Fungal Diversity
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Notes for genera: basal clades of Fungi (including *Aphelidiomycota, Basidiobolomycota, Blastocladiomycota, Calcarisporiellomycota, Caulochytriomycota, Chytridiomycota, Entomophthoromycota, Glomeromycota, Kickxellomycota, Monoblepharomycota, Mortierellomycota, Mucoromycota, Neocallimastigomycota, Olpidiomycota, Rozellomycota* and *Zoopagomycota*)

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Abstract
Compared to the higher fungi (Dikarya), taxonomic and evolutionary studies on the basal clades of fungi are fewer in number. Thus, the generic boundaries and higher ranks in the basal clades of fungi are poorly known. Recent DNA based taxonomic studies have provided reliable and accurate information. It is therefore necessary to compile all available information since basal clades genera lack updated checklists or outlines. Recently, Tedersoo et al. (MycoKeys 13:1–20, 2016) accepted *Aphelidiomycota* and *Rozellomycota* in Fungal clade. Thus, we regard both these phyla as members in Kingdom Fungi. We accept 16 phyla in basal clades *viz. Aphelidiomycota*, *Basidiobolomycota*, *Blastocladiomycota*, *Calcarisporiellomycota*, *Caulochytriomycota*, *Chytridiomycota*, *Entomophthoromycota*, *Glomeromycota*, *Kickxellomycota*, *Monoblepharomycota*, *Mortierellomycota*, *Mucoromycota*, *Neocallimastigomycota*, *Olpidiomycota*, *Rozellomycota* and *Zoopagomycota*. Thus, 611 genera in 153 families, 43 orders and 18 classes are provided with details of classification, synonyms, life modes, distribution, recent literature and genomic data. Moreover, *Catenariaceae* Couch is proposed to be conserved, *Cladochytriales* Mozl.-Standr. is emended and the family *Nephridiophagaceae* is introduced.

Keywords Invalid genera · *Nephridiophagaceae* fam. nov. · Outline · Phylogeny · Validation

Introduction

Classification and understanding the evolution of fungi has become one of the recent hot topics for research in mycology (Hyde et al. 2017a). DNA based systematic and evolutionary studies have become fundamental among mycologists and taxonomists as these provide a strong foundation for understanding the kingdom Fungi. There have been numerous taxonomic studies on the Ascomycota (e.g. Hyde et al. 2013, 2017b; Ariyawansa et al. 2015; Li et al. 2016; Wijayawardene et al. 2016, 2018), Basidiomycota (E.g. Justo and Hibbett 2011; Justo et al. 2011; Millanes et al. 2011; He and Dai 2012; Ortiz-Santana et al. 2013) (i.e. Dikarya) and in the basal clades of fungi (e.g. Spatafora et al. 2016; Seto et al. 2017; Radek et al. 2017), which are important sources for dictionaries, outlines, checklists, various databases and the basic study of the fungi (Kirk et al. 2008, 2013; Lumbsch and Huhndorf

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2010; Hyde et al. 2011, 2013, 2014; Humber 2012, 2016; Benny et al. 2014, 2016b; Wijayawardene et al. 2012, 2014, 2017a, b, 2018; Lücking et al. 2017; Index Fungorum 2018). However, understanding of the earliest diverging events of fungi are poorly understood as compared to the higher fungi i.e. Dikarya (Spatafora et al. 2016). Furthermore, the classification of basal clades of fungi is also debatable as mycologists do not have a broad agreement (e.g. Humber 2016 vs. Spatafora et al. 2016 on *Entomophthoromycota* and *Glomeromycota*). Moreover, elevating lower ranks to higher ranks and demoting the higher ranks to lower ranks (Spatafora et al. 2016; Tedersoo et al. 2016) also causes disagreements.

Distribution, life modes, applications

The basal lineages of fungi comprise the aquatic taxa (e.g. *Blastocladiomycota*, *Chytridiomycota*, *Neocallimastigomycetes*), and the terrestrial taxa (e.g. *Entomophthoromycota*, *Glomeromycota*) (Benny et al. 2016a, b). Most of the taxa are ubiquitous and show different life modes, *viz.* some causing diseases in agricultural crops (e.g. Choanephora rot caused by *Choanephora cucurbitarum*; *Gilbertella persicaria* as the cause of soft rot in *Syzygium cumini* and fruit rot in papaya *fide* Pinho et al. 2014; Cruz-Lachica et al. 2016); pathogens of humans and other mammals (e.g. mucormycosis caused by *Apophysomyces* spp. *fide* Kennedy et al. 2016; mucormycosis caused by *Rhizopus arrhizus*), mycoparasites (e.g. *Syncephalis fide* Lazarus et al. 2017), amoebae endoparasites (e.g. *Amoebophilus fide* Mrva 2011). Moreover, some taxa have been used in biotechnological biodegradation, biosorption, bioremediation and biotransformations (Benny et al. 2016a, b).

Classification

The classification of basal clades genera is conflicting in different publications. The collective term, Zygomycota Moreau was treated as a phylum in eumycotan fungi (e.g. Kendrick 2000; Kirk et al. 2008), but this rank has not been supported as a monophyletic clade in recent analyses and thus eumycotan taxa have been separated into different phyla (Spatafora et al. 2016). However, the establishment of new phyla has not been broadly accepted, thus synonymizing or erecting phyla/ subphyla have been frequent since James et al. (2006) (e.g. Hibbett et al. 2007) introduced *Neocallimastigomycota* to accommodate *Neocallimastigomycetes*, but Spatafora et al. (2016) treated this as a class in *Chytridiomycota*. Seto et al. (2017), however, recognized *Neocallimastigomycota* as a distinct phylum in their phylogenetic analyses. Table 1 summarizes the overview of phyla in basal clades based on major publications since 2000.

Recently, Tedersoo et al. (2016) proposed a new classification which accepted *Rozellomycota* (including *Microsporidia*) and *Aphelidiomycota* as phyla in Kingdom Fungi. Furthermore, Tedersoo et al. (2016) introduced *Calcarisporiellomycota*, *Kickxellomycota* and *Mortierellomycota* as new phyla. In this study, we follow classification in Tedersoo et al. (2016).

Overview

We accept 16 phyla (*viz.* *Aphelidiomycota*, *Basidiobolomycota*, *Blastocladiomycota*, *Calcarisporiellomycota*, *Caulochytriomycota*, *Chytridiomycota*, *Entomophthoromycota*, *Glomeromycota*, *Kickxellomycota*, *Monoblepharomycota*, *Mortierellomycota*, *Mucoromycota*, *Neocallimastigomycota*, *Olpidiomycota*, *Rozellomycota* and *Zoopagomycota*) as early divergence groups in fungi (Fig. 1). Below, we provide the outline of all phyla and short entries for each genus in notes section. Moreover, we propose to conserve the family *Catenariaceae* Couch (which is based on *Catenaria* Sorokīn; nom. illegit., Art. 53.1 *fide* Index Fungorum 2018), emend *Cladochytriales* Mozl.-Standr. and introduce *Nephridiophagaceae* R. Radek et al.

Materials and Methods

Data collection

Collecting data on existing names (including genera and higher ranks) was based on Kirk et al. (2008, 2013), Species Fungorum (2018) and Catalogue of Life (http://www.catalogueoflife.org/). The works by Humber (2012), Benny et al. (2016a, b), Spatafora et al. (2016), Cali et al. (2017), Desirò et al. (2017) and Tedersoo et al. (2016) were also used for further clarification. Data are provided in accordance to information available in publications and publicly-accessible databases such as NCBI. Wijayawardene et al. (2017a) was followed as the template for entries. The citation of the articles given in each entry was decided by the author who provided the entry and is not standardized. Based on recent publications and Species Fungorum (2018), synonyms of generic names (if fewer than 10) are also provided.

Taxonomy

Catenariaceae Couch ***nom. cons. prop.***
Nom. illegit., see Art. 18.3 (Melbourne)

Table 1 Phyla currently recognized in different studies

Phylum	*Basidiobolomycota*	*Blastocladiomycota*	*Caulochytriomycota*	*Chytridiomycota*	*Entomophthoromycota*	*Glomeromycota*
Introduced by	Doweld (2001)	James et al. (2006)	Doweld (2014g)	Doweld (2001)	Humber (2012)	Schüßler et al. (2001)
Demoted by					Spatafora et al. (2016)	Spatafora et al. (2016)
Current rank	Phylum	Phylum	Phylum	Phylum	Subphylum Entomophthoromycotina	Subphylum Glomeromycotina
In this study	Phylum	Phylum	Phylum	Phylum	Phylum	Phylum
Phylum	*Monoblepharomycota*	*Mucoromycota*	*Neocallimastigomycota*		*Olpidiomycota*	*Zoopagomycota*
Introduced by	Doweld (2001)	Doweld (2001)	Hibbett et al. (2007)		Doweld (2013c)	Spatafora et al. (2016)
Demoted by			Spatafora et al. (2016)/Seto et al. (2017)			
Current rank		Phylum	Class Neozygitomycetes/or as the phylum		Phylum	Phylum
In this study	Phylum	Phylum	Phylum		Phylum	Phylum

Type: ***Catenaria*** Sorokīn, Revue mycol., Toulouse 11(no. 43): 139 (1889) ***nom. cons. prop.*** ***nom. illegit.*** Art. 53.1

Cladochytriales Mozl.-Standr. **emend**.
Index Fungorum (2018) mentioned that the type was not indicated in Mozley-Standridge et al. (2009) thus below we state the type.
Type: *Cladochytrium* Nowak., Cohn Beitr. Biol. Pfl. 2: 92. 1876".
See Mozley-Standridge et al. (2009) for a Latin and English description.

In here, we introduce new family *Nephridiophagaceae*

Nephridiophagales Doweld
Life style obligate biotrophic/parasitic in arthropods; uni- to multinucleate stages; endogenous spore formation; no thallic organization.
Order type: *Nephridiophagaceae* R. Radek, Letcher, Wijayaw., P.M. Kirk & K.D. Hyde

Nephridiophagaceae R. Radek, Letcher, Wijayaw., P.M. Kirk & K.D. Hyde ***fam. nov.***
Index Fungorum number:IF550099
Merogonial plasmodia; sporogenic plasmodia with endogenous spore formation and residual somatic nuclei; cryptomitosis; bi- or tetranuclear sporoblasts; mature spores mostly uninucleate, flattened-oval form. Sporoblasts generally delimited in the sporogenic cytoplasm by ER cisternae and spore wall material deposited between the two resulting membranes. Extra- and intracellular in Malpighian tubules of insects. Transmission by oral infection.

Family type: *Nephridiophaga* Ivanić 1937

Notes: Doweld (2014f) introduced *Nephridiophagales* Doweld based on the morphology of insect parasitic genus *Nephridiophaga* Ivanić. However, Doweld (2014f) did not typify the order with a family (i.e. ordinal type). Radek et al. (2017) showed that three *Nephridiophaga* species *viz. N. blattellae* (H. Crawley) P. Woolever, *N. maderae* R. Radek et al. and *N. blaberi* Fabel et al. grouped as a distinct clade in their phylogenetic analyses. Hence, we introduce new family, *Nephridiophagaceae* as the ordinal type of *Nephridiophagales* (Fig. 2).

Outline for basal clades

APHELIDIOMYCOTA Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Aphelidiomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Aphelidiales Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov

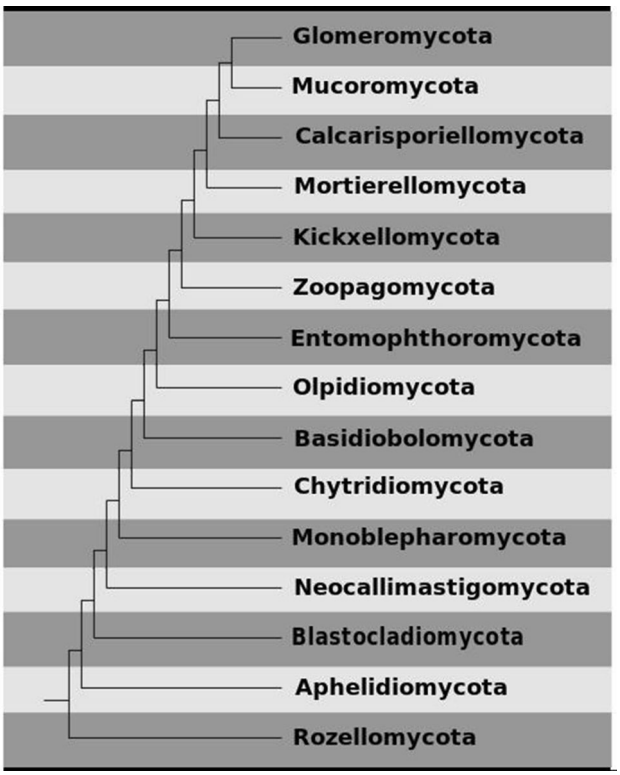

Fig. 1 Cladogram showing relationships between basal clades following taxonomy proposed by Tedersoo et al. (2016)

Aphelidiaceae Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Amoeboaphelidium Scherff.
Aphelidium Zopf
Paraphelidium Karpov, Moreira, Lopez-Garcia
Pseudaphelidium Schweikert & Schnepf

BASIDIOBOLOMYCOTA Doweld
Basidiobolomycetes Humber
Basidiobolales Caval.-Sm.
Basidiobolaceae Claussen
Basidiobolus Eidam
Schizangiella J. Dwyer, B. Burwell, Humber, C. Mcleod, M. Fleetwood & T. Johnson bis

BLASTOCLADIOMYCOTA T.Y. James
Blastocladiomycetes Doweld
Blastocladiales H.E. Petersen
Blastocladiaceae H.E. Petersen
Allomyces E.J. Butler
Blastocladia Reinsch
Blastocladiopsis Sparrow

Catenariaceae Couch
Catenophlyctis Karling
Nematoceromyces Doweld

Paraphysodermataceae Doweld
Paraphysoderma Boussiba Boussiba, Zarka & T.Y. James

Sorochytriaceae Dewel
Sorochytrium Dewel

Blastocladiales genera *incertae sedis*
Endoblastidium Codreanu

Catenomycetales Doweld
Catenomycetaceae Doweld
Catenomyces A.M. Hanson

Callimastigales Doweld
Callimastigaceae Fonseca
Callimastix Weissenb.

Coelomomycetaceae Couch
Coelomomyces Keilin
Coelomycidium Debais.

Blastocladiomycetes genera *incertae sedis*
Microallomyces R. Emers. & J.A. Robertson

Physodermatomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Physodermatales Caval.-Sm.
Physodermataceae Sparrow
Physoderma Wallr.

