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Shi-Ke Huang, Kevin D. Hyde, Kevin D. Hyde, Ausana Mapook ...+5 more authors

Institutions: Mae Fah Luang University, Zhongkai University of Agriculture and Engineering, University of Electronic Science and Technology of China, Goa University ...+3 more institutions

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Taxonomic Studies of Some often Over-Looked Diaporthomycetidae and Sordariomycetidae

Huang Shi-Ke (cocohuangsk@gmail.com)
Mae Fah Luang University School of Science
Kevin D. Hyde
Mae Fah Luang University School of Science
Ausana Mapook
Mae Fah Luang University School of Science
Sajeewa S.N. Maharachchikumbura
University of Electronic Science and Technology of China
D. Jayarama Bhat
Goa University
Eric H.C. McKenzie
Manaaki Whenua: Landcare Research New Zealand
Rajesh Jeewon
University of Mauritius
Ting-Chi Wen
Guizhou University

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Abstract

Sordariomycetes is an earlier and one of the widely distributed class of Ascomycota. The class was initially classified based on morphology in having inoperculate and unitunicate asci. With the development of DNA based phylogenetic analysis, several undetermined or polyphyletic members of Sordariomycetes were reclassified. However, not all species belonging to this class have been sequenced and analyzed. There are a number of species, especially those old and poorly studied ones which have never been sequenced before and not even recollected again for further taxonomic verification. One of the main objective in this study is to revise and update the taxonomy of several well-known old and poorly studied species whose classification are still obscure. Herein, we re-examined the type materials and/or authentic specimens together to explore 74 relatively poorly-studied genera, which mainly belong to Boliniales, Calosphaeriales, Chaetosphaeriales, Jobellisiales, and Sordariales classified under Diaporthomycetidae and Sordariomycetidae. We provide descriptions, notes, figures and/or drawings and discussed their phylogenetic relationships. As a result, the monotypic Jobellisiales is transferred from Hypocreomycetidae to Diaporthomycetidae. Based on phylogenetic analysis, the polyphyletic Lasiosphaeriaceae is divided into five families, Bombardiaceae (*Apodospora*, *Bombardia*, *Bombardioidea* and *Fimetariella*), Lasiosphaeriaceae (*Anopodium*, *Bellojisia*, *Corylomyces*, *Lasiosphaeria*, *Mammaria* and *Zopfiella*), Lasiosphaeridaceae (*Lasiosphaeris*), Strattoniaceae (*Strattonia*) and Zygospermellaceae (*Episternus* and *Zygospermella*). In addition, a new family *Neoschizotheciaceae* is established based on *Neoschizothecium*. Analysis of the type species of *Boothiella*, *Stellatospora*, *Sulcatistroma* and *Tengiomyces* placed them in Sordariaceae, Chaetomiaceae, Hypocreales and Coronophorales, respectively. We classify the genera lacking molecular data based on their morphology and expect them to be recollected; that is, *Kacosphaeria* in Calosphaeriales; *Arnium*, *Biconiosporella*, *Camptosphaeria*, *Diffractella*, *Emblemospora*, *Eosphaeria*, *Periamphispora*, *Ramophialophora*, *Synaptospora* and *Tripterosporella* in Sordariales; *Conidiotheca* in Sordariomycetes; *Copromyces*, *Effetia*, *Endophragmiella* and *Tulipispora* are accommodated in Ascomycota. Besides, we establish a new genus *Neoschizothecium* based on phylogenetic analysis. New combinations proposed include: *Camaropella amorpha*, *Cam. microspora*, *Cam. plana*, *Cladorrhinum grandiusculum*, *Cla. leucotrichum*, *Cla. terricola*, *Cla. olerum*, *Helminthosphaeria plumbea*, *Immersiella hirta*, *Jugulospora minor*, *Lasiosphaeris arenicola*, *Neoschizothecium aloides*, *Neo. carpinicola*, *Neo. conicum*, *Neo. curvisporum*, *Neo. fimbriatum*, *Neo. glutinans*, *Neo. inaequale*, *Neo. minicaudum*, *Neo. selenosporum*, *Neo. tetrasporum*, *Neurospora autosteira*, *Podospora brunnescens*, *P. flexuosa*, *P. jamaicensis*, *P. hamata*, *P. macrospora*, *P. spinosa*, *Strattonia petrogale* and *Triangularia microsclerotigena*, *T. nannopodalis*, *T. praecox*, *T. samala*, *T. tarvisina*, *T. unicaudata*, *T. yaeyamensis*. New epithets are proposed for *Apiorhynchostoma apiosporum* and *Podospora dacryoidea*.

Introduction

The class Sordariomycetes was introduced by Eriksson and Winka (1997) and is classified under the subdivision Pezizomycotina (Hyde et al. 2013, 2020; Maharachchikumbura et al. 2015, 2016;

Wijayawardene et al. 2018, 2020). The numbers of orders, families and genera accepted in Sordariomycetes has been debated, with authors accepting different numbers. Kirk et al. (2008) included 15 orders, 64 families and 1119 genera, Lumbsch and Huhndorf (2010) included 18 orders, 63 families and 947 genera, Maharachchikumbura et al. (2015) included 32 orders, 105 families and 1331 genera and Wijayawardene et al. (2018) included 37 orders, 134 families and 1060 genera. In the most recent treatments of Sordariomycetes, seven subclasses, 45 orders, 167 families and 1506 genera were accepted with more than 20,000 species (Hyde et al. 2020), while Wijayawardene et al. (2020) accepted 50 orders, 188 families and 1413 genera. Taxa in this class are widely distributed and include plant pathogenic (Jayawardena et al. 2019), endophytic (Rashmi et al. 2019), saprobic (Luo et al. 2019), epiphytic (Hongsanan et al. 2016) and coprophilous (Kruys et al. 2014), fungicolous (Sun et al. 2019) and lichenicolous (Maharachchikumbura et al. 2015, 2016) taxa. They are found in terrestrial, aquatic and marine habitats (Hyde and Wong 2000; Cai et al. 2006b; Jones et al. 2015, 2020; Maharachchikumbura et al. 2016; Luo et al. 2019; Bundhun et al. 2020; Hyde et al. 2020, 2021).

Traditionally, the taxa in Sordariomycetes were characterized by inoperculate, unitunicate asci. However, some members were reported with fissitunicate asci (the inner and the outer ascus wall layer almost completely detach from each other with the endoascus extruding out of the exoascus when ascus dehiscence) (Bellemère 1994, Damm et al. 2008; Maharachchikumbura et al. 2016; Hyde et al. 2020). Traditional morphology helped classify and understand species, however, phenotypes largely overlap and fluctuate under different environmental conditions (Trail et al. 2017). Therefore, combining DNA sequence analyses with morphological based studies to determine the affinities and taxonomic placement of Sordariomycetes and other species have been very useful to better understand their classification. Initially, phylogenetic analyses for Sordariomycetes were based on LSU and SSU sequence data (Berbee and Taylor 1992; Spatafora and Blackwell 1993; Spatafora 1995). Later protein coding gene regions (e.g. TEF, TUB and RPB2) were used to provide a more stable classification of this group (Zhang et al. 2006; Tang et al. 2007). Currently, rDNA sequences data combined with protein coding genes are widely recommended to resolve taxonomic placements in Sordariomycetes (Maharachchikumbura et al. 2015; Hyde et al. 2017, 2020; Hongsanan et al. 2017). Hyde et al. (2017, 2020) analyzed DNA sequence data with divergent time estimates to investigate evolutionary processes in Sordariomycetes.

Sordariomycetidae, as the earliest subclass of Sordariomycetes, accommodated eight orders based on molecular data and usually has dark ascomata, periphysate ostioles and unitunicate asci (Eriksson and Winka 1997; Maharachchikumbura et al. 2015, 2016; Hyde et al. 2020). The members of this subclass are widely distributed on various substrata worldwide and historically, the classification of these taxa was mainly determined using morphology and host (Eriksson and Winka 1997; Maharachchikumbura et al. 2015, 2016; Wang et al. 2019a, b; Hyde et al. 2020; Marin-Felix et al. 2020). Especially for Sordariales, which was established by Hawksworth and Eriksson (1986) and most species have membraneous or coriaceous ascomata and hyaline or brown, cylindrical or ellipsoidal or irregular-shaped ascospores often with appendages or sheath and grow on dung or decaying substrata (Zhang et al. 2006; Maharachchikumbura et al. 2015, 2016). Huhndorf et al. (2004b) divided this order into three families, Chaetomiaceae, Lasiosphaeriaceae and Sordariaceae, based on morphology and phylogenetic analysis.

Traditionally, a large number of Lasiosphaeriaceae species grow on decayed substrata and have membraneous or coriaceous ascomata and ellipsoidal to cylindrical ascospores, usually with appendages (Lundqvist 1972; Hilber and Hilber 1979; Shearer 1989; Guarro et al. 1991, 1996; Bell 2000). Most species that grow on faeces and characterized by dark ascomata and ellipsoidal or irregular ascospores, sometimes with ribs or pits on the surface or surrounded by gelatinous sheath, were included in Sordariaceae (Cain and Mirza 1969; Lundqvist 1972; Jeng and Krug 1976; Abdullah and Rattan 1978; Hawksworth and Manoharachary 1978; Krug 1989; Ito and Nakagiri 1994). Subsequently, traditionally defined genera assumed to be in Lasiosphaeriaceae and Sordariaceae were either found to be polyphyletic or found not to be close relative of these families based on DNA sequence analyses (García et al. 2004; Cai et al. 2006a, b; Huhndorf et al. 2004b; Nygren et al. 2011; Kruys et al. 2014; Wang et al. 2019a). Thus, several lasiosphaeriaceous taxa were reassigned to establish Diplogelasinosporaceae, Naviculisporaceae, Podosporaceae and Schizotheciaceae, and the remaining species were placed in Lasiosphaeriaceae *sensu lato* (Wang et al. 2019a; Marin-Felix et al. 2020). Schizotheciaceae was established based on *Schizothecium*, which is a synonym of *Podospora* (Podosporaceae) (Wang et al. 2019a; Marin-Felix et al. 2020; Index Fungorum 2020). *Stellatospora* was transferred from Sordariaceae to Chaetomiaceae based on available molecular data analysis (Wang et al. 2019a). Moreover, *Neurospora* has three mating strategies and ascospores with ribs or pits on surface (García et al. 2004; Cai et al. 2006b); *Sordaria* has smooth-walled ascospores surrounded by gelatinous sheath or sheath absent (Moreau 1953; Lundqvist 1972; von Arx et al. 1987; Cai et al. 2006b), but both genera are polyphyletic and these morphologies are not consistent with the classification recovered from DNA based phylogenies (García et al. 2004; Cai et al. 2006b; this study). In addition, Wang et al. (2016, 2019a, b) redefined several large genera in Chaetomiaceae, such as *Chaetomium*, *Humicola* and *Thielavia*, and re-circumscription of these taxa following phylogenetic analyses.

The monotypic Boliniales is widespread and usually saprobic on wood, and it was initially characterized by membranaceous ascomata, cylindrical asci and ellipsoidal ascospores (Kirk et al. 2001). Subsequently, several species with carbonaceous ascomata were classified into this order (Zhang et al. 2006). Thus, the monophyletic Boliniales was reported to form sister relationships to Phyllachorales in Sordariomycetidae and has cylindrical asci and smooth-walled ellipsoidal ascospores with germ pore(s) (Maharachchikumbura et al. 2016; Hongsanan et al. 2017; Hyde et al. 2017; this study).

Chaetosphaeriaceae, Helminthosphaeriaceae, Leptosporellaceae and Linocarpaceae were accommodated in Chaetosphaeriales based on molecular data analysis, and they are widely distributed as saprobic, pathogenic or fungicolous fungi (Huhndorf et al. 2004a; Maharachchikumbura et al. 2015, 2016; Hernández-Restrepo et al. 2017; Konta et al. 2017; Hyde et al. 2020). As the first introduced family in this order, Helminthosphaeriaceae contained seven genera, *Echinosphaeria*, *Endophragmiella*, *Helminthosphaeria*, *Hilberina*, *Ruzenia*, *Synaptospora* and *Tengiomyces*, which are characterized by hairy ascomata, cylindrical to clavate asci and cylindrical ascospores (Miller and Huhndorf 2004a; Miller et al. 2014; Maharachchikumbura et al. 2015; Hyde et al. 2020). However, *Endophragmiella* species were found to belong to Tubeufiales and Helminthosphaeriaceae in several phylogenies (Hernández-Restrepo et al.

2017; Vu et al. 2019). *Tengiomyces* which lacks DNA sequence data and phylogenies is more similar to Chaetosphaerellaceae with ellipsoidal, septate ascospores (Réblová 1999a; Huhndorf et al. 2004a).

Diaporthomycetidae was divided from Sordariomycetidae based on DNA phylogenies and its members are widespread as endophytic, pathogenic, parasitic or saprobic fungi (Maharachchikumbura et al. 2015). Its members usually have globose to subglobose ascomata, cylindrical to clavate asci, variously shaped ascospores and hyaline, aseptate conidia (Maharachchikumbura et al. 2015). Fifteen orders with different characteristics are included in this subclass, among which Calosphaeriales is similar to Togniniales in having clavate asci borne from spicate ascogenous hyphae, but are phylogenetically distant (Maharachchikumbura et al. 2015, 2016; Réblová et al. 2015; Hyde et al. 2020). The monotypic Togniniales was delimited based on molecular data of *Phaeoacremonium* (Maharachchikumbura et al. 2015, 2016; Hyde et al. 2020). Calosphaeriales comprises Calosphaeriaceae and Pleurostomataceae, initially including eight genera (Lumbsch and Huhndorf 2010; Maharachchikumbura et al. 2015, 2016). Later, *Calosphaeria*, *Flabellascus*, *Jattaea*, *Togniniella* and *Pleurostoma* were confirmed to belong to Calosphaeriales, but *Sulcatistroma* was nested in Hypocreales (Vu et al. 2019; this study). The taxonomy of *Kacosphaeria* and *Tulipispora*, which lack molecular data, are rarely discussed.

Maharachchikumbura et al. (2015) established monotypic Jobellisiales in Diaporthomycetidae, and then this order was listed in Hypocreomycetidae (Hyde et al. 2020; Wijayawardene et al. 2020). However, *Jobellisia* species formed an unstable monophyletic clade in Diaporthomycetidae (Réblová 2008; Liu et al. 2012; Maharachchikumbura et al. 2015, 2016; Hongsanan et al. 2017; Hyde et al. 2020), and they are similar to some Diaporthales species has yellow to brown ascomata, cylindrical asci and brown ascospores (Maharachchikumbura et al. 2015; Senanayake et al. 2017).

Morphology is the traditional method of delimiting species. For the earlier and/or infrequently mentioned species, they were initially classified mainly by morphology, which has been demonstrated to be sometimes inconsistent with DNA based phylogenies. García et al. (2004) and Cai et al. (2006) demarcated *Neurospora* species based on the ascospores wall structure, but it was incongruent with molecular data. Many species could not be accurately classified due to a lack of molecular or morphological information. Therefore, it is necessary to determine phylogenetically significant morphology coupled with DNA sequence data to better infer species classification. Recently, Wang et al. (2016, 2019a, b) and Marin-Felix et al. (2020) examined several authentic materials and sequenced species in Chaetomiaceae and Lasiosphaeriaceae and delimited about twenty genera and over fifty species based on phylogenetic analysis. Vu et al. (2019) also sequenced a large number of species to determine the taxonomic placement of more Sordariomycetes species. We re-examined the type materials, authentic specimens or extant literature pertaining to those species that have been earlier/seldom mentioned or whose classification is still controversial within the Diaporthomycetidae and Sordariomycetidae. Wherever possible, DNA sequence data are analyzed to update the taxonomy of these species.

Materials And Methods

Material examination

Specimens were loaned from BPI, BRIP, F, G, GZU, IMI, NBRC, NY, PC, PDD, PRM, S, TRTC and UPS herbaria. These samples were observed in pure water and/or 5% KOH for sectioning. Specimens were examined using a Motic SMZ 168 stereomicroscope. Micromorphological characters were examined using a Nikon ECLIPSE 80i compound microscope and images were captured with a Canon EOS 550D and/or a Canon EOS 600D digital camera. Taro soft ® Image Framework program version 0.9.0.7 was used for measurements. Some of the type specimens were in poor condition or could not be loaned. For these taxa, we redrew the morphological features based on the original publications. The images used for photoplates were processed with Adobe Photoshop CS6 software (Adobe Systems, USA).

Phylogenetic analyses

Sequences were obtained from GenBank following previous publications and aligned using the default settings of MAFFT version 7 (http://mafft.cbrc.jp/alignment/server/index.html) (Katoh and Standley 2013). These datasets were manually corrected using Bioedit 7.0.9.0 (Hall 1999, Dissanayake et al. 2020). The phylogenetic analyses of the combined gene regions were performed using maximum-likelihood (ML) and/or Bayesian inference (BI). The evolutionary model was obtained using jModeltest 2.1.1 (Darriba et al. 2012) or ModelFinder (Kalyaanamoorthy et al. 2017). The TIM1, TIM2, TIM3, TrN and TrNef substitution models were replaced by the GTR model (Lecocq et al. 2013). The ML analyses were run with IQ-TREE (Nguyen et al. 2015; Chernomor et al. 2016), using models for each partitioned gene, with 1000 rapid bootstrap replicates. Bayesian inference was implemented by MrBayes v.3.0b4 (Ronquist and Huelsenbeck 2003) with the best-fit model of sequence evolution. Phylogenetic trees were viewed with FigTree v1.4.0 (http://tree.bio.ed.ac.uk/software/figtree/) and processed by Adobe Illustrator CS5. The final alignments and trees were deposited in TreeBASE.

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Arrangement of genera in Boliniaceae, Calosphaeriaceae, Helminthosphaeriaceae, Jobellisiaceae, Lasiosphaeriaceae, Pleurostomataceae, Podosporaceae andSordariaceae. Those not in agreement with Wijayawardene et al. (2020) are marked with an asterisk.

Phylum Ascomycota Caval.-Sm.

ClassSordariomycetes O.E. Erikss. & Winka

SubclassDiaporthomycetidae Senan., Maharachch. & K.D. Hyde

Calosphaeriales M.E. Barr

Calosphaeriaceae Munk

Calosphaeria Tul. & C Tul.

Flabellascus Réblová

Jattaea Berl.

Togniniella Réblová et al.

Pleurostomataceae Réblová et al.

Pleurostoma Tul. & C. Tul

Calosphaeriales genus *incertae sedis*

Kacosphaeria Speg.

Jobellisiales M.J. D'souza & K.D. Hyde*

Jobellisiaceae Réblová

Jobellisia M.E. Barr

Other genera in Diaporthomycetidae

Ophiostomatales Benny & Kimbr.

Ophiostomataceae *Nannf.*

Fragosphaeria Shear

SubclassHypocreomycetidae O.E. Erikss. & Winka

Genera transferred to Hypocreomycetidae

Coronophorales genus *incertae sedis*

Tengiomyces Réblová*

Hypocreales genus incertae sedis

Sulcatistroma A.W. Ramaley*

SubclassSordariomycetidae O.E. Erikss. & Winka

Boliniales P.F. Cannon

Boliniaceae Rick

Apiocamarops Samuels & J.D. Rogers

Apiorhynchostoma Petr.

Camaropella Lar.N. Vassiljeva

Camarops P. Karst.

= *Bolinia* (Nitschke) Sacc.

Cornipulvina Huhndorf et al.

Endoxyla Fuckel

Mollicamarops Lar.N. Vassiljeva

Neohypodiscus J.D. Rogers et al.

Pseudovalsaria Spooner

Chaetosphaeriales Huhndorf, A.N. Mill. & F.A. Fernández

Helminthosphaeriaceae Samuels, Cand. & Magni

Echinosphaeria A.N. Mill. & Huhndorf

Helminthosphaeria Fuckel

Hilberina Huhndorf & A.N. Mill.

Ruzenia O. Hilber

Sordariales Chadef. ex D. Hawksw. & O.E. Erikss

Bombardiaceae S.K. Huang & K.D. Hyde*

Apodospora Cain & J.H. Mirza*

Bombardia (Fr.) P. Karst.*

Bombardioidea C. Moreau ex N. Lundqv.*

Fimetariella N. Lundq.*

Lasiosphaeriaceae Nannf.

Anopodium Lundq.

Bellojisia Réblová

Corylomyces Stchigel et al.

Lasiosphaeria Ces. & De Not.

Mammaria Ces. ex Rabenh.

Zopfiella G. Winter

Lasiosphaeridaceae S.K. Huang & K.D. Hyde*

Lasiosphaeris Clem.*

Podosporaceae X. Wei Wang & Houbraken

Cladorrhinum Sacc. & Marchal

Podospora Ces.

= *Schizothecium* Corda*

Triangularia Boedijn

= *Apiosordaria* Arx & W. Gams*

Sordariaceae G. Winter

Boothiella Lodhi & Mirza*

Guilliermondia Boud.

Neurospora Shear & B.O. Dodge

Pseudoneurospora Dania García et al.

Sordaria Ces & De Not.

Strattoniaceae S.K. Huang & K.D. Hyde*

Strattonia Cif.*

Zygospermellaceae S.K. Huang & K.D. Hyde*

Episternus Górz & Boroń*

Zygospermella Cain*

Other genera in Sordariales

Chaetomiaceae G. Winter

Stellatospora T. Ito & Nakagiri*

Neoschizotheciaceae S.K. Huang & K.D. Hyde*

Apodus Malloch & Cain*

Cercophora Fuckel*

Echria (N. Lundq.) Kruys et al.*

Immersiella A.N. Mill. & Huhndorf*

Jugulospora N. Lundq.*

Neoschizothecium S.K. Huang & K.D. Hyde*

Rinaldiella Deanna A. Sutton et al.*

Zygopleurage Boedijn*

Sordariales genera *incertae sedis*

Arnium Nitschke ex G. Winter*

Biconiosporella Schaumann*

Camptosphaeria Fuckel*

Diffractella Guarro et al.*

Emblemospora Jeng & J.C. Krug*

Eosphaeria Höhn.*

Isia D. Hawksw. & Manohar.

Lockerbia K.D. Hyde

Periamphispora J.C. Krug*

Ramophialophora M. Calduch et al.*

Reconditella Matzer & Hafellner

Roselliniopsis Matzer & Hafellner

Synaptospora Cain*

Tripterosporella Subram. & Lodha*

Other genera studied

SubclassXylariomycetidae O.E. Erikss. & Winka

Xylariales Nannf.

Diatrypaceae Nitschke

Monosporascus Pollack & Uecker

Sordariomycetes genus *incertae sedis*

Conidiotheca Réblová & L Mostert *

Ascomycota genera *incertae sedis*

Copromyces N. Lundq.*

Effetia Bartoli et al.*

Endophragmiella B. Sutton*

Tulipispora Révay & J. Gönczöl *

Table 2. Change of taxa placement from Wijayawardene et al. 2020 to present

Taxa	Taxa placement in Wijayawardene et al. 2020	Present placement
Jobellisiales M.J. D'souza & K.D. Hyde	**Hypocreomycetidae** O.E. Erikss. & Winka	**Diaporthomycetidae** Senan., Maharachch. & K.D. Hyde
Apodospora Cain & J.H. Mirza	**Lasiosphaeriaceae** Nannf.	**Bombardiaceae** S.K. Huang, Maharachch. & K.D. Hyde
Apodus Malloch & Cain	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Arnium Nitschke ex G. Winter	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Biconiosporella Schaumann	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Bombardia (Fr.) P. Karst.	**Lasiosphaeriaceae** Nannf.	**Bombardiaceae** S.K. Huang, Maharachch. & K.D. Hyde
Bombardioidea C. Moreau ex N. Lundqv.	**Lasiosphaeriaceae** Nannf.	**Bombardiaceae** S.K. Huang, Maharachch. & K.D. Hyde
Boothiella Lodhi & Mirza	**Sordariomycetes** genera *incertae sedis*	**Sordariaceae** G. Winter
Camptosphaeria Fuckel	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Cercophora Fuckel	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Conidiotheca Réblová & L Mostert	**Togniniaceae** Réblová, L. Mostert, W. Gams & Crous	**Sordariomycetes** genera *incertae sedis*
Copromyces N. Lundq.	**Sordariaceae** G. Winter	**Ascomycota** genera *incertae sedis*
Diffractella Guarro et al.	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Echria (N. Lundq.) Kruys et al.	Not mentioned	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Effetia Bartoli et al.	**Sordariaceae** G. Winter	**Ascomycota** genera *incertae sedis*
Emblemospora Jeng & J.C. Krug	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Endophragmiella B. Sutton	**Helminthosphaeriaceae** Samuels, Cand. & Magni.	**Ascomycota** genera *incertae sedis*
Eosphaeria Höhn.	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Episternus Górz & Boroń	**Lasiosphaeriaceae** Nannf.	**Zygospermellaceae** S.K. Huang, Maharachch. & K.D. Hyde
Fimetariella N. Lundq.	**Lasiosphaeriaceae** Nannf.	**Bombardiaceae** S.K. Huang, Maharachch. & K.D. Hyde

Immersiella A.N. Mill. & Huhndorf	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Jugulospora N. Lundq.	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Lasiosphaeris Clem.	**Sordariales** genera *incertae sedis*	**Lasiosphaeridaceae** S.K. Huang, Maharachch. & K.D. Hyde
Periamphispora J.C. Krug	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Ramophialophora M. Calduch et al.	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Rinaldiella Deanna A. Sutton et al.	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Stellatospora T. Ito & Nakagiri	**Sordariaceae** G. Winter	**Chaetomiaceae** G. Winter
Strattonia Cif.	**Lasiosphaeriaceae** Nannf.	**Strattoniaceae** S.K. Huang, Maharachch. & K.D. Hyde
Sulcatistroma A.W. Ramaley	**Calosphaeriales** genera *incertae sedis*	**Hypocreales** genera *incertae sedis*
Synaptospora Cain	**Helminthosphaeriaceae** Samuels, Cand. & Magni.	**Sordariales** genera *incertae sedis*
Tengiomyces Réblová	**Helminthosphaeriaceae** Samuels, Cand. & Magni.	**Coronophorales** genera *incertae sedis*
Tripterosporella Subram. & Lodha	**Lasiosphaeriaceae** Nannf.	**Sordariales** genera *incertae sedis*
Tulipispora Révay & J. Gönczöl	**Sordariomycetes** genera *incertae sedis*	**Ascomycota** genera *incertae sedis*
Zygopleurage Boedijn	**Lasiosphaeriaceae** Nannf.	**Neoschizotheciaceae** S.K. Huang & K.D. Hyde
Zygospermella Cain	**Lasiosphaeriaceae** Nannf.	**Zygospermellaceae** S.K. Huang, Maharachch. & K.D. Hyde

Diaporthomycetidae Senan., Maharachch. & K.D. Hyde, Fungal Diversity 72: 208 (2015)

Maharachchikumbura et al. (2015) introduced the subclass Diaporthomycetidae, which is related to Sordariomycetidae based on phylogenetic analyses (Hongsanan et al. 2017; Hyde et al. 2017, 2020; this study). There are 15 orders in this subclass, viz. Annulatascales, Atractosporales, Calosphaeriales, Diaporthales, Distoseptisporales, Jobellisiales, Magnaporthales, Myrmecridiales, Ophiostomatales, Pararamichloridiales, Phomatosporales, Sporidesmiales, Tirisporellales, Togniniales and Xenospadicoidales (Maharachchikumbura et al. 2015; Hyde et al. 2020; this study, Fig. 1) and they are widely distributed as saprobes, pathogens, or endophytes in aquatic or/and terrestrial habitats (Hongsanan et al. 2017; Hyde et al. 2017, 2020). The known asexual morphs in this subclass have been linked to hyphomycetous or coelomycetous fungi generally forming phialidic conidiogenesis and holoblastic conidiogenous cells (Zhang and Blackwell 2001; Vijaykrishna et al. 2004; Réblová et al. 2004, 2015; Najwa et al. 2012; Senanayake et al. 2017).

Calosphaeriales M.E. Barr, Mycologia 75(1): 11 (1983)

The genera in Calosphaeriales are characterized by black ascomata with an eccentric papilla or long neck, with conspicuously septate, tapered paraphyses, numerous, clavate or subglobose asci borne from fascicled or spicate ascogenous hyphae, hyaline, allantoid to subcylindrical ascospores and phialidic hyphomycetous asexual morphs (Barr 1985; Réblová et al. 2004, 2015; Réblová and Mostert 2007). Calosphaeriales and Togniniales are similar in morphology, but are phylogenetically distant (Réblová et al. 2015; this study, Fig. 1). Ascogenous hypha, on which the asci form, are conspicuous character of members in Calosphaeriales and Togniniales, and is an important feature to distinguish the genera in these two orders (Barr 1985; Mostert et al. 2006; Damm et al. 2008; Réblová et al. 2015). Two families are included in this order, Calosphaeriaceae with four genera, and the monotypic Pleurostomataceae (Wijayawardene et al. 2020; this study). Jobellisiaceae was transferred to Calosphaeriales based on multigene analysis (Hongsanan et al. 2017). However, Hongsanan et al. (2017) mentioned that Jobellisiaceae is an unstable group and it is closely related to Calosphaeriales, Diaporthales and Togniniales (Hyde et al. 2017; this study, Fig. 1). We place Jobellisiaceae under Jobellisiales (see notes for Jobellisiales). Calosphaeriales is sister to Togniniales in Diaporthomycetidae (Fig. 1).

Calosphaeriaceae Munk, Dansk bot. Ark. 17(no. 1): 278 (1957)

Saprobic on dead wood or leaves in aquatic and/or terrestrial habitats, sometimes fungicolous. **Sexual morph**: *Ascostromata* semi-immersed to erumpent through the surface of the host. *Ascomata* perithecial, gregarious or scattered or solitary, immersed, semi-immersed or superficial, globose to subglobose, brown to black, coriaceous to membranaceous, tuberculate or smooth or with hyphal coating, ostiolate, with long or short necks. *Peridium* coriaceous or membranaceous, composed of hyaline to brown cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, broad, cylindrical, septate, tapered. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with obovoid to obpyriform cells formed in sympodial succession, growing in dense clusters and each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate to subglobose, pedicellate, apex rounded or truncate, with or without an apical ring. *Ascospores* bi-seriate to overlapping, allantoid to ellipsoidal, straight to slightly curved, mostly aseptate, sometimes multi-septate and producing numerous ascoconidia when mature, hyaline to pale brown, smooth-walled, sometimes with guttules. *Ascoconidia* hyaline, allantoid to ellipsoidal, aseptate, smooth-walled, guttulate. **Asexual morph**: Hyphomycetous. *Conidiophores* micronematous or mononematous, hyaline, straight or flexuous, septate, branched or unbranched.

Phialides enteroblastic or holoblastic, monophialidic, hyaline, smooth-walled. *Conidia* aggregated, hyaline, aseptate, cylindrical to allantoid, with or without guttules (adapted from Réblová et al. 2004, 2015, 2016; Maharachchikumbura et al. 2016).

Type genus: ***Calosphaeria*** Tul. & C. Tul. 1863

Notes: *Calosphaeria*, *Conidiotheca*, *Jattaea*, *Kacosphaeria*, *Sulcatistroma*, *Togniniella* and *Tulipisopora* have traditionally been accommodated Calosphaeriaceae (Maharachchikumbura et al. 2015, 2016; Wijayawardene et al. 2018). Most species are wood inhabitants and are mostly reported from Asia and Europe (Barr 1985; Damm et al. 2008; Réblová et al. 2015). Réblová et al. (2004) established *Calosphaeriophora* as a member of Calosphaeriaceae, typified by *Cal. pulchella*. Subsequently, according to nomenclatural priority, Réblová et al. (2016) recommended that *Calosphaeriophora* should be synonymized under *Calosphaeria* (Réblová et al. 2004, 2015, 2016). Vu et al. (2019) sequenced the ex-type strain of *Sulcatistroma* and found that it is more closely related to *Allantonectria* (Nectriaceae) (Ramaley 2005; Hirooka et al. 2012; this study). *Kacosphaeria* was accepted as a member of Calosphaeriaceae based on the similarity of clavate asci with *Calosphaeria* (Spegazzini 1888). We were unable to obtain authentic material of *Kacosphaeria* and its description lacks sufficient detail to prove that this genus belongs to Calosphaeriaceae. Therefore, we propose to transfer it to Calosphaeriales genera *incertae sedis*. The *Tulipispora* has been placed in Calosphaeriaceae without molecular data (Maharachchikumbura et al. 2015, 2016). This hyphomycetous genus has multi-septate conidia which is different from other members of Calosphaeriaceae. Genera such as *Triscelophorus* and *Triramulispora* have multi-septate conidia which are similar to *Tulipispora* (Révay et al. 2009). Thus, we place *Tulipispora* in Ascomycota genera *incertae sedis*. The monotypic *Conidiotheca* is similar to *Jattaea* and *Pleonectria* (Nectriaceae) in having ellipsoidal to cylindrical ascospores producing ascoconidia (a conidium formed directly from an ascospore, especially when still within the ascus) (Hirooka et al. 2012). Molecular data of *Conidiotheca* is unavailable and it has black ascomata and muriform ascospores, instead of red ascomata in *Pleonectria* or transverse-septate ascospores in *Jattaea*. Therefore, we place this genus in Sordariomycetes genera *incertae sedis* pending further studies. Réblová et al. (2015) introduced *Flabellascus* as a member of Calosphaeriaceae based on morphological and phylogenetic analyses. Available phylogenetic data for Calosphaeriaceae, including *Calosphaeria*, *Flabellascus*, *Jattaea* and *Togniniella*, are shown in Fig. 2 and forms a sister clade to Pleurostomaceae in Calosphaeriales (Fig. 1).

Calosphaeria Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 108 (1863)

Saprobic on dead wood. **Sexual morph**: *Ascomata* perithecial, gregarious or solitary, immersed to semi-immersed, globose to subglobose, brown to black, coriaceous to membranaceous, tuberculate or smooth or with hyphal coating. *Necks* long or short, oblong to subglobose, ostiolate, periphysate. *Peridium* comprising two layers, outer layer coriaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, broad, cylindrical, septate, longer than the asci. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with ovoid to ellipsoidal cells, growing in sympodial succession, in dense clusters and each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate, pedicellate, apex rounded or truncate, with or without J- apical ring. *Ascospores* bi-seriate to overlapping in the upper part of ascus, allantoid to ellipsoidal, straight to slightly curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Conidiophores* micronematous, hyaline, straight or flexuous, septate, branched. *Phialides* enteroblastic or holoblastic, monophialidic, elongate ampulliform to subcylindrical, hyaline, smooth-walled. *Conidia* aggregated, hyaline, aseptate, cylindrical to allantoid, with or without guttules (adapted from Barr et al. 1993; Réblová et al. 2004).

Notes: *Calosphaeria* has been included in various families, such as Diatrypaceae and Gnomoniaceae, based on the tiny asci and allantoid ascospores (Barr et al. 1993; Réblová et al. 2004). Tulasne and Tulasne (1863) established *Calosphaeria*, typified by *C. princeps*. Over 80 species of *Calosphaeria* have been found on wood in freshwater and/or terrestrial habitats in America, Asia, Australia and Europe (Barr 1985; Réblová et al. 2004; Damm et al. 2008), but few have molecular data. Damm et al. (2008) and Réblová et al. (2004) sequenced *C. africana* and *C. pulchella*, and these *Calosphaeria* species form a sister clade to *Jattaea* in Calosphaeriaceae based on multi-gene analysis (0.98BY, Fig. 2).

Type species: ***Calosphaeria princeps*** Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 109 (1863)

Basionym: *Sphaeria pulchella* Pers., Neues Mag. Bot. 1: 83 (1794)

Facesoffungi number: *****??; Fig. 3

Saprobic on dead wood. **Sexual morph**: *Ascomata* 300–450 µm (n = 10) diam. at the venter, perithecial, gregarious, immersed, the long necks converging radially and erumpent through the bark of the host, globose, brown to dark brown, coriaceous, glabrous. *Necks* 1.5–2.5 × 0.1–0.2 mm ($\bar{x}$ = 2 × 0.15 mm, n = 10), coriaceous, central, fasciculate, dark brown to black, smooth, wall composed of brown to hyaline cells of *textura epidermoidea* to *textura prismatica* (45–75 µm wide, n = 20), ostiole with hyaline periphyses. *Peridium* 40–80 µm ($\bar{x}$ = 55 µm, n = 30) wide at venter-walled, comprising two layers, outer layer coriaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* 2–4.5 µm ($\bar{x}$ = 3.5 µm, n = 30) wide, numerous, cylindrical, septate, slightly constricted at the septa, branched, apically rounded, tapering, longer than the asci. *Ascogenous hyphae* discrete, elongate, hyaline, smooth-walled, branched, with hyaline, ovoid to ellipsoidal cells, 10–25 × 1.5–4 µm ($\bar{x}$ = 15.5 × 3 µm, n = 20), growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* 30–45(–50) × 3–5 µm ($\bar{x}$ = 40 × 4 µm, n = 50), 8-spored, unitunicate, clavate, very long pedicellate, apex blunt, without an apical ring. *Ascospores* 3.5–5.5 × 0.5–1.5 µm ($\bar{x}$ = 4 × 1 µm, n = 50), overlapping near the apex, hyaline, allantoid to ellipsoidal, straight to slightly curved, aseptate, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous.

Conidiophores micronematous, hyaline, straight or flexuous, septate. *Phialides* terminal or intercalary, monophialidic, ampulliform to subcylindrical, hyaline, smooth-walled. *Conidia* hyaline, aseptate, cylindrical to allantoid, with guttules (adapted from Réblová et al. 2004).

Material examined: USA, Kansas, Stockton, on the inner bark of *Prunus cerasus,* 5 October 1906, E. Bartholomew (S-F263455); USA, Missouri, Emma, on dead trunks of *Persica vulgaris*, November 1903, C.H. Demetrio (S-F263457); France, 86 Vienne, Poitiers, Pictavii, on trunks of cherry tree, 1840 (PC-MNHN-PC-PC0167696); France, 49 Maine-et-Loire, Angers, on trunks of cherry tree, J.P. Guépin (PC-MNHN-PC-PC0167711).

Known hosts and distribution: On decayed wood of *Betula*, *Cerasus* and *Prunus* in France (type locality), Germany and North America (Persoon 1794; Fries 1823a; Tulasne and Tulasne 1863; Schröter 1897; Barr 1985); on branches of *Solanum auriculatum* in South Africa (Doidge 1950).

Notes: Persoon (1794) introduced *Sphaeria pulchella* collected on decayed wood of *Cerasus* and *Prunus* and Fries (1823a) made further collections on *Betula* and *Prunus* in America. Tulasne and Tulasne (1863) established *Calosphaeria* and transferred *Sphaeria pulchella* to *Calosphaeria princeps* as the generic type. Schröter (1897) subsequently re-named *C. princeps* as *Calosphaeria pulchella* as type species, but this view was refuted by Clements and Shear (1931) and Barr (1985). Damm et al. (2008) reported that the ascospore size of '*Calosphaeria princeps*' differs from '*Calosphaeria pulchella*'. In this study, based on priority, the oldest name *Calosphaeria princeps* is recommended for use. The type material could not be obtained. Therefore, we re-examined the authentic samples collected from France and the USA. They are morphologically similar to *C. princeps* as described by Tulasne and Tulasne (1863). Phylogenetically, in this study, *C. pulchella* (strain CBS 115999) is considered as *C. princeps* and is sister to *C. africana* (100%ML/1.00BY, Fig. 2). However, more fresh collections and phylogenetic information are expected to determine the affinities of *Calosphaeria* species.

Flabellascus Réblová, in Réblová, Jaklitsch, Réblová& Štěpánek, PLoS ONE 10(12): e0144616, 15 (2015)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, immersed to semi-immersed, subglobose, ostiolate, with elongate necks, periphysate. *Peridium* coriaceous to membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, broad, cylindrical, septate, tapering, longer than the asci. *Ascogenous hyphae* discrete, hyaline, smooth-walled, elongate, branched, with ellipsoidal to obpyriform cells, growing in sympodial succession, in dense clusters and each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate, pedicellate, thickened at the apex. *Ascospores* bi-seriate to overlapping in the upper part of ascus, hyaline, allantoid to ellipsoidal, smooth-walled, aseptate. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous to semi-macronematous, brown, unbranched or branched, with terminate in a single or multiple verticillate phialide(s). *Phialides* ampulliform to elongate-ampulliform, hyaline to pale brown, tapering. *Conidia* aggregated, hyaline, aseptate, allantoid to reniform (adapted from Réblová et al. 2015).

Notes: *Flabellascus* is monotypic. Its sexual morph is similar to *Jattaea* and different asexual morphs distinguish them. The former has macronematous and branched conidiophores, whereas the latter generally has micronematous and unbranched conidiophores (Réblová et al. 2015). In our study, *Flabellascus* is sister to *Togniniella* in Calosphaeriaceae (100%ML/1.00BY, Fig. 2).

Type species: ***Flabellascus tenuirostris*** Réblová, in Réblová, Jaklitsch, Réblová & Štěpánek, PLoS ONE 10(12): e0144616, 15 (2015)

Fig. 4 a–b

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, immersed, the necks converging radially and erumpent through the bark of the host, subglobose, ostiolate, with elongate necks, periphysate. *Peridium* coriaceous to membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, broad, cylindrical, septate, tapering, longer than the asci. *Ascogenous hyphae* discrete, hyaline, smooth-walled, elongate, branched, with ellipsoidal to obpyriform cells, growing in sympodial succession, in dense clusters and each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate, pedicellate, conspicuously thickened at the apex. *Ascospores* bi-seriate to overlapping in the upper part of ascus, hyaline, allantoid to ellipsoidal, smooth-walled, aseptate. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous to semi-macronematous, brown, unbranched or branched, with terminate in a single phialide or 2–3 verticillate phialides. *Phialides* ampulliform to elongate-ampulliform, hyaline to pale brown, gradually tapering. *Conidia* aggregated, hyaline, aseptate, allantoid to reniform (adapted from Réblová et al. 2015).

Known hosts and distribution: On wood of *Fagus sylvatica* and *Quercus cerris* in Czech Republic (type locality) (Réblová et al. 2015).

Notes: Réblová et al. (2015) introduced the characteristics of *Flabellascus tenuirostris* in detail, and analyzed four strains with ITS, LSU, TUB and RPB2 regions. The drawing is provided for the type species (Fig. 4 a–b), based on Réblová et al. (2015).

Jattaea Berl., Icon. fung. (Abellini) 3(1-2): 6 (1900)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, aggregated to scattered, immersed to semi-immersed, often associated with other dead ascomata, brown to dark brown, globose to subglobose, membranaceous, glabrous or covered with hyphae, ostiolate, with long or short necks, periphysate. *Peridium* comprising two layers, outer layer composed of brown to pale brown cells of *textura angularis* to *textura prismatica*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, broad, cylindrical, septate. *Ascogenous hyphae* discrete, hyaline, smooth-walled, with ellipsoidal to obpyriform cells, growing in sympodial succession, in dense clusters and each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate, pedicellate, apex obtuse. *Ascospores* bi-seriate to overlapping, hyaline, allantoid to ellipsoidal, 0–multi-septate, smooth-walled, sometimes with guttules, sometimes producing numerous ascoconidia when mature. *Ascoconidia* hyaline, allantoid to ellipsoidal, aseptate, smooth-walled, guttulate. **Asexual morph**: Hyphomycetous, *Conidiophores* hyaline to pale brown, septate, unbranched to branched. *Phialides* monophialidic, elongate to ampulliform, fusiform, smooth-walled. *Conidia* hyaline, ovoid to suballantoid, straight or slightly curved, aseptate, smooth-walled (adapted from Berlese 1900; Réblová 2011).

Notes: *Jattaea* and *Wegelina* were proposed as independent genera (Clements and Shear 1931). Subsequently, Réblová (2011) showed that the type *Wegelina discreta* and *Jattaea* species are congeneric based on DNA sequence analyses, and reduced *Wegelina* to a synonym of *Jattaea* (Réblová 2011). *Jattaea* resembles *Calosphaeria*, *Flabellascus*, *Pleurostoma* and *Togniniella* in having clavate asci and allantoid ascospores (Réblová 2011; Huang et al. 2018). *Jattaea* species are aggregated and sister to *Calosphaeria* (0.98BY) and distinct from *Flabellascus*, *Pleurostoma* and *Togniniella* (Fig. 2).

Type species: ***Jattaea algeriensis*** Berl., Icon. fung. (Abellini) 3(1-2): 6 (1900)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, aggregated to scattered, immersed, black, glabrous, ostiolate, with necks. *Asci* 8-spored, unitunicate, cylindrical. *Ascospores* hyaline, allantoid, aseptate, smooth-walled. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidia* hyaline, ovoid to suballantoid, aseptate, smooth-walled (adapted from Berlese 1900; Damm et al. 2008).

Known hosts and distribution: On decayed stems or wood of *Rubus* in Algeria (type locality) (Berlese 1900).

Notes: *Jattaea algeriensis* was reported on the sarmentum of *Rubus fruticosus* in Algeria (Berlese 1900). Réblová (2011) used CBS 120871 to stand for *J. algeriensis*. However, strain CBS 120871 was sequenced from type material of *Jattaea prunicola* (Damm et al. 2008). The asci of *J. algeriensis* is clavate with long pedicel which is different from *J. prunicola* with cylindrical asci (Damm et al. 2008). We were unable to obtain authentic materials or find a reliable illustration. Therefore, we re-examined lectotype of *Jattaea discreta*, which is similar to *J. algeriensis* (Damm et al. 2008; Réblová 2011), and provide an illustration. Fresh collections and phylogenetic data of *J. algeriensis* are needed to determine its taxonomic placement.

Jattaea discreta (Berl.) Réblová, Fungal Diversity 49: 179 (2011)

Basionym: *Wegelina discreta* Berl., Icon. fung. (Abellini) 3(1-2): 8 (1900)

Facesoffungi number: *****; Fig. 5

Saprobic on wood. **Sexual morph**: *Ascomata* 200–350 μm (n = 10) diam. at the venter, perithecial, aggregated to scattered, immersed, the elongate necks converging radially and erumpent through the bark of the host, often associated with other dead ascomata, brown to dark brown, globose to subglobose, glabrous. *Necks* 100–150 × 400–700 *µm* ($\bar{x}$ = 130 × 550 µm, n = 10), central, ostiolate, periphysate, straight or slightly flexuous, rounded to slightly tapering at the apex, the wall composed of dark brown to brown cells of *textura epidermoidea* to *textura prismatica*. *Peridium* 20–55 µm ($\bar{x}$ = 35 µm, n = 30) wide at venter-walled, comprising two layers, outer layer composed of brown to pale brown cells of *textura angularis* to *textura prismatica*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 1–2 µm wide, numerous, broad, cylindrical, septate, slightly constricted at the septa, unbranched, apex rounded. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, ellipsoidal to obpyriform cells, 3–4.5 × 1.5–2.5 µm ($\bar{x}$ = 3.5 × 2 µm, n = 20), growing in sympodial succession, in dense clusters and each giving rise to an ascus. *Asci* (15–)17–23(–30) × 2–4 µm ($\bar{x}$ = 20 × 3 µm, n = 50), 8-spored, unitunicate, clavate, apex obtuse, without apical ring, long pedicellate. *Ascospores* 4–6 × 1–2 µm ($\bar{x}$ = 5 × 1.5 µm, n = 50), bi-seriate to overlapping, hyaline, allantoid to ellipsoidal, slightly curved, aseptate, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Conidiophores* hyaline to pale brown, erect, septate, unbranched or branched. *Phialides* monophialidic, terminal to intercalary, elongate to ampulliform, fusiform, narrowed at the apex, smooth-walled, hyaline, with cylindrical to ampulliform adelophialides. *Conidia* hyaline, ovoid to suballantoid, straight or slightly curved, aseptate, smooth-walled, aggregated, accumulating in slimy masses on the apex of the phialides (adapted from Réblová 2011).

Material examined: Italy, Veneto, Belluno, on decaying wood of a branch of *Acer pseudoplatanus*, Autumn 1879, (NY-00912077, **lectotype**).

Known hosts and distribution: On decayed wood of *Crataegus*, *Acer*, *Quercus*, *Vaccinium* in France, Italy (type locality) and USA (Berlese 1900; Réblová 2006, 2007; 2011).

Notes: *Wegelina* species have been transferred to *Barbatosphaeria*, *Ceratostomella* and *Jattaea* (Kummer et al. 2005; Réblová 2006, 2007, 2011). *Jattaea* and *Wegelina* have similar characters with clavate asci and hyaline, allantoid ascospores, but differ in the length of the ascomata's neck (Berlese 1900). Réblová (2011) confirmed that *Wegelina discreta* is a member of *Jattaea*. This sample (NY-00912077) was initially determined as *Calosphaeria wahlenbergii*, then identified as an isotype of *Wegelina discreta* by Barr in 1984 (mentioned in the label of material), and designated as a lectotype of *J. discreta* by Réblová (2011).

Togniniella Réblová, L. Mostert, W. Gams & Crous, Stud. Mycol. 50(2): 543 (2004)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, gregarious or solitary, immersed to semi-immersed, globose to subglobose, glabrous, brown to black, carbonaceous to coriaceous, immersed, the long necks erumpent through the bark of the host. *Necks* central, cylindrical or slightly flexuous, black, smooth, apex broadly rounded, ostiolate, periphysate. *Peridium* comprising two layers, outer layer carbonaceous or coriaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* unbranched, broad, cylindrical, septate, slightly constricted at the septa, tapering, with a rounded apex, longer than asci. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, obovoid to ellipsoidal cells, growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* 8-spored, unitunicate, clavate, pedicellate, apex obtuse, without apical ring. *Ascospores* overlapping near the apex, allantoid to suballantoid, straight to slightly curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous or micronematous, usually arising from aerial hyphae, erect, hyaline to pale brown, unbranched or branched, straight or flexuous, septate, constricted at the septa. *Phialides* monophialidic or polyphialidic, terminal or intercalary, subcylindrical to ampulliform, tapering, smooth-walled, hyaline, with cylindrical adelophialides. *Conidia* hyaline, obovoid to reniform, straight or slightly curved, aseptate, smooth-walled, accumulating in slimy masses on the apex of the phialides (adapted from Réblová et al. 2004).

Notes: The monotypic *Togniniella* initially typified by *T. acerosa*, and its asexual morph was introduced as *Phaeocrella acerosa* (Réblová et al. 2004). Subsequently, the name *T. acerosa* was corrected as *T. microspora* (Réblová 2011; Réblová et al. 2015). Réblová et al. (2016) recommended that *Phaeocrella* should be synonymized under *Togniniella*, according to nomenclatural priority. This genus is characterized by clavate, tiny asci, allantoid ascospores and verrucous phialides with reniform conidia (Réblová et al. 2004, 2015, 2016; Réblová 2011), and phylogenetic information is available (Réblová et al. 2004; Damm et al. 2008; Vu et al. 2019). In this study, *Togniniella* is sister to *Flabellascus* (100%ML/1.00BY, Fig. 2).

Type species: ***Togniniella microspora*** (Ellis & Everh.) Réblová, Fungal Diversity 49: 193 (2011)

Basionym: *Ceratostomella microspora* Ellis & Everh., Proc. Acad. nat. Sci. Philad. 45: 444 (1894)

Facesoffungi number: *****??; Fig. 6

Saprobic on wood. **Sexual morph**: *Ascomata* 200–400 µm (250 µm, n = 10) diam. at the venter, perithecial, gregarious or solitary, immersed to semi-immersed, the long necks erumpent through the bark of the host, globose to subglobose, glabrous, brown to black, carbonaceous to coriaceous. *Necks* 550–1000 × 55–75 µm ($\bar{x}$ = 755 × 65 µm, n = 10), carbonaceous, central, cylindrical or slightly flexuous, black, smooth, apex broadly rounded, ostiole with hyaline periphyses. *Peridium* 20–30 µm ($\bar{x}$ = 25 µm, n = 30) wide at venter-walled, comprising two layers, outer layer carbonaceous to coriaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* 7–8 µm ($\bar{x}$ = 7.5 µm, n = 30) wide near the base, 1.5–5 µm ($\bar{x}$ = 2.5 µm, n = 30) wide near the apex, unbranched, broad, cylindrical, septate, slightly constricted at the septa, tapering, with a rounded apex, longer than asci. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, obovoid to ellipsoidal cells, 3–4.5 × 1.5–2.5 µm ($\bar{x}$ = 3.5 × 2 µm, n = 20), growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* 10–16(–20) × 2–5 µm ($\bar{x}$ = 15 × 3 µm, n = 50), 8-spored, unitunicate, clavate, long pedicellate, apex obtuse, apical ring absent. *Ascospores* 2.5–4 × 0.2–0.5 µm ($\bar{x}$ = 3.5 × 0.3 µm, n = 50), overlapping near the apex, allantoid to suballantoid, straight to slightly curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous or micronematous, usually arising from aerial hyphae, erect, hyaline to pale brown, unbranched or branched, straight or flexuous, 1–4-septate, constricted at the septa. *Phialides* monophialidic or polyphialidic, terminal to intercalary, subcylindrical to ampulliform, tapering, smooth-walled, hyaline, with cylindrical adelophialides. *Conidia* hyaline, obovoid to reniform, straight or slightly curved, aseptate, smooth-walled, aggregated into a round at the apex of phialides (adapted from Réblová et al. 2004).

Material examined: New Zealand, South Island, Tasman Province, Nelson Lake National Park, St. Arnaud, Lake Rotoiti, Lakehead track ca. 1.5 km SE of NP Headquarters, on decayed wood of a trunk of *Nothofagus* sp., 22 February 2003, M. Réblová (PDD-81431, **holotype**); New Zealand, West Coast Province, Harihari 73 km SW of Hokitika, Saltwater Forest, Poerua River Valley, on decayed wood, 12 March 2003, M. Réblová (PDD-81432).

Known hosts and distribution: On decayed wood of *Nothofagus*, *Populus* in Canada (type locality) and New Zealand (Réblová et al. 2004; Réblová 2011).

Notes: *Togniniella microspora* is sister to *Flabellascus tenuirostris* (Réblová et al. 2004; Damm et al. 2008; Vu et al. 2019; 100%ML/1.00BY, Fig. 2). Ascomata of 81431 and 81432 are fragile, almost no ascoma with a long intact neck is seen, and most features are evanescent. We provided photo of observable characters and complete the description through Réblová et al. (2004).

Pleurostomataceae Réblová, L. Mostert, W. Gams & Crous, Stud. Mycol. 50(2): 540 (2004)

Saprobic on wood and soil; *parasitic* in humans. **Sexual morph**: *Ascomata* perithecial, gregarious or solitary, immersed or superficial, globose to subglobose, dark brown to black, glabrous, ostiolate, with papilla, periphysate. *Peridium* outer layer coriaceous, composed of dark brown to pale brown cells of *textura intricata* to *textura epidermoidea* to *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* not observed. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, ellipsoidal cells, growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* multi-spored, unitunicate, reniform to ellipsoidal, with blunt or rounded, thickened apex. *Ascospores* overlapping, cylindrical to allantoid, straight to curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Mycelium* composed of branched, septate, tuberculate or smooth-walled, hyaline to brown hyphae. *Conidiophores* usually arising from aerial or submerged hyphae, erect, septate, straight or flexuous, hyaline to brown. *Phialides* monophialidic or polyphialidic, with inconspicuous or flared collarettes, smooth-walled, hyaline, cylindrical. *Conidia* hyaline, ovoid to suballantoid, straight or slightly curved, aseptate, smooth-walled, accumulating in slimy masses on the apex of the phialides (adapted from Vijaykrishna et al. 2004).

Type genus: ***Pleurostoma*** Tul. & C. Tul. 1863

Notes: Tulasne and Tulasne (1863) established *Pleurostoma candollei* as the generic type. Vijaykrishna et al. (2004) introduced a second species *P*. *ootheca* and its asexual morph *Pleurostomophora ootheca*. Subsequently, three more species, *Pleurostomophora ochraceum* (human pathogen), *Ple*. *repens* and *Ple*. *richardsiae*, were confirmed with molecular data (Vijaykrishna et al. 2004; Najwa et al. 2012). Pleurostomataceae was proposed as an independent family in Calosphaeriales with two genera *Pleurostoma* and *Pleurostomophora* based on morphological and molecular analysis (Réblová et al. 2004). Réblová et al. (2015, 2016) recommended that the asexual *Pleurostomophora* be reduced as a synonym to *Pleurostoma* based on phylogenetic analysis and to maintain nomenclatural stability. The monotypic nature of Pleurostomataceae is characterized by branched ascogenous hyphae, allantoid ascospores and ovoid conidia, which is similar to Calosphaeriaceae, but the former has short-necked ascomata and reniform asci, and the latter has long-necked ascomata and clavate asci. Pleurostomataceae was revised based on morphology and phylogenetic analysis and it is confirmed as a sister family to Calosphaeriaceae in Calosphaeriales (100%ML/1.00BY, Fig. 2).

Pleurostoma Tul. & C. Tul., Select. fung. carpol. (Paris) 2: 247 (1863)

Saprobic on wood and soil; *parasitic* in humans. **Sexual morph**: *Ascomata* perithecial, gregarious or solitary, at first immersed, then becoming superficial, globose to subglobose, dark brown to black, coriaceous, glabrous, ostiolate, with papilla, periphysate. *Peridium* comprising three layers, outer layer coriaceous, composed of dark brown to pale brown cells of *textura intricata* to *textura epidermoidea*; middle layer coriaceous, composed of brown cells of *textura epidermoidea* to *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* not observed. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, ellipsoidal cells, growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* multi-spored, unitunicate, reniform to ellipsoidal, producing bristle-like pedicel when separating the ascogenous hyphae, with blunt or rounded and thickened apex. *Ascospores* overlapping, cylindrical to allantoid, straight to curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Hyphomycetous. *Mycelium* composed of branched, septate, tuberculate or smooth-walled, hyaline to brown hyphae. *Conidiophores* usually arising from aerial or submerged hyphae, erect, septate, straight or flexuous, hyaline to brown. *Phialides* monophialidic or polyphialidic, with inconspicuous or flared collarettes, smooth-walled, hyaline, cylindrical. *Conidia* hyaline, ovoid to suballantoid, straight or slightly curved, aseptate, smooth-walled, accumulating in slimy masses on the apex of the phialides (adapted from Tulasne and Tulasne 1863; Vijaykrishna et al. 2004).

Notes: *Pleurostoma* is characterized by glabrous, black ascomata, reniform to ellipsoidal asci with a thickened apex, cylindrical to allantoid ascospores and a phialophora-like asexual morph (Réblová et al. 2004, 2015, 2016; Vijaykrishna et al. 2004; Najwa et al. 2012). Two asexual species, *Pleurostoma minimum* and *P*. *vibratile*, were transferred to *Phaeoacremonium* based on phylogenetic analysis (Gramaje et al. 2015). Thus, *Pleurostoma* accommodates five species, three have been reported as asexual (*P. repens*, *P. richardsiae* and *P. ochraceum*), one sexual (*P. candollei*) and one holomorphic species (*P. ootheca*) (Tulasne and Tulasne 1863; Vijaykrishna et al. 2004; Najwa et al. 2012; Réblová et al. 2015).

Type species: ***Pleurostoma candollei*** Tul. & C. Tul. [as 'candollii'], Select. fung. carpol. (Paris) 2: 247 (1863)

Facesoffungi number: *****??; Fig. 7

Saprobic on decorticated wood. **Sexual morph**: *Ascomata* 470–520 × 370–420 μm ($\bar{x}$ = 500 × 400 μm, n = 10), perithecial, gregarious or solitary, semi-immersed or superficial, globose to subglobose, dark brown to black, coriaceous, glabrous, ostiolate papilla, central, periphysate. *Peridium* 35–95 μm ($\bar{x}$ = 60 μm, n = 30) wide, comprising three layers, outer layer coriaceous, composed of dark brown to pale brown cells of *textura intricata* to *textura epidermoidea*; middle layer coriaceous, composed of brown cells of *textura epidermoidea* to *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* not observed. *Ascogenous hyphae* discrete, hyaline, smooth-walled, branched, with hyaline, ellipsoidal cells, 1.5–4.5 × 1.5–3 μm ($\bar{x}$ = 2.5 × 2 μm, n = 20), growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* (15–)18–25(–35) × 6.5–11.5 μm ($\bar{x}$ = 23 × 8.5 μm, n = 50), multi-spored, unitunicate, reniform to ellipsoidal, producing bristle-like pedicel when separating the ascogenous hyphae, with rounded and asymmetrically thickened apex. *Ascospores* 2.5–4 × 0.5–1.5 μm ($\bar{x}$ = 3 × 1 μm, n = 50), overlapping, cylindrical to allantoid, straight to curved, aseptate, hyaline, smooth-walled, sometimes with guttules. **Asexual morph**: Undetermined.

Material examined: France, 92 Hauts-de-Seine, Chaville, on dead wood of *Quercus* sp., 8 March 1859 (PC-MNHN-PC-PC0167640, **holotype**); USA, Massachusetts, Medford, on inner surface of bark of standing beech tree, 20 April 1936, G.D. Darker (S-F21567).

Known hosts and distribution: On decayed and decorticated wood of *Quercus* in France (type locality), North America (Tulasne and Tulasne 1863; Bates et al. 2018).

Notes: Tulasne and Tulasne (1863) examined specimens of rotting bark-less oak collected in Chaville, France in the winter and introduced *Pleurostoma candollei*. We re-examined the specimen, PC0167640, which was collected on decorticated wood of *Quercus* at Chaville in March 1859. This sample was named *Sphaeria latericollis* DC. and *Sphaeria spermoides*, and finally determined as *Pleurostoma candollei* (mentioned in the label of material). This information is similar to the history of type material of *P. candollei* mentioned in Tulasne and Tulasne (1863). Thus, we re-examined the authentic material of PC0167640 and designated that it is the holotype of *P. candollei*.

Tulasne and Tulasne (1863) also found a kind of villiform, brown to greyish mycelium with branched conidiophores and aggregated, terminal, slender, straight or curved conidia in nature on the same specimen (Fig. 7 r). However, cultural characteristics and phylogenetic analysis have not confirmed the relationship between this hyphomycetous fungus and *P. candollei*. We could not find any asexual taxon on the materials. The hand-drawn provided for this hyphomycete (Fig. 7 r) is based on Tulasne and Tulasne (1863).

Calosphaeriales genera *incertae sedis*

Kacosphaeria Speg., Boln Acad. nac. Cienc. Córdoba 11(2): 214 (1887) [1888]

Saprobic on wood. **Sexual morph** *Ascomata* perithecial, aggregated, discoid, immersed to erumpent through the bark of the host, black, glabrous, thick-walled, with short necks. *Asci* 8-spored, unitunicate, clavate, long pedicellate, apex obtuse, with long paraphyses. *Ascospores* bi-seriate, allantoid, 1-septate, hyaline. **Asexual morph** Undetermined (adapted from Spegazzini 1888).

Notes: The monotypic *Kacosphaeria* with clavate asci and allantoid ascospores that is similar to some species of *Calosphaeria* (Spegazzini 1888). The specific ascogenous hyphae of Calosphaeriales is not mentioned in the description (Spegazzini 1888), nor is it found in the drawings of Spegazzini (Arambarri et al. 2020). Thus, we propose that *Kacosphaeria* be placed in Calosphaeriales genera *incertae sedis*, and await more fresh samples pending.

Type species: ***Kacosphaeria antarctica*** Speg., Boln Acad. nac. Cienc. Córdoba 11(2): 214 (1887) [1888]

Fig. 4 c–e

Saprobic on *Ribisma gellanicae*. **Sexual morph** *Ascomata* 280–320 μm, perithecial, 4–9 ascomata aggregated, discoid, immersed to erumpent through the bark of the host, black, glabrous, with short necks. *Asci* 40–50 × 4–5 μm, 8-spored, unitunicate, clavate, long pedicellate, obtuse apex, with long paraphyses. *Ascospores* 9–11 × 1.5 μm, bi-seriate, allantoid, 1-septate, hyaline. **Asexual morph** Undetermined (adapted from Spegazzini 1888).

Known hosts and distribution: On decayed wood of *Ribisma gellanicae* in Argentina (type locality) (Spegazzini 1888).

Notes: *Kacosphaeria antarctica* was found on dead branches of *Ribisma gellanicae* in Ushuaia, Argentina, in June 1882 (Spegazzini 1888). We were unable to obtain authentic material of *K. antarctica*, but provide a drawing (Fig. 4 c–e) based on Spegazzini's drawings from Arambarri et al. (2020).

Jobellisiales M.J. D'souza & K.D. Hyde 2015

Réblová (2008) and Liu et al. (2012) showed that *Jobellisia* species were closely related to members of Calosphaeriales, Diaporthales and Togniniaceae based on LSU sequence analysis.

Maharachchikumbura et al. (2015) established the monotypic order Jobellisiales in Diaporthomycetidae based on the multi-gene analysis. The phylogenetic position of this order is unstable and was previously thought to be related to Calosphaeriales and Togniniales (Hongsanan et al. 2017; Hyde et al. 2017). We find that Jobellisiales is basal to Calosphaeriales, Togniniales, Diaporthales and Tirisporellales (Fig. 1). Jobellisiales is different from Calosphaeriales and Togniniales with clavate asci and hyaline allantoid ascospores, and different from Tirisporellales with cylindrical asci and fusoid, falcate to lunate ascospores (Hyde et al. 2020). It is similar to Diaporthales, in having cylindrical to ellipsoidal asci and brown, subglobose ascospores; however, they are distantly related in phylogenetic analyses (Hyde et al. 2020; this study, Fig. 1).

Jobellisiaceae Réblová, Mycologia 100(6): 899 (2008)

Saprobic on wood. **Sexual morph**: *Ascostromata* crustose. *Ascomata* perithecial, gregarious, semi-immersed to superficial, globose to subglobose, black to dark brown, rough, ostiolate, with papilla, periphysate. *Peridium* membranaceous, composed of blue-green or brown or yellow to hyaline cells of *textura angularis* or *textura globosa* to *textura prismatica*. *Paraphyses* numerous, filiform, septate, unbranched, evanescent. *Asci* unitunicate, cylindrical, long pedicellate, apex obtuse, with J- apical ring. *Ascospores* 8-spored, ellipsoidal to subglobose, pale brown to dark brown, 0–1-septate, smooth-walled, with guttules and a germ pore at one or each end, without gelatinous appendages. **Asexual morph**: Undetermined (adapted from Barr 1993; Huhndorf et al. 1999a).

Type genus: ***Jobellisia*** M.E. Barr 1993

Notes: *Jobellisia* was established based on *Letendraea luteola* as a member of Clypeosphaeriaceae (Barr 1993). Subsequently, other species of *Jobellisia* which have been found in aquatic and/or terrestrial habitats in Asia, Europe and the USA, were reported as resembling *J. luteola*, in having ascomata with necks and brown, 1-septate ascospores with germ pore(s) (Barr 1994; Huhndorf et al. 1999a; Ranghoo et al. 2001; Leroy 2006; Untereiner et al. 2013). Huhndorf et al. (2004b) analyzed LSU sequence data for *J. fraterna* and *J. luteola* and found that they located in Diaporthales. However, Réblová (2008) transferred *J. rhynchostoma* to *Bellojisia* (Lasiosphaeriaceae) and established Jobellisiaceae as an independent family in Sordariomycetes based on LSU sequence data. Liu et al. (2012) introduced *J. guangdongensis* and found that Jobellisiaceae is basal to Calosphaeriales and Diaporthales. Maharachchikumbura et al. (2015, 2016) introduced the monotypic Jobellisiales, which is closely related to Calosphaeriales based on the multi-gene analysis. Hyde et al. (2017) found that Jobellisiales is sister to Togniniales with a divergence of *ca.* 130–188 MYA in the MCC tree. Hongsanan et al. (2017) and Wijayawardene et al. (2018) suggested that Jobellisiales should be reduced as a family in Calosphaeriales. Hyde et al. (2020) and Wijayawardene et al. (2020) listed Jobellisiales in Hypocreomycetidae. However, species of Jobellisiales have cylindrical asci with rounded apices and ellipsoidal, brown, 1-septate ascospores similar to those of Diaporthales (Maharachchikumbura et al.

2016; Hyde et al. 2020). The clade characterising Jobellisiales is phylogenetically distinct from other orders of Diaporthomycetidae (Fig. 1).

Jobellisia M.E. Barr, Mycotaxon 46: 60 (1993)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, gregarious, semi-immersed to superficial, obpyriform to subglobose, collapsing when dry or not, blue-green, yellow, brown to black, rough, ostiolate, with beaked to conical necks, periphysate. *Peridium* membranaceous, comprising three layers, outer layer composed of brown or blue-green or orange cells of *textura angularis-globosa*; middle layer composed of brown to yellow cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, filiform, septate, unbranched, evanescent. *Asci* unitunicate, cylindrical, long pedicellate, apex obtuse, with J- apical ring. *Ascospores* 8-spored, ellipsoidal to subglobose, pale brown to dark brown, straight to slightly curved, 0–1-septate, smooth-walled, with guttules and a germ pore at one or each end, without gelatinous appendages. **Asexual morph**: Undetermined (adapted from Barr 1993; Huhndorf et al. 1999a).

Notes: Barr (1993) established *Jobellisia* based on *Letendraea luteola*. Eight species have been accommodated in *Jobellisia*; however, only three (*Jobellisia fraterna* SMH2863, *J. guangdongensis* HMAS 251240 and *J. luteola* SMH2753) have molecular data (Huhndorf et al. 1999a; Réblová 2008; Liu et al. 2012). More phylogenetic information is needed to determine their taxonomic placement.

Type species: ***Jobellisia luteola*** (Ellis & Everh.) M.E. Barr, Mycotaxon 46: 61 (1993)

Basionym: *Letendraea luteola* Ellis & Everh., Proc. Acad. nat. Sci. Philad. 47: 415 (1895)

Facesoffungi number: *****??; Fig. 8

Saprobic on wood. **Sexual morph**: *Ascostromata* crustose. *Ascomata* 460–570 × 515–620 µm ($\bar{x}$ = 500 × 560 µm, n = 10), perithecial, gregarious, superficial, obpyriform to subglobose, collapsing when dry, black to dark brown, rough, ostiolate, with conical necks, periphysate. *Peridium* 40–75 µm ($\bar{x}$ = 55 µm, n = 30) wide, membranaceous, comprising three layers, outer layer composed of brown to orange cells of *textura angularis-globosa*; middle layer composed of brown to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, filiform, septate, unbranched, evanescent. *Asci* unitunicate, cylindrical, long pedicellate, apex obtuse, with J- apical ring. *Ascospores* 12–14 × 4.5–5.5 µm ($\bar{x}$ = 13.5 × 5 µm, n = 50), 8-spored, ellipsoidal to subglobose, pale brown to dark brown, straight to slightly curved, 1-septate, smooth-walled, with guttules and a germ pore at each end, without gelatinous appendages. **Asexual morph**: Undetermined (adapted from Barr 1993; Huhndorf et al. 1999a).

Material examined: USA, Michigan, Marquette, Huron Mountain Club, end of road at Mountain Lake, 45º00’ N / 87°0’ W, on dead wood over the water, 17 August 1997, S.M. Huhndorf (F-SMH 3349).

Known hosts and distribution: On decayed wood in Ohio, USA (type locality) (Ellis and Everhart 1895); on decayed decorticated wood in Iowa, Michigan, North Carolina, New York and Ontario, USA (Barr 1993; Huhndorf et al. 1999a).

Notes: *Jobellisia luteola* has been collected in temperate regions (Barr 1993; Huhndorf et al. 1999a). Maharachchikumbura et al. (2016) re-examined the holotype (NY00914363) collected by J.P. Morgan in Ohio, USA. Huhndorf et al. (1999a) also introduced two new specimens of *J. luteola*, SMH 2753 and SMH 3349. Subsequently, Huhndorf et al. (2004b) analyzed LSU sequence data for SMH 2753 which is widely used to represent *J. luteola*. In this study, the authentic material of SMH 3349 was re-examined.

Other genera in Diaporthomycetidae

Ophiostomatales Benny & Kimbr.

Ophiostomataceae Nannf.

Fragosphaeria Shear, Mycologia 15(3): 124 (1923)

Saprobic on wood. **Sexual morph**: *Ascomata* solitary, superficial, carbonaceous or coriaceous, globose, black, glabrous or surrounded by hyaline hyphae. *Asci* 8-spored, unitunicate, globose. *Ascospores* ovoid to reniform, aseptate, guttulate, smooth-walled. **Asexual morph**: Hyphomycetous. *Conidiophores* hyaline, branched. *Conidia* hyaline, aseptate, suballantoid to ellipsoidal (adapted from Saccardo 1881; Shear 1923).

Notes: *Fragosphaeria* is typified by *F. purpurea* and has cleistothecial ascomata, globose asci and reniform ascospores (Shear 1923). Chesters (1935) transferred this genus to *Cephalotheca* based on similar morphologies. In this study, we find that the sexual characteristics of *Fragosphaeria* are similar to members of Eurotiales (Eurotiomycetes), but the asexual morph is unknown. However, Suh and Blackwell (1999) found that *F. purpurea* is closely related to *Ophiostoma* (Ophiostomatales) based on LSU and SSU sequence analyses. Hence, *Fragosphaeria* is accepted as a genus in Ophiostomataceae (Diaporthomycetidae) (Hyde et al. 2020).

Type species: ***Fragosphaeria purpurea*** Shear, Mycologia 15(3): 124 (1923)

Facesoffungi number: *****??; Fig. 9

Saprobic on wood. **Sexual morph**: *Ascomata* 90–130 µm ($\bar{x}$ = 120 µm, n = 10) diam., cleistothecial, solitary, superficial, carbonaceous, globose, dark brown to black. *Peridium* brittle, composed of carbonaceous, brown to reddish brown cells of *textura prismatica*, squashed fragments pentagonal. *Asci* 4–6 µm ($\bar{x}$ = 5 µm, n = 20) diam., 8-spored, unitunicate, globose. *Ascospores* 2.5–3 × 1.5–2.8 µm ($\bar{x}$ = 2.8 × 2 µm, n = 20), overlapping, reniform, aseptate, hyaline when young, becoming pale brown to olivaceous when mature, guttulate, smooth-walled. **Asexual morph**: Hyphomycetous. *Conidiophores* hyaline, branched. *Conidia* hyaline, aseptate, suballantoid to ellipsoidal (adapted from Shear 1923).

Material examined: USA, Virginia, on culture of *Pilacre* sp., July 1920, C.L. Shear (BPI-566225, **type**); Sweden, Göteborg, Nature Park of Botanical Garden, on dead deciduous wood, 15 October 1970, U. Eliasson (BPI-566226).

Known hosts and distribution: On culture of *Pilacre petersii* in USA (type locality) (Shear 1923); on dead deciduous wood in UK, Sweden (Eliasson 1971; Yaguchi et al. 2006).

Notes: Shear (1923) introduced *Fragosphaeria purpurea*, which was found in the culture of *Pilacre petersii* in Virginia, September 1920, as the generic type. In this study, we re-examined type material (566225), which was isolated from a culture of *Pilacre* collected in Virginia, July 1920. This specimen is a dry fragmented culture, and we were unable to find any structure for observation. We also obtained authentic material, 566226 collected and determined by Eliasson (1971).

Genera transferred to Hypocreomycetidae

Coronophorales genera *incertae sedis*

Tengiomyces Réblová, Mycotaxon 70: 408 (1999)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, superficial, solitary to gregarious, globose to subglobose, coriaceous, dark brown to black, surrounded by setae, seated on sparse, brown, septate, branched hyphae, ostiolate, with papilla. *Setae* brown to dark brown, spine-like, straight, acute, aseptate, opaque, unbranched. *Peridium* membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* septate, evanescent. *Asci* 8-spored, unitunicate, cylindrical to clavate, broadly rounded to truncate and thickened at the apex, pedicellate. *Ascospores* ellipsoidal to clavate, with broadly rounded ends, straight to slightly curved, septate, middle cell(s) pale brown to brown, end cell(s) hyaline to subhyaline, slightly constricted at the septa, smooth-walled. **Asexual morph (associated)**: Hyphomycetous, spadicoides-like. *Mycelium* semi-immersed to superficial. *Conidiophores* arising from superficial hyphae growing from the base of the perithecial initials and mature ascomata, macronermatous, mononematous, unbranched or branched in the lower parts, cylindrical, pale brown, straight, flexuous in the lower parts, septate, not constricted or slightly constricted at the septa, apical cells rounded. *Conidiogenous cells* polytretic, integrated, intercalary and terminal. *Conidia* obpyriform to clavate, broadly rounded at the apex, septate, not constricted or slightly constricted at the septa, brown or the pigment fading from apex to bottom (adapted from Réblová 1999a).

Notes: Réblová (1999a) transferred *Chaetosphaerella indica* to *Tengiomyces* and established a monotypic genus. The black ascomata with setae on *T. indicus* are similar to *Helminthosphaeria* and *Chaetosphaerella*, and the ascospores comprise two brown middle cells and one hyaline cell at each end and are similar to *Crassochaeta* and *Chaetosphaerella* (Chaetosphaerellaceae, Coronophorales) (Réblová 1999a; Huhndorf et al. 2004a). A hyphomycetous spadicoides-like form was associated with *T. indicus* on the natural substratum (Réblová 1999a). *Spadicoides* is polyphyletic in Pleosporales (Dothideomycetes) (Ma et al. 2016; Réblová et al. 2018). However, we could not determine the relationship between *Tengiomyces* and *Spadicoides* without appropriate cultural characteristics and phylogenetic analysis. In this study, *Tengiomyces* with black, bristly ascomata and ellipsoidal ascospores comprise brown and hyaline cells is similar to *Chaetosphaerella* rather than *Helminthosphaeria*. Thus, we place *Tengiomyces* in Coronophorales genera *incertae sedis* pending further studies with molecular data.

Type species: ***Tengiomyces indicus*** (Varghese & V.G. Rao) Réblová, Mycotaxon 70: 408 (1999)

Basionym: *Chaetosphaerella indica* Varghese & V.G. Rao, Biovigyanam 5(1): 2 (1979)

Facesoffungi number: ??; Fig. 10

Saprobic on wood. **Sexual morph**: *Ascomata* 200–250 µm ($\bar{x}$ = 230 µm, n = 5) diam., perithecial, superficial, solitary to gregarious, globose to subglobose, coriaceous, dark brown to black, surrounded by setae, seated on sparse, brown, septate, branched hyphae 3–8 µm wide, ostiolate, with papilla. *Setae* 3.5–11 µm wide, brown to dark brown, spine-like, straight, acute, aseptate, opaque, unbranched. *Peridium* 20–26 µm wide, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* septate, evanescent. *Asci* 60–70 × 10–15 µm, 8-spored, unitunicate, cylindrical to clavate, broadly rounded to truncate and thickened at the apex, with short pedicel. *Ascospores* 10–15 × 4–5.5 µm ($\bar{x}$ = 13 × 5 µm, n = 20), bi-seriate, ellipsoidal to clavate, with broadly rounded ends, straight to slightly curved, 3-septate, two middle cells pale brown to brown, two end cells hyaline to subhyaline, slightly constricted at the septa, smooth-walled. **Asexual morph (associated)**: Hyphomycetous, spadicoides-like. *Mycelium* semi-immersed to superficial. *Conidiophores* 3.5–8 µm wide, arising from superficial hyphae growing from the base of the perithecial initials and mature ascomata, macronematous, mononematous, unbranched or branched in the lower parts, cylindrical, pale brown, straight, flexuous in the lower parts, septate, not constricted or slightly constricted at the septa, apical cells rounded. *Conidiogenous cells* 4–6 × 5–6 µm, polytretic, integrated, intercalary and terminal. *Conidia* 14–18 × 5.5–10 µm ($\bar{x}$ = 15 × 7.5 µm, n = 20), obpyriform to clavate, broadly rounded at the apex, 2–3-septate, not constricted or slightly constricted at the septa, brown or the pigment fades from apex to bottom (adapted from Réblová 1999a).

Material examined: China, AnHui, LangYa Shan, on dead wood of a deciduous tree, 20 June 1933, S.Q. Deng (BPI-622100); Guiana, Saint Laurent, Piste Balate, 12km from Saint Laurent, 20 m elev, on dead branch, A. Rossman, C. Feuillet and L. Skog, 19 November 1986 (BPI-622098).

Known hosts and distribution: On dead stems of a dicotyledoneous plant in India (type locality) (Varghese and Rao 1979); on dead wood of a deciduous tree in China (Réblová 1999a); on dead branch in Guiana.

Notes: Réblová (1999a) introduced *Tengiomyces indicus* after examining the holotype of *Chaetosphaerella indica* (AMH 3871), collected by Varghese in India (Varghese and Rao 1979) and a sample BPI 622100 collected by Deng in China. We re-examined two authentic specimens (622100 and 622098) which were determined by Réblová (mentioned in the label of material) and found that they were dry and observed only ascomata and evanescent asci and ascospores. We also found a spadicoides-like taxon by *T. indicus* on the natural substrate (Fig. 10 h–i).

Hypocreales genera incertae sedis

Sulcatistroma A.W. Ramaley, Mycotaxon 93: 140 (2005)

Saprobic on leaves. **Sexual morph**: *Ascostromata* discrete, multiloculate, erumpent through leaf epidermis, ellipsoidal, rarely circular. *Ascomata* perithecial, immersed, formed in stroma, subglobose, dark brown, ostiole with hyaline periphyses. *Peridium* membranaceous, composed of hyaline to brown cells of *textura angularis. Paraphyses* numerous, septate, slightly constricted at the septa, unbranched, tapering to a rounded apex. *Asci* 8-spored, unitunicate, clavate, short pedicellate. *Ascospores* bi-seriate, hyaline, allantoid with rounded ends, aseptate, smooth-walled. **Asexual morph**: Hyphomycetous. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Phialides* monophialidic, smooth-walled, hyaline, cylindrical, unbranched or with sympodial conidiogenous cells. *Conidia* hyaline to pale orange, ellipsoidal to allantoid, aseptate, smooth-walled, with rounded ends (adapted from Ramaley 2005).

Notes: The monotypic genus *Sulcatistroma* has ellipsoidal ascostromata, clavate asci, allantoid ascospores and ellipsoidal to allantoid conidia (Ramaley 2005). This genus is similar to the sexual morph of *Diatrype* (Xylariales), differing from *Sulcatistroma* in having sympodial conidiogenous cells, whereas *Diatrype* has percurrently proliferating conidiogenous cells (Ramaley 2005). Initially, *Sulcatistroma* was accepted as a member of Calosphaeriales based on its spicate clusters of asci (Ramaley 2005), and later it was included in Calosphaeriaceae (Lumbsch and Huhndorf 2010; Maharachchikumbura et al. 2015, 2016; Wijayawardene et al. 2018). Vu et al. (2019) analyzed ITS sequence data for ex-type strain *Sulcatistroma nolinae* (CBS 117709). This strain is more closely related to members of Nectriaceae (Hypocreales) (Fig. 1). *Sulcatistroma* has similar features to Nectriaceae species, such as clavate asci, aseptate, allantoid ascospores and phialophora-like asexual morphs, but does not have the red ascomata which is characteristic of Nectriaceae (Hirooka et al. 2012). We place *Sulcatistroma* in Hypocreales genera *incertae sedis* pending phylogenetic data.

Type species: ***Sulcatistroma nolinae*** A.W. Ramaley, Mycotaxon 93: 140 (2005)

Facesoffungi number: ??; Fig. 11

Saprobic on leaves. **Sexual morph**: *Ascostromata* discrete, multiloculate, erumpent through leaf epidermis, ellipsoidal, rarely circular, with long axis parallel to length of leaf, 900–1500 × 350–850 µm ($\bar{x}$ = 1200 × 450 µm, n = 5). *Ascomata* 120–250 µm diam., perithecial, immersed, subglobose, brown to dark brown, ostiole with hyaline periphyses. *Peridium* 7–25 µm ($\bar{x}$ = 16.5 µm, n = 20) wide, membranaceous, composed of hyaline to pale brown cells of *textura angularis*. *Paraphyses* numerous, septate, slightly constricted at the septa, unbranched, tapering to the rounded apex. *Asci* 8-spored, unitunicate, clavate, short pedicellate, apical ring not apparent. *Ascospores* bi-seriate, hyaline, allantoid with rounded ends, aseptate, smooth-walled. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Phialides* monophialidic, smooth-walled, hyaline, cylindrical, unbranched or an axis with 1–4 sympodial conidiogenous cells. *Conidia* hyaline to pale orange, ellipsoidal to allantoid, aseptate, smooth-walled, with rounded ends (adapted from Ramaley 2005).

Material examined: USA, New Mexico, Lincoln Co., Valley of Fires, roadside, on leaves of *Nolina micrantha*, A.W. Ramaley, 9 October 2002 (BPI-864276, **holotype**).

Known hosts and distribution: On decayed leaves of *Nolina micrantha* in the USA (type locality) (Ramaley 2005).

Notes: We re-examined the holotype (864276), but the ascomata contained only some filament-like supporting structures (Fig. 11 e–g). Therefore, we provided hand drawings of other characteristics (Fig. 11 a, h–i) based on Ramaley (2005).

Sordariomycetidae O.E. Erikss. & Winka

The subclass Sordariomycetidae was introduced by Eriksson and Winka (1997) and previously comprised six orders. Eight orders with 23 families are now included based on phylogenetic and morphological studies (Maharachchikumbura et al. 2015; Hongsanan et al. 2017; Hyde et al. 2017, 2020; Marin-Felix et al. 2020; Wijayawardene et al. 2020). Sordariomycetidae members are widespread and usually as saprobes, pathogens or endophytes (Maharachchikumbura et al. 2015, 2016; Hyde et al. 2020). Fig. 1 reveals that this subclass is sister to Diaporthomycetidae (68%ML) in Sordariomycetes.

Boliniales P.F. Cannon, in Kirk et al., Dictionary of Fungi 9 (2001)

The saprotrophic Boliniales was introduced by Kirk et al. (2001) and is characterized by black ascomata, cylindrical asci and fusiform to subglobose ascospores (Maharachchikumbura et al. 2015, 2016; Hyde et al. 2020). Some members of this order with carbonaceous ascomata were traditionally linked to Xylariales, e.g. *Camarops* (Karsten 1873). Boliniales was clarified by Maharachchikumbura et al.

(2015) and currently contains nine genera based on morphology and phylogenetic analyses (Hyde et al. 2020; Wijayawardene et al. 2020). This order is sister to Phyllachorales (Maharachchikumbura et al. 2016; Hongsanan et al. 2017; Hyde et al. 2017; this study, 83%ML, Fig. 1).

Boliniaceae Rick, Brotéria, sér. bot. 25(2-3): 65 (1931)

Saprobic on wood in terrestrial habitats. **Sexual morph**: *Ascostromata* immersed, erumpent or superficial, pale brown to black, irregular in shape, surface furfuraceous or surrounded by hyaline to brown hyphae. *Ascomata* perithecial, solitary or gregarious, immersed, erumpent or superficial, globose to obpyriform, brown to black, papillate. *Peridium* carbonaceous or coriaceous or membranaceous, composed of brown to dark brown cells of *textura intricata* or *textura prismatica*. *Paraphyses* abundant, filamentous, tapering, septate, branched. *Asci* 8-spored, unitunicate, cylindrical to clavate, apex rounded to blunt, pedicellate. *Ascospores* 2–3-seriate, normally cells in the center brown to dark brown, and the terminal cell(s) hyaline to pale brown, subglobose to ellipsoidal, 0–2-septate, smooth-walled, guttulate. **Asexual morph**: Undetermined (adapted from Rick 1931; Romero and Samuels 1991; Maharachchikumbura et al. 2016).

Type genus: ***Camarops*** P. Karst. 1873 (= *Bolinia* (Nitschke) Sacc. 1882)

Notes: Boliniaceae, introduced by Rick (1931), is characterized by black ascostromata and cylindrical asci with smooth-walled ascospores. Earlier, this family was placed in *Xylariales* based on morphological similarities, such as carbonaceous ascomata (Barr 1990; Romero and Samuels 1991). Andersson et al. (1995) relied on analyzing SSU sequence data and concluded that Boliniaceae was more closely related to Sordariales. This family was subsequently used to establish Boliniales by Kirk et al. (2001). Thus, Boliniaceae, based on *Bolinia* is typified by *B. tubulina*, is the only member of Boliniales (Maharachchikumbura et al. 2016; Kirk et al. 2001). Nannfeldt (1972) recommended *Bolinia* should be synonymized as *Camarops* which is typified by *Camarops hypoxyloides* (Karsten 1873) as they have similar characters. Phylogenetically, Boliniales is closely related to Phyllachorales and Sordariales in Sordariomycetidae (Huhndorf et al. 2004b; Miller and Huhndorf 2005; Hongsanan et al. 2017; Hyde et al. 2017; this study, Fig. 1). However, since both Boliniales and Boliniaceae were established based on *Bolinia tubulina*, even if *B. tubulina* was transferred to *Camarops tubulina*, this species is still the type of its order and family (Maharachchikumbura et al. 2016). We accept *Camarops tubulina* as type species of Boliniales and Boliniaceae, and *Camarops hypoxyloides* as the type of *Camarops*, as established (Karsten 1873; Rick 1931; Kirk et al. 2001); and more characteristics and phylogenetic information are expected to determine the affinities of *Camarops* and other genera in the Boliniaceae. Nine genera are accepted into this family, six of which have available molecular data (viz. *Apiorhynchostoma*, *Camaropella*, *Camarops*, *Cornipulvina*, *Endoxyla*, *Pseudovalsaria*) (Huhndorf and Miller 2008; Raja et al. 2011; Untereiner et al. 2013; Maharachchikumbura et al. 2015, 2016; Vu et al. 2019; Hyde et al. 2020; Wijayawardene et al. 2020), and *Apiocamarops*, *Mollicamarops*, *Neohypodiscus* were included because of their morphology similar to *Camarops* (Andersson et al. 1995; Rogers and Ju 2003; Vasilyeva 2007). In this study, we find that some species of ascospores are not arranged in a uniform direction in the ascus.

For example, in *Apiocamarops*, ascospore is composed of a large brown cell and a small hyaline cell (Samuels and Rogers 1987). Ascospores partly are oriented with the hyaline cell to the ascus apex; and partly in the opposite direction to the ascus base.

Apiocamarops Samuels & J.D. Rogers, Mycotaxon 28(1): 54 (1987)

Saprobic on wood. **Sexual morph**: *Ascostromata* superficial or semi-immersed, brown to black, irregular in shape, surface furfuraceous or glabrous. *Ascomata* perithecial, gregarious, superficial or semi-immersed, globose to subglobose, membranaceous, orange, brown to black, ostiolate, with periphyses. *Peridium* membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- apical ring. *Ascospores* uniseriate, 0–1-septate, unequal, oblong to ellipsoidal, smooth-walled, hyaline when young, composed of a large, brown cell with or without a terminal pore and a small, hyaline cell when mature, guttulate. **Asexual morph**: Undetermined (adapted from Samuels and Rogers 1987; Rogers 1988; Reagan and Waide 1996; Rogers and Ju 2003).

Notes: *Apiocamarops* was established by Samuels and Rogers (1987) and resembles *Camarops*. Both genera have similar cylindrical asci and ellipsoidal ascospores with germ pore(s), but the ascospores in *Apiocamarops* are 1-septate and apicosporous, while those of *Camarops* lack septum (Samuels and Rogers 1987; Rogers 1988; Reagan and Waide 1996; Rogers and Ju 2003). Four species are accommodated in this genus, but molecular data is lacking.

Type species: ***Apiocamarops alba*** Samuels & J.D. Rogers, Mycotaxon 28(1): 54 (1987)

Facesoffungi number: *****??; Fig. 13

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* superficial, brown to black, irregular in shape, surface furfuraceous. *Ascomata* 450–750 × 350–700 µm ($\bar{x}$ = 550 × 450 µm, n = 10), perithecial, gregarious, superficial, globose to subglobose, brown to black, papillate, ostiole central, with periphyses, covered by white to yellowish, furfuraceous layer. *Peridium* 35–60 µm ($\bar{x}$ = 45 µm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of dark brown to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 1–3 µm wide, numerous, filiform, septate, branched, longer than the asci. *Asci* 75–95(–110) × 4–6 µm ($\bar{x}$ = 90 × 5 µm, n = 50), 8-spored, unitunicate, cylindrical, pedicel short, apex rounded, with J- inconspicuous apical ring. *Ascospores* (4.5–)5.5–6.5(–8) × 1.5–3 µm ($\bar{x}$ = 6 × 2.5 µm, n = 50), uniseriate, oblong to ellipsoidal, slightly curved, 1-septate, unequal, hyaline when young, composed of a large, brown cell with a minute terminal pore and a small, hyaline cell when mature, partly hyaline cell towards the ascus apex; partly in the opposite direction, smooth-walled, guttulate. **Asexual morph**: Undetermined.

Material examined: Brazil, Amazonas, Plateau of Serra Araca, N side of North Mountain, alt. 1250 m., 00° 57' N, 63° 21' W, cloud forest, on decorticated wood, 19–24 February 1984, G.J. Samuels, G.T. Prance and J. Pipoly (NY-00986029, **holotype**); *ibid.* (NY-00986030, **paratype**).

Known hosts and distribution: On decorticated wood in Brazil (type locality), Guiana, Venezuela (Samuels and Rogers 1987).

Notes: As noted by Samuels and Rogers (1987), we re-examined the type materials, 00986029 and 00986030, which are well preserved.

Apiorhynchostoma Petr., Annls mycol. 21(3/4): 185 (1923)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, scattered, immersed to semi-immersed, globose to subglobose, dark brown to black, papillate, ostiole central, with periphyses. *Peridium* membranaceous, comprising two layers, outer layer composed of brown to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, with J- apical ring. *Ascospores* uniseriate, oblong to ellipsoidal, straight to slightly curved, 0–2-septate, hyaline when young, becoming composed of 1 or 2 large, brown cell(s) with a minute pore at the end, other end with a small, hyaline to pale brown cell, smooth-walled or verrucose, guttulate. **Asexual morph**: Undetermined (adapted from Petrak 1923).

Notes: Currey (1859) introduced two species, named '*Sphaeria apiculata*' and '*Sphaeria curreyi* Blox. MSS.'. Rabenhorst (1860) examined some materials and stated that *Sphaeria apiculata* Curr. is illegitimate as it has a homonym of *Sphaeria apiculata* Wallr. (Wallroth 1833). Thus, Rabenhorst (1860) re-named *S. apiculata* Curr. as *Sphaeria curreyi* Rabenh. which is a homonym of *S. curreyi* Blox. MSS. Due to the illegitimate species naming of '*Sphaeria apiculata*' and '*Sphaeria curreyi*', subsequent research has been controversial. Petrak (1923) established *Apiorhynchostoma* and named *S. apiculata* Curr. as *Apiorhynchostoma apiculatum* as the type species. Winter (1886) and Müller and von Arx (1962) recognized the former species related to '*Sphaeria curreyi*' and transferred *S. curreyi* Rabenh. as *Apiorhynchostoma curreyi* as the type species of *Apiorhynchostoma* (Rogers et al. 1994a; Hyde et al. 1998; Stadler et al. 2013; Untereiner et al. 2013). In our study, we proposed a new epithet, *Apiorhynchostoma apiosporum*, based on isotype material of *Sphaeria curreyi* Rabenh. to avoid future confusion. Therefore, the illegitimate *A. apiculatum* (≡ *S. apiculata* Curr.) and *A. curreyi* (≡ *S. curreyi* Rabenh.) are replaced by *A. apiosporum*. *Apiorhynchostoma* is characterized by subglobose ascomata and ascospores which are composed of two brown cells and a hyaline terminal cell (Müller and von Arx 1962; Rappaz 1995; Untereiner et al. 2013). This genus has been included in Amphisphaeriaceae and Clypeosphaeriaceae based on their similar ascomata and ascospores (Hyde et al. 1998; Réblová 1998; Wang et al. 2004). Untereiner et al. (2013) analyzed ITS-LSU sequence data for '*A. curreyi*' and showed that *Apiorhynchostoma* is closely related to *Cornipulvina* and *Pseudovalsaria* in Boliniales. In this study, the strain name of *A. curreyi* is replaced by *Apiorhynchostoma apiosporum* and it is sister to *Pseudovalsaria ferruginea* in Boliniales (72%ML, Fig. 12).

Type species: ***Apiorhynchostoma apiosporum*** S.K. Huang & K.D.Hyde, ***nom. nov.***

Synonym: *Sphaeria apiculata* Curr., Trans. Linn. Soc. London 22: 326 (1859)

Sphaeria curreyi Rabenh., Fungi europ. exsicc. Klotzschii herbarii vivi mycologici continuatio, Edn nova. Series secunda, Cent. 3: no. 250 (1860)

Apiorhynchostoma apiculatum (Sacc.) Petr. [as 'apiculata'], Annls mycol. 21(3/4): 185 (1923)

Apiorhynchostoma curreyi E. Müll., in Müller & von Arx, Beitr. Kryptfl. Schweiz 11(no. 2): 706 (1962)

Facesoffungi number. *****??; *Index Fungorum number*. IF558201; Fig. 14

Etymology: *apiosporum* refers to the ellipsoidal ascospores with one hyaline cell markedly smaller than the other.

Saprobic on decorticated wood. **Sexual morph**: *Ascomata* 530–660 × 470–580 µm ($\bar{x}$ = 590 × 530 µm, n = 10), perithecial, scattered, immersed to semi-immersed, globose to subglobose, dark brown to black, papillate, ostiole central, with periphyses. *Peridium* 15–65 µm ($\bar{x}$ = 35 µm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of brown to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 2–4.5 µm wide, numerous, filiform, septate, longer than asci. *Asci* 190–200(–250) × 7.5–13 µm ($\bar{x}$ = 198 × 10 µm, n = 50), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- inconspicuous apical ring. *Ascospores* 23.5–30 × 5.5–9 µm ($\bar{x}$ = 25 × 7.5 µm, n = 50), uniseriate, oblong to ellipsoidal, straight to slightly curved, 1–2-septate, unequal, hyaline when young, becoming composed of 1 or 2 large, brown cell(s) with a minute pore and a hyaline, thick-walled at the end, other end with a small, hyaline to pale brown cell, smooth-walled, guttulate. **Asexual morph**: Undetermined.

Material examined: UK, Batheaston, on dead decorticated wood, F. Currey, Rabenhorst Fungi Europaei Exsiccati nr. 250 (S-F61087, **lectotype**).

Known hosts and distribution: on decayed decorticated wood of conifers in Austria, Canada, Germany, Sweden, UK (type locality) (Currey 1859; Untereiner et al. 2013).

Notes: Currey (1859) described samples as being collected on dry old wood of the South Western Railway, not far from the Weybridge Station. Rabenhorst (1860) mentioned that Currey collected material of *Sphaeria curreyi* Rabenh. in Batheaston in 1856 and 1857, and this material was determined as the isotype of *S. curreyi* Rabenh. (Untereiner et al. 2013). As noted in S-F61087, this material was collected by

Currey in Batheaston and determined by Rabenhorst. Thus, we proposed this material as lectotype of *Apiorhynchostoma apiosporum*.

Camaropella Lar.N. Vassiljeva, Mikol. Fitopatol. 31(1): 6 (1997)

Saprobic on wood. **Sexual morph**: *Ascostromata* erect, immersed to semi-immersed, erumpent through bark of host, carbonaceous, black, glabrous, pulvinate, peltate, discoid or valsoid, hemispherical or spherical, sometimes with broad attachment to the substrate. *Ascomata* perithecial, gregarious, carbonaceous, cylindrical, black, ostiolate, with necks, periphysate. *Asci* 8-spored, unitunicate, cylindrical, apex rounded, pedicellate, with J- apical ring. *Ascospores* uniseriate, cylindrical to ellipsoidal, aseptate, pale brown or dark brown, smooth-walled, with guttules. **Asexual morph**: Undetermined (adapted from Vasilyeva 1997; Vasilyeva et al. 2007).

Notes: Vasilyeva (1997) transferred *Camarops pugillus* (≡ *Sphaeria pugillus* Schw.) to *Camaropella* as generic type. *Camaropella* species do not have a lopadostomoid type of stromata as found in *Camarops*, but has special eutypoid and eutypelloid or valsoid forms (Vasilyeva 1997). She also introduced a second species, *Camaropella lutea* (Vasilyeva et al. 2007). These two species are nested in Boliniales and distant from *Camarops tubulina* based on phylogenetic analysis (Huhndorf and Miller 2008; Untereiner et al. 2013; Vu et al. 2019). In this study, strains of *Camarops amorpha*, *C. microspora* and *C. plana*, which have pulvinate or peltate stromata (Miller and Huhndorf 2005; Spatafora et al. 2006; Raja et al. 2011), clustered with *Camaropella* species with 89%ML/0.93BY support (Fig. 12), and this clade is distant from *Camarops* clade (Untereiner et al. 2013; this study). Therefore, we recommend transferring these three *Camarops* species to *Camaropella*. However, *Camaropella* and *Camarops* are very similar in morphology, in the cylindrical asci, ellipsoidal ascospores and the arrangement type of the ascomata in stroma. The relationship between *Camarops* and *Camaropella* needs to be resolved with more collections and sequence data.

Type species: ***Camaropella pugillus*** (Schwein.) Lar.N. Vassiljeva, Mikol. Fitopatol. 31(1): 6 (1997)

Basionym: *Sphaeria pugillus* Schwein., Schr. naturf. Ges. Leipzig 1: 38 [12 of repr.] (1822)

Facesoffungi number: *****??; Fig. 15

Saprobic on wood. **Sexual morph**: *Ascostromata* 2–3 × 1.5–3 mm ($\bar{x}$ = 2.2 × 2 mm, n = 5) immersed to semi-immersed, erumpent through bark of host, carbonaceous, valsoid, black, glabrous. *Ascomata* 1.5–2.5 × 0.3–0.5 mm ($\bar{x}$ = 1.8 × 0.4 mm, n = 10), perithecial, gregarious, cylindrical, black, ostiolate, with necks, circular in apical view, periphysate. *Peridium* 25–60 μm ($\bar{x}$ = 50 μm, n = 30) wide, comprising two layers, outer layer carbonaceous, composed of brown to black cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* 1.5–3.5 μm wide, numerous, septate, unbranched, filiform, guttulate. *Asci* (45–)47–53(–65) × 3.5–5.5 µm ($\bar{x}$ = 50 × 4.5 µm, n = 50), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- apical ring inconspicuous. *Ascospores* 4.5–6.5 × 2–4 µm ($\bar{x}$ = 6 × 3 µm, n = 50), uniseriate, cylindrical to ellipsoidal, aseptate, hyaline when young, becoming pale brown or dark grey, sometimes slightly contracted at middle of the cell, smooth-walled, 2 guttules, with a germ pore at the base. **Asexual morph**: Undetermined.

Material examined: France, Aquitaine, Pyrénées-Atlantiques, Pau 64, on dead wood of *Quercus* sp., 24 October 1998, F. Candoussau and G.J. Samuels (S-F24255); Sweden, Uppland, Sollentuna, 700 m NNW of Hägerstalund, on rotten log, 3 May 1984, N. Lundqvist (UPS-UPS:BOT:F-120952).

Known hosts and distribution: On dead wood of *Acer*, *Liriodendron* and *Rhododendron* in the USA (type locality) (Shear 1940); on dead wood of *Alnus glutinosa* in Slovakia (Vasilyeva 1997); on dead wood in Austria, Sweden, Russia (Vasilyeva 1997); on dead wood of *Fraxinus excelsior* in Czech Republic (del Valle Catania and Romero 2003); on decorticated wood of *Podocarpus parlatorei* in Argentina (del Valle Catania and Romero 2003); on dead wood of *Quercus* in France (del Valle Catania and Romero 2003).

Notes: We could not obtain the holotype, so we re-examined specimens F-120952 from UPS and F24255 from S herbaria based on information provided by del Valle Catania and Romero (2003). The strain of *Camaropella pugillus* nests in *Camaropella* (Walker et al. 2012; Vu et al. 2019) and related to *Camaropella amorpha* and *Cam*. *microspora* (Fig. 12).

New combinations:

Camaropella amorpha (Boedijin) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sarcostromella amorpha* Boedijn, Persoonia 1(1): 17 (1959)

Synonym: *Camarops amorpha* (Boedijn) Nannf., Svensk bot. Tidskr. 66(4): 362 (1972)

Index Fungorum number: IF558202

Camaropella microspora (P. Karst.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Anthostoma microsporum* P. Karst., Fungi Fenniae Exsiccati, Fasc. 9: no. 860 (1869)

Synonym: *Camarops microspora* (P. Karst.) Shear, Mycologia 30(5): 588 (1938)

Index Fungorum number: IF558249

Camaropella plana (Pouzar) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Camarops plana* Pouzar, Česká Mykol. 40(4): 219 (1986)

Index Fungorum number: IF558250

Camarops P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 6, 53 (1873)

Synonym: ***Bolinia*** (Nitschke) Sacc., Syll. fung. (Abellini) 1: 352 (1882)

Saprobic on wood. **Sexual morph**: *Ascostromata* immersed, erumpent to superficial, dark brown to black, carbonaceous or coriaceous, pulvinate, peltate, discoid or valsoid, hemispherical, spherical or irregular, sometimes with broad attachment to the substrate. *Ascomata* perithecial, gregarious, globose to subglobose, brown to dark brown, ostiolate. *Peridium* comprising two layers, outer layer composed of brown to dark brown cells of *textura intricata*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* abundant, persistent, filamentous, septate, branched. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded to blunt, with J- apical ring. *Ascospores* 2–3-seriate, subglobose to ellipsoidal, aseptate, pale brown to dark brown, smooth-walled, guttulate. **Asexual morph**: Undetermined (adapted from Nannfeldt 1972).

Notes: *Bolinia* was introduced as a subgenus by Nitschke (1867) and raised to generic rank by Saccardo (1882), based on *Sphaeria tubulina* Alb. & Schw. Karsten (1873) had earlier introduced *Camarops* based on *C. hypoxyloides* P. Karst. *Bolinia* and *Camarops*, as very similar genera, have often been discussed together in subsequent studies. Munk (1957) and von Arx and Müller (1954) reviewed the taxonomy of these taxa and concluded that *Camarops* and *Bolinia* were distinct genera with similar characters, except the former has monostichous ascomata (ascomata arranged in one line or series in stroma, e.g. Fig. 16 b) and the latter has polystichous (ascomata arranged in multiple lines or groups in stroma, e.g. Fig. 17 d–e). Shear (1938) and Svrček (1969) recognized that *Sphaeria tubulina* Alb. & Schw. should be a species of *Camarops*, named *Camarops tubulina*. However, Nannfeldt (1972) re-examined species of *Camarops* and *Bolinia*, and suggested *Bolinia* should be merged with *Camarops* based on their similar characters. Nannfeldt (1972) also proposed that the structure of the ascospores, peridium and stroma should be emphasized in the remodeled *Camarops*, and the arrangement of ascomata in stroma and size, shape of stromata are considered to be the basis for distinguishing species (del Valle Catania and Romero 2003). Therefore, *Bolinia* was accepted as a synonym of *Camarops* under Boliniaceae (Lumbsch and Huhndorf 2010; Hyde et al. 2020; Wijayawardene et al. 2020). Vasilyeva (1997) established *Camaropella* based on *Camarops pugillus*. Untereiner et al. (2013) found that species of *Camaropella* and *Camarops sensu lato* form a cluster (see notes for *Camaropella*). In this study, we found that the previously proposed methods for distinguishing *Camaropella* and *Camarops* morphologically are inconsistent with phylogenetic analysis. Currently, we suggest using phylogenetic analysis as the main method to distinguish *Camaropella* and *Camarops*. The complex needs resolving based on more fresh collections.

Type species: ***Camarops hypoxyloides*** P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 53 (1873)

Facesoffungi number. *****??; Fig. 16

Saprobic on wood. **Sexual morph**: *Ascostromata* dark brown to black, carbonaceous, pulvinate, discoid, hemispherical or spherical, sometimes with broad attachment to the substrate. *Ascomata* perithecial, gregarious, globose to subglobose, brown to dark brown, monostichous, carbonaceous, ostiolate, with periphyses. *Peridium* 25–70 μm ($\bar{x}$ = 40 μm, n = 20) wide, comprising two layers, outer layer carbonaceous to coriaceous, composed of brown to dark brown cells of *textura intricata* to *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, apex rounded, pedicellate. *Ascospores* 6–8 × 4–6 μm ($\bar{x}$ = 6.5 × 4.5 μm, n = 20), uniseriate, subglobose to ellipsoidal, aseptate, hyaline when young, becoming pale brown, smooth-walled, with 2 large guttules, a germ pore at end. **Asexual morph**: Undetermined (adapted from Karsten 1873).

Material examined: USA, Louisiana, Ferriday, on dead wood of *Gleditsia* sp., 18 July 1931, Overholts and Siggers (BPI-797104).

Known hosts and distribution: On dead wood of *Alnus glutinosa* in UK (type locality) (Karsten 1873); on dead wood in tropical America and rare in Europe (Miller 1930); on decayed wood in Argentina (Mercuri 1972).

Notes: *Camarops hypoxyloides* was introduced by Karsten (1873). Miller (1930) proposed that *C. hypoxyloides* is closely related to *Solenoplea peltata* Lloyd from Porto Rico, and found that 'The Montagne specimen of *Hypoxylon polyspermum* at Kew is, according to Mason in a letter, the same as his English specimen of *Camarops* which is equal to Karsten's *C. hypoxyloides*', and then introduced *Camarops polysperma* (≡ *Hypoxylon polyspermum* Mont.) as the current name of *C. hypoxyloides* (Miller 1930; Mercuri 1972). However, this statement is not generally recognized and *C. hypoxyloides* is widely accepted as the type species of *Camarops* (Untereiner et al. 2013; Hyde et al. 2020; Index Fungorum 2020). We also recommend *C. hypoxyloides*, the name first used to introduce *Camarops*, as the type species, and accept *C. polysperma* as an independent species similar to *C. hypoxyloides*, until there is sufficient morphological or molecular data to discern their relationship. Raja et al. (2011) sequenced molecular data for *C. polysperma* which was collected from Sweden. *Camarops tubulina* is sister to *C. polysperma* (95%ML/0.99BY, Fig. 12). Morphologically, the former has polystichous ascomata in stroma, whereas the latter has monostichous ascomata (Shear 1938; Mercuri 1972). In this study, we were unable to obtain the type specimen. Therefore, we re-examined an authentic material (BPI-797104) collected in America.

Camarops tubulina (Alb. & Schwein.) Shear, Mycologia 30(5): 585 (1938)

Basionym: *Sphaeria tubulina* Alb. & Schwein., Consp. fung. (Leipzig): 6 (1805)

Facesoffungi number. *****??; Fig. 17

Saprobic on wood. **Sexual morph**: *Ascostromata* 15–20 × 2–5 mm ($\bar{x}$ = 18 × 4 mm, n = 5). carbonaceous to coriaceous, immersed to semi-immersed, dark brown, smooth, pulvinate, discoid, hemispherical or irregular, with broad attachment to the substrate. *Ascomata* 1–2.5 × 0.5–1 mm ($\bar{x}$ = 1.5 × 0.7 mm, n = 10), perithecial, gregarious, polystichous, carbonaceous, globose to subglobose, dark brown to black, ostiolate, with necks. *Necks* carbonaceous, dark brown to black, the wall composed of brown to hyaline cells of *textura intricata* to *textura prismatica*, with hyaline periphyses. *Peridium of venter* 40–120 μm ($\bar{x}$ = 90 μm, n = 30) wide, comprising two layers, outer layer coriaceous, composed of brown to dark brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* 0.8–1.8 μm wide, numerous, septate, branched, filiform. *Asci* 30–55 × 2–4.5 μm ($\bar{x}$ = 40 × 3 μm, n = 50), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- apical ring. *Ascospores* 3–6 × 1.5–2.5 μm ($\bar{x}$ = 4.5 × 2 μm, n = 50), uniseriate, subglobose to ellipsoidal, aseptate, hyaline when young, becoming dark brown or dark grey, with germ spore at base, smooth-walled, with 2 guttules. **Asexual morph**: Undetermined.

Material examined: Czech Republic, Novohradských Horách Mountains, Virgin forest of Žofínský prales, on the dead trunks of *Picea* sp., 18 October 1967, Z. Pouzar, determined by M. Svrček in January 1969 (PRM-PR647008).

Known hosts and distribution: On trunk of *Abies* in Upper Lusatia (type locality) (Albertini and Schweinitz 1805); on dead spruce stumps in moist places in the south of Sweden (Fries 1816); on decayed wood of *Abies*, rare *Juglans* and *Alnus* in Lusatia (Germany), Sweden and North America (Saccardo 1882); on dead wood of conifers (*Picea*, *Abies*) and rare broadleaved trees (*Fagus*) in Czech Republic (Holec 2005).

Notes: Saccardo (1882) transferred *Sphaeria tubulina* Alb. & Schw. to *Bolinia* as generic type (see notes for Boliniaceae). Shear (1938) and Svrček (1969) combined *Sphaeria tubulina* Alb. & Schw. under *Camarops tubulina* (see notes for *Camarops*). Thus, *Bolinia* was subsequently accepted as a synonym for *Camarops*, and its members were assigned to *Camaropella* and *Camarops* (Shear 1938; Nannfeldt 1972; Vasilyeva et al. 2007). Rehm (1904) and Theissen (1909) proposed *C. tubulina* is a synonym of *C. hypoxyloides*, but Miller (1930) thought that the correct samples were not examined. Thus, there is an issue with their assumption, that is, *C. tubulina* (≡ *Sphaeria tubulina*) collected by Mason has polystichous ascomata in stroma with long elongate necks, different from *C. hypoxyloides* as described by Karsten has monostichous ascomata. Huhndorf et al. (2004b) sequenced *C. tubulina*, which is sister to *C. polysperma* (Raja et al. 2011; this study, 95%ML/0.99BY, Fig. 12). In this study, we were unable to obtain the type material. Therefore, we re-examined an authentic sample determined by Svrček (mentioned in the label of material). *Camarops hypoxyloides* and *C. tubulina* are two vital species in

Boliniaceae (Boliniales), and their relationships should be resolved following fresh collections and epitypification.

Cornipulvina Huhndorf, A.N. Mill., F.A. Fernández & Lodge 2005

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* superficial, irregular in shape, membranaceous, brown to black, glabrous, with fascicular arrangement, necks rostrate. *Ascomata* perithecial, subglobose, dark brown to black, ostiolate, with papilla, periphysate. *Peridium* composed of brown to dark brown cells of *textura angularis*. *Paraphyses* numerous, septate, unbranched, filiform, guttulate, evanescent. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- inconspicuous apical ring. *Ascospores* uniseriate, subglobose to ellipsoidal, aseptate, hyaline, smooth-walled, with 2 guttules, without gelatinous appendages. **Asexual morph**: Undetermined (adapted from Huhndorf et al. 2005).

Notes: The monotypic genus *Cornipulvina* is characterized by ascostromata with long rostrate necks and ellipsoidal to subglobose ascospores without germ pores (Huhndorf et al. 2005). Sequence data from *Cornipulvina ellipsoides* (SMH 1378) is basal to *Apiorhynchostoma* and *Pseudovalsaria* in Boliniaceae (Huhndorf et al. 2005; 70%ML, Fig. 12).

Type species: ***Cornipulvina ellipsoides*** Huhndorf, A.N. Mill., F.A. Fernández & Lodge, Fungal Diversity 20: 63 (2005)

Facesoffungi number: *****??; Fig. 18

Saprobic on wood. **Sexual morph**: *Ascostromata* 1.5–3.5 × 1–2.5 mm ($\bar{x}$ = 2.5 × 1.5 mm, n = 5), superficial, irregular in shape, membranaceous, brown to black, glabrous, with fascicular arrangement, necks rostrate. *Ascomata* 450–900 × 250–600 µm ($\bar{x}$ = 750 × 450 µm, n = 10), perithecial, subglobose, dark brown to black, ostiolate, with papilla, periphysate. *Peridium* 25–65 µm ($\bar{x}$ = 50 µm, n = 30) wide, composed of brown to dark brown cells of *textura angularis*. *Paraphyses* 1–3.5 µm wide, numerous, septate, unbranched, filiform, guttulate, evanescent. *Asci* (50–)60–77(–85) × 3.5–7 µm ($\bar{x}$ = 70 × 5.5 µm, n = 50), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- inconspicuous apical ring. *Ascospores* (5–)7–8.5(–10) × 3–5 µm ($\bar{x}$ = 8 × 4.5 µm, n = 50), uniseriate, subglobose to ellipsoidal, aseptate, hyaline, smooth-walled, usually with two large guttules, without gelatinous appendages. **Asexual morph**: Undetermined.

Material examined: Puerto Rico, Luquillo Mountains, Bisley Watershed 3, 220m, 18º 19.00’ N / 65°0’ W, on dead decorticated wood, 8 May 1995, S.M. Huhndorf and D.J. Lodge (F-SMH 1378, **holotype**).

Known hosts and distribution: On decayed decorticated wood in Brazil, Puerto Rico (type locality) and Venezuela (Huhndorf et al. 2005).

Notes: We re-examined the holotype of *Cornipulvina ellipsoides* (SMH 1378), and it is sister to *Apiorhynchostoma* and *Pseudovalsaria* (70%ML, Fig. 12).

Endoxyla Fuckel, Jb. nassau. Ver. Naturk. 25-26: 321 (1871)

Saprobic on wood. **Sexual morph**: *Ascostromata* poorly developed or absent. *Ascomata* perithecial, gregarious or in bi-seriate linear groups, immersed to semi-immersed, globose to subglobose, black, ostiolate. *Asci* 8-spored, clavate, pedicellate. *Ascospores* ellipsoidal to cylindrical, hyaline to brown, slightly curvate, with a germ pore at one end. **Asexual morph**: Undetermined (adapted from Fuckel 1872).

Notes: Fuckel (1872) established *Endoxyla* based on globose ascomata with clavate asci and ellipsoidal ascospores, and while introducing *E. macrostoma*, mentioned that *Sphaeria parallela* Fr. and *S. operculata* Alb. & Schw. belong to *Endoxyla*. Saccardo (1882) accepted *S. parallela* as *Endoxyla parallela* and *S. operculata* as *E. operculata*. Subsequently, there was a controversy as to which species should be selected as the type of *Endoxyla*. Some mycologists have recognized *S. operculata* (≡ *E. operculata*) published earlier, as the type species (Clements and Shear 1931; Holm 1975). Others believed that Fuckel (1872) only described *E. macrostoma* in detail when establishing *Endoxyla*, so that, it should be regarded as the generic type (Untereiner 1993). *Endoxyla macrostoma* is widely accepted as the type species of *Endoxyla* (Untereiner 1993; Untereiner et al. 2013; Hyde et al. 2020). Untereiner et al. (2013) sequenced strains of *E. macrostoma*, *E. mallochii* and *E. operculata* which clustered with *Endoxyla* (98%ML, Fig. 12) in Boliniaceae. The *Endoxyla* species forms a sister clade to *Camaropella* (53%ML, Fig. 12).

Type species: ***Endoxyla macrostoma*** Fuckel, Jb. nassau. Ver. Naturk. 25-26: 322 (1871)

Fig. 20 l–m

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* poorly developed, brown, septate hyphae. *Ascomata* perithecial, gregarious or in bi- or uni-seriate linear groups, immersed to semi-immersed, ampulliform to subglobose, black, ostiolate, with papilla. *Peridium* comprising two layers, outer layer composed of dark brown to brown cells of *textura intricata* to *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* filiform, septate, sparse in mature ascomata. *Asci* 8-spored, clavate to cylindrical, pedicellate, with J- apical ring. *Ascospores* ellipsoidal to suballantoid, curved, 0–1-septate, unequal, composed of a large brown to pale brown cell with an apical germ pore and a tiny, conical, hyaline cell. **Asexual morph**: Undetermined (adapted from Fuckel 1872; Untereiner 1993).

Known hosts and distribution: On decayed, decorticated wood of *Quercus* in Germany (type locality) (Fuckel 1872); on decorticated wood of angiosperms and gymnosperms (*Abies*, *Picea*, *Pinus*) in

Canada, Czech Republic, Germany and Sweden (Untereiner 1993; Untereiner et al. 2013).

Notes: Fuckel (1872) established *Endoxyla* and introduced *E. macrostoma* which was collected from Germany. Holm (1975) suggested *E. operculata* as the type species. However, Untereiner (1993), after reviewing the species of *Endoxyla*, proposed that *E. macrostoma* should be used as the type (see notes for *Endoxyla*). Untereiner et al. (2013) sequenced molecular data for *E. macrostoma* collected from Canada and this strain is basal to *E. mallochii* and *E. operculata* (98%ML, Fig. 12).

Endoxyla operculata (Alb. & Schw.) Sacc., Syll. fung. (Abellini) 1: 181 (1882)

Basionym: *Sphaeria operculata* Alb. & Schwein., Consp. fung. (Leipzig): 40 (1805)

Facesoffungi number: *****??; Fig. 19

Saprobic on wood. **Sexual morph**: *Mycelium* brown, septate hyphae 2–6.5 µm wide, surrounded the base of the ascoma. *Ascostromata* poorly developed or absent. *Ascomata* 800–900 × 500–565 µm ($\bar{x}$ = 845 × 530 µm, n = 10), perithecial, solitary, immersed, with necks erumpent the rough wood of the surface, in linear groups, ampulliform to subglobose, black, ostiolate, with necks, periphysate. *Peridium* 40–100 µm ($\bar{x}$ = 70 µm, n = 30) wide, comprising three layers, outer layer carbonaceous or coriaceous, composed of dark brown cells of *textura intricata*; middle layer membranaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* filiform to ventricose, septate, sparse in mature ascomata. *Asci* 85–90 × 6.5–12 µm ($\bar{x}$ = 87.5 × 9.5 µm, n = 30), 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex blunt, with J- apical ring. *Ascospores* 9.5–16 × 4–6.5 µm ($\bar{x}$ = 13.5 × 5 µm, n = 50), uni- or bi-seriate, ellipsoidal to cylindrical, aseptate, hyaline when young, becoming pale grey, smooth-walled, slightly curved, guttulate, sometimes with an apical germ pore. **Asexual morph**: Undetermined (adapted from Untereiner 1993).

Material examined: Sweden, Uppland, Östera Ryd par., Rydboholm. S. of the castle in deciduous forest, on naked wood of deciduous tree, 17 May 1983, N. Lundqvist (S-F 138814); Norway, Troms, Storfjord commune, Helligskogen in Skibotndalen Valley (26 km SE of Skibotn), subalpine birch forest, on decayed wood of *Betula pubescens*, 17 August 1992, N. Lundqvist (S-F 138817).

Known hosts and distribution: On decayed wood of *Abies* in Lusatia and Sweden (type locality) (Albertini and Schweinitz 1805); on decayed, decorticated wood of angiosperms (*Acer*, *Fagus*, *Populus*, *Quercus*) and gymnosperms (*Alnus*, *Pinus*) in Canada, Czech Republic, Finland, France, Germany, Sweden, USA (Untereiner 1993; Untereiner et al. 2013).

Notes: Untereiner (1993) introduced a lectotype for *Endoxyla operculata* which was collected from Sweden by Fries which has immersed ascomata with clavate to cylindrical asci and cylindrical ascospores; however, the stomata are poorly developed or absent. In this study, we could not obtain the type material. Therefore, we re-examined authentic specimens collected by Lundqvist in Sweden and

Norway. These collections of *E. operculata* examined here, had prominent apical rings in the asci, and ascomata were not in a stroma (Fig. 19). These characters are not identical to *Camarops tubulina*, which is considered to be the current name of *E. operculata* (Index Fungorum 2020). *Endoxyla* is different from *Camarops* with crust-like stroma. Phylogenetically, the strain of *E. operculata* is sister to *E. mallochii* and is distant from *C. tubulina* (Untereiner et al. 2013; Réblová et al. 2018; this study, 84%ML, Fig. 12).

Mollicamarops Lar.N. Vassiljeva, Mycotaxon 99: 160 (2007)

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* semi-immersed, irregular in shape, widely effuse, ochreous or fulvous. *Ascomata* black, ostiolar region conspicuously stellate to furrowed. *Paraphyses* numerous, filiform, sinuous. *Asci* 8-spored, unitunicate, cylindrical, apical ring indistinct, long pedicellate. *Ascospores* ellipsoidal, light brown to brown, aseptate, smooth-walled, with guttules. **Asexual morph**: Undetermined (adapted from Vasilyeva 2007).

Notes: The monotypic genus *Mollicamarops* is characterized by stellate, ostiolate ascomata, cylindrical asci and ellipsoidal, aseptate ascospores. It is similar to *Camarops flava* in having yellow to brown ascostromata and can be distinguished as the latter has astellate ostioles and ornamented ascospores (Samuels and Rogers 1987; Vasilyeva 2007). Therefore, we place *Mollicamarops* in Boliniaceae.

Type species: ***Mollicamarops stellata*** Lar.N. Vassiljeva, Mycotaxon 99: 160 (2007)

Fig. 20 n–o

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* semi-immersed, irregular in shape, widely effuse, ochreous or fulvous. *Ascomata* black, ostiolar region conspicuously stellate to furrowed. *Paraphyses* numerous, narrow, sinuous. *Asci* 8-spored, unitunicate, cylindrical, apical ring indistinct. *Ascospores* ellipsoidal, light brown, aseptate, smooth-walled, with guttules. **Asexual morph**: Undetermined (adapted from Vasilyeva 2007).

Known hosts and distribution: On decayed, decorticated wood in Russia (type locality) (Vasilyeva 2007).

Notes: We were unable to obtain type material. Therefore, we draw the asci and ascospores of *Mollicamarops stellata* (Fig. 20 n–o) from Vasilyeva (2007).

Neohypodiscus J.D. Rogers, Y.M. Ju & Læssøe, Mycologia 86(5): 684 (1994)

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* subglobose to pulvinate to irregular, solitary or confluent, narrow to broad, carbonaceous, with longitudinal veins below and attachment to the substrate. *Ascomata* subglobose to ampulliform, brown to black, subglobose, carbonaceous, monostichous, ostiolate, rough-walled. *Paraphyses* numerous, mostly unbranched, septate. *Asci* 8-spored, unitunicate, cylindrical to clavate, with J- apical ring. *Ascospores* uniseriate, greenish to brown, ellipsoidal to crescent-shaped, 0–2-septate, smooth-walled, some with an apical thickening or acellular appendage at one end, with a germ pore at one or both end(s), guttulate. **Asexual morph**: Undetermined (adapted from Rogers et al. 1994b).

Notes: Rogers et al. (1994b) placed *Neohypodiscus* in Amphisphaeriaceae (Xylariomycetidae) based on its carbonaceous stromata, cylindrical asci and ellipsoidal to fusiform ascospores. Subsequently, Andersson et al. (1995) transferred it to Boliniaceae. No molecular data for this genus has been sequenced yet. In this study, we place *Neohypodiscus* in Boliniaceae because it has the same carbonaceous stromata and unequal ascospores with hyaline thickened end(s) as *Camarops* and *Apiorhynchostoma*.

Type species: ***Neohypodiscus rickii*** (Lloyd) J.D. Rogers, Y.M. Ju & Læssøe, Mycologia 86(5): 685 (1994)

Basionym: *Hypodiscus rickii* Lloyd, Mycol. Writ. 7(Letter 68): 1181 (1923)

Fig. 20 a–k

Saprobic on decorticated wood. **Sexual morph**: *Ascostromata* subglobose to irregular, confluent in mass, with narrow to broad connection to substrate, brown to black, with veins. *Ascomata* 350–1300 × 550–800 µm ($\bar{x}$ = 1100 × 755 µm, n = 10), brown to black, subglobose, carbonaceous, with a short umbilicate ostiole, rough-walled. *Paraphyses* 1.5–10 µm wide, numerous, mostly unbranched, septate. *Asci* 200 × 11 µm, 8-spored, unitunicate, cylindrical, apical ring indistinct. *Ascospores* 26.5–32 × 7–9 µm, uniseriate, greenish to brown, ellipsoidal to crescentic, aseptate or 1-septate near one end or rarely 2-septate, unequal, normally composed of one small cell and one large cell with a germ pore at end, smooth-walled, some with an apical thickening or acellular appendage at one end, with guttules. **Asexual morph**: Undetermined (adapted from Rogers et al. 1994b).

Material examined: Puerto Rico, El Toro Trail, off Rt. 186, Luquillo Mountains, on dead wood, 24 December 1996, D.J. Lodge, G.J. Samuels and H.J. Strauss (BPI-737826); Puerto Rico, El Verde, Luquillo Mts., Trail to the Radiation Center, on dead wood, 23 March 1993, D.J. Lodge and M. Boyd (BPI-802543).

Known hosts and distribution: On decayed, decorticated wood in Brazil (type locality), Puerto Rico (Rogers et al. 1994b).

Notes: Lloyd (1923) described *Hypodiscus rickii*, and Rogers et al. (1994b) transferred this species as *Neohypodiscus rickii* as its generic type. Rogers et al. (1994b) examined two samples collected by

Lloyd from Brazil and defined those collections as lectotype and paralectotype materials. In this study, we re-examined two authentic samples determined by Rogers (mentioned in the label of material) as we were unable to obtain type material. We were unable to find any structures in the samples except the ascomata, therefore, we provided a hand drawing of asci and ascospores (Fig. 20 j–k) following Rogers et al. (1994b).

Pseudovalsaria Spooner, Trans. Br. mycol. Soc. 86(3): 405 (1986)

Saprobic on wood. **Sexual morph**: *Ascostromata* immersed to erumpent through bark. *Ascomata* gregarious, brown to black, ellipsoidal to pyriform, immersed to semi-immersed in stroma. *Asci* 8-spored, unitunicate, cylindrical, apex rounded or blunt. *Ascospores* uniseriate, brown to dark brown, cylindrical to ellipsoidal, ends slightly tapered to rounded, 0–1-septate, smooth-walled, with a germ pore at the base, guttulate. **Asexual morph**: Undetermined (adapted from Spooner 1986).

Notes: Spooner (1986) established *Pseudovalsaria* typified by *P. foedans*, and Barr (1994) placed this genus in Clypeosphaeriaceae. Rappaz (1995) subsequently transferred it to Boliniaceae as it has similar characters to *Camarops*, such as cylindrical asci and ellipsoidal ascospores with germ pore. Untereiner et al. (2013) confirmed that *Pseudovalsaria* belong in Boliniaceae based on ITS-LSU sequence analyses of *P. ferruginea*. In this study, the strain of *P. ferruginea* is sister to *Apiorhynchostoma apiosporum* in Boliniaceae (72%/ML, Fig. 12).

Type species: ***Pseudovalsaria foedans*** (P. Karst.) Spooner, Trans. Br. mycol. Soc. 86(3): 405 (1986)

Basionym: *Phaeosperma foedans* P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 55 (1873)

Fig 20 p–q

Saprobic on wood of *Pinus silvestris*. **Sexual morph**: *Ascostromata* gregarious, immersed to erumpent through bark. *Ascomata* gregarious, immersed to semi-immersed in stroma, brown to black, ellipsoidal to pyriform, with long necks. *Necks* composed of pale brown to hyaline cells of *textura porrecta*, surrounded by stromatic tissue. *Peridium of venter* outer layer composed of dark brown, irregular patches forming opaque amorphous matter; middle layer composed of brown cells of *textura angularis* to *textura prismatica*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* mostly branched, filiform, septate. *Asci* 8-spored, unitunicate, cylindrical, apex rounded, with J- apical ring. *Ascospores* uniseriate, dark brown, cylindrical to ellipsoidal, slightly tapered to rounded ends, sometimes slightly curved, 1-septate, smooth-walled, with a terminal germ pore, guttulate. **Asexual morph**: Undetermined (adapted from Spooner 1986).

Known hosts and distribution: On decorticated wood of *Viburnum* sp. in China (Spooner 1986); on decayed wood of *Betula* sp., *Castanea sativa*, *Pinus silvestris*, *Prunus laurocerasus*, *Quercus* sp. in

England (type locality) (Spooner 1986); on decayed wood of *Alnus* in Finland (Spooner 1986); on decayed wood of *Alnus* sp. in Canada (Untereiner et al. 2013).

Notes: Spooner (1986) established *Pseudovalsaria* based on *Phaeosperma foedans*. Untereiner (1993) proposed that *Anthostoma ferrugineum*, which has J- asci and brown, 1-septate ascospores with an apical germ pore, is similar to *Pse*. *foedens*. Rappaz (1995) subsequently synonymized *A. ferrugineum* under *Pse*. *ferruginea* and mentioned that ascospores of *Pse*. *foedans* are normally cylindrical and slightly curved which distinguishes it from *Pse*. *ferruginea* which has symmetrical, cylindrical ascospores. Ju et al. (1996) believed that the difference in ascospores between *P*. *ferruginea* and *P*. *foedans* were indistinct, and these species were probably conspecific. They also merged these two species and recognized *P*. *ferruginea* as the current name (Ju et al. 1996). However, this was not verified by phylogenetic analysis. Morphologically, Rappaz (1995) had considered *Pse. ferrugine* as having grey-brown tissue around the brown-red ascomata as different to *Pse*. *foedans*, which has dark brown tissue around the dark brown ascomata (Spooner 1986). The holotype of *Pse. ferruginea* and *Pse*. *foedans* were collected from Germany and England respectively (Nitschke 1867; Karsten 1873). Untereiner et al. (2013) analyzed the sequence data from a collection of *Pse. ferruginea* which was isolated from a decorticate branch of *Populus* in Canada. This study recommends that the generic type *Pse*. *foedans* (Spooner 1986) and *Pse. ferruginea* as two independent species until there are more characteristics and phylogenetic data to determine their classification. The strain of *Pse. ferruginea* is sister to *Apiorhynchostoma apiosporum* (72%/ML, Fig. 12), but no sequence is available for *Pse*. *foedans*. We were unable to examine the type taxon, therefore, we provided a hand drawing of asci and ascospores (Fig. 20 p–q) following Spooner (1986).

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

Chaetosphaeriales was introduced by Huhndorf et al. (2004a) and four families (Chaetosphaeriaceae, Helminthosphaeriaceae, Leptosporellaceae and Linocarpaceae) are included in this order based on the morphology and phylogenetic analyses (Maharachchikumbura et al. 2015, 2016; Hernández-Restrepo et al. 2017; Hyde et al. 2020). Species of Chaetosphaeriales are mostly saprobes or/and pathogens in terrestrial and aquatic habitats, and can also be fungicolous (Maharachchikumbura et al. 2015, 2016).

Helminthosphaeriaceae Samuels, Cand. & Magni, Mycologia 89(1): 144 (1997)

Saprobic or *parasitic* on wood or decorticated branches or stems in terrestrial habitats, sometimes fungicolous. **Sexual morph**: *Ascomata* perithecial, solitary, scattered or gregarious, superficial or immersed, ovoid to subglobose, dark brown to black, carbonaceous or membranaceous, glabrous or tuberculate or with setae, papillate. *Peridium* carbonaceous or membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, evanescent, septate, unbranched or branched, filiform to cylindrical. *Asci* 8-spored, unitunicate, cylindrical to clavate, apex truncate, pedicellate, with J- apical ring. *Ascospores* normally bi-seriate, allantoid or clavate or cylindrical, 0–3-septate, hyaline to brown or grey or becoming dark colored in part, smooth-walled, with germ pore at one end or/and both ends, with guttules or guttules absent. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous, mononematous, gregarious, cylindrical, branched or unbranched, pale brown to brown, septate, smooth-walled. *Conidia* solitary, acrogenous, ellipsoidal to obclavate, 0–multi-septate, smooth-walled, hyaline to brown, with guttules or guttules absent (adapted from Fuckel 1870; Réblová 1999b; Maharachchikumbura et al. 2016).

Type genus: ***Helminthosphaeria*** Fuckel 1870

Notes: Helminthosphaeriaceae is typified by *Helminthosphaeria* (Fuckel 1870) and most of its species have black setose, globose ascomata and cylindrical asci with brown to hyaline, subglobose ascospores and mononematous conidiophores with oblong conidia. Initially, *Echinosphaeria*, *Endophragmiella*, *Helminthosphaeria*, *Hilberina*, *Ruzenia* and *Synaptospora* were included based on morphological and/or phylogenetic analysis (Miller and Huhndorf 2004a; Miller et al. 2014; Maharachchikumbura et al. 2015). *Diplococcium* and *Tengiomyces* were added to this family (Lumbsch and Huhndorf 2007; Wijayawardene et al. 2018). *Tengiomyces* was accepted in this family as its ascomata are similar to *Helminthosphaeria* (Réblová 1999a), whereas its ascospores are similar to *Chaetosphaerella* and *Crassochaeta* (Chaetosphaerellaceae, Coronophorales) (Réblová 1999a; Hyde et al. 2020; Wijayawardene et al. 2020). Thus, we suggest placing *Tengiomyces* in Coronophorales genera *incertae sedis* (see notes for *Tengiomyces*). The hyphomycetous *Diplococcium* and *Endophragmiella* asexual morphs have associated species of *Helminthosphaeria* and *Echinosphaeria* on the natural substratum (Sutton 1973; Samuels et al. 1997; Goh and Hyde 1998; Goh et al. 1998; Réblová 1999b; Huhndorf et al. 2004b). *Diplococcium* has phylogenetic affinities with *Helotiales* (Leotiomycetes) and *Pleosporales* (Dothideomycetes) (Shenoy et al. 2007, 2010); and *Endophragmiella* species are closely related to Helminthosphaeriaceae and Tubeufiales (Dothideomycetes) (Hernández-Restrepo et al. 2017; Vu et al. 2019). However, *Diplococcium* was transferred to Vibrisseaceae (Ekanayaka et al. 2019) and we recommend to place *Endophragmiella* in Ascomycota genera *incertae sedis* (see notes for *Endophragmiella*). In this study, *Synaptospora* is transferred to Sordariales genera *incertae sedis* (see notes for *Synaptospora*). Thus, four genera, *Echinosphaeria*, *Helminthosphaeria*, *Hilberina* and *Ruzenia* are presently accepted in Helminthosphaeriaceae.

Echinosphaeria A.N. Mill. & Huhndorf, Mycol. Res. 108(1): 29 (2004)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary or scattered, superficial, subglobose to ovoid, membranaceous, brown to black, with setae, ostiolate, with papilla, periphysate. *Setae* hyaline to brown, straight, rigid, with acute apex. *Peridium* composed of loose arrangement, of hyaline to brown cells of *textura angularis* to *textura prismatica. Asci* 8-spored, unitunicate, cylindrical to clavate, apex blunt, with J- apical ring, pedicellate. *Ascospores* cylindrical to allantoid, 0–multi-septate, hyaline to brown, smooth-walled or verrucose, ends rounded, slightly curved, guttulate. **Asexual morph**: Undetermined (adapted from Persoon 1796; Karsten 1873; Miller and Huhndorf 2004a).

Notes: Miller and Huhndorf (2004a) established *Echinosphaeria* for *Lasiosphaeria canescens* based on LSU sequence analysis. This genus clustered with *Helminthosphaeria* in Helminthosphaeriaceae (Hongsanan et al. 2017; Wijayawardene et al. 2018; Hyde et al. 2020). In this study, *Echinosphaeria* nests in Helminthosphaeriaceae based on the LSU-TUB sequence analysis (Fig. 21).

Type species: ***Echinosphaeria canescens*** (Pers.) A.N. Mill. & Huhndorf, Mycol. Res. 108(1): 31 (2004)

Basionym: *Sphaeria canescens* Pers., Observ. mycol. (Lipsiae) 1: 67 (1796)

Facesoffungi number: *****??; Fig. 22 a–r

Saprobic on wood. **Sexual morph**: *Ascomata* 365–660 × 340–590 µm ($\bar{x}$ = 470 × 450 µm, n = 10), perithecial, solitary or scattered, superficial, globose to ovoid, membranaceous, brown to black, with brown, densely setae, ostiolate, with papilla, periphysate. *Setae* 5.5–12 µm wide at base, rigid, hyaline to pale brown, with acute apex. *Peridium* 25–50 µm ($\bar{x}$ = 37 µm, n = 30) wide, comprising two layers, outer layer composed of loose arrangement, of brown to pale brown cells of *textura angularis*; inner layer composed of pale brown to hyaline cells of *textura prismatica*. *Paraphyses* 2–4 µm wide, numerous, septate, unbranched, filiform. *Asci* 105–115(–125) × 9–15.5 µm ($\bar{x}$ = 110 × 12.5 µm, n = 30), 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex blunt, with J- apical ring. *Ascospores* (22.5–)24–28(–31) × 4–7.5 µm ($\bar{x}$ = 26 × 6 µm, n = 50), bi-seriate, subglobose to allantoid, 0–1-septate, hyaline to pale brown, smooth-walled, ends rounded, slightly curved, guttulate. **Asexual morph**: Undetermined.

Material examined: USA, Michigan, Marquette, Huron Mountain Club, between Conway Lake and Lake Superior on road to Todd property, 46º00’ N/87º0’ W, on driftwood half buried in sand, 15 July 1996, S.M. Huhndorf et al. (F-SMH 2627). Sweden, Uppsala, Uppland, on dead wood, 26 August 1884, L. Romell (S-F 134887). Finland, on dead wood, 16 October 1861, P.K. Karsten (S-F 134901).

Known hosts and distribution: On dead, decorticated wood of *Betula*, *Pinus* and *Quercus* in Finland (type locality) (Persoon 1796; Karsten 1873); on dead wood in Denmark, Sweden and USA (Miller and Huhndorf 2004a).

Notes: *Echinosphaeria canescens* is the type species of *Echinosphaeria* (Miller and Huhndorf 2004a). This species has been reported with hyphomycetous *Endophragmiella* and selenosporella-like. Cultural characteristics for *Ech. canescens* are lacking (Hughes 1979; Sivanesan 1983; Miller and Huhndorf 2004a; Hernández-Restrepo et al. 2017; Vu et al. 2019). Strains of *Ech. canescens* clustered with *Helminthosphaeria* species in Helminthosphaeriaceae (Miller et al. 2014; Miller and Huhndorf 2004a; Hongsanan et al. 2017; this study, Fig. 21). The molecular data of two *Endophragmiella* species are available, *End*. *taxi* is closely related to Tubeufiales (Dothideomycetes) (Vu et al. 2019); and *End*. *dimorphospora* is nested in Helminthosphaeriaceae, but is phylogenetically distant from *Ech*. *canescens* (Hernández-Restrepo et al. 2017; this study, Fig. 21). *Selenosporella* strains are more closely related to Diatrypaceae (Xylariales) (Vu et al. 2019). In this study, we are unable to obtain the type material. We re-examined authentic samples collected by Karsten and Hundorf.

Helminthosphaeria Fuckel, Jb. nassau. Ver. Naturk. 23-24: 166 (1870) [1869-70]

Saprobic or *parasitic* on wood or decorticated branch in terrestrial habitats, sometimes fungicolous. **Sexual morph**: *Ascomata* perithecial, solitary, scattered or gregarious, superficial or immersed, globose to subglobose, dark brown to black, carbonaceous or membranaceous, glabrous or with setae, with or without ostiole, with periphyses. *Peridium* carbonaceous or membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, evanescent, septate, unbranched or branched, filiform to cylindrical. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex truncate, with J- apical ring. *Ascospores* bi-seriate, ellipsoidal to clavate, 0–3-septate, hyaline to brown or grey, smooth-walled, with germ pore at one end or/and both ends, guttulate. **Asexual morph (associated)**: Hyphomycetous. *Conidiophores* macronematous, mononematous, gregarious, cylindrical, branched, pale brown to brown, septate, smooth-walled. *Conidia* solitary, ellipsoidal to obclavate, 0–multi-septate, smooth-walled, hyaline to brown, guttulate (adapted from Fuckel 1870; Samuels et al. 1997; Miller et al. 2014).

Notes: Desmazières (1837) introduced a species growing on *Clavaria fuliginea* in northern France, and Fuckel (1870) later accepted it as the generic type of *Helminthosphaeria*, named as *H*. *clavariarum*. This genus was considered as member of Sordariales based on the ontogeny of the ascomata and 1-septate ascospores with germ pores are similar to *Sordaria* (Parguey-Leduc 1960; Lundqvist 1972; Eriksson and Hawksworth 1993). Subsequently, Samuels et al. (1997) monographed this genus, established Helminthosphaeriaceae and concluded that most species in this family were found on members of Clavariaceae or/and coriaceous basidiomycetes. They also found that *Helminthosphaeria* species were accompanied with hyphomycetous *Diplococcium* or/and heteroconium-like asexual morphs on the substratum (Samuels et al. 1997). Afterward, Miller et al. (2014) introduced several lignicolous *Helminthosphaeria* species based on phylogenetic analysis and reported that the polyphyletic *Helminthosphaeria* has *Diplococcium* and *Selenosporella* asexual morphs in nature, but not confirmed by cultural characteristics or phylogenetic analysis. *Helminthosphaeria* is characterized by a fungicolous and lignicolous habit, superficial or immersed ascomata, cylindrical asci with hyaline to brown ascospores and associated asexual morphs with smooth-walled or verrucose, septate conidia (Samuels et al. 1997; Goh and Hyde 1998; Réblová 1999a; Hernández-Restrepo et al. 2017). In this study, the polyphyletic *Helminthosphaeria* is related to *Endophragmiella dimorphospora* and *Hilberina* species, and scattered in Helminthosphaeriaceae (Fig. 21). However, we could not confirm the asexual morph of *Helminthosphaeria* due to lack of cultural characteristics and molecular data.

Type species: ***Helminthosphaeria clavariarum*** (Desm.) Fuckel, Jb. nassau. Ver. Naturk. 23-24: 166 (1870) [1869-70]

Basionym: *Peziza clavariarum* Desm., Annls Sci. Nat., Bot., sér. 2 8: 8 (1837)

Facesoffungi number: *****??; Fig. 23

Saprobic or *parasitic* on *Clavulina*. **Sexual morph**: *Ascomata* 295–390 × 195–275 µm ($\bar{x}$ = 335 × 240 µm, n = 10), perithecial, solitary, superficial, globose, black, rough, surrounded by setae, ostiolate, with papilla, periphysate. *Setae* 9.5–15 µm wide. brown to pale brown, tapering, with a septate lumen. *Ostioles* inconspicuous, a loose arrangement of cylindrical to oblong cells. *Peridium* 25–50 µm wide, membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 3–7 µm wide, numerous, evanescent, septate, filiform. *Ascogenous hyphae* discrete, smooth-walled, branched, with hyaline, ovoid to obpyriform cells, 9.5–12 × 3.5–6.5 µm ($\bar{x}$ = 11 × 5.5 µm, n = 10), growing in sympodial succession, in dense clusters, each giving rise to an ascus. *Asci* (70–)80–85(–110) × 8–13.5 µm ($\bar{x}$ = 82 × 10 µm, n = 30), 8-spored, unitunicate, cylindrical, apex rounded, pedicellate. *Ascospores* (9.5–)11–13(–16) × 5.5–7 µm ($\bar{x}$ = 12.5 × 6.5 µm, n = 50), uni-seriate, ellipsoidal to broad-fusiform or triangular, aseptate, hyaline to pale brown, smooth-walled, with guttules and an apical germ pore. **Asexual morph (associated)**: Hyphomycetous. *Conidiophores* (32.5–)42–55(–95) × 3.5–14 µm ($\bar{x}$ = 53 × 7 µm, n = 10), arising from the substrate, macronematous, mononematous, cylindrical, sparingly branched, pale brown to brown, septate, smooth-walled. *Conidiogenous cells* (10.5–)14–20(–22) × 3–7.5 µm ($\bar{x}$ = 17.5 × 5.5 µm, n = 10), terminal or intercalary, polytretic, brown, tapering, apex rounded, conidia formed through minute pores. *Conidia* (10–)17–20(–25) × 6–8 µm ($\bar{x}$ = 18 × 7 µm, n = 30), solitary, ellipsoidal to subglobose, 0–1-septate, sometimes constricted at septum, slightly curved, smooth-walled, hyaline to brown, with guttules.

Material examined: Sweden, Uppland, Fresta, on *Clavulina cinerea*, 18 September 1984, von H. Eichwald (S-F 135699); Sweden, Södermanland, Hölö sn. Tullgarnsomradet, SSO, Tullgarns slot, on *Clavulina* sp., 9 October 2008, K. Jaederfeldt (S-F 121831).

Known hosts and distribution: On old or living *Clavaria fuliginea* in Franch (type locality) (Desmazières 1837); on *Clavaria* in Franch, Germany, Sweden, UK and USA (Samuels et al. 1997).

Notes: *Helminthosphaeria clavariarum* is fungicolous and has been reported on Clavariaceae members in Europe and North America associated with diplococcium-like asexual morphs (Dennis 1978; Samuels et al. 1997). Huhndorf et al. (2004b) analyzed LSU sequence data for *H. clavariarum* (SMH4609). Miller et al. (2014) re-examined the material of SMH4609 and analyzed TUB sequence data for *H. clavariarum* (ANM Acc.17). In this study, we re-examined two authentic specimens (F 135699 and F 121831) determined by Lundqvist (mentioned in the label of material).

New combination:

Helminthosphaeria plumbea (Huhndorf, F.A. Fernández & Cand.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Synaptospora plumbea* Huhndorf, F.A. Fernández & Cand., Sydowia 51(2): 177 (1999)

Index Fungorum number: IF558251

Notes: See notes for *Synaptospora*.

Hilberina Huhndorf & A.N. Mill., Mycol. Res. 108(1): 31 (2004)

Saprobic on wood or leaves. **Sexual morph**: *Ascomata* perithecial, solitary or scattered, superficial, membranaceous, ovoid to obpyriform, brown to dark brown, tuberculate, covered with setae, ostiolate. *Asci* 8-spored, unitunicate, cylindrical. *Ascospores* biseriate, cylindrical, geniculate, one or both end(s) tapering to a distinct point or rounded ends, hyaline when young, becoming pale brown, smooth-walled, with guttules, 0–3-septate, sometimes with sheath. **Asexual morph**: Hyphomycetous. *Conidiophores* macronematous, mononematous, cylindrical, single or in group up to two, erect, arising directly from the host, multi-septate, cells expanding sometimes, brown to dark brown, apical cell swollen. *Conidiogenous cells* phialides, with cylindrical branches, hyaline to pale brown, discrete, smooth-walled; secondary branches, hyaline, 2–3 per branch, cylindrical, tapering at the apex. *Conidia* hyaline, aseptate, oblong to obovoid, smooth-walled (adapted from Fuckel 1870; Miller and Huhndorf 2004a).

Notes: Fuckel (1870) introduced *Leptospora caudata* has black ascomata and oblong ascospores and was accompanied with a hyphomycete with hyaline, oval conidia, on decayed wood of *Betula alba* in nature. This species was introduced as the generic type of *Hilberina* (Miller and Huhndorf 2004a). Subsequently, several taxa with bristly ascomata and ascospores distinctly curved or bent near the attenuate, lanceolate or acerose base were accepted as members of *Hiberina* (Declercq 2009, 2013; Miller et al. 2014). Miller et al. (2014) sequenced five *Hilberina* species and found that they are polyphyletic in Helminthosphaeriaceae and their asexual morphs unknown. In this study, *Hilberina* species are closely related to members of *Helminthosphaeria* and scattered in Helminthosphaeriaceae (Fig. 21). Its sexual-asexual link needs confirming with cultural characteristics and more phylogenetic data.

Type species: ***Hilberina caudata*** (Fuckel) Huhndorf & A.N. Mill., in Miller & Huhndorf, Mycol. Res. 108(1): 31 (2004)

Basionym: *Leptospora caudata* Fuckel, Jb. nassau. Ver. Naturk. 23-24: 144 (1870)

Facesoffungi number: *****??; Fig. 24

Saprobic on decorticated wood. **Sexual morph**: *Ascomata* 350–600 × 375–565 µm ($\bar{x}$ = 475 µm × 475 µm, n = 10), perithecial, solitary or scattered, superficial, membranaceous, ovoid to subglobose, dark brown to black, covered with setae, ostiolate, with papilla, periphysate. *Setae* 15–30 μm wide at base, brown to pale brown, tapering, with a septate lumen and apex rounded. *Peridium* 35–80 μm ($\bar{x}$ = 55 μm, n = 30) wide, comprising two layers, outer layer composed of pale brown to brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* 125–180 × 9.5–13.5 μm, 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- inconspicuous apical ring. *Ascospores* (38–)43–50 × 3–8 μm ($\bar{x}$ = 45.5 × 5.5 μm, n = 50), biseriate, cylindrical, geniculate, one end tapering to a distinct point, hyaline when young, becoming pale brown, smooth-walled, with guttules, 0–3-septate, without gelatinous appendages. **Asexual morph (associated)**: Hyphomycetous. *Conidiophores* 3–8.5 μm, cylindrical, single or in group up to two, erect, arising directly from the host, macronematous, mononematous, multi-septate, not constricted, cells expanding sometimes, brown to dark brown, apical cell swollen. *Conidiogenous cells* phialides (3–)5–8 × 1–2 μm ($\bar{x}$ = 6 × 1.5 μm, n = 30), with cylindrical branches, hyaline to pale brown, discrete, smooth-walled, aseptate; secondary branches (3.5–)4.5–5.5(–7.5) × 1–1.5 μm ($\bar{x}$ = 5 × 1.2 μm, n = 30), hyaline, aseptate, 2–3 per branch, cylindrical, tapering at the apex. *Conidia* 2.5–3.5 × 1–2 μm ($\bar{x}$ = 3 × 1.5 μm, n = 50), hyaline, aseptate, oblong to obovoid, smooth-walled (adapted from Fuckel 1870).

Material examined: Puerto Rico, Bisley Watershed 3, down slope on Quebrada 2 to Quebrada 3, Luquillo Mountains, 18º 19.00' N / 65°0.07' W, on dead wood, 28 January 1997, F.A. Fernández (F-SMH 3156); Germany, Hessen, 9º 0' 19" E / 49° 46' 28" N, on dead wood of *Betula* sp., K.W.G. Fuckel (G-G00266357 **syntype**).

Known hosts and distribution: On decorticated wood of *Betula alba* in Germany (type locality) (Fuckel 1870); on dead wood in Puerto Rico.

Notes: In this study, we re-examined a typical material and an authentic specimen, which were well preserved. The sexual morph of *Hilberina caudata* associated with haplographium-like asexual morph were found on the type materials. *Hilberina caudata* is sister to *Hilberina punctata* and nested in Helminthosphaeriaceae based on multi-gene analysis (Miller et al. 2014; this study, 96%ML/1.00BY, Fig. 21). However, cultural characteristics and phylogenetic data of *H. caudata* are required to gain better insights into the relationship with *Haplographium* and its taxonomic placement.

Ruzenia O. Hilber, The Genus Lasiosphaeria and Allied Taxa (Kelheim): 7 (2002)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, scattered to gregarious, superficial, subglobose to obovoid, dark brown to black, rough, ostiolate, with papilla, periphysate. *Peridium* membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- apical ring. *Ascospores* allantoid, 0–1-septate, hyaline, smooth-walled, guttulate. **Asexual morph**: Undetermined (adapted from Hilber and Hilber 2002).

Notes: The monotypic genus *Ruzenia* was introduced as similar to *Lasiosphaeria* (Hilber and Hilber 2002). Subsequently, its generic type, *Ruzenia spermoides*, was clarified as member of

Helminthosphaeriaceae based on phylogenetic analyses (Miller and Huhndorf 2004a; Miller et al. 2014). In this study, *Ruzenia* is similar to *Hilberina*, but differs in having less ascomata setae, lacking basal spines on the ascospores and being hyaline. It is basal to *Helminthosphaeria plumbea* and *Hilberina munkii* in Helminthosphaeriaceae (90%ML/0.93BY, Fig. 21).

