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Bambusicolous fungi

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Abstract Fourty-three species of microfungi from bamboo are treated, including one new family, *Occultibambusaceae*, three new genera, *Neoanthostomella*, *Occultibambusa* and *Seriascoma*, 27 new species, one renamed species and 15 re-described or re-illustrated species, and four designated reference specimens are treated in this paper, the majority of which are saprobic on dead culms. To determine species identification, separate phylogenetical analyses for each group are carried out, based on molecular data from this study and sequences downloaded from GenBank. Morphologically similar species and phylogenetically close taxa are compared and discussed. In addition a list of bambusicolous fungi published since Hyde and colleagues in 2002 is provided.

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Table of Contents

Introduction

Bamboo, members of the grass family *Poaceae* and subfamily *Bambusoideae*, comprise more than 115 genera with approximately 1,450 species (Gratani et al. 2008; Kelchner and Group 2013; Bamboo Botanicals 2016). Bamboo species are found growing in diverse climates, from cold mountain areas to hot tropical regions (Kelchner and Group 2013). They are distributed in almost all countries of Asia, Australia, Africa and the Americas (Bystriakova et al. 2003; Shimokawa et al. 2009; Song et al. 2011). Europe however, has no native bamboo species (INBAR 2016). In Thailand, bamboos are widely distributed in several forest types, especially mixed deciduous forest and in regenerated forests (Kirschner et al. 2009). Bamboo has a long history of use in Asian furniture and construction of roof thatches (Lin 2004). In China and India, bamboo has been used to hold up simple suspension bridges, either by making cables of split bamboo or twisting whole culms of sufficiently pliable bamboo together (Peters 1987). Bamboo shoots are also edible (Dransfield and Widjaja 1995) and are used in numerous Asian culinary dishes and broths, and are available in supermarkets in various sliced forms, both as fresh and canned versions (Idris and Mohamad 2002). Bamboo is used in Chinese traditional medicine for treating infections and healing (Janssen 1991).

Studies on the taxonomy and phylogeny of bamboo fungi can be of economic significance (Zhang and Zhang 2000; Jiang et al. 2002; Dharmananda 2004; Zhou et al. 2005; Singhal et al. 2013). Some fungi are pathogens causing spots or malformations on bamboo leaves and culms (Xu et al. 2006, 2007). Examples include *Linearistroma lineare* (Rehm) Höhn., *Shiraria bambusicola* P. Henn. and *Calonectria* spp., which can affect the growth and development of bamboo, and cause serious economic losses (Tewari 1993; Mohanan 2002; Li et al. 2009). However some fungi can be beneficial to humans. *Shiraia bambusicola* is of medical importance because of its metabolite, hypocrellin (Hudson et al. 1994), which has promising applications in photodynamic therapy (PDT) for anticancer treatment (Liu et al. 2012b).

A review of the literature on bamboo-associated fungi reveals that nearly 1100 species, which belong to 228 genera, have so far been described or recorded worldwide (Hyde et al. 2002a, b). There have been several large studies on bambusicolous fungi. Hino and Katumoto (1960) published 'Icones Fungorum Bambusicolum Japonicorum' and listed 258 species of fungi from bamboo in Japan. Petrini et al. (1989) investigated the fungi on bamboo in France and listed 63 species, including two new species. Eriksson and Yue (1998) provided a checklist of the ascomycetes on bamboo that included 587 names. Zhang and Wang (1999) recorded 213 species (including 104 species, belonging 60 genera of ascomycetes), described from bamboo in China.

There have been few thorough studies on the taxonomy and phylogeny of fungi on bamboo (Hyde et al. 2002a). Generally bambusicolous fungi have been poorly documented (Rehm 1913, 1914; Sydow and Sydow 1913, 1914b; Eriksson and Yue 1998; Zhou and Hyde 2001, 2002). In Japan, *ca.* 300 species are known from bamboo (Tanaka and Harada 2004) and from 2003 to 2015, Tanaka described 48 new species, which belong to 19 genera, including seven new genera from bamboo in Japan (Tanaka and Harada 2003a, b, 2004, 2005a, b; Shirouzu and Harada 2004; Hatakeyama et al. 2005, 2008; Sato et al. 2008; Tanaka et al. 2005, 2009, 2015). Since 2011 until now, 60 new species, belonging to 29 genera, including 16 new genera were published on bamboo in Thailand (Liu et al. 2011, 2012a, 2014, 2015; Dai et al. 2012, 2014a, b, c,

2015, 2016; Phookamsak et al. 2014, 2015; Adamčík et al. 2015; Ariyawansa et al. 2015; Senanayake et al. 2015).

As pointed by Hyde et al. (2002b), the hitherto knowledge on bamboo fungi is incomplete and largely remained at cataloguing stage. Numerous bamboo fungi lack molecular data and defined studies. In this paper, we provide detailed taxonomic and phylogenetic information on bambusicolous fungi from Thailand, including one taxon from China.

Materials and methods

Collection and isolation

Dead bamboo culms were collected from China and Thailand. The samples were placed in Ziplock plastic bags and brought to the laboratory. Fresh materials were examined by using stereo and compound microscopes. The specimens were incubated in a moist chamber for 3–7 days at room temperature, if they did not sporulate. Microscopic observations were made in distilled water. Staining of the ascus apical ring was tested in Melzer's reagent. India ink was used to observe the mucilaginous sheath and appendages of spores. Micro-morphological characters were examined by differential interference contrast (DIC), using a Nikon ECLIPSE 80*i* or N*i* compound microscope with a Cannon 550D or a 600D digital camera. Fruiting bodies were observed by stereomicroscopy using a Zeiss Stereo Discovery V8 and photographed by AxioCam ERc 5 s. Measurements were made using Tarosoft (R) Image Frame Work software.

The fungi were isolated based on the way of single spore isolation. Ascomata or conidiomata were cut horizontally, the hymenium containing ascospores, conidia mass or conidiophores bearing conidia (hyphomycetes) were transferred to a drop of sterile water on a flamed concave microscope slide. The hymenium contents or conidia mass were broken up and seperated by using the sterile needles until the single spores suspended in the sterile water. The spore suspension was siphoned by a sterile pipette and droped on the surface of a Petri dish with 2 % Difco potato-dextrose agar (PDA) media. To obtain germinating spores, the plates were keeped within 24–48 h at room temperature, under 12 h light/12 h dark. The germinating spores were individually transferred to three fresh plates. Cultures were growing on PDA or MEA (33.6 g/L sterile distilled water, Difco malt extract) in 15–45 days, at 25–32 °C, under 12 h light/12 h dark for recording growth rates and culture characters. Colours rated according to Kornerup and Wanscher (1978). Pieces of growing colonies were cut and transferred on WA (15 g/l sterile distilled water) placed nearby the sterile bamboo pieces to sporulate.

The growing colonies were transferred to 1.5 ml microcentrifuge tubes with PDA to store at 4 °C and suspended in 2 ml screw cap microcentrifuge tubes with 15 % glycerol for storage at −20 °C. Type materials are deposited at the herbarium of Mae Fah Luang University, Chiang Rai, Thailand (MFLU) and Herbarium of Kunming Institute of Botany, Chinese Academy of Sciences (KUN). Living cultures are deposited at Mae Fah Luang University Culture Collection (MFLUCC), CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands (CBS), Mycothèque de l'Université catholique de Louvain (MUCL), Kunming Culture Collection (KUMCC) and in the International Collection of Microorganisms from Plants (ICMP), Landcare Research, New Zealand. Facesoffungi (Jayasiri et al. 2015) and Index Fungorum (2016) numbers were provided for new taxa.

DNA extraction, PCR amplification and sequencing

Fungal isolates were grown on PDA for 15–30 day at 27 °C and genomic DNA was extracted from fresh mycelia, following the protocols of Biospin Fungus Genomic DNA Extraction Kit (BioFlux®). If cultures were unavailable, fungal fruiting bodies were used to directly extract DNA using an OMEGA E.Z.N.A.® Forensic DNA Kit following the manufacturer's instructions.

ITS5 and ITS4, NS1 and NS4 (White et al. 1990), and LROR and LR5 (Vilgalys and Hester 1990) primers were used for the amplification of internal transcribed spacers (ITS), small subunit rDNA (SSU) and large subunit rDNA (LSU) respectively. Translation elongation factor 1-α gene region (TEF 1-alpha) and RNA polymerase II second largest subunit (RPB2) genes were amplified by using EF1-983 F and EF1-2218R (Rehner 2001), fRPB2-5f and fRPB2-7cr primers (Liu et al. 1999) respectively.

Polymerase chain reaction (PCR) amplification was carried out as follows: the final volume of the PCR reaction was 25 μl, which contained 1 μl of DNA template, 1 μl of each forward and reverse primers, 12.5 μl of 2 × Power Taq PCR Master Mix (mixture of *EasyTaq*TM DNA Polymerase, dNTPs, and optimized buffer, Beijing Bio Teke Corporation (Bio Teke), PR China) and 9.5 μl Distilled-Deionized-Water. The PCR thermal cycle program of ITS, SSU, LSU and TEF 1-alpha genes amplifications were provided as: initially 94 °C for 3 min, followed by 35 cycles of denaturation at 94 °C for 30 s, annealing at 55 °C for 50 s, elongation at 72 °C for 1 min, and final extension at 72 °C for 10 min. The PCR thermal cycle program for the RPB2 gene was provided as initially 95 °C for 5 min, followed by 35 cycles of denaturation at 95 °C for 1 min, annealing at 52 °C for 2 min, elongation at 72 °C for 90 s, and final extension at 72 °C for 10 min. The quality of PCR products were checked by 1 % Biowest agarose gel electrophoresis. Amplified PCR fragments were sequenced at Shanghai Majorbio Bio-Pharm Technology Co., Ltd. and BGI Tech Solutions Co., Ltd. (BGI-Tech), P.R. China. Generated new sequences of ITS, LSU, SSU, RPB2 and TEF1 regions are deposited in GenBank.

Phylogenetic analyses

Based on blast searches in GenBank, using LSU or ITS sequence data, separate phylogenetic analyses were carried out to determine the placements of each fungal group. Additional sequences were downloaded from GenBank, based on blast search and recent publications.

Single gene sequence alignments were generated with MAFFT v. 7.215 (Katoh and Standley 2013: http://mafft.cbrc.jp/alignment/server/index.html) and edited manually when necessary in MEGA6 version 6.0 (Tamura et al. 2013) or BioEdit v. 7.0 (Hall 2004).

Maximum-likelihood (ML) analyses including 1000 bootstrap replicates were run using RAxMLGUI v.1.0. (Stamatakis 2006; Silvestro and Michalak 2011). Alignments in PHYLIP format were exchanged and loaded from the website (http://sing.ei.uvigo.es/ALTER/). The online tool Findmodel (http://www.hiv.lanl.gov/content/sequence/findmodel/findmodel.html) was used to determine the best nucleotide substitution model for each partition data.

Maximum-parsimony (MP) analyses were carried out in PAUP v. 4.0b10 (Swofford 2002) with 1000 replications. Maxtrees were set to 1000, branches of zero length were collapsed, and all multiple equally most parsimonious trees were saved. The robustness of the most parsimonious trees was evaluated from 1 000 bootstrap replications (Phillips et al. 2013).

Bayesian analyses were performed by using MrBayes v. 3.0b4 (Ronquist and Huelsenbeck 2003). The model of evolution was performed by using MrModeltest v. 2.2 (Nylander 2004). Posterior probabilities (PP) (Rannala and Yang 1996; Zhaxybayeva and Gogarten 2002) were determined by Markov Chain Monte Carlo sampling (MCMC) in MrBayes v. 3.0b4 (Huelsenbeck and Ronquist 2001). Six simultaneous Markov chains were run for 1,000,000 generations and trees were sampled every 100th generation. The burn-in was set to 0.25, and the run was automatically stopped when the average standard deviation of split frequencies reached below 0.01 (Maharachchikumbura et al. 2015).

Trees were visualized with TreeView (Page 1996) or FigTree v. 1.4.0 (http://tree.bio.ed.ac.uk software/figtree/), and additionally layouts were done with Adobe Illustrator CS v. 5. Maximum-likelihood bootstrap values (MLBP) and Maximum-parsimony bootstrap values (MPBP) equal or greater than 50 % are given for each tree. Bayesian posterior probabilities (BYPP) > 0.90 are indicated as thickened lines.

Results

Phylogeny

Due to the diversity of taxa found, we made the individual trees at the family or order levels. Phylogenic trees for each data set are provided below. Phylogenetically similar taxa are discussed. All new sequence data are deposited in GenBank and GenBank accession numbers are provided in Tables 1.

Taxonomy

Dothideomycetes O.E. Erikss. & Winka, Myconet 1(1): 5 (1997)

Dothideomycetes is one of the largest classes within Ascomycota with an estimated 19,000 species (Kirk et al. 2008; Schoch et al. 2009). Hyde et al. (2013) re-examined 105 family types of *Dothideomycetes* and provided multigene analyses for 64 families. Wijayawardene et al. (2014) listed all genera accepted in *Dothideomycetes* (belonging to 23 orders and 110 families), including pleomorphic and nonpleomorphic genera. Rossman et al. (2015) provided recommended names for pleomorphic genera in *Dothideomycetes*.

Botryosphaeriales C.L. Schoch, et al., Mycologia 98(6): 1050 (2007) [2006]

The order *Botryosphaeriales* was introduced by Schoch et al. (2006) with a single family *Botryosphaeriaceae*. Liu et al. (2012a) provided a phylogenetic analysis of *Botryosphaeriales* and included the families *Botryosphaeriaceae* and *Phyllostictaceae*. Hyde et al. (2013) stated that the order *Botryosphaeriales* comprises three families: *Botryosphaeriaceae*, *Planistromellaceae* and *Phyllostictaceae*. Subsequently, Slippers et al. (2013) introduced the families *Aplosporellaceae*, *Melanopsaceae* and *Saccharataceae*. Wijayawardene et al. (2014) recognized six families, viz. *Aplosporellaceae*, *Botryosphaeriaceae*, *Melanopsaceae*, *Phyllostictaceae*, *Planistromellaceae* and *Saccharataceae*, in this order.

Botryosphaeriaceae Theiss. & Syd. [as 'Botryosphaeriacae'], Annls mycol. 16(1/2): 16 (1918)

The family *Botryosphaeriaceae* was introduced by Theissen and Sydow (1918). This family has been well circumscribed by several authors (Crous et al. 2006b; Phillips et al. 2008, 2013; Liu et al. 2012a; Slippers et al. 2013; Hyde et al. 2014; Linaldeddu et al. 2015). Liu et al. (2012a) accepted 29 genera in this family, based on morphology. Phillips et al. (2013) considered only the genera known from culture and based the number of accepted genera on morphology and phylogeny. Thus 17 genera were recognized by Phillips et al. (2013) using morphological features and combined phylogenetic analysis of SSU, ITS, LSU, EF1-α and β-tubulin sequence data, and further keys to the genera and species were provided. Crous et al. (2015) introduced *Eutiarosporella*, *Marasasiomyces*, *Mucoharknessia* and *Sakireeta*, which Wijayawardene et al. (2016) accepted in their phylogenetic analyses.

Neodeightonia C. Booth, in Punithalingam, Mycol. Pap. 119: 17 (1970) [1969]

The genus *Neodeightonia* was introduced by Booth (Punithalingam 1969), and placed in the family *Botryosphaeriaceae*. This genus comprises four species, viz. *N. microspora* (new species in this study), *N. palmicola*, *N. phoenicum* and *N. subglobosa* based on morphological and phylogenetic analyses (Phillips et al. 2008, 2013; Liu et al. 2012).

Neodeightonia microspora D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552019; *Facesoffungi number*: FoF 01965; Figs. 1 and 2

Etymology: In reference to the small ascospores.

Holotype: MFLU 15–1201

Saprobic on dead bamboo culms. **Sexual morph**: *Ascostromata* 100–150 μm high, 95–150 μm diam., dark brown to black, immersed under epidermis to erumpent, solitary, visible as minute black dots or papillae on host tissue, uni-loculate, locules globose to subglobose or fused, coriaceous, vertically orientated to the host surface, with a central ostiole. *Peridium* 15–20 μm wide, comprising several layers of cells, with relatively thick brown to black walls of *textura angularis*, broader at the base. *Hamathecium* comprising only asci. *Asci* 70–110 × 14–20 μm ($\bar{x}$ = 90.8 × 18.5 μm, n = 20), 8–spored, bitunicate, fissitunicate, clavate to cylindro-clavate, with a 25–45 μm long pedicel, apically rounded, with a well-developed ocular chamber. *Ascospores* 10–12 × 4.5–6 μm ($\bar{x}$ = 10.5 × 5.4 μm, n = 30), 2–3-seriate, hyaline, aseptate, obovoid, usually wider at the apex, thick-walled, surrounded by a distinctive, structured, mucilaginous sheath. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from apex. Colonies growing fast on PDA, reaching 5 cm in 1 week at 28 °C, under 12 h light/12 h dark, effuse, velvety to hairy, circular, initially white, becoming dark brown to black after 1 week.

Material examined: THAILAND, Payae, Bah Huay Kawkhand, Ampher, on dead culms of bamboo, 31 October 2011, Dong-Qin Dai DDQ00228 (MFLU 15–1201, **holotype**); *ibid.* (KUN HKAS88710, **isotype**), living culture, MFLUCC 11–0483, KUMCC; Chiang Rai, Doi Pui, on dead culms of bamboo, 1 September 2011, Dong-Qin Dai DDQ00111 (MFLU 15–1314, **paratype**), living cultures, MFLUCC 11–0504.

Notes: *Neodeightonia microspora* is characterized by clavate to cylindro-clavate asci with long pedicels and small obovoid ascospores, with a thick mucilaginous sheath. The new taxon differs from *N. subglobosa* and *N. palmicola* in its smaller obovoid ascospores (10–12 × 4.5–6 μm) as compared to *N. subglobosa* (ellipsoidal to fusiform, 21–26 × 7.5–9.5 μm) and *N. palmicola* (ellipsoidal to fusiform, 23–31.5 × 8.5–12.5 μm). It also differs in having asci with a long pedicel. In the phylogenic analyses (Fig. 1) *N. microspora* separates from other *Neodeightonia* species with high bootstrap support (94/96 % MPBP/MLBP, BYPP value greater than 0.90).

Neodeightonia subglobosa C. Booth, in Punithalingam, Mycol. Pap. 119: 19 (1970) [1969]

Facesoffungi number: FoF 01966; Figs. 3 and 4

Synonymy: See index Fungorum

Saprobic on dead bamboo culms. **Sexual morphs**: *Ascostromata* 160–220 μm high, 250–370 μm diam., immersed under epidermis to erumpent, gregarious, visible as minute black dots or papilla on host tissue, dark brown to black, uniloculate, globose to subglobose, coriaceous, with a centrally located ostiole, papillate. *Peridium* 17–40 μm wide, comprising several layers, with outer layers composed of relatively thick brown to black-walled cells of *textura angularis*, inner layers composed of light brown to hyaline cells of *textura angularis*, poorly developed at the base. *Hamathecium* of hyaline, septate, up to 2–4 μm wide pseudoparaphyses. *Asci* 110–150 × 16–20 μm ($\bar{x}$ = 124.8 × 19.5 μm, n = 20), 8–spored, bitunicate, fissitunicate, cylindro-clavate, pedicellate, apically rounded with well-developed ocular chamber. *Ascospores* 17–21 × 8–10.5 μm ($\bar{x}$ = 20.5 × 8.4 μm, n = 20), 2–3-seriate, hyaline, aseptate, obovoid, usually wider at the apex, thick-walled, surrounded by a distinctive structured mucilaginous sheath. **Asexual morph**: Fertile on pine needls on WA after 1 month. *Conidiomata* 150–200 μm diam., pycnidial, immersed to superficial, solitary to gregarious, globose to subglobose, black, coriaceous. *Conidiogenous cells* 5–12.5 × 2–3 μm ($\bar{x}$ = 9.8 × 2.6 μm, n = 20), holoblastic, cylindrical, hyaline, straight to curved, smooth-walled. *Conidia* 11–13.5 × 8–10.5 μm ($\bar{x}$ = 12.6 × 9.3 μm, n = 20), globose to subglobose, hyaline, aseptate, smooth-walled, guttulate.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from apex. Colonies growing fast on PDA, reaching 5 cm in 1 week at 28 °C, under 12 h light/12 h dark, effuse, velvety to hairy, circular, white in first week, dark brown to black after 1 week from below and above.

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai DDQ00087 (MFLU 15–1189, **reference specimen designated here**); *ibid.* (KUN, HKAS88699, duplicates of reference specimen), living culture, MFLUCC 11–0482, MFLUCC 11–0607; asexual morph, 19 June 2011, Dong-Qin Dai DDQ00041, living cultures, MFLUCC 11–0388.

Notes: *Neodeightonia subglobosa* was originally collected from *Bambusa arundinacea* Willd. (synonym of *Bambusa bambos* (L.) Voss) in Africa, and introduced by Punithalingam (1969). Phillips et al. (2008) isolated this species, which causes keratomycosis of the eye, from a human host in an unknown location, illustrated only the asexual morph, and provided a sequence based on the culture CBS

Table 1 Newly sequence data with GenBank accession numbers in this study are provided

Organism	Strain	Collection_date	Country	Host	Specimen_voucher	Type	GenBank accession numbers				
							LSU	SSU	ITS	RPB2	RRR
Neodeightonia microspora	MFLUCC 11–0483	31-Oct-2011	Thailand	bamboo	MFLU 15–1201	holotype	KU863099	KU872104	KU940110	/	/
Neodeightonia microspora	MFLUCC 11–0504	1-Sep-2011	Thailand	bamboo	MFLU 15–1314		KU863100	KU872105	KU940111	/	/
Neodeightonia subglobosa	MFLUCC 11–0482	1-Aug-2011	Thailand	bamboo	MFLU 15–1189		KU863101	KU872106	KU940112	/	KU940184
Neodeightonia subglobosa	MFLUCC 11–0607	1-Aug-2011	Thailand	bamboo	MFLU 15–1189		KU863102	KU872107	KU940113	/	KU940185
Neodeightonia subglobosa	MFLUCC 11–0388	19-Jun-2011	Thailand	bamboo	/		KU863103	KU872108	KU940114	/	KU940186
Mendogia macrostroma	/	5-Oct-2012	Thailand	bamboo	MFLU 13–0642	holotype	KU863104	KU872109	KU940115	KU940162	KU940187
Bambusicola didymospora	MFLUCC 10–0557	10-Mar-2010	Thailand	bamboo	MFLU 11–0149	holotype	KU863105	KU872110	KU940116	KU940163	KU940188
Bambusicola didymospora	MFLUCC 15–0189	5-Dec-2014	Thailand	bamboo	MFLU 16–0882		KU863106	KU872111	KU940117	KU940164	KU940189
Bambusicola pustulata	MFLUCC 15–0190	5-Dec-2014	Thailand	bamboo	MFLU 15–1216	holotype	KU863107	KU872112	KU940118	KU940165	KU940190
Bambusicola thailandica	MFLUCC 11–0147	13-Aug-2010	Thailand	bamboo	MFLU 11–0183	holotype	KU863108	KU872113	KU940119	KU940166	KU940191
Bambusicola triseptatispora	MFLUCC 11–0166	13-Apr-2011	Thailand	bamboo	MFLU 11–0202	holotype	KU863109	/	KU940120	KU940167	/
Bambusicola splendida	MFLUCC 11–0611	1-Aug-2011	Thailand	bamboo	/		KU863110	KU872114	KU940121	KU940168	/
Bambusicola massarinia	MFLUCC 11–0135	16-Jun-2010	Thailand	bamboo	MFLU 11–0171		KU863111	KU872115	KU940122	KU940169	KU940192
Occultibambusa bambusae	MFLUCC 13–0855	9-Jul-2013	Thailand	bamboo	MFLU 15–1212	holotype	KU863112	KU872116	KU940123	KU940170	KU940193
Occultibambusa bambusae	MFLUCC 11–0394	14-May-2011	Thailand	bamboo	MFLU 16–0880		KU863113	KU872117	KU940124	KU940171	KU940194
Occultibambusa fusispora	MFLUCC 11–0127	29-Jun-2010	Thailand	bamboo	MFLU 11–0163	holotype	KU863114	/	KU940125	KU940172	KU940195
Occultibambusa pustula	MFLUCC 11–0502	19-Jul-2011	Thailand	bamboo	MFLU 15–1185	holotype	KU863115	KU872118	KU940126	/	/
Seriascoma didymospora	MFLUCC 11–0179	25-Oct-2010	Thailand	bamboo	MFLU 11–0215	holotype	KU863116	KU872119	KU940127	KU940173	KU940196
Seriascoma didymospora	MFLUCC 11–0194	13-Jan-2011	Thailand	bamboo	MFLU 11–0230		KU863117	KU872120	KU940128	KU940174	KU940197
Roussoella mukdahanensis	MFLUCC 11–0201	13-Apr-2011	Thailand	bamboo	MFLU 11–0237	holotype	KU863118	KU872121	KU940129	/	/
Roussoella neopustulans	MFLUCC 12–0003	13-Apr-2011	Thailand	bamboo	MFLU 11–0241		KU863119	KU872122	KU940130	/	/
		9-Jul-2013	Thailand	bamboo	MFLU 15–1209	holotype	KU863120	KU872123	KU940131	/	KU940198

Table 1 (continued)

Organism	Strain	Collection_date	Country	Host	Specimen_voucher	Type	GenBank accession numbers				
							LSU	SSU	ITS	RPB2	RRR
Roussoella pseudohysterioides	MFLUCC 13–0852										
Roussoella tuberculata	MFLUCC 13–0854	9-Jul-2013	Thailand	bamboo	MFLU 15–1211	holotype	KU863121	KU872124	KU940132	/	KU940199
Roussoella siamensis	MFLUCC 11–0149	13-Aug-2010	Thailand	bamboo	MFLU 11–0185	holotype	/	KU872125	/	/	/
Tubeufia longiseta	MFLUCC 15–0188	6-Oct-2014	Thailand	bamboo	MFLU 15–1215	holotype			KU940133	/	/
Leptosporella bambusae	MFLUCC 12–0846	31-Jul-2012	Thailand	bamboo	MFLU 15–1203	holotype	KU863122	/	KU940134	/	/
Myrothecium thailandicum	MFLUCC 11–0395	14-May-2011	Thailand	bamboo	MFLU 15–1180	holotype	KU863123	KU872126	KU940135	/	KU940200
Myrothecium chiangmaiense	MFLUCC 11–0506	26-May-2011	Thailand	bamboo	MFLU 15–1181	holotype	KU863124	KU872127	KU940136	KU940175	KU940201
Myrothecium cylindrosporum	MFLUCC 11–0392	14-May-2011	Thailand	bamboo	MFLU 14–0823	holotype	/	KU872128	/	/	/
Myrothecium uttaraditense	MFLUCC 11–0632	28-Oct-2011	Thailand	bamboo	MFLU 15–1197	holotype	KU863125	KU872129	KU940137	/	/
Nectria pseudotrichia	MFLUCC 11–0391	12-May-2011	Thailand	bamboo	MFLU 15–1179	holotype	KU863126	KU872130	KU940138	/	/
Cercophora thailandica	MFLUCC 12–0845	31-Jul-2012	Thailand	bamboo	MFLU 15–1202	holotype	KU863127	KU872131	KU940139	KU940176	/
Phaeoacremonium sphinctrophorum	MFLUCC 11–0629	6-Oct-2011	Thailand	bamboo	MFLU 15–1196		KU863128	KU872132	KU940140	/	KU940202
Arthrinium longistromum	MFLUCC 11–0481	19-Jul-2011	Thailand	bamboo	MFLU 15–1184	holotype	KU863129	/	KU940141	/	/
Arthrinium longistromum	MFLUCC 11–0479	17-Jul-2011	Thailand	bamboo	/		KU863130	/	KU940142	/	/
Arthrinium rasikravindrae	MFLUCC 15–0203	4-Oct-2014	Thailand	bamboo	MFLU 15–1227		KU863131	KU872133	KU940143	/	/
Arthrinium rasikravindrae	MFLUCC 11–0616	1-Oct-2011	Thailand	bamboo	/		KU863132	KU872134	KU940144	/	/
Arthrinium thailandicum	MFLUCC 15–0202	4-Oct-2014	Thailand	bamboo	MFLU 15–1226	holotype	KU863133	/	KU940145	/	/
Arthrinium thailandicum	MFLUCC 15–0199	4-Oct-2014	Thailand	bamboo	MFLU 15–1224		KU863134	/	KU940146	/	/
Arthrinium yunnanum	MFLUCC 15–0002	7-Jul-2014	China	bamboo	MFLU 15–0382	holotype	KU863135	KU872135	KU940147	KU940177	/
Arthrinium yunnanum	DDQ00281	7-Jul-2014	China	bamboo	/		KU863136	KU872136	KU940148	KU940178	/
Eutypa linearis	MFLUCC 15–0198	6-Dec-2014	Thailand	bamboo	MFLU 15–1223		KU863137	KU872137	KU940149	/	KU940203
Eutypa linearis		19-Jul-2011	Thailand	bamboo	MFLU 15–1186		KU863138	KU872138	KU940150	/	KU940204

Table 1 (continued)

Organism	Strain	Collection_date	Country	Host	Specimen_voucher	Type	GenBank accession numbers				
							LSU	SSU	ITS	RPB2	RRR
	MFLUCC 11–0503										
Peroneutypa scoparia	MFLUCC 11–0478	16-Jul-2011	Thailand	bamboo	MFLU 15–1183		KU863139	KU872139	KU940151	KU940179	KU940205
Peroneutypa scoparia	MFLUCC 11–0615	11-Aug-2011	Thailand	bamboo	MFLU 16–0881		KU863140	KU872140	KU940152	KU940180	KU940206
Anthostomella pseudobambusicola	MFLUCC 15–0192	6-Dec-2014	Thailand	bamboo	MFLU 16–0255	holotype	KU863141	KU872141	KU940153	/	/
Astrocystis mirabilis	MFLUCC 11–0636	28-Oct-2011	Thailand	bamboo	MFLU 15–1199		KU863142	KU872142	KU940154	/	KU940207
Daldinia bambusicola	MFLUCC 11–0605	1-Aug-2011	Thailand	bamboo	MFLU 15–1187		KU863143	KU872143	KU940155	KU940181	KU940208
Hypoxylon pseudefendleri	MFLUCC 11–0639	29-Oct-2011	Thailand	bamboo	MFLU 15–1200	holotype	KU863144	/	KU940156	/	/
Hypoxylon neosublenormandii	MFLUCC 11–0618	1-Aug-2011	Thailand	bamboo	MFLU 15–1193	holotype	KU863145	/	KU940157	/	/
Neoanthostomella pseudostromatica	MFLUCC 11–0610	1-Aug-2011	Thailand	bamboo	MFLU 15–1190	holotype	KU863146	KU872144	KU940158	/	/
Vamsapriya bambusicola	MFLUCC 11-0477	30-Jun-2011	Thailand	Dendrocalamus giganteus	MFLU 13-0368	holotype	/	/	/	/	KU940209
Vamsapriya bambusicola	MFLUCC 11-0637	28-Oct-2011	Thailand	bamboo	MFLU 15-1315		KU863147	KU872145	KU940159	KU940182	KU940210
Vamsapriya khunkonensis	MFLUCC 11-0475	30-Jun-2011	Thailand	Dendrocalamus giganteus	MFLU 13-0367	holotype	/	/	/	/	KU940211
Vamsapriya indica	MFLUCC 12-0544	21-Jun-2012	Thailand	bamboo	MFLU 13-0370	epitype	/	/	/	/	KU940212
Xylaria bambusicola	MFLUCC 11-0606	1-Aug-2011	Thailand	bamboo	MFLU 15-1188		KU863148	KU872146	KU940160	KU940183	/
Pleurophragmium bambusinum	MFLUCC 12-0850	3-Aug-2012	Thailand	bamboo	MFLU 15-1207	holotype	KU863149	/	KU940161	/	KU940213

448.91. Phillips et al. (2013) however, indicated CBS 448.91 as ex-type without any justification. Liu et al. (2012a) illustrated the sexual morph of this species based on a new collection. In this study, new isolates and specimens were obtained collected on bamboo in Thailand with both sexual and asexual morphs. Thus a reference specimen is designated here, and the species is re-described and illustrated species, due to no available strain linked to Punithalingam (1969). Punithalingam (1969) stated that *N. subglobosa* has brown and 1-septate ascospores. However, these characters were not observed in this study. Phylogenetic analyses show three new strains in the same branch, with another two strains of *N. subglobosa* (MFLUCC 11–0163 and CBS 448.91), clustering with high bootstrap support (98/94 % MPBP/MLBP) (Fig. 1).

Myriangiales Starbäck 1899

The order *Myriangiales* was introduced by Starbäck (1899) based on a genus producing crustose, loculate ascostromata, with muriform ascospores (Hyde et al. 2013). Three families, *Cookellaceae*, *Elsinoaceae* and *Myriangiaceae,* were included in *Myriangiales* by Kirk et al. (2008). Based on phylogenetic analyses, Lumbsch and Huhndorf (2010), Hyde et al. (2013), Wijayawardene et al. (2014) accepted only *Elsinoaceae* and *Myriangiaceae* in this order.

Myriangiaceae Nyl., Mém. Soc. Sci. nat. Cherbourg 2: 9 (1854)

The family *Myriangiaceae* was introduced by Nylander (1854). Von Arx and Müller (1975) placed 16 genera in the family, but Lumbsch and Huhndorf (2010) included only four genera (*Anhellia*, *Diplotheca*, *Eurytheca*, *Myriangium*). Dissanayake et al. (2014) re-examined the generic type specimens and accepted ten genera, providing descriptions and discussion on the generic types of *Anhellia, Ascostratum, Butleria, Dictyocyclus, Diplotheca, Eurytheca, Hemimyriangium, Micularia, Myriangium* and *Zukaliopsis*. However, only *Anhellia* and *Myriangium* have molecular data (Pinho et al. 2012; Hyde et al. 2013; Wijayawardene et al. 2014). The family *Myriangiaceae* is characterized by having only one ascus in each locule, and superficial, erumpent, dark ascostromata. The asci are clavate to subglobose or globose and ascospores smooth to verruculose and muriform, occasionally with only transverse septa (Miller 1938; Hyde et al. 2013; Dissanayake et al. 2014). The formations of the asci of

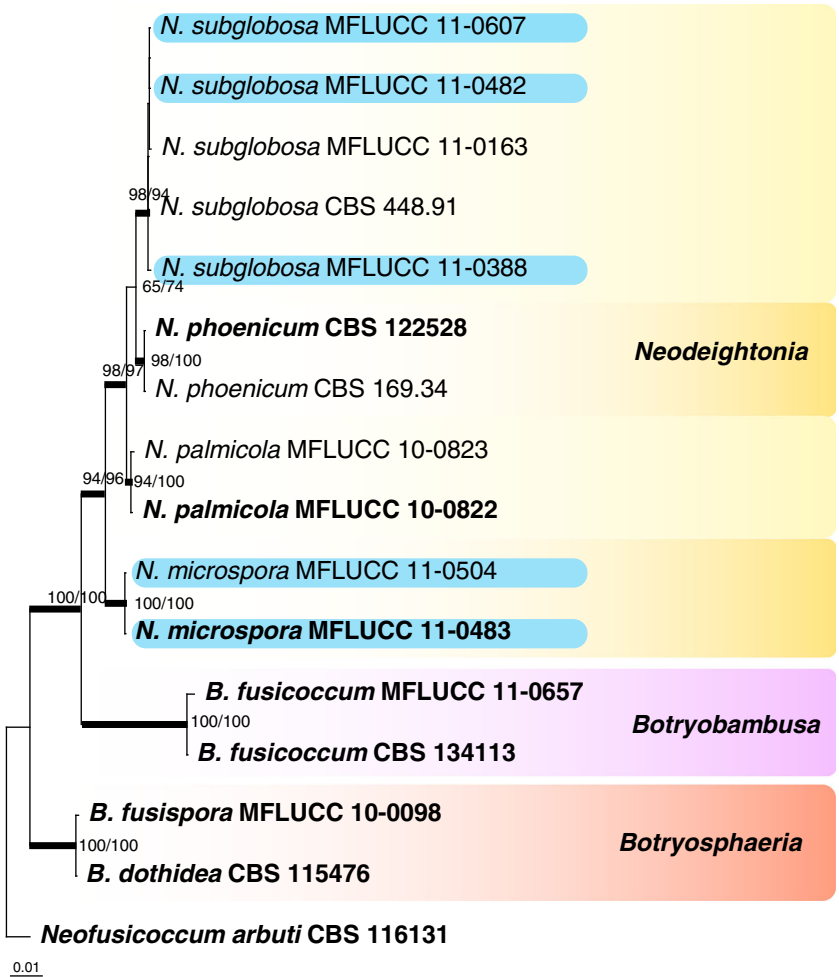


Fig. 1 Maximum likelihood phylogenetic tree (lnL = −2178.664062) generated by RAxML (GTR+G model), based on combined SSU, ITS and LSU sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes and branches with Bayesian posterior probabilities greater than 0.90 are in bold. The original isolate numbers codes are noted after the species names. The tree is rooted to *Neofusicoccum arbuti* (CBS 116131). Ex-type strains are in *bold*. Newly generated sequences are highlighted with a *blue* background

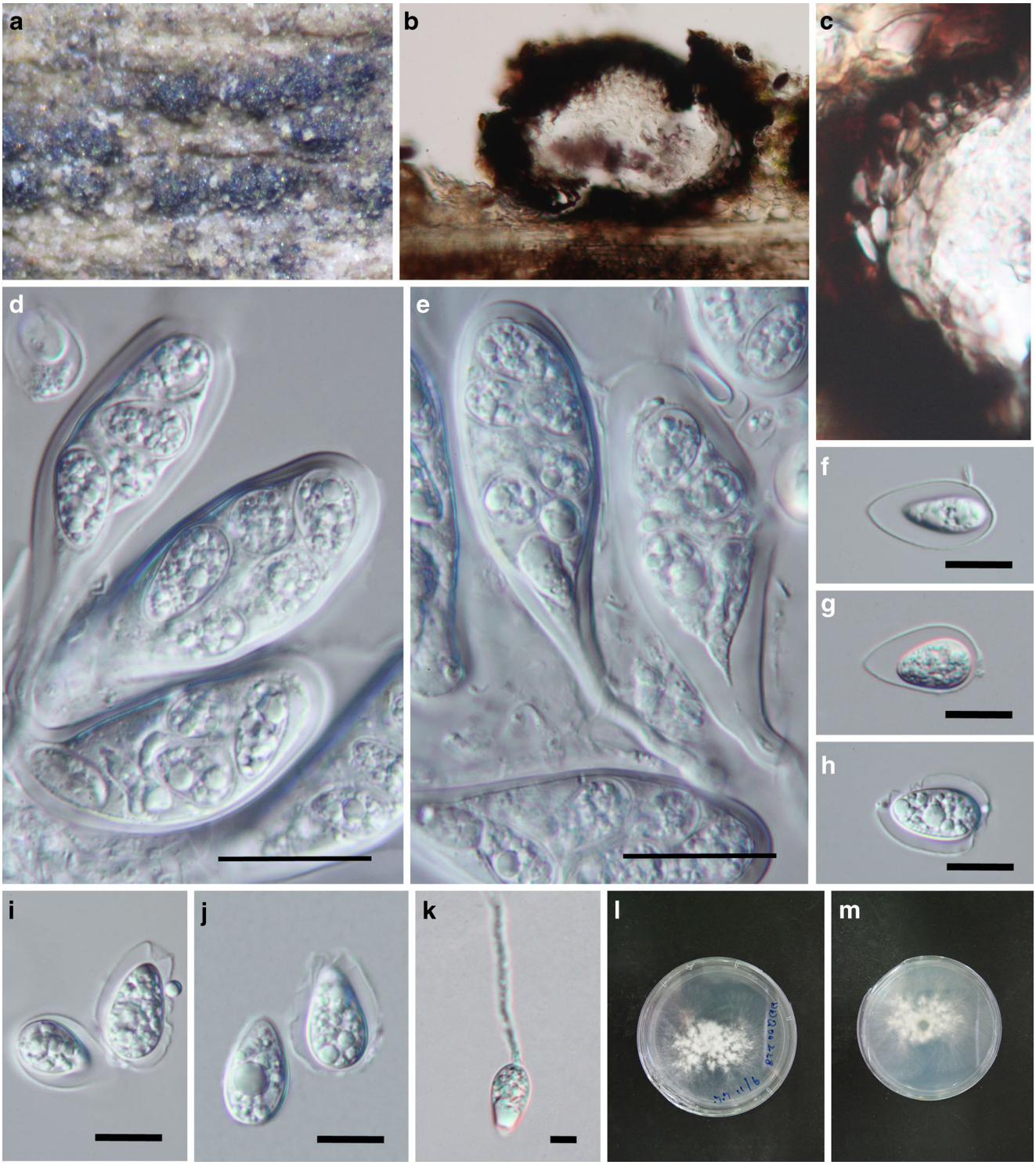
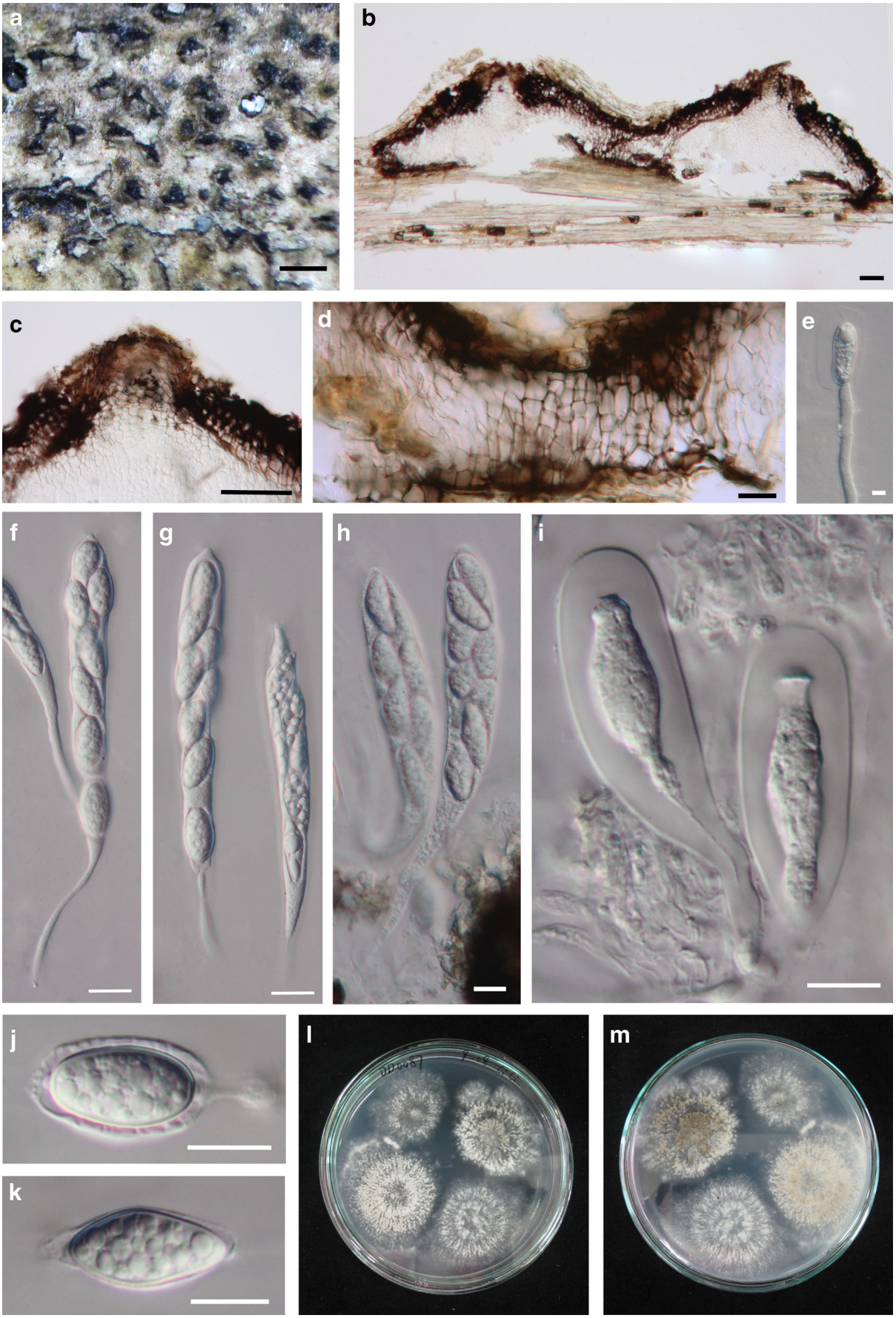


Fig. 2 *Neodeightonia microspora* (MFLU 15–1201, **holotype**). **a** Appearance of ascomata on bamboo host. **b** Vertical section of ascoma. **c** Peridium. **d**, **e** Asci with eight ascospores. **f**–**j** Ascospores surrounded by mucilaginous sheath. **k** Germinating ascospore. **l**, **m** Cultures on PDA. Scale bars: d, e = 20 *μm*, f–j = 10 *μm*

this family are two typies. Type I: The asci are scattered irregularly over the whole ascostromata. Type II: The asci are localized in definite regions, usually forming at the base of the ascostromata, which are differentiated into sterile and fertile regions (Miller 1940; Dissanayake et al. 2014). Species of *Myriangiaceae* are usually epiphytic on bark, leaves and branches of various plants (Hyde et al. 2013; Dissanayake et al. 2014).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◀ **Fig. 3** ***Neodeightonia subglobosa*** (MFLU 15–1189, **reference specimen**). **a** Appearance of ascomata on bamboo. **b** Vertical section of ascoma. **c** Ostiole of ascoma. **d** Peridium. **e** Germinating ascospores. **f–g** Asci. **i** Immature asci. **j**, **k** Ascospores. **l**, **m** Culture on PDA. Scale bars: a = 200 μm, b, c = 50 μm, d–k = 10 μm

Mendogia Racib., Parasit. Alg. Pilze Java's (Jakarta) 3: 31 (1900)

Epiphytic on living bamboo culms or palms. **Sexual morph**: *Ascostromata* small to large, solitary to gregarious, superficial, round to irregular, black, carbonaceous, flattened, with central area slightly raised, and peripheral wall of stromata cracking, pseudoparenchymatous tissue and asci growing under stroma, revealing the dark brown inner issue, with irregular edge, rugose to rugulose at the surface, loculate, easily removable from the host, with asci separated by paraphysoid-like filaments or pseudoparenchymatous cells. *Wall of ascostromata* consisting of two layers, outer layer composed of black, thin carbonaceous tissue, easily breaking; inner layer composed of large, hyaline to pale-brown to dark brown pseudoparenchymatous cells of *textura angularis*. *Hamathecium* with asci or paraphysoid-like filaments. *Asci* 8-spored, thick-walled, bitunicate, fissitunicate, subglobose to clavate, or cylindrical, with rounded pedicel, with a distinct ocular chamber. *Ascospores* irregularly arranged, ellipsoidal, muriform, with rounded ends, hyaline, smooth-walled. **Asexual morph**: Undetermined.

Type species: ***Mendogia bambusina*** Racib., Parasit. Alg. Pilze Java's (Jakarta) 3: 31 (1900)

Notes: Mendogia was introduced by Raciborski (1900) based on a single species on a bamboo host, collected in Java, Indonesia. Two more species *Mendogia manaosensis* (Henn.) Theiss. & Syd. and *Mendogia philippinensis* (Syd. & P. Syd.) Arx & E. Müll. observed on palms were named under this genus (Hennings 1904; von Arx and Müller 1975). *Mendogia* is characterized by small to large, black, rather flattened ascostromata, and subglobose to clavate asci, producing eight muriform ascospores. This genus was earlier placed in family *Schizothyriaceae* by von Arx and Müller (1975). Without molecular data, Hyde et al. (2013) and Wijayawardene et al. (2014) followed this placement.

In this study, we re-examined the type species *Mendogia bambusina* Racib. and introduce a new species, *Mendogia macrostroma*, from a bamboo host. Multi-gene (SSU, LSU and TEF1) phylogenetic analyses indicate that *Mendogia* belongs to order *Myriangiales* (97/97 % MPBP/MLBP) in the family *Myriangiaceae* (94/97 % MPBP/MLBP) (Fig. 5). This genus can phylogenetically be separated from similar studied genera (*Anhellia* and *Myriangium*) with high bootstrap support (99/100 % MPBP/MLBP) (Fig. 5).

Mendogia bambusina Racib., Parasit. Alg. Pilze Java's (Jakarta) 3: 31 (1900)

Facesoffungi number: FoF 01967; Fig. 6

Epiphytic on living bamboo culms. **Sexual morph**: *Ascostromata* 0.98–1.85 mm diam., scattered, solitary to gregarious, superficial on host surface, black, flattened, circular to round, hemisphaerical or shield-shape, rugulose, sunken near the edge, easily removed from the host, loculate, glabrous, walls rough, carbonaceous at the outer surface, with centre sterile region and fertile region located near the margin. *Fertile region* locule-like, 100–210 μm high, 260–420 μm diam. in vertical section, forming as circular ring near the edge of ascostroma, immersed in ascostroma, raised, subglobose to hemisphaerical, with asci separated by paraphysoid-like filaments, discharging asci and ascospores via cracking of the outer walls, with slit-like opening. *Peridium* 15–60 μm wide, thick-walled, of unequal thickness, thick at the rim, slightly thin at the base, composed of two layers, of dark brown to black cells, outer layers comprising thick, black, melanized cells, carbonaceous, arranged in a *textura angularis*, inner layers comprising thick, brown to dark brown, pseudoparenchymatous cells, arranged in *textura angularis*. *Hamathecium* composed of dense, 1.5–4 μm wide, paraphysoid-like filaments, septate, constricted at the septum, anastomosing among the asci. *Asci* arranged in type II, (55–)60–75(−80)(−90) × (17–)18–22(−25) μm ($\bar{x}$ = 71.6 × 20.5 μm, n = 25), 8-spored, bitunicate, fissitunicate, cylindric-clavate to clavate, short pedicellate, apically rounded with well-developed ocular chamber, thickened at the apex. *Ascospores* (13.5–)17–20(−25) × (5–)6–8 μm ($\bar{x}$ = 19.4 × 6.7 μm, n = 30), overlapping, uni- to tri-seriate, hyaline, ellipsoidal to clavate, muriform, with 3–5 transverse septa and 1–2 longitudinal septa, constricted at the septum, smooth-walled. **Asexual morph**: Undetermined.

Material examined: INDONESIA, Jawa Barat (West) District, Java, Buitenzorg, on bamboo, 1907, G. v. Höhnel (S, F48345).

Notes: *Mendogia bambusina* differs from other *Mendogia* species in having asci arrainged in a fertile region lying as concentric rings near the edge of ascostroma, with muriform ascospores, having 4–5 transverse septa and 1–2 longitudinal septa.

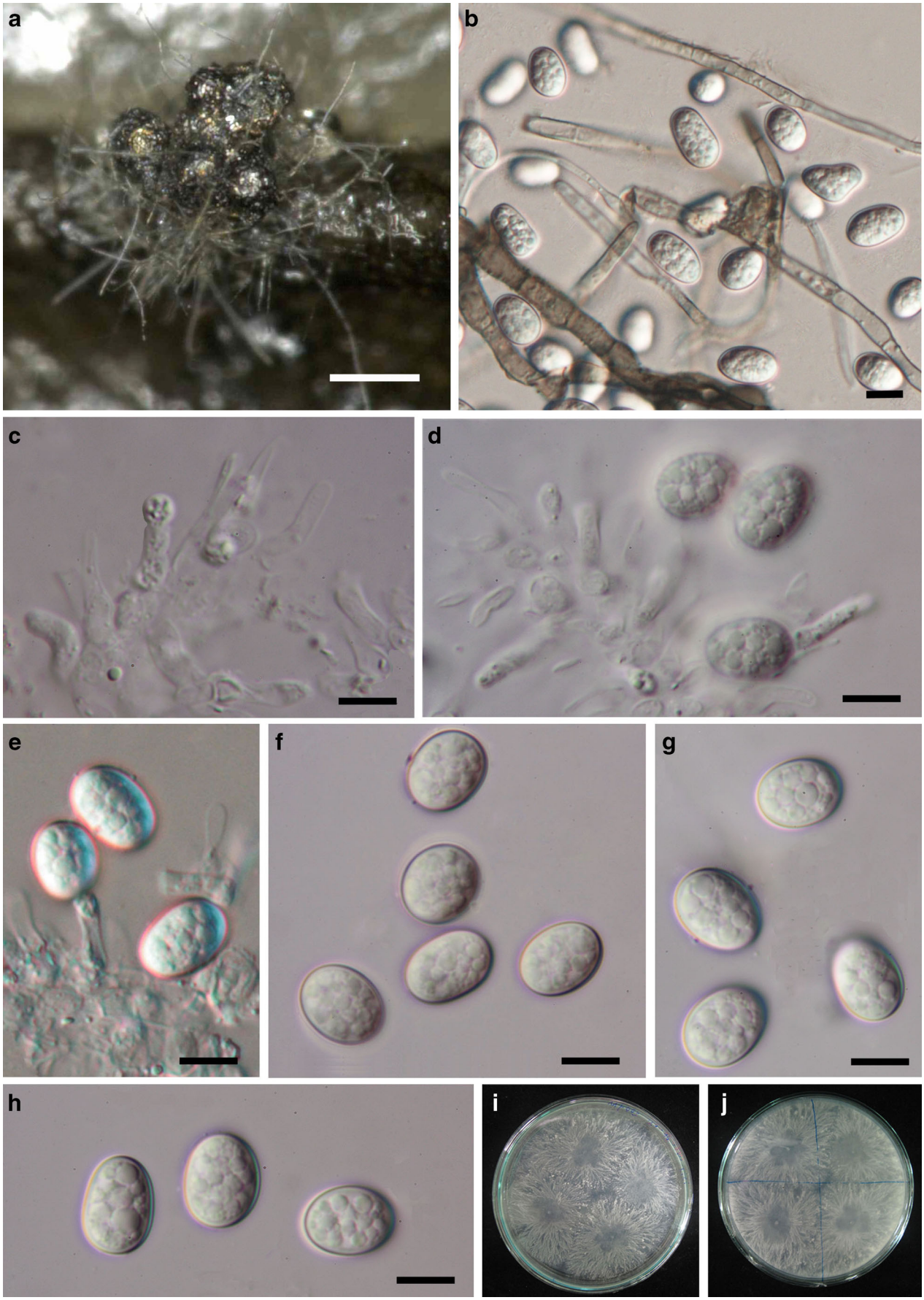
Mendogia macrostroma D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552020; *Facesoffungi number*: FoF 01968; Fig. 7

Etymology: In reference to it's large stromata.

Holotype: MFLU 13–0642

Epiphytic on living bamboo culms. **Sexual morph**: *Ascostromata* 10–20 × 5–15 mm, 130–200 μm high, solitary, or gregarious up to 25 × 20 mm, superficial, round, elliptical to irregular, black, coriaceous, flattened, with central area slightly raised, and peripheral wall of stromata cracking, revealing the dark brown inner issue, pseudoparenchymatous tissue and asci growing under stroma, with irregular edge, rugose to rugulose at surface, multi-loculate, easily removable from the host. *Surface cells of ascostromata* 20–30 μm thick,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◀ **Fig. 4** ***Neodeightonia subglobosa*** (MFLUCC 11–0388). **a** Appearance of conidiomata on pine needles. **b**, **f**–**h** Conidia. **c**–**e** Conidiogenous cells. **i**, **j** Cultures on PDA. Scale bars: a = 200 *μm*, b–h = 10 *μm*

composed of black tissue, easily breaking. *Cells between asci* 100–150 μm thick composed of large, hyaline, pseudoparenchymatous cells of *textura angularis*. *Hamathecium* with only asci; *pseudoparaphyses* not observed. *Asci* arranged in type II, 72–85 × 28–33.5 μm ($\bar{x}$ = 76.6 × 31.2 μm, *n* = 20), 8-spored, bitunicate, fissitunicate, subglobose to clavate, with rounded pedicel, with a distinct ocular chamber. *Ascospores* 20–27 × 9–11 μm ($\bar{x}$ = 24.2 × 10.1 μm, *n* = 20), irregularly arranged, hyaline, ellipsoidal, with rounded ends, muriform, with 4–6 transverse septa and 2–4 longitudinal septa, constricted at the septa, smooth-walled, narrow at basal end, occasionally narrow at both ends. **Asexual morph**: Undetermined.

Material examined: THAILAND, Chiang Rai, Khun Korn Waterfall, on living culms of bamboo, 5 October 2012, Dong-Qin Dai DDQ00255 (MFLU 13–0642, **holotype**); *Ibid*. (KUN HKAS88716, **isotype**); *Ibid*., August 2014, R. Phookamsak RP0134 (KUN HKAS83874).

Notes: *Mendogia macrostroma* differs morphylogically from other species of *Mendogia* by its large ascostromata (10–20 × 8–15 mm vs. less than 4 mm diam.) and wider asci (28–33.5 μm vs. less than 25 μm) (Hennings 1904; Sydow and Sydow 1914a, 1917). The new taxon can be compared with *Myriangium haraeanum* F.L. Tai & C.T. Wei (synonym: *Myriangium bambusae* Hara 1913) in having dark, flattened ascostromata and muriform ascospores (Tai and Wei 1933; Eriksson and Yue 1998). However, the new species differs in having larger ascostromata (10–20 × 8–15 mm vs. 1–3 mm in diam.). Moreover, *Mendogia macrostroma* has subglobose to clavate asci, whereas *Myriangium haraeanum* has cylindrical asci (Tai and Wei 1933).