CAULOCHYTRIOMYCOTA Doweld
Caulochytriomycetes Doweld
Caulochytriales Doweld
Caulochytriaceae Subram.
Caulochytrium Voos & L.S. Olive

CHYTRIDIOMYCOTA Doweld
Chytridiomycetes Caval.-Sm.
Chytridiales Cohn
Asterophlyctaceae Doweld
Asterophlyctis H.E. Petersen

Chytridiaceae Nowak.
Chytridium A. Braun
Dendrochytridium Letcher, Longcore & M.J. Powell
Irineochytrium Letcher, Longcore & M.J. Powell
Polyphlyctis Karling

Chytriomycetaceae Letcher
Avachytrium Vélez & Letcher
Chytriomyces Karling
Entophlyctis A. Fisch.
Fayochytriomyces W.J. Davis, Letcher, Longcore & M.J. Powell
Obelidium Nowak.
Odontochytrium Vélez & Letcher
Pendulichytrium K. Seto & Degawa
Physocladia Sparrow

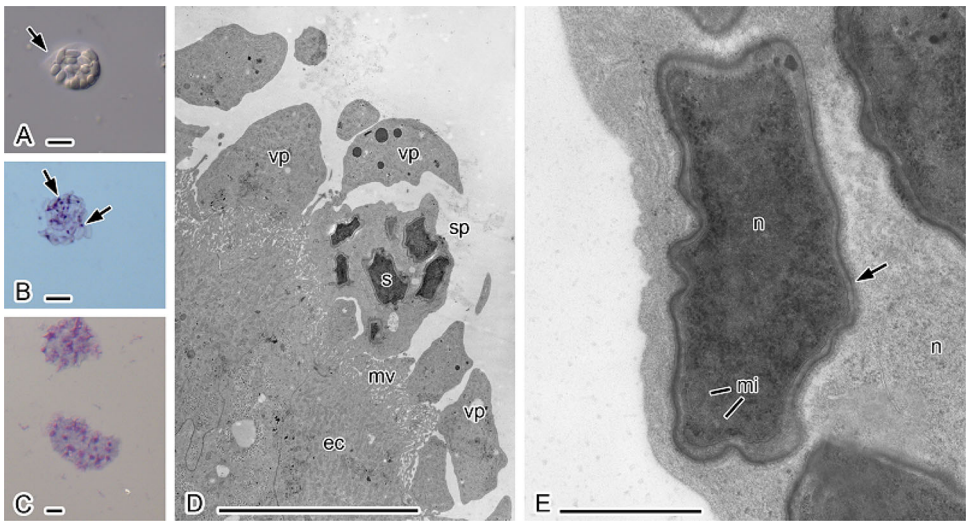

Fig. 2 **A**, **B**: ***Nephridiophaga archimandrita***, **C**–**E**: ***N. lucihormetica***. Bars **A**–**D** = 10 μm, **E** = 1 μm. **A** Sporogenic plasmodium with mature spores. Arrow = plasma membrane of plasmodium. Differential interference contrast (DIC). **B** Giemsa stained microscopic smear; sporogenic plasmodium. Arrows point to residual nuclei between the spores. Bright field. **C** Giemsa stained vegetative plasmodia with many nuclei. DIC. **D** Ultrathin section of infected Malpighian tubule. Vegetative plasmodia (vp) and sporogenic plasmodia (sp) with internal spores (s) attach to the microvilli (mv) of the epithelial cells (ec). **E** Part of a sporogenic plasmodium with mature spores. Spore with spore wall (arrow), nucleus (n) and mitochondria (mi). A further residual nucleus (n) is in the cytoplasm of the plasmodium

Podochytrium Pfitzer
Rhizoclosmatium H.E. Petersen
Siphonaria H.E. Petersen

Phlyctochytriaceae Doweld
Phlyctochytrium J. Schröt.

Phlyctorhizaceae Doweld
Phlyctorhiza A.M. Hanson

Pseudorhizidiaceae Doweld
Pseudorhizidium M.J. Powell, Letcher & Longcore

Scherffeliomycetaceae Doweld
Scherffeliomyces Sparrow

Zygorhizidiaceae Doweld
Zygorhizidium Löwenthal

Chytridiales genera *incertae sedis*
Delfinachytrium Vélez & Letcher

Nephridiophagales Doweld
Nephridiophagaceae R. Radek, Letcher, Wijayaw., P.M. Kirk & K.D. Hyde
Coleospora Gibbs
Nephridiophaga Ivanić
Oryctospora Purrini & Weiser
Peltomyces Léger

Polyphagales Doweld
Polyphagaceae F. Maekawa
Polyphagus Nowak.

Saccopodiales Doweld
Saccopodiaceae Jacz. & P.A. Jacz.
Saccopodium Sorokīn

Chytridiomycetes families *incertae sedis*
Amoebochytriaceae Doweld
Amoebochytrium Zopf

Sparrowiaceae Doweld
Sparrowia Willoughby

Sphaeromonadaceae Doweld
Sphaeromonas E. Liebet.

Tetrachytriaceae Doweld
Tetrachytrium Sorokīn

Thalassochytriaceae Doweld
Thalassochytrium Nyvall, M. Pedersén & Longcore

Chytridiomycetes genera *incertae sedis*
Aphanistis Sorokīn
Blyttiomyces A.F. Bartsch
Gamolpidium Vlădescu
Mucophilus Plehn
Plasmophagus De Wild.
Rhizidiocystis Sideris
Rhizosiphon Scherff.
Sagittospora Lubinsky
Scherffeliomycopsis Geitler
Septolpidium Sparrow
Sorokinocystis Doweld
Trematophlyctis Pat.

Bertramia Mesnil & Caullery
Canteria Karling
Dangeardia Schröd.
Dangeardiana Valkanov ex A. Batko
Dictyomorpha Mullins
Ichthyochytrium Plehn
Loborhiza A.M. Hanson
Macrochytrium Minden
Megachytrium Sparrow
Mitochytridium P.A. Dang.
Nowakowskia Borzí
Olpidiaster Pascher
Perolpidium Doweld
Physorhizophidium Scherff.
Pseudopileum Canter
Rhopalophlyctis Karling
Riethophlyctis Doweld
Saccomyces Serbinow
Schizolpidium Doweld
Septosperma Whiffen ex R.L. Seym.
Solutoparies Whiffen ex W.H. Blackw. & M.J. Powell
Sporophlyctidium Sparrow
Sporophlyctis Serbinow
Truittella Karling
Volvorax Doweld
Zygochytrium Sorokīn
Zygophlyctis Doweld

Cladochytriomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Cladochytriales Mozl.-Standr.
Catenochytridiaceae Doweld
Catenochytridium Berdan

Cladochytriaceae J. Schröt.
Cladochytrium Nowak

Endochytriaceae Sparrow ex D.J.S. Barr
Diplophlyctis J. Schröt.
Endochytrium Sparrow

Nowakowskiellaceae Sparrow ex Mozl.-Standr.
Nowakowskiella J. Schröt

Septochytriaceae Mozl.-Standr.
Septochytrium Berdan

Cladochytriales genera *incertae sedis*
Allochytridium D.J.S. Barr & Désauln.
Cylindrochytridium Karling
Nephrochytrium Karling

Lobulomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Lobulomycetales D.R. Simmons

Alogomycetaceae Doweld
Alogomyces D.R. Simmons & Letcher

Lobulomycetaceae D.R. Simmons
Clydaea D.R. Simmons
Cyclopsomyces K. Seto & Degawa
Lobulomyces D.R. Simmons
Maunachytrium D.R. Simmons

Lobulomycetales genus *incertae sedis*
Algochytrops Doweld

Mesochytriomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Gromochytriales Karpov & Aleoshin
Gromochytriaceae Karpov & Aleoshin
Gromochytrium Karpov & Aleoshin

Mesochytriales Doweld
Mesochytriaceae Doweld
Mesochytrium B.V. Gromov, Mamkaeva & Pljusch

Polychytriomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Polychytriales Longcore & D.R. Simmons
Arkayaceae Doweld
Arkaya Longcore & D.R. Simmons

Polychytriaceae Doweld
Karlingiomyces Sparrow
Lacustromyces Longcore
Neokarlingia Longcore & D.R. Simmons
Polychytrium Ajello

Rhizophydiomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Rhizophydiales Letcher
Alphamycetaceae Letcher
Alphamyces Letcher
Betamyces Letcher
Gammamyces Letcher

Angulomycetaceae Letcher
Angulomyces Letcher

Aquamycetaceae Letcher
Aquamyces Letcher

Batrachochytriaceae Doweld
Batrachochytrium Longcore, Pessier & D.K. Nichols

Coralloidiomycetaceae Doweld
Coralloidiomyces Letcher

Dinomycetaceae Karpov & Guillou
Dinomyces Karpov & Guillou

Globomycetaceae Letcher
Globomyces Letcher
Urceomyces Letcher

Gorgonomycetaceae Letcher
Gorgonomyces Letcher

Halomycetaceae Letcher & M.J. Powell
Halomyces Letcher & M.J. Powell
Paludomyces Letcher & M.J. Powell
Paranamyces Letcher & M.J. Powell
Ulkenomyces Letcher & M.J. Powell

Kappamycetaceae Letcher
Kappamyces Letcher & M.J. Powell

Operculomycetaceae Doweld
Operculomyces M.J. Powell, Letcher & Longcore

Pateramycetaceae Letcher
Pateramyces Letcher

Protrudomycetaceae Letcher
Protrudomyces Letcher

Rhizophydiaceae Letcher
Rhizophydium Schenk ex Rabenh.

Staurastromycetaceae S. Van den Wyngaert, K. Seto & K. Rojas
Staurastromyces S. Van den Wyngaert, K. Seto & K. Rojas-Jimenez

Terramycetaceae Letcher
Boothiomyces Letcher
Terramyces Letcher

Uebelmesseromycetaceae M.J. Powell & Letcher
Uebelmesseromyces M.J. Powell & Letcher

Rhizophydiales genera *incertae sedis*
Homolaphlyctis Longcore et al.

Rhizophlyctidomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Rhizophlyctidales Letcher
Arizonaphlyctidaceae Letcher
Arizonaphlyctis Letcher

Borealophlyctidaceae Letcher
Borealophlyctis Letcher

Rhizophlyctidaceae H.E. Petersen
Rhizophlyctis A. Fisch.

Sonoraphlyctidaceae Letcher
Sonoraphlyctis Letcher

Spizellomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov

Spizellomycetales D.J.S. Barr
Powellomycetaceae D.R. Simmons
Fimicolochytrium D.R. Simmons & Longcore
Geranomyces D.R. Simmons
Powellomyces Longcore
Thoreauomyces D.R. Simmons & Longcore

Spizellomycetaceae D.J.S. Barr
Barromyces M.J. Powell & Letcher
Brevicalcar Letcher & M.J. Powell
Bulbosomyces Letcher & Longcore
Gaertneriomyces D.J.S. Barr
Gallinipes Letcher & M.J. Powell
Kochiomyces D.J.S. Barr
Spizellomyces D.J.S. Barr
Triparticalcar D.J.S. Barr

Synchytriomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Synchytriales Doweld
Synchytriaceae J. Schröt.
Carpenterophlyctis Doweld
Endodesmidium Canter
Johnkarlingia Pavgi & S.L. Singh
Synchytrium de Bary & Woronin

Synchytriales genera *incertae sedis*
Micromyces P.A. Dang.

Chytridiomycota genera *incertae sedis*
Achlyella Lagerh.
Coenomyces K.N. Deckenb.
Achlyogeton Schenk

CALCARISPORIELLOMYCOTA Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Calcarisporiellomycotina Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Calcarisporiellomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Calcarisporiellales Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Calcarisporiellaceae Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Calcarisporiella de Hoog
Echinochlamydosporium X.Z. Jiang, H.Y. Yu, M.C. Xiang, X.Y. Liu & Xing Z. Liu

ENTOMOPHTHOROMYCOTA Humber
Entomophthoromycotina Humber
Entomophthoromycetes Humber
Entomophthorales G. Winter
Ancylistaceae J. Schröt.
Ancylistes Pfitzer
Conidiobolus Bref.
Macrobiotophthora Reukauf

Completoriaceae Humber
Completoria Lohde

Entomophthoraceae Nowak.
Batkoa Humber
Entomophaga A. Batko
Entomophthora Fresen.
Erynia (Nowak. ex A. Batko) Remaud. & Hennebert
Eryniopsis Humber
Furia (A. Batko) Humber
Massospora Peck
Orthomyces Steinkr., Humber & J.B. Oliv.
Strongwellsea A. Batko & J. Weiser
Tarichium Cohn *sensu stricto*
Zoophthora A. Batko

Meristacraceae Humber
Meristacrum Drechsler
Tabanomyces Couch, R.J. Andrejeva, Laird & Nolan

Neozygitomycetes Humber
Neozygitales Humber
Neozygitaceae Ben Ze'ev, R.G. Kenneth & Uziel
Apterivorax S. Keller
Neozygites Witlaczil
Tarichium Cohn *pro parte*
Thaxterosporium Ben Ze'ev & R.G. Kenneth

GLOMEROMYCOTA C. Walker & A. Schüßler
Archaeosporomycetes Sieverd., G.A. Silva, B.T. Goto & Oehl
Archaeosporales C. Walker & A. Schüßler
Ambisporaceae C. Walker et al.
Ambispora C. Walker, Vestberg & A. Schüßler

Archaeosporaceae J.B. Morton & D. Redecker
Archaeospora J.B. Morton & D. Redecker
Palaeospora Oehl, Palenz., Sánchez-Castro & G.A. Silva

Geosiphonaceae Engl. & E. Gilg
Geosiphon F. Wettst.

Glomeromycetes Caval.-Sm.
Diversisporales C. Walker & A. Schüßler
Acaulosporaceae J.B. Morton & Benny
Acaulospora Gerd. & Trappe

Diversisporaceae C. Walker & A. Schüßler
Corymbiglomus Błaszk. & Chwat
Desertispora Błaszk., Kozłowska, Ryszka, Al-Yahya'ei & Symanczik
Diversispora C. Walker & A. Schüßler
Otospora Oehl, Palenz. & N. Ferrol
Redeckera C. Walker & A. Schüßler
Tricispora Oehl, Sieverd., G.A. Silva & Palenz.

Gigasporaceae J.B. Morton & Benny
Cetraspora Oehl, F. A. Souza & Sieverd.
Dentiscutata Sieverd., F.A. Souza & Oehl
Gigaspora Gerd. & Trappe
Racocetra Oehl, F.A. Souza & Sieverd.
Scutellospora C. Walker & F.E. Sanders
Bulbospora Oehl & G.A. Silva
Intraornatospora B.T. Goto, Oehl & G.A. Silva
Paradentiscutata B.T. Goto, Oehl & G.A. Silva

Pacisporaceae C. Walker, Błaszk., A. Schüßler & Schwarzott
Pacispora Sieverd. & Oehl

Sacculosporaceae Oehl, Sieverd., G.A. Silva, B.T. Goto, Sánchez-Castro & Palenz.
Sacculospora Oehl, Sieverd., G.A. Silva, B.T. Goto, I.C. Sánchez & Palenz.

Glomerales J.B. Morton & Benny
Claroideoglomeraceae C. Walker & A. Schüßler
Claroideoglomus C. Walker & A. Schüßler

Glomeraceae Piroz. & Dalpé
Septoglomus Sieverd., G.A. Silva & Oehl
Sclerocystis Berk. & Broome
Rhizophagus P.A. Dang.
Kamienskia Błaszk., Chwat & Kovács
Glomus Tul. & C. Tul.
Funneliformis C. Walker & A. Schüßler
Dominikia Błaszk., Chwat & Kovács

Glomeromycetes genus *incertae sedis*,
Entrophospora R.N. Ames & R.W. Schneid.

Paraglomeromycetes Oehl, G.A. Silva, B.T. Goto & Sieverd.
Paraglomerales C. Walker & A. Schüßler
Paraglomeraceae J.B. Morton & D. Redecker
Paraglomus J.B. Morton & D. Redecker
Innospora Błaszk., Kovács, Chwat & Kozłowska

Pervetustaceae Błaszk., Chwat, Kozłowska, Symanczik & Al-Yahya'ei
Pervetustus Błaszk., Chwat, Kozłowska, Symanczik & Al-Yahya'ei

KICKXELLOMYCOTA Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Asellariomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Asellariales Manier ex Manier & Lichtw.
Asellariaceae Manier ex Manier & Lichtw.
Asellaria R.A. Poiss.

Asellariales genus *incertae sedis*
Baltomyces Cafaro

Barbatosporomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Barbatosporales Doweld
Barbatosporaceae Doweld
Barbatospora M.M. White, Siri & Lichtw.

Dimargaritomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Dimargaritales R.K. Benj.
Dimargaritaceae R.K. Benj.
Dimargaris Tiegh.
Dispira Tiegh.
Tieghemiomyces R.K. Benj.

Dimargaritales genus *incertae sedis*
Spinalia Vuill.

Harpellomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Harpellales Lichtw. & Manier
Harpellaceae L. Léger & Duboscq ex P.M. Kirk & P.F. Cannon
Carouxella Manier, Rioux & Whisler
Harpella L. Léger & Duboscq
Harpellomyces Lichtw. & S.T. Moss
Klastostachys Lichtw., M.C. Williams & M.M. White
Stachylina L. Léger & M. Gauthier
Stachylinoides Lichtw. & López-Lastra

Legeriomycetaceae Pouzar
Austrosmittium Lichtw. & M.C. Williams
Bactromyces William & Strongman
Baetimyces L.G. Valle & Santam.
Bojamyces Longcore
Capniomyces S.W. Peterson & Lichtw.
Caudomyces Lichtw., Kobayasi & Indoh
Coleopteromyces Ferrington, Lichtw. & López-Lastra
Dacryodiomyces Lichtw.
Ejectosporus S.W. Peterson, Lichtw. & M.C. Williams
Ephemerellomyces M.M. White & Lichtw.
Furculomyces Lichtw. & M.C. Williams
Gauthieromyces Lichtw.
Genistelloides S.W. Peterson, Lichtw. & B.W. Horn
Genistellospora Lichtw.
Glotzia M. Gauthier ex Manier & Lichtw.
Graminella L. Léger & M. Gauthier ex Manier
Laculus William & Strongman
Lancisporomyces Santam.
Legerioides M.M. White
Legeriomyces Pouzar
Legeriosimilis M.C. Williams, Lichtw., M.M. White & J.K. Misra
Orphella L. Léger & M. Gauthier
Pennella Manier
Plecopteromyces Lichtw., Ferrington & López-Lastra
Pseudoharpella Ferrington, M.M. White & Lichtw.
Pteromaktron Whisler
Simuliomyces Lichtw.
Sinotrichium Juan Wang
Smittium R.A. Poiss.
Spartiella Tuzet & Manier ex Manier
Stipella L. Léger & M. Gauthier
Stypomyces Doweld
Tectimyces L.G. Valle & Santam.
Trichozygospora Lichtw.
Trifoliellum Strongman & M.M. White
Zancudomyces Yan Wang, Tretter, Lichtw. & M.M. White
Zygopolaris S.T. Moss, Lichtw. & Manier

Harpellales genus *incertae sedis*
Trissocladomyces Doweld

Kickxellomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Kickxellales Kreisel ex R.K. Benj.
Kickxellaceae Linder
Coemansia Tiegh. & G. Le Monn.
Dipsacomyces R.K. Benj.
Kickxella Coem.
Linderina Raper & Fennell
Martensella Coem.
Martensiomyces J.A. Mey.
Mycoemilia Kurihara, Degawa & Tokum.
Myconymphaea Kurihara, Degawa & Tokum.
Pinnaticoemansia Kurihara & Degawa

Spirodactylon R.K. Benj.
Spiromyces R.K. Benj.

Ramicandelaberomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Ramicandelaberales Doweld
Ramicandelaberaceae Doweld
Ramicandelaber Y. Ogawa, S. Hayashi, Degawa & Yaguchi

Kickxellomycotina genera *incertae sedis*
Ballocephala Drechsler
Zygnemomyces K. Miura

MONOBLEPHAROMYCOTA Doweld
Hyaloraphidiomycetes Doweld
Hyaloraphidiales Doweld
Hyaloraphidiaceae Doweld
Hyaloraphidium Korshikov

Monoblepharidomycetes J.H. Schaffn.
Monoblepharidales Sparrow
Gonapodyaceae H.E. Petersen ex P.M. Kirk, P.F. Cannon & J.C. David
Gonapodya A. Fisch.
Monoblepharella Sparrow

Harpochytriaceae Wille
Harpochytrium Lagerh.

Monoblepharidaceae A. Fisch.
Monoblepharis Cornu

Oedogoniomycetaceae D.J.S. Barr
Oedogoniomyces Kobayasi & M. Ôkubo

Telasphaerulaceae Longcore & T.Y. James
Telasphaerula Longcore & T.Y. James

Sanchytriomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Sanchytriales Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Sanchytriaceae Karpov & Aleoshin
Amoeboradix Karpov, Lopez-Garcia, Mamkaeva & Moreira
Sanchytrium Karpov & Aleoshin

MORTIERELLOMYCOTA Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
Mortierellomycotina Kerst. Hoffm., K. Voigt & P.M. Kirk
Mortierellomycetes Doweld
Mortierellales Caval.-Sm.
Mortierellaceae A. Fisch.
Aquamortierella Embree & Indoh
Dissophora Thaxt.
Gamsiella (R.K. Benj.) Benny & M. Blackw.
Mortierella Coem.
Modicella Kanouse
Lobosporangium M. Blackw. & Benny

MUCOROMYCOTA Doweld
Mucoromycotina Benny
Endogonomycetes Doweld
Endogonales Jacz. & P.A. Jacz.
Endogonaceae Paol.
Densospora McGee
Endogone Link
Jimgerdemannia Trappe
Peridiospora C.G. Wu & Suh J. Lin
Sclerogone Warcup
Sphaerocreas Sacc. & Ellis

Mucoromycetes Doweld
Mucorales Fr.
Cunninghamellaceae Naumov ex R.K. Benj.
Absidia Tiegh.
Chlamydoabsidia Hesselt. & J.J. Ellis
Cunninghamella Matr.
Gongronella Ribaldi
Halteromyces Shipton & Schipper
Hesseltinella H.P. Upadhyay

Backusellaceae K. Voigt & P.M. Kirk
Backusella Hesselt. & J.J. Ellis

Choanephoraceae J. Schröt.
Blakeslea Thaxt.
Choanephora Curr.
Gilbertella Hesselt.
Poitrasia P.M. Kirk

Lentamycetaceae K. Voigt & P.M. Kirk
Lentamyces Kerst. Hoffm. & K. Voigt

Lichtheimiaceae Kerst. Hoffm., Walther & K. Voigt
Dichotomocladium Benny & R.K. Benj.
Lichtheimia Vuill.
Rhizomucor Lucet & Costantin
Thermomucor Subrahm., B.S. Mehrotra & Thirum.

Mucoraceae Dumort.
Actinomucor Schostak.
Ambomucor R.Y. Zheng & X.Y. Liu
Chaetocladium Fresen.
Dicranophora J. Schröt.
Ellisomyces Benny & R.K. Benj.

Helicostylum Corda
Hyphomucor Schipper & Lunn
Isomucor J.I. Souza, Pires-Zottar. & Harakava
Kirkiana L.S. Loh, Kuthub. & Nawawi
Mucor Fresen.
Nawawiella L.S. Loh & Kuthub.
Parasitella Bainier
Pilaira Tiegh.
Pirella Bainier
Rhizopodopsis Boedijn
Thamnidium Link
Tortumyces L.S. Loh

Mycocladaceae Kerst. Hoffm.
Mycocladus Beauverie

Mycotyphaceae Benny & R.K. Benj.
Benjaminiella Arx
Cokeromyces Shanor
Kirkomyces Benny
Mycotypha Fenner

Phycomycetaceae Arx
Phycomyces Kunze
Spinellus Tiegh.

Pilobolaceae Corda
Pilobolus Tode
Utharomyces Boedijn ex P.M. Kirk & Benny

Radiomycetaceae Hesselt. & J.J. Ellis
Radiomyces Embree

Rhizopodaceae K. Schum.
Amylomyces Calmette
Rhizopus Ehrenb.
Sporodiniella Boedijn
Syzygites Ehrenb.

Saksenaeaceae Hesselt. & J.J. Ellis
Apophysomyces P.C. Misra
Saksenaea S.B. Saksena

Syncephalastraceae Naumov ex R.K. Benj.
Circinella Tiegh. & G. Le Monn.
Fennellomyces Benny & R.K. Benj.
Phascolomyces Boedijn ex Benny & R.K. Benj.
Protomycocladus Schipper & Samson
Syncephalastrum J. Schröt.
Thamnostylum Arx & H.P. Upadhyay
Zychaea Benny & R.K. Benj.

Umbelopsidomycetes Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov

Umbelopsidales Spatafora & Stajich
Umbelopsidaceae W. Gams & W. Mey.
Umbelopsis Amos & H.L. Barnett

Mucoromycotina genera *incertae sedis*
Bifiguratus Torr.-Cruz & Porras-Alfaro
Palaeoendogone Strullu-Derr., Kenrick, Pressel, Duckett, J.P. Rioult & Strullu

Mucoromycota genus *incertae sedis*
Nothadelphia Degawa & W. Gams

NEOCALLIMASTIGOMYCOTA M.J. Powell
Neocallimastigomycetes M.J. Powell
Neocallimastigales J.L. Li, I.B. Heath & L. Packer
Anaeromycetaceae Doweld
Anaeromyces Breton, Bernalier, Dusser, Fonty, B. Gaillard & J. Guillot
Neocallimastigaceae I.B. Heath (= *Piromonadaceae* Doweld)
Buwchfawromyces T.M. Callaghan & G.W. Griff.
Caecomyces J.J. Gold
Cyllamyces Ozkose, B.J. Thomas, D.R. Davies, G.W. Griff. & Theodorou
Neocallimastix Vávra & Joyon ex I.B. Heath
Oontomyces Dagar
Orpinomyces D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng
Pecoramyces Hanafy, N.H. Youssef, G.W. Griff. & Elshahed
Piromyces J.J. Gold, I.B. Heath & Bauchop (= *Piromonas* E. Liebet.)

Sphaeromonadaceae Doweld
Sphaeromonas E. Liebet.

OLPIDIOMYCOTA Doweld
Olpidiomycetes Doweld
Olpidiales Caval.-Sm.
Olpidiaceae J. Schröt.
Chytridhaema Moniez
Cibdelia Juel
Leiolpidium Doweld
Olpidium (A. Braun) J. Schröt.

ROZELLOMYCOTA Doweld
Microsporidea Corliss & Levine
Chytridiopsida Weiser
Burkeidae Sprague
Burkea Sprague

Buxtehudiidae Larsson
Jiroveciana Larsson
Buxtehudea Larsson

Chytridiopsidae Sprague, Ormières & Manier
Acarispora Radek and Alberti

Chytridiopsis Schneider
Intexta Larsson, Steiner & Bjørnson
Nolleria Beard, Butler & Becnel

Enterocytozoonidae Cali & Owen
Desmozoon Freeman & Sommerville
Enterocytozoon Desportes, Le Charpentier, Galian, Bernard, Cochand-Priollet, Lavergne, Ravisse & Modigliani
Enterospora Stentiford, Bateman, Longshaw & Feist
Hepatospora Stentiford, Bateman, Dubuffet, Chambers & Stone
Nucleospora Hedrick, Groff & Baxa
Obruspora Diamant, Rothman, Goren, Galil, Yokes, Szitenberg & Huchon
Paranucleospora Nylund, Watanabe, Nylund, Sævareid, Erik Arnesen & Karlsbakk

Hesseidae Ormières & Sprague
Hessea Ormières & Sprague

Dissociodihaplophasida Sprague
Caudosporidae Weiser
Binucleospora Bronnvall & Larsson
Caudospora Weiser
Flabelliforma Canning, R. Killick-Kendrick & Killick-Kendrick
Neoflabelliforma Morris & Freeman
Octosporea Flu
Polydispyrenia Canning & Hazard
Ringueletium Garcia
Scipionospora Bylén & Larsson
Weiseria Doby & Saguez
Myrmecomorba R.M. Plowes, J.J. Becnel, E.G. LeBrun, D.H. Oi, S.M. Valles, N.T. Jones & L.E. Gilbert

Golbergiidae Issi
Golbergia Weiser
Krishtalia Kilochitskii
Simuliospora Khodzhaeva, Krylova & Issi

Mrazekiidae Léger & Hesse
Agmasoma Hazard & Oldacre
Anostracospora Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand
Euplotespora Fokin, Di Giuseppe, Erra & Dini
Helmichia Larsson
Hrabyeia Lom & Dyková
Jirovecia Weiser
Mrazekia Léger & Hesse
Rectispora Larsson

Nosematidae Labbe
Nosema Nägeli
Oligosporidium Codreanu-Balcescu, Codreanu & Traciuc
Vairimorpha Pilley

Ovavesiculidae Sprague, Becnel & Hazard
Antonospora Fries, Paxton, Tengo, Slemenda, da Silva, & Pieniazek
Ovavesicula Andreadis & Hanula
Paranosema Sokolova, Dolgikh, Morzhina, Nassonova, Issi, Terry, Ironside, Smith

Pseudopleistophoridae Sprague
Pseudopleistophora Sprague
Steinhausia Sprague, Ormières & Manier

Spragueidae Weissenberg
Inodosporus Overstreet & Weidner
Kabatana Lom, Dyková & Tonguthai
Microgemma Ralphs & Matthews
Spraguea Weissenberg
Potaspora Casal, Matos, Teles-Grilo & Azevedo
Tetramicra Matthews & Matthews

Glugeida Gurley
Abelsporidae Azevedo
Abelspora Azevedo

Encephalitozoonidae Voronin
Encephalitozoon Levaditi, Nicolau & Schoen
Mockfordia Sokolova, Sokolov & C.E. Carlton

Glugeidae Gurley
Alloglugea Paperna & Lainson
Amazonspora Azevedo & Matos
Glugea Thélohan
Ichthyosporidium Caullery & Mesnil
Johenrea Lange, Becnel, Razafindratiana, Przybyszewski & H. Razafindrafara
Loma Morrison & Sprague
Parapleistophora Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova
Pseudoloma Matthews, Brown, Larison, Bishop-Stewart, Rogers & Kent

Gurleyidae Sprague
Agglomerata Larsson& Yan
Binucleata Refardt, Decaestecker, Johnson & Vávra
Episeptum Larsson
Gurleya Doflein
Lanatospora Voronin
Larssonia Vidtmann & Sokolova
Marssoniella Lemmermann
Norlevinea Vávra
Paraepiseptum Hyliš, Oborník, Nebesářová & Vávra
Pyrotheca Hesse
Senoma Simakova, Pankova, Tokarev & Issi
Zelenkaia Hyliš, Oborník, Nebesářová & Vávra

Microfilidae Sprague, Becnel & Hazard
Microfilum Faye, Toguebaye & Bouix

Pleistophoridae Doflein
Dasyatispora Diamant, Goren, Yokeş, Galil, Klopman, Huchon, Szitenberg & Karhan
Heterosporis Schubert
Myosporidium Baquero, Rubio, Moura, Pieniazek & Jordana
Ovipleistophora Pekkarinen, Lom & F. Nilsen
Pleistophora Gurley
Trachipleistophora Hollister, Canning, Weidner, Field, Kench & Marriott
Vavraia Weiser

Tuzetiidae Sprague, Tuzet & Maurand
Nelliemelba Larsson
Pankovaia Simakova, Tokarev & Issi
Paratuzetia Poddubnaya, Tokarev & Issi
Tuzetia Maurand, Fize, Vernick & Michel

Unikaryonidae Sprague
Canningia Weiser, Wegensteiner & Žižka
Dictyocoela Terry, Smith, Sharpe, Rigaud, Littlewood, Ironside, Rollinson, Bouchon, MacNeil, Dick & Dunn
Larssoniella Weiser & David
Unikaryon Canning, Lai & Lie

Meiodihaplophasida Sprague, Becnel, Hazard
Amblyosporidae Weiser
Aedispora Kilochitskii
Amblyospora Hazard & Oldacre
Andreanna Simakova, C.R. Vossbrinck & Andreadis
Becnelia Tonka & Weiser
Crepidulospora Simakova, Pankova & Issi
Cristulospora Khodzhaeva & Issi
Culicospora Weiser
Culicosporella Weiser
Dimeiospora Simakova, Pankova & Issi
Edhazardia Becnel, V. Sprague & Fukuda
Hyalinocysta Hazard & Oldacre
Intrapredatorus Chen, Kuo & Wu 1998
Novothelohania Andreadis, Simakova, Vossbrinck, Shepard & Yurchenko
Parastempellia Khodzhaeva
Parathelohania Codreanu
Trichoctosporea Larsson
Tricornia Pell & Canning

Burenellidae Jouvenaz & Hazard
Burenella Jouvenaz & Hazard
Pilosporella Hazard & Oldacre
Tabanispora Bykova, Sokolova & Issi

Cylindrosporidae Issi & Voronin
Cylindrospora Issi & Voronin

Duboscqiidae R. Sprague
Duboscqia Pérez
Mitoplistophora Codreanu
Pulicispora Vedmed, Krylova & Issi
Tardivesicula Larsson& Bylén
Trichoduboscqia L. Léger

Pereziidae Loubes, Maurand, Comps & Campillo
Ameson V. Sprague
Nadelspora Olson, Tiekotter & Reno
Perezia Léger & Duboscq
Pernicivesicula Bylén & Larsson

Striatosporidae Issi & Voronin
Striatospora Issi & Voronin

Thelohaniidae Hazard & Oldacre
Bohuslavia Larsson
Chapmanium Hazard & Oldacre
Coccospora Wallr.
Cucumispora Ovcharenko, Bacela, Wilkinson, Ironside, Rigaud & Wattier
Hyperspora Stentiford, Ramilo, Abollo, Kerr, Bateman, Feist, Bass & Villalba
Napamichum Larsson
Nudispora Larsson
Octotetraspora Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova
Ormieresia C.P. Vivarès, G. Bouix & Manier
Orthothelohania Codreanu & Codreanu-Balcescu
Paradoxium G.D. Stentiford, S.H. Ross, R. Kerr, D. Bass & K.S. Bateman
Pegmatheca Hazard & Oldacre
Resiomeria Larsson
Spherospora J.J. Garcia
Thelohania Henneguy
Toxoglugea Léger & Hesse

Microsporidea families *incertae sedis*,
Areosporiidae G.D. Stentiford, S. Bateman, Feist, S. Oyarzún, J.C. Uribe, M. Palacios & D.M. Stone
Areospora G.D. Stentiford, S. Bateman, Feist, S. Oyarzún, J.C. Uribe, M. Palacios & D.M. Stone

Berwaldiidae Simakova, Tokarev, Issi
Berwaldia Larsson

Fibrillanosema Slothouber Galbreath, Smith, Terry, Becnel, & Dunn

Cougourdellidae Poisson
Cougourdella E. Hesse

Facilisporidae Jones, Prosperi-Porta & Kim
Facilispora Jones, Prosperi-Porta & Kim

Heterovesiculidae Lange, Macvean, Henry & Streett
Heterovesicula Lange, Macvean, Henry & Streett

Myosporidae Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck
Myospora Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck

Neonosemoidiidae Faye, Toguebaye & Bouix
Neonosemoides Faye & Toguebaye

Ordosporidae Larsson, Ebert & Vávra
Ordospora Larsson, Ebert & Vávra

Pleistosporidiidae Codreanu-Balcescu & Codreanu
Pleistosporidium Codreanu-Balcescu & Codreanu

Neopereziidae. Voronin
Bacillidium Janda
Bryonosema Canning, Refardt, Vossbrinck, Okamura & Curry
Neoperezia Issi & Voronin
Pseudonosema Canning, Refardt, Vossbrinck, Okamura & Curry
Schroedera D.J. Morris & A. Adams
Trichonosema Canning, Refardt, Vossbrinck, Okamura & Curry

Telomyxidae Léger & Hesse
Telomyxa Léger & Hesse

Toxoglugeidae Larsson
Toxospora Voronin

Tubulinosematidae Franzen, Fischer, Schröder, Schölmerich & Schneuwly
Anncaliia Issi, Krylova & Nikolaeva
Kneallhazia Sokolova & Fuxa
Tubulinosema Franzen, Fischer, Schröder, Schölmerich & Schneuwly

Microsporidea genera *incertae sedis*
Alfvenia Larsson
Anisofilariata Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova, Ignatieva & Issi
Auraspora Weiser & K. Purrini
Baculea Loubès & Akbarieh
Campanulospora Issi, Radishcheva & Dolzhenko
Caulleryetta Dogiel
Chytridioides Tregouboff
Ciliatosporidium Foissner & Foissner
Crispospora Tokarev, Voronin, Seliverstova, Pavlova & Issi
Cryptosporina Hazard & Oldacre
Cystosporogenes Canning, Barker, Nicholas & Page
Endoreticulatus Brooks, Becnel & Kennedy
Enterocytospora Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand
Evlachovaia Voronin
Geusia Rühl & Korn
Globulispora Vávra, Hylis, Viala, Nebesarova
Glugoides (Chatton) Larsson, Ebert, Vávra & Voronin
Gurleyides Voronin
Hamiltosporidium Haag, Larsson, Refardt, and Ebert
Hazardia Weiser
Hirsutosporos Batson
Holobispora Voronin
Issia Weiser
Janacekia Larsson
Kinorhynchospora Adrianov & Rybakov
Liebermannia Sokolova, Lange & Fuxa
Mariona Stempell
Merocinta Pell & Canning
Microsporidium Balbiani
Multilamina Becnel, Scheffrahn, Vossbrinck & Bahder
Myxocystis Mrazek
Nematocenator Sapir, Dillman, Connon, Grupe, Ingels, Mundo-Ocampo, Levin, Bladwin, Orphan & Sternberg
Nematocida Troemel, Félix, Whiteman, Barrière & Ausubel
Nosemoides Vinckier
Orthosomella Canning, Wigley & Barker
Sheriffia Larsson
Spiroglugea Léger & Hesse
Sporanauta Ardila-Garcia & Fast
Stempellia Léger & Hesse
Systenostrema Hazard & Oldacre
Takaokaspora Andreadis, Takaoka, Otsuka & Vossbrinck
Trichotuzetia Vávra, Larsson& Baker
Triwangia Wang, Nai, Chih Wang, Solter, Hsu, Wang & Lo
Vittaforma Silveira & Canning
Wittmannia Czaker

Rudimicrosporea Sprague
Metchnikovellida Vivier
Amphiacanthidae Larsson
Amphiacantha Caullery & Mesnil
Amphiamblys Caullery & Mesnil

Metchnikovellidae Caullery & Mesnil
Desportesia Issi & Voronin
Metchnikovella Caullery & Mesnil
Microsporidiopsis Schereschewsky

Rozellomycota genera *incertae sedis*
Mitosporidium Haag, James, Pombert, Larsson, Schaer, Refardt & Ebert
Nucleophaga Dangeard
Paramicrosporidium Corsaro, Walochnik, Venditti, Steinmann, Müller & Michel
Rozella Cornu

ZOOPAGOMYCOTA Gryganskyi, M.E. Sm., Spatafora & Stajich
Zoopagomycetes Doweld
Zoopagales Bessey ex R.K. Benj.
Cochlonemataceae Dudd.
Amoebophilus P.A. Dang.
Aplectosoma Drechsler
Bdellospora Drechsler
Cochlonema Drechsler
Endocochlus Drechsler
Euryancale Drechsler

Helicocephalidaceae Boedijn
Brachymyces G.L. Barron
Helicocephalum Thaxt.
Rhopalomyces Corda
Verrucocephalum Degawa

Piptocephalidaceae J. Schröt.
Kuzuhaea R.K. Benj.
Piptocephalis de Bary
Syncephalis Tiegh. & G. Le Monn.

Sigmoideomycetaceae Benny, R.K. Benj. & P.M. Kirk
Reticulocephalis Benny, R.K. Benj. & P.M. Kirk
Sigmoideomyces Thaxt.
Sphondylocephalum Stalpers
Thamnocephalis Blakeslee

Zoopagaceae Drechsler
Acaulopage Drechsler
Cystopage Drechsler
Lecophagus M.W. Dick
Stylopage Drechsler
Tentaculophagus Doweld
Zoopage Drechsler
Zoophagus Sommerst.

Zoopagales genera *incertae sedis*
Massartia De Wild.

Zoopagomycotina genus *incertae sedis*
Basidiolum Cienk.

NOTES FOR GENERA

In this section we provide an introduction for each phylum and entries for each genus with taxonomic placements, habitat, recent references etc.

Aphelidiomycota Tedersoo et al.

Tedersoo et al. (2016) introduced *Aphelidiomycota* which comprises one class, one order and one family. Currently, we accept four genera belonging in *Aphelidiomycota*.

Notes for genera

Amoeboaphelidium Scherff. 1925, *Aphelidiaceae*, *Aphelidiales*, *Aphelidiomycetes*, *Aphelidiomycota*, five species, type: *A. achnanthidis* Scherff., parasites, aquatic, cosmopolitan, see Letcher et al. (2015b; new species), Karpov et al. (2016; phylogeny), sequences are available.
Aphelidium Zopf 1885, *Aphelidiaceae*, *Aphelidiales*, *Aphelidiomycetes*, *Aphelidiomycota*, seven species, type: *A. deformans* Zopf, parasites of algae, aquatic, worldwide, see Karpov et al. (2016; phylogeny), Letcher et al. (2017a; new species), sequences are available.
Paraphelidium Karpov, Moreira, Lopez-Garcia 2017b, *Aphelidiaceae*, *Aphelidiales*, *Aphelidiomycetes*, *Aphelidiomycota*, two species, type: *P. tribonemae* Karpov, Moreira, Lopez-Garcia, parasites of *Tribonema gayanum*, aquatic, Russia, see Karpov et al. (2017b, c; taxonomy, phylogeny), sequences are available.
Pseudaphelidium Schweikert & Schnepf 1996, *Aphelidiaceae*, *Aphelidiales*, *Aphelidiomycetes*, *Aphelidiomycota*, one species, type: *P. drebesii* Schweikert & Schnepf, parasite, marine, Germany, see Schweikert and Schnepf (1996, 1997; description, light microscopy, electron microscopy), sequences are unavailable.

Basidiobolomycota Doweld

Doweld (2001) introduced *Basidiobolomycota* based on *Basidiobolus* Eidam. Taxonomic placement of *Basidiobolus* (including higher taxonomic ranks i.e. *Basidiobolaceae*, *Basidiobolales*, *Basidiobolomycetes*) was doubtful since different publications accommodated it in different placements in Kingdom Fungi. Nagahama et al. (1995) and James et al. (2000) showed that *Basidiobolus* grouped with *Chytridiomycetes* based on 18S rDNA sequence analyses. However, James et al. (2006), for the first time, accepted *Basidiobolus* belongs in *Entomophthoromycota*. The placement in James et al. (2006) was followed by Humber (2012) and Gryganskyi et al. (2013a, b). Nevertheless,

Hibbett et al. (2007) provided contrary conclusion with all above placements on *Basidiobolus*, and placed it in uncertain placement in Kingdom Fungi. Nevertheless, Tedersoo et al. (2016) accepted *Basidiobolomycota* (*fide* Doweld 2001) as a distinct phylum in their newly proposed classification of fungi. Our phylogenetic analyses also agree with this placement thus in here, we conclude *Basidiobolomycota* as a distinct phylum which comprises *Basidiobolus* and *Schizangiella* J. Dwyer et al. (Fig. 1).

Notes for genera

Basidiobolus Eidam 1886, *Basidiobolaceae*, *Basidiobolales*, *Basidiobolomycetes*, *Entomophthoromycota*, four species, type: *B. ranarum* Eidam, on dung, human pathogen, worldwide, see Rabie et al. (2011; Basidiobolomycosis), Sharma et al. (2011; human pathogen), Humber (2012; classification), Kumar Verma et al. (2012; subcutaneous zygomycosis), Kwon-Chung (2012; human pathogen), Gryganskyi et al. (2013a; notes), Kirk et al. (2013; genus accepted), Al-Maani et al. (2014; gastrointestinal basidiobolomycosis), Mendoza et al. (2015; human pathogen), Almoosa et al. (2017; pediatric gastrointestinal basidiobolomycosis), cultures and sequences are available, genomes available: *B. meristosporus* CDC-B9252 and CBS 931.73 (Chibucos et al. 2016) available at NCBI genomes, *B. heterosporus* CDC-B8920 (Chibucos et al. 2016) available at NCBI genomes.

Schizangiella J. Dwyer, B. Burwell, Humber, C. Mcleod, M. Fleetwood & T. Johnson bis 2006, *Basidiobolaceae*, *Basidiobolales*, *Basidiobolomycetes*, *Entomophthoromycota*, one species, type: *S. serpentis* J. Dwyer, B. Burwell, Humber, C. Mcleod, M. Fleetwood & T. Johnson bis, snake pathogen, cosmopolitan, see Gryganskyi et al. (2013a; notes, phylogeny), Hoffmann et al. (2013; notes), Humber (2016; classification), cultures and sequences are available.

Blastocladiomycota T.Y. James

James et al. (2006) elevated the order *Blastocladiales*, which was traditionally treated as in *Chytridiomycota*, to a phylum *Blastocladiomycota*. The members of *Blastocladiomycota* show different life modes such as saprobic, invertebrate parasites (e.g. *Callimastix* Weissenb., *Coelomomyces* Keilin), and fungal and algal parasites (Hoffman et al. 2008; James et al. 2011). In evolution perspective, *Blastocladiales* differs from the chytrids which have zygotic meiosis while most *Blastocladiales* have a life cycle with sporic meiosis (James et al. 2006). Subsequent studies by Hibbett et al. (2007), Porter et al. (2011), James et al. (2012, 2014), Jones et al. (2016), Seto et al. (2017) and Krings et al. (2016) also recognized *Blastocladiomycota* as a distinct phylum of fungi.

In this study, we accept one class, three orders, eight families and 14 genera in *Blastocladiomycota*.

Notes for genera

Allomyces E.J. Butler 1911 (= *Septocladia* Coker & F.A. Grant 1922), *Blastocladiaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, c. ten species, type: *A. arbusculus* E.J. Butler, from soil, cosmopolitan, see Porter et al. (2011; phylogeny), James and Berbee (2012; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Blastocladia Reinsch 1877, *Blastocladiaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, c. 20 species, type: *B. pringsheimii* Reinsch, saprobes, aquatic, Argentina, see Porter et al. (2011; DNA, phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Blastocladiopsis Sparrow 1950, *Blastocladiaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, two species, type: *B. parva* Whiffen ex Sparrow, saprobes, aquatic, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Callimastix Weissenb. 1912, *Callimastigaceae*, *Callimastigales*, *Blastocladiomycetes*, *Blastocladiomycota*, one species, type: *C. cyclopis* Weissenb., on crustaceans, terrestrial, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Catenomyces A.M. Hanson 1944, *Catenomycetaceae*, *Catenomycetales*, *Blastocladiomycetes*, *Blastocladiomycota*, two species, type: *C. persicinus* A.M. Hanson, saprobes, North America, see Freeman et al. (Freeman et al. 2009; phylogeny), Kirk et al. (2013; genus accepted), Hillman et al. (2017; microbes in gastrointestinal tract), cultures and sequences are available.

Catenophlyctis Karling 1965 (= *Perirhiza* Karling 1946), *Catenariaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, two species, type: *C. variabilis* (Karling) Karling, saprobes, worldwide, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Coelomomyces Keilin 1921, *Coelomomycetaceae*, *Callimastigales*, *Blastocladiomycetes*, *Blastocladiomycota*, c. 75 species, type: *C. stegomyiae* Keilin, insect pathogens, worldwide, see Seye et al. (2009; pathogens of *Aedes albopictus*), Kirk et al. (2013; genus accepted), sequences are available.

Coelomycidium Debais. 1919 (= *Zografia* Bogoyavl. 1922), *Coelomomycetaceae*, *Callimastigales*, *Blastocladiomycetes*, *Blastocladiomycota*, one species, type: *C. simulii* Debais., insect pathogens, worldwide, see Porter et al. (2011; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Endoblastidium Codreanu 1931, *Blastocladiales* genera *incertae sedis*, *Blastocladiomycetes*, *Blastocladiomycota*, one species, type: *E. caulleryi* Codreanu, saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available for unidentified species.

Microallomyces R. Emers. & J.A. Robertson 1974, *Blastocladiomycetes* genera *incertae sedis*, *Blastocladiomycota*, two species, type: *M. dendroideus* R. Emers. & J.A. Robertson, saprobes, aquatic, Costa Rica, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Nematoceromyces Doweld 2013, *Catenariaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, three species, type: *N. spinosus* (W. Martin) Doweld, parasitic in eggs of insects, cosmopolitan, see Doweld et al. (2014k; genus accepted), cultures and sequences are unavailable.

Paraphysoderma Boussiba, Zarka & T.Y. James 2011, *Paraphysodermataceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, three species, type: *P. sedebokerense* Boussiba, Zarka & T.Y. James, parasitic on *Haematococcus pluvialis*, Israel, see James et al. (2011; taxonomy), Letcher et al. (2016; ultrastructure studies), Strittmatter et al. (2016; flagellated dispersion stage), cultures and sequences are available.

Physoderma Wallr. 1833 (= *Oedomyces* Sacc. ex Trab. 1894; = *Physopella* G. Poirault 1905; = *Urophlyctis* J. Schröt. (1886) [1889]), *Physodermataceae*, *Physodermatales*, *Physodermatomycetes*, *Blastocladiomycota*, c. 60 species, type: *P. maculare* Wallr., saprobes, worldwide, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Sorochytrium Dewel 1985, *Sorochytriaceae*, *Blastocladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, one species, type: *S. milnesiophthora* Dewel, saprobes, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Caulochytriomycota Doweld

Doweld (2014g) introduced *Caulochytriomycota* based on *Caulochytrium* Voos & L.S. Olive. *Caulochytrium gloeosporii* Voos & L.S. Olive, the type species of *Caulochytrium* was isolated from dead leguminous pods and treated as in *Chytridiales* (Voos and Olive 1968). The genus lacks DNA sequences in GenBank (accession date 29.06.2018) thus the erection was based only on morphology and habitat. Currently the phylum comprises one class, one order, one family and one genus.

Note for genus

Caulochytrium Voos & L.S. Olive 1968, *Caulochytriaceae*, *Caulochytriales*, *Caulochytriomycetes*, *Caulochytriomycota*, two species, type: *C. gloeosporii* Voos & L.S. Olive, saprobes, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Chytridiomycota Doweld

Doweld (2001) introduced *Chytridiomycota* based on *Chytridium* A. Braun (1851). Hibbett et al. (2007) also introduced *Chytridiomycota* M.J. Powell based on the same genus thus this name is treated as an isonym of *Chytridiomycota* Doweld. (Index Fungorum 2018). Taxa in *Chytridiomycota* (Figs. 3 and 4) show a broad range of distribution and mostly occur as aquatic (fresh water or marine) saprobes and parasites, although taxa in some orders (e.g. *Spizellomycetales* and *Rhizophlyctidales*) are nearly exclusively terrestrial saprobes of refractive substrates.

Hibbett et al. (2007) accepted two classes i.e. *Chytridiomycetes* Caval.-Sm. (including three orders) and *Monoblepharidomycetes* J.H. Schaffn. (including one order). Subsequent studies by Letcher et al. (2008a, b, c), Mozley-Standridge et al. (2009), Simmons et al. (2009), Longcore and Simmons (2012), Karpov et al. (2014) added several orders to *Chytridiomycetes*. We accept two classes, 13 orders, 57 families and 151 genera in *Chytridiomycota*.

Notes for genera

Achlyella Lagerh. 1890, *Chytridiomycota* genera *incertae sedis*, one species, type: *A. flahaultii* Lagerh., on pollen grains, aquatic, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Achlyogeton Schenk 1859, *Chytridiomycota* genera *incertae sedis*, one species, type: *A. entophytum* Schenk, parasitic, aquatic, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Algochytrops Doweld 2014i, *Lobulomycetales* genera *incertae sedis*, *Lobulomycetes*, *Chytridiomycota*, one species, type: *A. polysiphoniae* (Cohn) Doweld, epibiotic, marine, cosmopolitan, see Simmons et al. (2009; as *Chytridium polysiphoniae*, phylogeny), Doweld (2014i; taxonomy), cultures and sequences are unavailable.

Allochytridium D.J.S. Barr & Désauln. 1987 (= *Allochytridium* Salkin 1970), *Cladochytriales* genera *incertae sedis*, *Cladochytriomycetes*, *Chytridiomycota*, one species, type: *A. luteum* D.J.S. Barr & Désauln., from sandy soil, Canada, see Mozley-Standridg et al. (2009; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Alogomyces D.R. Simmons & Letcher 2012, *Alogomycetaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomycota*, one species, type: *A. tanneri* D.R. Simmons & Letcher, from horse manure, USA, see Simmons et al. (2012; taxonomy), Doweld (2014b; introduced *Alogomycetaceae*), cultures and sequences are available.

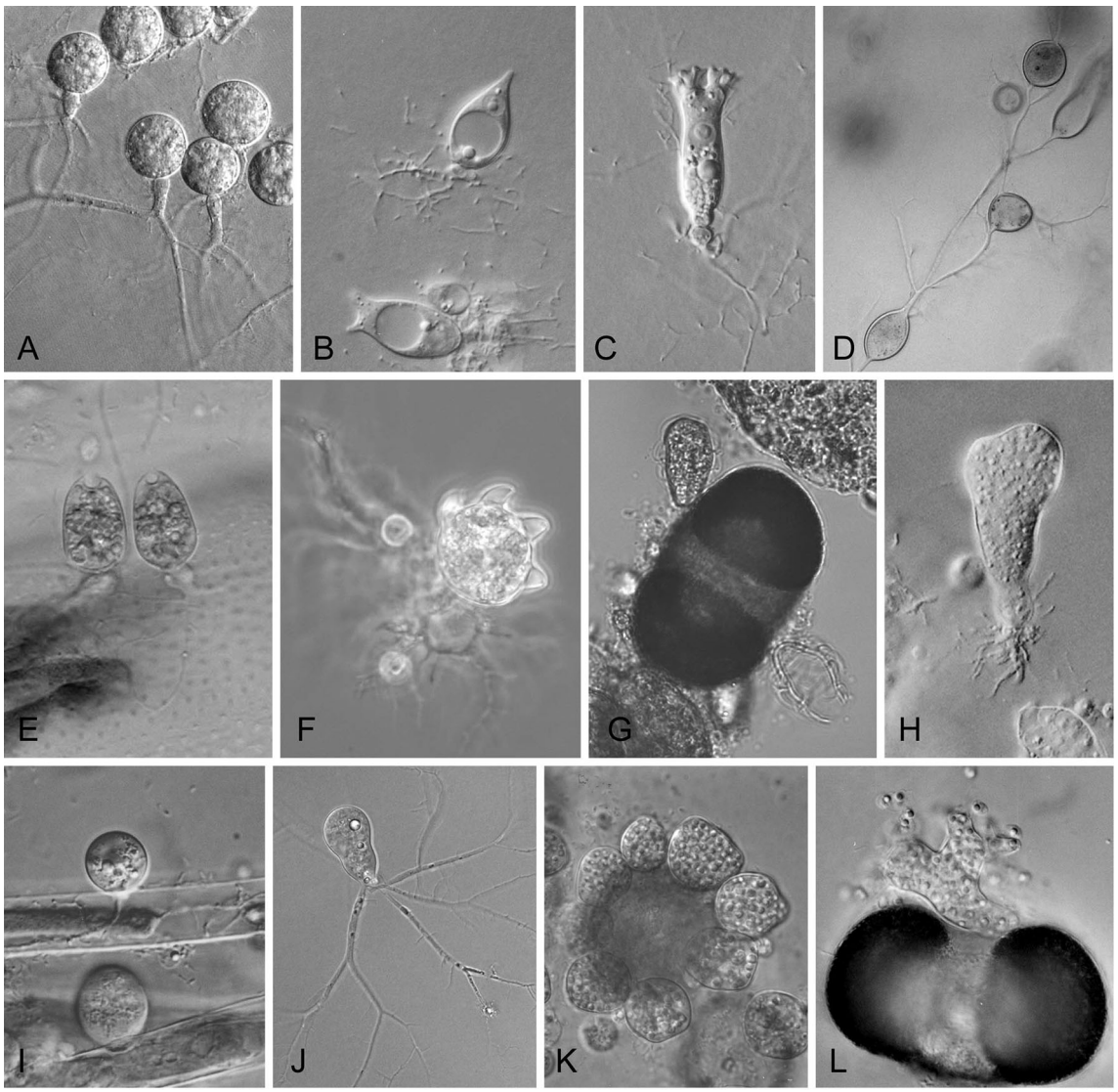

Fig. 3 **A–D** *Chytriomycetceae*, *Chytridiales*. **A** *Chytriomyces hyalinus*. **B** *Obelidium mucronatum*. **C** *Podochytrium dentatum*. **D** *Physocladia obscura*. **E**, **F** *Chytridiaceae, Chytridiales*. **E** *Phlyctochytrium planicorne*. **F** *Phlyctochytrium bullatum*. **G**, **H** *Lobulomycetales*. **G** *Lobulomyces poculatus*. **H** *Lobulomyces angularis*. **I–L** *Rhizophydiales*. **I** *Rhizophydium globosum*. **J** *Operculomyces laminatus*. **K** *Terramyces subangulosus*. **L** *Coralloidiomyces digitatus*

Alphamyces Letcher 2008, *Alphamycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *A. chaetifer* (Sparrow) Letcher, on pollen, Argentina, see Letcher et al. (2008c, 2012a, b; taxonomy), Akinwole et al. (2014; fatty acids), cultures and sequences are available.

Amoebochytrium Zopf 1884, *Amoebochytriaceae*, *Chytridiomycetes* families *incertae sedis*, *Chytridiomycota*, one species, type: *A. rhizidioides* Zopf, from soil, cosmopolitan, see Kirk et al. (2013; genus accepted), Doweld (2014c; introduced *Amoebochytriaceae*), cultures and sequences are unavailable.

Angulomyces Letcher 2008, *Angulomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *A. argentinensis* Letcher, from submersed mud, cosmopolitan, see Letcher et al. (2008b; taxonomy), Davis et al. (2013; from Alabama), cultures and sequences are available, ITS of the type culture NR_119644.

Aphanistis Sorokīn 1883, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: needs typification, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Aquamyces Letcher 2008, *Aquamycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *A. chlorogonii* (Serbinow) Letcher, South America, see Letcher et al. (2008c; taxonomy, phylogeny), cultures and sequences are available, ITS of the type culture EF585643.

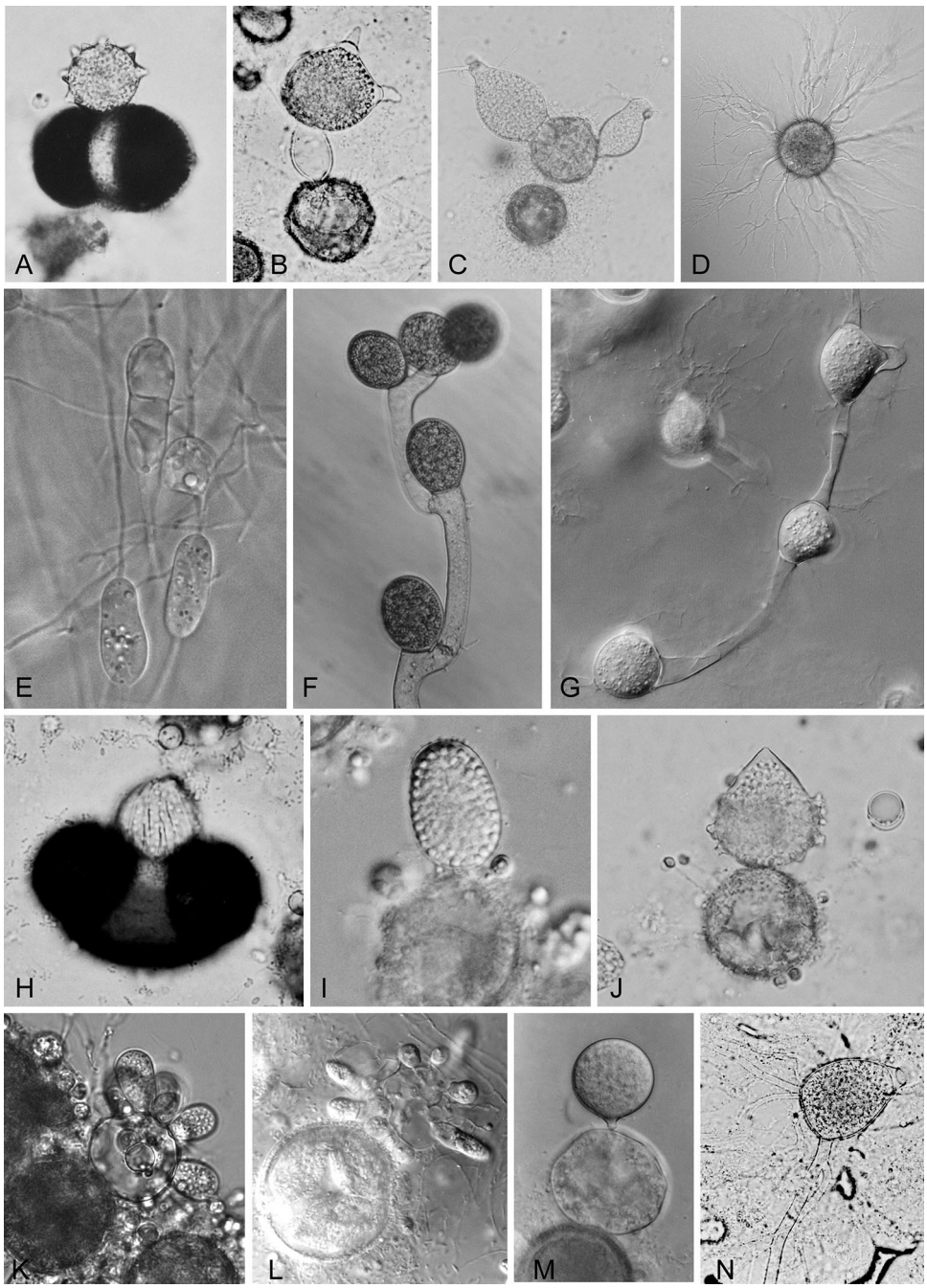

Fig. 4 **A**, **B** *Spizellomycetaceae*, *Spizellomycetales*. **A** *Spizellomyces punctatus*. **B** *Phlyctochytrium reinboldtiae*. **C** *Powellomycetaceae*, *Spizellomycetales*. *Powellomyces variabilis*. **D** *Rhizophlyctidales*. *Rhizophlyctis rosea*. **E** *Cladochytriales*. *Cladochytrium replicatum*. **F**, **G** *Blastocladiomycota*. **F** *Allomyces anomalus*. **G** *Catenaria anguillulae*. **H**–**N** *incertae sedis*. **H** *Blyttiomyces helicus*. **I** *Polyphlyctis cystofera*. **J** *Phlyctochytrium mucronatum*. **K** *Chytridium rhizophydii*. **L** *Septosperma rhizophydii*. **M** *Rhizophydium obpyriformis*. **N** *Rhizophlyctis ingoldii*

Arizonaphlyctis Letcher 2008, *Arizonaphlyctidaceae*, *Rhizophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomycota*, one species, type: *A. lemmonensis* Letcher, USA, see Letcher et al. (2008a; taxonomy, phylogeny), cultures and sequences are available, ITS of the type culture EU379214.

Arkaya Longcore & D.R. Simmons 2012, *Arkayaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, two species, type: *A. lepida* Longcore & D.R. Simmons, USA, see Longcore and Simmons (2012; taxonomy, phylogeny), cultures and sequences are available.

Asterophlyctis H.E. Petersen 1903, *Asterophlyctaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, two species, type species. *A. sarcoptoides* H.E. Petersen, see Vélez et al. (2011, taxonomy, phylogeny), Doweld (2014e; introduced *Asterophlyctaceae*), cultures and sequences available.

Avachytrium Vélez & Letcher 2013, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, two species, type: *A. platense* Vélez & Letcher, USA, see Vélez et al. (2013; taxonomy, phylogeny), Letcher et al. (2014;

DNA), cultures and sequences are available, ITS of the type culture NR_111808.

Barromyces M.J. Powell & Letcher 2018, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *B. tenuis* (D.J.S. Barr) M.J. Powell & Letche, from soil, USA, see Powell et al. (2018; taxonomy), ITS of type culture FJ827713.

Batrachochytrium Longcore, Pessier & D.K. Nichols 1999, *Batrachochytriaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, two species, type: *B. dendrobatidis* Longcore, Pessier & D.K. Nichols, from skin of amphibians, USA, The Netherlands, see Fisher et al. (2009; amphibian chytridiomycosis), Van Rooij et al. (2012; amphibian pathogens), Blooi et al. (2013; real time PCR), Doweld (2013b; *Batrachochytriaceae*), Martel et al. (2013; new species, phylogeny), Dillon et al. (2017; pathogens), cultures and sequences are available.

Bertramia Mesnil & Caullery 1897, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, six species, type: *B. capitellae* Mesnil & Caullery, in annelids, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Betamyces Letcher 2012, *Alphamycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *A. americaemeridionalis* Letcher, Vélez, Schultz & M.J. Powell, on pollen, Argentina, see Letcher et al. (2012b; taxonomy), cultures and sequences are available, ITS of the type culture EF585664.

Blyttiomyces A.F. Bartsch 1939, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, eleven species, type: *B. spinulosus* (A. Blytt) A.F. Bartsch, saprobes, aquatic, worldwide, see Blackwell et al. (2011; reported from Alabama and Argentina, notes), Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Boothiomyces Letcher 2006, *Terramycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *B. macroporosum* (Karling) Letcher, from soil, terrestrial, New Zealand, see Davis et al. (2013; DNA, reported from Alabama), cultures and sequences are available, ITS of the type culture NR_119591.

Borealophlyctis Letcher 2008, *Borealophlyctidaceae*, *Rhizophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomycota*, two species, type: *B. paxensis* Letcher, from soil, on pollen, terrestrial, USA, see Letcher et al. (2008c; taxonomy), Davis et al. (2016a, b; new species), cultures and sequences are available, ITS of the type culture NR_111314.

Brevicalcar Letcher & M.J. Powell 2018, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *B. kilaueaense* Letcher and M.J. Powell, from soil, on pollen, terrestrial, Hawaii, see Letcher and Powell (2018; taxonomy), cultures and sequences are available.

Bulbosomyces Letcher & Longcore 2018, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *B. maxikinetosomus* Letcher & Longcore, from soil, on pollen, terrestrial, USA, see Letcher and Powell (2018; taxonomy), cultures and sequences are available.

Canteria Karling 1971, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *C. apophysata* (Canter) Karling, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Carpenterophlyctis Doweld 2013 (= *Carpenterella* Tehon & H.A. Harris 1941, *Synchytriaceae*, *Synchytriales*, *Synchytriomycetes*, *Chytridiomycota*, two species, type: *C. cannae* (Mundk. & Tirum.) Doweld, see Doweld (2013a; nomenclature), cultures and sequences are unavailable.

Catenochytridium Berdan 1939, *Catenochytridiaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, c. eight species, type: *C. carolinianum* Berdan, saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available for unidentified species.

Chytridium A. Braun 1851, *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 50 species, type: *C. olla* A. Braun, worldwide, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Chytriomyces Karling 1945, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 30 species, type: *C. hyalinus* Karling, worldwide, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Cladochytrium Nowak. 1877 (= *Pyroctonum* Prunet 1897), *Cladochytriaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, c. 15 species, type: *C. tenue* Nowak., Europe, see Mozley-Standridge et al. (2009; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Clydaea D.R. Simmons 2009, *Lobulomycetaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomycota*, one species, type: *C. vesicula* D.R. Simmons, USA, see Simmons et al. (2009; taxonomy), cultures and sequences are available, ITS of the type culture NR_121339.

Coenomyces K.N. Deckenb. 1901 (= *Deckenbachia* Jacz. 19311), *Chytridiomycota* genera *incertae sedis*, one species, type: *C. consuens* K.N. Deckenb., saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Coleospora Gibbs 1959, *Nephridiophagaceae*, *Nephridiophagales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *C. binucleata* Gibbs, insect parasites, cultures and sequences are unavailable.

Coralloidiomyces Letcher 2008, *Coralloidiomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *C. digitatus* Letcher, saprobes, South America, see Letcher et al. (2008b; genus accepted),

Doweld (2014d; introduced *Coralloidiomycetaceae*), Powell et al. (2015; phylogeny), cultures and sequences are available.

Cyclopsomyces K. Seto & Degawa 2015, *Lobulomycetaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomycota*, one species, type: *C. plurioperculatus* K. Seto & Degawa, saprobes, Asia, see Seto et al. (2015; taxonomy, phylogeny), cultures and sequences are available.

Cylindrochytridium Karling 1941, *Cladochytriales* genera *incertae sedis*, *Cladochytriomycetes*, *Chytridiomycota*, two species, type: *C. johnstonii* Karling, saprobes, cosmopolitan, see Kirk et al. (2008) accepted the genus but Kirk et al. (2013) did not list the genus, Steiger et al. (2012; phylogeny, accepted as in *Cladochytriales*).

Dangeardia Schröd. 1898, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, six species, type: *D. mamillata* Schröd., saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Dangeardiana Valkanov ex A. Batko 1970 (= *Dangeardiana* Valkanov 1964), *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *D. eudorinae* Valkanov ex A. Batko, saprobes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Delfinachytrium Vélez & Letcher 2013, *Chytridiales* genera *incertae sedis*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *D. mesopotamicum* Vélez & Letcher, from marsh of semipermanent stream, Argentina, see Vélez et al. (2013; genus accepted), cultures and sequences are available.

Dendrochytridium Letcher, Longcore & M.J. Powell 2014, *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *D. crassum* Letcher, Longcore & M.J. Powell, saprobes, Argentina, see Letcher et al. (2014; taxonomy, phylogeny), cultures and sequences are available.

Dictyomorpha Mullins 1961, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *D. dioica* Couch ex Mullins, insect pathogens, USA, see Kirk et al. (2013; genus accepted), Blackwell et al. (2017; taxonomy), cultures and sequences are unavailable.

Dinomyces Karpov & Guillou 2014, *Dinomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *D. arenysensis* Karpov & Guillou, from *Alexandrium*, Europe, see Lepelletier et al. (2014; taxonomy), Gleason et al. (2015; parasitic on harmful algal blooms), Jephcott et al. (2016; impact on harmful algal blooms), cultures and sequences are available.

Diplophlyctis J. Schröt. 1892 (= *Asterophlyctis* H.E. Petersen 1903), *Endochytriaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, twelve species, type: *D. intestina* (Schenk) J. Schröt., saprobes, cosmopolitan, see Mozley-Standridge et al. (2009; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available for unidentified species.

Endochytrium Sparrow 1933, *Endochytriaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, seven species, type: *E. oophilum* Sparrow, parasitic on eggs, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available for unidentified species.

Endodesmidium Canter 1949, *Synchytriaceae*, *Synchytriales*, *Synchytriomycetes*, *Chytridiomycota*, one species, type: *E. formosum* Canter, parasitic on desmids, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available for unidentified species.

Entophlyctis A. Fisch. 1892, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 30 species, type: *E. cienkowskiana* (Zopf) A. Fisch, parasites, in soil, cosmopolitan, see Kirk et al. (2013; genus accepted), Wang et al. (2017b; in soil), cultures and sequences are available.

Fayochytriomyces W.J. Davis, Letcher, Longcore & M.J. Powell 2015a, b, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *F. spinosus* (Fay) W.J. Davis, Letcher, Longcore & M.J. Powell, saprobes, see Davis et al. (2015; taxonomy), cultures and sequences are available.

Fimicolochytrium D.R. Simmons & Longcore 2012, *Powellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *F. jonesii* D.R. Simmons & Longcore, on manure, USA, see Simmons and Longcore (2012; taxonomy), cultures and sequences are available.

Gaertneriomyces D.J.S. Barr 1980, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, two species, type: *G. semiglobifer* Uebelm. ex D.J.S. Barr, from soil, cosmopolitan, see Kirk et al. (2013; genus accepted), Powell et al. (2018; new species), cultures and sequences are available.

Gallinipes Letcher & M.J. Powell 2018, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, three species, type: *G. danensis* Letcher and M.J. Powell, from soil, on pollen, terrestrial, USA, see Letcher and Powell (2018; taxonomy), cultures and sequences are available.

Gammamyces Letcher 2012, *Alphamycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *G. ourimbahensis* Letcher, saprobes, Australia, see Letcher et al. (2012a, b; genus accepted), cultures and sequences are available.

Gamolpidium Vlădescu 1892, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *G. nitidum* Vlădescu, on algae, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Geranomyces D.R. Simmons 2011, *Powellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, four species, type: *G. variabilis* (Longcore, D.J.S. Barr & Désauln.) D.R. Simmons, from soil, on manure, USA, see Simmons (2011; taxonomy, phylogeny), Simmons and Longcore (2012; new species), cultures and sequences are available.

Globomyces Letcher 2008, *Globomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *G. pollinis-pini* (A. Braun) Letcher, saprobes, cosmopolitan, see Letcher et al. (2008c; taxonomy, phylogeny), Davis et al. (2013; in Alabama), cultures and sequences are available.

Gorgonomyces Letcher 2008, *Gorgonomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *G. haynaldii* (Schaarschm.) Letcher, saprobes, cosmopolitan, see Letcher et al. (2008c; taxonomy, phylogeny), Davis et al. (2013; in Alabama), Powell et al. (2015; phylogeny), cultures and sequences are available.

Gromochytrium Karpov & Aleoshin 2014, *Gromochytriaceae*, *Gromochytriales*, *Mesochytriomycetes*, *Chytridiomycota*, one species, type: *G. mamkaevae* Karpov & Aleoshin, parasites, Russia, see Karpov et al. (2014; taxonomy, phylogeny), cultures and sequences are available, ITS of the type species NR_132054.1.

Halomyces Letcher & M.J. Powell 2015, *Halomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *H. littoreus* (Amon) Letcher & M.J. Powell, saprobes, marine, cosmopolitan, see Letcher et al. (2015a; taxonomy, phylogeny), cultures and sequences are available.

Homolaphlyctis Longcore, Letcher & T.Y. James 2011, *Rhizophydiales* genera *incertae sedis*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *H. polyrhiza* Longcore, Letcher & T.Y. James, saprobes, from acidic lake, USA, see Longcore et al. (2011; taxonomy), cultures and sequences are available.

Ichthyochytrium Plehn 1920, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *I. vulgare* Plehn, saprobes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Irineochytrium Letcher, Longcore & M.J. Powell 2014, *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *I. annulatum* (Dogma) Letcher, Longcore & M.J. Powell, saprobes, see Letcher (2014; nomenclature correction), cultures and sequences are available.

Johnkarlingia Pavgi & S.L. Singh 1979, *Synchytriaceae*, *Synchytriales*, *Synchytriomycetes*, *Chytridiomycota*, one species, type: *J. brassicae* S.L. Singh & Pavgi, saprobes, India, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Kappamyces Letcher & M.J. Powell 2005, *Kappamycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *K. laurelensis* Letcher & M.J. Powell, saprobes, from aquaculture of moss-covered soil, Eurasia, see Monchy et al. (2011; phylogeny), Davis et al. (2013; in Alabama), cultures and sequences are available.

Karlingiomyces Sparrow 1960, *Polychytriaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, c. six species, type: *K. asterocystis* (Karling) Sparrow, saprobes, see Marano et al. (2011; diversity of zoosporic fungi in Las Cañas stream, Argentina), Longcore and Simmons (2012; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Kochiomyces D.J.S. Barr 1980, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *K. dichotomus* (Umphlett) D.J.S. Barr, saprobes, USA, see Wakefield et al. (2010; phylogeny), Kirk et al. (2013; genus accepted), Letcher and Powell (2017; phylogeny), cultures and sequences are available.

Lacustromyces Longcore 1993, *Polychytriaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, one species, type: *L. hiemalis* Longcore, from soil, USA, see Karpov et al. (2010; relationship with *Mesochytrium*), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Loborhiza A.M. Hanson 1944, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *L. metzneri* A.M. Hanson, saprobes, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Lobulomyces D.R. Simmons 2009, *Lobulomycetaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomycota*, two species, type: *L. angularis* (Longcore) D.R. Simmons, saprobes, see Simmons et al. (2009, 2012; taxonomy, phylogeny), cultures and sequences are available.

Macrochytrium Minden 1902, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *M. botrydioides* Minden, saprobes, see Kirk et al. (2013; genus accepted), Krings et al. (2016; fossil fungi), cultures and sequences are unavailable.

Maunachytrium D.R. Simmons 2009, *Lobulomycetaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomycota*, one species, type: *M. keaense* D.R. Simmons, from soil, Hawaii, see Simmons et al. (2009, 2012; taxonomy, phylogeny), cultures and sequences are available.

Megachytrium Sparrow 1931, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *M. westonii* Sparrow, saprobes, North America, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Mesochytrium B.V. Gromov, Mamkaeva & Pljusch 2000, *Mesochytriaceae*, *Mesochytriales*, *Mesochytriomycetes*, *Chytridiomycota*, one species, type: *M. penetrans* B.V. Gromov, Mamkaeva & Pljusch, from green algae, Asia, see

Karpov et al. (2010, 2014; phylogeny), cultures and sequences are available.

Micromyces P.A. Dang. 1889 (= *Micromycopsis* Scherff. 1926), *Synchytriales* genera *incertae sedis*, *Synchytriomycetes*, *Chytridiomycota*, c. 13 species, type: *M. zygogonii* P.A. Dang., on algae, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Mitochytridium P.A. Dang. 1911, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *M. ramosum* P.A. Dang., cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Mucophilus Plehn 1920, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *M. cyprini* Plehn, in fishes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Myiophagus Thaxt. ex Sparrow 1939, *Chytridiales* genera *incertae sedis*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *M. ucrainicus* (Wize) Sparrow, in fishes, Europe, USA, Colombia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Neokarlingia Longcore & D.R. Simmons 2012, *Polychytriaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, one species, type: *N. chitinophila* (Karling) Longcore & D.R. Simmons, USA, see Longcore and Simmons (2012; taxonomy), cultures and sequences are available

Nephridiophaga Ivanić 1937, *Nephridiophagaceae*, *Nephridiophagales*, *Chytridiomycetes*, *Chytridiomycota*, 13 species, type: *N. apis* Ivanić, insect parasites, worldwide, see Radek et al. (2011, 2017; new species), cultures of infected hosts and sequences are available

Nephrochytrium Karling 1938, *Cladochytriales* genera *incertae sedis*, *Cladochytriomycetes*, *Chytridiomycota*, three species, type: *N. appendiculatum* Karling, cosmopolitan, see Mozley-Standridge et al. (2009; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available

Nowakowskia Borzí 1885, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *N. hormothecae* Borzí, saprobes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable

Nowakowskiella J. Schröt. 1893, *Nowakowskiellaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, c. 15 species, type: *N. elegans* (Nowak.) J. Schröt., saprobes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are available

Obelidium Nowak. 1877, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, three species, type: *O. mucronatum* Nowak., on mosquito larva, Europe, see Blackwell et al. (2012; review), Kirk et al. (2013; genus accepted), cultures and sequences are available

Odontochytrium Vélez & Letcher 2013, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *O. milleri* Vélez & Letcher, saprobes, South America, see Vélez et al. (2013; taxonomy), Letcher et al. (2014; phylogeny), cultures and sequences are available, ITS of the type: NG_042745.

Olpidiaster Pascher 1917, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, three species, type: *O. brassicae* (Woronin) Doweld, parasitic, cosmopolitan, see Doweld et al. (2014l; taxonomy), cultures and sequences are unavailable.

Operculomyces M.J. Powell, Letcher & Longcore 2011, *Operculomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *O. laminatus* M.J. Powell, Letcher & Longcore, from soil, USA, see Powell et al. (2011; taxonomy), cultures and sequences are available, ITS of the type: NR_119590.

Oryctospora Purrini & Weiser 1990, *Nephridiophagaceae, Nephridiophagales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *O. alata* Purrini and Weiser, insect parasites, cultures and sequences are unavailable.

Paludomyces Letcher & M.J. Powell 2015, *Halomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *P. mangrovei* (Ulken) Letcher & M.J. Powell, marine, see Letcher et al. (2015a; taxonomy), cultures and sequences are available, ITS of the type: NR_138404.

Paranamyces Letcher & M.J. Powell 2015, *Halomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *P. uniporus* Letcher & M.J. Powell, marine, South America, see Letcher et al. (2015a; taxonomy), cultures and sequences are available, ITS of the type: KP723828.

Pateramyces Letcher 2008, *Pateramycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *P. corrientinensis* Letcher, South America, see Letcher et al. (2008c; taxonomy), Powell et al. (2015; phylogeny), cultures and sequences are available, ITS of the type: NR_111261.

Peltomyces Léger 1909, *Nephridiophagaceae, Nephridiophagales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *P. hyalinus* Léger, insect parasites, cultures and sequences are unavailable.

Pendulichytrium K. Seto & Degawa 2018, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *P. sphaericum* K. Seto & Degawa, saprobes, Japan, see Seto and Degawa (2018; taxonomy), cultures and sequences are available, ITS of the type: LC223124.

Perolpidium Doweld 2014, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *P. saccatum* (Sorokīn) Doweld, saprobes, see Doweld (2014m; taxonomy), cultures and sequences are unavailable.

Phlyctochytrium J. Schröt. 1892, *Phlyctochytriaceae Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 35 species, type: *P. hydrodictyi* (A. Braun) J. Schröt., saprobes, see Letcher et al. (2012a, b; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Phlyctorhiza A.M. Hanson 1946, *Phlyctorhizaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *P. endogena* A.M. Hanson, saprobes, on insect remains, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Physocladia Sparrow 1932, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *P. obscura* (Sparrow) Sparrow, saprobes, on insect remains, USA, see Picard et al. (2009; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Physorhizophidium Scherff. 1926, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *P. pachydermum* Scherff., on diatoms, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Plasmophagus De Wild. 1895, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *P. oedogoniorum* De Wild., in algae, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Podochytrium Pfitzer 1870, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, seven species, type: *P. clavatum* Pfitzer, worldwide, see Kirk et al. (2013; genus accepted), Blooi et al. (2013; growing media), cultures and sequences are available.

Polychytrium Ajello 1942, *Polychytriaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, one species, type: *P. aggregatum* Ajello, saprobes, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are available, ITS from reference material NR_119549 (*fide* James et al. 2006).

Polyphagus Nowak. 1877, *Polyphagaceae*, *Polyphagales*, *Chytridiomycetes*, *Chytridiomycota*, ten species, type: *P. euglenae* (Bail) Nowak., saprobes, worldwide, see Kirk et al. (2013; genus accepted), Doweld (2014n; new species), cultures and sequences are unavailable.

Polyphlyctis Karling 1968, *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, two species, type: *P. unispina* (R.A. Paterson) Karling, saprobes, cosmopolitan, see Vélez et al. (2011; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Powellomyces Longcore, D.J.S. Barr & Désauln. 1995, *Powellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *P. hirtus* Longcore, D.J.S. Barr & Désauln., saprobes, Canada, see Simmons (2011; DNA, phylogeny, proposed *Powellomycetaceae*), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Protrudomyces Letcher 2008, *Protrudomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *P. lateralis* (A. Braun) Letcher, saprobes, South America, see Letcher et al. (2008c; taxonomy), cultures and sequences are available, ITS of the type NR_119650.

Pseudopileum Canter 1963, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *P. unum* Canter, saprobes, British Isles, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Pseudorhizidium M.J. Powell, Letcher & Longcore 2013, *Pseudorhizidiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *P. endosporangiatum* (Karling) M.J. Powell, Letcher & Longcore, saprobes, USA, see Powell et al. (2013; genus accepted), cultures and sequences are available, ITS of the type NR_111221.

Rhizidiocystis Sideris 1929, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *R. ananasi* Sideris, saprobes, Hawaii, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Rhizidium A. Braun 1856, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 20 species, type: *R. mycophilum* A. Braun, saprobes, cosmopolitan, see Picard et al. (2009; new species, DNA), Kirk et al. (2013; genus accepted), Doweld (2014h; sub-order *Rhizidiineae*), cultures and sequences are available.

Rhizoclosmatium H.E. Petersen 1903, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, species, type: *R. globosum* H.E. Petersen, saprobes, worldwide, see Kirk et al. (2013; genus accepted), Akinwole et al. (2014; fatty acids), cultures and sequences are available.

Rhizophlyctis A. Fisch. 1892, *Rhizophlyctidaceae*, *Rhizophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomycota*, c. ten species, type: *R. rosea* (de Bary & Woronin) A. Fisch., saprobes, worldwide, see Marano et al. (2011; diversity), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Rhizophydium Schenk ex Rabenh. 1868, *Rhizophydiaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, c. 110 species, type: *R. globosum* (A. Braun) Rabenh., saprobes, parasites, worldwide, see Lilje and Lilje (2008; colony physiology), Gerphagnon et al. (2013; occurrence), Kirk et al. (2013; genus accepted), Zhang et al. (2015; occurrence and molecular detection), Maier and Peterson (2016, specific qPCR detection and identification), Scholz et al. (2016; pathogen), Seto et al. (2017; phylogeny), Frenken et al. (2017; ecology), cultures and sequences are available.

Rhizosiphon Scherff. 1926, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, three species, type: *R. crassum* Scherff., parasitic, worldwide, see Kirk et al.

(2013; genus accepted), Doweld (2014o; new species), cultures and sequences are unavailable.

Rhopalophlyctis Karling 1945, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *R. sarcoptoides* Karling, parasitic, America, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Riethophlyctis Doweld 2014, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *R. vaucheriae* Doweld, Europe, see Doweld (2014p; taxonomy), cultures and sequences are unavailable.

Saccomyces Serbinow 1907, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *S. dangeardii* Serbinow, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Saccopodium Sorokīn 1877, *Saccopodiaceae*, *Saccopodiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *S. gracile* Sorokīn, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Sagittospora Lubinsky 1955, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. cameronii* Lubinsky, on *Eudiplodinium*, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Scherffeliomyces Sparrow 1934, *Scherffeliomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one species, type: *S. parasitans* (Sparrow) Sparrow, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Scherffeliomycopsis Geitler 1962, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. coleochaetes* Geitler, on algae, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Schizolpidium Doweld 2014, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. majus* (Ivimey Cook & W.B. Collins) Doweld, on cucumber, see Doweld et al. (2014q; taxonomy), cultures and sequences are unavailable.

Septochytrium Berdan 1939, *Septochytriaceae*, *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, five species, type: *S. variabile* Berdan, on grass, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Septolpidium Sparrow 1933, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. lineare* Sparrow, in diatoms, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Septosperma Whiffen ex R.L. Seym. 1971, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, four species, type: *S. anomalum* (Couch) Whiffen ex R.L. Seym., on chytrids, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Siphonaria H.E. Petersen 1903, *Chytriomycetaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, three species, type: *S. variabilis* H.E. Petersen, on chytrids, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Solutoparies Whiffen ex W.H. Blackw. & M.J. Powell 1998, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, four species, type: *S. pythii* Whiffen ex W.H. Blackw. & M.J. Powell, on chytrids, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Sonoraphlyctis Letcher 2008, *Sonoraphlyctidaceae*, *Rhizophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomycota*, one species, type: *S. ranzonii* Letcher, saprobes, USA, see Letcher et al. (2008a; taxonomy), cultures and sequences are available, ITS of the type NG_042454.

Sorokinocystis Doweld 2014, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. mirabilis* (Sorokīn) Doweld, saprobes, see Doweld et al. (2014r; taxonomy), cultures and sequences are unavailable.

Sparrowia Willoughby 1963, *Sparrowiaceae*, *Chytridiomycetes* families *incertae sedis*, *Chytridiomycota*, four species, type: *S. parasitica* Willoughby, on fungi, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Spizellomyces D.J.S. Barr 1980, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, eight species, type: *S. punctatus* (W.J. Koch) D.J.S. Barr, saprobes, worldwide, see Freeman et al. (2009; occurrence), Kirk et al. (2013; genus accepted), Russ et al. (2016; genome sequence), Ahrendt et al. (2017; biotechnology), Hérivaux et al. (2017; biotechnology), cultures and sequences are available, ITS of the type: NR_111189.

Sporophlyctidium Sparrow 1933, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: *S. africanum* Sparrow, on algae, Morocco, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Sporophlyctis Serbinow 1900, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *S. rostrata* Serbinow, on algae, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Staurastromyces S. Van den Wyngaert, K. Seto & K. Rojas-Jimenez 2017, *Staurastromycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: S. oculus S. Van den Wyngaert, K. Seto & K. Rojas-Jimenez, Germany, see Van den Wyngaert et al. (2017: taxonomy, phylogeny), sequences available, ITS of the type culture KY350146.

Synchytrium de Bary & Woronin 1863 [1865], *Synchytriaceae*, *Synchytriales*, *Synchytriomycetes*, *Chytridiomycota*, c. 100 species, type: *S. taraxaci* de Bary & Woronin, saprobes, Europe, see Ballvora et al. (2011; pathogenicity),

Yun et al. (2011; new report from Korea), Kirk et al. (2013; genus accepted), Smith et al. (2014; taxonomy and molecular detection), Obidiegwu et al. (2015; pathogenicity), Longcore et al. (2016; new species), cultures and sequences are available.

Terramyces Letcher 2006, *Terramycetaceae*, *Rhizophydiales*, *Chytridiomycetes*, *Rhizophydiomycetes*, one species, type: *T. subangulosus* (A. Braun) Letcher, on diatoms, Europe, see Letcher et al. (2008b; phylogeny), Gleason et al. (2011; physiology), cultures and sequences are available, ITS of the type: NR_119592.

Tetrachytrium Sorokīn 1874, *Tetrachytriaceae*, *Chytridiomycetes* families incertae sedis, *Chytridiomycota*, one species, type: *T. triceps* Sorokīn, saprobes, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Thalassochytrium Nyvall, M. Pedersén & Longcore 1999, *Thalassochytriaceae*, *Chytridiomycetes* families *incertae sedis*, *Chytridiomycota*, one species, type: *T. gracilariopsidis* Nyvall, M. Pedersén & Longcore, saprobes, China, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Thoreauomyces D.R. Simmons & Longcore 2012, *Powellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *T. humboldtii* D.R. Simmons & Longcore, in soil, USA, see Simmons and Longcore (2012; taxonomy), cultures and sequences are available.

Trematophlyctis Pat. 1918, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *T. leptodesmiae* Pat., saprobes, Madagascar, see Simmons and Longcore (2012; taxonomy), cultures and sequences are unavailable.

Triparticalcar D.J.S. Barr 1980, *Spizellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one species, type: *T. arcticum* (D.J.S. Barr) D.J.S. Barr, cultures and sequences are available.

Truittella Karling 1949, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *T. setifera* Karling, saprobes, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Uebelmesseromyces M.J. Powell & Letcher 2015, *Uebelmesseromycetaceae*, *Rhizophlyctidales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *U. harderi* M.J. Powell & Letcher, saprobes, USA, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Ulkenomyces Letcher & M.J. Powell 2015, *Halomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *U. aestuarii* (Ulken) Letcher & M.J. Powell, saprobes, USA, see Letcher et al. (2015a; taxonomy), cultures and sequences are available.

Urceomyces Letcher 2008, *Globomycetaceae*, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species, type: *U. sphaerocarpus* (Zopf) Letcher, saprobes, America, see Letcher et al. (2008c; taxonomy), cultures and sequences are available.

Volvorax Doweld 2013, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *V. ingoldii* Doweld, saprobes, UK, see Doweld et al. (2013e; taxonomy), cultures and sequences are unavailable.

Zygochytrium Sorokīn 1874, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *Z. aurantiacum* Sorokīn, saprobes, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Zygophlyctis Doweld 2014, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, one species, type: *Z. planktonica* Doweld, saprobes, Europe, see Doweld (2014s; taxonomy), cultures and sequences are unavailable.

Zygorhizidium Löwenthal 1904, *Zygorhizidiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. ten species, type: *Z. willei* Löwentha, saprobes, cosmopolitan, see Gsell et al. (2013; pathogenicity), Kirk et al. (2013; genus accepted), Seto et al. (2017; DNA, phylogeny), cultures and sequences are available.

Calcarisporiellomycota Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov

Hirose et al. (2012) showed that *Calcarisporiella* de Hoog has phylogenetic affinity within Mucoromycotina but distinct to *Endogonales*, *Mortierellales* and *Mucorales*. Tedersoo et al. (2016) confirmed the findings in Hirose et al. (2012) and established a new phylum, *Calcarisporiellomycota* to accommodate *Calcarisporiella* and *Echinochlamydosporium*.

We accept one class, one order, one family and two genera in *Calcarisporiellomycota*.

Notes for genera

Calcarisporiella de Hoog 1974, *Calcarisporiellaceae*, *Calcarisporiellales*, *Calcarisporiellomycetes*, *Calcarisporiellomycota*, one species, type: *C. thermophilum* H.C. Evans, hyphomycetous, isolate obtained from coal spoil tip soil, Europe, see Seifert et al. (2011; morphology), Hirose et al. (2012; DNA), Morgenstern et al. (2012; phylogeny), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are available.

Echinochlamydosporium X.Z. Jiang, H.Y. Yu, M.C. Xiang, X.Y. Liu & Xing Z. Liu 2011, *Calcarisporiellaceae*, *Calcarisporiellales*, *Calcarisporiellomycetes*, *Calcarisporiellomycota*, one species, type: *E. variabile* X.Z. Jiang, H.Y. Yu, M.C. Xiang, X.Y. Liu & Xing Z. Liu, from nematodes, Liaoning (China), see Jiang et al. (2011;

taxonomy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Entomophthoromycota Humber

Introduction

Humber (2012) introduced the phylum *Entomophthoromycota* to accommodate subphylum Entomophthoromycotina Humber which was introduced by Hibbett et al. (2007). The phylum comprises obligate parasites of animals which are distributed worldwide. Spatafora et al. (2016) did not accept Humber (2012) and proposed to maintain the subphylum *Entomophthoromycotina* under *Zoopagomycota*.

However, Tedersoo et al. (2018) accepted *Entomophthoromycota* as a distinct phylum. We follow Tedersoo et al. (2018) and accept *Entomophthoromycota* as a distinct phylum which comprises two classes, two orders, five families and 21 genera.

Notes for genera

Ancylistes Pfitzer 1872, *Ancylistaceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, five species, type: *A. closterii* Pfitzer, pathogens of desmid algae, cosmopolitan, see Humber (2012; classification), Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a; notes), cultures and sequences are unavailable.

Apterivorax S. Keller 2005, *Neozygitaceae*, *Neozygitales*, *Neozygitomycetes*, *Entomophthoromycota*, two species, type: *A. sminthuri* (S. Keller & Steenb.) S. Keller, pathogens, worldwide, see Humber (2012; classification), Gryganskyi et al. (2013a; notes), cultures and sequences are unavailable.

Batkoa Humber 1989, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, ten species, type: *B. apiculata* (Thaxt.) Humber, pathogens of insects, cosmopolitan, see Rocha et al. (2009; Brazil), Humber (2012; classification), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a; notes), cultures and sequences are unavailable.

Completoria Lohde 1874, *Completoriaceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, one species, type: *C. complens* Lohde, on pteridophyta, worldwide, see Humber (2012, 2016; classification), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a; notes), cultures and sequences are unavailable.

Conidiobolus Bref. 1884, *Ancylistaceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 40 species, type: *C. utriculosus* Bref., pathogens or saprobes, worldwide, see Shankar et al. (2010; recovering silver from X ray film), Vilela et al. (2010; infection on sheep), Wüppenhorst et al. (2010; human pathogen), Kimura et al. (2011), Subramanian and Sobel (2011; human conidiobolomycosis), Humber (2012; classification), Nie et al. (2012; new species), Hoffmann et al. (2013; notes), Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a; notes), Mackey et al. (2015; dog pathogens), John et al. (2016; human pathogen), Yong et al. (2016; new species), cultures and sequences are available, *C. incongruus* CDC-B7586 (Chibucos et al. 2016) available at NCBI, *C. coronatus* NRRL 28638 [25977457] available at NCBI.

Entomophaga A. Batko 1964, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 17 species, type: *E. grylli* (Fresen.) A. Batko, on insects, saprobes, cosmopolitan, see Kereselidze et al. (2011; Georgia), Tabaković-Tošić et al. (2012; Serbia), Gryganskyi et al. (2013a; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Entomophthora Fresen. 1856, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 30 species, type: *E. muscae* (Cohn) Fresen., on insects, saprobes, cosmopolitan, see Jensen et al. (2009; differential divergence), Lihme et al. (2009; epidemics), Gryganskyi et al. (2013a, b; phylogeny, species complex), Kirk et al. (2013; genus accepted), Mendoza et al. (2015; human pathogens), cultures and sequences are available, genome available: *Entomophthora muscae* [27717247] at NCBI.

Erynia (Nowak. ex A. Batko) Remaud. & Hennebert 1980, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 20 species, type: *E. ovispora* (Nowak.) Remaud. & Hennebert, on insects, cosmopolitan, see Gryganskyi et al. (2012, 2013a; phylogeny), Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Eryniopsis Humber 1984, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, five species, type: *E. lampyridarum* (Thaxt.) Humber, on insects, cosmopolitan, see Gryganskyi et al. (2013a; phylogeny), Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), Steinkraus et al. (2017; insect pathogens), cultures and sequences are available.

Furia (A. Batko) Humber 1989, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 18 species, type: *F. virescens* (Thaxt.) Humber, on insects, cosmopolitan, see Tkaczyk et al. (2011; Poland, Austria), Humber (2012; classification), Gryganskyi et al. (2013a; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available.

Macrobiotophthora Reukauf 1912, *Ancylistaceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, two species, type: *M. vimariensis* Reukauf, in soil, pathogens of nematodes, Europe, see Humber (2012; classification), Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a; notes phylogeny), Hussain et al. (2014; mycoinsecticide), a sequence is available.

Massospora Peck 1878, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 14 species, type: *M. cicadina* Peck, on insects, cosmopolitan, see Humber (2012; classification), Gryganskyi et al. (2013a, 2017; phylogeny, insect pathogens), Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), Cooley et al. (2018; host sexual signal hijack), cultures and sequences are available.

Meristacrum Drechsler 1940, *Meristacraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 15 species, type: *M. asterospermum* Drechsler, on nematodes, cosmopolitan, see Humber (2012; classification), Gryganskyi et al. (2013a; classification), Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Neozygites Witlaczil 1885, *Neozygitaceae*, *Neozygitales*, *Neozygitomycetes*, *Entomophthoromycota*, 24 species, type: *N. fresenii* (Nowak.) Remaud. & S. Keller, insects, mites and springtails pathogens, worldwide, see Simelane et al. (2008; host control), Agboton et al. (2011, 2013; phylogeny, interaction with predatory mite *Typhlodromalus aripo*), Gryganskyi et al. (2013a; DNA), Kirk et al. (2013; genus accepted), Zhou et al. (2017; new species), cultures and sequences are available.

Orthomyces Steinkr., Humber & J.B. Oliv. 1998, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, one species, type: *O. aleyrodis* Steinkr., Humber & J.B. Oliv., in insects, USA, see Humber (2012, 2016; classification), Gryganskyi et al. (2013a; phylogeny, insect pathogens), Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Strongwellsea A. Batko & J. Weiser 1965, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, three species, type: *S. castrans* A. Batko & J. Weiser, in insects, USA, see Humber (2012; classification), Gryganskyi et al. (2013a; phylogeny, insect pathogens), Kirk et al. (2013; genus accepted), cultures and a sequence are available.

Tabanomyces Couch, R.V. Andrejeva, Laird & Nolan 1979, *Meristacraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 15 species, type: *T. milkoi* (Dudka & Koval) Couch, R.V. Andrejeva, Laird & Nolan, from larva of horse flies, Ukraine, see Humber (2012; classification), cultures and sequences are unavailable.

Tarichium Cohn 1875, *Entomophthoraceae* or *Neozygitaceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 26 species, type: *T. megaspermum* Cohn, in insects, USA, see Keller et al. (2009; new species), Humber (2012; classification, attributable in part to *Entomophthoraceae* with some mite-pathogenic species probably better classified in *Neozygites*), Gryganskyi et al. (2013a; phylogeny, insect pathogens), Kirk et al. (2013; genus accepted), Hajek et al. (2016; two species known only from resting spores but placed genomically in *Zoophthora*), some cultures and sequences are available.

Thaxterosporium Ben Ze'ev & R.G. Kenneth 1987, *Neozygitaceae*, *Neozygitales*, *Neozygitomycetes*, *Entomophthoromycota*, one species, type: *T. turbinatum* (R.G. Kenneth) R.G. Kenneth & Ben Ze'ev, insect pathogens, worldwide, see Humber et al. (2012; classification), Gryganskyi et al. (2013a; DNA), Kirk et al. (2013; genus accepted), cultures and sequences are unavailable, current name of the type: *Neozygites turbinata* (R.G. Kenneth) Remaud. & S. Keller *fide* Species Fungorum (2018).

Zoophthora A. Batko 1964, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, 36 species, type: *Z. radicans* (Bref.) A. Batko, in insects, worldwide, see Guzmán-Franco et al. (2008; PCR primers), Xu et al. (2009; EST analysis), Batta et al. (2011; application), Humber (2012; classification), Mascarin et al. (2012; on *Thaumastocoris peregrines*), Gryganskyi et al. (2013a; phylogeny, insect pathogens), Kirk et al. (2013; genus accepted), Hajek et al. (2016; new species), a sequence is available.

Glomeromycota C. Walker & A. Schüßler

Introduction

Schüßler et al. (2001) introduced the phylum *Glomeromycota* to accommodate arbuscular mycorrhizal fungi. Subsequent studies by Hibbett et al. (2007), Kirk et al. (2008), Oehl et al. (2011d, e, g) and Redecker et al. (2013) accepted this phylum. However, Spatafora et al. (2016) introduced subphylum *Glomeromycotina* Spatafora & Stajich (demoted the phylum to subphylum) and accepted under phylum *Mucoromycota* but this has been challenged in a more inclusive study by Tedersoo et al. (2018).

We accept *Glomeromycota* (as a distinct phylum) with three classes, four orders, twelve families and 33 genera.

Notes for genera

Acaulospora Gerd. & Trappe 1974 (= *Kuklospora* p. p. Oehl & Sieverd. 2006), *Acaulosporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, c. 54 species, type: *A. laevis* Gerd. & Trappe, arbuscular mycorrhizal, terrestrial, worldwide, see Kaonongbua et al. (2010; new species), Krüger et al. (2011, 2012; new species, phylogeny), Vaingankar and Rodrigues (2011; new species), Oehl et al. (2011a, b, 2012b, c, 2014; new species, phylogeny), Furrazola et al. (2013; new species), Goto et al. (2013; new species), Redecker et al. (2013; notes, phylogeny), Błaszkowski et al. (2015a; new species), Palenzuela et al. (2013a, 2014, 2015; new species), Pereira et al. (2016a, b; new species), de Souza et al. (2017; new species), de Pontes et al. (2017; new species), Crossay et al. (2018; new species), cultures and sequences are available.

Ambispora C. Walker, Vestberg & A. Schüßler 2007 (= *Appendicispora* Spain, Oehl & Sieverding 2006; = *Paracaulospora* S.P. Gautam & U.S. Patel 2007; = *Pseudoglomus* S.P. Gautam & U.S. Patel 2007), *Ambisporaceae*, *Archaeosporales*, *Archaeosporomycetes*, *Glomeromycota*, c. 3-10 species depending on taxonomic opinion, type: *A. fennica* C. Walker, Vestberg & A. Schüßler, arbuscular mycorrhizal, terrestrial, worldwide, see Goto et al. (2008; new species), Walker (2008; resurrected the family, new species), Palenzuela et al. (2011; new species), Krüger et al. (2012; phylogeny), Oehl et al. (2012a; new species), Redecker et al. (2013; notes, phylogeny), Bills and Morton (2015; accepted only three species *viz.*: *A. leptoticha*, *A. gerdemannii* and *A. granatensis*, phylogeny), cultures and sequences are available.

Archaeospora J.B. Morton & D. Redecker 2001 (= *Intraspora* p. p. Oehl & Sieverd. 2006), *Archaeosporaceae*, *Archaeosporales*, *Archaeosporomycetes*, *Glomeromycota*, c. three species, type: *A. trappei* (R.N. Ames & Linderman) J.B. Morton & D. Redecker, arbuscular mycorrhizal, terrestrial, worldwide, see Schüßler and Walker (2010; new combination), Oehl et al. (2011d; new combinations), cultures and sequences are available.

Bulbospora Oehl & G.A. Silva 2014, *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *B. minima* Oehl, Marinho, B.T. Goto & G.A. Silva, mycorrhizal status unknown, terrestrial, Brazil, see Marinho et al. (2014; taxonomy, described from field collected spores), cultures are unavailable and sequences from multi-species soil trap cultures available.

Cetraspora Oehl, F. A. Souza & Sieverd. 2009, *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, c. four species, type: *C. gilmorei* (Trappe & Gerd.) Oehl, F.A. Souza & Sieverd, arbuscular mycorrhizal, terrestrial, North and South America, Azores, Europe, see Schüßler and Walker (2010; taxonomy), Oehl et al. (2011f; new species), Redecker et al. (2013; accepted three species), Lima et al. (2014; new species), cultures and sequences are available.

Claroideoglomus C. Walker & A. Schüßler 2010 (= *Albahypha* p. p. Oehl, G.A. Silva, B.T. Goto & Sieverd. 2011), *Claroideoglomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, eight species, type: *C. claroideum* (N.C. Schenck & G.S. Sm.) C. Walker & A. Schüßler, arbuscular mycorrhizal, terrestrial, worldwide, see Schüßler and Walker (2010; taxonomy), Krüger et al. (2012; phylogeny), Redecker et al. (2013; phylogeny), cultures and sequences are available.

Corymbiglomus Błaszk. & Chwat 2012, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, four species, type: *C. corymbiforme* Błaszk. & Chwat, arbuscular mycorrhizal, terrestrial, Europe and North and South America, see Błaszkowski (2012; taxonomy), Redecker et al. (2013; notes), Medina et al. (2014; new species), cultures and sequences are available.

Dentiscutata Sieverd., F.A. Souza & Oehl (2009) [2008], *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, c. five species, type: *D. nigra* (J.F. Redhead) Sieverd., F.A. Souza & Oehl, arbuscular mycorrhizal, terrestrial, worldwide, see Oehl et al. (2008; taxonomy), Redecker et al. (2013; epitype, rejection of *Fuscutata* and *Quatunica* and their combination with *Dentiscutata*), cultures and sequences are available, but not for type species.

Desertispora Błaszk., Kozłowska, Ryszka, Al-Yahya'ei & Symanczik 2018, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *D. omaniana* (Symanczik, Błaszk. & Al-Yahya'ei) Symanczik, Błaszk., Kozłowska & Al-Yahya'ei, arbuscular mycorrhizal, terrestrial, Oman, see Symanczik et al. (2018; taxonomy), cultures and sequences are available.

Diversispora C. Walker & A. Schüßler 2004, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, 17 species, type: *D. spurca* (C.M. Pfeiff., C. Walker & Bloss) C. Walker & A. Schüßler, arbuscular mycorrhizal, terrestrial, worldwide, see Gamper et al. (2009; new species), Schüßler and Walker (2010; new combinations), Estrada et al. (2011; new species), Oehl et al. (2011c; new combinations), Schüßler et al. (2011b; relationships), Symanczik et al. (2014; new species), Błaszkowski et al. (2015e; new species), Balázs et al. (2015; new species), cultures and sequences are available.

Dominikia Błaszk., Chwat & Kovács 2015, *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 13 species, type: *D. minuta* (Błaszk., Tadych & Madej) Błaszk., Chwat & Kovács, arbuscular mycorrhizal, terrestrial, worldwide, see Błaszkowski et al. (2015c, d, 2016; taxonomy, phylogeny), Oehl et al. (2015a; new species), cultures and sequences are available.

Entrophospora R.N. Ames & R.W. Schneid. 1979, *Glomeromycetes* genera *incertae sedis*, *Glomeromycota*, three species, type: *E. infrequens* (I.R. Hall) R.N. Ames & R.W. Schneid., arbuscular mycorrhizal, terrestrial, worldwide, see Oehl et al. (2011g; notes, phylogeny), Redecker et al. (2013; notes about unclear phylogenetic position), cultures and sequences are available, but sequence data and phylogenetic placement conflicting.

Funneliformis C. Walker & A. Schüßler 2010, *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 12 species, type: *F. mosseae* (T.H. Nicolson & Gerd.) C. Walker & A. Schüßler, arbuscular mycorrhizal, terrestrial, worldwide, see Schüßler and Walker (2010; taxonomy), Oehl et al. (2011c; new combinations), Krüger et al. (2012; phylogeny), Redecker et al. (2013; phylogeny), cultures and sequences are available.

Geosiphon F. Wettst. 1915 (= *Geosiphonomyces* Cif. & Tomas. 1957), *Geosiphonaceae*, *Archaeosporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *G. pyriformis* (Kütz.) F. Wettst., symbiosis with *Nostoc*, terrestrial, central Europe, see Krüger et al. (2012; phylogeny), Ellerbeck et al. (2013; ammonium transporters), cultures and sequences are available.

Gigaspora Gerd. & Trappe 1974, *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, seven species, type: *G. gigantea* (T.H. Nicolson & Gerd.) Gerd. & Trappe, arbuscular mycorrhizal, terrestrial, worldwide, see Kirk et al. (2013; genus), cultures and sequences are available, but not for type species.

Glomus Tul. & C. Tul. 1844 (= *Endogone* p. p. Link 1809; =*Parapseudoglomus* p. p. S.P. Gautam & U.S. Patel, 2007; = *Paurocotylis* p. p. Berk. & Broome 1855; = *Sclerocystis* p. p. Berk. & Broome 1873;= *Simiglomus* p. p. Sieverd. 2011; = *Sphaerocreas* p. p. Sacc. & Ellis 1882), *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 60 species (most are *Glomus sensu lato* and may belong in other genera), type: *G. macrocarpum* Tul. & C. Tul., arbuscular mycorrhizal, terrestrial, worldwide, see Khade (2009; new species), Błaszkowski (2010; new species), Błaszkowski et al. (2010; new species), Furrazola et al. (2011; new species), Goto et al. (2012a; new species), Cai et al. (2013; new species), Błaszkowski et al. (2015b; new species), cultures and sequences are available.

Innospora Błaszk., Kovács, Chwat & Kozłowska 2017, *Paraglomeraceae*, *Paraglomerales*, *Paraglomeromycetes*, *Glomeromycota*, one species, type: *I. majewskii* (Blaszk. & Kovács) Błaszk., Kovács, Chwat & Kozłowska, arbuscular mycorrhizal, terrestrial, worldwide, see Błaszkowski et al. (2017; taxonomy, transfer of *Paraglomus majewskii* to *Innospora*), cultures and sequences are available.

Intraornatospora B.T. Goto, Oehl & G.A. Silva 2012, *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *I. intraornata* (B.T. Goto & Oehl) B.T. Goto, Oehl & G.A. Silva, arbuscular mycorrhizal, terrestrial, Brazil, see Goto et al. (2012b; taxonomy), Redecker et al. (2013; phylogeny, discussed the genus as "orphan taxon"), multi-species cultures availability unknown and sequences from multi-species cultures are available.

Kamienskia Błaszk., Chwat & Kovács 2015, *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, three species, type: *K. bistrata* (Błaszk., D. Redecker, Koegel, Symanczik, Oehl & Kovács) Błaszk., Chwat & Kovács, arbuscular mycorrhizal, terrestrial, worldwide, see Błaszkowski et al. (2015c, 2016; taxonomy, phylogeny, new species), cultures and sequences are available.

Oehlia Błaszk., Kozłowska, Niezgoda, B.T.Goto & Dalpé 2018, *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, one species, type species: *O. diaphana* (J.B. Morton & C. Walker) Błaszk., Kozłowska & Dalpé, arbuscular mycorrhizal, terrestrial, worldwide, see Błaszkowski et al. (2018; taxonomy, phylogeny), cultures and sequences are available.

Otospora Oehl, Palenz. & N. Ferrol 2008, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *O. bareae* Palenz., N. Ferrol & Oehl, arbuscular mycorrhizal, terrestrial, known from Spain, see Palenzuela et al. (2008; taxonomy), Oehl et al. (2011g; notes), Redecker et al. (2013; phylogeny, mentioning genus as questionable), cultures are unavailable, sequences available are from multi-species soil trap cultures.

Pacispora Sieverd. & Oehl 2004, *Pacisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, seven species, type: *P. scintillans* (S.L. Rose & Trappe) Sieverd. & Oehl ex C. Walker, Vestberg & A. Schüßler, arbuscular mycorrhizal, terrestrial, known from Europe, North and South America, Asia, see Krüger et al. (2012; phylogeny), Redecker et al. (2013; notes, phylogeny), cultures are unavailable and sequences available.

Palaeospora Oehl, