate, cylindric-clavate to ampulliform, or obclavate, often ventricose, apedicellate, apically rounded, with an ocular chamber (0.5–1 *μm* wide). *Ascospores* 9–12×2–3 *μm* ($\bar{x}$=10.5×2.9 *μm*, *n*=30), overlapping 2–3-seriate, oblong to clavate, hyaline, 1-septum, not contricted to slightly constricted at the septa, with smooth or rough walls, with small guttules, or slightly echinulate, mostly upper cell wider than lower cell. **Asexual morph** Undetermined.

Culture characters: Colonies on MEA slow growing, reaching 18–20 mm diam. after 3 weeks at 25–30 °C, dark greenish at the margin, pale greenish at the centre, becoming pale greenish-grey to grey at the centre; reverse dark greenish, becoming paler in the centre; dense, irregular, raised to umbonate, with entire edge, velvety, slightly radiating, curved, radially furrowed.

Material examined: THAILAND: Chiang Rai, Muang District, Khun Korn Waterfall, on dead leaves of palm, 12

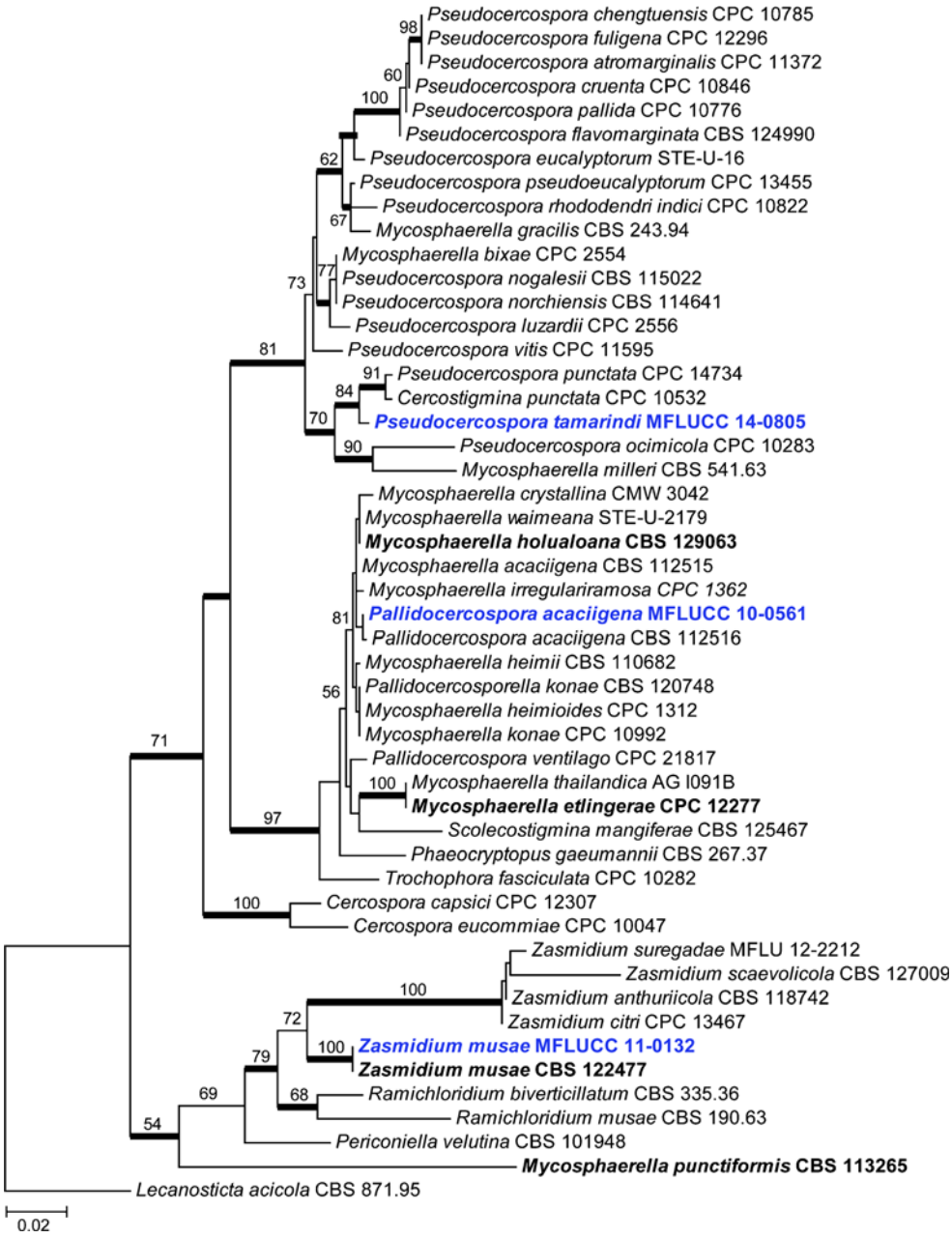


Fig. 105 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and ITS sequence data of *Capnodiales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Lecanosticta acicola* CBS 871.95

May 2010, R. Phookamsak RP0032 (MFLU 11–0153), living culture, MFLUCC 10–0561. GenBank ITS: KP744451; LSU: KP744494.

Notes: *Pallidocercospora* was introduced by Crous et al. (2013) to accommodate taxa that are not congeneric with *Mycosphaerella* (Crous et al. 2012). The genus was considered to be distinguished from *Mycosphaerella* based on its asexual morph. *Mycosphaerella* is represented by *Ramularia* asexual morphs (Quaedvlieg et al. 2013), whereas, *Pallidocercospora* has pseudocercospora-like asexual morphs (Crous et al. 2004, 2012). *Pallidocercospora acaciigena* is morphologically similar to *Mycosphaerella thailandica* Crous et al., but differs in its asexual morph and ascomata (Crous et al. 2004). *Pallidocercospora acaciigena* has longer pseudocercospora-like conidia than *M. thailandica* and the ascomata of *P. acaciigena* are also dense, superficial and clustered (Crous et al. 2004). *Pallidocercospora acaciigena* has been reported as pathogen on *Acacia* in *Venezuela* (Crous et al. 2004), while our isolate was found as a saprobe on palms in Thailand, representing a new host and continent. Based on a megablast nucleotide search in GenBank of ITS gene, our isolate is related to *P. acaciigena* (99 % similarity), *P. crystallina* (99 %), and *Mycosphaerella heimii* (99 %). However, the ITS pairwise comparison has shown that our isolate is most closely related to *P. acaciigena*. Phylogenetic analyses of LSU genes shows that our isolate forms a strongly

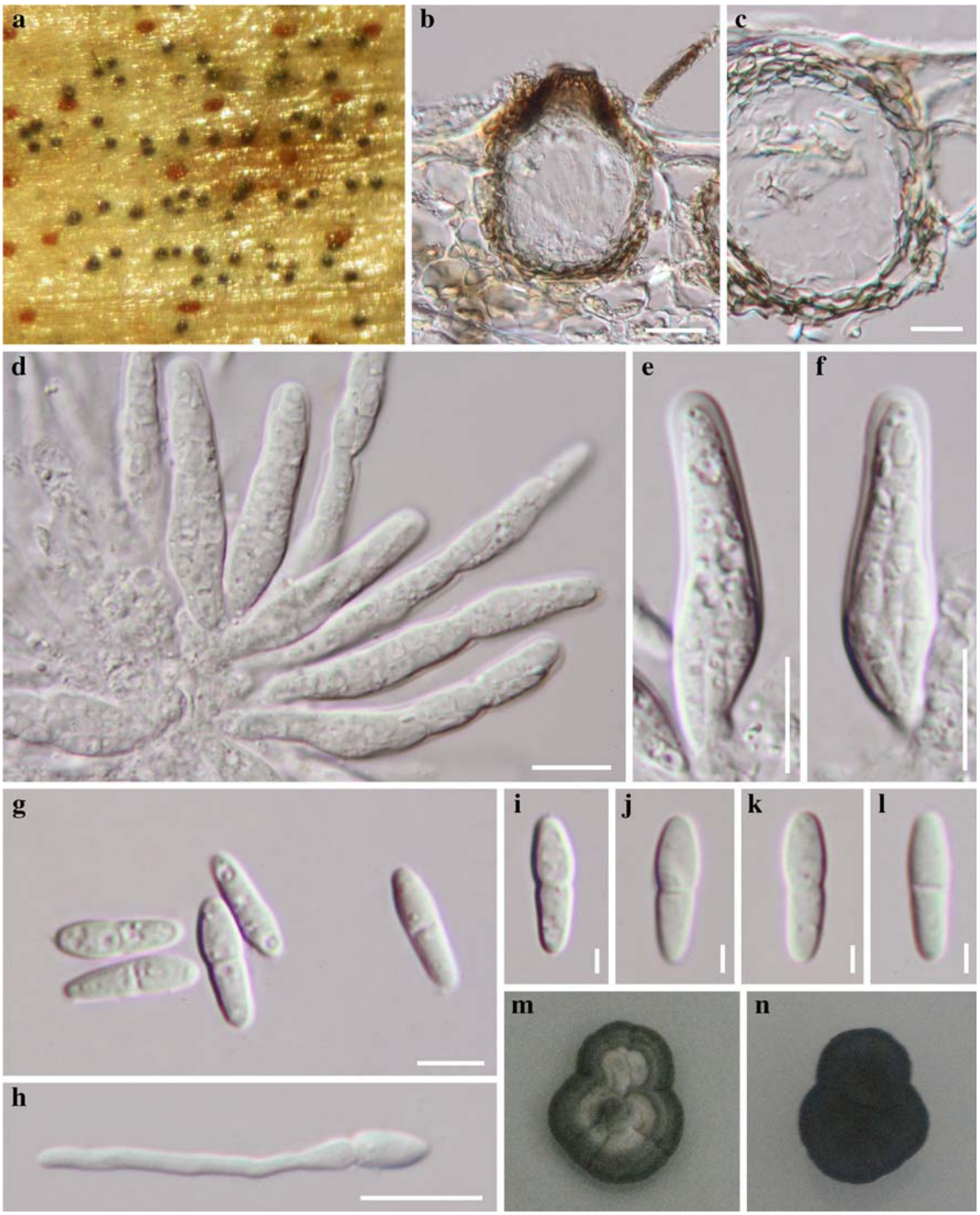


Fig. 106 ***Pallidocercospora acaciigena*** (MFLU 11–0153) **a** Ascomata visible as black spots on host surface **b** Vertical section through an ascoma **c** Peridium **d, e, f** Asci **g, i, j, k, l** Ascospores **h** Germinating ascospore **m, n** Culture characters. Scale bars: b=20 μm, c–f=10 μm, g, h, = 5 μm, i–l=2 μm

supported clade with *P. acaciigena*.

75. *Pseudocercospora tamarindi* Goon. & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550996, *Facesoffungi number*: FoF00473; Fig. 107

Etymology: in reference to the host *Tamarindus indica*.

Holotype: MFLU 14–0805

Pathogen on living leaves of *Tamarindus indica*. **Sexual morph** Undetermined. **Asexual morph** *Leaf spots* epiphyllous, indistinct, subcircular but mostly irregular, 0.5–1 *cm* diam., at most 2 *cm* diam. when confluent, pale brown to golden brown, delimited by leaf mid rib. *Caespituli* amphigenous but predominantly epiphyllous, abundant on leaf spots, dense, dark, punctiform. *Stromata* superficial, globular, pale to dark brown 11–25 μm diam., cells rounded,

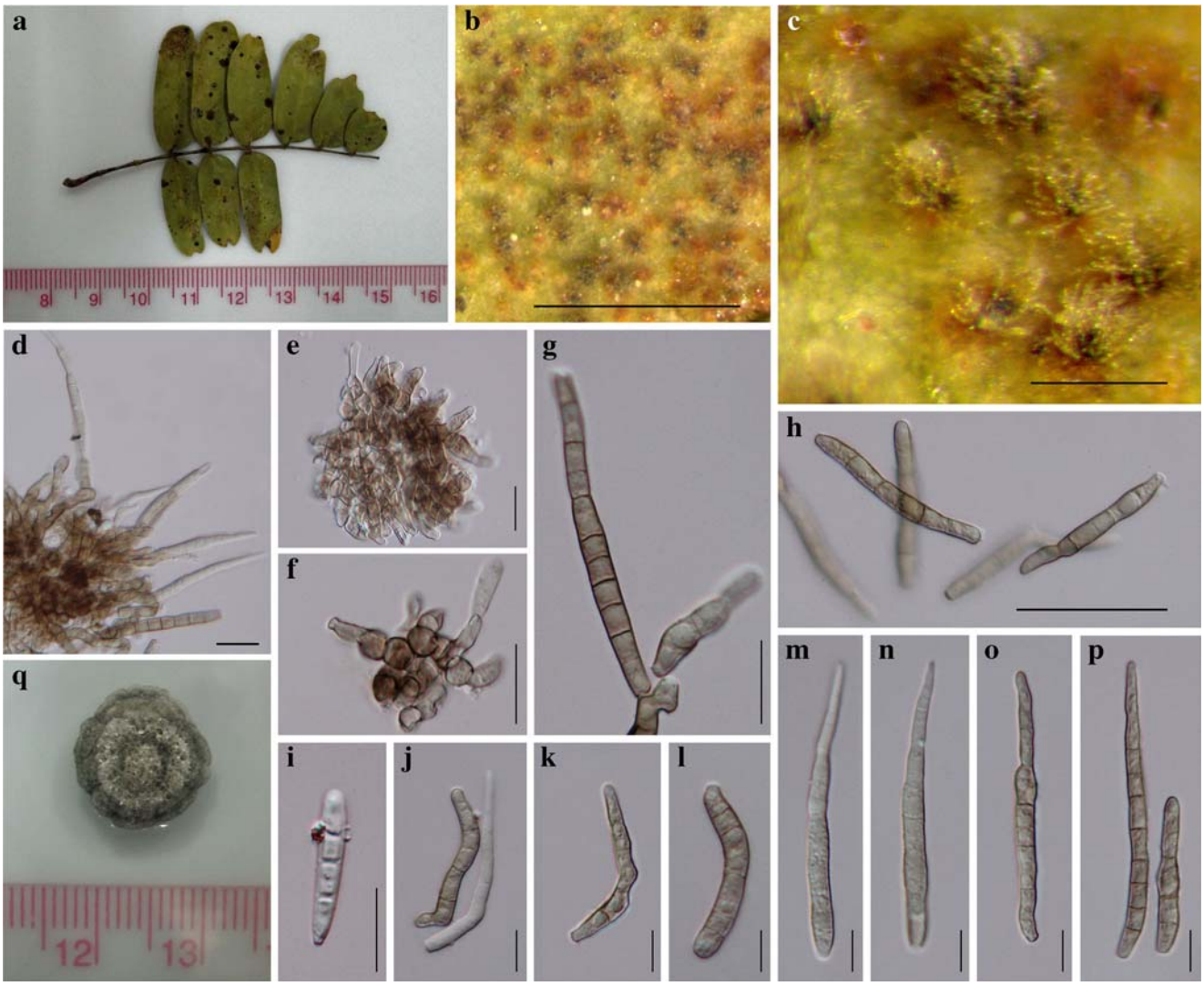


Fig. 107 ***Pseudocercospora tamarindi*** **(holotype) a** Symptoms on leaves (upper surface) **b, c** Close up of leaf spot **d, e** Stroma with attached conidiophores and conidia **f** Stromatal cells **g-p** Conidia of different sizes and maturity **q** Colony on PDA (3 weeks). Scale bars: b=500 μm, c=50 μm, d–f, h–o=10 μm, g, p=20 μm

oblong or irregular, 2–3 μm diam., wall thickness less than 0.3 μm. *Conidiophores* fasciculate, arising from the stromata, brown becoming pale brown towards the apex, smooth, 0–2-septate, often short or one-cells, straight to slightly curved, apex rounded to truncate, unbranched, 3–12×1–2 μm ($\bar{x}$= 7.37×1.81 μm, n=20), wall thickness less than 0.25 μm. *Conidiogenous cells* 5–7×0.8–2 μm ($\bar{x}$=5.66×1.59, n=10), integrated, terminal or conidiophores reduced to conidiogenous cells, occasionally branched, smooth, hyaline to pale brown, integrated, proliferating percurrently, conidiogenous loci inconspicuous. *Conidia* (13–)17–25(–30)×(1.8–)2–3(–3.5) μm ($\bar{x}$=21×2.38 μm, n=30), solitary, subhyaline to brown, cylindrical to obclavate, some showing constrictions at septa, some guttulate, subacute to obtuse apex, obconically subtruncate base, 2–14–septate, hila neither thickened or darkened, 0.7–2 μm diam.

Culture characters: Colonies on PDA show slow growth, attaining 10–12 mm diam. after 3 weeks at 25 °C, dark-grey to black at the margin, grey to pale grey in the centre; reverse dark-green to black; medium dense with dense center, irregular, convex surface, smooth lobate margin, hairy, non-pigmented.

Material examined: THAILAND, Chiang Rai Province, Mueang Chiang Rai District, on living leaves of *Tamarindus indica* L. (*Fabaceae*), 12 February 2014, K.D. Hyde IG018 (MFLU 14–0805, **holotype**); ex-type living culture, MFLUCC 14–0805. GenBank ITS: KP744461; LSU: KP744506; SSU: KP753965.

Notes: The genus *Pseudocercospora* was introduced by Spegazzini (1910) with *Pseudocercospora vitis* as the type species. The genus comprises asexual morphs or species with *Mycosphaerella*-like sexual morphs, which includes many

important plant pathogens (Hyde et al. 2013). They are characterized morphologically by their conidiophores and conidia being pigmented and by the conidiogenous loci being inconspicuous or at least unthickened and not darkened (Crous and Braun 2003; Crous et al. 2013). This new species is the first cercosporoid to be described from the host *Tamarindus indica* in Thailand. Previously, a species *Cercospora tamarindi* had been recorded on leaves of *Tamarindus indica* in Uttar Pradesh, India (Khan et al. 1988; Index Fungorum 2015). *Pseudocercospora tamarindi* differs from this species by having conidiophores that lack distinct spore scars with much less thick wall (>0.25 μm) and darker coloured conidia. Although they both have a similar range for the number of septa (-14), the spores of *P. tamarindi* are much smaller (13–)17–25(–30)×(1.8–)2–3(–3.5) μm compared to those of C. *tamarindi* (38.4–93×3.8 μm according to Khan et al. 1988). A molecular analysis based on a combined gene analysis of ITS and LSU shows that *Pseudocercospora tamarindi* clusters within the major clade that includes the type species *Pseudocercospora vitis* with a bootstrap value of 84 % but is distant from the type species. Yet it is clearly separated from other *Pseudocercospora* species. *Pseudocercospora tamarindi* is related with *Pseudocercospora punctata* (Wakef.) B. Sutton (= *Cercostigmina punctata* Wakef.) which has verruculose conidia (which the former lacks). It is also morphologically similar, but different in conidial size and the number of septa to *Pseudocercospora ocimicola* which has 1–8 septate conidia of (15–)25–75(–85)×2–4 μm (Crous et al. 2013).

76. *Zasmidium musae* (Arzanlou & Crous) Crous & U. Braun., Schlechtendalia **20**: 102 (2010)

≡ *Stenella musae* Arzanlou & Crous, Persoonia 20: 31 (2008)

Index Fungorum number: IF516587, *Facesoffunginumber*: FoF 00440; Fig. 108

Biotrophic or hemibiotrophic causing necrotic leaf spots on palms. *Lesions* initially small, globose to subglobose, becoming irregularly broader lesions, dark brown to reddish-brown at the margin, dry, pale brown at the centre. **Sexual morph** *Ascomata* 50–60 μm high, 60–75 μm diam., scattered, solitary to gregarious, immersed to semi-immersed, with protruding papilla, visible as black spots on host surface, uniloculate, globose to subglobose, glabrous, ostiole central, with minute papilla, rounded at the apex. *Peridium* 5–11 μm wide, thin-walled, of equal thickness, comprising 3–7 cell layers of brown to dark brown, pseudoparenchymatous cells, arrenged in a *textura angularis*. *Hamathecium* lacking pseudoparaphyses. *Asci* (26.5–)27–33(–36)×9–12 μm ($\overline{x}$= 31.9×10.9 μm, n=25), 8-spored, bitunicate, fissitunicate, ampulliform to ovoid, with subsessile to knob-like pedicel, apically rounded, with well-developed ocular chamber, thick-walled at the apex. *Ascospores* 8–10×2–3 μm ($\overline{x}$=9.5× 2.7 μm, n=30), irregular overlapping 1–4-seriate, oblong to clavate, hyaline, 1-septate, not contricted at the septa, wall smooth to rough, thick-walled, mostly upper cell wider than lower cell. **Asexual morph** Undetermined.

Culture characters: Colonies on MEA slow growth, 24–25 mm diam. after 3 weeks at 25–30 °C, dark greenish to dark grey at the margin, white to pale grey at the centre; reverse dark greenish to black; dense, irregular, raised, rough with entire edge, glabrous to velvety, radially furrowed.

Material examined: THAILAND: Chiang Mai, San Sai District, Maejo University, on living leaves of palm, 18 July 2010, R. Phookamsak RP0048 (MFLU11–0168), living culture, MFLUCC 11–0132. GenBank ITS: KP744472; LSU: KP744514; SSU: KP753970.

Notes: *Zasmidium musae* (Arzanlou & Crous) Crous & U. Braun was described as *Stenella musae* Arzanlou & Crous based on its asexual morph and lack of known sexual morph (Arzanlou et al. 2008). Based on a megablast nucleotide search in GenBank of the ITS sequences, our isolate is identified as *Stenella musae* and the pariwise comparison of ITS shows that our isolate and *Z. musae* differ only in one base pair. Based on phylogenetic analysis of LSU gene data, our isolate forms a clade clustered with *Zasmidium scaevolicola*. Therefore, we report the sexual morph of *Zasmidium musae*.

77. *Paradictyoarthriniaceae* Doilom, J.K. Liu & K.D. Hyde, ***fam. nov.***

Index Fungorum number: IF550921; *Facesoffungi number*: FoF00499.

Saprobic on dead wood. **Sexual morph** Undetermined. **Asexual morph** *Colonies* on natural substrate, superficial, scattered, black, powdery. *Conidiophores* macronematous, erect to slightly curved, constricted at septa. *Conidiogenous cells* blastic, integrated, terminal, determinate. *Conidia* muriform, subglobose to ellipsoidal, brown to black, verrucose, solitary or developing in branched chains with short 1–3 chains, very variable in size and shape, circular to irregular with a protruding basal cell; rounded to truncate at the base.

Notes: The family *Paradictyoarthriniaceae* is established to accommodate the genus *Paradictyoarthrinium* in the order *Pleosporales*, *Dothideomycetes* based on its unique morphology and distinct lineage in the phylogenetic analysis. The combined phylogeny of LSU, SSU, TEF1 and RPB2 gene data (Fig. 109) shows that *Paradictyoarthrinium* species groups close to *Roussoellaceae* (Liu et al. 2014) and *Biatriosporaceae* (Hyde et al. 2013), but is a distinct clade with MLBS (64 %) and PP (0.99) support within the order *Pleosporales* (Fig. 109). The morphology differs from the asexual morph of *Roussoellaceae* in many characters (see Liu et al. 2014). The family presently comprises two species, namely *Paradictyoarthrinium diffractum* Matsush and *P. tectonicola* sp. nov.

Type genus: ***Paradictyoarthrinium*** Matsush., Matsush. Mycol. Mem. 9:18 (1996)

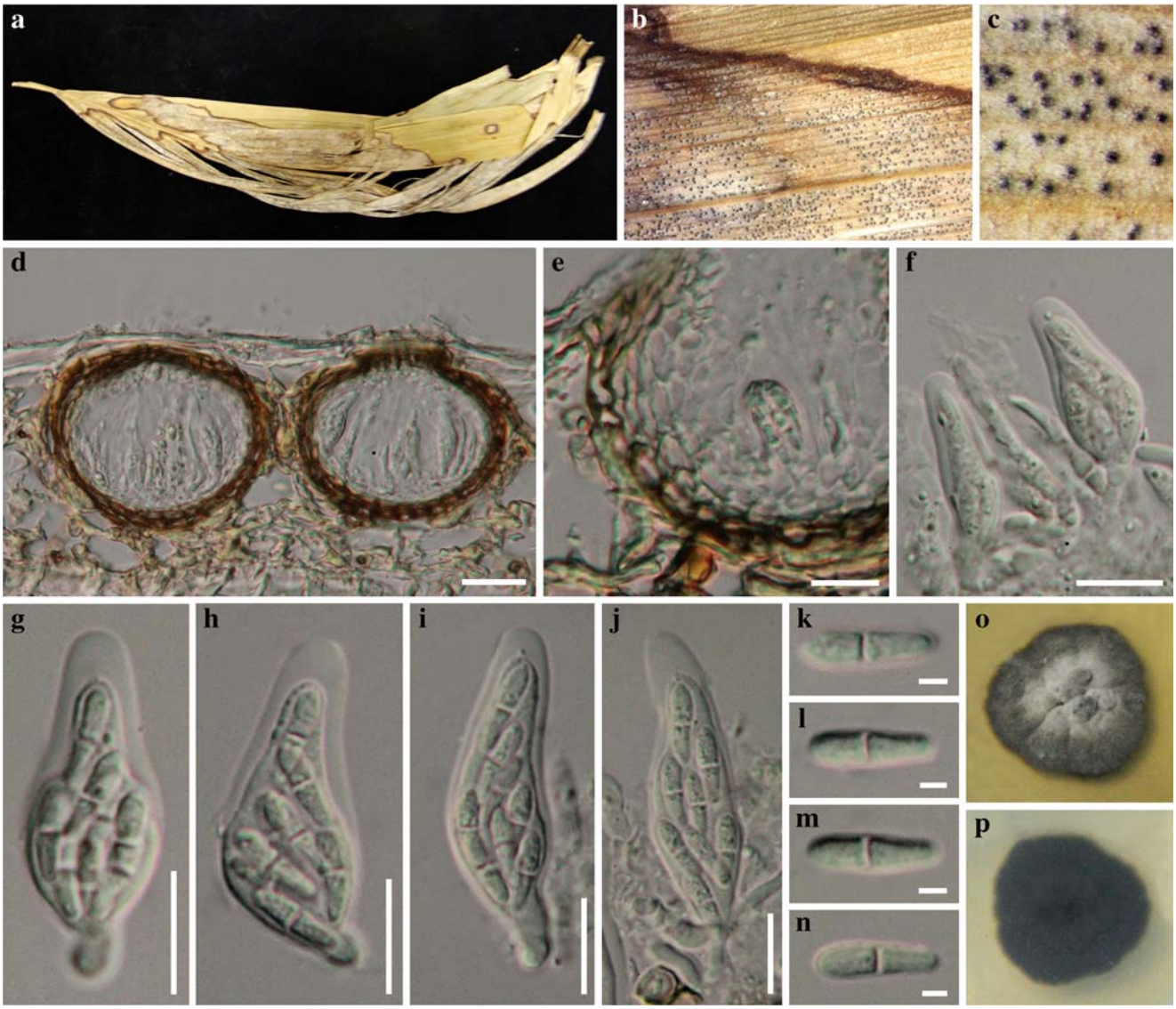


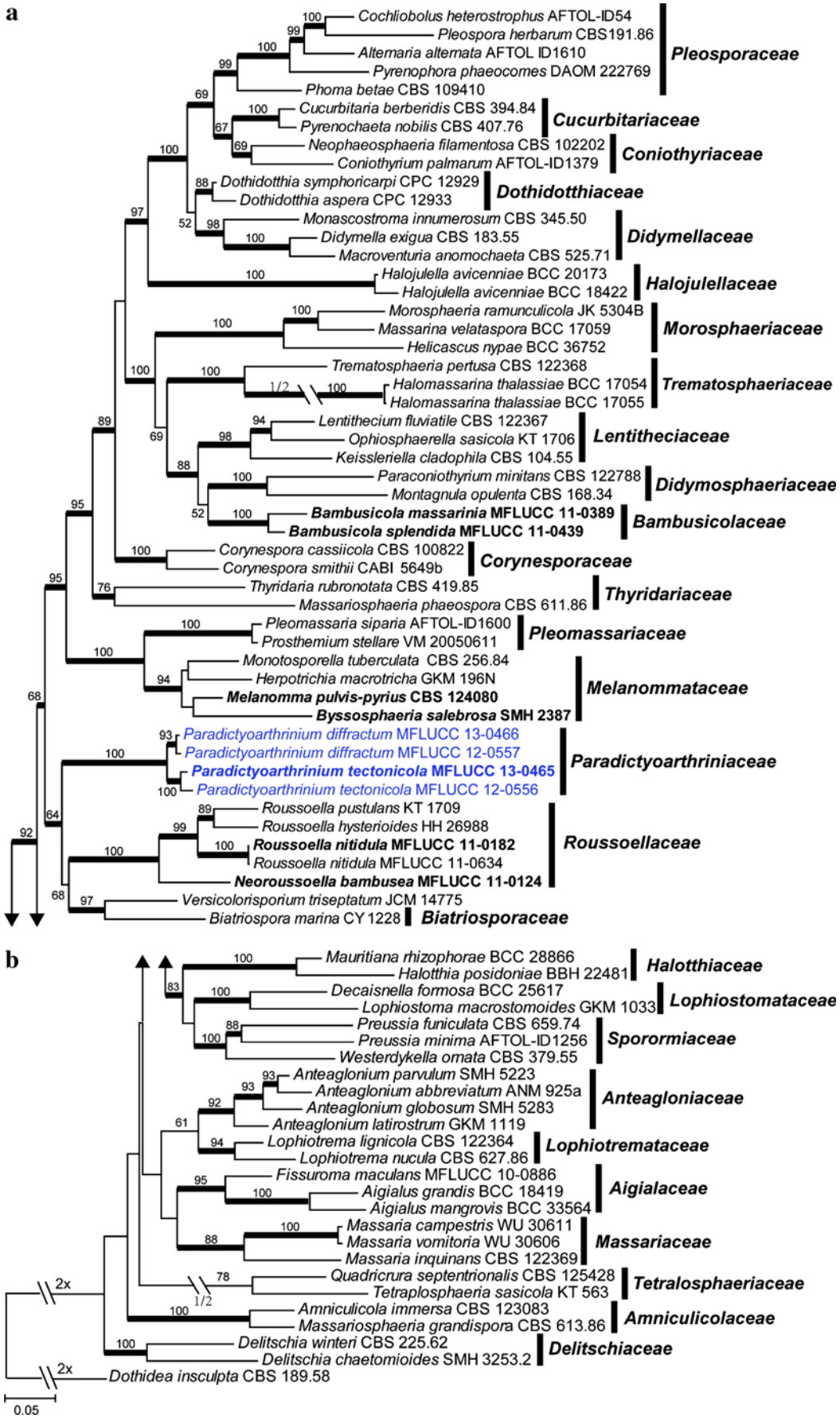
Fig. 108 ***Zasmidium musae*** (MFLU11–0168) **a-c** Ascomata visible as black spots on leaf lesions. **d** Vertical section through an ascoma. **e** Peridium. **f–j** Asci. **k–n** Ascospores. **o**, **p** Culture characteristic. Scale bars: d=20 μm, e–j=10 μm, k–n=2 μm

Type species: ***Paradictyoarthrinium diffractum*** Matsush., Matsush. Mycol. Mem. 9:18 (1996).

Notes: *Paradictyoarthrinium* was introduced as a monotypic genus by Matsushima (1996) with *Paradictyoarthrinium diffractum* as the type species. It was described from a dead decaying spathe of *Cocos nucifera* from a rivulet at Rustenburg in South Africa. Prabhugaonkar and Bhat (2011) stated that based on ML analysis of ITS gene data, the genus *Paradictyoarthrinium* is related with members of the order *Pleosporales*, *Dothideomycetes*. However, multigene phylogenetic analysis with an extended dataset and the relevant type strains were thought to be required to resolve their suitable placement within the families of *Pleosporales* (Prabhugaonkar and Bhat 2011).

In the current study we resolve the placement of *Paradictyoarthrinium*. The MP ITS analysis showed two isolates in this study (MFLUCC 12-0557 and MFLUCC 13-0466) grouping with *P. diffractum* (ex-type GUFCC 15514) with strong bootstrap support (91 % MPBS, tree not shown). We established isolates MFLUCC 12–0557 and MFLUCC 13–0466 as *P. diffractum* based on identical morphology and phylogenetic analysis as compared to the type. The combined dataset of LSU, SSU, TEF1 and RPB2 were then used for family placement (see note for family). Our new sequence data of *Paradictyoarthrinium diffractum* is provided here. GenBank: (MFLUCC 12-0557, ITS: KP744454; LSU: KP744497); (MFLUCC 13-0466, ITS: KP744455; LSU: KP744498; SSU: KP753960).

78. *Paradictyoarthrinium tectonicola* Doilom & K.D. Hyde, ***sp. nov.***


a
Cochliobolus heterostrophus AFTOL-ID54
Pleospora herbarum CBS191.86
Alternaria alternata AFTOL ID1610
Pyrenophora phaeocomes DAOM 222769
Pleosporaceae
Phoma betae CBS 109410
Cucurbitaria berberidis CBS 394.84
Pyrenochaeta nobilis CBS 407.76
Cucurbitariaceae
Neophaeosphaeria filamentosa CBS 102202
Coniothyrium palmarum AFTOL-ID1379
Coniothyriaceae
Dothidotthia symphoricarpi CPC 12929
Dothidotthia aspera CPC 12933
Dothidotthiaceae
Monascostroma innumerosum CBS 345.50
Didymella exigua CBS 183.55
Macroventuria anomochaeta CBS 525.71
Didymellaceae
Halojulella avicenniae BCC 20173
Halojulella avicenniae BCC 18422
Halojulellaceae
Morosphaeria ramunculicola JK 5304B
Massarina velataspora BCC 17059
Helicascus nypae BCC 36752
Morosphaeriaceae
Trematosphaeria pertusa CBS 122368
Halomassarina thalassiae BCC 17054
Halomassarina thalassiae BCC 17055
Trematosphaeriaceae
Lentithecium fluviatile CBS 122367
Ophiosphaerella sasicola KT 1706
Keissleriella cladophila CBS 104.55
Lentitheciaceae
Paraconiothyrium minitans CBS 122788
Montagnula opulenta CBS 168.34
Didymosphaeriaceae
Bambusicola massarinia MFLUCC 11-0389
Bambusicola splendida MFLUCC 11-0439
Bambusicolaceae
Corynespora cassiicola CBS 100822
Corynespora smithii CABI 5649b
Corynesporaceae
Thyridaria rubronotata CBS 419.85
Massariosphaeria phaeospora CBS 611.86
Thyridariaceae
Pleomassaria siparia AFTOL-ID1600
Prosthemium stellare VM 20050611
Pleomassariaceae
Monotosporella tuberculata CBS 256.84
Herpotrichia macrotricha GKM 196N
Melanomma pulvis-pyrius CBS 124080
Byssosphaeria salebrosa SMH 2387
Melanommataceae
Paradictyoarthrinium diffractum MFLUCC 13-0466
Paradictyoarthrinium diffractum MFLUCC 12-0557
Paradictyoarthrinium tectonicola MFLUCC 13-0465
Paradictyoarthrinium tectonicola MFLUCC 12-0556
Paradictyoarthriniaceae
Roussoella pustulans KT 1709
Roussoella hysterioides HH 26988
Roussoella nitidula MFLUCC 11-0182
Roussoella nitidula MFLUCC 11-0634
Neoroussoella bambusea MFLUCC 11-0124
Roussoellaceae
Versicolorisporium triseptatum JCM 14775
Biatriospora marina CY 1228
Biatriosporaceae
b
Mauritiana rhizophorae BCC 28866
Halotthia posidoniae BBH 22481
Halotthiaceae
Decaisnella formosa BCC 25617
Lophiostoma macrostomoides GKM 1033
Lophiostomataceae
Preussia funiculata CBS 659.74
Preussia minima AFTOL-ID1256
Westerdykella ornata CBS 379.55
Sporormiaceae
Anteaglonium parvulum SMH 5223
Anteaglonium abbreviatum ANM 925a
Anteaglonium globosum SMH 5283
Anteaglonium latirostrum GKM 1119
Anteagloniaceae
Lophiotrema lignicola CBS 122364
Lophiotrema nucula CBS 627.86
Lophiotremataceae
Fissuroma maculans MFLUCC 10-0886
Aigialus grandis BCC 18419
Aigialus mangrovis BCC 33564
Aigialaceae
Massaria campestris WU 30611
Massaria vomitoria WU 30606
Massaria inquinans CBS 122369
Massariaceae
Quadricrura septentrionalis CBS 125428
Tetraplosphaeria sasicola KT 563
Tetralosphaeriaceae
Amniculicola immersa CBS 123083
Massariosphaeria grandispora CBS 613.86
Amniculicolaceae
Delitschia winteri CBS 225.62
Delitschia chaetomioides SMH 3253.2
Delitschiaceae
Dothidea insculpta CBS 189.58
2x
1/2
0.05

◀ **Fig. 109** Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU, *TEF1* and *RPB2* sequence data of *Pleosporales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Dothidea insculpta* CBS 189.58

IndexFungorum no: IF550900, *Facesoffungi number*: FoF00315; Fig. 110

Etymology: In reference to the host *Tectona*, and *cola* meaning loving.

Holotypus: MFLU 14–0629.

Saprobic on dead stump of *Tectona grandis* L.f. **Sexual morph** Undetermined. **Asexual morph** *Colonies* on natural substrate, superficial, gregarious, scattered, black, powdery. *Conidiophores* up to 33 μm long, 1.5–3 μm diam., macronematous, erect to slightly curved, constrict at the septa, arising from hyphae. *Conidiogenous cells* blastic, integrated, terminal, determinate. *Conidia* (8–) 17–21 (–26) high × (8–) 16–19 (–22) μm ($\bar{x}$ = 18 × 16 μm, n = 30), muriform, subglobose to ellipsoidal, brown to black, verrucose, solitary or developing in branched chains, with 1–3 short chains, very variable in size and shape; circular to irregular with a protruding basal cell; rounded to truncate at the base.