Pleosporales Luttr. ex M.E. Barr 1987

Pleosporales, the largest order of *Dothideomycetes*, was introduced by Nitschke (1869), and later validated by Barr (1987). Luttrell (1975) included eight families in this order, Kirk et al. (2008) listed 23 families, Lumbsch and Huhndorf (2010) accepted 28 families and Zhang et al. (2012) included 25 families in the phylogenetic analysis. Fourty-one families were placed in *Pleosporales* by Hyde et al. (2013), based on the

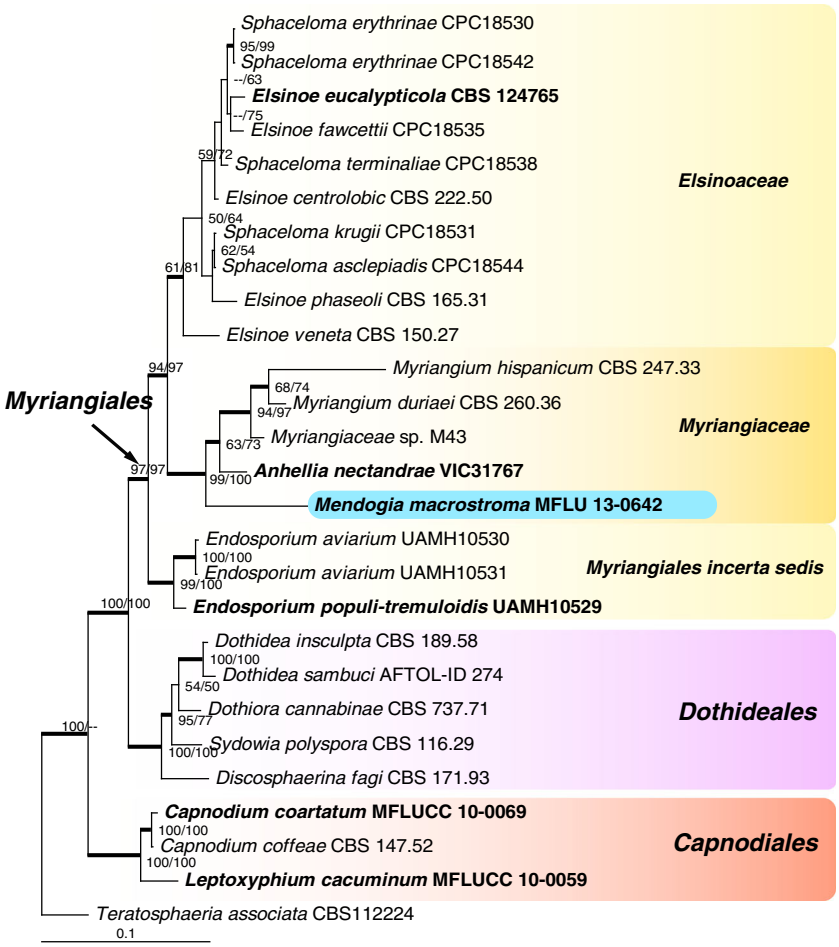


Fig. 5 Maximum likelihood phylogenetic tree (lnL = −2981.957640) generated by RAxML (GTR+G model) based on combined SSU, LSU and TEF1 sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes and branches with Bayesian posterior probabilities greater than 0.90 are in bold. The original isolate or specimen numbers are noted after the species names. The tree is rooted to *Teratosphaeria associata* (CBS 112224). Ex-type strains are in *bold*. Newly generated sequence is highlighted with a *blue* background

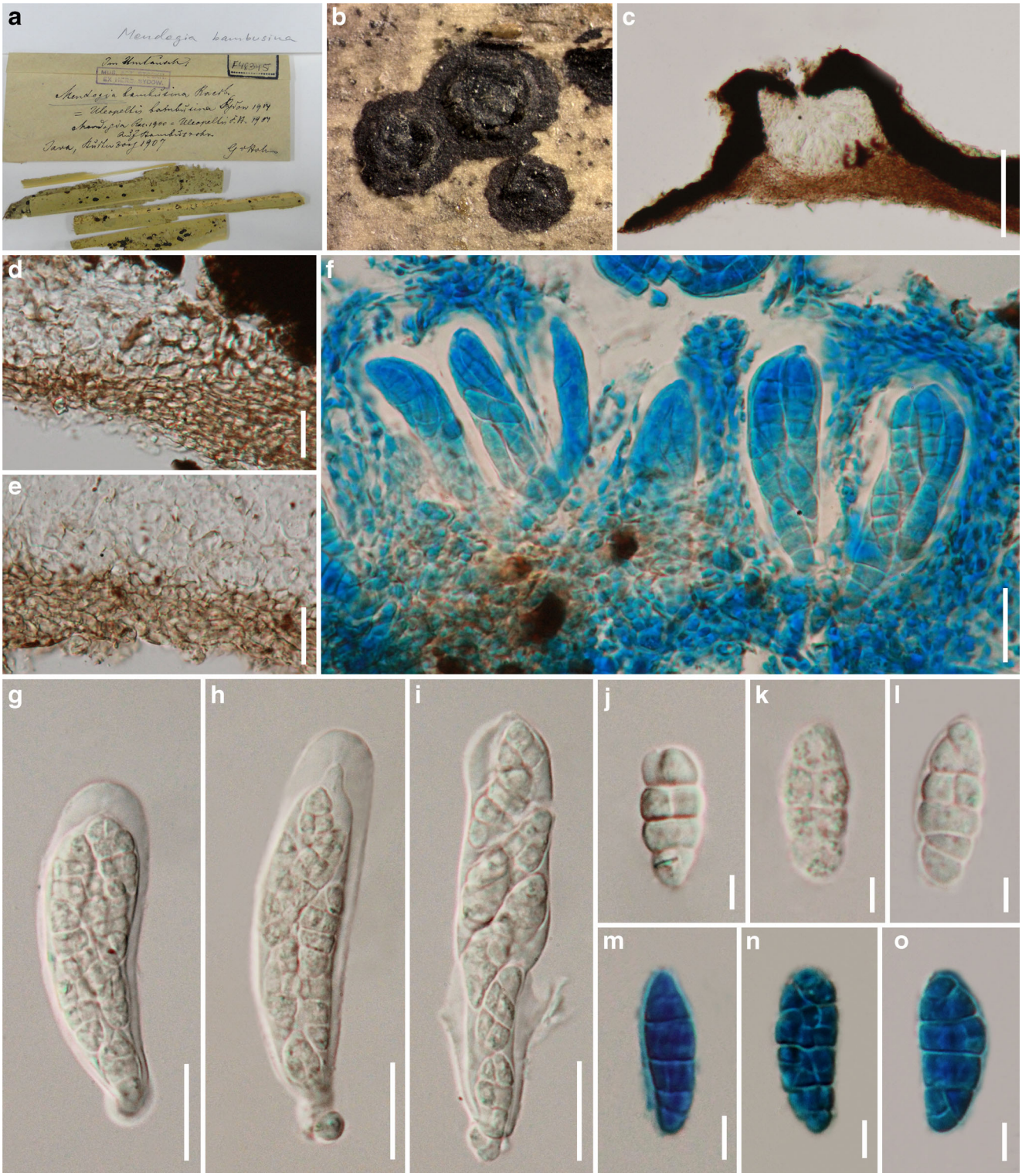


Fig. 6 ***Mendogia bambusina*** (S F48345). **a** Herbaium materials. **b** Black ascostromata on bamboo host. **c** Section of ascostroma. **d**, **e** Peridium. **f** Asci separated by paraphysoid-like filaments. **g**–**i** Asci. **j**–**o** Ascospores (**m**–**o**: Ascospores stained in cotton blue). Scale bars: c = 100 *μm*, d–i = 20 *μm*, j–o = 5 *μm*

multi-gene analyses and morphological study of family types. However, Wijayawardene et al. (2014) accepted 39 families. Two new families (*Parabambusicolaceae* Kaz. Tanaka & K. Hiray. and *Sulcatisporaceae* Kaz. Tanaka & K. Hiray.) were introduced by Tanaka et al. (2015) in the suborder *Massarineae* of the *Pleosporales*.

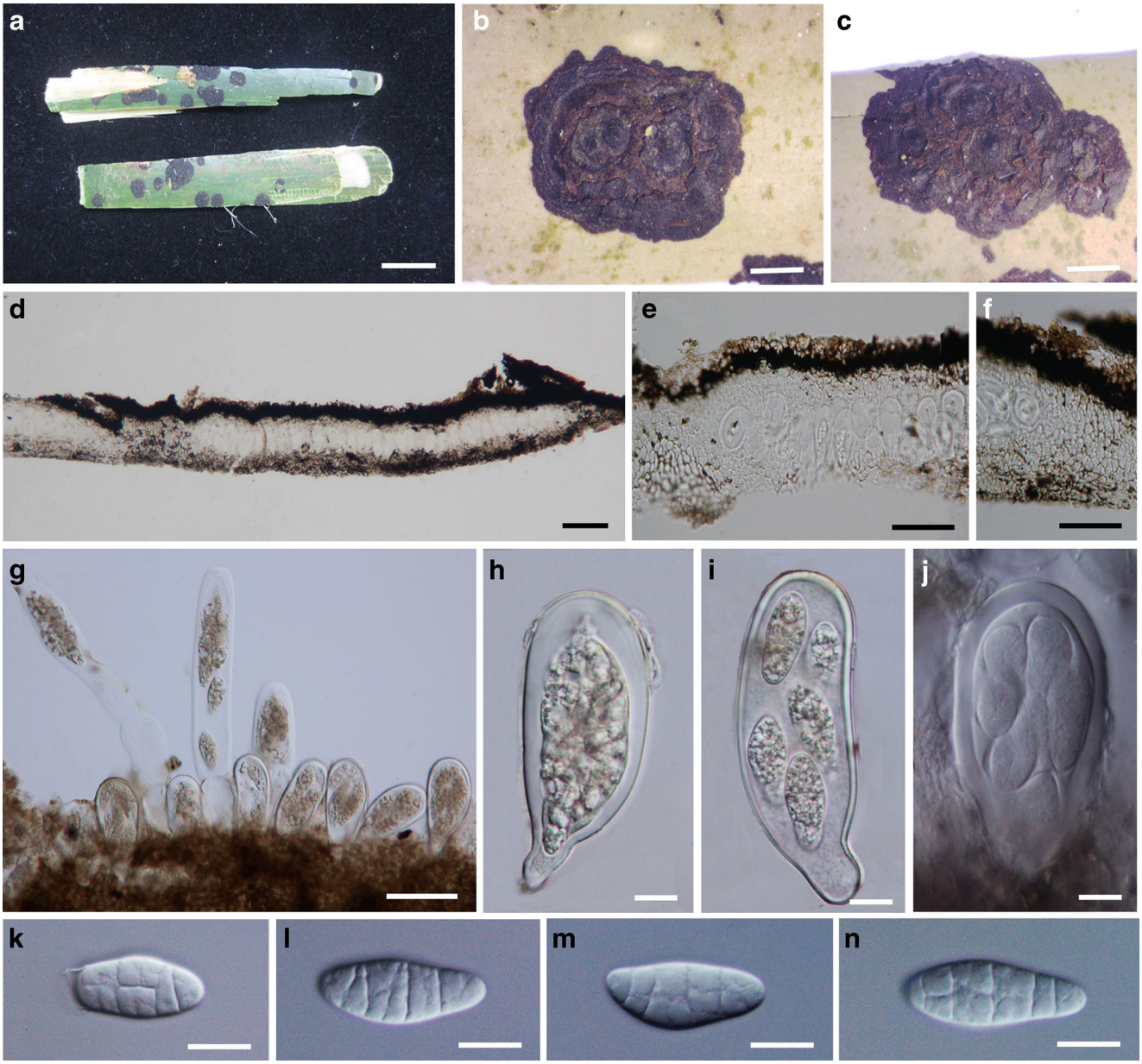


Fig. 7 ***Mendogia macrostroma*** (MFLU 13–0642, **holotype**). **a** Type material. **b**, **c** Black ascostromata on host. **d** Vertical section of ascostroma. **e**, **f** Surface cells of ascostromata and pseudoparenchymatous cells between asci. **g**–**j** Asci (**g**: Showing fissitunicate dehiscence). **k**–**n** Ascospores. Scale bars: a = 2 mm, b, c = 1 mm, d–g = 100 *μm*, h–j = 20 *μm*

Ariyawansa et al. (2015) introduced three more new families *Ascocylindricaceae* Abdel-Wahab et al., *Caryosporaceae* H. Zhang et al. and *Wicklowiaceae* Ariyawansa & K.D. Hyde in *Pleosporales*.

Bambusicolaceae D.Q. Dai & K.D. Hyde, Fungal Diversity 63: 49 (2013)

The family *Bambusicolaceae* was introduced by Hyde et al. (2013), with the type genus *Bambusicola*, to accommodate taxa with small, immersed ascomata, with cellular to trabeculate pseudoparaphyses, cylindrical, bitunicate asci and fusiform ascospores, and usually inhabiting bamboo. Crous et al. (2014b) isolated a related asexual taxon from leaves of *Strelitzia nicolai* (*Strelitziaceae*) and introduced a new genus *Neobambusicola*. Liu et al. (2015) described *Palmiascoma* from a dead palm frond, thus widening the family concept (Dai et al. 2015). The species of *Bambusicolaceae* usually produce asxual morph on host substrate or on culture, with holoblastic, annelidic or phialidic conidiogenous cells (Dai et al. 2012; Crous et al. 2014b; Liu et al. 2015). In this paper, we provide a multi-gene (SSU, LSU, TEF1 and RPB2 sequence data) phylogram for all genera of *Bambusicolaceae* (Fig. 8).

Bambusicola D.Q. Dai & K.D. Hyde, Cryptog. Mycol. 33(3): 367 (2012)

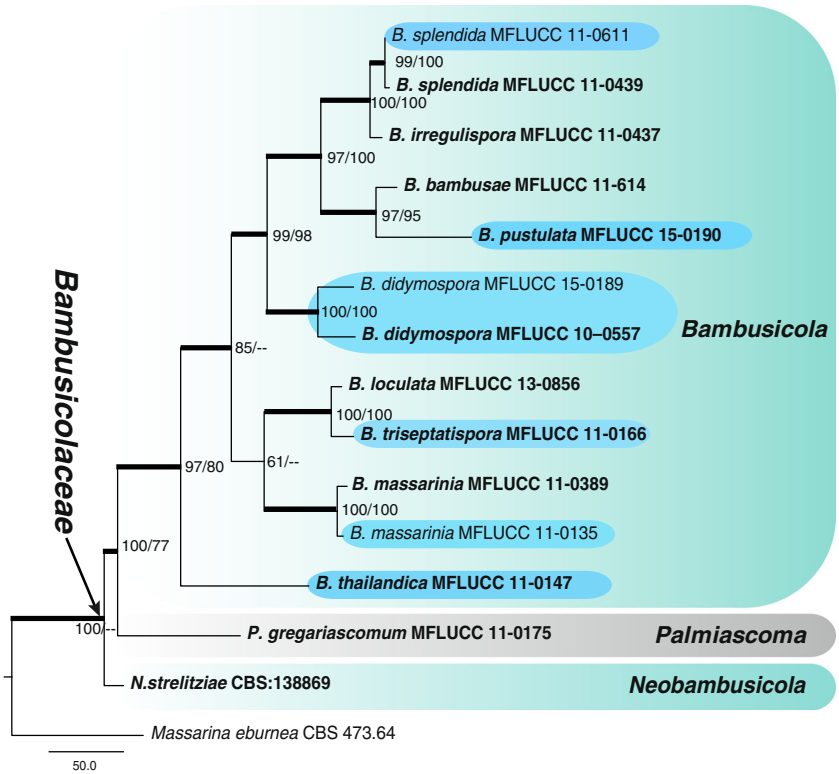


Fig. 8 Maximum likelihood phylogenetic tree generated by RAxML (GTR+G model) based on analysis of combined SSU, LSU, TEF1 and RPB2 sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Massarina eburnea* (CBS 473.64). Ex-type strains are in *bold*. Newly generated sequences are highlighted with a *blue* background

Bambusicola was introduced by Dai et al. (2012) and typified by *B. massarinia* D.Q. Dai & K.D. Hyde. This genus is characterized by ascomata forming dark to light raised areas on the host surface with an asexual morph typified by holoblastic, annelidic conidiogenous cells and cylindrical conidia. *Bambusicola* now contains nine species including four new species described in this paper (Dai et al. 2012, 2015).

Key to species of *Bambusicolaceae*

1. Fruiting bodies ascostromata.....2
1. Fruiting bodies conidiomata only.....10
2. Ascospores hyaline.....3
2. Ascospores dark brown.....*Palmiascoma gregariascomum*
3. Ascostromata containing a single locule.....5
4. Ascostromata containing more than one locule.....**Bambusicola loculata**
5. Ascospores 3-septate.....6
5. Ascospores 1-septate.....7
6. Ascostromata less than 160 μm high × 450 μm diam.....**B. thailandica**
6. Ascostromata more than 160 μm high × 450 μm diam.....**B. triseptatispora**
7. Ascostromata forming dark, rounded, raised spots, on host surface, with a black halo around the ostiolar opening.....8
7. Ascostromata forming light coloured, raised spots, on the host surface, with split ostiolar opening.....9
8. Asexual morph with cylindrical conidia.....**B. massarinia**
8. Asexual morph with oblong to ellipsoidal conidia.....**B. didymospora**
9. Ascospores larger than 15 μm × 3 μm.....*B. bambusae*
9. Ascospores smaller than 15 μm × 3 μm.....*B. pustulata*
10. Conidia fusoid-ellipsoid.....*Neobambusicola strelitziae*
10. Conidia cylindrical.....11
11. Conidiomata acerose, conidia 15–18 × 1.5–3 μm.....**B. irregulispora**
11. Conidiomata subglobose, conidia 20–30 × 3.5–5 μm.....**B. splendida**

Bambusicola didymospora Phookamsak, D.Q. Dai & K.D. Hyde, ***sp. nov.***

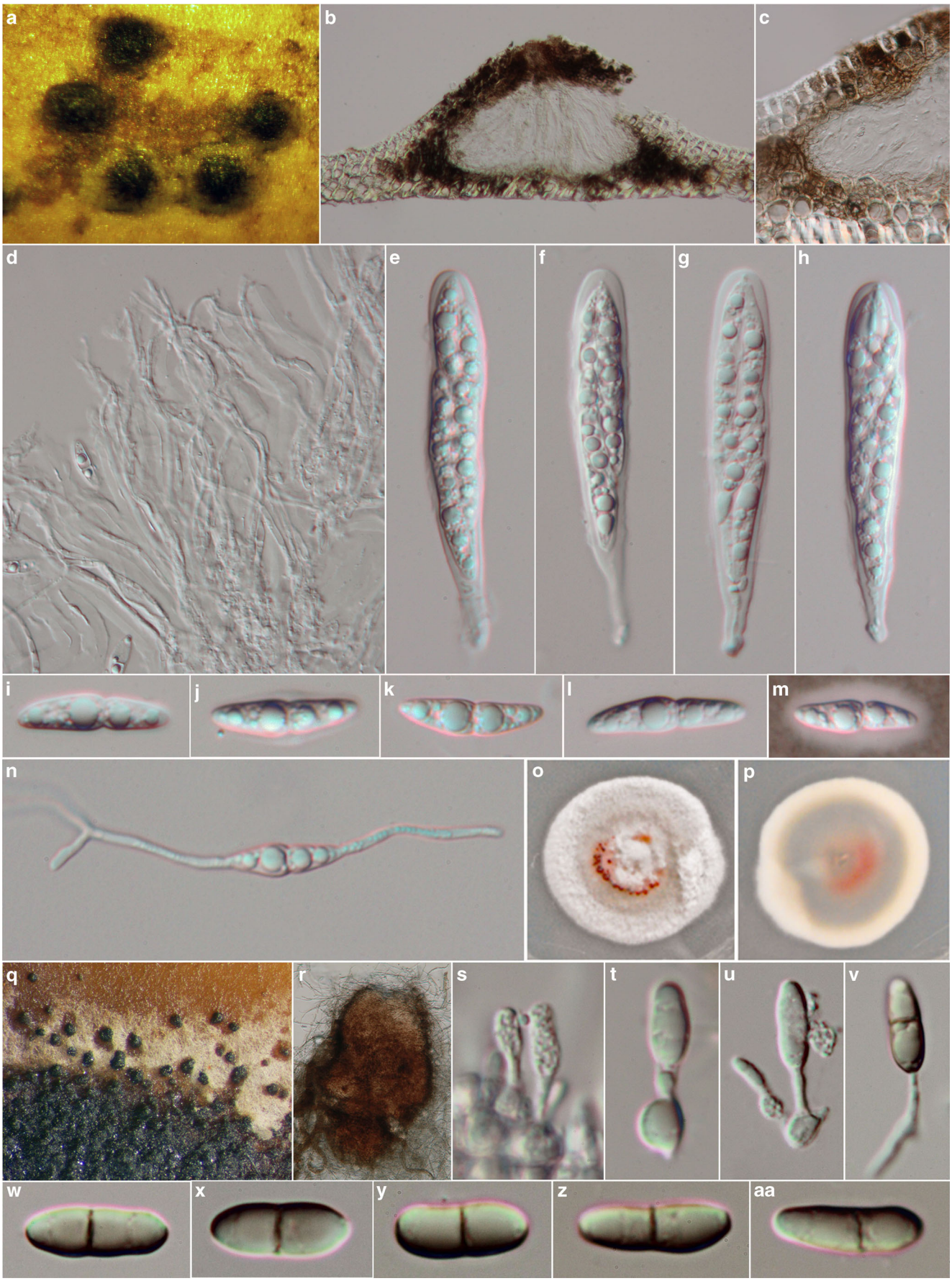
Index Fungorum: IF552021; *Facesoffungi number*: FoF 01969; Fig. 9

Etymology: The epithet "didymospora" refers to the didymosporous ascospores and conidia.

Holotype: MFLU 11–0149

Saprobic on dead bamboo culms, as raised, black, dome-shaped structures, on host surface. **Sexual morph**:

Fig. 9 ***Bambusicola didymospora*** (MFLU 11–0149, **holotype**). **a** Appearance of ascostromata on host surface. **b** Vertical section through ascoma. **c** Peridium. **d** Pseudoparaphyses. **e**–**h** Asci. **i**–**l** Ascospores. **m** Ascospore stained in Indian ink. **n** Ascospore germination on WA. **o**, **p** Culture characteristics (upper and lower sides). **q**, **r** Conidiomata produced on culture colony. **s**–**v** Conidiogenous cells producing conidia. **w**–**aa** Conidia. Scale bars: b = 100 *μm*, c, r = 50 *μm*, d, e–h, n = 20 *μm*, i–m = 10 *μm*, s–aa = 5 *μm*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Ascostromata 90–155 μm high, 310–400 μm diam., solitary, scattered to gregarious, immersed in host cortex, with red pigment in the ostiole, with flattened base, convex or dome-shaped, uni-loculate, rarely bi-loculate, with centrally located ostiole. *Peridium* 16–33 μm wide, thin- to thick-walled, of unequal thickness, poorly developed at the base, composed of several layers of dark brown to black, pseudoparenchymatous cells, intermixed with host cells, arranged in a *textura angularis*, coriaceous. *Hamathecium* of dense, 0.5–1.5 μm wide, filamentous, indistinct, septate, cellular pseudoparaphyses, not constricted at the septum, slightly rough-walled, anastomosing at the apex, embedded in a hyaline gelatinous matrix. *Asci* 55–85 × 9–13 μm ($\bar{x}$ = 71 × 11.2 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindric-clavate to clavate, short pedicellate, apically rounded, with an ocular chamber. *Ascospores* 17–23 × 4.5–6 μm ($\bar{x}$ = 20.7 × 5.6 μm, n = 25), overlapping bi-seriate, hyaline, fusiform, with rounded to acute ends, 1-septate, constricted at the septum, upper cell larger than lower cell, smooth-walled, guttulate, surrounded by a mucilaginous sheath. **Asexual morph**: Coelomycetous, produced in culture after 4 months. *Conidiomata* 90–210 μm high, 95–180 μm diam., pycnidial, solitary, semi-immersed to embedded in agar, visible as raised, black dots, ovoid to obpyriform, or irregular in shape, uni-loculate, ostiolate, covered by vegetative hyphae. *Wall of conidiomata* thin-walled, composed of a few layers of orangish brown to dark brown, pseudoparenchymatous cells, arranged in *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* (2–)5–8 × 1–3 μm ($\bar{x}$ = 5.5 × 2 μm, n = 30), enteroblastic, phialidic, determinate, discrete, cylindrical to ampulliform, hyaline, aseptate, apically attenuated, with distinct periclinal thickening, smooth-walled. *Conidia* (9.5–)10–13(−15) × 4–5 μm ($\bar{x}$ = 12.5 × 4.5 μm, n = 30), pale brown, oblong to ellipsoidal, rounded apex, with truncate base, 1-septate, slightly constricted at the septum, smooth-walled.

Culture characters: Colonies on MEA 26–30 mm diam. after 2 weeks at 25–30 °C, under 12 h light/12 h dark, circular, dense, flat, slightly raised, dull with entire edge, fluffy to floccose, with regular edge; white at the margin, becoming greyish at the center with red droplets; reverse white to cream at the margin, greenish-grey at middle, pale yellowish to reddish, slightly radiating with pale yellowish concentric ring; non-pigmented, forming black pycnidia at the margin.

Material examined: THAILAND, Chiang Rai, Muang District, Huai Mae Sai Waterfall, on dead culms of bamboo, 10 March 2010, R. Phookamsak, RP0028 (MFLU 11–0149, **holotype**), ex-type living culture, MFLUCC 10–0557, KUMCC; Phang-Nga Province, Amphoe Mueang Phang-nga, Tambon Tham Nam Phut, forest, 8°26′24″N 98°32′15″ E, on dead culms of bamboo, 5 December 2014, Kevin D. Hyde DDQ00288 (MFLU 16–0882, **paratype**), living cultures, MFLUCC 15–0189, MUCL 55886.

Notes: *Bambusicola didymospora* is similar to *B. massarinia* D.Q. Dai & K.D. Hyde, *B. bambusae* D.Q. Dai & K.D. Hyde, *B. loculata* D.Q. Dai & K.D. Hyde and *B. pustulata* D.Q. Dai & K.D. Hyde in having didymosporous, fusiform ascospores with rounded ends. However, *B. didymospora* differs from *B. massarinia* in its asexual morph. *Bambusicola didymospora* forms oblong to ellipsoidal, brown to reddish brown conidia, with phialidic conidiogenous cells, while *B. massarinia* forms cylindrical, pale brown conidia with many guttules; phialidic conidiogenous cells were not observed (Dai et al. 2012). *Bambusicola didymospora* differs from *B. loculata* in having scattered ascostromata, while *B. loculata* forms multi-loculate ascostromata (Dai et al. 2015). *Bambusicola didymospora* differs from *B. bambusae* and *B. pustulata* in having immersed ascostromata strongly raised from host surface, black, dome-shaped, however, in *B. bambusae* and *B. pustulata* darken only at the slightly raised cracks (Dai et al. 2012). Multi-gene phylogenetic analyses show that *B. didymospora* forms a robust clade close to *B. bambusae* and *B. pustulata*, but is distinct with high boostrap support (99/98 % MPBP/MLBP, BYPP value greaer than 0.90).

Bambusicola pustulata D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum numbers: IF552022; *Facesoffungi numbers*: FoF 01970; Fig. 10

Etymology: In reference to the ascomata rising as pustules.

Holotype: MFLU 15–1216

Saprobic on dead culm of bamboo, forming dark pustule-like spots on the host surface with ascostromata breaking through raised cracks at the centre. **Sexual morph**: *Ascostromata* 100–125 μm high, 250–300 μm diam., solitary, scattered or in groups of 2–5, immersed under the host tissue, uni-loculate, subglobose, light brown, coriaceous, ostiolate at the centre, black at the apex of ostiolar opening, 40–45 μm diam. and 30–35 μm high. *Peridium* comprising several layers of host and fungal tissues, laterally 30–45 μm thick, composed of brown to hyaline cells of *textura angularis*, intermingled with host cells, basal part poorly developed; wedge of palisade-like cells at the periphery: 80–105 μm thick, composed of large, thick-walled, dark brown, 4.5–8 × 1–3 μm, cells. *Hamathecium* of dense, long, 0.5–1 μm broad, septate, branched, anastomosing, trabeculate pseudoparaphyses, occurring between and above the asci. *Asci* 40–60 × 5.5–7 μm ($\bar{x}$ = 52.6 × 6.3 μm, n = 10), 8-spored, bitunicate, fissitunicate, cylindrical, with a shallow apical chamber and a short furcate pedicel. *Ascospores* 11.5–17.5 × 2.5–3.8 μm ($\bar{x}$ = 14.2 × 2.9 μm, n = 20), 2–3-seriate, hyaline, fusiform, 1-septate, occasionally with large upper cell, with narrowly rounded ends, smooth-walled, surrounded by a thick gelatinous sheath 2.5–4.5 μm wide; each cell with 1–2 guttules. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced at both ends. *Colonies* slow

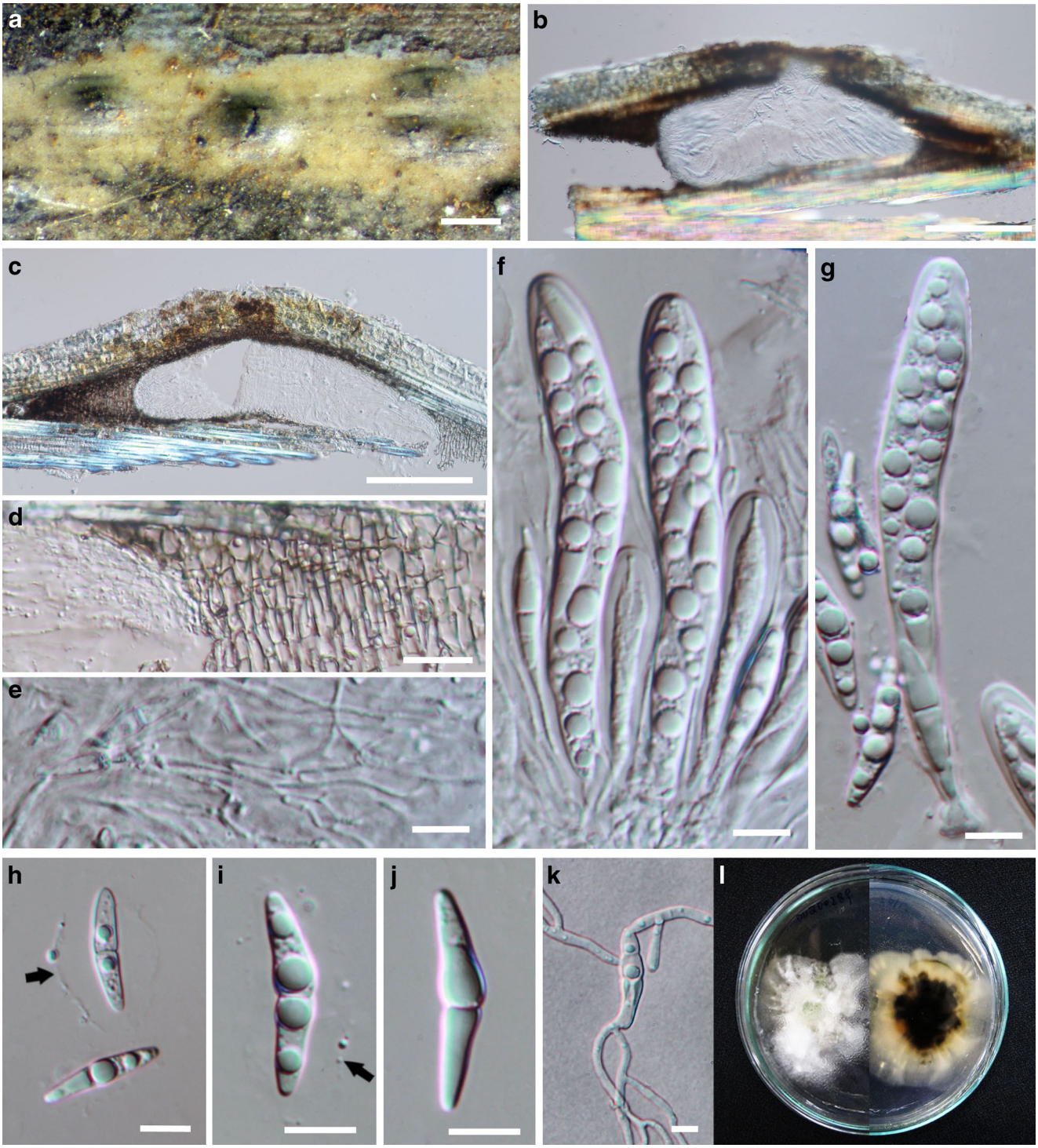


Fig. 10 ***Bambusicola pustulata*** (MFLU 15–1216, **holotype**). **a** Appearance of ascostromata on bamboo host. **b**, **c** Vertical section of ascostromata. **d** Peridium. **e** Pseudoparaphyses. **f**, **g** Asci. **h**–**j** Ascospores (**h**, **i** Ascospores surrounded by gelatinous sheath). **k** Germinating ascospore. **i** Cultures on PDA. Scale bars: a = 500 *μm*, b, c = 100 *μm*, d = 10 *μm*, e–k = 5 *μm*

growing, attaining 35 mm diam. after 40 days at room temperature (25–28 °C), under 12 h light/12 h dark, circular, white on the periphery and yellowish green in center from above, dark yellow to black from below.

Material examined: THAILAND, Phang-Nga Province, Amphoe Mueang Phang-nga, Tambon Tham Nam Phut, forest, 8°26′24″N 98°32′15″E, on dead culms of bamboo, 5 December 2014, Kevin D. Hyde DDQ00289 (MFLU 15–1216, **holotype**); *Ibid*. (KUN HKAS88723, **isotype**), ex-type living cultures, MFLUCC 15–0190, MUCL 55887.

Notes: Bambusicola pustulata is similar to *B. bambusae* in having small, immersed ascostromata, cylindrical asci and

slightly broad fusiform, 1-septate, hyaline ascospores (Dai et al. 2012). However, this new taxon differs by having dark ascostromata and smaller ascospores (14.2 × 2.9 μm vs. 17.6 × 3.4 μm), and greener culture (Dai et al. 2012). The branch length of the phylogenetic tree (Fig. 8) also indicates they are different species.

Bambusicola thailandica Phookamsak, D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum: IF552023; *Facesoffungi number*: FoF 01971; Fig. 11

Etymology: The epithet "thailandica" refers to the country where the fungus was collected.

Holotype: MFLU 11–0183

Saprobic on dead bamboo culms. **Sexual morph**: *Ascostromata* 90–155 μm high, 310–400 μm diam., solitary, scattered to gregarious, immersed in host cortex to semi-immersed, erumpent through host tissue at maturity, visible as raised, dark spots on host surface, with flattened base, convex or dome-shaped, wedge-shaped at sides, uniloculate, glabrous, with centrally located ostiole, with a clypeus and flattened tope. *Peridium* 14–28 μm wide, thin-to thick-walled, of unequal thickness, poorly developed at the base, composed of several layers of dark brown to black, pseudoparenchymatous cells intermixed with host cells, arranged in a *textura angularis* to *textura epidermoidea*, coriaceous. *Hamathecium* of dense, 1–2 μm wide, filamentous, indistinctly septate, smooth-walled, cellular pseudoparaphyses, anastomosing at the apex, embedded in a hyaline, gelatinous matrix. *Asci* (60–)70–90(−97) × 10–12(−14) μm ($\bar{x}$ = 75.5 × 12 μm, n = 20), 8-spored, bitunicate, fissitunicate, broadly cylindrical to cylindri-clavate, with a short pedicel, apically rounded with well-developed ocular chamber. *Ascospores* (16–)18–22(−24) × (3.5–)4–6 μm ($\bar{x}$ = 20.8 × 5 μm, n = 30), overlapping, uni- to bi-seriate, hyaline, fusiform, with acute ends, 3-septate, slightly constricted at the median septum, smooth-walled. **Asexual morph**: Undetermined.

Culture characters: Colonies on MEA fast growing, 65–70 mm diam. after 4 weeks at 25–30 °C, under 12 h light/12 h dark, circular, medium dense, flat, slightly raised, smooth, with entire edge, fluffy to floccose, white to cream, reverse white to cream at the margin, reddish grey to greenish grey at middle, pale grey at the center, slightly radiating, not producing pigments.

Material examined: THAILAND, Chiang Rai Province, Muang District, Mae Fah Luang University campus grounds, on dead culms of bamboo, 13 August 2010, R. Phookamsak, RP0063 (MFLU 11–0183, **holotype**), ex-type living cultures, MFLUCC 11–0147, KUMCC.

Notes: *Bambusicola thailandica* is morphylogically similar to *B. triseptatispora* in having phragmospores, however, differs from latter in having a thiner and lighter peridium. Moreover, ascomata in *B. thailandica* have a flattened top, whereas, these in *B. triseptatispora* are pointed. *Bambusicola thailandica* forms a distinct clade in multigene analyses, at the base of *Bambusicola*, whereas *B. triseptatispora* clusters with *B. loculata* (Fig. 8).

Fig. 11 ***Bambusicola thailandica*** (MFLU 11–0183, **holotype**). **a** Appearance of ascomata on host surface. **b** Vertical section through ascoma. **c**, **d** Section through peridium. **e** Pseudoparaphyses. **f**–**h** Asci. **i**–**m** Ascospores. **n**, **o** Culture characteristics (upper and lower sides). Scale bars: b = 100 *μm*, c–h = 20 *μm*, i–m = 5 *μm*

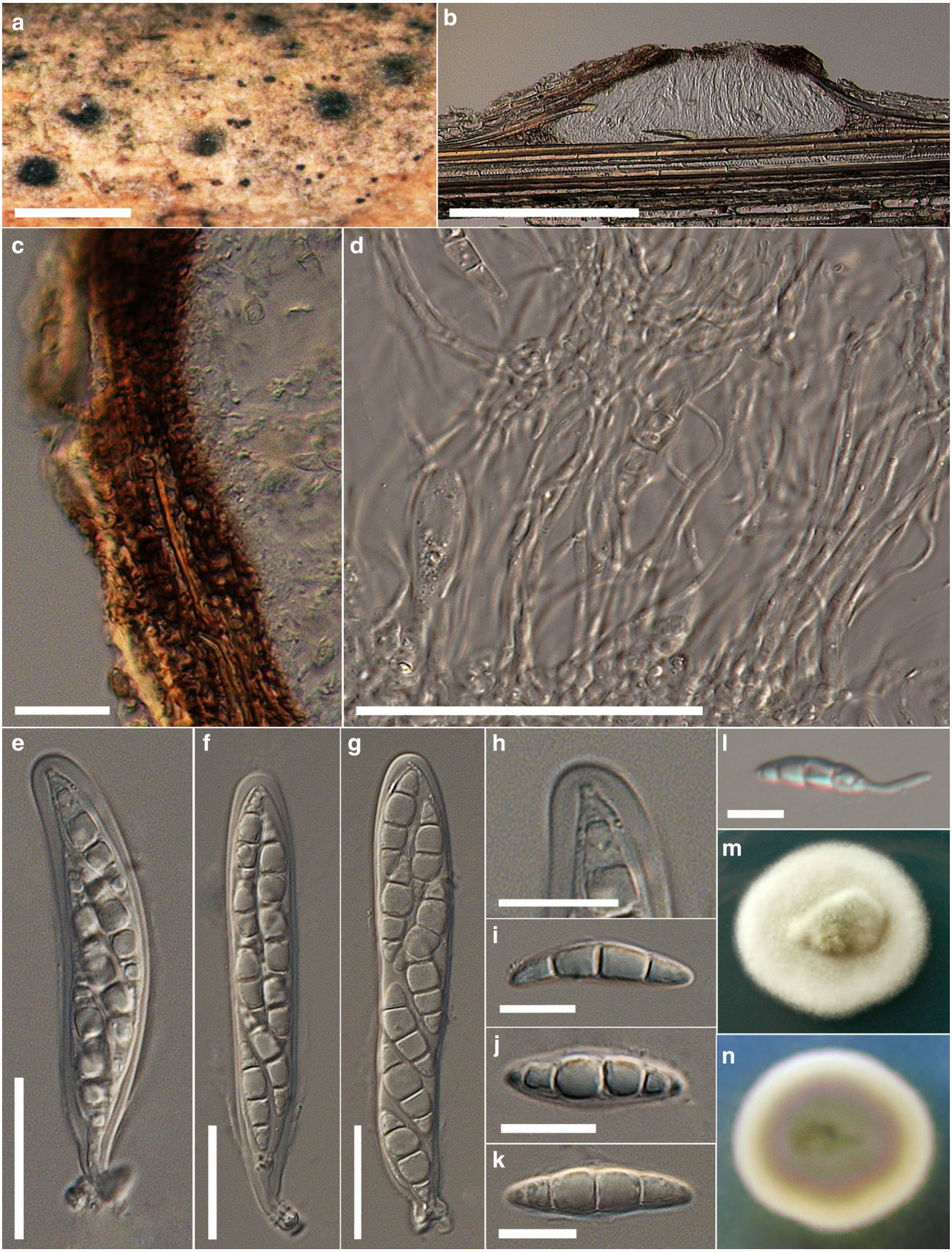
Bambusicola triseptatispora Phookamsak, D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum: IF552024; *Facesoffungi number*: FoF 01972; Fig. 12

Etymology: The epithet "*triseptatispora*" refers to the 3-septate ascospores and conidia.

Holotype: MFLU 11–0202

Saprobic on rotten dead bamboo culms. **Sexual morph**: *Ascostromata* 180–310 μm high, 470–730 μm diam., scattered to clustered, solitary to gregarious, immersed, sub-epidermal, visible as raised, black structures on the host surface, with flattened base, convex or dome-shaped to ampulliform, uni-loculate; sometimes forming pseudostroma, bi- to tri-loculate, glabrous, centrally ostiolate ascomata. *Peridium* 10–40 μm wide, thin- to thick-walled, of unequal thickness, slightly thick at the sides, poorly developed at the base, composed of several layers of brown to dark brown, pseudoparenchymatous cells interdispersed with host cells, with inner layers comprising several layers of hyaline *textura angularis* cells, outer layers comprising several layers of flattened, brown to dark brown *textura angularis* cells, coriaceous. *Hamathecium* dense, filamentous, 1–2 μm wide, distinctly septate, smooth-walled, cellular pseudoparaphyses, anastomosing at the apex, embedded in a hyaline gelatinous matrix. *Asci* (78–)80–100(−110) × 10–12(−14) μm ($\bar{x}$ = 95 × 11.1 μm, n = 30), 8-spored, bitunicate, fissitunicate, cylindrical to cylindri-clavate, short pedicellate, apically rounded, with well-developed ocular chamber. *Ascospores* (25–)26–30(−31) × 4–6 μm ($\bar{x}$ = 27.7 × 5.5 μm, n = 30), overlapping, uni- to bi-seriate, hyaline to pale brown, fusiform, with acute ends, 3-septate, rarely constricted at septa, smooth-walled, surrounded by an irregular mucilaginous sheath. **Asexual morph**: Coelomycetous, produced on bamboo pieces on WA after 2 months. *Conidiomata* 350–480 μm high, 420–700 μm diam., pycnidial, solitary to gregrarious, semi-immersed at the base, becoming superficial, visible as raised, black dots on colonies, eustromatic or sometimes pseudostromatic, irregularly shaped, uni- to multi-loculate, covered by vegetative hyphae, with indistinct ostioles. *Wall of Comidiomata* 17–60 μm wide, thin- to thick-walled, of unequal thickness, slightly thick at sides, composed of several layers, of dark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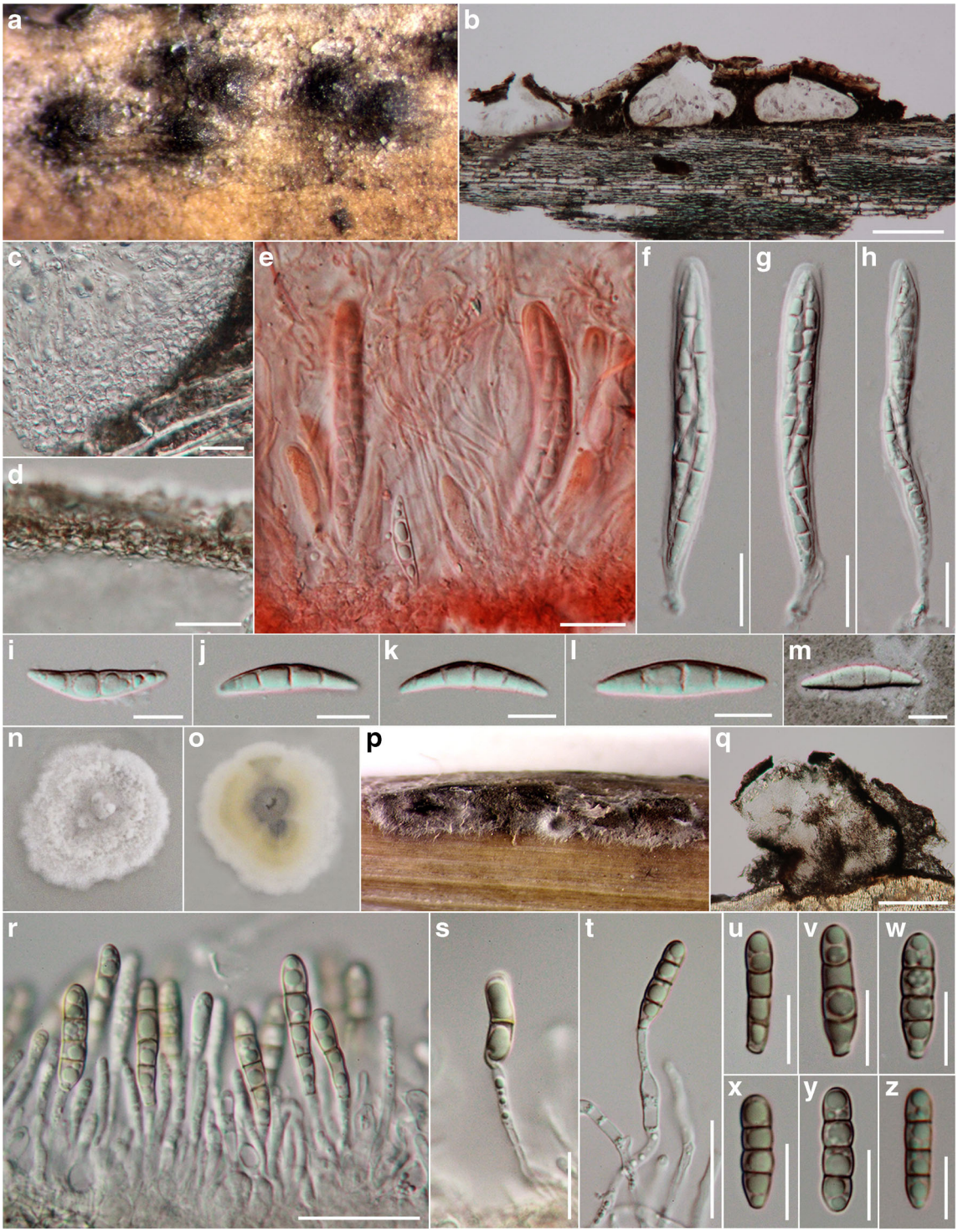


Fig. 12 ***Bambusicola triseptatispora*** (MFLU 11–0202, **holotype**). **a** Appearance of ascostromata on host surface. **b** Vertical section through ascostromata. **c**, **d** Section through peridium. **e** Asci with pseudoparaphyses stained with congo red. **f**–**h** Asci. **i**–**l** Ascospores. **m** Ascospore stained with Indian ink. **n**, **o** Cultures characters (upper and lower sides). **p** Conidiomata produced on bamboo pieces on WA. **q** Section through pycnidia. **r**–**t** Conidiogenous cells attached with conidia. **u**–**z** Conidia. Scale bars: b, q = 200 *μm*, c–h, r, t = 20 *μm*, i–m, s, u–z = 10 *μm*

brown to black, *textura angularis* to *textura prismatica* pseudoparenchymatous cells mixed with host cells. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* (9–)(10–)12–28(−32) × 1.5–3 μm ($\overline{x}$ = 18.8 × 2.2 μm, *n* = 30), holoblastic, determinate, discrete, cylindrical to irregularly-shaped, hyaline, with distinct

periclinal thickening, smooth. *Conidia* (15–)18–20(−22) × 3–5 μm ($\bar{x}$ = 19.3 × 4.1 μm, *n* = 30), cylindrical to cylindric-clavate, narrow towards ends, apex rounded, with truncate base, initially 1-septate and hyaline, becoming 3-septate and brown at maturity, constricted at the septa, smooth, with guttules.

Culture characters: Colonies on PDA fast growing, 50–60 mm diam. after 4 weeks at 25–30 °C, under 12 h light/12 h dark, irregular, medium dense to dense, flat, slightly raised, rough with lobate edge, fluffy to floccose, or velvety; white to cream at the margin, white-grey at the centre; reverse white to cream at the margin, pale yellowish to yellowish at middle, yellowish grey to dark grey at the center, slightly radiating outwards; forming grey to white tufts, with pycnidia and yellowish droplets surrounding the colonies.

Material examined: THAILAND, Mukdahan Province, Nongsung District, Wang Hai Village, on dead culms of bamboo, 13 April 2011, R. Phookamsak, RP0082 (MFLU11–0202, **holotype**), ex-type living cultures, MFLUCC 11–0166, KUMCC.

Notes: *Bambusicola triseptatispora* is similar to *B. thailandica* in having phragmosporous, fusiform, 3-septate ascospores. However, *B. triseptatispora* differs from *B. thailandica* by the colour of its ascospores, ascostromata and asexual morph. *Bambusicola triseptatispora* has phragmosporous, fusiform, pale brown, 3-septate, smooth ascospores with uni- to multi-loculate pseudoascostromata and phragmosporous, cylindric-clavate, brown, 3-septate conidia, whereas *B. thailandica* forms phragmosporous, fusiform, hyaline, ascospores slightly constricted at median septum, with scattered, uni-loculate ascostromata. The asexual morph of *B. triseptatispora* is similar to *B. splendida*. However, *B. triseptatispora* has smaller conidia and longer conidiogenous cells. Based on multi-gene phylogenetic analyses (Fig. 8), *B. triseptatispora* forms a robust clade with *B. loculata*, which is similar, but has multi-loculate ascomata and 1-septate ascospores (Dai et al. 2015).

Occultibambusaceae D.Q. Dai & K.D. Hyde, ***fam. nov.***

Index Fungorum number: IF552012; *Facesoffungi number*: FoF 01973

Saprobic on dead bamboo culms or teak branches, forming dark, ascostromata on raised areas, with ostiolate oppening. **Sexual morph**: *Ascostromata* solitary, scattered or gregarious, subglobose, uni- or multi-loculate, greyish to dark brown, coriaceous, with a central, papillate, rounded ostiole, internally lined with periphyses. *Peridium* comprising host and fungal tissues or, only fungal tissue brown and thick-walled to hyaline and thin-walled cells of *textura angularis*. *Hamathecium* composed of long, septate, cellular pseudoparaphyses, above the asci. *Asci* 8-spored, bitunicate, broadly cylindrical to clavate, with a short furcate pedicel, with a shallow ocular chamber. *Ascospores* 2–3-seriate, slightly broad-fusiform, 1–3-septate, hyaline, pale brown to dark brown, surrounded by a gelatinous sheath, with guttulate cells. **Asexual morph**: Coelomycetous, produced on bamboo pieces on WA. *Conidiomata* eustromatic, immersed to partly immersed, solitary to gregarious, globose to subglobose, conical in section, dark ostiolate, with a short neck. *Conidiomata wall* with several layers, composed of dark to hyaline cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* enteroblastic, phialidic, determinate, discrete, ampulliform to cylindrical, smooth-walled. *Conidia* obovoid, cylindrical to oblong, 0–3-septate, hyaline to pale brown, rounded at the apex, smooth-walled, guttulate.

Notes: *Occultibambusaceae* is introduced herein to accommodate two new genera *Occultibambusa* and *Seriascoma*, a coelomycetous genus *Versicolorisporium* (Hatakeyama et al. 2008) and *Neoocculitibambusa* introduced in Doilom et al. (2016).

Species of the family *Occultibambusaceae* usually occur on monocotyledons, such as bamboo, but have also been found on hardwood trees such as teak (*Tectona grandis* L.f., *Lamiaceae*). This family is characterized by immersed, solitary to gregarious ascomata with black ostioles, broadly cylindrical to clavate, bitunicate asci, cellular pseudoparaphyses and broad-fusiform, hyaline to dark brown ascospores with 1–3 septa. The asexual morphs are morphologically diverse. For example, the conidia in the genus *Occultibambusa* are oblong and pale brown, whereas *Seriascoma* has cylindrical and hyaline conidia. Obovoid conidia with a darker middle cell are observed in *Versicolorisporium* (Hatakeyama et al. 2008). However, they are all formed in eustromatic conidomata and have phialidic conidiogenous cells with enteroblastic conidiogenesis.

Members of *Occultibambusaceae* are similar to species of *Bambusicola*, *Lophiostoma*, and *Massarina* in having fusiform ascospores and clavate asci (Zhang et al. 2009; Dai et al. 2012, 2015). However, *Bambusicola* has hyaline ascospores and asexual morphs with usually annellidic conidiogenous cells (Dai et al. 2012). Ascospores of the species of *Occultibambusaceae* are mostly brown, no annellidic conidiogenous cells observed. *Lophiostoma* has ascomata containing a compressed/crest-like ostiole (Zhang et al. 2009; Thambugala et al. 2015), while those in *Occultibambusaceae* are papillate. *Lophiostoma* and *Massarina* differ by cylindrical or oblong asci (Zhang et al. 2009; Thambugala et al. 2015).

The family *Occultibambusaceae* is phylogenetically close to the family *Biatriosporaceae* (Fig. 13). However, the species of *Biatriosporaceae* are manglicolous and the dark brown ascospores usually have hyaline, rounded, swollen ends which release mucilage (Hyde et al. 2013). Members of *Occultibambusaceae* are separated from *Biatriosporaceae* by high bootstrap support (100 % MLBP, BYPP greater than 0.90).

Type: ***Occultibambusa*** D.Q. Dai & K.D. Hyde

Occultibambusa D.Q. Dai & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF552013; *Facesoffungi number*: FoF 01974

Etymology: Occulti means hidden in Latin, and refers to members of this genus hidden on bamboo substrates.

Saprobic on dead bamboo culms, forming dark, round, black spots on host surface, with ascostromata on raised areas, with an ostiolate oppening. **Sexual morph**: *Ascostromata* solitary, scattered, immersed under host tissue, subglobose, conical in section, uni-loculate, black at ostiolar region, coriaceous, with a central, papillate, rounded ostiole, internally lined with periphyses. *Peridium* comprising host and fungal tissues, composed of brown and thick-walled to hyaline and thin-walled cells of *textura angularis* intermingled with host cells. *Hamathecium* composed of long, septate, cellular pseudoparaphyses above the asci. *Asci* 8-spored, bitunicate, broadly cylindrical to clavate, with a short furcate pedicel, and a shallow ocular chamber. *Ascospores* 2–3-seriate, broad-fusiform, 1-septate, usually with larger upper cell, narrowly acute at both ends, dark brown, straight to curved, surrounded by a gelatinous sheath, guttulate. **Asexual morph**: Coelomycetous, produced on bamboo pieces on WA. *Conidiomata* eustromatic, immersed to partly-immersed, solitary to gregarious, globose to subglobose, black, with a black papillae or short neck. *Wall of conidiomata* comprising several layers, composed of dark to hyaline cells of *textura angularis*. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* enteroblastic, phialidic, determinate, ampulliform to cylindrical, smooth-walled. *Conidia* oblong, aseptate, pale brown to hyaline, rounded at the apex, smooth-walled, guttulate.

Type species: ***Occultibambusa bambusae*** D.Q. Dai & K.D. Hyde

Notes: The genus *Occultibambusa* is characterized by immersed, dark coloured, ascostromata with periphysate ostioles, broad cylindrical to clavate asci, and dark brown, fusiform, 1-septate ascospores. The asexual morphs of *Occultibambusa* produce black necks at the center of the conidiomata. This character is not observed in other genera of the family *Occultibambusaceae.* Characters such as pale brown and oblong conidia are similar with *Bambusicola* species (Dai et al. 2012), however, annellidic conidiogenous cells are not observed in *Occultibambusa*.

Occultibambusa bambusae D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552016; *Facesoffungi number*: FoF 01975; Fig. 14

Etymology: Refers to the bamboo host.

Holotype: MFLU 15–1212

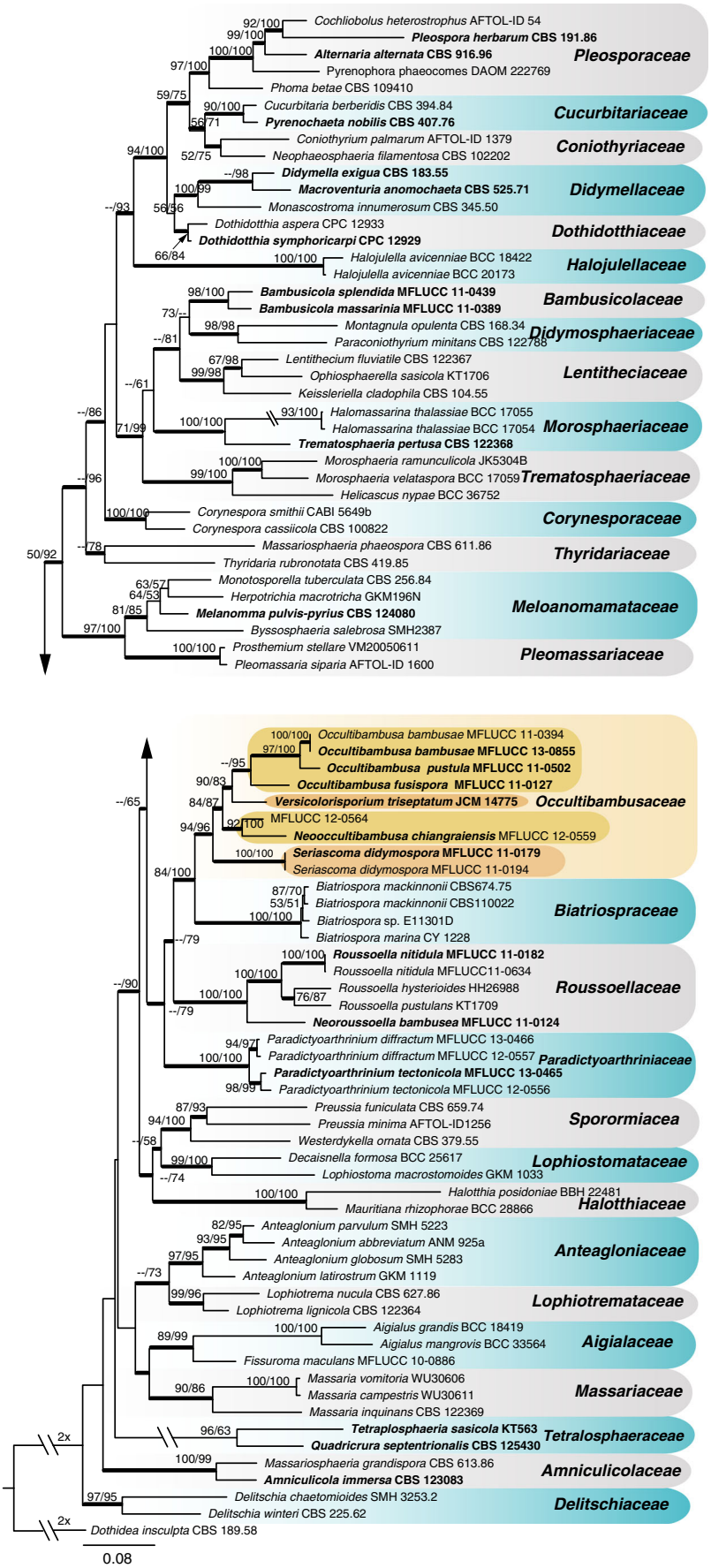
Saprobic on dead bamboo culms, forming dark, round spots on host surface, with ascostromata on raised areas, but still immersed under host tissue. **Sexual morph**: *Ascostromata* 150–200 μm high, 400–550 μm diam., solitary, scattered, immersed, subglobose, slightly conical in section, uni-loculate, black at the ostiolar regions, coriaceous, with a central, rounded, papillate ostiole, lined internally with periphyses. *Peridium* comprising host and fungal tissues, 30–45 μm thick, composed of brown to hyaline, thick- to thin-walled cells of *textura angularis*, intermingled with host cells, with basal part 15–30 μm thick; wedge of palisade-like cells at the periphery: 50–100 μm thick, composed of large, brown cells. *Hamathecium* composed of long, 2–3.5 μm wide, septate, cellular pseudoparaphyses branching above the asci. *Asci* (50–)60–80(−90) × (9.5–)11.5–14.5(−15) μm ($\bar{x}$ = 70.8 × 13.1 μm, n = 20), 8-spored, bitunicate, broadly cylindrical, with a short furcate pedicel, with a shallow ocular apical chamber. *Ascospores* (22–)23.5–27.5 × 4.5–7 μm ($\bar{x}$ = 25.7 × 6.3 μm, n = 20), 2–3-seriate, slightly broad and fusiform, 1-septate, occasionally with larger upper cell, narrowly acute at both ends, dark brown, straight to curved, surrounded by a gelatinous sheath, each cell with 2–3 guttules. **Asexual morph**: Undetermined.

Cultural characters: Ascospores germinating on PDA within 24 h with germ tubes produced from both cells. Colonies growing slowly on PDA, reaching 1.5–2 mm in 18 days at 28 °C, under 12 h light/12 h dark, circular, floccose, with even margin, dark brown above and below. Mycelium immersed and superficial in the media, composed of branched, septate, smooth-walled, brown hyphae.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang Unversity, on dead culms of bamboo, 9 July 2013, Dong-Qin Dai, DDQ00262 (MFLU 15–1212, **holotype**); *Ibid*. (KUN HKAS88749, **isotype**), ex-type living cultures, MFLUCC 13–0855, CBS 139960, MUCL 55882; Chiang Mai, Mae Sae Village, on dead culms of bamboo, 14 May 2011, Dong-Qin Dai, DDQ00025 (MFLU 16–0880), living culture, MFLUCC 11–0394.

Notes: *Occultibambusa bambusae* is similar to *O. fusispora* in having clavate asci and fusiform, dark brown ascospores. However, *O. bambusae* differs in its larger ascomata (150–200 μm high, 400–550 μm diam. vs. 135–185 μm high, 240–275 μm diam.). The branch length of phylogenetic tree shows they are different species (Fig. 13). *Occultibambusa bambusae* can produce ascomata on bamboo pieces on WA after 3 months, however, asexual morph are not ovserved from culture.

Fig. 13 Maximum likelihood phylogenetic tree generated by RAxML ▶ (GTR+G model) based on combined SSU, LSU, TEF1 and RPB2 sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Dothidea insculpta* (CBS 189.58). Ex-type strains are in *bold*. The new family is highlighted with a *yellow* background


Cochliobolus heterostrophus AFTOL-ID 54
Pleospora herbarum CBS 191.86
Alternaria alternata CBS 916.96
Pyrenophora phaeocomes DAOM 222769
Phoma betae CBS 109410
Pleosporaceae
Cucurbitaria berberidis CBS 394.84
Pyrenochaeta nobilis CBS 407.76
Cucurbitariaceae
Coniothyrium palmarum AFTOL-ID 1379
Neophaeosphaeria filamentosa CBS 102202
Coniothyriaceae
Didymella exigua CBS 183.55
Macroventuria anomochaeta CBS 525.71
Monascostroma innumerosum CBS 345.50
Didymellaceae
Dothidotthia aspera CPC 12933
Dothidotthia symphoricarpi CPC 12929
Dothidotthiaceae
Halojulella avicenniae BCC 18422
Halojulella avicenniae BCC 20173
Halojulellaceae
Bambusicola splendida MFLUCC 11-0439
Bambusicola massarinia MFLUCC 11-0389
Bambusicolaceae
Montagnula opulenta CBS 168.34
Paraconiothyrium minitans CBS 122788
Didymosphaeriaceae
Lentithecium fluviatile CBS 122367
Ophiosphaerella sasicola KT1706
Keissleriella cladophila CBS 104.55
Lentitheciaceae
Halomassarina thalassiae BCC 17055
Halomassarina thalassiae BCC 17054
Trematosphaeria pertusa CBS 122368
Morosphaeriaceae
Morosphaeria ramunculicola JK5304B
Morosphaeria velataspora BCC 17059
Helicascus nypae BCC 36752
Trematosphaeriaceae
Corynespora smithii CABI 5649b
Corynespora cassiicola CBS 100822
Corynesporaceae
Massariosphaeria phaeospora CBS 611.86
Thyridaria rubronotata CBS 419.85
Thyridariaceae
Monotosporella tuberculata CBS 256.84
Herpotrichia macrotricha GKM196N
Melanomma pulvis-pyrius CBS 124080
Byssosphaeria salebrosa SMH2387
Meloanomamataceae
Prosthemium stellare VM20050611
Pleomassaria siparia AFTOL-ID 1600
Pleomassariaceae
Occultibambusa bambusae MFLUCC 11-0394
Occultibambusa bambusae MFLUCC 13-0855
Occultibambusa pustula MFLUCC 11-0502
Occultibambusa fusispora MFLUCC 11-0127
Versicolorisporium triseptatum JCM 14775
Occultibambusaceae
MFLUCC 12-0564
Neoocculitibambusa chiangraiensis MFLUCC 12-0559
Seriascoma didymospora MFLUCC 11-0179
Seriascoma didymospora MFLUCC 11-0194
Biatriospora mackinnonii CBS674.75
Biatriospora mackinnonii CBS110022
Biatriospora sp. E11301D
Biatriospora marina CY 1228
Biatriospraceae
Roussoella nitidula MFLUCC 11-0182
Roussoella nitidula MFLUCC11-0634
Roussoella hysterioides HH26988
Roussoella pustulans KT1709
Neoroussoella bambusea MFLUCC 11-0124
Roussoellaceae
Paradictyoarthrinium diffractum MFLUCC 13-0466
Paradictyoarthrinium diffractum MFLUCC 12-0557
Paradictyoarthrinium tectonicola MFLUCC 13-0465
Paradictyoarthrinium tectonicola MFLUCC 12-0556
Paradictyoarthriniaceae
Preussia funiculata CBS 659.74
Preussia minima AFTOL-ID1256
Westerdykella ornata CBS 379.55
Sporormiacea
Decaisnella formosa BCC 25617
Lophiostoma macrostomoides GKM 1033
Lophiostomataceae
Halotthia posidoniae BBH 22481
Mauritiana rhizophorae BCC 28866
Halotthiaceae
Anteaglonium parvulum SMH 5223
Anteaglonium abbreviatum ANM 925a
Anteaglonium globosum SMH 5283
Anteaglonium latirostrum GKM 1119
Anteagloniaceae
Lophiotrema nucula CBS 627.86
Lophiotrema lignicola CBS 122364
Lophiotremataceae
Aigialus grandis BCC 18419
Aigialus mangrovis BCC 33564
Fissuroma maculans MFLUCC 10-0886
Aigialaceae
Massaria vomitoria WU30606
Massaria campestris WU30611
Massaria inquinans CBS 122369
Massariaceae
Tetraplosphaeria sasicola KT563
Quadricrura septentrionalis CBS 125430
Tetralosphaeraceae
Massariosphaeria grandispora CBS 613.86
Amniculicola immersa CBS 123083
Amniculicolaceae
Delitschia chaetomioides SMH 3253.2
Delitschia winteri CBS 225.62
Delitschiaceae
Dothidea insculpta CBS 189.58
0.08

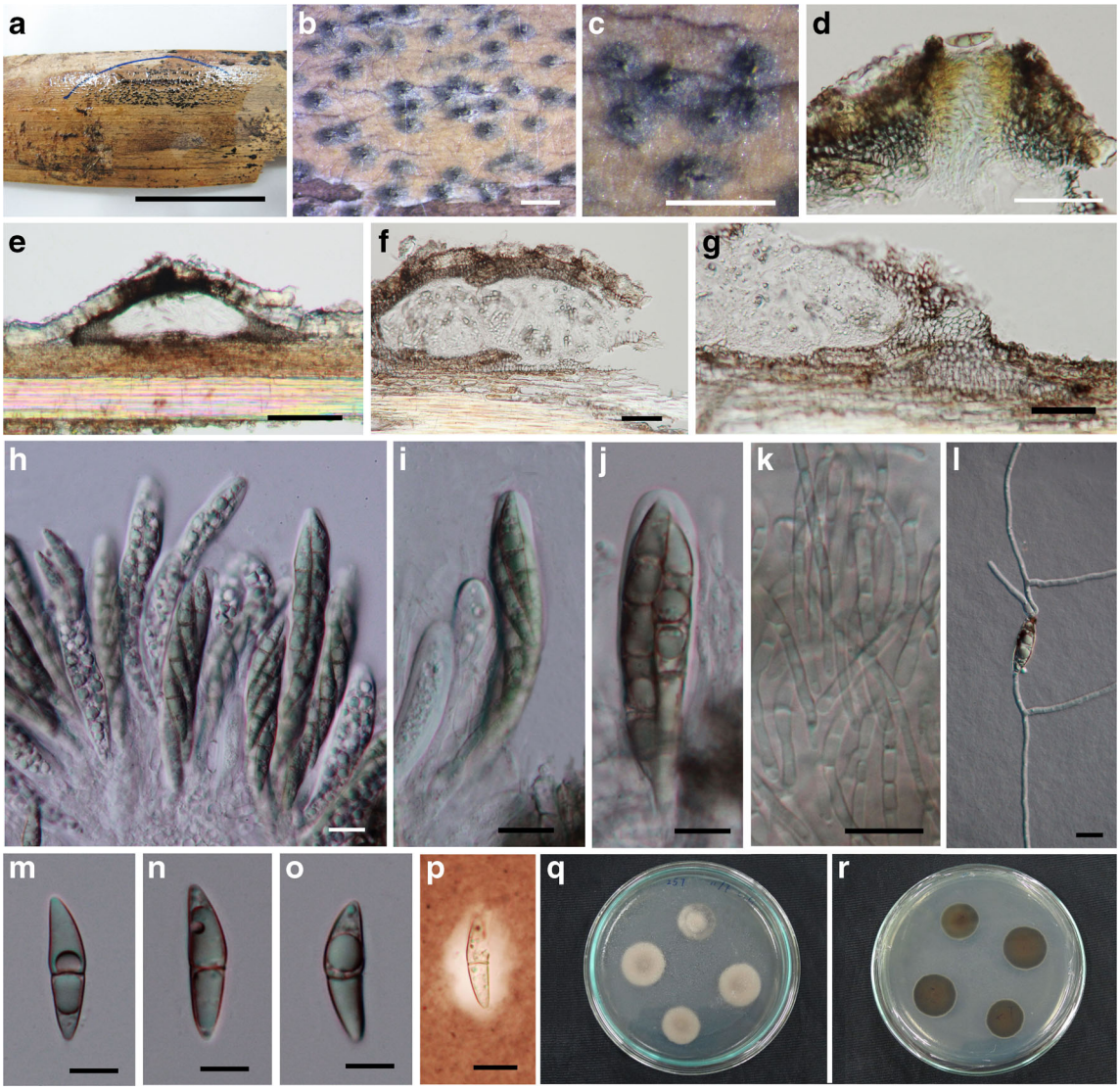


Fig. 14 ***Occultibambusa bambusae*** (MFLU 15–1212, **holotype**). **a**–**c** Ascostromata developing on bamboo culm. **d** Ostiole with periphyses. **e**, **f** Vertical section of ascostroma (**e** Ascostroma with wedge of palisade-like cells at the periphery). **g** Wall of ascostroma. **h**–**j** Asci containing ascospores. **k** Pseudoparaphyses. **l** Germinating ascospore. **m**–**o** Dark brown ascospores with a single septum. **p** Ascospore with gelatinous sheath. **q**, **r** Cultures on MEA. Scale bars: a = 5 cm, b, c = 500 *μm*, e = 100 *μm*, d, f, g = 50 *μm*, h–p = 10 *μm*

Occultibambusa fusispora Phookamsak, D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum: IF552017; *Facesoffungi number*: FoF 01976; Fig. 15

Etymology: The epithet "fusispora" refers to the fusiform ascospores.

Holotype: MFLU 11–0163

Saprobic on dead bamboo culm. **Sexual morph**: *Ascomata* 135–185 μm high, 240–275 μm diam., scattered, gregarious, subpepidermal, semi-immersed to erumpent through host surface, raised, brown to dark brown, with black papillate dots, conical with wedged sides, uni-loculate, ostiole central with minute papilla. *Peridium* 7–60 μm wide, pseudostromatic, with thin- to thick-walled cells of unequal thickness, slightly thick at the sides and towards apex, poorly developed at the base, composed of several layers of small, brown to dark brown, *textura angularis* to *textura prismatica* pseudoparenchymatous cells.. *Hamathecium* composed of dense, broad, 1.8–2.7 μm wide, filamentous, distinctly septate, cellular pseudoparaphyses, not constricted at the septa, anastomosing at the apex, embedded in a gelatinous matrix. *Asci* (60–)65–90(−110) × (11–)12–14(−15)(−16) μm ($\bar{x}$ = 75.6 × 13.2 μm, n = 30), 8-spored, bitunicate, fissitunicate, clavate to cylindric-clavate, short pedicellate, with furcate to obtuse ends, apically rounded with well-developed, ocular chamber. *Ascospores* (20–)22–25(−26) × 5–6(−6.5) μm ($\bar{x}$ = 23.9 × 5.7 μm, n = 30), overlapping, bi-seriate, fusiform, with acute ends, light brown, mostly 1-septate, rarely 2–

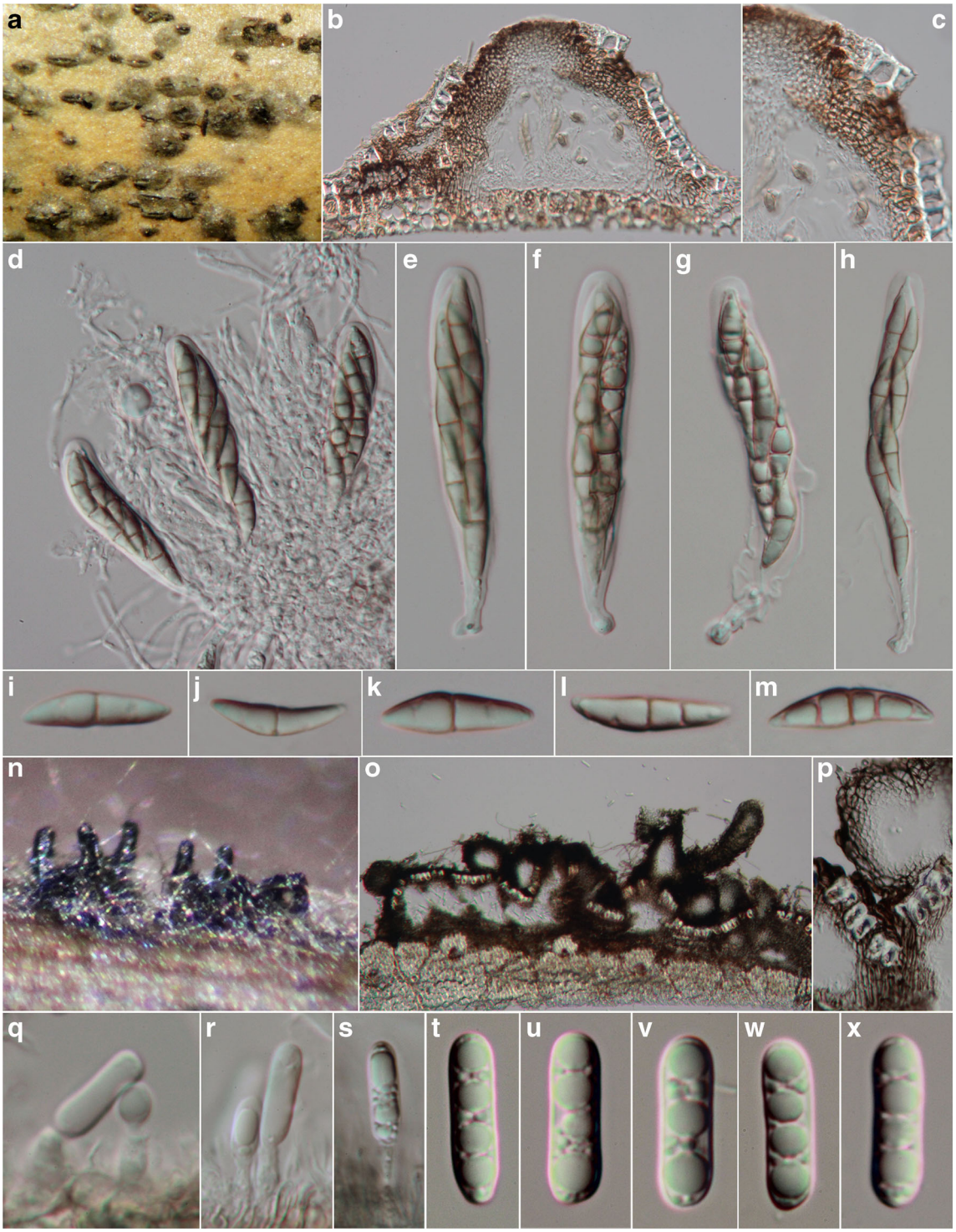


Fig. 15 ***Occultibambusa fusispora*** (MFLU 11–0163, **holotype**). **a** Appearance of ascostromata on host surface. **b** Vertical section through ascostroma. **c** Section through peridium. **d** Asci with pseudoparaphyses. **e**–**h** Asci. **i**–**m** Ascospores. **n** Pycnostroma produced on bamboo pieces on WA. **o** Section through pycnostroma. **p** Pycnidial wall. **q**–**s** Conidiogenous cells. **t**–**x** Conidia. Scale bars: o = 200 *μm*, b = 100 *μm*, c = 50 *μm*, d–h, p = 20 *μm*, i–m, q–s = 10 *μm*, t–x = 5 *μm*

3-septate, not constricted at the septum, slightly curved, smooth-walled. **Asexual morph**: Coeloemycetous, produced on bamboo pieces on WA after 12 weeks. *Conidiomata* 160–250 μm high (including beaks), 500–800 μm diam., eustromatic, subepidermal, solitary to gregarious, clustered, visible as raised, black, elongate spikes, covered by sparse hyphae on bamboo pieces, elongate irregular in shape, multi-loculate,

glabrous, ostiolate with long beaked papilla. *Locules* 140–250 μm high (including neck), 110–230 μm diam., gregarious, clustered, immersed in cortex of host to erumpent through host surface by papilla, conical to ampulliform, or irregular-shaped. *Neck* 50–195 μm high 50–100 μm diam., in each locule, ostiole central, slightly oblique, with short to long beaks. *Wall of conidiomata* 10–45 μm wide, thin- to thick-walled, of unequal thickness, thick at the sides and base of pycnidia, composed of several layers of dark brown to black, *textura angularis* to *textura prismatica* pseudoparenchymatous cells, with host cells and fungal tissue. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* (6–)7–12(−15) × 2–4 μm ($\bar{x}$ = 10.2 × 2.7 μm, n = 30), enteroblastic, phialidic, determinate, discrete, cylindrical to ampulliform or lageniform, hyaline, aseptate, apically attenuated, with indistinct periclinal thickening, smooth-walled. *Conidia* (14–)15–17(−19) × 4–5(−5.5) μm ($\bar{x}$ = 16.5 × 5.2 μm, n = 30), oblong to cylindrical, with rounded ends, hyaline, aseptate, smooth-walled, with large guttules.

Culture characters: Colonies on MEA fast growing, 55–60 mm diam. after 4 weeks at 25–30 °C, under 12 h light/12 h dark, colonies irregular, dense, flat, slightly raised, dull to rough, with undulate edge, velvety, radiating, wrinkled and folded at the margin, green to brown greenish at the margin, dull green to white-grey at the centre from above, brown greenish at the margin, dark greenish to black at the centre from below, no pigments on PDA.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang District, Doi Tung, on dead branch of bamboo, 29 June 2010, R. Phookamsak, RP0043 (MFLU 11–0163, **holotype**), ex-type living cultures, MFLUCC 11–0127, KUMCC.

Notes: Morphologically, *Occultabambusa fusispora* is similar to *O. bambusae* in having clavate asci and fusiform, brown ascospores. However, they differ in the size of asci and ascospores, ascospore septation, sheath surrounding the ascospores and asexual morph. *Occultabambusa fusispora* has longer asci (60–110 μm vs. 50–90 μm) and smaller ascospores (22–25 × 5–6 μm vs. 23.5–27.5 × 4.5–7 μm). In addition, *O. fusispora* has 1–3-septate ascospores, lacks a mucilaginous sheath. *Occultabambusa bambusae* has 1-septate ascospores with a mucilaginous sheath. Based on multi-gene phylogenetic analyses (Fig. 13), *O. fusispora* forms a robust clade which is distinct from *O. bambusae* (95 % MLBP, BYPP greater than 0.90). Therefore, we introduce a second species in the genus *Occultabambusa*.

Occultibambusa pustula D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552018; *Facesoffungi number*: FoF 01977; Fig. 16

Etymology: Refers to its pustule-like ascomata.

Holotype: MFLU 15–1212

Saprobic on decaying bamboo culms, forming black, rounded, pustule-like spots on host surface, with immersed ascostromata on raised areas. **Sexual morphs**: *Ascostromata* 150–200 μm high, 200–300 μm diam., immersed, subepidermal, slightly conical, black, with a centrally located ostiole. *Peridium* 30–80 μm thick, composed of brown and thick-walled to hyaline and thin-walled *textura angularis,* upper peridium combined with epidermal cells. *Hamathecium* composed of dense, long, up to 2 μm wide, cellular pseudoparaphyses above the asci. *Asci* 80–105 × 8–12 μm ($\bar{x}$ = 90.4 × 11.4 μm, n = 20), 8-spored, bitunicate, cylindrical, with a short furcate pedicel, with a shallow ocular chamber. *Ascospores* 22–25 × 5–5.5 μm ($\bar{x}$ = 21.6 × 5.3 μm, n = 20), 2–3-seriate, slightly broad-fusiform, 1-septate, hyaline to pale brown, guttulate, surrounded by a gelatinous sheath. **Asexual morphs**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends. Colonies growing slowly on PDA, reaching 40 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, edge regular, flocculent, dark brown from above and below. Mycelium superficial to immersed in media, composed of branched, septate, smooth hyphae.

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culm of bamboo, 19 July 2011, Dong-Qin Dai DDQ00081 (MFLU 15–1185, **holotype**); *Ibid*. (KUN HKAS88695, **isotype**), ex-type living culture, MFLUCC 11–0502.

Notes: Occultabambusa pustula is similar to *O. bambusae* in having broad fusiform, 1-septate ascospores, but the latter has darker brown ascospores. Further distinctions between *O. pustula* and *O. bambusae* is that the former has raised and darker ascomata and there are also colony differences. Branch length in the phylogenetic tree (Fig. 13) shows that they are different species with high bootstrap support value (97/100 % MPBP/MLBP, BYPP greater than 0.90).

Seriascoma Phookamsak, D.Q. Dai & K.D. Hyde, ***gen. nov.***

Index Fungorum number: IF552014; *Facesoffungi number*: FoF 01978

Etymology: The generic epithet "*Seriascoma*" refers to the elongate rows of ascomata which form on the host surface.

Saprobic on bamboo culms. **Sexual morph**: *Ascostromata* gregarious, clustered, immersed beneath clypeus, coriaceous, raised, erumpent in linear rows, with slit-like opening, multiloculate, ostiolate. *Locules* arranged in rows, immersed, clustered, gregarious, subglobose to ampulliform, or quadrilateral, glabrous, central ostiole with minute papilla. *Peridium* thick-walled, composed of several layers of small, dark brown pseudoparenchymatous cells of *textura angularis*. *Hamathecium* composed of broad, filamentous, distinctly, septate, cellular, pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate,

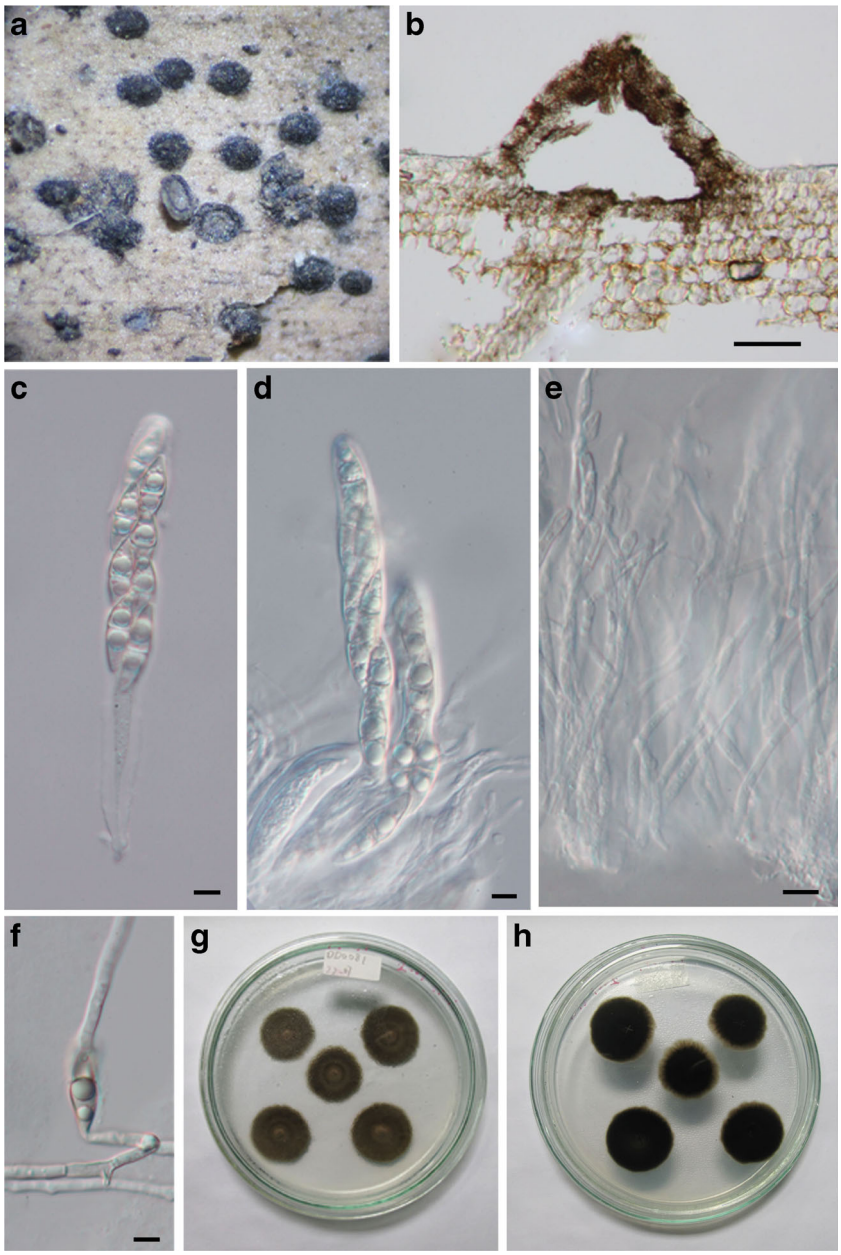


Fig. 16 *Occultibambusa pustula* (MFLU 15–1185, **holotype**). **a** Appearance of ascostromata on bamboo. **b** Vertical section of ascostromata. **c**, **d** Asci. **e** Pseudoparaphyses. **f** Germinating ascospores. **h**, **i** Culture on PDA. Scale bars: b = 50 *μm*, c–f = 5 *μm*

clavate, long pedicellate, apically rounded, with well-developed, ocular chamber. *Ascospores* overlapping, uni- to tri-seriate, clavate to fusiform, with rounded ends, hyaline, 1-septate, slightly constricted at the septum, straight to curved, smooth-walled, with guttules. **Asexual morph**: Coelomycetous, *Conidiomata* eustromatic, solitary to gregarious, immersed in cortex layers, raised, black, elongate on bamboo pieces, conical, uni-loculate, glabrous, covered by vegetative hyphae. *Wall of conidiomata* comprising host and fungi tissue, with several layers composed of dark brown to black, *textura angularis* pseudoparenchymatous cells. *Conidiophores* arising from the basal cavity, reduced to conidiogenous cells. *Conidiogenous cells* holoblastic, phialidic, determinate, discrete, cylindrical to ampulliform or lageniform, hyaline, aseptate, apically attenuated, with distinct periclinal thickening, smooth-walled. *Conidia* oblong, with rounded to obtuse ends, hyaline, aseptate, smooth-walled.

Type species: ***Seriascoma didymospora*** Phookamsak, D.Q. Dai & K.D. Hyde

Notes: *Seriascoma* is introduced to accommodate Dothideomycete species forming elongated, multiloculate, coriaceous ascostromata, embedded beneath a clypeus, erumpent and splitting the host epidemis parallel with the veination to form a slit like opening. The ascospores are didymosporous, clavate to fusiform andhyaline. The genus is commonly found on bamboo. *Seriascoma* morphologically differs from other genera in the family *Occultabambusaceae*

in the position of its ascostromata under a clypeus. The asexual morph of *Seriascoma* is also different from *Occultabambusa* and *Versicolorisporium*. *Seriascoma* has hyaline, oblong, aseptate conidia, similar to *Occultabambusa*, but the conidia of *Seriascoma* (4.9 × 1.9 μm) are smaller than *Occultabambusa* (16.5 × 5.2 μm). *Versicolorisporium* forms brown, clavate and septate conidia. Based on multi-gene analyses (Fig. 13), *Seriascoma* forms a robust clade, close to *Neooccultabambusa* (Doilom et al. 2016). Ascostroma of *Seriascoma* are similar to those of *Apiospora* which are commonly found on bamboo. However, *Apiospora* has unitunicate asci and belongs to *Sordariomycetes* (Senanayake et al. 2015). Therefore, we propose to introduce the new genus *Seriascoma*.

Seriascoma didymospora Phookamsak, D.Q. Dai, S.C.Karunarathana & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552015; *Facesoffungi number*: FoF 01979; Fig. 17

Etymology: The epithet "*didymospora*" refers to the ascospores having two cells.

Holotype: MFLU 11–0215

Saprobic on bamboo culms. **Sexual morph**: *Ascostromata* 150–320 μm high, 1000–1900 μm diam., gregarious, clustered, immersed beneath clypeus, coriaceous, raised, erumpent in linear rows, with slit-like opening, multi-loculate, ostiolate. *Locules* 120–230 μm high, 180–300 μm diam., arranged in rows, clustered, gregarious, subglobose to ampulliform, glabrous, central ostiole with minute papilla. *Peridium* 15–85 μm wide, thin- to thick-walled, sometimes unequal in thickness, thicker at the sides towards apex, thinner at the base, composed of several layers of small, dark brown pseudoparenchymatous cells of *textura angularis*. *Hamathecium* composed of 2–2.5 μm wide, broad, filamentous, distinctly septate cellular pseudoparaphyses. *Asci* (56–)60–75(−80) × 8–11(−13) μm ($\bar{x}$ = 68 × 10 μm, n = 30), 8-spored, bitunicate, fissitunicate, clavate, long pedicellate, with furcate to obtuse ends, apically rounded, with well-developed ocular chamber. *Ascospores* 11–12(−14.5) × 3–4 μm ($\bar{x}$ = 11.9 × 3.9 μm, n = 30), overlapping, uni- to triseriate, didymosporous, clavate to fusiform, with rounded ends, hyaline, slightly constricted at the septum, straight to curved, with upper cell shorter and wider than lower cell, smooth-walled, with large and small guttules. **Asexual morph**: Coelomycetous, produced on bamboo pieces on WA after 4 months. *Conidiomata* 110–170 μm high, 250–470 μm diam., eustromatic, solitary to gregarious, semi-immersed in cortex layers, to erumpent, raised, black, elongate on bamboo pieces, conical, uni-loculate, glabrous, covered by vegetative hyphae. *Wall of conidiomata* 8–80 μm thick, thin- to thick-walled, of unequal thickness, thick at the sides, comprised of host and fungi tissue, with several layers of dark brown to black, pseudoparenchymatous cells of *textura angularis*. *Conidiophores* arising from the base of the cavity, reduced to conidiogenous cells. *Conidiogenous cells* 4–7(−8) × 1.5–3 μm ($\bar{x}$ = 5.7 × 2.4 μm, n = 30), enteroblastic, phialidic, determinate, discrete, cylindrical to ampulliform or lageniform, hyaline, aseptate, apically attenuated, with distinct periclinal thickening, smooth-walled. *Conidia* 4–5.5 × 1.5–2 μm ($\bar{x}$ = 4.9 × 1.9 μm, n = 30), oblong, with rounded to obtuse ends, hyaline, aseptate, smooth-walled.

Culture characters: Colonies on PDA fast growing, 64–73 mm diam. after 4 weeks at 25–30 °C, under 12 h light/12 h dark, colonies circular, dense, flat, slightly raised, smooth with entire edge, velvety to floccose, slightly radiating, aspect smooth, slightly raised at the centre, dull green to dark green from above, blackish green from below.

Material examined: THAILAND, Chiang Rai Province, Mae Jun District, Huai Kang Pla waterfall, on dead clums of bamboo, 25 October 2010, R. Phookamsak, RP0095 (MFLU 11–0215, **holotype**), ex-type living cultures, MFLUCC 11–0179, KUMCC; Muang District, Khun Korn waterfall, on dead culms of bamboo, 13 January 2011, S.C.Karunarathana, RP0110 (MFLU 11–0230, paratype), living cultures, MFLUCC 11–0194, KUMCC.

Roussoellaceae J.K. Liu, et al. Phytotaxa 181(1): 7 (2014)

The family *Roussoellaceae,* introduced by Liu et al. (2014), is characterized by immersed, gregarious, clypeate ascostromata, cylindrical, bitunicate asci and 2-celled, brown, ornamented ascospores. Wijayawardene et al. (2014) included five genera, *Appendispora*, *Cytoplea*, *Neoroussoella*, *Roussoella* and *Roussoellopsis*, in this family. Members of *Roussoellaceae* mostly occur on monocotyledons, such as bamboo and palms (Hyde et al. 1996; Hyde 1997; Liu et al. 2014). Crous et al. (2014b), however, described a new species, *Roussoella acaciae*, from *Acacia*, a dicotyledonous plant. The asexual morphs of this family are linked to *Cytoplea*, *Melanconiopsis* and *Neomelanconium* (Liu et al. 2014). Ariyawansa et al. (2015) reported a microconidial state occurring in the same conidiomata of *Roussoella* species.

Roussoella Sacc., in Saccardo & Paoletti, Atti Inst. Veneto Sci. lett., ed Arti, Sér. 6 6: 410 (1888)

Roussoella was introduced by Saccardo and Paoletti (1888), with the type species *R. nitidula* Sacc. & Paol., which was collected from bamboo in Malaysia. This genus was previously placed in order *Xylariales* (Müller and von Arx 1962), as from the asci and the paraphyses, it was very difficult to distinguish if they were unitunicate or bitunicate. However, Hyde et al. (1996) re-examined the type material and demonstrated that *Roussoella* has bitunicate asci, lacking a blue staining ring. Hyde (1997) reviewed *Roussoella* with a modified key provided. The asexual morph of *Roussoella* links to *Cytoplea* (Liu et al. 2014).

Roussoella mukdahanensis Phookamsak, D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum: IF552025; *Facesoffungi number*: FoF 01980; Fig. 18

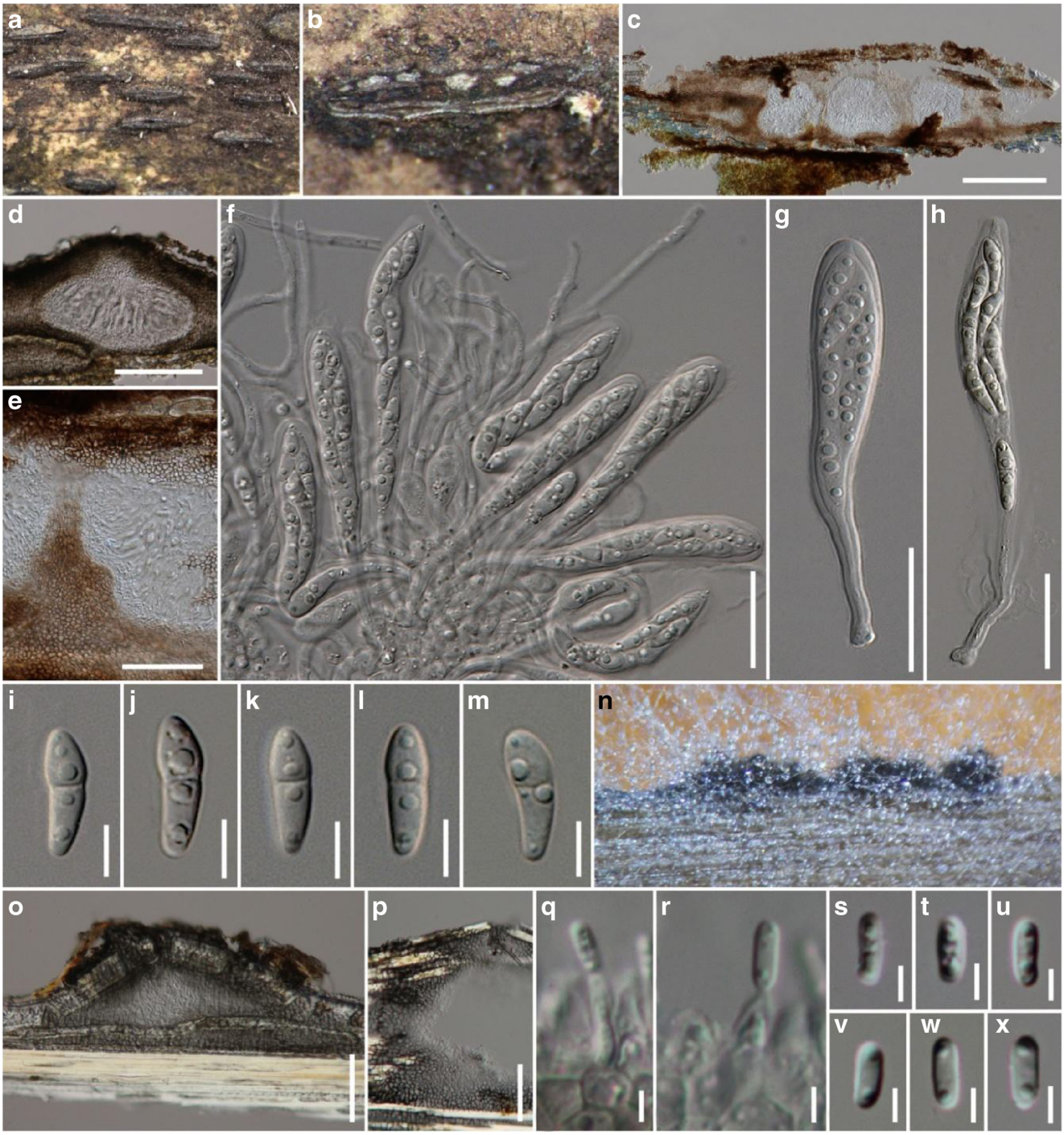


Fig. 17 ***Seriascoma didymospora*** (MFLU 11–0215, **holotype**). **a** Appearance of ascostromata on host surface (MFLU 11–0230). **b** Horizontal section through ascostroma (MFLU 11–0230). **c** Vertical section through ascostroma (MFLU 11–0230). **d** Section through locule (MFLU 11–0215). **e** Section through peridium (MFLU 11–0230). **f** Asci with pseudoparaphyses (MFLU 11–0230). **g**–**h** Asci (MFLU 11–0230). **i**–**m** Ascospores (MFLU 11–0230). Asexual morph from MFLU 11–0215: **n** Rows of conidiomata produced on bamboo pieces on WA. **o** Section through conidiomata. **p** Conidiomata wall. **q**–**r** Conidiogenous cells. **s**–**x** Conidia. Scale bars: c = 200 *μm*, d, o = 100 *μm*, e, p = 50 *μm*, f–h = 20 *μm*, i–m = 5 *μm*, q–x = 2 *μm*

Etymology: The epithet "mukdahanensis" refers to the Mukdahan Province, one of the Northeastern provinces in Thailand, where the fungus was found.

Holotype: MFLU 11–0237

Saprobic on dead bamboo culms, forming raised, dark brown areas with black dots on host surface. **Sexual morph**: *Ascostromata* pseudostromatic, 280–350 μm high, 520–880 μm diam., solitary to gregarious, immersed, uni- to

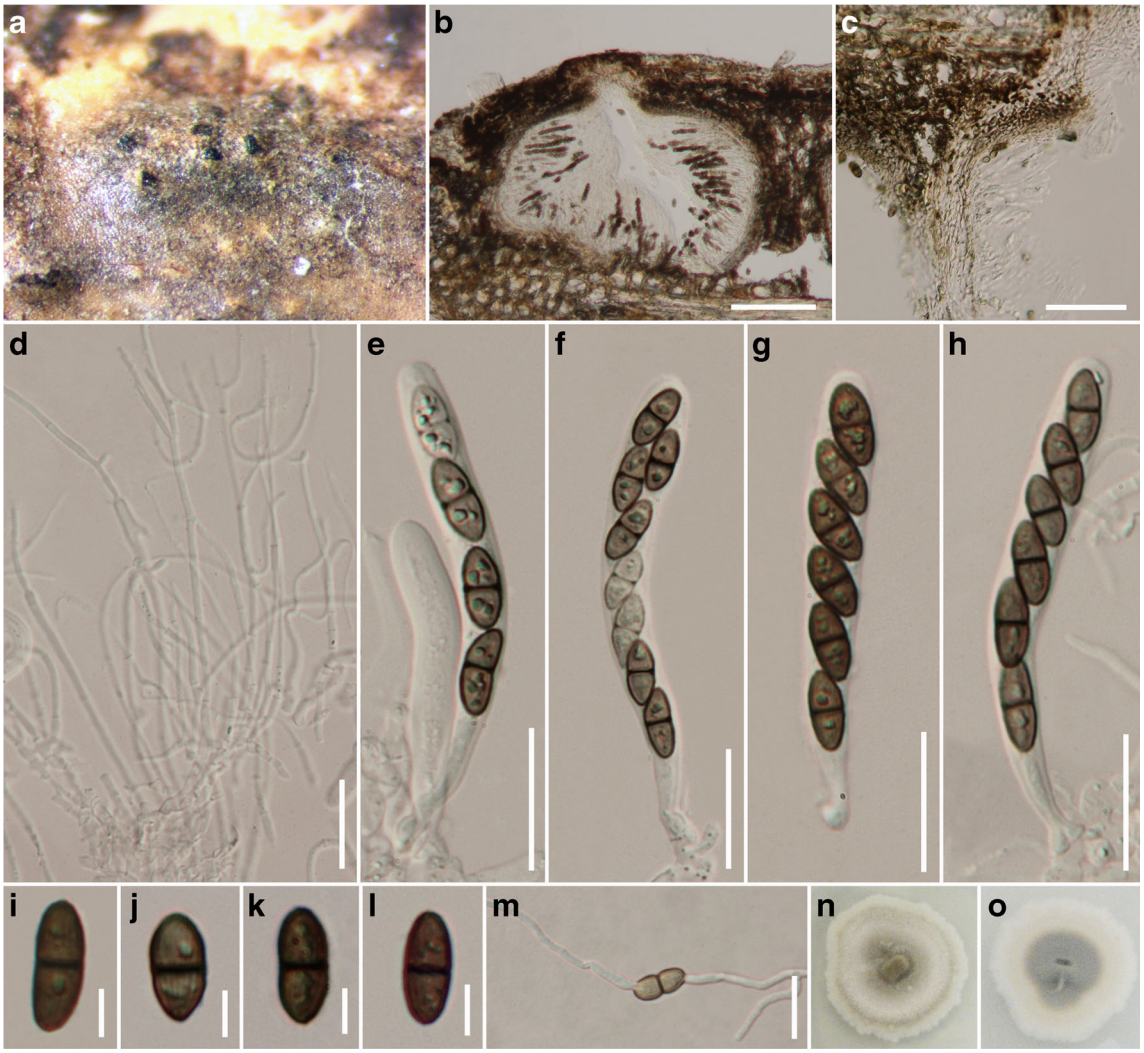


Fig. 18 ***Roussoella mukdahanensis*** (MFLU 11–0237, **holotype**). **a** Appearanceof scostromata on host surface. **b** Vertical section through ascostroma. **c** Section through peridium. **d** Pseudoparaphyses. **e**–**h** Asci. **i**–**l** Ascospores. **m** Germinating ascospore. **n**–**o** Culture characters (n = upper side, o = lower side). Scale bars: b = 100 *μm*, c = 50 *μm*, d–h, m = 20 *μm*, i–l = 5 *μm*

multi-loculate. *Locules* 250–350 μm high, 300–420 μm diam., scattered to clustered, forming groups immersed in ascostroma to erumpent through host surface by papilla, globose to subglobose, glabrous, ostioles central, with minute papilla, periphyses. *Peridium* 15–40 μm wide, thin-walled, of equal thickness, comprising several layers of flattened, brown to dark brown, *textura angularis* to *textura prismatica* pseudoparenchymatous cells, *textura epidermoidea* beside papilla . *Hamathecium* composed of dense, 1.5–2.5 μm wide, cellular pseudoparaphyses, distinctly septate, not constricted at the septa, branched, anastomosing at the apex, embedded in a gelatinous matrix. *Asci* (65–)70–80(−89) × (7–)8–10 μm ($\bar{x}$ = 77.9 × 8.8 μm, n = 30), 4–6–8-spored, bitunicate, cylindrical to cylindric-clavate, short to long pedicellate with furcate or knob-like pedicel, apically rounded with indistinct ocular chamber. *Ascospores* (10.5–)11–13(−14) × (4–)5–6 μm ($\bar{x}$ = 12.4 × 5.4 μm, n = 30), overlapping, uni-seriate, ellipsoidal to fusiform, with rounded to acute ends, brown to dark brown, 1-septate, not constricted at the septum, rough-walled, striate or longitudinally ribbed. **Asexual morph**: Undetermined.

Culture characters: Colonies on MEA slow growing, 38–40 mm diam. after 4 weeks at 25–30 °C, under 12 h light/12 h dark, colonies irregular, dense, slightly raised to umbonate, dull with undulate edge, floccose to velvety, slightly radiating, the margin separated by yellowish brown concentric ring, white to cream at the margin, white to grey outwards towards the centre, grey at the centre from above, white to cream at the margin, grey to dark grey at the centre, separated from margin by orangish brown concentric ring from below, not producing pigments.

Material examined: THAILAND, Mukdahan Province, Nongsung District, Wang Hai village, on dead culms of bamboo, 13 April 2011, R. Phookamsak, RP0117 (MFLU 11–

0237, **holotype)**; *Ibid.* (BBH **isotype**), ex-type living cultures, MFLUCC 11–0201, KUMCC.

Notes: *Roussoella mukdahanensis* is similar to *R. donacicola*, *R. minutella*, *R. munkii*, *R. neopustulans* and *R. pustulans* in the size of asci and ascospores, however, they can be differentiated by their ascostroma size and morphology on the host surface (Saccardo 1891; Aptroot 1995; Ju et al. 1996; Hyde 1997; Liu et al. 2014). *Roussoella mukdahanensis* is most similar to *R. neopustulans* and *R. pustulans* in sharing the size range of asci and ascospores and papillate ostioles in *R. neopustulans* (Liu et al. 2014). Based on the multi-gene phylogenetic analyses (Fig. 19), *Roussoella mukdahanensis* distinctly separates from the morphologically similar species. Liu et al. (2014) mentioned that *Roussoella* species were barely distinguishable by morphological characters, however, they can be separated by phylogenetic investigation.

Roussoella neopustulans D.Q. Dai, J.K. Liu & K.D. Hyde, in Liu et al. Phytotaxa 181(1): 1–33 (2014)

Facesoffungi number: FoF 01981; Fig. 20

Saprobic on dead culms of bamboo, forming raised, brown to dark brown area, with black dots on host surface. **Sexual morph**: *Ascostromata* 210–280 μm high, 300–400 μm diam., gregarious, immersed to erumpent through host surface by papilla, globose to subglobose, uni-loculate, glabrous, with a central ostiole, with minute papilla. *Peridium* 9.5–25.5 μm wide, thin-walled, of unequal thickness, slightly thinner at

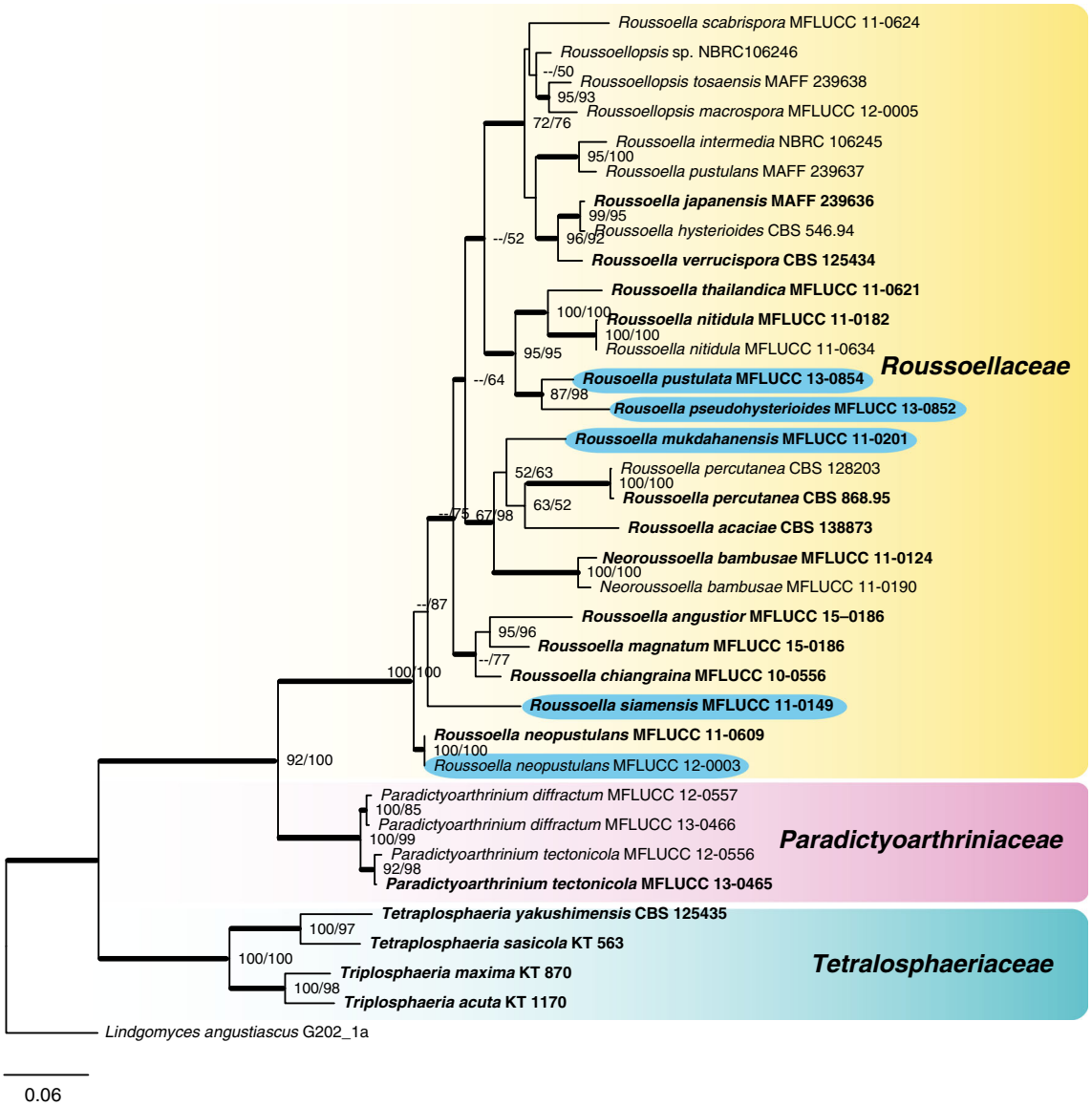


Fig. 19 Maximum likelihood phylogenetic tree generated by RAxML (GTR+G model) based on combined SSU, LSU and TEF1 sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Lindgomyces angustiascus* (G202_1a). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

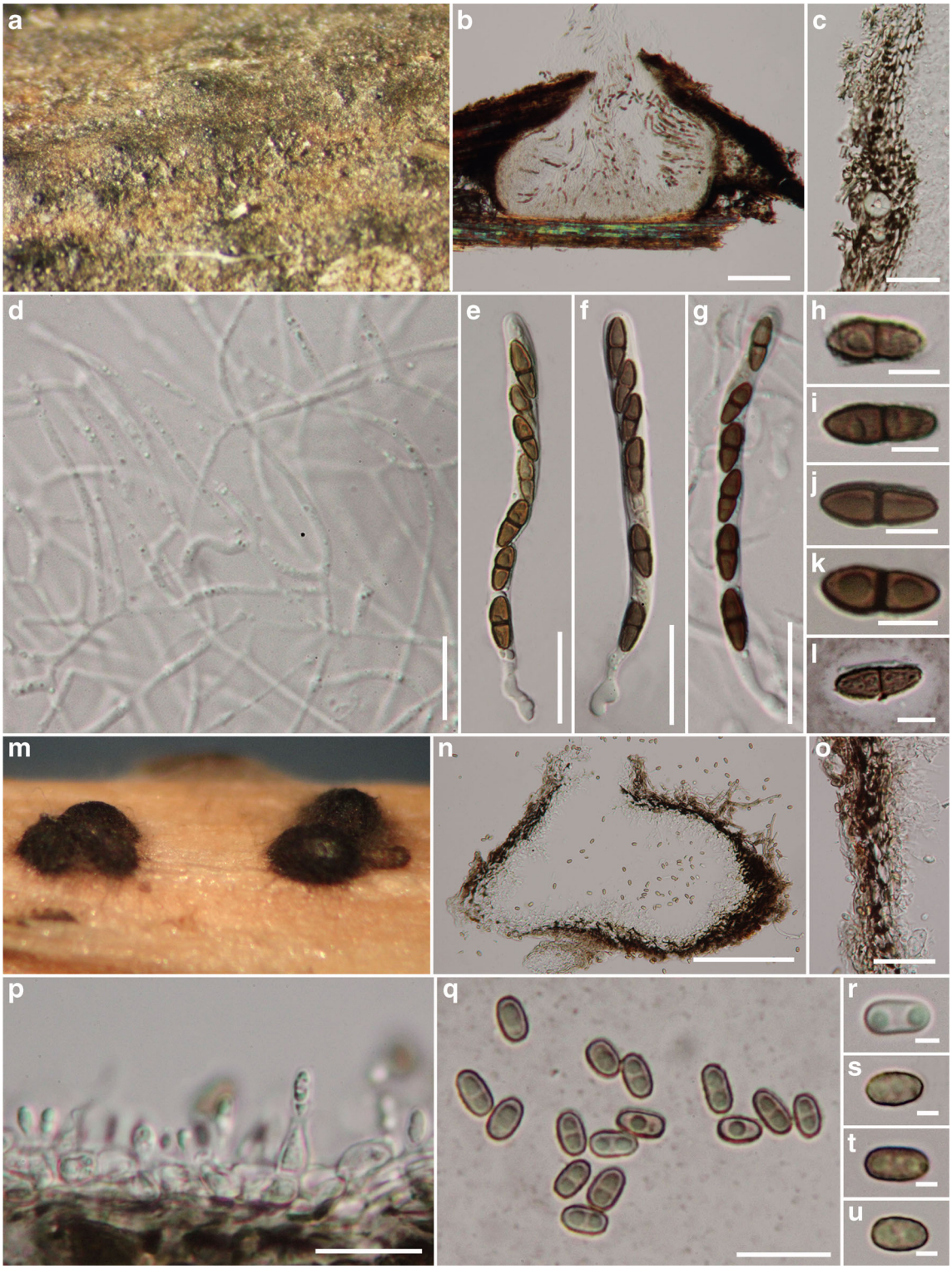


Fig. 20 ***Roussoella neopustulans*** (MFLU 11–0241). **a** Appearance of ascostromata on host surface. **b** Vertical section through ascostroma. **c** Section through peridium. **d** Pseudoparaphyses. **e**–**g** Asci. **h**–**k** Ascospores. **l** Ascospore stained with Indian ink. **m** Conidiomata on bamboo pieces on WA. **n** Vertical section through conidioma. **o** Section through pycnidial wall. **p** Conidiogenous cells. **q** Conidia stained with Indian ink. **r**–**u** Conidia. Scale bars: b, n = 100 *μm*, c, e, f, g, o = 20 *μm*, d, p, q = 10 *μm*, h–l = 5 *μm*, r–u = 2 *μm*

the base, composed of several layers of flattened, brown to dark brown, *textura prismatica* pseudoparenchymatous cells, rarely *textura angularis*. *Hamathecium* composed of dense, 2–2.5 μm wide, cellular pseudoparaphyses, distinctly septate,

constricted at the septum, anastomosing at the apex, embedded in a gelatinous matrix. *Asci* (63–)75–90(−96) × 5–6(−7) μm ($\bar{x}$ = 80.1 × 5.9 μm, *n* = 30), 8-spored, bitunicate, cylindrical, short pedicellate, with furcate or knob-like pedicel, apically rounded with indistinct ocular chamber. *Ascospores* (8–)9–12× 3–4(−5) μm ($\bar{x}$ = 10.3 × 3.8 μm, *n* = 30), overlapping, uni-seriate, ellipsoidal to fusiform, with rounded to acute ends, brown to dark brown, 1-septate, slightly constricted at the septum, rough-walled, with striations or longitudinally ribbed, surrounded by mucilaginous sheath. **Asexual morph**: produced on bamboo pieces on WA after 12 weeks. *Conidiomata* 140–300 μm high, 170–320 μm diam., pycnidial, solitary to gregarious, clustered, superficial, visible as blackdots on bamboo pieces, variable in shape, globose to subglobose, lenticular, dome-shaped to irregular-shaped, uni- to multi-loculate, covered by hyphae, ostiole central, with pore-like opening. *Wall of conidomata* 12–25.5 μm wide, thin-walled, of equal thickness, composed of two types cell layers, inner part comprising several layers of flattened, dark brown to black, *textura angularis* pseudoparenchymatous cells, barely distinguishable from conidiogenous cells, outer part comprising a few layers of *textura epidermoidea* to *textura intricata. Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* (2.5–)3–6 × (2–)3–5 μm ($\bar{x}$ = 4.8 × 3.9 μm, *n* = 30), enteroblastic, annellidic and phialidic, determinate, discrete, unbranched, ampulliform to lageniform, hyaline, aseptate, smooth-walled. *Conidia* 4–5.5(−6) × 2–3 μm ($\bar{x}$ = 5.2 × 3 μm, *n* = 30), oblong to ellipsoidal, with rounded to obtuse ends, initially hyaline, becoming brown, aseptate, verrucose.

Culture characters: Colonies on PDA fast growing, 30–40 mm diam. after 2 weeks at 25–30 °C, colonies irregular, sparse to medium dense, slightly raised to umbonate, surface rough, with entire edge, woolly at the magin, floccose to velvety in the centre, wrinkled at the centre, colonies white at the margin, grey to greenish grey in the middle, with white-grey at the centre from above, white to cream at the margin, brown to dark brown at the centre from below, not producing pigments.

Material examined: THAILAND, Mukdahan Province, Nongsung District, Wang Hai Village, on dead culms of bamboo, 13 April 2011, R. Phookamsak, RP0121 (MFLU 11–0241), living cultures, MFLUCC 12–0003, KUMCC.

Notes: *Roussoella neopustulans* was introduced by Liu et al. (2014), with a description of only the sexual morph. This species was recollected in the same country, and the new collection sporulated on bamboo pieces on water agar. Thus this species is redescribed and illustrated here with both sexual and asexual morphs.

This species is morphologically similar to *R. pustulans*. However, *R. neopustulans* has smaller ascospores but larger asci (Liu et al. 2014). Additionally, *R. neopustulans* ascospores have linear striations along their entire length, while those of *R. pustulans* have shorter and irregular striations. Based on multi-gene phylogenetic analyses (Fig. 19), *R. neopustulans* forms a distinct basal clade in the family *Roussoellaceae. Roussoella pustulans* has no known asexual morph.

Roussoella pseudohysterioides D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552026; *Facesoffungi number*: FoF 01982; Fig. 21

Etymology: Refers to the similarity with *Roussoella hysterioides*.

Holotype: MFLU 15–1209

Saprobic on decaying bamboo culms. **Sexual morph**: *Ascostromata* forming under black area, up to 3–5 mm long and 1–2 mm wide, raised at maturity, ellipsoidal to irregular, black, coriaceous. *Locules* in vertical section 200–250 μm high, 170–350 μm diam., solitary to gregarious, subglobose to ellipsoidal, dark brown, with ostiolate opening. *Peridium* 15–25 μm wide, composed of dark brown to hyaline cells of compressed *textura angularis*, with upper wall 15–45 μm wide, darker, comprising host and fungal tissues. *Hamathecium* comprising dense, 2–3.5 μm wide, cellular pseudoparaphyses, indistinctly septate, anastomosing and branching at the apex, embedded in a gelatinous matrix. *Asci* 100–270 × 7–15 μm ($\bar{x}$ = 148.2 × 9.7 μm, *n* = 20), 8-spored, bitunicate, cylindrical, with a short furcate pedicel, with an apical ocular chamber. *Ascospores* 12.5–20 × 4–6 μm ($\bar{x}$ = 16.1 × 5.2 μm, *n* = 20), uniseriate, fusiform-ellipsoidal, 1-septate, constricted at the septum, narrow at both ends, with longitudinally striate and verrucose wall ornamentation. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from lower end or both ends. Colonies circular, slow growing, 25 mm diam. in 30 days at 28–32 °C, under 12 h light/12 h dark, cottony, yellowish brown at the centre, light coloured and floccose at the periphery from above, yellow to dark brown to orange from below.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang University, on dead culm of bamboo, 9 July 2013, Dong-Qin Dai DDQ00259 (MFLU 15–1209); *Ibid*. (KUN HKAS88717, **isotype**), ex-type living cultures, MFLUCC 13–0852, CBS 139992.

Note: Roussoella pseudohysterioides is similar to *R. hysterioides* in having black stromatic ascomata, cylindrical asci and fusiform-ellipsoidal ascospores with longitudinal striations (Hyde et al. 1996). *Roussoella pseudohysterioides,* however, differs by its smaller ascospores (12.5–20 × 4–6 μm vs. 18–34 × 6–8 μm) (Hyde et al. 1996). Moreover, *R. pseudohysterioides* has verrucose ascospores, a character not observed in *R. hysterioides*. In the phylogenic tree (Fig. 19) *R. pseudohysterioides* is close to *R. pustulata*, while the branch length indicates that they are different species.

Roussoella tuberculata D.Q. Dai & K.D. Hyde, ***sp. nov.***

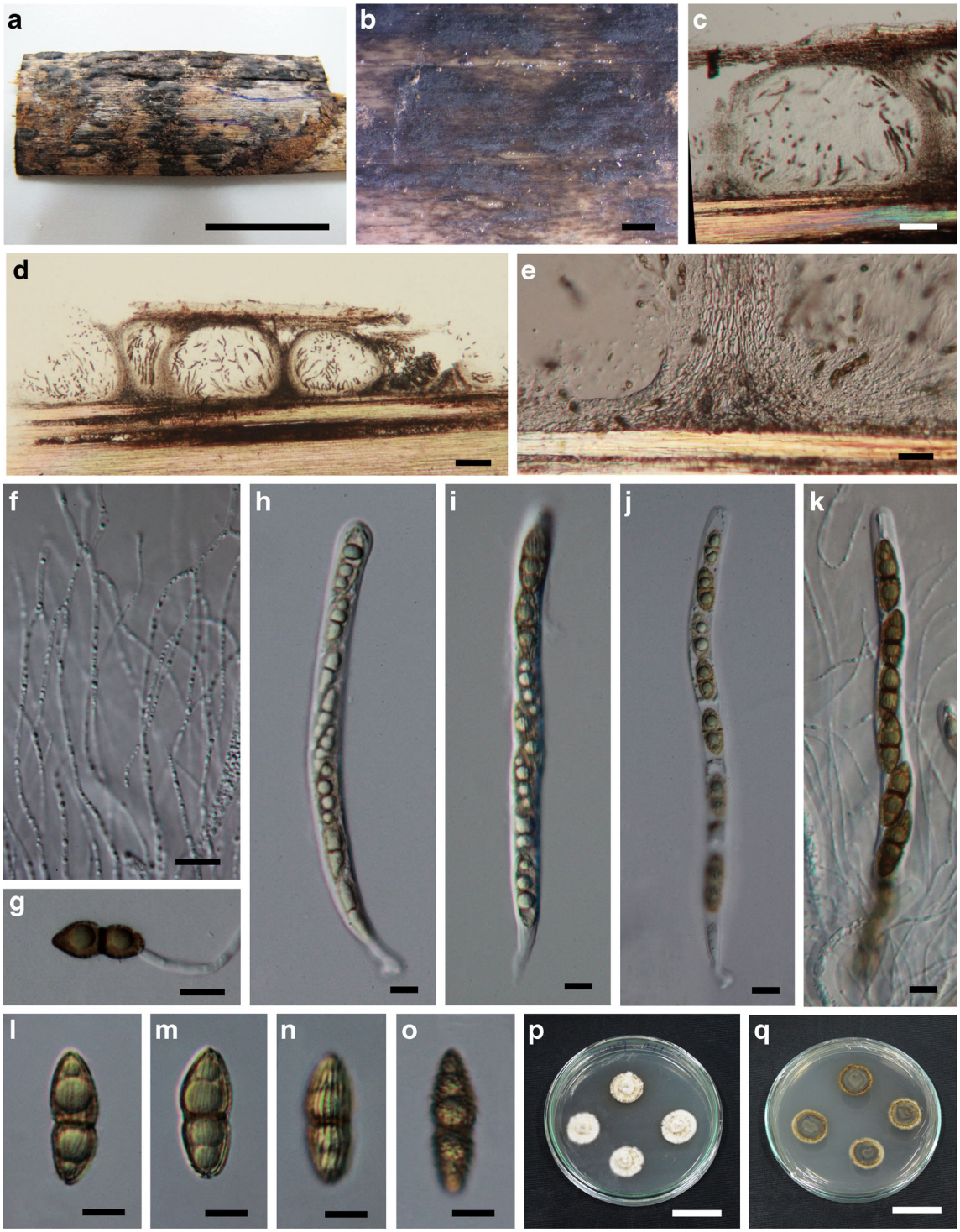


Fig. 21 ***Roussoella pseudohysterioides*** (MFLU 15–1209, **holotype**). **a**, **b** Ascostromata developing on bamboo culm. **c**, **d** Vertical sections of ascostromata. **e** Peridium. **f** Branched pseudoparaphyses. **g** Germinating ascospore. **h**–**k** Asci containing eight ascospores. **l**–**o** Dark brown ascospores. **p**, **q** Cultures on MEA. Scale bars: a = 2 cm, b = 1 mm, c = 50 μm, d = 100 μm, e = 20 μm, f–k = 10 μm, l–o = 5 μm, p, q = 25 mm

Index Fungorum number: IF552027; *Facesoffungi number*: FoF 01983; Fig. 22

Etymology: Refers to the conidia covered by tubercules.

Holotype: MFLU 15–1211

Saprobic on decaying bamboo culms. **Sexual morph**: Undetermined. **Asexual morph**: *Stromata* forming under a blackened area, up to 1–2 mm long and 2–3 mm wide, and becoming raised at maturity, ellipsoidal to irregular.

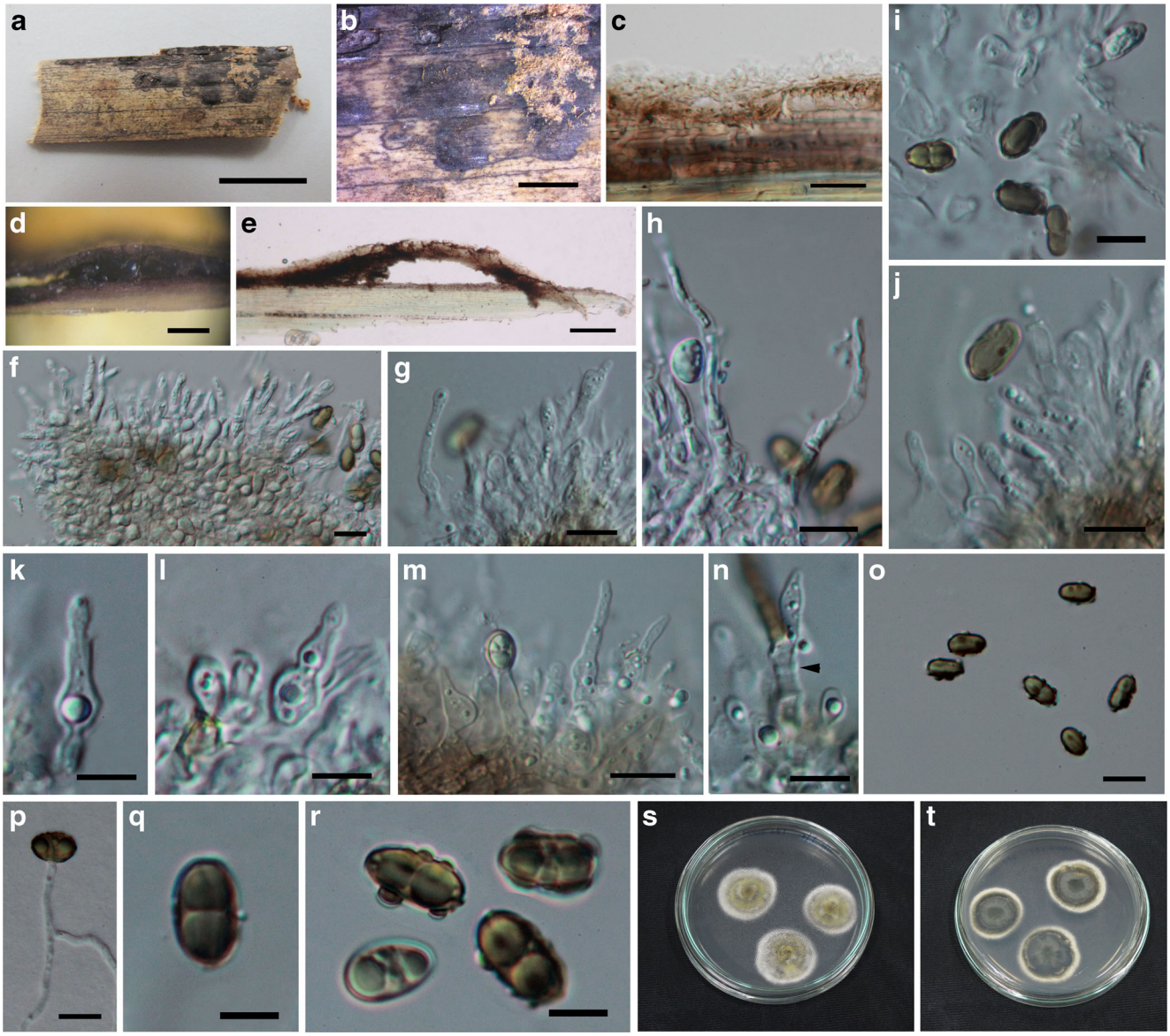


Fig. 22 ***Roussoella tuberculata*** (MFLU 15–1211, **holotype**). **a**, **b** Conidiomata on bamboo culm. **c** Basal wall of conidioma. **d**, **e** Vertical sections of conidiomata. **f**, **g**, **i**–**n** Conidiogenous cells developing conidia (**n**: showing annellidic conidiogenous cells). **h** Paraphyses. **p** Germinating conidia. **o**, **q**, **r** Dark brown conidia (**o**, **r**: Mature conidia covered by small tubercules). **s**, **t** Cultures on MEA. Scale bars: a = 2 cm, b = 2 mm, b, d, e = 200 μm, c = 20 μm, f–j, m, o = 10 μm, k, l, n, p–r = 5 μm

Conidiomata 150–250 μm high, 500–800 μm diam., eustromatic, immersed in the stromata, globose to subglobose, dark brown, with ostiolate opening. *Conidiomatal wall* comprising two layers of cells of *textura angularis*, with dark to brown outer thin layer 5 μm thick, with 10–17 μm thick, hyaline, conidiogenous inner layer. *Paraphyses* 30–40 μm long × 2–3.5 μm wide, septate, wide at the base, curved. *Conidiophores* 5–12.5 × 2.5–4 μm ($\bar{x}$ = 7.4 × 3.6 μm, n = 20) short, hyaline, wide at base, smooth, formed from the inner cells of the conidiomata wall. *Conidiogenous cells* 2. 5–12 × 1.5–3.5 μm ($\bar{x}$ = 8.1 × 2.5 μm, n = 20) obclavate, enteroblastic, phialidic, becoming annellidic, with 1–3 barely discernible annellations, indeterminate, discrete, cylindrical to ampulliform, hyaline, smooth-walled. *Conidia* 8.5–10 × 4.5–5.5 μm ($\bar{x}$ = 9.5 × 5.2 μm, n = 20), ellipsoidal to oblong, occasionally obovoid, aseptate, straight, rounded at both ends, brown to dark brown, smooth-walled, with wall sparsely covered by small, roughened tubercules, inside usually containing 1–2 large guttules.

Culture characters: Conidia germinating on MEA within 24 h and germ tubes produced from sides. Colonies slow growing, 30 mm diam. after 15 days at 28–32 °C, under 12 h light/12 h dark, circular, with even margin, floccose at the center, drift white at margin, and light greenish brown at the centre.

Material examined: THAILAND, Chiang Rai Province, Mae Fah Luang Unversity, on dead culms of bamboo, 9 July 2013, Dong-Qin Dai, DDQ00261 (MFLU 15–1211, **holotype**); *Ibid*. (KUN HKAS88719, **isotype**), ex-type living cultures, MFLUCC 13–0854, ICMP 20529.

Notes: Roussoella tuberculata is characterized by immersed, eustromatic conidiomata, enteroblastic, phialidic, annellidic conidiogenous cells and ellipsoidal conidia covered by small tubercules. *Roussoella tuberculata* is similar to *R. hysterioides*, but differs in having annellidic conidiogenous cells (Hyde et al. 1996). Conidia of *Roussoella* species usually have verrucose wall ornamentation (Hyde et al. 1996; Liu et al. 2014), while *R. tuberculata* has conidia with small, roughened tubercules.

Roussoella siamensis Phookamsak, J.K. Liu & K.D. Hyde., in Liu et al. Phytotaxa 181(1): 1–33 (2014)

Facesoffungi number: FoF 01984; Figs. 23

Saprobic on dead bamboo culms. **Sexual morph**: *Ascostromata* 120–150 μm high, 620–750 μm diam., gregarious, immersed within cortex, visible as raised, brown to dark brown areas on the host surface, shield-shaped to continuously low convex, uni- to multi-loculate, coriaceous. *Locules* 70–120 μm high, 130–350 μm diam., scattered to clustered, gregarious, immersed in ascostromata, lenticular to subglobose, with a flattened base, glabrous, ostiole central, with a minute ostiole embedded beneath a clypeus, becoming pore-like opening on host surface at maturity. *Peridium* 7–15 μm wide, thin-walled of unequal thickness, thinner at the base, composed of several layers of flattened, brown to dark brown, compressed *textura angularis* pseudoparenchymatous cells. *Hamathecium* composed of dense, 1–2 μm wide, cellular pseudoparaphyses, indistinctly septate, not constricted at the septum, anastomosing and branching at the apex, embedded in a gelatinous matrix. *Asci* (67–)70–90(−94) × 6–8 μm ($\bar{x}$ = 77.8 × 7.3 μm, n = 25), 8-spored, bitunicate, cylindrical, short to long pedicellate with furcate or foot-like pedicel, apically rounded, with an indistinct ocular chamber. *Ascospores* (8.5–)10–12(−14) × 4–5 μm ($\bar{x}$ = 10.8 × 4.6 μm, n = 30), overlapping, uni-seriate, ellipsoidal to fusiform, with rounded ends, brown to dark brown, 1-septate, constricted at the septum, rough-walled, longitudinally ribbed. **Asexual morph**: Coelomycetous, produced on bamboo pieces on WA after 12 weeks. *Conidiomata* 360–940 μm high, 560–1300 μm diam., solitary to gregarious, clustered, semi-immersed to superficial, visible as black irregular pycnostroma, covered by hyphae on bamboo pieces, globose to subglobose, uni-loculate, becoming glabrous at maturity, indistinctly ostiolate. *Conidiomata wall* 20–45 μm wide, thin-walled, of equal thickness, composed of four strata, an inner layer comprising conidiogenous cells arising from a thin layer of hyaline cells, a stratum of 3–5 layers of dark brown to black, pseudoparenchymatous cells, arranged in a *textura angularis*, a median stratum comprising several layers of flattened, hyaline cells, arranged in *textura angularis* to *textura prismatica*, and an outer stratum comprising several layers of dark brown to black stromatic cells, arranged in *textura intricata. Conidiophores* arising from the basal cavity around conidiomata, unbranched, 0–1 septate, or reduced to conidiogenous cells. *Conidiogenous cells* 3–6(−10) × 2.5–5 μm ($\bar{x}$ = 5.3 × 3.7 μm, n = 30), enteroblastic, phialidic or broadly annellidic, determinate, discrete, unbranched, ampulliform to lageniform, or irregular in shape, hyaline, aseptate, smooth-walled, with distinct periclinal thickening. *Conidia* 4–5 × 3–4 μm ($\bar{x}$ = 4.8 × 3.4 μm, n = 50), globose to subglobose, initially hyaline, becoming brown, aseptate, rough-walled, verrucose.

Culture characters: Colonies on PDA fast growing, 55–60 mm diam. after 4 weeks at 25–30 °C, colonies irregular, medium dense, slightly raised to umbonate, dull with undulate edge, floccose to woolly, slightly radiating, pale yellowish to brownish orange at the margin, white to cream medianly, pale yellowish at the centre from above, pale yellowish at the margin, brown to golden brown medianly, dark brown to black at the centre from below, produced yellowish brown pigment in agar.

Material examined: THAILAND, Chiang Rai Province, Muang District, Mae Fah Luang University campus grounds, on dead culms of *Bambusa* sp., 13 August 2010, R. Phookamsak, RP0065 (MFLU 11–0185, **holotype**), ex-type living cultures, MFLUCC 11–0149, KUMCC.

Notes: *Roussoella siamensis* was introduced by Liu et al. (2014), and lacked the asexual morph description. In this study, the ex-type culture produced a coeloemycetous asexual morph on bamboo pieces on water agar. Thus, we redescribe and illustrate this species based on morphological characters of both sexual and asexual morphs.

The species was described as forming multi-loculate ascomata with cylindrical, bitunicate asci and brown, striate, didymosporous ascospores (Liu et al. 2014). Based on the morphological characters, *Roussoella siamensis* is similar to *R. chiangraina* and *R. neopustulans* (Liu et al. 2014). However, *R. siamensis* differs from *R. chiangraina* and *R. neopustulans* by forming multi-loculate ascostromata, and having larger asci, ascospores and conidia than *R. chiangraina* and *R. neopustulans*. Based on multi-gene phylogenetic analyses, *R. siamensis* forms a single basal clade (Fig. 19).

Tubeufiales Boonmee & K.D. Hyde, Fungal Diversity 68 (1): 245 (2014)

The order *Tubeufiales* was introduced by Boonmee et al. (2014), and accommodates a single family *Tubeufiaceae* (Boonmee et al. 2011). Boonmee et al. (2014) examined the sexual and asexual morphs, and provided a key to the 19 accepted genera (including five asexual genera).

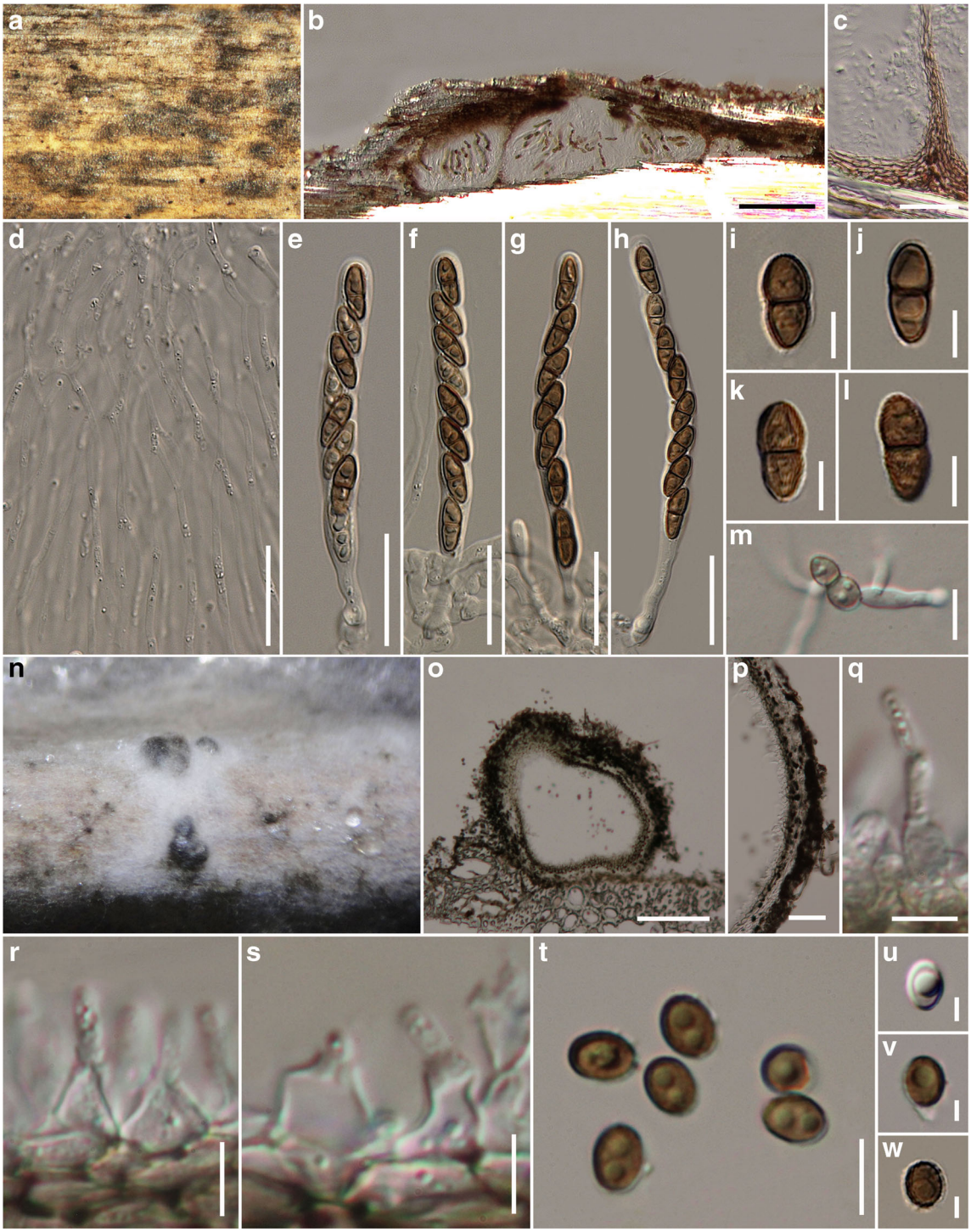


Fig. 23 ***Roussoella siamensis*** (MFLU 11–0185, **holotype**). **a** Appearance of ascostromata on host surface. **b** Vertical section through ascostroma. **c** Section through peridium between locules. **d** Pseudoparaphyses. **e**–**h** Asci. **i**–**l** Ascospores. **m** Germinating ascospore. **n** Conidiomata on bamboo pieces on WA. **o** Vertical section through conidioma. **p** Section through pycnidial wall. **q**–**s** Conidiogenous cells. **t**–**w** Conidia. Scale bars: b, o = 100 *μm*, c–h, p = 20 *μm*, m = 10 *μm*, i–l, q–s, t = 5 *μm*, u–w = 2 *μm*

Subsequently, Wijayawardene et al. (2014) recognized 21 genera in *Tubeufiaceae*.

Tubeufia javanica Penz. & Sacc., Malpighia 11(11–12): 517 (1898) [1897], Fig. 24

Material examined: THAILAND, Chiang Rai, Muang, Khun Korn Waterfall, on dead culm-sheaths of bamboo, 31 July 2012, Dong-Qin Dai DDQ00239 (MFLU 13–0371, **epitype**); *Ibid*. (PDD 104450, iso-epitype).

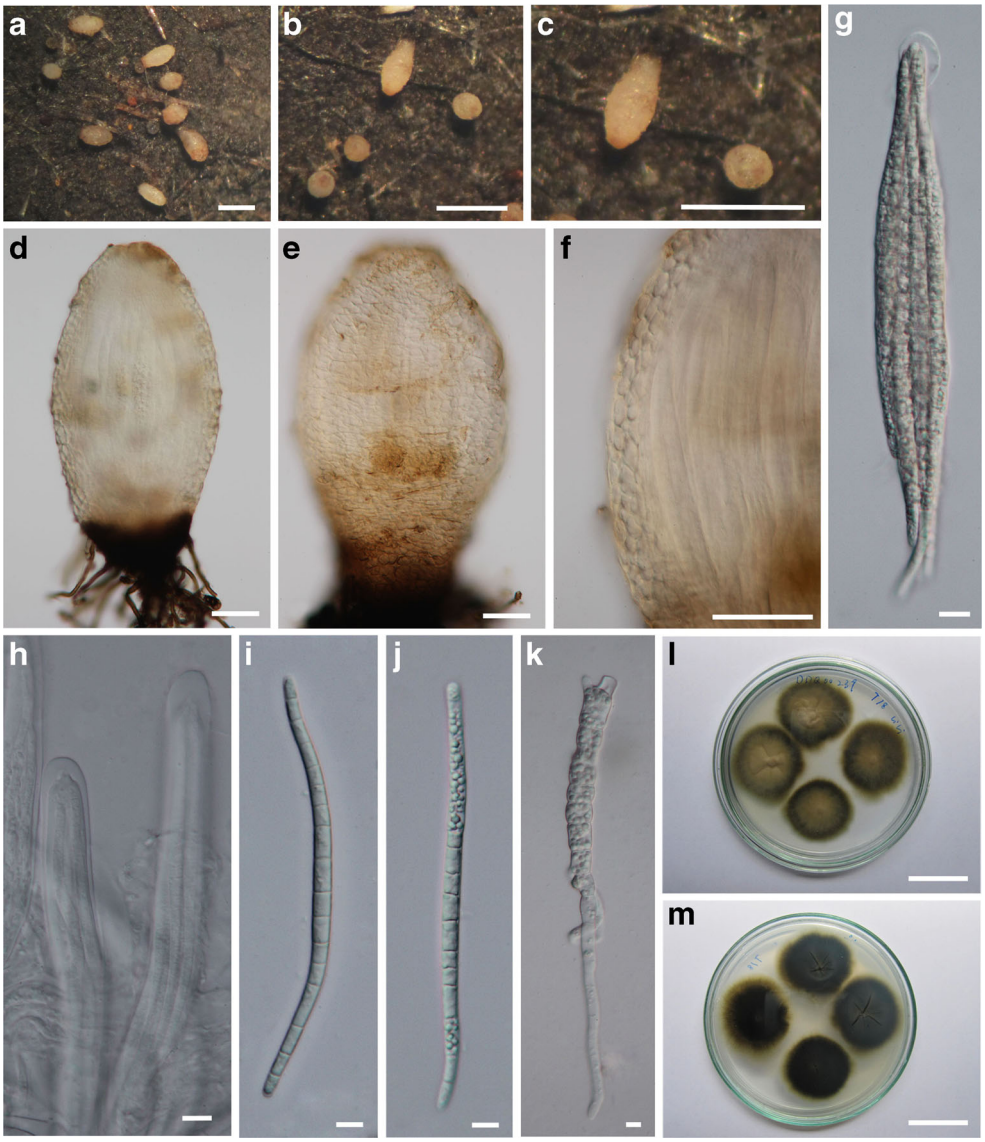


Fig. 24 *Tubeufia javanica* (MFLU 13–0371, **epitype**). **a–c** Oblong to clavate ascomata on host surface. **d** Ascoma forming on dark brown hyphae. **e**, **f** Peridium of ascomata g Broken ascus. **h** Cylindrical asci with ocular chambers. **i**, **j** Hyaline to pale brown, filiform, multi-septate ascospores. **k** Germinating ascospore. **l**, **m** Dark brown colonies on PDA media. Scale bears: a–c = 400 *μm*, d–f = 50 *μm*, g, h = 10 *μm*, i–k = 5 *μm*, l, m = 25 mm

Notes: Tubeufia javanica, the family type of *Tubeufiaceae*, was described by Penzig and Saccardo (1897) based on a specimen collected from bamboo. It was recollected, epitypified and redescribed in Boonmee et al. (2014). In this paper, we reillustrate this important species to show the typical morphology of *Tubeufiaceae*.

Tubeufia longiseta D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum umbers: IF552029; *Facesoffungi number*: FoF 01985; Fig. 25

Etymology: In reference to its ascomata with long setae.

Holotype: MFLU 15–1215

Saprobic on bamboo culm. **Sexual morph**: *Ascomata* 250–370 μm high, 180–250 μm diam., superficial, solitary, gregarious or in loosegroups, subglobose, oboviod, black, with a central ostiole. Setae 100–350 × 3.5–5.5 μm, dense, covering the whole ascoma, black, unbranched, septate, dark brown, thick-walled. *Peridium* 25–40 μm wide, composed of 7–11 layers of cells of *textura angularis*; outer stratum composed of large, dark brown, thick-walled, 11–21 × 6.5–14.5 μm cells; inner stratum composed of small, hyaline, thin-walled cells. *Hamathecium* comprising 2–2.5 μm wide, septate, branched, hyaline, cellular pseudoparaphyses embedded in a gelatinous matrix. *Asci* 90–140 × 14.5–18 μm ($\bar{x}$ = 118.1 × 16.8 μm, n = 20), 8-spored, bitunicate, fissitunicate, cylindrical, short pedicellate, apically rounded, with an ocular chamber. *Ascospores* 38.5–55.5 × 4.5–6 μm ($\bar{x}$ = 47.3 × 5.6 μm, n = 20), long subfusiform, elongate, pointed at the ends, slightly curved, 10–13-septate, not constricted at the septa, hyaline, smooth-walled. **Asexual morph**: Undetermined.

Cultural characters: Ascospores germinating on PDA within 24 h. Colonies growing slowly on PDA, reaching 2 mm in 30 d at 28 °C, under 12 h light/12 h dark, effuse, velvety to hairy, edge fimbriate, olive to olive brown, dark

Fig. 25 ***Tubeufia longiseta*** (MFLU 15–1215, **holotype**). **a** Herbarium specimen. **b–d** Black ascomata with setae on host surface. **e**, **f** Vertical sections of ascomata. **g** Peridium. **h** Dark brown setae. **i–k** Asci. **l**, **m** Sterile cells from PDA. **n**, **o** Cultures on PDA. **p–t** Ascospores. **u** Germinating ascospore. Scale bars: a = 5 mm, b–d = 1 mm, e–g = 50 μm, h–u = 10 μm

brown on PDA media. Mycelium superficial and partially immersed, branched, septate, pale brown to olivaceous brown, smooth, sterile at 60 days.

Material examined: THAILAND, Phang-Nga, Doi Nang Hong, Tham Thong Lang, Thap Put District, 8°32′11″N 98°33′35″E, on dead culms of bamboo, 6 October 2014, Kevin D. Hyde DDQ00287 (MFLU 15–1215, **holotype**); *Ibid*. (KUN HKAS88722, **isotype**), ex-type living cultures, MFLUCC 15–0188, KUMCC.

Notes: *Tubeufia longiseta* is similar to *T. acacia* in having superficial, subglobose, black ascomata, covered with black setae, cylindrical asci and long subfusiform, elongate ascospores. However, *T. longiseta* has smaller ascomata (250–370 μm high, 180–250 μm diam. vs. 300–375 μm high, 225–255 μm diam.), ascospores with more transverse septa (10–13 vs. 5–7 septa), and is found on different substrates (bamboo vs. acacia). Black ascomata with long, black setae can be observed in several genera of *Tubeufiaceae*, such as *Acanthohelicospora*, *Acanthostigma*, *Chlamydotubeufia*, *Helicangiospora*, *Neocanthostigma* and *Thaxteriellopsis* (Boonmee et al. 2014). However, phylogenetic analyses confirm that this new taxon belongs to *Tubeufia sensu stricto* and is closely related to *T. javanica* (Fig. 26). The latter species differs in having white to yellowish, oblong to clavate ascomata and broad, filiform ascospores (Boonmee et al. 2014).

Valsariales Jaklitsch, K.D. Hyde & Voglmayr, Fungal Diversity 73:167 (2015)

The order *Valsariales* was introduced by Jaklitsch et al. (2015) to accommodate the single family *Valsariaceae*. Jaklitsch et al. (2015) revised *Valsaria* and introduced *Valsariaceae* based on multi-gene phylogeny analyses (SSU, LSU, ITS, RPB2 and tef1 sequences). Jaklitsch et al. (2015) re-examined and re-collected type species and provided full descriptions and illustrations. Two new combined genera were introduced by Jaklitsch et al. (2015). Thus, *Valsariaceae* includes three genera, *Bambusaria*, *Myrmaecium* and *Valsaria*.

Bambusaria bambusae (J.N. Kapoor & H.S. Gill) Jaklitsch, D.Q. Dai, K.D. Hyde & Voglmayr, Fungal Diversity 73: 196 (2015), Figs. 27 and 28

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai, DDQ0097 (MFLU 15–1192); Doi Pui, 1 September 2011, Dong-Qin Dai, DDQ00109 (MFLU 15–1194).

Notes: The monotypic genus *Bambusaria* was introduced by Jaklitsch et al. (2015) and is typified by *B. bambusae* (J.N. Kapoor & H.S. Gill) Jaklitsch, D.Q. Dai, K.D. Hyde (basionym: *Valsaria bambusae* J.N. Kapoor & H.S. Gill). *Bambusaria bambusae* was originally isolated from bamboo in India by Kapoor and Gill (1961). The same species was recollected on *Thyrsostachys siamensis* (*Bambuseae*) and published in Jaklitsch et al. (2015). In the present study, this species is re-illustrated based on new collections (sexual and asexual morph specimens).

Sordariomycetes O.E. Erikss. & Winka, Myconet 1(1): 10 (1997)

Sordariomycetes is one of the largest classes of Ascomycota consisting of 15 orders, 64 families, 1119 genera, and 10564 species (Kirk et al. 2008). Maharachchikumbura et al. (2015) provided an updated outline of *Sordariomycetes* and a backbone tree incorporating asexual and sexual genera in the class. Six subclasses, 28 orders, 90 families and 1344 genera were included by Maharachchikumbura et al. (2015).

Chaetosphaeriales Huhndorf, A.N. Mill. & F.A. Fernández, Mycologia 96(2): 378 (2004)

The order *Chaetosphaeriales* was introduced by Huhndorf et al. (2004). Lumbsch and Huhndorf (2010) included a single family *Chaetosphaeriaceae* with ten genera in this order. Based on combined LSU, SSU, TEF and RPB2 genes analyses, Maharachchikumbura et al. (2015) moved the family *Helminthosphaeriaceae* with seven genera into *Chaetosphaeriales* and recognized 35 genera within *Chaetosphaeriaceae*, and placed six genera, as *Chaetosphaeriales*, genera *incertae sedis*.

Chaetosphaeriales, genera *incertae sedis*

Leptosporella Penz. & Sacc., Malpighia 11(9–10): 406 (1897)

Leptosporella was introduced by Penzig and Saccardo (1897), and typified by *L. gregaria* Penz. & Sacc. Lumbsch and Huhndorf (2010) placed *Leptosporella* in Sordariomycetidae, genera *incertae sedis*. Huhndorf and Miller (2011) re-examined the holotype of *L. gregaria* and collected fresh specimens. Based on LSU sequence data, Huhndorf and Miller (2011) moved *Leptosporella* into *Chaetosphaeriales*. However, the family placement of *Leptosporella* is still not yet determined (Maharachchikumbura et al. 2015).

Leptosporella bambusae D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum numbers: IF552030; *Facesoffungi numbers*: FoF 01986; Figs. 29 and 30

Etymology: Refers to the bamboo host.

Holotype: MFLU 15–1203

Saprobic on dead bamboo culms. **Sexual morph**: *Ascomata* forming under a black pseudostromata, immersed within cortex, becoming raised and conical when mature, 300–450 μm high, 700–1000 μm long and 500–850 μm wide, coriaceous, with black and round papilla; in vertical section 200–250 μm high, 500–850 μm diam., solitary, subglobose, dark brown, with flattened base, with centrally located ostiole, periphyses not observed. *Peridium* 15–25 μm wide, composed of dark brown to hyaline cells of *textura angularis*, with poorly developed lower and upper walls. *Hamathecium* of dense, 2–3.5 μm wide, long, filamentous, unbranched, indistinctly septate, paraphyses. *Asci*

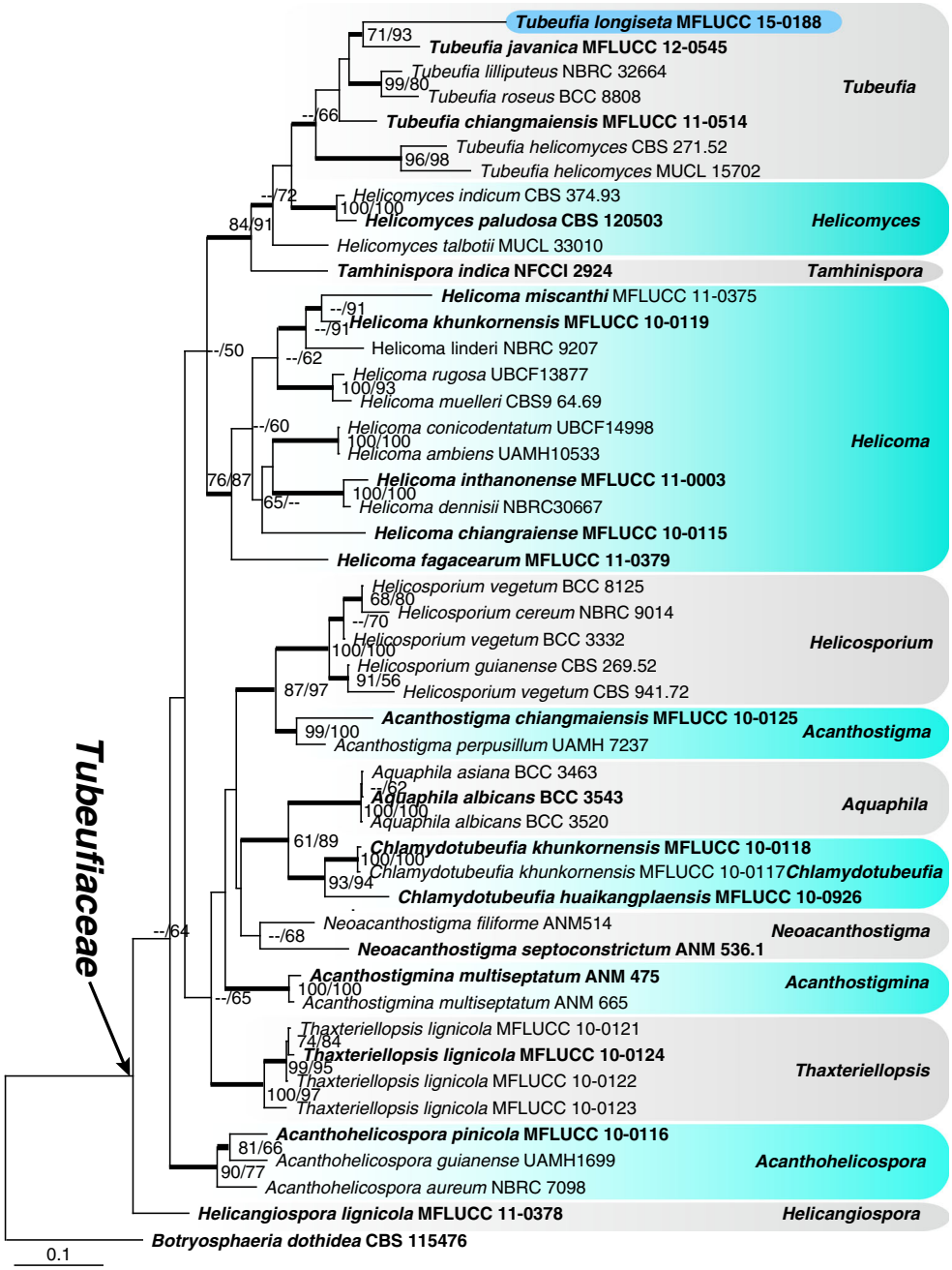


Fig. 26 Maximum likelihood phylogenetic tree (lnL = −1912.497367) generated by RAxML (GTR+G model) based on combined LSU and ITS sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Botryosphaeria dothidea* (CBS 115476). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

100–195.5 × 9–13.5 μm ($\bar{x}$ = 168.6 × 10.8 μm, n = 20), 2–8-spored, unitunicate, cylindrical, with a short furcate pedicel, with a J-, apical ring. *Ascospores* 130–175 × 2–3 μm ($\bar{x}$ = 160.3 × 2.4 μm, n = 20), fasciculate, hyaline, long fusiform, 2–6-septate, narrow and acute at both ends, curved, with abundant small and round guttules, smooth-walled. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 48 h and germ tubes produced from both ends. *Colonies* growing slowly on PDA, reaching 20 mm in 45 d at 25–32 °C, under 12 h light/12 h dark, circular, with even margin, floccose, white and high convex in centre, brown at margin. Mycelium immersed and superficial in the media, composed of branched, septate, smooth-walled, brown hyphae.

Material examined: THAILAND, Chiang Rai, Khun Korn Waterfall, on dead culms of bamboo, 31 July 2012, Dong-Qin Dai DDQ00243 (MFLU 15–1203, **holotype**); *Ibid*. (KUN HKAS88712, **isotype**), ex-type living cultures, MFLUCC 12–0846, MUCL 55879.

Notes: Currently 13 records of *Leptosporella* are listed in Index Fungorum (2016) of which 9 are considered to be species of *Leptosporella*. Members of *Leptosporella* usually occur on wood or branches (Rehm 1901; von

Fig. 27 ***Bambusaria bambusae*** (MFLU 15–1192). **a** ascostromata on bamboo. **b** Vertical section of ascostroma. **c** Ostiole of locule. **d** Peridium of ascostroma and locule. **e**–**h** Asci. **i** Pseudoparaphyses. **j** Ascospores with striations. **k** Germinating ascospore. **l**, **m** Culture on PDA. Scale bars: b, c = 50 *μm*, d–h = 10 *μm*, i–k = 5 *μm*

Höhnel 1909; Spegazzini 1912; Sydow 1938; Chardón 1939; Hansford 1957; Huhndorf and Miller 2011) and occasionally on ferns and *Rosa* sp. (Edward et al. 1972; Index Fungorum 2016). However, our new taxon, *Leptosporella bambusae,* was collected from bamboo. *Leptosporella bambusae* can be compared with the generic type, *L. gregaria*, but it has narrower ascospores (150–175 × 2–3 μm vs. 107–137 × 2.8–4 μm) and possesses septa (2–6-septate vs. 0-septate) (Huhndorf and Miller 2011). In the phylogenic analyses (Fig. 29), the

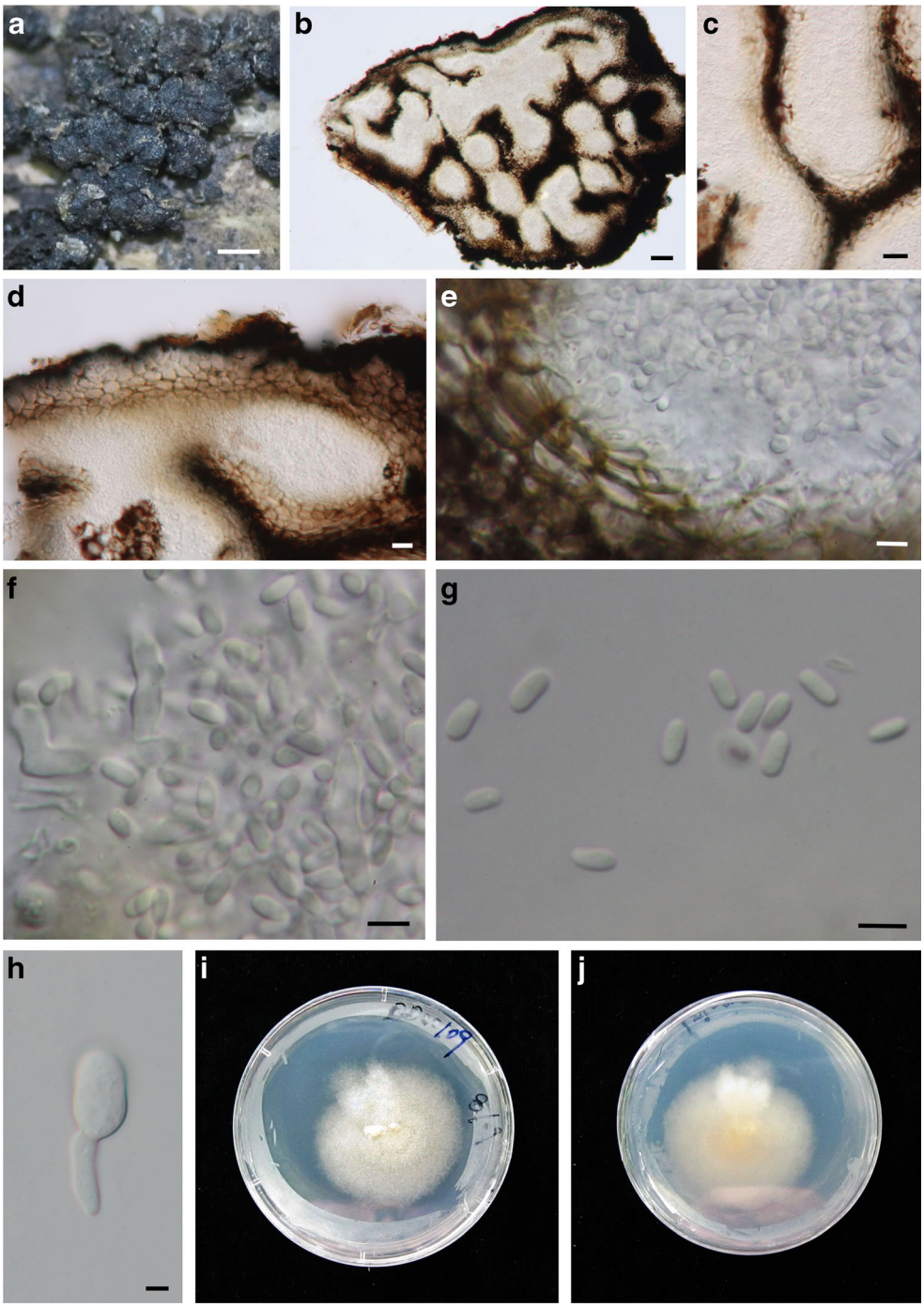


Fig. 28 ***Bambusaria bambusae*** (MFLU 15–1194). **a** Conidiomata on bamboo. **b** Vertical section of conidioma. **c** Conidiolocules. **d** Wall of conidiolocules. **e**, **f** Conidiogenous cells and conidia. **g** Conidia **h** Germinating conidium. **i**, **j** Cultures on PDA. Scale bars: a = 1 mm, b = 50 *μm*, c–e = 10 *μm*, f–h = 5 *μm*

new taxon clusters in *Leptosporella* with strong support (100/99 % MPBP/MLBP).

Hypocreales Lindau, in Engler & Prantl, Nat. Pflanzenfam., Teil. I (Leipzig) 1(1): 343 (1897)

Hypocreales are highly diverse in the tropics and subtropics (Põldmaa 2011; Maharachchikumbura et al. 2015). Kirk et al. (2008) indicated that *Hypocreales* comprised seven families, 237 genera and 2647 species. Maharachchikumbura et al. (2015) included *Bionectriaceae*, *Clavicipitaceae*, *Cordycipitaceae*, *Hypocreaceae*, *Nectriaceae*, *Niessliaceae*, *Ophiocordycipitaceae*, *Stachybotryaceae* and *Tilachlidiaceae* in the order, based on phylogenetic analyses.

Stachybotryaceae L. Lombard & Crous [as *'Stachybotriaceae'*], in Crous et al., Persoonia, Mol. Phyl. Evol. Fungi 32: 283 (2014)

Stachybotryaceae, typified by *Stachybotrys* Corda, was introduced by Crous et al. (2014a). This family was established to accommodate the genera *Myrothecium*, *Peethambara* and *Stachybotrys* (Crous et al. 2014a), three genera earlier placed in *incertae sedis* of the order *Hypocreales* (Lumbsch and

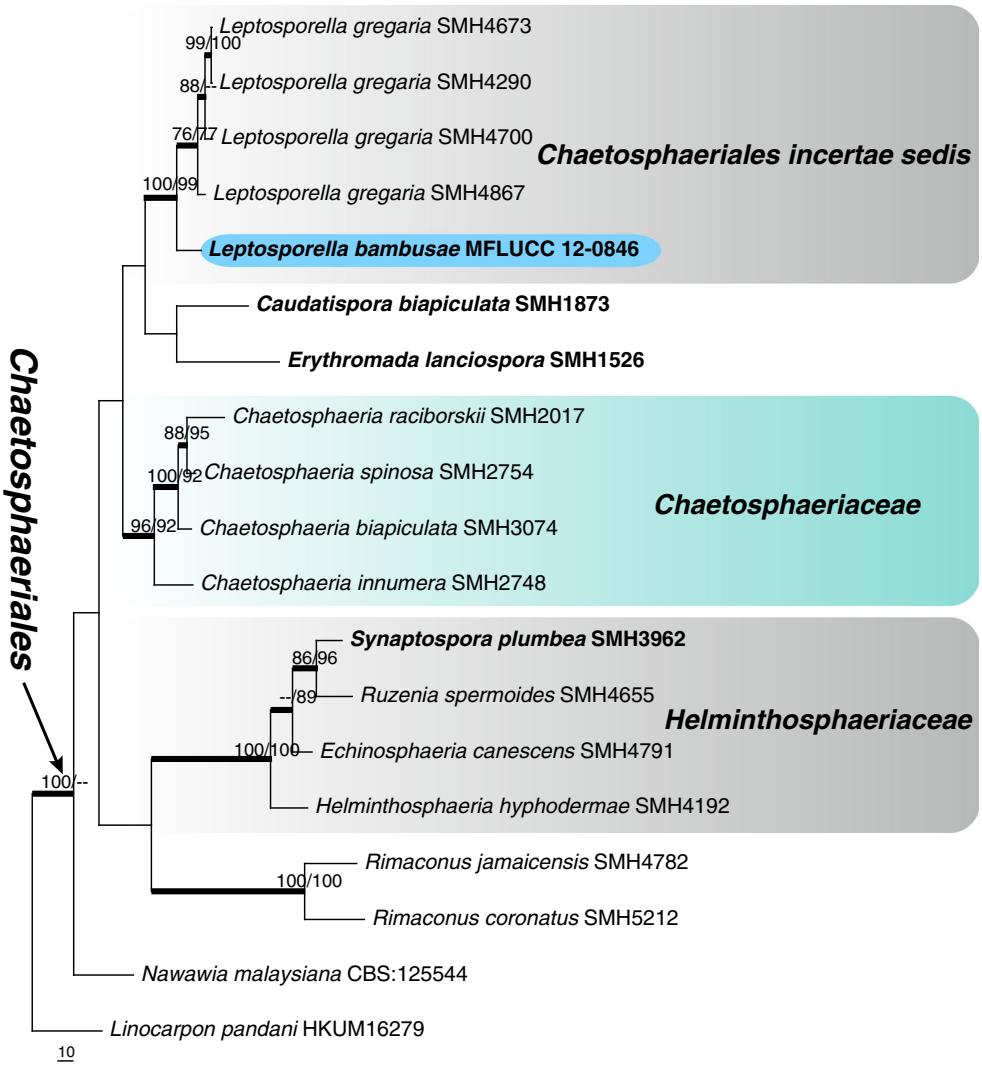


Fig. 29 Maximum likelihood phylogenetic tree (lnL = −3059.137345) generated by RAxML (GTR+G model) based on LSU sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Linocarpon pandani* (HKUM16279). Ex-type strains are in *bold* and a newly generated sequence is highlighted with a *blue* background

Huhndorf 2010; Crous et al. 2014a). A further four genera, *Albosynnema*, *Parasarcopodium*, *Sarcopodium* and *Scopinella* were transferred to *Stachybotryaceae* by Maharachchikumbura et al. (2015).

Myrothecium Tode, Fung. mecklenb. sel. (Lüneburg) 1: 25 (1790)

Myrothecium was introduced by Tode (1790). The genus was placed in *Hypocreales* order *incertae sedis* by Castlebury et al. (2004), Lumbsch and Huhndorf (2010), Summerbell et al. (2011) and Wijayawardene et al. (2012). Later, it was transferred to *Stachybotryaceae* by Crous et al. (2014). Maharachchikumbura et al. (2015) verified this placement by phylogenic analyses. *Myrothecium* species are usually found in decaying habitats, soil and rotting leaves (Pidoplichko and Kirilenko 1969; Tulloch 1972; Saccardo 1886; Udagawa and Awao 1984; Matsushima 1989; Jiang et al. 2014; Wu et al. 2015) occasionally on dung (Faurel and Schotter 1965) and algae (DiCosmo et al. 1980). Liu et al. (2015) introduced a *Myrothecium* species occurring on bamboo. Chen et al. (2016) revised *Myrothecium* in detail, with phylogenetic analyses of ITS, ATP6, EF1-α, LSU, RPB1 and SSU sequence data. In this paper three new species were isolated from bamboo and are described and illustrated.

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

Index Fungorum number: IF552031; *Facesoffungi numbers*: IF 01987; Figs. 31 and 32

Entomology: Referes to the country where this species first collected.

Holotype: MFLU 15–1180

Saprobic on decaying bamboo culms. **Sexual morph**: Undetermined. **Asexual morph**: *Mycelium* partly immersed on the substrate, partly superficial, composed of septate, branched, hyaline, smooth hyphae. *Synnemata* 600–1000 μm long, apical part 45–60 μm wide, basal part 20–30 μm wide, superficial, gregarious, white, apically crowned byslimy, glistening, dark green conidial head. *Conidiophores* macronematous, cylindrical, pale brown,

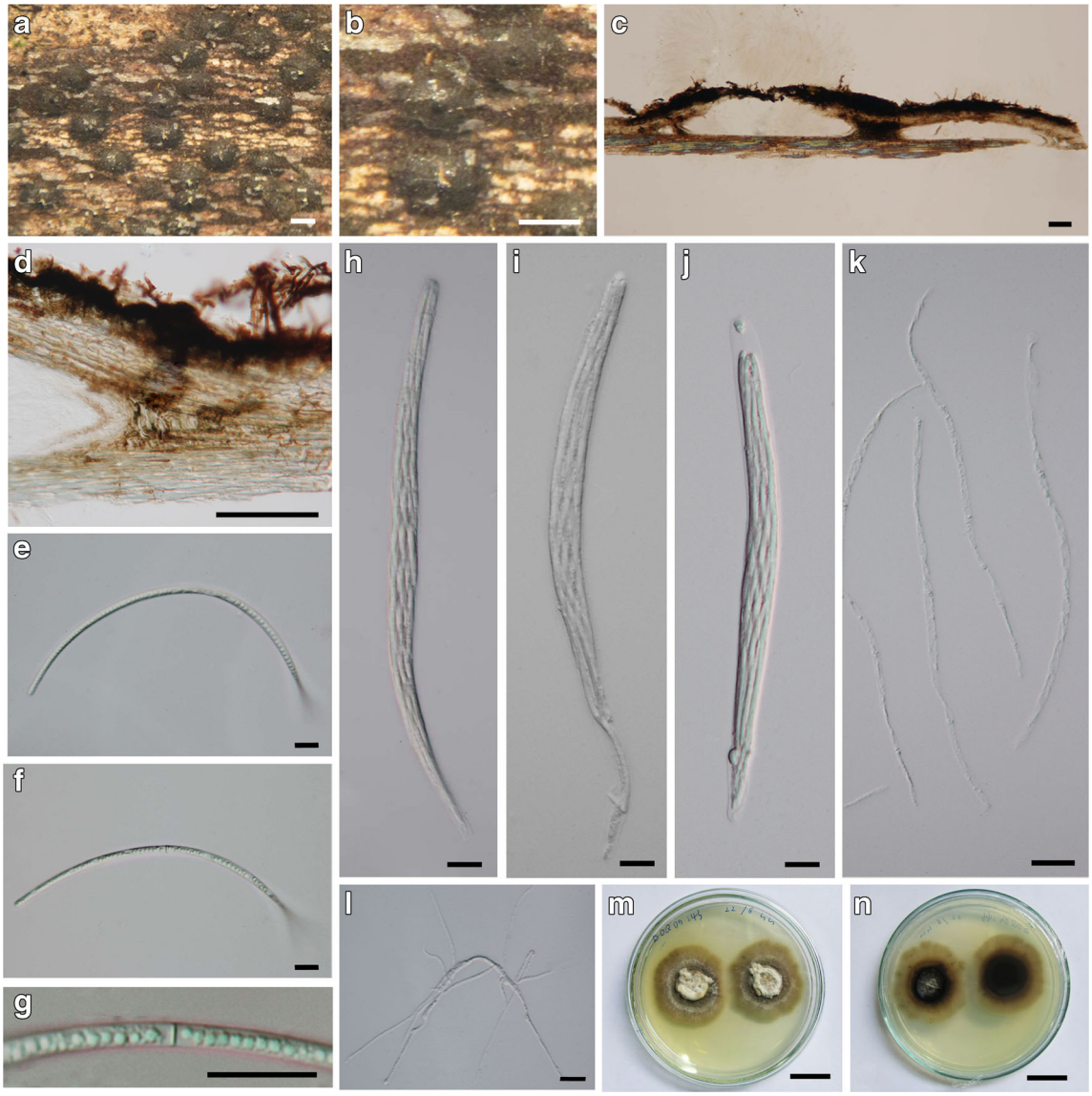


Fig. 30 ***Leptosporella bambusae*** (MFLU 15–1203, **holotype**). **a**, **b** Appearance of ascostromata on bamboo host. **c** Vertical section of ascostromata. **d** Peridium at the side. **e**–**g** Hyaline ascospores (**g**: showing septum of ascospore). **h**–**j** Asci (**j**: showing ascal apical ring). **k** Paraphyses. **l** Geminating spore. **m**, **n** Cultures on PDA. Scale bars: a, b = 1 mm, c, d = 100 *μm*, e–l = 10 *μm*, m, n = 25 mm

septate, unbranched, straight, smooth, single conidiophores 400–650 × 4–5 μm. *Conidiogenous cells* 15–20 × 1.5–2 μm ($\bar{x}$ = 17.3 × 1.7 μm, *n* = 20), phialidic, integrated or discrete, cylindrical, pale brown to hyaline, smooth-walled, straight. *Conidia* 6.5–10 × 2.5–4.5 μm ($\bar{x}$ = 8.5 × 3.4 μm, *n* = 20), cylindrical, narrow at the apex, truncate at the base, straight, aseptate, hyaline, smooth-walled, with guttules.

Culture characters: Conidia germinating on PDA within 24 h and germ tubes developing from both apices. Colonies growing slowly on PDA, reaching 4 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, with regular edge, hyaline from above and below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Chiang Mai, Mae Sae Village, on dead culms of bamboo, 14 May 2011, Dong-Qin Dai, DDQ00029 (MFLU 15–1180, **holotype**); *Ibid*. (KUN HKAS88691, **isotype**), living cultures, MFLUCC 11–0395, KUMCC.

Notes: *Myrothecium thailandicum* can be phylogenetically distinguished from other species (Fig. 31). This species differs from *M. chiangmaiense* in having shorter conidiophores forming together, wider conidia (2.5–4.5 μm vs. 1.5–2.5 μm), and different culture (culture with a circle in middle and with regular edge vs. one without circle and with irregular edge).

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

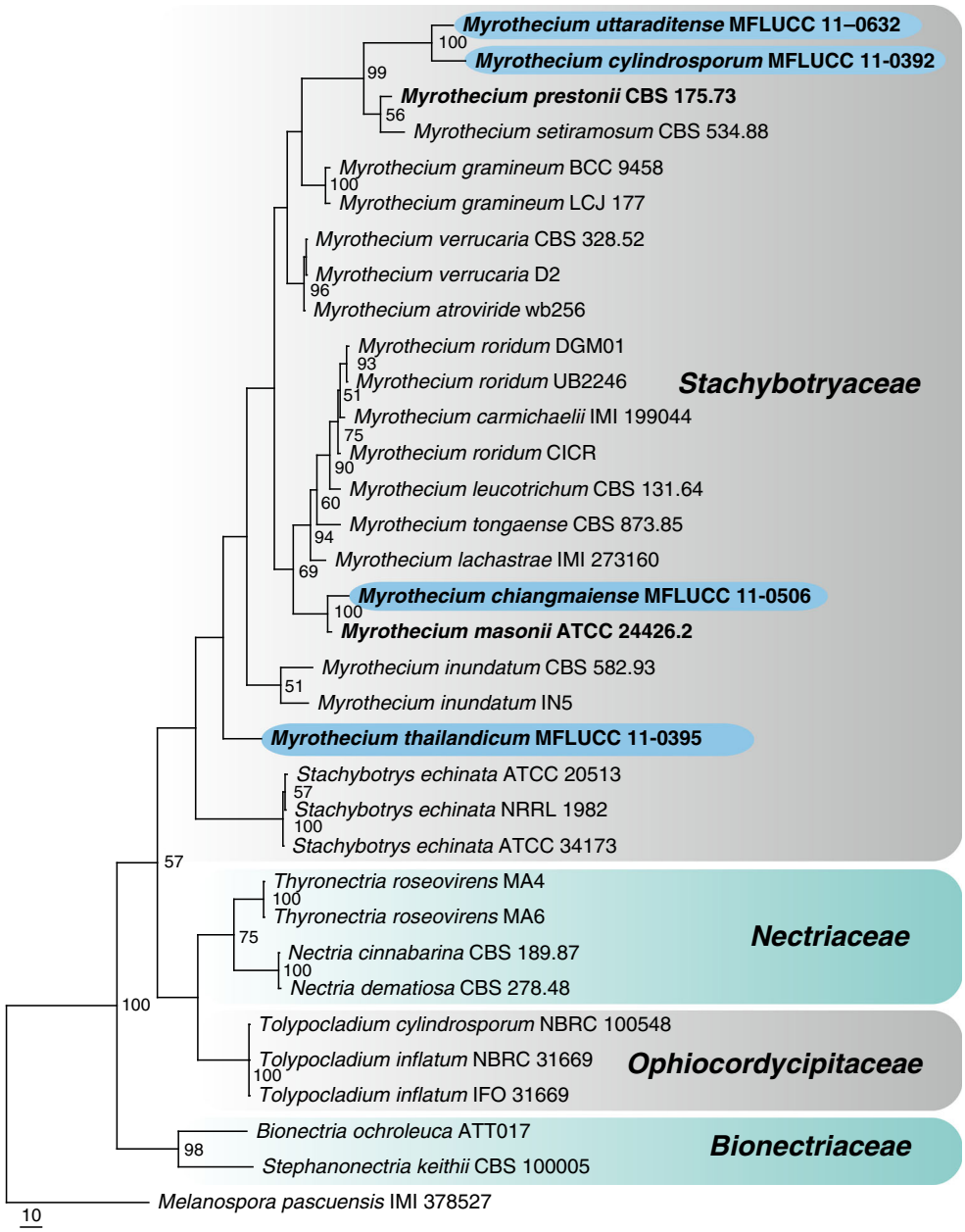


Fig. 31 One of six equally most parsimonious trees obtained from the ITS sequence data. MP values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes. The original isolate codes are noted after the species names. The tree is rooted to *Melanospora pascuensis* (IMI 378527). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

Index Fungorum number: IF552032, *Facesoffungi number:* FoF 01988; Fig. 33

Entomology: Refers to the province where this species first collected.

Holotype: MFLU 15–1181

Saprobic on decaying bamboo culms. *Mycelium* immersed in substrate, composed of septate, branched, hyphae. **Sexual morph**: Undetermined. **Asexual morph**: *Synnemata* 1000–2000 × 500–700 μm ($\bar{x}$ = 1450× 640 μm, n = 20), superficial, solitary, creamish white, with conidiophores arranged in a palisade layer, sometimes proliferating 2–3 times vertically, apically crowned by a slimy, glistening, greenish brown conidial head. *Conidiophores* macronematous, synnematous, white, branched, septate, straight, with white and flocculent hyphae at the base. *Conidiogenous cells* 10–30 × 4–5 μm ($\bar{x}$ = 25.3 × 4.7 μm, n = 20), phialidic, cylindrical, hyaline, smooth, straight. *Conidia* 4–7 × 1.5–2.5 μm ($\bar{x}$ = 5.6 × 1.9 μm, n = 20) μm, cylindrical, long ellipsoid, narrow at basal end, straight to slightly curved, aseptate, hyaline, smooth-walled, guttulate.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends. Colonies growing fast on PDA, reaching 30 cm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, irregular edge, flocculent, snow white from above and below. Mycelium superficial to immersed in media, branched, septate, smooth.

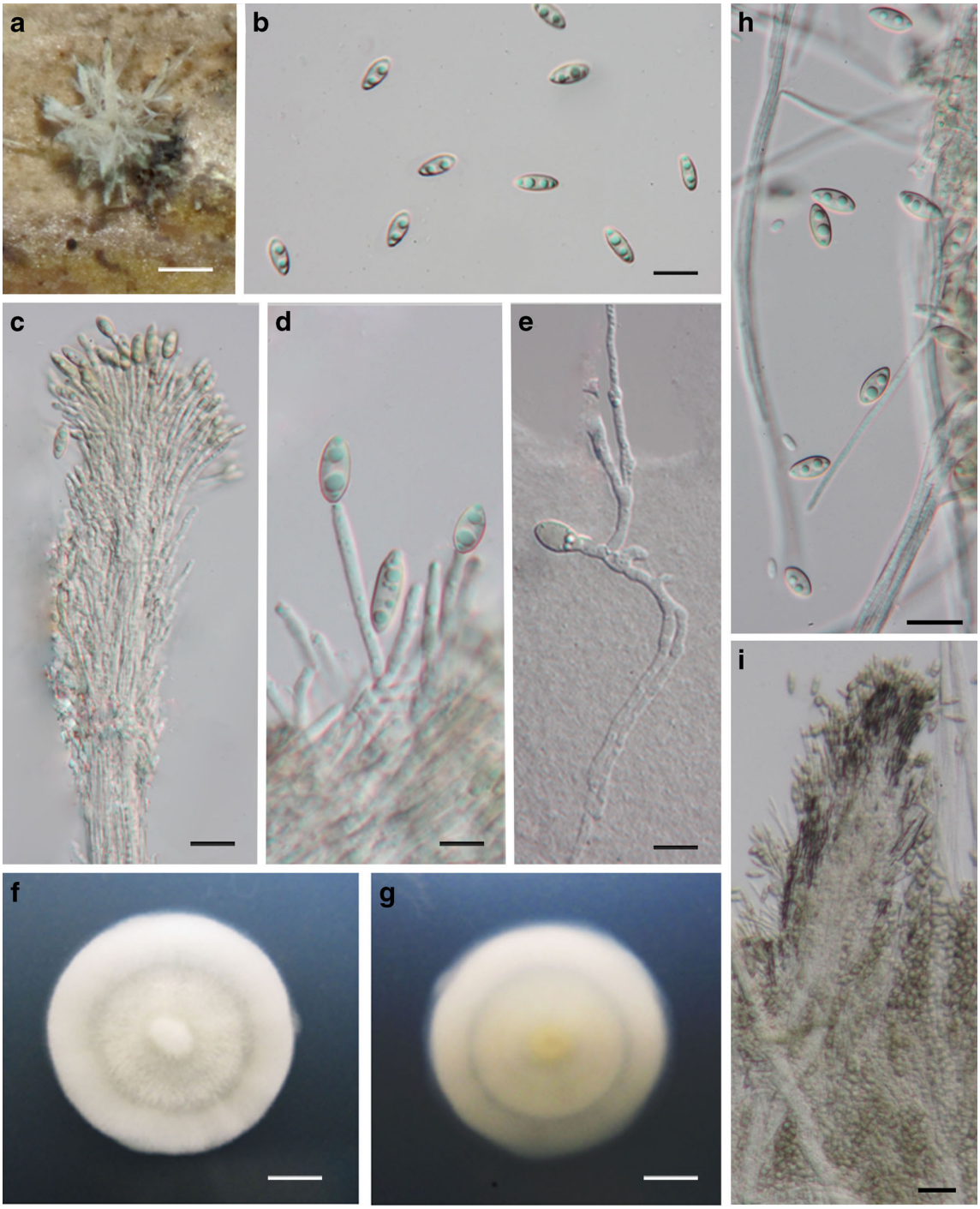


Fig. 32 ***Myrothecium thailandicum*** (MFLU 15–1180, **holotype**). **a** Synnemata gregariously on bamboo. **b**, **h** Conidia. **c**, **i** Conidiophores. **d** Conidiogenous cells. **e** Germinating conidum. **f**, **g** Cultures on PDA. Scale bars: a = 10 mm, b–e = 10 *μm*, f, g = 30 mm

Material examined: THAILAND, Chiang Mai, Mae Sae Village, on dead culms of bamboo, 14 May 2011, Dong-Qin Dai DDQ00031 (MFLU 15–1181, **holotype**); *Ibid*. (KUN HKAS88692, **isotype**), living cultures, MFLUCC 11–0506, CBS 139986.

Notes: *Myrothecium chiangmaiense* is close to *M. masonii* M.C. Tulloch based on the phylogenic analysis (Fig. 31). However, *M. masonii* was isolated from leaves of *Glyceria* R.Br. in UK (Tulloch 1972), but our species is from culms of bamboo, in Thailand.

Myrothecium cylindrosporum D.Q. Dai & K.D.Hyde, ***nom. nov.***

Index Fungorum Number: IF552044

Synonym: *Myrothecium macrosporum* D.Q. Dai & K.D.Hyde, in Liu et al., Fungal Diversity: 10.1007/s13225-015-0324-y, [33] (2015)

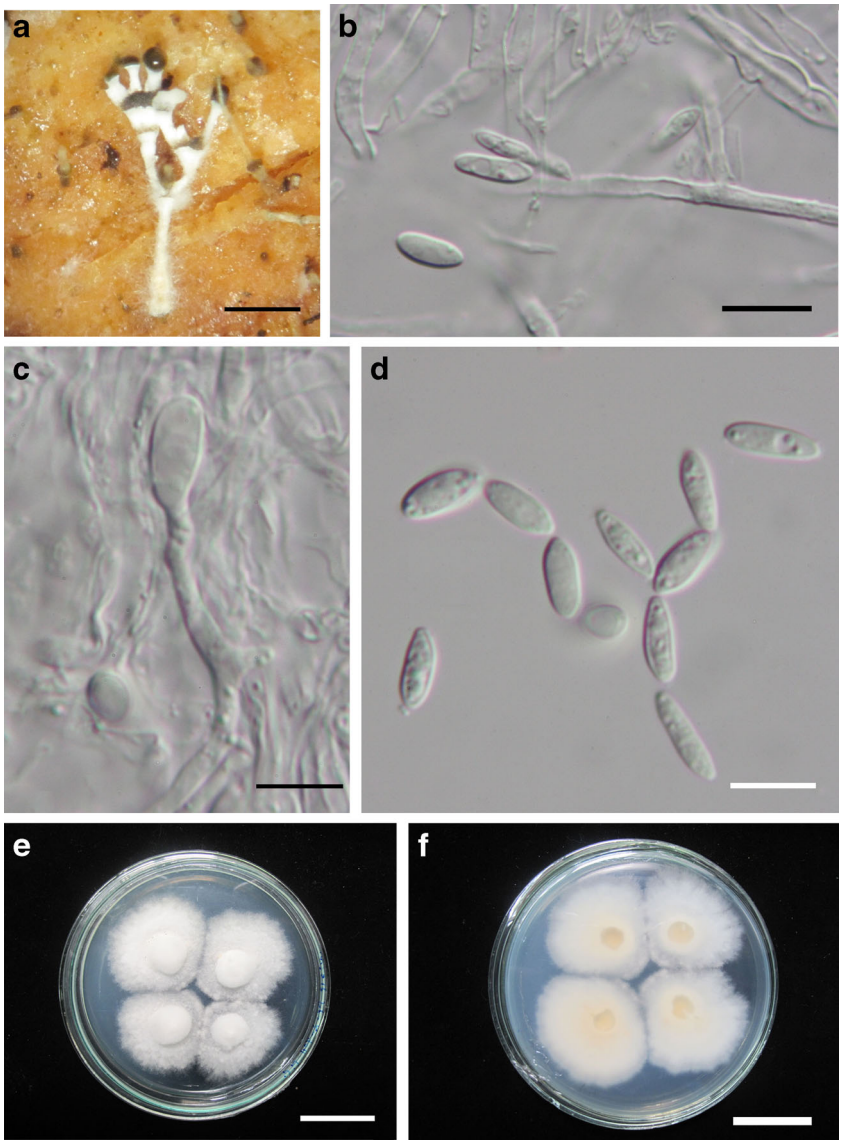


Fig. 33 ***Myrothecium chiangmaiense*** (MFLU 15–1181, **holotype**) **a** Conidiophores on surface of host. **b**, **d** Hyaline conidia. **c** Conidiogenous cell. **e**, **f** Cultures on PDA. Scale bars: a = 500 *μm*, b–d = 5 *μm*, e, f = 25 mm

Notes: Jiang et al. (2014) described *Myrothecium macrosporum* H.F. Wang & T.Y. Zhang from forest soil. This taxon has pale greenish brown, to dark greenish brown, obovoid to pyriform conidia. Due to Index Fungorum (2016) releasing *Myrothecium macrosporum* H.F. Wang & T.Y. Zhang late, Liu et al. (2015), also introduced *Myrothecium macrosporum* D.Q. Dai & K.D. Hyde to accommodate another *Myrothecium* species which has large, hyaline, cylindrical conidia. As, the name *Myrothecium macrosporum* D.Q. Dai & K.D. Hyde is invalid, we herein provide a new name *Myrothecium cylindrosporum* ***nom. nov.*** to accommodate this taxon.

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

Index Fungorum number: IF552033; *Facesoffungi number*: FoF 01989; Fig. 34

Entomology: Refers to the province where this species first collected.

Holotype: MFLU 15–1197

Saprobic on decaying bamboo culms. **Sexual morph**: Undetermined. **Asexual morph**: *Mycelium* immersed in the substrate, composed of septate, branched hyphae. *Sporodochia* comprising white mycelium, round to irregular, at first dark green, becoming black with a white margin, without setae. *Conidiophores* macronematous, cylindrical, brown to dark brown, septate, branching irregularly penicillate, straight, smooth, single conidiophores 60–100 × 2–3 μm ($\bar{x}$ = 75.3 × 2.6 μm, n = 20). *Conidiogenous cells* 12–25 × 1.5–2.5 μm ($\bar{x}$ = 20.6 × 2.1 μm, n = 20), phialidic, integrated or discrete, cylindrical, pale brown, smooth, straight. *Conidia* 10–15 × 2–3.5 μm ($\bar{x}$ = 12.6 × 3.1 μm, n = 20) μm,

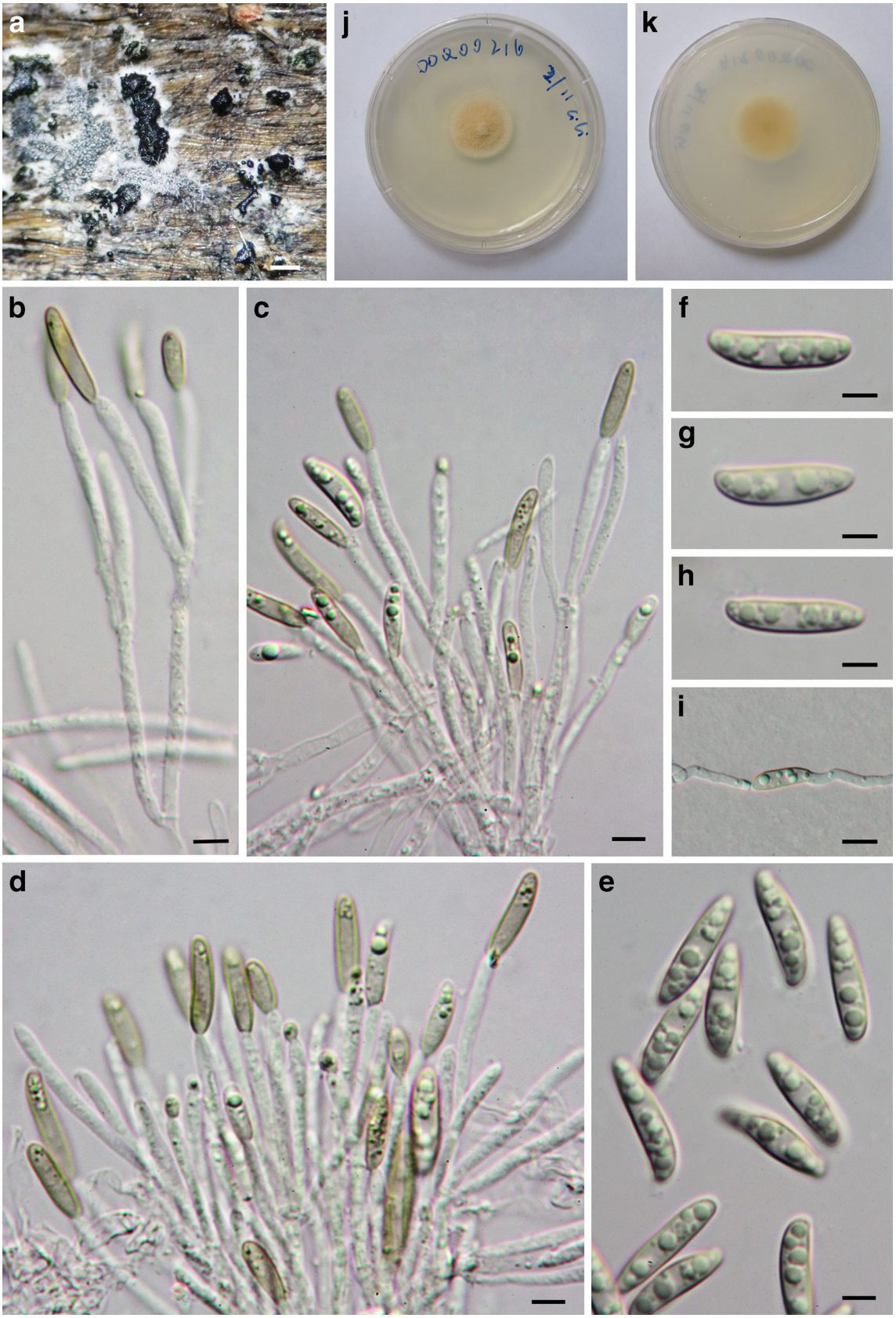


Fig. 34 ***Myrothecium uttaraditense*** (MFLU 15–1197, **holotype**). **a** Sporodochium on bamboo. **b–d** Conidiophores and conidia. **f–h** Conidia. **i** Geminating conidia. **j**, **k** Cultures on PDA. Scale bars: a = 500 μm, b–i = 5 μm

cylindrical to long ellipsoid, narrow and truncate at basal end, aseptate, pale brown, straight to slightly curve, smooth-walled, guttulate.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both apicies. Colonies growing slowly on PDA, reaching 5 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, orange from above and below. Mycelium superficial to immersed in media, branched, septate, smooth.

Material examined: THAILAND, Uttaradit Province, on dead culms of bamboo, 28 October 2011, Dong-Qin Dai DDQ00216 (MFLU 15–1197, **holotype**); *Ibid*. (KUN HKAS88748, **isotype**), living cultures, MFLUCC 11–0632, KUMCC.

Notes: *Myrothecium uttaraditense* is morphologically similar to *M. inundatum* Tode and *M. roridum* Tode in its dark sporodochia surrounded by white mycelium. However, *M. uttaraditense* phylogenetically separates from the above species (Fig. 31). In addition, *M. inundatum*, was isolated from *Agaricis*, and *M. roridum* from leaves, stems or seeds of Angiosperms and Gymnosperms (Saccardo 1886; Worapong et al. 2009), whereas, our new species was isolated from bamboo culms. In the phylogenetic tree (Fig. 31), *M. uttaraditense* is closest to *M. cylindrosporum*, but differs in having pigmented and shorter conidia (pale brown and 10–15 μm long vs. hyaline and 25–35 μm long).

Nectriaceae Tul. & C. Tul. [as '*Nectriei*'], Select. fung. carpol. (Paris) 3: 3 (1865)

Nectriaceae, typified by *Nectria* (Fr.) Fr., was introduced by Tulasne and Tulasne (1865). This family is characterized by light to bright-coloured (usually white, yellow, orange-red or purple), soft-textured, superficial, uniloculate perithecia, unitunicate asci, and phialidic asexual morphs (Hirooka et al. 2012; Lombard et al. 2015). Chaverri et al. (2011) placed seven genera in the family. Lumbsch and Huhndorf (2010) included 26 genera and of these, Hirooka et al. (2012) accepted 16 genera. Lombard et al. (2015) mentioned that *Nectriaceae* contains around 55 genera based on sexual and asexual morphs and resolved the identity of 47 genera based on DNA sequences of 10 loci (acl1, act, cmdA, his3, ITS, LSU, rpb1, rpb2, tef1 and tub2). Maharachchikumbura et al. (2015) listed 67 genera within *Nectriaceae*. This family presently includes approximately 900 species (Lombard et al. 2015). Notable asexual morph genera of *Nectriaceae* are *Acremonium*, *Clonostachys*, *Cylindrocarpon*, *Cylindrocladium*, *Fusarium*, *Stilbella* and *Tubercularia* (Seifert et al. 2011).

Nectria (Fr.) Fr., Summa veg. Scand., Section Post. (Stockholm): 387 (1849)

The genus *Nectria* is characterized by its brightly coloured perithecia with 82 estimated species (Kirk et al. 2008). However, more than 1000 records are listed in Index Fungorum (2016). Hirooka et al. (2012) revised the genus *Nectria* with 29 species based on morphology and phylogenetic analyses and provided full descriptions, illustrations and keys to sexual and asexual species. The asexaul morphs of *Nectria* are linked to *Acremonium*-like, *Cylindrocarpon*, *Gyrostroma*, *Stilbella*, *Tubercularia*, and *Zythiostroma* species (Kirk et al. 2008; Wijayawardene et al. 2012; Hirooka et al. 2012).

Nectria pseudotrichia Berk. & M.A. Curtis, J. Acad. Nat. Sci. Philadelphia 2, 2: 289. 1853.

Facesoffungi number: FoF 01990; Figs. 35 and 36

Saprobic on bamboo culms. **Sexual morph**: Not observed. **Asexual morph**: *Colonies* effuse. *Mycelium* partly immersed on the substrate, composed of septate, branched, brown, hyphae. *Conidiophores* macronematous, synnematous, orange, septate, branched. *Synnemata* solitary or gregarious, erect, rigid, orange, branched in top half, hyaline at the tip, velvety, smooth, composed of compactly arranged conidiophores, 1.5–3.5 mm long, 200–270 μm wide at the base, 110–150 μm wide in the middle, 20–50 μm wide at the tip, fertile only apically, usually flexuous to curved in upper parts. *Conidiogenous cells* 12–23 × 1.5–3 μm ($\bar{x}$ =15.1× 1.9 μm, n = 20), enteroblastic, phialidic, integrated or discrete, cylindrical, hyaline, smooth. *Conidial mass* 75–120 μm diam., globose, light orange in colour. *Conidia* 3.5–5 × 2–3 μm ($\bar{x}$ = 4.6 × 2.7 μm, n = 20) μm, cylindrical, straight, aseptate, hyaline, smooth-walled.

Culture characters: Conidia germinating on PDA within 24 h. Colonies fast growing on PDA, reaching 90 mm in 2 weeks at 28 °C, under 12 h lighr/12 h dark, flat, circular, hyaline with reddish orange pigmentation from above and below. Mycelium immersed in media, later on the surface, with septate, branched, smooth, hyaline hyphae.

Material examined: THAILAND, Chiang Rai, Doi Fung, on dead culms of bamboo, 12 May 2011, Dong-Qin Dai DDQ0005 (MFLU 15–1179); *Ibid*. (KUN HKAS88690), living cultures, MFLUCC 11–0391, KUMCC.

Notes: *Nectria pseudotrichia* was introduced by Berkeley and Curtis (1853) based on a sexual morph on bark. This species is widely spread especially in tropical areas and usually occurs on dead wood (Hirooka et al. 2012). Hirooka et al. (2012) linked *N. pseudotrichia* to *Tubercularia lateritia* (Berk.) Seifert. An epitype was established by Hirooka et al. (2012) with a detailed description and illustration. Our new collection (MFLUCC 11–0391) grouped with seven *N. pseudotrichia* strains including ex-epitype (CBS 129240) with high bootstrap support (100/100 % MPBP/MLBP) (Fig. 35). However, our collection has longer, branched synnemata (1.5–3.5 mm vs. 1–2.7 mm compared to its epitype) and a smaller conidia mass (75–120 μm vs. 120–350 μm in diam.) (Hirooka et al. 2012). Zhao et al. (2011) mentioned that, sometimes, two different *Nectria* species may share the same sequence data of the internal transcribed spacers of ribosomal RNA (ITS) and 28S rDNA (LSU), while differing in

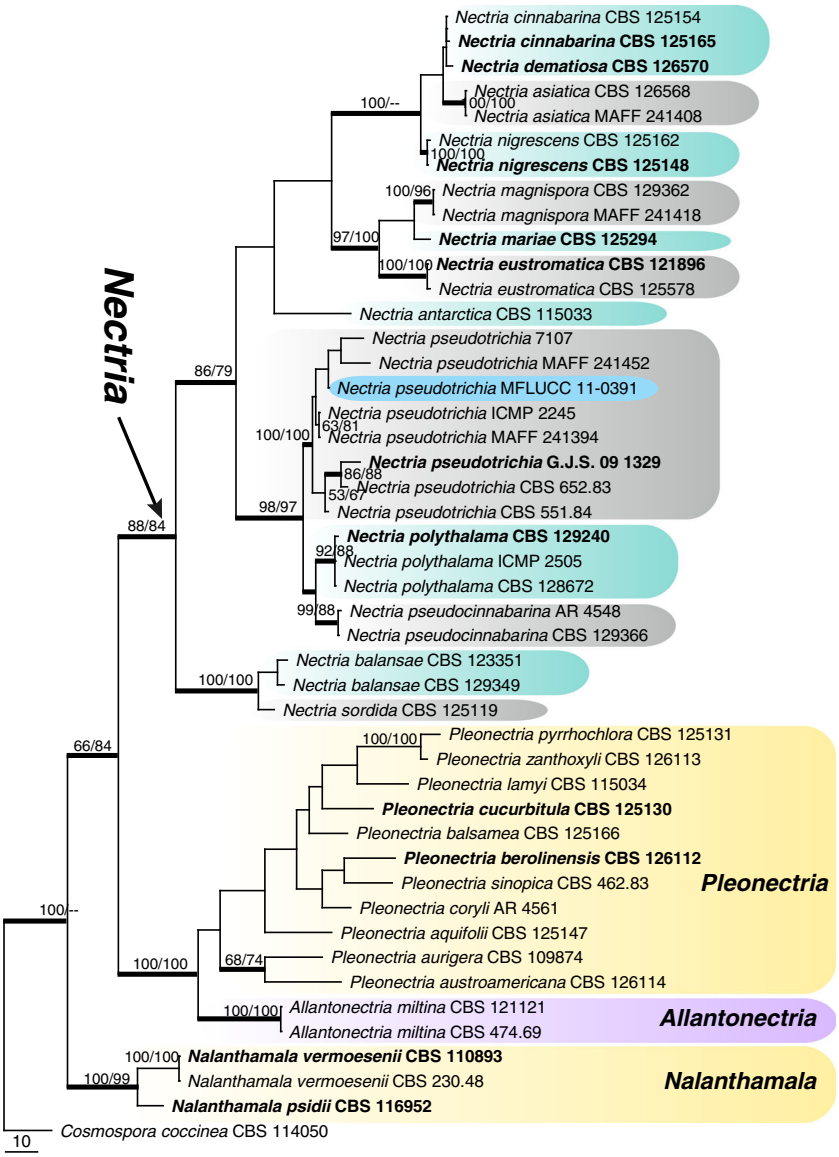


Fig. 35 One of eight equally most parsimonious trees resulting from 1000 bootstrap replicates obtained from combined ITS, LSU sequence data. Maximum likelihood phylogeneic tree (lnL = −3031.102133) was generated by RAxML (GTR+G model). MP/ML values (>50 %) are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in bold. The original isolate numbers are noted after the species names. The tree is rooted to *Cosmospora coccinea* (CBS 114050). Ex-type strains are in *bold* and newly generated sequence is highlighted with a *blue* background

morphology. In the absence of an appropriate DNA barcode for *Nectria*, we provisionally report our collection as *N. pseudotrichia*.

Sordariales Chadef. ex D. Hawksw. & O.E. Erikss., Syst. Ascom. 5(1): 182 (1986)

The order *Sordariales* was introduced by Hawksworth and Eriksson (1986). Huhndorf et al. (2004) mentioned that 14 families are included in this order. However, Kirk et al. (2008) included only five families with 97 genera. Lumbsch and Huhndorf (2010) and Maharachchikumbura et al. (2015) acceped three families, *Chaetomiaceae*, *Lasiosphaeriaceae* and *Sordariaceae* and placed around 20 genera in *Sordariales* genera *incerta sedis*. The species accommodated in the order *Sordariales* usually have erumpent to superficial, perithecial ascomata with large-celled ascomal walls, unitunicate asci and one to two celled ascospores with appendages or sheaths (Huhndorf et al. 2004; Zhang et al. 2006).

Lasiosphaeriaceae Nannf., Nova Acta R. Soc. Scient. upsal., Ser. 4 8(no. 2): 50 (1932)

Lasiosphaeriaceae, introduced by Nannfeldt (1932), is typified by *Lasiosphaeria* Ces. & De Not. Kirk et al. (2008) included 36 genera in this family and of these, Lumbsch and Huhndorf (2010) accepted 31 genera, whereas Maharachchikumbura et al. (2015) listed 35 genera. The family *Lasiosphaeriaceae* is the largest and most morphologically diverse familial taxon in the order *Sordariales* (Huhndorf et al. 2004). It is also highly polyphyletic (Miller and Huhndorf 2004; Huhndorf et al. 2004; Cai et al. 2006; Kruys et al. 2015), containing several paraphyletic genera (Miller and Huhndorf 2005; Kruys et al. 2015). Kruys et al. (2015) demonstrated that the monophyletic family *Sordariaceae* phylogenetically nested among *Lasiosphaeriaceae* with taxa traditionally placed in the family. The phylogenic tree given in this paper shows a

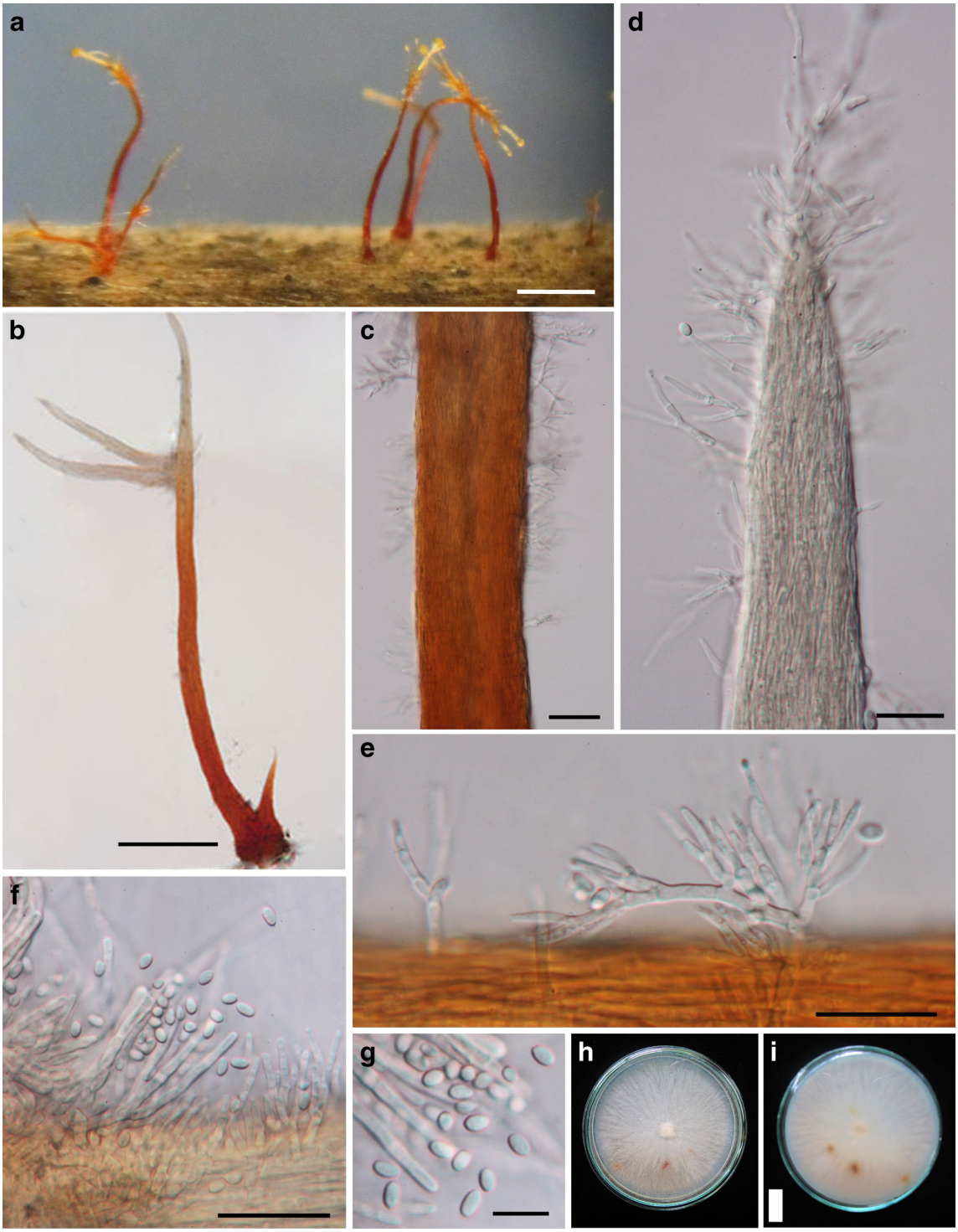


Fig. 36 ***Nectria pseudotrichia*** (MFLU 15–1179). **a**, **b** Synnemata. **c** Middle part of synnema. **d** Apex of synnema with conidiogenous cells. **e** Conidiogenous cells. **f**, **g** Conidia. **h**–**i** Cultures on PDA. Scale bars: a = 1 mm, b = 500 *μm*, c = 50 *μm*, d–f = 25 *μm*, g = 10 *μm*

similar result (Fig. 37). The asexual morph of *Lasiosphaeriaceae* can be linked to *Angulimaya*, *Bagadiella*, *Cladorrhinum*, *Mammaria* and *Phialophora*-like taxa (Wijayawardene et al. 2012).

Cercophora Fuckel, Jb. nassau. Ver. Naturk. 23–24: 244 (1870) [1869–70]

The genus *Cercophora* was introduced by Fuckel (1870) to accommodate taxa having membraneous to coriaceous, dark ascomata and hyaline, cylindrical ascospores which develop a swollen, pigmented head (Miller and Huhndorf 2001). *Cercophora* can be compared with genera such as *Arnium*, *Lasiosphaeria*, *Podospora* and

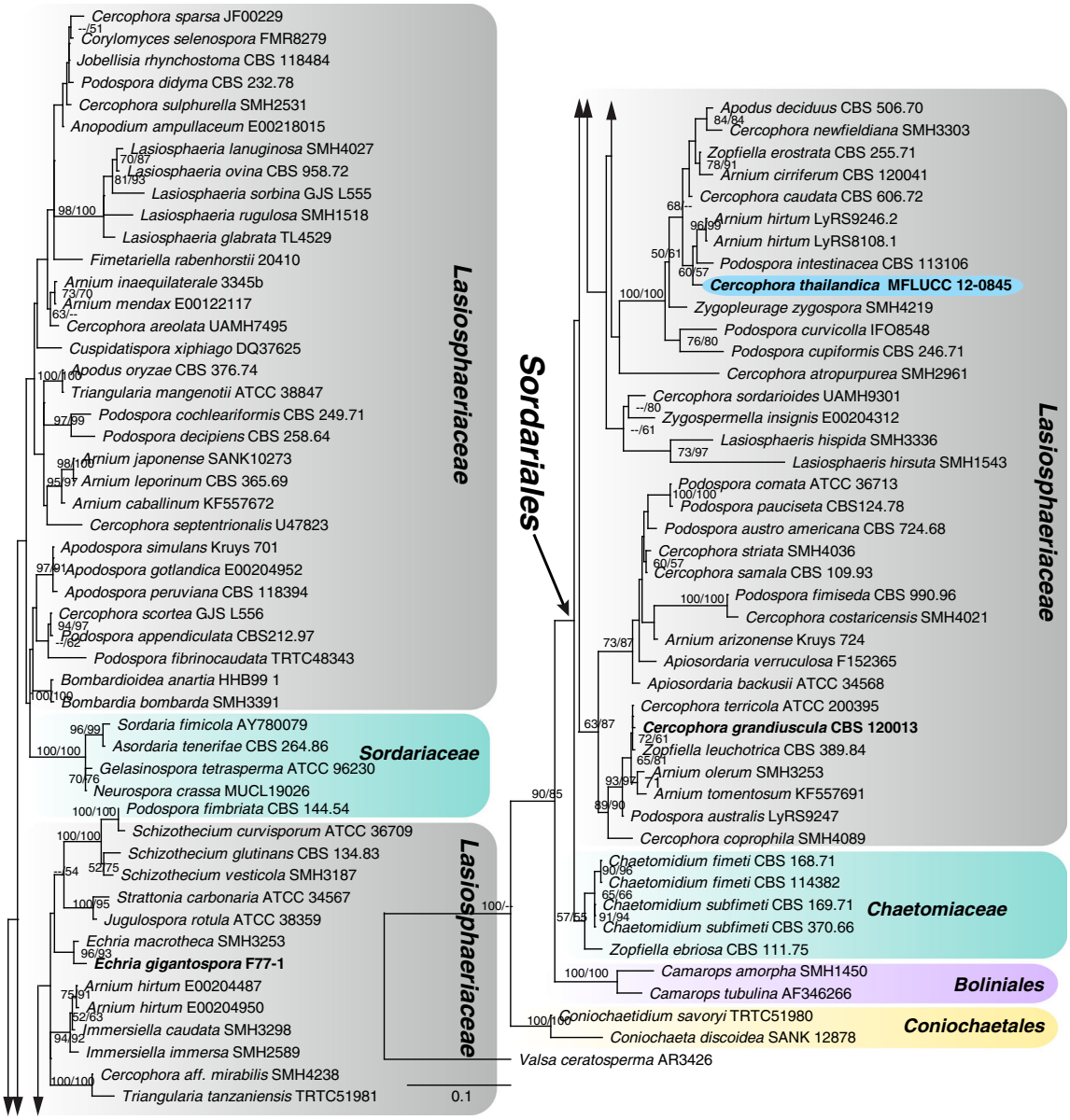


Fig. 37 Maximum likelihood phylogeneic tree generated by RAxML (GTR+G model) based on LSU sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes. The original isolate numbers are noted after the species names. The tree is rooted to *Valsa ceratosperma* (AR3426). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

Zopfiella. However, species of *Lasiosphaeria* do not form ascospores with a swollen, pigmented head (Seaver 1912; Taylor et al. 2001; Miller and Huhndorf 2001). Members of *Arnium* and *Podospora* generally grow on dung and produce ascospores with gelatinous appendages (Krug and Cain 1972; Lorenzo and Havrylenko 2001; Melo et al 2015). *Zopfiella* has septate ascospores with a hyaline pedicel which often collapses (Cai et al. 2006). Phylogenic analyses (Miller and Huhndorf 2005; Cai et al. 2006; Kruys et al. 2015) showed that *Arnium*, *Cercophora*, *Podospora* and *Zopfiella* are polyphyletic. Thus, presently members in these groups are distinguished following the conventional taxonomy of Lundqvist (1972).

Cercophora thailandica D.Q. Dai & K.D. Hyde, ***sp. nov***

Index Fungorum number: IF552034; *Facesoffungi number*: FoF 01991; Fig. 38

Entomology: In reference to the country where this species first collected.

Holotype: MFLU 15–1202

Saprobic on rotting bamboo culms. *Hyphae* 1.5–3 μm wide, superficial, dark brown, septate, branching, thick-walled, surrounding ascomata in a false subiculum. **Sexual morph**: *Ascomata* 350–480 μm high, 300–350 μm diam., perithecial, solitary, superficial, with base immersed in the hyphae, subglobose to pyriform, black, membranous, centrally located ostiole with a short neck, without periphyses, easily removed, with a rough surface and lackingsurface

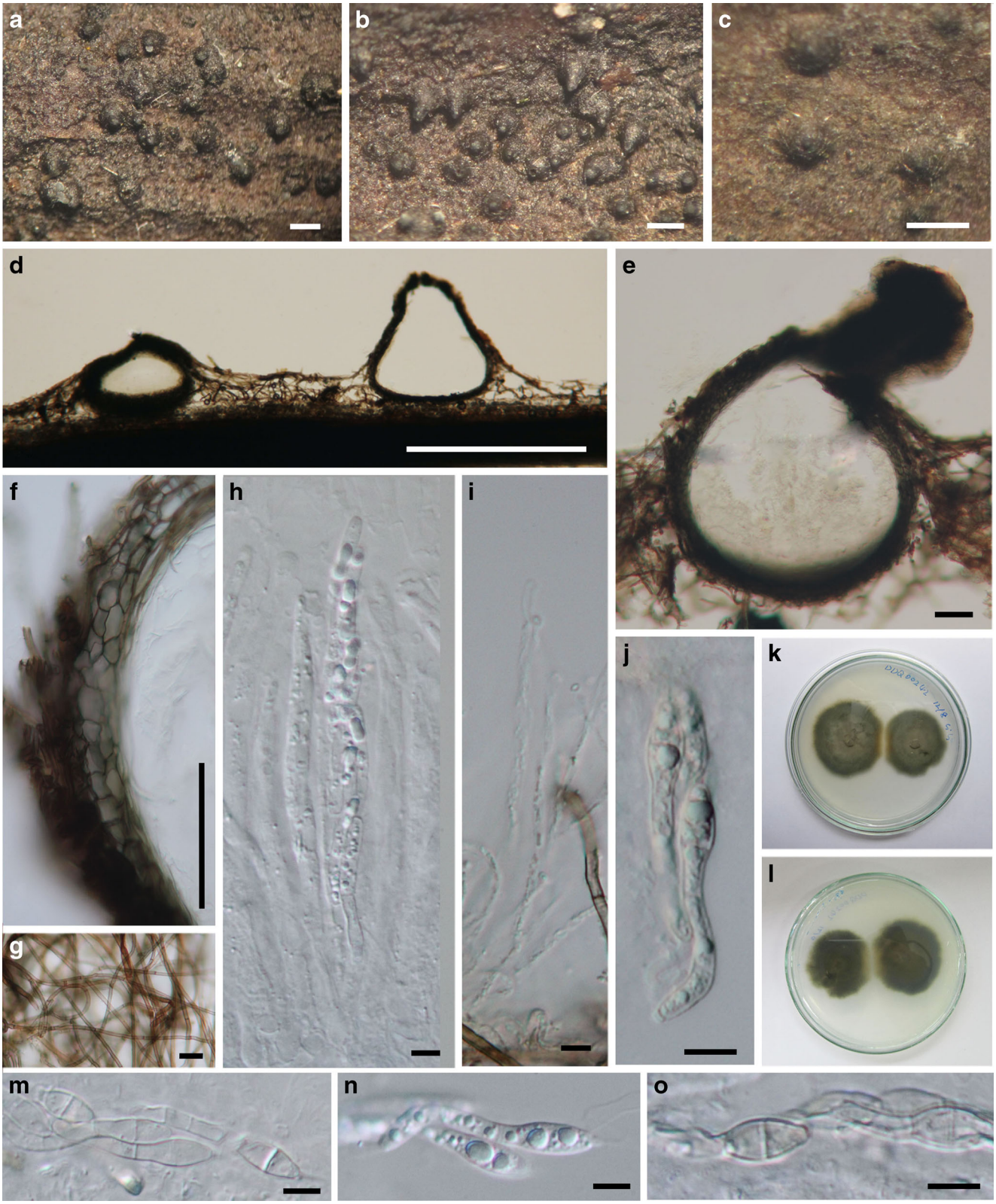


Fig. 38 *Cercophora thailandica* (MFLU 15–1202, **holotype**). **a**–**c** Appearance of ascomata on bamboo host. **d**, **e** Vertical sections of ascomata. **f** Peridium. **g** Brown mycelium. **h** Asci. **i** Paraphyses. **j**, **m**–**o** Ascospores. **k**, **l** Colonies on PDA. Scale bars: a–d = 500 μm, e, f = 50 μm, g–j, m–o = 10 μm

hairs, 150–180 × 100–120 μm. *Peridium* 10–25 μm thick, comprising two layers; outer layer composed of dark brown, 7–20 × 5–9 μm cells of *textura angularis*; inner layer thin, composed of elongated, spindly, light brown to hyaline cells. *Hamathecium* of septate, unbranched, 1.5–4.5 μm wide, filiform-ventricose paraphyses. *Asci* 90–110 × 10–15 μm ($\bar{x}$ = 101.7 × 10.8 μm, *n* = 20), 8-spored, unitunicate, cylindrical, apex blunt, with a short pedicel. *Ascospores* 30–35 × 3–3.5 μm, 2-seriate, cylindrical, hyaline, curved, rounded at both ends; upper part becoming swollen into narrowly fusiform to ellipsoid, 9.5–15 × 4–6.5 μm ($\bar{x}$ = 10.9 × 5.3 μm, *n* = 20) 0–1-septate, hyaline to pale brown head, with conical appendage at the apex, 3–5 μm long, truncate at the base; lower part elongated 18–23.5 × 3–3.5 μm ($\bar{x}$ = 20.5 × 3.2 μm, *n* = 20) 3-septate, curved, slightly sigmoid, with 5–7 μm long and 2 μm wide appendage at the base. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 48 h and germ tubes produced from both ends. *Colonies* circular, with even margin, dark brown, floccose, fast growing, 40 mm diam. in 45 days at 25–32 °C, under 12 h light/12 h dark, flat, olive to olive brown from above and below. Mycelium immersed and partially superficial, branched, septate, pale brown to olivaceous brown, smooth, asexual spores not formed within 60 days.

Material examined: THAILAND, Chiang Rai, Khun Korn Waterfall, on rotting culm of bamboo, 31 July 2012, Dong-Qin Dai DDQ00242 (MFLU 15–1202, **holotype**); *Ibid*. (KUN HKAS88711, **isotype**), living cultures, MFLUCC 12–0845, KUMCC.

Notes: *Cercophora* species usually grow on dung or occasionally rotten wood (Miller and Huhndorf 2001). *Cercophora thailandica* is similar to *C. atropurpurea* in ascospores having a swollen head. However, *C. thailandica* has shorter ascomata with a short neck (350–480 μm vs. 620–790 μm in height) (Miller and Huhndorf 2001). This new species is phylogenetically close to *Arnium hirtum* (LyRS9246.2 and LyRS8108.1) and *Podospora intestinacea* (CBS 113106). *Arnium hirtum* has ascomata with hairs, and large dark brown ascospores (more than 45 × 20 μm), with long appendages (more than 35 × 7 μm) (Lundqvist 1972). *Podospora intestinacea* has ascospores with typical dark brown apical cell and a hyaline basal pedicel (Doveri 2008). *Arnium*, *Cercophora* and *Podospora* are interesting because of their coprophilous habitat. They generally appear on herbivore dung, however, our new species was collected on a rotten bamboo culm.

Togniniales Senan., Maharachch. & K.D. Hyde, Fungal Diversity 72: 220 (2015)

Togniniales was introduced by Maharachchikumbura et al. (2015) and contains a single family, *Togniniaceae*. This family was previously placed in the *Calosphaeriales* (Mostert et al. 2003). Based on SSU and LSU gene analysis, Mostert et al. (2006) transferred *Togniniaceae* to *Diaporthales*. Maharachchikumbura et al. (2015) indicated that *Togniniaceae* formed a distinct clade from *Diaporthales* in the subclass *Diaportheomycetidae* based on phylogenetic analysis of combined LSU, SSU, TEF and RPB2 sequence data. Lumbsch and Huhndorf (2010) included a single genus *Togninia* in the family *Togniniaceae*. Maharachchikumbura et al. (2015) listed three genera, including a sexual morph genus *Phaeoacremonium*. Gramaje et al. (2015) presented a case for retaining the genus *Phaeoacremonium* over that of *Togninia*.

Phaeoacremonium sphinctrophorum L. Mostert et al., Stud. Mycol. 54: 85 (2006)

Facesoffungi numbers: FoF 01992; Figs. 39 and 40

Saprobic on dead bamboo culms. **Sexual morph**: *Ascomata* perithecial, 100–150 μm high, 170–250 μm diam., dark brown to black, immersed under epidermis to erumpent, gregarious, uniloculate, globose to subglobose, coriaceous; with a central neck 20–40 μm long × 10–15 μm wide, black, straight to curved. *Peridium* comprising several strata, outer stratum 8–10 μm thick, composed of small, dark brown to brown cells of *textura angularis*; inner stratum composed of larger, pale brown to hyaline cells of *textura angularis*. *Paraphyses* 15–25 μm long × 2–3.5 μm wide, hyaline, septate. *Asci* form small fascicles arising from short ascogenous hyphae, 15–20 × 3.5–4 μm ($\bar{x}$ = 18.8 × 3.7 μm, *n* = 20), 8-spored, unitunicate, clavate to cylindro-clavcate, pedicellate, apically rounded to truncate, J-; ascogenous hyphae hyaline, branched. *Ascospores* 3–4 × 1–1.5 μm ($\bar{x}$ = 3.5 × 1.4 μm, *n* = 30), 2–3-seriate, allantoid, hyaline, rounded at both ends, smooth-walled. **Asexual morph**: Fertile on PDA after 2 months. *Conidiophores* micronematous, septate, hyaline to brown, smooth, verrucose wall not observed. *Conidiogenous cells* enteroblastic, monophialidic, terminal or lateral, hyaline, smooth; phialides of three types: type I 2–7 × 1.5–2 μm cylindrical, rasied from the hypha; type II 7–12 × 1.5–3 μm elongate-ampulliform; type III 17–21 × 1.5–2.5 μm subcylindrical. *Conidia* 3–4.5 × 1.5–2 μm ($\bar{x}$ = 3.8 × 1.7 μm, *n* = 20), oblong, ellipsoidal or obovoid, hyaline, smooth-walled.

Culture Characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends. Colonies growing fast on PDA, reaching 50 mm in 1 week at 28 °C, under 12 h light/12 h dark, circular, irregular edge, white from above and pale red from reverse view. Mycelium superficial to immersed in media, branched, septate, smooth.

Material examined: THAILAND, Chiang Mai, Mae Taeng, Mushroom Research Foundation, on dead culms of bamboo, 6 October 2011, Dong-Qin Dai DDQ00210 (MFLU 15–1196); *Ibid*. (KUN HKAS88705), living cultures, MFLUCC 11–0629, MUCL 55877.

Notes: *Phaeoacremonium* species are commonly isolated from stems and branches of diseased woody hosts,

humans with phaeohyphomycosis, and occasionally from soil (Crous et al. 1996; Mostert et al. 2003, 2006; Essakhi et al. 2008; Graham et al. 2009; Gramaje et al. 2015). Gramaje et al. (2015) monographed *Phaeoacremonium* and expanded the genus, which presently contains 46 species and its sexual morph, *Togninia*, containing 26 epithets. *Phaeoacremonium sphinctrophorum* was described by Mostert et al. (2006) based on asexual morph characters of a collection inhabiting a human in Canada. In our study, we collected the sexual morph on a bamboo stub in Thailand, and observed the asexual morph on PDA, which has same morphology with the type. Our collection forms a clade with two strains of *P. sphinctrophorum*, including the type strain (CBS 337.90) in the phylogeny tree (Fig. 41) with high bootstrap support (99/91 % MPBP/MLBP).

Xylariales Nannf., Nova Acta R. Soc. Scient. upsal., Ser. 4 8(no. 2): 66 (1932)

The order *Xylariales* is a large taxon of unitunicate, perithecial ascomycetes within the class *Sordariomycetes* (Smith et al. 2003; Kirk et al. 2008; Jaklitsch and Voglmayr 2012; Daranagama et al. 2015; Maharachchikumbura et al. 2015; Senanayake et al. 2015). Smith et al. (2003) stated that this order contains seven families, over 92 genera and 795 species. Kirk et al. (2008) included nine families, 209 genera and 2487 species. Lumbsch and Huhndorf (2010) accepted six families and 154 genera. Based on phylogenetic

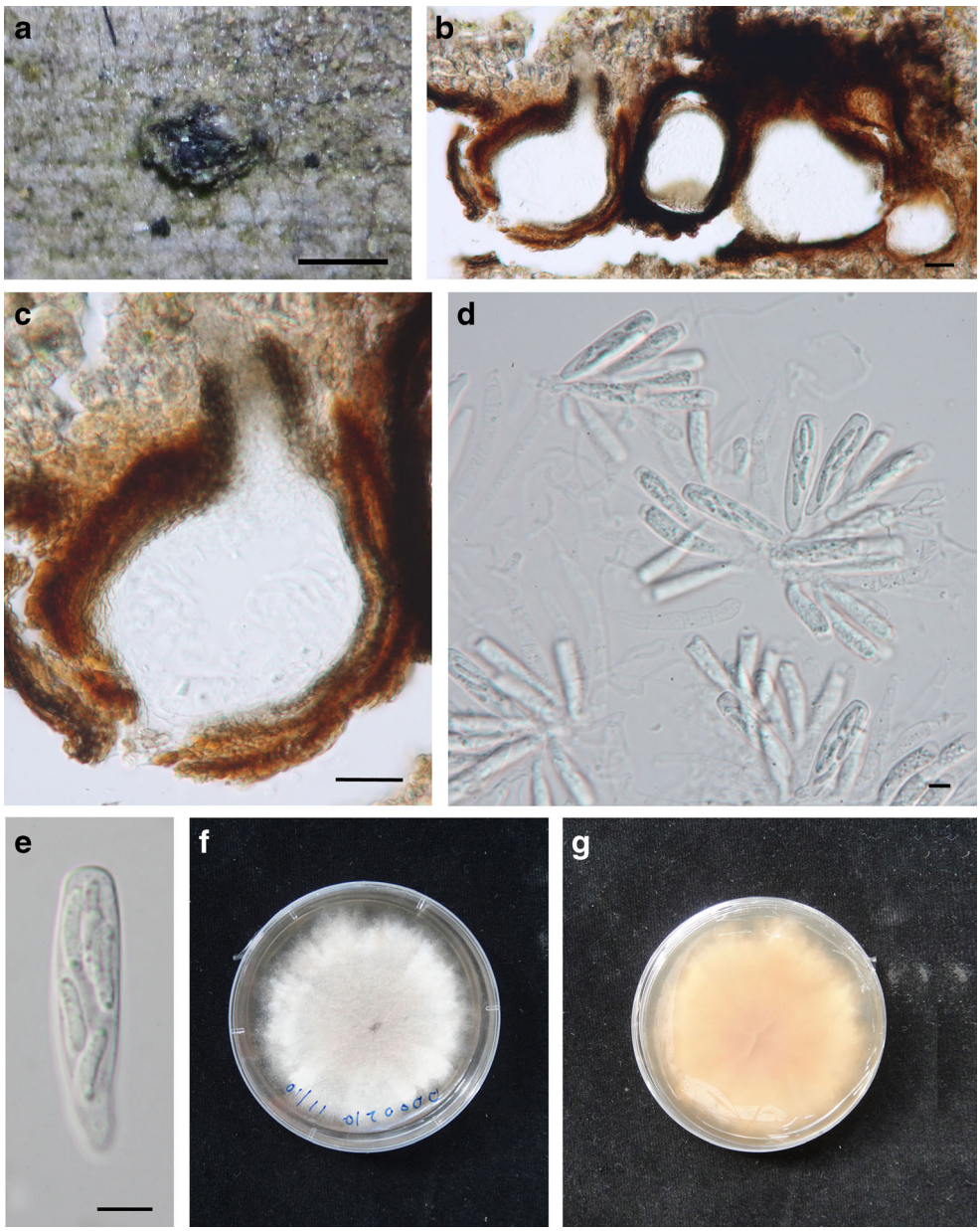


Fig. 39 ***Phaeoacremonium sphinctrophorum*** (MFLU 15–1196). **a** Appearance of ascomata on bamboo. **b**, **c** Vertical sections of ascomata. **d**, **e** Asci containing ascospores. **f**, **g** Cultures on PDA. Scale bars: a = 1 mm, b, c = 20 *μm*, d–e = 5 *μm*

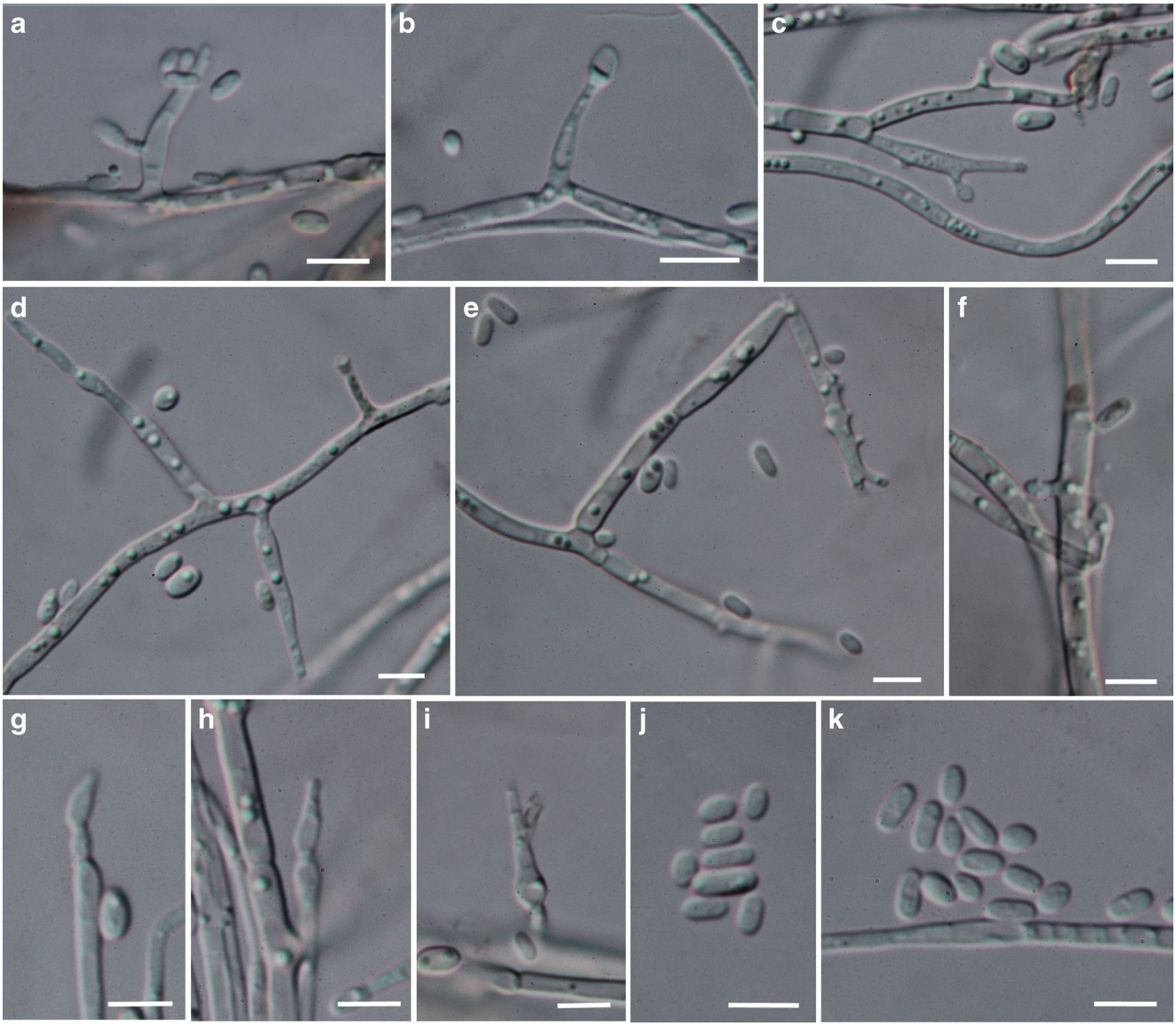


Fig. 40 Asexual morph of *Phaeoacremonium sphinctrophorum* from PDA (MFLUCC 11–0629). **a**–**i** Conidiogenous cells (**a**, **c**, **f**: type I phialides, **g**–**i**: type II phialides, **b**, **d**, **e**: type III phialides). **j**, **k** Conidia. Scale bars: a–k = 5 *μm*

analysis, eleven families are circumscribed in the *Xylariales* by Maharachchikumbura et al. (2015). Senanayake et al. (2015) transfered *Amphisphaeriaceae* to *Amphisphaeriales*, and introduced two new families *Lopadostomaceae* and *Pseudomassariaceae*, based on morphological and phylogenetic evidence. Thus, this order is expanded to contain 12 families.

Apiosporaceae K.D. Hyde et al., Sydowia 50(1): 23 (1998)

Apiosporaceae was introduced by Hyde et al. (1998), and typified by *Apiospora* Sacc. The family placement of *Apiospora* was undertermined during 1875 to 1995 (Müller and von Arx 1962; Barr 1976, 1990; Barr and Cannon 1994; Hawksworth et al. 1995). Subsequently Hyde et al. (1998) re-examined the type (*Apiospora montagnei* Sacc.) and introduced the family *Apiosporaceae* to accommodate *Apiospora* (Sexual morph of *Arthrinium*) and *Appendicospora*. The family placement of *Apiospora* has been clarified as *Apiosporaceae* has been recognized in order *Xylariales* by several authors (Huhndorf et al. 2004; Zhang et al. 2006; Jaklitsch and Voglmayr 2012; Dai et al. 2014c; Sharma et al. 2014; Senanayake et al. 2015). Crous and Groenewald (2013) synonymised *Apiospora* under *Arthrinium* Kunze. Thus, this family contains six genera, *Appendicospora*, *Arthrinium*, *Dictyoarthrinium*, *Endocalyx*, *Scyphospora* and *Spegazzinia* (Maharachchikumbura et al. 2015).

Arthrinium Kunze, in Kunze & Schmidt, Mykol. Hefte 1: 9 (1817) : Fr., Syst. Mycol. 1: xliv (1821)

Arthrinium, introduced by Schmidt and Kunze (1817), is widespread in diverse ecological niches (Crous and Groenewald 2013). The genus is morphologically and phylogenetically delimited by Crous and Groenewald

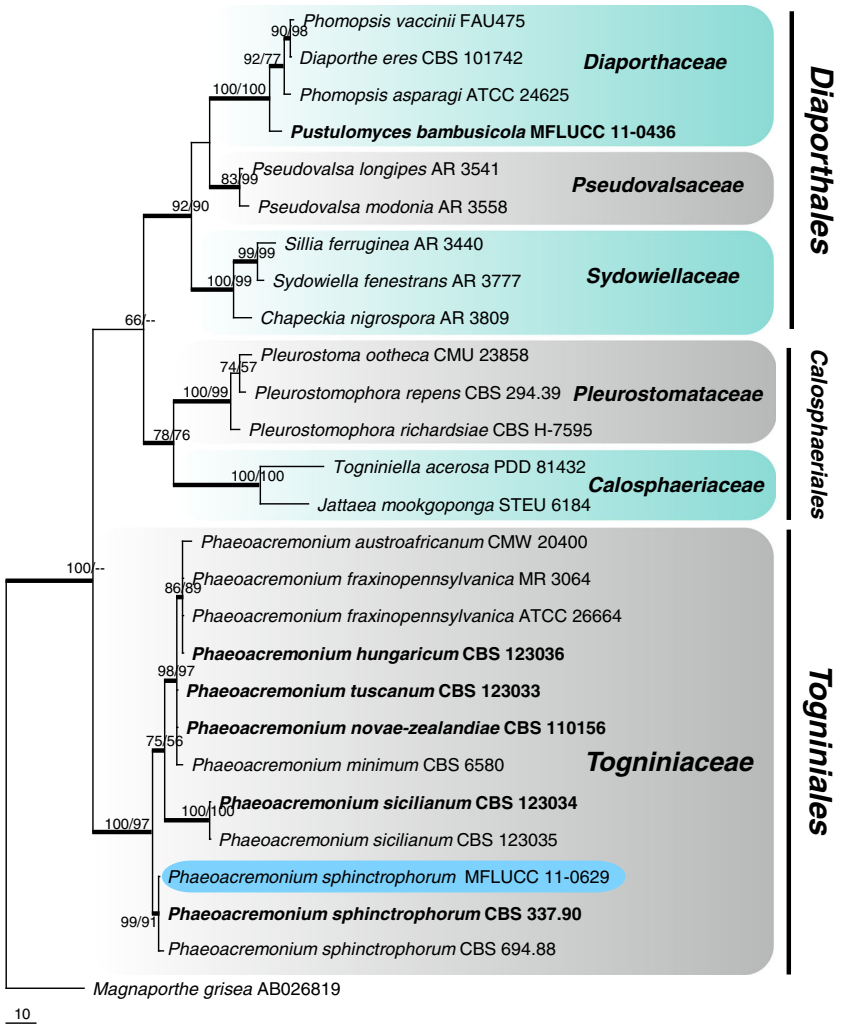


Fig. 41 Maximum likelihood phylogenetic tree (lnL = −2056.989940) generated by RAxML (GTR+G model) based on LSU sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes. The original isolate numbers are noted after the species names. The tree is rooted to *Magnaporthe grisea* (M82). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

(2013) and Senanayake et al. (2015). The distinguishing characters of *Arthrinium* are the basauxic conidiogenesis in the asexual morph, with apiospores in the sexual morph (Samuels et al. 1981; Bahl 2006; Senanayake et al. 2015).

Arthrinium longistromum D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552035; *Facesoffungi number*: FoF 01993; Figs. 42 and 43

Entomology: Refers to its long stromata.

Holotype: MFLU 15–1184

Saprobic on decaying bamboo culms, forming black, linear, raised areas on the host surface, with ascostromata breaking through raised cracks at the black centre. **Sexual morph**: *Ascostromata* 5–30 mm long, 0.25–0.5 mm wide, 0.25–0.3 mm high, gregarious, raised, irregularly and sinuously filiform, black, with long axis broken at the apex, with black dot-like ostioles of ascomata. *Ascomata* perithecial, 140–280 μm diam., 145–265 μm high, 10–30 gregarious in one ascostroma, subglobose, sometimes with flattened base, slight brown to reddish brown, membranous, with a centrally located, periphysate, 50–80 × 60–75 μm wide, distinctive ostiole. *Peridium* laterally 10–15 μm thick, composed of brown and small light brown to reddish brown to hyaline cells of compressed *textura angularis* to *textura intricata*; upper wall near ostiole 25–35 μm thick, black to reddish black. *Cells between perithecia* 50–100 μm thick, comprising host and fungal tissues, composed of small, brown cells of *textura angularis*. *Hamathecium* composed of few, 4.5–7 μm broad, septate, unbranched, paraphyses. *Asci* 70–95 × 15.5–20 μm ($\bar{x}$ = 79.7.6 × 18.4 μm, n = 20), 8-spored, unitunicate, broad cylindrical to clavate, with rounded apex and a short pedicel, J-. *Ascospores* 20–30 × 4.5–6.5 μm ($\bar{x}$ = 23.1 × 5.7 μm, n = 20), 2–3-seriate, 1-septate, elliptical to broad fusiform, with a large, upper cell and small lower cell, with narrowly rounded ends, hyaline, smooth-walled, with many guttules, without a sheath. **Asexual morph**: Undermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes developing from the upper cell. Colonies slowly growing on PDA, reaching 60 mm in 4 weeks

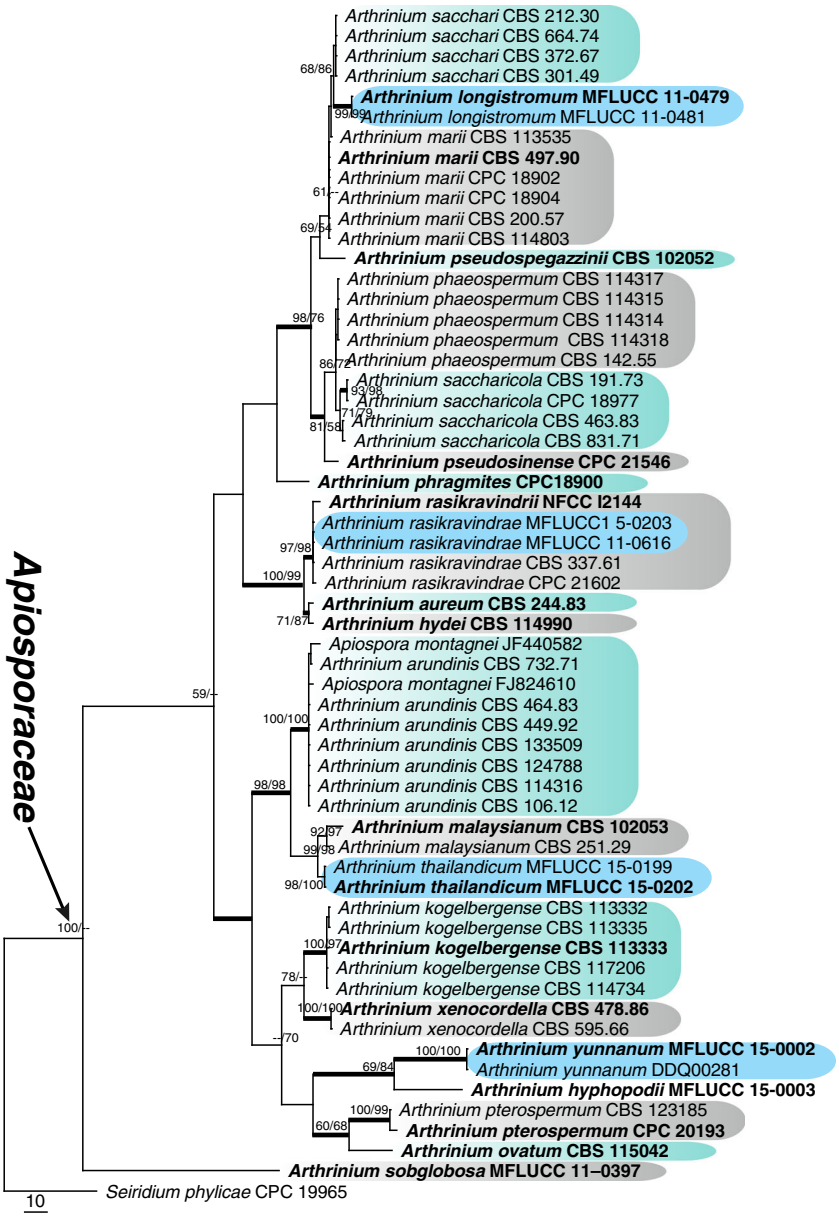


Fig. 42 One of four equally most parsimonious trees resulting from 1000 bootstrap replicates obtained from the of ITS sequence data. Maximum likelihood phylogenetic tree (lnL = −2217.066944) was generated by RAxML (GTR+G model). MP/ML values (>50 %) are given at the nodes, and branches with Bayesian posterior probabilities greater than 0.90 are given in *bold*. The original isolate numbers are noted after the species names. The tree is rooted to *Seiridium phylicae* (CPC 19965). Ex-type strains are in *bold* and newly generated sequences are highlighted with a *blue* background

at 26 °C, under 12 h light/12 h dark, cottony, circular, with irregular edge, white from above, brown to dark brown in centre from below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 19 July 2011, Dong-Qin Dai DDQ00079 (MFLU 15–1184, **holotype**); *Ibid.* (KUN HKAS88694, **isotype**), living cultures, MFLUCC 11–0481, KUMCC; *Ibid.*, 17 July 2011, Dong-Qin Dai DDQ00074, living culture, MFLUCC 11–0479.

Notes: *Arthrinium longistromum* is characterized by the linear ascostromata (5–30 mm long) containing more than ten perithecia. *Arthrinium longistromum* is phylogenetically close to *A. sacchari* (Speg.) M.B. Ellis and *A. marii* Larrondo & Calvo (Fig. 42). However, the branch length indicates that they are different species (Fig. 42).

Arthrinium rasikravindrae Shiv M. Singh et al., [as '*rasikravindrii*'], in Singh et al., Mycotaxon 122: 452 (2012)

Facesoffungi number: FoF 01994; Figs. 44 and 45

Saprobic on dead bamboo culms, forming black, fusiform spots, with ascostromata breaking through raised cracks at the black centre. **Sexual morph**: *Ascostromata* 0.8–1.7 mm long, 0.4–0.6 mm wide, 0.15–0.2 mm high, solitary, immersed, fusiform, black, with a long broken axis at the top. *Ascomata* perithecial, 100–150 μm high, 200–300 μm diam., 3–5 perithecia immersed within the ascostromata, subglobose with a flattened base, dark brown, membranous, with centrally located, periphysate, 45–60 × 40–50 μm wide distinctive ostiole.

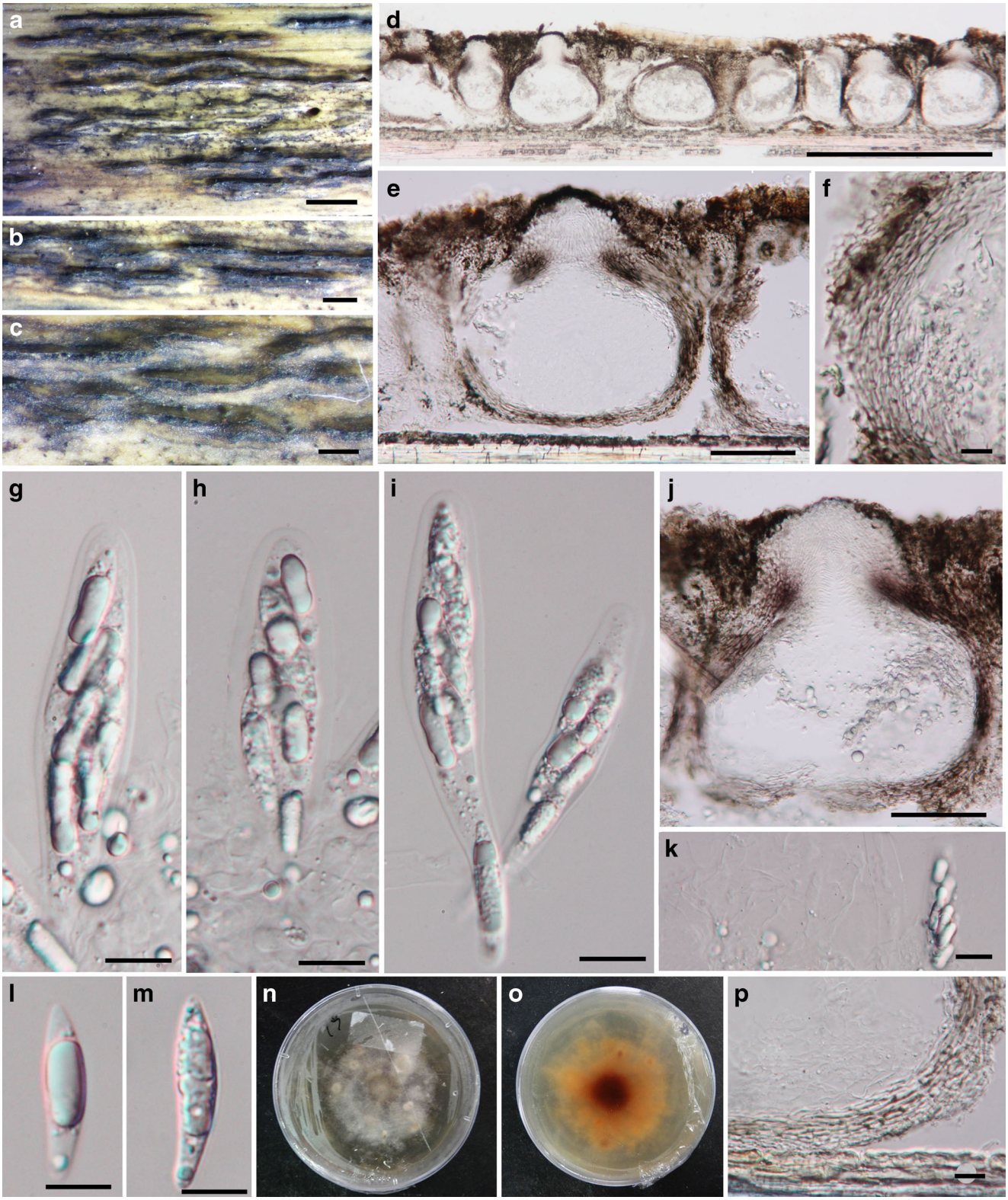


Fig. 43 ***Arthrinium longistromum*** (MFLU 15–1184, **holotype**). **a**–**c** Dark, long ascostromata on bamboo host. **d** Vertical section of ascostroma. **e**, **j** Vertical sections of perithecia (**j**: showing periphysate ostiole). **f**, **p** Peridium. **g**–**i** Asci. **k** Paraphyses. **l**, **m** Ascospores. **n**, **o** Cultures on PDA. Scale bars: a = 1 mm, b–d = 500 *μm*, e = 100 *μm*, f = 10 *μm*, j = 50 *μm*, g–m, p = 10 *μm*

Peridium composed of dark brown to brown to hyaline cells of compressed *textura angularis* to *textura intricata*, laterally 5–10 μm thick; upper wall around ostiole 10–15 μm thick, with black pigment. *Cells between perithecia* 50–250 μm

thick, comprising host and fungal tissues, composed of small, brown cells of *textura angularis*. *Hamathecium* composed of dense, long, 1.5–3 μm broad, septate, unbranched, paraphyses. *Asci* 70–90 × 15–17.5 μm ($\bar{x}$ = 82.1 × 16.6 μm, n = 20), 8-spored, unitunicate, broadly cylindrical to long clavate, with a short pedicel. *Ascospores* 21.5–24.5 × 7–9.5 μm ($\bar{x}$ = 23.1 × 8.3 μm, n = 20), 2–3-seriate, 1-septate, ellipsoidal to broad fusiform, with a large, occasionally curved, upper cell and a small lower cell, with narrowly rounded ends, hyaline, smooth-walled, with many guttules and one large guttule in the centre, surrounded by 3.5–9 μm wide gelatinous sheath attached at both ends. **Asexual morph**: Fertile on PDA, after 1 month. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* basauxic, cylindrical, discrete, smooth-walled. *Conidia* 7–10 × 4.5–8.5 μm ($\bar{x}$ = 8.1 × 6.8 μm, n = 20), lenticular, globose to subglobose, occasionally elongated to ellipsoidal, dark brown, smooth-walled, with a longitudinal, hyaline, thin, germ-slit.

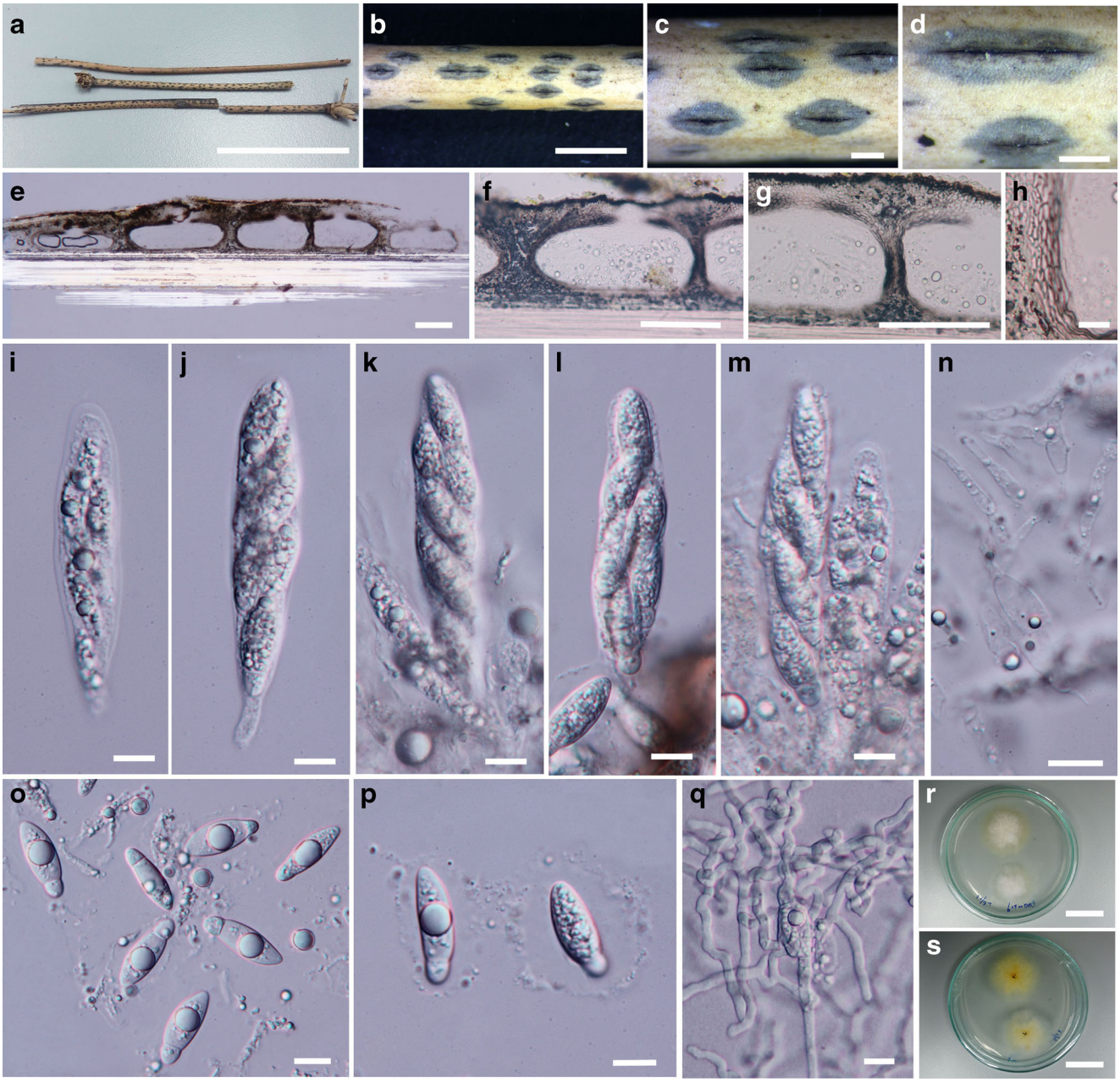


Fig. 44 ***Arthrinium rasikravindrii*** (MFLU 15–1227). **a** Bamboo specimens. **b**–**d** Black ascostromata on bamboo host. **e** Vertical section of ascostroma. **f**, **g** Vertical sections of perithecia. **h** Peridium. **i** Immature ascus. **j**–**m** Mature asci. **n** Paraphyses. **o**–**p** Ascospores. **q** Germinating ascospore. **r**, **s** Cultures on PDA. Scale bars: a = 5 mm, b = 1 mm, c, d = 500 μm, e–g = 100 μm, h–q = 10 μm

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes developing from the upper cell. Colonies fast growing on PDA, reaching 90 mm in 2 weeks at 26 °C, under 12 h light/12 h dark, cottony, circular, with irregular edge, white from above, brown to dark brown in centre from below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Krabi, Wat Tham Sua Temple, 8°07′34″N 98°55′28″E, limestone outcrop, on dead culms of bamboo, 4 October 2014, Kevin D. Hyde DDQ00309 (MFLU 15–1227); *Ibid*. (KUN HKAS88734), living cultures, MFLUCC 15–0203, MUCL 55894; Chiang Rai, Mae Fah Luang University, 1 October 2011, Dong-Qin Dai DDQ00102, living culture, MFLUCC 11–0616.

Notes: *Arthrinium rasikravindrae* was introduced by Singh et al. (2012) based on the asexual morph characters and phylogeny analyses. The type was originally isolated from soil in Norway (Singh et al. 2012). Singh et al. (2012) also reported that this species occurred on wood from marine coast and *Pinus thunbergii* Parl., as well as stubble of *Triticum aestivum* L. However, only the asexual morph was observed by Singh et al. (2012). In this paper, we describe and illustrate both sexual and asexual morphs (Figs. 44 and 45). The conidia of our collection (MFLUCC 15–0203) are smaller than the type (7–10 × 4.5–8.5 μm vs. 10–15 × 6–10.5 μm) (Singh et al. 2012). However, in the phylogenetic tree (Fig. 42), our two isolates form same branch with ex-type strain (NFCCI 2144), as well as two authentic strains (CBS 337.61 and CPC 21602) with high bootstrap support (97/98 % MPBP/MLBP).

Arthrinium thailandicum D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552036; *Facesoffungi number*: FoF 01995; Figs. 46 and 47

Entomology: In reference to the country where this species was collected.

Holotype: MFLU 15–1226

Saprobic on dead bamboo culms, forming black, lenticular spots with ascostromata breaking through raised cracks at the black centre. **Sexual morph**: *Ascostromata* 450–990 μm long, 300–550 μm wide, 150–200 μm high, solitary to gregarious, immersed, fusiform to ellipsoid, black, with long axis broken at the top. *Ascomata* perithecical, 145–160 μm high, 250–280 μm diam., immersed within the ascostromata, subglobose, dark brown, membranous, with a single perithecium, with a distinctive centrally located, periphysate, 50–75 μm wide, ostiole, covered by a black clypeus. *Peridium* thin to thick, comprising several strata, composed of dark brown to brown to hyaline cells of compressed *textura angularis*, thinner at the base, laterally 5–10 μm thick, with upper wall around ostiole, laterally 15–25 μm thick; surrounded by 150–250 μm thick stromatic tissue composed of large, brown cells of *textura prismatica* to *textura angularis*. *Hamathecium* composed of dense, long, 2–5 μm broad, septate, unbranched, paraphyses. *Asci* 80–100 × 16–20 μm ($\bar{x}$ = 94.4 × 19.8 μm, n = 20), 8-spored, unitunicate,

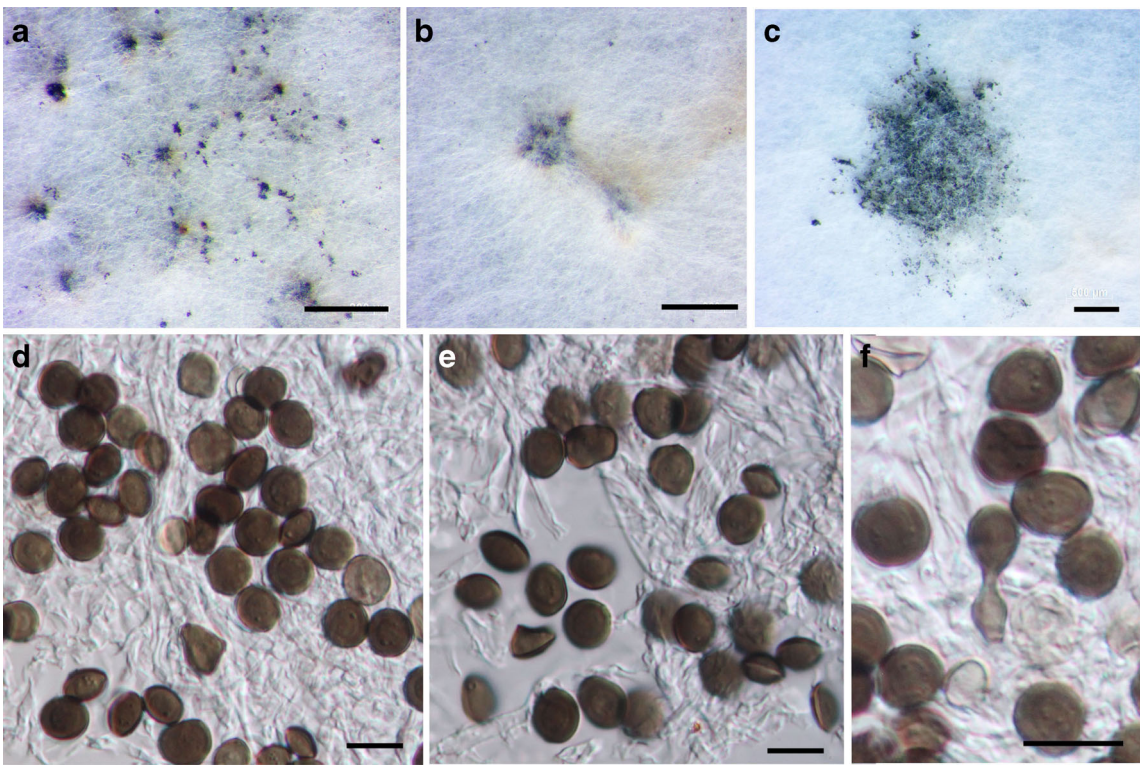


Fig. 45 **Asexual morph of *Arthrinium rasikravindrii*** (MFLUCC 15–0203). **a**, **b** Colony on PDA producing conidia mass. **c** Conidia mass. **d**–**f** Conidia. Scale bars: a–c = 500 *μm*, d–f = 10 *μm*

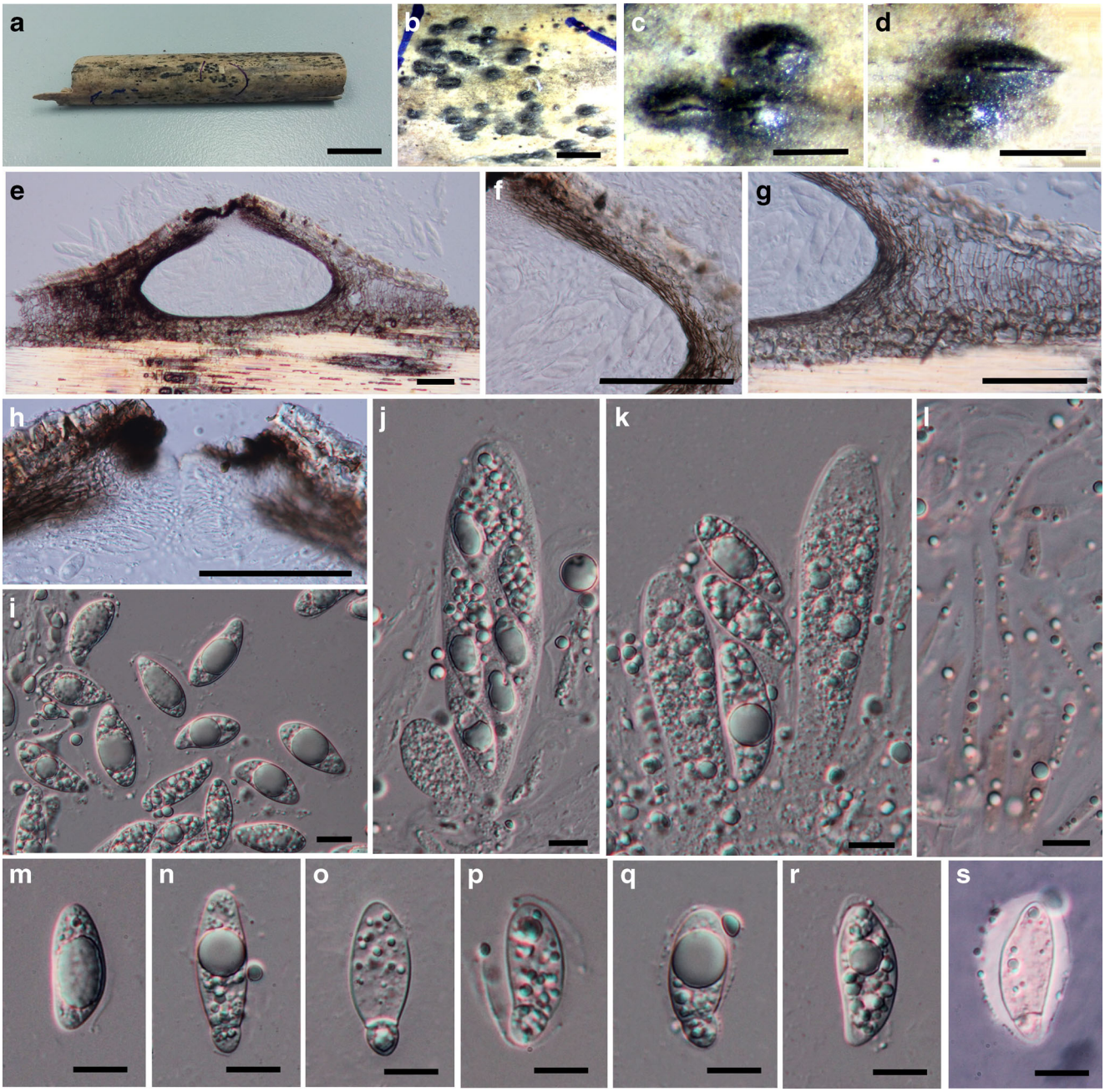


Fig. 46 ***Arthrinium thailandicum*** (MFLU 15–1226, **holotype**). **a** Type specimen, a bamboo culm. **b**–**d** Appearance of ascostromata on host. **e** Vertical section of ascostroma. **f** Peridium of ascoma. **g** Peridium of ascoma surrounded by stromatic tissue. **h** Ostiole opening with periphyses. **j**, **k** Asci. **l** Paraphyses in congo red. **i**, **m** Ascospores. **s** Ascospore with sheath in indian ink. Scale bars: a = 2 mm, b = 1 mm, c, d = 500 μm, e–h = 50 μm, i–s = 10 μm

broadly cylindrical to long clavate, with a short pedicel. *Ascospores* 22–30 × 8–12.5 µm ($\bar{x}$ = 25.3 × 10.3 µm, n = 20), 2–3-seriate, 1-septate, elliptical, with a large, curved, upper cell and small lower cell, with narrowly rounded ends, hyaline, smooth-walled, with many guttules, surrounded by 3–5 µm wide gelatinous sheath attached, at both ends. **Asexual morph**: Fertile on PDA, after 1 month. *Conidiophore mother cells* 5.5–11 × 3–4.5 µm ($\bar{x}$ = 7.6 × 3.8 µm, n = 20), ampulliform to cylindrical, smooth-walled. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* 11.5–39 × 2–3.5 µm ($\bar{x}$ = 26.7 × 2.6 µm, n = 20), basauxic, polyblastic, sympodial, cylindrical, discrete, sometimes branched, smooth-walled. *Conidia* 5–9 × 5–8 µm ($\bar{x}$ = 7.1 × 6.2 µm, n = 20), lenticular, globose to subglobose, occasionally elongated to ellipsoidal, dark brown, smooth-walled, with a truncate basal scar, occasionally with a longitudinal, hyaline, thin, germ-slit.

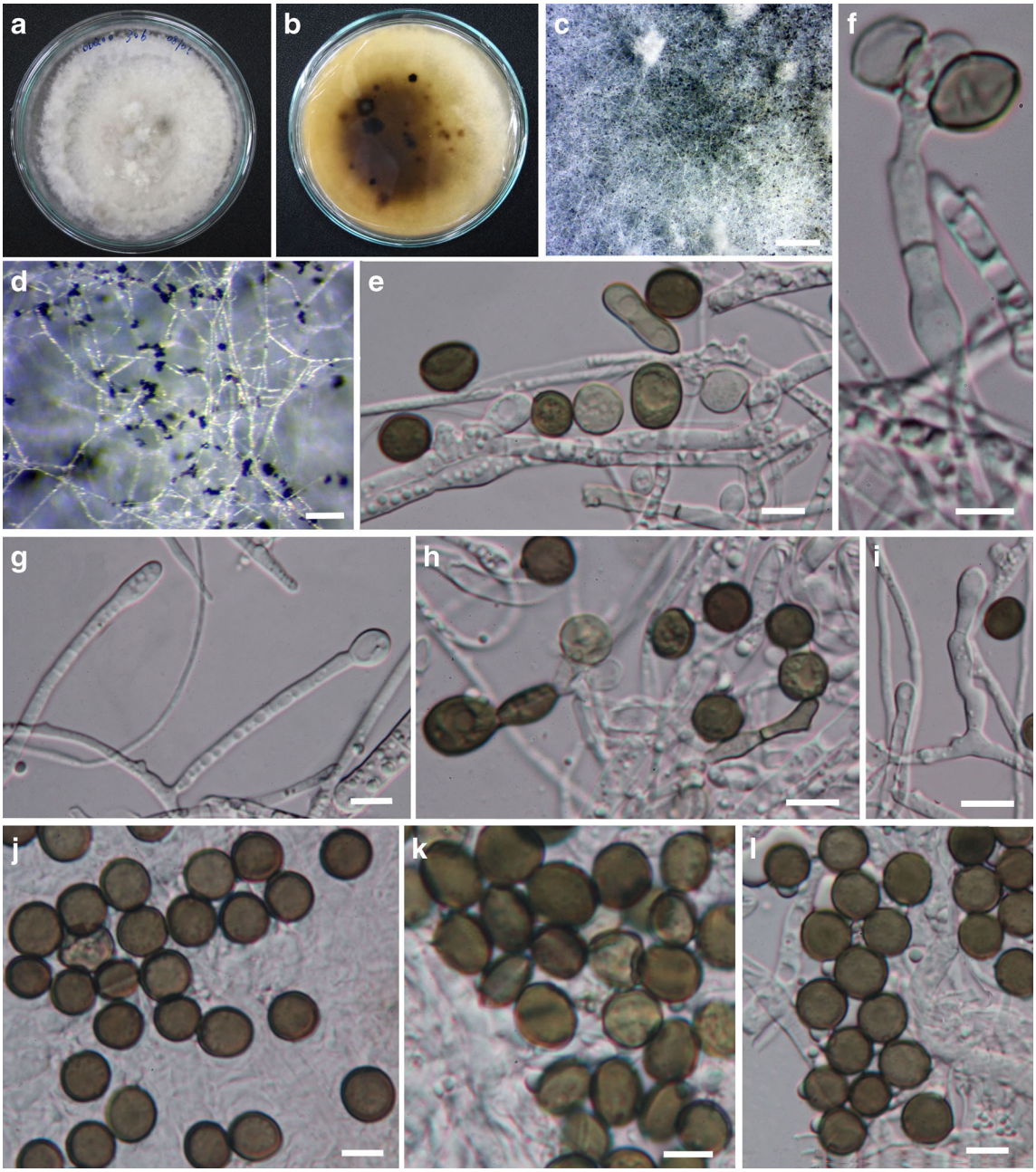


Fig. 47 **Asexual morph of *Arthrinium thailandicum*** (MFLUCC 15–0202, ex-type). **a**, **b** Colony on PDA. **c**, **d** Mycelium with conidia. **e**, **f**, **i**, **j** Conidiogenous cells. **h** Elongated conidia. **k** Conidia from above view. **l** Conidia from side view. Scale bars: c, d = 1 mm, e–l = 5 *μm*

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes developing from the upper cell. Colonies fast growing on PDA, reaching 90 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, cottony, circular, with irregular edge, white from above, brown to dark brown in the centre from below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Krabi, Krabi Noi, Wat Tham Sua Temple, 8°07′34″N 98°55′28″E, limestone outcrop, on dead culms of bamboo, 4 October 2014, Kevin D. Hyde DDQ00308 (MFLU 15–1226, **holotype**); *Ibid*. (KUN HKAS88733, **isotype**), ex-living cultures, MFLUCC 15–0202, KUMCC; *Ibid*., DDQ00304 (MFLU 15–1224); *Ibid*. (KUN HKAS88731), living culture, MFLUCC 15–0199, KUMCC.

Notes: *Arthrinium thailandicum* is phylogenetically close to *A. malaysianum* Crous (Fig. 42) introduced by Crous and Groenewald (2013) with description of only the asexual morph. *Arthrinium malaysianum* has short, unbranched

conidiogenous cells (4–7 × 3–5 μm), whereas *A. thailandicum* has longer, branched conidiogenous cells (11.5–39 × 2–3.5 μm). Their conidia overlap in size but the average is larger in *A. thailandicum* (Crous and Groenewald 2013).

Arthrinium yunnanum D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552037; *Facesoffungi number*: FoF 01996; Figs. 48 and 49

Entomology: Refers to the province where the species was first collected.

Holotype: MFLU 15–0382

Saprobic on decaying bamboo culms, forming black, lenticular spots on the host surface, with ascostromata breaking through raised cracks at the black centre. **Sexual morph**: *Ascostromata* 0.7–1.5 mm long, 0.35–0.55 mm wide, 0.2–0.3 mm high, solitary, or occasionally two gregarious, immersed, subepidermal, fusiform to ellipsoid, black, with a long slit opening at the top. *Ascomata* perithecial, 150–300 μm diam., 155–200 μm high in section, 2–3 immersed under ascostromata, subglobose, light brown to reddish brown, membranous, distinctive ostiole at the centre, with a black clypeus. *Peridium* laterally 15–25 μm thick, composed of brown and small light brown to reddish brown to hyaline, elongated cells of *textura angularis*; surrounded by 100–300 μm stromatic tissues, composed of small cells of *textura angularis*. *Hamathecium* composed of dense, 2–7 μm broad, septate, unbranched, paraphyses. *Asci* 85–100 × 30–35 μm ($\bar{x}$ = 92.3 × 33.1 μm, n = 20), 8-spored, unitunicate, broad cylindrical to subglobose, with narrow apex. *Ascospores* 28–37 × 9–11 μm ($\bar{x}$ = 32.7 × 10.2 μm, n = 20), 2–3-seriate, 1-septate, elliptical, with a large, curved, upper cell and small lower cell, with narrowly rounded ends, hyaline, smooth-walled, with many guttules, surrounded by a 5–20 μm wide, gelatinous sheath. **Asexual morph**: Coelomycetous, fertile on PDA, after 1 month. *Conidiomata* 300–350 μm diam., 350–400 μm high, stromatal, sporodochial, solitary to gregarious, superficial on media, surrounded by hyaline colonies, globose to subglobose, coriaceous. *Conidiophore mother cells* 6.5–9 × 2.5–4 μm, cylindrical, smooth-walled, arising from the stroma. *Conidiogenous cells* 16.5–50 × 2–4 μm ($\bar{x}$ = 37.8 × 2.9 μm, n = 20), basauxic, cylindrical, discrete, smooth-walled. *Conidia* 17.5–26.5 × 15.5–25 μm ($\bar{x}$ = 22.3 × 9.2 μm, n = 20), lenticular, globose to obovoid, dark brown, smooth-walled, with a truncate basal scar.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes developing from the upper part. Colonies fast growing on PDA, reaching 90 mm in 2 weeks at 26 °C, under 12 h light/12 h dark, cottony, circular, with irregular edge, white from above, brown to dark brown in centre from below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: CHINA, Yunnan, Kunming, Kunming Institute of Botany, Chinese Academy of Science, on dead culms of *Phyllostachys nigra*, 7 July 2014, Dong-Qin Dai DDQ00279 (MFLU 15–0382, **holotype**); *Ibid*. (KUN HKAS83867 **isotype**), ex-type living cultures, MFLUCC 15–0002, CBS 139958.

Notes: *Arthrinium yunnanum* is phylogenetically close to *A. hyphopodii* D.Q. Dai & K.D. Hyde (Fig. 42). However, *A. yunnanum* differs from the latter in having longer conidiogenous cells (16.5–50 × 2–4 μm vs. 4–6 × 2–3.5 μm) and larger conidia (17.5–26.5 × 15.5–25 μm vs. 5–10 × 4–8 μm) (Senanayake et al. 2015). *Arthrinium yunnanum* is morphological similar to *A. setosa* Samuels and *A. bambusae* (Turconi) Sivan. However, *A. setosa* has smaller asci (65–85 × 20–28 μm vs. 85–100 × 30–35 μm) whereas *A. bambusae* has smaller conidia (15–19 × 15–17 μm vs. 17.5–26.5 × 15.5–25 μm) (Samuels et al. 1981; Sivanesan 1983). Moreover, the blast results using the LSU sequence in NCBI's GenBank indicates that *A. yunnanum* is a distinct species.

Diatrypaceae Nitschke [as '*Diatrypeae*'], Verh. naturh. Ver. preuss. Rheinl. 26: 73 (1869)

Kirk et al. (2008) included 13 genera in this family. However, Lumbsch and Huhndorf (2010) accepted ten genera, while Maharachchikumbura et al. (2015) list 15 genera in *Diatrypaceae*. The phylogenetic analyses (Acero et al. 2004; Trouillas et al. 2011, 2015) showed some common genera are polyphyletic, such as *Diatrype*, *Diatrypella*, *Cryptosphaeria*, *Eutypa* and *Eutypella*. This family is characterized by perithecial ascomata, immersed in a well developed eu- or pseudostroma, often long-necked with unitunicate, long stalked asci, often with a truncate apex, and allantoid, hyaline to pale brown ascospores (Carmarán et al. 2006; Vasilyeva and Stephenson 2004, 2006). Members of this family are common worldwide, typically occurring on a broad range of dead or declining woody angiosperms (Acero et al. 2004).

Eutypa Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 52 (1863)

The genus *Eutypa* was established by Tulasne and Tulasne (1863), and typified by *Eutypa lata* (Pers.) Tul. & C. Tul.. Kirk et al. (2008) accepted 32 species in this genus, however, more than 200 epithets are listed in Index Fungorum (2016). *Eutypa* species have a wide host range, and can cause vrious diseases on plants (DeScenzo et al. 1999; Rolshausen et al. 2006). Asexual morphs of this genus are linked to *Libertella* and *Cytosporina* (Kirk et al. 2008).

Eutypa linearis Rehm, Annls mycol. 5(6): 523 (1907)

Facesoffungi number: FoF 01997; Figs. 50 and 51

Saprobic on dead bamboo culms, forming black parallel to naviculate ascostromata on the host, breaking through the host tissue as a slit when mature, exposing black ostioles. **Sexual morph**: *Ascostromata* 1.5–6 mm long, 300–650 μm wide,

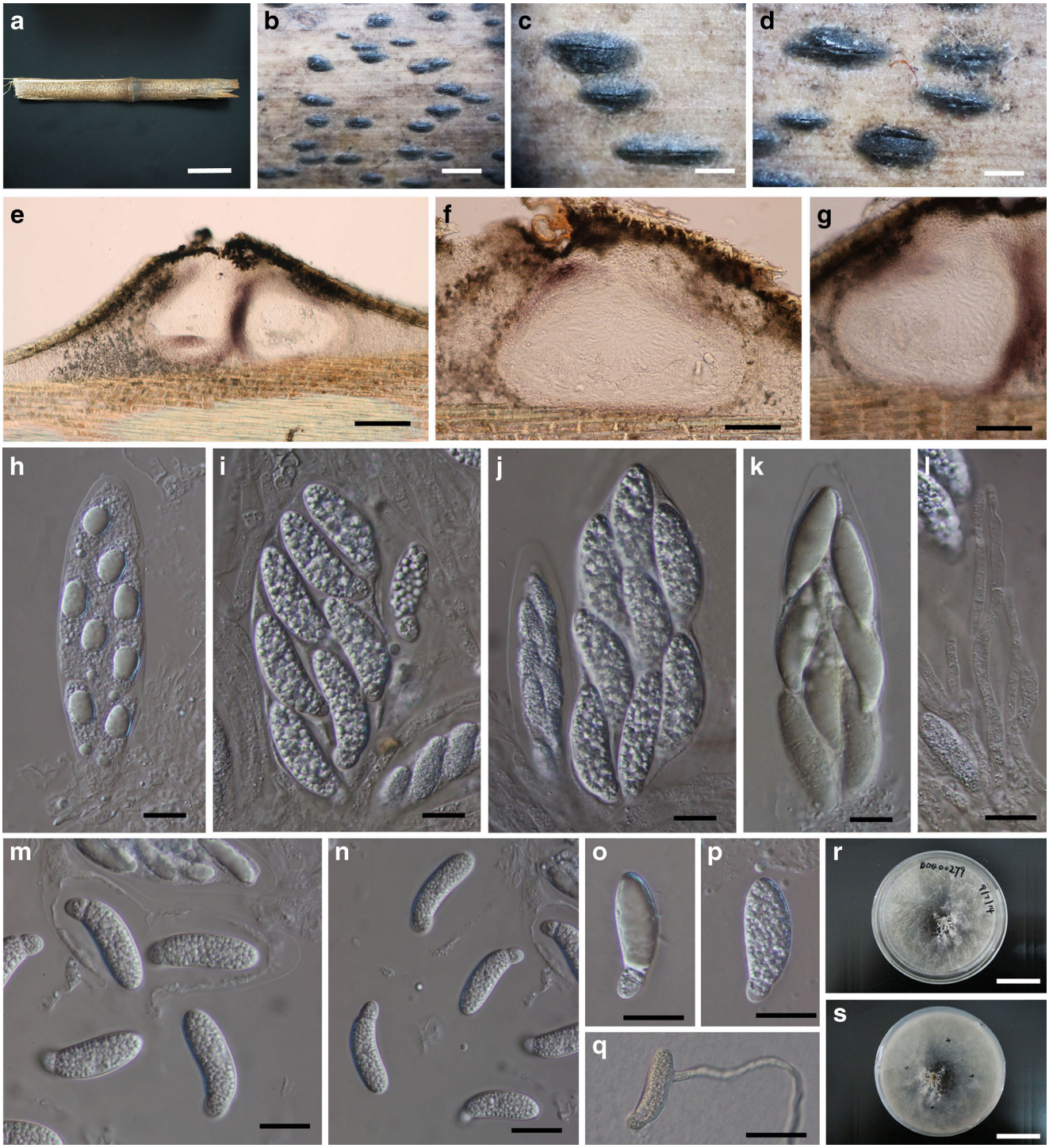


Fig. 48 ***Arthrinium yunnanum*** (MFLU 1515–0382, **holotype**). **a** Bamboo specimen. **b–d** Black ascostromata on bamboo host. **e** Vertical section of ascostroma. **f**, **g** Vertical sections of ascoma. **h** Immature ascus. **i–j** Mature asci. **k** Ascus stained by Meltzer's. **l** Paraphyses. **m–p** Ascospores. **q** Germinating ascospore. **r**, **s** Cultures on PDA. Scale bars: a = 5 cm, b–d = 500 *μm*, e = 200 *μm*, f = 150 *μm*, g = 100 *μm*, h–l = 10 *μm*, m–q = 5 *μm*, r, s = 25 cm

and 300–500 μm high, immersed under the host, long fusiform, irregular ellipsoidal. Upper cells of stromata near the perithecial ostiole are black, thick-walled. Stromatic tissue is yellow, compact. *Ascomata* perithecial, 100–150 μm diam., 250–400 μm high, immersed in stromata, obpyriform, with a central, ostiolate, opening, 95–105 × 45–65 μm, erumpent over stromata, with periphyses. *Peridium* 6–10 μm thick, composed of brown to hyaline, elongate, cells of *textura angularis*, surrounded by yellow stromatic tissue. *Hamathecium* with ca. 1 μm wide, unbranched, paraphyses.

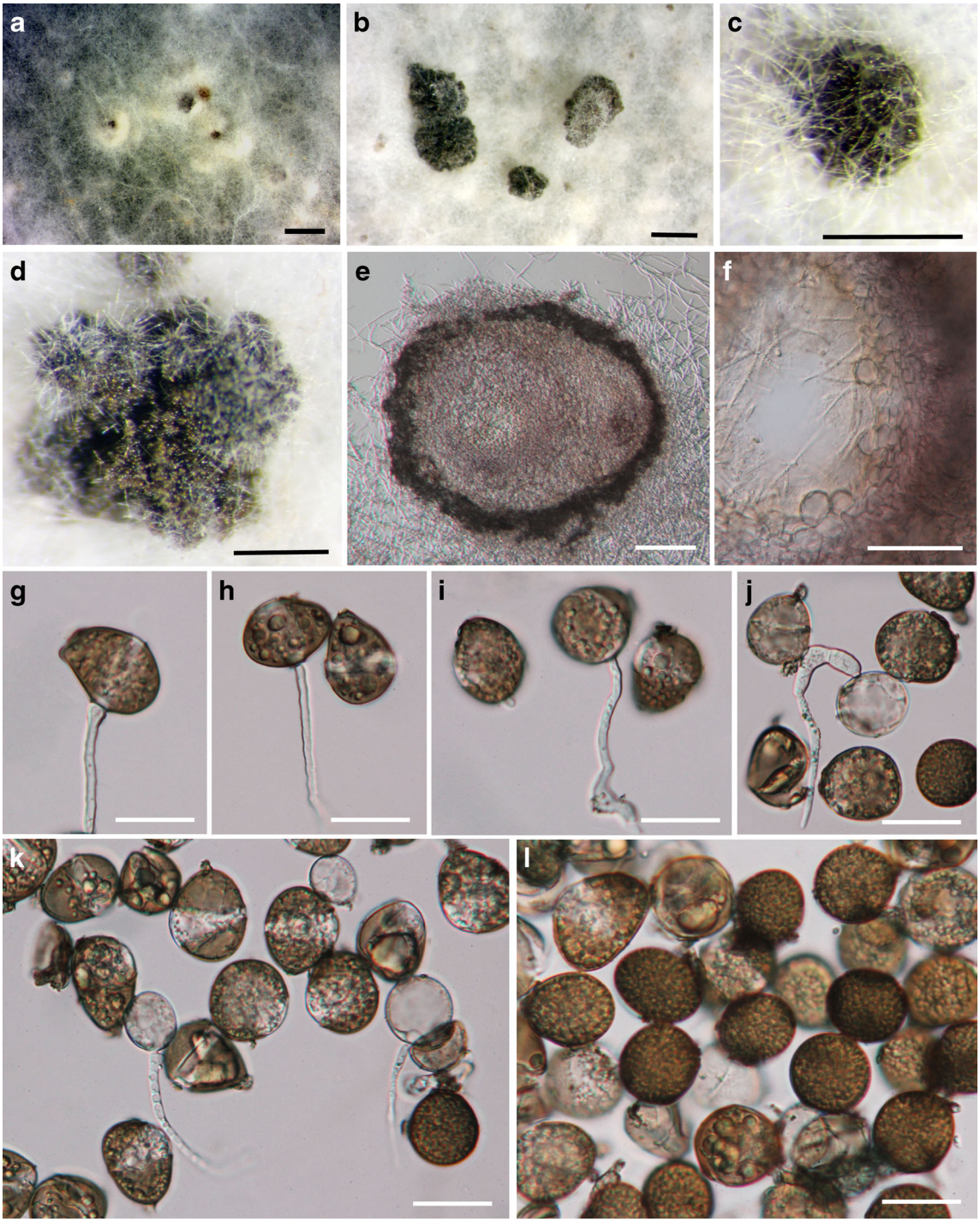


Fig. 49 **Asexual morph of *Arthrinium yunnanum*** (MFLUCC 15–0002, ex-type). **a** Colony on PDA producing conidiomata. **b–d** Conidia mass. **e** Vertical section of stromata. **f** stromata wall. **g–j** Conidiogenous cells. **k**, **l** Conidia. Scale bars: a, b = 1 mm, c, d = 500 *μm*, e = 100 *μm*, f = 50 *μm*, g–l = 20 *μm*

Asci 50–90 × 5–7.5 μm ($\bar{x}$ = 70.1 × 6.2 μm, *n* = 20), 8-spored, unitunicate, cylindrical, with a long and thin perdical, apex truncate, with a small, J-, apical ring. *Ascospores* 5–7 × 1–2 μm ($\bar{x}$ = 6.1 × 1.4 μm, *n* = 20), 2–3-seriate, allantoid, aseptate, rounded at both ends, hyaline, smooth-walled. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends. Colonies growing fast on PDA, reaching 9 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, edge irregular, hyaline from above and below. Mycelium superficial to immersed in media, branched, septate, smooth.

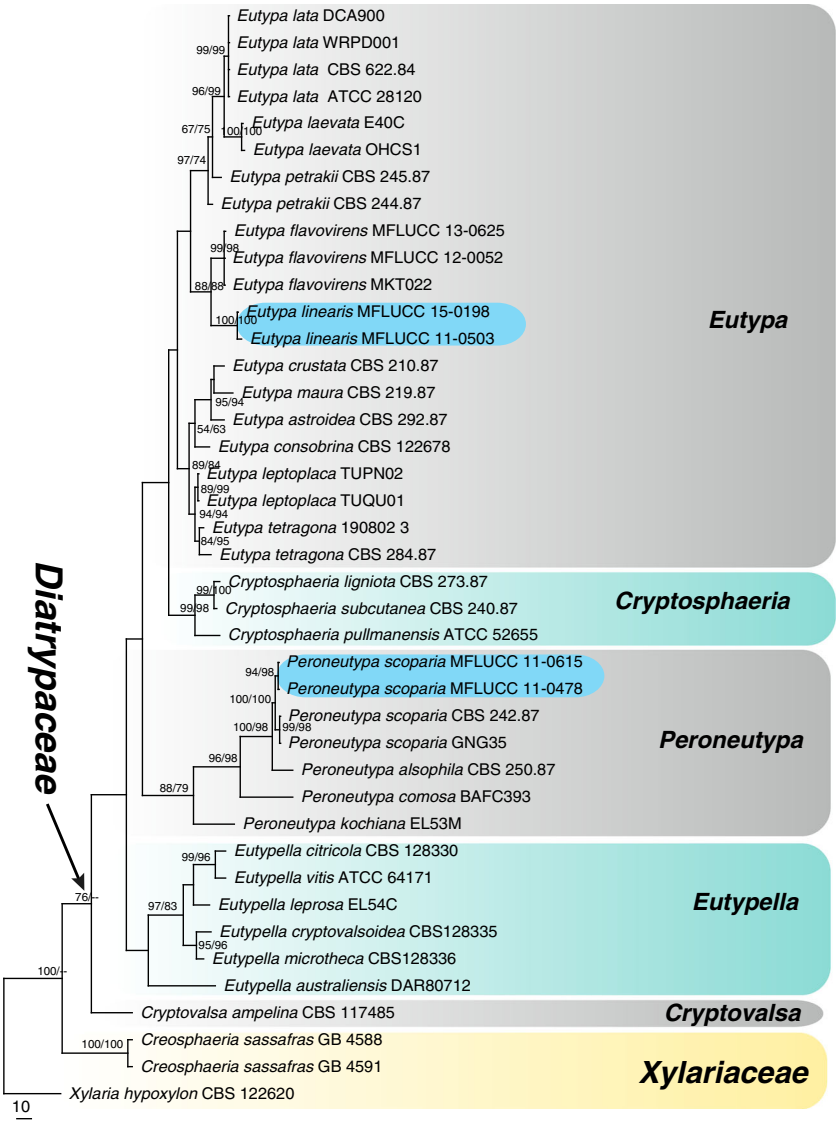


Fig. 50 One of three equally most parsimonious trees resulting from 1000 bootstrap replicates obtained from ITS sequence data. Maximum likelihood phylogenetic tree (lnL = −2688.878680) was generated by RAxML (GTR+G model). MP/ML values (>50 %) are given at the nodes, and branches. The original isolate numbers are noted after the species names. The tree is rooted to *Xylaria hypoxylon* (CBS122620). Newly generated sequences are highlighted with a blue background

Material examined: THAILAND, Phang Nga, Thap Put District, Tham Thong Lang, Doi Nang Hong, on dead culms of bamboo, 6 December 2014, Kevin D. Hyde DDQ00303 (MFLU 15–1223, **reference specimen designated here**); *Ibid*. (KUN HKAS88730, **duplicate of reference specimen**), living cultures, MFLUCC 15–0198, MUCL 55892; Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 19 July 2011, Dong-Qin Dai DDQ00082 (MFLU 15–1186); *Ibid*. (KUN HKAS88696), living culture, MFLUCC 11–0503.

Notes: *Eutypa linearis* was described by Rehm (1907), based on a specimen collected in Brazil. This species occurred on culms of *Arundinariae* (bamboo) (Rehm 1907). Eriksson and Yue (1998) provided a line drawing of stromata of *Eutypa linearis*. Our new collections have the same size of ascospores with that in Rehm (1907), but larger stromata (1.5–6 mm vs. 0.5–3 mm in length). The phylogenetic tree (Fig. 50) shows *Eutypa linearis* is closest to *E. flavovirens*. However, *E. flavovirens* has smaller (less than 1.5 mm in length) round stromata, and occurs on twigs (Senanayake et al. 2015). *Eutypa linearis* is a common species occurring on bamboo (Eriksson and Yue 1998), however, no molecular data is available in GenBank, and thus reference specimen is designated here.

Peroneutypa Berl., Icon. fung. (Abellini) 3(3–4): 80 (1902)

Peroneutypa is typified by *Peroneutypa bellula* (Desm.) Berl. and was introduced by Berlese (1902). Berlese (1968) amended this genus to accommodate species with small, clavate asci and perithecia with long necks. It is listed as a synonym of *Eutypella* (Nitschke) Sacc in Index Fungorum (2016). However, Carmarán et al. (2006) accepted *Peroneutypa* with seven species, and there areapproximately 50 epithets listed in Index Fungorum (2016).

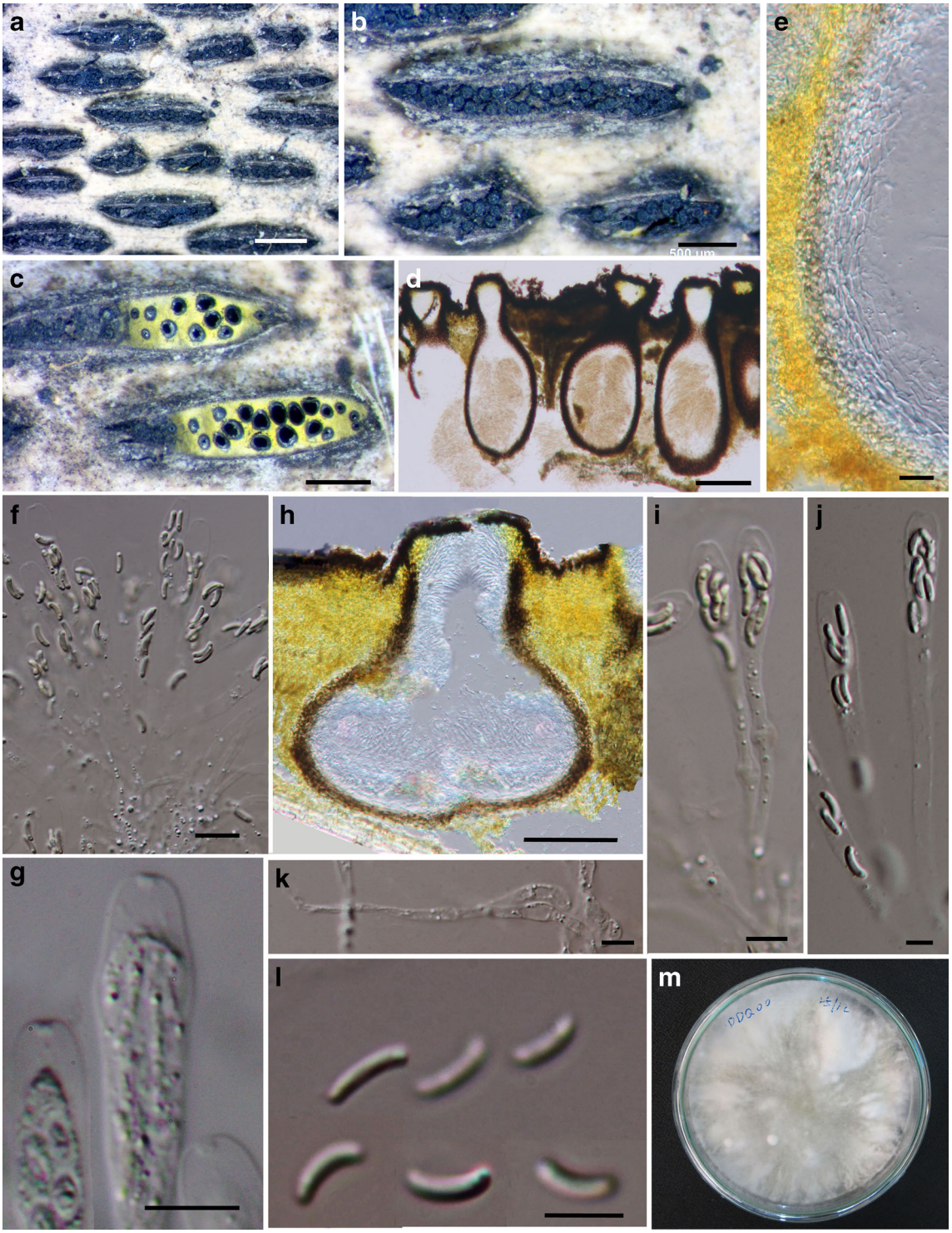


Fig. 51 ***Eutypa linearis*** (MFLU 15–1223, **reference specimen**). **a**, **b** Appearance of ascostromata on bamboo host. **c** Horizontal slice through ascostromata. **d**, **h** Vertical sections of ascomata in stroma. **e** Peridium of ascoma. **g** Apical ring of asci. **f**, **i**, **j** Asci. **k** Paraphyses. **l** Ascospores. **m** Culture on PDA. Scale bars: a = 1 mm, b, c = 500 *μm*, d = 50 *μm*, e, f = 10 *μm*, h = 100 *μm*, g, k–l = 5 *μm*

Peroneutypa scoparia (Schwein.) Carmarán & A.I. Romero, in Carmarán et al., Fungal Diversity Res. Ser. 23: 84 (2006)

Facesoffungi number: FoF 01998; Fig. 52

Synonym: See Index Fungorum.

Saprobic on dead bamboo culms, necks breaking through host epidermis, after maturity. **Sexual morph**: *Ascomata* perithecial, 350–450 μm diam., 150–170 μm high, solitary to 2–3

gregarious, immersed in the cortex, globose to subglobose, dark brown to black, coriaceous. *Necks of ascomata* 1.5–3 mm long, 100–150 μm wide, black, straight to curved, with periphyses. *Peridium* 15–25 μm thick, comprising hyaline to dark brown cells of *textura angularis*. *Hamathecium* comprising only asci, paraphyses not observed. *Asci* 21–40.5 × 3.5–5.5 μm ($\bar{x}$ = 32.6.3 × 4.9 μm, *n* = 20), 8–6-spored, unitunicate, clavate to cylindro-clavate, apically rounded to truncate, with a 15–20 μm long pedicel, J-. *Ascospores* 3.5–4.5 × 1–1.5 μm ($\bar{x}$ = 4.1 × 1.4 μm, *n* = 30), 2–3-seriate to irregular arranged, allantoid, hyaline, rounded at both ends, smooth-walled. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends. Colonies growing fast on PDA, reaching 45 mm in 1 week at 28 °C, under 12 h light/12 h dark, circular, edge irregular, white from above and below. Mycelium superficial to immersed in media, branched, septate, smooth.

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 16 July 2011, Dong-Qin Dai DDQ00074 (MFLU 15–1183, **reference specimen designated here**); *Ibid*. (KUN HKAS88693, **duplicate of reference specimen**), living culture, MFLUCC 11–0478; Jiew Santonkok, on dead culms of bamboo, 11 August 2011, Dong-Qin Dai DDQ00101 (MFLU 16–0881), living culture, MFLUCC 11–0615.

Notes: *Peroneutypa scoparia* was combined by Carmarán et al. (2006) based on *Sphaeria scoparia* Schwein. Pongcharoen et al. (2006) isolated this species from leaves of *Garcinia dulcis* (Roxb.) Kurz, collected in Songkhla

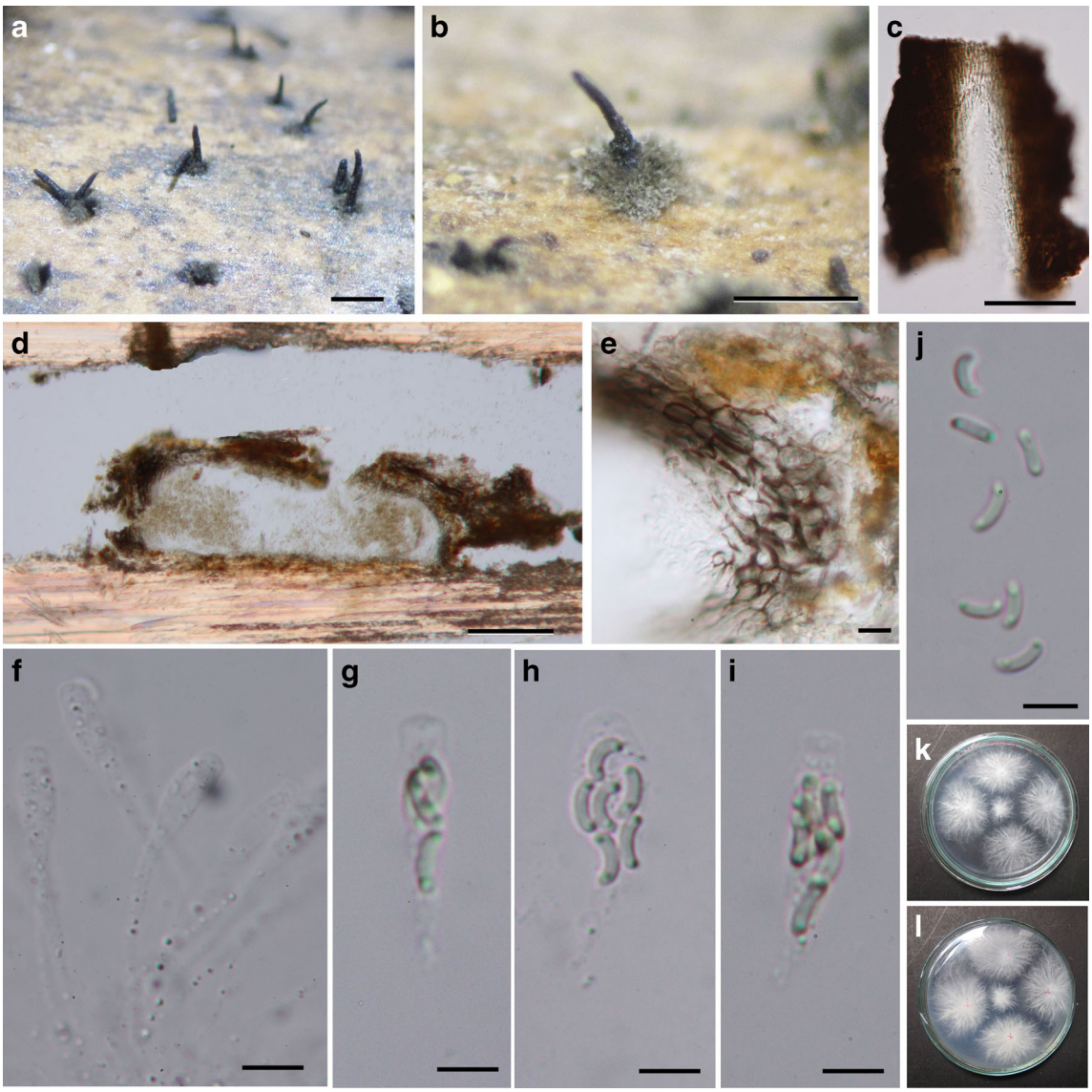


Fig. 52 ***Peroneutypa scoparia*** (MFLU 15–1183, **reference specimen**). **a**, **b** Perithecia immersed in host tissue, appearing as long, black necks. **c** Section of perithecial neck. **d** Vertical section of perithecium. **e** Peridium. **f** Immature asci. **g**–**i** Asci. **j** Ascospores. **k**, **l** Culture on PDA. Scale bars: a, b = 3 mm, c = 50 *μm*, d = 100 *μm*, e = 10 *μm*, f–j = 5 *μm*

Province, Thailand. We recollected same species on bamboo in northern Thailand and designated it as a reference specimen.

Xylariaceae Tul. & C. Tul. [as 'Xylariei'], Select. fung. carpol. (Paris) 2: 3 (1863)

Xylariaceae is one of the best-known pyrenomycete families in *Ascomycetes* and is distributed throughout the world (Rogers and Ju 1998, 2012; Ju and Rogers 1999; Peláez et al. 2008; Rogers et al. 2008; Chareprasert et al. 2012). Members of *Xylariaceae* are mainly wood inhabitants and prevalent in tropical and subtropical regions (Chareprasert et al. 2012). The xylariaceous fungi generally have well-developed stromata (Ju and Rogers 1999). Ju and Rogers (1996) accepted 38 genera and Whalley et al. (1996) recognized 40. Lumbsch and Huhndorf (2007) listed 76 genera. Subsequently Maharachchikumbura et al. (2015) included 86 genera in this family. The phylogenetic studies of *Xylariaceae* based on ribosomal DNA or other gene sequences have been carried out by many authors (Peláez et al. 2008; Tang et al. 2009; Hsieh et al. 2010; Jaklitsch and Voglmayr 2012; Stadler et al. 2013; Daranagama et al. 2015).

Anthostomella Sacc., Atti Soc. Veneto-Trent. Sci. Nat., Padova, Sér. 4 4: 84 (1875)

Anthostomella, introduced by Saccardo (1875), is a species-rich genus, with more than 300 putative species (Francis 1975; Lu and Hyde 2000). Hyde (1996) described 14 species (of which 10 were new) on palms. Lu and Hyde (2000) provided a monograph of *Anthostomella*, with keys and illustrations of 86 species. Daranagama et al. (2015) revised the genus *Anthostomella* based on analysis of combined ITS, RPB2, β-tubulin and LSU and introduced three new species. *Anthostomella* is presently regarded as a polyphyletic genus (Stadler et al. 2013; Daranagama et al. 2015). However, very few species of the genus have been sequenced. *Anthostomella* has virgariella-like and nodulisporium-like asexual morphs (Daranagama et al. 2015).

Anthostomella pseudobambusicola D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552038; *Facesoffungi number*: FoF 01999; Fig. 53

Entomology: Refers to the morphologically being similar to *Anthostomella bambusicola*.

Holotype: MFLU 16–0255

Saprobic on dead bamboo culms, visible as conical, dark, raised, 0.9–1.3 mm diam., 0.5 mm high, solitary to gregarious pseudostromata with a central blackened ostiole. **Sexual morph**: *Ascomata* 550–650 μm diam., 400–450 μm high, immersed, globose to subglobose, dark brown, coriaceous, centrally ostiolate, with a black, 60–100 μm thick, pseudoclypeus. *Peridium* laterally 10–15 μm thick, comprising several layers of compressed, brown to hyaline cells of *textura angularis. Hamathecium* of dense, long, 2–2.5 μm wide, septate, paraphyses, intermixed with asci. *Asci* 115–155 × 5–7 μm ($\bar{x}$ = 136.1 × 6.2 μm, n = 20), 4–8-spored, unitunicate, cylindrical, with a 50–70 μm long furcate pedicel, with a 0.5–1 high × 1–1.5 diam. J+, wedge-shaped, subapical ring. *Ascospores* 8.5–11.5 × 4–5 μm ($\bar{x}$ = 10.1 × 4.3 μm, n = 20), uniseriate, ellipsoid, slightly pointed at the ends, aseptate, dark brown, guttulate, smooth-walled, with a straight germ-slit, extending over the full length longitudinally. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 48 h with germ tubes produced from the central part of the spore. Colonies growing slowly on PDA, reaching 4 mm in 4 weeks at 28 °C, under 12 h light/12 h dark, effuse, velvety to hairy, white from above, pale yellowish brown from the below. Mycelium superficial and immersed, branched, septate, smooth, hyaline, irregular.

Material examined: THAILAND, Doi Nang Hong, Tham Thong Lang, Thap Put District, Phang-Nga, on dead culms of bamboo, 6 December 2014, Kevin D. Hyde DDQ00292 (MFLU 16–0255, **holotype**); *Ibid*. (KUN HKAS92503, **isotype**), living cultures, MFLUCC 15–0192, KUMCC.

Notes: *Anthostomella pseudobambusicola* resembles *A. bambusicola* Hohn. in having immersed ascomata, raising the host tissue, visible as conical structures, with a central blackened ostiole, and black clypeus (Lu and Hyde 2000). However, *Anthostomella pseudobambusicola* has smaller asci (115–155 × 5–7 μm vs. 155–175 × 11.5–14 μm) and ascospores (8.5–11.5 × 4–5 μm vs. 16.5–24 × 7.5–10 μm) (Lu and Hyde 2000). Lu and Hyde (2000) re-examined the holotype of *A. bambusicola* and noted its short-pedicellate asci lacking a visible apical apparatus. *Anthostomella pseudobambusicola* has long-pedicellate asci (50–70 μm long), with a J+, wedge-shaped, subapical ring. In the phylogenetic tree (Fig. 54), the new taxon groups with *Anthostomella eucalyptorum* Crous & M.J. Wingf. and *Anthostomella proteae* S.J. Lee & Crous. However, the morphological characters are not similar to these species (Lee and Crous 2003; Crous et al. 2006a).

Astrocystis Berk. & Broome, J. Linn. Soc., Bot. 14(no. 74): 123 (1873) [1875]

The genus *Astrocystis*, typified by *A. mirabilis* Berk. & Broome (Berkeley and Broome 1874), is usually found on monocotyledons, and is a typical member of *Xylariaceae* (Smith and Hyde 2001). This genus is characterized by uni-, to multi-peritheciate pseudoascostromata which develop beneath the host epidermis and become erumpent through the host tissue to become stellate and appear superficial (Ju and Rogers 1990; Læssøe and Spooner 1993; Smith and Hyde 2001). To date, 21 species are listed in Index Fungorum (2016). The asexual morph of *Astrocystis* is allied to the genus *Acanthodochium* (Smith and Hyde 2001).

Astrocystis mirabilis Berk. & Broome, J. Linn. Soc., Bot. 14(no. 74): 123 (1873) [1875]

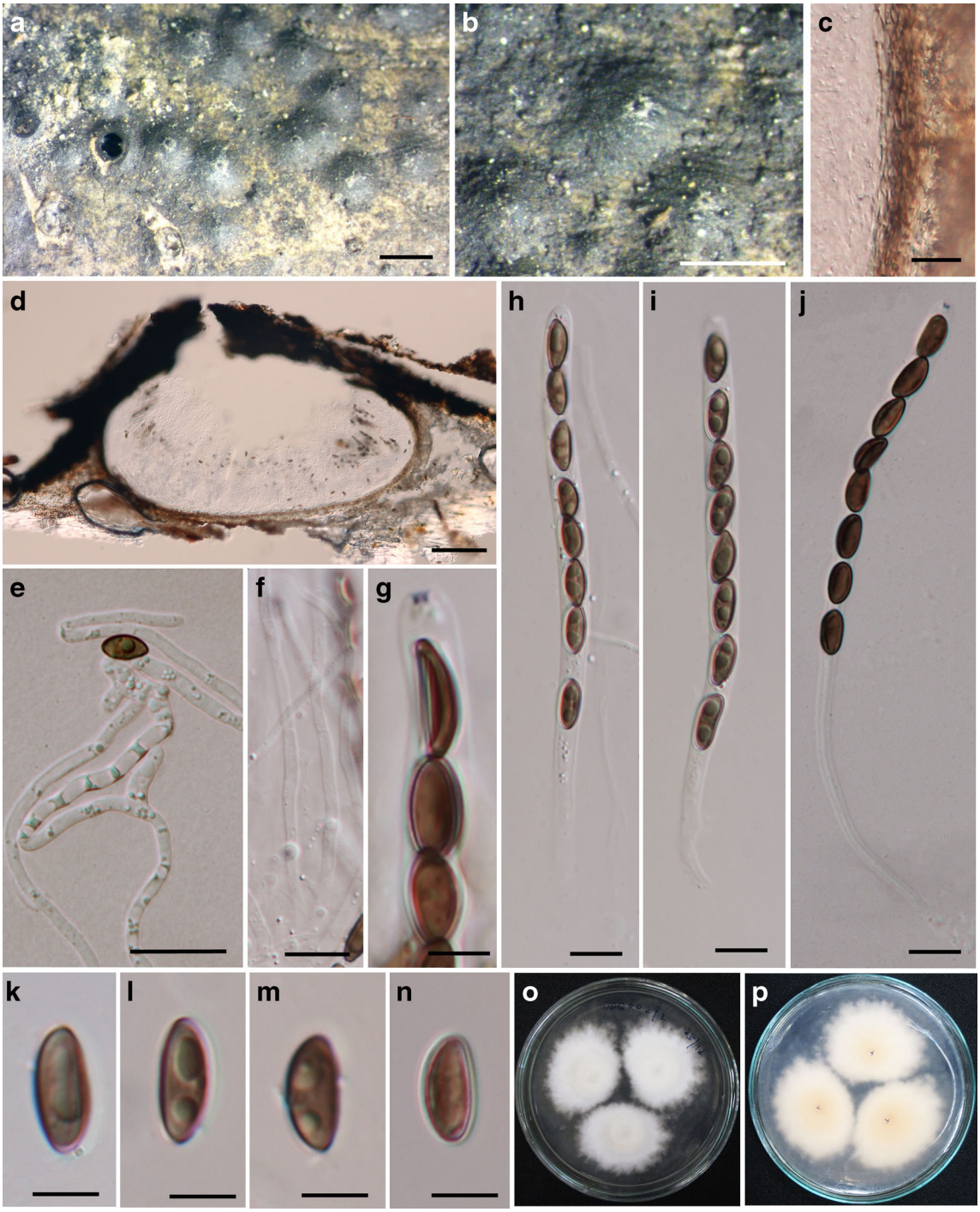
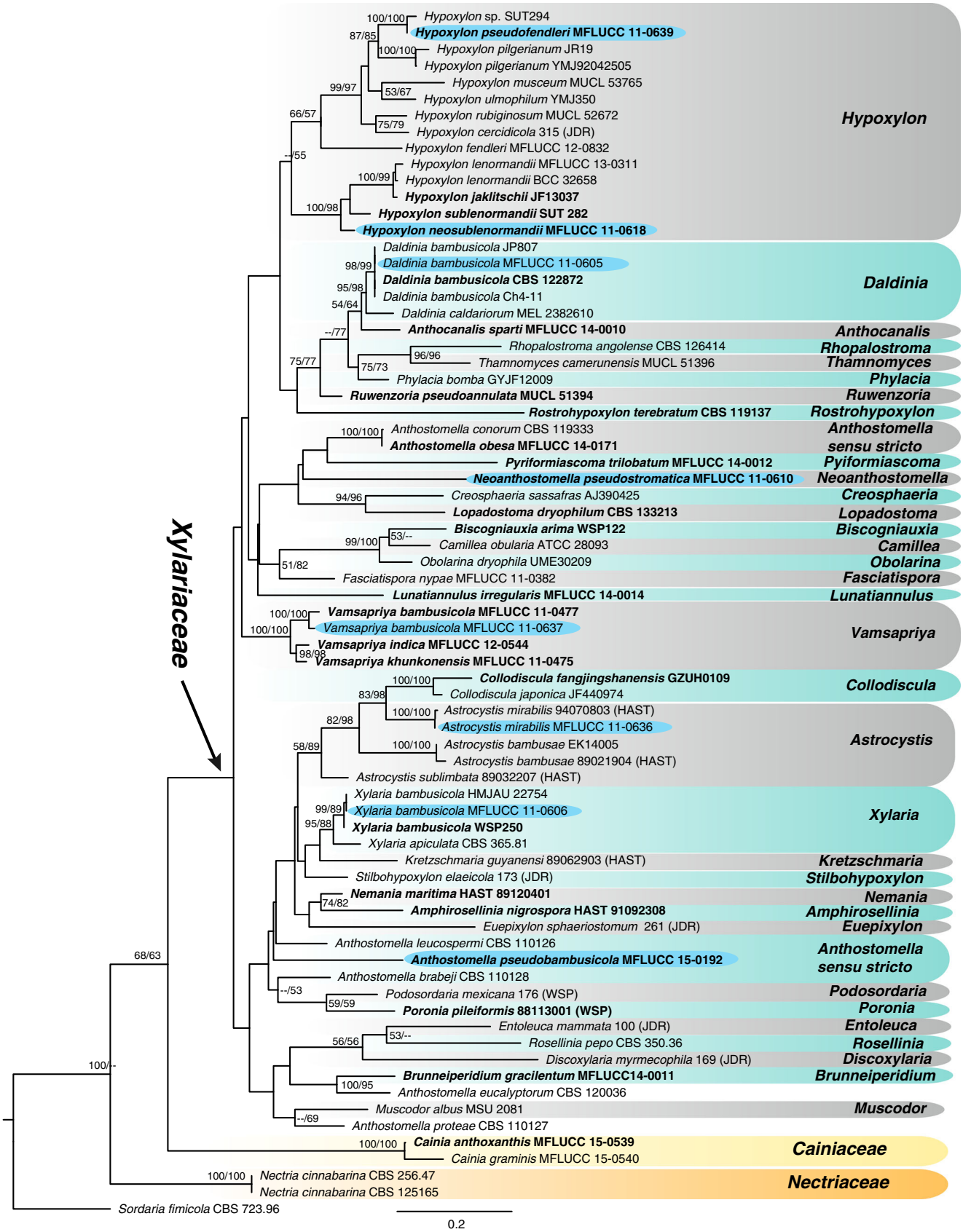


Fig. 53 ***Anthostomella pseudobambusicola*** (MFLU 16–0255, **holotype**). **a**, **b** Appearance of pseudostromata on bamboo host. **c** Peridium of ascoma. **d** Vertical section of pseudostroma. **e** Germinating ascospore. **f** Paraphyses. **g** Apical ring of asci stained by Melzer's reagent. **h**–**j** Asci. **k**–**n** Ascospores. **o**, **p** Culture on PDA. Scale bars: a, b = 1 mm, c = 10 *μm*, d = 100 *μm*, e = 50 *μm*, f, h–j = 10 *μm*, g, k–n = 5 *μm*

Facesoffungi number: FoF 02000; Fig. 55

Saprobic on dead bamboo culms, forming black, erumpent, star-like flanged pseudostromata, visible by the ruptured host tissue. **Sexual morph**: *Ascomata* perithecial, 350–600 μm diam., 300–400 μm high, solitary to gregarious, immersed becoming erumpent raised and superficial,

Fig. 54 Maximum likelihood phylogenetic tree (lnL = −3555.676955) ▶ generated by RAxML (GTR + G model) based on analysis of ITS sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes, and branches. The original isolate numbers are noted after the species names. The tree is rooted to *Sordaria fimicola* (CBS 723.96). Ex-type strains are in *bold*. Newly generated sequences are highlighted with a *blue* background


Xylariaceae
Hypoxylon sp. SUT294
Hypoxylon pseudofendleri MFLUCC 11-0639
Hypoxylon pilgerianum JR19
Hypoxylon pilgerianum YMJ92042505
Hypoxylon musceum MUCL 53765
Hypoxylon ulmophilum YMJ350
Hypoxylon rubiginosum MUCL 52672
Hypoxylon cercidicola 315 (JDR)
Hypoxylon fendleri MFLUCC 12-0832
Hypoxylon lenormandii MFLUCC 13-0311
Hypoxylon lenormandii BCC 32658
Hypoxylon jaklitschii JF13037
Hypoxylon sublenormandii SUT 282
Hypoxylon neosublenormandii MFLUCC 11-0618
Hypoxylon
Daldinia bambusicola JP807
Daldinia bambusicola MFLUCC 11-0605
Daldinia bambusicola CBS 122872
Daldinia bambusicola Ch4-11
Daldinia caldariorum MEL 2382610
Daldinia
Anthocanalis sparti MFLUCC 14-0010
Anthocanalis
Rhopalostroma angolense CBS 126414
Rhopalostroma
Thamnomyces camerunensis MUCL 51396
Thamnomyces
Phylacia bomba GYJF12009
Phylacia
Ruwenzoria pseudoannulata MUCL 51394
Ruwenzoria
Rostrohypoxylon terebratum CBS 119137
Rostrohypoxylon
Anthostomella conorum CBS 119333
Anthostomella obesa MFLUCC 14-0171
Anthostomella sensu stricto
Pyriformiascoma trilobatum MFLUCC 14-0012
Pyiformiascoma
Neoanthostomella pseudostromatica MFLUCC 11-0610
Neoanthostomella
Creosphaeria sassafras AJ390425
Creosphaeria
Lopadostoma dryophilum CBS 133213
Lopadostoma
Biscogniauxia arima WSP122
Biscogniauxia
Camillea obularia ATCC 28093
Camillea
Obolarina dryophila UME30209
Obolarina
Fasciatispora nypae MFLUCC 11-0382
Fasciatispora
Lunatiannulus irregularis MFLUCC 14-0014
Lunatiannulus
Vamsapriya bambusicola MFLUCC 11-0477
Vamsapriya bambusicola MFLUCC 11-0637
Vamsapriya indica MFLUCC 12-0544
Vamsapriya khunkonensis MFLUCC 11-0475
Vamsapriya
Collodiscula fangjingshanensis GZUH0109
Collodiscula japonica JF440974
Collodiscula
Astrocystis mirabilis 94070803 (HAST)
Astrocystis mirabilis MFLUCC 11-0636
Astrocystis bambusae EK14005
Astrocystis bambusae 89021904 (HAST)
Astrocystis sublimbata 89032207 (HAST)
Astrocystis
Xylaria bambusicola HMJAU 22754
Xylaria bambusicola MFLUCC 11-0606
Xylaria bambusicola WSP250
Xylaria apiculata CBS 365.81
Xylaria
Kretzschmaria guyanensi 89062903 (HAST)
Kretzschmaria
Stilbohypoxylon elaeicola 173 (JDR)
Stilbohypoxylon
Nemania maritima HAST 89120401
Nemania
Amphirosellinia nigrospora HAST 91092308
Amphirosellinia
Euepixylon sphaeriostomum 261 (JDR)
Euepixylon
Anthostomella leucospermi CBS 110126
Anthostomella pseudobambusicola MFLUCC 15-0192
Anthostomella brabeji CBS 110128
Anthostomella sensu stricto
Podosordaria mexicana 176 (WSP)
Podosordaria
Poronia pileiformis 88113001 (WSP)
Poronia
Entoleuca mammata 100 (JDR)
Entoleuca
Rosellinia pepo CBS 350.36
Rosellinia
Discoxylaria myrmecophila 169 (JDR)
Discoxylaria
Brunneiperidium gracilentum MFLUCC14-0011
Brunneiperidium
Anthostomella eucalyptorum CBS 120036
Muscodor albus MSU 2081
Muscodor
Anthostomella proteae CBS 110127
Cainia anthoxanthis MFLUCC 15-0539
Cainia graminis MFLUCC 15-0540
Cainiaceae
Nectria cinnabarina CBS 256.47
Nectria cinnabarina CBS 125165
Nectriaceae
Sordaria fimicola CBS 723.96
0.2

subglobose to hemisphaerical, black, carbonaceous, with flattened top, surrounding by star-like flanged pseudostromata tissue, each pseudostroma containing a single perithecium with a centrally papillate ostiole, 35 μm diam, lacking periphyses. *Peridium* 30.5–85 μm thick, outer stratum comprising black, fragile, carbonaceous tissue; inner stratum composed of brown to hyaline cells of *textura angularis*. *Hamathecium* comprising dense, long, 2–5.5 μm wide, septate, paraphyses intermixed with asci. *Asci* 95–120 × 8.5–12 μm ($\overline{x}$ = 107.9 × 11.2 μm, n = 20), 8-spored, unitunicate, cylindrical, with a short pedicel, with a 3–4.5 high × 1.5–2.5 diam. J+, apical ring. *Ascospores* 10–12 × 4.5–6 μm ($\overline{x}$ = 11.8 × 5.4 μm, n = 20), uniseriate, ellipsoid, slightly pointed at the ends, aseptate, brown to dark brown, guttulate, smooth-walled, with germ-slit slightly less than full length, with a 1.5–2.5 μm thick gelatinous sheath. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends of the spore. Colonies growing fast on PDA, reaching 90 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, cottony circular, edge irregular, white from above, brown in centre from below. Mycelium superficial to immersed in media, with septate, branched, smooth hyphae.

Material examined: THAILAND, Uttaradit Province, on dead culms of bamboo, 28 October 2011, Dong-Qin Dai DDQ00220 (MFLU 15–1199, **references specimen designated here**); *Ibid*. (KUN HKAS88708, **duplicate of reference specimen**), living culture, MFLUCC 11–0636.

Notes: *Astrocystis mirabilis*, the type of *Astrocystis* was originally described from bamboo by Berkeley and Broome (1874). Ju and Rogers (1990) re-examined type materials of two similar species, *A. mirabilis* and *A. bambusae*, with descriptions, line drawings of the ascostromata and ascospores, but assigned *A. mirabilis* to *Rosellinia*. Smith and Hyde (2001) restored this species in *Astrocystis*. Bahl et al. (2005) included *A. mirabilis* (AY862572) in a phylogenetic analyses based on ITS sequence data, and indicated its close relationship with *A. bambusae* (AY862573), however, AY862572 is designated as *Rosellinia mirabilis* in GenBank, and although Bahl et al. (2005) discussed the morphological differences and recommended separating *Astrocyctis* and *Rosellinia*, no morphological study was undertaken. In this study we collected a specimen which has same morphology as *A. mirabilis* and when compared with the holotype of *A. mirabilis*, re-examined by Ju and Rogers (1990), this new collection (MFLU 15–1199) is similar. It has the same length, but smaller (4.5–6 μm vs. 6–7.5 μm) width ascospores, and has shorter asci (95–120 μm vs. 110–190 μm long). This new collection is morphologically and phylogenetically (Fig. 53) identified as *A. mirabilis*, and is designated as the reference specimen. The blast result shows that ITS gene AY862572 is same with that of MFLU 15–1199. Thus its name should be changed to *A. mirabilis* in GenBank.

Astrocystis mirabilis is morphologically similar to *A. bambusae* (Ju and Rogers 1990; Læssøe and Spooner 1993). The main distinctions between them are: the apex of the perithecia of *A. mirabilis* is flattened, however that of *A. bambusae* is usually rounded (Ju and Rogers 1990); and the ascospores of *A. mirabilis* are broad relative to their length and with the length usually less than 12 μm; however those of *A. bambusae* are narrow, with the length occasionally up to 16 μm (Ju and Rogers 1990).

Daldinia Ces. & De Not., Comm. Soc. crittog. Ital. 1(4): 197 (1863)

Daldinia was introduced by Cesati and De Notaris (1863) to honor Agostino Daldini (1817–1895), and comprises 19 species including the type species *D. concentrica* (Bolton) Ces. & De Not. (Ju et al. 1997; Stadler et al. 2014). *Daldinia* species usually grow on decaying wood (Ju et al. 1997, 1999) and are occasionally found as endophytes (Pažoutová et al. 2013). To date, 98 records of *Daldinia* species are listed in Index Fungorum (2016). Petrini and Müller (1986) established five species found on monocotyledons. The asexual morph of *Daldinia* can be linked to *Nodulisporium* Preuss (Wijayawardene et al. 2012; Stadler et al. 2014).

Daldinia bambusicola Y.M. Ju, et al., Mycotaxon 61: 253. 1997

Facesoffungi number: FoF 02001; Fig. 56

Saprobic on decaying bamboo culms, forming large, globose, fruiting bodies. *Stromata* 12–20 mm diam. solitary to gregarious, superficial, globose, sessile, smooth, surface dark vinaceous to black, with inconspicuous perithecial outlines; tissue between perithecia black brown to light brown, and below the perithecial layer composed of alternating zones; darker zones are dark vinaceous brown, pithy to woody, 0.1–0.2 mm thick; lighter zones are white to greyish brown, pithy to woody, persistent, 0.5–2 mm thick, and above the perithecial layer composed of black to dark brown tissue. *Perithecia* 250–450 μm diam., 630–715 μm high, immersed, arranged in a row under the outermost wall of stromata, obovoid to tubular, lower part round and dark brown. *Ostioles* slightly papillate. *Hamathecium* composed of long, 3.5–5.5 μm broad, hyaline, septate, hyphae-like paraphyses. *Asci* 120–160 × 5–7.5 μm ($\overline{x}$ = 146.1 × 6.6 μm, n = 20), 6–8-spored, unitunicate, cylindrical, with thin, 70–100 μm long pedicel and a round, 1–1.5 high × 2.5–3 diam. J+, apical ring, truncate at the apex. *Ascospores* 7–8 × 3.5–4.5 μm ($\overline{x}$ = 7.3 × 3.8 μm, n = 20), uniseriate, aseptate, curved, elliptical, hyaline, becoming dark brown, with narrowly rounded ends, smooth-walled.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends

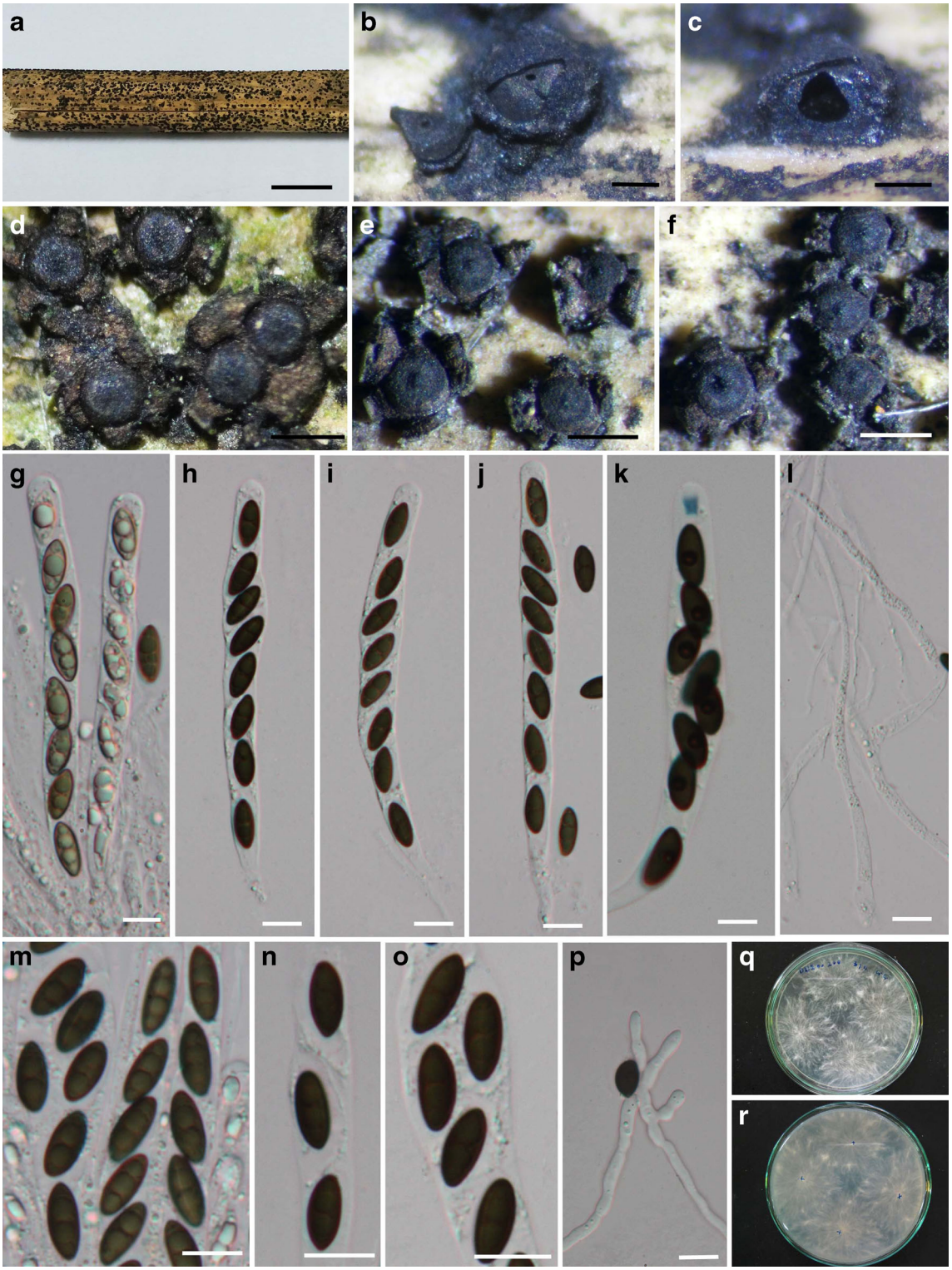


Fig. 55 ***Astrocystis mirabilis*** (MFLU 15–1199, **reference specimen**). **a** Bamboo culm with fungal fruiting bodies. **b**–**f** Black perithecia. **j**–**k** Asci. **l** Paraphyses. **m**–**o** Ascospores (**n**, **o**: showing sheath of ascospores). **p** Germinating ascospore. **q**, **r** Cultures on PDA. Scale bars: a = 5 mm, b, c = 200 μm, d, f = 500 μm, g–p = 10 μm

of spore. Colonies growing fast on PDA, reaching 90 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, cottony circular, edge irregular, white from above, brown in centre from below. Mycelium superficial to immersed in media, with septate, branched, smooth hyphae.

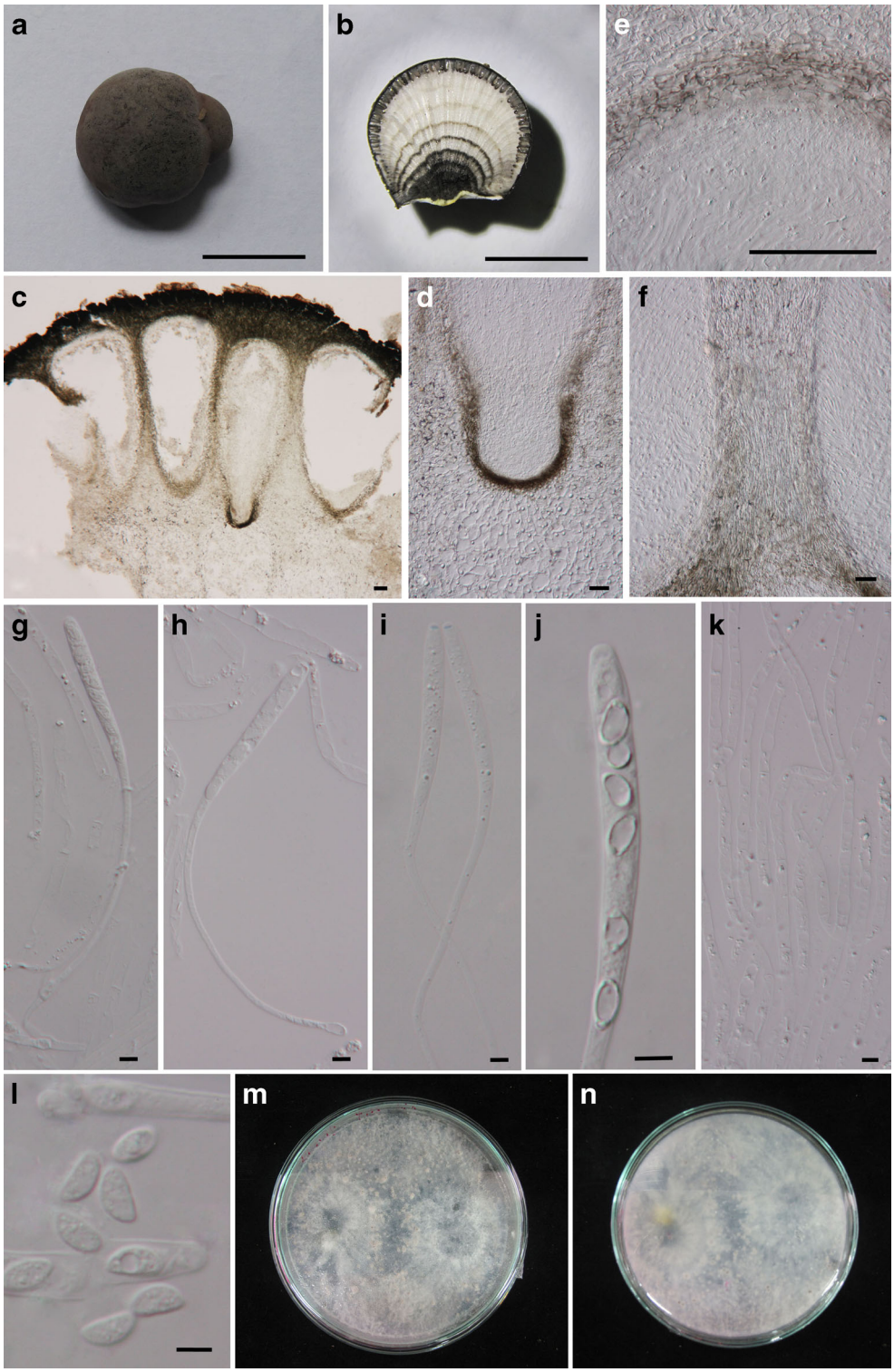
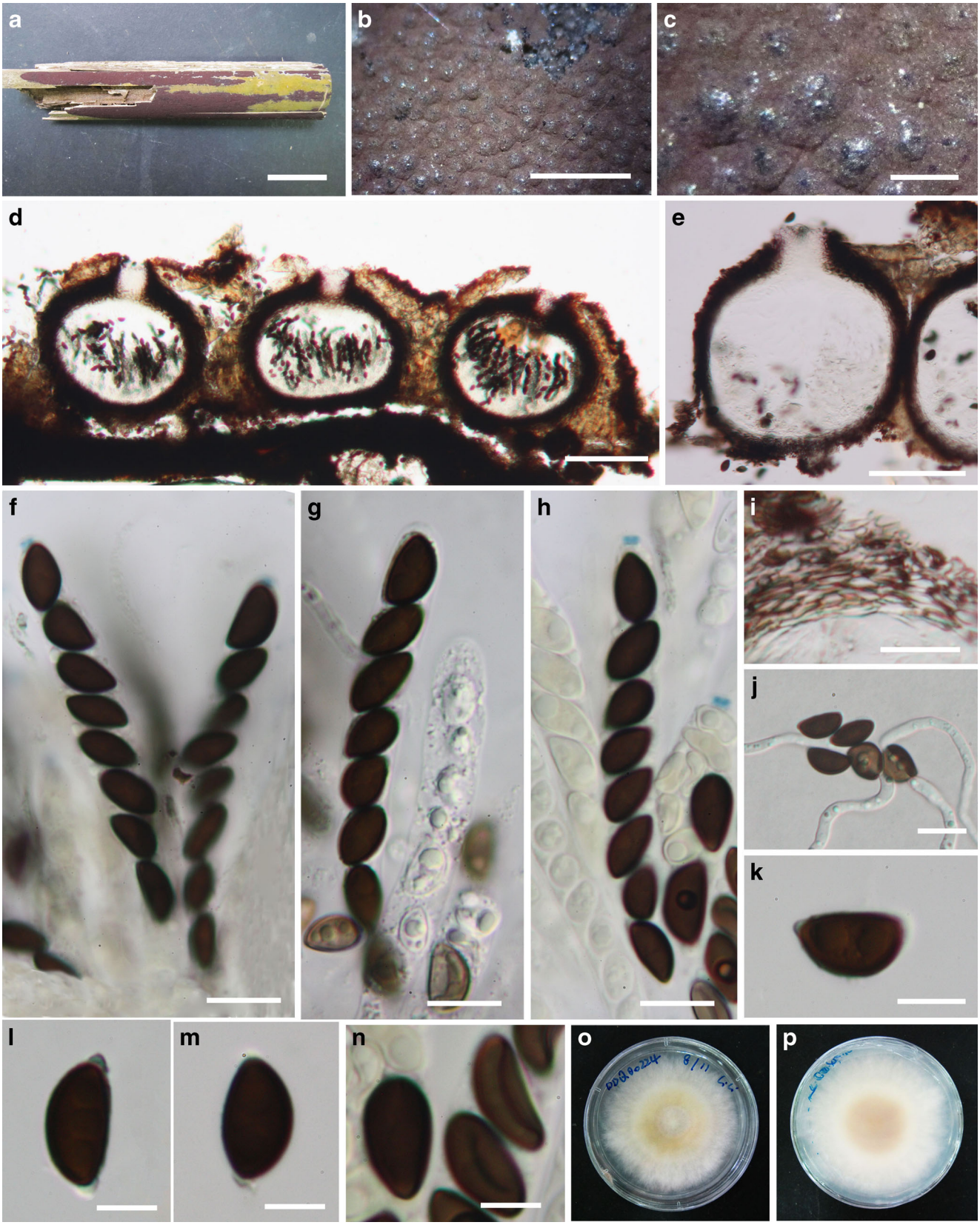


Fig. 56 *Daldinia bambusicola* (MFLU 15–1187). **a**, **b** Stromata. **c** Vertical section of ascostroma. **d** Lower part of perithecium. **f** The tissue between perithecia. **g**–**j** Asci with long pedicel. **k** Paraphyses. **l** Ascospores. **m**, **n** Culture on PDA. Scale bars: a, b = 10 mm, c–f = 50 μm, g–l = 5 μm

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai DDQ00085 (MFLU 15–1187); *ibid*. (KUN HKAS88697), living cultures, MFLUCC 11–0605, CBS 139987.

Fig. 57 *Hypoxylon pseudefendleri* (MFLU 15–1200, **holotype**). **a** ▶ Appearance of stromata on bamboo host. **b**, **c** Purplish-brown stromata. **d** Vertical section of stroma. **e** Vertical section of perithecia. **f**–**h** Asci containing eight ascospores, with J+, apical rings. **i** Wall of perithecium. **j** Germinating ascospores. **k**–**n** Dark brown ascospores. **o**, **p** Cultures on PDA. Scale bars: a = 3 mm, b = 1 mm, c = 200 μm, d = 100 μm, e = 50 μm, f–j = 10 μm, k–n = 5 μm



Notes: *Daldinia bambusicola* is specifically associated with bamboo and commonly distributed in tropical regions with a likely record in the USA (Ju et al. 1997; Stadler et al. 2014). This species was originally collected in Chiang Mai

Province, Thailand by Ju et al. (1997). We recollected the same species in Chiang Rai Province, and it is illustrated in Fig. 56. Phylogenic analyses (Fig. 53) show that the new collection groups well with ex-type strain (CBS 122872) of *D. bambusicola* with high bootstrap support value (100/100 % MPBP/MLBP). Ju et al. (1997) mentioned *Daldinia bambusicola* has darker, zonate internal tissue in the stromata. However, Stadler et al. (2014) re-examined the holotype (WSP 69652), and did not observe this character, probably due to the dry and broken material. The fresh collection (MFLU 15–1187) circumscribed by phylogenic analyses (Fig. 53) has exactly the same features as described by Ju et al. (1997).

Hypoxylon Bull., Hist. Champ. Fr. (Paris) 1: 168 (1791)

Hypoxylon is presently one of the most species diverse genera in *Xylariaceae*; the species are saprobes or facultative parasites, and they are frequently encountered as endophytes (Ju and Rogers 1996; Suwannasai et al 2005; Cruz and Cortez 2015; Sir et al. 2015). *Hypoxylon* is one of the typical genera of *Xylariaceae* in having well-developed stromata, within which multiple perithecia are usually embedded, an ascus apical ring usually bluing in iodine, and dark brown, one-celled ascospores with a germ slit (Ju and Rogers 1996; Hsieh et al. 2005). Kuhnert et al. (2014, 2015) reported several chemical compounds extracted from *Hypoxylon* species. Asexual morphs of this genus are *Nodulisporium*-like and *Triplicaria* (Ju and Rogers 1996; Wijayawardene et al. 2012; Kuhnert et al. 2015; Senanayake et al. 2015).

Hypoxylon pseudefendleri D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552039; *Facesoffungi number*: FoF 02002; Fig. 57

Entomology: Refers to the morphologically being similar to *Hypoxylon fendleri*.

Holotype: MFLU 15–1200

Saprobic on dead bamboo culms, forming large purplish-brown stromata with raised necks of perithecia, appearing as black spots on stromata. **Sexual morph**: *Stromata* gregarious, 5–30 cm long, 3–10 cm broad, 0.3–0.5 mm thick, usually covering the whole surfaces of host culm, superficial, effuse-pulvinate, flattened, purplish-brown. *Topical layer of stromata* comprising darker tissue. *Cells between perithecia* are stromatic tissue, yellowish brown, large and lighter than perithecial wall. *Perithecia* 500–850 μm diam., 350–500 μm high, immersed in stromata, globose to subglobose, brown to dark brown, coriaceous, with short raised necks. *Necks* 50–55 × 35–45 μm long, forming at the center of perithecia, appearing as darker spots on stromata surface when mature, without periphyses, slightly higher than the stromata surface. *Peridium* laterally 20 μm thick, composed of dark brown and thick-walled, to hyaline and thinner walled, cells of *textura angularis*. *Hamathecium* of dense, long, 2.5–4.5 μm wide, septate, paraphyses. *Asci* 70–90.5 × 6.5–10.5 μm ($\bar{x}$ = 80.6 × 8.6 μm, n = 20), 8-spored, unitunicate, cylindrical, occasionally with a short pedicel, with a 1–1.5 high × 1.5–2.5 diam. J+, apical ring. *Ascospores* 9–11.5 × 4.5–6.5 μm ($\bar{x}$ = 10.2 × 5.7 μm, n = 20), ellipsoid, slightly pointed at the ends, aseptate, dark brown, guttulate, smooth-walled. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes developing from both ends of spore. Colonies fast growing on PDA, reaching 80 mm in 3 weeks at 28 °C, 12 h light/12 h dark, cottony, circular, diffuse from centre, with irregular edge, white with pale yellow in centre from above and below. Mycelium superficial to immersed in media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Phitsanulok Province, on dead culms of bamboo, 29 October 2011, Dong-Qin Dai DDQ00224 (MFLU 15–1200, **holotype**); *ibid*. (KUN HKAS88709, **isotype**), living cultures, MFLUCC 11–0639, KUMCC.

Notes: *Hypoxylon pseudefendleri* is morphologically similar with *H. fendleri* in having large, purplish-brown stromata, perithecia with a central raised neck, appearing as black spots on stromata (Ju and Rogers 1996; Suwannasai et al. 2013). However, *H. pseudefendleri* has shorter (9–11.5 μm vs. 12–13 μm long) and wider ascspores (4.5–6.5 μm vs. 4 μm wide) (Cooke 1883). Moreover, the phylogenetic analyses (Fig. 53) shows they are different species. Phylogenetically, *Hypoxylon pseudefendleri* is close to *H. pilgerianum* (Fig. 53), whereas, *H. pseudefendleri* has larger stromata 5–30 cm long × 3–10 cm broad, rather than 0.2–6 cm long × 0.2–3 cm broad (Ju and Rogers 1996).

Hypoxylon neosublenormandii D.Q. Dai & K.D. Hyde, ***sp. nov.***

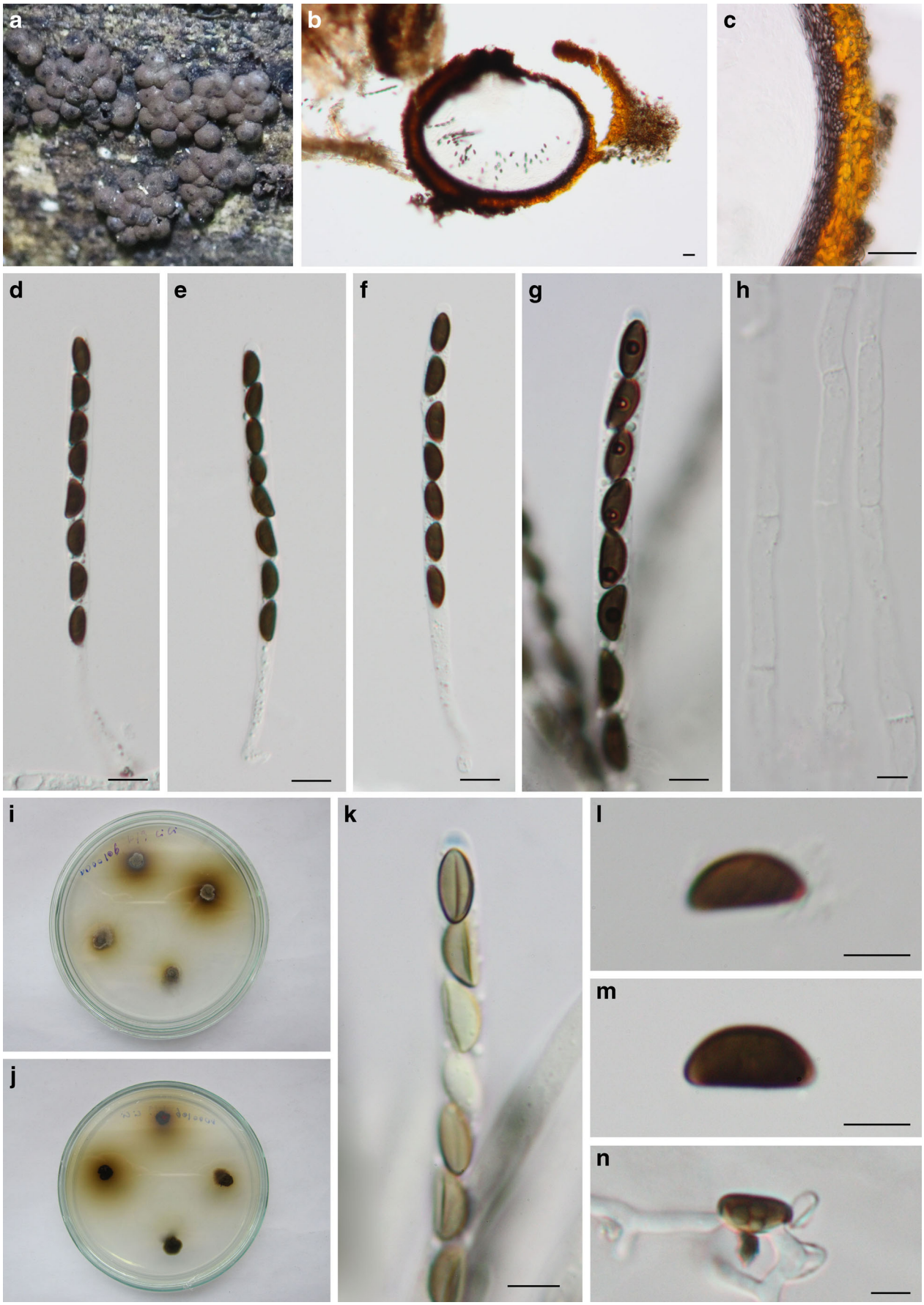
Index Fungorum number: IF552040; *Facesoffungi number*: FoF 02003; Fig. 58

Entomology: Refers to the morphologically being similar to *Hypoxylon sublenormandii*.

Holotype: MFLU 15–1193

Saprobic on dead bamboo culms. **Sexual morph**: *Stromata* 300–380 μm diam., 250–300 μm high, gregarious, superficial, globose to subglobose, purplish-brown, carbonaceous to coriaceous, surface smooth, containing a single perithecium. *Ostiole* papillate, forming at the center of stromata, with a black opening, without periphyses. *Peridium* composed of two strata, outer stratum 15–28 μm thick, composed of orange coloured tissue; inner stratum 10–15 μm thick, composed of dark brown and thick-walled cells of *textura angularis*. *Hamathecium* with long, 2.5–4 μm wide, septate, paraphyses,

Fig. 58 ***Hypoxylon neosublenormandii*** (MFLU 15–1193, **holotype**). **a** ▶ Appearance of stromata on bamboo. **b** Vertical section of stroma. **c** Peridium. **d**, **g** Asci. **h** Paraphyses. **i**, **j** Cultures on PDA. **k** Asci with a J+, apical ring. **l**, **m** Ascospores. **n** Germinating ascospores. Scale bars: b, c = 20 *μm*, d–h = 10 *μm*, i–l = 5 *μm*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intermixed with the asci. *Asci* 98–120 × 5–7 μm ($\bar{x}$ = 109.4 × 6.1 μm, *n* = 20), 8-spored, unitunicate, cylindrical, with a short furcate pedicel, with a 1–1.5 high × 1.5–2.5 diam. J+, apical ring. *Ascospores* 8.5–10 × 4–5 μm ($\bar{x}$ = 9.3 × 4.6 μm, *n* = 20), ellipsoid, slightly pointed at the ends, aseptate, dark brown, guttulate, smooth-walled, with a longitudinal germ-slit on one side. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 48 h and germ tubes produced from both ends. Colonies growing slowly on PDA, reaching 30 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, irregular edge, with little mycelium, dark brown from above and below. Mycelium superficial to immersed in media, branched, septate, smooth.

Material examined: THAILAND, Chiang Rai, Doi Pui, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai DDQ00106 (MFLU 15–1193, **holotype**); *Ibid*. (HKU HKAS88702, **isotype**), living cultures, MFLUCC 11–0618, KUMCC.

Notes: *Hypoxylon neosublenormandii* resembles *H. sublenormandii* Suwann. et al., a species originally observed on a bamboo substrate, in Kanchanaburi Province of Thailand by Suwannasai et al. (2005). They are morphologically similar in having superficial, globose to subglobose, purplish-brown, carbonaceous ascomata. However, *H. neosublenormandii* has wider asci (5–7 μm wide vs. 3.8–5 μm). In addition, *H. neosublenormandii* forms a separate branch from *H. sublenormandii* (SUT 282, ex-type) with high bootstrap support (100/98 % MPBP/MLBP). *Hypoxylon sublenormandii* can be morphologically compared with *H. jaklitschii* and *H. lenormandii* (Kuhnert et al. 2015). However the phylogenic tree (Fig. 54) indicates that they are different species.

Neoanthostomella D.Q. Dai & K.D. Hyde, ***gen. nov.***

Indexfungorum number: IF552041; *Facesoffungi number*: FoF 02004

Entomology: Refers to the morphylogical similaritieswith *Anthostomella*.

Saprobic on dead bamboo culms, forming large, blackened, circular to elliptical, raised areas, visible as pustules on the host surface. **Sexual morph**: *Pseudostromata* solitary to gregarious, circular to elliptical, raised as blacked areas with host tissue. *Ascomata* 2–5 growing together in a single pseudostroma, immersed, globose to subglobose, dark brown, coriaceous, with a central, periphysate, ostiolate neck. *Peridium* comprising several layers of compressed, brown to hyaline cells of *textura angularis. Hamathecium* of dense, long, septate, paraphyses intermixed with asci. *Asci* 8-spored, unitunicate, cylindrical, with a short furcate pedicel, without an apical ring. *Ascospores* uni-to bi-seriate, sometimes overlapping, ellipsoid, slightly pointed at the ends, aseptate, dark brown, guttulate, smooth-walled, with mucilaginous sheath, with a straight germ slit extending over the full-length. **Asexual morph**: Undetermined.