Type species: ***Ruzenia spermoides*** (Hoffm.: Fr.) O. Hilber ex A. N. Mill. & Huhndorf, Mycological Research 108 (1): 31 (2004)

Basionym: *Sphaeria spermoides* Hoffm., Veg. Crypt. 2: 12 (1790)

Facesoffungi number: *****??; Fig. 25

Saprobic on wood. **Sexual morph**: *Ascomata* 385–620 × 360–530 µm ($\bar{x}$ = 485 × 465 µm, n = 10), perithecial, scattered to gregarious, superficial, subglobose to obovoid, dark brown to black, rough, ostiolate, with papilla, periphysate. *Peridium* 75–105 µm ($\bar{x}$ = 90 µm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 3–7.5 µm wide, septate, constricted at the septum, unbranched, cylindrical, tapering towards the rounded apex. *Asci* (100–)110–130(–150) × 8–12 µm ($\bar{x}$ = 125 × 10 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with J- apical ring. *Ascospores* 20–26 × 3–5.5 µm ($\bar{x}$ = 23 × 4 µm, n = 50), bi-seriate, allantoid, 0–1-septate, hyaline, smooth-walled, guttulate. **Asexual morph**: Undetermined.

Material examined: Sweden, Uppland, Bladaker; on dead, decorticated wood of *Tilia cordata*, 20 September 1992, N. Lundqvist (S-F 242341); Sweden, Uppland, Österaker-Östra Ryd, on dead, decorticated wood, 17 May 1983, N. Lundqvist (S-F 242342).

Known hosts and distribution: On dead decorticated wood in Czech Republic, Denmark, Germany (type locality), Sweden and USA (Hoffmann 1790; Fries 1823a; Miller and Huhndorf 2004a).

Notes: *Ruzenia spermoides* strains clustered in Helminthosphaeriaceae with 100%ML/1.00BY support and this clade is basal to *Helminthosphaeria plumbea* and *Hilberina munkii* (90%ML/0.93BY, Fig. 21) in the phylogenetic analysis (Miller and Huhndorf 2004a; Miller et al. 2014). In this study, we were unable to obtain the type material. Therefore, we re-examined two authentic samples collected by Lundqvist in Sweden.

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

Sordariales comprises Bombardiaceae, Chaetomiaceae, Diplogelasinosporaceae, Lasiosphaeriaceae, Lasiosphaeridaceae, Naviculisporaceae, Podosporaceae, Neoschizotheciaceae, Strattoniaceae, Sordariaceae and Zygospermellaceae as clarified by phylogenetic analyses (Hawksworth and Eriksson 1986; Huhndorf et al. 2004b; Kruys et al. 2014; Maharachchikumbura et al. 2016; Hongsanan et al. 2017;

Hyde et al. 2017, 2020; Marin-Felix et al. 2020; this study). Most taxa of Sordariales occur in terrestrial or/and aquatic habitats as saprobes and have ascospores with various appendages or different wall patterns (Maharachchikumbura et al. 2015, 2016; Hyde et al. 2020). This order is basal to Phyllachorales and Boliniales in Sordariomycetidae (59%ML, Fig. 1).

Bombardiaceae S.K. Huang, Maharachch. & K.D. Hyde, ***fam. nov.***

Index Fungorum number: IF558344

Etymology: Named after *Bombardia*, the oldest genus in this family.

Coprophilous or *saprobic* on soil or wood. **Sexual morph**: *Ascomata* perithecial or cleistothecial, solitary to scattered or gregarious, immersed to semi-immersed to superficial, globose to subglobose, glabrous or hairy, yellow to dark brown to black, sometimes semitransparent, membranaceous or coriaceous. *Paraphyses* numerous, filiform to cylindrical, septate, evanescent. *Asci* 4–8-spored, unitunicate, cylindrical to clavate, pedicellate, usually with J- apical ring, sometimes with apical globule. *Ascospores* uni-seriate or bi-seriate, ellipsoidal or cylindrical or maraca-shaped, 0–multi-septate, hyaline to brown to dark brown, verrucose or smooth-walled, sometimes with gelatinous sheath or irregular appendage(s). **Asexual morph**: Hyphomycetous. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Phialides* monophialidic, smooth-walled, hyaline, cylindrical, unbranched or branched. *Conidia* small, hyaline to pale yellow, ellipsoidal to oval, aseptate, smooth-walled, forming globose masses on the apex of the phialides (adapted from Malloch and Cain 1971; Lundqvist 1964, 1972; Udagawa and Furuya 1974; Khan and Krug 1991; Krug and Scott 1994; Bell 2005; Davison et al. 2008).

Type genus: ***Bombardia*** (Fr.) P. Karst. 1873

Notes: Marin-Felix et al. (2020) mentioned that *Apodospora*, *Bombardia*, *Bombardioidea*, *Fimetariela* and several species of *Cercophora*, *Podospora* and *Zopfiella* formed a low support clade. In this study, these taxa clustered (85%ML) and is sister to Sordariaceae (83%ML, Fig. 26).

The species of this cluster have diverse morphological characteristics. Most of them are coprophilous fungi, except for *Zopfiella attenuata* collected from soil and *Bombardia bombarda* found on hardwood (Lundqvist 1972; Udagawa and Furuya 1974). They have hairy or glabrous, membranaceous (sometimes with carbonaceous neck), or coriaceous ascomata (Malloch and Cain 1971; Lundqvist 1972; Udagawa and Furuya 1974; Khan and Krug 1991; Krug and Scott 1994; Bell 2005; Davison et al. 2008). *Zopfiella attenuata* and *Z. pleuropora* have cleistothecial ascomata and ascospores comprise fusiform to ellipsoidal, brown upper cell(s) and a conical hyaline lower cell, without appendages or sheath (Malloch and Cain 1971; Udagawa and Furuya 1974); the other members have perithecial ascomata and ascospores have appendages or surround the gelatinous sheath (Lundqvist 1964, 1972; Khan and Krug 1991; Krug and Scott 1994; Krug 1995; Bell 2005; Davison et al. 2008). *Apodospora peruviana*, *A. simulans*, *A. gotlandica*, *Bombardioidea anartia* and *Fimeteriella rabenhorstii* have broadly fusiform to ellipsoidal ascospores surrounded by gelatinous sheath (Lundqvist 1964, 1972; Krug and Scott 1994;

Krug 1995; Davison et al. 2008). All *Apodospora* species have the gelatinous sheath with an apical invagination (Lundqvist 1972; Krug and Scott 1994; Krug 1995; Davison et al. 2008). *Fimeteriella rabenhorstii* is the only species in the cluster with 4-spored asci (Lundqvist 1964; Krug 1995). *Bombardioidea anartia* and *Podospora appendiculata* have a special coriaceous peridium similar to *Bombardia bombarda* (Lundqvist 1972; Krug and Scott 1994). Whereas, *Bombardia bombardia*, *Cercophora scortea*, *Podospora fabiformis*, *P*. *fibrinocaudata* and *P*. *appendiculata* have ascospores comprise an ellipsoidal, brown upper cell and a cylindrical, hyaline pedicel, with terminal appendage(s) at each or one end (Lundqvist 1972; Khan and Krug 1991; Bell 2005). *Podospora fabiformis* has ascospores with apical and basal appendages, sometimes two lateral appendages arising from the top of the pedicel (Bell 2005). *Podospora fibrinocaudata* has ascospores with gelatinous sheath surrounding the pedicel's basal (Khan and Krug 1991). *Bombardia bombarda*, *Cercophora scortea* and *Podospora appendiculata* have cylindrical to clavate asci with a subapical or apical globule and ascospores with appendages at each end (Lundqvist 1972).

Apodospora Cain & J.H. Mirza, Can. J. Bot. 48(5): 891 (1970)

Coprophilous or *saprobic* on wood. **Sexual morph**: *Ascomata* perithecial, gregarious to scattered, immersed to semi-immersed, globose to subglobose, dark brown to black, glabrous or hairy. *Peridium* membranaceous, composed of hyaline to brown cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, filiform, septate, evanescent. *Asci* 8-spored, unitunicate, ellipsoidal, pedicellate, blunt at the apex. *Ascospores* oval to ellipsoidal, aseptate, brown to dark brown, verrucose, surrounded by gelatinous sheath, usually with an apical invagination. **Asexual morph**: Hyphomycetous. *Mycelium* grey-brown, with numerous phialides scattered on hyphae. *Conidia* small, ovate masses on the apex of the phialides (adapted from Cain and Mirza 1969).

Notes: Cain and Mirza (1969) introduced *Apodospora* typified by *A*. *simulans*, which has oblong to ellipsoidal ascospores surrounded by a gelatinous sheath and oval to globose small conidia masses on the phialides. This genus resembles *Sordaria* in having ascospores surrounded by gelatinous sheath (Cain and Mirza 1969). Six species are accommodated in this genus (Cain and Mirza 1969; Lundqvist 1972; Fakirova 1973; Muroi et al. 1987), and *A. gotlandica*, *A. peruviana,* and *A. simulans* have molecular data (Kruys et al. 2014). In this study, *Apodospora* species clustered in Bombardiaceae in the phylogenetic analysis (100%ML/1.00BY, Fig. 26).

Type species: ***Apodospora simulans*** Cain & J.H. Mirza, Can. J. Bot. 48(5): 891 (1970)

Facesoffungi number: *****??; Fig. 27

Coprophilous. **Sexual morph**: *Ascomata* 380–530 × 250–400 µm ($\bar{x}$ = 410 × 275 µm, n = 5), perithecial, gregarious to scattered, immersed to semi-immersed, globose to subglobose, dark brown to black, ostiolate, with papilla. *Peridium* 25–50 μm ($\bar{x}$ = 38 μm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of pale brown to brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 3–4 μm wide, filiform, septate, evanescent. *Asci* (200–)220–280(–350) × 12–20 μm ($\bar{x}$ = 250 × 16 μm, n = 30), 8-spored, unitunicate, ellipsoid, pedicellate, apex blunt, with J- apical ring distinct. *Ascospores* (15–)18–21(–25) × 8–10.5 μm ($\bar{x}$ = 20 × 9 μm, n = 50), uni-seriate, oblong to oval, aseptate, brown to dark brown, verrucose, surrounded by gelatinous sheath 2.5–6 μm diam. **Asexual morph**: Hyphomycetous. *Mycelium* grey-brown, with numerous phialides scattered on the hyphae. *Phialides* pale brown, with flaring collarette. *Conidia* small, ovate forming globose masses on the apex of the phialides (adapted from Cain and Mirza 1969).

Material examined: Sweden, Uppland, Danmark par., 500m E. of Grynbacken, in coniferous forest, on old moose dung, 18 May 1959, N. Lundqvist (S-F122911).

Known hosts and distribution: On dung of moose (*Alces americanus*) in Canada (type locality) (Cain and Mirza 1969); on moose dung in Canada, Norway and Sweden (Lundqvist 1972; Kruys et al. 2014).

Notes: We re-examined authentic material (S-F122911) of *Apodospora simulans* which was determined by Cain (mentioned in the label of material).

Bombardia (Fr.) P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 20 (1873)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, immersed to semi-immersed, solitary or gregarious, oval to subglobose, coriaceous to membranaceous, dark brown to black, glabrous or surrounded by branched hairs, ostiolate, with papilla. *Paraphyses* filiform, branched. *Asci* 8-spored, unitunicate, ellipsoidal to cylindrical, pedicellate, rounded or truncate apex, evanescent. *Ascospores* hyaline and cylindrical when young, upper cell becoming swollen to fusiform or oval, brown; lower cell cylindrical or subglobose, hyaline, smooth-walled, with guttules. **Asexual morph**: Undetermined (adapted from Fries 1849).

Notes: Fries (1849) introduced *Sphaeria* subgenus, *Bombardia*, based on '*Sphaeria* (*Bombardia*) *fasciculata*', and Karsten (1873) raised this species to genus level and established *Bombardia*. Saccardo (1882) clarified '*Sphaeria* (*Bombardia*) *fasciculata*' (≡ *Sphaeria fasciculata* Fr.) and *S. bombarda* Batsch. as conspecific, and named *Bombardia fasciculata* which is a homonym of *B. fasciculata* Rab. (Batsch 1786; Rabenhorst 1851). However, the illegitimate *B. fasciculata* is still used (Maharachchikumbura et al. 2016; Index Fungorum 2020) and caused some confusion. *Bombardia bombarda* (= *Sphaeria bombarda* Batsch.) was recommended as the generic type instead of *B. fasciculata* (Schröter 1894; Lundqvist 1972), and its molecular data was sequenced later (Miller and Huhndorf 2005; Spatafora et al. 2006). In this study, *Bombardia* is sister to *Bombardioidea* in Bombardiaceae (100%ML/1.00BY, Fig. 26).

Type species: ***Bombardia bombarda*** (Batsch) J. Schröt., in Cohn, Krypt.-Fl. Schlesien (Breslau) 3.2(1–2): 302 (1893)

Basionym: *Sphaeria bombarda* Batsch, Elench. fung. (Halle): 271 (1786)

Facesoffungi number: *****??; Fig. 28

Saprobic on wood. **Sexual morph**: *Ascomata* 1–1.5 × 0.4–0.8 mm ($\bar{x}$ = 1.2 × 0.6 mm, n = 5), perithecial, immersed to semi-immersed, gregarious, oval to subglobose, coriaceous, dark brown to black, glabrous, ostiolate papilla, with 2.5 µm wide periphyses. *Peridium* 75–120 µm ($\bar{x}$ = 95 µm, n = 30) wide, coriaceous, comprising four layers, outer layer composed of amorphous brown to black material; middle layer composed of hyaline to brown cells of *textura intricata*, and dark brown, strongly tight cells of *textura angularis*; inner layer composed of pale brown to hyaline cells of *textura prismatica*. *Paraphyses* 2–3 µm wide, filiform, septate, evanescent. *Asci* (180–)200–230(–270) × 10–15 µm ($\bar{x}$ = 230 × 12 µm, n = 30), 8-spored, unitunicate, ellipsoidal to cylindrical, pedicellate, apex rounded, with apical globule, evanescent. *Ascospores* bi-seriate, hyaline and cylindrical when young, upper cell becoming swollen to fusiform, brown, (10–)12–15 × 5–10 µm ($\bar{x}$ = 13.5 × 8 µm, n = 50), with an apical germ pore, sometimes with a tiny, hyaline, unconspicuous decoration on the apex; lower cell cylindrical, hyaline, (20–)24–30 × 3.5–6 µm ($\bar{x}$ = 26 × 4.5 µm, n = 50), smooth-walled, guttulate, with a terminal conical appendage at the base, evanescent. **Asexual morph**: Undetermined.

Material examined: Italy, Veneto, Treviso, Cansiglio, on dead trunks of *Fagus*, October 1874, P.A. Saccardo (S-F750); Ukraine, Lvivska oblast, Stryi, riverbank near Wierzany, on stems of *Alnus*, 28 October 1916, F. Petrak (S-F753).

Known hosts and distribution: On dead, decorticated wood in Germany (type locality) (Saccardo 1882); on dead wood in Belgium, Denmark, England, Finland, France, Germany, Hungary, Italy, New Zealand, Poland, Russia, Sweden, UK, Ukraine and USA (Lundqvist 1972; Miller and Huhndorf 2005).

Notes: We re-examined authentic materials of *Bombardia bombarda*, F750 and F753, collected by Saccardo and Petrak respectively. The molecular data of *B*. *bombarda* were sequenced (Miller and Huhndorf 2005; Spatafora et al. 2006), and in this study, *B*. *bombarda* (SMH4821) is sister to *Bombardioidea anartia* (HHB99-1) (100%ML/1.00BY, Fig. 26).

Bombardioidea C. Moreau ex N. Lundq., Symb. bot. upsal. 20(no. 1): 274 (1972)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, superficial or semi-immersed, gregarious or scattered, ovoid to subglobose, coriaceous to membranaceous, dark brown to black, verrucose, ostiolate, with papilla. *Peridium* coriaceous, outer layer composed of amorphous brown to black material; middle layer composed of hyaline to brown cells of *textura intricata*, and dark brown, strongly tight cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* filiform, septate. *Asci* 4–8-spored, unitunicate, ellipsoidal to cylindrical, pedicellate, usually with apical ring distinct, evanescent. *Ascospores* uni- or bi-seriate, ellipsoidal, ovoid or oblong, hyaline when young, becoming brown when mature, aseptate, verrucose, with a germ pore at each end, surrounded by gelatinous sheath, guttulate. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidiophores* brown to dark brown, septate, branched, clusters of several phialides, producing conidia in chains or forming globose masses on the apex. *Conidia* numerous, aseptate, hyaline to pale brown, globose to subglobose (adapted from Niessl 1872; Moreau 1953; Lundqvist 1972).

Notes: *Sordaria bombardioides* was transferred to *Bombardioidea* as its generic type (Niessl 1872; Moreau 1953; Lundqvist 1972). Species of this genus are coprophilous usually reported on leporid dung (Lundqvist 1972; Krug and Scott 1994). Huhndorf et al. (2004b) sequenced molecular data for *Bombardioidea anartia* and in this study, it is sister to *Bombardia bombarda* (100%/ML/1.00BY) in Bombardiaceae (Fig. 26).

Type species: ***Bombardioidea bombardioides*** (Auersw.) in Lundqvist, Symb. bot. upsal. 20(no. 1): 277 (1972)

Basionym: *Sordaria bombardioides* Auersw., in Niessl, Verh. nat. Ver. Brünn 10: 187 (1872)

Facesoffungi number: *****??; Fig. 29

Coprophilous. **Sexual morph**: *Ascomata* 0.5–1.5× 0.5–0.8 mm ($\bar{x}$ = 1.2 × 0.6 mm, n = 5), perithecial, superficial, gregarious, oval to subglobose, coriaceous, dark brown to black, verrucose, ostiolate, with papilla. *Peridium* 120–160 µm ($\bar{x}$ = 135 µm, n = 30) wide, coriaceous, comprising four layers, outer layer composed of amorphous brown to black material; middle layer composed of hyaline to brown cells of *textura intricata*, and dark brown, strongly tight cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* filiform, septate. *Asci* (140–)145–160 × 15–25 µm ($\bar{x}$ = 150 × 20 µm, n = 30) ascospore-bearing part, 8-spored, unitunicate, ellipsoidal to cylindrical, pedicellate, about 80 µm long, apex rounded, evanescent. *Ascospores* (20–)22–27(–30) × 10–17 µm ($\bar{x}$ = 25 × 12 µm, n = 50), uni-seriate, ellipsoidal, hyaline when young, becoming brown when mature, aseptate, verrucose, with a germ pore at each end, surrounded by gelatinous sheath 1–6 µm wide, guttulate. **Asexual morph**: Hyphomycetous. *Conidiophores* brown to dark brown, becoming hyaline towards the apex, septate, branched, with clusters of 2–7 phialides. *Phialides* subhyaline to dark brown, subglobose to ampulliform. *Conidia* numerous, aseptate, hyaline to pale brown, globose to subglobose (adapted from Krug and Scott 1994).

Material examined: Czech Republic, Jihomoravsky Kraj, Brünn, on hare dung, 9 August 1883, G. Niessl von (S-F726); Poland, Silesia, Karlsbrunn, on hare dung, August 1902, G. Niess von (S-F729).

Known hosts and distribution: On hare dung in Germany (type locality) (Niessl 1872); on hare and rabbit dung, occasionally on cow, roe-deer, horse, mose, porcupine and sheep dung in Austria, Bulgaria, Canada, Croatia, Czech Republic, Denmark, England, Japan, Israel, Germany, Hungary, Netherlands, Poland, Sweden and USA (Lundqvist 1972; Krug and Scott 1994).

Notes: We re-examined authentic specimens of *Bombardioidea bombardioides*, F726 and F729, collected by Niessl and determined by Lundqvist (mentioned in the label of material). In this study, we provided hand-drawings of the asexual morph (Fig. 31 r) from Krug and Scott (1994).

Fimetariella N. Lundq., Bot. Notiser 117: 239 (1964)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to semi-immersed, pyriform to subglobose, brown to black, ostiolate. *Peridium* comprising membranaceous to coriaceous, pale brown to brown cells. *Paraphyses* numerous, filiform, evanescent. *Asci* 4–8-spored, unitunicate, cylindrical, pedicellate, apex rounded. *Ascospores* uni-seriate, ellipsoidal to oval, aseptate, hyaline to brown to dark brown, with a germ pore at one or each end, surrounded by hyaline, gelatinous sheath. **Asexual morph**: Hyphomycetous. *Phialides* abundant, hyaline, reduced to collarettes producing conidia. *Conidia* ovoid, hyaline, aseptate (adapted from Lundqvist 1964b; Kruys et al. 2014).

Notes: Lundqvist (1964b) transferred *Sordaria rabenhrstii* to *Fimetariella* as its type species. It is characterized by pyriform ascomata and aseptate ascospores surrounded by a hyaline, gelatinous sheath. Kruys et al. (2014) sequenced *F. rabenhorstii* (20410), which was isolated from moose dung in Sweden and collected by Lundqvist. This strain is basal to *Zopfiella attenuata* and *Z. pleuropora* in Bombardiaceae (83%ML, Fig. 26).

Type species: ***Fimetariella rabenhorstii*** (Niessl) N. Lundq., Bot. Notiser 117: 239 (1964)

Basionym: *Sordaria rabenhorstii* Niessl, in Rabenhorst, Fungi europ. exsicc.: no. 1528 (1873)

Facesoffungi number: *****??; Fig. 30

Coprophilous. **Sexual morph**: *Ascomata* 400–500 × 350–400 µm ($\bar{x}$ = 430 × 380 µm, n = 10), perithecial, solitary, immersed to semi-immersed, ovoid to subglobose, membranaceous, black, ostiolate, with papilla. *Peridium* 24–40 µm ($\bar{x}$ = 30 µm, n = 30) wide, outer layer composed of pale brown to brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, filiform, evanescent, broader towards the base, without constrictions, septate. *Asci* (95–)110–128(–132) × 9.5–13 µm ($\bar{x}$ = 120 × 12 µm, n = 20), 4-spored, unitunicate, cylindrical, pedicellate, apex rounded with thickened wall. *Ascospores* (10–)13–15(–18) × 7.5–10 µm ($\bar{x}$ = 14 × 8.5 µm, n = 40), uni-seriate, ellipsoidal to oval, aseptate, hyaline when young, becoming brown to dark brown, surrounded by hyaline, gelatinous sheath 1–2.5 µm wide. **Asexual morph**: Undetermined.

Material examined: Sweden, Uppland, Älvkarleby par., SE of the mire Gustavmyrarna (4 km SW of Skutskär), in coniferous forest, on elk dung (*Alces alces*) in moist chamber, 8 June 1996, N. Lundqvist (S-F66877); Czech Republic, Jihomoravsky kraj, Brünn, on dung of *Caprearum*, G. Niessl (S-F66507,

holotype); Czech Republic, Jihomoravsky kraj, Brünn, on dung of *Caprearum*, G. Niessl (S-F66508, **isotype**).

Known hosts and distribution: On dung of roe and hare in the Czech Republic (type locality) (Saccardo 1882); on dung of deer, elk, goat, moose, rabbit, wapiti in Belgium, Canada, Denmark, Sweden and USA (Krug 1995).

Notes: We re-examined the type materials of *Sordaria rabenhorstii,* which were determined as *Fimetariella rabenhrstii* by Lundqvist (mentioned in the label of material). It is in good condition.

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

Coprophilous or *saprobic* on soil or wood. **Sexual morph**: *Ascomata* perithecial or cleistothecial, solitary to scattered or gregarious, immersed to semi-immersed to superficial, globose to subglobose, dark brown to black. *Paraphyses* numerous, filiform to cylindrical, septate, evanescent. *Asci* 4–8-spored, unitunicate, cylindrical to clavate, pedicellate. *Ascospores* uni-seriate or bi-seriate, ellipsoidal to oval or irregular, 0–multi-septate, hyaline to brown to dark brown, verrucose or smooth-walled, with gelatinous sheath or irregular appendage(s). **Asexual morph**: Hyphomycetous. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Conidia* small, oval to globose, ovate forming globose masses on the apex of the phialides (adapted from Nannfeldt 1932; Lundqvist 1972).

Type genus: ***Lasiosphaeria*** Ces. & De Not. 1863

Notes: Lasiosphaeriaceae is typified by *Lasiosphaeria* and has black ascomata, cylindrical to clavate asci and varied ascospores (Cesati and de Notaris 1863; Nannfeldt 1932; Lundqvist 1972; Wang et al. 2019; Marin-Felix et al. 2020). Species in Lasiosphaeriaceae were reported to be similar to taxa in Nitschkiaceae, Sordariaceae and Tripterosporaceae based on their ascospores with various ornamentations and appendages, such as *Bombardia*, *Lasiosphaeria* (Munk 1957; Carroll and Munk 1964; Lundqvist 1972; Barr 1990; Kruys et al. 2014). The traditional classification of Lasiosphaeriaceae is based on morphology; obviously, it is inconsistent with molecular phylogeny (Miller and Huhndorf 2004; 2005; Wang et al. 2019; Marin-Felix et al. 2020). Huhndorf et al. (2004b) confirmed that Lasiosphaeriaceae is polyphyletic based on LSU sequence data. Subsequently, many polyphyletic genera in this family were repositioned based on the sequence data (Cai et al. 2006a; Chang et al. 2010; Kruys et al. 2014; Wang et al. 2019; Marin-Felix et al. 2020). Wang et al. (2019) redefined three genera, *Cladorrhinum*, *Podospora* and *Triangularia*, and established Podosporaceae based on phylogenetic analysis. Wijayawardene et al. (2020) listed 32 genera in Lasiosphaeriaceae. Marin-Felix et al. (2020) re-classified *Cercophora*, *Diplogelasinospora*, *Immersiella*, *Jugulospora*, *Rinaldiella*, *Schizothecium*, *Zygopleurage* and some species of *Apiosordaria* and *Podospora* to establish Diplogelasinosporaceae, Naviculisporaceae and Schizotheciaceae in Sordariales based on morphology and phylogenetic analyses.

In this study, based on phylogenetic analyses, we divide the remaining Lasiosphaeriaceae taxa into five clades (Fig. 26): i) Bombardiaceae clade: This is a sister clade of Sordariaceae (83%ML). *Apodospora*, *Bombardia*, *Bombardioidea*, *Fimetariella* and some species of *Cercophora*, *Podospora* and *Zopfiella* clustered in this clade (85%ML); ii) Lasiosphaeriaceae clade: This clade is regarded as Lasiosphaeriaceae *sensu stricto* (Marin-Felix et al. 2020) because several typical *Lasiosphaeria* species with molecular data are included in this clade; however, the ex-type strain of *L. ovina* has not been sequenced. This clade is sister to Naviculisporaceae (82%ML). It clusters *Anopodium*, *Bellojisia*, *Corylomyces*, *Lasiosphaeria*, *Mammaria*, *Zopfiella* and some species of *Cercophora*, *Podospora* and *Ramophialophora* in 96%ML support; iii) Lasiosphaeridaceae clade: This is an orphan clade in Sordariales, which clusters *Lasiosphaeris* species only (100%ML/1.00BY); iv) Strattoniaceae clade: This is an unstable clade which includes *Strattonia* species and is sister to Diplogelasinosporaceae with poor support; v) Zygospermellaceae clade: This clade contains *Episternus onthosphagi*, *Zygospermella insignis* and *Ramophialophora petraea* (71%ML/0.99BY), and is an orphan clade in Sordariales (88%ML/1.00BY).

In addition, the generic type of *Apodus* is nested in Neoschizotheciaceae in phylogenetic analysis (Fig. 26). The polyphyletic *Arnium* and *Ramophialophora*, which have no molecular data of their type species, are placed in Sordariales genera *incertae sedis*. Given the diversity of the morphology of lasiosphaeriaceous taxa and locating each genus more accurately, we put the genera (*Biconiosporella*, *Camptosphaeria*, *Diffractella*, *Emblemospora*, *Eosphaeria*, *Periamphispora*, *Tripterosporella*) without molecular data in Sordariales genera *incertae sedis* pending further studies.

Thaxteria is typified by *T. didyma*, which was synonymized under *Bertia didyma* (Saccardo 1891; Mugambi and Huhndorf 2010). *Apiosordaria* is the synonym of *Triangularia* based on its available molecular data of type species (Wang et al. 2019). Therefore, they will not be discussed in this study.

Marin-Felix et al. (2020) redefined Lasiosphaeriaceae and proposed that Lasiosphaeriaceae *sensu stricto* may divided into two clades; *Lasiosphaeria* clade and the clade includes the generic type of *Anopodium*, *Bellojisia*, *Corylomyces*, *Zopfiella* and several other species *Cercophora sulphurella*, *C. sparsa*, *Podospora didyma* and *Ramophialophora humicola* (clade I, Fig. 26). In this study, we added the molecular data which was derived from Vu et al. (2019) of *Mammaria* and found that this genus is basal to *Lasiosphaeria* clade and clade I in Lasiosphaeriaceae (96%ML, Fig. 26). Therefore, six genera are accommodated in Lasiosphaeriaceae based on phylogenetic analysis.

This family has high morphological variability. *Ramophialophora humicola* is a phialophora-like hyphomycetes (Madrid et al. 2010). All sexual species have perithecial ascomata, except for *Zopfiella tabulata*, which has cleistothecial ascomata; *Anopodium ampullaceum*, *Cercophora sulphurella*, *C. sparsa*, *Mammaria echinnobotryoides*, *Podospora didyma* and *Zopfiella tabulata* have cylindrical ascospores with swollen apical cell and terminal appendage(s) present or absent, whereas *Bellojisia rhynchostoma* and *Corylomyces seleonsporus* have allantoid to reniform ascospores (Saccardo 1878, 1906; Lundqvist 1964, 1972; Guarro et al. 1991; Stchigel et al. 2006; Réblová 2008). However, more fresh collections and phylogenetic data are requested to determine the affinities and taxonomic placement for the members in this clade.

Anopodium N. Lundq., Bot. Notiser 117: 356 (1964)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, scattered, semi-immersed, or erumpent through the bark of host, or superficial, globose, pale brown to dark brown, ostiolate, with black papilla, surrounded by setae. *Peridium* membranaceous, composed of hyaline to brown cells of *textura angularis* to *textura prismatica*. *Asci* 8-spored, unitunicate, ellipsoidal, pedicellate, blunt at the apex. *Ascospores* subglobose to oval, collapsing when dry, aseptate, hyaline when young, becoming dark brown, smooth-walled, with an apical germ pore. **Asexual morph**: Undetermined (adapted from Lundqvist 1964a).

Notes: *Anopodium* was introduced by Lundqvist (1964a) with two species *A. ampullaceum* (type) and *A. epile*. This coprophilous genus is characterized by pale brown ascomata with black necks and ascospores with a pedicel at the end (Lundqvist 1964a). *Anopodium epile* differs from *A. ampullaceum* in having glabrous ascomata (Lundqvist 1964a). Kruys et al. (2014) sequenced *A. ampullaceum*. In this study, Fig. 26 shows *Anopodium* nests in Lasiosphaeriaceae clade I.

Type species: ***Anopodium ampullaceum*** N. Lundq., Bot. Notiser 117: 356 (1964)

Facesoffungi number: *****??; Fig. 31

Coprophilous. **Sexual morph**: *Ascomata* 400–550 × 275–400 µm ($\bar{x}$ = 480 × 335 µm, n = 10), perithecial, scattered, semi-immersed, or erumpent through bark of host, or superficial, globose, pale brown to dark brown, ostiolate, with black papilla, surrounded by setae 1.5–4.5 wide. *Necks* 180–200 × 100–135 µm ($\bar{x}$ = 185 × 120 µm, n = 5), membranaceous, central, dark brown to black, smooth-walled, with hyaline periphyses. *Peridium* 20–55 µm ($\bar{x}$ = 40 µm, n = 20) wide, membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 4–5 µm wide, numerous, broad, evanescent. *Asci* (135–)150–170(–200) × 35–45 µm ($\bar{x}$ = 160 × 40 µm, n = 30), 8-spored, unitunicate, ellipsoidal, pedicellate, apex blunt, apical ring absent, evanescent. *Ascospores* (25–)28–32(–35) × 15–25 µm ($\bar{x}$ = 30 × 20 µm, n = 50) for the mature swollen cells, bi-seriate, subglobose to oval, collapsing when dry, aseptate, hyaline, swollen cell towards the apex of ascus when young, becoming dark brown, partly ascospores of their swollen cell toward the apex; partly toward the base when mature, smooth-walled, with an apical germ pore and an evanescent pedicel (10–)18–25 × 1.5–3.5 µm ($\bar{x}$ = 20 × 2.5 µm, n = 20) at the other end. **Asexual morph**: Undetermined.

Material examined: Sweden, Jämtland, Mårdsundsbodarna, Hallen par., in subalpine birch forest, on hare dung (*Lepus timidus*) in moist chamber, Stockholm, 11 July 1988, N. Lundqvist (S-F47944); UK, Midlothian, Edinburgh, Hillend, on rabbit dung (*Oryctolagus cuniculus*) in moist chamber, 26 December 1996, M.J. Richardson (S-F66862).

Known hosts and distribution: On fresh hare dung in Sweden (type locality) (Lundqvist 1964a); on rabbit dung in Belgium, Norway, Sweden and UK (Lundqvist 1972; Kruys et al. 2014).

Notes: Lundqvist (1964a) discovered *Anopodium ampullaceum* on hare dung in Sweden, and it was reported in the UK (Kruys et al. 2014). In this study, we re-examined authentic material collected by Lundqvist in Sweden and a sample collected in the UK. We found that most of the swollen ascospores cells in the same ascus from S-F47944 were towards the ascus apex when they were young, becoming partly toward the ascus apex and partly toward the base. Kruys et al. (2014) sequenced *A. ampullaceum* (MJR 40/07 and E00218015) and found that these strains are related to *Bellojisia*, *Corylomyces* and *Lasiosphaeria*. In this study, *A. ampullaceum* is sister to *Cercophora sulphurella* in Lasiosphaeriaceae clade I (87%ML, Fig. 26).

Bellojisia Réblová, Mycologia 100(6): 897 (2008)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary to gregarious, semi-immersed to superficial, carbonaceous, pyriform to subglobose, tomentose, brown to black, ostiolate, with necks, periphysate. *Peridium* composed of brown to hyaline cells of *textura prismatica* to *textura intricata* to *textura angularis*. *Paraphyses* septate. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, with J- apical ring. *Ascospores* 0–1-septate, navicular to reniform to falciform, dark brown, with a large guttule in each cell and an apical germ pore. **Asexual morph**: Undetermined (adapted from Réblová 2008).

Notes: The monotypic *Bellojisia* was established based on *Jobellisia rhynchostoma* in phylogenetic analysis and its unique reniform ascospores different from *Jobellisia* (Réblová 2008). In this study, the strain of *B. rhynchostoma* is basal to *Podospora didyma* and *Zopfiella tabulata* in Lasiosphaeriaceae clade I (89%ML, Fig. 26).

Type species: ***Bellojisia rhynchostoma*** (Höhn.) Réblová, Mycologia 100(6): 897 (2008)

Fig. 34 i–j

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary to gregarious, semi-immersed to superficial, carbonaceous, pyriform to subglobose, tomentose, brown to black, ostiolate, with necks, periphysate. *Peridium* comprising two layers, outer layer composed of brown cells of *textura prismatica* to *textura intricata*, inner layer composed of hyaline to brown cells of *textura angularis*. *Paraphyses* septate. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, with J- apical ring. *Ascospores* 0–1-septate, navicular to reniform to falciform, dark brown, with a large guttule in each cell and an apical germ pore. **Asexual morph**: Undetermined (adapted from Réblová 2008).

Known hosts and distribution: In pericarps of *Juglans regia* in the Austria (type locality); on decorticated wood of *Robinia pseudoacacia* in the France (Réblová 2008).

Notes: The reniform ascospores of *Bellojisia rhynchostoma* are similar to *Corylomyces selenosporus* and they nested in Lasiosphaeriaceae clade I in phylogenetic analysis (Fig. 26).

Corylomyces Stchigel, M. Calduch & Guarro, Mycol. Res. 110(11): 1362 (2006)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, pyriform to subglobose, olivaceous-yellow to olive, tomentose, ostiolate, with long necks, surrounded by hairs. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, evanescent. *Ascospores* uni-seriate, reniform, 0–1-septate, hyaline to dark brown, with an apical, umbonate germ pore. **Asexual morph**: Undetermined (adapted from Stchigel et al. 2006).

Notes: The monotypic *Corylomyces* was reported on hazelnut and is placed in Lasiosphaeriaceae based on the LSU sequence data (Stchigel et al. 2006). In this study, the ex-type of *C. selenosporus* (CBS 113930) is sister to *Cercophora sparsa* in Lasiosphaeriaceae clade I (85%ML, Fig. 26).

Type species: ***Corylomyces selenosporus*** Stchigel, M. Calduch & Guarro [as 'selenospora'], in Stchigel, Cano, Miller, Calduch & Guarro, Mycol. Res. 110(11): 1362 (2006)

Fig. 42 k

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, pyriform to subglobose, olivaceous-yellow to olive, tomentose, ostiolate, with long necks, surrounded by hairs. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, evanescent. *Ascospores* uni-seriate, reniform to lunate, 0–1-septate, hyaline to dark brown, with an apical, umbonate germ pore. **Asexual morph**: Undetermined (adapted from Stchigel et al. 2006).

Known hosts and distribution: On hazelnut (*Corylus avellana*) decomposing on soil in France (type locality) (Stchigel et al. 2006).

Notes: *Bellojisia rhynchostoma* and *Corylomyces selenosporus* have long necks, tomentose ascomata and 0–1-septate ascospores; whereas the ascospores of the former are lunate and the latter are navicular (Stchigel et al. 2006; Réblová 2008). *Cercophora sparsa* has cylindical ascospores, which is different from *Cor. selenosporus* has navicular ascospores (Hilber and Hilber 1979; Stchigel et al. 2006).

Lasiosphaeria Ces. & De Not., Comm. Soc. crittog. Ital. 1(fasc. 4): 229 (1863)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary or gregarious, superficial to semi-immersed, globose to subglobose, brown, surrounded by white furfuraceous cover, ostiolate, with distinct black papilla. *Peridium* comprising membranaceous to coriaceous, brown to hyaline cells. *Paraphyses* filiform. *Asci* 8-spored, unitunicate, cylindrical, pedicellate. *Ascospores* cylindrical to ellipsoidal, sometimes slight curved, hyaline to brown, 0–multi-septate, guttulate, smooth-walled. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidiogenous cells* phialides, monophialidic, cylindrical to oblong, hyaline, with collarette or collarette absent. *Conidia* oval to pyriform, hyaline, truncate at the base (adapted from Cesati and de Notaris 1863; Huhndorf et al. 2004b; Miller and Huhndorf 2004a; Miller et al. 2014).

Notes: *Lasiosphaeria* as the type genus of Lasiosphaeriaceae is characterized by globose ascomata, cylindrical asci and cylindrical to ellipsoidal ascospores (Cesati and de Notaris 1863; Huhndorf et al. 2004b; Miller and Huhndorf 2004a; Miller et al. 2014). Strains of *Lasiosphaeria* species are close to *Anopodium*, *Bellojisia*, *Corylomyces* and *Zopfiella* in phylogenetic analysis (Maharachchikumbura et al. 2016; Hyde et al. 2020, Marin-Felix et al. 2020). In this study, the *Lasiosphaeria* strains is sister to clade I comprises *Anopodium*, *Bellojisia*, *Corylomyces* and *Zopfiella* (85%ML), and is related to *Mammaria* (Fig. 26).

Type species: ***Lasiosphaeria ovina*** (Pers.) Ces. & De Not., Comm. Soc. crittog. Ital. 1(fasc. 4): 229 (1863)

Basionym: *Sphaeria ovina* Pers., Syn. meth. fung. (Göttingen) 1: 71 (1801)

Facesoffungi number: *****??; Fig. 32

Saprobic on wood. **Sexual morph**: *Ascomata* 360–450 × 340–370 µm ($\bar{x}$ = 400 × 345 µm, n = 10), perithecial, solitary or gregarious, superficial to semi-immersed, globose to subglobose, brown, membranaceous, surrounded by white furfuraceous cover, ostiolate, with distinct black papilla. *Peridium* comprising three layers, outer layer composed of white cells of *textura intricata*, 23–48 µm wide; middle layer coriaceous, composed of brown cells of *textura angularis*, 23–35 µm wide; inner layer membranaceous, composed of hyaline cells of *textura prismatica*, 6–16 µm wide. *Paraphyses* 1–2 µm wide, numerous, filiform. *Asci* (80–)95–110(–120) × 8–12 µm ($\bar{x}$ = 100 × 10 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded with subapical globule, apical ring distinct. *Ascospores* (25–)28–34(–45) × 2–5 µm ($\bar{x}$ = 30 × 3 µm, n = 50), bi-seriate, slight curved, cylindrical to geniculate, hyaline and aseptate when young, becoming pale brown and multi-septate when mature, with a large guttule in each cell, smooth-walled. **Asexual morph**: Undetermined.

Material examined: Sweden, Småland, Högsby par., Massemåla, on decayed branch of apple tree in old pasture, 3 October 1992, N. Lundqvist (S-F123316); Sweden, Uppland, Uppsala, "Predikstolen" N of Lurbo (5 km SSW of Uppsala), on decayed wood in deciduous forest, 7 September 1994, N. Lundqvist (S-F123318); Sweden, Västergötland, Säter par., Ăngen (2 km WNW of Stöpen), on rotten birch log in deciduous forest, 13 September 2001, N. Lundqvist (S-F123375).

Known hosts and distribution: On rotten trunk in Denmark, England, Germany (type locality), Sweden, Turkey and USA (Persoon 1801; Miller and Huhndorf 2004b; Dülger and Akata 2016; Vu et al. 2019).

Notes: Several *Lasiosphaeria ovina* were sequenced, but the ex-type strain is lacking (Miller and Huhndorf 2004b; Fernández et al. 2006; Raja et al. 2011; Vu et al. 2019). In this study, strains of *L. ovina* (CBS 126299 and SMH 1538) are nested in *Lasiosphaeria* clade (Fig. 26). We could not obtain the type material. Therefore, we re-examined authentic specimens collected by Lundqvist.

Lasiosphaeria rehmiana Henn., Verh. bot. Ver. Prov. Brandenb. 40: 135 (1898) [1899]

Facesoffungi number: *****??; Fig. 33

Saprobic on wood. **Sexual morph**: *Ascomata* 220–290 × 240–270 µm ($\bar{x}$ = 240 × 255 µm, n = 10), perithecial, gregarious, superficial, globose to subglobose, brown, membranaceous, surrounded by white furfuraceous cover, ostiolate, with distinct black papilla. *Setae* 3–10 µm wide, brown to dark brown, aseptate, swollen at the base, tapering, with a swollen, hyaline apex. *Peridium* comprising three layers, outer layer composed of white cells of *textura intricata*, 10–24 µm wide; middle layer coriaceous, composed of brown cells of *textura angularis*, 10–24 µm wide; inner layer membranaceous, composed of hyaline cells of *textura prismatica*, 6–14 µm wide. *Paraphyses* 2–4 µm wide, numerous, septate, cylindrical. *Asci* (100–)115–120(–150) × 10–15 µm ($\bar{x}$ = 118 × 13 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded. *Ascospores* (20–)24–30(–35) × (3–)4–6(–7) µm ($\bar{x}$ = 27 × 5 µm, n = 50), bi-seriate, slight curved, ellipsoidal, 3–5-septate, hyaline when young, becoming brown and swollen at the middle cells when mature, slightly constricted at septum, guttulate, smooth-walled. **Asexual morph**: Undetermined.

Material examined: Germany, Berlin, Hoard. Bot. Berol., Warmhaus, on an imported wood from Cameroon, on decayed wood, May 1891, P. Hennings (S-F6328, **holotype**).

Known hosts and distribution: On dead wood in Germany (type locality) (Hennings 1898).

Notes: *Lasiosphaeria rehmiana* was introduced as a species closely related to *Chaetosphaeria* in having ellipsoidal, septate ascospores (Hennings 1898). Réblová and Huhndorf subsequently re-examined the type material, *Lasiosphaeria rehmiana* (F6328) and considered it as *Melanochaeta hemipsila* (Chaetosphaeriaceae) (mentioned in the label of material).

Mammaria Ces. ex Rabenh., Bot. Ztg. 12: 190 (1854)

Saprobic on wood or leaves. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, globose to subglobose, black, ostiolate. *Asci* 8-spored, unitunicate, cylindrical. *Ascospores* bi-seriate, cylindrical to geniculate, hyaline to brown, with a germ pore at each end. **Asexual morph**: Hyphomycetous. *Mycelium* hyaline to pale brown, branched. *Conidiophores* mononematous, erect, hyaline to pale brown, branched. *Conidia* globose, hyaline to pale brown, smooth-walled (adapted from Cesati 1854; del Valle Catania et al. 2011).

Notes: *Mammaria* was introduced as a hyphomycetous genus and is typified by *M. echinobotryoides* (Cesati 1854). Saccardo (1886) transferred this species to *Trichosporum* (Dothideomycetes). Vu et al. (2019) sequenced *M. echinobotryoides*, and in this study, *M. echinobotryoides* is branched out of *Lasiosphaeria* and clade I in Lasiosphaeriaceae (96%ML, Fig. 26). *Pseudocercophora ingoldii* and *Cercophora solaris* were reported as the sexual morph of *M. echinobotryoides* (Subramanian and Sekar 1986; del Valle Catania et al. 2011), and Réblová et al. (2016) recommended using the old *Mammaria* over *Pseudocercophora*. In this study, *Mammaria echinobotryoides* and *C. solaris* clustered (100%ML/1.00BY) in Lasiosphaeriaceae (Fig. 26).

Type species: ***Mammaria echinobotryoides*** Ces., in Rabenhorst, Klotzschii Herb. Viv. Mycol. 19: no. 1859 (1854)

Synonym: *Cercophora solaris* (Cooke & Ellis) R. Hilber & O. Hilber, Z. Mykol. 45(2): 221 (1979)

Fig. 34 k–m

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, globose to subglobose, black, ostiolate, with papilla. *Asci* 8-spored, unitunicate, cylindrical. *Ascospores* bi-seriate, aseptate, cylindrical to geniculate, hyaline, becoming 0–1-septate, upper cell triangular, brown; lower cell cylindrical, hyaline, with a germ pore at each end. **Asexual morph**: Hyphomycetous. *Mycelium* hyaline to pale brown, branched. *Conidiophores* mononematous, erect, hyaline to pale brown, branched. *Chlamydospores* oval to ellipsoid, pale brown to brown, slightly apiculate, flattened basal, with a longitudinal germ slit. *Conidia* globose, hyaline to pale brown, smooth-walled (adapted from Hennebert 1968; del Valle Catania et al. 2011)

Known hosts and distribution: On hollow trunk in Belgium, Canada, Italy (type locality), Singapore and USA (Saccardo 1886; Subramanian and Sekar 1986; Vu et al. 2019).

Notes: *Mammaria echinobotryoides* was found as a hyphomycetous species (Cesati 1854). Later *Cercophora solaris* was introduced as the sexual morph of *M. echinobotryoides* based on similar cultural characteristics (Subramanian and Sekar 1986, del Valle Catania et al. 2011). *Cercophora solaris* has cylindrical to geniculate ascospores similar to *Lasiosphaeria*; phylogenetically, the strains of *Cercophora solaris* and *M. echinobotryoides* clustered (100%ML/1.00BY, Fig. 26). Thus, we recommend to transfer *C. solaris* as *M. echinobotryoides*.

Zopfiella G. Winter, Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.2: 56 (1884)

Saprobic on wood or *coprophilous*. **Sexual morph**: *Ascomata* cleistothecial, scattered, superficial, globose to subglobose, brown, surrounded by septate, olive to yellow-green hairs. *Peridium* membranaceous, comprising brown to olivaceous brown cells of *textura angularis*. *Asci* 4–8-spored, unitunicate, cylindrical to clavate, evanescent. *Ascospores* bi-seriate, upper cell(s) ellipsoidal to fusiform, aseptate to multi-septate, pale brown to dark brown, with an apical germ pore and a truncate base; lower cell hyaline, cylindrical, gelatinous, evanescent. **Asexual morph**: Hyphomycetous, humicola-like. *Conidia* globose, hyaline to pale brown (adapted from Winter 1884; Guarro et al. 1991).

Notes: *Zopfiella* is characterized by cleistothecial ascomata and ascospores comprise ellipsoidal, brown upper cell(s) and a cylindrical, hyaline pedicel (Winter 1884; Guarro et al. 1991). Subsequently, *Zopfiella* species scattered in Naviculisporaceae, Podosporaceae and Neoschizotheciaceae based on phylogenetic analysis (Wang et al. 2019; Marin-Felix et al. 2020; this study, Fig. 26). However, the generic type, *Z. tabulate* is sister to *Podospora didyma* in Lasiosphaeriaceae clade I (100%ML/0.95BY, Fig. 26).

Type species: ***Zopfiella tabulata*** (Zopf) G. Winter, Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.2: 56 (1884)

Basionym: *Cephalotheca tabulata* Zopf, Sber. Gesellschaft naturf. Freunde Berlin 2: 34 (1880)

Fig. 42 m

Coprophilous. **Sexual morph**: *Ascomata* cleistothecial, scattered, superficial, globose to subglobose, brown, surrounded by septate, olive to yellow-green hairs. *Peridium* membranaceous, comprising brown to olivaceous brown cells of *textura angularis*. *Asci* 4-spored, unitunicate, cylindrical to clavate, evanescent. *Ascospores* bi-seriate, ellipsoidal, hyaline when young, becoming upper cell(s) ellipsoidal to fusiform, 0–1-septate, pale brown to dark brown, with an apical germ pore and a truncate base; lower cell hyaline, cylindrical, gelatinous, evanescent. **Asexual morph**: Undetermined (adapted from Winter 1884; Guarro et al. 1991).

Known hosts and distribution: On dung of hare, porcupine, rabbit and sheep in Germany (type locality) (Winter 1884; Cai et al. 2005).

Notes: *Zopfiella tabulata* was isolated from dung of hare, rabbit and sheep (Winter 1884; Guarro et al. 1991). Subsequently, Cai et al. (2005) sequenced *Zopfiella tabulata* (CBS 230.78) collected from porcupine dung. This strain is sister to *Podospora didyma* (CBS 232.78) in phylogenetic analysis, whereas the latter has perithecial ascomata and ascospores with terminal appendages (Mirza and Cain 1969).

Lasiosphaeridaceae S.K. Huang, Maharachch. & K.D. Hyde, ***fam. nov.***

Index Fungorum number: IF558345

Etymology: Named for *Lasiosphaeris*, the type genus of this family.

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, subglobose to obpyriform, black, ostiolate, tuberculate or/and surrounded by brown, septate setae or hairs. *Asci* 8-spored, unitunicate, cylindrical, with J- apical ring and a subapical globule. *Ascospores* cylindrical to geniculate or sigmoid, 0–multi-septate, ends rounded, hyaline to pale brown, becoming brown to dark brown, ellipsoidal to broadly fusiform at apical cell(s), sometimes with terminal, short, conical gelatinous appendage at each end. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidia* oval to globose, hyaline (adapted from Tode 1791; Hilber and Hilber 1979; Miller and Huhndorf 2004a).

Type genus: ***Lasiosphaeris*** Clem. 1909

Notes: *Lasiosphaeris* is similar to *Lasiosphaeria* and *Immersiella* in having geniculate or sigmoid ascospores, but *Lasiosphaeria* has white furfuraceous tissue covering on the surface of the ascomata and *Immersiella* has immersed ascomata, whereas *Lasiosphaeris* has superficial, hairy ascomata (Tode 1791; Clements 1909; Miller and Huhndorf 2004a; Kruys et al. 2014). However, these three genera were subsequently found to be far apart in phylogenetic analysis (Miller and Huhndorf 2004a; Kruys et al. 2014; Marin-Felix et al. 2020, this study). Miller and Huhndorf (2004a) regarded *Lasiosphaeris* species as an independent clade in Lasiosphaeriaceae based on LSU sequence data. Marin-Felix et al. (2020) showed that *Lasiosphaeris* is sister to *Zygospermella* based on multi-gene analysis. In this study, *Cercophora arenicola*, *Lasiosphaeris hirsuta* and *L. hispida* form a clade (100%ML/1.00BY) which is nested in Sordariales as an orphan clade (74%ML, Fig. 26). Furthermore, *Cercophora arenicola* is similar to *Lasiosphaeris* which has hairy ascomata, cylindrical to clavate asci with a subapical globule. Still, ascospores have swollen apical cells with a terminal appendage at each end (Hilber and Hilber 1979). Therefore, we accepted *C. arenicola* as *Lasiosphaeris arenicola* (see the combination list below) and delimited the new family Lasiosphaeridaceae based on *Lasiosphaeris*.

Lasiosphaeris Clem., Gen. fung. (Minneapolis): 35 (1909)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, subglobose to obpyriform, black, ostiolate, tuberculate or/and surrounded by brown, septate setae or hairs. *Asci* 8-spored, unitunicate, cylindrical, with J- apical ring and a subapical globule. *Ascospores* cylindrical to geniculate or sigmoid, 0–multi-septate, ends rounded, hyaline to pale brown, becoming brown to dark brown, ellipsoidal to broadly fusiform at apical cell(s), sometimes with terminal, short, conical gelatinous appendage at each end. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidia* oval to globose, hyaline (adapted from Tode 1791; Miller and Huhndorf 2004a).

Notes: *Lasiosphaeris* was established based on *Sphaeria hispida* (Clements 1909) and Réblová et al. (2011) introduced *Lasiadelphia lasiosphaeriae* for the asexual morph of *Lasiosphaeris hispida*.

However, Réblová et al. (2016) recommended to use the old *Lasiosphaeris* over *Lasiadelphia*. *Lasiosphaeris* is characterized by hairy ascomata, cylindrical to clavate asci with apical globule and geniculate or sigmoid ascospores (Tode 1791; Hilber and Hilber 1979), which is related to *Immersiella* and *Lasiosphaeria* in morphology, but distinct in phylogenetic analysis. *Lasiosphaeris* species clustered as an independent clade in Sordariales based on single/multi-gene analysis (Miller and Huhndorf 2004a; Kruys et al. 2014; Marin-Felix et al. 2020). This resulted in *Lasiosphaeris* being placed in Sordariales genera *incertae sedis* (Miller and Huhndorf 2004a; Wijayawardene et al. 2020). Since a large number of lasiosphaeriaceous taxa have been repositioned according to the phylogenetic analysis (Marin-Felix et al. 2020), we raised *Lasiosphaeris* as a novel family, Lasiosphaeridaceae, which includes all *Lasiosphaeris* species and is branched out of other families in Sordariales (74%ML) in our phylogenetic analysis (Fig. 26).

Type species: ***Lasiosphaeris hispida*** (Tode) Clem., Gen. fung. (Minneapolis): [173] (1909)

Basionym: *Sphaeria hispida* Tode, Fung. mecklenb. sel. (Lüneburg) 2: 17 (1791)

Facesoffungi number: *****??; Fig. 35

Saprobic on wood. **Sexual morph**: *Ascomata* 440 × 600 µm ($\bar{x}$ = 520 µm, n = 10), perithecial, solitary or gregarious, superficial to semi-immersed, globose to subglobose, black, membranaceous, ostiolate, with septate, brown, tapering hairs, 3.5–5.5 wide. *Peridium* 45–75 µm ($\bar{x}$ = 62 µm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 2.5–5 µm wide, numerous, filiform. *Asci* (185–)210–230(–250) × 14–20 µm ($\bar{x}$ = 220 × 17 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with apical globule, apical ring distinct. *Ascospores* 60–70(–75) × 4.5–7.5 µm ($\bar{x}$ = 65 × 6 µm, n = 50), bi-seriate, cylindrical to geniculate, slight curved near the base, hyaline and aseptate when young, becoming pale brown and multi-septate when mature, with a large guttule in each cell, smooth-walled. **Asexual morph**: Undetermined.

Material examined: USA, Michigan, Marquette, Huron Mountain Club, around Ives Lake, 45 º0.00’N, 87 º0.00’W, on decayed wood, 17 August 1997, S.M. Huhndorf and M.H. Huhndorf (F-SMH3336).

Known hosts and distribution: On dead wood in Germany (type locality) and USA (Fuckel 1870; Miller and Huhndorf 2005).

Notes: The molecular data of *Lasiosphaeris hispida* were sequenced (Miller and Huhndorf 2005; Vu et al. 2019). In this study, *L. hispida* is basal to *L. arenicola* and *L. hirsute* in Lasiosphaeridaceae (100%ML/1.00BY, Fig. 26). We could not obtain the type material. Therefore, we re-examined an authentic specimen collected by Huhndorf.

New combination:

Lasiosphaeris arenicola (R. Hilber) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cercophora arenicola* R. Hilber, in Hilber & Hilber, Z. Mykol. 45(2): 214 (1979)

Index Fungorum number: IF558252

Podosporaceae X. Wei Wang & Houbraken, in Wang et al., Stud. Mycol. 93: 223 (2019)

Coprophilous or *saprobic* on soil or wood. **Sexual morph**: *Ascomata* perithecial or cleistothecial, solitary to scattered or gregarious, immersed to semi-immersed or superficial, obpyriform or ovoid, membranaceous to carbonaceous, brown to black, glabrous or surrounded by hairs. *Paraphyses* cylindrical, septate. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, evanescent. *Ascospores* uni- or bi-seriate, ovoid, ellipsoidal or triangular, 0–1-septate, hyaline to dark brown, with an apical germ pore. **Asexual morph**: Hyphomycetous. *Conidia* globose to oval, hyaline, smooth-walled, ovate masses on the apex of the phialides (adapted from Wang et al. 2019).

Type genus: ***Podospora*** (Corda) Ces. 1856

Notes: Three redefined genera, *Cladorrhinum*, *Podospora* and *Triangularia* were classified in Podosporaceae based on phylogenetic analyses (Wang et al. 2019). *Apiosordaria* was synonymized under *Triangularia* because its generic type, *A. verruculosa*, was nested in *Triangularia* clade (Wang et al. 2019). In this study, species of *Cladorrhinum*, *Podospora* and *Triangularia* (= *Apiosordaria*) are scattered in Sordariales, especially *Podospora* (Fig. 26). These three genera are polyphyletic with different characteristics; *Cladorrhinum* has ornamented ascospores, *Podospora* has ascospores with unique gelatinous appendages, while *Triangularia* has polygonal ascospores (Krug et al. 1983; Guarro and Cano 1988; Bell and Mahoney 1997). Herein we review each genus of Podosporaceae based on phylogenetic analyses and characteristics of the generic types.

Cladorrhinum Sacc. & Marchal, in Marchal, Bull. Soc. R. Bot. Belg. 24(1): 64 (1885)

Saprobic on wood or soil, *coprophilous*. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to superficial, globose to subglobose, semi-transparent, brown to black, surrounded by hyaline, septate hyphae. *Peridium* membranaceous, comprising pale brown to reddish brown cells of *textura intricata* to *textura epidermoidea*. *Asci* 8-spored, unitunicate, cylindrical to clavate to obovoid, pedicellate, apex rounded, evanescent. *Ascospores* ovoid to ellipsoidal, aseptate, hyaline to dark brown, with an apical germ pore and a gelatinous appendage at one or each end. **Asexual morph**: Hyphomycetous. *Conidiophores* micronematous. *Conidiogenous cells* intercalary or terminal, with a flared collarette, producing blastic conidia. *Conidia* globose to oval, hyaline, aseptate, smooth-walled, with a truncate base (adapted from Mouchacca and Gams 1993; Wang et al. 2019)

Notes: The hyphomycete *Cladorrhinum* was reported as an asexual morph of *Apiosordaria* and *Cercophora* (Mouchacca and Gams 1993), and it is characterized by clustered dematiaceous hyphae, with a lateral phialide producing globose, aseptate, hyaline conidia. *Cladorrhinum* was transferred to Podosporaceae based on multi-gene analysis of the generic type (Wang et al. 2019). Subsequently, Marin-Felix et al. (2020) modified *Cladorrhinum* and transferred *Arnium tomentosum* and *Cercophora coprophila* as *Cla*. *tomentosum* and *Cla*. *coprophilum* respectively based on phylogenetic analysis. In this study, four species are transferred to *Cladorrhinum* based on their molecular data (see the combination list below, Fig. 26).

Type species: ***Cladorrhinum foecundissimum*** Sacc. & Marchal, in Marchal, Bull. Soc. R. Bot. Belg. 24(1): 64 (1885)

Fig. 34 p

Saprobic in soil or *coprophilous*. **Sexual morph**: Undetermined. **Asexual morph**: Hyphomycetous. *Mycelium* yellowish-grey, velvety, dense. *Hyphae* filiform, septate, hyaline, branched. *Conidiophores* micronematous. *Conidiogenous cells* intercalary, with a flared collarette, producing blastic conidia. *Conidia* globose, hyaline, smooth-walled, with a truncate base, masses on the apex of the phialides (adapted from Marchal 1885; Wang et al. 2019).

Known hosts and distribution: On wild boar dung in Belgium (type locality) (Marchal 1885); on soil in the Netherlands (Wang et al. 2019).

Notes: Hyphomycetous *Cladorrhinum foecundissimum* was first isolated from wild boar dung in Belgium (Marchal 1885). Wang et al. (2019) provided an ex-neotype strain for *Cla*. *foecundissimum* (CBS 180.66) which was isolated from soil in the Netherlands since the holotype was lost. In this study, we found that this strain is sister to *Cla*. *grandiusculum* with 63%ML support (Fig. 26).

New combinations:

Cladorrhinum grandiusculum (A.E. Bell & Mahoney) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cercophora grandiuscula* A.E. Bell & Mahoney, in Bell, CBS Diversity Ser. (Utrecht) 3: 59 (2005)

Index Fungorum number: IF558255

Cladorrhinum leucotrichum (Speg.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria leucotricha* Speg., Michelia 1(no. 2): 225 (1878)

Synonym: *Zopfiella leucotricha* (Speg.) Malloch & Cain, Can. J. Bot. 49(6): 876 (1971)

Index Fungorum number: IF558256

Cladorrhinum terricola (S. Ueda) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cercophora terricola* S. Ueda, Mycoscience 35(3): 287 (1994)

Index Fungorum number: IF558257

Cladorrhinum olerum (Fr.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sphaeria olerum* Fr., Elench. fung. (Greifswald) 2: 98 (1828)

Synonym: *Arnium olerum* (Fr.) N. Lundq. & J.C. Krug, Symb. bot. upsal. 20(no. 1): 212 (1972)

Facesoffungi number: *****??; *Index Fungorum number*: IF558330; Fig. 36

Coprophilous, *saprobic* on herbaceous plant. **Sexual morph**: *Ascomata* perithecial, scattered, semi-immersed, broadly obpyriform to subglobose, membranaceous, pale brown to dark brown, semi-transparent, ostiolate, with a black papilla, periphysate. *Peridium* composed of yellowish cells of *textura intricata*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, evanescent. *Ascospores* (40–)47–58(–65) × 20–40 µm ($\bar{x}$ = 50 × 30 µm, n = 20), uni-seriate, obovoid to ellipsoidal, aseptate, hyaline when young, becoming dark brown when mature, with ornamented wall and a gelatinous appendage at each end. **Asexual morph**: Undetermined.

Material examined: Norway, Nord-Trøndelag, Grong, Godejorden, on old cow dung after 1–2 months in moist chamber in Uppsala, 17 June 1962, N. Lundqvist (UPS-UPS:BOT:F-125924); Sweden, Gotland, Visby par., Skansudd, NE of Visby, on old cow dung in moist chamber in Uppsala, 30 July 1961, N. Lundqvist (UPS- UPS:BOT:F-125925).

Known hosts and distribution: On stems of *Brassica oleracea* in Franch (type locality) (Fries 1828); usually on cabbage stalk in Austria, Belgium, Czech Republic, Denmark, England, Finland, France, Germany, Morocco, Norway, Portugal, Sweden (Lundqvist 1972; Jeng and Krug 1977; Kruys et al. 2014).

Notes: We re-examined two specimens of *Cladorrhinum olerum* which was collected and determined by Lundqvist (1972), and the hand-drawing of ascus and ascospores are provided (Fig. 42 e–

f) based on Kruys et al. (2014). Phylogenetically, *Arnium olerum* nested in Lasiosphaeriaceae (Kruys et al. 2014) and was transferred to *Cladorrhinum* (Marin-Felix et al. 2020). In this study, *Cla*. *olerum* is sister to *Cla*. *grandiusculum* in Podosporaceae (63%ML, Fig. 26).

Podospora Ces., Hedwigia 1(15): 103 (1856)

Synonym: ***Schizothecium*** Corda, Icon. fung. (Prague) 2: 29 (1838)

Saprobic on wood or soil. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to semi-immersed, obpyriform to ovoid, brown to black, ostiolate. *Peridium* membranaceous to coriaceous, composed of pale brown to reddish brown-walled cells of *textura porrecta* to *textura angularis* to *textura prismatica*. *Paraphyses* cylindrical, septate. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded, evanescent. *Ascospores* ovoid to ellipsoid, aseptate, hyaline when young, becoming a swollen, dark brown upper cell and a hyaline lower cell when mature, with a gelatinous appendage at one or each end. **Asexual morph**: Hyphomycetous, cladorrhinum-like. *Conidiophores* micronematous. *Conidiogenous cells* intercalary or terminal, with a flaring collarette producing blastic conidia. *Conidia* globose to oval, aseptate, hyaline, smooth-walled, with a truncate base (adapted from Cesati 1856; Lundqvist 1972).

Notes: *Podospora* is typified by *P*. *fimicola* which has coriaceous ascomata covered with simple short hairs and ascospores with gelatinous appendages (Cesati 1856). Lundqvist (1972) clarified *Podospora* species and proposed that *Podospora fimiseda* is a name change for *Podospora fimicola*. Thus, these species are conspecific (Niessl 1883; Lundqvist 1972; Bell and Mahoney 1997; Doveri 2008). However, following priority, Wang et al. (2019) accepted *P*. *fimicola* as its generic type and redefined *Podospora*, the type genus of Podosporaceae. Phylogenetically, we transfer seven species clustered in *Podospora* clade, to *Podospora* to avoid confusion (see the combination list below, Fig. 26). Species of *Podospora* (*s. lat.*) are also scattered in Bombardiaceae, Lasiosphaeriaceae, Naviculisporaceae and Neoschizotheciaceae (Fig. 26).

Type species: ***Podospora fimicola*** (Corda) Ces., Hedwigia 1(15): 103 (1856)

Basionym: *Schizothecium fimicola* Corda [as 'fimicolum'], Icon. fung. (Prague) 2: 29 (1838)

Fig. 34 a–d

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to semi-immersed, obpyriform to ovoid, membranaceous, brown to black, ostiolate. *Peridium* comprising three layers, outer layer composed of pale brown to reddish brown-walled cells of *textura porrecta* to *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* cylindrical, septate. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded, evanescent. *Ascospores* biseriate, ovoid to ellipsoid, aseptate, hyaline when young, becoming dark brown when mature, with ornamented wall and a gelatinous appendage at each end, with longitudinally striate. **Asexual morph**: Hyphomycetous (*Cladorrhinum* on CMA). *Conidia* globose to oval, hyaline, smooth-walled (adapted from Bell and Mahoney 1997).

Material examined: Italy, Piemonte, Biella, Bugellensibus Mountain, on cow dung, 1855, V. Cesati (S-F26041, **lectotype**).

Known hosts and distribution: On dry cattle dung on dry pastures in Czech Republic (type locality) (Corda 1838); on cow, horse dung in Austria, Belgium, Brazil, Canada, Chile, China, Denmark, Finland, France, Germany, Hungary, Italy, Liberia, Norway, Poland, Puerto Rico, Romania, Russia, Scotland, Spain, Sweden, USA, and Venezuela (Lundqvist 1972).

Notes: Lundqvist (1972) reviewed samples of related *Podospora fimicola* and found that this species is generally found in the faeces of herbivores. Vu et al. (2019) sequenced molecular data for the epitype strain of *Schizothecium fimicola* (= *Podospora fimicola*), CBS 482.64, and this strain is sister to *P. costaricensis* in Podosporaceae (Fig. 26). In this study, we observed the lectotype material of *P. fimicola* however only the dried ascomata could be seen. We drew the ascus and ascospores of *P. fimicola* concerning Bell and Mahoney (1997) and Doveri (2008).

New combinations:

Podospora brunnescens (W. Gams) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cladorrhinum brunnescens* W. Gams, Mycotaxon 48: 435 (1993)

Index Fungorum number: IF558259

Podospora dacryoidea S.K. Huang & K.D. Hyde, ***nom. nov.***

Synonym: *Cladorrhinum australe* Gasoni, in Carmarán, Berretta, Martínez, Barrera, Munaut & Gasoni, Mycol. Progr. 14(no. 94): 9 (2015)

Index Fungorum number: IF558260

Etymology: '*dacryoidea*' refers to Carmarán et al. (2015) mentioned that this fungus has dacryoid conidia.

Podospora flexuosa (Madrid et al.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cladorrhinum flexuosum* Madrid, Cano, Gené & Guarro, Mycologia 103(4): 801 (2011)

Index Fungorum number. IF558261

Podospora jamaicensis (B.M. Robison) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Echinopodospora jamaicensis* B.M. Robison, Trans. Br. mycol. Soc. 54(2): 318 (1970)

Synonym: *Apiosordaria jamaicensis* (B.M. Robison) J.C. Krug, Udagawa & Jeng, Mycotaxon 17: 546 (1983)

Index Fungorum number. IF558298

Podospora hamata (Wu et al.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Apiosordaria hamata* B. Wu, K.D. Hyde, Jing Z. Sun & Xing Z. Liu, in Wu, Tian, Wang, Liu, Hyde & Sun, Mycotaxon 131(4): 852 (2016) [2017]

Index Fungorum number. IF558299

Podospora macrospora (Guarro & Calvo) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Zopfiella macrospora* Guarro & Calvo, Nova Hedwigia 37(4): 663 (1983)

Index Fungorum number. IF558300

Podospora spinosa (Cailleux) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Tripterospora spinosa* Cailleux, Cahiers de La Maboké 8(1): 16 (1970)

Synonym: *Apiosordaria spinosa* (Cailleux) J.C. Krug, Udagawa & Jeng, Mycotaxon 17: 546 (1983)

Index Fungorum number. IF558301

Triangularia Boedijn, Annls mycol. 32(3/4): 302 (1934)

Synonym: **_Apiosordaria_** Arx & W. Gams, Nova Hedwigia 13: 201 (1967)

Saprobic in soil. **Sexual morph**: *Ascomata* cleistothecial or perithecial, gregarious to scattered, superficial to immersed, membranaceous or carbonaceous or coriaceous, obpyriform to pyriform, black, opaque or semi-transparent, glabrous or surrounded by hairs or setae, ostiolate, with papilla. *Peridium* comprising membranaceous to coriaceous, pale brown to reddish brown cells. *Paraphyses* filiform, septate. *Asci* 4–8–multi-spored, unitunicate, clavate to cylindrical, pedicellate, evanescent. *Ascospores* ellipsoidal to triangular, aseptate, hyaline when young, becoming 1-septate, upper cell larger, brown, ellipsoidal to polygonal, smooth-walled or with ornamented wall, with numerous broad or narrow pits, with a sub-apical or apical germ pore; lower cell smaller, hyaline, sometimes collapsing, with gelatinous appendages at one or each end, smooth-walled or sometimes with ornamented on surface, guttulate. **Asexual morph**: Hyphomycetous, cladorrhinum-like. *Conidiophores* micronematous. *Conidiogenous cells* intercalary or terminal, with a flaring collarette producing blastic conidia. *Conidia* globose to oval, aseptate, hyaline, smooth-walled, with a truncate base (adapted from Boedijn 1934; Guarro and Cano 1988; Wang et al. 2019).

Notes: *Triangularia* was transferred from *Trigonia*, and is typified by *T. bambusae* in having glabrous ascomata or those covered with hairs and ellipsoidal to triangular ascospores (Boedijn 1934; Guarro and Cano 1988). This genus was previously accepted in Lasiosphaeriaceae (Wijayawardene et al. 2018), and Wang et al. (2019) redefined *Triangularia* as a member of Podosporaceae based on multi-gene analysis. *Apiosordaria* was synonymized under *Triangularia*, because the strain of its generic type *A. verruculosa* (Fig. 34 e–f) nested in *Triangularia* (Wang et al. 2019). In this study, seven species clustered in *Triangularia* were transferred to *Triangularia* to avoid confusion (see the combination list below, Fig. 26). Species of *Apiosordaria* and *Triangularia* are also scattered in Naviculisporaceae and Neoschizotheciaceae in the phylogenetic analysis (Fig. 26).

Type species: ***Triangularia bambusae*** (J.F.H. Beyma) Boedijn, Annls mycol. 32(3/4): 302 (1934)

Basionym: *Trigonia bambusae* J.F.H. Beyma, Centbl. Bakt. ParasitKde, Abt. II 89: 236 (1933)

Fig. 34 q

Saprobic in soil. **Sexual morph**: *Ascomata* perithecial, gregarious to scattered, superficial to immersed, ovoid to pyriform, black, glabrous or surrounded by hairs. *Peridium* comprising membranaceous, pale brown to reddish brown cells of *textura angularis*. *Asci* 8-spored, unitunicate, clavate to cylindrical, pedicellate, evanescent. *Ascospores* uni- or bi-seriate, ellipsoidal to triangular, aseptate and hyaline when young, becoming conical with an oblique septum near one end, upper cell triangular, brown, with a subapical germ pore; lower cell irregular or hemispherical, hyaline, collapsing. **Asexual morph**: Undetermined (adapted from Guarro and Cano 1988).

Known hosts and distribution: On culms of Bambusaceae in Netherlands (type locality) (Van Beyma Thoe Kingma 1933).

Notes: *Triangularia bambusae* is sister to *T. batistae* in Podosporaceae based on phylogenetic anaylsis (Vu et al. 2019; Wang et al. 2019; this study, 100%ML/1.00BY, Fig. 26).

New combinations:

Triangularia microsclerotigena (Madrid et al.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cladorrhinum microsclerotigenum* Madrid, Cano, Gené & Guarro, Mycologia 103(4): 804 (2011)

Index Fungorum number: IF558302

Triangularia nannopodalis (Cain) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora nannopodalis* Cain, Can. J. Bot. 40(3): 455 (1962)

Index Fungorum number: IF558303

Triangularia praecox (Cailleux) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora praecox* Cailleux, Cahiers de La Maboké 7: 102 (1969)

Index Fungorum number: IF558304

Triangularia samala (Udagawa & T. Muroi) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cercophora samala* Udagawa & T. Muroi, Trans. Mycol. Soc. Japan 20(4): 454 (1979)

Index Fungorum number: IF558305

Triangularia tarvisina (Sacc.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Philocopra setosa* subsp. *tarvisina* Sacc., Syll. fung. (Abellini) 1: 250 (1882)

Synonym: *Podospora tarvisina* (Sacc.) J.H. Mirza & Cain, Can. J. Bot. 47(12): 2041 (1970) [1969]

Index Fungorum number: IF558306

Triangularia unicaudata (C. Moreau & M. Moreau ex G. Sm.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Pleurage unicaudata* C. Moreau & M. Moreau ex G. Sm., Trans. Br. mycol. Soc. 40(4): 488 (1957)

Synonym: *Podospora unicaudata* (C. Moreau & M. Moreau ex G. Sm.) Cain, Can. J. Bot. 40: 460 (1962)

Index Fungorum number. IF558321

Triangularia yaeyamensis (Morinaga et al.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Apiosordaria yaeyamensis* Morinaga, Utatsu & Minoura, Trans. Mycol. Soc. Japan 20(4): 493 (1979)

Index Fungorum number. IF558322

Sordariaceae G. Winter [as 'Sordarieae'], Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 1.2: 162 (1885)

Saprobic or *endophytic* on herbs or woody plants, isolated from soil or/and dung, in terrestrial and/or aquatic habitats. **Sexual morph**: *Ascomata* perithecial or cleistothecial, solitary, scattered or gregarious, superficial, erumpent or immersed, globose, subglobose, pyriform to ovoid, carbonaceous, coriaceous or membranaceous, yellow, olivaceous brown, brown to black, tuberculate or glabrous, with setae or not, ostiolate or not, with papilla or indistinct or papilla absent, with hyaline periphyses or periphyses absent. *Peridium* comprising hyaline to brown-walled cells, carbonaceous, coriaceous or membranaceous. *Paraphyses* numerous, branched or unbranched, septate, filiform or cylindrical, evanescent, or absent. *Asci* 2–8-spored, unitunicate, cylindrical to clavate, pedicellate, with J- apical ring or ring indistinct or absent. *Ascospores* uni–bi-seriate, hyaline, becoming yellowish or olivaceous brown or brown or black when mature, globose to ellipsoidal, aseptate, with 0–multi germ pore(s), smooth-walled or with angular to circular reticulate patterns or pits or longitudinal ribs on surface, with sheath or sheath absent, guttulate. **Asexual morph**: Hyphomycetous. *Hyphae* flexuous, hyaline to dark brown, septate, branched. *Conidiophores* hyaline to brown, branched or unbranched, straight or flexuous, smooth-walled, septate. *Conidia* hyaline, yellow, orange or dark brown, oval to ellipsoidal, smooth-walled, with sheath or sheath absent (adapted from Lundqvist 1972; García et al. 2004; Cai et al. 2006b; Maharachchikumbura et al. 2016).

Type genus: ***Sordaria*** Ces. & De Not. 1863

Notes: Sordariaceae was established by Winter (1885), and traditionally eight genera, *Copromyces*, *Effetia*, *Gelasinospora*, *Guilliermondia*, *Neurospora*, *Pseudoneurospora*, *Sordaria* and *Stellatospora* have been accommodated (Maharachchikumbura et al. 2015, 2016; Wijayawardene et al. 2018). Most of the species in this family grow on dung, soil or decaying substrata in terrestrial and/or aquatic habitats (Frederick et al. 1969; Lundqvist 1972; Guarro and von Arx 1987; Krug and Scott 1994; García et al. 2004; Cai et al. 2006b), and they are closely related to Lasiosphaeriaceae, based on phylogenetic analysis and similarities in perithecial ascomata (Lundqvist 1972; Huhndorf et al. 2004b; Maharachchikumbura et al. 2015, 2016; Figs. 1, 26). Due to the typical morphology of ascospores, the genera in Sordariaceae have undergone various taxonomic changes. The monotypic genera, *Effetia* and *Guilliermondia* were included in Sordariaceae because of their characteristics are similar to *Sordaria* (Boudier 1904; Lundqvist 1967; Bartoli et al. 1984; Maharachchikumbura et al. 2015). *Copromyces* lacked reliable molecular data and was suspected of resembling *Rechingeriella* (Dothideomycetes) (Petrak 1967). Thus, we recommend placing this genus in Ascomycota genera *incertae sedis* pending future work. *Pseudoneurospora* was independent of *Neurospora* because it has unique ascospores with irregular ornamentation on the surface and it also exists as a separate cluster in molecular analysis (García et al. 2004). The monotypic *Boothiella* was accepted in Sordariaceae based on its type strain (CBS 334.67) nested in Sordariaceae (Wang et al. 2019; this study). Wang et al. (2019) removed *Stellatospora* from Sordariaceae as its ex-type strain, *Stellatospora terricola* (CBS 811.95), clusters in Chaetomiaceae. *Gelasinospora* was synonymized under *Neurospora* based on their similar morphology and close phylogenetic relationship (García et al. 2004). The traditional genera *Neurospora* and *Sordaria* were previously defined by morphology: *Neurospora*, which means 'nerve spore' refers to the ascospores with axon-like ornamentation on the surface (Shear and Dodge 1927; García et al. 2004). *Sordaria* is a genus mainly found in the faeces and has ascospores with sheaths (Cesati and de Notaris 1863; Maharachchikumbura et al. 2016). These two genera are polyphyletic in Sordariales (Spatafora and Blackwell 1994; Dettman et al. 2001; García et al. 2004; Cai et al. 2006b; this study). In this study, we found that all *Neurospora* and *Sordaria* species clustered in Sordariaceae. Their respective positions are usually unstable in multi-gene (Fig. 37) or single-gene analyses (not shown). Hence, *Neurospora* and *Sordaria* can be mainly distinguished by morphology. *Neurospora* is characterized by globose to pyriform, brown to black ascomata, cylindrical to broadly clavate asci and aseptate ascospores with a variety of ribs or pits, whereas, *Sordaria* has subglobose to ovoid, brown to black ascomata, cylindrical to clavate asci and ellipsoidal to ovoid ascospores with smooth-walls and may or may not have sheath. However, in this study, we include five genera in Sordariaceae based on morphology and phylogenetic analyses.

Boothiella Lodhi & Mirza, Mycologia 54(2): 217 (1962)

Saprobic in soil. **Sexual morph**: *Ascomata* cleistothecial, solitary or gregarious, superficial to immersed in the medium, globose to subglobose, membranaceous, brown to black, glabrous. *Peridium* composed of membranaceous, hyaline to subhayline cells of *textura angularis*. *Asci* 4-spored, unitunicate, clavate to cylindrical, short pedicellate, apex rounded, evanescent. *Ascospores* hyaline, becoming dark brown, oval to citriform,1–2-apiculate, aseptate, with a germ pore at one or each end. **Asexual morph**: Undetermined (adapted from Lodhi and Mirza 1962; Wang et al. 2019).

Notes: The monotypic genus *Boothiella* was introduced as a member of Eurotiales and its ascospores are similar to *Thielavia* (Lodhi and Mirza 1962). Kirk et al. (2008) transferred *Boothiella* to Sordariaceae and Maharachchikumbura et al. (2015, 2016) placed this genus in Chaetomiaceae. Vu et al. (2019) and Wang et al. (2019) analyzed sequence data from isolates CBS 334.67 (ex-type) and CBS 887.97, and showed that *B. tetraspora* nests in Sordariaceae. In the present study, *Boothiella* strains form a clade in Sordariaceae (100%ML/1.00BY, Fig 26, 37).

Type species: ***Boothiella tetraspora*** Lodhi & J.H. Mirza, Mycologia 54(2): 217 (1962)

Fig. 66 r–s

Saprobic in soil. **Sexual morph**: *Ascomata* cleistothecial, solitary or gregarious, superficial to immersed in the medium, globose to subglobose, membranaceous, brown to black, glabrous. *Peridium* composed of membranaceous, hyaline to subhayline cells of *textura angularis*. *Asci* 4-spored, unitunicate, clavate to cylindrical, short pedicellate, apex rounded, evanescent. *Ascospores* hyaline, becoming dark brown, oval to citriform,1–2-apiculate, aseptate, with a germ pore at one or each end. **Asexual morph**: Undetermined (adapted from Lodhi and Mirza 1962; Wang et al. 2019).

Known hosts and distribution: On soil in Pakistan (type locality) Lodhi and Mirza 1962); on sand in Spain (Wang et al. 2019).

Notes: *Boothiella tetraspora* is similar to *Thielavia*, except for its translucent ascomata (Lodhi and Mirza 1962). Wang et al. (2019) proposed that this species resembles *Hyalosphaerella fragilis* and *Pseudothielavia subhyaloderma* (Chaetomiaceae), but the former has 4-spored and the latter two have 8-spored asci. However, *B. tetraspora* nests in Sordariaceae based on phylogenetic analyses (Wang et al. 2019; this study, Fig. 26, 37).

Guilliermondia Boud., Bull. Soc. mycol. Fr. 20: 19 (1904)

Coprophilous on horse dung. **Sexual morph**: *Ascomata* cleistothecial, solitary or gregarious, superficial, dark brown to black, tuberculate. *Peridium* outer layer composed of carbonaceous, dark tissues; inner layer composed of membranaceous, hyaline to dark brown cells of *textura angularis*. *Paraphyses* numerous, evanescent, filamentous, septate, branched. *Asci* 8-spored, unitunicate, spherical, without an apical ring, with long and evanescent pedicel. *Ascospores* overlapping, ellipsoidal, brown, aseptate, smooth-walled, surrounded by hyaline or brown gelatinous sheath. **Asexual morph**: Undetermined (adapted from Boudier 1904).

Notes: The monotypic *Guilliermondia* is typified by *G. saccoboloides* has black ascomata and ellipsoidal ascospores surrounded by a brown sheath (Boudier 1904). Initially, Boudier (1904) proposed that this genus is related to *Phillipsiella* (Saccardiaceae), and *Guilliermondia* was later considered similar to *Sordaria* and transferred to Sordariaceae (Kirk et al. 2008; Lumbsch and Huhndorf 2010; Hyde et al. 2020). In this study, *Guilliermondia* is placed in Sordariaceae, because the generic type *G. saccoboloides* is similar to *Sordaria fimicola*. Both taxa are isolated from the faeces of herbivores and have dark ascomata and ellipsoidal, brown ascospores with gelatinous sheaths.

Type species: ***Guilliermondia saccoboloides*** Boud., Bull. Soc. mycol. Fr. 20: 20 (1904)

Facesoffungi number. ??; Fig 38

Coprophilous on horse dung. **Sexual morph**: *Ascomata* 295–460 × 170–275 µm ($\bar{x}$ = 350 × 230 µm, n = 10), cleistothecial, solitary or gregarious, superficial, dark brown to black, tuberculate. *Peridium* outer layer composed of carbonaceous, dark tissues; inner layer composed of membranaceous, hyaline to dark brown cells of *textura angularis*. *Paraphyses* 1–2 µm wide, numerous, evanescent, filamentous, septate, branched. *Asci* 20–30 µm ($\bar{x}$ = 25 µm, n = 30) diam. at ascospore-bearing part, 8-spored, unitunicate, spherical, without an apical ring, with long and evanescent pedicel. *Ascospores* 10–16 × 6–9 µm ($\bar{x}$ = 14 × 7 µm, n = 50), overlapping, ellipsoidal, brown, aseptate, smooth-walled, surrounded by hyaline or brown gelatinous sheath 1–2.5 µm thick. **Asexual morph**: Undetermined (adapted from Boudier 1904).

Material examined: France, Lyon, 69 Rhôneon, on horse dung, April 1903, M.A.A. Guilliermond (PC-MNHN-PC-PC0167691, **holotype**).

Known hosts and distribution: On horse dung in France (type locality) (Boudier 1904).

Notes: We re-examined the holotype, MNHN-PC-PC0167691, and found that most of the ascomata had collapsed and the pedicel of the asci were basically inconspicuous.

Neurospora Shear & B.O. Dodge, J. Agric. Res., Washington 34: 1025 (1927)

Coprophilous or isolated from soil, burned or unburned vegetation in terrestrial habitats, heterothallic or pseudohomothallic. **Sexual morph**: *Ascomata* perithecial or cleistothecial, gregarious or scattered, solitary, semi-immersed to superficial, globose, subglobose to ovoid, brown to black, ostiole with hyaline periphyses. *Peridium* comprising brown to hyaline cells of *textura angularis*, *textura globulosa, textura prismatica, textura intrincata* or *textura epidermoidea*, carbonaceous to membranaceous. *Paraphyses* numerous, filiform or cylindrical or lacking. *Asci* 4- or 8-spored, unitunicate, cylindrical to clavate, pedicellate, with J- apical ring. *Ascospores* hyaline, olivaceous brown, grey or black, oval to ellipsoidal, aseptate, with longitudinal ribs or irregular to circular, deep or shallow pits on surface and germ pore(s) at one/each end, with or without guttules. **Asexual morph**: Hyphomycetous. *Mycelium* hyaline to light brown, septate. *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* phialidic, oval to clavate, hyaline, smooth-walled. *Conidia* ellipsoidal to oval, hyaline, yellow, orange or dark brown, smooth-walled (adapted from Shear and Dodge 1927; Tai 1935; Perkins et al. 1976; Perkins and Turner 1988; Turner et al. 2001).

Notes: *Neurospora* is characterized by dark brown ascospores with ornamented surface and its asexual morph is usually found in nature and/or culture and is chrysonilia-like (Shear and Dodge 1927; von Arx 1981a, b; Jacobson et al. 2004). This genus is widespread and usually found in soil and burned or unburned vegetation in terrestrial habitats (Perkins et al. 1976; Perkins and Raju 1986; Perkins and Turner 1988; Turner et al. 2001; García et al. 2004). Three different mating strategies have been shown in *Neurospora*: homothallism, pseudohomothallism and heterothallism (Shear and Dodge 1927; Tai 1935; Mahoney et al. 1969; Krug and Khan 1991; Krug et al. 1994). Initially, *Gelasinospora* was distinct from *Neurospora* as the latter has longitudinal orientated structures on the ascospores, while the former has foveolate ascospores (Dowding 1933). Phylogenetic analysis demonstrated that *Gelasinospora* and *Anixiella* species scattered in *Neurospora* clades (García et al. 2004). Hence, *Gelasinospora* and *Anixiella* were synonymized under *Neurospora* (García et al. 2004; Kirk et al. 2008; Index Fungorum 2020). *Pseudoneurospora* was independent from *Neurospora* because it has an irregular pattern on the ascospores surface (García et al. 2004). Species of *Neurospora* were traditionally distinguished based on ascospore wall ornamentation (Dowding 1933; García et al. 2004; Cai et al. 2006b). Subsequently, García et al. (2004) and Cai et al. (2006b) showed that the traditional classification of *Neurospora* results in species being a polyphyletic in the Sordariales in phylogenetic analysis. García et al. (2004) considered the ornamentation of the epispore and the mating strategy are the most important characters to consistent the phylogenetic relatedness in *Neurospora* (Whitehouse 1949; Taylor and Natvig 1989; Grognet and Silar 2015). In this study, we were unable to find characteristics consistent with polyphyletic *Neurospora* in phylogenetic analysis, either ascospore morphology or mating strategies. Therefore, we propose to delimit *Neurospora* as species nested in Sordariaceae in phylogenetic analysis and has aseptate ascospores with various ribs and/or pitted on surface. In this study, *Neurospora* is divided in four clades based on multi-gene analysis. We have sorted out their mainly characteristics based on mating type, form of ascomata, ascospore appearance and types of epispore, and listed in Fig. 37.

Type species: ***Neurospora sitophila*** Shear & B.O. Dodge, J. Agric. Res., Washington 34: 1026 (1927)

Facesoffungi number: *****??; Fig. 39 a–j

Saprobic on wood and burnt vegetation, heterothallic. **Sexual morph**: *Ascomata* 280–380 µm ($\bar{x}$ = 315 µm, n = 10) diam., perithecial, superficial, solitary, globose, dark brown to black, with an ambiguous ostiole, covered by white hyphae. *Peridium* 70–120 µm ($\bar{x}$ = 95 µm, n = 30) wide, comprising four layers, outer layer composed of compact, dark brown cells of *textura angularis*; middle layer closely aligned from external to internal with hyaline to pale brown cells of *textura globulosa* to *textura angularis*; and composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* (150–)180–190(–200) × 13–16 µm ($\bar{x}$ = 185 × 14.5 µm, n = 30), 8-spored, unitunicate, cylindrical, slightly curved, short pedicellate, thin-walled and evanescent at maturity. *Ascospores* (17–)19–23(–28) ×

(10–)12–14(–15) µm ($\bar{x}$ = 22 × 13 µm, n = 50), uni-seriate, subglobose to ellipsoidal or oval, thick-walled, light brown when young, becoming dark brown or olivaceous at maturity, aseptate, epispore smooth, with a germ pore at each end. *Ribs* longitudinal or reticulation, frequently branched, pigment deposited externally, nested straight, discrete, elongate pits. **Asexual morph**: Hyphomycetous. *Conidia* orange, globose to subglobose, aseptate, smooth-walled (adapted from García et al. 2004).

Material examined: Canada, Ottawa, on drying veneer (birch and poplar) of fruit basket, culture 5574, 5 February 1927, M. Hantsport (BPI-630404, **from ex-type**).

Known hosts and distribution: On corn-meal agar culture of *Monilia sitophila* in Germany (type locality) (Shear and Dodge 1927); in the air, on garbage, leaves, wood in Australia, Canada, France, New Zealand and USA (Shaw 1998; Francuz et al. 2010; Vojtkova et al. 2020); on burnt vegetation and non-burnt substrata distributed worldwide (García et al. 2004).

Notes: Shear and Dodge (1927) found *Neurospora sitophila* on a culture of *Monilia sitophila* and established *Neurospora*. Subsequently, the hyphomycetous *Chrysonilia sitophila* and *M. sitophila* were synonymized under *N. sitophila* (Perkins et al. 1976; Perkins and Turner 1988; Turner et al. 2001; García et al. 2004), and this species was found in the air and human waste, such as food or coffee residues, and was identified as one of the causes of allergies and asthma (Shaw 1998; Francuz et al. 2010; Vojtkova et al. 2020). In this study, *N. sitophila* clustered in *Neurospora* clade II accommodates heterothallic species (Fig. 37). *Gelasinospora autosteira* was considered as *N. calospora* based on the similar morphology (García et al. 2004); however, the ex-type strain of *Gelasinospora autosteira* was sequenced by Vu et al. (2019), and this strain is sister to *N. nigeriensis* in *Neurospora* clade III, whereas has far distance with *N. calospora*. Therefore, we recommend to transfer *G. autosteira* as *Neurospora autosteira* based on phylogenetic analysis (see the combination list below, Fig. 37).

Neurospora tetraspora Dania García et al., in García et al., Mycol. Res. 108(10): 1134 (2004)

Basionym: *Gelasinospora tetrasperma* Dowding, Canadian Journal of Research, Section C 9: 294 (1933)

Facesoffungi number: *****??; Fig. 40

Isolated from soil, dung or burnt vegetation, pseudohomothallic. **Sexual morph** (On culture): *Mycelium* composed of hyaline to light brown, branched, septate hyphae 3–5 µm wide ($\bar{x}$ = 4 µm, n = 30). *Ascomata* perithecial, solitary or scattered, semi-immersed to superficial, slightly coriaceous, pyriform, ostiolate, brown to black. *Asci* 4-spored, unitunicate, with J- apical ring. *Ascospores* oval to ellipsoidal, hyaline becoming dark brown, slightly flattened on one side, aseptate, with a germ pore at each end, with circular pits. **Asexual morph**: Undetermined (adapted from Dowding 1933; Matsushima 1975; von Arx 1982; Fort et al. 1990; García et al. 2004).

Material examined: Culture from CBS, Netherlands (IMI-38600, **from ex-type**).

Known hosts and distribution: On ptarmigan and rabbit dung in Canada (type locality) (Dowding 1933); on dung and soil in Canada, England, Finland, Norway, Russia, Spain, Sweden and USA (Lundqvist 1972; García et al. 2004).

Notes: Dowding (1933) cultivated the spores which was found on ptarmigan and rabbit dung in Manitobba and Ontario and introduced a homothallic *Gelasinospora tetrasperma* as the generic type of *Gelasinospora*. Dettman et al. (2001) confirmed that *G. tetrasperma* is a pseudohomothallic species. Subsequently, *Gelasinospora* was placed as a synonym of *Neurospora*, and *G. tetrasperma* was replaced by *Neurospora tetraspora* (García et al. 2004). Sequences data from the ex-type strain (CBS:178.33) is available (Cai et al. 2006b; Spatafora et al. 2006), and in this study, this strain is distinct with *N. tetraspora* and nested in *Neurospora* clade I which mainly comprises homothallic species with an ornate epispore (Fig. 37). We re-examined the ex-type culture (38600) of *G. tetrasperma*, and found that were no ascomata, but a large number of conidia (22–28 × 12–15 μm) with a pitted surface in clumps on pale brown to brown, septate, shrunken hyphae (Fig. 40).

New combination:

Neurospora autosteira (Alexop. & S.H. Sung) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Gelasinospora autosteira* Alexop. & S.H. Sung, Mycologia 42(6): 723 (1951) [1950]

Index Fungorum number: IF558325

Pseudoneurospora Dania García et al., Mycol. Res. 108(10): 1139 (2004)

Isolated from soil. **Sexual morph**: *Mycelium* composed of hyaline to brown, branched hyphae. *Ascomata* perithecial or cleistothecial, gregarious or scattered, superficial to immersed, yellowish to brown or black, sometimes translucent, pyriform to subglobose, ostiolate, surrounded by hyaline, septate hyphae or sinuose, brown, septate setae. *Peridium* membranaceous, comprising brown to hyaline cells of *textura angularis* or *textura globulosa*. *Asci* 8-spored, unitunicate, cylindrical to clavate, short pedicellate, apex rounded, with J- apical ring, evanescent. *Ascospores* uni- or bi- seriate, hyaline when young becoming dark brown or black, oval to ellipsoidal, aseptate, verrucose to tuberculate, with a germ pore at each end. **Asexual morph**: Undetermined (adapted from Udagawa 1980; García et al. 2004).

Notes: *Pseudoneurospora amorphoporcata* was initially described as *Gelasinospora amorphoporcata* (Udagawa 1980), and García et al. (2004) separated it from *Gelasinospora* and established *Pseudoneurospora* based on phylogenetic analysis and because its ascospores had a strongly verrucose to tuberculate irregular pattern (Fig. 45k) on the surface. Subsequently, a second species, *P. canariensis*, was introduced by Crous et al. (2014) having similar ascospores and molecular data. In this study, an invalid name '*Copromyces octosporus*' (CBS 386.78) is sister to *P. canariensis* (see notes for *Copromyces*). *Pseudoneurospora* species clustered with 92%ML/1.00BY support and basal to *Sordaria* clade II in Sordariaceae (97%ML/1.00BY, Fig 37).

Type species: ***Pseudoneurospora amorphoporcata*** (Udagawa) Dania García et al., Mycological Research 108 (10): 1139 (2004)

Basionym: *Gelasinospora amorphoporcata* Udagawa, Transactions of the Mycological Society of Japan 21 (1): 19 (1980)

Fig. 39 k

Isolated from soil. **Sexual morph**: *Ascomata* perithecial, brown to black, gregarious or scattered, superficial to immersed, pyriform to subglobose, membranaceous, ostiolate, with papilla. *Peridium* comprising brown to hyaline cells of *textura angularis* or *textura globulosa*, membranaceous. *Asci* 8-spored, unitunicate, cylindrical, short pedicellate, apex rounded, with J- apical ring. *Ascospores* hyaline when young becoming dark brown or black, oval to ellipsoidal, aseptate, with a germ pore at each end, with irregular reticulate patterns. **Asexual morph**: Undetermined (adapted from Udagawa 1980; García et al. 2004).

Known hosts and distribution: On soil in Philippines and Thailand (type locality) (Udagawa 1980; García et al. 2004).

Notes: *Pseudoneurospora amorphoporcata* was considered similar to *Copromyces bisporus* and *Emblemospora monotrema* in having ornamented ascospores (García et al. 2004). However, *Pseudoneurospora* can be distinguished from *C*. *bisporus* because the latter lacks an apical ring in the asci and has globose ascospores with one germ pore. It also can be differentiated from *E*. *monotrema* which has ascospores with plate-like wrinkles (Lundqvist 1972; Jeng and Krug 1976). In this study, *P*. *amorphoporcata* is basal to *P*. *canariensis* and '*Copromyces octosporus*' (92%ML/1.00BY, Fig. 37).

Sordaria Ces. & De Not., Comm. Soc. crittog. Ital. 1(4): 225 (1863)

Isolated from dung and soil or *saprobic* on wood. **Sexual morph**: *Ascomata* perithecial, gregarious, immersed to superficial, brown, translucent, subglobose to pyriform, glabrous or with rare hairs, ostiolate, with papilla, periphysate. *Peridium* membranaceous, composed of dark brown to hyaline cells of *textura angularis* to *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, short pedicellate, apex rounded, with J- apical ring, with or lacking paraphyses. *Ascospores* uni-seriate, subglobose to ellipsoidal, hyaline, becoming dark brown, aseptate, smooth-walled, germ pore at one end, with or without a gelatinous sheath. **Asexual morph**: Undetermined (adapted from De Notaris 1867; Winter 1884; Potebnia 1907; Cain 1957a; Lundqvist 1972; Khan and Krug 1989; Watanabe 1989).

Notes: *Sordaria* was first mentioned in Cesati and de Notaris (1863), and typified by *Sphearia sordaria* Fr., which later was transferred as *Coniochaeta sordaria* (Petrak 1953). Moreau (1953) introduced *Sordaria fimicola* as its generic type, which has been widely accepted (von Arx and Müller 1954; Munk 1957; Stafleu and Voss 1969; Lundqvist 1972). Lundqvist (1972) clarified *Sordaria* species as having dark perithecial ascomata, cylindrical asci and brown, smooth-walled ascospores with or without a gelatinous sheath. Traditionally, species of *Sordaria* are coprophilous and usually found in faeces and soil (Kirk et al. 2008; Maharachchikumbura et al. 2016). von Arx et al. (1987) re-defined species with a gelatinous sheath as *Sordaria*, while these lacking a gelatinous sheath were placed in *Asordaria*. Subsequently, Cai et al. (2006b) proposed that the presence or absence of the ascospore sheath is not a phylogenetically significant for the separation of *Asordaria* from *Sordaria*. We placed *Asordaria* under *Sordaria*, and *Sordaria* is divided in three clades (Sordaria clade I, II, III) in Sordariaceae based on phylogenetic analysis (Fig. 37).

Type species: ***Sordaria fimicola*** (Roberge ex Desm.) Ces. & De Not., Comm. Soc. crittog. Ital. 1(4): 226 (1863)

Basionym: *Sphaeria fimicola* Roberge ex Desm., Annls Sci. Nat., Bot., sér. 3 11(2): 339 (1849)

Facesoffungi number: *****??; Fig. 41

Saprobic on dead wood, homothallic. **Sexual morph**: *Ascomata* 250–350 × 190–300 μm ($\bar{x}$ = 270 × 240 μm, n = 10), perithecial, solitary or gregarious, immersed, erumpent through bark of the host at maturity, globose to subglobose, membranaceous, dark brown to black, ostiolate, with papilla. *Peridium* 15–30 μm wide, comprising two layers, outer layer composed of brown to dark brown cells of *textura angularis*; inner layer composed of pale brown to hyaline cells of *textura prismatica*. *Paraphyses* evanescent. *Asci* (155–)165–180(–220) × 12–20 μm ($\bar{x}$ = 175 × 15 μm, n = 50), 8-spored, unitunicate, cylindrical to subclavate, short pedicellate, apex truncate to rounded, with J- inconspicuous apical ring. *Ascospores* (17–)19–23 × (9–)10–13 μm ($\bar{x}$ = 20 × 11.5 μm, n = 50), uni-seriate, subglobose to oval or ellipsoidal, smooth-walled, pale brown to dark brown, aseptate, germ pore at one end, with gelatinous sheath. **Asexual morph**: Undetermined.

Material examined: Germany, Berlin, Brandenburg, Berlin Bot. Garden, on rotten stems of *Phragmites* sp. with *Claviceps* sp., May 1889, P. Hennings (S-F6838, **lectotype** of *Sordaria fimicola* var. *phragmiticola* Henn.); Germany, Hessen, Nassau, Östrich, on horse dung, 1802, L. Fuckel (S-F6841, **lectotype** of *Sphaeria equina* Fuckel); Italy, on decaying *Vitis* sp., 22 March 1930, Shear (BPI-580866).

Known hosts and distribution: On horse dung in France (type locality) (Desmazières 1849); on hare, horse, guinea-pig, camel and rabbit dung, heather soil, grass culms, filter paper, ergot-infested panicles of *Phragmites communis* in Argentina, Austria, Belgium, Bulgaria, Canada, Czech Republic, Denmark, England, Egypt, Finland, France, Germany, Hungary, Italy, Netherlands, Norway, Poland, South Africa, Spain and Sweden (Lundqvist 1972).

Notes: We re-examined three specimens, the lectotype of *Sordaria fimicola* var. *phragmiticola* Henn. (F6838), lectotype of *Sphaeria equina* Fuckel (F6841) and *Sordaria fimicola* (BPI-580866). These authentic materials were determined as *Sordaria fimicola* by Lundqvist (1972). Phylogenetically, the strains of *Sordaria fimicola*, which collected from Canada and Netherlands (Vu et al. 2019), clustered in *Sordaria* clade II (62%ML, Fig. 37).

Strattoniaceae S.K. Huang, Maharachch. & K.D. Hyde, ***fam. nov.***

Index Fungorum number: IF558346

Etymology: Named for *Strattonia*, the type genus of this family.

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary, scattered or gregarious, superficial to immersed, coriaceous to membranaceous, pyriform to subglobose, brown to black, hairy, ostiolate, with a black papilla, periphysate. *Paraphyses* filiform-ventricose, septate. *Asci* 4–8-spored, unitunicate, cylindrical, apex truncate or rounded, with J- apical ring. *Ascospores* uni-seriate, fusiform to obovoid, hyaline to subhyaline, 1-septate near the base, sometimes finely guttulae; upper cell becoming brown to black, swollen, ellipsoidal, with an apical germ pore; pedicel short, conical or cylindrical, hyaline, collapsing when dry, surrounded by gelatinous sheath. *Gelatinous sheath* rounded or irregular, swelling in water, invaginated at the pedicel, with indentations. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Phialides* monophialidic, smooth-walled, hyaline, cylindrical, unbranched or branched. *Conidia* hyaline to pale yellow, ellipsoidal to oval, aseptate, smooth-walled (adapted from Lundqvist 1972; Bell 2000, 2005).

Type genus: ***Strattonia*** Cif. 1954

Notes: The coprophilous *Strattonia* was introduced based on *Fimetaria tetraspora* and was initially characterized by superficial to immersed, coriaceous ascomata, 4-spored asci and brown ascospores (Ciferri 1954). Subsequently, Lundqvist (1972) delimited this genus as having ostiolate ascomata, non-amyloid asci and two-celled ascospores (a dark brown fusiform or ellipsoidal upper cell and a hyaline pedicel), sometimes with gelatinous sheath, which is similar to *Podospora*, *Sordaria* and *Triangularia*. Since authentic material of *S. tetraspora* is lacking, Lundqvist (1972) described this type species based on previous literature and found a special feature, that is, if gelatinous sheath present, it surrounds the ascospores but collapses at the pedicel. Eleven species accepted in this genus based on morphology (Ciferri 1954; Lundqvist 1972; Abdullah 1983; Bell 2000, 2005).

Vu et al. (2019) sequenced *Podospora petrogale* and *Strattonia oblecythiformis*. These two strains clustered in 100%ML/1.00BY support as an unstable sister clade to *Diplogelasinospora* (Fig. 26).

Morphologically, these two species are coprophilous and have similar hairy ascomata, non-amyloid, cylindrical asci and ascospores comprise a fusiform to ellipsoidal, brown to dark brown upper cell and a hyaline pedicel, while surrounded by gelatinous sheath, except pedicel, in addition, both of them have phialophora-like asexual morph (Bell 2000, 2005). These characters are also similar to *S. tetraspora*. The difference between *P. petrogale* and *S. oblecythiformis* is that the former has a cylindrical pedicel in ascospores, whereas the latter has oblecythiform pedicel (Bell 2000, 2005). Therefore, we placed *Podospora petrogale* in *Strattonia* (see the combination list below).

Strattonia carbonaria, *S. karachiensis* and *S. minor* with no gelatinous sheath were placed in *Jugulospora* and *Lundqvistomyces* (Neoschizotheciaceae) in phylogenetic analysis (Marin-Felix et al. 2020; this study). Thus, we believe that the gelatinous sheath surrounds the ascospores except pedicel should be accepted as a feature for the identifying *Strattonia* species.

We also raised *Strattonia* at a family level, Strattoniaceae. It is characterized by two-celled ascospores comprise a brown upper cell and a hyaline pedicel and surrounded by gelatinous sheath except for pedicel, which is different from other lasiosphaeriaceous taxa. Phylogenetically, *Strattonia* species form a sister clade to Diplogelasinosporaceae (Fig. 26).

Strattonia Cif., Sydowia 8(1-6): 245 (1954)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary, scattered or gregarious, superficial to immersed, coriaceous to membranaceous, pyriform to subglobose, brown to black, hairy, ostiolate, with a black papilla, periphysate. *Paraphyses* filiform-ventricose, septate. *Asci* 4–8-spored, unitunicate, cylindrical, apex truncate or rounded, with J- apical ring. *Ascospores* uni-seriate, fusiform to obovoid, hyaline to subhyaline, 1-septate near the base, sometimes finely guttulae; upper cell becoming brown to black, swollen, ellipsoidal, with an apical germ pore; pedicel short, conical or cylindrical, hyaline, collapsing when dry, surrounded by gelatinous sheath. *Gelatinous sheath* rounded or irregular, swelling in water, invaginated at the pedicel, with indentations. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Phialides* monophialidic, smooth-walled, hyaline, cylindrical, unbranched or branched. *Conidia* hyaline to pale yellow, ellipsoidal to oval, aseptate, smooth-walled (adapted from Lundqvist 1972; Bell 2000, 2005).

Notes: *Strattonia* is typified by *S. tetraspora,* which has hairy ascomata, cylindrical asci and ascospores comprise a brown upper cell and a hyaline pedicel and surrounded by gelatinous sheath except pedicel (Ciferri 1954; Lundqvist 1972). Lundqvist (1972) proposed that *Strattonia* is connected with *Podospora*, *Sordaria* and *Triangularia* and tried to sort out the affinities of *Strattonia* species by morphology. Subsequently, the no gelatinous sheath *Strattonia carbonaria*, *S. karachiensis* and *S. minor* were placed in *Jugulospora* and *Lundqvistomyces* respectively, based on phylogenetic analysis (Miller and Huhndorf 2005; Vu et al. 2019, Marin-Felix et al. 2020; this study, see notes for *Jugulospora minor*). We divide the remaining *Strattonia* species that do not have receivable molecular data into three groups according to the characteristics of their gelatinous sheath: i) *Strattonia grandis*, *S. tetraspora* and *S. zopfii* are similar to *S. petrogale* and *S. oblecythiformis* have gelatinous sheath surrounds ascospores except pedicel (Lundqvist 1972; Bell 2005); ii) *Strattonia borealis* and *S. mesopotamica* have terminal gelatinous appendages surrounding apical germ pore and pedicel (Lundqvist 1972; Abdullah 1983), which are similar to *Podospora fibrinocaudata* in Bombardiaceae; iii) *Strattonia dissimilis* and *S. insignis* have ascospores surrounded by gelatinous sheath except apical germ pore and pedicel (Lundqvist 1972; Barrasa et al. 1985), which are similar to *Apodospora gotlandica* in Bombardiaceae. However, more fresh collections and molecular information of *Strattonia* are expected to define its taxonomic placement more accurately.

Type species: ***Strattonia tetraspora*** (R. Stratton) Cif., Sydowia 8(1-6): 245 (1954)

Basionym: *Fimetaria tetraspora* R. Stratton, Ohio St. Univ. Bull. 26: 84 (1921)

On rotten paper. ***Sexual morph*** *Ascomata* perithecial, solitary to gregarious, superficial to immersed, coriaceous, pyriform to subglobose, black, ostiolate. *Asci* 4-spored, unitunicate, cylindrical. *Ascospores* uni-seriate, fusiform to obovoid, composed of a brown upper cell, with an apical germ pore, and a hyaline pedicel, sometimes surrounded by gelatinous sheath, but pedicel never. ***Asexual morph*** Undetermined (adapted from Ciferri 1954; Lundqvist 1972).

Known hosts and distribution: On rotten paper in Dominica (type locality) (Ciferri 1954).

Notes: Ciferri (1954) introduced *Strattonia tetraspora* and noted that this species was found on rotten paper from Moca, Santiago, Dominican Republic, in April 1928. Lundqvist (1972) mentioned that the authentic sample of *S. tetraspora* is lacking. In this study, we also could not obtain any authentic specimens or illustrations of *S. tetraspora*. This makes it impossible for us to identify its substrate, nor can we provide more information about this species. However, we provided the hand-drawing of *Strattonia zopfii* (Fig. 42 a), which is similar to *S. tetraspora* has ascospores surrounded by gelatinous sheath but invaginated at the pedicel, refer to Lundqvist (1972).

New combination:

Strattonia petrogale (A.E. Bell) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora petrogale* A.E. Bell, Muelleria 12(2): 236 (2000) [1999]

Index Fungorum number: IF558343

Zygospermellaceae S.K. Huang, Maharachch. & K.D. Hyde, ***fam. nov.***

Index Fungorum number. IF558347

Etymology: Named for *Zygospermella*, the type genus of this family.

Coprophilous, *entomogenous* or on the rock. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, obpyriform to subglobose, dark brown to black, verrucose, ostiolate. *Peridium* comprising carbonaceous to membranaceous, brown to black cells of *textura angularis* to *textura prismatica*. *Paraphyses* unbranched, broad, cylindrical, ventricose, septate. *Asci* 8-spored, unitunicate, cylindrical to subclavate, pedicellate, apex rounded, with J- apical ring. *Ascospores* uni- or bi-seriate, hyaline, aseptate, fusiform to ellipsoidal when young, becoming elongate-subfusiform, ends truncate, 1–3-septate, constricted at the middle septum, dark brown when mature, with an appendage and germ pore at each end. *Appendages* terminal, hyaline, cylindrical, tapering, smooth-walled, ends rounded, with longitudinally striate. **Asexual morph**: Hyphomycetous. *Conidiophores* arising from aerial hyphae, erect, inflated at the base. *Conidia* small, globose to oval, forming globose masses on the apex of the phialides (adapted from Cain 1934,1935; Lundqvist 1972; Zhang et al. 2017).

Type genus: ***Zygospermella*** Cain 1935

Notes: *Zygospermella* was initially introduced as *Delitschia* (Pleosporales) because of the similar hourglass-shaped ascospores, and then redefined as *Zygospermella* and placed in Lasiosphaeriaceae (Mouton 1897; Cain 1935; Lundqvist 1969). Phylogenetically, *Zygospermella* and *Lasiosphaeris* form a clade sister to Neoschizotheciaceae (Kruys et al. 2014; Marin-Felix et al. 2020). In this study, *Lasiosphaeris*, *Zygospermella*, *Episternus* and *Ramophialophora petraea* clustered as a sister clade of Neoschizotheciaceae in LSU sequence data (not shown). However, in multi-gene analysis, *Episternus onthophagi*, *Ramophialophora petraea* and *Zygospermella insignis* form an independent cluster and nested in Sordariales (71%ML/0.99BY) as an orphan clade (Fig. 26). In addition, the phialophora-like hyphomycetous *E. onthophagi* is epizoic fungus and *R. petraea* was collected on the rock in Karst cave (Zhang et al. 2017; Górz and Boroń 2018). *Zygospermella* has special hourglass-shaped ascospores attached to terminal appendages with longitudinally striate, which is different from the other members in Sordariales.

Episternus Górz & Boroń, Phytotaxa 376(1): 49 (2018)

Type species: ***Episternus onthophagi*** Górz & Boroń, Phytotaxa 376(1): 49 (2018)

Known hosts and distribution: On legs of dung beetle (*Onthophagus verticicornis*) in Poland (type locality) (Górz and Boroń 2018).

Notes: Górz and Boroń (2018) found the hyphae arising from the surface of a dung beetle and has 1-septate, ovoid conidia. The monotypic *Episternus* was established as an epizoic fungus in Lasiosphaeriaceae based on LSU-SSU-ITS sequence data (Górz and Boroń 2018). In this study, the ex-type strain of *E. onthophagi* (KRAM F 58223) is basal to *Zygospermella insignis* and *Ramophialophora petraea* in Zygospermellaceae (71%ML/0.99BY, Fig. 26).

Zygospermella Cain, Mycologia 27(2): 227 (1935)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, obpyriform to subglobose, dark brown to black, verrucose, ostiolate. *Peridium* comprising carbonaceous to membranaceous, brown to black cells of *textura angularis* to *textura prismatica*. *Paraphyses* unbranched, broad, cylindrical, ventricose, septate. *Asci* 8-spored, unitunicate, cylindrical to subclavate, pedicellate, apex rounded, with J- apical ring. *Ascospores* uni- or bi-seriate, hyaline, aseptate, fusiform to ellipsoidal when young, becoming hourglass-shaped to elongate-subfusiform, ends truncate, usually 1-septate, constricted at the middle septum, dark brown when mature, with a germ pore and appendage at each end. *Appendages* hyaline, cylindrical, tapering, smooth-walled, ends rounded, with longitudinally striate. **Asexual morph**: Undetermined (adapted from Cain 1934,1935; Lundqvist 1972).

Notes: *Zygospermella* was invalidly introduced as *Zygospermum* (Cain 1934). Cain (1935) proposed that *Zygospermum* should be corrected to *Zygospermella* and accepted *Zygospermella insignis* and *Z. setosa*. Lundqvist (1969, 1972) clarified that these species are conspecific, as *Z. insignis*, and introduced another species, *Zygospermella striata*. Therefore, two species are presently accepted for *Zygospermella*, *Z. insignis* (type) and *Z. striata*. Subsequently, Kruys et al. (2014) sequenced *Z. insignis*, which was collected on muskox dung in the USA, cattle dung in France and cow dung in Sweden, and found these strains clustered in Lasiosphaeriaceae (*s. lat.*). In this study, *Z. insignis* is sister to *Ramophialophora petraea* in Zygospermellaceae (100%ML/1.00BY, Fig. 26).

Type species: ***Zygospermella insignis*** (Mouton) Cain, Mycologia 27(2): 227 (1935)

Facesoffungi number. *****??; Fig. 43

Coprophilous. **Sexual morph**: *Ascomata* 650–900 × 250–500 μm, perithecial, solitary, superficial to semi-immersed, carbonaceous to membranaceous, pyriform to subglobose, dark brown to black, verrucose, surrounded by setae, ostiolate, with black, carbonaceous necks 180–250 × 100–150 μm, inner cells with hyaline periphyses. *Setae* 2.5–4.5 μm wide, brown, aseptate, tapering towards the acute apex. *Peridium* 25–40 μm wide, outer layer composed of carbonaceous, brown to black cells of *textura intricata* to *textura angularis*; inner layer composed of membranaceous, hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* 2.5–3.5 μm wide ($\bar{x}$ = 2.5 μm, n = 30), unbranched, cylindrical, septate, tapering, slightly constricted at the septa. *Asci* (150–)200–240(–270) × 15–25 μm ($\bar{x}$ = 220 × 20 μm, n =

20), 8-spored, unitunicate, cylindrical to subclavate, pedicellate, apex rounded and thickened. *Ascospores* uni- or bi-seriate, hyaline, aseptate, fusiform to ellipsoidal when young, becoming hourglass-shaped to elongate-subfusiform, ends truncate, 1-septate, sometimes 3-septae, constricted at the middle septum 3–7 µm wide, dark brown when mature, (26–)30–40(–45) × 7–10 µm ($\bar{x}$ = 35 × 8 µm, n = 20), with a germ pore and appendage at each end. *Appendages* 4.5–8 µm wide, hyaline, cylindrical, tapering, ends rounded, smooth-walled, with longitudinally striate. **Asexual morph**: Undetermined.

Material examined: Canada, Ontario. Bear Island, Lake Temagami, on cow dung, 21 November 1933, R.F. Cain (BPI-618905).

Known hosts and distribution: On dung of cow, sheep and horse in Belgium (type locality), Canada, England, Norway, Scotland, Spain and Sweden (Mouton 1897; Lundqvist 1969).

Notes: We re-examined authentic material collected by Cain and determined by Lundqvist (mentioned in the label of material) since the type specimen was unavailable.

Other genera in Sordariales

Chaetomiaceae G. Winter

Stellatospora Tad. Ito & Nakagiri, Mycoscience 35 (4): 413 (1994)

Isolated from rice field soil. **Sexual morph**: *Mycelium* white, superficial, effuse. *Ascomata* cleistothecial, solitary or gregarious, globose to subglobose, dark brown to black, covered in hyaline hairs. *Peridium* composed of brown to hyaline cells of *textura angularis*. *Asci* 3–8-spored, unitunicate, obpyriform to oval, evanescent. *Ascospores* multi-seriate, stellate to irregular with up to 9 short protuberances when mature, aseptate, pale greenish brown to brown, with a germ pore on one protuberance, guttulate. **Asexual morph**: Undetermined (adapted from Ito and Nakagiri 1994).

Notes: The monotypic *Stellatospora* typified by *S. terricola* has stellate ascospores and was initially placed in Sordariaceae (Ito and Nakagiri 1994). Subsequently, the ex-type strain (CBS 811.95) is available (Wang et al. 2019; Vu et al. 2019), and nests in Chaetomiaceae (Wang et al. 2019; this study, 100ML/1.00BY, Fig. 26). Therefore, this genus belongs in Chaetomiaceae based on phylogenetic analysis.

Type species: ***Stellatospora terricola*** Tad. Ito & Nakagiri, Mycoscience 35(4): 413 (1994)

Facesoffungi number: *****??; Fig. 44

Isolated from rice field soil, colonies on oatmeal agar (OA). **Sexual morph**: *Mycelium* white, superficial, effuse. *Ascomata* 75–120 µm diam., cleistothecial, solitary or gregarious, globose to subglobose, dark brown to black, covered in hyaline hairs. *Peridium* 3–5 µm wide, composed of pale brown to hyaline cells of *textura angularis*. *Asci* 3–8-spored, unitunicate, obpyriform to oval, evanescent. *Ascospores* (9–)11–15(–17) µm ($\bar{x}$ = 12 µm, n = 50) diam., multi-seriate, stellate to irregular with up to 9 short protuberances when mature, aseptate, pale greenish brown to brown, with a germ pore on one protuberance, guttulate. **Asexual morph**: Undetermined (adapted from Ito and Nakagiri 1994).

Material examined: Japan, Ikeda, Osaka, rice field soil, 22 May 1990, T. Ito (NBRC-IFO-H-12166, **holotype**).

Known hosts and distribution: Rice field soil, Japan (type locality) (Ito and Nakagiri 1994).

Notes: We re-examined the type material and found that there are star-like ascospores filling the ascomata, but no complete asci. *Stellatospora terricola* (CBS 811.95) is basal to *Ovatospora* and *Trichocladium* in Chaetomiaceae (100ML/1.00BY, Fig. 26).

Neoschizotheciaceae S.K. Huang & K.D. Hyde, ***fam. nov.***

Facesoffungi number: *****??; *Index Fungorum number*: IF558385

Etymology: Named for *Neoschizothecium*, the type genus of this family.

Coprophilous or *saprobic* on soil or wood. **Sexual morph**: *Ascomata* perithecial, solitary to scattered or gregarious, immersed to semi-immersed or superficial, obpyriform or ovoid, membranaceous to coriaceous, brown to black, sometimes semi-transparent, ostiolate, with long or short necks, glabrous or surrounded by hairs, periphysate. *Peridium* comprising yellowish to pale brown or dark brown cells of *textura angularis*, *textura globulosa* or *textura epidermoidea*. *Paraphyses* absent, or cylindrical, septate. *Asci* 4- to multi-spored, unitunicate, cylindrical to clavate, pedicellate, evanescent. *Ascospores* uni- or bi-seriate, ellipsoidal or triangular, usually 0–1-septate, hyaline to dark brown, with germ pore at one or each end, usually with gelatinous appendages at one or each end, rarely surrounded by gelatinous sheath. **Asexual morph**: Hyphomycetous. *Conidia* globose to cylindrical, hyaline to pale brown, smooth-walled, ovate masses on the apex of the phialides (adapted from Marin-Felix et al. 2020).

Type genus: ***Neoschizothecium*** S.K. Huang & K.D. Hyde

Notes: The Neoschizotheciaceae clade accommodates the genera *Apodus*, *Cercophora*, *Echria*, *Immersiella*, *Jugulospora*, *Lundqvistomyces*, *Neoschizothecium*, *Pseudoechria*, *Pseudoschizothecium*, *Rinaldiella* and *Zygopleurage* based on the molecular data of their generic types, and also several *Arnium*, *Apiosordaria*, *Podospora*, *Ramophialophora* and *Zopfiella* species (88%ML, Fig. 26). These taxa are similar to Bombardiaceae, Podosporaceae and Lasiosphaeriaceae in having ellipsoidal ascospores, sometimes with appendages, but are phylogenetically distinct from these three families (Fig. 26). Marin-Felix et al. (2020) introduced this clade as Schizotheciaceae based on *Schizothecium*. However, *Schizothecium* is a synonym of *Podospora* (Podosporaceae) based on the type species *S. fimicola*, which nests in *Podospora* in the phylogenetic analysis (Wang et al. 2019; Index Fungorum 2020; this study, Fig. 26). We introduce Neoschizotheciaceae as a new family in Sordariales with 74%ML support (Fig. 26), based on *Neoschizothecium*. This family includes 11 genera and is characterized by ostiolate ascomata, cylindrical to clavate asci and ellipsoidal ascospores, sometimes with long or short cylindrical or lash-like gelatinous appendages. Marin-Felix et al. (2020) introduced three genera *Lundqvistomyces*, *Pseudoechria* and *Pseudoschizothecium* which we do not discuss in our study.

Apodus Malloch & Cain, Can. J. Bot. 49(6): 872 (1971)

Saprobic on *Oryza* sp. or *coprophilous*. **Sexual morph**: *Mycelium* hyaline to brown, septate, branched hyphae. *Ascomata* cleistothecial, solitary, superficial, globose to subglobose, brown to black, surrounded by hairs. *Peridium* composed of brown to hyaline cells of *textura angularis*. *Asci* 8-spored, unitunicate, clavate to cylindrical, blunt at the apex, evanescent. *Ascospores* bi-seriate or irregular, subglobose to ellipsoidal, 0–1-septate, pale brown to dark brown, with a germ pore at the apex, sometimes with hyaline sheath. **Asexual morph**: Undetermined (adapted from Malloch and Cain 1971).

Notes: *Apodus* is typified by *A. deciduus* in having ascomata with long hairs and ellipsoidal ascospores with a germ pore at the apex (Malloch and Cain 1971). Subsequently, *A. oryzae* was collected from a sheath of *Oryza sativa* in Italy, characterized by lacking an ostiole, but with dark brown ascomata covered with light brown, flexuous, septate hairs, clavate asci and ellipsoidal to broadly fusiform, 0–1-septate ascospores with an apical germ pore and sometimes covered with a hyaline gelatinous sheath (von Arx 1975). *Apodus deciduus* and *A. oryzae* were recognized as congeneric because of their similar morphology, but they do not cluster together in a phylogenetic analysis (Cai et al. 2006b). In this study, strains of *A. deciduus* and *A. oryzae* nested in Neoschizotheciaceae and Naviculisporaceae, respectively (Fig. 26). Therefore, we place *Apodus* in Neoschizotheciaceae based on phylogenetic placement of the generic type, *A. deciduus*. *Apodus oryzae* belongs to Naviculisporaceae but requires further data.

Type species: ***Apodus deciduus*** Malloch & Cain, Can. J. Bot. 49(6): 872 (1971)

Facesoffungi number: *****??; Fig. 45

Coprophilous. **Sexual morph**: *Mycelium* hyaline to brown, septate, branched hyphae 2–4.5 μm wide. *Ascomata* 195–500 μm ($\bar{x}$ = 300 μm, n = 5) diam., cleistothecial, solitary, superficial, globose to subglobose, brown to black, surrounded by long, septate, brown, flexuous, tapering hairs. *Peridium* 15–30 μm wide, composed of brown to hyaline cells of *textura angularis*. *Asci* (45–)52–58(–60) × (12–)14–17 μm ($\bar{x}$ = 55 × 15 μm, n = 20), 8-spored, unitunicate, clavate to cylindrical, with short pedicel, apex blunt, with an indistinct apical ring, evanescent. *Ascospores* 12–16 × 8–11.5 μm ($\bar{x}$ = 14 × 9.5 μm, n = 20), bi-seriate or irregular, subglobose to ellipsoid, usually aseptate, often producing a single septum in culture, pale brown to dark brown, sometimes collapsing at the middle, with a germ pore at the apex. **Asexual morph**: Undetermined (adapted from Malloch and Cain 1971).

Material examined: USA, California, San Mateo Co., Crystal Springs Reservoir, on dung of dusky-footed wood rat in nest, 30 December 1969, D. Malloch (TRTC-045704, **holotype**).

Known hosts and distribution: On rat dung in the USA (type locality) (Malloch and Cain 1971).

Notes: We requested the holotype but the sample was too dry to find any clear structure except ascomata. The features of ascospores were found from a permanent mount. Cai et al. (2006b) sequenced the ex-type strain *Apodus deciduus* (CBS 506.70) which is basal to *Cercophora newfieldiana* and *Zopfiella tardifaciens* in Neoschizotheciaceae (100ML/0.96BY, Fig. 26).

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

Saprobic on woody or herbaceous plants or *coprophilous*. **Sexual morph**: *Ascomata* perithecial, scattered to gregarious, superficial to semi-immersed, globose to subglobose, brown to black, glabrous or hairy, ostiolate, with papilla. *Peridium* composed of pale brown to brown cells of *textura angularis*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, evanescent. *Ascospores* bi-seriate, straight or slight curved, ellipsoidal to cylindrical, aseptate, hyaline, with guttules and bipolar appendages when young, becoming 2–multi-celled, upper cell(s) swelling to become fusiform, dark brown when mature; lower cell(s) hyaline when mature, smooth-walled, with guttules, appendages disappear with age. **Asexual morph**: Hyphomycetous. *Conidiophores* micronematous, reduced to conidiogenous cells. *Conidia* asepate, hyaline to brown, smooth-walled, globose to subglobose or usually with a truncate base and rounded apex (adapted from Fuckel 1870; del Valle Catania et al. 2011).

Notes: *Cercophora* is characterized by membranaceous to carbonaceous ascomata and ascospores with a swollen head and hyaline appendage(s) (Fuckel 1870). *Chrysoporium*, *Cladorrhinum* and *Phialophora* species have been published as the asexual morphs of *Cercophora* (Udagawa and Muroi 1979; von Arx 1981a; Ueda 1994; del Valle Catania et al. 2011). In this study, we found that *Cercophora* species are scattered in Lasiosphaeriaceae, Naviculisporaceae, Podosporaceae and Neoschizotheciaceae in Sordariales (Fig. 26). Molecular data for the generic type, *Cercophora mirabilis*, has been sequenced and found that this species grouped with hyphomycetous *Ramophialophora globispora* in Neoschizotheciaceae (Miller and Huhndorf 2005; Marin-Felix et al. 2020; this study, 100%ML/1.00BY, Fig. 26). Therefore, we place this genus in Neoschizotheciaceae.

Type species: ***Cercophora mirabilis*** Fuckel, Jb. nassau. Ver. Naturk. 23-24: 245 (1870) [1869-70]

Facesoffungi number: *****??; Fig. 46

Saprobic on woody or herbaceous plants or *coprophilous*. **Sexual morph**: *Ascomata* perithecial, scattered, semi-immersed, globose to subglobose, brown to black, surrounded by hairs, ostiolate, with papilla. *Peridium* composed of pale brown cells of *textura angularis*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with subapical globule, evanescent. *Ascospores* bi-seriate, slight curved, ellipsoid, aseptate, hyaline, with guttules and bipolar appendages when young, becoming 2-celled, upper cell smaller than lower cell: the upper cell swelling to become fusiform, truncate at the base, dark brown when mature, (15–)18–25 × 10–15 µm ($\bar{x}$ = 20 × 12 µm, n = 20); lower cell cylindrical, hyaline when mature, 32–40 × 4–5 µm ($\bar{x}$ = 35 × 4.5 µm, n = 20), smooth-walled, with guttules, appendages disappear with age. **Asexual morph**: Hyphomycetous. *Conidiophores* micronematous, reduced to conidiogenous cells. *Conidia* asepate, hyaline to brown, globose to subglobose, smooth-walled (adapted from Udagawa and Muroi 1979; del Valle Catania et al. 2011).

Material examined: Sri Lanka, Hambantota Distr., southernmost part of Yala National Park near the coast, open dry jungle, on buffalo (*Bubalus bubalis*) dung in moist chamber, 11 February 1974, N. Lundqvist (UPS-UPS:BOT:F-698102).

Known hosts and distribution: On rotten stalks of cabbage in Germany (type locality) (Fuckel 1870); on dead woody or herbaceous plants or dung in Brazil, Canada, Corsiea, Denmark, Finland, Germany, Italy, Morocco, Norway, Poland, Scotland, Sri Lanka, Sweden (Lundqvist 1972).

Notes: *Cercophora* is typified by *C. mirabilis* (Fuckel 1870), which has vermiform ascospores with a swollen head, hyaline appendage(s) and a phialophora-like species was introduced as its asexual morph (Udagawa and Muroi 1979). Strain of *C. mirabilis* which nested in Neoschizotheciaceae were sequenced (Miller and Huhndorf 2005; Marin-Felix et al. 2020). We re-examined an authentic specimen determined by Lundqvist (mentioned in the label of material). The type strain *Cercophora mirabilis* (CBS 120402) is sister to *Ramophialophora globispora* (LC6218) in Neoschizotheciaceae (100%ML/1.00BY, Fig. 26).

Echria (N. Lundq.) Kruys, Huhndorf & A.N. Mill., Fungal Diversity 70: 106 (2014) [2015]

Coprophilous or *saprobic* on wood. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, globose to subglobose, with rigid hairs, ostiolate, with papilla. *Asci* 8-spored, unitunicate, cylindrical, pedicellate. *Ascospores* uni-seriate, ellipsoidal to fusiform, aseptate, smooth-walled or roughened wall, with a large central guttule and surrounded by gelatinous sheath. **Asexual morph**: Undetermined (adapted from Lundqvist 1972; Kruys et al. 2014).

Notes: *Echria* initially was introduced as a subgenus of *Arnium* and typified by *Arnium macrotheca* (Lundqvist 1972), and Kruys et al. (2014) raised *Echria* to generic level and transferred two *Arnium* species, *A. gigantospora* and *A. macrotheca*, to *Echria* based on LSU and TUB sequences data. Subsequently, Marin-Felix et al. (2020) showed that these two *Echria* species clustered and, in this study, two *Echria* species clustered (100%ML/1.00BY) and is sister to *Rinaldiella pentagonospora* in Neoschizotheciaceae (100%ML/0.96BY, Fig. 26). *Echria* different from *Rinaldiella* in having subglobose ascomata with rigid hairs and ellipsoidal ascospores surrounded by gelatinous sheaths, whereas *Rinaldiella* has subglobose ascomata covered with hairs and clavate ascospores (Lundqvist 1972; Crous et al. 2014).

Type species: ***Echria macrotheca*** (P. Crouan & H. Crouan) Kruys, Huhndorf & A.N. Mill., Fungal Diversity 70: 106 (2014) [2015]

Basionym: *Sphaeria macrotheca* P. Crouan & H. Crouan, Florule Finistère (Paris): 24 (1867)

Coprophilous or *saprobic* on wood. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, globose to subglobose, ostiolate, with papilla, surrounded by brown setae. *Asci* 8-spored, unitunicate, cylindrical, pedicellate. *Ascospores* uni-seriate, ellipsoidal to subglobose, aseptate, with a large central guttule and surrounded by gelatinous sheath. **Asexual morph**: Undetermined (adapted from Lundqvist 1972; Kruys et al. 2014).

Known hosts and distribution: On old cow dung among the *Splachnum ampullaceum* in France (type locality) (Crouan and Crouan 1867); on dung of cow, hare, horse, mule, rabbit, rat and sheep in Bulgaria, Canada, Denmark, England, France, Morocco, Puerto Rico, Sweden and USA (Lundqvist 1972).

Notes: Marin-Felix et al. (2020) established Schizotheciaceae and placed *E. macrotheca* in this family based on phylogenetic analysis. In this study, *Echria macrotheca* is sister to *E. gigantospora* in Neoschizotheciaceae (100%ML/1.00BY, Fig. 26).

Immersiella A.N. Mill. & Huhndorf, Mycol. Res. 108(1): 31 (2004)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to semi-immersed, ovoid to obpyriform, brown, verrucose, ostiolate, with papilla, covered with brown hairs. *Peridium* comprising membranaceous, hyaline to brown cells of *textura angularis* or *textura prismatica*. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, with J- apical ring distinct, evanescent. *Ascospores* bi-seriate, cylindrical to geniculate, hyaline to pale brown, 0–multi-septate, guttulate, smooth-walled, with gelatinous appendages or appendage absent. **Asexual morph**: Undetermined (Miller and Huhndorf 2004a; Kruys et al. 2014).

Notes: Miller and Huhndorf (2004a) established *Immersiella* with *I. caudata* and *I. immersa* (type) in Sordariales based on phylogenetic analysis of LSU sequence data. Subsequently, Kruys et al. (2014) found that the clade comprising *I. caudata* and *I. immersa* was closely related to *Arnium hirtum*, which was isolated from dung in Scotland. In our study, *A. hirtum*, *I. caudata* and *I. immersa* also form a strongly supported clade in Neoschizotheciaceae (100%ML/0.97BY, Fig. 26). Therefore, we recommend to treat *A. hirtum* as *Immersiella hirta*.

Type species: ***Immersiella immersa*** (P. Karst.) A.N. Mill. & Huhndorf, Mycol. Res. 108(1): 31 (2004)

Basionym: *Lasiosphaeria immersa* P. Karst., Bidr. Känn. Finl. Nat. Folk 23: 163 (1873)

Facesoffungi number: *****??; Fig. 47

Saprobic on wood. **Sexual morph**: *Ascomata* 270–450 × 360–460 µm ($\bar{x}$ = 325 × 370 µm, n = 10), perithecial, solitary to scattered, superficial to semi-immersed, sitting on subiculum, ovoid to obpyriform, brown, membranaceous, verrucose, ostiolate, with papilla. *Subiculum* composed of brown, septate, hyphae,1.5–3.5 µm wide. *Peridium* 55–95 µm ($\bar{x}$ = 75 µm, n = 30) wide, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, branched, septate, filiform. *Asci* (200–)220–250(–270) × 14–17 µm ($\bar{x}$ = 235 × 15 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with subapical globule, distinct J-apical ring, evanescent. *Ascospores* 35–45(–50) × 4.5–6.5 µm ($\bar{x}$ = 42 × 5 µm, n = 50), bi-seriate, slight curved, cylindrical to geniculate, hyaline and aseptate when young, becoming pale brown and multi-septate, swelling at end when mature, with a large guttule in each cell, smooth-walled, with a germ pore at each end. **Asexual morph**: Undetermined.

Material examined: USA, Wisconsin, 45º0.00’ N / 90°0.00’ W, on dead wood, 9 June 1999, S.M. Huhndorf (F-SMH 4104).

Known hosts and distribution: On dead wood of *Betula* in Finland (type locality) (Karsten 1873); on dead wood in USA (Miller and Huhndorf 2004a).

Notes: *Immersiella immersa* is characterized by pyriform ascomata with cylindrical to geniculate ascospores (Miller and Huhndorf 2004a). We could not obtain the type material. Therefore, we re-examined an authentic specimen collected by Huhndorf.

New combination:

Immersiella hirta (E.C. Hansen) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria hirta* E.C. Hansen, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 59: 22 (1877)

Synonym: *Arnium hirtum* (E.C. Hansen) N. Lundq. & J.C. Krug, Symb. bot. upsal. 20(no. 1): 218 (1972)

Index Fungorum number: IF558326

Jugulospora N. Lundq., Symb. bot. upsal. 20(no. 1): 256 (1972)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial to semi-immersed, ovoid to subglobose, brown to black, membranaceous to carbonaceous, ostiolate, with central papilla, periphysate. *Peridium* composed of brown cells of *textura angularis*. *Paraphyses* numerous, filiform, flexuous, septate. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex truncate, with apical ring, evanescent. *Ascospores* uni-seriate, broadly ellipsoidal to ovoid, with an apical germ pore, hyaline when young, becoming upper cell aseptate, brown to dark brown, with plate-like wrinkles on surface when mature and truncate at the base; lower cell tiny, hyaline conical. **Asexual morph**: Undetermined (adapted from Lundqvist 1972).

Notes: *Jugulospora* is typified by *J. rotula* and characterized by ovoid ascomata and ovoid ascospores with a gelatinous cap-like cell at the base and a plate-like wrinkles (Lundqvist 1972). Marin-Felix et al. (2020) transferred this genus to Schizotheciaceae and introduced three more species, *J. antarctrica*, *J. carbonaria* and *J. vestita* based on morphology and phylogenetic analysis. This study also confirms that *Jugulospora* strain nest in Neoschizotheciaceae (50%ML/0.96BY, Fig. 26).

Type species: ***Jugulospora rotula*** (Cooke) N. Lundq., Symb. bot. upsal. 20(no. 1): 260 (1972)

Basionym: *Sphaeria rotula* Cooke, Handb. Brit. Fungi 2: 868 (1871)

Facesoffungi number: *****??; Fig. 48

Coprophilous. **Sexual morph**: *Ascomata* 230–250 × 150–230 µm ($\bar{x}$ = 240 × 170 µm, n = 10), perithecial, gregarious, superficial to semi-immersed, ovoid to subglobose, brown to black, membranaceous to carbonaceous, ostiolate, with central, papilla, periphysate. *Peridium* 15–45 µm wide, composed of brown cells of *textura angularis*. *Paraphyses* numerous, filiform, flexuous, septate. *Asci* (80–)100–120(–150) × 9–15 µm ($\bar{x}$ = 110 × 10 µm, n = 20), 8-spored, unitunicate, cylindrical, pedicellate, apex truncate, with apical ring, evanescent. *Ascospores* (10–)14–15(–16) × 8–10 µm ($\bar{x}$ = 14.5 × 9 µm, n = 50), uni-seriate, broadly ellipsoidal to ovoid, with an apical germ pore, hyaline when young; becoming upper cell aseptate, brown to dark brown when mature, with plate-like wrinkles on surface and truncate at the base connected a tiny, hyaline conical lower cell. **Asexual morph**: Undetermined.

Material examined: UK, Surrey, Abinger, on burnt ground, October 1816, M.C. Cooke (NY-01050505, **Isolectotype**).

Known hosts and distribution: On burnt ground in Belgium, Canada, Denmark and England (type locality) (Cooke 1871; Lundqvist 1972).

Notes: The sequence data of *Jugulospora rotula* were sequenced (Miller and Huhndorf 2005; Marin-Felix et al. 2020) and in this study, these strains form a sister clade to *J. minor* (100%ML, Fig. 26) in Neochizotheciaceae. We re-examined a type of *Jugulospora rotula* which was collected by Cooke (mentioned in the label of material).

New combination:

Jugulospora minor (N. Lundq.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Strattonia minor* N. Lundq., Symb. bot. upsal. 20(no. 1): 271 (1972)

Facesoffungi number: *****??; *Index Fungorum number*: IF558327; Fig. 42 b–j

Saprobic in soil. **Sexual morph**: *Ascomata* 300–400 × 320–340 µm ($\bar{x}$ = 350 × 330 µm, n = 5), perithecial, solitary to gregarious, superficial to semi-immersed, membranaceous, pyriform to subglobose, brown to black, verrucose, ostiolate, with iso-radiating cells at surface, inner cells with hyaline periphyses. *Peridium* 15–60 µm wide, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 6–10 µm wide, filiform. *Asci* (120–)160–170(–230) × 8–12 µm ($\bar{x}$ = 165 × 10 µm, n = 20), 8-spored, unitunicate, cylindrical. *Ascospores* 20–22(–25) × 6–10 µm ($\bar{x}$ = 21 × 8 µm, n = 50), uni-seriate, oval to ellipsoidal, with a germ pore at the apex, hyaline when young, becoming upper cell aseptate, brown to dark brown when mature, verrucose; lower cell small, hyaline, caudal, triangular 2–3.5 × 2–3 µm. **Asexual morph**: Undetermined.

Material examined: Sweden, Uppland, Uppsala, Stadsskogen Forest, on burnt ground among *Anthracobiae* and small mosses, N. Lundqvist (UPS-UPS:BOT:F-117927, **holotype**).

Known hosts and distribution: On burnt soil in Belgium, Denmark, France and Sweden (type locality) (Lundqvist 1972).

Notes: *Strattonia* is characterized by ascospores with a large, brown cell and a short, hyaline cell, surrounded by gelatinous sheath (Lundqvist 1972). Miller and Huhndorf (2005) and Vu et al. (2019) sequenced *Strattonia carbonaria* and *S. minor*, and these two strains clustered with *Jugulospora* in Neoschizotheciaceae (100%ML/1.00BY, Fig. 26). These two species, have ascospores comprise a brown and a hyaline cell, but gelatinous sheath absent (Lundqvist 1972), are more similar to *Jugulospora*. *Strattonia carbonaria* has been transferred as *Jugulospora carbonaria* (Marin-Felix et al. 2020). Therefore, we transfer *S. minor* as *Jugulospora minor* based on morphology and phylogenetic analyses.

Neoschizothecium S.K. Huang & K.D. Hyde, ***gen. nov.***

Etymology: Name refers to genus similar to, but different from *Schizothecium*

Facesoffungi number: *****??; *Index Fungorum number*: IF558329

Saprobic on wood, *coprophilous*. **Sexual morph**: *Ascomata* perithecial, solitary, scattered or gregarious, superficial to semi-immersed, pyriform, olivaceous-brown to dark brown, semi-transparent, surrounded by pale brown hyphae, ostiolate, with papilla. *Peridium* comprising membranaceous, pale brown cells of *textura angularis*. *Paraphyses* cylindrical, septate. *Asci* 8–multi-spored, unitunicate, cylindrical, evanescent. *Ascospores* uni-seriate to irregularly arranged, ellipsoidal to broadly fusiform, aseptate, hyaline to dark brown, truncate at the base with a cylindrical, slender, hyaline pedicel, umbonate apex, verrucose, with an apical germ pore. **Asexual morph**: Undetermined (adapted from Corda 1838; Lundqvist 1972; Munngai et al. 2012; Wang et al. 2019).

Notes: *Schizothecium* was introduced by Corda (1838) and is typified by *S. fimicola* and has membranaceous ascomata and ascospores with lash-like caudae (Corda 1838; Lundqvist 1972; Hu et al. 2006; Mungai et al. 2012). The generic type, *Schizothecium fimicola*, was synonymized as *Podospora fimicola* based on the epitype strain *S. fimicola* (CBS 482.64), which nested in *Podospora* (Podosporaceae) (Wang et al. 2019; Index Fungorum 2020). Marin-Felix et al. (2020) established Schizotheciaceae and raised *Schizothecium* as its type genus; however, the generic type of *Schizothecium* has not been clarified. Currently, *Schizothecium* is a synonym of *Podospora* under Podosporaceae, whereas several *Schizothecium* species clustered in Schizotheciaceae (Marin-Felix et al. 2020; this study, 100ML/1.00BY, Fig. 26). In this study, a novel genus *Neoschizothecium* is therefore proposed to accommodate species in the Neoschizotheciaceae clade (Fig. 26) and is typified by *Neo. curvisporum* (see the combination list below). This genus nests in Neoschizotheciaceae (95%ML) and is distinct from *Podospora* in multi-gene analysis (Fig. 26).

Type species: ***Neoschizothecium curvisporum*** (Cain) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria curvispora* Cain, Canadian Journal of Research, Section C 26: 492 (1948)

Synonym: *Schizothecium curvisporum* (Cain) N. Lundq., Symb. bot. upsal. 20(no. 1): 334 (1972)

Index Fungorum number: IF558333; Fig. 49 q–r

Saprobic on seeds. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, pyriform, olivaceous brown to dark brown, semi-transparent, surrounded by pale brown hyphae, ostiolate, with papilla, periphysate. *Peridium* composed of membranaceous, pale brown cells of *textura angularis*. *Asci* 8-spored, unitunicate, cylindrical, apex rounded, pedicellate. *Ascospores* uni- or bi-seriate, reniform, aseptate, brown to dark brown, truncate at the base with a clavate, hyaline pedicel, with an apical germ pore. **Asexual morph**: Undetermined.

Known hosts and distribution: On seeds of *Apium graveolens* and *Daucus carota* in the USA (type locality) (Cain 1948).

Notes: *Schizothecium curvisporum* was established based on *Sordaria curvispora* which was isolated in culture from seed of *Daucus carota* L. var. *sativa* DC. in the USA (DAOM 20504) (Cain 1948; Lundqvist 1972). Subsequently, Vu et al. (2019) sequenced the ex-type strain *S. curvisporum* (CBS 506.50), and this strain nests in *Neoschizothecium* (100%ML/1.00BY, Fig. 26). In this study, we were unable to obtain authentic materials. Ascomata of *N. curvisporum* is similar to *N. conicum* and the hand-drawing is provided for the asci and ascospores (Fig. 49 q–r) based on Cain (1948).

New combinations:

Neoschizothecium aloides (Fuckel) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria aloides* Fuckel, Fungi rhenani exsic., suppl., fasc.: no. 2549 (1868)

Synonym: *Schizothecium aloides* (Fuckel) N. Lundq., Symb. bot. upsal. 20(no. 1): 253 (1972)

Index Fungorum number. IF558331

Neoschizothecium carpinicola (Mouch.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora carpinicola* Mouch., Persoonia 13(1): 197 (1986)

Synonym: *Schizothecium carpinicola* (Mouch.) L. Cai, Fungal Diversity 19: 14 (2005)

Index Fungorum number. IF558332

Neoschizothecium conicum (Fuckel) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Cercophora conica* Fuckel, Jb. nassau. Ver. Naturk. 23-24: 245 (1870)

Synonym: *Schizothecium conicum* (Fuckel) N. Lundq., Symb. bot. upsal. 20(no. 1): 253 (1972)

Facesoffungi number. *****??; *Index Fungorum number*. IF558328; Fig. 49 a–p

Coprophilous. **Sexual morph**: *Ascomata* 450–600 × 200–400 µm ($\bar{x}$ = 500 × 320 µm, n = 5), perithecial, solitary or gregarious, superficial to semi-immersed, pyriform, brown to dark brown, membranaceous, ostiole, central, papillate with iso-radiating cells, surrounded by pale brown hyphae 2–4 µm wide, with hyaline, septate periphyses. *Peridium* 20–40 µm ($\bar{x}$ = 30 µm, n = 30) wide, comprising two layers, outer layer composed of pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* tapering, cylindrical, septate. *Asci* (150–)165–175(–195) × 20–35 µm ($\bar{x}$ = 170 × 20 µm, n = 30), 8-spored, unitunicate, cylindrical, apex rounded, with thickened wall, pedicellate, evanescent. *Ascospores* (16–)18–23(–25) × 10–16 µm ($\bar{x}$ = 20 × 13 µm, n = 50), uni-seriate, ellipsoidal to broadly fusiform, aseptate, hyaline to dark brown, truncate at the base with a conical, hyaline pedicel, umbonate apex with a cylindrical, evanescent gelatinous appendage, verrucose, with an apical germ pore, collapsing when dry. **Asexual morph**: Undetermined.

Material examined: Sweden, Öland, Ås par., Ottenby lund., on fallen deer dung (*Dama dama*) in moist chamber in Stockholm, 16 May 1984, N. Lundqvist (S-F124742); Sweden, Skåne, Östra Vemmerlöv par., W of Hörte., in seashore meadow, on horse dung in moist chamber in Storvreta, 19 September 1996, N. Lundqvist (S-F124745).

Known hosts and distribution: On various kinds of dung, particularly cow and horse dung in all over the Nordic area, like Germany (type locality) and Sweden (Fuckel 1870; Lundqvist 1972); on roots in Canada (Vu et al. 2019).

Notes: *Schizothecium conicum* was found with *Cercophora mirabilis* on rotten cow dung under an oak tree (Fuckel 1870). Subsequently, Lundqvist (1972) clarified the relevant materials to *Sch*. *conicum* and proposed *Sordaria curvula* (= *Podospora curvula*) is a synonym. Vu et al. (2019) sequenced *P*. *curvula* (= *Sch*. *conicum*) (CBS 434.50), and this strain clustered with other *Schizothecium* strains with 100%ML/1.00BY support in Neoschizotheciaceae (Marin-Felix et al. 2020; this study, Fig. 26). In this study, we placed *Sch*. *conicum* in *Neoschizothecium* and re-examined an authentic specimen collected by Lundqvist.

Neoschizothecium fimbriatum (A. Bayer) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria fimbriata* A. Bayer, Práce Mor. Přirodověd. Společn. Brno 1(3): 83 (1924)

Synonym: *Schizothecium fimbriatum* (A. Bayer) Barrasa & Soláns, Revta Ibér. Micol. 6(1): 3 (1989)

Index Fungorum number: IF558334

Neoschizothecium glutinans (Cain) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria glutinans* Cain, Univ. Toronto Stud., Biol. Ser. 38: 40 (1934)

Synonym: *Schizothecium glutinans* (Cain) N. Lundq., Symb. bot. upsal. 20(no. 1): 254 (1972)

Index Fungorum number: IF558338

Neoschizothecium inaequale (Cain) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria inaequalis* Cain, Canadian Journal of Research, Section C 26: 489 (1948)

Synonym: *Schizothecium inaequale* (Cain) N. Lundq., Symb. bot. upsal. 20(no. 1): 334 (1972)

Index Fungorum number: IF558339

Neoschizothecium minicaudum (Faurel & Locq.-Lin.) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora minicauda* Faurel & Locq.-Lin., Revue Mycol., Paris 42: 344 (1978)

Index Fungorum number. IF558340

Neoschizothecium selenosporum (Stchigel, Guarro & M. Calduch) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Podospora selenospora* Stchigel, Guarro & M. Calduch, Mycologia 94(3): 554 (2002)

Synonym: *Schizothecium selenosporum* (Stchigel, Guarro & M. Calduch) Y. Marín & Stchigel, in Marin-Felix et al., Microorganisms 8(9, no. 1430): 34 (2020)

Index Fungorum number. IF558341

Neoschizothecium tetrasporum (G. Winter) S.K. Huang & K.D. Hyde, ***comb. nov.***

Basionym: *Sordaria tetraspora* G. Winter, Hedwigia 11: 161 (1872)

Synonym: *Schizothecium tetrasporum* (G. Winter) N. Lundq., Symb. bot. upsal. 20(no. 1): 256 (1972)

Index Fungorum number. IF558342

Rinaldiella Deanna A. Sutton, Y. Marín, Guarro & E.H. Thomps., in Crous et al., Persoonia 32: 301 (2014)

Human pathogen. **Sexual morph**: *Ascomata* perithecial, immersed, scattered, pyriform to subglobose, membranaceous, dark brown to black, surrounded by filiform hairs, ostiolate, with papilla. *Peridium* membranaceous, translucent, composed of brown to yellowish brown cells of *textura epidermoidea*. *Paraphyses* filiform, septate. *Asci* 8-spored, unitunicate, clavate to cylindrical, pedicellate, evanescent. *Ascospores* uni- to bi-seriate, hyaline, clavate and aseptate when young, upper cell becoming swollen to polygonal, brown, with truncate base and slightly acuminate apex; lower cell conical, subhyaline, slightly warted. **Asexual morph**: Undetermined (adapted from Crous et al. 2014).

Notes: The monotypic genus *Rinaldiella* was isolated from a contaminated human lesion and is characterized by pyriform ascomata with filiform brown hairs and clavate, 1-septate ascospores with a swollen, verrucose upper cell (Crous et al. 2014). It is different from *Echria* has subglobose ascomata with rigid hairs and ellipsoidal ascospores surrounded by gelatinous sheath (Lundqvist 1972). In this study, we place this species to Neoschizotheciaceae, based on its ex-type strain, *Rinaldiella* *pentagonospora* (CBS 132344) which is sister to *Echria* in Neoschizotheciaceae (100%ML/1.00BY, Fig. 26).

Type species: ***Rinaldiella pentagonospora*** Deanna A. Sutton, Y. Marín, Guarro & E.H. Thomps., in Crous et al., Persoonia 32: 301 (2014)

Fig. 34 n–o

Human pathogen. **Sexual morph**: *Ascomata* perithecial, immersed, scattered, pyriform to subglobose, membranaceous, dark brown to black, surrounded by filiform hairs, ostiolate, with papilla. *Peridium* membranaceous, translucent, composed of brown to yellowish brown cells of *textura epidermoidea*. *Paraphyses* filiform, septate. *Asci* 8-spored, unitunicate, clavate to cylindrical, pedicellate, evanescent. *Ascospores* uni- to bi-seriate, hyaline, clavate and aseptate when young, upper cell becoming swollen to polygonal, brown, with truncate base and slightly acuminate apex; lower cell conical, subhyaline, slightly warted. **Asexual morph**: Undetermined (adapted from Crous et al. 2014).

Known hosts and distribution: On human lesion in the USA (type locality) (Crous et al. 2014).

Notes: *Rinaldiella* is sister to *Echria* (100%ML/1.00BY, Fig. 26). The former is characterized by ascospores comprise a brown, polygonal upper cell and a subhyaline, conical lower cell, but different from the latter in having ellipsoidal ascospores surrounded by gelatinous sheath (Crous et al. 2014; Kruys et al. 2014).

Zygopleurage Boedijn, Persoonia 2(3): 316 (1962)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, superficial to semi-immersed, semi-transparent, pyriform to subglobose, olivaceous-brown to black, verrucose, ostiolate, with short necks. *Peridium* comprising membranaceous, hyaline to brown cells of *textura angularis*. *Asci* 4–8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded. *Ascospores* irregularly arranged or spirally coiled around each other, hyaline, cylindrical to fusiform, aseptate when young, becoming elongate, the terminal cells swelling fusiform or oval and dark brown or olivaceous-brown with truncate base; the intercalary cell elongate, hyaline, sometimes slightly swelling when mature, usually 3-celled, sometimes multi-septate, with gelatinous appendages. **Asexual morph**: Undetermined (adapted from Boedijn 1962; Mirza and Nasir 1968; Lundqvist 1969, 1972).

Notes: All three species of *Zygopleurage* were collected from dung, especially cow dung, and the generic type, *Zygopleurage zygospora*, was first found in Italy and *Zygopleurage faiyumensis* and *Z. multicaudata* were collected in Egypt and Pakistan respectively (Boedijn 1962; Mirza and Nasir 1968; Lundqvist 1969). Lundqvist (1972) proposed that this genus is similar to *Lasiosphaeria* and *Podospora* based on ascospores comprise two brown cells connected by a long hyaline cell. Huhndorf et al. (2004b) sequenced *Z. zygospora* (SMH4219). In this study, this strain nested in Neoschizotheciaceae with 92%ML support (Fig. 26).

Type species: ***Zygopleurage zygospora*** (Speg.) Boedijn, Persoonia 2(3): 316 (1962)

Basionym: *Sordaria zygospora* Speg., Michelia 1(no. 2): 227 (1878)

Facesoffungi number. *****??; Fig. 50

Coprophilous. **Sexual morph**: *Ascomata* 0.7–1 × 0.5–0.8 mm, perithecial, solitary to scattered, superficial to semi-immersed, membranaceous, semi-transparent, pyriform to subglobose, olivaceous-brown, verrucose, ostiolate, with dark brown necks 300–400 × 150–300 µm, inner cells with hyaline periphyses. *Peridium* 25–60 µm wide, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* (250–)280–315(–330) × (35–)40–50(–55) µm ($\bar{x}$ = 300 × 45 µm, n = 20), 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded and thick-walled. *Ascospores* bi-seriate, 3-celled, the two terminal cells hyaline to dark brown, ellipsoidal to fusiform with an apical germ pore and truncate at the base, (25–)27–32(–35) × (12–)14–18(–20) µm ($\bar{x}$ = 30 × 15 µm, n = 50), with 4 distinct hyaline gelatinous processes at each end; connected by a long, hyaline 4–7 µm wide cell, with gelatinous ornamentation, evanescent. **Asexual morph**: Undetermined.

Material examined: Egypt, Faiyum Province, Al Fayyum, Libyan Desert, along the Cairo-Faiyum desert road, in the dried-up salt marsh at Kom Aushim 10 km N.E. of Lake Qarun, on cow dung in moist chamber in Uppsala, 1 March 1968, N. Lundqvist (S-F43798); Sweden, Småland, Vimmerby parish, 3 km S of Storebro, on cow dung after 3 weeks in moist chamber in Uppsala, 31 May 1959, N. Lundqvist (S-F43801).

Known hosts and distribution: On dung of cow, guinea pig, horse in Canada, Egypt, France, Italy (type locality), Liberia, Puerto Rico, Sweden and USA (Boedijn 1962; Lundqvist 1969).

Notes: We re-examined the authentic specimen collected by Lundqvist (mentioned in the label of material).

Sordariales genera *incertae sedis*

Arnium Nitschke ex G. Winter, Bot. Ztg. 31: 450 (1873)

Saprobic on wood, *coprophilous*. **Sexual morph**: *Ascomata* perithecial, scattered, superficial to semi-immersed, obpyriform to subglobose, membranaceous, pale brown to dark brown, ostiolate, with necks. *Necks* cylindrical to conical, black, glabrous or covered with unbranched, tapering, brown hairs, with hyaline, filiform periphyses. *Paraphyses* filiform to cylindrical, septate. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded, evanescent. *Ascospores* uni-seriate to irregularly arranged, obovoid to ellipsoidal to fusiform, aseptate, hyaline when young, becoming dark brown when mature, with ornamented wall and a gelatinous appendage at each end or surrounded by a gelatinous sheath. **Asexual morph**: Undetermined (adapted from Nitschke 1873; Lundqvist 1974).

Notes: *Arnium* is typified by *A. lanuginosum* and has subglobose ascomata, cylindrical to clavate asci and ascospores with a gelatinous appendage at each end (Nitschke 1873). Subsequently, *A. lanuginosum* was synonymized under *Podospora brassicae* (Ellis and Everhart 1892). This genus was rarely mentioned until it was clarified by Lundqvist (1972), and several *Arnium* species were then introduced (Cain and Mirza 1972; Krug and Cain 1972; Lundqvist 1974). *Arnium* species are phylogenetically scattered among the families of Sordariales, and several taxa have been transferred to *Cladorrhinum*, *Podospora* and *Triangularia* (Wang et al. 2019; Marin-Felix et al. 2020). In this study, *Arnium* species nested in Naviculisporaceae, Podosporaceae and Neoschizotheciaceae, but there is no molecular data for *A. lanuginosum*. Thus, we place the genus in Sordariales genera *incertae sedis* pending more data.

Type species: ***Arnium lanuginosum*** Nitschke [as 'lanuginosa'], Bot. Ztg. 31: 450 (1873)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, superficial, globose to subglobose, tomentose. *Asci* 8-spored, unitunicate, cylindrical. *Ascospores* oval to ellipsoidal, dark brown, with gelatinous appendage at each end. **Asexual morph**: Undetermined (adapted from Nitschke 1873; Ellis and Everhart 1892).

Notes: Ellis and Everhart (1892) believed that *Arnium lanuginosum* and *Podospora brassicae* were conspecific, and these species were synonymized under *A. olerum* (Lundqvist 1972) based on similar ellipsoidal ascospores with cylindrical gelatinous appendages. In this study, *A. olerum* was transferred as *C. olerum* based on phylogenetic analysis (see notes for *Cladorrhinum olerum*). However, there is no molecular data for *A. lanuginosum* and we could not obtain any related specimens.

Biconiosporella Schaumann, Veröff. Inst. Meeresf. Bremerhaven 14(1): 24 (1972)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, scattered, semi-immersed to superficial, globose to subglobose, collapsing when dry, membranaceous, black, ostiolate, with papilla. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, evanescent. *Ascospores* uni-seriate, obovoid to ellipsoidal, hyaline when young, becoming pale brown to brown when mature, smooth-walled, 3-septate, with a germ pore at each end and with tubercules at the middle. **Asexual morph**: Undetermined (adapted from Schaumann 1972).

Notes: *Biconiosporella* is characterized by obovoid to ellipsoidal ascospores with tubercules at the middle (Schaumann 1972). Jones et al. (2009) referred this genus to Lasiosphaeriaceae based on morphological observations. We found that its unique ascospores are similar to *Stellatospora* (Chaetomiaceae). Molecular data for *B. corniculate* is lacking, therefore, we place *Biconiosporella* in Sordariales genera *incertae sedis* pending fresh collection.

Type species: ***Biconiosporella corniculata*** Schaumann, Veröff. Inst. Meeresf. Bremerhaven 14(1): 24 (1972)

Facesoffungi number: *****??; Fig. 51

Saprobic on wood. **Sexual morph**: *Ascomata* 275–470 × 150–240 µm ($\bar{x}$ = 370 × 180 µm, n = 5), perithecial, scattered, semi-immersed to superficial, globose to subglobose, collapsing when dry, membranaceous, black, ostiolate, with papilla. *Peridium* comprising dark brown to hyaline cells of *textura angularis*. *Asci* (200–)220–250(–300) × 20–35 µm ($\bar{x}$ = 230 × 26 µm, n = 20), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, evanescent. *Ascospores* 28–35(–38) × 19–25 µm ($\bar{x}$ = 33 × 22.5 µm, n = 50), uni-seriate, obovoid to ellipsoidal, hyaline when young, becoming pale brown to brown when mature, smooth-walled, with a germ pore at each end and 3–4 obvious coniform tubercules evenly distributed at middle, 3-septate, one septum near apex, two septa near the truncate base. **Asexual morph**: Undetermined.

Material examined: Germany, on rotten wood in sea water, 25 November 1969, K. Schaumann (NY-01388911, **holotype**).

Known hosts and distribution: On dead wood in Germany (type locality) (Schaumann 1972).

Notes: The monotypic *Biconiosporella* has unique ascospores with coniform tubercules at center. We re-examined the holotype which is well preserved, but there were no mature asci.

Camptosphaeria Fuckel, Jb. nassau. Ver. Naturk. 23-24: 140 (1870) [1869-70]

Saprobic on stems or wood or *coprophilous*. **Sexual morph**: *Ascomata* perithecial, scattered, superficial to semi-immersed, erumpent through bark of host, pyriform to subglobose, black, glabrous or hairy, ostiolate, with papilla, periphysate. *Peridium* membranaceous. *Paraphyses* filiform. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, with J- apical ring. *Ascospores* broadly clavate to obpyriform, aseptate, hyaline to brown, smooth-walled or verrucose, with conical gelatinous appendage at the apex. **Asexual morph**: Undetermined (adapted from Fuckel 1870; Lundqvist 1972).

Notes: Fuckel (1870) established *Camptosphaeria* which is typified by *Cam. sulphurea*. Lundqvist (1972) reduced this genus as a subgenus of *Cercophora* because the cylindrical to broadly fusiform ascospores are similar to *Cercophora* and *Podospora*. Krug and Jeng (1977) re-defined *Camptosphaeria* as a genus which has pod-like ascospores with conical gelatinous appendages and suggested that its ascospores are similar to *Bombardia* and *Lasiosphaeria*.

Type species: ***Camptosphaeria sulphurea*** Fuckel, Jb. nassau. Ver. Naturk. 23-24: 140 (1870) [1869-70]

Facesoffungi number. *****??; Fig. 52

Saprobic on stems. **Sexual morph**: *Ascomata* 520–650 × 400–450 µm ($\bar{x}$ = 560 × 420 µm, n = 5), perithecial, scattered, semi-immersed, erumpent through bark of host, pyriform to subglobose, black, ostiolate, with papilla, periphysate. *Peridium* 20–50 µm ($\bar{x}$ = 30 µm, n = 30) wide, membranaceous, comprising two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* filiform. *Asci* (130–)140–170(–180) × 12–25 µm ($\bar{x}$ = 150 × 18 µm, n = 30), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with apical globule. *Ascospores* (25–)28–30(–35) × 10–15 µm ($\bar{x}$ = 30 × 13 µm, n = 30), bi-seriate, cylindrical to broadly clavate to obpyriform, aseptate, hyaline to pale brown, smooth-walled, with conical gelatinous appendage at the apex. **Asexual morph**: Undetermined (adapted from Fuckel 1870; Lundqvist 1972).

Material examined: Germany, Hessen, Nessen, Östrich, on stems of *Peucedanum officinale,* 1894, L. Fuckel (G-318793/1, **holotype**).

Known hosts and distribution: On stems of *Peucedanum* in Germany (type locality) (Fuckel 1870).

Notes: Fuckel (1870) introduced *Camptosphaeria sulphurea* with pod-like ascospores having conical gelatinous appendages. We re-examined the holotype (318793/1) which was determined by Lundqvist. Complete asci and ascospores were not observed, so we drew them with reference to Fuckel (1870) and Lundqvist (1972).

Diffractella Guarro, P.F. Cannon & Aa, Syst. Ascom. 10: 107 (1991)

Saprobic on wood. **Sexual morph**: *Ascomata* cleistothecial, solitary, superficial, carbonaceous, globose, with alveolate-reticulate ornamentation, brown to black, surrounded by long setae. *Peridium* composed of brown to reddish brown, radial, septate, cylindrical cells. *Asci* 8-spored, unitunicate, globose to oval. *Ascospores* multi-seriate, fusiform to falciform, upper cell(s) brown to dark brown, aseptate or with 1-septate near the base, guttulate; lower cell cap-like, hyaline. **Asexual morph**: Undetermined (adapted from Fuckel 1872; Guarro et al. 1991).

Notes: Guarro et al. (1991) transferred *Cephalotheca curvata* (Fuckel 1872) to *Diffractella* as the generic type, which is characterized by cleistothecial ascomata, globose asci and fusiform ascospores with cap-like basal cell. The genus was considered as a member of Lasiosphaeriaceae because it has falciform ascospores with a special cap-like cell, which is similar to *Bellojisia* and *Zopfiella* (Guarro et al. 1991; Réblová 2008).

Type species: ***Diffractella curvata*** (Fuckel) Guarro, P.F. Cannon & Aa, Syst. Ascom., Reprint of Volumes 1-4 (1982-1985) 10(2): 108 (1991)

Basionym: *Cephalotheca curvata* Fuckel, Jb. nassau. Ver. Naturk. 25-26: 298 (1871)

Facesoffungi number. *****??; Fig. 53

Saprobic on wood. **Sexual morph**: *Ascomata* 245–400 µm ($\bar{x}$ = 300 µm, n = 5) diam., cleistothecial, solitary, superficial, carbonaceous, globose, with alveolate-reticulate ornamentation, brown to black, surrounded by long setae. *Setae* 4–6 µm wide, filiform, septate, brown and tapering, lighter at the rounded apex. *Peridium* composed of brown to reddish brown, radial-shaped, septate, cylindrical cells. *Asci* 15–22 µm ($\bar{x}$ = 18 µm, n = 20) diam., 8-spored, unitunicate, globose to oval. *Ascospores* 15–18(–21) × 4.5–7.5 µm ($\bar{x}$ = 17 × 6 µm, n = 20), multi-seriate, fusiform to falciform, upper cell(s) brown to dark brown, aseptate or with 1-septate near the base, guttulate; lower cell cap-like, hyaline, sometimes collapsing when dry. **Asexual morph**: Undetermined.

Material examined: Germany, Baden-Wurttemberg, Ca. Eberbach, 9 º0’11”E/48 º35’33”N, on rotten oak wood, 1894, L. Fuckel (G-352276/1, **holotype**).

Known hosts and distribution: On rotten hollow trunks of oak in Germany (type locality) (Fuckel 1872).

Notes: We re-examined the holotype of *Diffractella curvata* (G-352276/1).

Emblemospora Jeng & J.C. Krug, Can. J. Bot. 54(16): 1971 (1976)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, pyriform to subglobose, brown to black, ostiolate, with black necks, surrounded by setae. *Peridium* membranaceous, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* 8-spored, unitunicate, subglobose to clavate, pedicellate, apex rounded or truncate, with J- apical ring, evanescent. *Ascospores* bi-seriate, ellipsoidal to subglobose, brown to dark brown, aseptate, with plate-like wrinkled wall, germ pore at one or both end(s), guttulate. **Asexual morph**: Undetermined (adapted from Jeng and Krug 1976).

Notes: Jeng and Krug (1976) established *Emblemospora*, which includes two species, *E. ditrema* and *E. monotreme* (type), in Sordariaceae. Species are similar to *Diplogelasinospora*, *Jugulospora* and *Neurospora* in having pyriform ascomata and clavate asci with one-celled ascospores with ornamentation (Jeng and Krug 1976). Molecular data is unavailable for this genus.

Type species: ***Emblemospora monotrema*** Jeng & J.C. Krug, Can. J. Bot. 54(16): 1972 (1976)

Facesoffungi number: *****??; Fig. 54

Coprophilous. **Sexual morph**: *Ascomata* 450–600 × 230–380 µm ($\bar{x}$ = 500 × 300 µm, n = 5), perithecial, solitary, superficial to semi-immersed, pyriform to subglobose, brown to black, membranaceous, ostiolate, with black necks (65–100 × 100–120 µm), surrounded by setae, with hyaline, septate periphyses. *Setae* 1.5–3.5 µm wide, numerous, cylindrical, erect, septate, apex rounded, brown and tapering lighter at the apex. *Peridium* 18–35 µm ($\bar{x}$ = 27 µm, n = 20) wide, two layers, outer layer composed of brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Asci* 160–225 × 25–55 µm ($\bar{x}$ = 190 × 40 µm, n = 30), 8-spored, unitunicate, subglobose to clavate, pedicellate, apex rounded, with J- apical ring, evanescent. *Ascospores* 27–35 × 15–25 µm ($\bar{x}$ = 30 × 20 µm, n = 50), bi-seriate, ellipsoidal to subglobose, brown to dark brown, aseptate, with plate-like wrinkled wall and an apical germ pore, guttulate. **Asexual morph**: Undetermined.

Material examined: Venezuela, Edo. Scure, NW of Irapa, trail between Manacal and Los Pocitos, on dung of burro, 13 July 1972, K.P. Dumont, R.F. Cain, G.J. Samuels, G. Morillo and J. Farfan (TRTC-175786, **holotype**).

Known hosts and distribution: On dung of burro in Venezuela (type locality) (Jeng and Krug 1976).

Notes: *Emblemospora monotrema* is similar to *Neurospora* species and is characterized by pyriform ascomata and clavate asci with one-celled ornamented ascospores (Jeng and Krug 1976).

Eosphaeria Höhn., Annls mycol. 15(5): 362 (1917)

Saprobic in soil. **Sexual morph**: *Ascomata* perithecial, gregarious, superficial, globose to subglobose, brown to black, carbonaceous, verrucose, ostiolate, papillate, periphysate. *Peridium* carbonaceous to membranaceous, composed of black to pale brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, filiform, evanescent. *Asci* 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with subapical globule, evanescent. *Ascospores* bi-seriate, slightly curved, aseptate, multi-guttulate, hyaline and ellipsoidal when young, becoming multi-septate, geniculate, 2/3 upper cell swelling, truncate at the base, dark brown when mature; 1/3 lower cell hyaline when mature, smooth-walled, with bipolar short appendages, disappearing with age. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidia* small, oval to globose (adapted from von Höhnel 1917).

Notes: The monotypic genus *Eosphaeria* is typified by *E. uliginosa* and is characterized by subglobose ascomata and L-shaped ascospores with short appendage at each end (von Höhnel 1917). The genus was considered similar to *Lasiosphaeria*, and was thus initially accommodated in

Lasiosphaeriaceae (Barr 1990; Kirk et al. 2001; Huhndorf et al. 2004b). Except for appendages at each end in ascospores, *Eosphaeria* is similar to *Immersiella* in having black ascomata, cylindrical asci with an apical globule, and L-shaped ascospores. Molecular data is unavailable for *Eosphaeria*.

Type species: ***Eosphaeria uliginosa*** (Fr.) Höhn., Annls mycol. 15(5): 362 (1917)

Basionym: *Sphaeria uliginosa* Fr., in Kunze & Schmidt, Mykologische Hefte (Leipzig) 2: 39 (1823)

Facesoffungi number. *****??; Fig. 55

Saprobic in soil. **Sexual morph**: *Ascomata* 280–620 µm ($\bar{x}$ = 480 µm, n = 10) diam., perithecial, gregarious, superficial, globose to subglobose, brown to black, carbonaceous, verrucose, ostiolate, with papilla, periphysate. *Peridium* 60–100 µm ($\bar{x}$ = 75 µm, n = 20) wide, comprising two layers, outer layer carbonaceous, composed of black cells; inner layer membranaceous, composed of pale brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, filiform, evanescent. *Asci* (170–)190–250(–280) × 13–17 µm ($\bar{x}$ = 225 × 16 µm, n = 20), 8-spored, unitunicate, cylindrical, pedicellate, apex rounded, with subapical globule, evanescent. *Ascospores* bi-seriate, slightly curved, aseptate, multi-guttulate, hyaline and ellipsoidal when young, becoming multi-septate, geniculate, 2/3 upper cells swelling, truncate at the base, dark brown when mature, 30–35(–45) × 4–7 µm ($\bar{x}$ = 34 × 5.5 µm, n = 50); 1/3 lower cells hyaline when mature, 12–18(–20) × 4–6 µm ($\bar{x}$ = 15 × 4.5 µm, n = 50), smooth-walled, with bipolar short conical appendages (upper cauda 3.5–5.5 × 1–2.5 µm; lower cauda 6.5–10 × 1.5–3 µm), disappearing with age. **Asexual morph**: Hyphomycetous, phialophora-like. *Conidia* small, oval to globose (adapted from von Höhnel 1917).

Material examined: USA, Maine, Hancock Co. Township of 728MD, Lead Mountain (Humpback), along road near parking area, 44°51’28”N, 68°05’52”W, beech-maple forest, in soil, 2 September 2014, R.C. Harris (NY-01818643).

Known hosts and distribution: On soil in marshy places in Germany (type locality) (Fries 1823b; von Höhnel 1917); on clay soil in USA (Ellis and Everhart 1893).

Notes: *Lasiosphaeria dichroospora*, which was collected on clay soil in USA, was synonymized under *Eosphaeria uliginosa* (Ellis and Everhart 1893; von Höhnel 1917). We could not obtain type material of *E. uliginosa* and, therefore, re-examined an authentic specimen collected from USA by Harris with features similar to those described in Ellis and Everhart (1893) and von Höhnel (1917).

Isia D. Hawksw. & Manohar., Trans. Br. mycol. Soc. 71(2): 332 (1978)

Saprobic on leaves or soil. **Sexual morph**: *Ascomata* perithecial, solitary, immersed, membranaceous, globose, dark brown to black, ostiolate, with papilla. *Peridium* composed of membranaceous, brown to black cells of *textura angularis*. *Asci* 8-spored, unitunicate, cylindrical, evanescent. *Ascospores* uni-seriate, subglobose to ellipsoid, 0–1-septate, hyaline to pale brown, with dense irregular verrucose ornamentation on surface. **Asexual morph**: Undetermined (adapted from Hawksworth and Manoharachary 1978; Udagawa and Sugiy 1982).

Notes: Hawksworth and Manoharachary (1978) introduced *Isia* with *I. neocaledoniensis* as the type. It was transferred from *Thielavia*, and is similar to *Copromyces* and *Jugulospora* in having ascospores with verrucose ornamentation on the surface, although *Copromyces* has globose ascospores and *Jugulospora* has a conical pedicel on ascospores (Hawksworth and Manoharachary 1978). Therefore, this genus is accommodated in Sordariales genera *incertae sedis* (Hawksworth and Manoharachary 1978; Maharachchikumbura et al. 2016; Hyde et al. 2020).

Type species: ***Isia neocaledoniensis*** (C. Moreau) D. Hawksw. & Manohar., Trans. Br. mycol. Soc. 71(2): 334 (1978)

Basionym: *Thielavia neocaledoniensis* C. Moreau, Bull. trimest. Soc. mycol. Fr. 81(4): 699 (1966)

Facesoffungi number: *****??; Fig. 56

Saprobic on leaves. **Sexual morph**: *Ascomata* perithecial, solitary, immersed, membranaceous, globose, dark brown to black, ostiolate, with papilla, periphysate. *Peridium* composed of membranaceous, brown to black cells of *textura angularis*. *Asci* (118–)120–135(–150) × 13–18(–22) µm ($\bar{x}$ = 130 × 16 µm, n = 20) ascospore-bearing part, 8-spored, unitunicate, cylindrical, apex rounded or truncate, with J- apical ring. evanescent. *Ascospores* 18–23(–25) × (7.5–)9–12(–14) µm ($\bar{x}$ = 20 × 10 µm, n = 50), uni-seriate, subglobose to ellipsoid, 0–1-septate, hyaline when young, becoming pale brown at maturity, apex cuspidal and base blunt, wall with densely verrucose ornamentation. **Asexual morph**: Undetermined.

Material examined: India, Bihar, on leaves of *Pandanus* sp., 23 April 1977, M.A. Rizwi (IMI-213076, **holotype**).

Known hosts and distribution: On leaves of *Pandanus* in New Caledonia and India (type locality) (Hawksworth and Manoharachary 1978).

Notes: *Thielavia neocaledoniensis* was transferred to *Isia* which was considered as a member of Sordariaceae (Hawksworth and Manoharachary 1978). We re-examined the type (213076) that contains a permanent mount but we could find only a few ascospores in its ascomata.

Lockerbia K.D. Hyde, Sydowia 46(1): 23 (1994)

Saprobic on palm fronds or wood. **Sexual morph**: *Ascomata* cleistothecial, solitary, superficial, membranaceous, globose, dark brown to black. *Peridium* composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* numerous, filamentous, branched, embedded in a gelatinous matrix. *Asci* 8-spored, unitunicate, cylindrical to subclavate, pedicellate, apex rounded and thick-walled. *Ascospores* uni-seriate, limoniform to oval, hyaline to brown to dark brown when mature, wall minutely verrucose, aseptate, guttulate, surrounded by inconspicuous hyaline mucilaginous sheath. **Asexual morph**: Undetermined (adapted from Hyde 1994; Raja and Shearer 2008).

Notes: *Lockerbia palmicola* was introduced as generic type, and is similar to *Diplogelasinospora*, *Neurospora* and *Sordaria* species in having ellipsoidal ascospores with slightly irregular verrucose wall and surrounded by a hyaline mucilaginous sheath (Hyde 1994; Raja and Shearer 2008). Hence, *Lockerbia* was considered as a member in Sordariales genera *incertae sedis* (Maharachchikumbura et al. 2016; Hyde et al. 2020).

Type species: ***Lockerbia palmicola*** K.D. Hyde, Sydowia 46(1): 24 (1994)

Facesoffungi number: *****??; Fig. 57

Saprobic on palm fronds. **Sexual morph**: *Ascomata* 220–390 µm ($\bar{x}$ = 280 µm, n = 5) diam., cleistothecial, solitary, superficial, membranaceous, globose, dark brown to black. *Peridium* 15–23 µm ($\bar{x}$ = 20 µm, n = 20) wide, comprising two layers, outer layer composed of brown to black cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 1–2 µm wide, numerous, filamentous, branched, embedded in a gelatinous matrix. *Asci* (120–)145–160(–170) × (13–)16–23(–25) µm ($\bar{x}$ = 150 × 20 µm, n = 20), 8-spored, unitunicate, cylindrical to subclavate, pedicellate, apex rounded and thick-walled. *Ascospores* (16–)18–21(–25) × 10–16(–18) µm ($\bar{x}$ = 20 × 15 µm, n = 50), uni-seriate, limoniform to oval, hyaline when young, brown to dark brown when mature, aseptate, guttulate, wall minutely verrucose, surrounded by inconspicuous hyaline mucilaginous sheath. **Asexual morph**: Undetermined.

Material examined: Australia, north Queensland, Bamaga, ‘Lockerbie’ rainforest, on dead palm rachides (*Archontophoenix* sp.) on forest floor, February 1992, K.D. Hyde (BRIP-21334, **holotype**).

Known hosts and distribution: On dead rachides of palm in Australia (type locality) (Hyde 1994).

Notes: Hyde (1994) found *Lockerbia palmicola* is characterized by cleistothecial ascomata and ellipsoidal to oval ascospores. We re-examined the type (BRIP-21334).

Periamphispora J.C. Krug, Mycologia 81(3): 476 (1989)

Coprophilous. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, superficial to semi-immersed, globose to subglobose, brown, membranaceous to coriaceous, tuberculate, surrounded by hairs, ostiolate, with papilla. *Peridium* composed of pale brown to hyaline cells of *textura porrecta* to *textura angularis* to *textura prismatica*. *Paraphyses* numerous, filiform, septate, evanescent. *Asci* 8-spored, unitunicate, cylindrical to clavate, pedicellate, apex rounded. *Ascospores* bi-seriate, ellipsoidal to oval, aseptate, ends rounded, with a germ pore at the apex, hyaline when young, becoming brown to reddish brown, rough-walled, surrounded by hyaline, gelatinous sheath. **Asexual morph**: Undetermined (adapted from Krug 1989).

Notes: The monotypic genus *Periamphispora* is characterized by globose to subglobose ascomata with hairs and ellipsoidal ascospores irregularly ribbed on the surface, which is similar to *Fimetariella*, *Podospora* and *Sordaria* (Krug 1989). This genus was previously considered a member in Lasiosphaeriaceae (Krug 1989; Maharachchikumbura et al. 2015, 2016; Wijayawardene et al. 2020). This genus is also similar to *Podospora* and *Sordaria* in having hairy ascomata, clavate to cylindrical asci and ellipsoidal ascospores with sheath, however molecular data are unavailable.

Type species: ***Periamphispora phacelodes*** J.C. Krug, Mycologia 81(3): 476 (1989)

Facesoffungi number: *****??; Fig. 58

Coprophilous. **Sexual morph**: *Ascomata* 650–700 × 360–380 µm ($\bar{x}$ = 670 × 370 µm, n = 5), perithecial, solitary to scattered, superficial to semi-immersed, globose to subglobose, brown, membranaceous to coriaceous, tuberculate, ostiolate, with necks. *Necks* brown to dark brown, surrounded by numerous, pale brown, filiform, septate, hairs 1.5–3.5 µm wide. *Peridium* 33–55 µm ($\bar{x}$ = 43 µm, n = 30) wide, outer layer composed of pale brown to reddish brown cells of *textura porrecta* to *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, filiform, septate, evanescent. *Asci* 200–300 × 40–65 µm ($\bar{x}$ = 250 × 55 µm, n = 30) ascospore-bearing part, 8-spored, unitunicate, cylindrical to clavate, pedicellate, about 100 µm long, apex rounded. *Ascospores* (30–)40–45(–50) × 20–25(–30) µm ($\bar{x}$ = 42 × 23 µm, n = 50), bi-seriate, ellipsoidal to oval, aseptate, ends rounded, with a germ pore at the apex, hyaline when young, becoming brown to reddish brown, rough-walled, surrounded by hyaline, gelatinous sheath, 2–5 µm wide. **Asexual morph**: Undetermined.

Material examined: Spain, Málaga, about 20km W of Málaga, Benalmádena (36°36’N, 4°34’W), on horse dung, 30 April 1971, P. Blaser (TRTC-55023, **holotype**).

Known hosts and distribution: On horse dung in Spain (type locality) (Krug 1989).

Notes: We re-examined the type, *Periamphispora phacelodes* 55023, which was grown on dung extract agar medium culture (Weitzman and Silva-Hutner 1967), and it is well preserved.

Ramophialophora M. Calduch, Stchigel, Gené & Guarro, Stud. Mycol. 50(1): 84 (2004)

Saprobic on soil and wood. **Sexual morph**: Undetermined. **Asexual morph**: Hyphomycetous. *Mycelium* superficial to immersed. *Hyphae* pale brown, septate, branched. *Conidiophores* macronematous, mononematous, erect, cylindrical, septate, branched, brown to dark brown. *Conidiogenous cells* monophialidic or polyphialidic, terminal or/and lateral. *Conidia* brown, globose to oval, aseptate, with a protuberant basal hilum (adapted from Calduch et al. 2004).

Notes: *Ramophialophora* is typified by *R. vesiculosa* and has macronematous, mononematous conidiophores and aseptate, brown conidia in slimy masses (Calduch et al. 2004). The genus was accepted as a member of Lasiosphaeriaceae based on phylogenetic analysis (Hyde et al. 2020; Wijayawardene et al. 2020). In this study, the strains of *Ramophialophora* are scattered in Lasiosphaeriaceae, Neoschizotheciaceae and Zygospermellaceae in Sordariales (Fig. 26), but there is no molecular data for *R. vesiculosa*. Therefore, we recommend transferring this genus to Sordariales genera *incertae sedis* until more evidence is available.

Type species: ***Ramophialophora vesiculosa*** M. Calduch, Stchigel, Gené & Guarro, in Calduch, Gené, Cano, Stchigel, Cano & Guarro, Stud. Mycol. 50(1): 84 (2004)

Facesoffungi number: *****??; Fig. 59

Saprobic on soil and wood. **Sexual morph**: Undetermined. **Asexual morph**: Hyphomycetous. *Colonies* on sterilized wood, hairy, brown. *Mycelium* superficial to immersed on substrate. *Hyphae* 1.5–2.5 µm wide, pale brown, septate, branched. *Conidiophores* 2–6.5 µm wide, macronematous, mononematous, erect, cylindrical, septate, branched, pale brown to dark brown, becoming paler towards the apex. *Conidiogenous cells* 5.5–9 × 2.5–4 µm ($\bar{x}$ = 7 × 3.5 µm, n = 30), monophialidic or polyphialidic, terminal and lateral, lageniform, smooth-walled, with conspicuous collarettes, 1.5–2.5 µm wide. *Conidia* 2–3 µm ($\bar{x}$ = 2.5 µm, n = 30) diam., aggregated, pale brown to brown, globose to ellipsoidal, aseptate, smooth-walled, with a truncate and protuberant base.

Material examined: Spain, Asturias, Muniellos Integral Biological Reserve, in soil (isolated on sterilized wood), 26 June 1999, M. Calduch and A.M. Stchigel (IMI-389151, **holotype**).

Known hosts and distribution: On soil in Spain (type locality) (Calduch et al. 2004).

Notes: In this study, we re-examined the type, *R. vesiculosa* (IMI-389151), but molecular data is lacking.

Reconditella Matzer & Hafellner, Biblthca Lichenol. 37: 46 (1990)

Saprobic on lichen. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, membranaceous, pyriform to subglobose, dark brown to black, verrucose, surrounded by brown, septate setae, ostiolate, with papilla, periphysate. *Peridium* composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* unbranched, filiform. *Asci* 4–8-spored, unitunicate, cylindrical, pedicellate, apex rounded. *Ascospores* uni- or bi-seriate, ellipsoidal to fusiform, slightly curved, 0–1-septate, hyaline to pale brown, striate and/or verrucose, guttulate. **Asexual morph**: Undetermined (adapted from Matzer and Hafellner 1990).

Notes: The monotypic genus *Reconditella* is typified by *R. physconiarum* which was initially considered as a member of Sordariales (Matzer and Hafellner 1990). We re-examined the type material and found that this genus is characterized by ellipsoidal to broadly fusiform, 0–1-septate ascospores with fine warts forming ridges, which is similar to *Podospora* and *Neurospora*. Therefore, we place this genus in Sordariales genera *incertae sedis*.

Type species: ***Reconditella physconiarum*** Hafellner & Matzer, in Matzer & Hafellner, Biblthca Lichenol. 37: 47 (1990)

Facesoffungi number: *****??; Fig. 60

Saprobic on lichen. **Sexual morph**: *Ascomata* 270–350 × 200–275 µm ($\bar{x}$ = 320 × 255 µm, n = 5), perithecial, solitary, superficial to semi-immersed, membranaceous, pyriform to subglobose, dark brown to black, verrucose, surrounded by brown, septate setae 3.5–6.5 µm wide, ostiolate, with papilla, periphysate. *Peridium* 40–60 µm ($\bar{x}$ = 45 µm, n = 20) wide, comprising two layers, outer layer composed of brown to black cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 5–6 µm wide, unbranched, filiform. *Asci* (70–)95–110(–120) × 10–17(–20) µm ($\bar{x}$ = 100 × 15 µm, n = 20), 4–8-spored, unitunicate, cylindrical, pedicellate, apex rounded. *Ascospores* 15–20(–25) × 6–8(–9.5) µm ($\bar{x}$ = 18 × 7.5 µm, n = 50), uni- or bi-seriate, ellipsoidal to fusiform, slightly curved, 0–1-septate, hyaline to pale brown, striate and/or verrucose, guttulate. **Asexual morph**: Undetermined.

Material examined: Austria, Steiermark, Gesäuse area, Johnsbach, c. 0.5 km E of Gasthof Kölbl. Alt. c. 875 m. MTB 8453/4, on *Fraxinus excelsior*, on thallus of *Physconia distorta*, 20 May 1988, S.J. Hafellner and E. Schreiner (GZU-287606, **holotype**); *ibid.* (S-F20696, **isotype**).

Known hosts and distribution: On *Physconia distorta* in Austria (type locality) (Matzer and Hafellner 1990).

Notes: We re-examined the type specimens of *Reconditella physconiarum*. Specimen 287606 has fragile ascomata and has good quality permanent mount; F20696 is well preserved. There is no molecular data available for *R. physconiarum*.

Roselliniopsis Matzer & Hafellner, Biblthca Lichenol. 37: 97 (1990)

Saprobic on wood or lichens. **Sexual morph**: *Ascomata* perithecial, solitary, superficial to semi-immersed, membranaceous, pyriform to subglobose, black, verrucose, ostiolate, with papilla. *Peridium* composed of pale brown to hyaline cells of *textura angularis* to *textura prismatica*. *Paraphyses* evanescent. *Asci* 8-spored, unitunicate, cylindrical to ellipsoidal, pedicellate, apex rounded. *Ascospores* uni-seriate, ellipsoidal to fusiform, aseptate, pale brown to dark brown, smooth-walled, with guttules. **Asexual morph**: Undetermined (adapted from Matzer and Hafellner 1990; Matzer 1993; Alstrup et al. 1994; Kondratyuk et al. 2013).

Notes: *Roselliniopsis* was established as a lichenicolous genus in Sordariales and is typified by *R. groedensis* (Matzer and Hafellner 1990; Maharachchikumbura et al. 2016; Hyde et al. 2020; Wijayawardene et al. 2020). It is placed in Sordariales genera *incertae sedis* and characterized by superficial ascomata with brown setae and pale brown ascospores (Matzer and Hafellner 1990), but no molecular data is available.

Type species: ***Roselliniopsis groedensis*** (Zopf) Matzer & Hafellner, Biblthca Lichenol. 37: 99 (1990)

Basionym: *Rosellinia groedensis* Zopf, Hedwigia 35(6): 350 (1896)

Facesoffungi number: *****??; Fig. 61

Lichenicolous. **Sexual morph**: *Ascomata* 300–370 × 300–400 µm ($\bar{x}$ = 330 × 350 µm, n = 5), perithecial, solitary, superficial to semi-immersed, membranaceous, pyriform to subglobose, black, verrucose, ostiolate, with papilla. *Setae* 5–10 µm wide, brown, septate, apex rounded, cells swollen near the septum. *Peridium* 50–120 µm ($\bar{x}$ = 75 µm, n = 20) wide, comprising two layers, outer layer composed of pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* evanescent. *Asci* (100–)110–125(–132) × (10–)14–17(–22) µm ($\bar{x}$ = 120 × 15 µm, n = 20), 8-spored, unitunicate, cylindrical to ellipsoidal, pedicellate, apex rounded. *Ascospores* 14–20(–22) × (8–)10–12(–14) µm ($\bar{x}$ = 18 × 11 µm, n = 50), uni-seriate, oval to fusiform, aseptate, pale brown to dark brown, smooth-walled, with germ pore at each end, guttulate. **Asexual morph**: Undetermined.

Material examined: Italy, Trentino-Alto Adige, Bolzano, St. Ulrich in Gröden (Südtirol), on *Pertusaria sulphurella* Köerb. var. *variolosa*, W. Zopf (S-F47825).

Known hosts and distribution: On lichen in Italy (type locality) (Zopf 1896; Matzer and Hafellner 1990).

Notes: Zopf (1896) introduced lichenicolous *Rosellinia groedensis* and Matzer and Hafellner (1990) re-examined its isotype from Italy and designated it as the type species of *Roselliniopsis*. We re-examined an authentic specimen collected by Zopf and found it to be similar to *Podospora* and *Sordaria* in having membranaceous, black ascomata and cylindrical asci with smooth-walled, ellipsoidal to fusiform ascospores, but it lacks molecular data.

Synaptospora Cain, Beih. Sydowia 1: 4 (1957) [1956]

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, superficial, gregarious to scattered, globose to subglobose, carbonaceous, with ostiole, black, verrucose, surrounded by setae. *Peridium* carbonaceous to membranaceous, composed of hyaline to brown cells of *textura angularis*. *Paraphyses* septate, cylindrical, evanescent. *Asci* 2–8-spored, unitunicate, cylindrical to clavate, apex broadly rounded or truncate. *Ascospores* uni- or bi-seriate, globose to subglobose, aseptate, hyaline when young, becoming pale brown to dark brown, fused in groups. **Asexual morph**: Undetermined (adapted from Cain 1957b; Huhndorf et al. 1999b; Réblová 2002).

Notes: Cain (1957b) established *Synaptospora* and introduced two distinctive taxa, *S. petrakii* (type) and *S. tartaricola*. The genus has mature ascospores which become fused in groups and Cain (1957b) inferred that this genus is closely related to *Bombardia*, *Podospora* and *Sordaria*, due to its carbonaceous ascomata. Subsequently, *S. olandica*, *S. plumbea* and *S. setosa* were introduced, all of which have fused ascospores, except for *S. plumbea* with unfused, ellipsoidal ascospores (Huhndorf et al. 1999b; Réblová 2002). Miller et al. (2014) sequenced *S. plumbea* (ANM963 and SMH3962) and found that it clustered with *Helminthosphaeria* species. Thus, *Synaptospora* was transferred to Helminthosphaeriaceae based on phylogenetic analyses (Miller et al. 2014; Hyde et al. 2020; Wijayawardene et al. 2020). We found that *S. plumbea* is similar to *Helminthosphaeria* in having globose ascomata, cylindrical asci and brown aseptate, ellipsoidal, unfused ascospores, differing from other *Synaptospora* species with fused ascospores. Phylogenetically, *S. plumbea* nested in Helminthosphaeriaceae (61%ML, Fig. 21). Therefore, we recommend transferring *S. plumbea* to *Helminthosphaeria*. The remaining four *Synaptospora* species have globose ascomata, cylindrical asci and globose, fused ascospores, but no molecular information is available. We place *Synaptospora* in Sordariales genera *incertae sedis* pending future work.

Type species: ***Synaptospora petrakii*** Cain, Beih. Sydowia 1: 5 (1957) [1956]

Facesoffungi number: ??; Fig. 62

Saprobic on decorticated wood. **Sexual morph**: *Ascomata* 200–350 × 250–450 µm ($\bar{x}$ = 300 × 350 µm, n = 5), perithecial, superficial, gregarious to scattered, globose to subglobose, carbonaceous, with ostiole, black, verrucose, surrounded by sparse, brown, septate setae, 3.5–7 µm wide, with a rounded apex. *Subiculum* ascomata seated on sparse, brown, septate, branched, friable hyphae, 5.5–7.5 µm wide. *Peridium* 30–75 µm ($\bar{x}$ = 55 µm, n = 20) wide, comprising two layers, outer layer carbonaceous, composed of brown cells of *textura angularis*; inner layer membranaceous, composed of hyaline cells of *textura prismatica*. *Paraphyses* 2.5–8.5 µm wide, septate, slender to cylindrical, evanescent. *Asci* (70–)80–95(–100) × 7.5–10 µm ($\bar{x}$ = 85 × 8 µm, n = 30), normally 2-spored, unitunicate, cylindrical, broadly rounded and thickened at the apex, long pedicellate. *Ascospores* (20–)22–24(–26) × 4–8 µm ($\bar{x}$ = 23 × 6 µm, n = 50) for four cells, uni-seriate, subglobose to ellipsoidal, hyaline and aseptate when young, gradually becoming cylindrical to oblong, dark brown, usually 2–4-septate, distinctly constricted at the septa, the cells swollen, ends broadly rounded, straight to slightly curved, smooth-walled, with a large guttule in each cell, breaking into part spores. *Part spores* 6–9 × 4.5–7 µm ($\bar{x}$ = 7.5 × 5.5 µm, n = 50), hyaline to dark brown, globose to ellipsoidal, aseptate, smooth-walled, with a large guttule, discharging through constricting septa. **Asexual morph**: Undetermined (adapted from Cain 1957b).

Material examined: Canada, Ontario, north of Mississauga, in willow grove by Credit River on Creditview Road, on decaying logs, 11 November 1987, L.A. Novak (TRTC-51203); Canada, Ontario, Muskoka district, Haliburton, 11 km south of Dorset, on decorticated wood, October 1975, D. Tighe (TRTC-51205).

Known hosts and distribution: On dead decorticated log of *Betula papyrifera* in Canada (type locality) (Cain 1957b).

Notes: The holotype material (TRTC-32168) was collected by Cain (1957b) in Canada. We were unable to obtain the type material and, therefore, we re-examined two authentic samples, TRTC-51203 and TRTC-51205, collected in Canada and determined by M. Matzer (mentioned in the label of material). Ascospores of *Synaptospora* was described as ellipsoidal to globose and fused in groups when mature (Cain 1957b; Barr 1990; Huhndorf et al. 1999b). We could not find mature ascospores fused in groups in TRTC-51203 and TRTC-51205. However, we found that the ascospores were initially hyaline, ellipsoidal to oblong or cylindrical and gradually formed distinct septa, and finally the septa split the brown ascospores into individual globose to subglobose part spores (Fig. 62 m–r). Fresh collections of *Synaptospora* species are required to determine the nature of ascospores and placement of the genus.

Tripterosporella Subram. & Lodha, Curr. Sci. 37: 246 (1968)

Coprophilous **Sexual morph**: *Ascomata* cleistothecial, scattered, superficial, globose to subglobose, semi-translucent to opaque, dark brown to black, surrounded by brown, septate hairs. *Peridium* membranaceous, composed of brown cells of *textura angularis* to *textura prismatica*. *Asci* 8-spored, unitunicate, clavate to cylindrical, pedicellate, evanescent, apex rounded or truncate, with J- apical ring. *Paraphyses* filiform or absent. *Ascospores* bi-seriate or irregularly arranged, cylindrical, aseptate and hyaline when young, upper cell(s) becoming swollen and fusiform, 0–1-septate, brown to olivaceous brown, guttulate, with truncate base and an apical germ pore, collapsing when dry; lower cell(s) tail-like, hyaline, 0–multi-septate, smooth-walled, slightly curved near the base. **Asexual morph**: Undetermined (adapted from Subramanian and Lodha 1968; Abdullah and Rattan 1978).

Notes: *Tripterosporella* was isolated from herbivores dung (horses and cows), and is similar to lasiosphaeriaceous taxa in having ascospores with brown upper cell(s) and a long hyaline pedicel (Subramanian and Lodha 1968; Doveri 2010; Wijayawardene et al. 2020). We place *Tripterosporella* in Sordariales genera *incertae sedis* but phylogenetic data is required to confirm its placement.

Type species: ***Tripterosporella coprophila*** Subram. & Lodha, Curr. Sci. 37: 246 (1968)

Fig. 34 r

Coprophilous **Sexual morph**: *Ascomata* cleistothecial, scattered, superficial, globose, black, membranaceous, surrounded by brown, septate hairs. *Peridium* membranaceous, composed of brown to hyaline cells of *textura angularis* to *textura prismatica*. *Asci* 8-spored, unitunicate, clavate to cylindrical, pedicellate, apex rounded, with J- apical ring. *Ascospores* bi-seriate, cylindrical, aseptate and hyaline when young, upper cell(s) becoming swollen and ellipsoidal to subglobose, 0–1-septate, brown, with truncate base and an apical germ pore, collapsing when dry; lower cell(s) tail-like, hyaline, 0–mulit-septate, smooth-walled, slightly curved near the base. **Asexual morph**: Undetermined (adapted from Abdullah and Rattan 1978).

Known hosts and distribution: On dung of *Bos taurus* in India (type locality) and Iraq (Subramanian and Lodha 1968; Abdullah and Rattan 1978).

Notes: *Tripterosporella coprophila* has brown ascospores with ellipsoidal upper cell(s) and a long, cylindrical, hyaline, multi-septate pedicel (Subramanian and Lodha 1968; Abdullah and Rattan 1978). However, the septate pedicel was rarely mentioned in subsequent researches (Abdullah and Rattan 1978; Doveri 2010). *Tripterosporella coprophila* is similar to *Podospora*, *Lasiosphaeria* and *Zopfiella* in having cleistothecial ascomata and multi-septate ascospores comprising two types of cells. We were unable to obtain the authentic material of this species and therefore, we refer to Subramanian and Lodha (1968) for hand-drawing (Fig. 34 r).

Other genera studied

Subclass Xylariomycetidae O.E. Erikss. & Winka

Xylariales Nannf.

Diatrypaceae Nitschke

Monosporascus Pollack & Uecker, Mycologia 66(2): 348 (1974)

Saprobic on wood. **Sexual morph**: *Colonies* white and hyaline. *Ascomata* perithecial, solitary to gregarious, semi-immersed, membranaceous, ellipsoidal to globose, dark brown to black, ostiolate, with papilla. *Peridium* membranaceous, comprising brown to olivaceous-brown cells of *textura angularis* to *textura epidermoidea*. *Paraphyses* numerous, filiform, cylindrical, flexuous, septate. *Asci* 1, 2, 3 or 4-spored, unitunicate, clavate to cylindrical, pedicellate. *Ascospores* globose, aseptate, hyaline to bright brown to brown to black, smooth-walled, guttulate. **Asexual morph**: Undetermined (adapted from Pollack and Uecker 1974; Negreiros et al. 2019).

Notes: Pollack and Uecker (1974) introduced *Monosporascus* typified by *M. cannonballus*. It has a *Xylaria*-type centrum and 1- or 2-spored asci with aseptate, globose ascospores with guttules. This genus was shown to belong to Diatrypaceae (Xylariales) based on phylogenetic analyses (Schoch et al. 2014; Maharachchikumbura et al. 2016; Negreiros et al. 2019; Hyde et al. 2020; this study, Fig. 1).

Type species: ***Monosporascus cannonballus*** Pollack & Uecker, Mycologia 66(2): 348 (1974)

Facesoffungi number: *****??; Fig. 63

Culture on malt yeast agar from *Cucumis melo*. **Sexual morph**: *Colonies* white and hyaline. *Ascomata* 310–500 × 270–420 µm ($\bar{x}$ = 380 × 330 µm, n = 10), perithecial, solitary to gregarious, semi-immersed, membranaceous, ellipsoidal to globose, dark brown to black, ostiolate, with papilla. *Peridium* 35–80 µm ($\bar{x}$ = 55 µm, n = 20) wide, comprising 5-layers, outer layer composed of hyaline, plectenchymatous tissues; next layer composed of olive-brown cells of *textura epidermoidea*; third layer composed of hyaline cells of *textura angularis* cells; fourth layer composed of olive-brown to brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 3–6 µm wide, numerous, filiform, cylindrical, flexuous, septate. *Asci* (40–)45–53(–60) × (18–)20–30(–35) µm ($\bar{x}$ = 50 × 24 µm, n = 20), 1-spored, unitunicate, clavate to pyriform, thick-walled, pedicellate, persistent. *Ascospores* 1-celled, globose, hyaline when young, becoming bright brown to brown (15–25 µm diam.) to black (35–45 µm diam.) at maturity, smooth-walled, guttulate. **Asexual morph**: Undetermined.

Material examined: USA, Arizona, Yuma, from *Cucumis melo* L., on culture of malt yeast agar-1/4 dilution, 21 June 1972, F.G. Pollack and F.A. Uecker (BPI-579840, **holotype**).

Known hosts and distribution: On *Cucumis melo* in Brazil, Spain and USA (type locality) (Pollack and Uecker 1974; Schoch et al. 2014).

Notes: We re-examined the type of *Monosporascus cannonballus* (BPI-579840). The strain of *M. cannonballus* is sister to *M. mossoroensis* and *M. nordestinus* (Diatrypaceae) (Fig. 1).

Sordariomycetes genera *incertae sedis*

Conidiotheca Réblová & L. Mostert, Mycol. Res. 111(3): 305 (2007)

Saprobic on wood. **Sexual morph**: *Ascomata* perithecial, solitary to scattered, immersed to semi-immersed, dark brown to black, subglobose to broadly conical, ostiolate, with papilla, periphysate. *Peridium* membranaceous, comprising two layers, outer layer composed of black to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* numerous, septate, tapering, longer than the asci. *Asci* 8-spored, cylindrical to clavate, short pedicellate, apex obtuse, with J- apical ring. *Ascospores* 1–2-seriate, hyaline, ellipsoidal to subglobose, 0–1-septate, sometimes slightly curved when young, becoming fusiform, with transverse and longitudinal septa, constricted at septa, producing several lateral appendices as ascoconidia. *Ascoconidia* hyaline, allantoid to ellipsoidal, aseptate, smooth-walled, guttulate, filling the whole ascus and discharged through constricted apical ring. **Asexual morph**: Undetermined (adapted from Réblová and Mostert 2007).

Notes: Barr (1985) described *Romellia tympanoides* (≡ *Conidiotheca tympanoides*) with clavate asci and ascospores producing ascoconidia similar to *Tympanis* (Leotiomycetidae). Barr et al. (1993) transferred it to *Jattaea* based on the spicate clusters of clavate asci. Réblová and Mostert (2007) transferred *J. tympanoides* to *Conidiotheca* which was placed in Ascomycota genera *incertae sedis*. Maharachchikumbura et al. (2015, 2016) and Wijayawardene et al. (2018) placed this genus in Calosphaeriales and Togniniales, respectively. We re-examined the type and found that *Conidiotheca* is similar to *Jattaea* (Calosphaeriaceae, Diaporthomycetidae) and *Pleonectria* (Nectriaceae, Hypocreomycetidae), which have clavate asci and septate ascospores with numerous ascoconidia. However, *Conidiotheca* has brown to black ascomata whereas those of *Pleonectria* are yellow to red (Réblová and Mostert 2007; Hirooka et al. 2012). *Conidiotheca tympanoides* is also similar to *Jattaea taediosa*, as they both have black ascomata, clavate asci and septate ascospores with numerous ascoconidia when mature, however, the former does not have the ascogenous hyphae unique to the latter (Réblová et al. 2015). Unfortunately, there is no molecular data available for *C. tympanoides*. We place this genus in Sordariomycetes genera *incertae sedis* pending more data.

Type species: ***Conidiotheca tympanoides*** (M.E. Barr) Réblová & L. Mostert, Mycol. Res. 111(3): 305 (2007)

Basionym: *Romellia tympanoides* M.E. Barr, Mycologia 77(4): 561 (1985)

Facesoffungi number: ??; Fig. 64

Saprobic on wood. **Sexual morph**: *Ascomata* 250–455 × 350–550 µm ($\bar{x}$ = 345× 425 µm, n = 10), perithecial, solitary to scattered, papillate, immersed, erumpent through the bark of the host, dark brown to black, subglobose to broadly conical, ostiolate, with papilla, periphysate. *Peridium* 25–50 µm ($\bar{x}$ = 35 µm, n = 30) wide, comprising two layers, outer layer composed of black to pale brown cells of *textura angularis*; inner layer composed of hyaline cells of *textura prismatica*. *Paraphyses* 2–3.5 µm wide ($\bar{x}$ = 2.8 µm, n = 30), numerous, septate, tapering, longer than the asci. *Asci* (120–)150–180(–200) × 15–18(–25) µm ($\bar{x}$ = 170 × 16 µm, n = 50), 8-spored, cylindrical to clavate, short pedicellate, apex obtuse, with J- apical ring. *Ascospores* (10–)13–20(–25) × 3.5–6.5 µm ($\bar{x}$ = 18 × 5 µm, n = 50), 1–2-seriate, hyaline, ellipsoidal to subglobose, 0–1-septate, sometimes slightly curved when young, becoming fusiform, with transverse and longitudinal septa, constricted at septa, producing several lateral appendices as ascoconidia. *Ascoconidia* (2.5–)3–5(–6) × 1–2.5 µm ($\bar{x}$ = 4 × 1.5 µm, n = 50), hyaline, allantoid to ellipsoidal, aseptate, smooth-walled, guttulate, filling the whole ascus and discharged through constricted apical ring. **Asexual morph**: Undetermined.

Material examined: USA, Massachusetts, Baptist Hill, Conway, 21 April 1969, M.E. Barr, on twigs of *Prunus pennsylvanica* (NY-00912076, **holotype**).

Known hosts and distribution: On decayed wood of *Prunus pennsylvanica* in the USA (type locality) (Réblová and Mostert 2007).

Notes: The monotypic *Conidiotheca* is typified by *C. tympanoides* (Réblová and Mostert 2007). We found the holotype NY00912076 is well preserved, but there are few complete asci, and production of ascoconidia is unclear. Therefore, the hand-drawing is provided for the asci (Fig. 63 l–n) and the process of producing ascoconidia (Fig. 63 s–v) based on Réblová and Mostert (2007).

Ascomycota genera *incertae sedis*

Copromyces N. Lundq., Ark. Bot. 6: 327 (1967)

Coprophilous. **Sexual morph**: *Ascomata* cleistothecial, solitary, superficial, globose to subglobose, membranaceous, dark brown, with hyaline surface hairs. *Peridium* membranaceous, composed of dark brown to hyaline cells of *textura angularis*. *Asci* 2-spored, ovoid, apex rounded, short pedicel. *Ascospores* globose to subglobose, bright yellow, becoming olivaceous, brown to black at maturity, aseptate, guttulate, with a germ pore and irregular plate-like wrinkles on the surface. **Asexual morph**: Undetermined (adapted from Lundqvist 1967; Avila et al. 2002).

Notes: The monotypic genus *Copromyces* is typified by *C. bisporus* and has cylindrical to clavate, 2-spored asci and globose ascospores (Lundqvist 1967; Avila et al. 2002). The genus was initially placed in Sordariaceae (Lundqvist 1967). Petrak (1967) transferred *C. bisporus* to *Rechingeriella* (Zopfiaceae, Dothideomycetes), because it has 2-spored asci and tubercular ascospores similar to those of *R. insignis*. Subsequently, Lundqvist (1972) suggested that *Rechingeriella* and *Copromyces* are unrelated, because *R. insignis* has black, carbonaceous ascomata, distinctly bitunicate asci and ascospores with no germ pore, whereas, *C. bisporus* has membranaceous ascomata and ascospores with germ pore. Later, Avila et al. (2002) recorded that *C. bisporus* has cleistothecial ascomata and unitunicate asci with globose ascospores. Unfortunately, molecular data for *C. bisporus* is unavailable.

Copromyces sp. (CBS 386.78) was reported in the taxa sequence list of Huhndorf et al. (2004b) and noted as strain TRTC 51747 (& CBS 386.78, named as *C. octosporus* Jeng & Krug). This species, however, has not been formally described and is invalid. '*Copromyces octosporus*' (CBS 386.78) was listed as the second species in *Copromyces*, and placed in Sordariaceae based on LSU and ITS sequence data (Huhndorf et al. 2004b; Maharachchikumbura et al. 2015, 2016; Vu et al. 2019; Hyde et al. 2020). However, in this study, the strain CBS 386.78 is sister to *Pseudoneurospora canariensis* (91%ML, Fig. 37). As the species has not been formally described and there is no apparent holotype it needs recollecting and introducing.

We re-examined the isotype (749020) of *Copromyces bisporus*, which is well preserved, and found that it has inconspicuously evanescent asci and dissolved hyaline filaments between the asci. We place *Copromyces* in Ascomycota genera *incertae sedis* pending molecular data.

Type species: ***Copromyces bisporus*** N. Lundq., Arch. für Botanik, Ser. 2 6: 328 (1967)

Facesoffungi number: *****??; Fig. 65

Coprophilous on rabbit dung. **Sexual morph**: *Ascomata* 200–250 µm ($\bar{x}$ = 235 µm, n = 10) diam., cleistothecial, solitary, uniloculate, superficial, globose to subglobose, membranaceous, dark brown, with hyaline surface hairs. *Peridium* 30–50 µm wide, membranaceous, composed of dark brown to hyaline cells of *textura angularis*. *Asci* (24–)26–32(–35) × 12–15(–17) µm ($\bar{x}$ = 30 × 13 µm, n = 50), 2-spored, ovoid, apex rounded, short pedicellate. *Ascospores* (11–)12–16(–20) µm ($\bar{x}$ = 15 µm, n = 50) diam., globose to subglobose, bright yellow, becoming olivaceous, brown to black at maturity, aseptate, guttulate, with a germ pore and irregular plate-like wrinkles on the surface. **Asexual morph**: Undetermined.

Material examined: Sweden, Skane, Ivetofta parish, Aby, in pasture, on rabbit dung, 8 June 1962, N. Lundqvist (BPI-749020, **isotype**).

Known hosts and distribution: On dung of rabbit (*Oryctolagus cuniculus*) in Sweden (type locality) (Lundqvist 1967); on rabbit and fox dung in Venezuela (Avila et al. 2002).

Effetia Bartoli, Maggi & Persiani, Mycotaxon 19: 517 (1984)

Saprobic in forest soil. **Sexual morph**: *Ascomata* perithecial, solitary, brown to dark brown, globose to subglobose, ostiolate, with short necks. *Peridium* membranaceous. *Asci* 8-spored, unitunicate, cylindrical, apex rounded. *Ascospores* hyaline to brown, ellipsoidal, aseptate, with an apical germ pore. **Asexual morph**: Hyphomycetous. *Mycelium* dark brown, superficial, forming a thick subiculum. *Hyphae* flexuous, brown, septate, branched, becoming brittle. *Conidiophores* brown, unbranched, straight or flexuous, smooth-walled, septate, narrowed towards apex. *Conidiogenous cells* polyblastic, terminal ones give rise to new ones becoming intercalary, sympodial, swollen at the apex. *Conidia* acropleurogenous, oval to ellipsoidal, aseptate, light brown to dark brown, smooth-walled, with sheath. *Chlamydospores* single or like a string of beads, irregular, brown, thick-walled (adapted from Bartoli et al. 1984).

Notes: Bartoli et al. (1984) introduced the monotypic genus *Effetia* and proposed that its sexual morph is similar to *Apodus* and *Fimetariella* based on its black ascomata, cylindrical asci and ellipsoidal, hyaline to light brown ascospores, while its asexual morph (in culture) was described as virgariella-like, which is more similar to Xylariaceae. However, Bartoli et al. (1984) proposed to place *Effetia* in Sordariaceae based on its sexual morph, but no molecular data is available. We recommend transferring *Effetia* to Ascomycota genera *incertae sedis* pending future work.

Type species: ***Effetia craspedoconidica*** Bartoli, Maggi & Persiani, Mycotaxon 19: 517 (1984)

Facesoffungi number: ??; Fig. 66 a–q

Saprobic in forest soil. **Sexual morph**: *Ascomata* perithecial, solitary, brown to dark brown, globose to subglobose, ostiolate, with short necks. *Peridium* membranaceous. *Asci* 8-spored, unitunicate, cylindrical, apex rounded. *Ascospores* hyaline to brown, ellipsoidal, aseptate, with a germ pore. **Asexual morph**: Hyphomycetous. *Mycelium* dark brown, superficial, forming a thick subiculum. *Hyphae* 1.5–3.5 µm ($\bar{x}$ = 2.5 µm, n = 30) wide, flexuous, brown, septate, branched, becoming brittle. *Conidiophores* brown, unbranched, straight or flexuous, smooth-walled, septate, narrowed towards apex. *Conidiogenous cells* polyblastic, terminal ones give rise to new ones becoming intercalary, sympodial, swollen at the apex. *Conidia* 7.5–11 × 3–5 µm ($\bar{x}$ = 9.5 × 4 µm, n = 50), acropleurogenous, oval to ellipsoidal, aseptate, light brown to dark brown, smooth-walled, with sheath 1–1.5 µm wide. *Chlamydospores* (5–)7–10(–12) µm ($\bar{x}$ = 9 µm, n = 20) diam., single or like a string of beads, irregular, brown, thick-walled (adapted from Bartoli et al. 1984).

Material examined: Ivory Coast, Tai forest National Park, on rain forest litter, December 1976, B. Rambelli (IMI-223521, **holotype**).

Known hosts and distribution: On woodland soil in Ivory Coast (type locality) (Bartoli et al. 1984).

Notes: Bartoli et al. (1984) noted that the sexual morph of *Effetia craspedoconidica* was produced only in the initial isolates, and then it lost viability. We re-examined the type (223521) and only found the asexual morph in culture. We draw the sexual morph with reference to Bartoli et al. (1984).

Endophragmiella B. Sutton, Mycol. Pap. 132: 58 (1973)

Sexual morph: Undetermined. **Asexual morph**: Hyphomycetous. *Mycelium* immersed to superficial, composed of pale brown to brown, septate, branched, smooth-walled hyphae. *Conidiophores* macronematous, mononematous, erect, simple or branched, straight or flexuous, pale brown, smooth-walled. *Conidiogenous cells* monoblastic, integrated, terminal, tapering towards the truncate apex. *Conidia* solitary, acrogenous, simple, ellipsoidal, pale brown to brown, smooth-walled, 1–multi-septate (adapted from Sutton 1973).

Notes: The hyphomycete genus *Endophragmiella* is typified by *End*. *pallescens* which was found associated with stromata of *Cytospora chrysosperma* (Valsaceae) on wood of *Populus tremuloides* (Sutton 1973). Hughes (1979) suggested that *Endophragmiella* maybe the sexual morph of *Echinosphaeria* and the synanamorph of *Selenosporella*. Hughes (1979) also described two specimens of *Echinosphaeria canescens*, one of which was accompanied by *End*. *biseptata*; and the other was related to *Selenosporella* (Hughes 1979). These associations are not confirmed through culture or phylogenetic analysis. Molecular data is available for *End*. *dimorphospora* (CBS 438.74) and *End*. *taxi* (CBS 614.84), but not for *End. pallescens* (Hernández-Restrepo et al. 2017;Vu et al. 2019). *End. dimorphospora* nests in Helminthosphaeriaceae (Fig. 21), but *End. taxi* is closely related to members of Tubeufiales (Dothideomycetes) (not shown).

Type species: ***Endophragmiella pallescens*** B. Sutton, Mycol. Pap. 132: 62 (1973)

Fig. 22 s

Sexual morph: Undetermined. **Asexual morph**: Hyphomycetous. *Colonies* effuse, reddish brown, hairy, originating around effete stromata of immersed microfungi and spreading over the bark. *Mycelium* about 4 μm wide, immersed to superficial, composed of brown, septate, branched, smooth-walled hyphae. *Conidiophores* macronematous, mononematous, erect, simple or branched, flexuous, infrequently rigid, septate, light brown, becoming pale brown towards the apex, smooth-walled. *Conidiogenous cells* monoblastic, integrated, cylindrical, terminal, apex with 1–3 unflared annellations, pale brown. *Conidia* solitary, acrogenous, simple, ellipsoidal, pale brown, smooth-walled, 1–2-septate, not constricted at the septa, with a basal marginal frill (adapted from Sutton 1973).

Known hosts and distribution: On dead wood of *Populus tremuloides* in Canada (type locality) (Sutton 1973).

Notes: The mycelium of *Endophragmiella pallescens* associated with stromata of *Cytospora chrysosperma* on natural substratum in Manitoba, Canada (Sutton 1973). The hand-drawing is provided for the type species (Fig. 22 s) based on Sutton (1973).

Tulipispora Révay & Gönczöl, in Révay, Gönczöl & Descals, Nova Hedwigia 88(1-2): 42 (2009)

Saprobic on wood, rarely on leaves. **Sexual morph**: Undetermined. **Asexual morph**: Hyphomycetous. *Mycelium* semi-immersed in wood. *Conidiophores* hyaline, semi-macronematous, mononematous, simple, septate. *Conidiogenous cells* integrated, terminal, proliferations sympodial. *Conidia* solitary, acrogenous to subacrogenous, multi-septate, composed of elongate main axis and branches, branches mostly subverticillate, sometimes grouped near the base of the axis, curved (adapted from Révay et al. 2009).

Notes: The monotypic *Tulipispora* resembles *Triscelophorus* and *Triramulispora* in having multi-septate conidia with an elongate main axis and branches (Révay et al. 2009). It has been accommodated in Calosphaeriaceae, Sordariomycetes and Ascomycota genera *incertae sedis* (Maharachchikumbura et al. 2015, 2016; Wijayawardene et al. 2018, 2020). However, as an asexual genus, *Tulipispora* is dissimilar to the known asexual morph of other members in Calosphaeriaceae. *Tulipispora* species have multi-septate and elongate conidia, whereas species of Calospaheriaceae usually have asepate, allantoid conidia. We place *Tulipispora* in Ascomycota genera *incertae sedis*.

Type species: ***Tulipispora ingoldii*** Révay & Gönczöl, Nova Hedwigia 88(1-2): 42 (2009)

Fig. 67

Saprobic on wood, rarely on leaves. **Sexual morph**: Undetermined. **Asexual morph**: Hyphomycetous. *Mycelium* semi-immersed in wood. *Conidiophores* hyaline, semi-macronematous, mononematous, simple, septate. *Conidiogenous cells* integrated, terminal, proliferations sympodial. *Conidia* solitary, acrogenous to subacrogenous, multi-septate, composed of elongate main axis and branches, branches mostly subverticillate, sometimes grouped near the base of the axis, curved (adapted from Révay et al. 2009).

Known hosts and distribution: On decayed wood and leaves in Hungary (type locality) (Révay et al. 2009).

Declarations

The authors declare that no known conflicts of interests exist.

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Figures

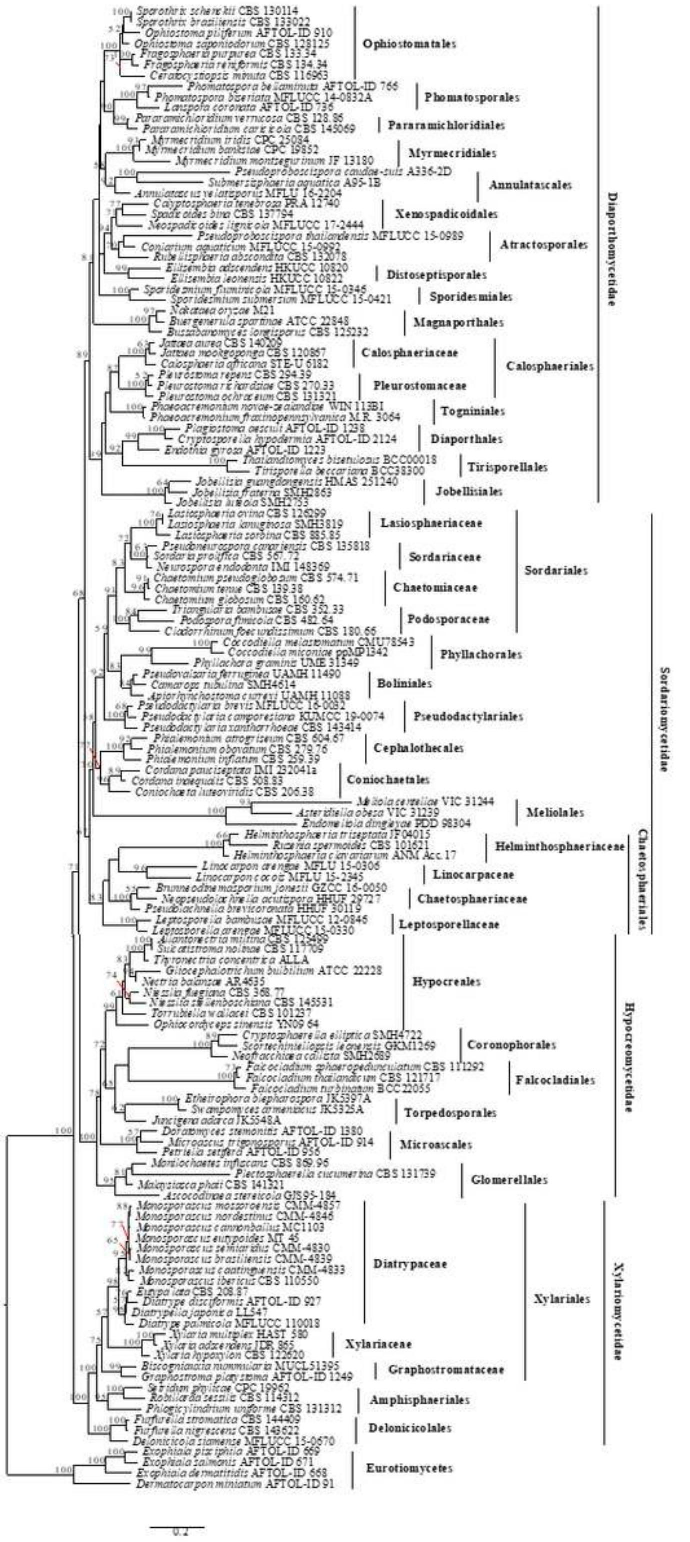


Figure 1

Phylogram generated from maximum likelihood analysis based on combined LSU, SSU, RPB2 and TEF sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 50%) above corresponding nodes. A total of 139 strains are included in the combined analyses, which comprise 3892 characters (864 characters for LSU, 1049 characters for SSU, 1059 characters for RPB2, 920 characters for TEF) after alignment. Strains of Eurotiomycetes are used as outgroup taxa. The model of each partitioned gene is GTR+I+G. The best score in IQ-TREE explores with a final likelihood value of -65617.0325 is presented. Alignments are available at TreeBASE (URL:http://purl.org/phylo/treebase/ phylows/study/TB2:S27415).

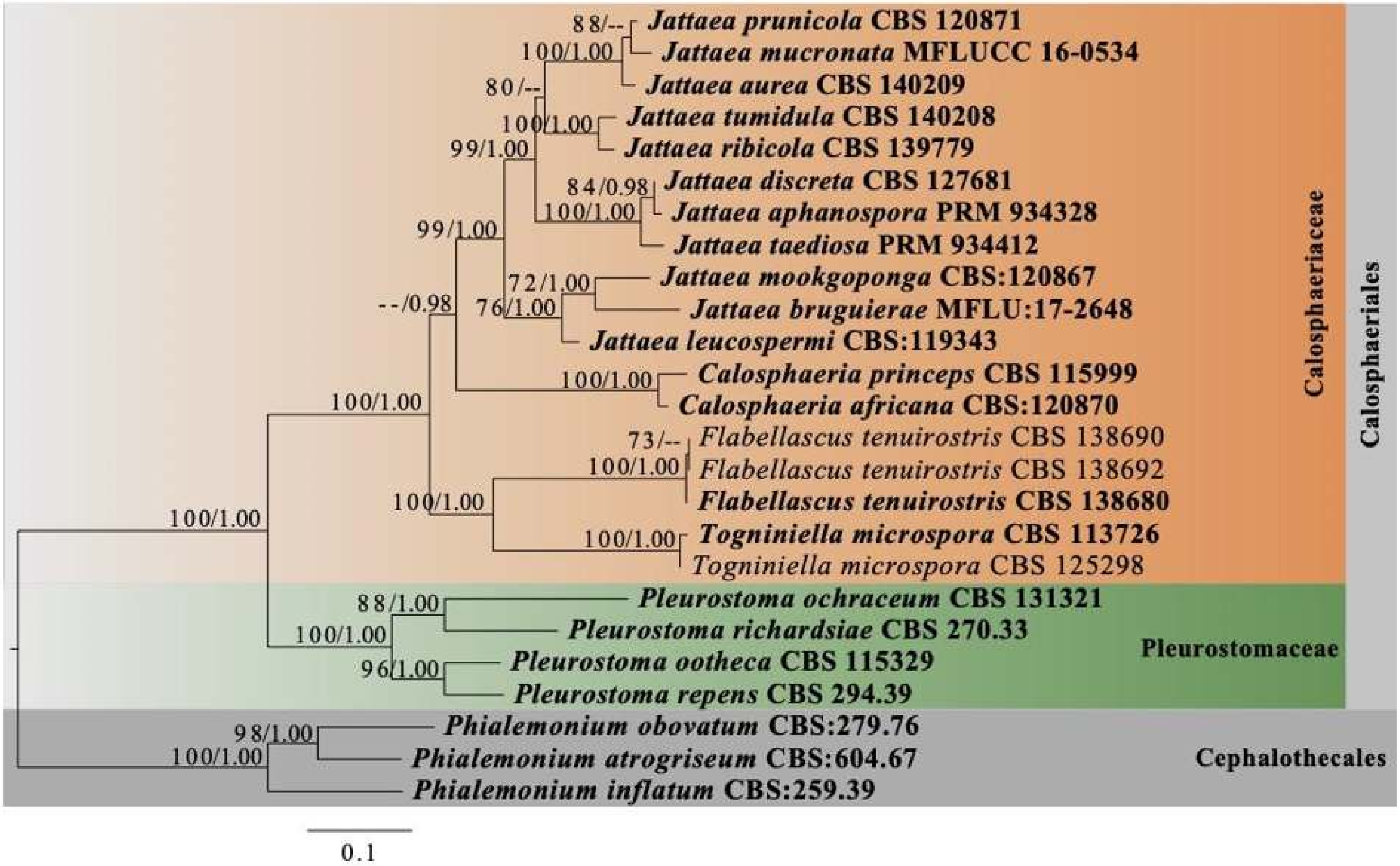


Figure 2

Phylogram generated from maximum likelihood analysis based on combined LSU, SSU, ITS, TUB and RPB2 sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 70%, before the backslash) and the posterior probabilities (PP) from the Bayesian (BY) analysis (BY-PP > 0.95, after the backslash) above corresponding nodes. The '–' indicates lack of statistical support (< 70% for ML-BS and < 0.95 for BY-PP). Twenty-five strains are included in the combined analyses, which comprise 4592 characters (991 characters for LSU, 1596 characters for SSU, 478 characters for ITS, 475 characters for TUB, 1052 characters for RPB2) after alignment. Strains of Coniochaetales are used as the outgroup taxa. The best score in IQ-TREE explores with a final likelihood value of -21774.1640 is presented. The model of each partitioned gene is: LSU: GTR+I+G; SSU: GTR+I+G; ITS: GTR+I+G; TUB: HKY+I+G; RPB2: GTR+I+G. The strain numbers are noted after the species names. Ex-type strains are in bold. Alignments are available at TreeBASE (URL: http://purl.org/phylo/treebase/phylows/study/TB2:S27416).

Figure 3

Calosphaeria princeps: a, i, l–m (PC-MNHN-PC-PC0167711); b–g, j–k, p (S-F263455); h, q (S-F263457); n–o (PC-MNHN-PC-PC0167696); r (redrawn from Réblová et al. 2004). a Material. b–c Gregarious ascomata. d Ascoma. e–f Ascoma in cross section. g Wall of neck. h Numerous asci and paraphyses. i Peridium on the basal part of ascoma. j Asci with branched paraphyses. k Asci and paraphyses attached to ascogenous hyphae with ovoid to ellipsoidal cells (arrow indicates a cell on ascogenous hyphae). l–p Mature asci (n–p stained in Melzer's reagent). q Ascospores. r Hyphae with phialides and conidia. Scale bars: b–c = 1 mm, d–f = 200 μm, h–i = 100 μm, j = 50 μm, g. k = 20 μm, l–p. r = 10 μm, q = 2 μm.

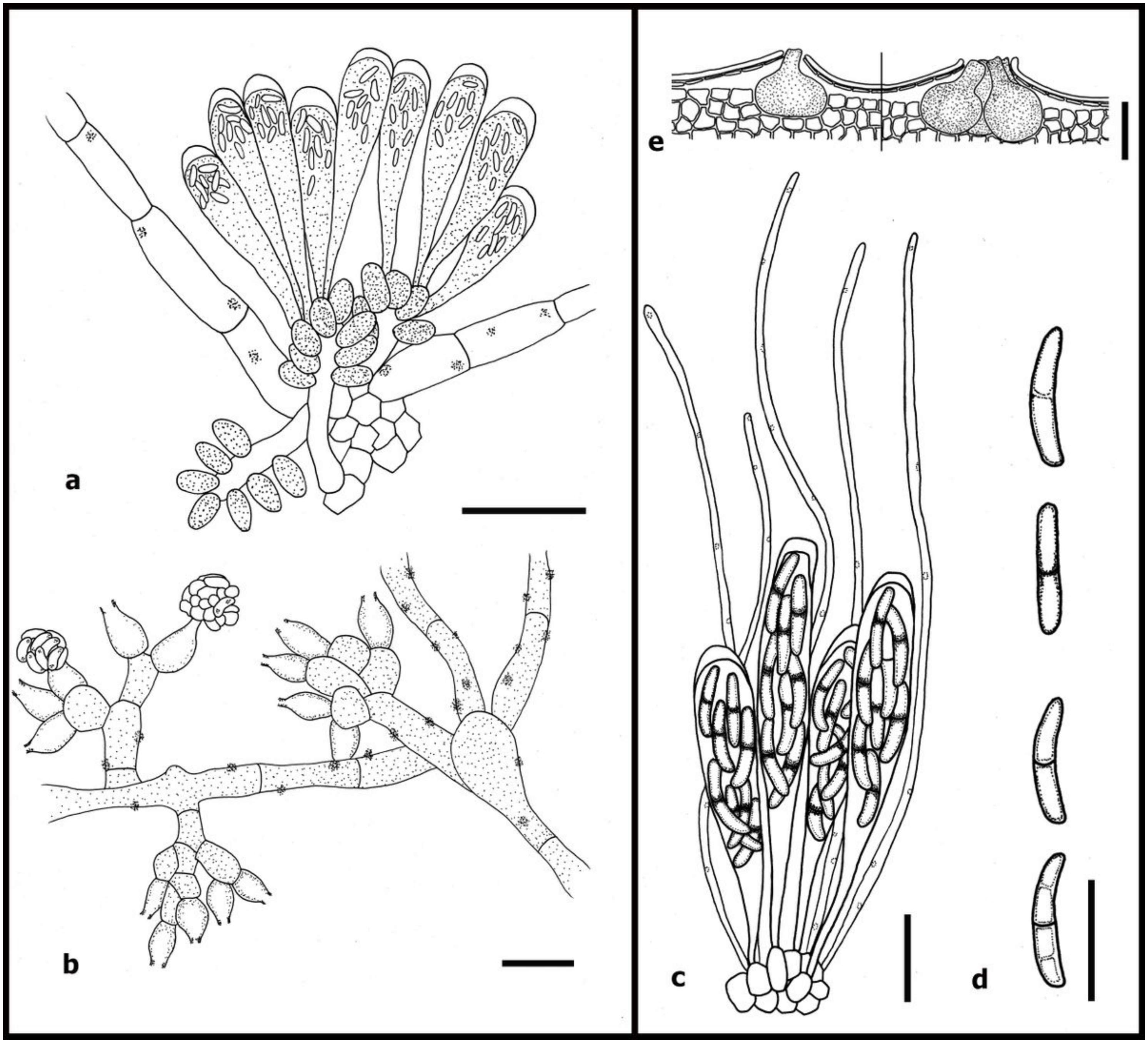


Figure 4

Flabellascus tenuirostris: a–b (redrawn from Réblová et al. 2015). a Asci link with ascogenous hyphae and paraphyses. b Conidiophores with conidia; Kacosphaeria antarctica: c–e (redrawn from Arambarri et al. 2020). c Asci with paraphyses. d Ascospores. e Ascomata. Scale bars: e = 200 µm, a–d = 10 µm.

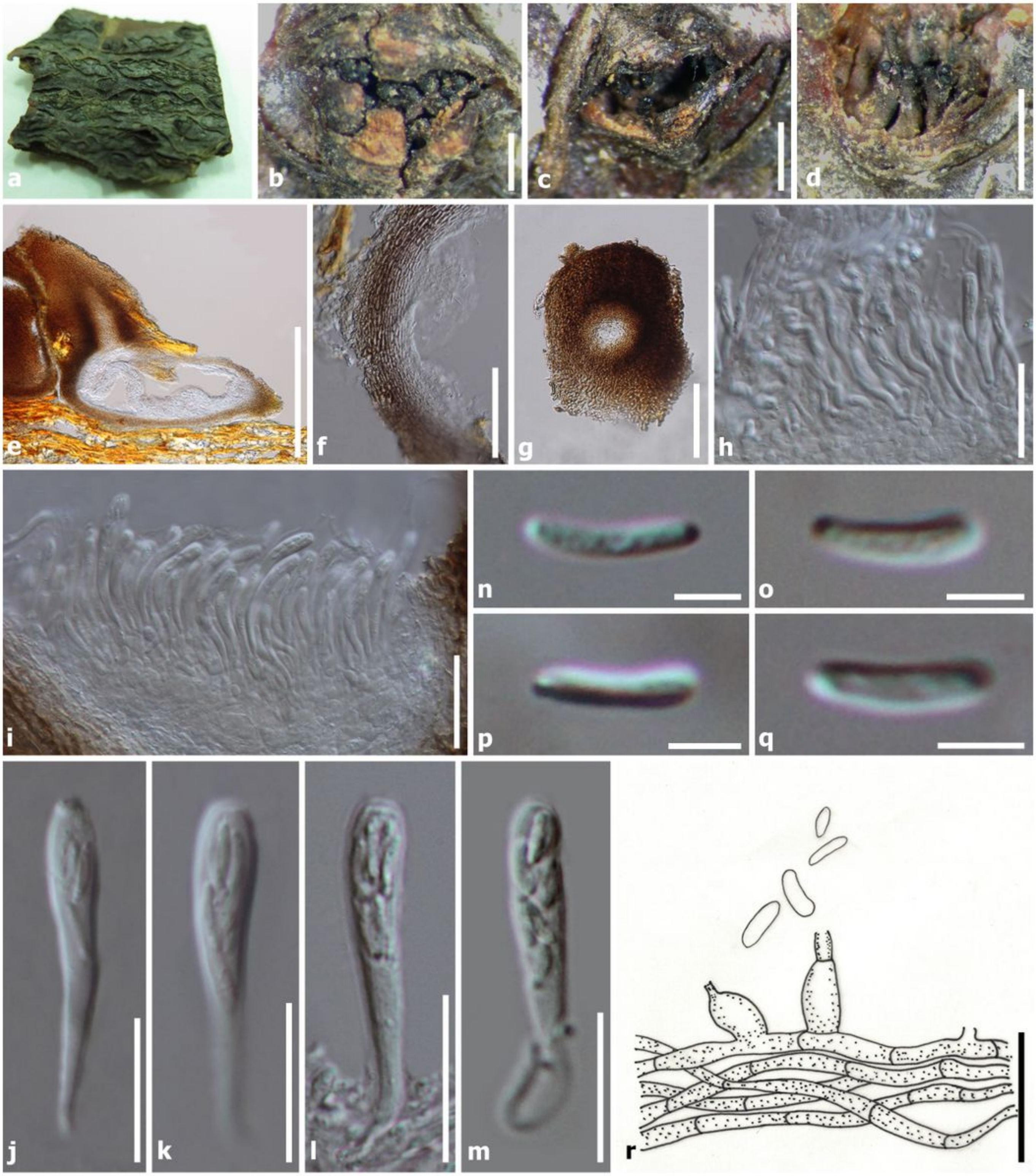


Figure 5

Jattaea discreta: a–q (NY-00912077, lectotype); r (redrawn from Réblová 2011). a Material. b–d Ascomata erumpent through the bark of the host. e Ascoma in cross section. f Peridium. g Transverse section of neck. h–i Asci linked with ascogenous hyphae and paraphyses. j–m Asci. n–q Ascospores, r.

Conidiophores with conidia. Scale bars: d = 1 mm, b–c = 500 µm, e = 200 µm, f–g = 50 µm, h–i = 20 µm, j–m, r = 10 µm, n–q = 2 µm.

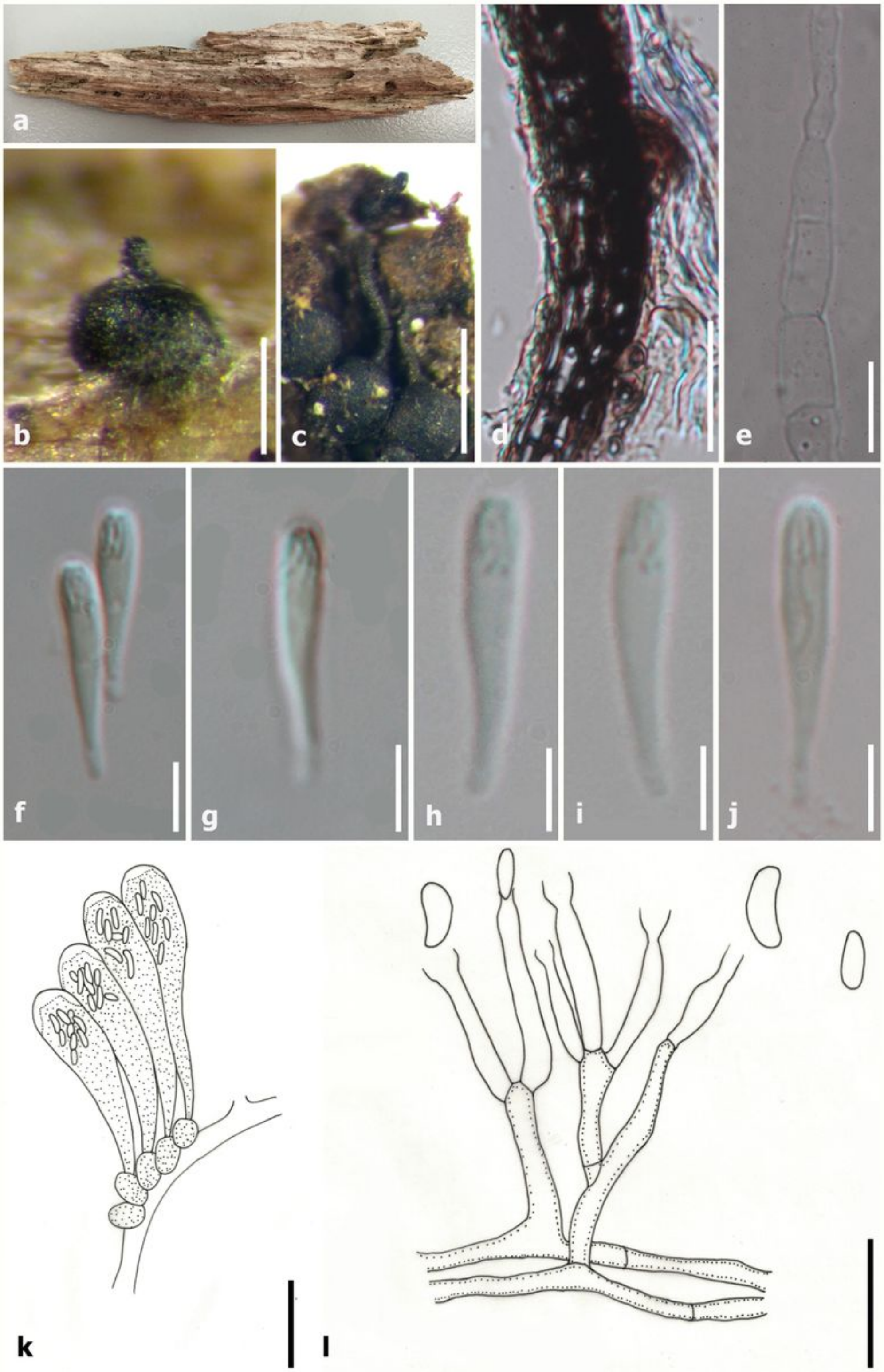


Figure 6

Togniniella microspora: a–b, d–e, h–j (PDD-81431, holotype); c, f–g (PDD-81432); k, l (redrawn from Réblová 2011). a Material. b–c Ascomata. d Peridium. e Septate paraphysis. f–j Asci. k Asci with ascogenous hyphae. l. Conidiophores with conidia. Scale bars: c = 500 µm, b = 200 µm, d = 20 µm, e. k–l

= 10 μm, f–j = 5 μm. Pleurostomataceae Réblová, L. Mostert, W. Gams & Crous, Stud. Mycol. 50(2): 540 (2004)

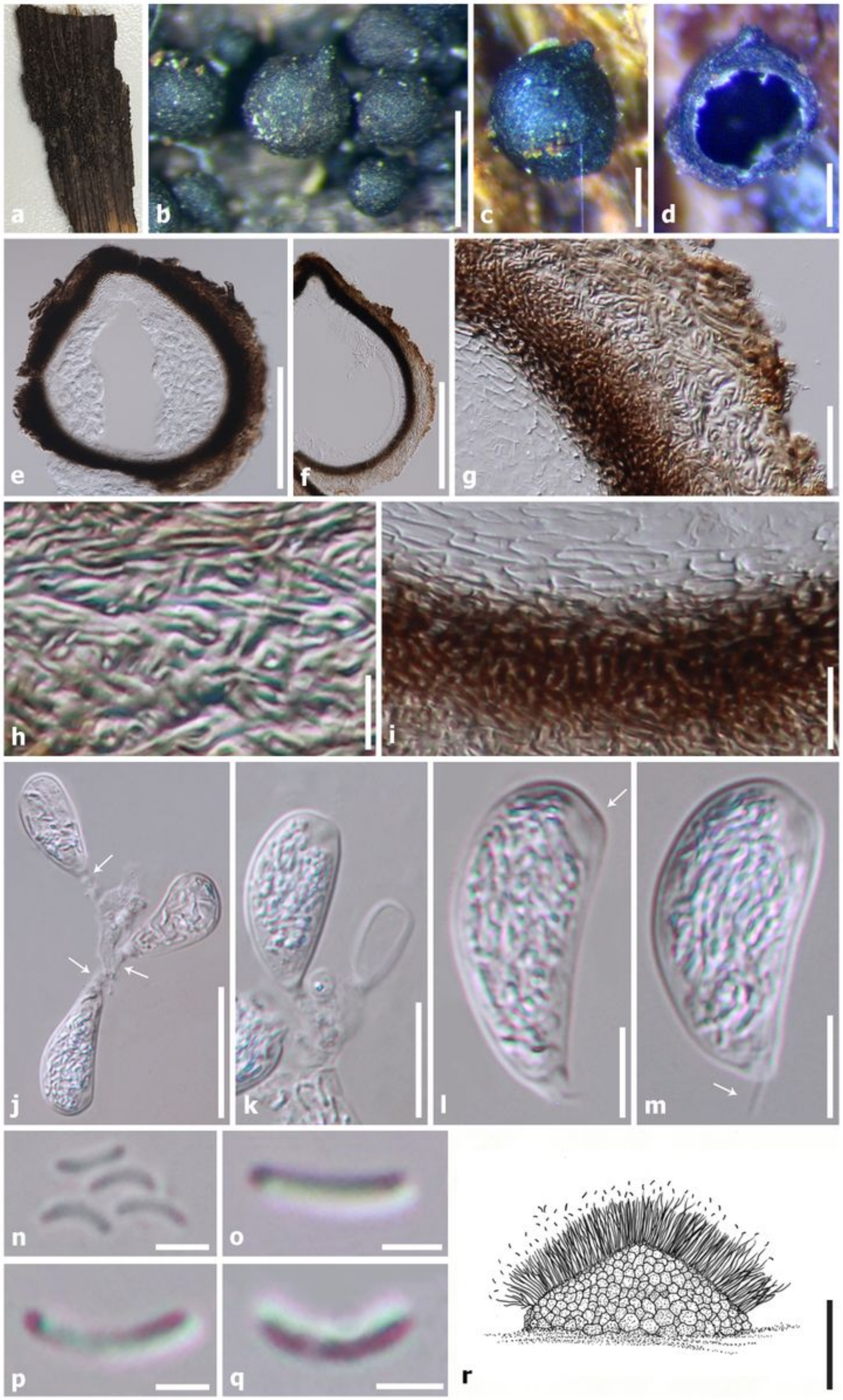


Figure 7

Pleurostoma candollei: a–b, e–j, n (PC-MNHN-PC-PC0167640, holotype); c–d, k–m, o–q (S-F21567); r (redrawn from Tulasne and Tulasne 1863). a Material. b–d Ascomata (d Ascomata in cross section on host). e–f Ascoma in cross section. g–i Peridium (h outer layer, i inner layer). j Asci arise from single cells on ascogenous hyphae (arrows indicate cells) k Mature and immature asci. l–m Asci with apical thickening and short pedicel (l arrow indicates an asymmetrically thickened apex, k arrow indicates a bristle-like pedicel). n–q Ascospores. r Villiform hyphae and slender conidia on host. Scale bars: b = 500 μm, c–f = 200 μm, r = 50 μm, g, i–j = 20 μm, h, k = 10 μm, l–m = 5 μm, n = 2 μm, o–q = 1 μm.

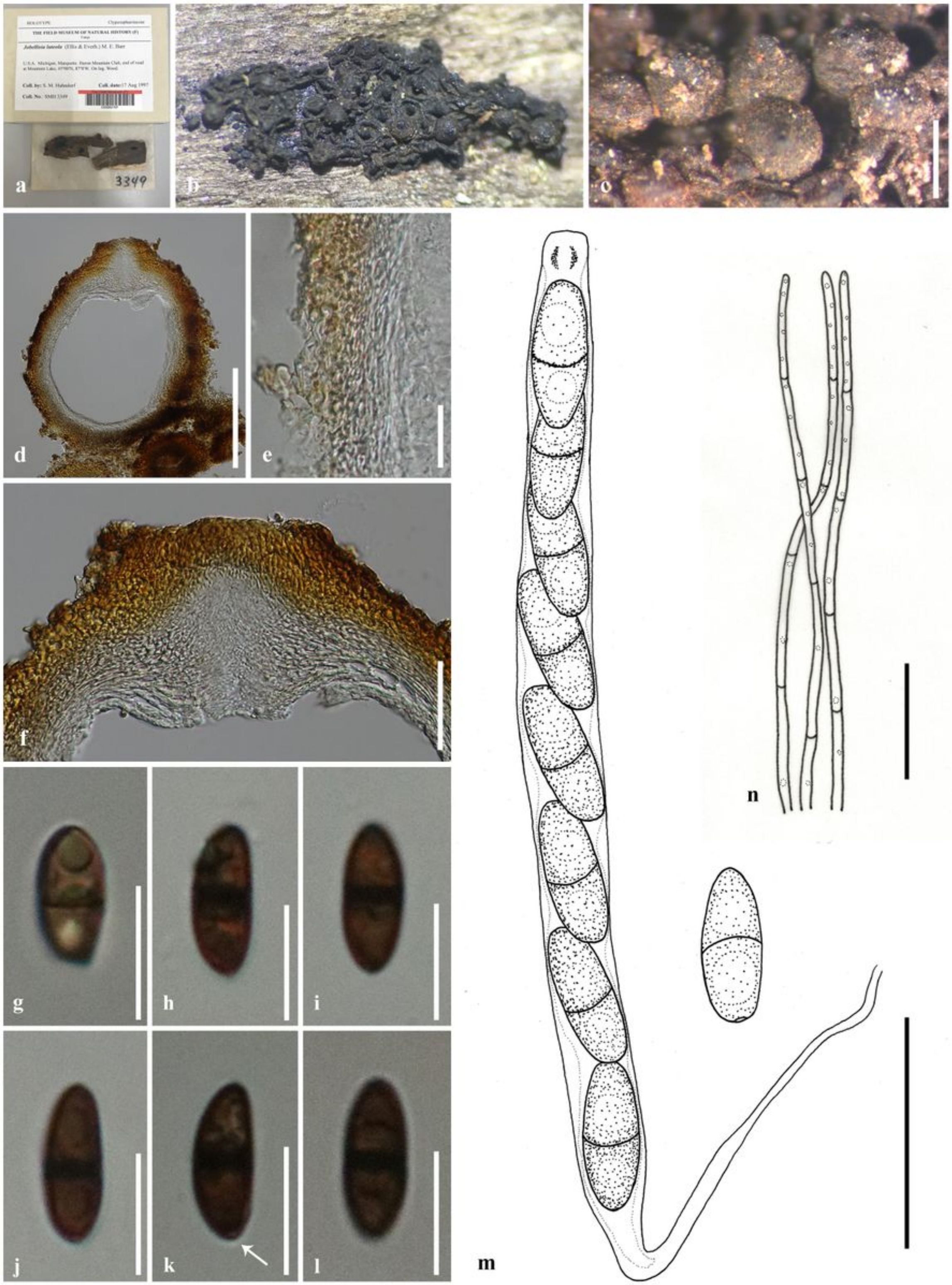


Figure 8

Jobellisia luteola: a–l (F-SMH 3349); m–n (redrawn from Huhndorf et al. 1999a). a Material label. b Collapsing ascomata. c Ascomata on host. d Ascoma in cross section. e Peridium. f Ostiole with periphyses. g–l Ascospores (arrow indicates a germ pore). m Ascospores and asci with apical thickening and long pedicel. n Septate paraphyses. Scale bars: c = 500 μm, d = 200 μm, f, n = 50 μm, e, m = 20 μm, g–l = 10 μm.

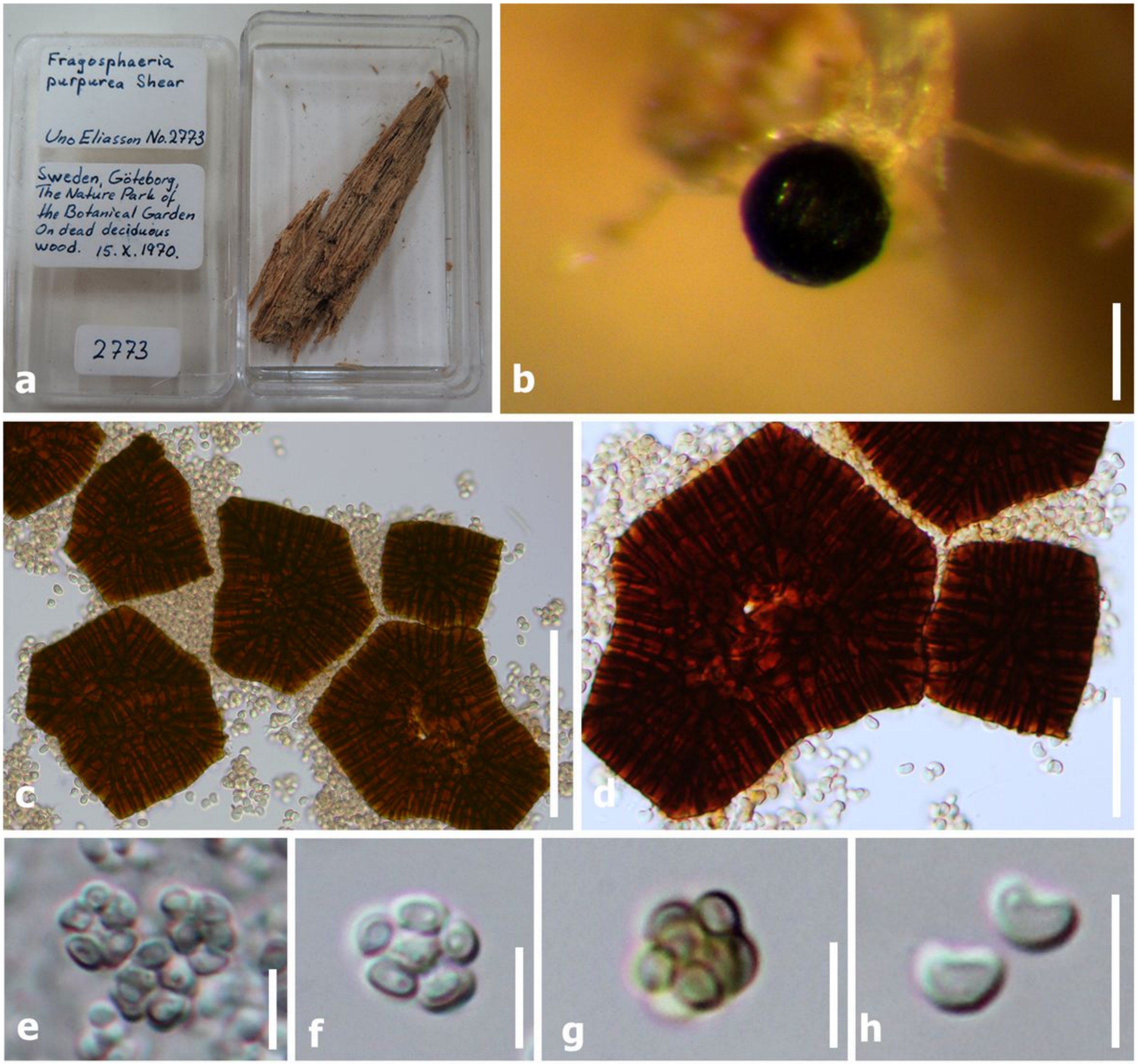


Figure 9

Fragosphaeria purpurea: (BPI-566226). a Material label. b Ascoma. c–d Squash mounts of ascoma (d in cotton blue). e–g Asci (g in Melzer's reagent). h Ascospores. Scale bars: b = 100 μm, c = 50 μm, d = 20 μm, e–h= 5 μm.

Figure 10

Tengiomyces indicus: a–c (BPI-622098); d–f, h–i (BPI-622100); g, j (redrawn from Réblová 1999a). a Material. b–d Ascomata on host. e Squashed ascoma with dark brown setae. f Ascus. g Ascus with ascospores. h Conidiophore with conidium. i Conidium. j Conidiophores of spadicoides-like from nature. Scale bars: b, d = 500 µm, c = 200 µm, e = 100 µm, f–h, j = 20 µm, i = 10 µm.

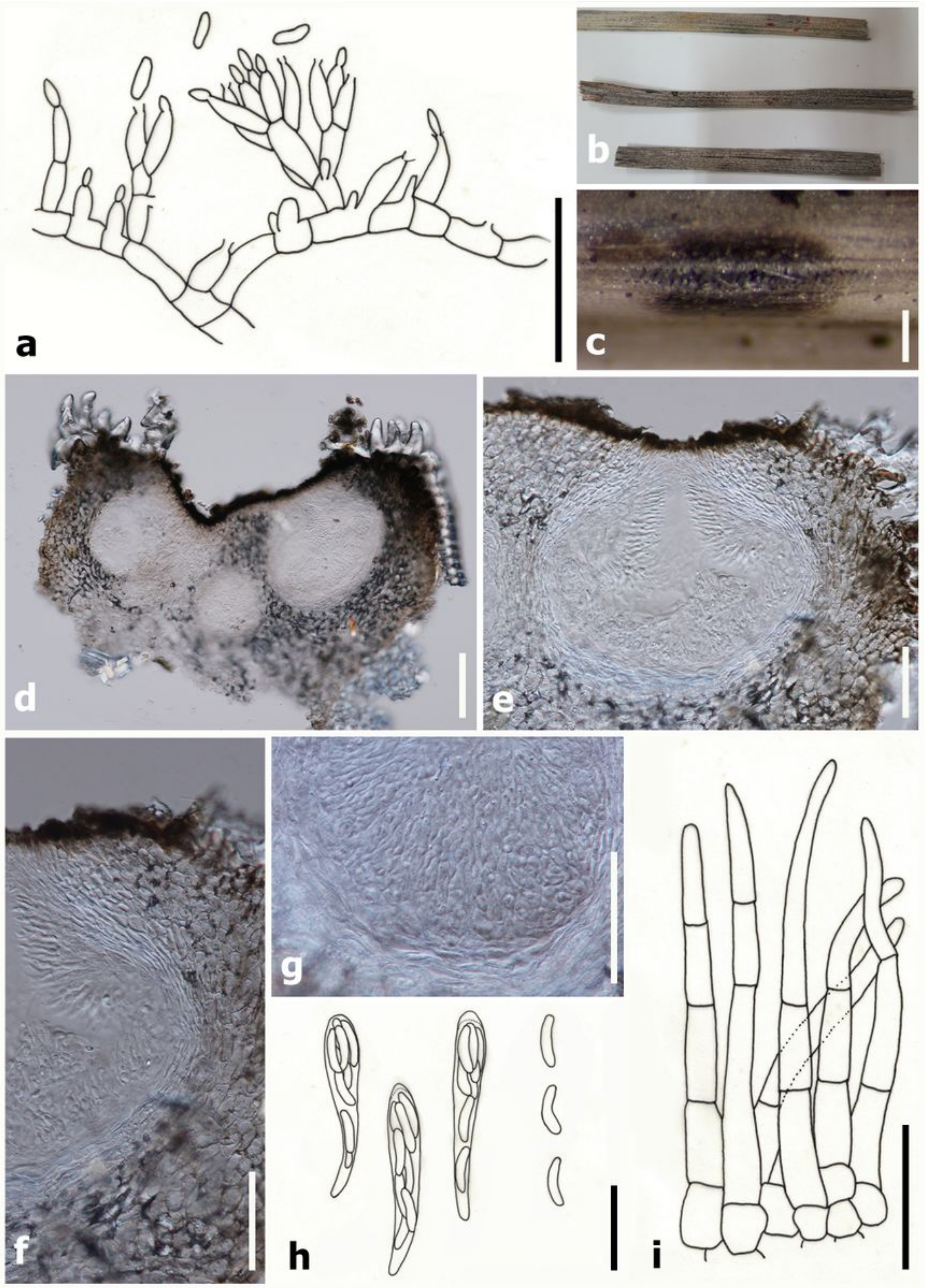


Figure 11

Sulcatistroma nolinae: b–g (BPI-864276, holotype); a. h–i (redrawn from Ramaley 2005). a Conidiophores with conidia. b Material. c Immersed ascostroma. d Multiloculate ascostroma. e Ascoma in cross section. f Peridium. g Filament-like support structures in ascoma. h Asci and ascospores. i Tapering and septate paraphyses. Scale bars: c = 200 μm, d = 100 μm, e–g = 50 μm, a, h–i = 20 μm.

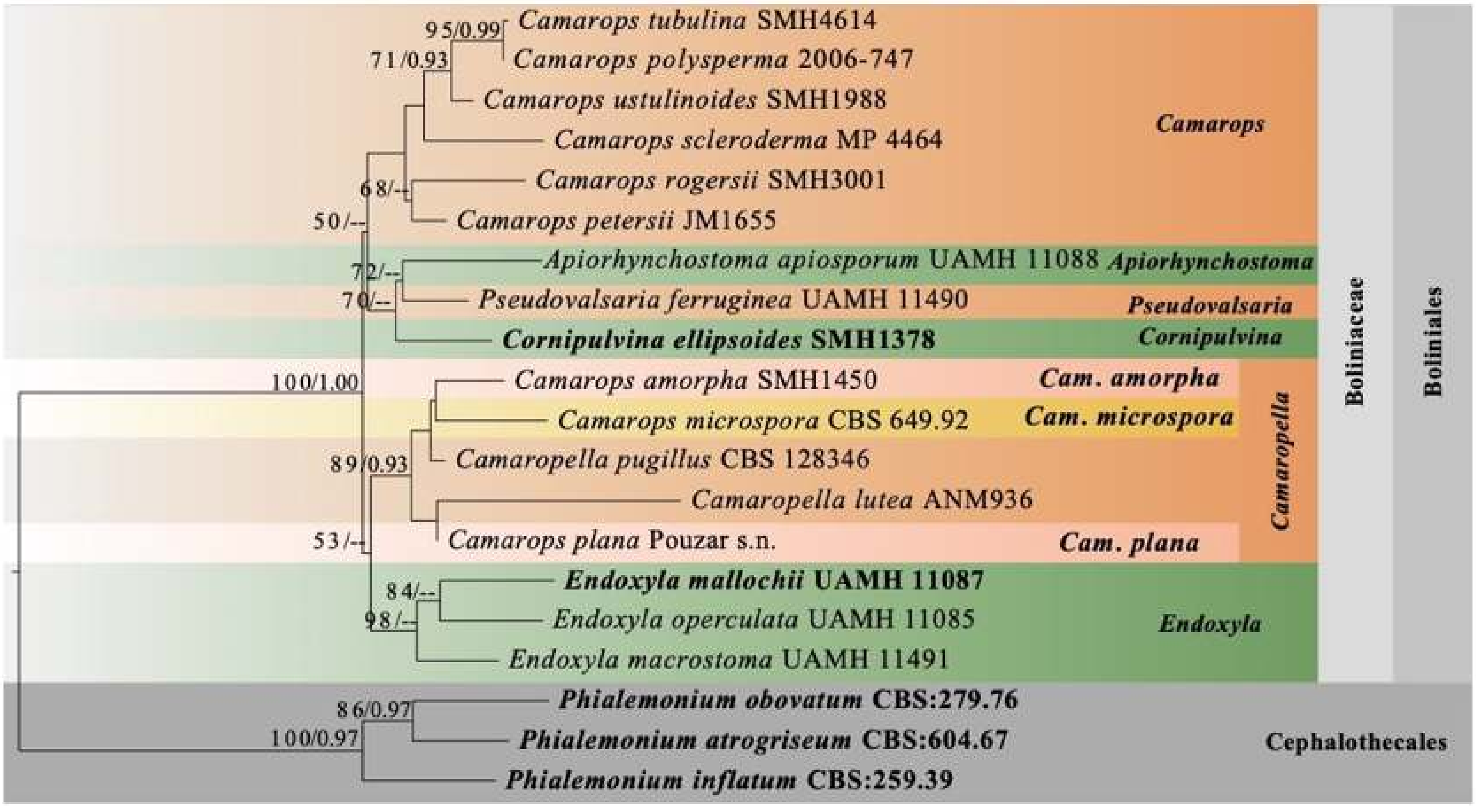


Figure 12

Phylogram generated from maximum likelihood analysis based on combined LSU, ITS and RPB2 sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 50%, before the backslash) and the posterior probabilities (PP) from the Bayesian (BY) analysis (BY-PP > 0.90, after the backslash) above corresponding nodes. The '–' indicates lack of statistical support (< 50% for ML-BS and < 0.90 for BY-PP). Twenty strains are included in the combined analyses which comprise 2485 characters (960 characters for LSU, 475 characters for ITS, 1050 characters for RPB2) after alignment. Strains of Cephalothecales are used as the outgroup taxa. The best score in IQ-TREE explores with a final likelihood value of -9890.4903 is presented. The model of each partitioned gene is: LSU: GTR+I+G; ITS: GTR+G; RPB2: GTR+I+G. The strain numbers are noted after the species names. Ex-type strains are in bold. Alignments are available at TreeBASE (URL: http://purl.org/phylo/treebase/ phylows/study/TB2:S27417).

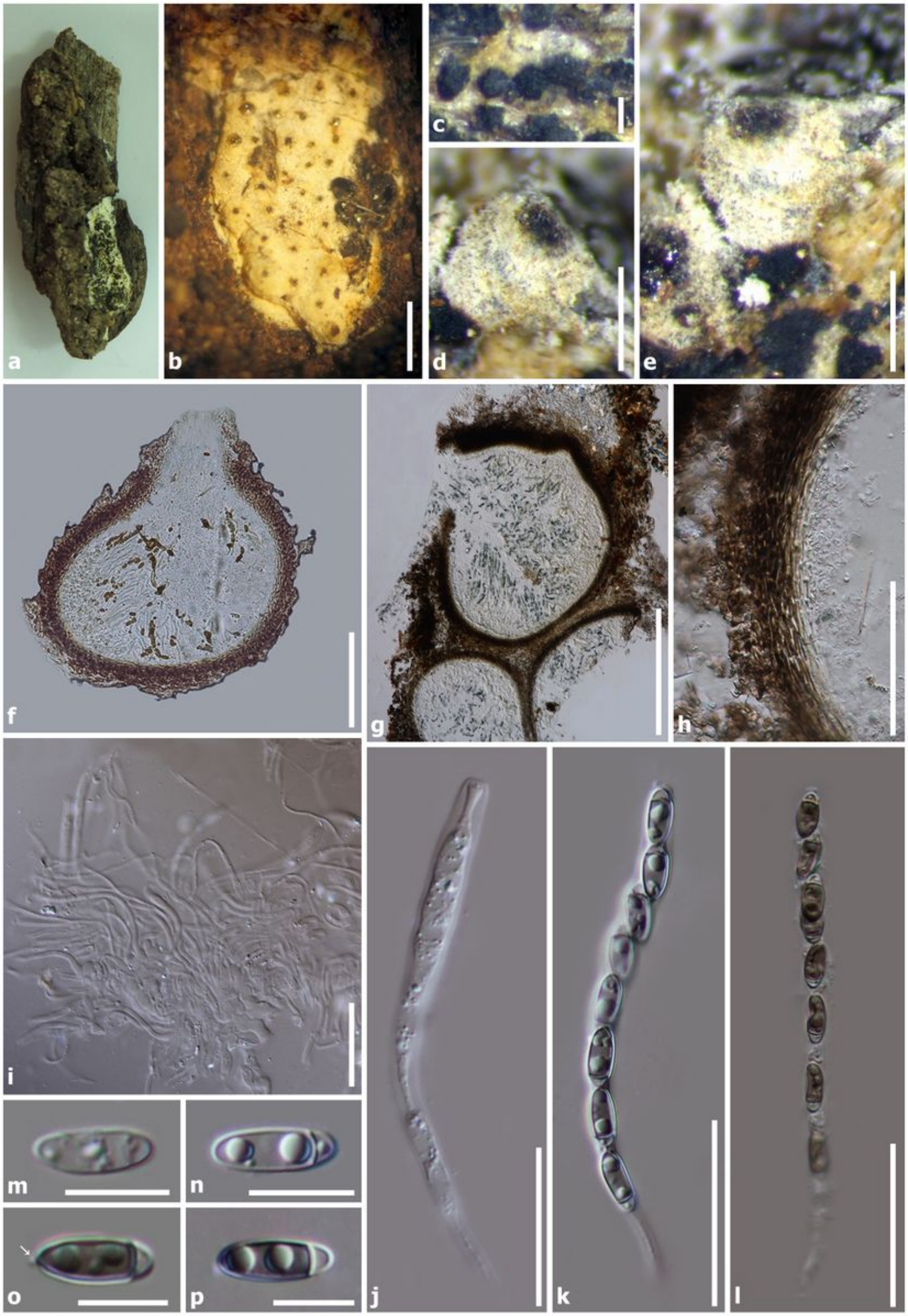


Figure 13

Apiocamarops alba: a, c–e, h, l–m, o (NY-00986029, holotype); b, f–g, i–k, n, p (NY-00986030, paratype). a Material. b Ascostroma on host. c Papilla without furfuraceous cover. d–e Ascomata. f–g Ascomata in cross section (f from dry slide). h Peridium. i Paraphyses. j–l Asci. m–p Ascospores (o arrow indicates terminal pore). Scale bars: b = 2 mm, d–e = 500 μm, c, g = 200 μm, f = 100 μm, h–i = 50 μm, j–l = 20 μm, m–p = 5 μm.

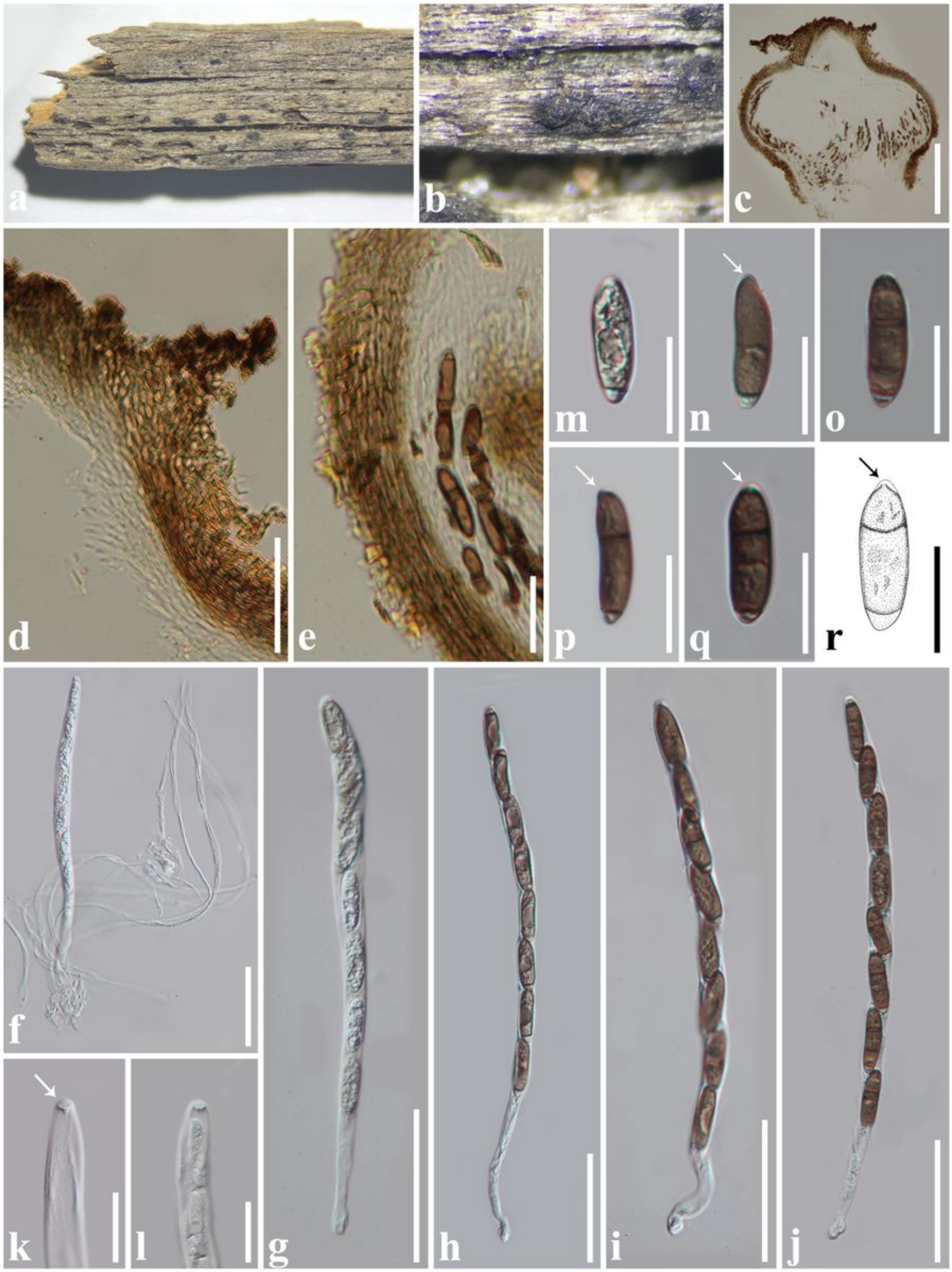


Figure 14

Apiorhynchostoma apiosporum: (S-F61087, lectotype). a Rotting, decorticated wood. b Ascomata on host. c Ascoma in cross section. d Papilla with periphyses. e Peridium. f Ascus with paraphyses. g–j Asci. k–l Apical pore of ascus (k arrow indicates pore). m–r Ascospores (arrows indicate the minute pore in n and a hyaline, thick-walled at the end in p–r). Scale bars: c = 200 μm, d, f–j = 50 μm, e, k–r = 20 μm.

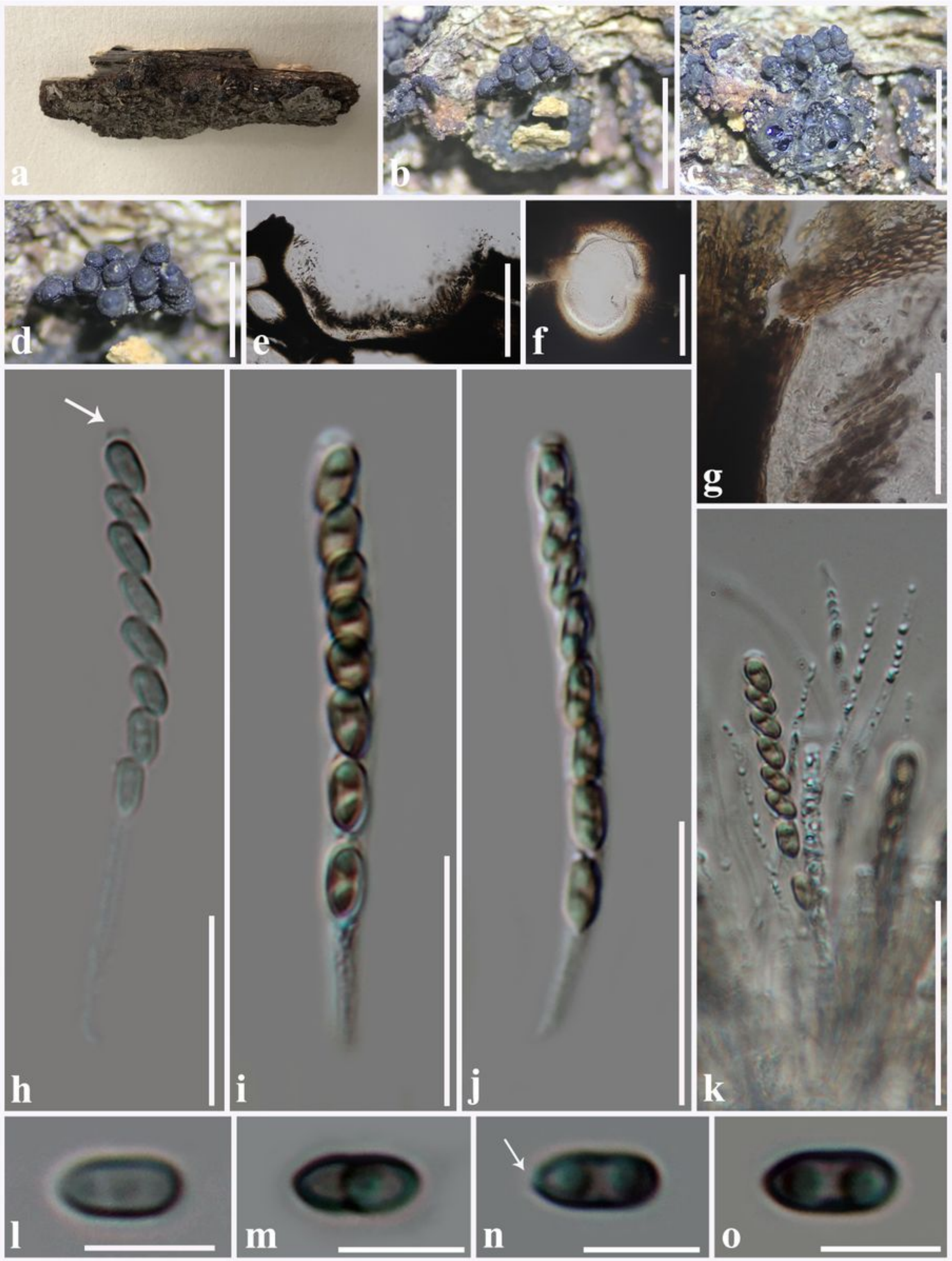


Figure 15

Camaropella pugillus: (S-F24255). a Material. b Semi-immersed ascostroma. c Ascostroma in longitudinal section. d Ascostroma in apical view. e Ascoma in cross section. f Neck vertical section with periphyses. g Peridium. h–j Asci (h arrow indicates an inconspicuous apical ring and i mounted in Melzer's reagent). k Asci with paraphyses. l–o Ascospores (n arrow indicates germ pore at end of ascospore and o mounted in Melzer's reagent). Scale bars: b–c = 2 mm, d = 1 mm, e = 200 μm, f = 100 μm, g. k = 50 μm, h–j = 20 μm, l–o = 5 μm.

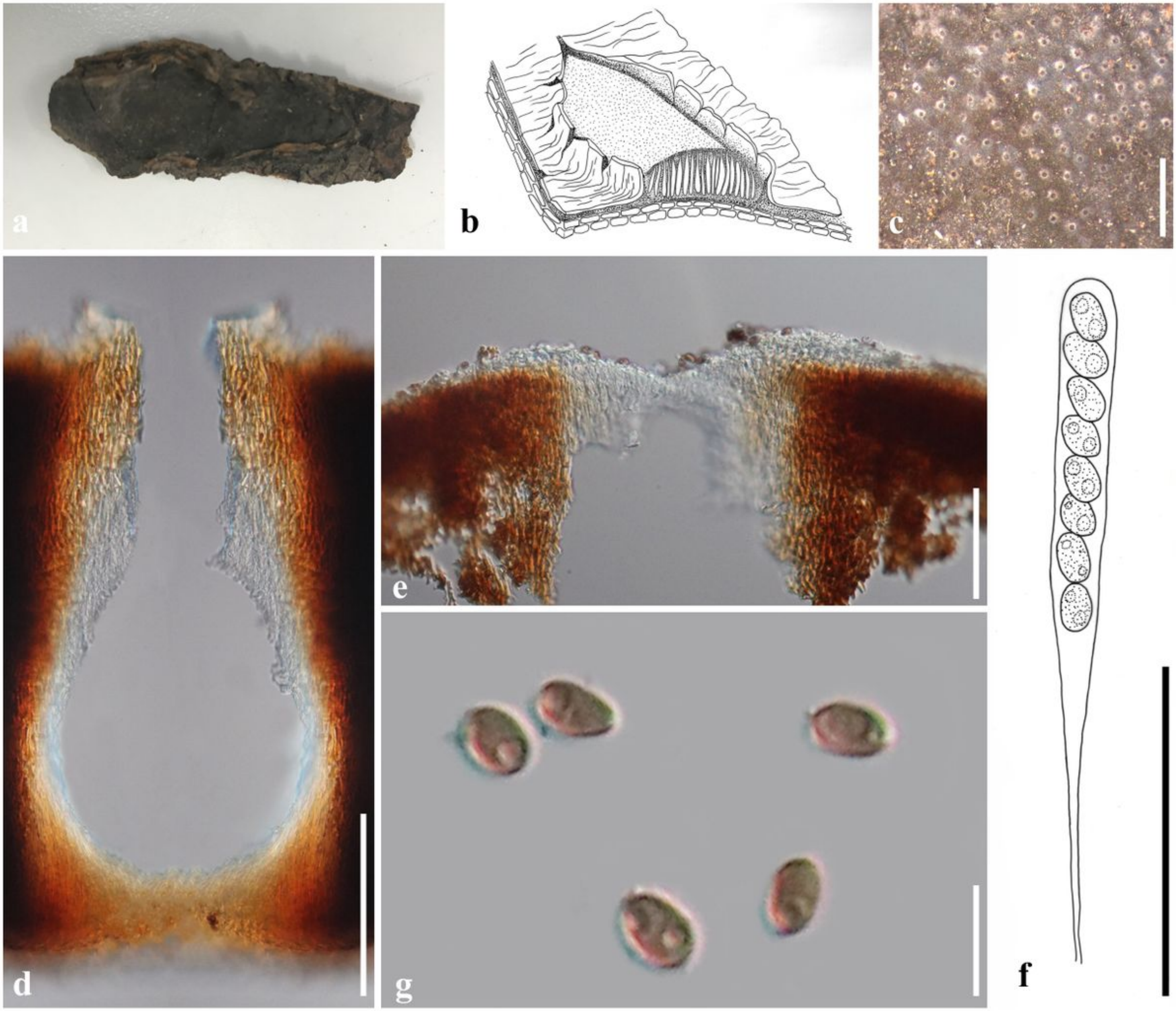


Figure 16

Camarops hypoxyloides: a, c–e, g (BPI-797104); b, f (redrawn from Mercuri 1972). a Material. b–c Ascostromata (b monostichous ascomata). d Ascoma in cross section. e Ostiole. f Ascospores. g Ascus. Scale bars: c = 1 mm, d = 100 μm, e–f = 50 μm, g = 10 μm.

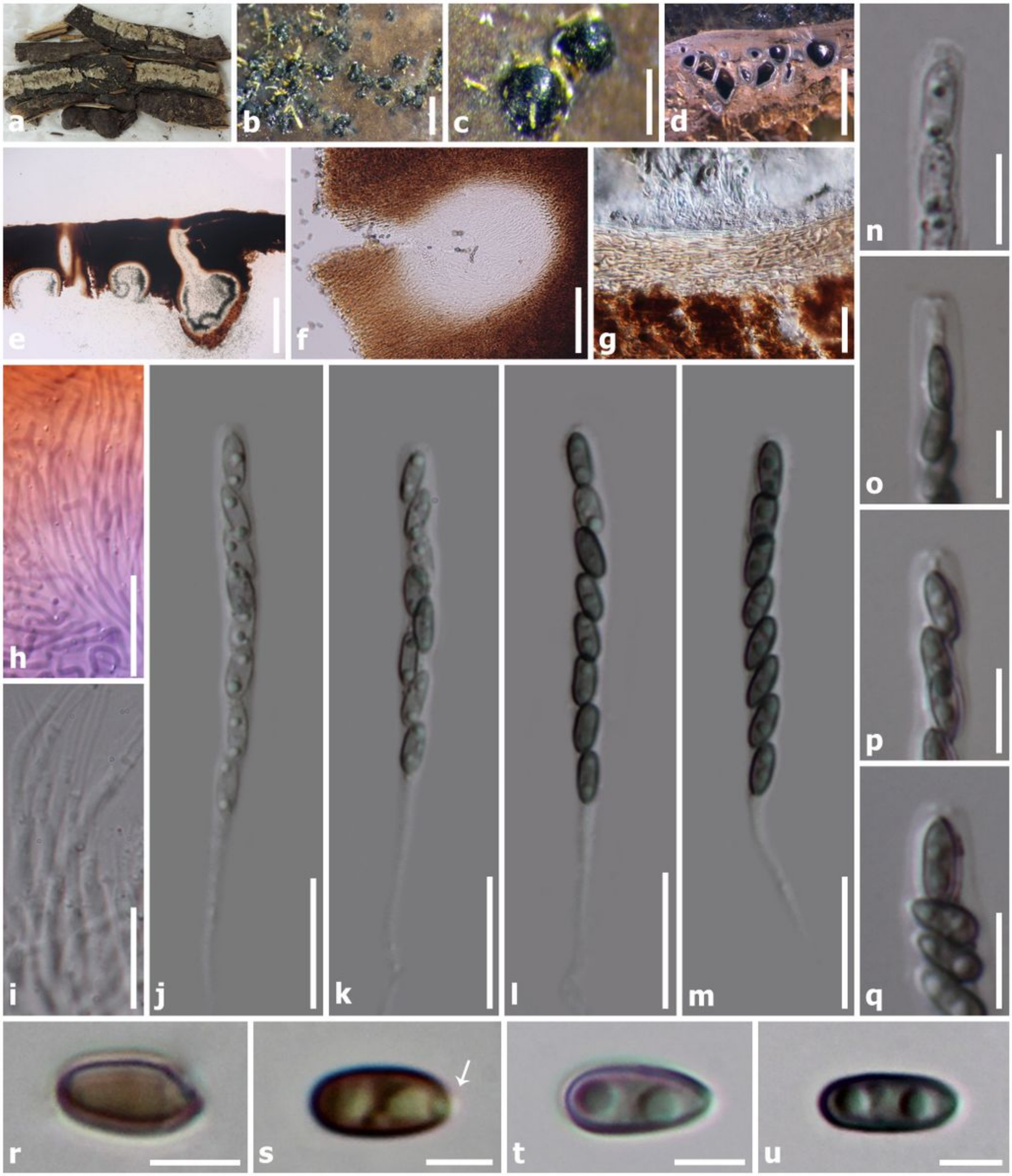


Figure 17

Camarops tubulina – as Bolinia tubulina: (PRM-PR647008). a Material. b–c Ascostromata in apical view. d Ascostroma in longitudinal section. e Ascomata in cross section. f Neck vertical section with periphyses. g Peridium of the base. h–i Paraphyses (h mounted in cotton blue). j–m Asci. n–q Apical ring of ascus. r–u Ascospores (s arrow points to germ pore). Scale bars: d = 2 mm, b, e = 500 μm, c = 200 μm, f = 50 μm, g = 20 μm, h–m =10 μm, n–q = 5 μm, r–u = 2 μm.

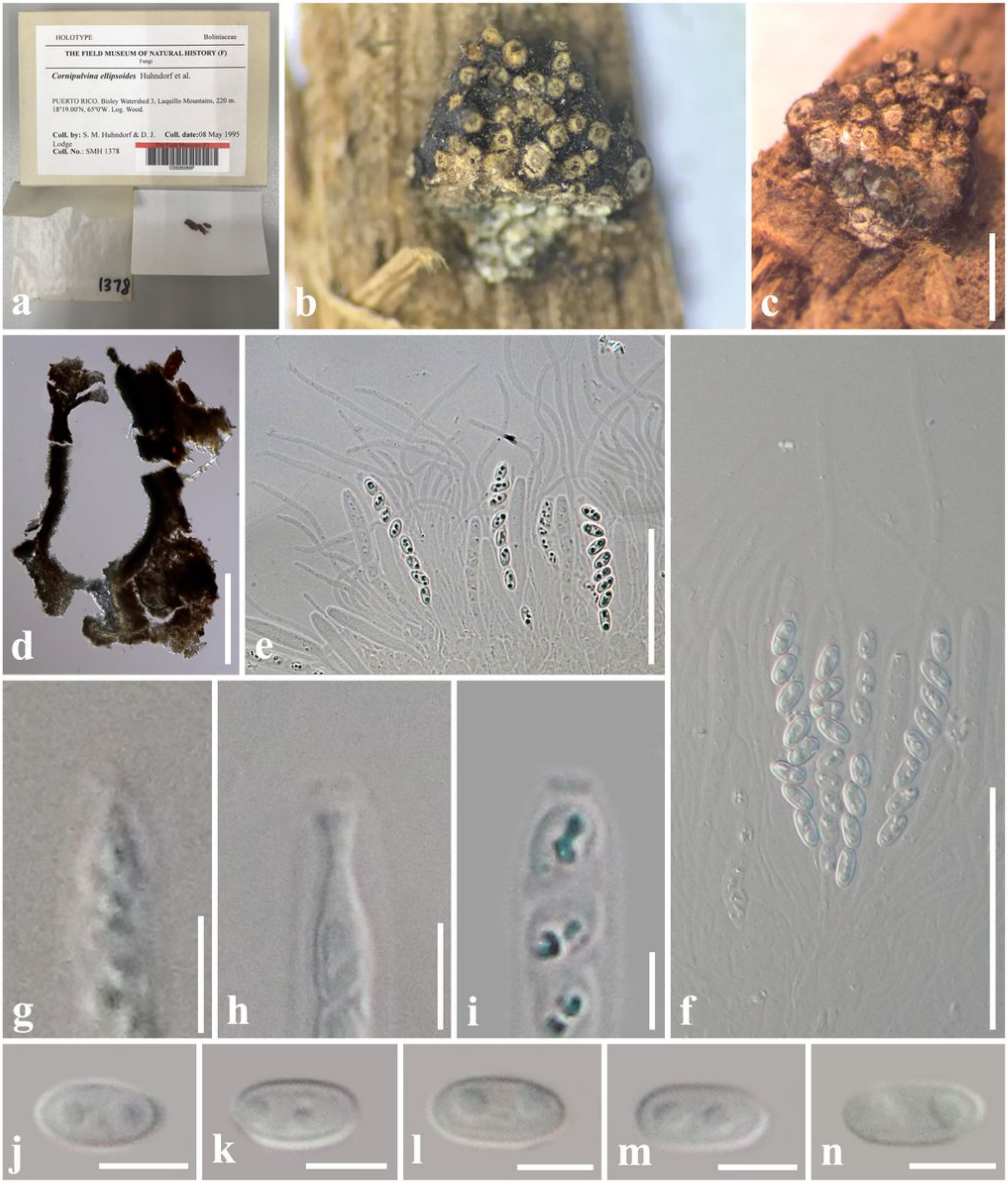


Figure 18

Cornipulvina ellipsoides: (F-SMH 1378, holotype). a Material label. b–c Cluster of ascomata on host. d Ascoma in cross section. e–f Asci with paraphyses. g–i Apical ring. j–n Ascospores. Scale bars: c = 1 mm, d = 200 μm, e–f = 50 μm, g–n = 5 μm.

Figure 19

Endoxyla operculata: a–b, e–f, j, l, s (S-F 138817); c–d, g–i, k, m–r (S-F 138814). a Material. b–c Ascomata on host. d–e Ascomata in cross section. f–g Peridium. h Neck in cross section with periphyses. i Base of ascoma with mycelium. j–m Asci. n–s Ascospores. Scale bars: b–c = 1 mm, e = 500 µm, d. i = 200 µm, f–g = 100 µm, h. j–m = 50 µm, n–s = 10 µm.

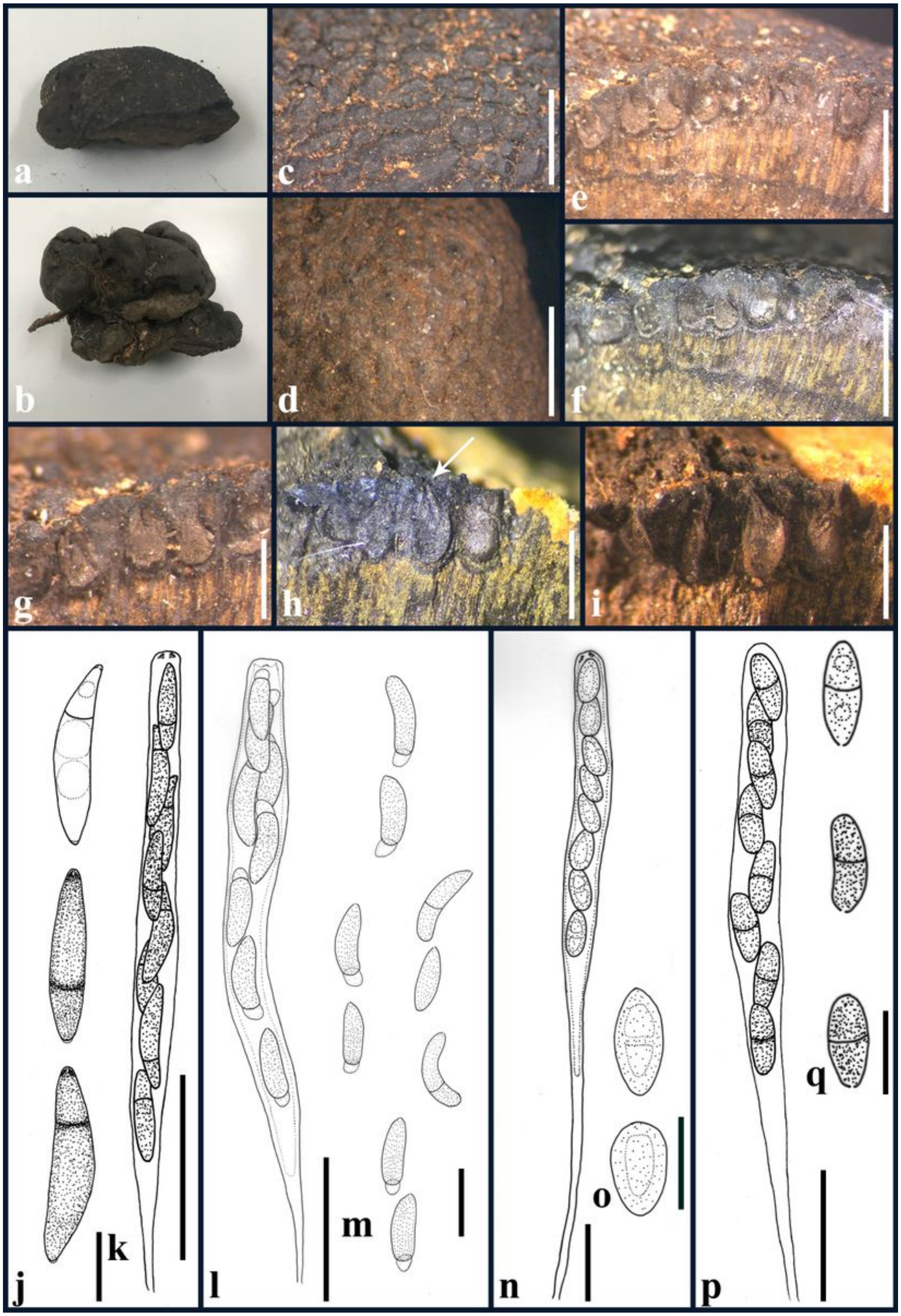


Figure 20

Neohypodiscus rickii: a, c, e, g–h (BPI-737826); b, d, f, i (BPI-802543); j–k (redrawn from Rogers et al. 1994b). a–b Material. c–d Ascostromata on host. e–f Ascostromata narrow to broad connection to substrate with veins. g–i Ascomata (h arrow indicates short umbilicate ostiole). j Ascospores with appendage at the ends. k Ascus with indistinct apical ring; Endoxyla macrostoma: l–m (redrawn from Untereiner 1993). l Ascus. m Ascospores; Mollicamarops stellata: n–o (redrawn from Vasilyeva 2007). n

Ascus. o Ascospores; Pseudovalsaria foedans: p–q (redrawn from Spooner 1986). p Ascus. q Ascospores. Scale bars: c–f = 2 mm, g–i = 1 mm, k = 50 μm, l, p = 20 μm, j, m–n, q = 10 μm, o = 5 μm.

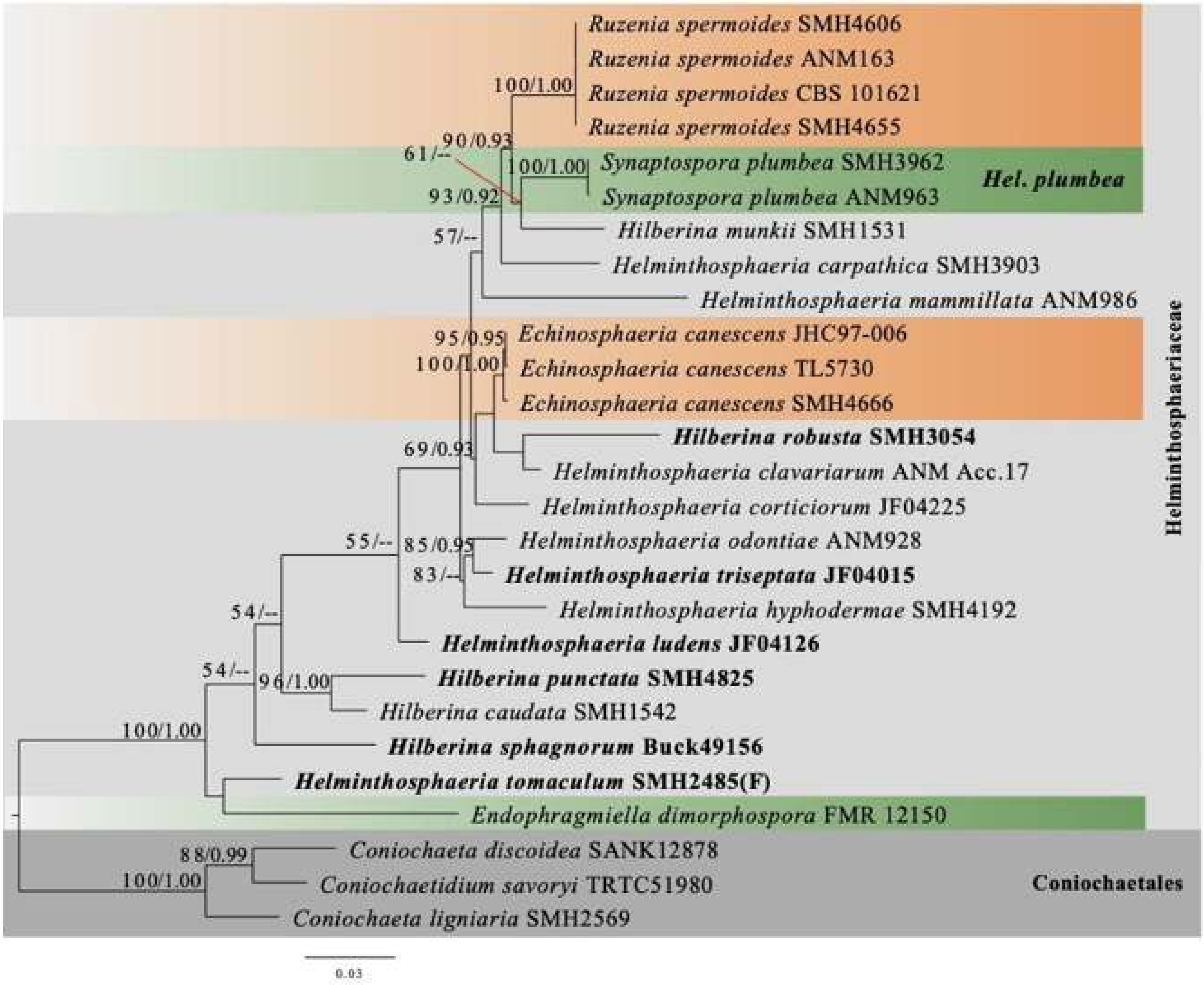


Figure 21

Phylogram generated from maximum likelihood analysis based on combined LSU and TUB sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 50%, before the backslash) and the posterior probabilities (PP) from the Bayesian (BY) analysis (BY-PP > 0.90, after the backslash) above corresponding nodes. The '–' indicates lack of statistical support (< 50% for ML-BS and < 0.90 for BY-PP). Twenty-seven strains are included in the combined analyses which comprise 1648 characters (995 characters for LSU, 653 characters for TUB) after alignment. Strains of Coniochaetales are used as the outgroup taxa. The best score in IQ-TREE explores with a final likelihood value of -7018.1436 is presented. The model of each partitioned gene is: LSU: GTR+I+G; TUB: GTR+G. The strain numbers are noted after the species names. Ex-type strains are in bold. Alignments are available at TreeBASE (URL: http://purl.org/phylo/treebase/phylows/study/TB2:S27418).

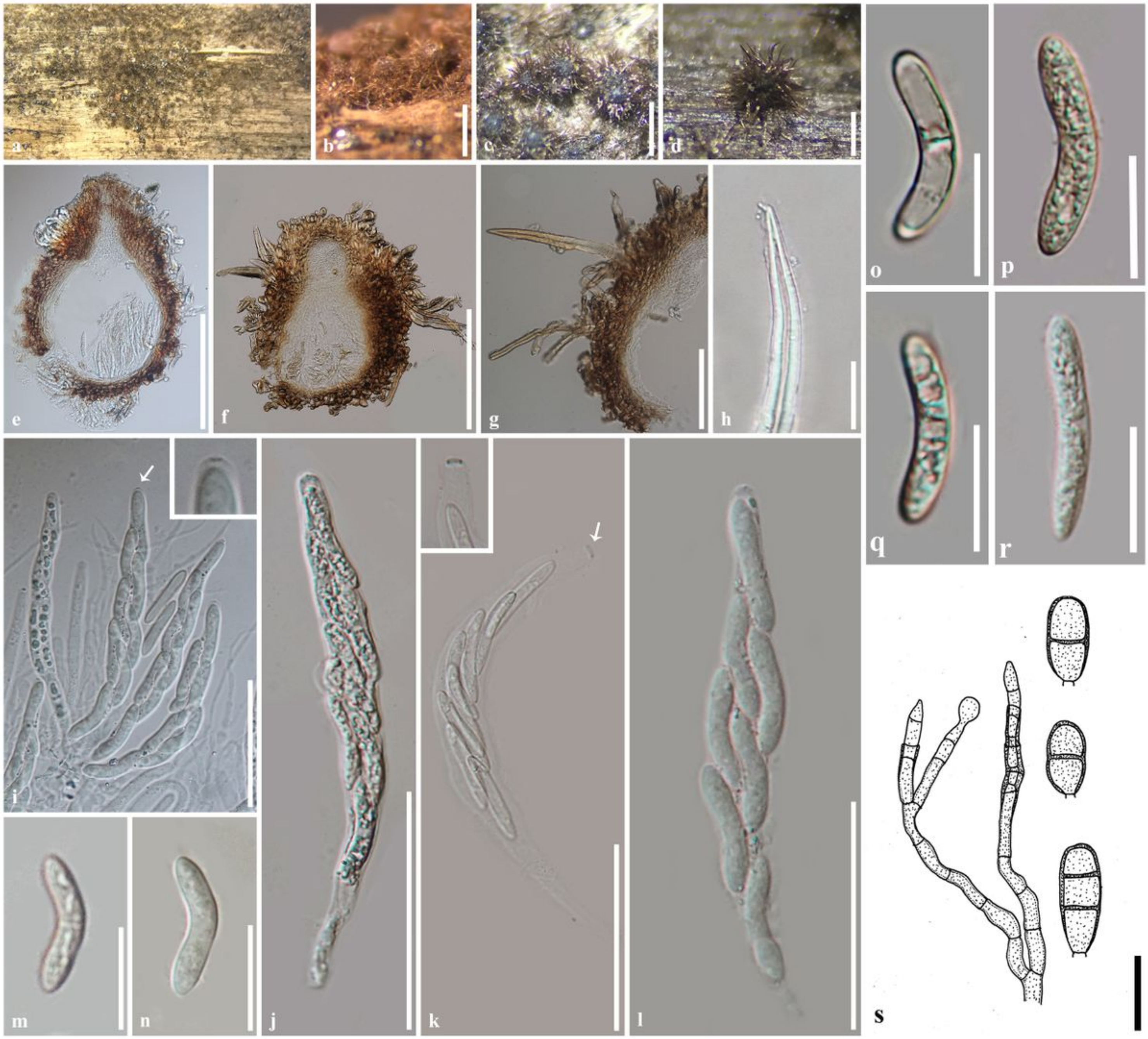


Figure 22

Echinosphaeria canescens: a–b, e, h–i, l–n (F-SMH 2627); f–g, j, o–p (S-F 134887); c–d, k, q–r (S-F 134901). a Ascomata on host. b–d Solitary or scattered ascomata. e–f Ascomata in cross section with setae. g Peridium. h Seta. i Asci with paraphyses. j–l Asci. m–r Ascospores; Endophragmiella pallescens: s (redrawn from Sutton 1973). s Conidiophores with conidia. Notes: i. k. Arrows points to the apical ring of ascus. Scale bars: b–d = 500 µm, e–f = 200 µm, g = 100 µm, i–l = 50 µm, h, m–s = 20 µm.

Figure 23

Helminthosphaeria clavariarum: a–s (S-F 135699); t–cc (S-F 121831). a Host of Clavulina cinerea. b Ascomata on host. c, e Ascomata in cross section. d Setae. f Peridium with cylindrical cells of ostiole in the upper part. g Asci with paraphyses (arrows indicate a cell on ascogenous hyphae). h Septate paraphyses. i–j Asci. k–s Ascospores. t Colonies on host. u–v Conidiophores and conidia. w–cc Conidia. Scale bars: b = 500 μm, c = 200 μm, d–e = 100 μm, f = 50 μm, g–j. u–v = 20 μm, k–s. w–cc = 10 μm.

Figure 24

Hilberina caudata: a, c, h, m–p (G-G00266357, Syntype); b, d–g, j–l (F-SMH 3156); i (redrawn from Fuckel 1870). a Scattered ascomata. b Ascoma on host. c Ascoma in longitudinal section surrounded by setae. d Ascoma in cross section. e Peridium. f Setae. g–i Asci. j–l Ascospores. m Conidiophores with conidia. n–o Primary and secondary branches of conidiogenous cells with conidia. p Conidia. Scale bars: a = 1 mm, b–c = 500 µm, d = 200 µm, f = 100 µm, e. h. i. m = 50 µm, g. j–l. n–o. = 20 µm, p = 10 µm.

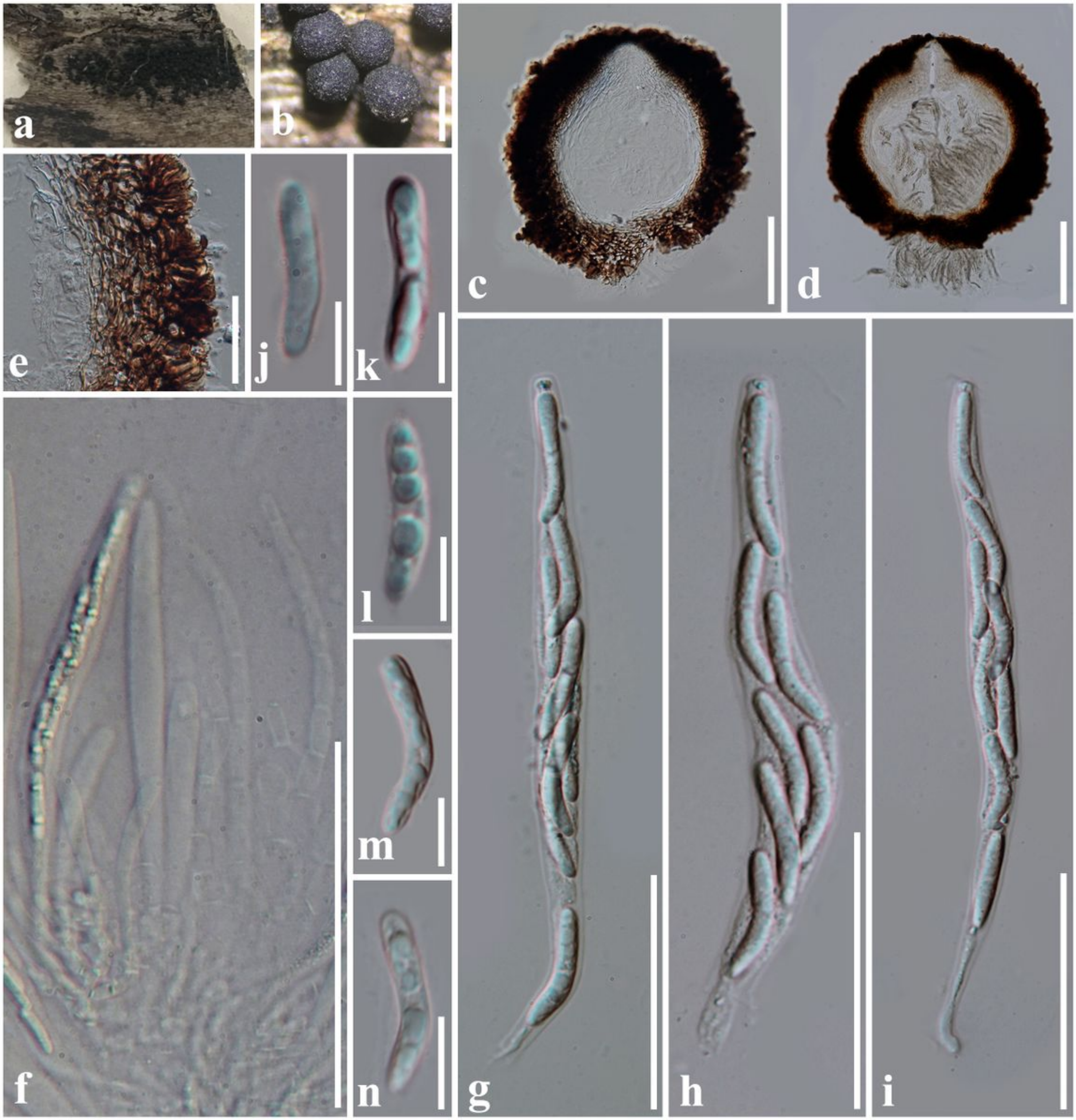


Figure 25

Ruzenia spermoides: a–c, e–f, j–k (S-F242341); d, g–i, m–n (S-F242342). a Gregarious ascomata. b Ascomata on host. c–d Ascoma in cross section. e Peridium. f Asci with paraphyses. g–i. Asci. j–n Ascospores. Scale bars: b = 500 µm, c–d = 200 µm, f = 100 µm, e. g–i = 50 µm, j–n = 10 µm.

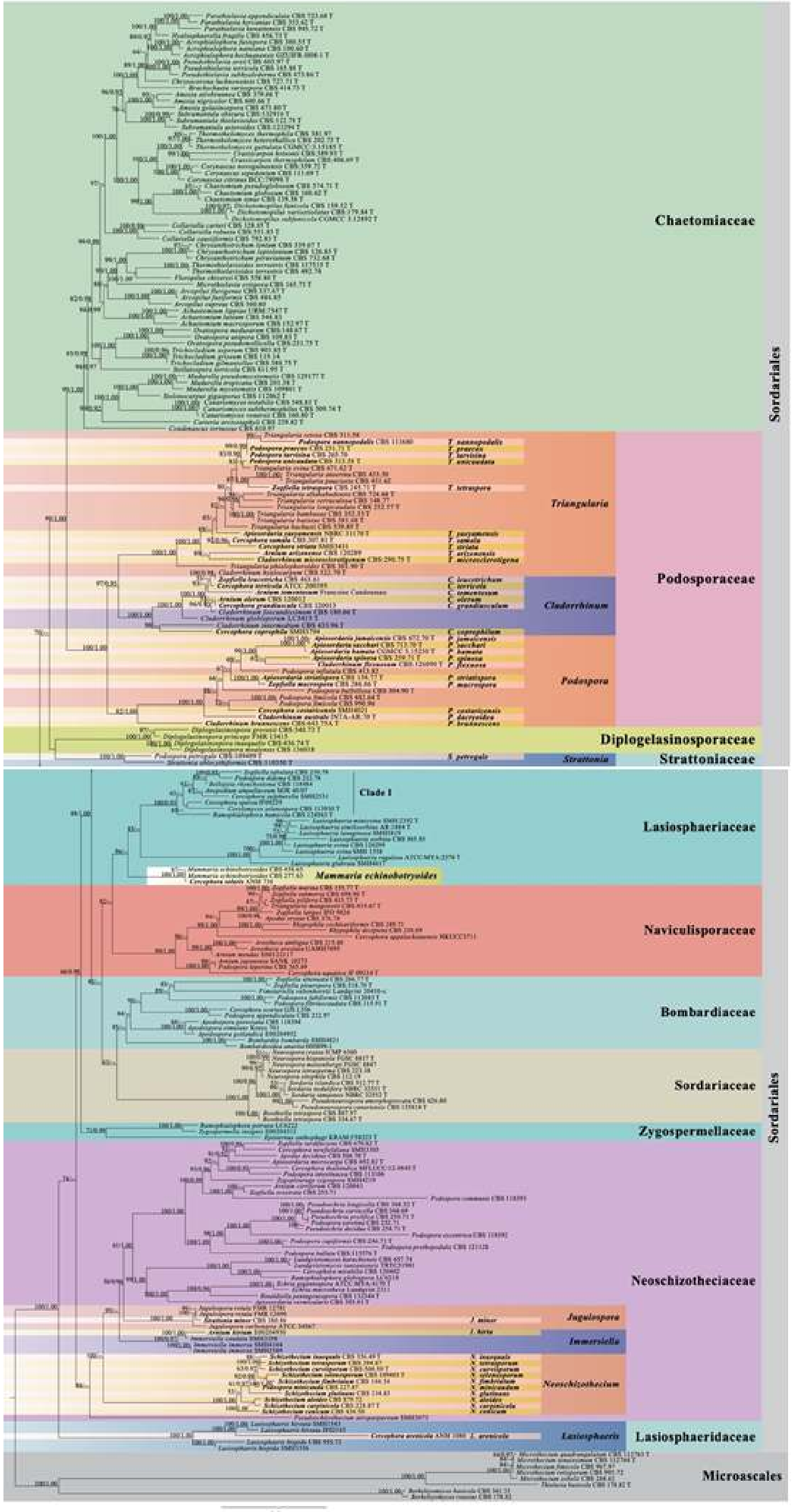


Figure 26

Phylogram generated from maximum likelihood analysis based on combined LSU, ITS, TUB and RPB2 sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 50%, before the backslash) and the posterior probabilities (PP) from the Bayesian (BY) analysis (BY-PP > 0.90, after the backslash) above corresponding nodes. The '–' indicates lack of statistical support (< 50% for ML-BS and < 0.90 for BY-PP). Two hundred and thirty-five strains are included in the combined analyses, which comprise 2877 characters (851 characters for LSU, 509 characters for ITS, 665 characters for TUB, 852 characters for RPB2) after alignment. Strains of Microascales are used as outgroup taxa. The best score in IQ-TREE explores with a final likelihood value of -83411.0978 is presented. The model of each partitioned gene is: LSU: TIM3e+G4; ITS: TIM2e+I+G4; TUB: HKY+F+I+G4; RPB2: TIM3+F+I+G4. Strain numbers are noted after the species names and ex-type strains marked with ‘T’ after the culture number. Alignments are available at TreeBASE (URL: http://purl.org/phylo/treebase/phylows/study/TB2: S27419).

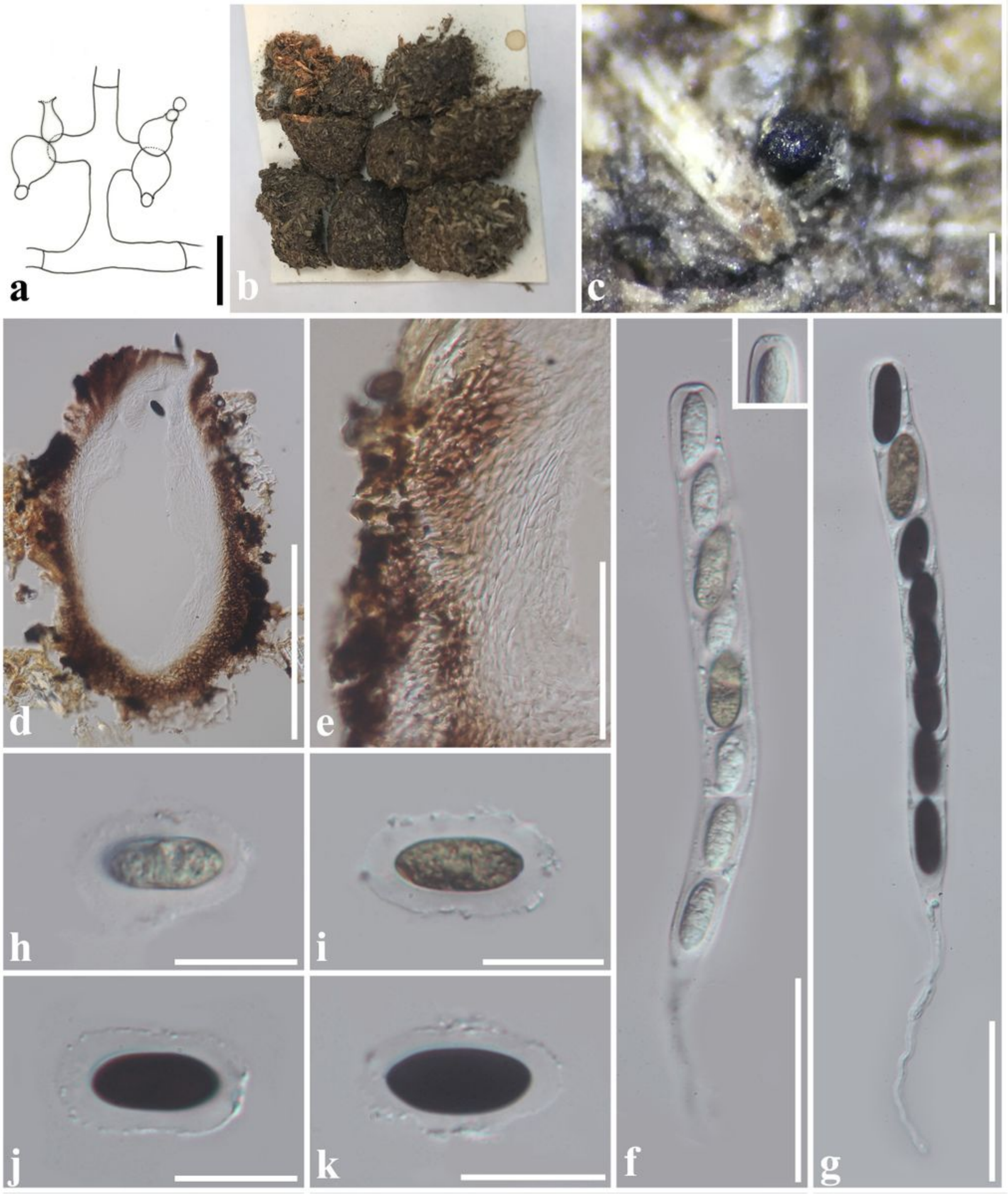


Figure 27

Apodospora simulans: a (redrawn from Cain and Mirza 1969); b–k (S-F 122911). a Conidophores with conidia. b Material. c Ascomata on host. d Ascoma in cross section. e Peridium. f–g Asci (enlarged: apex ring). h–k Ascospores. Notes: Fig d–k are stained in KOH. Scale bars: c = 500 μm, d = 200 μm, e–g = 50 μm, h–k = 20 μm, a = 10 μm.

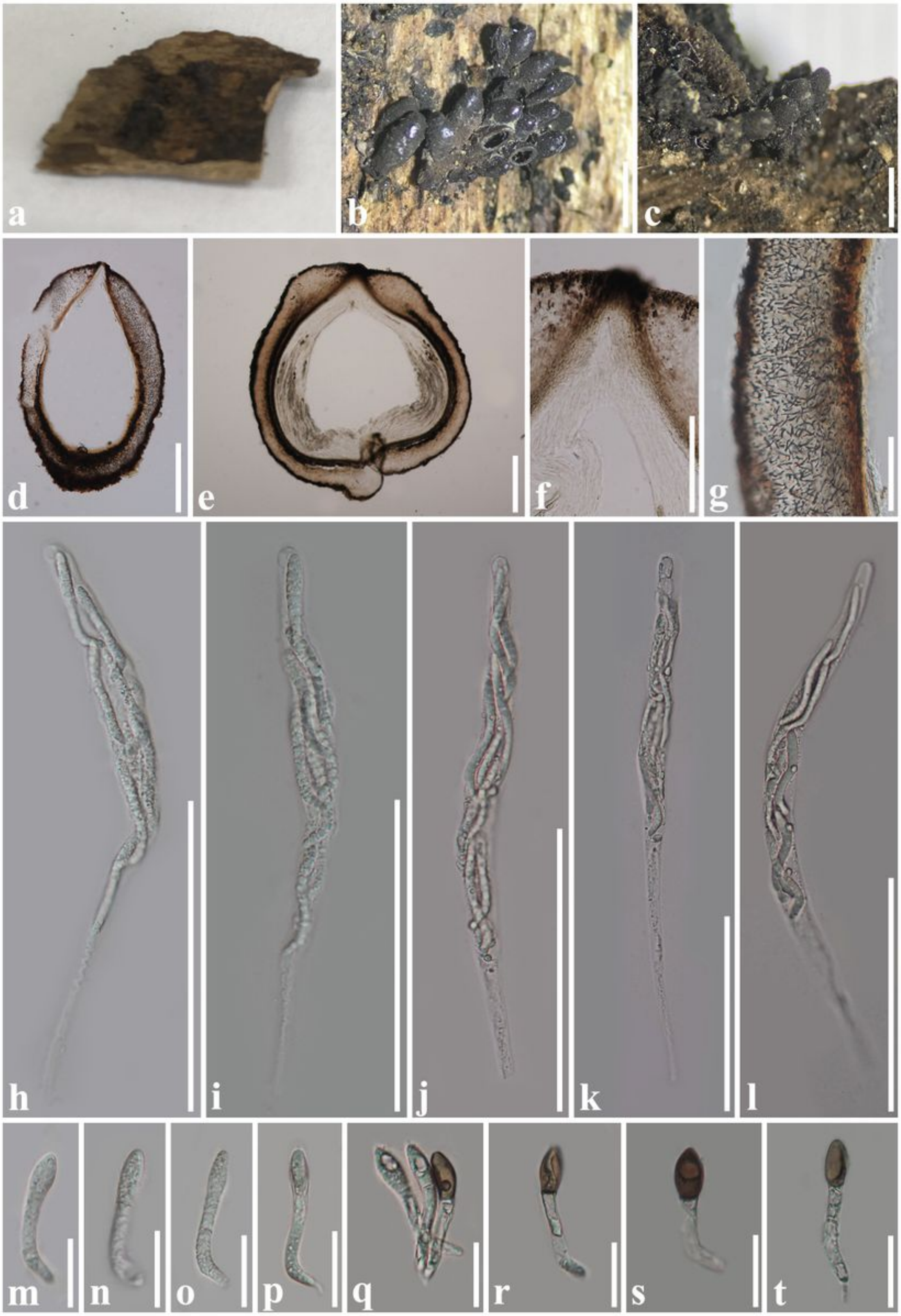


Figure 28

Bombardia bombarda: a–b, d, g–i, m–p (S-F750); c, e–f, j–l, q–t (S-F753). a Material. b–c Ascomata on host. d–e Ascoma in cross section. f Ostiole with periphyses. g Peridium. h–l Asci. m–t Ascospores. Scale bars: b–c = 1 mm, d–e = 200 μm, f. h–l = 100 μm, g = 50 μm, m–t = 20 μm.

Figure 29

Bombardioidea bombardioides: a–b, e–f, h–j, n–p (S-F726); c–d, g, k–m (S- F729); r (redrawn from Krug and Scott 1994). a Material. b–c Ascomata on host. d Ascoma in cross section. e Ostiole with periphyses.

f–g Peridium. h–k Asci. l–q Ascospores (arrowed: germ pore). r Conidiophores with conidia. Notes: Fig j–k. n–p stained in Congo red. Scale bars: c = 500 μm, d = 200 μm, f–g = 100 μm, e. h–k = 50 μm, l–q = 20 μm, r = 5 μm.

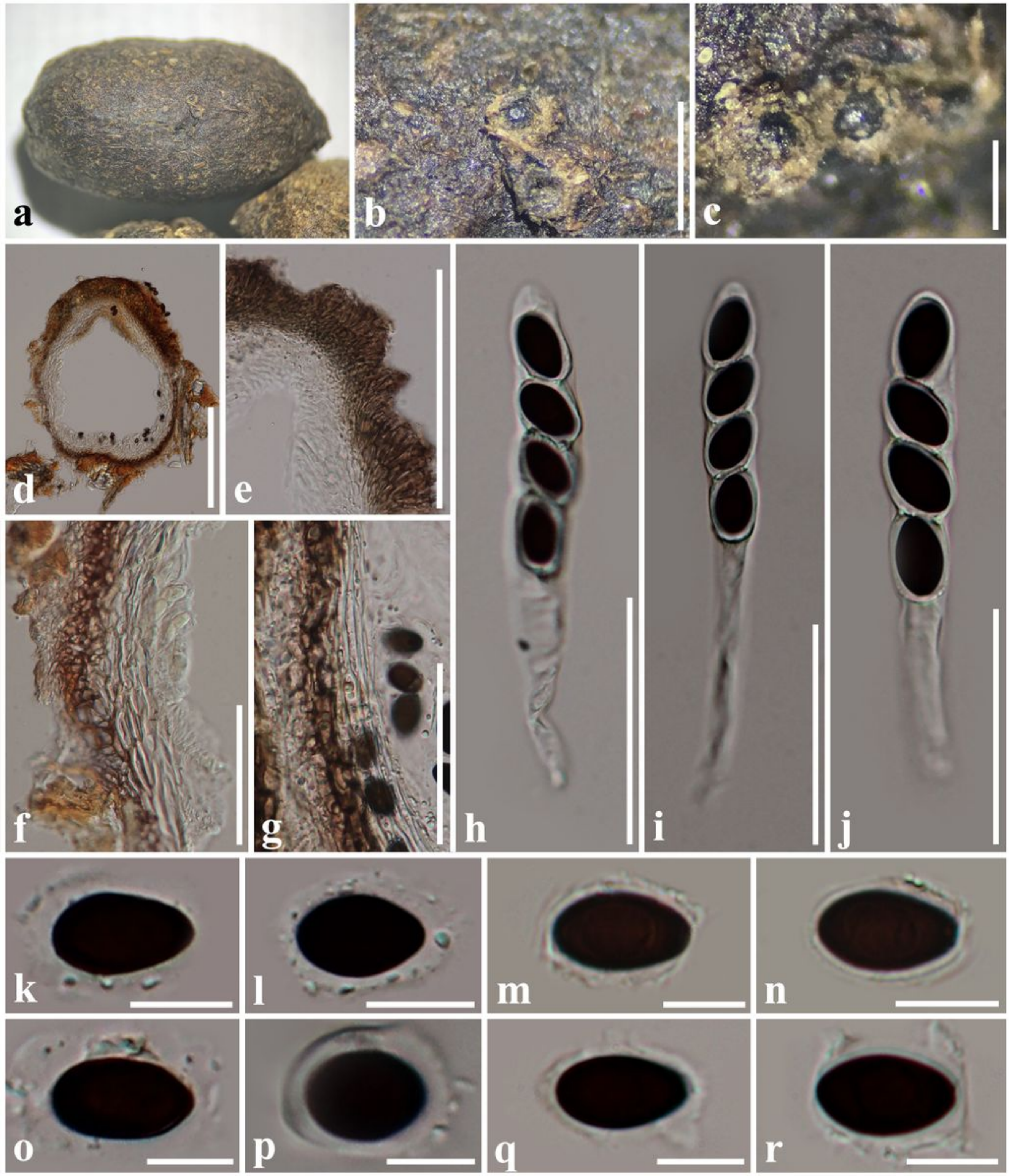


Figure 30

Fimetariella rabenhorstii: a–b, d, f, m–n, q–r (S-F66507, holotype); c, e, g–l, o–p (S-F66508, isotype). a Material b–c Ascomata on host. d Ascoma in cross section. e Ostiole with hyaline periphyses. f–g

Peridium. h–j Asci. k–r Ascospores. Scale bars: b–c = 500 μm, d = 200 μm, e–j = 50 μm, k–r = 10 μm.

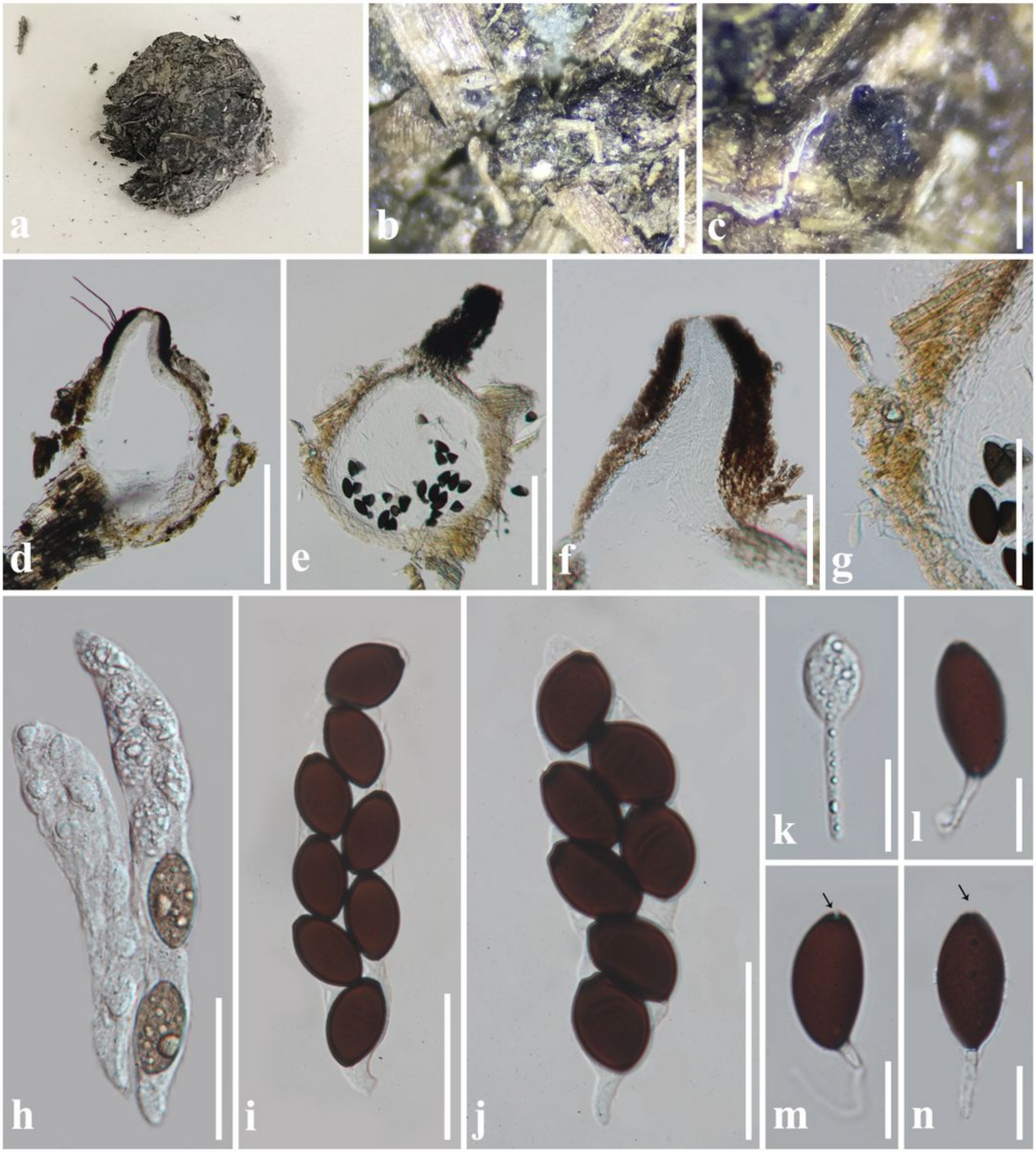


Figure 31

Anopodium ampullaceum: a–b, d, h, j–n (F 47944); c, e–g, i (F 66862). a Material. b–c Ascomata on host. d–e Ascoma in cross section. f Black neck in cross section. g Peridium. h–j Asci. k–n Ascospores (arrows show germ pores). Scale bars: b = 500 μm, c–e = 200 μm, f–g = 100 μm, h–j = 50 μm, k–n = 20 μm.

Figure 32

Lasiosphaeria ovina: a–b, e, o (S-F123316); h, j–k, n, p (S-F123318); c–d, f–g, i, l–m, q–r (S-F123375). a Material. b–c Ascomata on host. d Black papilla of ascoma. e Ascoma in cross section. f Peridium. g Paraphyses. h–k Asci. l–r Ascospores. Scale bars: b–c = 500 μm, d = 200 μm, e = 100 μm, f. h–k = 20 μm, g, l–r = 10 μm.

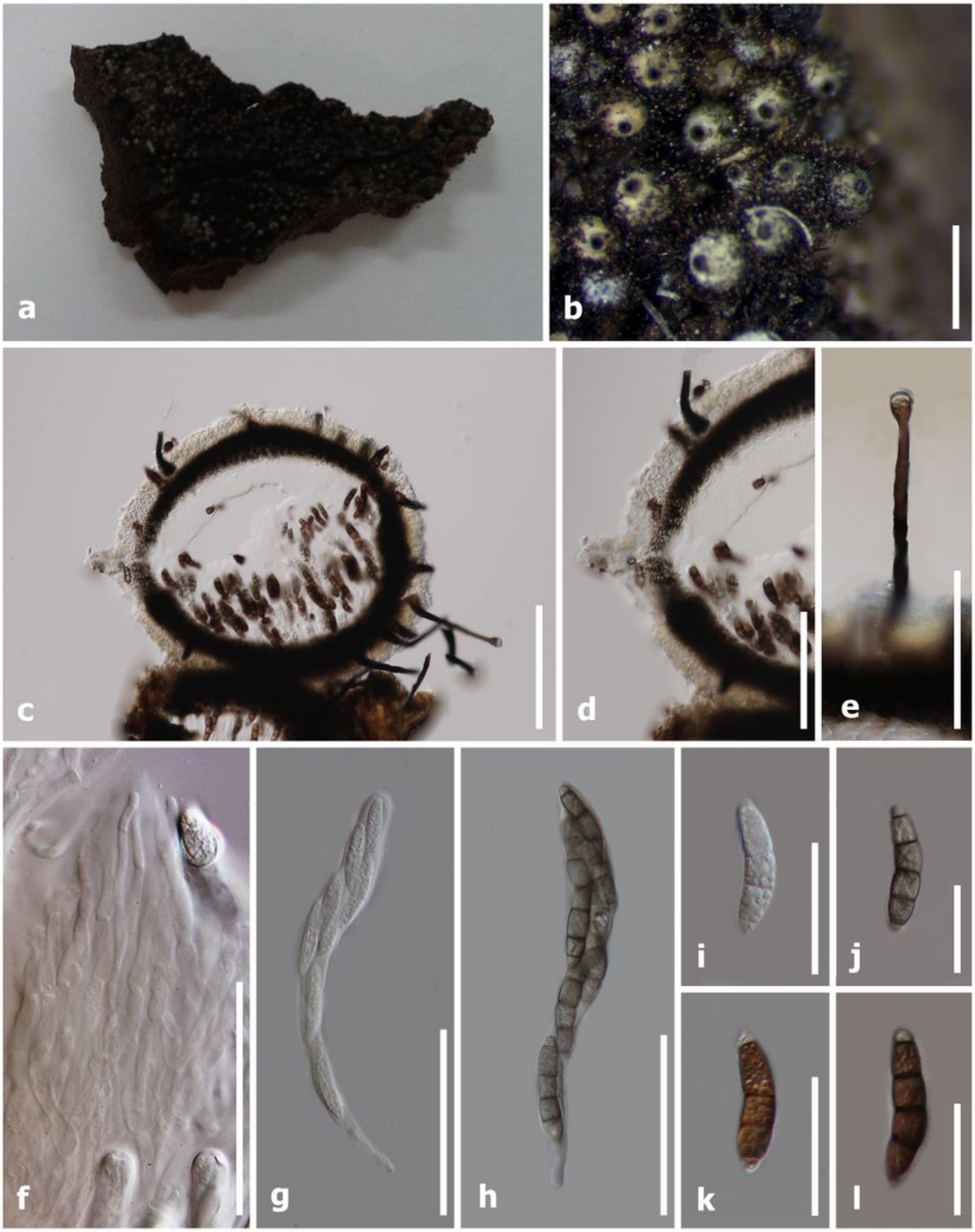


Figure 33

Lasiosphaeria rehmiana: (S-F6328, holotype). a Material. b. Ascomata. c. Ascoma in cross section. d. Peridium. e. Seta. f. Paraphyses. g–h. Asci. i–l. Ascospores. Scale bars: b = 500 μm, c = 100 μm, d–h = 50 μm, i–l = 20 μm.

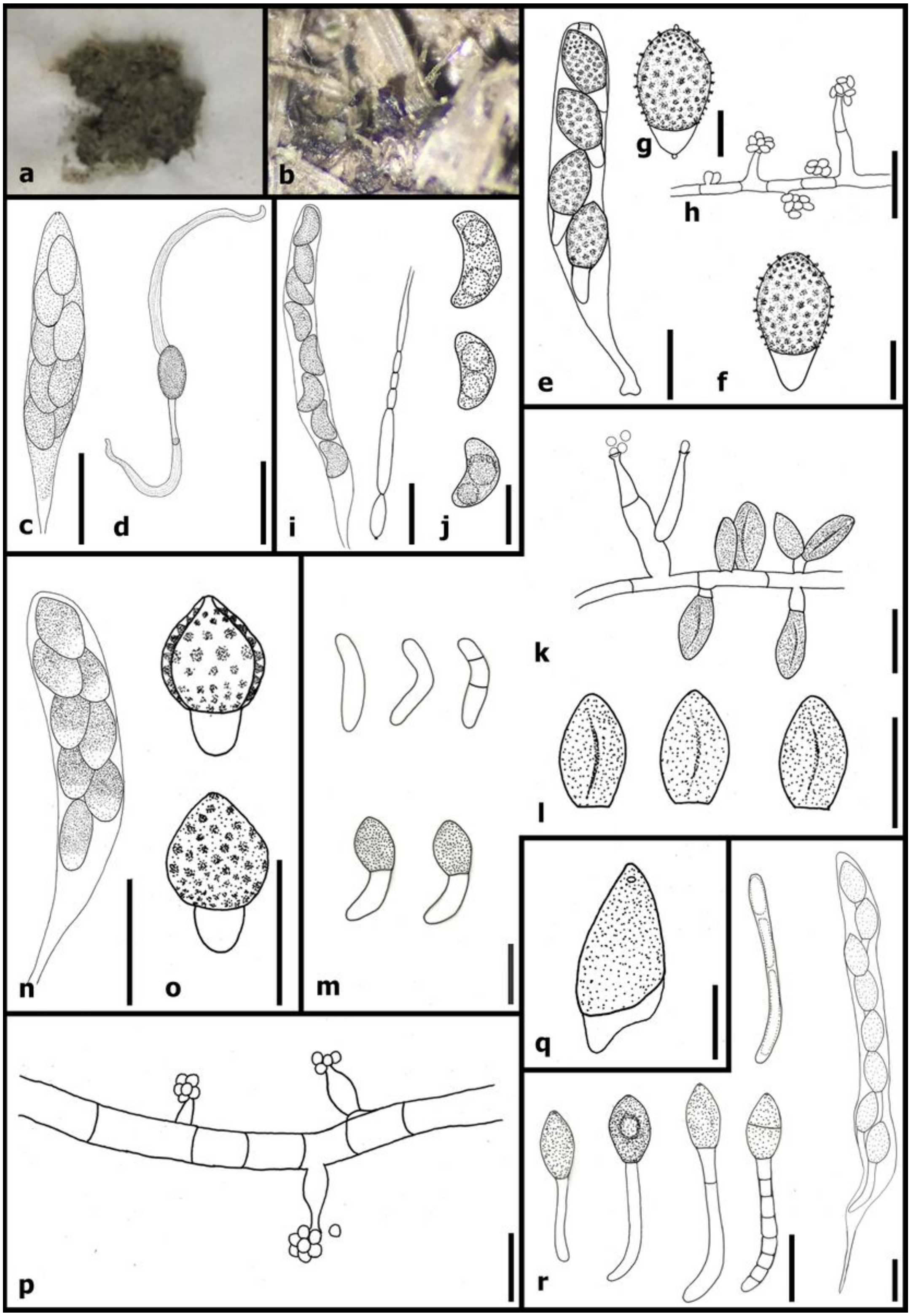


Figure 34

Podospora fimicola: a–b (S-F26041, lectotype); c–d (redrawn from Bell and Mahoney 1997, Doveri 2008). a Herbarium material. b Ascoma on host. c Ascus. d Ascospore; Triangularia verruculosa – as Apiosordaria verruculosa: e–f (redrawn from Jensen 1912). e Ascus. f Ascospore; Apiosordaria tetraspora: g–h (redrawn from Krug et al. 1983). g Ascospore. h Conidiophore and conidia; Bellojisia rhynchostoma: i–j (redrawn from Réblová 2008). i Ascus and paraphysis. j Ascospores; Mammaria echinobotryoides: k–m (redrawn from Hennebert 1968; del Valle Catania et al. 2011) k–l Conidiophore, Chlamydospores and conidia. m Ascospores; Rinaldiella pentagonospora: n–o (redrawn from Crous et al. 2014). n Ascus. o Ascospores; Cladorrhinum foecundissimum: p (redrawn from Hyde and Goh 1999). p Conidiophore and conidia; Triangularia bambusae: q (redrawn from Guarro and Cano 1988). q Ascospores; Tripterosporella coprophila: r (redrawn from Subramanian and Lodha 1968). r Ascus and ascospores. Scale bars: c–d = 100 μm, e. h–i. n. r = 20 μm, f–g. j–m. o–q = 10 μm.

Figure 35

Lasiosphaeris hispida: (F-SMH 3336). a Material label. b Material. c–d Ascomata on host. e Ascoma in cross section. f Peridium. g–j Asci. k–n Ascospores. Notes: Fig n soaked in Melzer's reagent. Scale bars: d = 500 μm, e = 200 μm, f–j = 100 μm, k–n = 20 μm.

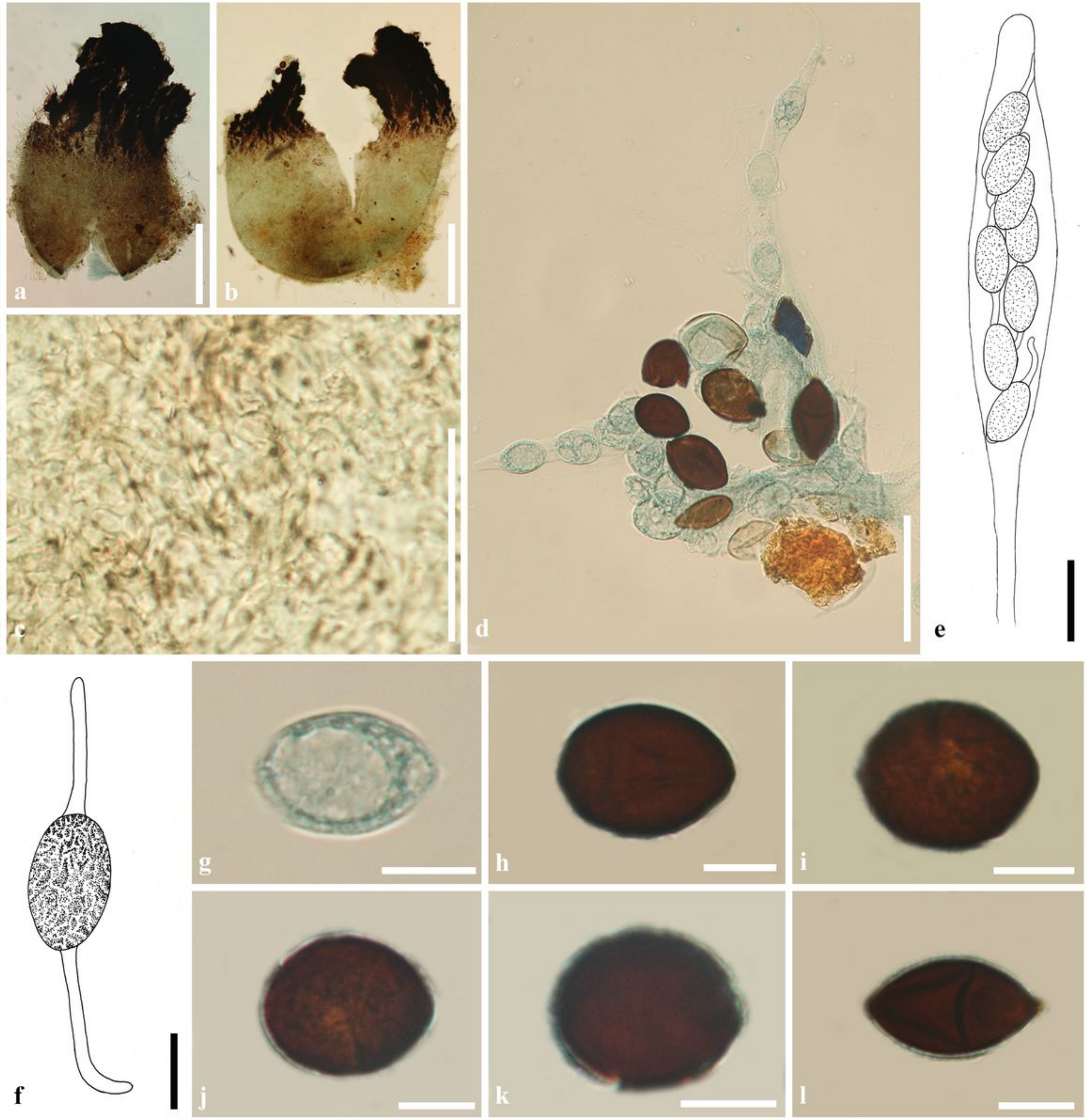


Figure 36

Cladorrhinum olerum–as Arnium olerum: a (UPS-UPS:BOT:F-125924); b–d g–l (UPS-UPS:BOT:F-125925); e–f (redrawn from Kruys et al. 2014). a–b Squashed ascomata c Peridium. d–e Asci. f–l Ascospores.

Notes: a–d, g–l from permanent mount. Scale bars: a–b = 500 μm, d = 100 μm, c. e = 50 μm, f–l = 20 μm.

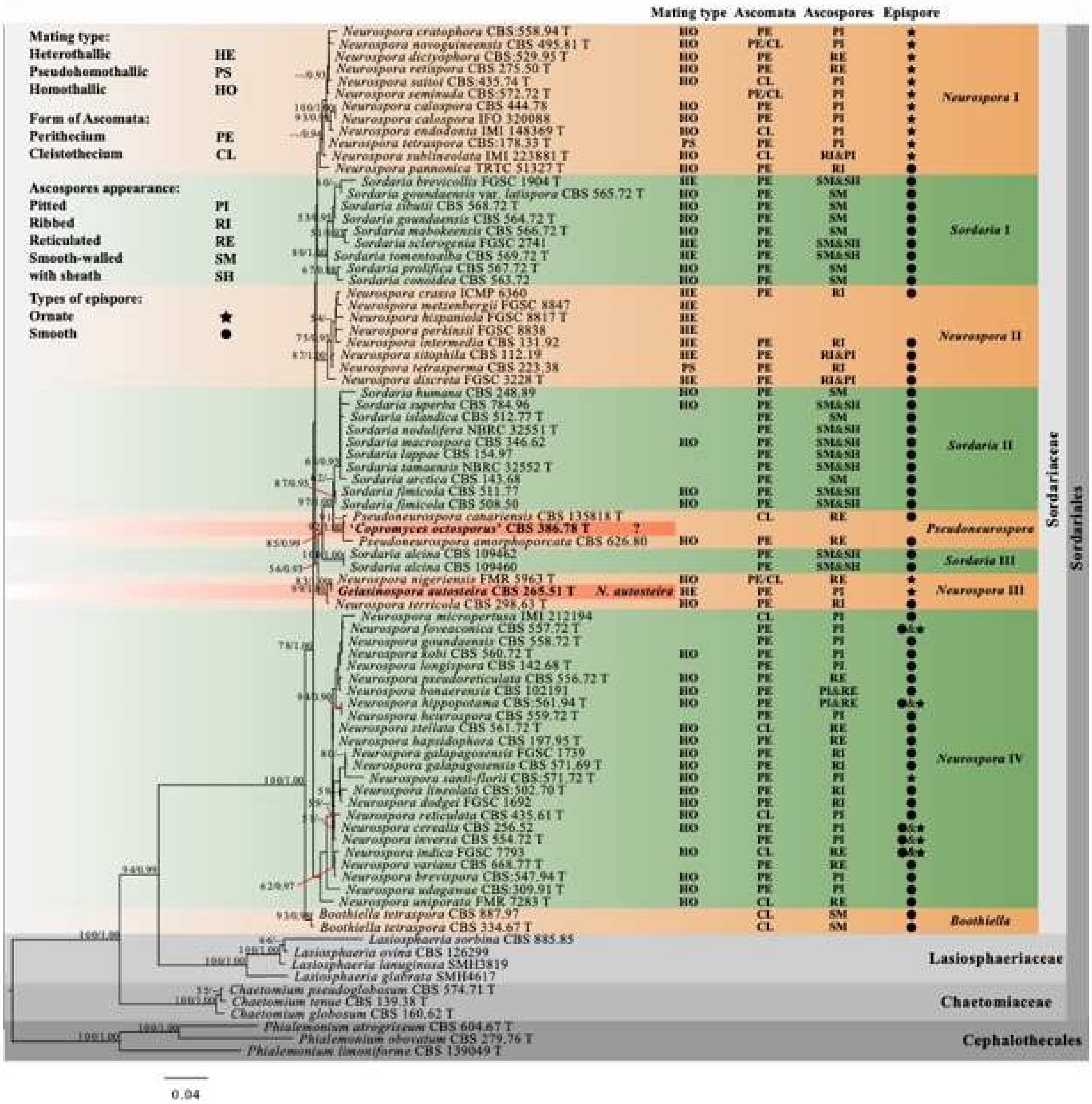


Figure 37

Phylogram generated from maximum likelihood analysis based on combined LSU, ITS and TUB sequence data with the confidence values of bootstrap (BS) proportions from the Maximum Likelihood (ML) analysis (ML-BS > 50%, before the backslash) and the posterior probabilities (PP) from the Bayesian (BY) analysis (BY-PP > 0.90, after the backslash) above corresponding nodes. The '–' indicates lack of statistical support (< 50% for ML-BS and < 0.90 for BY-PP). Related sequences were referred to Cai et al. (2006b), Wang et al. (2019) and Vu et al. (2019). Eighty-four strains are included in the combined analyses which comprise 1909 characters (862 characters for LSU, 583 characters for ITS, 464 characters for TUB) after alignment. Strains of Cephalothecales are used as the outgroup taxa. The model of each partitioned gene is GTR+I+G. The best score in IQ-TREE explores with a final likelihood value of -9569.3117 is presented. Sequences generated indicated in bold. Strain numbers are noted after the species names and ex-type strains marked with 'T' after the culture number. Some important characters of Sordariaceae species treated in this study are illustrated at the right side of the tree. Alignments are available at TreeBASE (URL: http://purl.org/phylo/treebase/phylows/study/TB2:S27420).

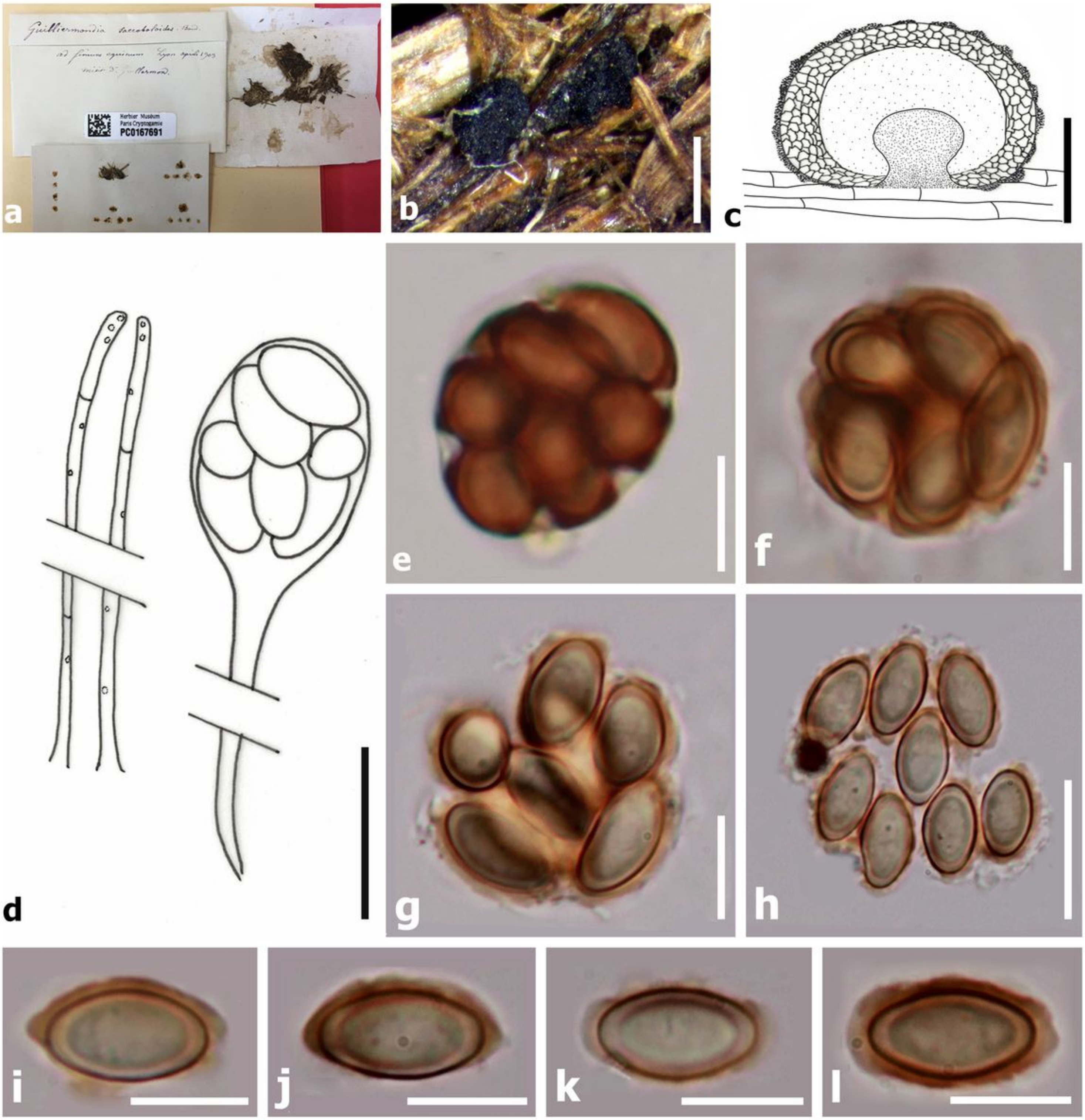


Figure 38

Guilliermondia saccoboloides: a–b, e–l (PC-MNHN-PC-PC0167691, holotype); c–d (redrawn from Boudier 1904). a Label and material. b Ascomata. c Vertical view of ascoma. d Ascus and paraphyses. e–h Asci (pedicel evanescent). i–l Ascospores. Scale bars: b = 500 µm, c = 200 µm, d. h = 20 µm, e–l = 10 µm.

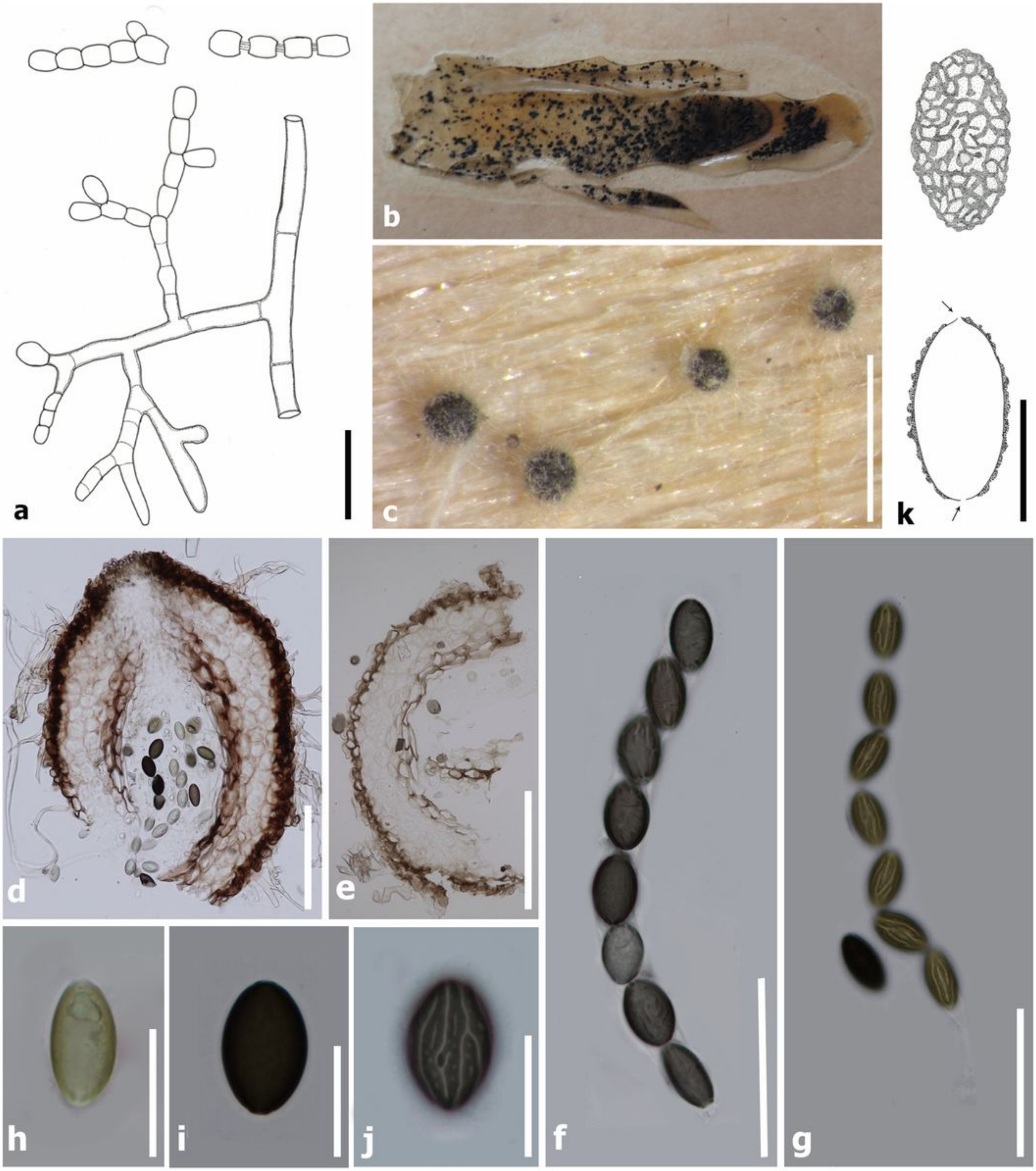
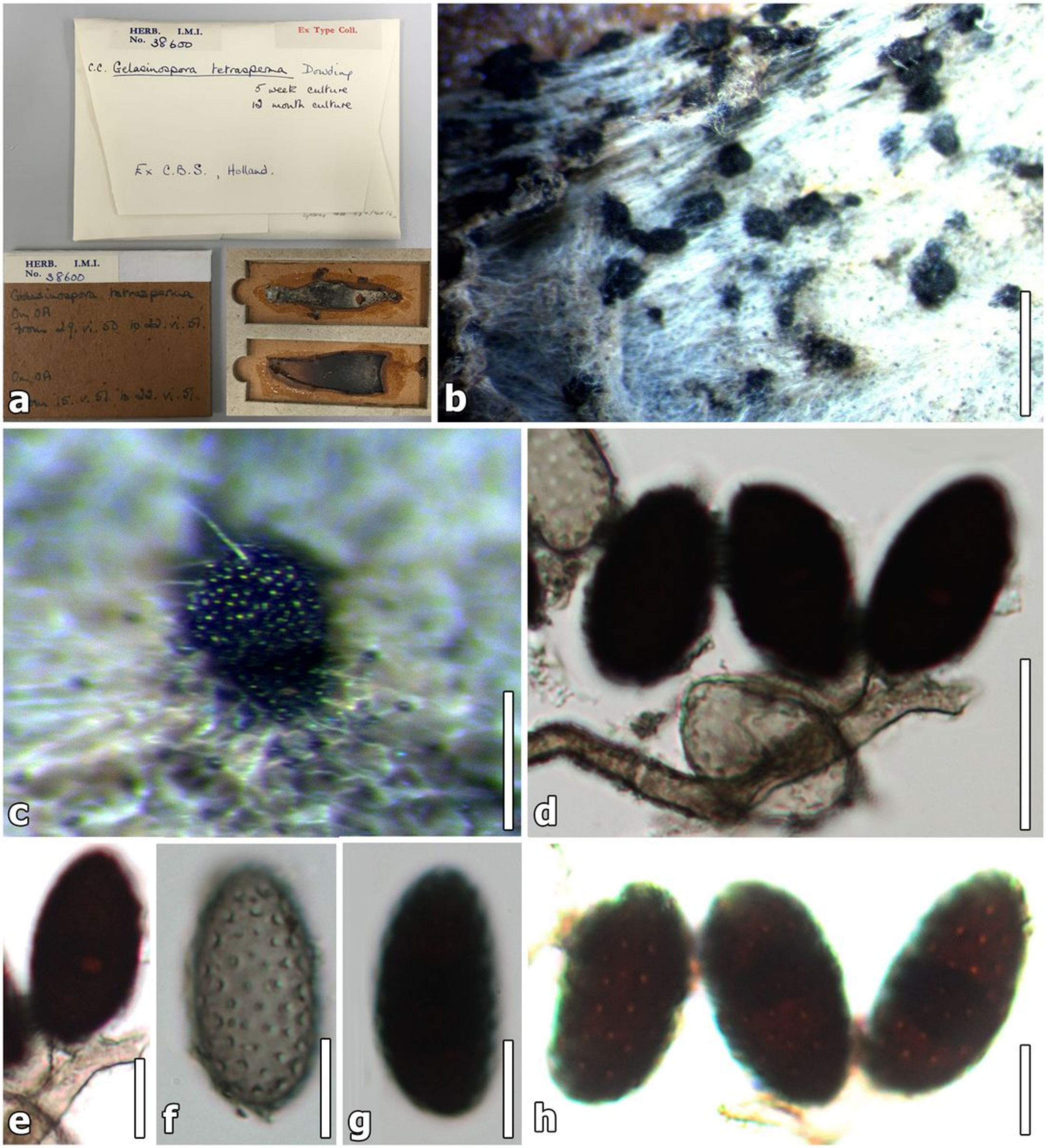


Figure 39

Neurospora sitophila: a (redrawn from Shear and Dodge 1927); b–j (BPI-630404, from ex-type). a Conidiogenous cells with conidia. b Culture. c Ascomata. d Vertical section of ascoma. e Peridium. f–g Asci (evanescent). h–j Ascospores; Pseudoneurospora amorphoporcata: k (redrawn from Udagawa 1980). k Ascospores. Scale bars: c = 1 mm, d–e = 100 µm, f–g = 50 µm, a. h–k = 20 µm.



HERB. I.M.I.
No. 38600

Ex Type Coll.

C.C. Gelasinospora tetrasperma Dowding
5 week culture
12 month culture

Ex C.B.S., Holland.

HERB. I.M.I.
No. 38600

Gelasinospora tetrasperma
On OA
from 29. vi. 50 to 22. vi. 51.

On OA
from 15. vi. 51 to 22. vi. 51.

Figure 40

Neurospora tetraspora (IMI-38600, from ex-type). a Herbarium label. b Scattered group of spores on mycelium. c Group of conidia. d–h Conidia (f showing pits, h showing guttules). Scale bars: b = 1 mm, c = 200 μm, d = 20 μm, e–h = 10 μm.

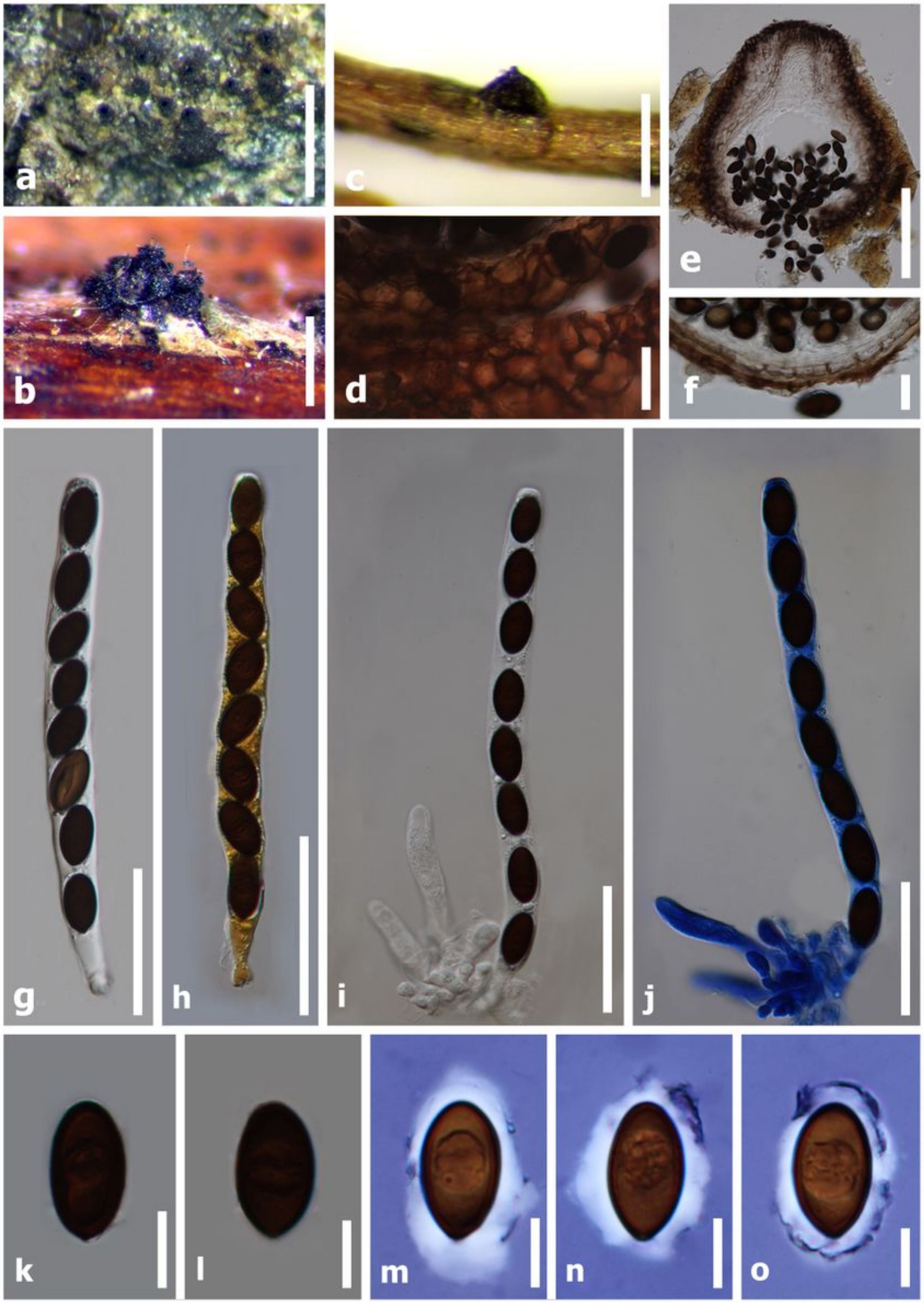


Figure 41

Sordaria fimicola: a, e, g, m–o (S-F6841); c, k (S-F6838); b, d, f, h–j, l (BPI-580866). a–c Ascomata on various hosts. d Peridium crushed. e Vertical section of ascoma. f Peridium. g–j Immature to mature asci (h in Melzer's reagent, j in cotton blue). k–o Ascospores (m–o in Indian ink). Scale bars: a–b = 500 μm, c = 200 μm, e = 100 μm, g–j = 50 μm, d. f = 20 μm, k–o = 10 μm.

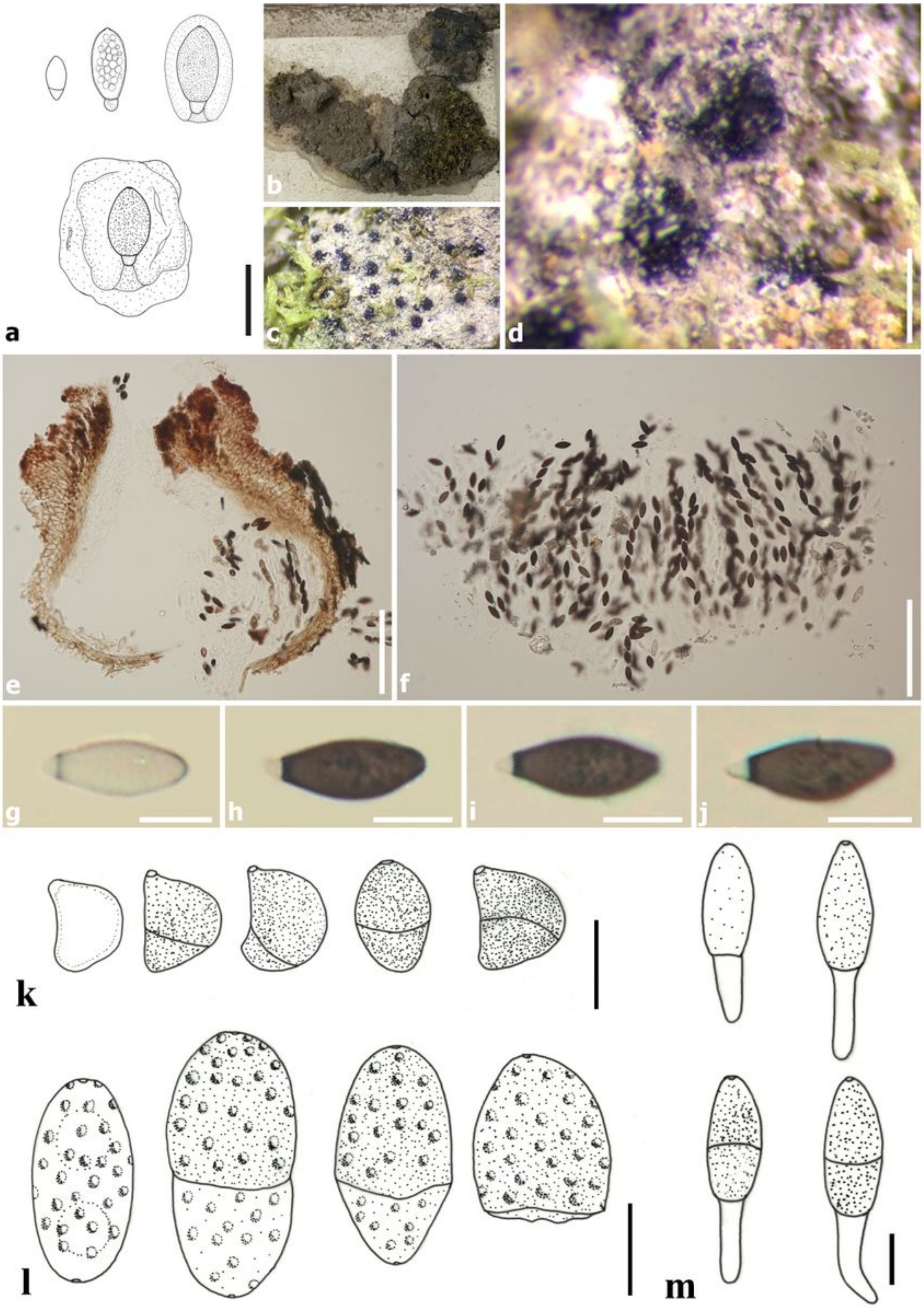


Figure 42

Strattonia zopfii: a (redrawn from Lundqvist 1972). a Immature to mature ascospores surrounded by gelatinous sheath but invaginated at the pedicel; Jugulospora minor: b–j (UPS-UPS:BOT:F-117927, holotype). b Material. c Ascomata on host. d Ascomata e Ascoma in cross section. f Asci. g–j Ascospore; Corylomyces selenospora: k (redrawn from Stchigel et al. 2006). k Ascospores; Diplogelasinospora princeps: l (redrawn from Cain 1961). l Ascospores; Zopfiella tabulata: m (redrawn from Winter 1884). m Ascospores. Scale bars: d = 200 μm, e–f = 100 μm, a = 50 μm, g–m = 10 μm.

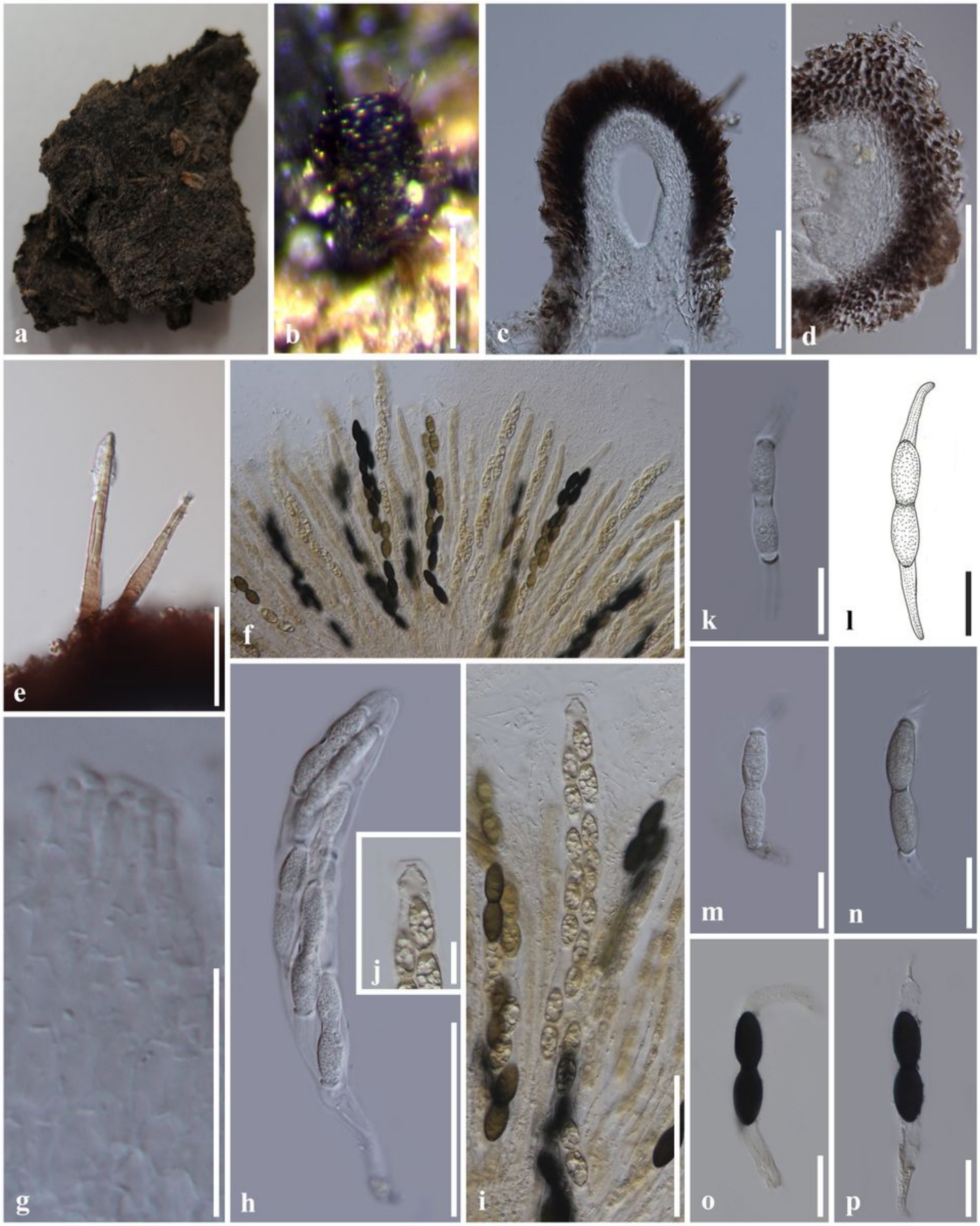


Figure 43

Zygospermella insignis: a–k, m–p (BPI-618905); l (redrawn from Cain 1934). a Material. b Ascoma semi-immersed on host. c Vertical section of the neck. d Peridium. e Setae. f Asci with paraphyses. g

Paraphyses. h–i Asci. j Apical ring of ascus. k–p Ascospores. Notes: f. i–j from permanent mount. Scale bars: b = 500 μm, f = 100 μm, c–d, h–i = 50 μm, e, g, k–p = 20 μm, j = 10 μm.

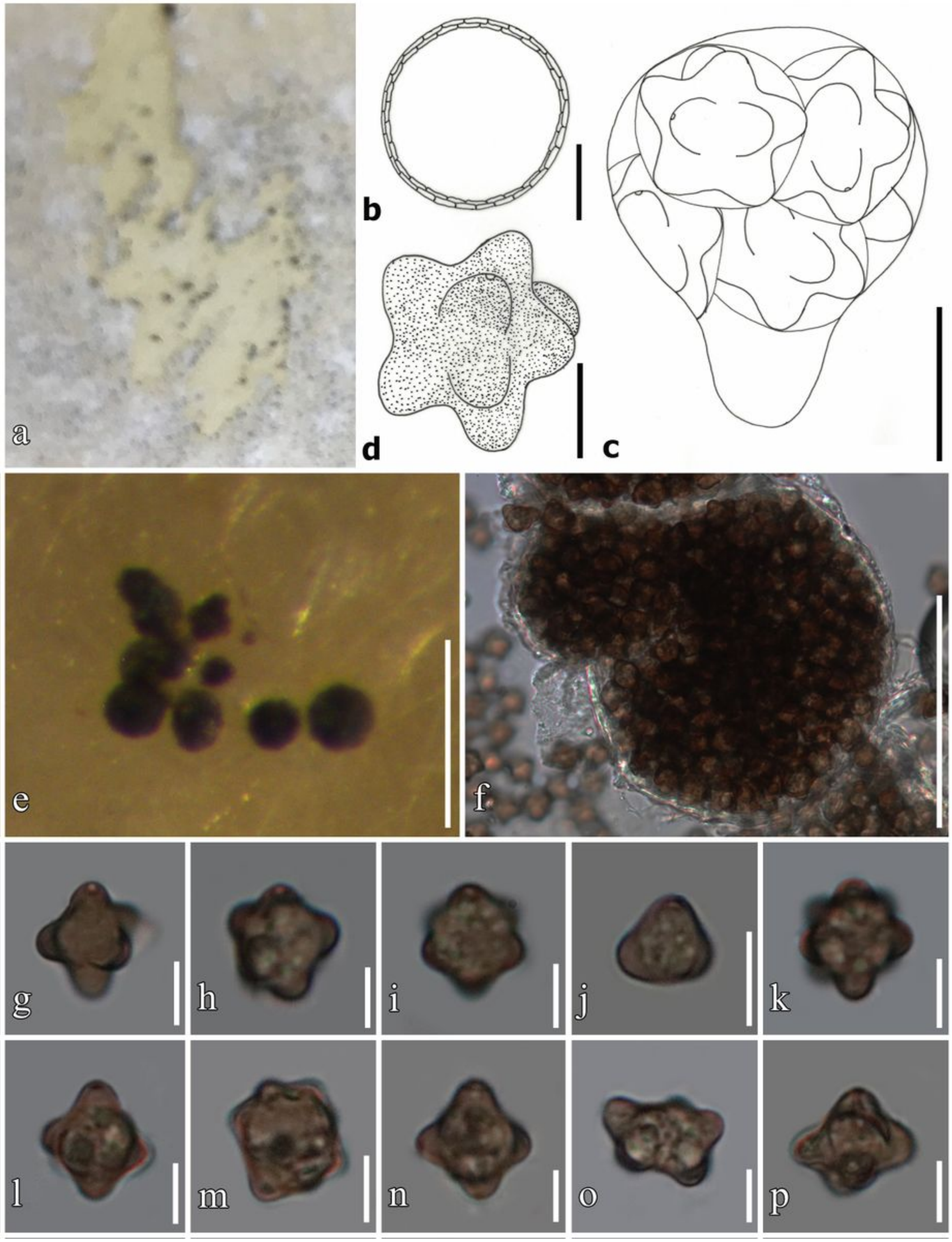


Figure 44

Stellatospora terricola: a, e–p (NBRC-IFO-H-12166, holotype); b–d (redrawn from Ito and Nakagiri 1994). a Dry culture. b Ascoma in cross section. c Ascus. e Ascomata with mycelium. f Squashed ascoma. d, g–p Ascospores. Scale bars: e = 200 μm, f = 100 μm, b = 50 μm, c. g–p = 10 μm, d = 5 μm.

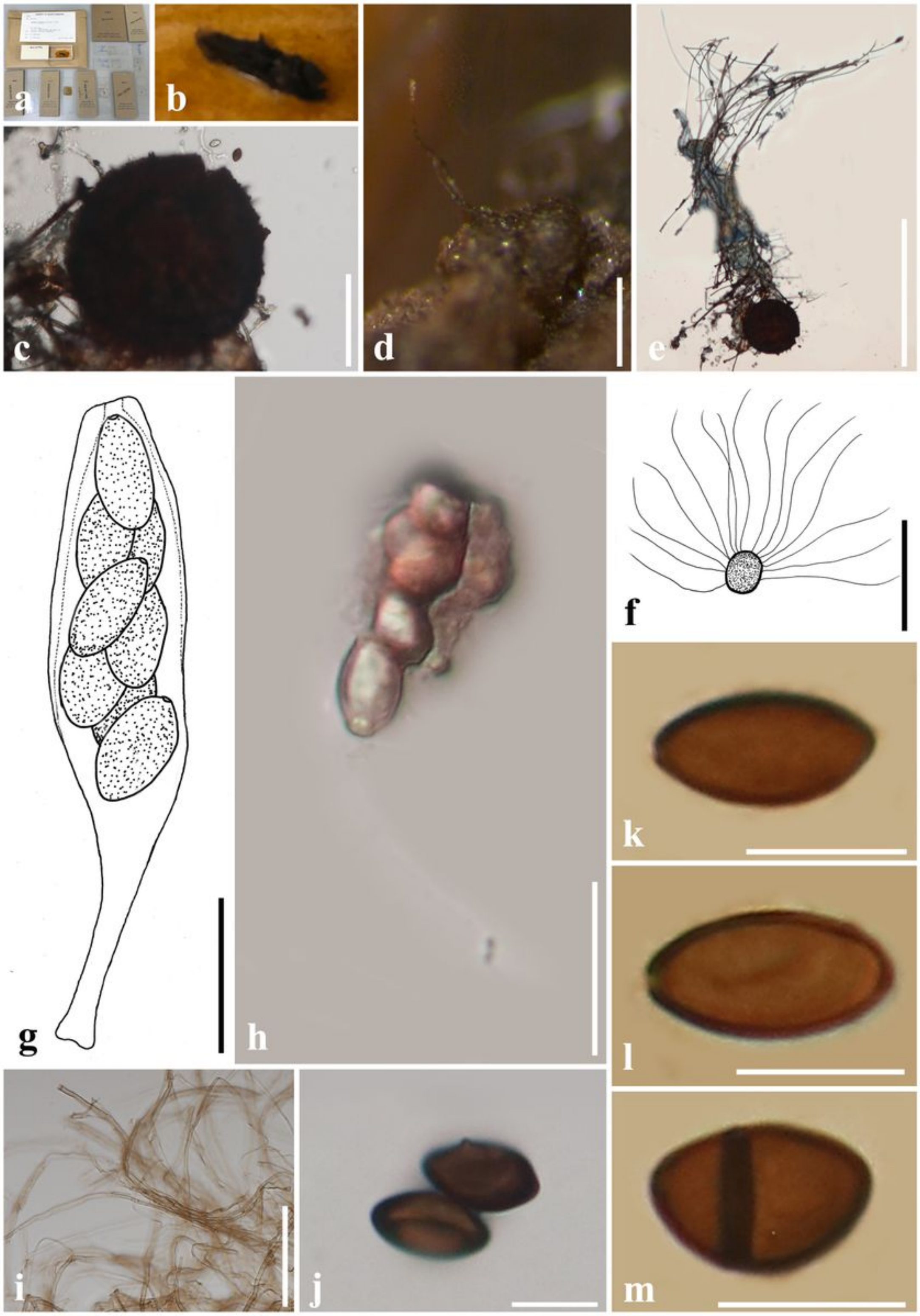
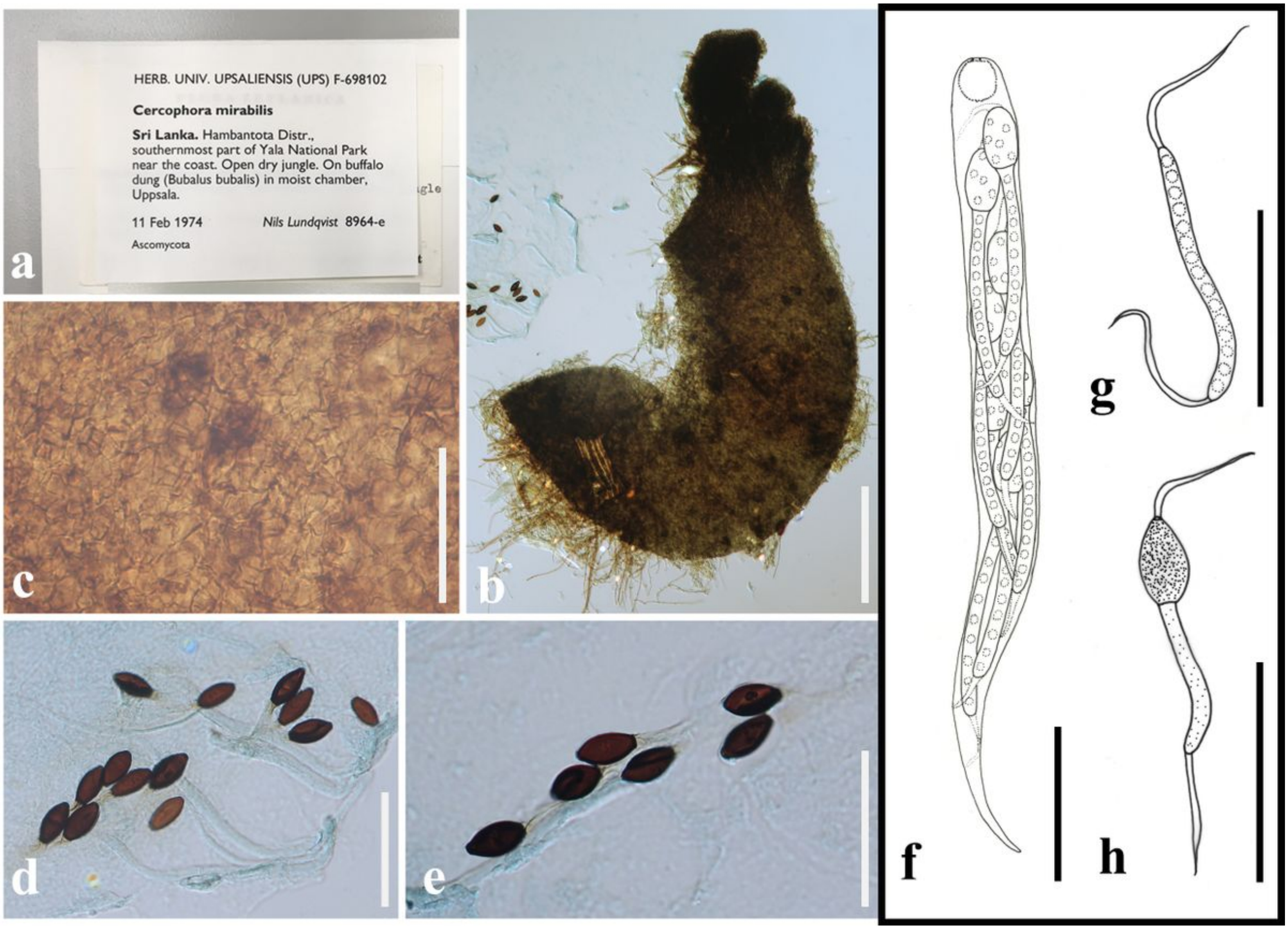


Figure 45

Apodus deciduus: a–e. h–m (TRTC-045704 holotype); f–g (redrawn from Malloch and Cain 1970). a Material label. b Material. c Squashed ascoma. d Ascoma on host. e–f Ascoma with long hairs. g–h Asci. i Mycelium. j–m Ascospores. Scale bars: e–f = 500 μm, d = 200 μm, c, i = 100 μm, g–h = 20 μm, j–m = 10 μm.



HERB. UNIV. UPSALIENSIS (UPS) F-698102

Cercophora mirabilis

Sri Lanka. Hambantota Distr., southernmost part of Yala National Park near the coast. Open dry jungle. On buffalo dung (Bubalus bubalis) in moist chamber, Uppsala.

11 Feb 1974 *Nils Lundqvist* 8964-e

Ascomycota

Figure 46

Cercophora mirabilis: a–e (UPS-UPS:BOT:F-698102); f–i (redrawn from Lundqvist 1972). a Material label. b Ascoma. c Crushed peridium. d–e Ascospores with elongate pedicel. f Ascus. g–h Ascospores becoming maturity. Scale bars: b = 200 μm, c–h = 50 μm.

THE FIELD MUSEUM OF NATURAL HISTORY (F)
Fungi

Immersiella immersa (P. Karst.) A. N. Mill. &
Huhndorf

U.S.A. Wisconsin. 45°0.00'N, 90°0.00'W. On branch. Wood.

Coll. by: S. M. Huhndorf
Coll. date:09 Jun 1999
Coll. No.: SMH 4104

The Field Museum (F)
C0353074F

4104

Figure 47

Immersiella immersa (F-SMH 4104). a Material label. b–c Ascomata on host. d Ascoma in cross section. e Setae. f Asci and paraphyses. g–h, n Asci. i–k Ascospores. l–m Germinated ascospores. Scale bars: c= 500 μm, d = 200 μm, e–f = 100 μm, g–h. n = 50 μm, i–m = 20 μm.

Figure 48

Jugulospora rotula: (NY-01050505, Isolectotype). a Material. b Ascomata on host. c Ascoma in cross section. d. Peridium. e–i Asci (h. apical ring). j–q Ascospores. Scale bars: b = 200 µm, c. e = 100 µm, d. f–g. i = 50 µm, j–q = 10 µm.

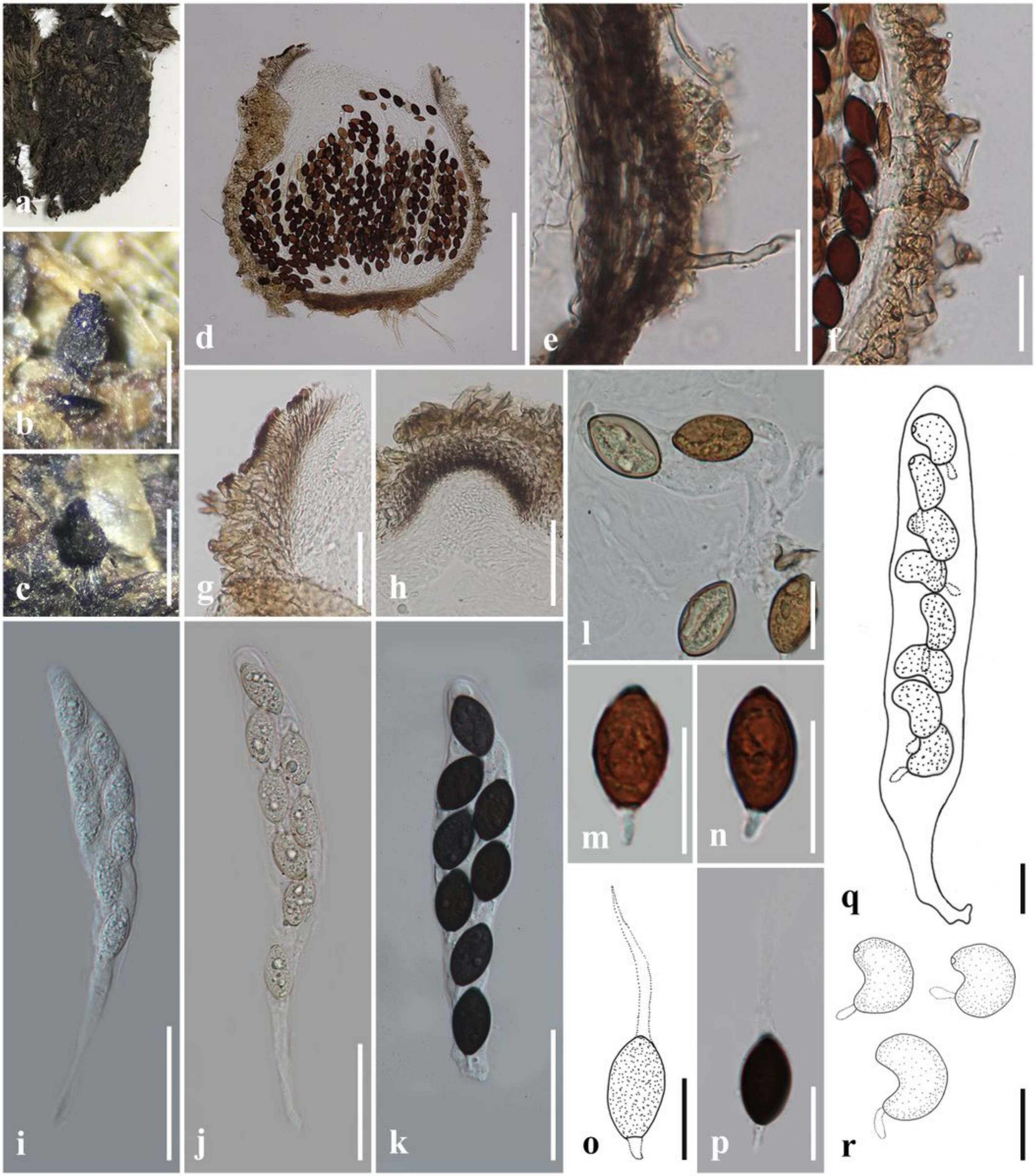


Figure 49

Neoschizothecium conicum: a–b, e, h–l, p (F124745); c–d, f–g, m–n (S-F124742); o (redrawn from Fuckel 1870). a Material. b–c Ascoma on host. d Ascoma in cross section. e–f Peridium. g–h Wall structure around ostiole with periphyses. i–k Asci. l–p Ascospores; Neoschizothecium curvisporum: q–r (redrawn from Cain 1948). q Asci. r Ascospores Scale bars: b–c = 500 μm, d = 200 μm, h–k = 50 μm, e–g. l–p = 20 μm, q–r = 10 μm.

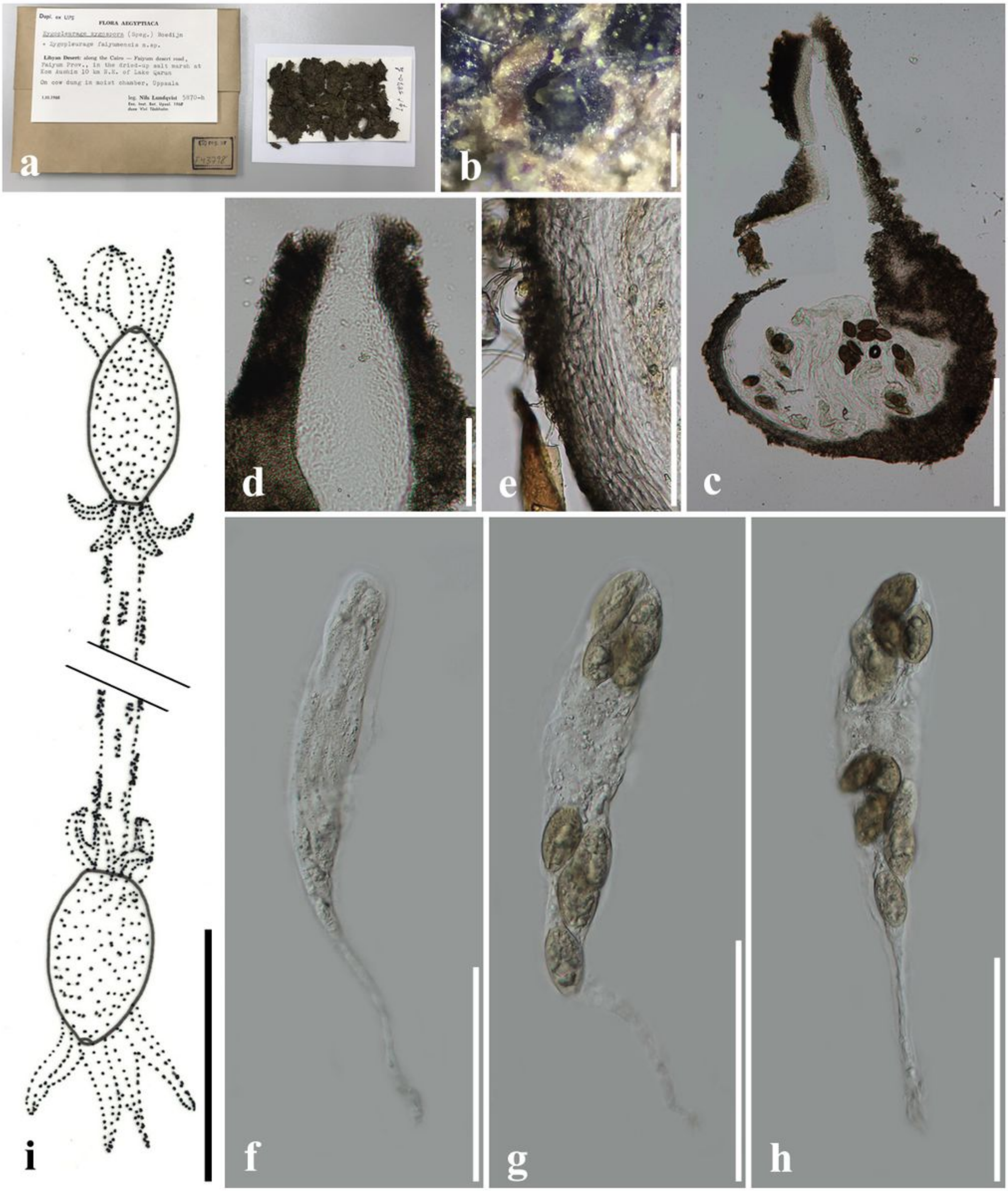


Figure 50

Zygopleurage zygospora: a–h (S-F43798); i (redrawn from Lundqvist 1969). a Material label. b Ascoma on host. c Ascoma in cross section. d Neck with periphyses. e Peridium. f–h Asci. i Ascospores. Scale bars: b = 500 μm, c = 200 μm, d. f–h = 100 μm, e. i = 50 μm.

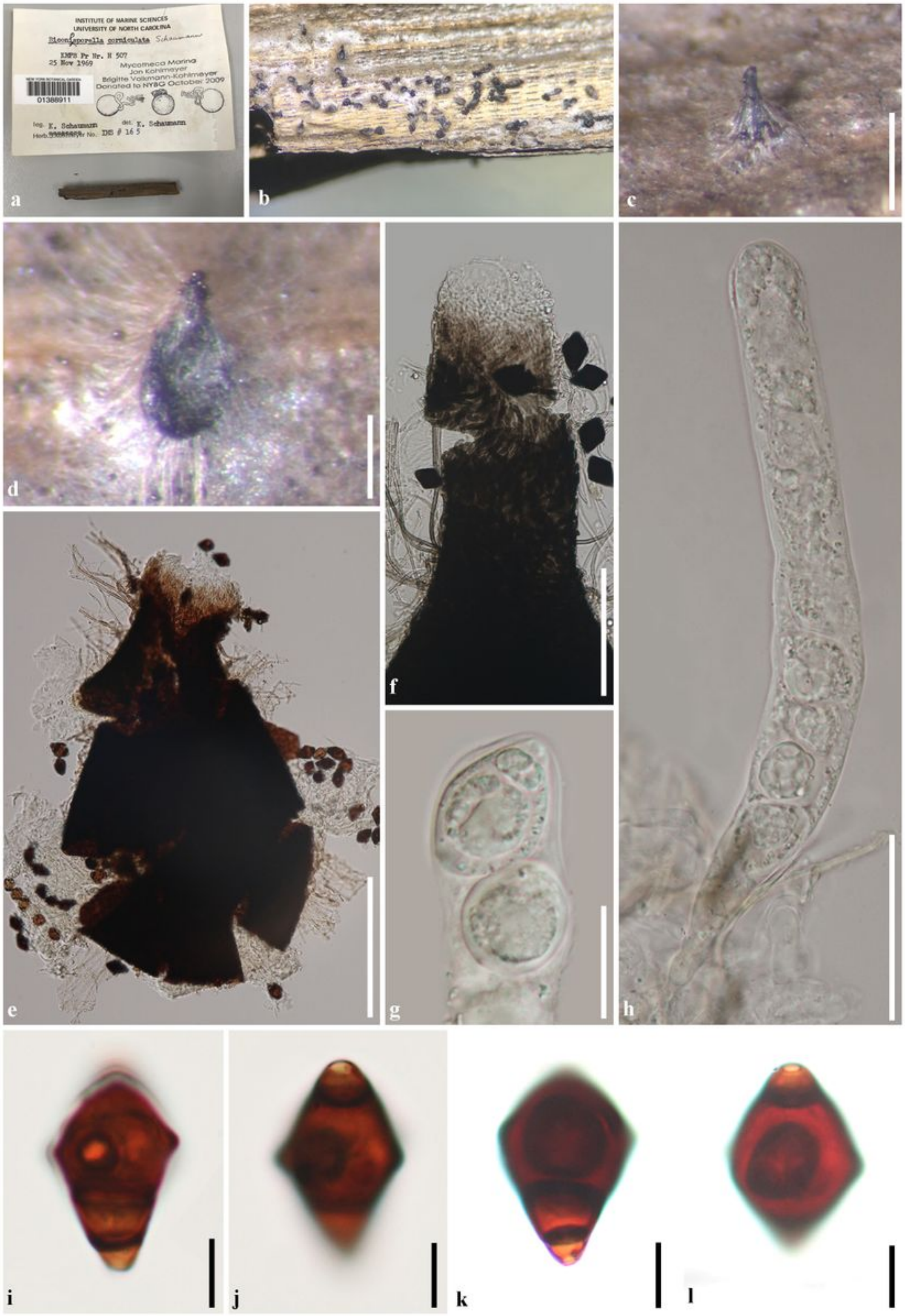


Figure 51

Biconiosporella corniculata (NY-01388911, holotype). a Material label. b Scattered ascomata. c Ascoma on host. d Collapsing ascoma. e Squashed ascoma. f Ostiole. g Apex of ascus. h Ascus (immature). i–l Ascospores. Scale bars: c = 500 µm, d–e = 200 µm, f = 100 µm, h = 50 µm, g = 20 µm, i–l = 10 µm.

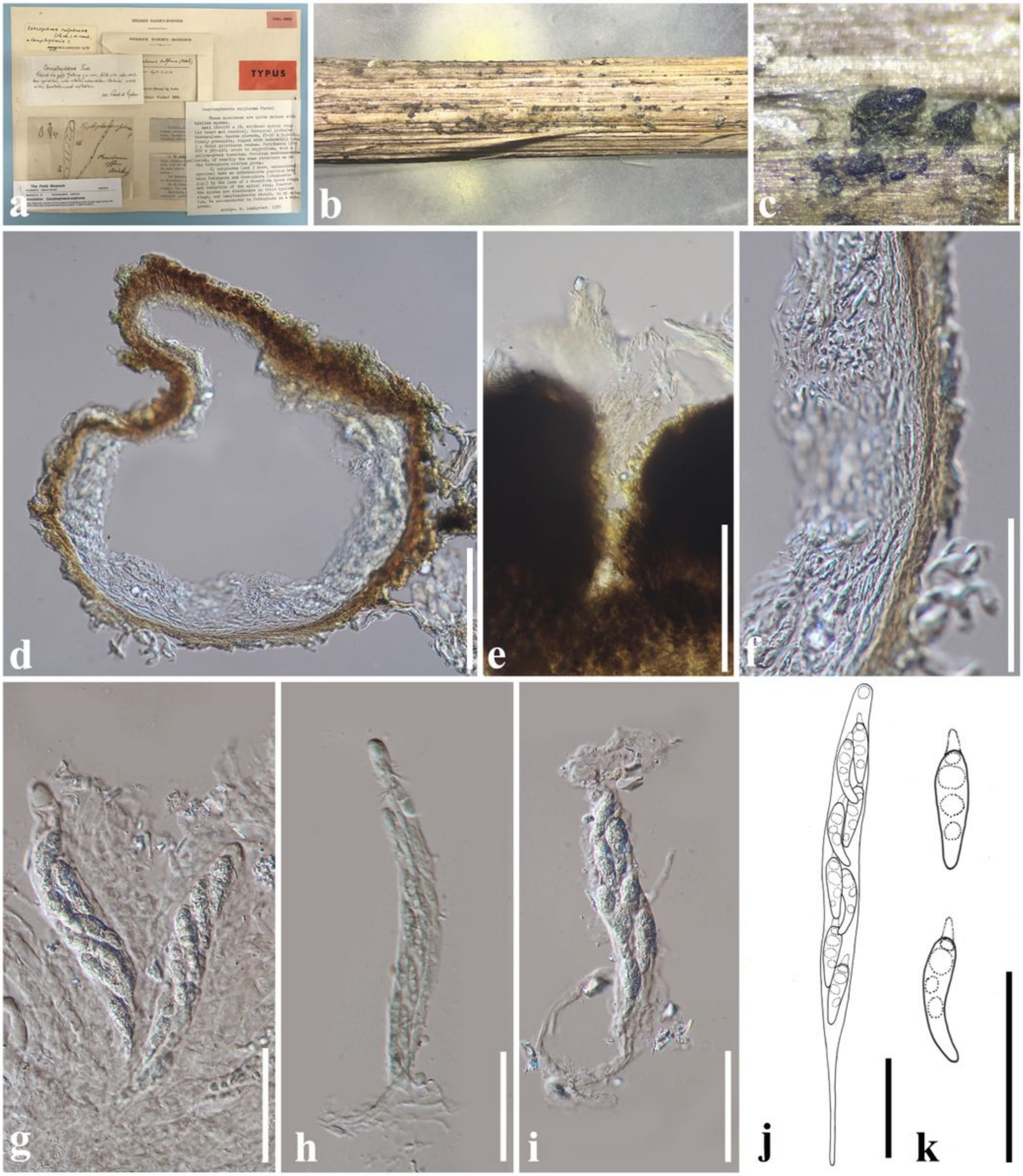


Figure 52

Camptosphaeria sulphurea: a–i (G-318793/1, holotype); j–k (redrawn from Fuckel 1870 and Lundqvist 1972). a Material label. b Material. c Ascomata on host. d Ascoma in cross section. e Crushed papilla with periphyses. f Peridium. g–j Asci. k Ascospores. Scale bars: d = 200 μm, e = 100 μm, f–k = 50 μm.

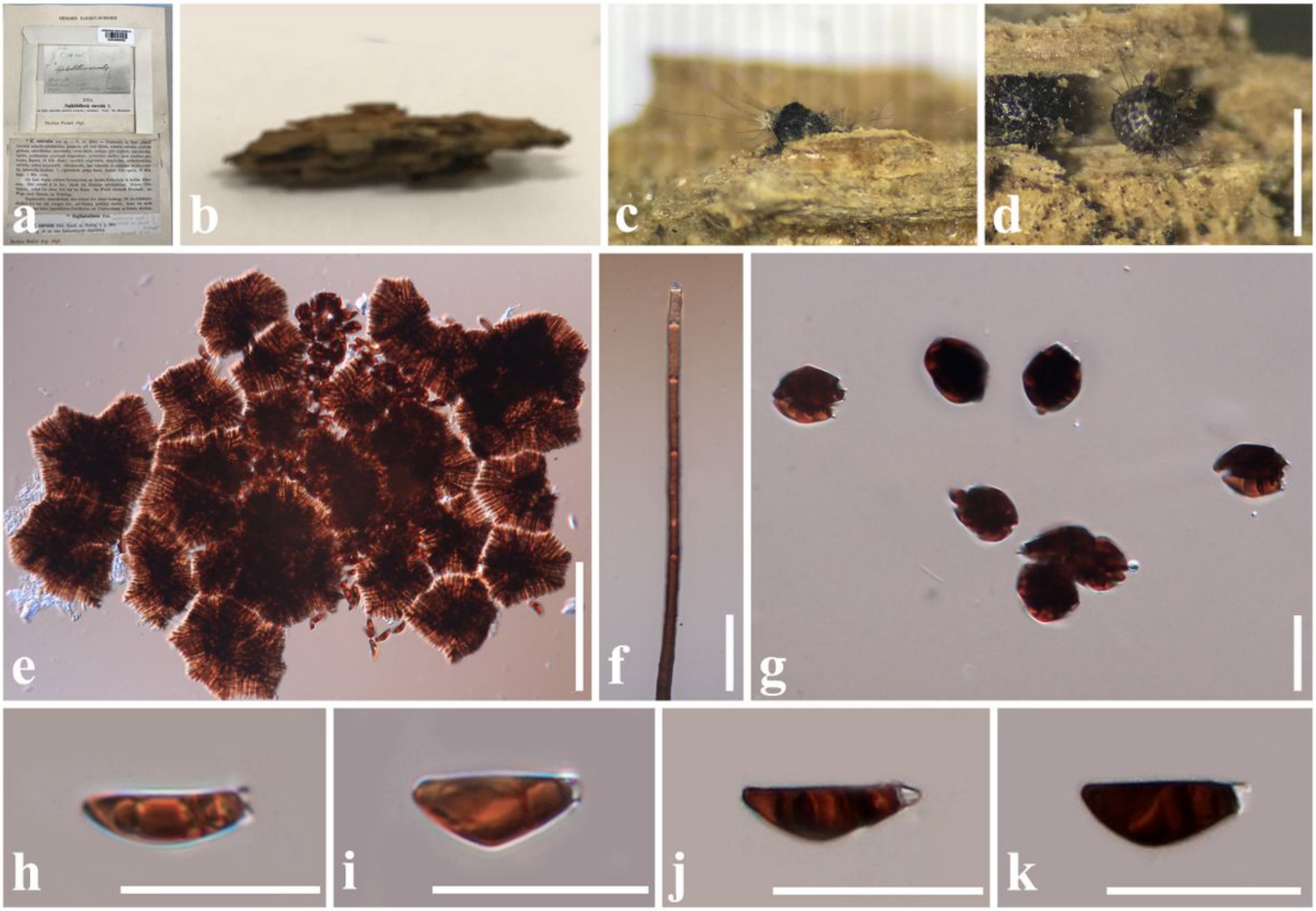


Figure 53

Diffractella curvata: (G-352276/1, holotype). a Material label. b Material. c Ascoma on host. d Ascoma surrounded by long setae. e Crushed ascoma. f Septate seta. g Asci. h–k Ascospores stained in KOH. Scale bars: d = 500 μm, e = 100 μm, f = 50 μm, g–k = 20 μm.

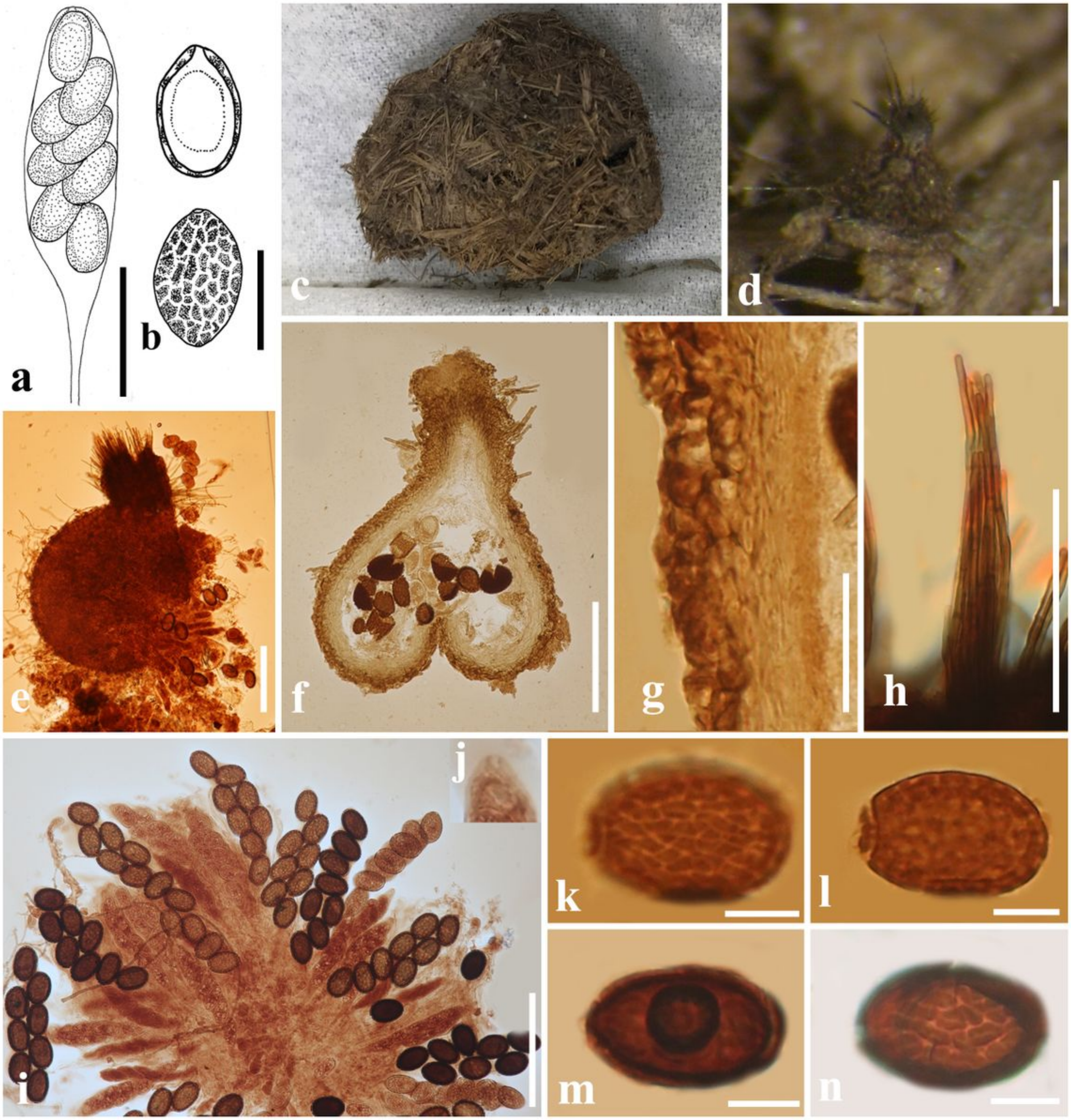


Figure 54

Emblemospora monotrema: a–b (redrawn from Jeng and Krug 1976); c–n (TRTC-175786, holotype). a, i Asci. b, k–n Ascospores. c Material. d Ascoma on host. e Squashed ascoma f Ascoma in cross section. g Peridium. h Setae at the neck. j Apical structure in ascus. Scale bars: d = 500 μm, e = 200 μm, f. i = 100 μm, a. h = 50 μm, b = 20 μm, k–n = 10 μm.

The New York Botanical Garden
[illegible] OF MAINE, U.S.A.
FUNGI

Eosphaeria uliginosa (Fr.) Höhnel

on soil

Hancock County: Township of 728MD, Lead Mountain (Humpback), along road near parking area, 44°51'28"N, 68°05'52"W; beech-maple forest.

2 September 2014

Richard C. Harris 60578

01818643

Figure 55

Eosphaeria uliginosa: a–f, h–m (NY-01818643); g (redrawn from von Höhnel 1917). a Material label. b Material. c Ascomata on host. d Ascoma in cross section. e Peridium. f Asci with paraphyses. g Ascus. h–m Ascospores. Scale bars: c = 1 mm, d = 200 μm, e–f = 100 μm, g = 50 μm, h–m = 20 μm.

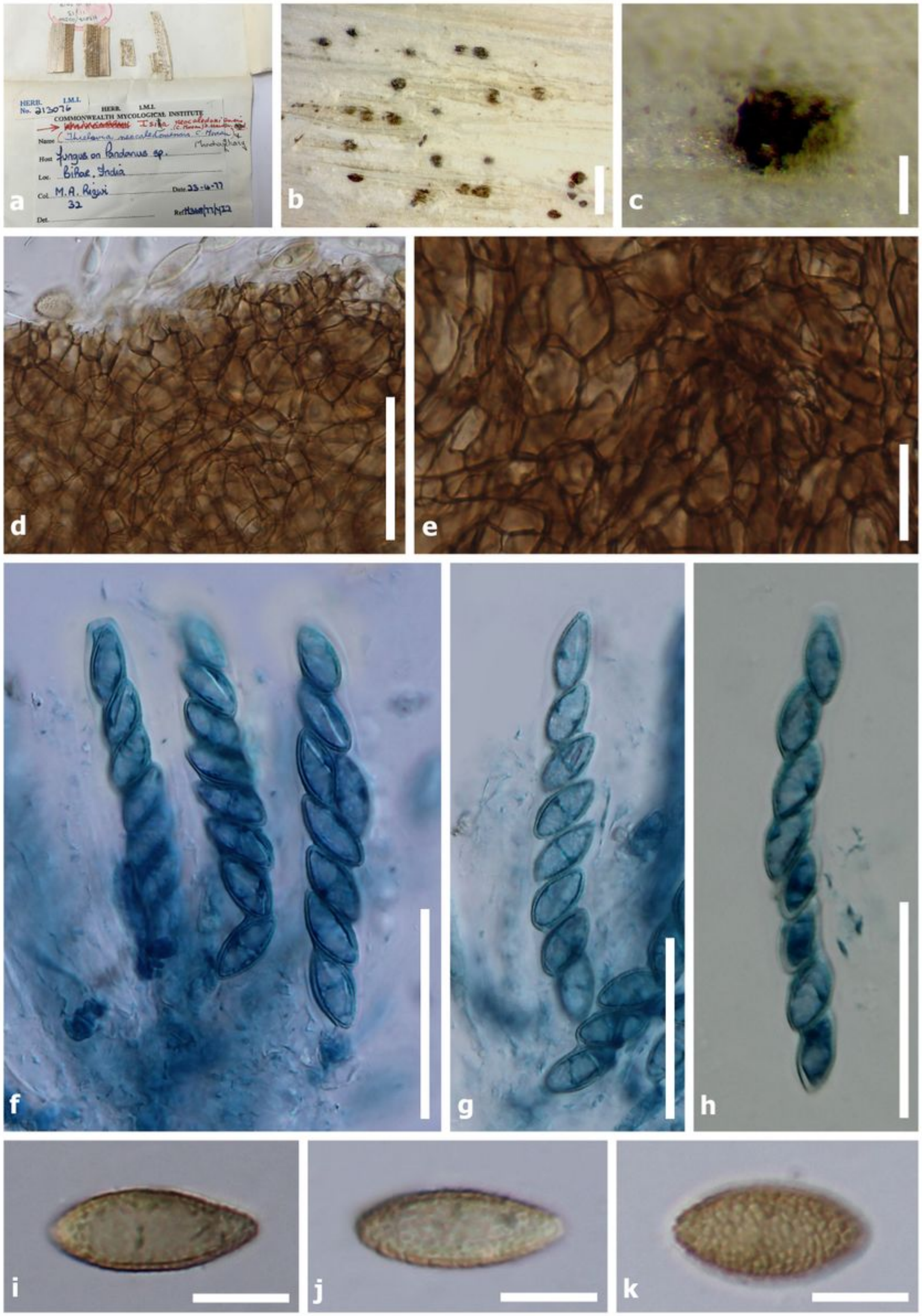


Figure 56

Isia neocaledoniensis: (IMI-213076, holotype). a Material label. b Immersed ascomata on host. c Ascoma. d–e Peridium. f–h Asci. i–k Ascospores. Notes: d–h from permanent mount. Scale bars: b = 1 mm, c = 100 µm, d. f–h = 50 µm, e = 20 µm, i–k = 10 µm.

BIOSECURITY QUEENSLAND
PLANT PATHOLOGY HERBARIUM (BRIP)

BRIP 21334 (Holotype)
Ascomycota
Sordariomycetes

Lockerbia palmicola K.D. Hyde

Host: ***Archontophoenix* sp.**
Host family: Arecaceae
Symptom:
Locality: Lockerbie, near Bamaga QLD Australia
Collector(s): K.D. Hyde
Coll. No: KDH 1052 **Coll. Date:** Feb 1992
Determiner: K.D. Hyde

Comments: In rainforest. See Sydowia (1993) 46: 24.

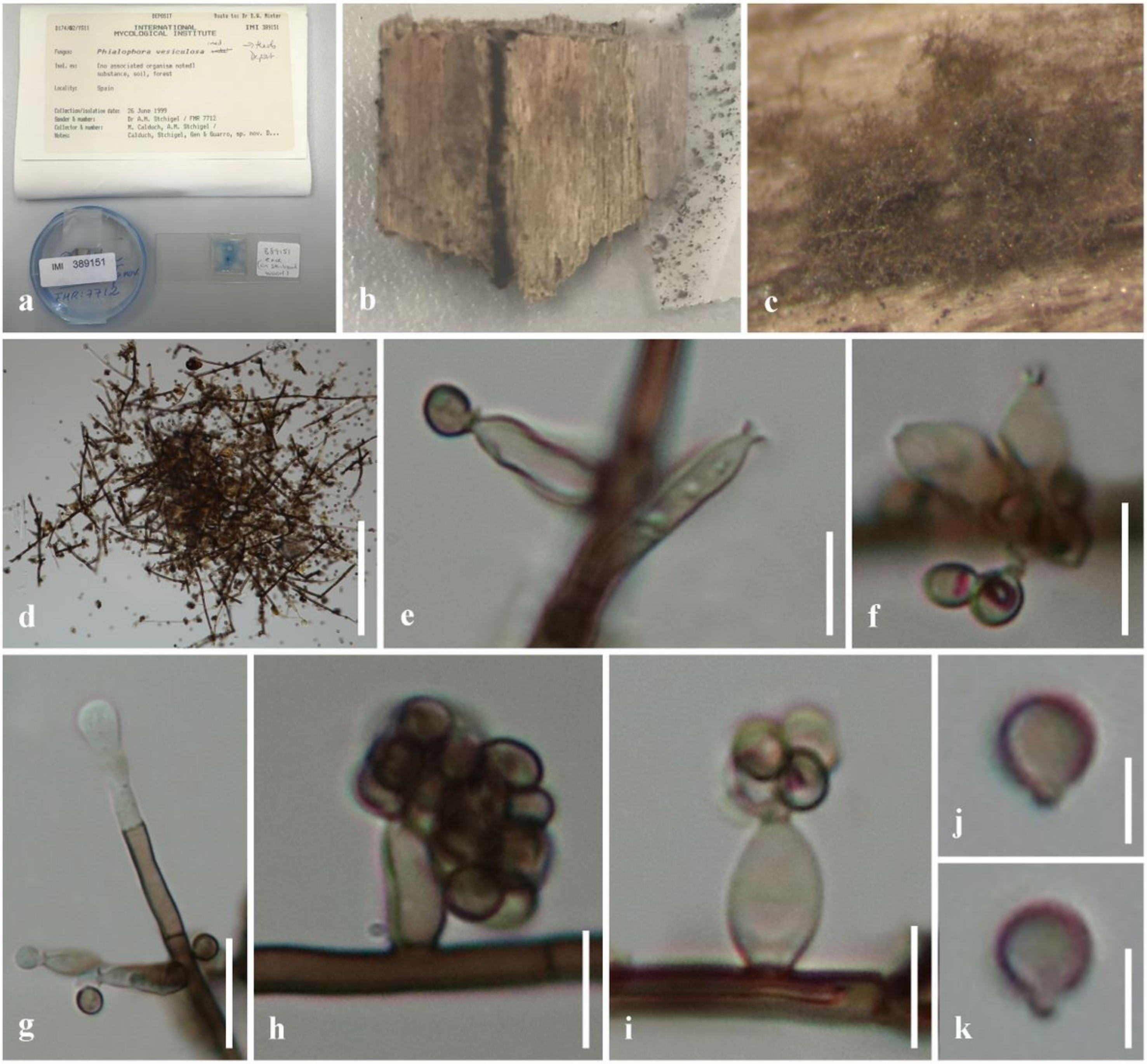
Accession No.: BRIP 21334 a
Duplicates:
Other Taxa:
Genus: Lockerbia **Species:** palmicola **Infraspecies:**
Authority: K.D. Hyde
Name Comments:
Classification: Fungi, Ascomycota, Sordariomycetes, Xylariales, Incertae sedis
Determiner: Hyde, K.D.
Host Genus: Archontophoenix **Host Species:** sp. **Host Infraspecies:**
Host Authority: **Cultivar:**
Host Family: Arecaceae **Common Name:**
Host Organ: Rachis **Host Symptom:**
Host Misc.: Dead rachis on forest floor
Collector(s): Hyde, K.D. **Coll. Date:** Feb 1992 **Coll. No.:** KDH 1052
Locality: Lockerbie, near Bamaga
State: QLD **Country:** Australia
Latitude: 10 48 S **Longitude:** 142 27 E
Specimen Type: Boxed specimen **Type Status:** Holotype
Living Culture: No
Comments: In rainforest. See Sydowia (1993) 46: 24.

Figure 57

Lockerbia palmicola: (BRIP-21334, holotype). a–b Material label. c Material. d–e Ascomata. f Ascoma in cross section. g Peridium. h Paraphyses and an immature ascus. i Ascus. j Ascospores with minute pitting. k–n Ascospores. Notes: h–k stained in Congo red reagent. Scale bars: d = 500 μm, e = 200 μm, f = 100 μm, g. i = 50 μm, h. j = 20 μm, k–n = 10 μm.

Figure 58

Periamphispora phacelodes: (TRTC-55023, holotype). a Material label. b Ascomata on Weitzman and Silva-Hutner’s agar medium. c Appearance of ascoma with hyphae. d Ascoma in cross section. e Peridium. f Perithecial neck with periphyses. g Hyphae. h Asci. i–k Ascospores with germ pore (arrowed and enlarged the apical germ pore). Scale bars: b = 1 mm, c = 500 μm, d = 200 μm, h = 100 μm, e–g = 50 μm, i–k = 20 μm.



DEPOSIT Route to: Dr D.W. Minter

B174/02/YS11 INTERNATIONAL MYCOLOGICAL INSTITUTE IMI 389151

Fungus: *Phialophora vesiculosa*

Ind. etc: [no associated organism noted] substance, soil, forest

Locality: Spain

Collection/isolation date: 26 June 1999

Sender & number: Dr A.M. Stchigel / FMR 7712

Collector & number: M. Calduch, A.M. Stchigel /

Notes: Calduch, Stchigel, Gen & Guarro, sp. nov. D...

Figure 59

Ramophialophora vesiculosa (IMI-389151, holotype). a Material label. b Material. c Mycelium on host. d Mycelium. e–i Conidiophores with conidia. j–k Conidia. Scale bars: d = 100 μm, g = 10 μm, e–f, h–i = 5 μm, j–k = 2 μm.

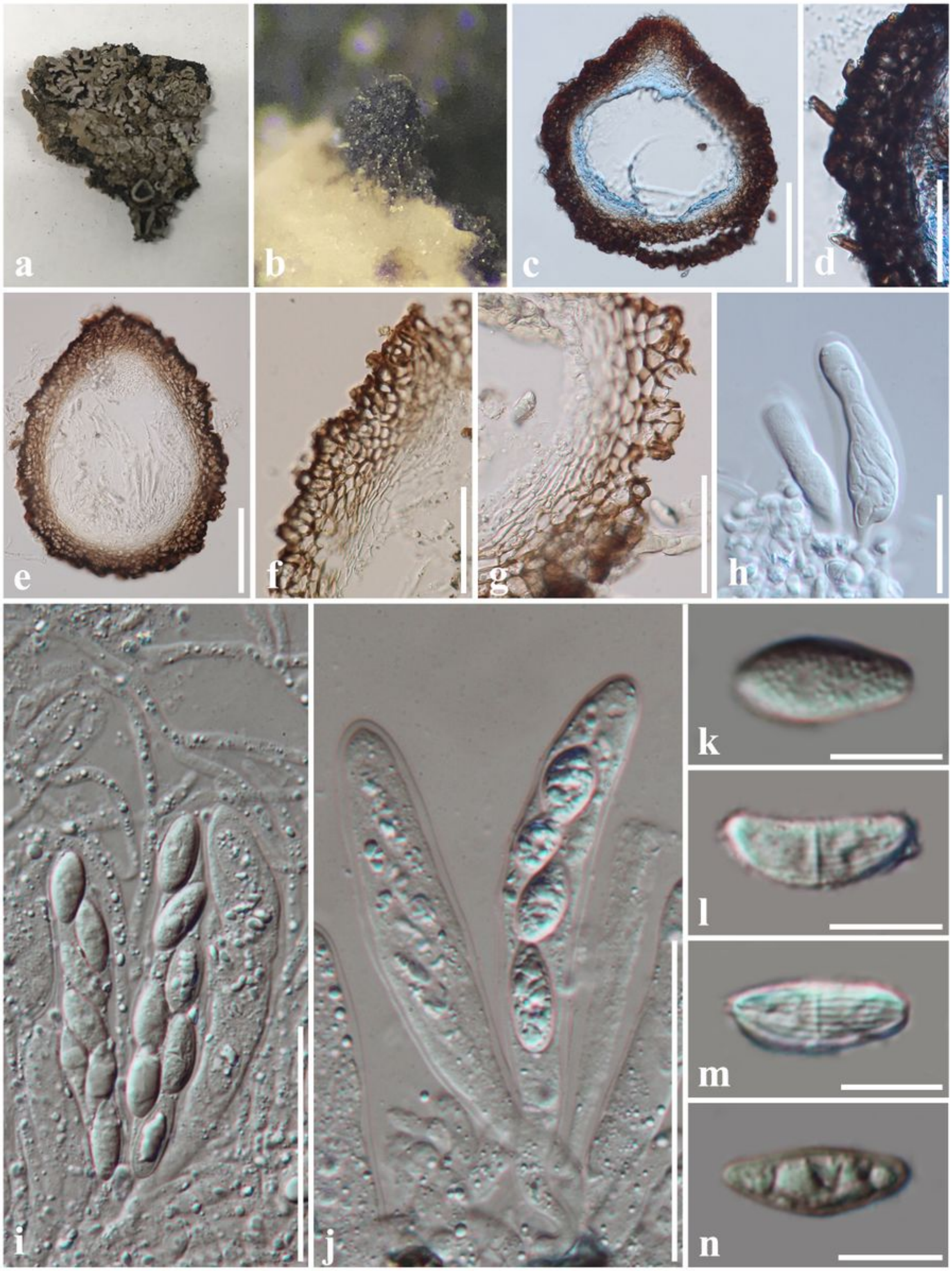


Figure 60

Reconditella physconiarum: a–b, e–g, i–n (S-F20696, isotype); c–d, h (GZU-287606, holotype). a Host lichen of Physconia distorta. b Ascoma on host. c, e Ascomata in cross section. d, f–g Peridium. h, j Asci. i Asci with paraphyses. k–n Ascospores. Notes: c–d from permanent mount. Scale bars: c. e = 100 μm, d. f–g. i–j = 50 μm, h = 20 μm, k–n = 10 μm.

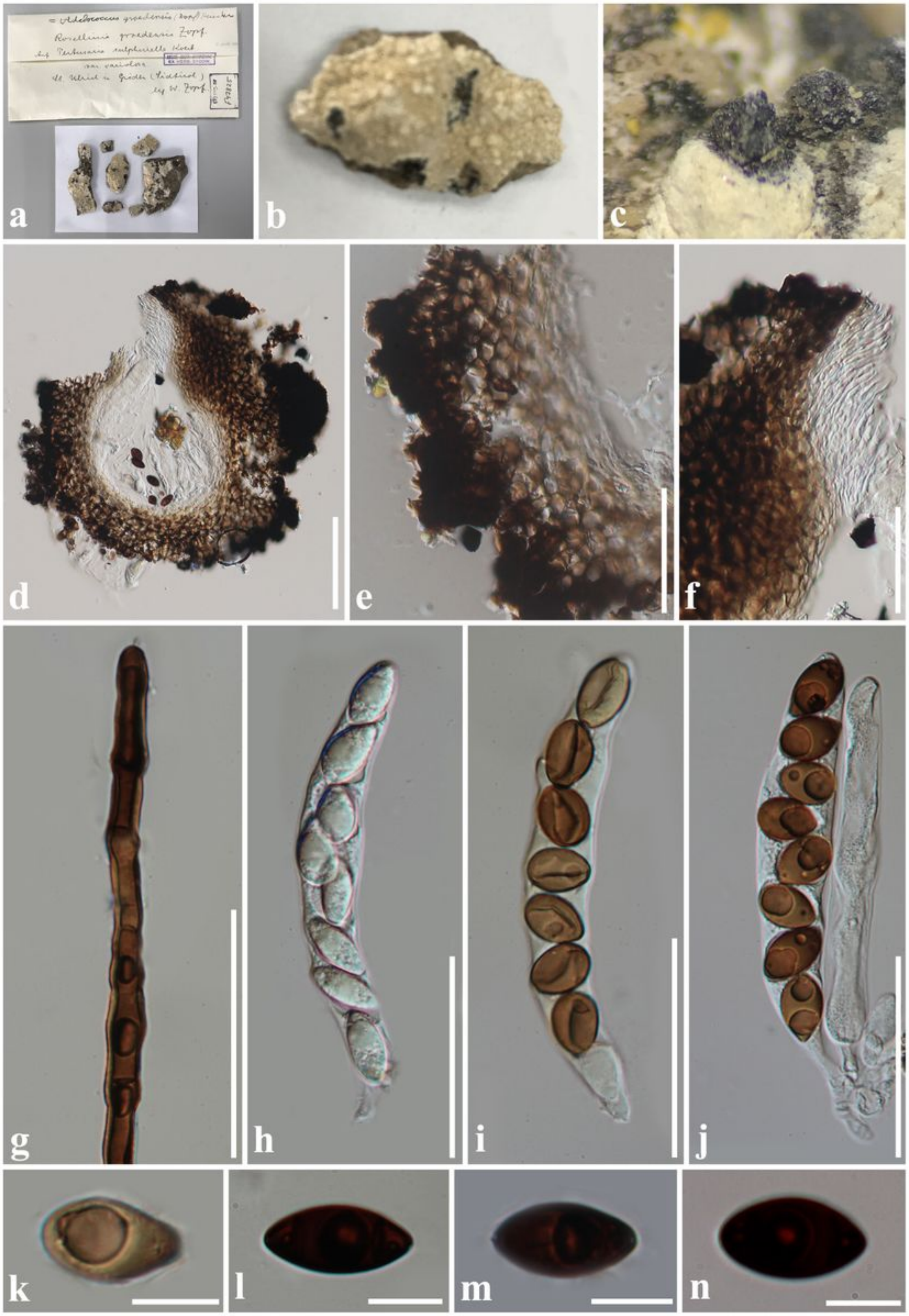


Figure 61

Roselliniopsis groedensis: (S-F47825). a Material label. b Material. c Ascomata on host. d Ascoma in cross section. e Peridium. f Ostiole with periphyses. g Seta. h–j Asci. k–n Ascospores. Scale bars: d = 100 µm, e–j = 50 µm, k–n = 10 µm.

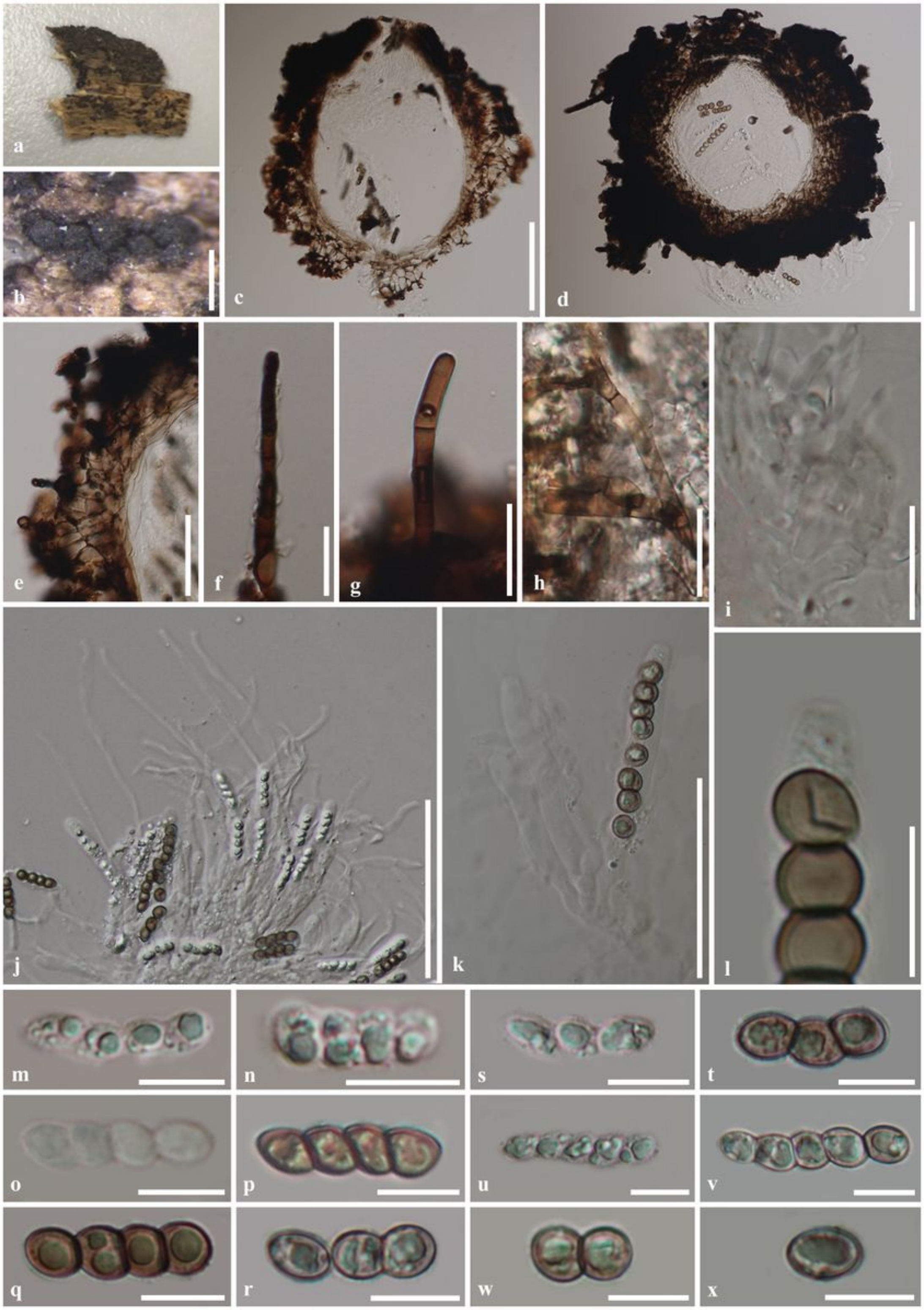


Figure 62

Synaptospora petrakii: a–c, e–f, h–o, q–x (TRTC-51203); d, g, p (TRTC-51205). a Material. b Ascomata on host. c–d Ascoma in cross section. e Peridium. f–g Setae. h Hyphae of subiculum. i Septate paraphyses. j Asci with paraphyses. k Asci. l Apex of ascus (stained in Melzer's reagent). m–q, s–v Immature to mature ascospores (m–q 3-septate; s–t 2-septate; u–v 4-septate). r, w Ascospores breaking into individual cells. x Individual spore cells. Scale bars: b = 500 μm, c–d, j = 100 μm, e, k = 50 μm, f–i = 20 μm, l–x = 10 μm.

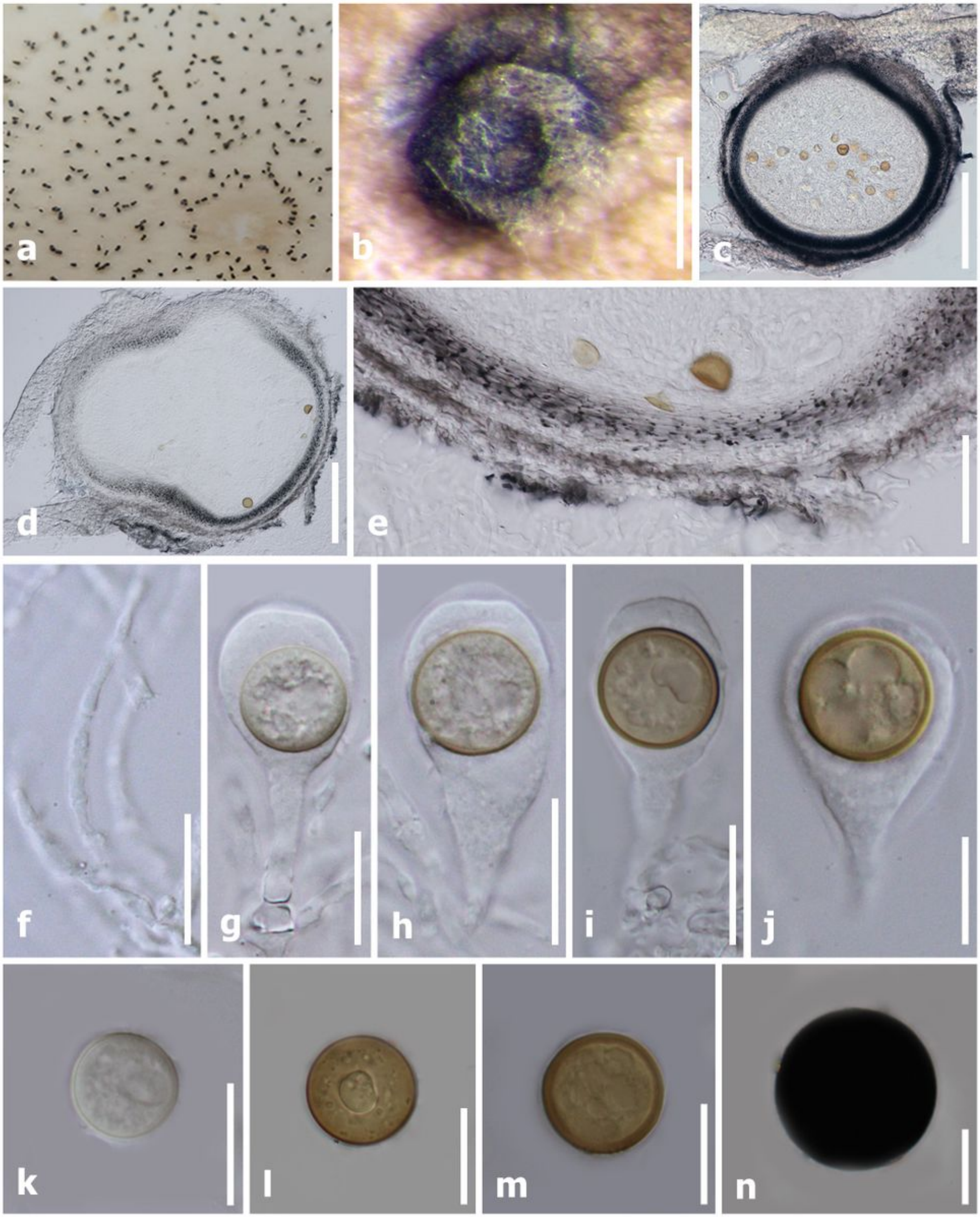


Figure 63

Monosporascus cannonballus: (BPI-579840, holotype). a Dry culture. b Ascoma with collapsing papilla. c–d Vertical sections of ascomata. e Peridium. f Paraphyses. g–j Asci. k–n Ascospores. Scale bars: b–d = 200 μm, e = 50 μm, f–n = 20 μm.

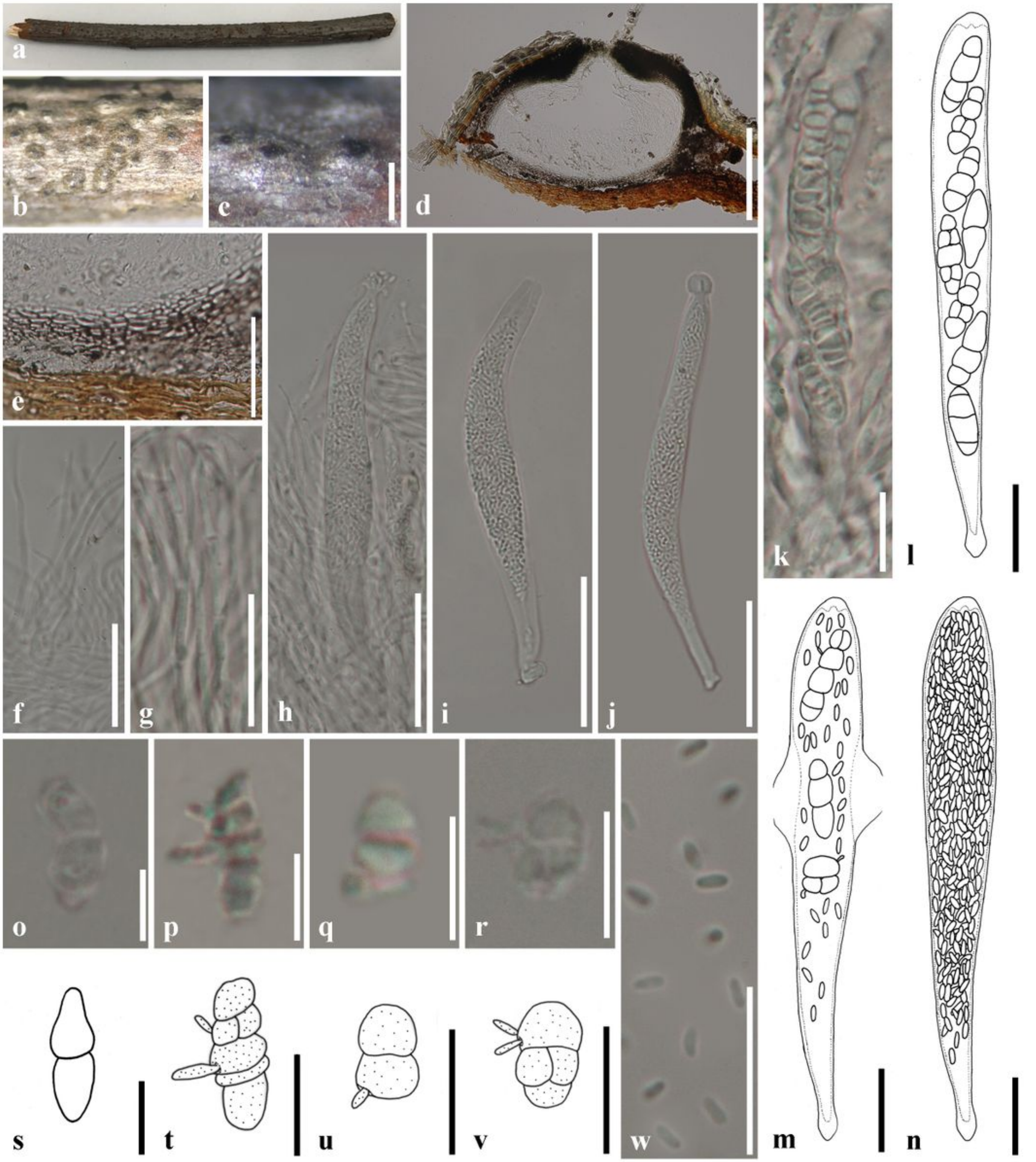
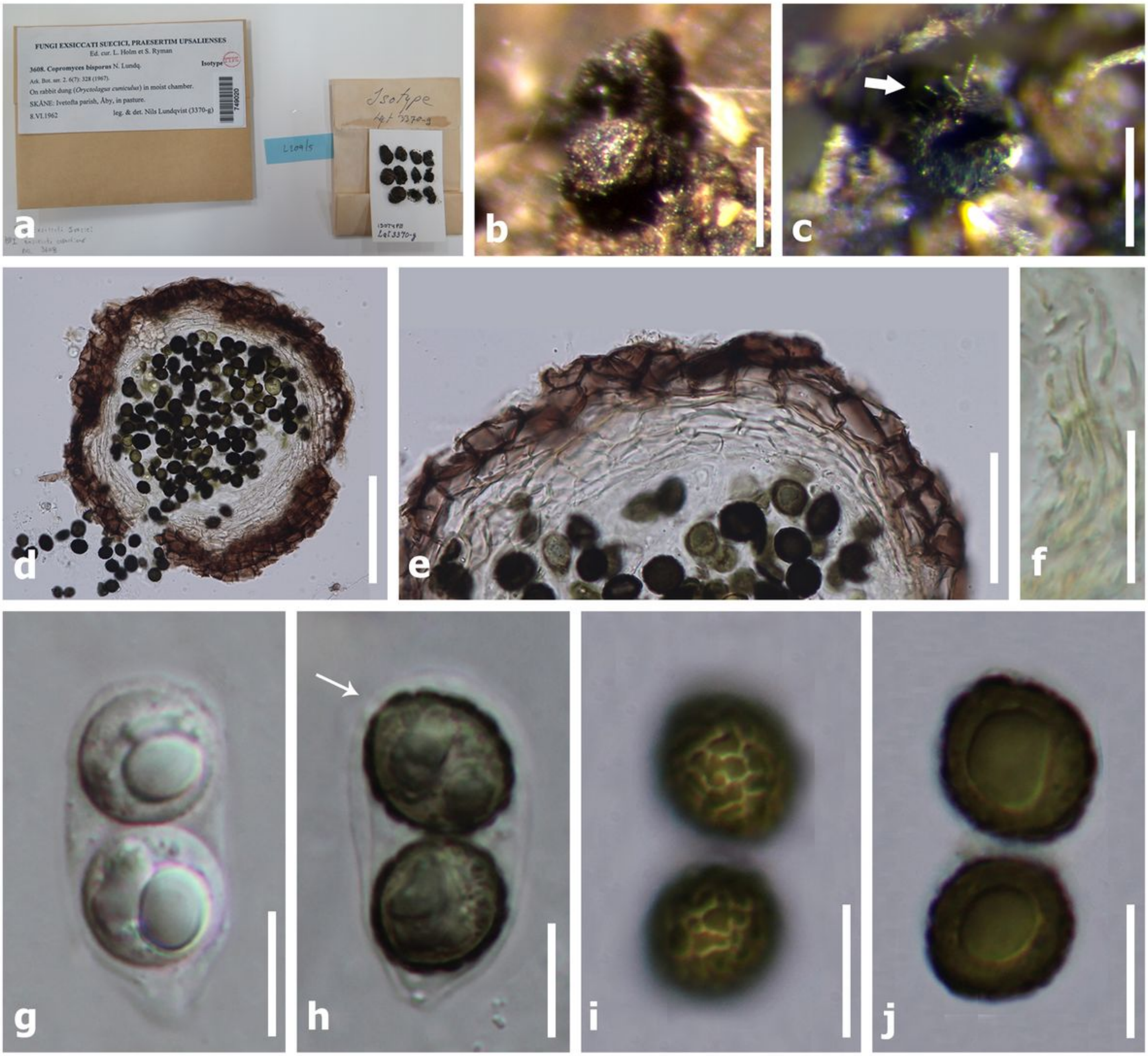


Figure 64

Conidiotheca tympanoides: a–k, o–r, w (NY-00912076, holotype); l–n (redrawn from Réblová and Mostert 2007); s–v (Drawn following observation by microscope). a Material. b Gregarious ascomata. c Ascomata. d Ascoma in cross section. e Peridium. f–g Septate paraphyses. h Ascus with paraphyses. i–j Ascoconidia filling the whole ascus and discharged through constricted apical ring. k–n Ascospores gradually swollen in ascus and producing large numbers of ascoconidia. o–v Immature to mature ascospores (p–r, t–v ascospores producing ascoconidia). w Ascoconidia. Scale bars: c = 500 μm, d = 200 μm, e–j = 50 μm, k–n, w = 20 μm, o–v = 10 μm.



FUNGI EXSICCATI SUECICI, PRAESERTIM UPSALIENSES
Ed. cur. L. Holm et S. Ryman
3608. Copromyces bisporus N. Lundq. Isotype
Ark. Bot. ser. 2. 6(7): 328 (1967).
On rabbit dung (*Oryctolagus cuniculus*) in moist chamber.
SKÅNE: Ivetofta parish, Åby, in pasture.
8.VI.1962 leg. & det. Nils Lundqvist (3370-g)
749020

Isotype

Figure 65

Copromyces bisporus (BPI-749020, isotype). a Material label. b Ascoma. c Ascoma with hyaline hairs (arrow). d Vertical section of ascoma. e Peridium. f Evanescent filaments (stained in Melzer's reagent). g–j Asci stained in 5% KOH (h. arrow marks germ pore, h–j are the same ascus). Scale bars: b–c= 200 μm, d = 100 μm, e = 50 μm, f = 20 μm, g–j = 10 μm.

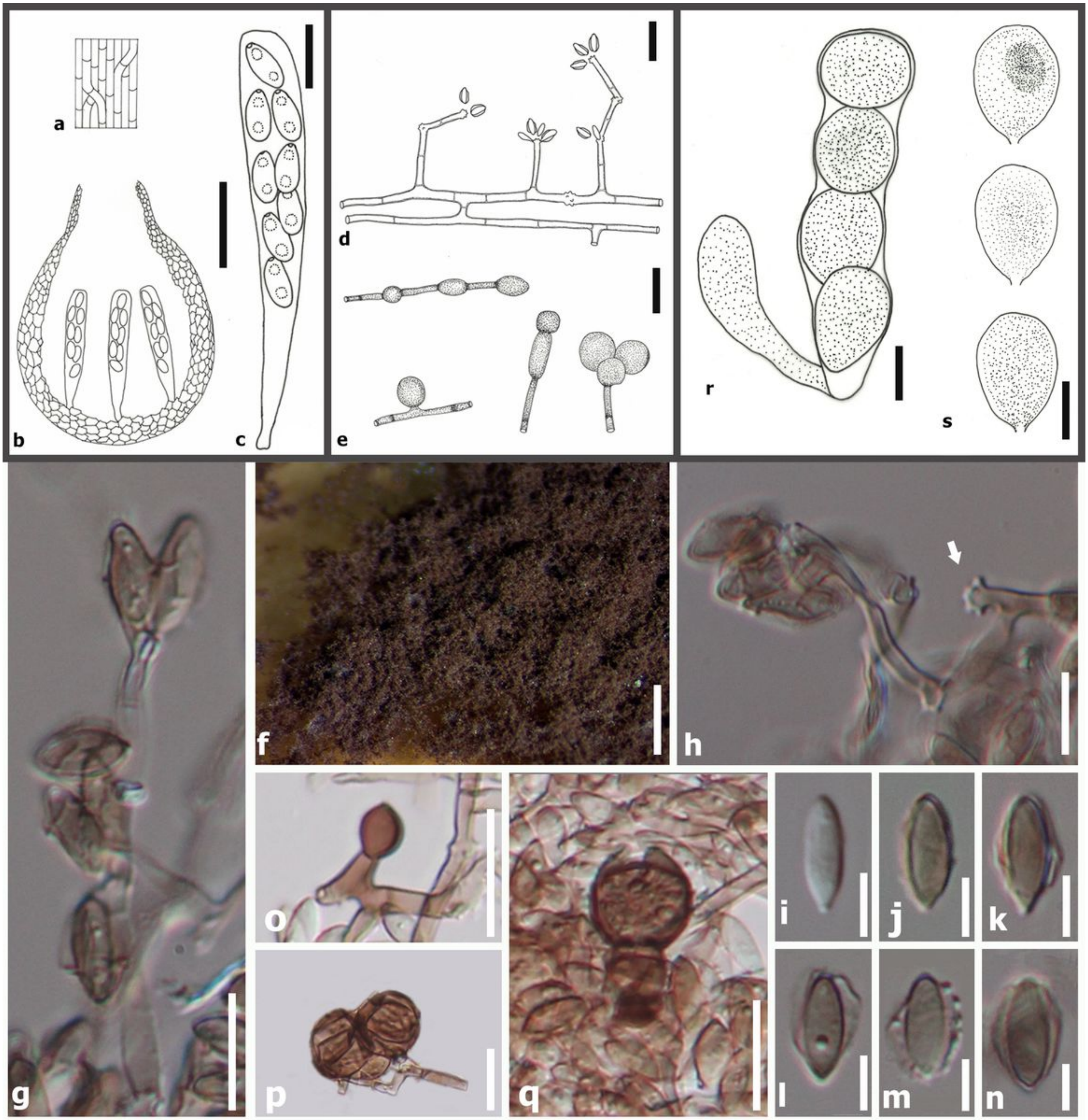


Figure 66

Effetia craspedoconidica: a–e (redrawn from Bartoli et al. 1984); f–q (IMI-223521, holotype). a Part of young ascomata on surface view. b Vertical view of ascoma with asci. c Ascus. d Conidiophores with conidia. e, o–q Chlamydospores (o. young state, p–q. dry and collapsed). f Part of colony. g–h Conidiophores with conidia (h. arrow marks swollen and sympodial conidiogenous cells). i–n Conidia with sheath; Boothiella tetraspora: r–s (redrawn from Lodhi and Mirza 1962). r Ascus s Ascospores. Scale bars: f = 500 µm, b = 50 µm, d–e = 20 µm, c. g–h. o–s = 10 µm, i–n= 5 µm.

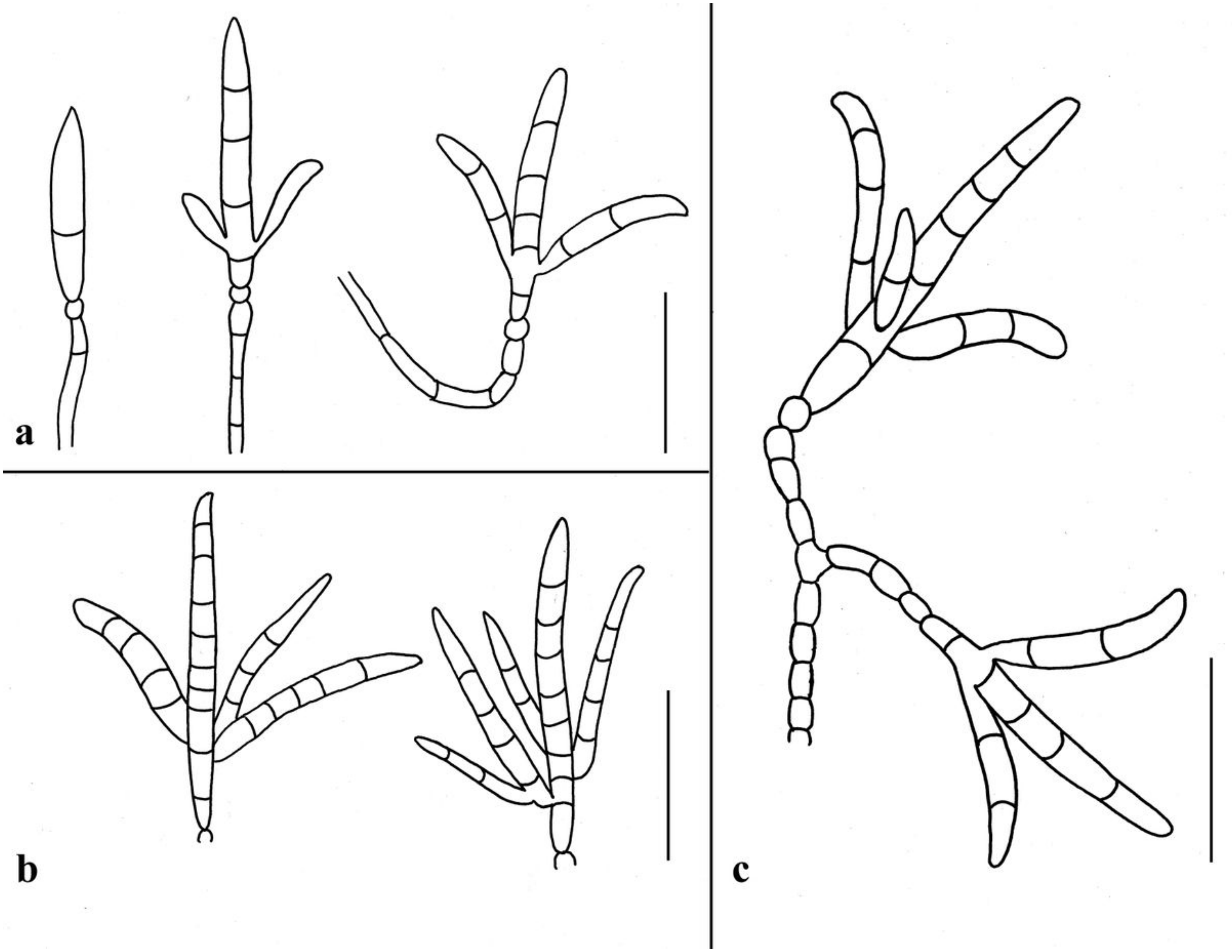


Figure 67

Tulipispora ingoldii (redrawn from Révay et al. 2009). a Developing conidia showing the separating cells. b Main axes and conidia bearing a secondary branch. c Conidiophores with conidia. Scale bars = 20 µm.