Culture characters: Ascospores germinating on PDA within 24 h. Germ tubes produced around conidia. Colonies on MEA reaching 18–28 and 26–35 mm diam. after 7 and 10 d in the dark at 25 °C respectively (av = 20 mm (7 d), 29 mm (10 d) n = 10), circular shape, superficial, flattened to effuse, velvety, dense, grey (26E1), entire edge. Mycelium 1.5–3.5 μm broad, partly superficial, partly immersed, pale brown to dark brown, septate, branched, verruculose. Chlamydospores reddish-brown. *Conidiophore*s up to 30 μm long, 3–4 diam., arising from hyphae. *Conidia* (9–) 15–23 (–37) high × (9–) 14–18 (–35) μm ($\bar{x}$ = 19 × 17 μm, n = 30), muriform, reddish-brown to dark brown.

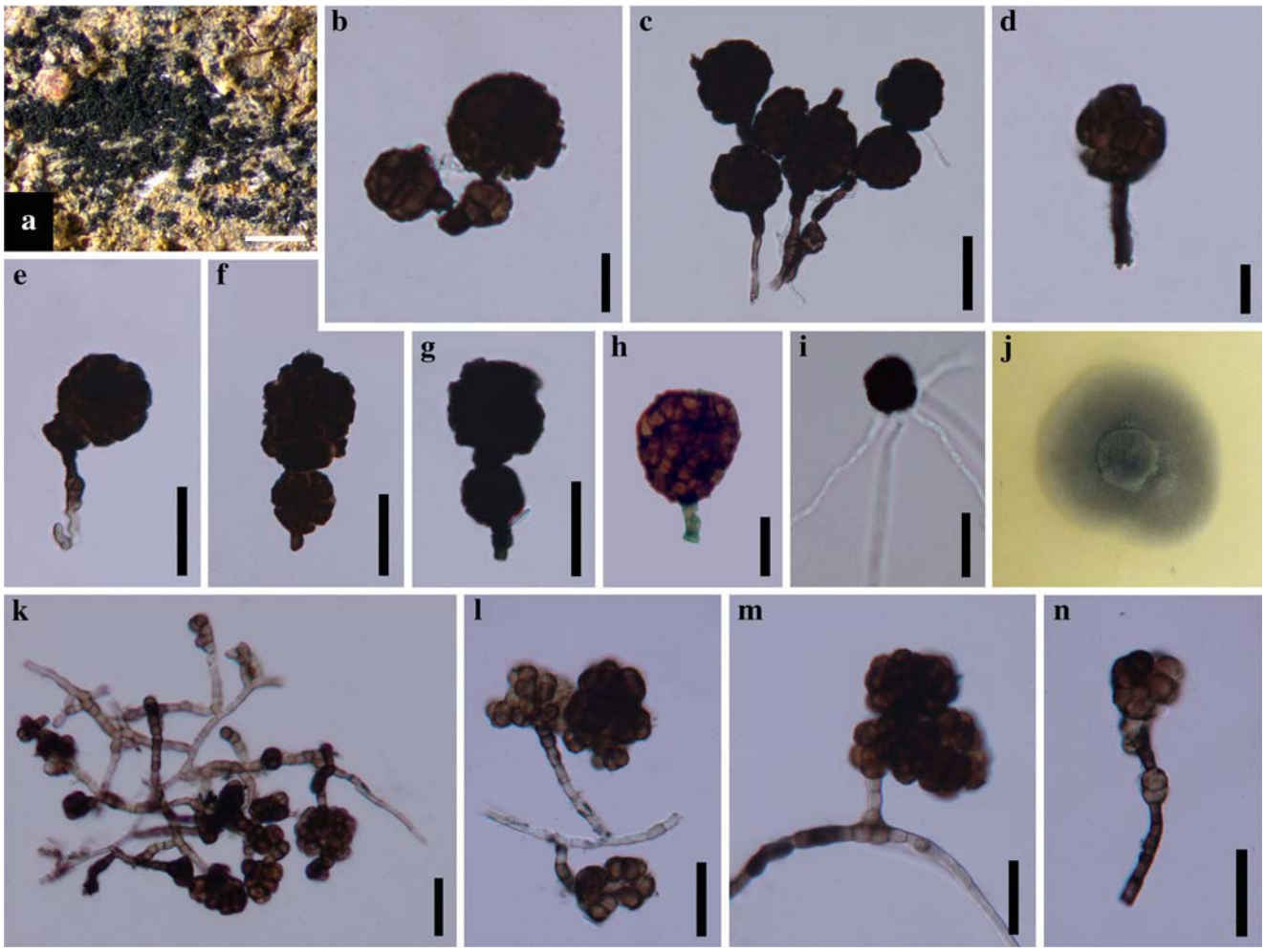


Fig. 110 ***Paradictyoarthrinium tectonicola*** (**holotype**) **a** Colonies on host **b** Conidia with basal cells **c–e** Conidia with conidiogenous cells on host **f, g** Conidia with conidial chains **i** Germinating conidia **j** Culture on MEA after 1 week **k-n** Conidia with conidiophores on MEA. Scale bars: a = 500 μm, b, d, h = 10 μm, c, e-f, i, k-n = 20 μm

Material examined: THAILAND, Chiang Rai Province, Mae Chan District, Kiu Tap Yang garden, on dead stem of *Tectona grandis* (*Lamiaceae*), 3 March 2013, M. Doilom (MFLU 14–0629, **holotype)**, ex-type living culture, MFLUCC 13–0465, ICMP 20686. GenBank ITS: KP744456; LSU: KP744500; SSU: KP753961; *ibid*., MFLU 14-0630, living culture MFLUCC 12-0556. GenBank LSU: KP744499.

Notes: *Paradictyoarthrinium tectonicola* is introduced as second species of *Paradictyoarthrinium*. Two species can be distinguished as colonies of *P. tectonicola* are slower growing on MEA for at least 10 days than *P. diffractum* (Prabhugaonkar and Bhat 2011). *Paradictyoarthrinium tectonicola* and *P. diffractum* are very variable in size and shape of conidia, thus having no obvious different conidia dimensions. Nevertheless, phylogenetic analyses based on ITS sequence data can separate them at the species level. Isolates of *P. tectonicola* (MFLUCC 12–0556 and ex-type MFLUCC 13–0465) grouped separately from *P. diffractum* (MFLUCC 12–0557 and MFLUCC 13–0466) with strong MLBS (100 %) and PP (1.00) support in the combined LSU, SSU, TEF1 and RPB2 phylogeny (Fig. 109).

Phaeosphaeriaceae

A phylogenetic analysis and monograph of genera of *Phaeosphaeriaceae* was published by Phookamsak et al. (2014) and this is followed here. The phylogenetic tree is presented in Fig. 111.

79. *Allophaeosphaeria* Ariyawansa, Camporesi, J.K. Liu & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF550997; *Facesoffunginumber*: FoF 00494

Etymology: Named after its morphological resemblance to *Phaeosphaeria* in contrast to the phylogenetic distance between both genera.

Type species: *Allophaeosphaeria muriformia* Ariyawansa, Camporesi & K.D. Hyde

Saprobic on dead wood. **Sexual morph** *Ascomata* superficial, globose to subglobose, ostiolate. *Ostiole* papillate, without periphyses *Peridium* comprising 2-layers, outer layer composed of heavily pigmented thick-walled, innermost layer of broad, hyaline compressed rows of cells of *textura angularis*. *Hamathecium* lacking pseudoparaphyses. *Asci* bitunicate, fissitunicate, elongate cylindrical to slightly clavate with an ocular chamber. *Ascospores* oblong to narrowly oblong, multi-septate, muriform, constricted at each septa, hyaline, pale brown when mature, smooth-walled. **Asexual morph** Undetermined.

80. *Allophaeosphaeria dactylidis* Wanasinghe, Camporesi, E.B.G. Jones & K.D. Hyde, ***sp. nov.***

Index Fungorum Number: IF550894, *Facesoffungi Number*: FoF 00384; Fig. 112

Etymology: Named after the host genus from which it was collected, *Dactylis*.

Holotype: MFLU 14–0754

Saprobic on dead herbaceous branches. **Sexual morph** *Ascomata* 100–150 μm high 100–175 μm diam. ($\bar{x}$=142.2×131.2 μm, n=10), solitary, scattered, immersed to erumpent, globose or subglobose, dark brown to black, coriaceous, ostiolate. *Ostiole* 30–70 μm high 20–30 μm diam. ($\bar{x}$=48.7×23.8 μm, n=10), blackish-brown, smooth, ostiolar canal filled with dark brown cells. *Peridium* 10–15 μm wide at the base, 8–12 μm wide at the sides, composed with reddish to dark brown cells of *textura angularis*. *Hamathecium* comprising numerous, 1.5–2.5 μm (n=30) wide, filamentous, branched septate, pseudoparaphyses. *Asci* 60–90×10–20 μm ($\bar{x}$=69×14.6 μm, n=40), 8-spored, bitunicate, fissitunicate, cylindric-clavate to clavate, pedicellate, thick-walled at the apex, with minute ocular chamber. *Ascospores* 15–20×5–8 μm ($\bar{x}$=18.2×6.3 μm, n=50), overlapping 1–2-seriate, ellipsoidal to subfusiform, upper part wider than the lower part, muriform, 3–5 transversely septate, with 1–3 vertical septa, constricted at the central septum, initially hyaline, becoming yellowish-brown at maturity, ends remaining lighter and cone-shaped, with rounded ends, without a mucilaginous sheath. **Asexual morph** Undetermined.

Material examined: ITALY, Province of Forlì-Cesena [FC], Corniolo, dead upright stems of *Dactylis glomerata* (*Poaceae*), 12 July 2013, E. Camporesi (MFLU 14–0754, **holotype**); ex-type living culture, MFLUCC 13–0618. GenBank ITS: KP744432; LSU: KP744473; SSU: KP753946.

Notes: *Allophaeosphaeria dactylidis* is the second species of *Allophaeosphaeria* and it has muriform ascospores similar to those characterized in *P. vagans* (Niessl) O.E. Erikss., *P phragmiticola* Leuchtm and *P. phragmitis* (Hollós) Leuchtm (Shoemaker and Babcock 1989). Multi-gene phylogenetic analyses (ITS, LSU and SSU sequences) indicated that *Allophaeosphaeria dactylidis* belongs to *Phaeosphaeriaceae*, but is distinct from *Phaeosphaeria sensu stricto*.

81. *Allophaeosphaeria muriformia* Ariyawansa, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550998, *Facesoffunginumber*: FoF00410; Fig. 113

Etymology: The specific epithet *muriformia* is based on the ascospore septation.

Holotype: MFLU 15-0067

Saprobic on dead wood. **Sexual morph** *Ascomata* 275–340 μm high×300–380 μm diam. ($\bar{x}$=290×340 μm), solitary, scattered, superficial, globose to subglobose, ostiolate. *Ostiole* papillate, black, smooth, with neck and without periphyses *Peridium* 45–70 μm wide, comprising 2-layers, outer layer

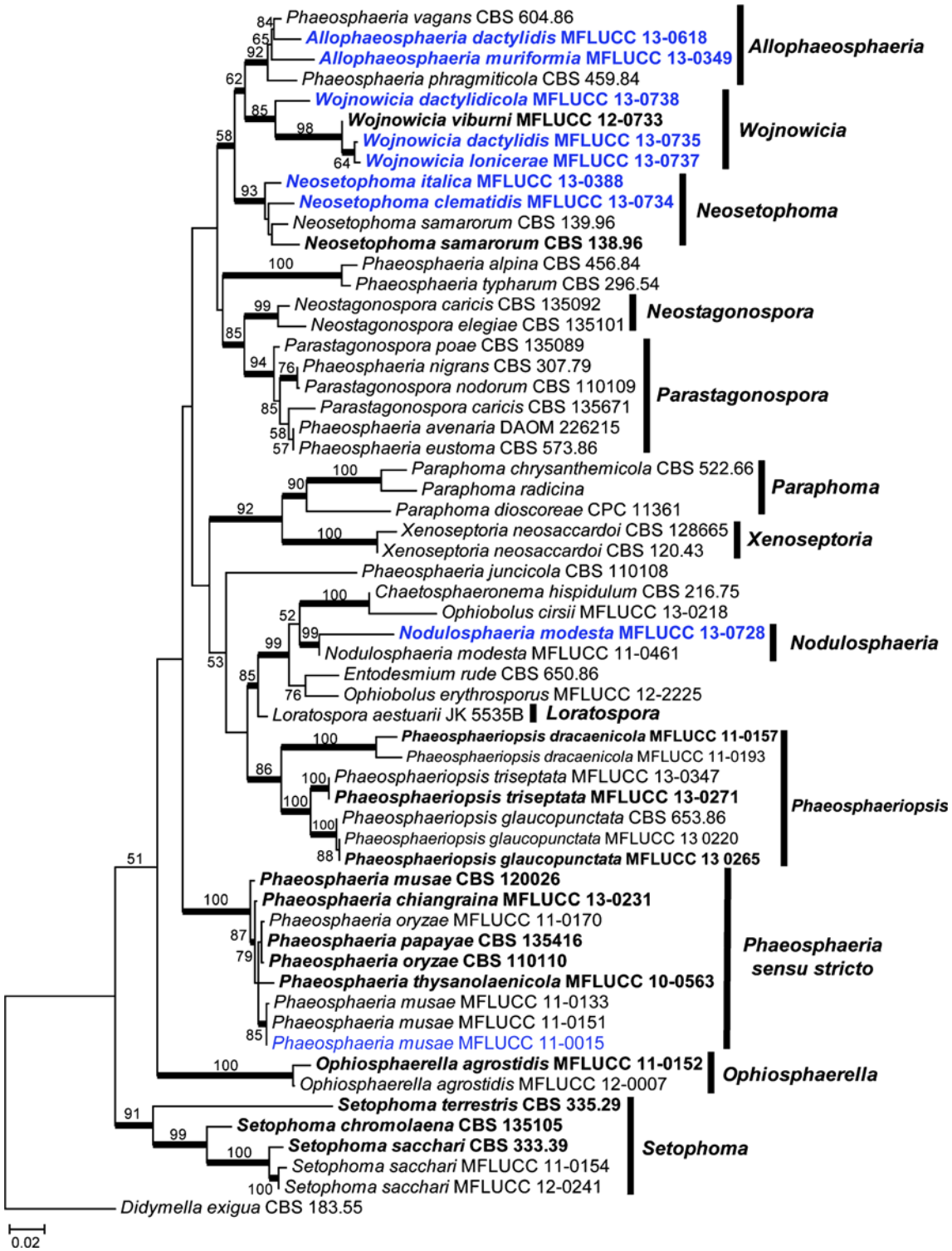
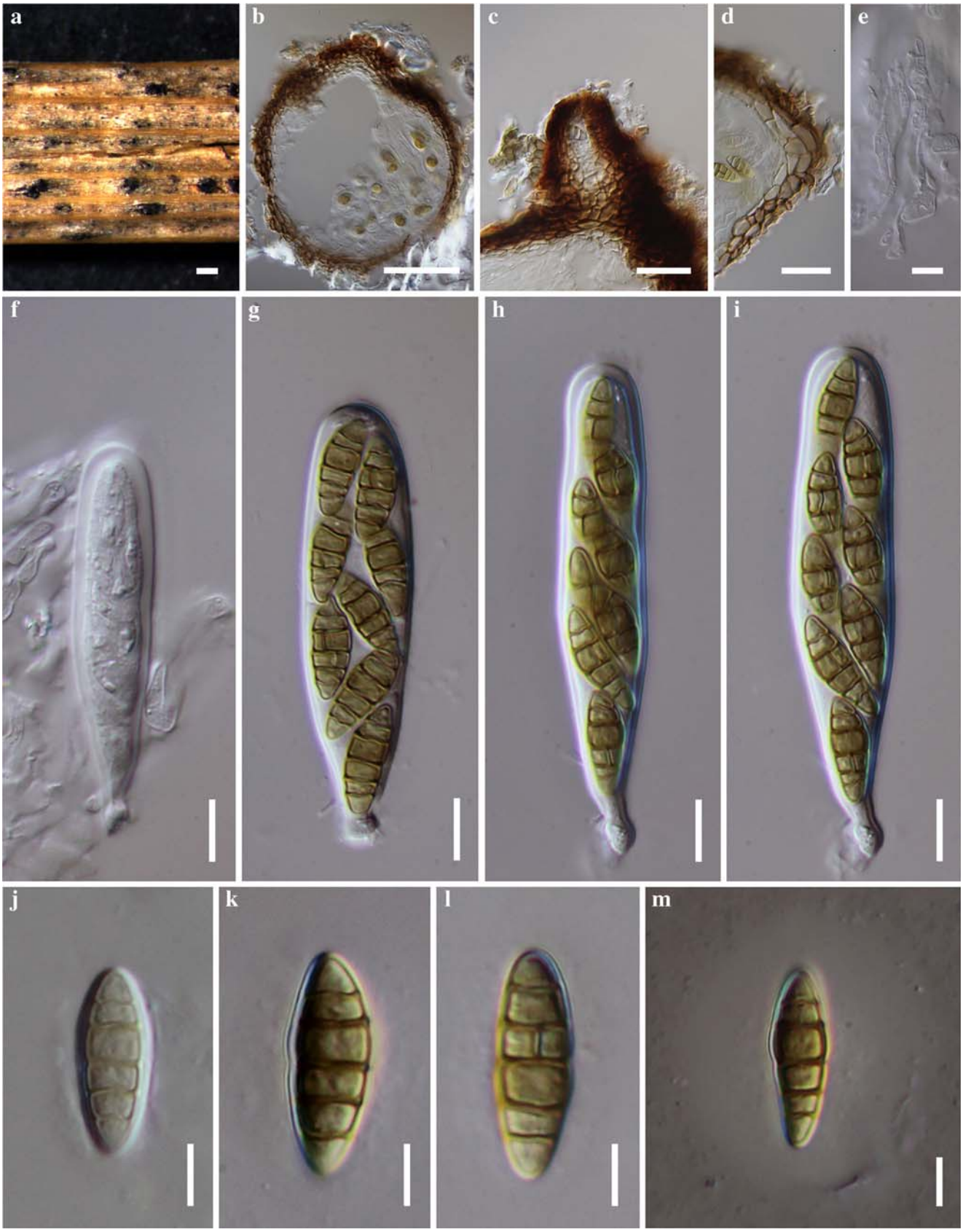


Fig. 111 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU and ITS sequence data of *Phaeosphaeriaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Didymella exigua* CBS 183.55

composed of heavily pigmented thick-walled cells, innermost layer of broad, hyaline compressed rows of cells of *textura angularis*. *Hamathecium* lacking pseudoparaphyses. *Asci* 210–237 × 50–70 μm ($\bar{x}$ = 235 × 62 μm, n = 20), 8-spored, bitunicate, fissitunicate, elongate cylindrical to slightly clavate, with a minute pedicel, thick-walled and rounded at apex,


a
b
c
d
e
f
g
h
i
j
k
l
m

◀ **Fig. 112** ***Allophaeosphaeria dactylidis*** **(holotype)**. **a** Ascomata on host substrate **b** Section of ascoma **c** Close up of ostiole **d** Peridium **e** Pseudoparaphyses **f**–**i** Asci **j**–**l** Ascospores **m** Ascospores stained in Indian ink. Scale bars: a=200 μm, b=50 μm, c, d=20 μm, e–i=10 μm, j–m=5 μm

with an ocular chamber. *Ascospores* 40–60×20–30 μm ($\bar{x}$= 56×26 μm, n=40), overlapping 2–3-seriate, oblong to narrowly oblong, straight to slightly curved, muriform, multi-septate, constricted at each septa, hyaline, pale brown when mature, smooth-walled. **Asexual morph** Undetermined.

Material examined: ITALY, Province of Forlì-Cesena, Montevescovo, on dead stem, 4 February 2013, E. Camporesi (MFLU 14–1122, **holotype**), ex-type living culture, MFLUCC 13–0349. GenBank ITS: KP765680; LSU: KP765681; SSU: KP765682.

Notes: *Allophaeosphaeria* resembles many species of *Phaeosphaeria* in having a peridium comprising 2–3 layers of brown to dark brown cells of *textura angularis* and multi-septate ascospores with a gelatinous sheath, but differs in having elongate-cylindrical to slightly clavate asci with a clear ocular chamber and lacks pseudoparaphyses. The phylogenetic analysis of combined ITS, LSU and SSU sequences provided strong evidence that the type species of *Allophaeosphaeria*, *A. muriformia* belongs in *Phaeosphaeriaceae* and clustered together with putatively named strains of *Phaeosphaeria phragmiticola* (CBS 459.84) and *Phaeosphaeria vagans* (CBS 604.86).

82. ***Neosetophoma clematidis*** Wijayawardene, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF 505909, Faces of Fungi number: FoF 00419; Fig. 114

Etymology: Named after host on which it was first collected

Holotypus: MFLU 14–0746

Saprobic on branch of *Clematis vitalba*. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 425–475 μm diam., 220–270 μm high, pycnidial, superficial, black, gregarious, unilocular, but occasionally multi-locular, with a papillate ostiole. *Pycnidial wall* 30–55 μm wide, thick at outer layer,

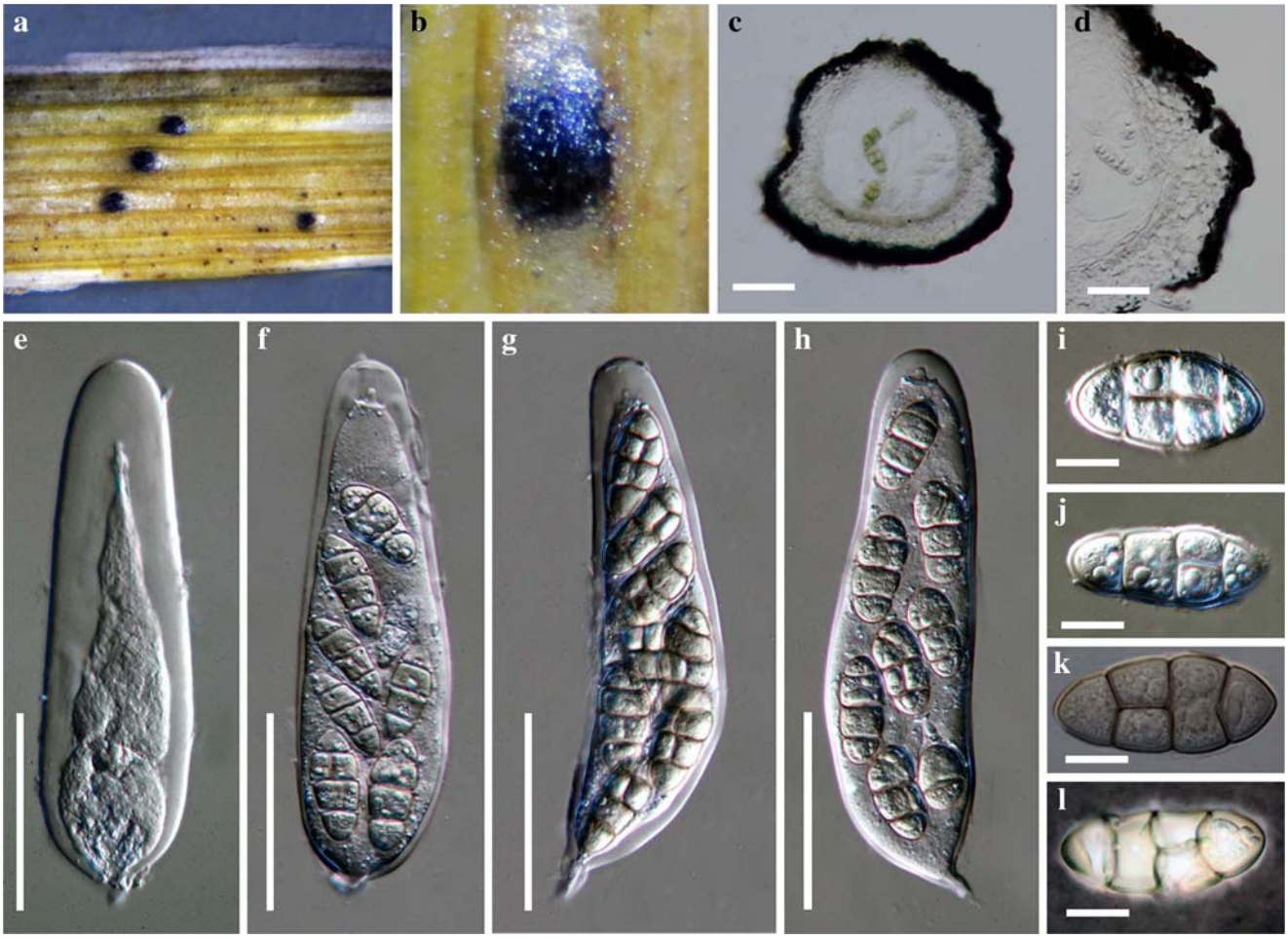


Fig. 113 ***Allophaeosphaeria muriformia*** **(holotype) a, b** Ascomata on the host surface **c** Section of an ascoma **d** Close up of the peridium **e**–**h** Cylindrical asci with a minute pedicel **i**–**k** Hyaline to pale brown ascospores **k** Ascospores mounted in Indian ink. Scale bars: c=50 μm, d=5 μm, e-g=30 μm, h-j=5 μm, k=10 μm

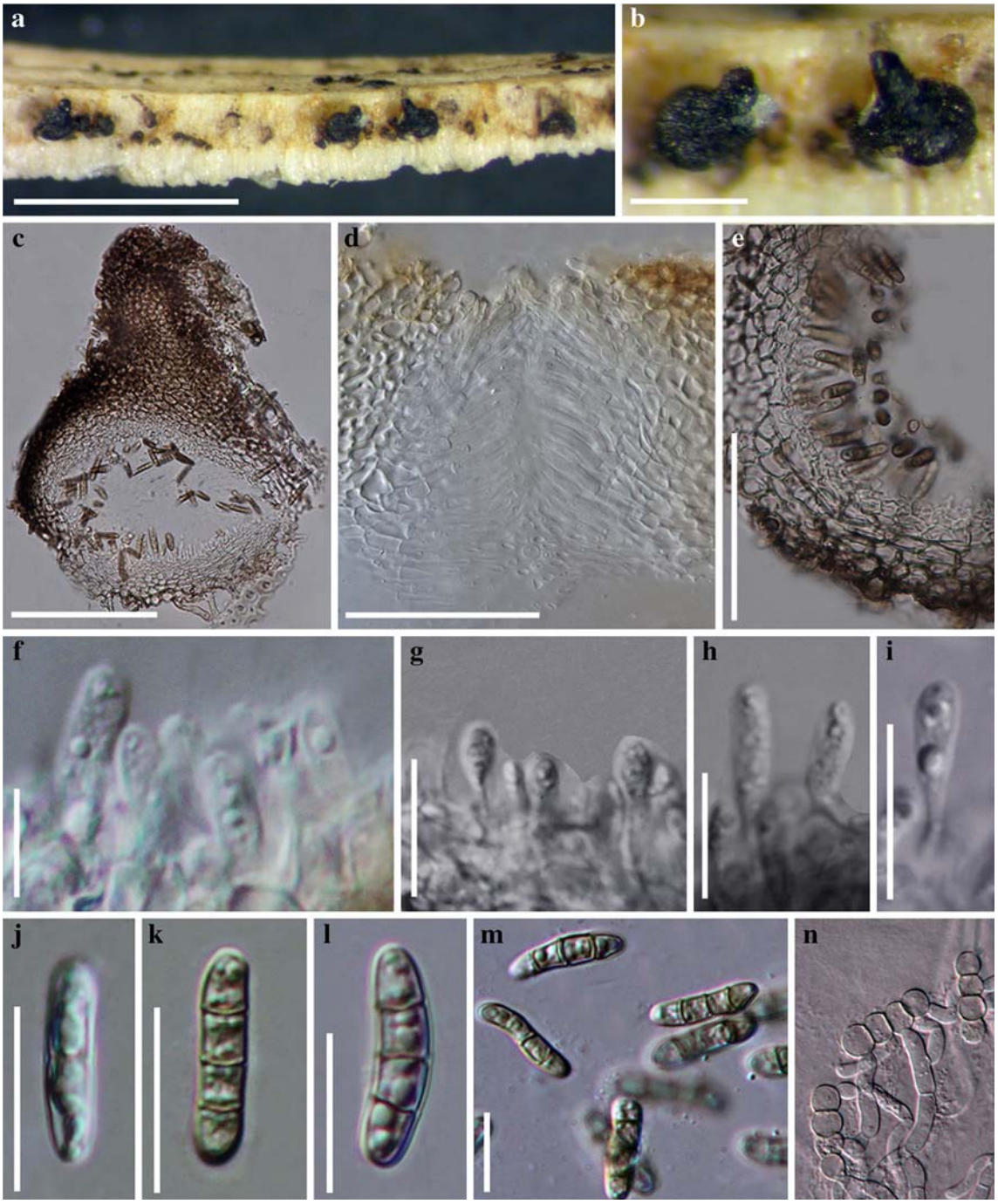


Fig. 114 *Neosetophoma clematidis* (**holotype**) **a**, **b** Conidiomata on the host plant **c** Cross section of conidioma **d**, **e** Pycnidium wall **f-i** Different stages of conidiogeny **j-m** Conidia **n** Germinating conidia. Scale bars: a=500 μm, b=200 μm, c=100 μm, d-e=50 μm, f=5 μm, g-m=10 μm

brown to dark brown, with 4–10 cell layers, inner layer hyaline, 3–5 cell layers, cells of *textura angularis. Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 3–5×1–3 μm, simple, smooth, hyaline, integrated, enteroblastic, phialidic. *Conidia* 11–15×2–4 μm ($\bar{x}$=12.71×2.95 μm, n=20), slightly brown, straight to curve, continuous, with truncate base, with obtuse apex, 3-euseptate, often slightly narrower in the middle, smooth-walled, guttulate.

Culture characters: on PDA white from above and greyish white from reverse, cottony, circular, zonate, slow growing, attaining a diam. of 1.5 cm in 7 days at 18 °C.

Material examined: Italy, Province of Forlì-Cesena, Pietrapazza, Bagno di Romagna, on dead branch of *Clematis vitalba* L. (*Ranunculaceae*), 20 January 2013, E. Camporesi, IT1027 (MFLU 14–0746, **holotype**); *ibid.*, GUHC 7204, isotype), ex-type living culture, MFLUCC 13–0734, GUCC

20. GenBank ITS: KP744450; LSU: KP684153; SSU: KP684154.

Notes: The phylogenetic tree showed that this species belongs to *Neosetophoma* and is a different species to *N. italica* and *N. samarorum* (Fig. 111).

83. *Neosetophoma italica* W.J. Li, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550920, *Facesoffunginumber*: FoF 00425; Fig. 115

Etymology: Named after the country where it was collected, Italy.

Holotypus: MFLU 14–0809

Saprobic on dead leaves of *Iris germanica* L., forming conspicuous, dark brown conidiomata. **Sexual morph** Undetermined. **Asexual morph** coelomycetous. *Conidiomata* 50–60 μm high, 40–75 μm diam., pycnidial, separate, dark brown, globose, subepidermal, unilocular, thin-walled, papillate. *Peridium* 5–10 μm wide, composed of 3–4 layers, with outer 1–2 layers comprising brown and inner 1–2 layers of pale brown to hyaline cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 2–5 μm long × 3–6 μm wide, enteroblastic, phialidic, doliiform to ampulliform, determinate, hyaline, smooth-walled. *Conidia* 6–11 × 3–4 μm ($\bar{x}$=9 × 3; n=30), subcylindrical, fusiform, or ellipsoid to fusiform, pale brown, smooth-walled, 1–2-euseptate, constricted at the septa, apex and base obtuse, or sometimes with truncate base, smooth-walled.

Culture characters: Colonies on PDA, reaching 30–35 mm diam. after one month, slow growing, white to yellowish in the first week, with central area becoming grey after three weeks, circular, dense, aerial, reverse dark brown, filamentous. *Colonies* on MEA, pale grey to almost white, reverse dark brown, without any pigments produced.

Material examined: ITALY, Province of Forlì-Cesena [FC], Castrocaro Terme, on dead leaf of *Iris germanica* L. (*Iridaceae*), 20 September 2012, E. Camporesi IT–733 (MFLU 14–0809, **holotype**), ex-type living cultures, MFLUCC 13–0388, ICMP. GenBank ITS: KP711356; LSU: KP711361; SSU: KP711366; *ibid*. (KUN! HKAS 83968, **isotype**).

Notes: *Neosetophoma*, is typified by *N. samararum* (Desm.) Gruyter et al. and is monotypic (Gruyter et al. 2010). The species has been reported as a pathogen causing leaf spots of various hosts (Phookamsak et al. 2014). The genus is characterized by globose to irregular conidiomata, with papillate ostioles, and with yellowish conidia that are attenuate at one end (Gruyter et al. 2010). The morphological characters of *N. italica* are in accordance with the generic concepts of *Neosetophoma*, and the only difference between *N. italica* and *N. samararum* is the colour of the conidia (pale brown in *N. italica*, versus yellowish in *N. samararum*). Phylogenetic analyses based on multi-genes (Fig. 111) show that *N. italica* groups with two strains of *N. samararum* with high bootstrap support (93 %). However, *N. italica* is distinct from *N. samararum* strains, forming a distinct branch. Therefore *Neosetophoma italica* is introduced as novel species.

84. *Phaeosphaeria musae* Arzanlou & Crous., Fungal Planet **9**: (2006)

Facesoffungi number: FoF00597; Fig. 116

Ascomata immersed, mostly erumpent, raising the host tissue, visible as black pustules on surface view, subglobose, brown to black, solitary, clustered or scattered; in section 120–240 μm high ×150–310 μm diam., rounded at base. *Ostiole* central, brown to black, papillate, aperiphysate layers. *Peridium* thin, comprising several layers of brown walled angular pseudoparenchymatous cells. *Asci* 60–80 × 9–12 μm, 8-spored, bitunicate, fissitunicate, cylindrical-clavate, short pedicellate, apically rounded, with an ocular chamber. *Ascospores* 20–25 × 4–6 μm, biseriate, ellipsoidal, fusiform to narrowly fusiform with narrowly rounded ends, 5-celled, euseptate, lightly constricted at the septum, guttulate at each cell, hyaline when young, turning light brown and concolourous while in the ascus, wall smooth, surrounded by a mucilaginous sheath.

Material examined: THAILAND**:** Chiang Mai Province, Doi Inthanon National Park, junction of Highway 1009 and road to Mae Chen, N19°31.58′ E 98°29.64′, elev. 1700 m, on a dead leaf of palms. 21, Sep. 2009. Jian-Kui Liu, JKA-0021 (MFLU 15-0043), living culture MFLUCC 11-0015. GenBank ITS: KP744458; LSU: KP744502; SSU: KP753963.

Notes: *Phaeosphaeria musae* (MFLUCC 11-0015) clustered in the *Phaeosphaeria sensu stricto* clade and could not be well-resolved. Phookamsak et al (2014) showed that this group is a complex section in *Phaeosphaeriaceae*, and protein coding genes, such as TEF1 and RPB2 are useful for resolving the genus complex, or even the species complex. In this study the taxon was isolated from leaves of palms as the sexual morph, whereas it was first described from *Musa* sp. based on its asexual morph.

85. *Wojnowicia dactylidicola* Wijayawardene, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550906, *Facesoffungi number*: FoF00415; Fig. 117

Etymology: Named after the host *Dactylis*.

Holotypus: MFLU 14–0743

Saprobic on branch of *Dactylis* sp. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 70–100 μm diam., 100–130 μm high, pycnidial, superficial, black, gregarious to solitary, unilocular, with an eccentric papillate ostiole. *Pycnidial wall* 18–20 μm wide, with thick outer layer, dark brown, 5–6 cell layered, with inner most layer hyaline, 2–3

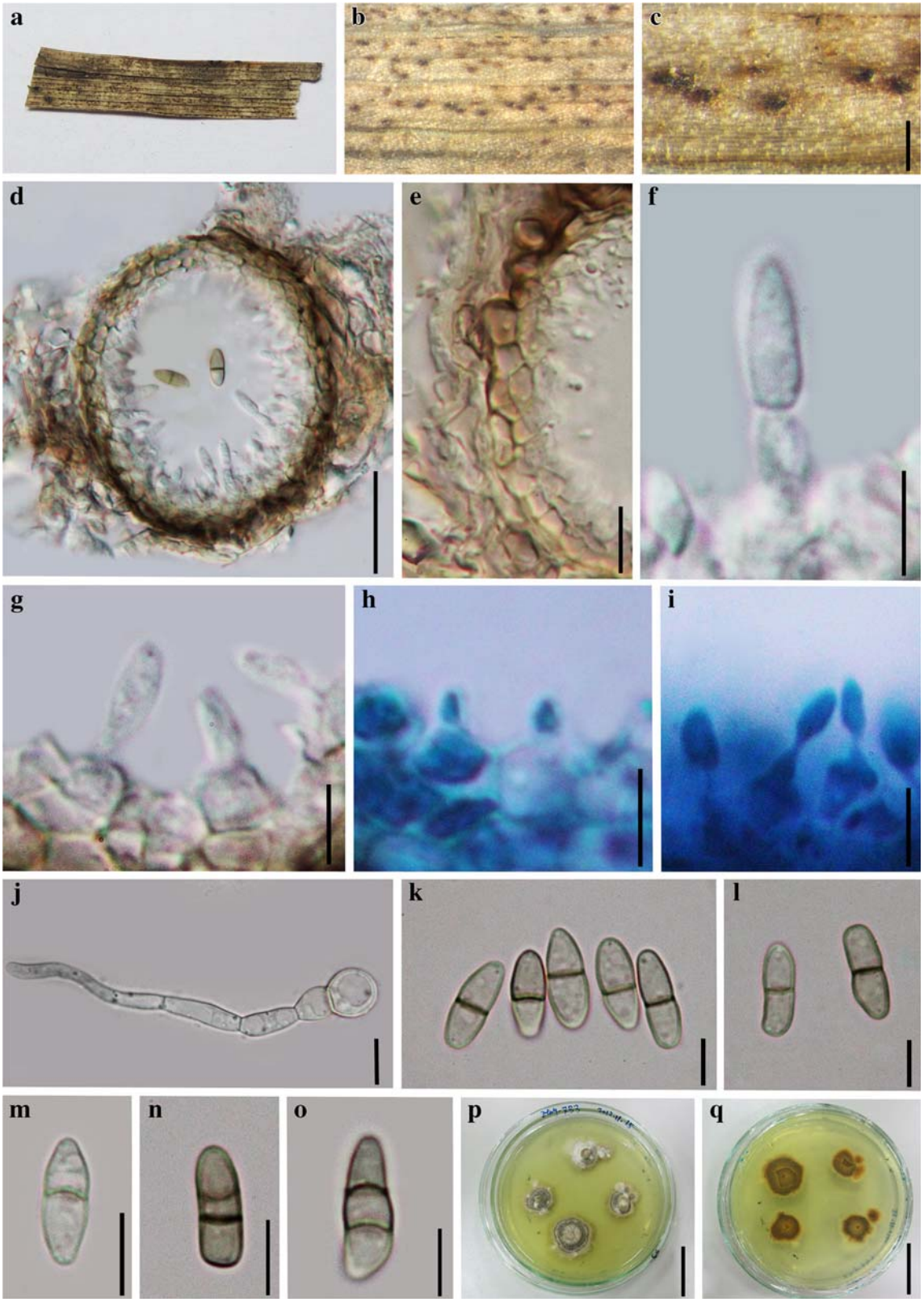


Fig. 115 *Neosetophoma italica* (**holotype**) **a** Specimen **b, c** Brown conidiomata on the host surface **d** Vertical section of conidioma **e** Section of peridium **f–i** Conidiogenous cells and developing conidia **j** Germinated spore **k–o** Conidia p Culture on PDA. Scale bars: c= 200 μm, d=25 μm, e=5 μm, f–i=5 μm, j–o=5 μm, p=25 mm

Fig. 116 ***Phaeosphaeria musae***. **a** Appearance of ascomata on the host surface. **b** Section of ascoma. **c** Peridium. **d, e-i** Asci **e-g, j.** Ascospores **a-i** In water. **j** In India ink. Scale bars: a=500 μm. b, c, d=30 μm. e-g=10 μm. h, i=20 μm. j=10 μm

cell layered, with cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 1–2.5× 1.5–3 µm, simple, smooth, hyaline, short, integrated, holoblastic to phialidic. *Conidia* 25–35×3.5–6.5 μm ($\overline{x}$=28.38× 4.87 μm, n=20), pale brown, fusiform to cylindrical, straight to curved, with obtuse apex and base, 3–5-septate, discrete, smooth-walled, guttulate.

Culture characters: on PDA olive brown from above and brown from reverse, with thin mycelium, zonate, slow growing, attaining a diam. of 2.5 cm in 7 days at 18 °C.

Material examined: Italy, Province of Forlì-Cesena, Fiumicello, Premilcuore, on dead branch of *Dactylis glomerata* L. (*Poaceae*), 15 March 2013, E. Camporesi, NNW IT1259 (MFLU 14–0743, **holotype**); *ibid.*, (GUHC (Guizhou University Herbarium Collection) 7201, **isotype**), ex-type living culture, MFLUCC 13–0738, GUCC 11. GenBank ITS: KP744469; LSU: KP684147; SSU: KP684148.

Notes: Saccardo (1892) established *Wojnowicia*, with *W. hirta* as the type species. Currently only four species are accepted (Sutton 1980; Farr and Bills 1995; Wijayawardene et al. 2013). In conidial dimension, our collection is similar to *Wojnowicia colluvium* D.F. Farr & Bills (19–36×3–4 μm). However, *Wojnowicia colluvium* only has 3 septa, while our collection has 3–5 septa. Multi-gene analysis (Fig. 111) shows that the new strain is distinct from other *Wojnowicia* species, thus we introduce a new species, *W. dactylidicola*, to accommodate our collection.

86. *Wojnowicia dactylidis* Wijayawardene, Camporesi and K.D. Hyde, ***sp. nov.***

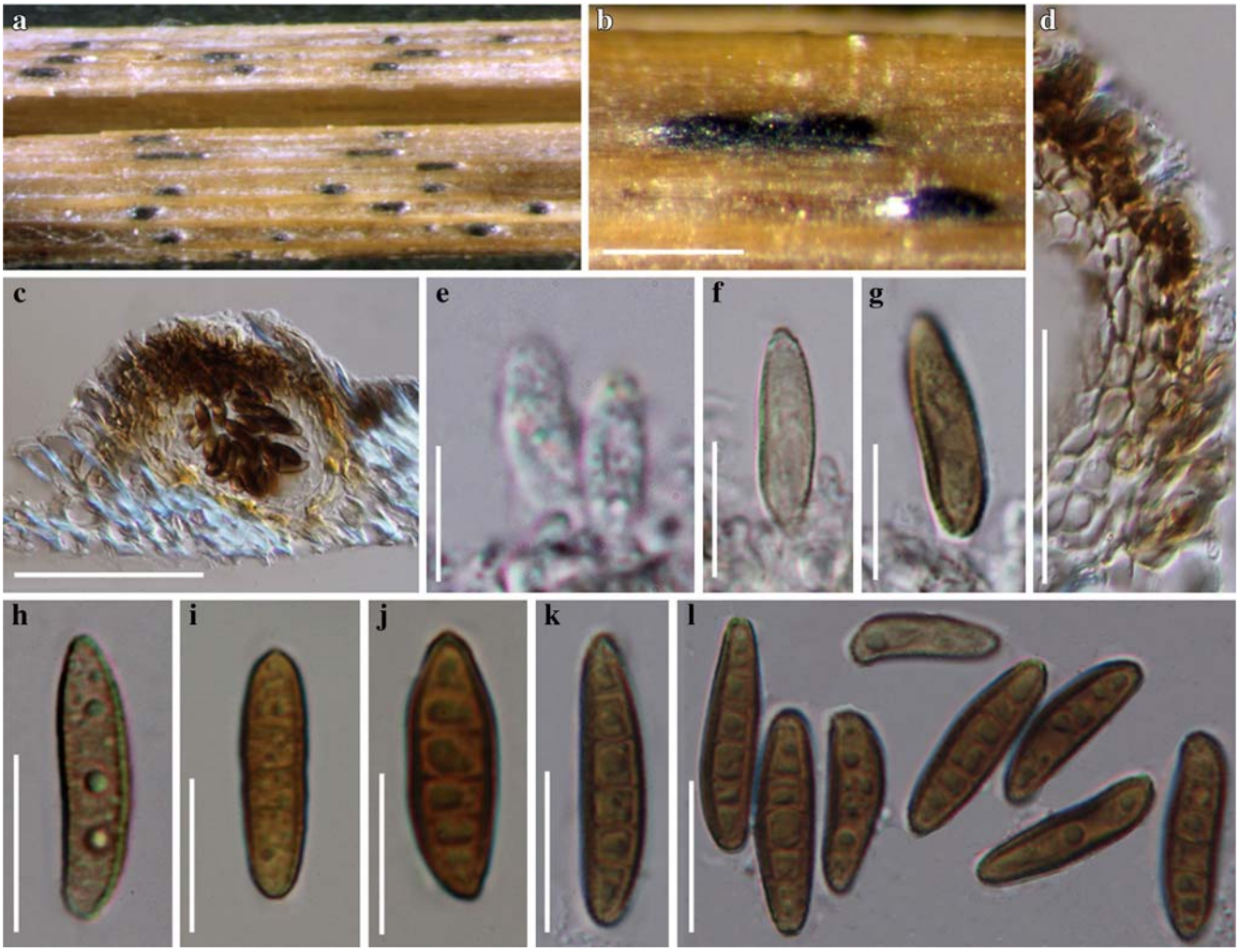


Fig. 117 *Wojnowicia dactylidicola* **(holotype). a, b** Conidiomata on host material **c** Cross sections of the pycnidium **d** Pycnidial wall **e-g** Conidia attached to conidiogenous cell **h-l** Conidia. Scale bars: b=200 *μm*, c=50 *μm*, c=50 *μm*, e-g=10 *μm*, h-l=15 *μm*

Index Fungorum number: IF550910, *Faces of Fungi number*: FoF00417; Fig. 118

Etymology: Named after the generic name of host it occurs

Holotypus: MFLU14–0745

Saprobic on grass. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 200–250 *μm* diam., 120–150 *μm* high, pycnidial, superficial, black, solitary to gregarious, unilocular, with a central, papillate ostiole. *Pycnidial wall* 10–20 *μm*, with thick outer layer, brown to dark brown, with 5–7 cell layers, inner layer hyaline, 2–3 cell layered, with cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 2–4×2–3 *μm*, simple, smooth, hyaline, enteroblastic, phialidic. *Conidia* 35–40×4–5.5 *μm* ($\bar{x}$= 37.05×5.45 μm, *n*=20), pale brown, fusiform to cylindrical, straight to curved, with obtuse apex and base, 7–11-septate, smooth-walled.

Culture characters: on PDA olive brown from above and dark brown from reverse, cottony, circular, zonate, slow growing, attaining a diam. of 2 cm in 7 days at 18 °C.

Material examined: Italy, Province of Forlì-Cesena, Teodorano, Meldola, on dead branch of *Dactylis glomerata* L. (*Poaceae*), 7 March 2013, E. Camporesi, NNW IT1101 (MFLU 14–0745, holotype); *ibid*., GUHC 7203, **isotype**), ex-type living culture, MFLUCC 13–0735, GUCC 9. GenBank ITS: KP744470; LSU: KP684149; SSU: KP684150.

Notes: *Wojnowicia dactylidicola* was also reported from *Dactylis glomerata*. The species has smaller conidia and only 3–5 transverse septa, while our new collection has larger conidia (35–40×4–5.5 *μm*) and 7–11 septa. Phylogenetic analysis showed *Wojnowicia dactylidicola* and *W. dactylidis* to be distantly related (Fig. 111). Thus, based on both morphological and molecular characters our new collection is introduced as a new species, *W. dactylidis*.

87. *Wojnowicia lonicerae* Wijayawardene, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550907, *Facesoffungi number*: FoF00416, Fig. 119

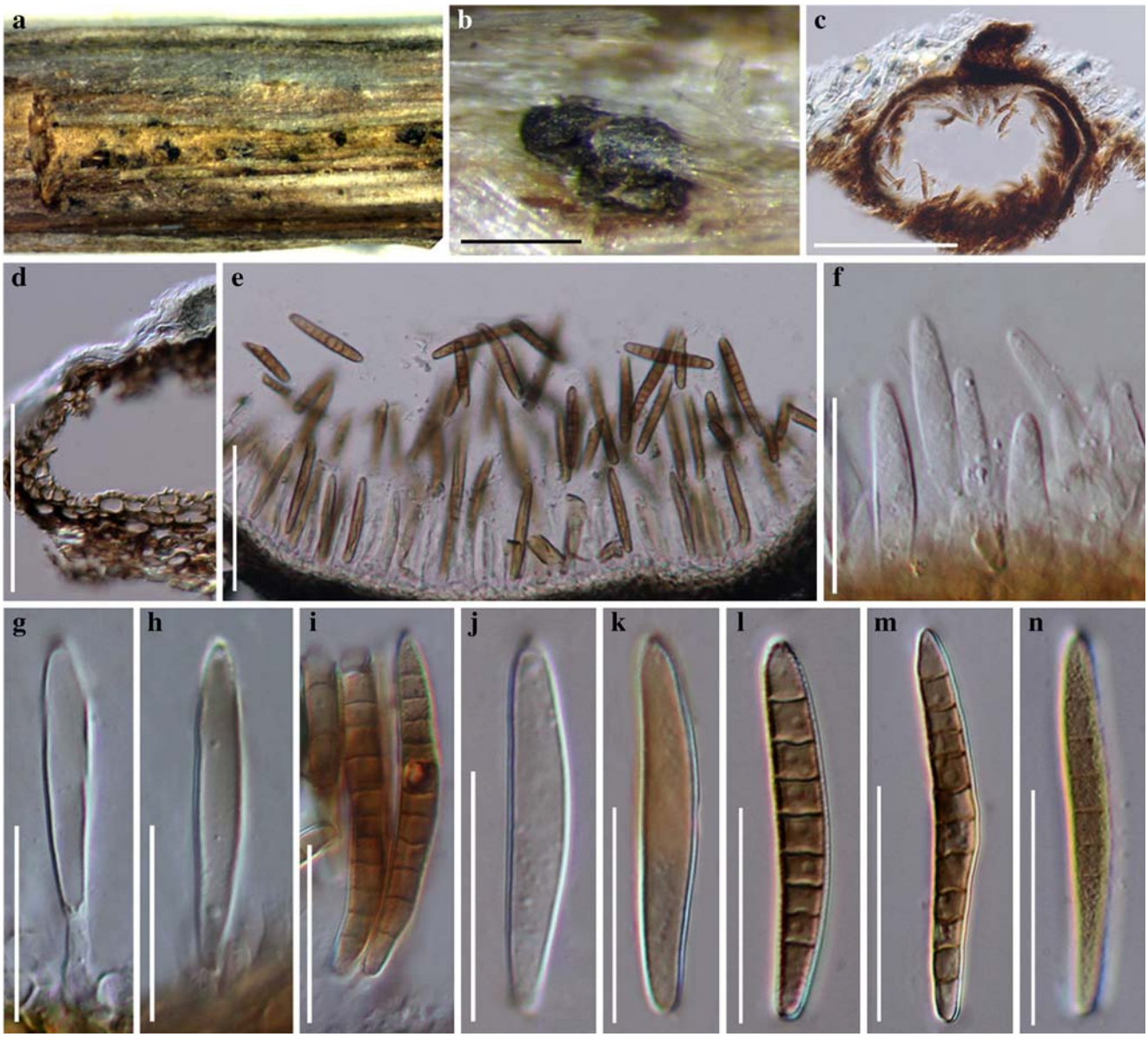


Fig. 118 ***Wojnowicia dactylidis*** **(holotype) a** Host material **b** Conidiomata on host surface **c, d** Cross section of pycnidia **e-h** Developing conidia attached to conidiogenous cells **i-n** Conidia. Scale bars: b=200 μm, c=100 μm, d-e=50 μm, f-n=20 μm

Etymology: Named after the generic name of host it occurs

Holotypus: MFLU 14–0744

Saprobic on branch of *Lonicera* sp. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 150–175 μm diam., 120–130 μm high, pycnidial, superficial, black, solitary, unilocular, with a central, papillate ostiole. *Pycnidial wall* 15–30 μm wide, with thick outer layer, dark brown, with 5–8 cell layers, inner layer hyaline, 2–3 layered, with cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 1–3×1.5–2 μm, simple, smooth, hyaline, enteroblastic, phialidic. *Conidia* 38–49×5–6 μm ($\overline{x}$=42.34×5.45 μm, n=20), pale brown, fusiform to cylindrical, straight to curved, with obtuse apex and base, 8–11-septate, constricted at the septa.

Culture characters: on PDA olive brown from above and greyish-brown from reverse, cottony, circular, zonate, slow growing, attaining a diam. of 3 cm in 7 days at 18 °C.

Material examined: Italy, Arezzo Province, Pieve Santo Stefano, on dead branch of *Lonicera* sp. L. (*Caprifoliaceae*), 15 March 2013, E. Camporesi, IT1246 (MFLU 14–0744, **holotype**); GUHC 7202, **isotype**), ex-type living culture, MFLUCC 13–0737, GUCC 10. GenBank ITS: KP744471; LSU: KP684151; SSU: KP684152.

Notes: In conidial length, *Wojnowicia lonicerae* is similar to *W. hirta* (31–44×3–4 μm), but the former has narrower conidia. *Wojnowicia lonicerae* has 8–11 transverse septate; whereas *W. hirta* has only 7–8 transverse septa. Multi-gene analyses shows *Wojnowicia lonicerae* grouping with *W. dactylidis*, but with low

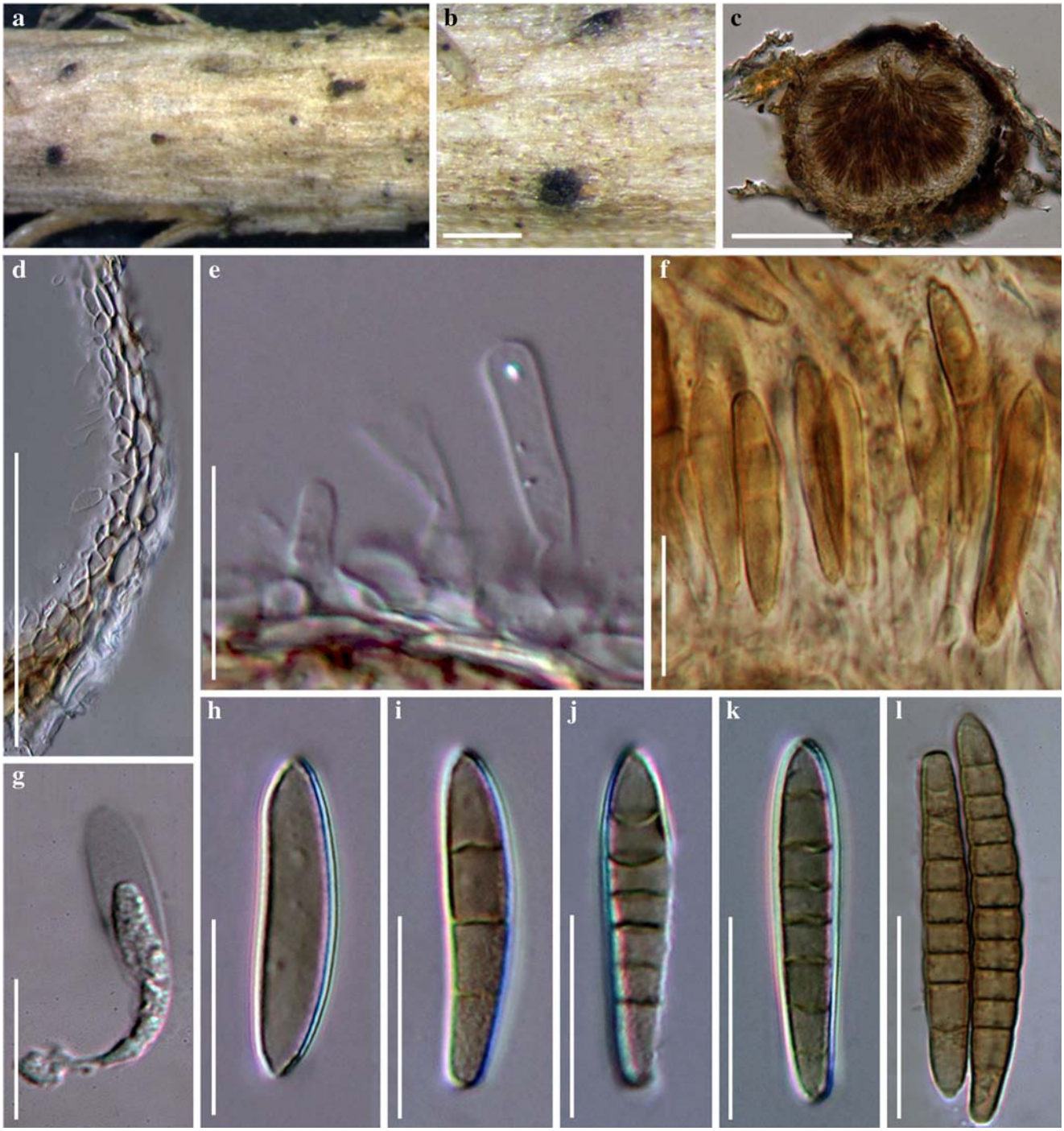


Fig. 119 ***Wojnowicia lonicerae*** **(holotype). a** Host material **b** Conidiomata on the host **c** Cross section of pycnidium **d** Pycnidium wall **e-g** Conidia attach to conidiogenous cell **h-l** Conidia. Scale bars: b=200 μm, c=100 μm, d=50 μm, e-g=10 μm, h-l=20 μm

bootstrap support. However, conidial morphology of our new strain and *W. dactylidis* is distinct. Hence we introduce a new species, *W. lonicerae*, to accommodate our collection.

Pleomassariaceae

The family *Pleomassariaceae* comprises saprobes or pathogens on wood or lichens in terrestrial environments. The family was introduced by Barr (1979a) and included the generic type *Pleomassaria*, plus *Asteromassaria* and *Splanchnonema*. *Pleomassaria* differs from the other two genera in producing muriform and somewhat asymmetrical ascospores with a submedian primary septum. *Eopyrenula* (Aptroot 1991), *Kirschsteiniothelia*, *Macrovalsaria* (Barr 1993a) and *Lichenopyrenis* (Calatayud et al. 2001) have also been added. Currently the family comprises *Lichenopyrenis*,

Splanchnonema, *Peridiothelia* and *Pleomassaria* (Zhang et al. 2012a). *Pleomassaria* was treated as a synonym of *Splanchnonema* (Barr 1993) based on their similar characteristics, but this was not followed by many researchers.

The asexual morphs of the *Pleomassariaceae* are mostly coelomycetous. *Pleomassaria siparia*, the type of this family has been linked with *Prosthemium betulinum*. The asexual morphs of *Pleomassaria* are *Prosthemium* and *Shearia* (Barr 1982; Sivanesan 1984; Tanaka et al. 2010). *Pleomassariaceae* was treated as a synonym of *Melanommataceae* based on molecular studies (Zhang et al. 2009a). In the study of Zhang et al. (2012a) *Pleomassaria siparia* and four *Prosthemium* species formed a well-supported monophyletic clade, thus proving *Pleomassariaceae* as a separate family in the order *Pleosporales*. The phylogenetic tree based on the LSU is presented in Fig. 120.

88. *Splanchnonema pupula* (Fr.) Kuntze, Revis. gen. pl. (Leipzig) 3(2): 531 (1898)

Stigmatomassaria pupula (Fr.) Munk, Dansk bot. Ark. 15(no. 2): 127 (1953)

Facesoffungi number: FoF00475; Fig. 121

Saprobic on dead branches of *Acer pseudoplatanus*. **Sexual morph** *Ascomata* 437–521 μm high × 672–882 μm diam. ($\bar{x}$ = 482 × 717 μm, n = 10), solitary, immersed, dark brown to black, slightly depressed, uniloculate, globose to subglobose, ostiole central, papilla projecting through the bark. *Peridium* 35–47 μm wide, composed of 4–5 layers of brown to black-walled cells of *textura angularis*. *Hamathecium* comprising 1.5–2.5 μm wide, hyaline, septate, branched pseudoparaphyses, embedded in a gelatinous matrix. *Asci* 118–152 × 31–36 μm ($\bar{x}$ = 134 × 32 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical or fusoid, pedicellate, rounded at apex, with a distinct ocular chamber. *Ascospores* 37–51 × 11–18 μm ($\bar{x}$ = 44 × 14 μm, n = 20), partially overlapping to biseriate, hyaline to light brown, always brown at maturity, 1-septate in early states, constricted at the septum, muriform, becoming 3-euseptate, somewhat asymmetrical, ellipsoidal with broadly rounded ends, thick-walled, smooth-walled, surrounded by mucilaginous sheath. **Asexual morph** Undetermined.

Material examined: ITALY, Province of Monte Secchieta, Pratomagno, Arezzo, on dead branches of *Acer pseudoplatanus*, (*Sapindaceae*), 5 June 2012, E. Camporesi (MFLU 14–0807, **holotype**). The DNA was extracted from the fungal fruiting body. GenBank ITS: KP659196; LSU: KP659197.

Notes: This collection is identified as *Splanchnonema pupula*; however, there is no sequence data in GenBank for the type of this genus, *S. pustulatum*. *Splanchnonema platani* is a synonym of *Macrodiplodiopsis desmazieresii* and belongs near *Bambusicolaceae* and is not *Lophiostomataceae* (*sensu* Wijayawardene et al. 2014). Other species of *Splanchnonema* are placed in *Massarinaceae* and *Pleosporaceae* (Fig. 120), and thus the genus is polyphyletic. As there is no type sequence data it is not clear which family *Splanchnonema sensu stricto* belongs in. *Stigmatomassaria pupula* is the type species of *Stigmatomassaria* and this may be a good generic name for this species in *Pleomassariaceae*, however until the type species of *Splanchnonema* is made available we name it as *Splanchnonema pupula*.

Pleosporaceae

Pleosporaceae is a family in the order *Pleosporales*, with *Pleospora herbarum* (Pers.) Rabenh. as the generic type. The family was revised by Ariyawansa et al. (2015) and 18 genera accepted. Phylogenetic analysis of 45 strains representing 24 sections from the *Alternaria* species complex, including our new sexual strains, indicated it was a new species. The novelty of *Alternaria cesenica* as new species receives strong support in the phylogenetic tree (Fig. 122).

89. *Alternaria cesenica* Phukhamsakda, Qing Tian, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550899, *Facesoffungi number*: FoF 00408; Fig. 123.

Etymology: The specific epithet *Cesenica* refers to the place in which the fungus was first collected.

Holotypus: MFLU 14–0795

Saprobic on dead branch of *Bellevalia romana* (L.) Sweet. **Sexual morph** *Ascomata* 100–200 μm high, 84–225 μm diam. ($\bar{x}$ = 170 × 160 μm, n = 10), on the surface of the host, solitary, scattered, or sometimes gregarious, globose, superficial, black, smooth. *Peridium* 22–33.5 μm ($\bar{x}$ = 28.5 μm, n = 6), at the outside composed of irregular, thick-walled, brown to black cells of *textura angularis*, inner layer composed of slightly, smaller cells of *textura angularis*. *Asci* 68–104 × 11–14 μm ($\bar{x}$ = 85 × 12 μm, n = 10), 6–8-spored, bitunicate, clavate to subellipsoid, short pedicellate, apically rounded, with an ocular chamber. *Hamathecium* comprising 1–2 μm broad, septate, long, branched or simple, pseudoparaphyses. *Ascospores* 16–23 × 8–10 μm ($\bar{x}$ = 19 × 9 μm, n = 10), uniseriate or overlapping uniseriate, ellipsoid to fusiform, muriform, dark brown to blackish-brown, constricted at the center, lower cell narrow and longer, smooth-walled. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA, reaching 2 cm diam. after 2 weeks at 16 °C, later with dense mycelium, circular, margin rough, white, surface flat, without aerial mycelium. Hyphae septate branched, hyaline, thin.

Material examined: ITALY, Forlì-Cesena Province: Fiumana, Predappio, dead and hanging branches of *Bellevalia romana* (*Asparagaceae*), 7 February 2013, E. Camporesi IT1052 (MFLU 14–0795, **holotype**); ex-type living culture, MFLUCC 13–0450. GenBank ITS: KP711383; LSU: KP711384; SSU: KP711385; TEF: KP711386.

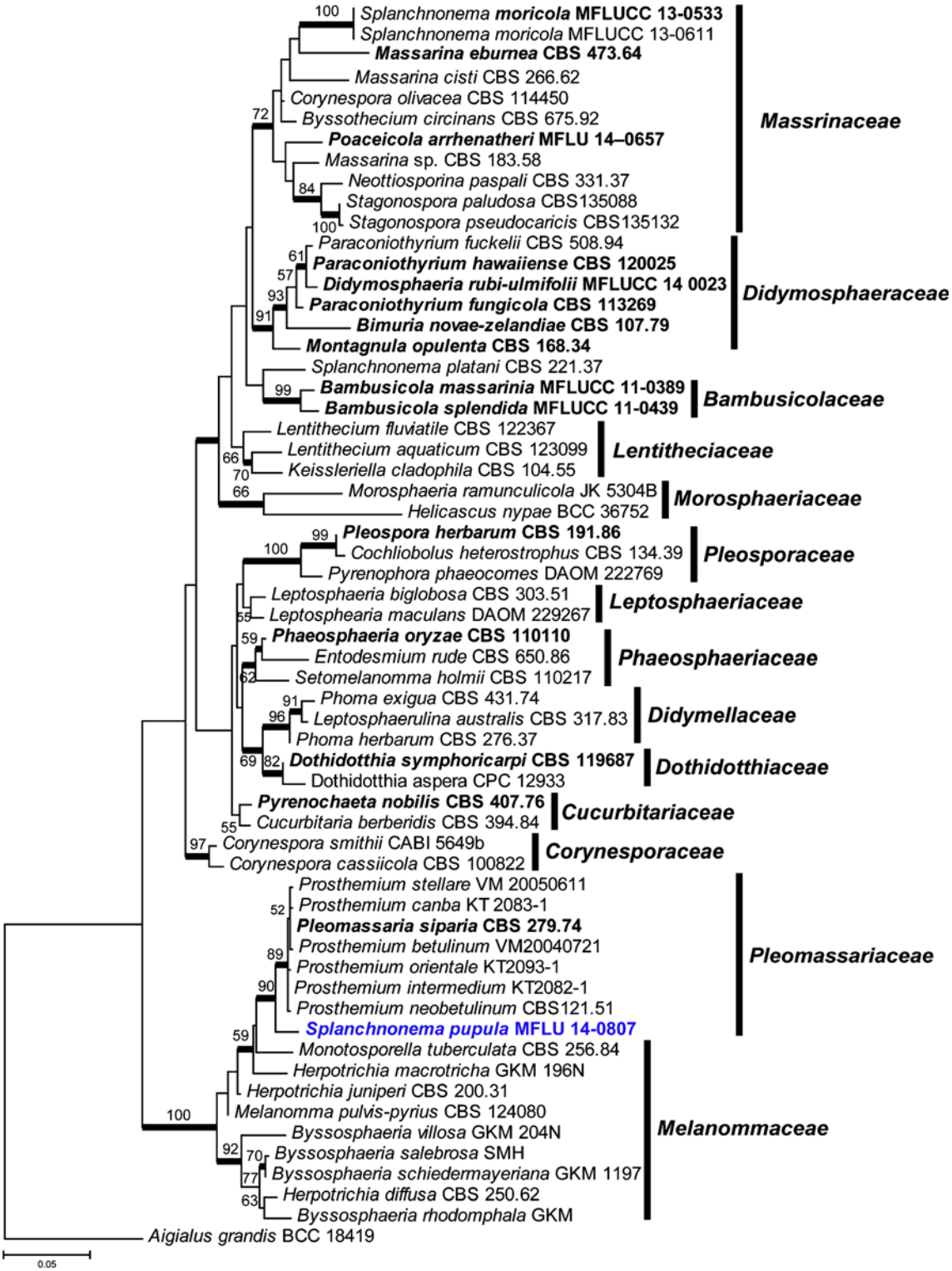


Fig. 120 Phylogram generated from Maximum likelihood (RAxML) analysis based on LSU sequence data of *Pleosporales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Aigialus grandis* BCC 18419

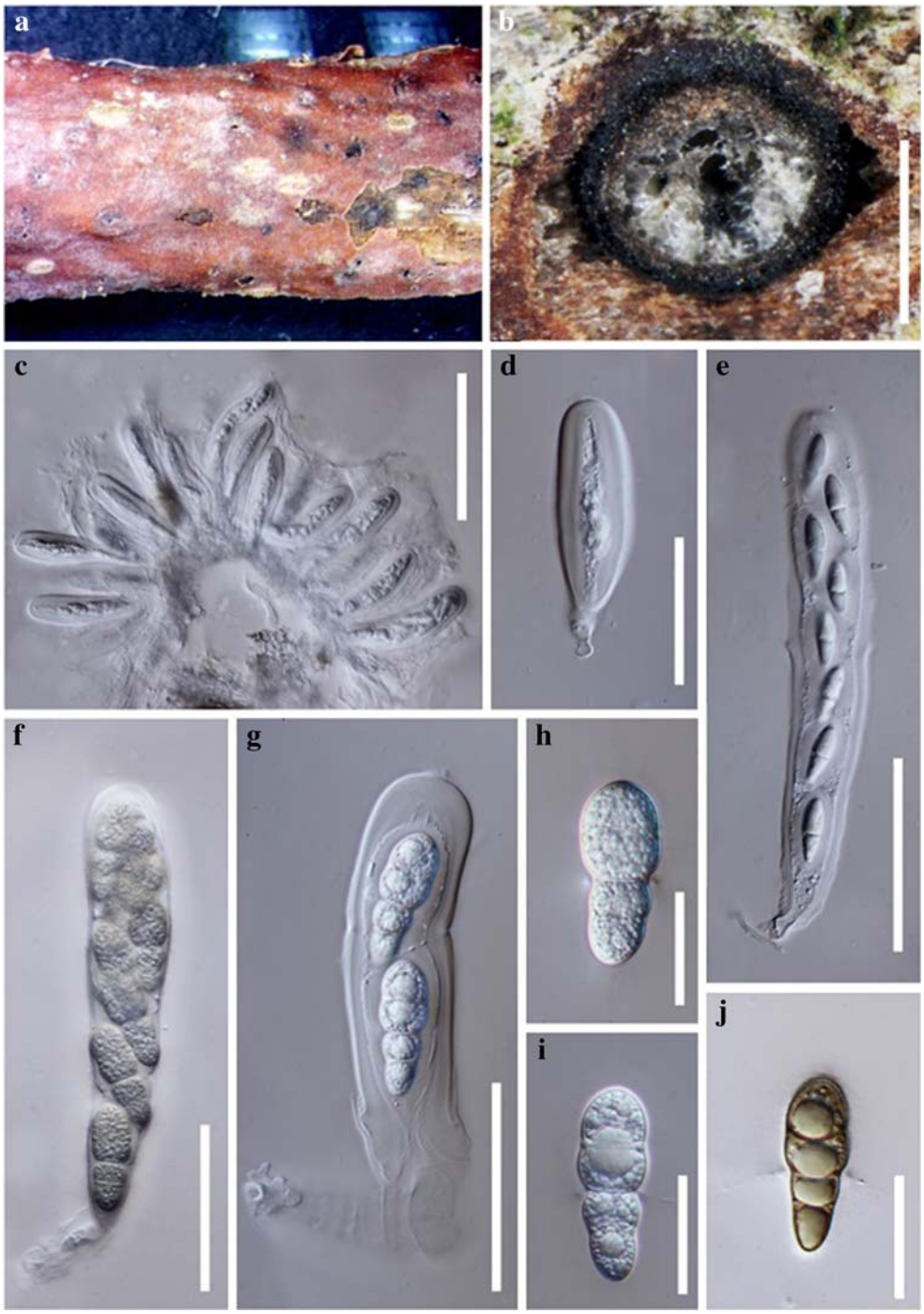


Fig. 121 ***Splanchnonema pupula*** (MFLU 14–0807). **a** Ascomata on host substrate **b** Transverse section of ascomata **c** Immature asci **d** Immature ascus **e** Immature ascospores showing primary septum **f, g** Mature ascus **h, i** Hyaline ascospores **j** Mature brown ascospore. Scale bars: b= 400 μm, c=200 μm, d–g=80 μm, h, j=30 μm

Notes: *Alternaria* is a genus of pathogenic and saprobic taxa (Woudenberg et al. 2013). The genus was originally introduced by Nees (1816) as *Alternaria tenuis*, which is currently treated as a synonym of *Alternaria alternata* (Woudenberg et al. 2013). *Comoclathris* has been reported as a sexual morph of *Alternaria* and has muriform, yellowish to dark brown ascospores. *Comoclathris* clusters within *Alternaria* in phylogenetic analyses (Woudenberg et al. 2013). Molecular analysis provides evidence that *Alternaria cesenica* is a new species grouping in section infectoriae

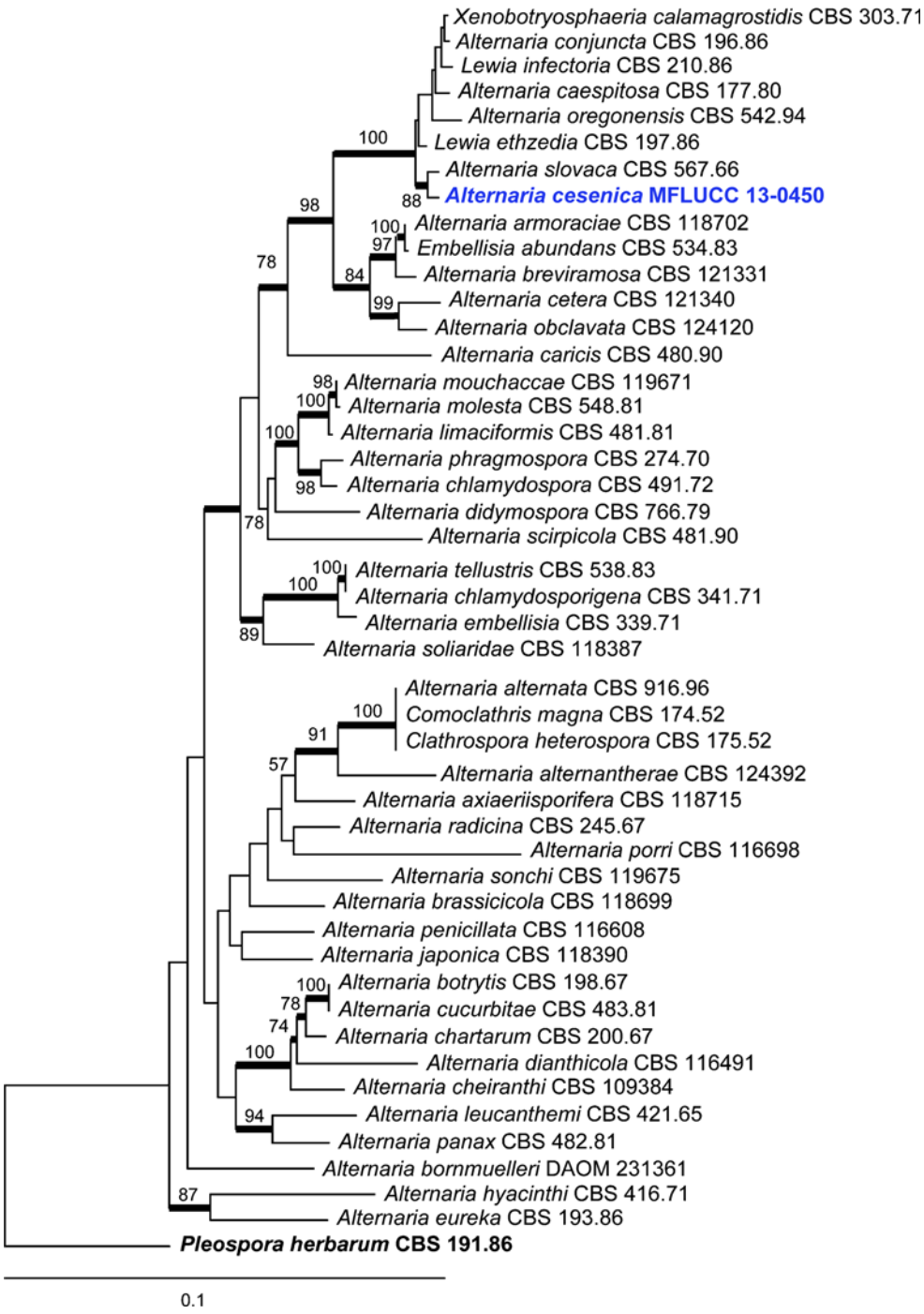


Fig. 122 Phylogram generated from parsimony analysis based on LSU, SSU, ITS and *TEF1* sequence data of *Pleosporaceae*. Parsimony bootstrap support values greater than 50 % are indicated above the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Pleospora herbarum* CBS 191.86

(relatively high bootstrap support of 88 % from RAxML and the Bayesian PP of 1.00, Fig. 122). The sexual morph is rarely found in *Alternaria*.

Pleosporales* genera *incertae sedis

Camarosporium

Camarosporium was introduced by Schulzer (1870) with *Camarosporium quaternatum* (Hazsl.) Schulz. as the type species. The phylogenetic tree is presented in Fig. 124.

90. *Camarosporium aborescentis* Phukhamsakda, Bulgakov & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550911, *Facesoffungi number*: FoF00406; Fig. 125

Etymology: The specific epithet arborescentis refers to the host species Colutea arborescens and latin entis means residing that reference to the host from which the fungus was first collected.

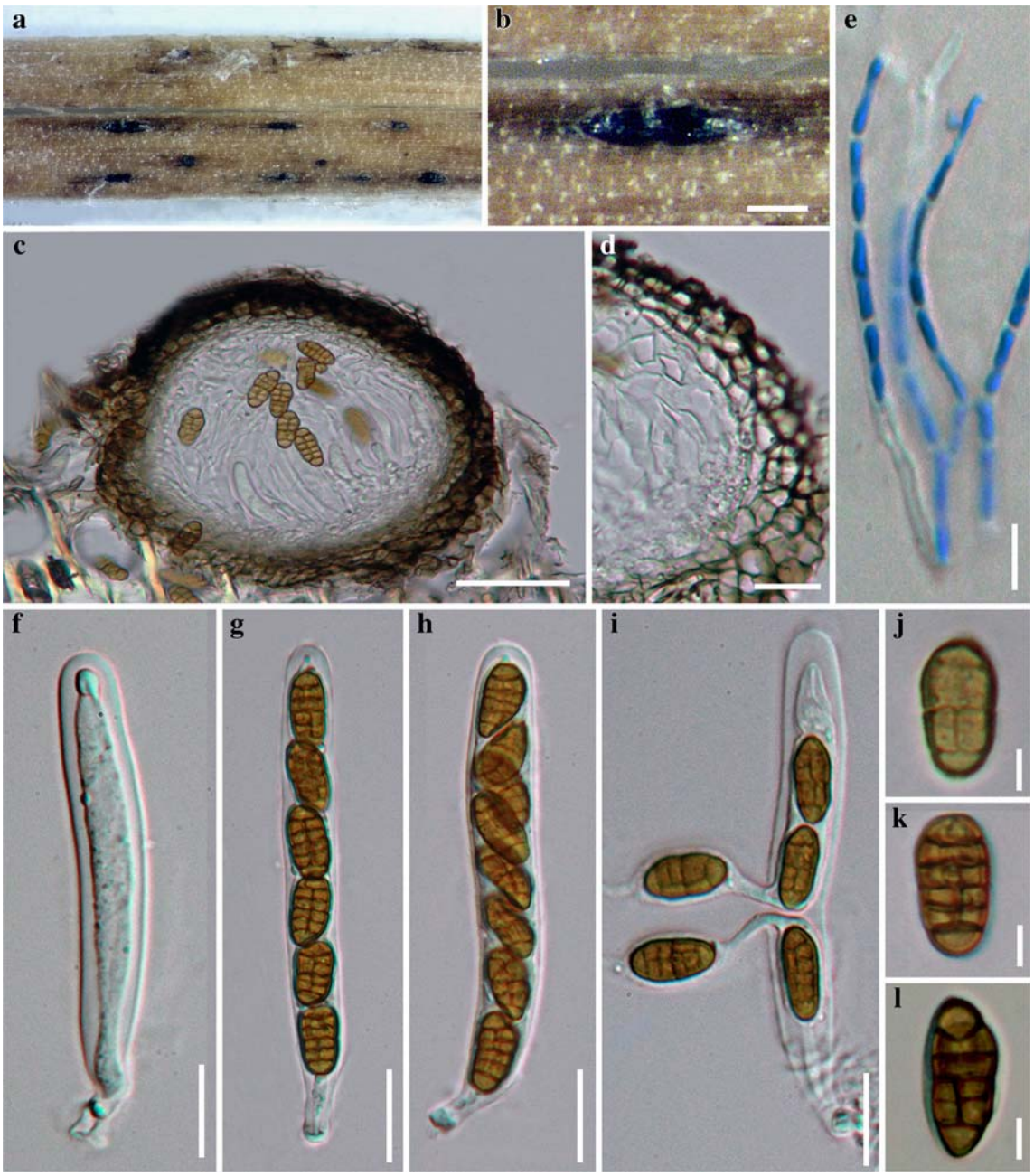


Fig. 123 ***Alternaria cesenica*** **(holotype) a, b** Ascomata on host **C** Section of ascomata **d** Peridium **e** Pseudoparaphyses **f** Immature ascus. **g, h** Asci with ascospores **i** Fissitunicate ascus **j-l**. Ascospores. Scale bars: b=500 *μm*, c=200 *μm*, d=100 *μm*, e-i=10 *μm*, j-l=5 *μm*

Holotypus: MFLU 14–0793

Saprobic on dead branch of *Colutea arborescens* L. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 490–770 *μm* diam., 350–600 *μm* high, pycnidial, immersed, erumpent at maturity, solitary to gregarious, scattered, uniloc-ular, dark brown, papillate ostiole. *Pycnidial wall* 32–54 *μm* (–70 *μm* at apex), multi-layered, with 4–6 layers, comprising of brown walled cells of *textura angularis*. *Conidiophores* re-duced to conidiogenous cells. *Conidiogenous cells* enteroblastic with percurrent annelidic, discrete, doliiform, hyaline, brown when mature, smooth-walled, formed from the inner layer of pycnidium wall. *Conidia* 12–25×5–13 *μm* ($\bar{x}$=20.3×9 *μm*, *n*=50), oblong, ellipsoid, straight or rarely slightly curved, narrowly rounded at both ends, muriform, with 1–3 transverse septa, and 1–4 longitudinal septa, initially hyaline, pale brown to brown at maturity, smooth-walled.

Culture characters: Colonies on PDA reaching 25–33 mm diam. after 1 week at 16 °C, later with dense mycelium, cir-cular, fimbriate, margin rough, white at first, olive-green after 5 days in the centre of the colony, convex with papillate on the surface, without aerial mycelium. Hyphae septate, branched, hyaline.

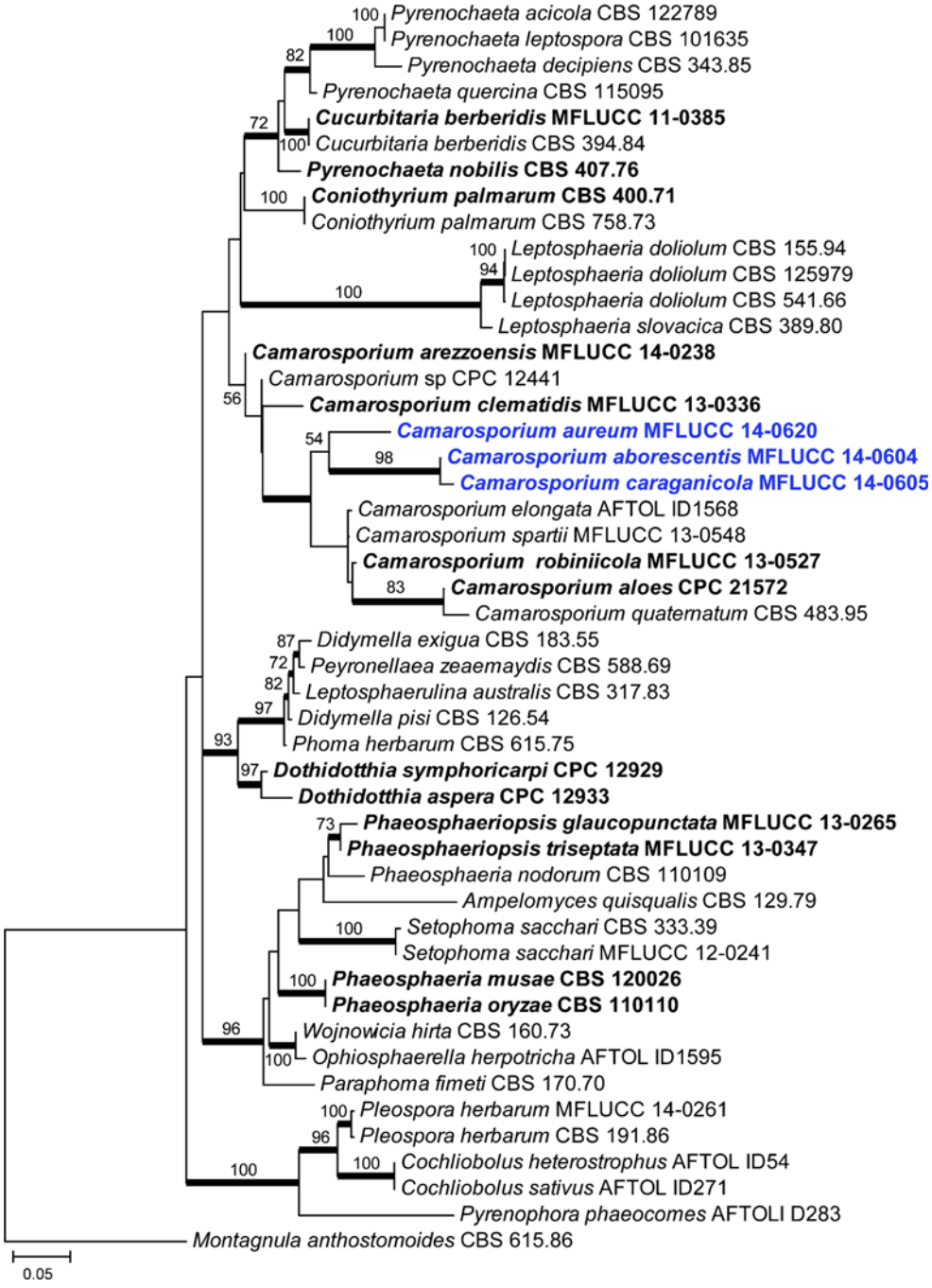


Fig. 124 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU, SSU and ITS sequence data of *Pleosporales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Montagnula anthostomoides* CBS 615.86

Material examined: RUSSIA, Rostov Province, Rostov-na-Donu, Badia Tega, Botanical Garden of Southern Federal University, Systematic Arboretum, on dead twigs of *Colutea arborescens L.* (*Fabaceae*), 8 May 2014, T. Bulgakov T44 (MFLU 14–0793, **holotype**); ex-type living culture, MFLUCC 14–0604. GenBank ITS: KP711377; LSU: KP711378; SSU: KP711379.

Notes: Our collection is morphologically similar to *Camarosporium feurichii* which has erumpent, black conidiomata and brown, smooth-walled, oblong, 3 transverse septa conidia, usually with one longitudinal septum (Eille and Eille 1985). Molecular data analyses of combined SSU, LSU and ITS sequence data (Fig. 124) show our strain cluster with *Camarosporium sensu stricto* which is a distinct lineage in *Pleosporinae*, *Pleosporales* (Wijayawardene et al. 2014).

91. *Camarosporium aureum* Norphanphoun, Bulgakov & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550905, *Facesoffungi Number*: FoF 00551; Fig. 126

Fig. 125 ***Camarosporium aborescentis*** **(holotype) a**, **b** Conidiomata on surface of twigs **c** Side view of conidiomata erumpent on surface of host **d** Vertical section of multi-locular conidiomata **e** Vertical section of unilocular conidiomata **f** Part of pycnidial wall **g**-**j** Conidiogenous cells and developing conidia **k**-**l** Immature conidia **m**-**o** Conidia at maturity. Scale bars: b-d=500 μm, e=200 μm, f=50 μm, g–o=10 μm

Etymology: From the Latin, *aureum* meaning gold, in reference to the colour nature of the conidia.

Holotype: MFLU 14–0770

Saprobic on dead herbaceous branches of *Cotinus coggygria* (Scop.). **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 400–550 μm high, 350–550 μm diam. pycnidial, solitary, immersed, unilocular, dark brown, with a central ostiole. *Pycnidial wall* 25–30 μm multi-layered, with 4–5 layers of brown, cells of *textura angularis*, with inner most layer thin, hyaline. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* enteroblastic, phialidic, hyaline, smooth, formed from the inner most layer

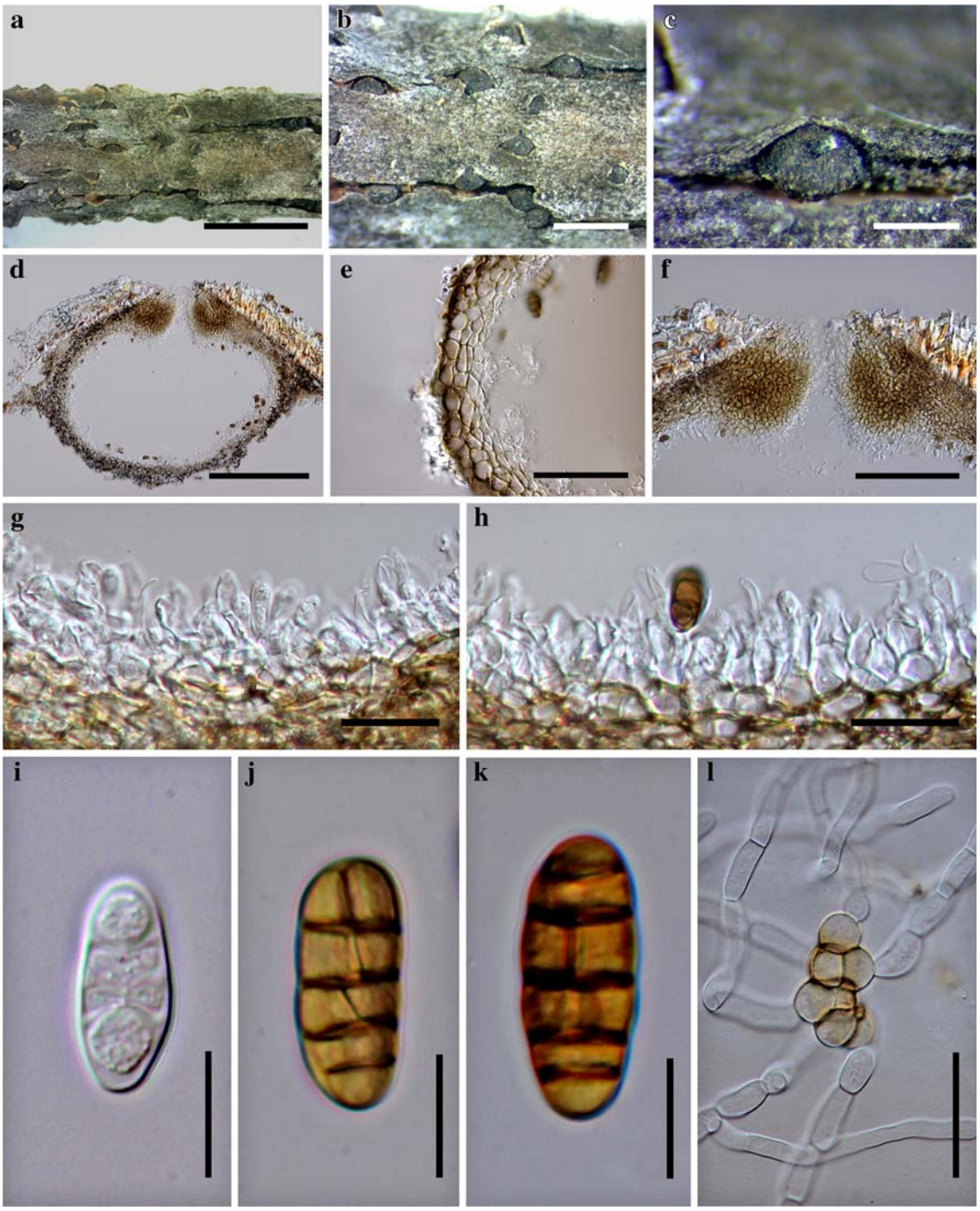


Fig. 126 ***Camarosporium aureum*** (**holotype**), **a** Stromatal habit in wood **b, c** Fruiting bodies on substrate **d** Cross section of the stroma showing perithecia **e** Peridium **f** Apex of perithecia **g-h** Conidiogenous cell with attached conidia **i** Immature conidia. **j–k** Mature conidia. **l** Germinating conidia. Scale bars: d=200 μm, e=50 μm, f=100 μm, g–h=20 μm, i–k=10 μm, l=30 μm

of pycnidium wall. *Conidia* (19–)–19.5–22.5(–24)×8–9(–10) μm ($\bar{x}$=21×9.5 μm, n=30) oblong, mostly straight, infrequently slightly curved, muriform, with 4–5 transverse septa, with 2–3 longitudinal septa, not constricted at the septa, initially hyaline, pale gold to brown at maturity, narrowly rounded at both ends, smooth-walled.

Culture characters: Colonies on PDA slow growing, reaching 2 cm diam. after 11 days at 25 °C, later producing dense mycelium, circular, margin rough, white at first, greenish-yellow after 5 days, flat or effuse on surface, without aerial mycelium. Hyphae septate branched, hyaline, thin.

Material examined: RUSSIA, Rostov region, Shakhty city, near Grushevsky pond, shelterbelt artificial forest, on dead branches of *Cotinus coggygria* Scop. (*Anacardiaceae*) 18 March.2014, T. Bulgakov (MFLU 14 – 0770, **holotype**); *ibid*. (PDD **isotype**); ex-type culture, MFLUCC 14–0620. GenBank ITS: KP744436; LSU: KP744478; SSU: KP753948.

Notes: Sutton (1980) reported the type species of *Camarosporium*, *C. quaternatum* from *Lycium halimifolium*, which was characterized by fusiform conidia, with 3–4 transverse septa, and several secondary longitudinal or oblique septa. Our new species has oblong, larger conidia and 4–5 transverse septa, with 2–3 longitudinal septa and is golden brown at maturity. Molecular phylogenetic analysis of combined ITS and LSU gene data places *C. aureum* close to *C. spartii* Trail from *Cytisus* sp. (Fig. 124). However, *C. spartii* has shorter and narrower conidia (13–16×6–7 μm).

92. *Camarosporium caraganicola* Phukhamsakda, Bulgakov & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550912, *Facesoffungi number*: FoF00407; Fig. 127

Etymology: The specific epithet *caraganicola*refers to the origin of host species *Caragana frutex* and latin *cola* meaning originating, in reference to the host from which the fungus was first isolated.

Holotypus: MFLU 14–0794

Saprobic on dead branch of *Caragana frutex* L. **Sexual morph** Undetermined. **Asexual morph** *Conidiomata* 280–780 μm diam., 413–604 μm high, pycnidial, erumpent at maturity, confluent, gregarious, dark brown to black, papillate ostiole, lacking periphyses. *Pycnidial wall* 15–45 μm (–50 μm at apex), multi-layered, with 5–6 layers of brown cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* enteroblastic with percurrent annelidic, doliiform, discrete, solitary, hyaline, brown when mature, smooth-walled, and formed from the inner layer of pycnidium wall. *Conidia* 13–26×6–13 μm ($\bar{x}$= 19.5×9.8 μm, n=50), oblong, ellipsoid, straight or occasionally curved at the apex, muriform, with 1–4 transverse septa, with 1–4 longitudinal septa, initially hyaline, pale brown to brown at maturity, narrowly rounded at both ends, smooth-walled.

Culture characters: Colonies on PDA reaching 3 cm diam. after 1 week at 16 °C, later with dense mycelium, circular, margin rough, white at first, dark green after 5 days in the centre of the colony, surrounded by white mycelium, flat on the surface, without aerial mycelium. Hyphae septate branched, hyaline.

Material examined: RUSSIA, Rostov Province, Rostov-na-Donu, BadiaTega, Botanical Garden of Southern Federal University, Systematic Arboretum, on dead twigs of *Caraganafrutex* (L). (*Fabaceae*), 26 April 2014, T. Bulgakov T46 (MFLU 14–0794, **holotype**); ex-type living culture, MFLUCC 14–0605. GenBank ITS: KP711380; LSU: KP711381; SSU: KP7113824.

Notes: *Camarosporium caraganae* is recorded from *Caragana* spp. and has brown conidia with 3–5 transverse septa and 1(−2) longitudinal septa (Karst 1885). Our collection *Camarosporium caraganicola* was discovered on *C. frutex* shows unique conidia morphology with 1–4 transverse, and 1–4 longitudinal septa. The molecular analysis of combined SSU, LSU and ITS data (Fig. 124) shows a close relationship with *C. aborescentis*. Morphologically, *C. caraganicola* and *C. aborescentis* are similar but colonize different hosts.

93. *Multiseptospora* Phookamsak & K.D. Hyde**, *gen. nov.***

Index Fungorum number: IF550928, *Facesoffungi number*: FoF00430

Etymology: The generic epithet *Multiseptospora* refers to the phragmosporous ascospores.

Type species: *Multiseptospora thailandica* Phookamsak & K.D. Hyde

Saprobic on *Poaceae*. **Sexual morph** *Ascomata* solitary to gregarious, immersed, uni-loculate, globose to subglobose, setose, ostiole central, with pore-like opening. *Peridium* thick-walled, of unequal thickness, thick at the base, composed of black, pseudoparenchymatous cells, *textura angularis* to *textura prismatica. Hamathecium* composed of dense, narrow, cellular pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, broadly cylindrical, subsessile, apically rounded with indistinct ocular chamber. *Ascospores* overlapping 2–3-seriate, fusiform to vermiform, with acute ends, hyaline to pale brown when young, becoming brown when mature, 10–11-septate, slightly curved, slightly constricted at the septum, smooth-walled, surrounded by distinct mucilaginous sheath. **Asexual morph** Undetermined.

Notes: *Multiseptospora* is a monotypic genus introduced to accommodate the fungus associated with *Thysanolaena maxima*. The genus is similar to *Falciformispora* K.D. Hyde in its ascospores, however, they differ with regard to their ascomata and host (Zhang et al. 2012a, b). *Multiseptospora* forms setose ascomata with pore-like openings, immersed in the host, while *Falciformispora* forms epapillate, glabrous coriaceous, erumpent to superficial, ascomata, (Zhang et al. 2012a, b). Based on multigene phylogenetic analyses, *Multiseptospora* forms a sister clade basal to *Trematosphaeriaceae* (Fig. 54). Therefore, we introduce a new genus to accommodate a single species and placed it in *Pleosporales*, genera *incertae sedis*.

94. *Multiseptospora thailandica* Phookamsak & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550929, *Facesoffungi number*: FoF00431; Fig. 128

Fig. 127 ***Camarosporium caraganicola*** (**holotype**) **a, b** Conidiomata on host surface **c** Gregarious conidiomata on host surface **d** Vertical section of multi-loculate conidiomata **e** Ostioles **f** Part of pycnidium wall **g**-i Conidiogenous cells and developing conidia **j-l** Conidia when immature **m-o** Mature conidia. Scale bars: b=500 μm, c-e=200 μm, f=100 μm, g-h=20 μm, i–o=10 μm

Etymology: The specific epithet "*thailandica*" refers to the country where the taxon was first collected.

Holotypus: MFLU 11–0219

Saprobic on *Thysanolaena maxima*. **Sexual morph** *Ascomata* 180–260 μm high, 210–320 μm diam., solitary to gregarious, scaterred, immersed, visible as dark spots with sparse, with tufts of hyphae on host surface, uni-loculate, globose to subglobose, setose, ostiole central, with pore-like opening, obtuse at the apex. *Peridium* 10–60 μm wide, with thin to thick walls, of unequal thickness, slightly thick at the base and sides, composed of several layers of dark brown to black cells, oganized in a *textura angularis* to *textura prismatica. Hamathecium* composed of dense, 0.8–1.5 μm

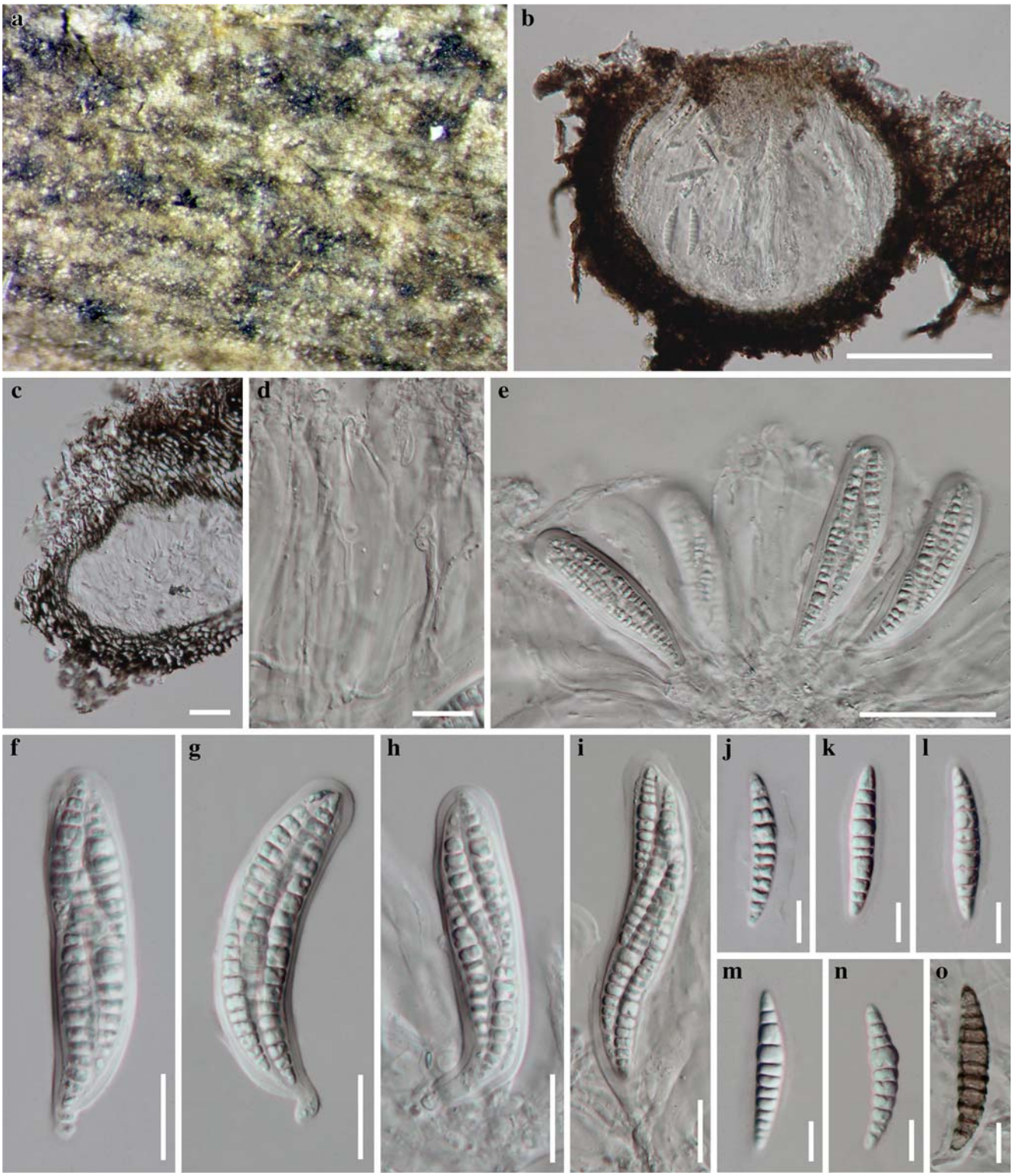


Fig. 128 ***Multiseptospora thailandica*** **(holotype) a** Ascomata on host surface **b** Section through an ascoma **c** Peridium **d** Pseudoparaphyses **e–i** Asci **j–n** Ascospores **o** Ascospore at maturity. Scale bars: b=100 μm, e=50 μm, c-i=20 μm, j-o=10 μm

wide, narrow cellular, distinctly septate pseudoparaphyses not constricted at the septa, anastomosing above the asci, embedded in a hyaline gelatinous matrix. *Asci* (77–)80–95(–110)×(18–)19–22.5 μm ($\bar{x}$=85×20 μm, n=25), 8-spored, bitunicate, fissitunicate, broadly cylindrical, short pedicellate, apically rounded with indistinct ocular chamber. *Ascospores* (35–)37–43(–45)×6–8 μm ($\bar{x}$=40.6×7.3 μm, n=30), overlapping 2–3-seriate, fusiform to vermiform, with acute ends, slighty curved, initially hyaline to pale brown, becoming brown to dark brown at maturity, 10– to 11-septate, slightly

constricted at the septa, smooth-walled, surrounded by thin, distinct, mucilaginous sheath. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA fast growing, 70–80 mm diam. after 4 weeks at 25–30 °C, brown to orangish-brown at the margin, dark brown to dark grey in the centre; reverse brown to orangish-brown at the margin, dark grey in the middle, black at the centre; dense, circular, slightly raised to umbonate, smooth to dull with entire edge, concave at the centre, fluffy to floccose, aspect smooth, producing brown pigments in agar.

Material examined: THAILAND: Chiang Mai, Doi Suthep-Pui, on dead stem of *Thysanolaena maxima* Kuntze (*Poaceae*), 13 Febuary 2011, R. Phookamsak RP0099 (MFLU 11–0219, **holotype**), ex-type living culture, MFLUCC 11–0183. GenBank ITS: KP744447; LSU: KP744490; SSU: KP753955.

95. *Saccotheciaceae* Bonord. [as 'Saccotheciei'], Abh. naturforsch. Ges. Halle 8: 82 (1864)

= *Aureobasidiaceae* Cif., Man. Mic. Med., Edn 2 (Pavia) 1: 178 (1958)
= *Aureobasidiaceae* Thambugala & K.D. Hyde in Hyde et al., Fungal Diversity 68 (1): 133 (2014), isonym.
Type: ***Saccothecium*** Fr., Fl. Scan.: 349 (1836)
Type species: *Saccothecium sepincola* (Fr.) Fr. [as 'saepincola'], Summa veg. Scand., Section Post. (Stockholm): 398 (1849)
≡ *Sphaeria sepincola* Fr. [as 'saepincola'], Observ. mycol. (Havniae) 1: 181 (1815)

Notes: *Saccotheciaceae* was introduced by Bonorden (1864) in order to accommodate *Saccothecium* Fr., while Theissen and Sydow (1917) introduced *Dothioraceae* Theiss. & Syd. in *Dothideales* which was typified by *Dothiora* Fr. Doweld (2012) suggested to conserve *Dothioraceae* against the older *Saccotheciaceae*. However, Thambugala et al (2014) synonymized *Dothioraceae* under *Dothideaceae* based on morphology and molecular phylogeny, and also introduced *Aureobasidiaceae* K.M. Thambugala & K.D. Hyde to accommodate *Aureobasidium* Viala & G. Boyer, *Saccothecium* and five other genera. The family *Aureobasidiaceae* had in fact already been introduced by Ciferri (1958). Nevertheless, *Aureobasidiaceae* should be synonymized under *Saccotheciaceae* because the latter is the oldest available name for the family that contains *Aureobasidium* and *Saccothecium*.

Venturiales Y. Zhang et al., Fungal Diversity 51(1): 251 (2011)

Venturiales was excluded from the *Pleosporales* and introduced as a new order by Zhang et al. (2011a). It presently includes *Sympoventuriaceae* and *Venturiaceae*, families which are supported by morphological characteristics and strong support in multi-gene phylogenetic analyses (Hyde et al. 2013).

Venturiaceae E. Müll. & Arx ex M.E. Barr, Mycologia 71(5): 947 (1979)

The family *Venturiaceae* was introduced Müller and von Arx (1950) and validated by Barr (1979). Genera in *Venturiaceae* are usually characterized by yellowish, greenish-brown to brown, two-celled ascospores and obclavate asci (Barr 1968, 1989; Wu et al. 2011). Members of *Venturiaceae* are distinct and distantly related to other members of *Pleosporales* and have a unique set of morphological and ecological characters (Kruys et al. 2006; Zhang et al. 2012a, 2012a, b), as it is confirmed that *Venturiaceae* was excluded from the Pleosporales by Zhang et al. (2011a) and placed in Venturiales based on strong support of multi-gene phylogenetic analyses.

Tothia Bat., Annls hist.-nat. Mus. natn. hung. 52: 105 (1960).

Index Fungorum number: IF5506, *Facesoffungi number*: FoF 00401

Notes: Wu et al. (2011) epitypified the generic type *T. fuscella* which clustered outside the family *Microthyriaceae* and was related to *Venturiales* in phylogenetic analysis of LSU and ITS. A New species is introduced in this genus and the phylogenetic tree is presented in Fig. 129.

96. *Tothia spartii* Qing Tian, Camporesi & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550898, *Facesoffungi number*: FoF00401; Fig. 130

Etymology: The specific epithet *spartii* refers to the host genus on which the fungus occurs.

Holotypus: MFLU 14–0739

Saprobic on a dead or living branches of *Spartium junceum*. **Sexual morph** Superficial mycelium absent. *Ascomata* (170–)185–250(–270)×(150–)180–(280–) 300 μm ($\bar{x}$=232×210.5 μm, n=10), superficial on branches, solitary, scattered, sometimes gregarious, thyriothecial , dome-shaped or flat-conical, black, membranaceous, opening by a short, papillate ostiole. *Peridium* thick at the apex, 18(–25)–(20–)23 μm ($\bar{x}$=21.5 μm, n=5), upper wall comprising irregular-lobed cells, tightly fitting together like a jigsaw puzzle, one-layered, lower wall poorly developed. *Hamathecium* comprising 1–3 μm broad long, hyaline, pseudoparaphyses, with transverse septa, branched, longer than asci. *Asci* 30(–35)–50(–55)×7(–9)–12(–13) μm ($\bar{x}$=42×10.5 μm, n=10), 8-spored, bitunicate, fissitunicate, obclavate, with a knob-like short-pedicellate, thin-walled. *Ascospores* (10–)11–12(–13)×(3–)4–4(–5) μm ($\bar{x}$=10.5×4.2 μm, n=10), biseriate or multi-seriate, ellipsoid to fusiform, 1-septate, normally unequal, upper cell slightly wider than the lower, slightly constricted at the septum, rounded at both

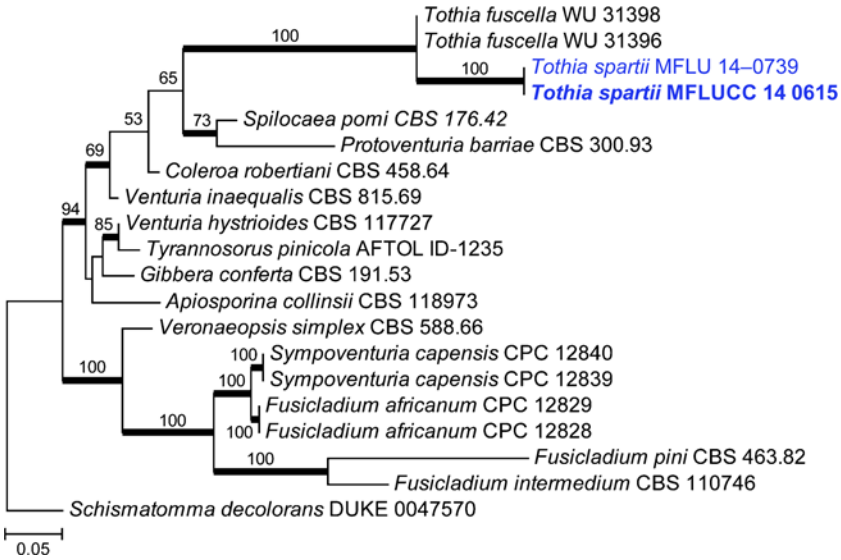


Fig. 129 Phylogram generated from Maximum Likelihood (RAxML) analysis based on combined LSU, SSU, *TEF* and *RPB2* sequenced data of *Venturiaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above and below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Schismatomma decolorans* DUKE 0047570

sides, hyaline and becoming light brown when mature, with four guttules, smooth-walled. **Asexual morph** Undetermined.

Culture characters: Colonies on PDA erumpent, slow growing, reaching 1 cm diam. after 20 d, velvety, mycelium black, dense, globose to irregular, in the centre raised, with water droplets on the surface, reverse dark, sunken. No asexual morph was produced on PDA after 60 d incubation.

Material examined: ITALY, Province of Forlì-Cesena [FC], Fiumicello, Premilcuore, on living and dead branches of *Spartium junceum* (*Fabaceae*), 17 March 2012, E. Camporesi (MFLU 14–0739, **holotype**); ex-type living culture, MFLUCC 14–0615. GenBank ITS: KR025861; LSU: KR025865.

Notes: *Tothia* is a monotypic genus which was introduced to accommodate type species *Tothia fuscella* (Sacc.) Bat. It is a poorly known genus forming thyriothecia and classified in the *Microthyriaceae* by Lumbsch and Huhndorf (2010). *Tothia* shares morphological characters with typical representatives of *Microthyriaceae*, such as two-celled, guttulate, and slightly asymmetrical ascospores which resemble *Microthyrium*, but differ in being brown. Thyriothecial ascomata are unusual for the *Venturiaceae*, however, most genera in *Venturiaceae* usually have yellowish, greenish brown to brown, two-celled ascospores and obclavate asci which match *Tothia* well (Barr 1968, 1989). In recent studies, *Tothia* was found to be most closely related to the Venturiaceae based on analysis of LSU and ITS rRNA genes (Hyde et al. 2013; Wu et al. 2011). In addition, our study confirmed the placement of *Tothia* in *Venturiaceae* and indicated the new collection to be a new species based on analysis of LSU, SSU, TEF1 and RPB2 genes. Ascospores of *T. fuscella* are fusiform or oblong-ellipsoid, tapering at both sides, while ascospores are ellipsoid to fusiform and rounded at both sides in *T. sparticola*.

Eurotiomycetes

Chaetothyriales

The order *Chaetothyriales* was introduced by Batista and Ciferri (1962) and validated by Barr (1987); and the family type is *Chaetothyriaceae* (Batista and Ciferri 1962). Schoch et al. (2006) confirmed the placement of *Chaetothyriales* placement in *Eurotiomycetes* based on phylogenetic analysis. *Chaetothyriales* comprised two families, *Chaetothyriaceae* and *Herpotrichiellaceae* (Geiser et al. 2006; Kirk et al. 2008). Chomnunti et al. (2012a, b) introduced *Trichomeriaceae* under *Chaetothyriales* based on morphology and phylogeny. Réblová et al. (2013) introduced the family *Cyphellophoraceae* in *Chaetothyriales* with only asexual morphs, which was separated from the *Herpotrichiellaceae*; they also transferred *Trichomeriaceae* to *Chaetothyriaceae* based on their phylogenetic tree. Hui et al. (2014) and Chomnunti et al. (2014), however, accepted *Trichomeriaceae* as distinct from *Chaetothyriaceae* because of its morphological and phylogenetic differences.

Chaetothyriaceae

The family *Chaetothyriaceae* was introduced by Hansford (1946), with the generic type *Chaetothyrium*. Species in *Chaetothyriaceae* are referred to as sooty moulds because of the similarity of appearance and ecology with other sooty moulds in *Capnodiaceae* (Chomnunti et al. 2012a; b, 2014). However, these two families are clear distinct in morphology and phylogeny. Phylogenetic analyses of *Chaetothyriaceae* confirmed that this family should be placed in the order *Chaetothyriales*, class *Eurotiomycetes* with strong support (Schoch et al. 2006; Chomnunti et al. 2012a; b; Hui et al.

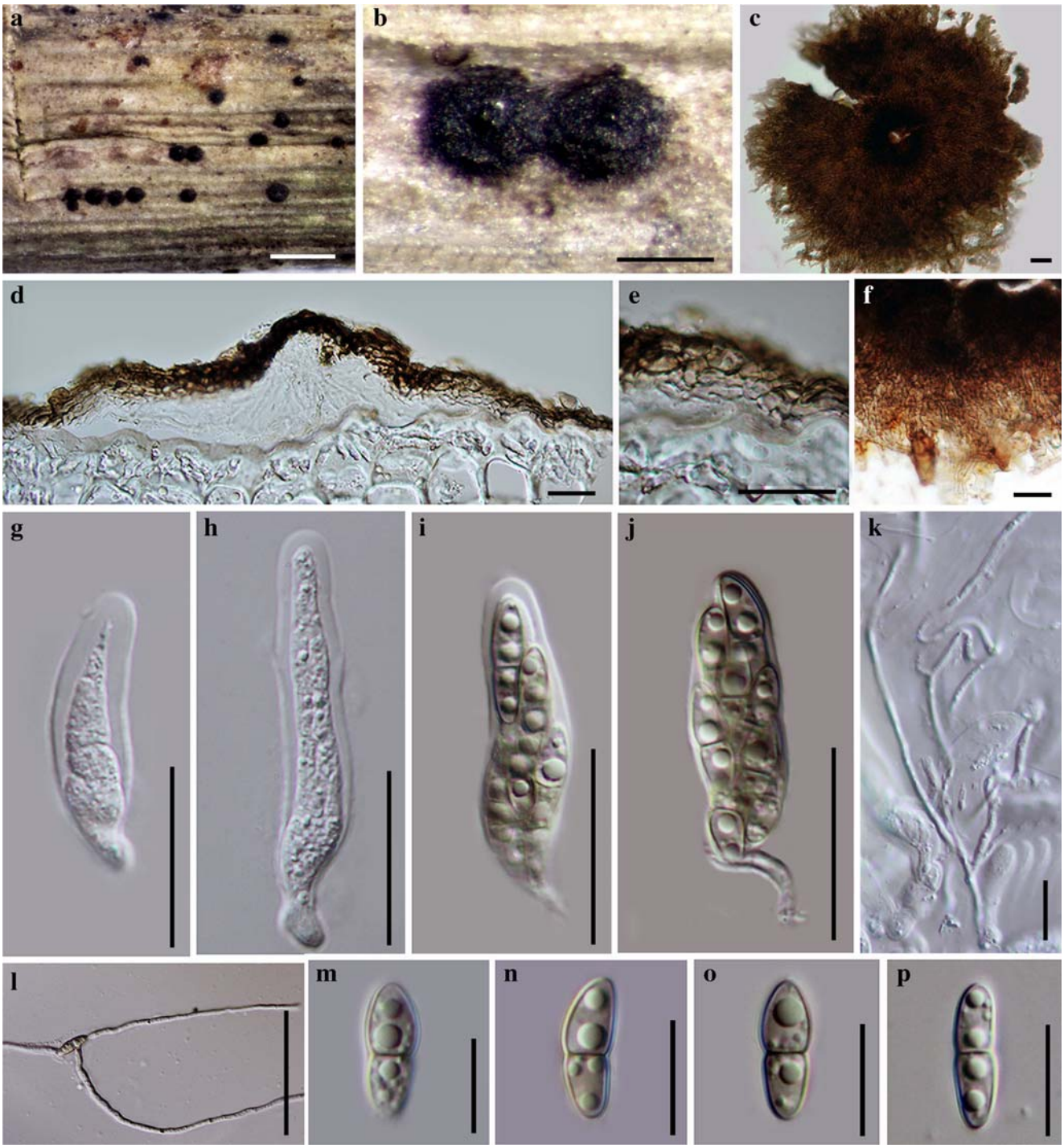


Fig. 130 ***Tothia spartii*** **(holotype) a, b** Ascomata on the host **c, f** Squash mount of ascoma **d, e** Vertical section of ascoma **g-j** Asci with ascospores **k** Pseudoparaphyses **l** Germinating ascospore **m–p** Ascospores. Scale bars: a=1000 μm, b=200 μm, c-k=20 μm, l=50 μm, m-p=10 μm

2014). A new species of *Chaetothyrium* is introduced here. The phylogenetic tree is presented in Fig. 131.

97. *Chaetothyrium agathis* Hongsanan & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550893, *Facesoffungi number*: FoF00396; Fig. 132

Etymology: From the Latin *agathis*, meaning precious thing which is the genetic name of the host plant.

Holotypus: MFLU 14–0749

Saprobic on surface of leaves of *Agathis*. **Sexual morph** *Ascomata* 80×124 μm diam. ($\overline{x}$=94 μm, n=5), rather small, solitary or clustered (usually solitary), superficial on surface

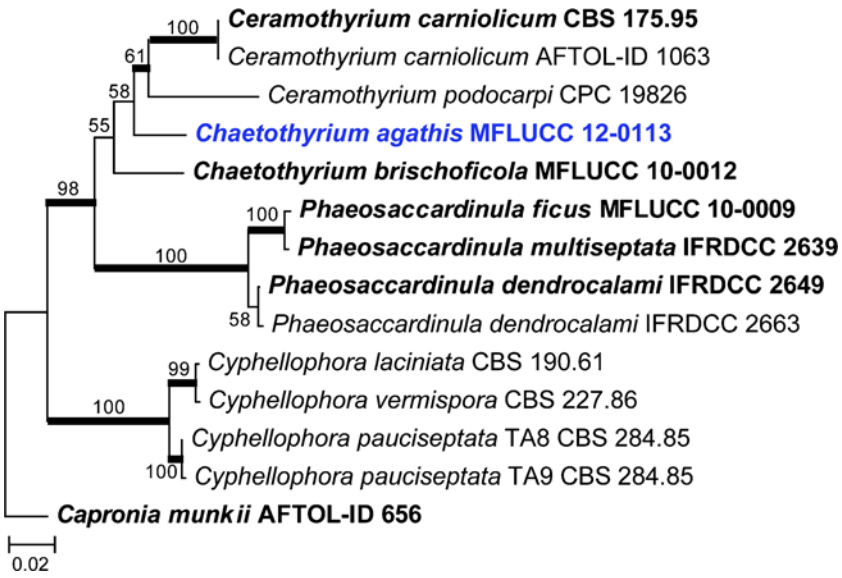


Fig. 131 Phylogram generated from Maximum likelihood (RAxML) analysis based on combined LSU and ITS sequence data of *Chaetothyriales*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in bold. The ex-types (reference strains) are in bold; the new isolates are in blue. The tree is rooted with *Capronia munkii* AFTOL-ID 656

of leaves, subglobose to globose, rounded above, wall composed of pale brown cells, lacking an ostiole. *Setae* 62–107 long×1.8–2.6 wide μm ($\bar{x}$=74×2 μm, n=10), dark brown, rounded at the base and wider than apex, stellate when viewed under stereomicroscope because of setae arrangement, dark brown to black. *Peridium* 21–34 μm ($\bar{x}$=26 μm, n=5) comprising two cell layers of *textura angularis*, inner layer hyaline, outer layer brown. *Hamathecium* lacking paraphyses. *Asci* 52–43×16–20 μm ($\bar{x}$=48×19 μm, n=10), 8-spored, bitunicate, fissitunicate, broadly ovoid or oblong, usually short pedicellate, with an ocular chamber. *Ascospores* 21–29×4–5 μm ($\bar{x}$=26×5 μm, n=10), 2–3-seriate, oblong to ellipsoidal, with 4–7 trans-septa, small and narrow at both end cells, hyaline, slightly rough-walled and constricted at septum in water, rough-walled and not constricted at the septum when in Melzer's reagent, smooth-walled and not constricted at the septum when in cotton blue reagent. **Asexual morph** Undetermined.

Material examined: PHILIPPINES, Laguna Province, Mount Makiling, on leaves of *Agathis* sp. (*Araucariaceae*), February 2012, K.D. Hyde HSA15 (MFLU 14–0749, **holotype)**; ex-type living culture, MFLUCC 12–0113, CPC 20477. GenBank ITS: KP744437; LSU: KP744480.

Notes: *Chaetothyrium agathis* is most similar to *C. brischoficola* (see Chomnunti et al. 2012a; b) in having setae. The setae in *C. brischoficola* are however, short, while those in *C. agathis* are long. Ascospores of *C. brischoficola* are obovoid, 3–4-septate or muriform, while in *C. agathis* they are cylindrical with 3–7-septate.

Trichomeriaceae

The family *Trichomeriaceae* was introduced by Chomnunti & K.D. Hyde (2013) based on generic type *Trichomerium*. *Trichomeriaceae* are sooty moulds under the order *Chaetothyriales* and similar to *Capnodiaceae* and *Chaetothyriaceae*, but differ in having an apical ascal ring, ascospores with or without sheath and septation (Chomnunti et al. 2012a, b; 2014). Réblová et al. (2013) transferred species of *Trichomeriaceae* to *Chaetothyriaceae* based on their phylogenetic tree. In other studies, phylogenetic analysis and morphology demonstrated that the family *Trichomeriaceae* clusters separately from *Capnodiaceae* and *Chaetothyriaceae* (Chomnunti et al. 2012a, b, 2014; Hui et al. 2014). The family *Trichomeriaceae* comprises a single genus, *Trichomerium* (Chomnunti et al. 2012a; b; 2014), which contains 27 species in Index Fungorum (2015). In this paper a new species of *Trichomerium* is introduced. The phylogenetic tree is presented in Fig. 133.

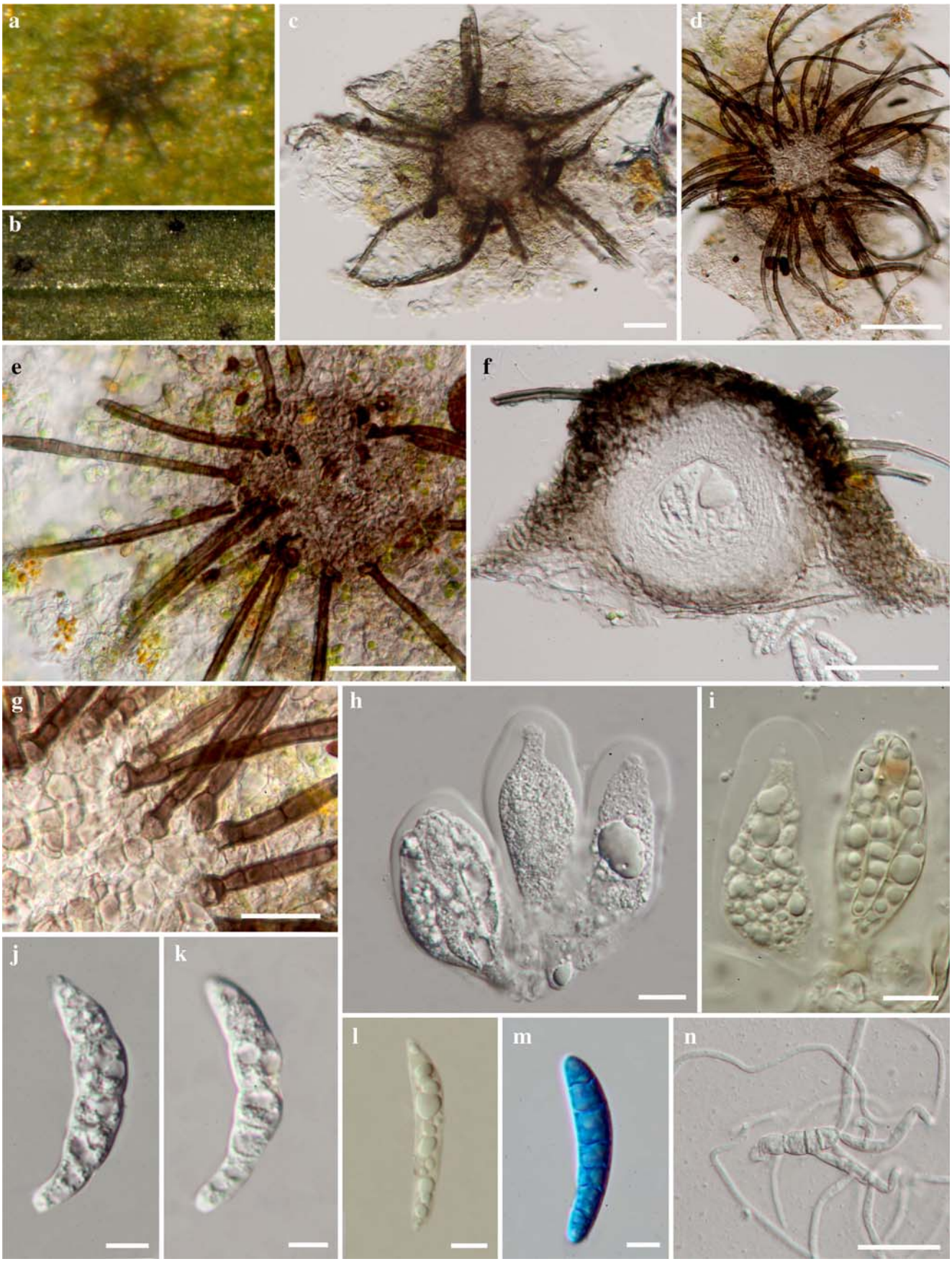
98. *Trichomerium siamensis* Hongsanan & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550885, *Facesoffunginumber*: FoF 00395; Fig. 134

Etymology: *siamensis* is from Latin derived from *siam+ensis* which means "of Siam" or "Thailand".

Holotypus: MFLU 14–0750.

Saprobic on the lower surface of leaves. *Superficial hyphae* 3–4 μm wide, septate, constricted at the septum, pale brown to brown. **Sexual morph** *Ascomata* 112–130 μm diam. ($\bar{x}$=126 μm, n=5), superficial, mostly solitary, subglobose, rounded above, light brown, ostiolate, held to the leaf surface by basal mycelium, with apical setae. *Setae* 38–56×4–5 μm ($\bar{x}$=48×4 μm, n=10) at upper part of ascomata, larger and rounded at the base, curved, dark brown to black. *Peridium* 9–14 μm ($\bar{x}$=10 μm, n=5), comprising two-layers of cells of *textura angularis*, outer layer composed of pigmented, thick-walled cells of *textura angularis*, inner layer composed


a
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◀ **Fig. 132** ***Chaetothyrium agathis*** **(holotype)**. **a, b** Ascomata on host surface **c, d** Ascomata viewed in squash mount **e** Ascoma with long setae around the centre. **f** Section through ascoma **g** Base of setae **h** Asci when immature **i** Asci in Melzer's reagent with ocular chamber **j, k** Multi-septate, verrucose ascospores **l** Multi-septate ascospore in Melzer's reagent **m** Ascospore in cotton blue reagent **n** Germinating ascospore. Scale Bars: c, d=20 μm, e, f=50 μm, h, i=10 μm, j, k, l, m=5 μm

of pale, pigmented and thin-walled cells of *textura angularis*. *Hamathecium* lacking paraphyses. *Asci* 48–64×14–21 μm ($\bar{x}$=62×17 μm, n=5), 8-spored, bitunicate, broadly cylindrical or oblong, usually with short pedicel. *Ascospores* 20–23×6–7 μm, ($\bar{x}$=21×6 μm, n=10), bi to tri-seriate, oblong to ellipsoid, 3-septate, not constricted at the septum, end cells narrow and smaller than central cells, hyaline, wall slightly roughened. **Asexual morph** Undetermined.

Material examined: THAILAND, Chiang Rai, Tasud, on leaves of *Tecoma* sp. (*Bignoniaceae*), November 2011, S. Hongsanan HSA09 (MFLU 14–0750, **holotype**); ex-type living culture, MFLUCC 12–0097, CPC 20469. GenBank ITS: KP744468.

Notes: This new taxon is similar to other species of *Trichomerium* (*Trichomeriaceae*) based on its superficial ascomata on the surface of leaves, and dark setae on the upper part of ascomata (Chomnunti et al. 2014). *Trichomerium siamensis* is most similar to *T. ornatum* based on ascospore shape and septation, but differs in having short setae at the upper part of ascomata in *T. siamensis*, while ascomata have long setae in *T. ornatum*. Moreover, *T. siamensis* is also similar to *T. criniporum* due to the ascomata with setae and shape of ascospores, but differs in having setae with septa, while setae are aseptate in *T. criniporum*. Molecular analysis (ITS) supports the fact that *T. siamensis* is the new species in *Trichomerium* with 91 % ML and 100 % BP support.

Lecanorales

Squamarinaceae

Among the ascomycetes, the subclass of Lecanoromycetidae is characterized by discocarp ascomata, often with an I+ hymenium and typically by thick-walled asci with amyloid apical structures (Kirk et al 2008). The fungi are mainly lichen-forming with mutualistic relationship to green algal and cyanobacterial photobionts. While many groups of the subclass Ostropomycetidae exhibit associations with trentepohlioid algae, the remaining three subclasses Acarosporomycetidae, Umbilicariomycetidae and Lecanoromycetidae mostly form thalli with, aside from cyanobacterial associations, chlorococcoid and trebouxioid algal species (Peršoh et al. 2004; Miadlikowska et al. 2006; Miadlikowska et al. 2014). Lecanoromycetidae represent about half of all lichenized species (Rambold et al. 2001 onwards), and form the majority of rock-inhabiting communities with apothecial structures. About two percent of those are lichenicolous and some 40 species exhibit endolichenic growth of the vegetative thallus (about half of that number within Lecanorales Nannf.), at least during their juvenile stages. Based on morphological traits, the lichen family *Squamarinaceae* was established by Hafellner (1984), but, based on molecular phylogenetic data, has been transferred into the synonymy of *Stereocaulaceae* Chevall (Lumbsch and Huhndorf 2010). The LSU sequence of *P. pratorum*, its closest relatives according to GenBank BLAST query, and

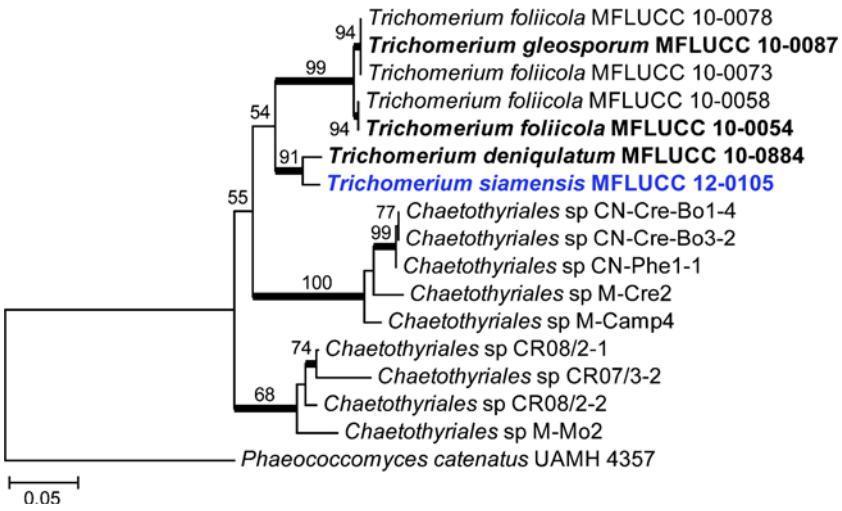

Fig. 133 Phylogram generated from Maximum likelihood (RAxML) analysis based on ITS sequence data of *Trichomeriaceae*. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, and branches with Bayesian posterior probabilities greater than 0.95 are given in *bold*. The ex-types (reference strains) are in *bold*; the new isolates are in *blue*. The tree is rooted with *Phaeococcomyces catenatus* UAMH 4357

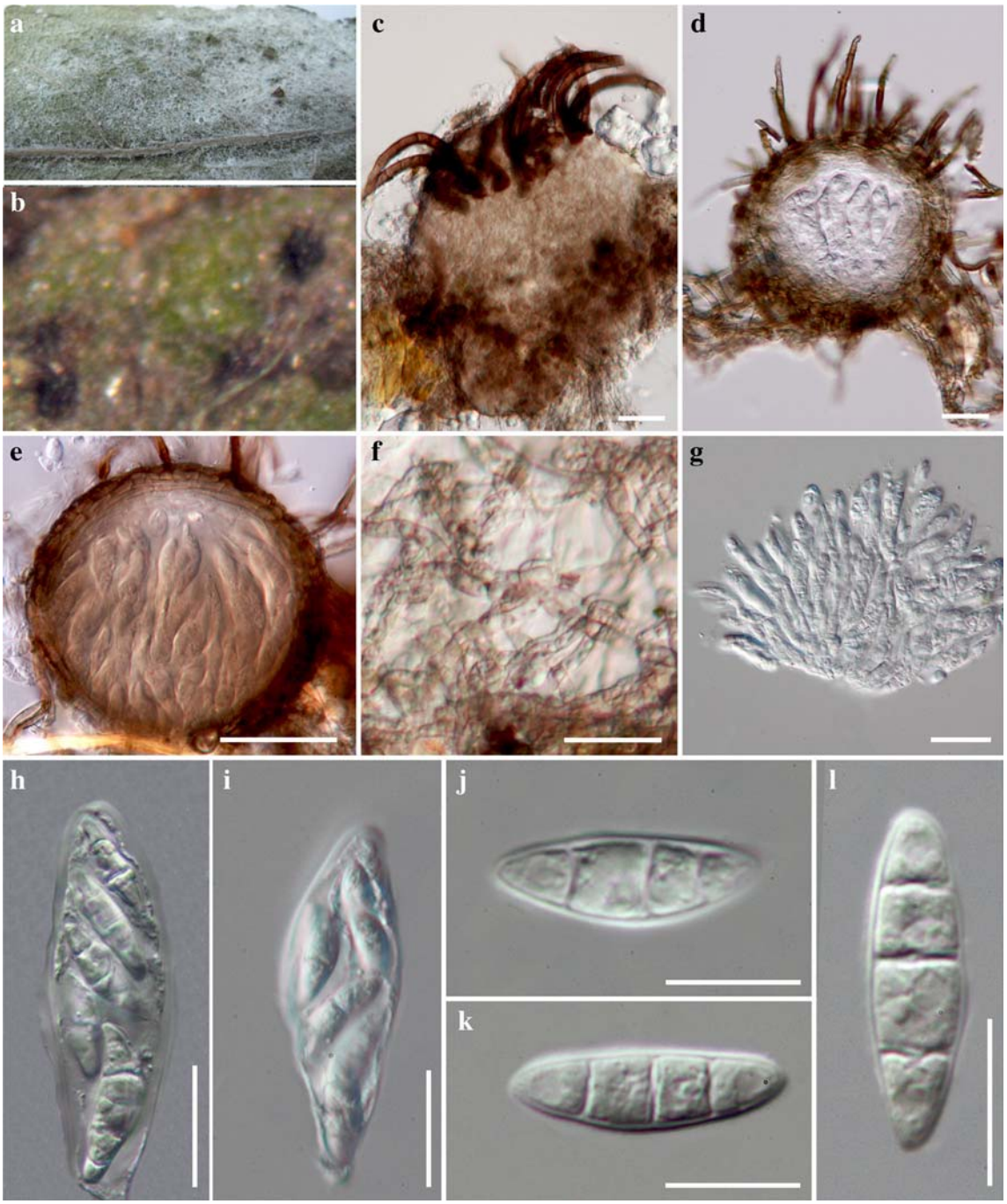

Fig. 134 ***Trichomerium siamensis*** **(holotype) a**, **b** Ascomata on lower surface of leaf **c** Dark setae clustered at the apex of ascomata **d** Section through ascomata showing asci arrangement **e** Peridium and ascus arrangement **f** Mycelium on surface of leaves **g** Asci embedded in gelatinous matrix **h**, **i** Asci **j–l** Ascospore with 3-septa. Scale bars: c, d, h, i=20 μm, e, g=50 μm, f, j, k, l=10 μm

further representatives of the Lecanoromycetidae were aligned using MUSCLE, as implemented in Geneious v. 6 (Biomatters, Auckland, New Zealand), the phylogenetic tree generated for Lecanoromycetidae is presented in Fig. 135.

99. *Paralecia* Brackel, Greiner, Peršoh & Rambold, ***gen. nov.***

Index Fungorum number: IF551012, *Facesoffunginumber*: FoF 00563

Etymology: The genus name '*Paralecia*' refers to 'para-' (along with, beside) and to 'lecia' (refers to the lecideine apothecia).

Type species: *Paralecia pratorum* Brackel, Greiner, Peršoh & Rambold

Notes: This new species is characterized by its lichenicolous, endothallic growth, lecideine apothecia, asci with I+ dark blue tube-like apical structure, hyaline, and

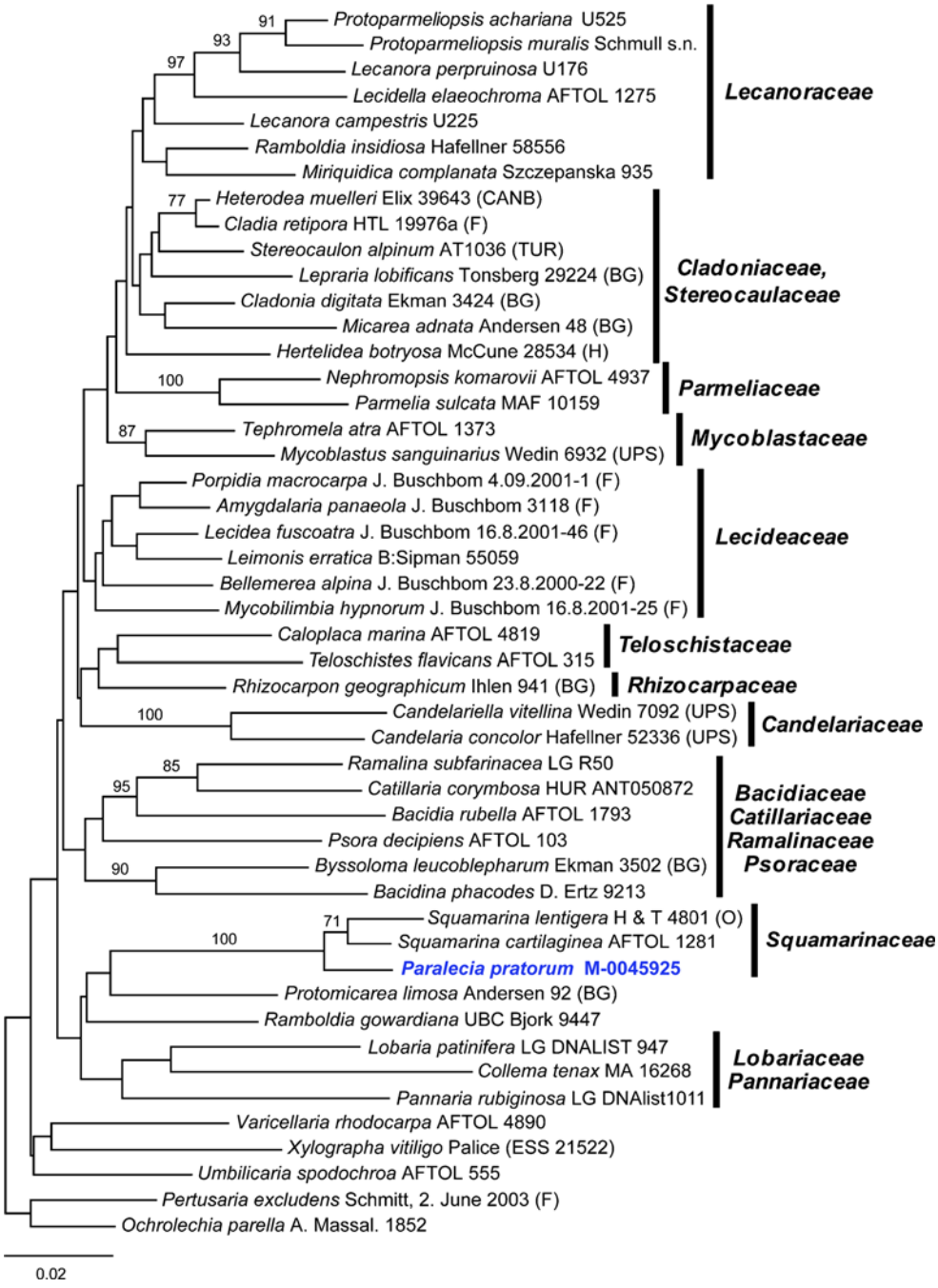

Fig. 135 Phylogram generated from Maximum likelihood (PhyxML v. 2.20) analysis based on LSU sequence data. Maximum likelihood bootstrap support values greater than 70 % are indicated above the nodes. Species names are followed by the voucher IDs and the new species is in *blue*

simple ascospores. Among families with lecanoralean asci (i.e. Lecanoromycetidae), this combination of traits matches with species of the families (sensu Triebel, D. & Bensch, K. 2005 onwards) *Aphanopsidaceae*, *Cladoniaceae*, *Lecanoraceae*, *Lecideaceae*, *Malmidiaceae*, *Micareaceae*, *Pannariaceae*, *Pilocarpaceae*, *Psoraceae*, *Ramalinaceae*, *Stereocaulaceae*, *Vezdaceae*, and the not yet family-assigned genus *Myochroidea* (Rambold et al. 2001 onwards: lichenicolous growth ignored; thallus growth habit set to crustose endosubstratal, episubstratal, (sub-)crustose, OR (sub-)squamulose, primary photobiont set to chlorophytaceous). However, *Myochroidea* differs by its well-developed thallus and reddish brown apothecia (black in *Paralecia*).

According to molecular data, all families, but *Stereocaulaceae* (incl. *Squamarinaceae* Hafellner) and *Psoraceae* (incl. *Protomicarea* Hafellner), may be discarded as taxa to be considered. The LSU (GenBank Acc. No.: KP224503) and ITS (KP224502) rRNA gene sequences were compared with data in GenBank, using the BLAST function of NCBI (Zhang *et al.* 2000). The next similar LSU sequence originated from *Squamarina cartilaginea* (With.) P. James

(DQ986763, grade 98.4 %, coverage 100 %, similarity 96.9 %). The ITS sequence of *Paralecia pratorum*, however, did not reasonably match (similarity<80 %) any sequences in the international sequence databases (INSDC; www.insdc.org). According to LSU phylogeny topology (Fig. 135), which is largely not conflicting with published phylogenies (e.g., Andersen and Ekman 2005; Bendiksby and Timdal 2013; Wedin et al. 2009), *P. pratorum* is phylogenetically close to the lichenized genus *Squamarina* (with *S. cartilaginea*, DQ986763, and *S. lentigera* (Weber) Poelt, AY756363) and is tentatively considered a member of the *Squamarinaceae* Hafellner (Hafellner 1984). Within this family, it is unique by its lichenicolous growth, lecideine apothecia, and a more pronounced amyloid tube-structure of the tholus. The ascus type (with a tube-like amyloid structure) is in accordance with that known from *Squamarina gypsacea* (Sm.) Poelt (Hertel and Rambold 1988). Next related, but with only 91 % similarity (722 out of 795 bp are identical) and without bootstrap support, appears to be *Protomicarea limosa* (Ach.) Hafellner (AY756332), exhibiting a rather similar combination of apothecial traits (excipulum, pigmentation, ascus, ascospores).

Hitherto, only one record of an undescribed taxon, '*Lecidea* aff. *insidiosa*', growing on *P. muralis*, exists (Nimis and Poelt 1987; Rambold and Triebel 1992). *Lecidea insidiosa* Th. Fr. (KJ766650), exhibiting a more or less typical *Lecanora*-type ascus, has meanwhile been combined to *Ramboldia insidiosa* (Th. Fr.) Hafellner, but clusters in the present LSU tree with *Miriquidica complanata* (Körb.) Hertel & Rambold (KF562179; generic type of *Miriquidica*) (Fig. 135). Phylogenetic analysis results further show a closer relationship of the *Squamarinaceae* Hafellner to *Lobariaceae* and *Pannariaceae*, but not to the *Stereocaulaceae*, which supports the suggestion of Miadlikowska et al. (2014) to resurrect and recircumscribe this family.

100. *Paralecia pratorum* Brackel, Greiner, Peršoh & Rambold, ***sp. nov.***

Index Fungorum number: IF550913, *Facesoffunginumber*: FoF 00553; Fig. 136

Etymology: The specific epithet '*pratorum*' (lat., genitive plural of '*pratum*') refers to the name of the type locality 'Prati [= meadows] di Logarghena'.

Holotype: M-0045925

Lichenicolous on *Protoparmeliopsis muralis*. Thallus externally not visible, endothallic (Fig. 136a). **Sexual morph** Apothecia breaking through the cortex of the host thallus, in loose groups, sessile, constricted at the base, 200–450 μm wide; disc plane to convex at maturity, roundish, black, epruinose; proper margin developed, mostly paler than the disc and somewhat translucent, disappearing at maturity;

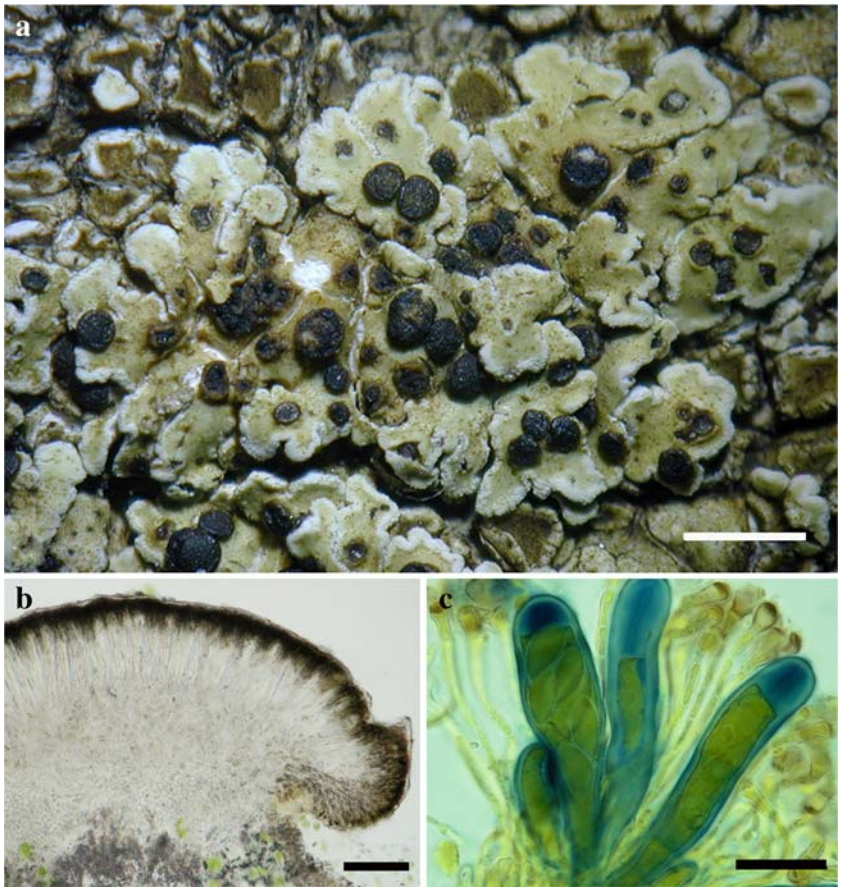

Fig. 136 ***Paralecia pratorum*** **(holotype). a** Habitius: ascomata of *P. pratorum* on young lobes of *Protoparmeliopsis muralis* **b** apothecium in longitudinal section **c** asci at different ontogenetical stages and paraphyses in Lugol's solution after pretreatment with KOH. Scale bars: a=1 mm, b=50 μm, c=20 μm

excipulum c. 70 μm thick, hyaline to slightly brownish on upper side, filled with numerous crystals, composed of thick-walled cells, 6–12×2–4 μm; epihymenium pale brown, K+ greyish brown, 10–20 μm thick, filled with a multitude of small crystals dissolving in K; hymenium hyaline, slightly brownish on upper side, 60–85 μm thick; hypothecium hyaline, 120–150 μm thick (Fig. 136b). Paraphyses hyaline, slightly brownish at the ends, with a brown cap, simple or sparingly branched, 1.5–3 μm wide; apices swollen up to 5 μm. Asci (4–)8-spored, cylindrical to narrowly clavate, 55–80×10–18 μm, with a thickened tholus; tholus I+ blue with a I+ dark blue tube-like structure, outer gelatinous layer I+ blue (Fig. 136c). Ascospores hyaline, simple, ellipsoid, with a rounded upper and a slightly attenuated lower end, or sometimes with both ends being slightly attenuated, (11–)11.8–13.7(–15)×(4.5–)4.7–5.6(–6.5) μm, l/b=(1.7–)2.2–2.8(–3.1) [n=40]. **Asexual morph** Undetermined.

Material examined: ITALY, Toscana, Prov. di Massa-Carrara, Prati di Logarghena above the city of Pontremonli, N44° 22.848′, E9° 56.573′, elev. 845 msl., growing on *Protoparmeliopsis muralis* (Schreb.) M. Choisy, on schistose rock outcrops in a meadow, 7 October 2013, W. v. Brackel (M-0045925, **holotype**; GenBank ITS: KP224502; LSU: KP224503; hb. Brackel 6996, **isotype**). ITALY, Toscana, Prov. di Massa-Carrara, Valdantena, above Molinello, N44° 25.165′, E9° 55.883′, 460 msl., on *P. muralis* on a shady old wall at the roadside, 5 October 2013, W. v. Brackel (hb. Brackel 6914); below Passo Cirone, N44° 25.317′, E9° 54.988′, c. 1000 msl, on *P. muralis* on sandstone outcrops in beech forest, 5 October 2013, W. v. Brackel (hb. Brackel 6941).

Notes: The fungus causes no recognisable harm to the host thallus, but induces the formation of new lobes, also originating from the apothecial margin. The production of host apothecia is suppressed to some degree. One has been analysed to confirm the presence of Lecanora-type asci.

Ascomycota genera, incertae sedis

101. *Lauriomyces synnematicus* Somrithipol, ***sp. nov.***

Index Fungorum number: IF551016, *Facesoffungi* number: FoF 00554; Figs. 137, 138

Etymology: *synnematicum*, refers to the synnematal structure

Holotype: SFC 2156 in BBH

Saprobic on decaying leaves. **Sexual morph** Undetermined. **Asexual morph** Colonies scattered, white conidial sporulation on scattered synnemata. *Synnemata* solitary or in groups, scattered, black, 50–225 μm high, 10–40 μm diam. with 5–20 filaments closely adpressed along most of their length. Filaments septate, thick and smooth-walled,

Fig. 137 ***Lauriomyces synnematicus*** (**holotype**). **a** A synnema with conidial mass **b** Synnematous filaments bearing conidiogenous cells and branched chains of conidia and **c** Cylindrical conidia. Scale bars: a=50 μm, b, c=10 μm

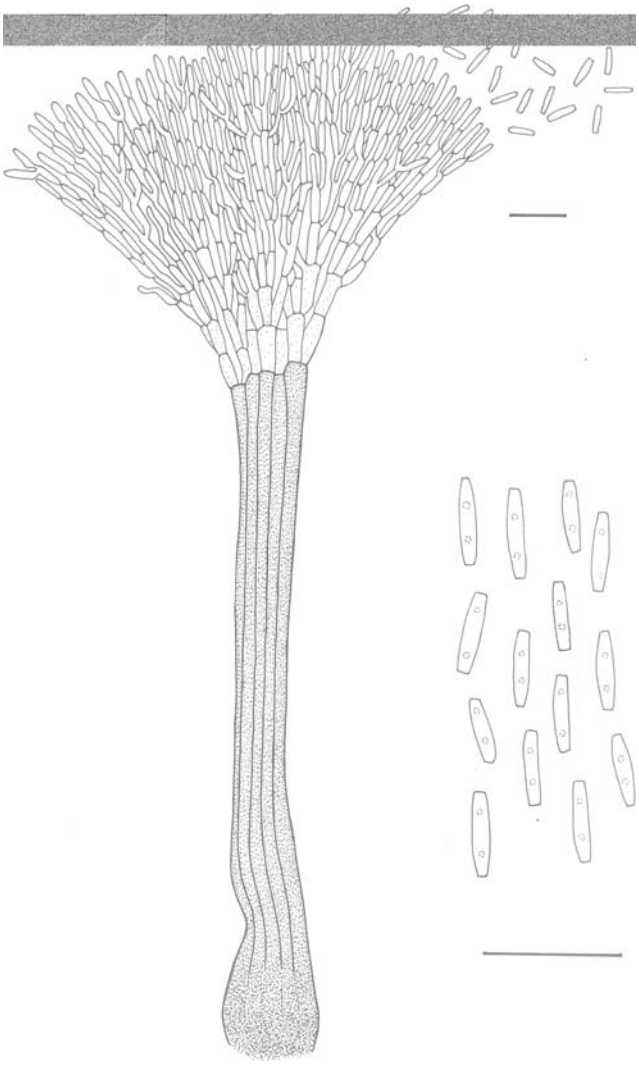

Fig. 138 ***Lauriomyces synnematicus*** **(holotype)**. Line drawing of a synnema with filaments bearing branched chains of conidia and cylindrical conidia. Scale bars: = 10 *μm*

brown to dark brown, 5–6 *μm* wide, with terminal branches. Branches cylindrical, thin and smooth-walled, hyaline to subhyaline. Primary branches in clusters of 3–5 at the apex of the filament, 6–7.5 *μm* long ($\bar{x}$=7±0.68 *μm*, *n*=5), 1–2.5 *μm* wide ($\bar{x}$=2±0.28 μm, *n*=5). Subsequent branches in clusters of 3–5, 6–7.5 *μm* long ($\bar{x}$=6.75±0.68 *μm*, *n*=5), 1–2 μm wide ($\bar{x}$=1.4±0.28 *μm*, *n*=5). Ramoconidia and conidia holoblastic, cylindrical, one-celled, hyaline to subhyaline, thin- and smooth-walled, in acropetal branched chains, 4.5–7.5 *μm* long ($\bar{x}$=5.4±0.61 *μm*, *n*=50), 0.7–1.3 *μm* wide ($\bar{x}$=1±0.12 *μm*, *n*=50).

Material examined: THAILAND, Nakhon Rachasima, on decaying leaves, 23 August 2008, B. Thongnuch (SFC 2156 in BBH, **holotype**).

Notes: *Lauriomyces synnematicus* differs from other species of the genus in possessing synnemata. The synnema is an important characteristic to distinguish several hyphomycete species, for example: *Janetia synnematosa* (Sivanesan and Hsieh 1990), *Melanographium selenioides* (Ellis 1963), *Memnoniella stilboidea* (Ellis 1976) and *Dictyoarthrinium synnematicum* (Somrithipol 2007). Conidia of *L. synnematicum* are rather narrower than those of the other species in the genus with cylindrical conidia. Somrithipol and Jones (2007) illustrated the gelatinization process during the conidial formation of *L. cylindricus*, resulting in deposition of mucilage between the conidia to join them into a persistent chain. This conidial chain is the only character distinguishing the genus *Lauriomyces* from *Haplographium*. In *L. synnematicum*, the mucilage was less evident but some persistent chains could be observed.

Contributions to Basidiomycota

Agaricus L.: Fr.

Agaricus (= *Psalliota* Fr.), the large and well-known edible mushroom genus which also includes a small number of species that are toxic if eaten (Kerrigan et al. 2006; Zhao et al. 2012), comprises numerous species. According to Bas (1991), the number of *Agaricus* described worldwide is probably close to 400; Zhao et al. (2011) recognized 386 species in the genus. Taxa from temperate regions are grouped into eight commonly recognized sections based on morphological and organoleptic traits, as well as macrochemical reactions (Cappelli 1984; Parra 2008, 2013). Compared with temperate areas, knowledge of species diversity is less-developed in tropical regions. Phylogenetic analyses of Zhao *et al*. (2011) revealed seven (TR I to TR VII) strongly supported tropical clades in addition to the clades of the eight classical sections. In the past decade about 36 *Agaricus* species have been described and 15 out of 36 were from tropical areas. The phylogenetic tree is presented in Fig. 139.

102. ***Agaricus flavicentrus*** Karunarathna & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550891, *Facesoffungi number*: FoF 00392; Figs. 140, 141

Etymology: *flavicentrus*, in reference to the "yellow centre", which is the colour of the pileus centre of this new species.

Holotypus: MFLU 12–0146

Pileus 30–70 mm diam., circular from above, hemisphaerical when young, convex when old; pileus splits when matured, surface dry, smooth, with small yellow flakes on the centre, yellowish white (2A2) at the centre white (5A1) towards the margin when young and old; no colour changes on pileus and stipe surfaces. *Context* in pileus 3–5 mm thick at the disc, fragile, white, soft, and colour unchangeable. *Lamellae* free, crowded with 4 tiers of lamellulae, 2–3 mm wide with homomorph edge, light brown (5D4) at first, then dark brown to chocolate brown (6F) at maturity, with concolourous even edge. *Annulus* is simple, single, fragile,

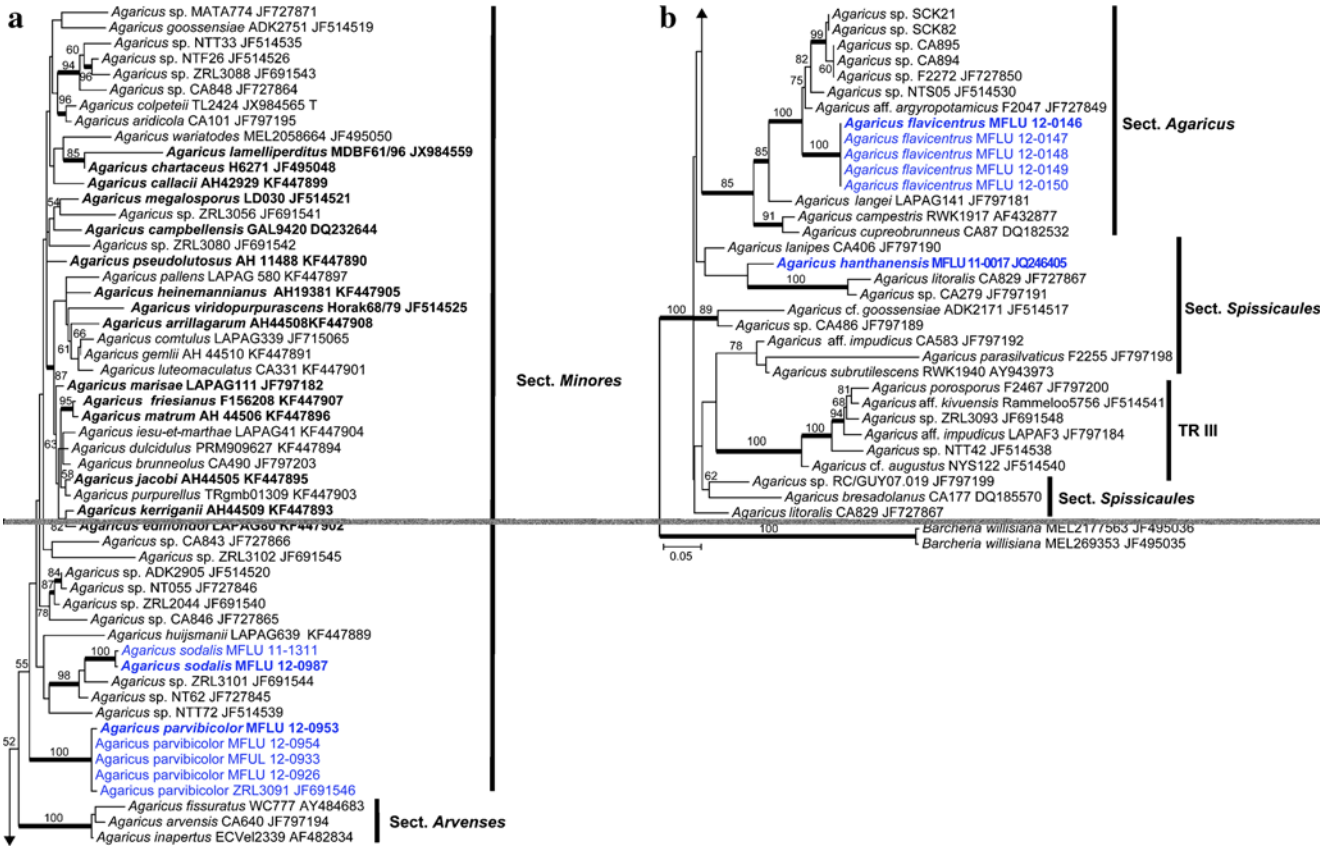

Fig. 139 Phylogram generated from Maximum Likelihood (PhyML ver 3.0) analysis based on ITS sequences of *Agaricus* from the sections *Agaricus*, *Sanguinolenti*, *Spissicaules*, *Arvenses* and *Minores* (Lebel and Syme 2012; Zhao et al. 2011). Maximum Likelihood bootstrap support values greater than 50 % are indicated above the nodes, and branches with Maximum parsimony bootstrap support values greater than 75 % are given in *bold*. The type species are given in *bold*; the new specimens are in *blue*. The tree is rooted with *Barcheria willisiana*

no floccose pieces, 10 mm diam., pendent, stretched, white, cottony, white to slight yellowish white (3A2). *Stipe* 40–70×10 mm at the base, at the middle, and at the top, cylindrical, centrally attached to pileus, buried, fistulose; context white, cottony; surface smooth, slight yellowish white (2A2) at the top and yellowish white

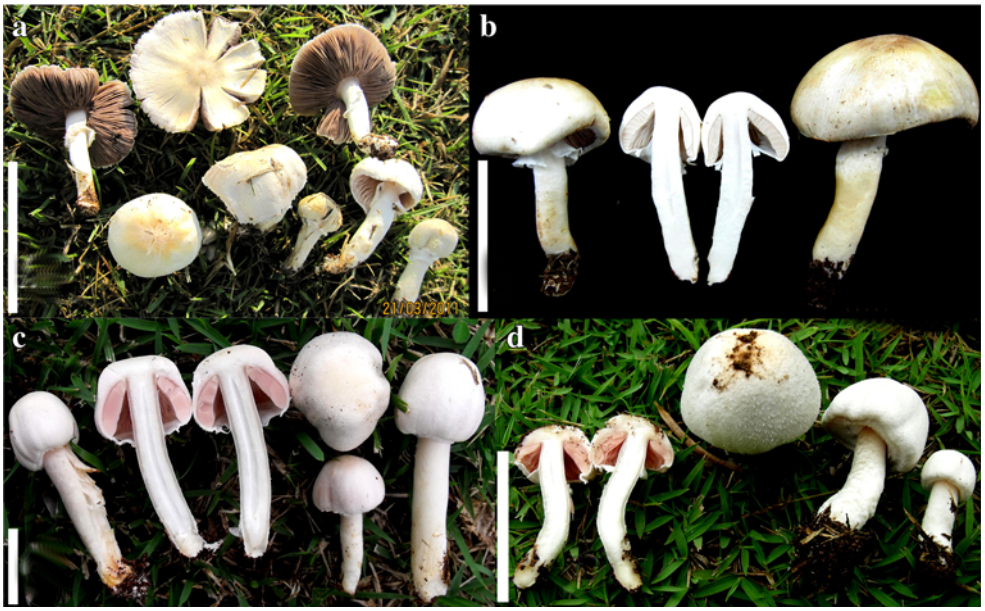

Fig. 140 ***Agaricus flavicentrus*** **a** fruiting bodies in the field (MFLU 12–0146, **holotype**). **b** fruiting bodies in the laboratory (MFLU 12–0148). **c** fruiting bodies in the field (MFLU 12–0147). **d** fruiting bodies in the field (MFLU 12–0149). Scale bars: a, b, d=10*cm*, c=5*cm*

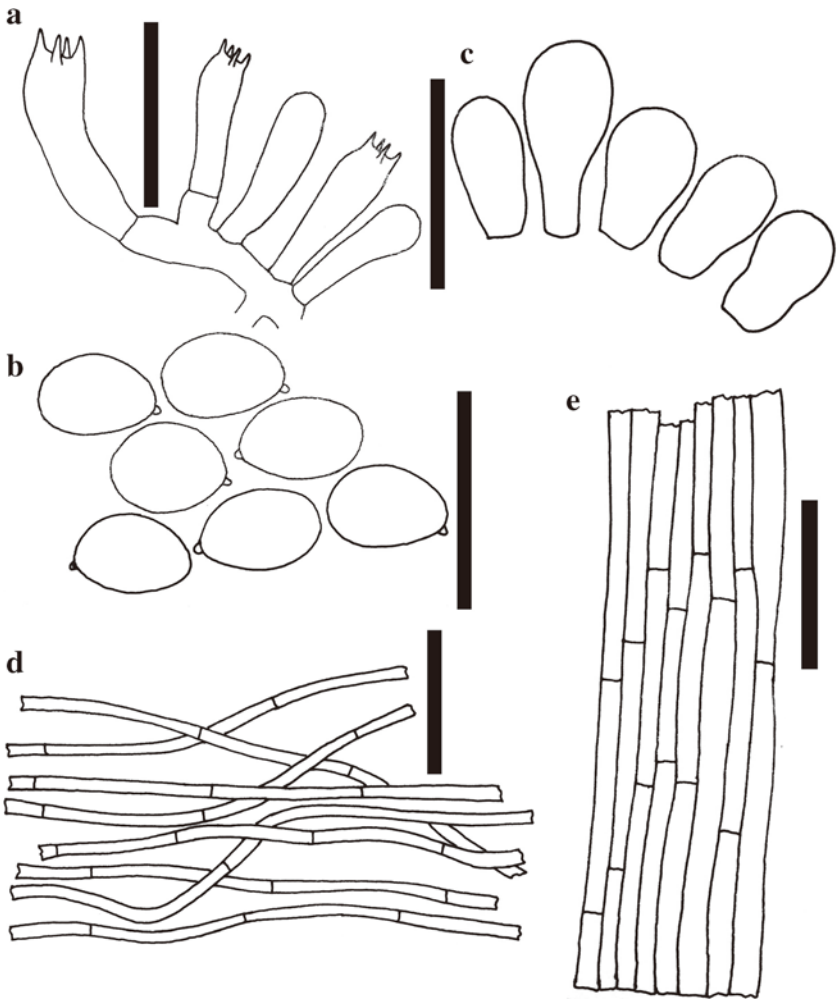

Fig. 141 *Agaricus flavicentrus* (MFLU12–0146, **holotype**) **a** Basidia. **b** Basidiospores. **c** Cheilocystidia. **d** Hyphae of stipitipellis. **e** Hyphae of pileipellis. Scale bars: a–e=20 μm

(3A2) at base; rhizomorphs absent at base. No discolouration observed in the pileus or stipe context on touching or cutting. *Odour* bitter almond-like.

Macrochemical reaction: no reaction with 5 % KOH on pileus surface and stipe surface (negative). Negative results obtained for the Schaeffer reaction on fresh context of pileus and stipe base.

Basidiospores 10–11×6–7 μm ($\overline{x}$=10.50×6.50 μm, Q=1.75–2.12, Q_m =1.97, n=40), mostly oblong but rarely ellipsoid, without germ pore, smooth, chocolate-brown in mass, thick-walled. *Basidia* 18–25×4–6.5 (–7) μm, clavate, 4-spored. *Cheilocystidia* 12–18×8–10 μm, broadly clavate, single, hyaline, smooth. *Pleurocystidia* absent. *Pileipellis* a cutis; hyphae 2.5–3 μm diam., inflated, hyaline, unbranched. *Stipitipellis* hyphae similar to pileipellis hyphae 1.5–2 μm diam. *Clamp connections* absent.

Habitat: as a group on grassland with humus-rich, organic matter rich soil. Fruiting at the beginning of the rainy season, found in open grassland with lot of organic litter mixed soil.

Material examined: THAILAND, Chiang Rai Province, Mueang Chiang Rai District, Mae Fah Luang University park, 20° 2′44.39″N 99°53′37.38″E, 258 m, 21 March 2011, S.C. Karunarathna (MFLU12–0146, **holotype**); GenBank ITS: KR025857. THAILAND, Chiang Mai Province, Mueang Chiang Mai District, Chiang Mai University park, 18°48′22″ N 98°57′10″E, 345 m, 27 July 2011, S.C. Karunarathna (MFLU12–0147); GenBank ITS: KR025854. THAILAND, Chiang Rai Province, Mueang Chiang Rai District, Mae Fah Luang University park, 20° 2′44.39″N 99°53′37.38″E, 258 m, 23 March 2011, 15 May 2013, S.C. Karunarathna (MFLU12–0148; GenBank ITS: KR025855; MFLU12–0149; GenBank ITS: KR025856).

Notes: This new species is distinguished by its relatively small to moderate basidiomes with a soft, hemisphaerical and yellowish centered pileus; 10–11×6–7 μm sized mostly oblong, thick-walled basidiospores, well visible single, non-floccose, fragile, annulus; 12–18×8–10 μm, broadly clavate cheilocystidia and pleasant bitter almond odour.

103. *Agaricus hanthanaensis* Karunarathna & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550892, *Facesoffungi number*: FoF00393; Figs. 142, 143

Etymology: refers to the type collecting site “Hanthana”.

Holotypus: MFLU11–0017

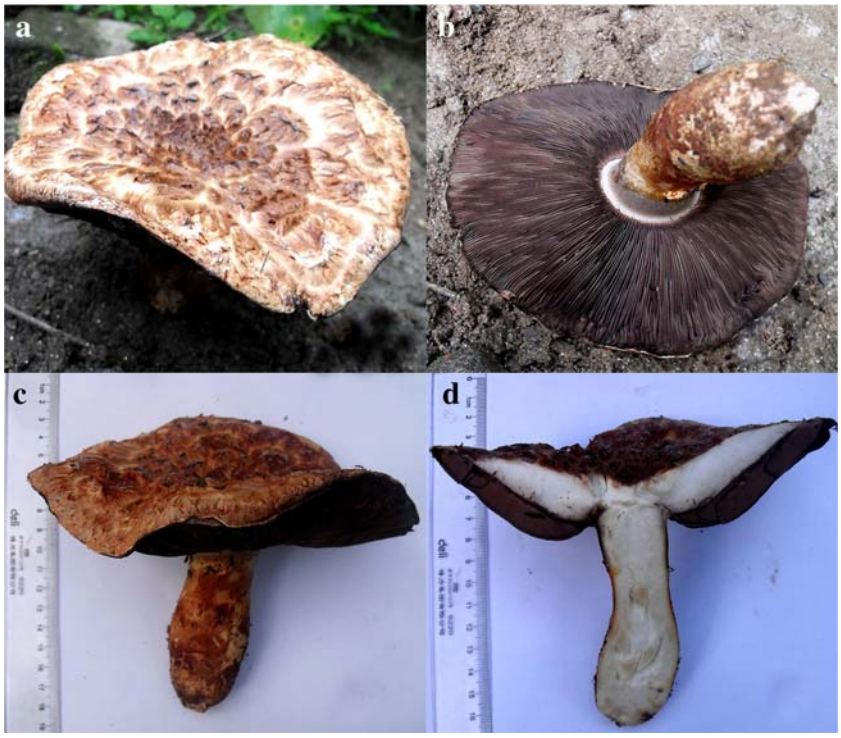

Fig. 142 ***Agaricus hanthanaensis*** (MFLU 11–0017, **holotype**) **a–b** Basidiome in the field. **c–d** Basidiome in the laboratory

Pileus 190–200 mm diam., ovoid, plano-convex, applanate, at centre slightly depressed; surface squarrose or densly squamose, dark to light brown (6D5); squamules on the pileus reddish-dark brown (6D1), silky-fibrous, woolly, soft; colour readily changing to red on bruising, touching or cutting. *Context* in pileus 20–25 mm thick at the disc, fragile, white soon after cut, white to light yellow with age. *Lamellae* free, crowded with 8 tiers of lamellulae, 10 mm wide, ventricose, light brown (6D4) at first, then dark brown (6E4) to chocolate brown (6F8) at maturity, with concolourous even edge. *Annulus* is not well visible but the remnants of the universal veil are visible on the stipe which forms the annulus, brown, floccose. *Stipe* 95×30 mm, at base 35 mm diam., cylindrical and subbulbous at base, without rhizomorphs, buried, solid; surface scabrous, reddish dark brown (6D1). Immediate discolouration on touching and cutting, context at top of stipe pale red, at bottom of the stipe pale yellow. *Odour* strong and peculiar.

Macrochemical reaction: 5 % KOH reaction on pileus surface and stipe surface yellow (positive). Schaeffer reaction on dried tissue of the flesh of the cap and stipe base positive.

Basidiospores 4.2–6.5×2–3.5 μm ($\bar{x}$=5.1×2.8 μm, Q=1.6–2.2, Q_m =1.7, n=40), ellipsoid, without germ pore, smooth, reddish-brown in mass, thick-walled. Basidia 20–27×6–8 (–9) μm, clavate, 4-spored. Cheilocystidia 30–50 (–56)×5–11 μm, clavate, single, hyaline, smooth. Pleurocystidia absent. Pileipellis a cutis; hyphae 7–24 μm diam., inflated, hyaline or light brown, with intracellular light brown pigments in dots. Stipitipellis hyphae similar to pileipellis hyphae 12–20 μm diam. Clamp connections absent.

Habitat: solitary in humus-rich soil under heavily rotted litter in a highland forest. Fruiting during the middle of the rainy season, found under *Dipterocarpus* spp. and *Pinus* spp.

Material examined: SRI LANKA, Central Province, Kandy District, Hanthana Mountain Range, Peradeniya, rainforest with *Dipterocarpus* spp. and *Pinus* spp., 7°15′35.03″N 80°36′4.07″E, elev. 590 m, 5 July 2009, S.C. Karunarathna (MFLU 11–0017, **holotype**). GenBank ITS: JQ246405.

Notes: The morphological characters (yellow KOH reaction, positive Schaeffer's reaction, peculiar odour, well-developed pileus squamules, and clavate cheilocystidia) support the molecular data in that the species belongs to the section *Spissicaules* (Nauta et al. 1999). The basal part of the stipe context stains pale yellow, whereas the upper part stains pale red on cutting or bruising which are also characteristic features of the section *Spissicaules* (Nauta et al. 1999) where we place *A. hanthanaensis*. The dark brown pileus squamules on a dark to light brown background, the very thick fleshy (20–25 mm) large pileus (190–200 mm) and the universal veil remnants which forms the ring on the stipe of *A. hanthanaensis* easily distinguishes it from the other species of section *Spissicaules*. *Agaricus hanthanaensis* is remarkable amongst tropical *Agaricus* species because of its relatively large-sized solitary basidiocarps, as most tropical species of *Agaricus* have solitary, but small-sized basidiocarps (Zhao et al. 2011b). The surface of the basidiome changes from brownish to red on bruising or cutting. This new species bears superficial resemblance to *A. bresadolanus* but the latter species is distinct in having 36–85 mm pilei with 5.5–7.5×4–5 μm, ellipsoid

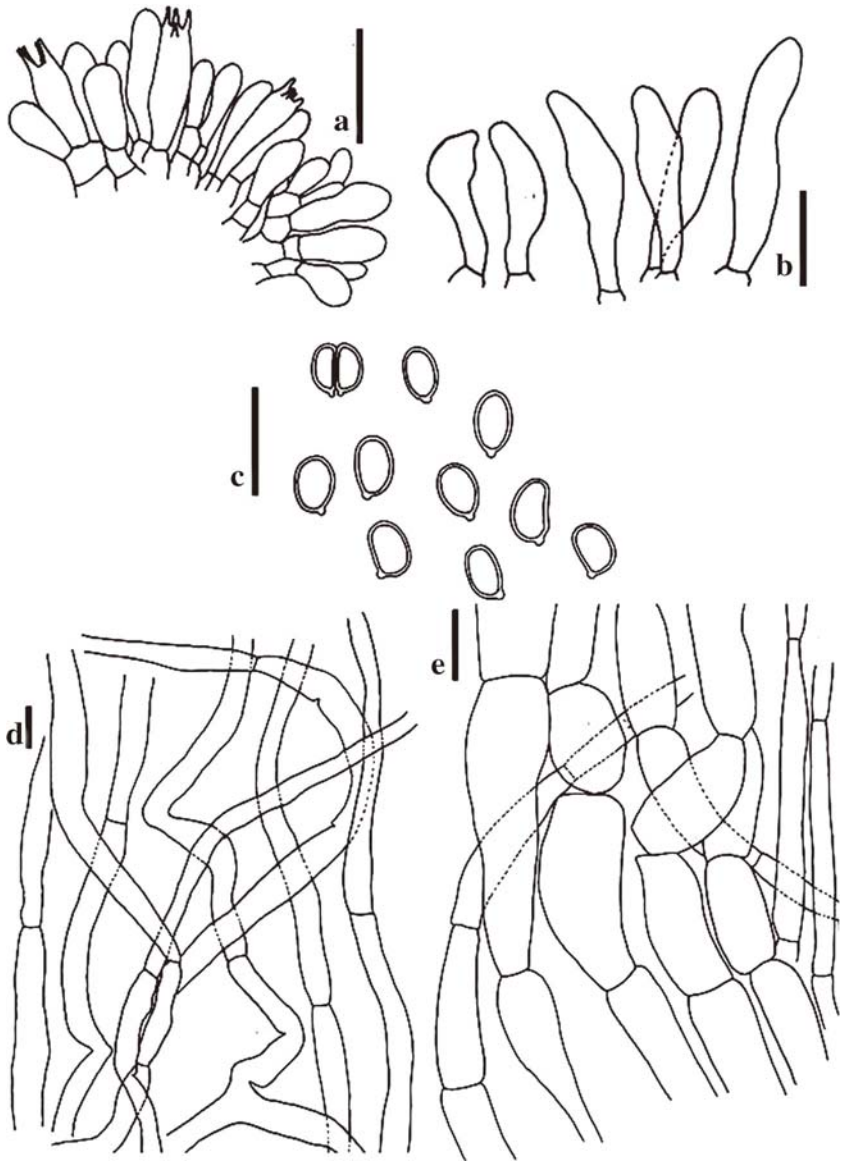

Fig. 143 ***Agaricus hanthanaensis*** **(**MFLU 11-0017, **holotype**) **a** Basidia. **b** Cheilocystidia. **c** Basidiospores. **d** Hyphae on Stipipellis. **e** Hyphae on Pileipellis. Scale bars: a, b, d, e=20 μm, c=10 μm

basidiospores and 13–25×7–11 μm, clavate cheilocystidia (Nauta et al. 1999). In some aspects *Agaricus hanthanaensis* is similar to *Agaricus simulans* Berk. which was first described from Sri Lanka as a fleshy species typical of the subgenus *Lanagaricus* with a large basidiome (~140 mm), but it differs in having ovoid spores, a floccose annulus formed by universal veil, sticky scales on the pileus and stipe and smaller cheilocystidia (28–32×6.5–7.5 μm) (Pegler 1986). Our new species also shares some similarities with *A. parasilvaticus* Heinem., but the latter is distinct in having a 6 mm thick context, 25–60 mm wide pilei, a superior annulus and 13–37.5×7–15 μm cheilocystidia (Heinemann 1962a).

104. ***Agaricus parvibicolor*** L.J. Chen, R.L. Zhao & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF550999, *Facesoffungi number*: FoF00467; Figs. 144, 145

Etymology: Refers to the size of sporocarps and the white and violaceous pileus.

Holotype: MFLU 12–0953

Pileus 15–40 mm diam., 1 mm thick, first parabolic, then hemisphaerical to convex, and finally applanate; surface dry, with reddish brown to violet brown fibrils, densely arranged at disc, very few or none towards the margin on a white background; occasionally, with pileus expansion, starting from the centre, the surface disrupted into triangular fibrillose squamules; margin crenulate, at times appendiculate by remnants from of the annulus, finely striate when sporocarps become mature; *Lamellae* free, crowded, lamellulae with more than 5 series, 3–4 mm broad, at first white, then pinkish, later greyish-brown and finally dark brown. *Stipe* 32–57×2.5–5 mm, fistulose, cylindrical to slightly bulbous at base, with numerous

Fig. 144 **a–d** ***Agaricus parvibicolor*** (MFLU 12–0953, **holotype**) **a** Sporocarps in *situ*. **b** Pileus characters. **c** Finely striate on the margin. **d** Membranous annulus. **e–h** ***Agaricus sodalis*** (MFLU 12–0987, **holotype**) **e** Sporocarps in *situ*. **f** Sporocarp. **g** Lamellae and annulus. **h** Staining yellow when cut. Scale bars: a–h=10 mm

rhizomorphs, surface white, staining orange by handing or bruising, smooth above annulus, fibrillose below. *Annulus* membranous, single, white, fragile. *Context*, firm, white. *Odour* strong of almonds.

Macrochemical reactions: KOH reaction positive yellow. Schäffer's reaction positive reddish orange.

Basidiospores 4.7–5.5 (–5.7)×3–3.5 (–3.7) μm, ($\overline{x}$=5.2×3.3 μm, Q=1.39–1.77, Q_m=1.55, n=20), ellipsoid to oblong, smooth, brown, thick–walled. *Basidia* 10–17×5.5–8 μm, clavate to broadly clavate, hyaline, smooth, 4-spored. *Cheilocystidia* 18–38×7.5–13 μm, abundant, simple, broadly clavate, pyriform or sphaeropedunculate, hyaline, smooth. *Pleurocystidia* absent. *Pileipellis* a cutis composed of hyphae of 5–9 μm diam., cylindrical, light brown, smooth, at times slightly constricted at the septa.

Habit: gregarious in small groups or solitary in soil of grassland.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang University, 21 July 2012, collector Jie Chen, LD2012116 (MFLU 12–0953, **holotype**). GenBank ITS: KP715162; Chiang Rai Province, Mae fah Luang University, 13 July 2012, collector Jie Chen, LD201288 (MFLU 12–0926), GenBank ITS: KP715165; LD201295 (MFLU 12–0933), GenBank ITS: KP715164; Mae Fah Luang University, 21 July 2012, collector Jie Chen, LD2012118 (MFLU 12–0954), GenBank ITS: KP715163;

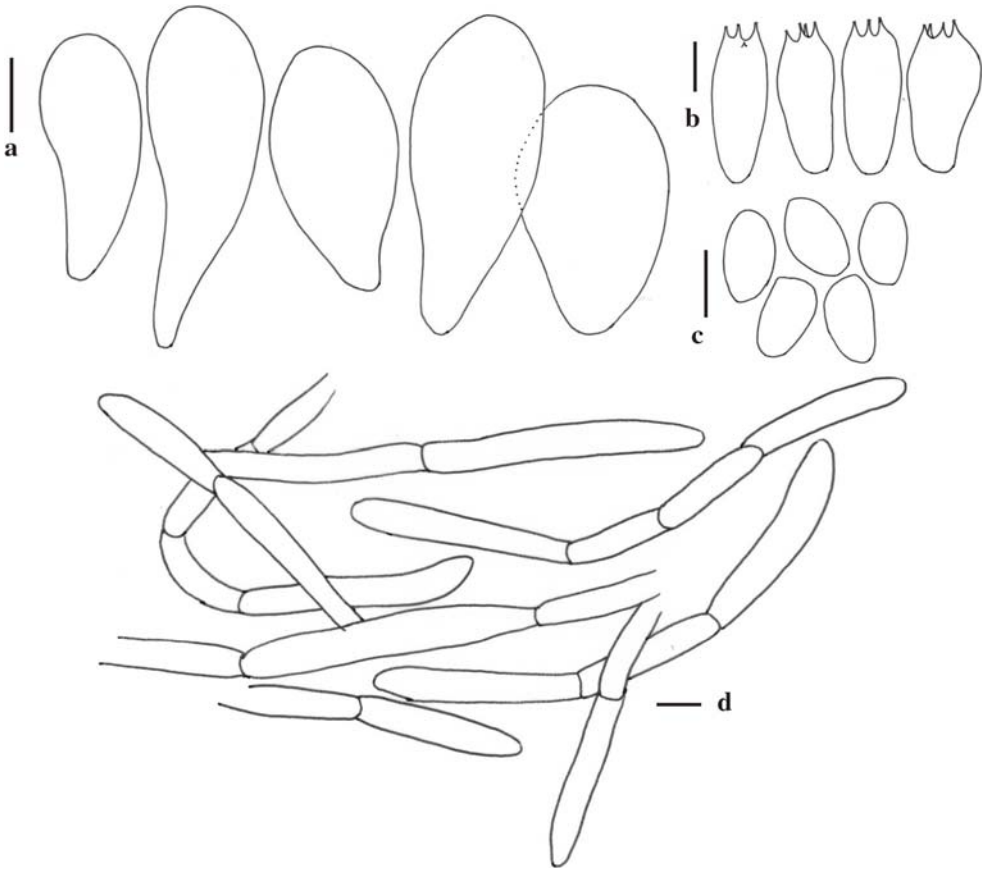

Fig. 145 ***Agaricus parvibicolor*** **(holotype) a** Cheilocystidia **b** Basidia **c** Basidiospores **d** Pileipellis. Scale bars: a–c=5 μm, d=10 μm

Mae Souy Dist., Pamae Lao National Park., 2 August 2006, collected by Ruilin Zhao, ZRL3091 (SFSU).

Notes: The positive KOH and Schäffer's reactions and almond-like odour suggest this species belongs to *Agaricus* section *Minores*. *Agaricus parvibicolor* is characterized by its slender sporocarps, with reddish-brown to violet brown fibrils at the centre of the pileus surface, and whitish towards the margin, the simple cheilocystidia, frequently broadly clavate or sphaeropedunculate in shape, the spore with an average size of 5.2×3.3 μm. Morphologically, the most similar species is *A. purpurellus* (F.H. Møller) F.H. Møller, which also shares a slender sporocarp and purplish fibrillose pileus. However, *A. purpurellus* shows an entirely purplish pileus, slightly wider in spore size (5.16×4 μm) and a distinctive habitat of conifer woods (Parra 2013). Another species with reddish-purple fibrils on the disc, but white elsewhere, is *A. dulcidulus* Schulzer, but it can be easily distinguished by its much smaller spore size which average is to 4.31×3 μm (Parra 2013). In the phylogenetic analysis, *A. parvibicolor* forms a single clade in *Agaricus* section *Minores*.

105. ***Agaricus sodalis*** L.J. Chen, R.L. Zhao & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551000, *Facesoffungi number*: FoF00477; Figs. 144, 146

Etymology: Refers to the Latin adjective sodalis meaning "the *Agaricus* of friends"

Holotype: MFLU 12–0987

Pileus 42–90 mm diam., 3.5 mm thick, plano-convex with truncate centre; surface dry, with violet brown fibrils, densely arranged at disc, rarely distributed or none towards the margin on whitish background; margin finely crenulate; *Lamellae* free, crowded, lamellulae with 3 series, 2.5–4 mm broad, at first white, then pinkish, later greyish-brown and finally dark brown; lamellae not exceeding the margin. *Stipe* 40–80×5–9 (10–15 at base) mm, fistulose, cylindrical with a bulbous base, surface white, becoming yellow by handing, smooth above annulus, fibrillose below. *Annulus* membranous, single, fragile white, turning yellowish on bruising. *Context* firm, first white, becoming conspicuously yellow when cut. *Odour* like almond.

Macrochemical reactions: KOH reaction positive yellow. Schäffer's reaction positive reddish orange.

Basidiospores 5–5.6 (–6.2)×(3.2–) 3.4–3.8 μm, ($\bar{x}$=5.4×3.6 μm, Q=1.39–1.63, Q_m=1.50, n=20), ellipsoid, smooth, brown, thick-walled. *Basidia* 12.5–25×7–8.5 μm, clavate, hyaline, smooth, 4-spored; *Cheilocystidia* 21–38×6.5–14 μm, abundant, simple, broadly clavate, pyriform or sphaeropedunculate, with yellowish pigment, smooth. *Pleurocystidia* absent. *Pileipellis* a cutis composed of hyphae of 5–12 μm diam., cylindrical, rarely branched, hyaline, smooth, constricted at the septa.

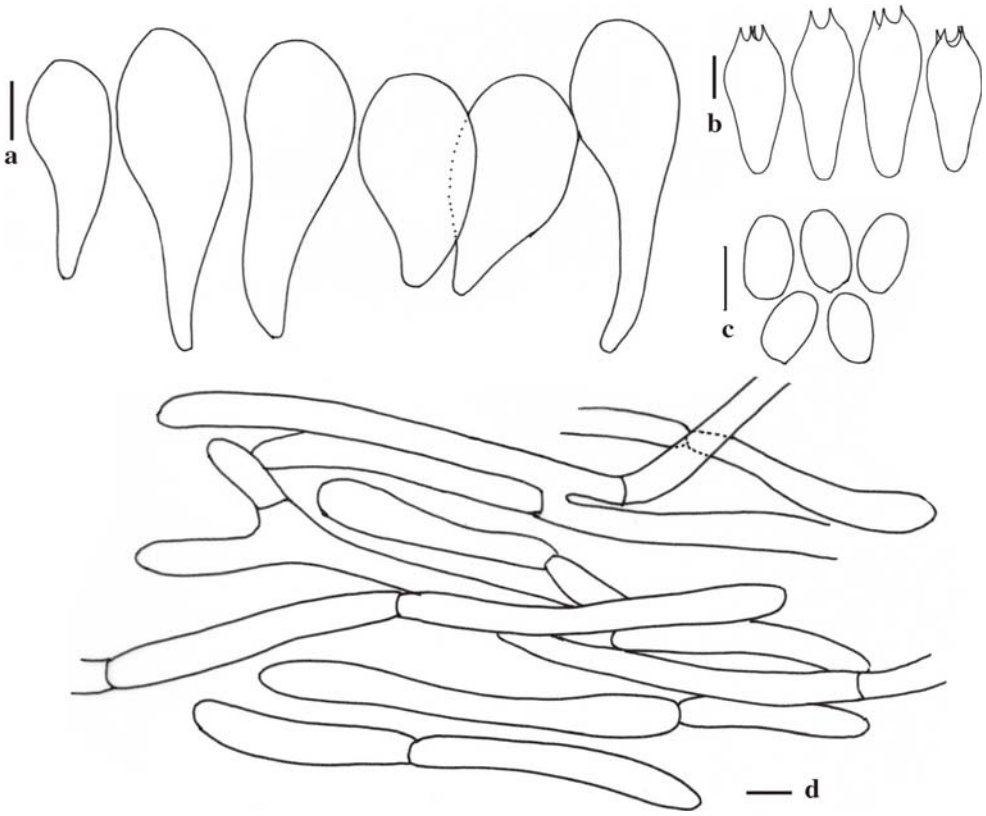

Fig. 146 ***Agaricus sodalis*** **(holotype) a** Cheilocystidia **b** Basidia **c** Basidiospores **d** Pileipellis. Scale bars: a–c 5=μm, d=10μm

Habit: gregarious or solitary in open area of forest.

Material examined: THAILAND, Chiang Rai Province, Doi Pui site 2, 31 July 2012, collector Jie Chen, LD2012159 (MFLU 12–0987, **holotype**), GenBank ITS: KP715161; Chiang Rai Province, Doi Pui site 1, 1 September 2011, collector Benjarong Thongbai, LD2011029 (MFLU 11–1311), GenBank ITS: KP715160.

Notes: The positive KOH and Schäffer's reactions, the almond-like odour and the simple cheilocystidia, place *A. sodalis* in *Agaricus* section *Minores*. It is characterized by its robust sporocarps, violet brown fibrils on the disc of the pileus surface, but few or none elsewhere on a whitish background, the simple cheilocystidia containing yellowish pigments, generally broadly clavate or sphaeropedunculate in shape and the spores with an average size of 5.4×3.6μm. Within the section, there are few species having robust sporocarps, exceptions are *A. brunneolus* (J.E. Lange) Pilát, *A. megalosporus* J. Chen et al. and *A. pseudolutosus* (G. Moreno et al.) G. Moreno et al. Firstly, *A. brunneolus* exhibits much more coloured fibrils on the entire pileus surface while the colour can be very variable, from dark reddish purple to white and all the intermediate colour shades, and there is no yellowish pigments been described from its cheilocystidia. The two other species can be differentiated by their larger sized spores (*A. megalosporus* 6×3.5μm; *A. pseudolutosus* 6.37×4.78μm); additionally *A. megalosporus* shows a well coloured fibrillose squamules pileus and a variable shape of cheilocystidia has been observed in *A. pseudolutosus* (Chen et al. 2012; Parra 2013). In the phylogenetic analysis, *A. sodalis* forms a clade with *A. huijsmanii* and three undescribed species labelled as *A*. sp. ZRL3101, *A*. sp. NT62 and *A*. sp. NTT72, but without significant support.

Cantharellus Adans.:Fr.

The economically very important edible genus *Cantharellus* (*Cantharellales*) has been a taxonomical headache for several centuries because of the poor differentiation of its microscopical features, an aspect that is probably related to the fact that it represents one of the oldest clades of mushroom-forming basidiomycetes. The molecularly oriented approach of the past decade has led to an explosion of newly described species, in particular from the tropics, and revealed important differences between northern and southern hemisphere species groups (Buyck et al. 2014; Buyck et al. 2015a, b). The genus presently counts slightly over one hundred species, and all of them are ectomycorrhizal symbionts. The phylogenetic tree is presented in Fig. 147.

106. *Cantharellus luteostipitatus* Buyck, Randrianjohany & V. Hofstetter, ***sp. nov.***

MycoBank: MB 810671, *Facesoffungi number*: FoF 00555; Figs. 148, 149

Etymology: refers to the partly or entirely bright yellow colouration of the stipe (*luteo-* meaning yellow and *stipus* meaning stipe.

Holotype: PC0085575

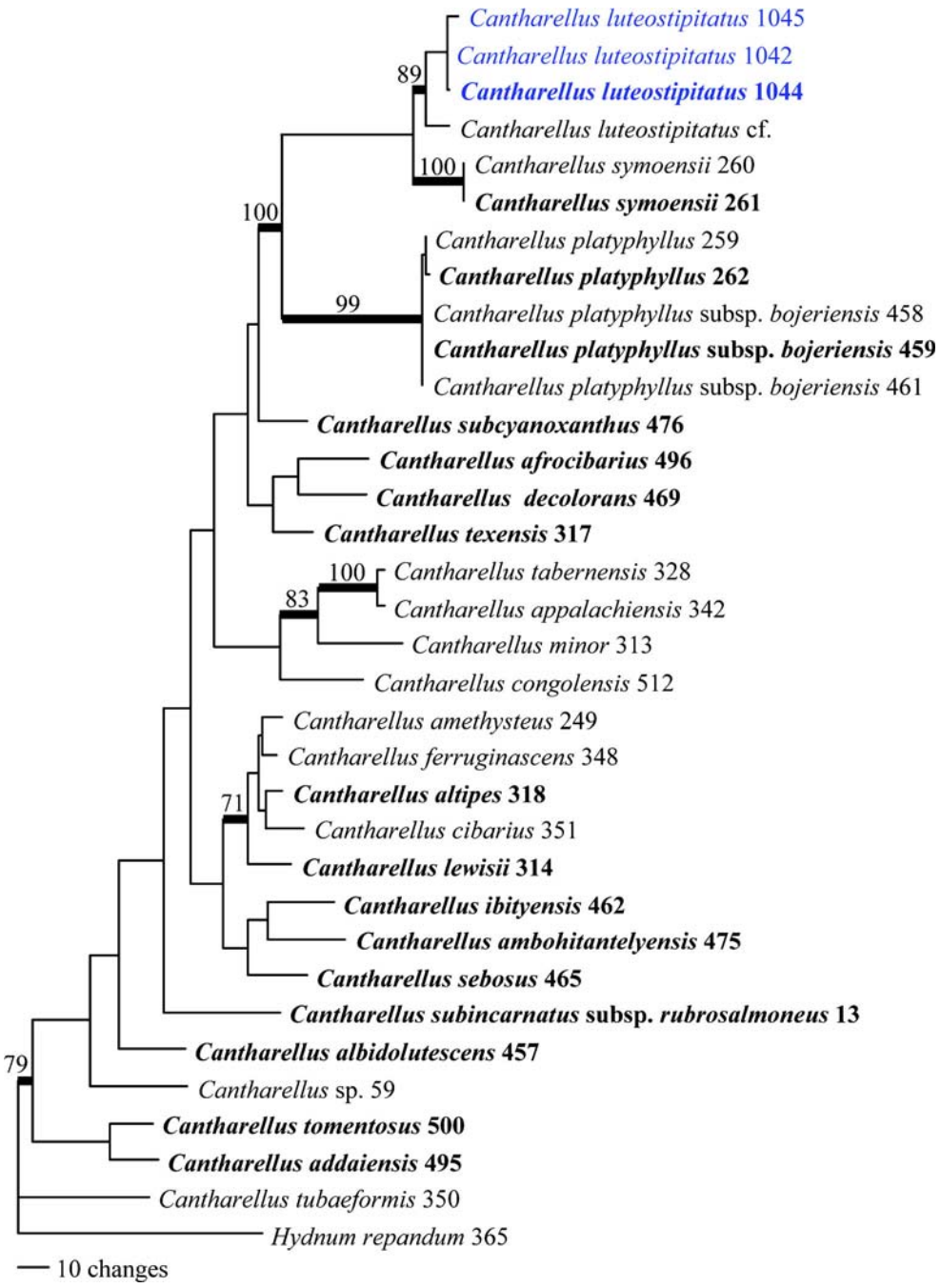

Fig. 147 Phylogram generated from Maximum Parsimony analysis based on *TEF1* sequence data of *Cantharellus*. Sequences used in this study have been sampled from Buyck et al. (2014) or newly generated for *C. luteostipitatus* sp. nov. Branches indicated in *bold* received significant (≥70 %) bootstrap support. Species for which obtained sequences are based on type material have names in *bold*

Pileus mostly 30–50(–60) mm diam., regular or with uneven surface when young and with sunken center from the beginning, the margin strongly inrolled when young and remaining so for a long time, only in older specimens becoming uplifted or revolute at the very extreme border only, sometimes slightly striate over a distance of max. 10 mm, hygrophanous, when wet smooth and with velvety or even distinctly greasy aspect, under a hand lens having almost a frozen aspect, on drying becoming cottony-tomentose toward the center, more rarely fragmenting in larger, appressed squamules, colours varying between reddish pink and yellowish orange tints, often unevenly distributed on the surface and fading rapidly on drying. *Hymenophore* decurrent, of well-developed gill folds, 2–4(–6) mm high, very variable in colour, starting out as very pale cream or nearly whitish, but sometimes rapidly developing yellowish orange tints, particularly toward the cap margin, gills predominantly unequal, forkings abundant only close to the very cap margin, varying from completely smooth to heavily anastomosed in between gills. *Stipe* mostly shorter than the cap diam., 8–17 mm diam., subcylindrical or slightly narrowing upwards, tinged with bright chrome yellow to a diluted yellowish orange over part

Fig. 148 ***Cantharellus luteostipitatus*** (PC0085576). General habit (photo B. Buyck)

or all of its surface, except for the extreme base which remains generally pure white, solid. *Flesh* firm and thick beneath the cap center but then rapidly becoming very thin toward the margin, white but with orange-reddish tinges immediately below the cap surface, sometimes showing distinct bluish tinges when cut, on the surface of stipe and gills yellowing when handled. *Taste* mild. *Smell* of apricot. *Spore print* pale yellowish.

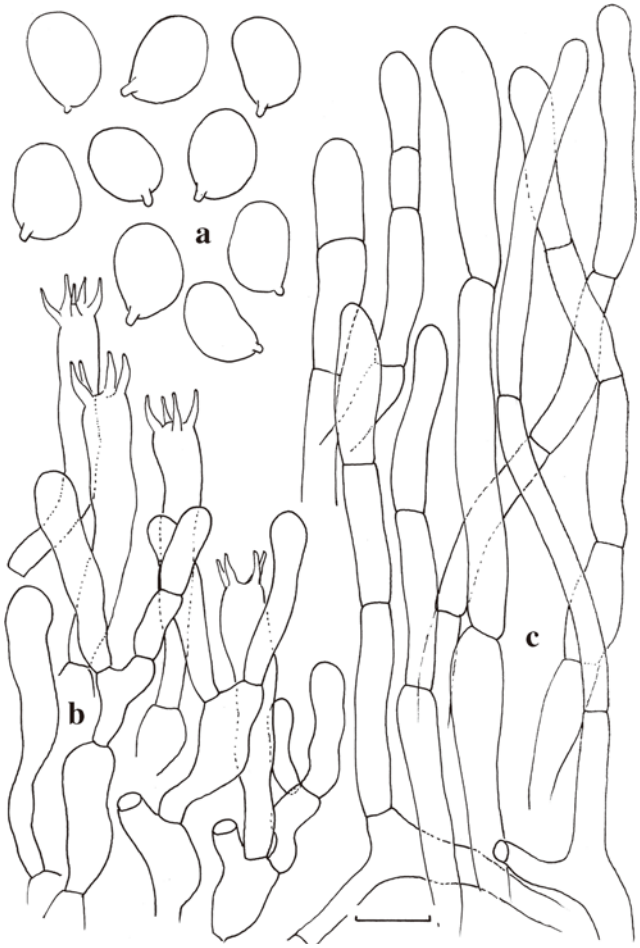

Fig. 149 ***Cantharellus luteostipitatus*** (**holotype**) **a** Spores. **b** Basidia, basidiola and subhymenial cells. **c** Hyphal extremities of the pileipellis. Scale bars=10 μm, but only 5 μm for spores. Drawings B. Buyck

Spores ellipsoid, (7.1)7.5–*8.04*–8.5(8.8)×(4.8)5.2–*5.77*–6.3(6.7) μm, Q=(1.25)1.31–1.40–1.49(1.56), smooth, filled with numerous oily inclusions. *Basidia* 50–60×7–9 μm, subcylindrical to weakly clavulate, (2)4(–5)-spored and with 5–8 μm long sterigmata (longer for 2–3 spored basidia); basidiola not particularly irregular in form. *Subhymenium* pseudoparenchymatic, of large voluminous cells. *Cystidia* none. *Pileipellis* a loose (tricho)cutis of ramifying, thin-walled hyphal extremities, measuring mostly 5–10 μm diam., terminal cells subcylindrical and undifferentiated or sometimes remarkably short and occasionally more inflated to claviform; incrusting pigments most distinct on the narrowest hyphae of subpellis and trama. *Clamp connections* absent from all tissues.

Material examined: MADAGASCAR, Province of Toamasina, East Coast, 15 km south of Brickaville, on a private property near Ambila Lemaitso, growing in groups of 3 to 6 individuals under *Uapaca littoralis* in the deep sandy soils of the littoral forest, 27 June 2011, Buyck & V. Hofstetter 11.042 (PC0085573, paratypus), GenBank TEF: KP033509; Buyck & V. Hofstetter 11.044 (PC0085575, holotypus), GenBank TEF: KP033510; Buyck & V. Hofstetter 11.045 (PC0085576, paratypus), GenBank TEF: KP033511. MADAGASCAR Central Plateau, Ibity, in *Uapaca bojeri* woodland, 1500–1700 m alt., 27 January 2008, Buyck & V. Hofstetter 08.210 (PC 0085130).

Notes: Madagascar is extremely rich in chanterelles (Buyck 2012, 2014; Buyck et al. 2014; Buyck and Randrianjohany 2013) with many species showing very close relationships to mainland African taxa. The newly described chanterelle in this paper strongly resembles the type variety of the mainland African *Cantharellus platyphyllus* Heinemann in the field because of the pinkish red tinges in its cap colour and pale-coloured hymenophore of distinct gill folds. The Malagasy *C. platyphyllus* ssp. *bojerienis Eyssart. & Buyck*, which is common and abundant in the *Uapaca bojeri* woodlands on the Central Plateau, has more grayish-yellowish-greenish-orange tints on the cap. Our species differs from both essentially in the bright yellow colouration of its stipe. Nevertheless, there is quite some variation in the general habit and colouration of these taxa. The only feature so far that allowed to separate all the forms of *C. platyphyllus* from the mainland African *C. symoensii* Heinemann, a red-capped species that typically develops a deep, egg-yolk yellow hymenophore at maturity, was the form of the spores: shortly ellipsoid to ellipsoid (mean length-width ratio ca 1.4) for *C. platyphylllus* and its various infraspecific taxa versus narrowly ellipsoid to elongate spores for *C. symoensii* (mean length-width ratio of ca 1.9 – see Eyssartier and Buyck 1999). Our new species, although genetically closer to *C. symoensii*, has the same spores as *C.*

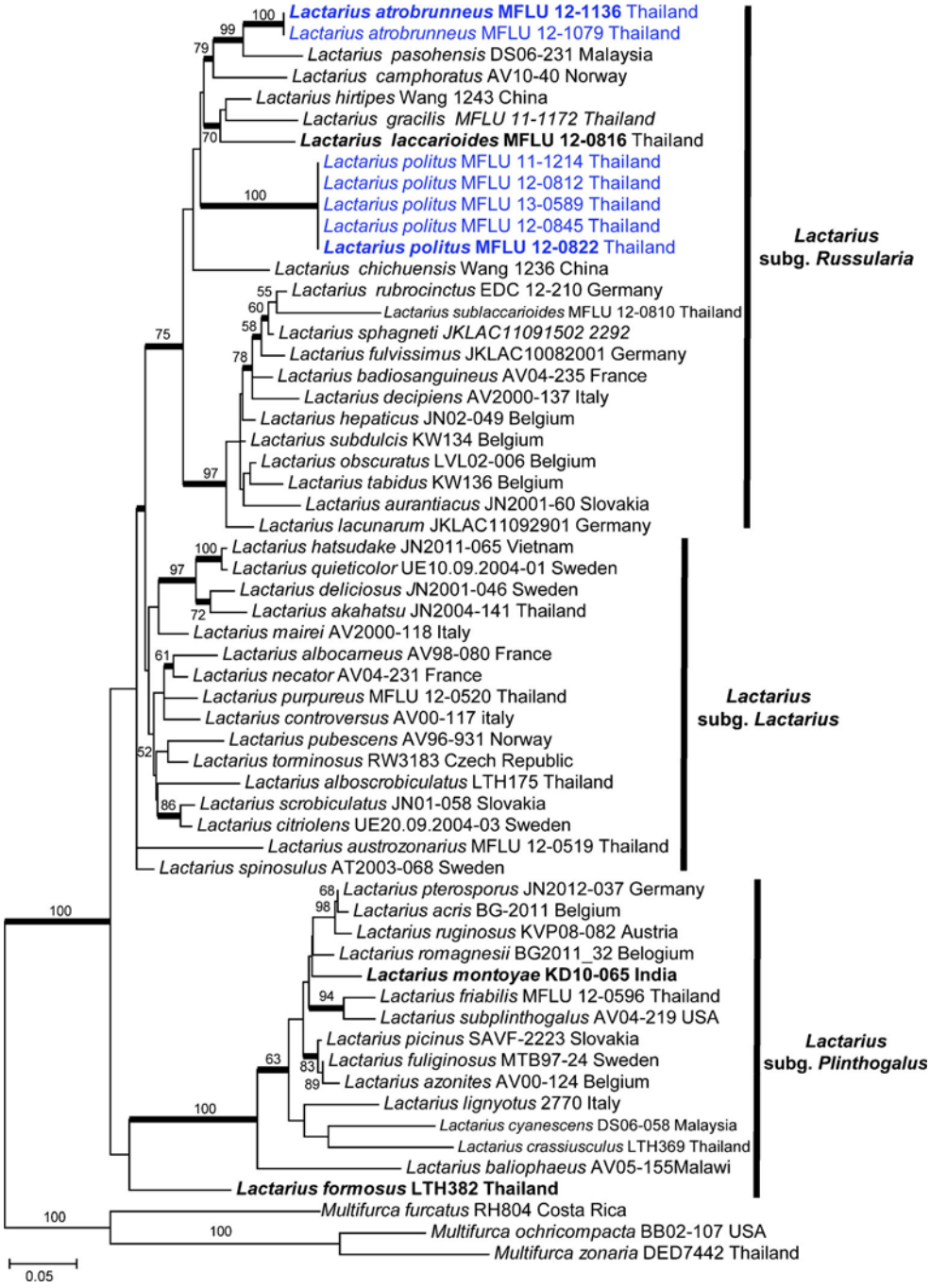

Fig. 150 Phylogram generated from Maximum likelihood (RAxML) analysis based on ITS sequence data. Maximum likelihood bootstrap support values greater than 50 % are indicated above or below the nodes, new species are in blue and species for which obtained sequences are based on type material have names in bold.The tree is rooted with *Multifurca furcatus* RH804, *Multifurca ochricompacta* BB02-107 and *Multifurca zonaria* DED7442

platyphyllus and therefore makes the identification of the African taxa in subgen. *Afrocantharellus* Eyssart. & Buyck even more delicate.

All specimens of *C. luteostipitatus* were collected in the deep sandy soils of the littoral forest, but are genetically close to one collection (Fig. 147, as *C. luteostipitatus cf*) made on the rocky, lateritic soils of the seasonally much colder woodlands of the Central highlands near Ibity at 1500–1700 m altitude. The latter collection consists of a single very immature specimen that lacks the yellow stipe and, therefore, looks even more like typical mainland *C. platyphyllus*. As these ecologically and climatically very different sites harbor mutually exclusive host tree species, it would seem surprising that their associated fungi were less affected. Additional collecting will be needed to solve the status of this Central Highland's collection.

Cantharellus luteostipitatus is the second species of subgenus *Afrocantharellus* described from Madagascar. Whereas this subgenus was for many years exclusively known from Africa, its distribution has very recently been extended to Malaysia (Buyck et al. 2014) and China (Shao et al. 2014).

Lactarius Pers.

Fig. 151 ***Lactarius atrobrunneus*** **(holotype)**. Basidiocarps in the field (photo by K. Wisitrassameewong)

Lactarius is a dominant genus of ectomycorrhizal fungi represented worldwide which exudes latex when the fruiting body is bruised. According to the critical revision of the genus (Buyck et al. 2010), three subgenera are conserved: *L.* subg. *Lactarius*, *L.* subg. *Russularia* and *L.* subg. *Plinthogalus*. In this contribution two new species presented from Thailand are introduced. Both species belong to subg. *Russularia*. The phylogenetic tree is presented in Fig. 150.

107. ***Lactarius atrobrunneus*** Wisitrassameewong & K. D. Hyde, ***sp. nov.***

Index Fungorum number: IF551005 *Facesoffungi number*: FoF 00483, Figs. 151, 152

Etymology: atrobrunneus refers to dark brown colour.

Holotypus: MFLU 12–1136

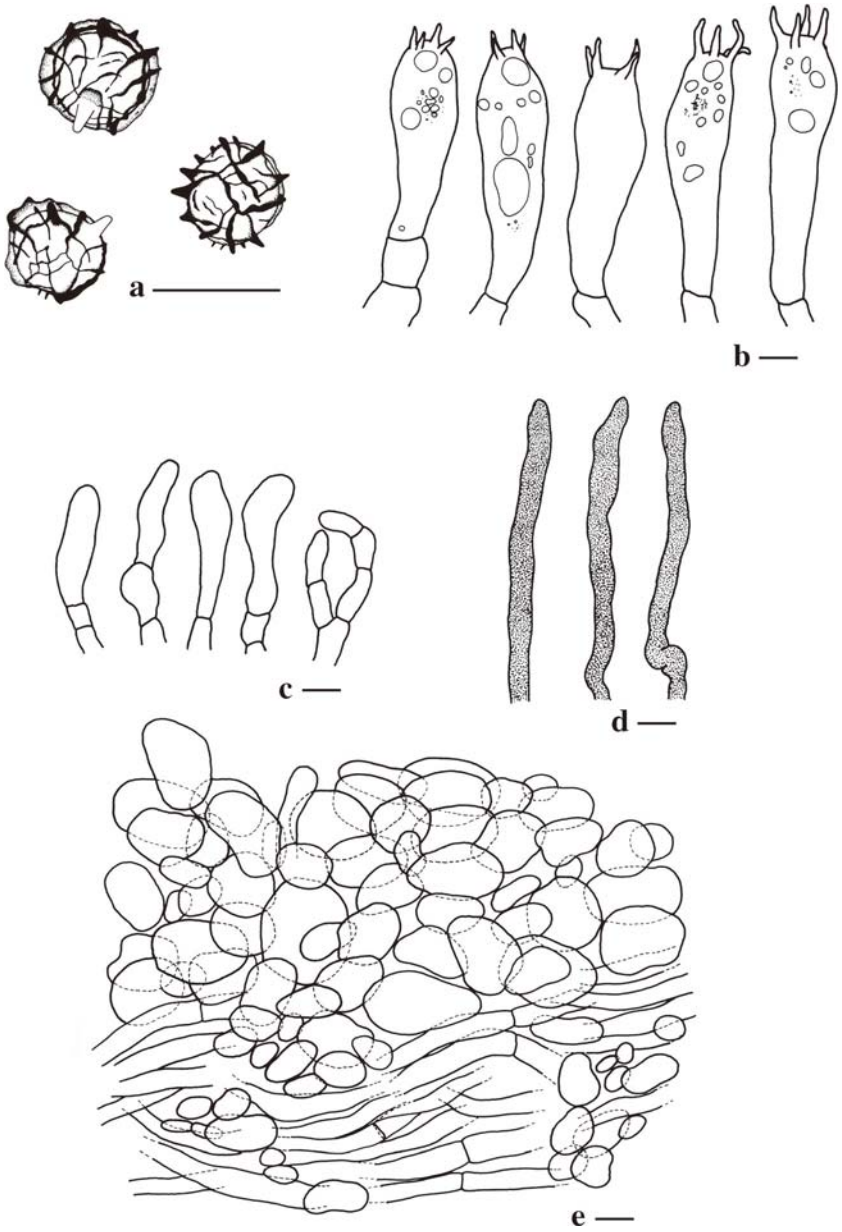

Fig. 152 ***Lactarius atrobrunneus*** **(holotype) a** Basidiospore **b** Basidia **c** Marginal cells **d** Pseudocystidia e pileipellis. Scale bar=10 μm. Drawings by K. Wisitrassameewong

Basidiocarps small sized. *Pileus* 6–31 mm diam., broadly convex in young specimens, with or without a small papilla, becoming plane to infundibuliform at maturity; surface dry, radially rugulose, particularly in inner half of pileus, strongly and irregularly wrinkled in the outer half of pileus, with grooves that show the lamellae in transparency; margin striate, occasionally fissured, incurved; surface blackish to dark brown when young, turning less unicolourous and between dark brown (9 F8), reddish-brown (9E8) and blackish when older. *Lamellae* subdecurrent to decurrent, 1–2 mm broad, distant, with 1–2 series of lamellulae, beige to greyish beige (4C2–4C3) to fuliginous. *Stipe* 14–37×1–4 mm, fragile, cylindrical, more or less concolourous to pileus, with darker brown tints when old. *Context* thin-fleshed, 0.5–1 mm broad in pileus, pinkish to clay buff, darker in cortex, unchanging when cut, but changing yellow with 10 % KOH within seconds; smell like *L. quietus*, like Pentatomidae bugs; taste mild. *Latex* rather abundant, pure watery, unchanging when exposure, unchanging with 10 % KOH, unchanging on white tissue or paper; taste faintly bitter. *Basidiospores* subglobose to ellipsoid; 6.9–8.1–8.2–9.6 (−10.7)×6–7–7.2–8.3(−8.5) μm, Q=1.06–1.15–1.16–1.29 (n=40); ornamentation amyloid, subreticulate, composed of ridges up to 1.5 μm high; ridges often spiny and irregular, rather broad, interconnected by finer lines, forming an incomplete to subcomplete reticulum; isolated warts infrequent; plage distally amyloid. *Basidia* 55–72×18–20 μm, mostly 4–spored, with small or large guttulate contents. *Pleuromacrocystidia* absent. *Pseudocystidia* 4–6 μm diam., cylindrical, often curved, slightly emergent to emergent. *Lamellae edge* heterogeneous, with some basidia present; marginal cells 11–44×5–12 μm, subcylindrical to subclavate; cheilocystidia absent. *Lamellar trama* mixed, composed of small and large globose cells, septate hyphae and lactiferous hyphae. *Pileipellis* an epithelium, about 40–70 μm thick, composed of globose cells of 5–25 μm diam., with some subclavate elements on top; underlying layer composed of smaller globose cells and cylindrical hyphae.

Habitat: gregarious on naked soil, in montane tropical forest with Fagaceae trees.

Material examined: THAILAND, Chiang Mai Province, Mae Taeng District, Pa Pae sub-district, Mushroom Research Centre, N19°17.12 E98°44.00, elev. ca 900 msl., KW347, 9 July 2012 (MFLU12–1136, **holotype**, **isotype** in GENT. GenBank ITS: KP744442); *ibid.*, KW270, 7 June 2012 (MFLU12–1079, paratypes; isoparatypes in GENT GenBank ITS: KP744443).

Notes: *Lactarius atrobrunneus* is rather unique and well-recognizable in the subgenus by its small size and striking blackish-brown colour. Furthermore the strongly rugose cap, the pure transparent latex and distant gills are striking field characters. Microscopically, the rather spiny and heavy spore ornamentation and the well-developed epithelium as a pileipellis structure are striking. Other species of the subgenus with remarkably distant lamellae are *L. laccarioides* Wisitrassameewong & Verbeken, *L. sublaccarioides* Wisitrassameewong & Verbeken, *L. stubbei* Wisitrassameewong & Verbeken and *L. pasohensis* Wisitrassameewong & Stubbei (Wisitrassameewong et al. 2014). All of them are larger and have distinctly orange brown colours and white latex.

108. *Lactarius politus* Wisitrassameewong & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF551004 *Facesoffungi number*: FoF00484; Figs. 153, 154

Etymology: politus refers to polished cap surface

Holotypus: MFLU 12–0822

Basidiocarp medium sized. *Pileus* 25–66 mm diam., at first broadly convex, later turning infundibuliform, inconspicuously mucronate in centre; surface dry and polished, somewhat smooth when young, becoming minutely wrinkled; margin incurved, translucently striate up to almost halfway the radius, crenulate when mature; surface reddish brown or dark brown (8F8), with darker zonation at least in inner half of pileus, palest at pileus margin, in outer half ranging from dark brown (7F8–8F8) to reddish brown (7E8) to brownish orange (5C4–C5) to brown (5E8) to olive brown (4E8) to greyish orange (5B4). *Lamellae* decurrent, 3 mm broad, medium crowded, sometimes forked, with 1–2 series of lamellulae, light yellow (4A4) to greyish yellow (4B4) to olive brown (4D5–E3), with greyish brown (5E3) tinge. Stipe 30–62×5–8 mm, cylindrical; surface dry, longitudinally wrinkled, brown (5E5) to greyish orange (6B3) to dark brown (9F8). *Context* 2 mm broad in pileus, medium firm, hollow in stipe, greyish pink; smell strong, sweetish and spicy, maggi-like in dried specimens; unchanging with 10 % KOH and unchanging with $FeSO_4$. *Latex* transparent, unchanging on exposure, unchanging with 10 % KOH, unchanging on white tissue or paper; taste mild. *Basidiospores* globose to subglobose, sometimes ellipsoid;

Fig. 153 ***Lactarius politus*** (MFLU 12–0822, **holotype**). Basidiocarp in the field (photo by K. Wisitrassameewong)

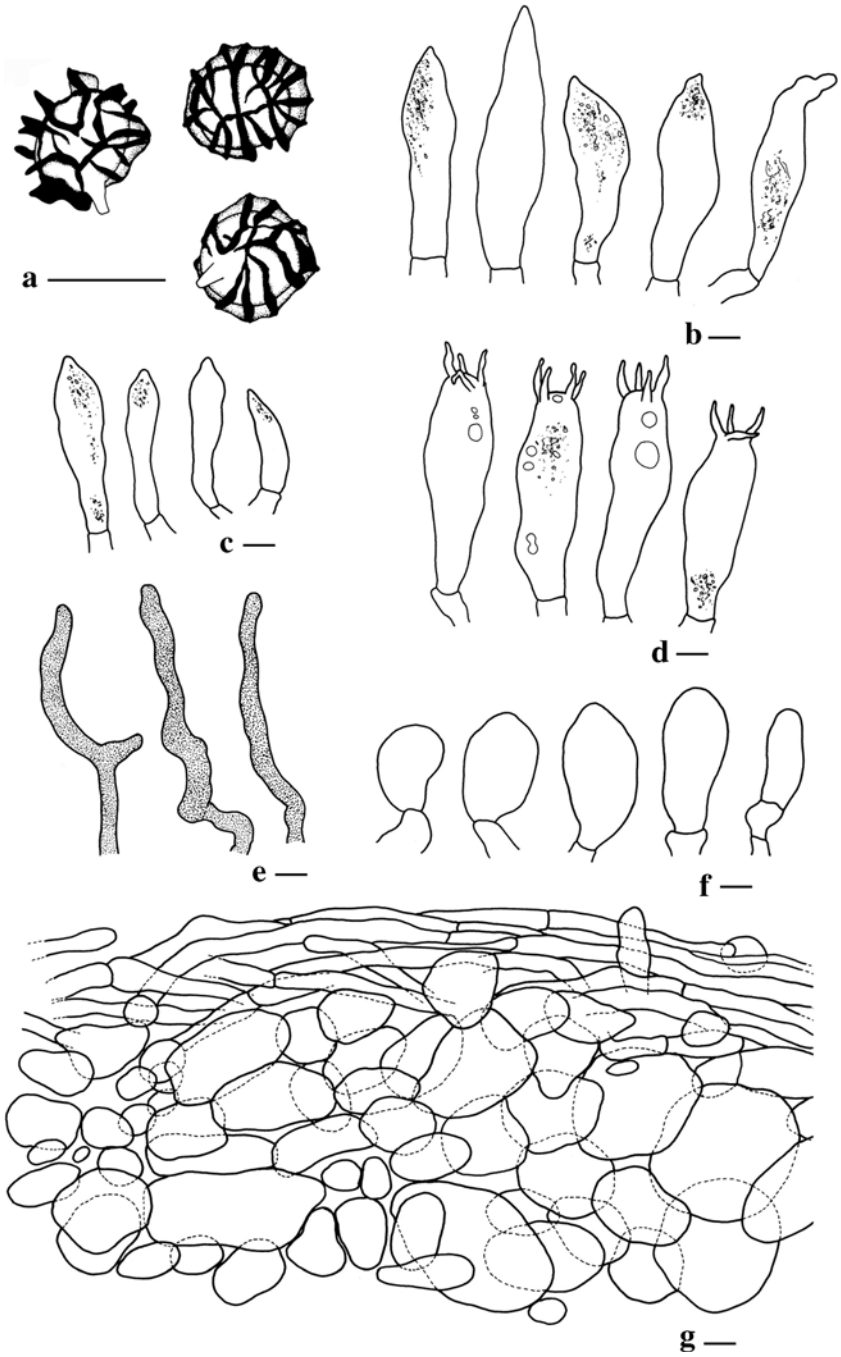

Fig 154 *Lactarius politus* (MFLU 12–0822, **holotype**) **a** Basidiospore **b** Pleuromacrocystidia **c** Cheilocystidia **d** Basidia **e** Pseudocystidia **f** Marginal cells **g** Pileipellis. Scale bar=10 μm. Drawings by K. Wisitrassameewong

7.7–8.6–9–10.2(−10.6)×6.7–7.6–7.8–8.7 μm; Q=1.03–1.11–1.17–1.33 (n=80); ornamentation amyloid, reticulate, ornamented with very heavy, dense and high ridges up to 2.5 μm; ridges irregular and thick interconnected with finer lines, forming a dense reticulum, sometimes with a slight tendency of zebroid ornamentation; plage sometimes distally amyloid. *Basidia* 55–84×18–23 μm, 4–spored, subclavate, with guttulate contents. *Pleuromacrocystidia* very scarce, 55–77×16–20 μm, not emergent, subfusiform to subclavate, mucronate to rounded, with small granules and guttulate contents. *Pseudocystidia* 3–6 μm diam., not emergent, tortuous cylindrical, often curved, sometimes ramified. *Lamellae edge* heterogeneous, with some basidia present; marginal cells subcylindrical to subclavate to obovoid to capitate, 25–43×11–22 μm; cheilocystidia scarce, 30–55×8–14 μm, not emergent, subcylindrical to subclavate, with mucronate apex. *Lamellar trama* consisting of small and large globose cells, septate hyphae and lactiferous hyphae. *Pileipellis* a

hyphoepithelium; upper layer 20–30 μm thick, consisting of repent cylindrical hyphae; subpellis consisting of globose cells of 10–40 μm diam.

Habitat: solitary or scattered on soil in montane tropical forest near *Lithocarpus sootepensis* stand.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang district, Doi Mae Salong Nok sub-district, Doi Mae Salong, elev. ca 1269 msl., N20°16.90 E99°62.30, 13 July 2012, KW351 (MFLU 12–0822, **holotype**, **isotype** in GENT; GenBank ITS: KF433019), *ibid*., 22 August 2012, KW396 (MFLU 12–0845, paratype, isoparatype in GENT; GenBank ITS: KF433018), *ibid*., 10 September 2013, KW468 (MFLU13–0589, paratype, isoparatype in GENT; GenBank ITS: KP744445); Chiang Mai province, Mae Taeng district, Pa Pae sub-district, Mushroom Research Center, elev. ca 900 msl., N19°07.20 E98°44.04, 3 July 2012, KW331(MFLU 12–0812, paratype, isoparatype in GENT; GenBank ITS: KF433020), Chiang Mai province, Bahn Mae Sae village, on Highway no.1095 near 50 km marker, elev. ca 962 msl., N19°14.59 E098°39.45, 4 July 2011, KW107 (MFLU 11–1214, paratype, isoparatype in GENT; GenBank ITS: KP744444).

Notes: *Lactarius politus* is recognized by its large, ellipsoid spores and firm ornamentation forming a complete reticulum. The other important characters are the watery latex and the strong smell. The species is rather variable in pileus colour which could be brown zonation or rather even dark brown in inner half of pileus and with paler margin. The pileipellis structure is hyphoepithelium which is common feature in subgenus *Russularia*.

Phylloporia

Phylloporia Murrill, typified by *P. parasitica* Murrill, is one of the most economically important wood decaying genera within the *Hymenochaetaceae*, Hymenochaetales, because some species in this genus are considered to be forest pathogens. *Phylloporia* is evidenced from nLSU sequences to be a monophyletic genus, but its species are highly diverse in morphology. A species with distinct morphological characters is newly described from China below. The phylogenetic tree is presented in Fig. 155.

109. *Phylloporia dependens* Y.C. Dai, ***sp. nov.***

Index Fungorum number: IF551014 *Facesoffungi number*: FoF00556; Figs. 156, 157

Etymology: referring to the hanging down growing habit.

Holotype: BJFC013379

Basidiocarps perennial, pileate to pendent, corky and without odour or taste when fresh, becoming woody hard up on drying. *Pilei* projecting up to 5 cm, 4 cm wide and 5 cm thick at base. *Pileal surface* vinaceous brown to black when fresh and dry, narrowly sulcate, glabrous; *margin* obtuse, vinaceous brown to brown. *Pore surface* cream-brown to pale brown when fresh, buff-yellow to cinnamon-buff when dry, more or less glancing; *margin* buff-yellow, narrow to almost lacking; *pores* circular or angular, 7–9 per mm; *dissepiments* thin, entire. *Context* yellowish-brown to cinnamon, corky, up to 1 mm thick. *Tubes* cinnamon, slightly darker than pore surface, up to 49 mm long. *Hyphal system* monomitic; generative hyphae with simple septa; neither amyloid nor dextrinoid, acyanophilous; tissue darkening but otherwise unchanged in KOH. *Contextual hyphae* pale yellowish brown to yellowish brown, thick-walled with a wide to narrow lumen, occasionally collapsed, rarely branched, regularly arranged, 2.4–3.1 μm diam. *Tramal hyphae* pale yellowish brown to yellowish brown, thick-walled with a wide to narrow lumen, occasionally branched, straight, subparallel along the tubes, 2–3 μm diam. *Setae* absent; *cystidia* absent; *cystidioles* present, fusoid, hyaline, thin-walled, 9–17×3–4.5 μm; *basidia* more or less barrel-shaped, with four sterigmata and a simple septum at the base, 9–12×4–5 μm; *basidioles* mostly pear-shaped, slightly smaller than basidia. *Crystals* polyhedric, frequently present among trama and subhymenium. *Basidiospores* broadly ellipsoid, yellowish, thick-walled, usually collapsed when mature, neither amyloid nor dextrinoid, moderately cyanophilous, 3–3.4×2.7–3 (–3.1) μm, L=3.16 μm, W=2.9 μm, Q=1.09 (n=30/1).

Material examined: CHINA, Yunnan Province, Ruili, Moli Tropical Rainforest, on rotten angiosperm stump, 1 November 2012, Dai 13167 (BJFC013379, **holotype**; GenBank LSU: KP698746; IFP 019122, **isotype**).

Notes: *Phylloporia verae-crucis* (Berk. ex Sacc.) Ryvarden has similar pores (7–9 per mm) to *P. dependens*, but has larger basidiospores (4–4.5×3–3.5 μm, Wagner and Fischer 2002). In addition, it lives on ground over buried wood, and occurs in South America (Wagner and Fischer 2002). *Phylloporia* was well studied in China, and 13 species were recorded in the county besides the new species (Dai 2010, 2012; Zhou and Dai 2012; Zhou 2013). *Phylloporia dependens* differs from all the existed species in the genus by its hanging down growing habit. In addition, phylogenetic analysis based on nLSU region indicates that *P. dependens* belonged to *Phylloporia*, and occupied a distinct lineage with strong support (96 % BS and 1 BPP, Fig. 155). So the morphological and molecular evidence confirmed the placement of the new species.

Russula Pers.

Russula Pers. is one of the most diverse genera of ectomycorrhizal basidiomycetes with an estimated diversity of several thousands of species ranging from completely hypogeous to stipitate epigeous or pleurotoid forms. It is also very well represented in the tropics. The phylogenetic tree is presented in Fig. 158.

110. *Russula cortinarioides* Buyck, Adamčík, Lewis & V. Hofstetter, ***sp. nov.***

MycoBank MB 810670; *Facesoffungi number*: FoF 00557; Figs. 159, 160, 161

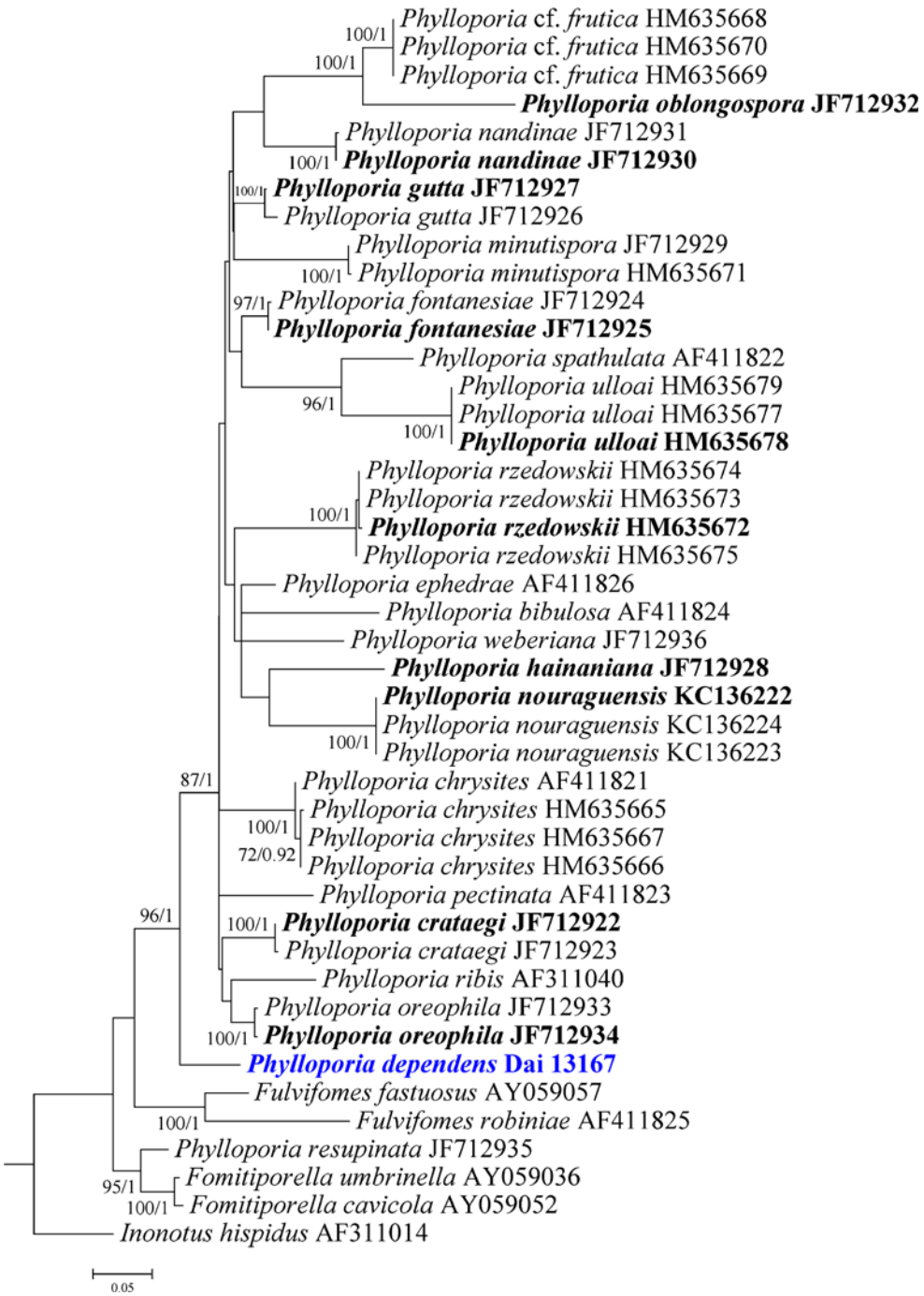

Fig. 155 Phylogram generated from Maximum Likelihood (RAxML) analysis based on LSU sequence data. Maximum likelihood bootstrap support values greater than 50 % and Bayesian posterior probabilities greater than 0.90 are indicated above the nodes, new species are in blue and species for which obtained sequences are based on type material have names in bold. The tree is rooted with *Inonotus hispidus*

Etymology: referring to the gradually developing reddish brown colour of the gills, giving this species almost a *Cortinarius*-like aspect.

Holotypus: PC 0142175.

Basidiocarps growing individually or in small groups. *Cap* 36–50(65) mm diam., regular, smooth, hardly pealing, glabrous, slightly depressed and not discolouring in the centre, unevenly tinged in colours that vary from grayish brown, yellowish brown to reddish brown, sometimes also predominantly dirty cream to whitish, particularly closer to the cap margin, greasy-viscose when wet, shiny even when dry, separable up to mid-radius, not striate at margin. *Gills* adnate to subdecurrent, brittle, unequal and irregularly alternating with lamellulae of one, two to sometimes three lengths, not widely spaced (8–15 l+L/cm at cap margin), 3–5 mm high, sometimes forked or anastomosing particularly close to the cap margin, whitish when very young, then rapidly cream to pale yellowish brown and finally turning vinaceous to deep brownish red when old; edges concolourous, even. *Stipe* central, shorter or more rarely longer than cap diam., 31–33(55)×7–

Fig. 156 ***Phylloporia dependens*** basidiocarps (**holotype**)

11 mm, cylindrical, with the base often irregularly deformed-wrinkled and sometimes narrowing (as in *R. adusta*), surface smooth, and although not pruinose, often more or less silvery-glistening and whitish, rapidly dirty grayish when handled or rubbed gently as the initial whitish covering disappears and revealing a distinct longitudinal striation, relatively firm, spongy inside under a hard outer cortex which is grayish brown in section, not really chambered but irregularly hollowing in the central medulla. *Context* firm and fleshy in the cap center, only 2 mm thick at cap mid radius, whitish, turning brown with age, weakly reddening to becoming vinaceous when cut. *Smell* distinct and nauseous, somewhat alkaline (as in *R. pseudolateriticola*). *Taste* unpleasant and faintly astringent. *Spore print* white.

Macrochemical reactions: stipe surface reacting strongly with guaiac, insensitive to $FeSO_4$.

Spores ellipsoid, (7.5–)7.8–*8.1*–8.4(–8.7)×(5.6–)5.8–*6.1*–6.4(–6.6) *μm*, *Q*=(1.25–)1.28–*1.32*–1.36(–1.4), with subreticulate to reticulate ornamentation of low, distinctly amyloid, obtuse warts [6–8 warts in a 3 *μm* diam. circle on the spore surface], 0.2–0.3 *μm* high, connected by fine line connections [2–5 lines in the circle] or fused in pairs or short chains [(1–)2–4 fusions in the circle], with a smooth, relatively large, nonamyloid suprahilar spot. *Basidia* (39–)46–*50*–57×8–*9*–10 *μm*, 4-spored, narrowly clavate to subcylindrical; basidiola first cylindrical, then narrowly clavate. *Subhymenium* composed of densely septate, narrow cells. *Lamellar trama* with large sphaerocytes only present near the cap trama. *Hymenial cystidia* on gill sides abundant, [3000–4000 per mm^2], (62–)67–*80*–93(–115)×7–*8*–9 *μm*, also numerous but much shorter near the gill edge, measuring (26–)40–*47*–56×6–*8*(–10) *μm*, thin–walled, subulate, narrowly lageniform to subcylindrical, rarely clavate or lanceolate, sometimes mucronate with a short, 1–3(–5) *μm* long appendage, the interior partly filled with granular or slightly crystalline contents, turning reddish grey in sulfovanilin. *Marginal cells* not differentiated. *Pileipellis* 110–140 *μm* deep, gelatinized, orthochromatic in Cresyl blue, ill-delimited from the underlying context. Incrustations absent. Hyphal extremities ascending, long and slender, becoming gradually denser downwards, uniformly cylindrical, sparsely branching, with obtuse terminal cells measuring (19–)30–*41*–60(–85)×(3–)4–5(–6) *μm* near cap margin, but narrower, 2.5–*3.5*–4(–4.5) *μm* diam. in the cap center. Pileocystidia numerous, usually very long (frequently>100 *μm*) and originating deep in subpellis or cap trama where they continue as abundant cystidioid hyphae, one–celled, subcylindrical, apically attenuated and slightly mucronate, without or with one or two appendages (2–8 *μm* long), often shorter, obtuse–rounded and more clavate in cap center, thin–walled, (3.5–)4.5–*5*–6 *μm* diam., filled with granular to yellowish-oily contents that do not react in sulfovanilin. *Clamp connections* absent in all parts.

Specimens examined: UNITED STATES, Texas, Newton Co., Canyon Rim, near Mayflower, along State Highway 87, in Beech-Magnolia-Loblolly Pine woods, 28 July 2007, Buyck 07.133 (PC 0142175, **holotypus**); Ibid., 5 July 2002, Buyck 02.115 (PC0142176), 02.116bis (PC0142183), 29 Jul 2005, Buyck 05.084 (PC0124614), 28 July 2007, Buyck 07.131 (PC0142177 paratypus); Bleakwood, on Core's residence, in open Oak-Pine vegetation, N 30° 42.068′, W 93° 49.770′, Lewis 9185 (PC0142182). Montgomery Co., Conroe, in Oak-Pine woods, 27 July 2007, Buyck 07.103 (PC0124672), 07.104 (PC 0142178 paratypus), 07.105 (PC 0142179), 07.111 (PC 0142180 paratypus); Hardin Co., near Saratoga, Lance Rosier Unit, Big Thicket National Preserve, along Teel Cemetery road near cypress swamp among *Cantharellus texensis* in Oak-Loblolly Pine woods, N 30° 15.901′, W 94° 30.759′, ca 50 m alt., 16 June 2013, DP Lewis 10797 (PC 0142181), ibidem, 23 June 2014, Buyck, Hofstetter & Lewis leg., Buyck 14.024–14.027 (PC 0142213–PC 014226); Turkey Creek unit, Big Thicket National Preserve, along Kirby nature trail, N 30.47181-W 94.34888, 2 July 2014, Buyck 14.118 (PC 0142307)

Notes: The combined phylogenetic analysis of ITS, LSU & RPB2 sequences (Fig. 158) shows that the new species, *Russula cortinarioides*, is the most related to *R. polyphylla* Peck, the type species of subsect. *Polyphyllinae* Singer 1951 *nom. inval.* (Art. 39.1). This subsection was originally defined by the presence of numerous "gloeo-vessels or macrocystidioid oleiferous hyphae" in the upper layer of the cap cuticle, to distinguish them from other members of sect. *Rigidae* Fr. (= subgenus *Heterophyllidia* Romagn.). Singer (from 1951 onwards) recognized four species in this subsection: *R. polyphylla* (Peck 1898), *R. magnifica* (Peck 1903), *R. polycystis* (Singer 1939) and *R. viridella* (Peck 1906).

Even before introducing this new subsection, Singer (1943) had already suggested the co-identity of the former two species, a synonymy he maintained up to the last edition of his Agaricales (Singer 1986), and in which he was followed by

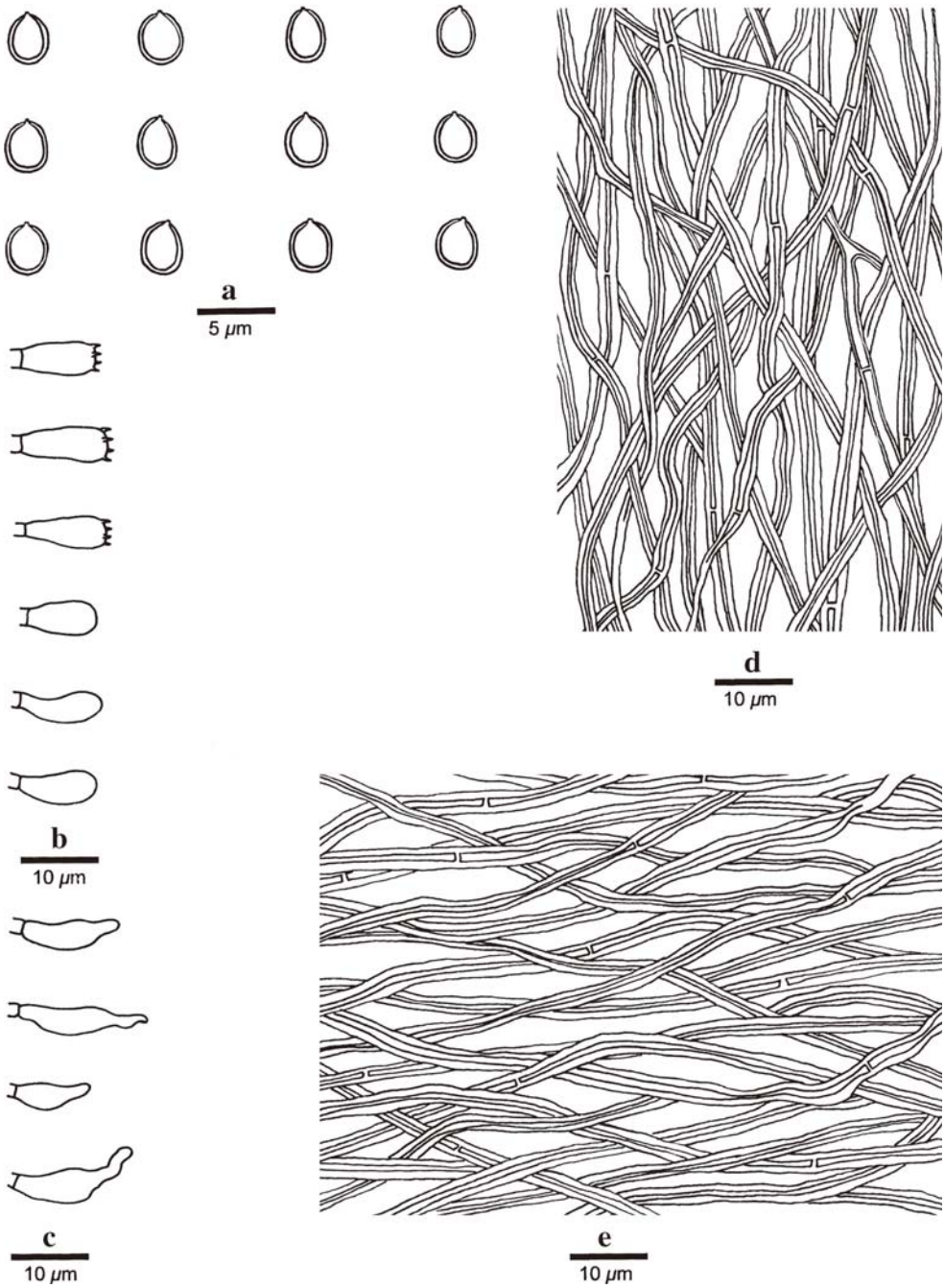

Fig. 157 ***Phylloporia dependens*** (**holotype**) microscopic structures **a** Basidiospores. **b** Basidia and basidioles. **c** Cystidioles. **d** Hyphae in trama. **e** Hyphae in context

most mycologists. It is therefore difficult to understand why Singer placed *Polyphyllinae* in sect. *Rigidae* near subsect. *Virescentinae* (Schaeff.) Fr. because *R. magnifica* was described (Peck 1903) as a whitish species having unequal gills, with suggested affinities to a completely different group: subsect. *Lactarioideae* in subgen. *Compacta* Fr. (see Buyck and Adamčík 2013). Even Singer (as early as 1926) agreed with such a systematic placement for *R. magnifica* until he changed opinion in 1951 without any clear argumentation.

The two other species, *R. polycystis* and *R. viridella*, have been placed in *Virescentinae*, until Singer (1951) transferred them to *Polyphyllinae*. *R. polycystis* was originally described as a new species of *Virescentinae* (Singer 1939) and this position has been maintained, although with some hesitation, when Bills (1984) reported on recollecting it for the first time since its original description. *R. viridella* has also been associated with *Virescentinae* (Singer 1932 and thereafter) not with standing its acrid taste. It is more than likely that both these species are unrelated to either of these subsections.

It was Buyck (in Buyck et al. 2005) who, for the first time, pointed out the strong microscopical similarities between *R. polyphylla* and *R. eccentrica* Peck, a relationship that is fully

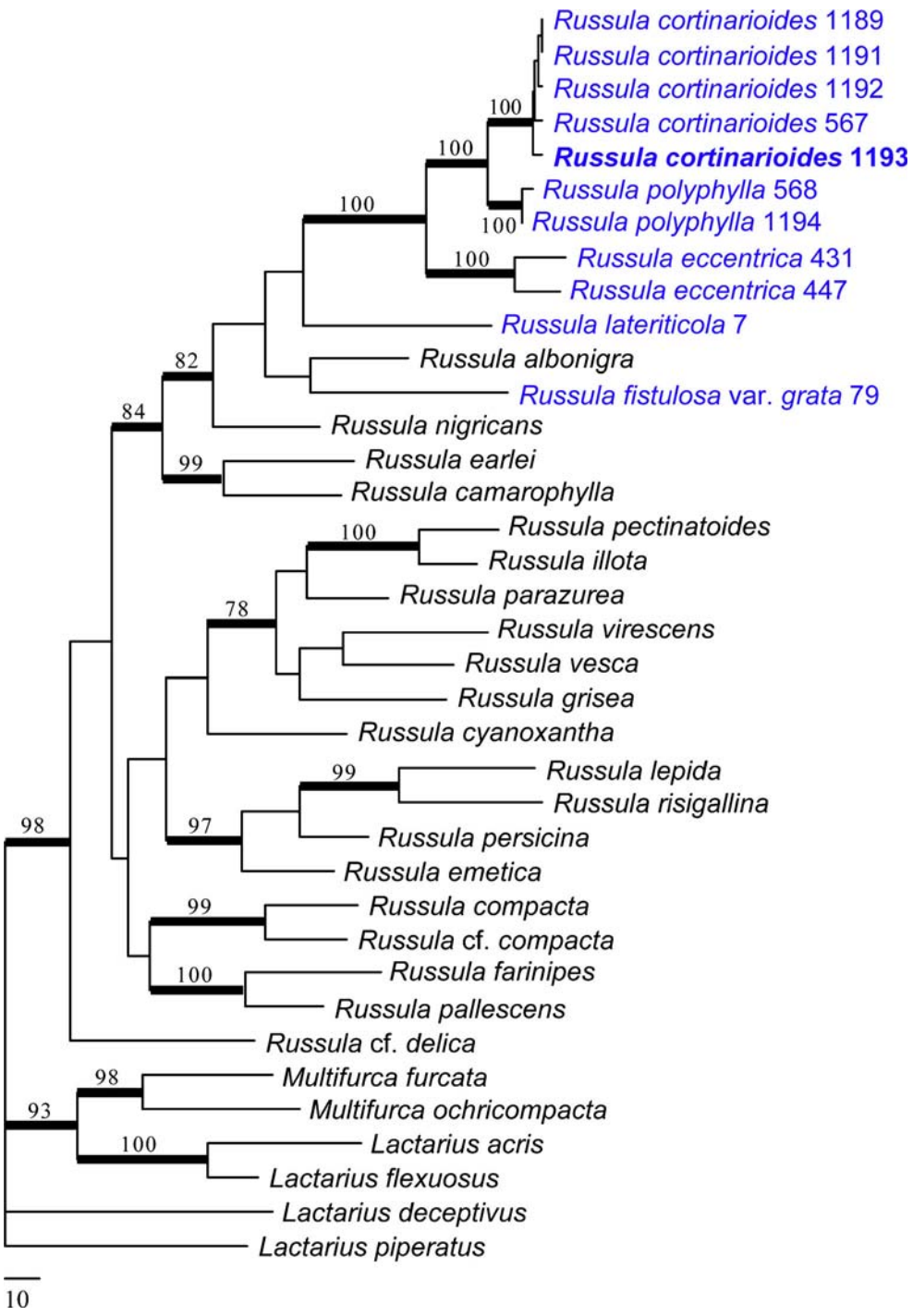

Fig. 158 Phylogram generated from Maximum Parsimony analysis based on combined sequence data of *RPB*2, LSU, ITS for 31 *Russula* and six outgroup sequences (2 *Multifurca* spp., 2 *Lactarius* spp. and 2 *Lactifluus* spp.). Sequences used in this study have been sampled from a previous study (Buyck *et al* 2008) or newly generated for *R. cortinarioides*, R. *polyphylla*, *R. eccentrica*, *R. lateriticola* and *R. fistulosa var. grata* [see GenBank accession numbers KP033498–KP033508 (RPB2), KP033487–KP033497 (nucLSU), KP033476–KP033486 (ITS). Branches indicated in *bold* received significant (≥70 %) bootstrap support

supported (BS = 100 %) by our phylogenetic analysis (Fig. 158). The molecular data indicate that *Polyphyllinae* are neither related to *Virescentinae*, nor to *Lactarioideae*, but are closely related to subsect. *Nigricantes* Fr., a species group typically characterized by their, often first reddening, then blackening context. The closest, native American taxon to our new species seems to be *R. densifolia* var. *paxilloides* Peck, which differs from our species by the differentiation of marginal cells and in the less reticulate and less dense, slightly higher spore ornamentation (see Adamčík and Buyck 2014).

Polyphyllinae differ from *Nigricantes* by the fact that their context is only reddening but never blackening, a feature most easily observed on the ageing hymenophore which turns pinkish to reddish brown at maturity. As morphology in our diagnosis, *R. cortinarioides* is most similar to *R. eccentrica* in the field but has denser gills, a feature that is even much more

Fig. 159 ***Russula cortinarioides*** **(holotype)**. Habit (Buyck 07.133). Photo B. Buyck

pronounced in the larger, nearly whitish *R. polyphylla*, its sister-species, which has crowded gills.

In the field, *R. cortinarioides* is also very easily confused with *R. compacta* Frost because of the unequal gills, brownish colours, unpleasant smell, white spore print and overall similar habit. The latter differs from our new species in the hymenium bruising brownish upon handling but not slowly turning reddish to reddish brown as in *R. cortinarioides*; both species are also easily distinguished by the very different microscopic features of their pileipellis and our phylogeny distinctly shows both species to be quite unrelated.

As a result of our molecular analysis, we therefore restrict *Polyphyllinae* in North America presently to *R. polyphylla*, *R. eccentrica* and the here newly described *R. cortinarioides*.

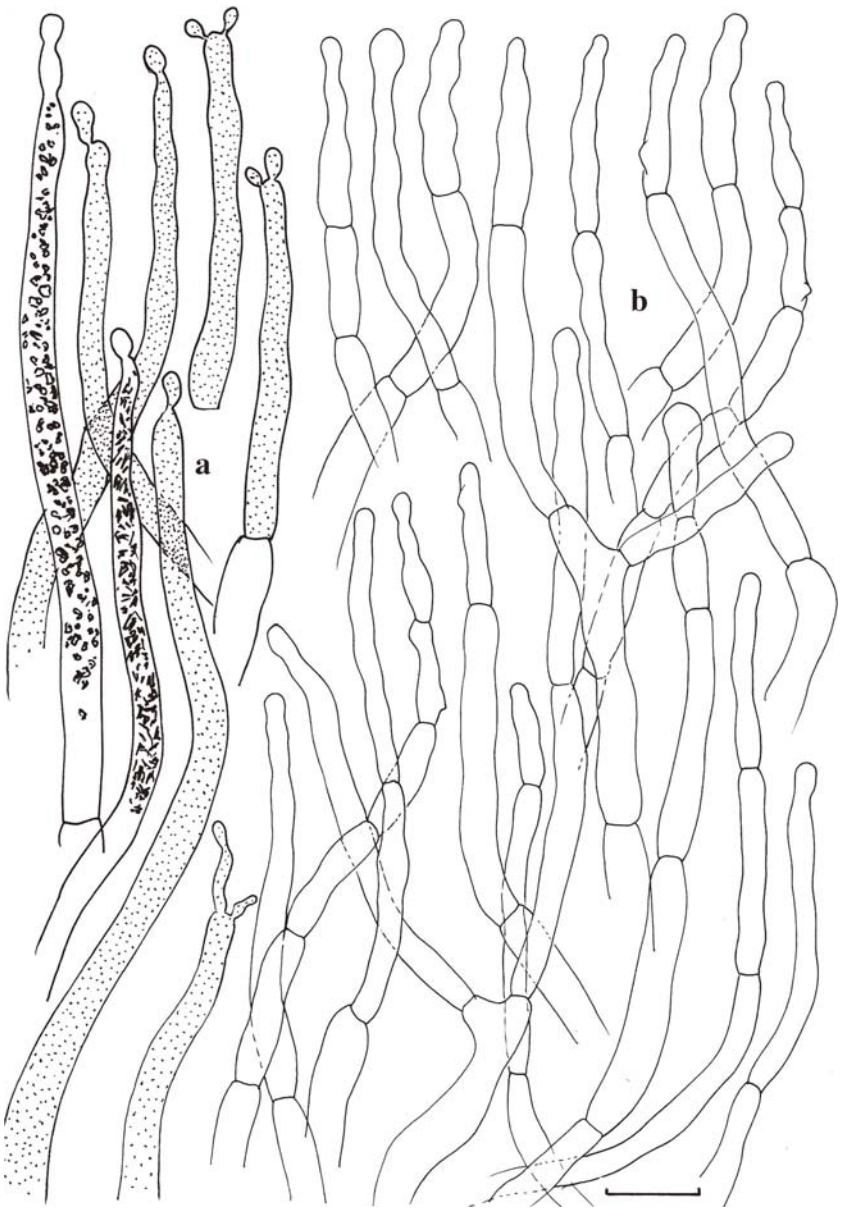

Fig. 160 ***Russula cortinarioides*** **(holotype)**. Microscopic features of the pileipellis. **a** Pileocystidia with indication of contents as observed in Congo Red for two elements, schematically in all other elements. **b** Hyphal extremities. Scale bars=10 μm. Drawings B. Buyck

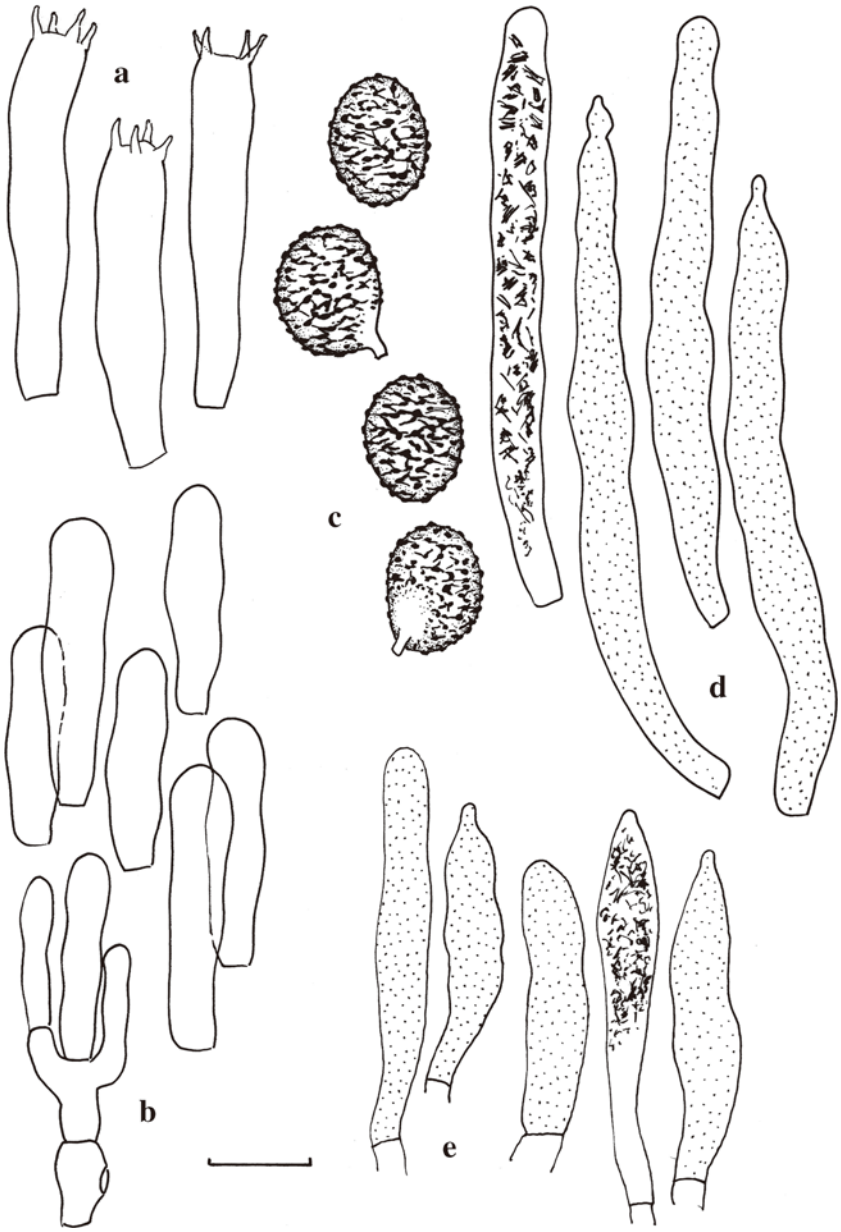

Fig. 161 ***Russula cortinarioides***. Microscopic features of the hymenium. **a** Basidia. **b** Basidiola. **c** Spores. **d** Gloeopleurocystidia. **e** Gloeocheilocystidia (no marginal cells differentiated). Gloeocystidia with indication of contents as observed in Congo Red for two elements, schematically in all other elements. Scale bars = 10 μm, but only 5 μm for spores. Drawings B. Buyck

Polyphyllinae is also known from Costa Rica (see Buyck and Halling 2004; Buyck et al. 2005) and the subsection is well represented in most other tropical and subtropical areas of the world (Buyck unpubl.). All species of this subsection are recognizable by their unequal gills becoming pinkish to reddish brown at maturity, a slowly, mostly weakly reddening, but not blackening context; they have gloeoplerous elements in all parts of the carpophore and possess very similar spores.

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