Type species: ***Neoanthostomella pseudostromatica*** D.Q. Dai & K.D. Hyde

Notes: *Neoanthostomella* is characterized by large, blackened, raised pseudostromata on the host tissue, unitunicate, and cylindrical asci containing eight dark brown ascospores, surrounded by a thick mucilaginous sheath. This genus is similar to *Anthostomella* in having cylindrical asci containing eight dark brown ascospores. However, the feature of several ascomata clustering in a large pseudostroma distinguishes it from *Anthostomella* (Lu and Hyde 2000). From the phylogeneic tree in Fig. 54, *Neoanthostomella* forms a single branch within the family *Xylariaceae*, and can therefore also be phylogenetically separated from *Anthostomella*.

Neoanthostomella pseudostromatica D.Q. Dai & K.D. Hyde, ***sp. nov.***

Index Fungorum number: IF552042; *Facesoffungi number*: FoF 02005; Fig. 59

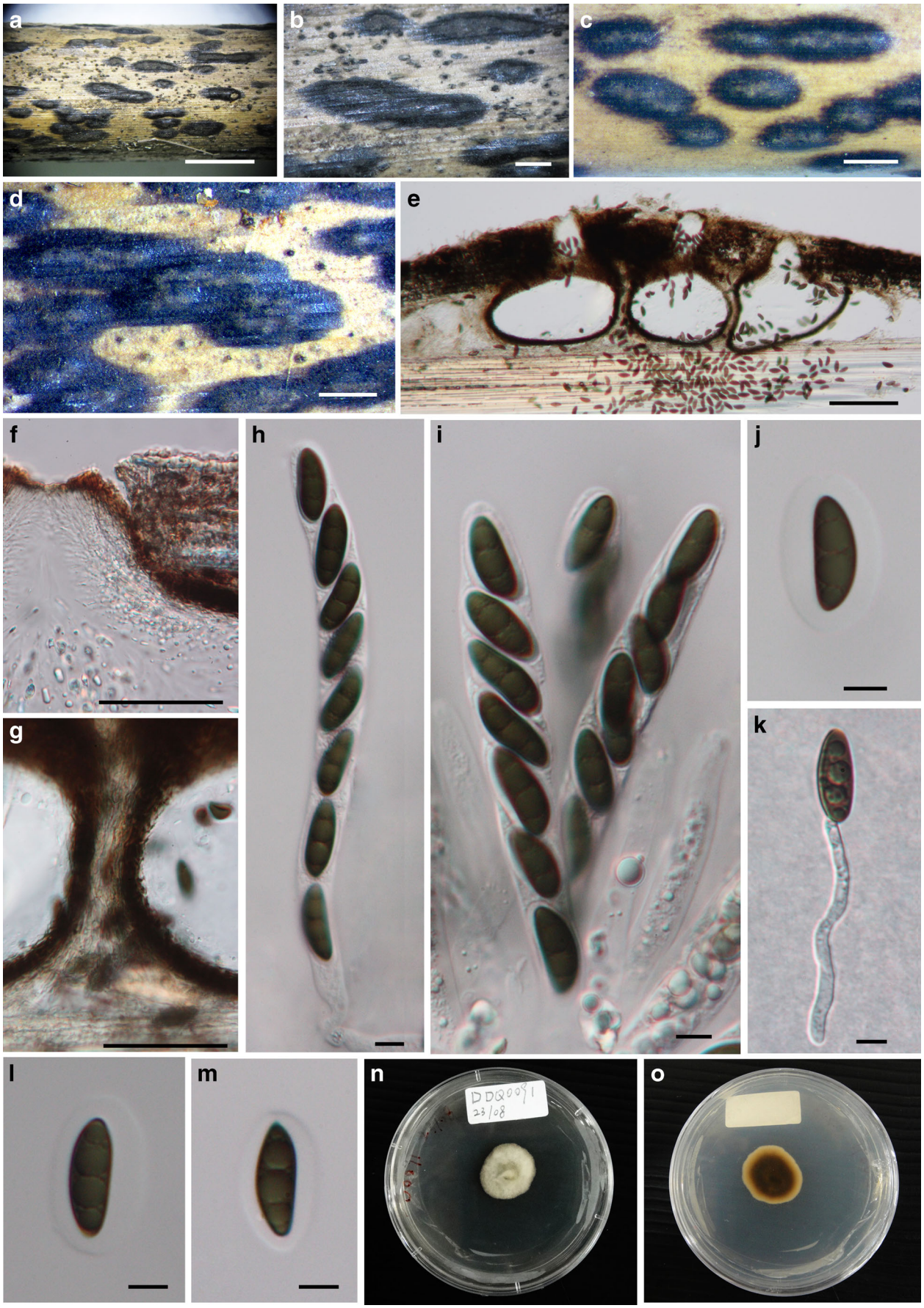
Entomology: Refers to the distinguishing feature of the pseudostroma.

Holotype: MFLU 15–1190

Saprobic on dead bamboo culms, forming large, blackened, circular to elliptical, raised areas, visible as pustules on the host surface. **Sexual morph**: *Pseudostromata* 1.5–4.8 mm long, 0.65–1.5 mm wide, 0.25–0.35 mm high, solitary to gregarious, circular to elliptical, black areas raising the host tissue. *Ascomata* 150–300 μm diam., 160–280 μm high, 2–5 growing together in a single pseudostroma, immersed, globose to subglobose, dark brown, coriaceous, with a central periphysate ostiolate neck, 35–45 μm diam., 55–90 μm long. *Peridium* laterally 5–10 μm thick, comprising several layers of compressed, brown to hyaline cells of *textura angularis. Hamathecium* of dense, long, 2.5–4 μm wide, septate, paraphyses intermixed with asci. *Asci* 75–110 × 8.5–13.5 μm ($\bar{x}$ = 85.1 × 10.2 μm, *n* = 20), 8-spored, unitunicate, cylindrical, with a short furcate pedicel, lacking an apical ring. *Ascospores* 11.5–15 × 4–5.5 μm ($\bar{x}$ = 13.5 × 5.1 μm, *n* = 20), 1–2-seriate to overlapping uniseriate, ellipsoid, slightly pointed at the ends, aseptate, dark brown, guttulate, smooth-walled, with a 1.5–3.5 μm thick mucilaginous sheath, with a straight germ slit, extending the full-length. **Asexual morph**: Undetermined.

Culture characters: Ascospores germinating on PDA within 48 h with germ tubes produced from lower end. Colonies growing slowly on PDA, reaching 5 mm in 4 weeks at 28 °C, effuse, velvety to hairy, white from above, dark brown from the below. Mycelium superficial and immersed, branched, septate, smooth, hyaline, irregular.

Fig. 59 ***Neoanthostomella pseudostromatica*** (MFLU 15–1190, **holotype**). **a**–**d** Appearance of pseudostromata on bamboo host. **e** Vertical section of pseudostroma. **f** Ostiole. **g** Peridium. **h**, **i** Asci. **k** Germinating ascospore. **j**, **l**, **m** Ascospores. **n**, **o** Culture on PDA. Scale bars: a = 5 mm, b–d = 1 mm, e = 100 *μm*, f–g = 50 *μm*, h–m = 5 *μm* ▶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Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai DDQ00091 (MFLU 15–1190, **holotype**); *Ibid*. (KUN HKAS88700, **isotype**), living cultures, MFLUCC 11–0610, KUMCC.

Notes: *Neoanthostomella pseudostromatica* is similar to *Anthostomella tumulosa* (Roberge ex Desm.) Sacc. in its globose ascomata with a central, periphysate, ostiolar canal (Lu and Hyde 2000). However, *N. pseudostromatica* can be distinguished as the asci lack an apical ring (*A. tumulosa* has a J+, subapical ring) and smaller ascospores (11.5–15 × 4–5.5 μm vs. 17.5–22.5 × 6.5–9.5 μm) (Lu and Hyde 2000). According to Eriksson and Yue (1998), and Lu and Hyde (2000), several *Anthostomella* species occurred on bamboo, such as *Anthostomella bambusicola*, *A. eructans*, *A. longa*, *A. nitidissima*, *A. palmicola*, *A. puiggarii*, *A. punctulata*, *A. rehmii*, *A. tomicoides*. These species have solitary, papillate ascomata, *Neoanthostomella pseudostromatica* however, differes in having 2–5 ascomata aggregating in a black pseudostroma, and each ascoma with a central, periphysate, ostiolate neck.

Vamsapriya Gawas & Bhat, Mycotaxon 94: 150 (2006)

Vamsapriya, typified by *V. indica* Gawas & Bhat, was originally described by Gawas and Bhat (2005), based on a collection from a bamboo host. Later Pratibha and Bhat (2008) described a second species *V. mahabaleshwarensis* Pratibha & Bhat, collected on an unidentified dead twig. Dai et al. (2014c) recollected and epitypified the genus type, *V. indica*, and introduced two more species based on the phylogeneic analyses. However, molecular data of *V. mahabales hwarensis* is still unavailable in GenBank. *Vamsapriya* was established in family *Xylariaceae* by Dai et al. (2014c) and Liu et al. (2015) based on multi-gene analyses. Initially *Vamsapriya* species were only found as asexual morphs by Gawas and Bhat (2005), Pratibha and Bhat (2008) and Dai et al. (2014c). In this study we observed the sexual morph of *V. bambusicola* in Fig. 60.

An earlier reference was also found with a detailed description of a fungus with similar morphology to that of *Vamsapriya* Gawas & Bhat, but named as *Tretophragmia* Subram. & Natarajan (Subramanian and Natarajan 1972). The genus, typified by *T. longispora*, is characterized by conspicuous, long, compact, apically flared, synnematous, branched, dark brown conidiophores, monotretic conidiogenous cells and solitary, long, transversely septate, flexuous, smooth, dark brown conidia. The fungus was isolated from dead bamboo twigs, in Coonoor, Tamil Nadu, India.

It is possible that *Tretophragmia* and *Vamsapriya* could be congeneric. These two genera are distinguished by a single character. That is, in *Tretophragmia* the conidia are solitary, whereas they are catenate in *Vamsapriya*. However, the type of *Tretophragmia* has not been sequenced and until that is done, the fungi are maintainedas two distinct genera.

Based on a blast search of LSU sequence data in GenBank, *Vamsapriya* species are close to *Fasciatispora nypae* K.D. Hyde (type species of *Fasciatispora*). However, *Vamsapriya* is distinct from *Fasciatispora* in having hyaline apiospores, whereas *Fasciatispora* has dark ascospores typically with a pallid band (Alias et al. 1994; Hyde 1991, 1995; Hidayat et al. 2007). Furthermore, in the phylogenetic tree (Fig. 54) based on ITS sequence data, *Vamsapriya* species form a clade in *Xylariaceae*, and separate from *Fasciatispora nypae* (MFLUCC 11–0382, reference strain designated by Liu et al. (2015)).

Vamsapriya bambusicola D.Q. Dai, D.J. Bhat & K.D. Hyde, Cryptog. Mycol. 35(4): 353 (2014)

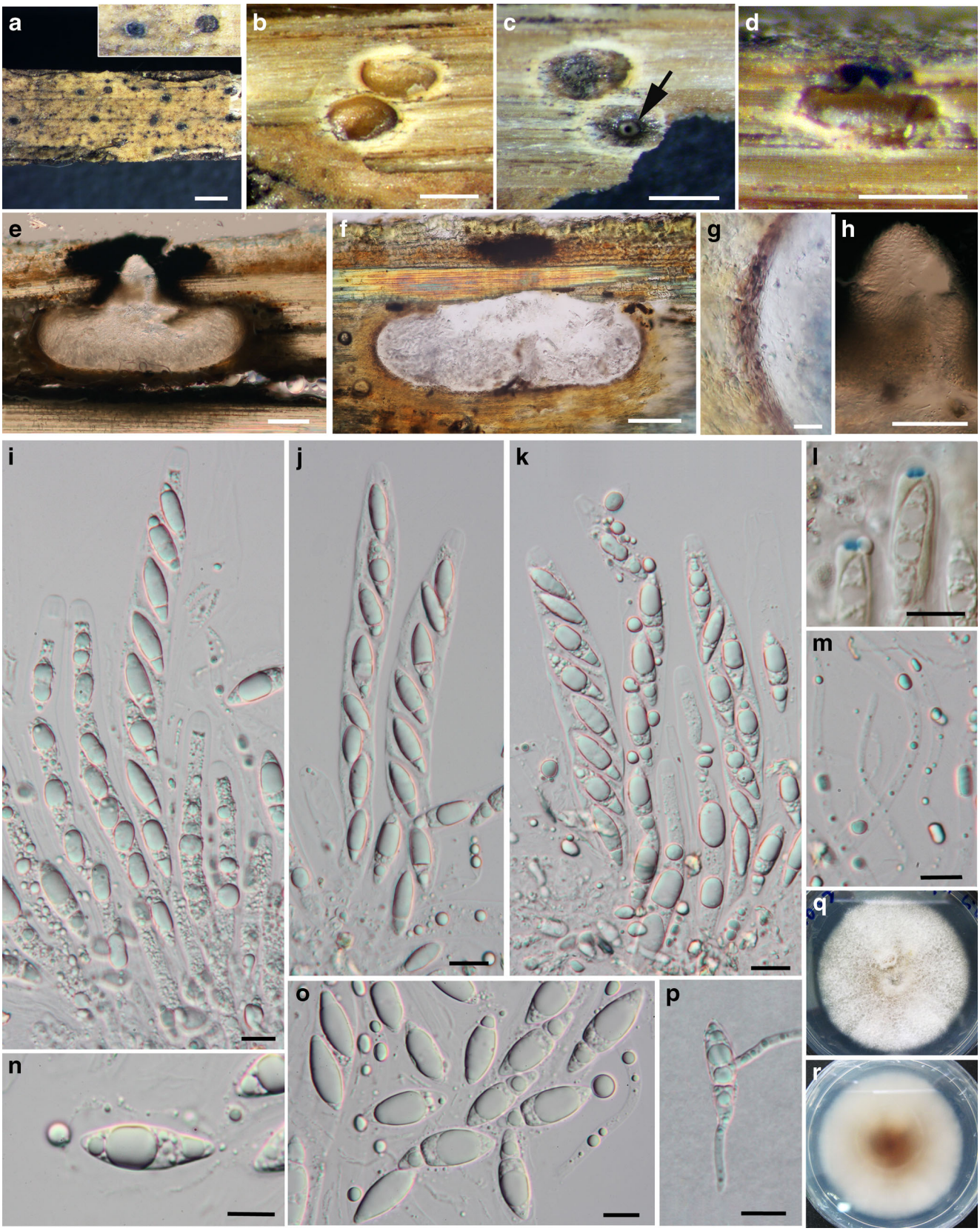
Facesoffungi number: FoF 02006; Figs. 60 and 61

Saprobic on dead bamboo culms, immersed within the host cortex, black pigmented, clypeus-like tissue around ostiolate opening, visible as black, circular, 120–320 μm diam., spots on the host surface. **Sexual morph**: *Ascomata* 450–600 × 380–500 μm, 400–500 μm high, solitary, scattered, immersed within the host cortex, subglobose, light brown, papillate, with black clypae-like tissue sorrounding the papillate ostiolate opening. *Ostioles* 60–80 μm diam., 100–120 μm high, raised from center of ascomata, with periphyses. *Peridium* laterally 10–15 μm thick, composed of thin-walled, light brown to hyaline cells of *textura angularis*. *Hamathecium* comprising long, 1.5–3 μm wide, hyaline, septate paraphyses. *Asci* 115–140 × 10.5–18.5 μm ($\bar{x}$ = 124.8 × 13.8 μm, n = 20), 8-spored, unitunicate, cylindrical, short pedicellate, with a 1.5–2.5 high × 2.5–3.5 diam. J+, apical ring and round to truncate apex. *Ascospores* 20.5–26.5 × 6.5–7.5(−7.9) μm ($\bar{x}$ = 23.4 × 7.4 μm, n = 20), overlapping uniseriate to 1–2-seriate, apiosporous, fusiform to broad fusiform, 1-septate, hyaline, pointed at both ends, usually with a large guttule in upper cell, and a small round guttule in lower cell, surrounded by a small inconspicuous mucilaginous sheath. **Asexual morph**: Refer to Dai et al. (2014c).

Cultural characters: Ascospores germinating on PDA within 36 h and germ tubes produced from both cells. Colonies growing fast on PDA, reaching 5 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, cottony and light-coloured at the centre, circular, from above; light brown from the below. Mycelium immersed in the media, composed of branched, septate, smooth, hyaline, hyphae.

Fig. 60 ***Vamsapriya bambusicola*** (MFLU 15–1315). **a** Species visible as blacked ostiolar opening on host surface. **b**, **c** Horizontal section of ascomata (**c**: Showing ostiolate opening). **d** Vertical section of ascoma showing black clypeus around papillate ostiole. **e**, **f** Vertical section of ascomata. **j** Peridium. **h** Ostiole with periphyses. **i**–**k** Asci. **l** Ascal apecies stained blue in Melzer's reagent. **m** Paraphyses. **n**, **o** Ascospores (**n** showing ascospore surrounding by sheath). **p** Germinating ascospore. **p**, **r** Cultures on PDA. Scale bars: a = 1 mm, b–d = 500 μm, e, f = 100 μm, h = 50 μm, i–p = 10 μm

Material examined: THAILAND, Uttaradit Province, on dead culms of bamboo, 28 October 2011, Dong-Qin Dai, DDQ00221 (MFLU 15–1315); *Ibid*. (KUN, HKAS88972), living cultures, MFLUCC 11–0637, KUMCC.



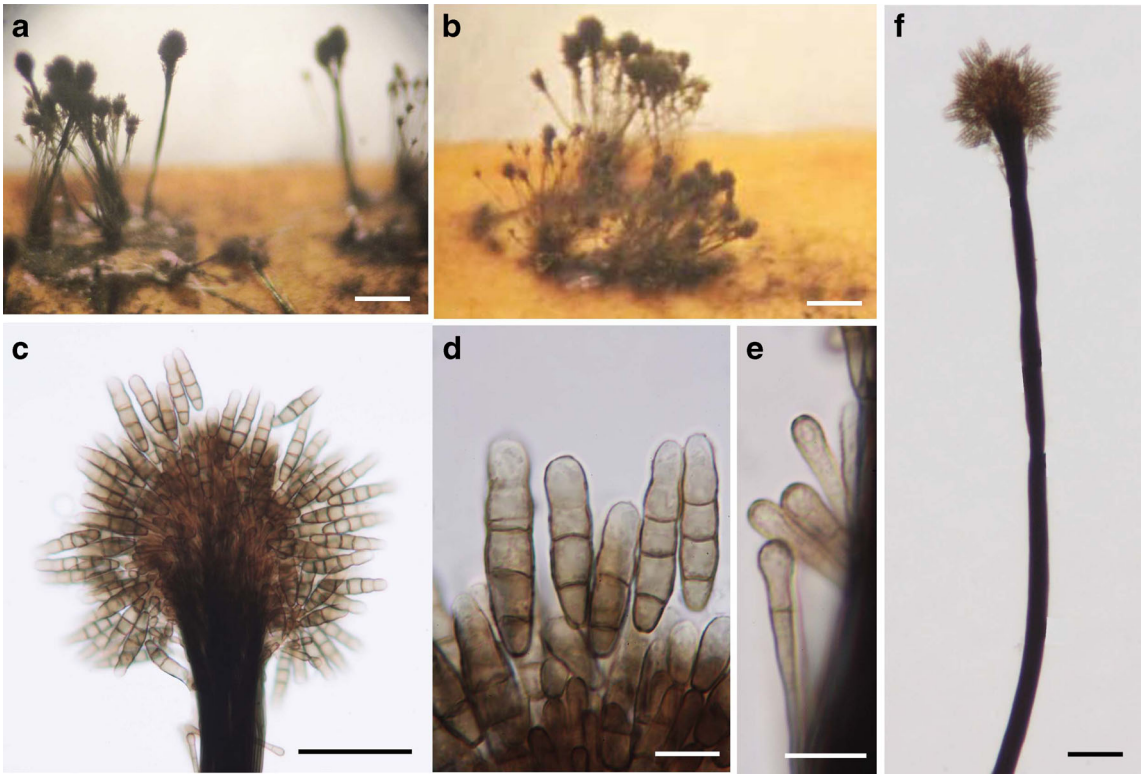


Fig. 61 ***Vamsapriya bambusicola*** (MFLU 13–0368, **holotype**). **a**, **b** Synnemata on bamboo host. **c** Apical part of synnema. **d** Conidia. **e** Conidiogenous cells. **f** Synnema. Scale bars: a, b = 500 *μm*, c, f = 100 *μm*, d, e = 10 *μm*

Notes: *Vamsapriya bambusicola* was introduced by Dai et al. (2014c) to accommodate a hyphomycetous fungus with dark synnemata, monotretic and enteroblastic, conidiogenous cells, and cylindrical, brown, septate conidia. The newly recognized sexual morph strain (MFLUCC 11–0637) is linked to type strain (MFLUCC 11–0477) by ITS phylogenenic analyses with high bootstrap support (100/100 % MPBP/MLBP) (Fig. 53).

Vamsapriya bambusicola is similar to members of *Apioclypea* K.D. Hyde by having immersed ascomata with a rounded, black clypeus and hyaline apiospores (Hyde et al. 1998). *Vamsapriya bambusicola* however, has longer ascospores (can reach to 26.5 μm long), compared to *Apioclypea* species which are shorter than 25 μm (Hyde 1994; Hyde et al. 1998; Taylor and Hyde 2003). So far *Apioclypea* species were only observed on palms and are placed in family *Clypeosphaeriaceae* (Hyde et al. 1998; Taylor and Hyde 2003). Smith et al. (2003) indicated *Apioclypea* is polyphyletic, and submitted a LSU gene of *Apioclypea* sp. to GenBank. However, the blast search using LSU gene of *Vamsapriya bambusicola* in GenBank shows they are not related. Further collections of these genera are needed to establish their natural placement in Xylariomycetidae (Maharachchikumbura et al. 2015; Senanayake et al. 2015).

Xylaria Hill ex Schrank, Baier. Fl. (München) 1: 200 (1789)

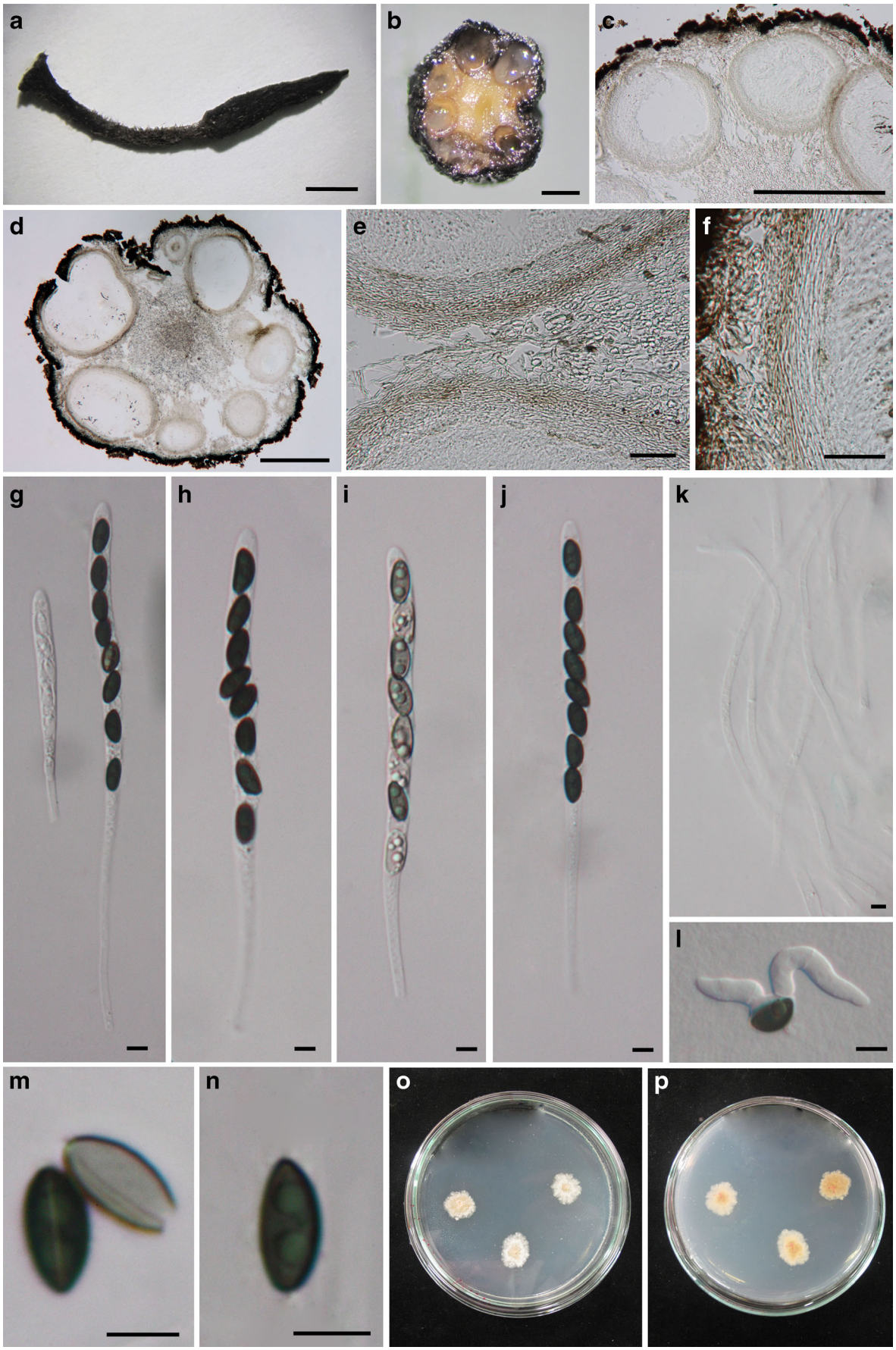
Xylaria are commonly seen on dead wood, but can also be found in soil or on various other substrates, such as decaying fallen leaves, petioles, herbaceous stems, dung, grasses, seeds or fruits and wood (Ju and Tzean 1985; Rogers 1986; Rogers and Samuels 1986). They are also dominant endophytes in the tropics (Rodrigues and Petrini (1997). Kirk et al. (2008) reported 300 species in *Xylaria*, however, currently more than 700 are listed in Index Fungorum (2016). Ju et al. (2012) synonymized *Penzigia* under *Xylaria* and provided a key for the major penzigioid species of *Xylaria*. Asexual morphs are *Moelleroclavus*, *Geniculosporium*-like, *Xylocoremium* (Kirk et al. 2008; Wijayawardene et al. 2012).

Xylaria bambusicola Y.M. Ju & J.D. Rogers, Mycotaxon 73: 400 (1999)

Facesoffungi numbers: FoF 02007; Fig. 62

Saprobic on dead bamboo culms, forming large, long, *Xylaria*-like stromata on bamboo host. *Stromata* solitary to densely gregarious, superficial, clavate to cylindrical, black, carbonaceous to coriaceous, unbranched to

Fig. 62 ***Xylaria bambusicola*** (MFLU 15–1188). **a** Stromata. **b–d** ▶ Horizontal section of stroma. **e**, **f** Peridium. **g–j** Asci. **k** Paraphyses. **l**, **m** Ascospores **n** Germinating ascospore. **o**, **p** Culture on PDA. Scale bars: a = 5 mm, b–d = 500 *μm*, e, f = 50 *μm*, k–m = 5 *μm*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branched, 2–6 cm long in total; well defined, slender, black stipes, covered by short black hairs, 2–3 mm diam.; top fertile part 1–3 cm long, 5–6 mm diam.. *Outer layer of stromata* 25–55 µm thick composed of black tissue. *Cells between perithecia* light brown to hyaline, of *textura intricata* to *oblita*. *Perithecia* 300–650 µm diam., immersed, arranged under outside layer of stromata, globose, membranous, light brown. *Peridium* laterally 20–45 µm thick, composed of small, light brown to hyaline cells of *textura oblita*. *Hamathecium* composed of long, hyaline, septate, 1.5–2 µm broad, paraphyses. *Asci* 95–120 × 4.5–5.5 µm ($\bar{x}$ = 99.7 × 4.8 µm, n = 20), 8-spored, unitunicate, cylindrical, with a long, thin pedicel and a 1–1.5 high × 2–3 diam. J+, round apical ring. *Ascospores* 6–8 × 3–3.5 µm ($\bar{x}$ = 6.8 × 3.4 µm, n = 20), uniseriate, aseptate, elliptical, light brown to brown, with narrowly rounded ends, smooth-walled, with asymmetric, full length, germ-slit.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from both ends of spore. Colonies growing fast on PDA, reaching 90 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, cottony circular, irregular edge, white from above,

Fig. 64 ***Pleurophragmium bambusinum*** (MFLU 15–1207, **holotype**: a, b, e, j, k observed from host substrate; c, d, f, h, i, g, l–r observed from PDA culture). **a**, **b** Conidiomata on bamboo host. **c**, **d** Sporulation on PDA. **e** Conidiophore. **f** Upper part of conidiophore. **g**–**n** Polyblastic conidiogenous cells (**g**, **h**, **l**–**n** Conidiogenous cells producing conidia). **o**–**r** brown conidia with 3 septa. **s** Colonies on PDA. Scale bars: a, b = 1 mm, c, d = 500 µm, e = 100 µm, f = 50 µm, h–n = 10 µm, q–r = 5 µm

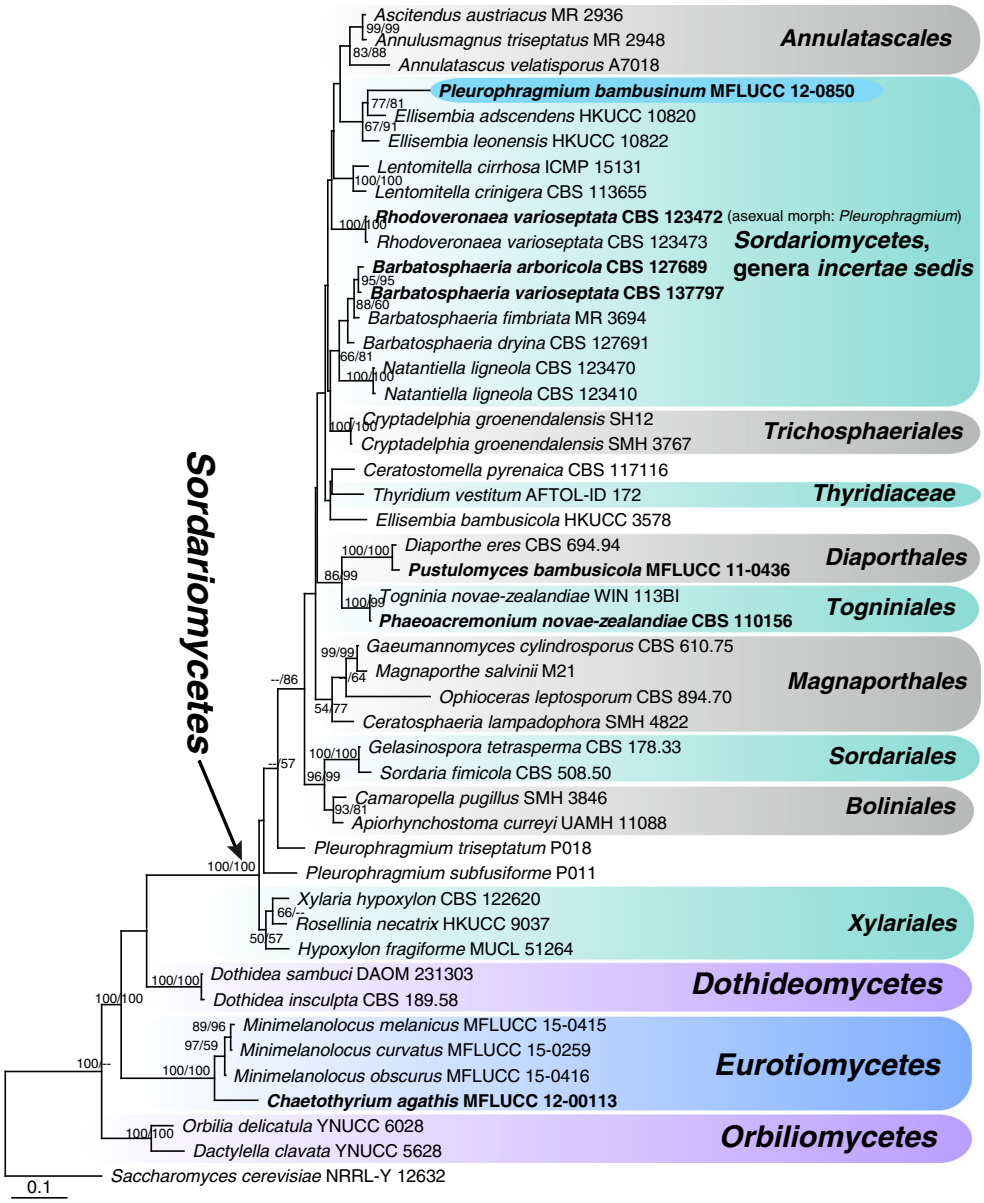
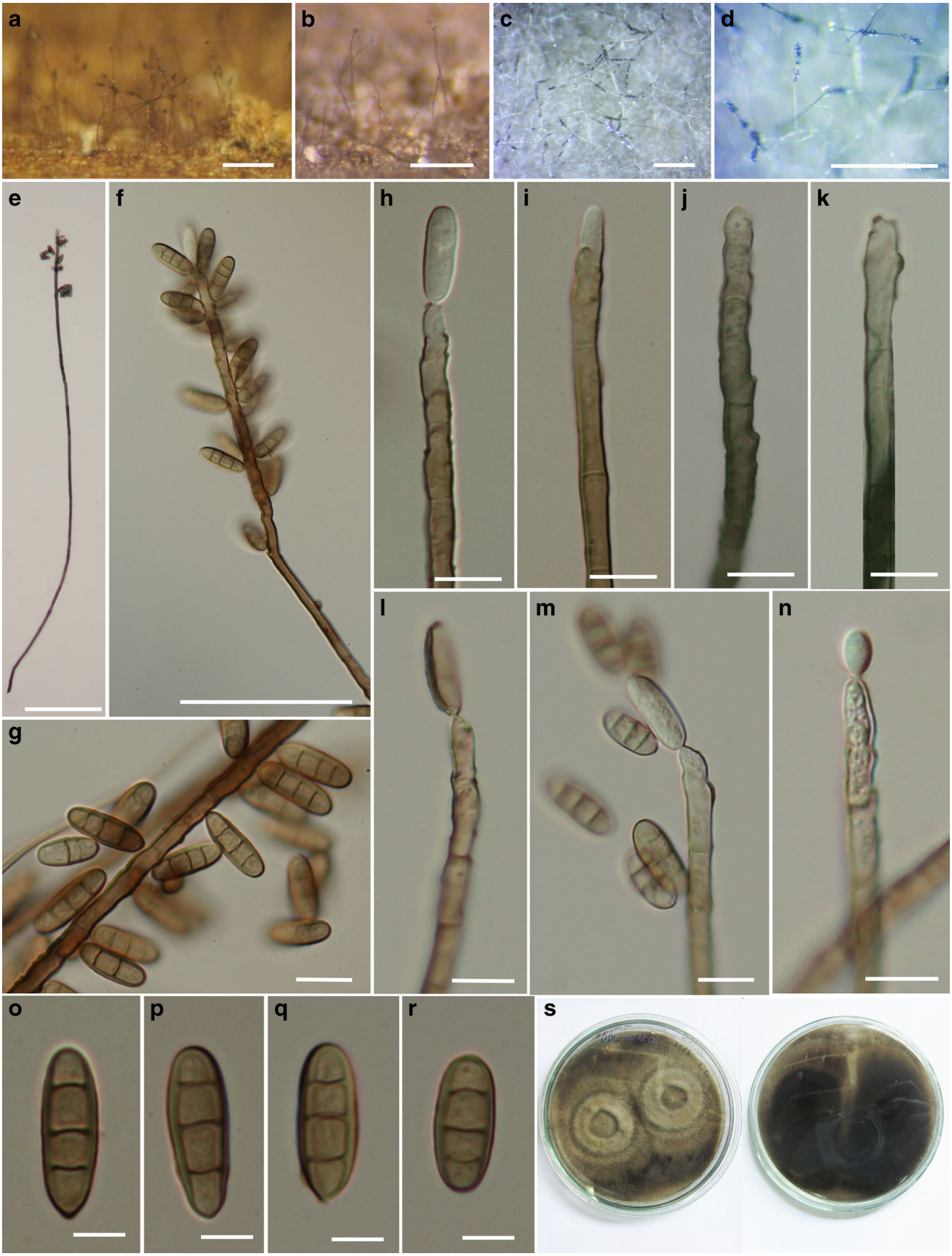


Fig. 63 Maximum likelihood phylogenetic tree (lnL = −2178.664062) generated by RAxML (GTR + G model) based on LSU sequence data. MP/ML values (>50 %) resulting from 1000 bootstrap replicates are given at the nodes. The original isolate numbers codes are noted after the species names. The tree is rooted to *Saccharomyces cerevisiae* (CBS 116131). Ex-type strains are in *bold*. Newly generated sequences are highlighted with a *blue* background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brown in centre from below. Mycelium superficial to immersed in/on media, with branched, septate, smooth hyphae.

Material examined: THAILAND, Chiang Rai, Mae Fah Luang University, on dead culms of bamboo, 1 August 2011, Dong-Qin Dai DDQ00086 (MFLU 15–1188); *ibid*. (KUN HKAS88698), living cultures, MFLUCC 11–0606, CBS 139988.

Notes: *Xylaria bambusicola* was originally described by Ju and Rogers (1999) based on a collection from bamboo, in Taiwan. Our new strain (MFLUCC 11–0606) groups within the type strain of *Xylaria bambusicola* (WSP205) with high bootstrap support (100 %/99 % MPBP/MLBP) (Fig. 54). The new collection has similar morphology with the type, however, is shorter in asci (95–120 μm vs. 120–150 μm in length) and ascospores (6–8 μm vs. 9.5–11 μm long) (Ju and Rogers 1999). *Xylaria bambusicola* can be compared with *X. apiculata* and *X. arbuscula* in having black *Xylaria*-like stromata. However, *Xylaria apiculata* has larger ascospores (20–22 × 7 μm vs. 6–8 × 3–3.5 μm) (Cooke 1879). *Xylaria bambusicola* differs from *X. arbuscula* in its smaller ascospores (6–8 × 3–3.5 μm vs. 14–16 × 5–7 μm) (Saccardo 1878) and in having a full length germ-slit (Ju and Rogers 1999).

Sordariomycetes, genera ***incertae sedis***

Pleurophragmium Costantin, Mucéd. Simpl. (Paris): 100 (1888)

Pleurophragmium was established by Costantin (1888) with *P. bicolor* Costantin as type species, and was placed in Ascomyceta, genera *incertae sedis*. The genus is characterized by single unbranched, brown to dark brown conidiophores, with polyblastic, integrated, terminal, sympodial, denticulate conidiogenous cells, producing ellipsoid to fusiform, or clavate, brown, 0–7-septate conidia, with pointed bases (De Hoog 1985; Abarca et al. 2007; Ma et al. 2014). The feature of dark conidia is used to distinguish *Pleurophragmium* from *Dactylaria* (De Hoog 1985; Abarca et al. 2007). D'Souza and Bhat (2012) compared 23 species of *Pleurophragmium* based on their substrates and locations and provided the key for species. Réblová (2009) reported a sexual species *Rhodoveronaea varioseptata* Arzanlou, et al. with a *Pleurophragmium* asexual morph, and provided a phylogeneic analysis based on LSU sequence data. Our phylogeneic tree in Fig. 63, shows *Pleurophragmium* clusters in *Sordariomycetes*, genera *incertae sedis*. More than 20 species were introduced in this genus (Abarca et al. 2007), and its species may be polyphyletic. However, very little molecular data is available in GenBank, and fresh collections are requested to clarify the order and family level placement of the genus, as well as species relationships.

Pleurophragmium bambusinum D.Q. Dai & K.D. Hyde, ***sp. nov.***

Indexfungorum number: IF552043; Facesoffungi number: FoF 02008; Fig. 64

Etymology: Refers to the host bamboo.

Holotype: MFLU 15–1207

Saprobic on decaying bamboo culms. *Mycelium* immersed in the substrate, composed of septate, branched, hyphae. **Sexual morph**: Undetermined. **Asexual morph**: *Conidiophores* 800–1900 × 3–4.5 μm ($\bar{x}$ = 968.3 × 3.9 μm, n = 20) macronematous, cylindrical, brown to dark brown, septate, unbranched, straight to slightly flexuous. *Conidiogenous cells* 12–25 × 3–4.5 μm ($\bar{x}$ = 17.3 × 4.1 μm, n = 20), polyblastic, integrated, terminal, sympodial, cylindrical, pale brown, smooth, straight, denticulate. *Conidia* 13–21 × 5–7 μm ($\bar{x}$ = 17.6 × 6.2 μm, n = 20) μm, ellipsoid, slightly narrow at towards base, straight to slightly curved, 3-septate, brown, smooth-walled, thick-walled, without guttules.

Culture characters: Ascospores germinating on PDA within 24 h and germ tubes produced from basal end. Colonies growing slowly on PDA, reaching 5 mm in 2 weeks at 28 °C, under 12 h light/12 h dark, circular, dark brown from above and below. Mycelium superficial to immersed in media, branched, septate, smooth. Fertile after 2 months in room temperature on PDA.

Material examined: THAILAND, Chiang Rai, Hnong Kao Hong, Dong Mada, Mea Laos, on dead culms of bamboo, 3 August 2012, D. Jayarama Bhat DDQ00250 (MFLU 15–1207, **holotype**); *Ibid*. (KUN HKAS83941, **isotype**), living cultures, MFLUCC 12–0850, KUMCC.

Notes: *Pleurophragmium bambusicola* is characterized by polyblastic, sympodial, denticulate conidiogenous cells and 3-septate, brown, thick-walled conida. D'Souza and Bhat (2012) described *P. indicum* M.A. D'Souza & Bhat and *P. varieseptatum* Matsush. from bamboo. However, *P. indicum* has larger conidia (20–30 × 4.5–11 μm vs. 13–21 × 5–7 μm) with varied coluoration (middle cells dark brown and end cells pale brown vs. identical color). *Pleurophragmium bambusicola* differs from *P. varieseptatum* in having smooth-walled, ellipsoid conidia (D'Souza and Bhat 2012).

Discussion

This study treats 43 fungal species representing 24 genera, including 29 new species, three new genera and one new family. They are arranged into two classes. Twenty-one fungal species belonging to eight genera (*Bambusaria*, *Bambusicola*, *Mendogia*, *Neodeightonia*, *Occultibambusa*, *Roussoella*, *Seriascoma* and *Tubeufia*), of seven families (*Bambusicolaceae*, *Botryosphaeriaceae*, *Myriangiaceae*, *Occultibambusaceae*, *Roussoellaceae*, *Tubeufiaceae* and

Table 2 List of bambusicolous fungi published since Hyde et al. (2002b)

Taxa	Bamboo host	Substrate	Country	Order/Family	References
Amphibambusa bambusicola	Bamboo	On dead culms	Thailand	*Amphisphaeriales/Amphisphaeriaceae*	Liu et al. (2015)
Anthostomella pseudobambusicola	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
Arthrinium hyphopodii	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	Senanayake et al. (2015)
A. longistromum	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	This study
A. rasikravindrae	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	This study
A. subglobosa	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	Senanayake et al. (2015)
A. thailandicum	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	This study
A. yunnanum	Bamboo	On dead culms	Thailand	*Xylariales/Apiosporaceae*	This study
Astrocystis mirabilis	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
Astrosphaeriella africana	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Liu et al. (2011)
A. bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. exorrhiza	*Thysanolaena maxima*	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. fusispora	*Phyllostachis bambusoides*	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. neofusispora	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. neostellata	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A.stellata	*Phyllostachis bambusoides*	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Liu et al. (2011); Phookamsak et al. (2015)
A. thailandica	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. thysanolaenae	*Thysanolaena maxima*	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
A. tornata	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
Bambusaria bambusae	*Thyrsostachys siamensis*	On dead culms	Thailand	*Valsariales/Valsariaceae*	Jaklitsch et al. (2015); This study
Bambusicola bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	Dai et al. (2012)
B. didymospora	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	This study
B. irregularispora	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	Dai et al. (2012)
B. loculata	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	Dai et al. (2015)
B. massarinia	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	Dai et al. (2012)
B. pustulata	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	This study
B. splendida	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	Dai et al. (2012)
B. thailandica	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	This study
B. triseptatispora	Bamboo	On dead culms	Thailand	*Pleosporales/Bambusicolaceae*	This study
Bambusistroma didymosporum	Bamboo	On dead culms	Thailand	*Pleosporales/Massarinaceae*	Adamčík et al. (2015)
Botryobambusa fusicoccum	Bamboo	On dead culms	Thailand	*Botryosphaeriales/Botryosphaeriaceae*	Liu et al. (2012a)

Table 2 (continued)

Taxa	Bamboo host	Substrate	Country	Order/Family	References
Brunneoclavispora bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Halotthiaceae*	Ariyawansa et al. (2015)
Cercophora thailandica	Bamboo	On dead culms	Thailand	*Sordariales/Lasiosphaeriaceae*	This study
Collodiscula fangjingshanensis	Bamboo	On dead culms	China	*Xylariales/Xylariaceae*	Liu et al. (2015)
C. leigongshanensis	Bamboo	On dead culms	China	*Xylariales/Xylariaceae*	Liu et al. (2015)
Daldinia bambusicola	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
Dictyosporium pseudomusae	Bamboo	On dead culms	Japan	*Pleosporales/Dictyosporiaceae*	Tanaka et al. (2015)
Dinemasporium bambusicola	*Pleioblastus chino*	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. cruciferum	Bamboo	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D.japonicum	*Sasa kurilensis*	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. longicapillatum	Bamboo	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. parastrigosum	Bamboo	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. rishiriense	*Sasa kurilensis*	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. sasae	*Sasa kurilensis*	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
D. strigosum	*Sasa kurilensis*	On dead culms	Japan	*Xylariomycetidae/ Incertae sedis*	Hashimoto et al. (2015)
Dothiorella thailandica	Bamboo	On dead culms	Thailand	*Botryosphaeriales/Botryosphaeriaceae*	Liu et al. (2012a); Phillips et al. (2013)
Embryonispora bambusicola	Bamboo	On dead culms	China	*Ascomycota/ Incertae sedis*	Zhao et al. (2014)
Eriosporella bambusicola	Bamboo	On dead culms	Thailand	*Capnodiales/Incertae sedis*	Dai et al. (2014b)
Eutypa linearis	Bamboo	On dead culms	Thailand	*Xylariales/Diatrypaceae*	This study
Fissuroma aggregata ≡ *Astrosphaeriella aggregata*	*Phyllostachys bambusoides*	On dead culms	Japan, Thailand	*Pleosporales/Aigialaceae*	Tanaka and Harada (2005a); Liu et al. (2011); Phookamsak et al. (2015)
F. bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Aigialaceae*	Phookamsak et al. (2015)
F. neoaggregata	Bamboo	On dead culms	Thailand	*Pleosporales/Aigialaceae*	Phookamsak et al. (2015)
F. thailandicum	Bamboo	On dead culms	Thailand	*Pleosporales/Aigialaceae*	Phookamsak et al. (2015)
Flammeascoma bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Anteagloniaceae*	Liu et al. (2015)
Goosiomyces bambusicola	*Bambusa arundinacea*	On dead culms	China	*Ascomycota/ Incertae sedis*	Dubey and Neelima (2014)
Gibberella bambusae	Bamboo	On dead culms	China	*Hypocreales/Nectriaceae*	Zhang and Zhuang (2003)
Gregarithecium curvisporum	Sasa sp.	On dead culms	Japan	*Pleosporales/Dictyosporiaceae*	Tanaka et al. (2015)
Helminthosporium bambusicola	*Bambusa* sp.	On dead culms	China	*Pleosporales/Massarinaceae*	Zhang et al. (2010)
Hypoxylon laminosum	Bamboo	On dead culms	French	*Xylariales/Xylariaceae*	Kuhnert et al. (2014)
H. neosublenormandii	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
H. pseudefendleri	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
H. sublenormandii	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	Suwannasai et al. (2005)

Table 2 (continued)

Taxa	Bamboo host	Substrate	Country	Order/Family	References
Kamalomyces indicus	*Dendrocalamus strictus*	On dead culms	Thailand	*Tubeufiales/Tubeufiaceae*	Boonmee et al. (2011)
Katumotoa bambusicola	Sasa kurilensis;	On dead culms	Japan	*Pleosporales/Lentitheciaceae*	Tanaka and Harada (2005a); Tanaka et al. (2015)
Leptosporella bambusae	Bamboo	On dead culms	Thailand	*Chaetosphaeriales/Incertae sedis*	This study
Linocarpon bambusicola	*Bambusa* sp.	On dead culms	Philippines	*Xylariales/Incertae sedis*	Cai et al. (2004)
Lophiostoma arundinis	Sasa palmata	On dead culms	Japan	*Pleosporales/Lophiostomataceae*	Tanaka and Harada (2003a)
Massarina arundinariae	*Phyllostachys bambusoides*	On dead culms	Japan	*Pleosporales/Massarinaceae*	Tanaka and Harada (2003b)
M. bambusina	*Sasa kurilensis; Phyllostachys bambusoides*	On dead culms	Japan	*Pleosporales/Massarinaceae*	Tanaka and Harada (2003b)
M. ryukyuensis	*Pleioblastus linearis*	On dead culms	Japan	*Pleosporales/Massarinaceae*	Tanaka and Harada (2003b)
Mendogia bambusina	Bamboo	On living culms	Thailand	*Myriangiales/Myriangiaceae*	This study
Myrothecium thailandicum	Bamboo	On dead culms	Thailand	*Hypocreales/Stachybotryaceae*	This study
M. chiangmaiense	Bamboo	On dead culms	Thailand	*Hypocreales/Stachybotryaceae*	This study
M. cylindrosporum	Bamboo	On dead culms	Thailand	*Hypocreales/Stachybotryaceae*	Liu et al. (2015); This study
M. uttaraditense	Bamboo	On dead culms	Thailand	*Hypocreales/Stachybotryaceae*	This study
Nectria pseudotrichia	Bamboo	On dead culms	Thailand	*Hypocreales/Nectriaceae*	This study
Neoanthostomella pseudostromatica	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	This study
Neodeightonia microspora	Bamboo	On dead culms	Thailand	*Botryosphaeriales/Botryosphaeriaceae*	This study
N. subglobosa	*Bambusa arundinacea*	On dead culms	Thailand	*Botryosphaeriales/Botryosphaeriaceae*	Liu et al. (2012a); This study
Neogaeumannomyces bambusicola	Bamboo	On dead culms	Thailand	*Magnaporthales/Magnaporthaceae*	Liu et al. (2015)
Neokalmusia brevispora	*Sasa senanensis; Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Didymosphaeriaceae*	Tanaka and Harada (2004); Ariyawansa et al. (2014)
Neokalmusia didymospora	Bamboo	On dead culms	Thailand	*Pleosporales/Didymosphaeriaceae*	Dai et al. (2016)
Neokalmusia scabrispora	*Phyllostachys bambusoides*	On dead culms	Japan	*Pleosporales/Didymosphaeriaceae*	Tanaka et al. (2005)
Neoophiosphaerella sasicola	*Sasa senanensis; Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Lentitheciaceae*	Tanaka et al. (2015)
Neoroussoella bambusae	*Bambusa* sp.	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
Occultibambusa bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Occultibambusaceae*	This study
O. fusispora	Bamboo	On dead culms	Thailand	*Pleosporales/Occultibambusaceae*	This study
O. pustula	Bamboo	On dead culms	Thailand	*Pleosporales/Occultibambusaceae*	This study
Oxydothis bambusicola	*Bambusa* sp.	On dead culms	China	*Xylariales/Incertae sedis*	Shenoy et al. (2005)
Parabambusicola bambusina	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Parabambusicolaceae*	Tanaka et al. (2015)
Passalora bambusae	*Bambusa spinosa*	On culms	India	*Capnodiales/Mycosphaerellaceae*	Kamal (2010)
Peroneutypa scoparia	Bamboo	On dead culms	Thailand	*Xylariales/Diatrypaceae*	This study
Phaeoacremonium sphinctrophorum	Bamboo	On dead culms	Thailand	*Togniniales/Togniniaceae*	This study
Phaeoisaria pseudoclematidis	Bamboo	On dead culms	Thailand	*Xylariales/Diatrypaceae*	Liu et al. (2015)

Table 2 (continued)

Taxa	Bamboo host	Substrate	Country	Order/Family	References
Phaeosphaeria bambusae	*Pleioblastus simoni*	On dead culms	Japan	*Pleosporales/Phaeosphaeriaceae*	Tanaka and Harada (2004)
P. oryzae	*Bambusa multiplex*	On dead culms	Japan	*Pleosporales/Phaeosphaeriaceae*	Tanaka and Harada (2004)
Phaeosphaeria sp.	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Phaeosphaeriaceae*	Tanaka and Harada (2004)
Phialosporostilbe gregariclava	*Sasa nipponica*	On dead culms	Japan	*Ascomycota incertae sedis*	Shirouzu and Harada (2004)
Pleurophragmium bambusinum	Bamboo	On dead culms	Thailand	*Sordariomycetes* genera, *incertae sedis*	This study
Polyplosphaeria fusca	*Pleioblastus chino; Phyllostachys bambusoides; Chimonobambusa marmorea; Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Pseudoastrosphaeriella africana	Bamboo	On dead culms	Thailand	*Pleosporales/Pseudoastrosphaeriellaceae*	Phookamsak et al. (2015)
P. bambusae	Bamboo	On dead culms	Thailand	*Pleosporales/Pseudoastrosphaeriellaceae*	Phookamsak et al. (2015)
P. longicolla	Bamboo	On dead culms	Thailand	*Pleosporales/Pseudoastrosphaeriellaceae*	Phookamsak et al. (2015)
P. papillata	Bamboo	On dead culms	Thailand	*Pleosporales/Pseudoastrosphaeriellaceae*	Phookamsak et al. (2015)
P. thailandensis	Bamboo	On dead culms	Thailand	*Pleosporales/Pseudoastrosphaeriellaceae*	Phookamsak et al. (2015)
Pseudolachnella yakushimensis	*Pleioblastus* sp.	On dead culms	Japan	*Ascomycota incertae sedis*	Sato et al. (2008)
Pseudotetraploa curviappendiculata	*Sasa kurilensis; Sasa senanensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Hatakeyama et al. (2005); Tanaka et al. (2009)
P. javanica	*Sasa* sp.; *Phyllostachys bambusoides*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Hatakeyama et al. (2005); Tanaka et al. 2009
P. longissima	*Pleioblastus chino*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Hatakeyama et al. (2005); Tanaka et al. 2009
Psiloglonium sasicola	Bamboo	On dead culms	Thailand	*Hysteriales/Hysteriaceae*	Liu et al. (2015)
Pteridiospora chiangraiensis	Bamboo	On dead culms	Thailand	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2015)
Pteridiospora javanica	Bamboo	On dead culms	Thailand, Indonesia	*Pleosporales/Astrosphaeriellaceae*	Phookamsak et al. (2014)
Pustulomyces bambusicola	Bamboo	On dead culms	Thailand	*Diaporales/Diaporthaceae*	Dai et al. (2014a)
Quadricrura bicornis	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Q. meridionalis	Bamboo	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Q. septentrionalis	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Rehmiodothis bambusae	*Bambusa vulgaris*	On dead culms	India	*Phyllachorales/Phyllachoraceae*	Verma et al. (2008)
Roussoella angustior	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Ariyawansa et al. (2015)
R. chiangraina	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R.intermedia	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. japanensis	*Sasa veitchii* var. *veitchii*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. magnatum	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Ariyawansa et al. (2015)
R. mukdahanensis	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	This study

Table 2 (continued)

Taxa	Bamboo host	Substrate	Country	Order/Family	References
R.neopustulans	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014); This study
R. nitidula	Bamboo	On dead culms	Malaysia/Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. pseudohysterioides	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	This study
R. pustulans	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R.pustulata	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	This study
R. scabrispora	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. siamensis	*Bambusa* sp.	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014); This study
R.thailandica	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. verrucispora	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
Roussoellopsis japonica	*Phyllostachys bambusoides*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. macrospora	Bamboo	On dead culms	Thailand	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
Roussoellopsis sp.	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
R. tosaensis	Bamboo	On dead culms	Japan	*Pleosporales/Roussoellaceae*	Liu et al. (2014)
Seriascoma didymospora	Bamboo	On dead culms	Thailand	*Pleosporales/Occultibambusaceae*	This study
Sphaerulina bambusicola	*Bambusa* sp.	On dead culms	China	*Capnodiales/Mycosphaerellaceae*	Zhao and Zhao (2012)
Tetraploa sp.	Bamboo	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Tetraplosphaeria nagasakiensis	Bamboo	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
T. sasicola	*Sasa senanensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Triplosphaeria acuta	*Sasa nipponica?*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
T. cylindrica	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
T.a maxima	*Sasa kurikensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Triplosphaeria sp.	*Sasa kurilensis*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
T. yezoensis	*Sasa palmata*	On dead culms	Japan	*Pleosporales/Tetraplosphaeriaceae*	Tanaka et al. (2009)
Tubeufia javanica	Bamboo	On dead sheath	Thailand	*Tubeufiales/Tubeufiaceae*	Boonmee et al. (2014); This study
T. longiseta	Bamboo	On dead culms	Thailand	*Tubeufiales/Tubeufiaceae*	This study
Vamsapriya bambusicola	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	Dai et al. (2014c); This study
V. indica	Bamboo	On dead culms	Thailand, India	*Xylariales/Xylariaceae*	Dai et al. (2014c); Gawas and Bhat (2005)
V. khunkonensis	Bamboo	On dead culms	Thailand	*Xylariales/Xylariaceae*	Dai et al. (2014c)
Versicolorisporium triseptatum	*Pleioblastus chino; Sasamorpha borealis*	On dead culms	Japan	*Pleosporales/Occultibambusaceae*	Hatakeyama et al. (2008)
Xylaria bambusicola	Bamboo	On dead culms	Thailand	*XylarialesNXylariaceae*	This study

Vasariaceae) are *Dothideomycetes*. Twenty three fungal species, belonging to 16 genera (*Anthostomella*, *Arthrinium*, *Astrocystis*, *Cercophora*, *Daldinia*, *Eutypa*, *Hypoxylon*, *Leptosporella*, *Myrothecium*, *Nectria*, *Neoanthostomella*, *Peroneutypa*, *Phaeoacremonium*, *Pleurophragmium*, *Vamsapriya* and *Xylaria*), of seven families (*Apiosporaceae*, *Diatrypaceae*, *Lasiosphaeriaceae*, *Nectriaceae*, *Stachybotryaceae*, *Togniniaceae* and *Xylariaceae*) and of one genus, *incertae sedis* belongs to *Sordariomycetes*.

Based on our research, it was observed that most fungi on bamboo are not pathogens. Only *Mendogia* species are epiphytic on living bamboo culms whereas the other 42 species are saprobic, and it is rare to find diseased bamboo in Thailand. Fungi associated with bamboo are also interesting. For example, *Phaeoacremonium sphinctrophorum* was originally reported as human skin disease (subcutaneous cyst), diagnosed in North America (Mostert et al. 2006). However, we found it growing on a dead bamboo culm in Thailand. According to the literature cited in this paper (Table 2) and based on our own research, most fungi have been recorded from bamboo culms and only a few are isolated from leaves and sheaths. However, fungi occurring on shoots, roots, or inflorescences were not covered in this study. In this paper, we linked sexual and asexual morphs of *Arthrinium*, *Bambusicola*, *Neodeightonia*, *Phaeoacremonium*, *Occultabambusa*, *Roussoella* and *Vamsapriya* by culture sporulation and molecular data. Thus, this work contributes to the effort to designate one name for each fungus (Hawksworth 2012; Wingfield et al. 2012).

Hitherto information on the association of fungi with bamboo substrates has been incomplete (Hyde et al. 2002a). More than 1400 fungal species from bamboo have been recorded (Hyde et al. 2002a), however, very few taxa have molecular data in GenBank. Therefore, the existing species need to be recollected, epitypified and sequenced. Hyde et al. (2002a) stated that most fungal species on bamboo are recorded from temperate regions, while, more genera of bamboo occur in tropical regions. Thus we believe that there are numerous taxa of bambusicolous fungi waiting for recognition and description in tropical areas. A list of bambusicolous fungi published since Hyde et al. (2002a) is provided here.

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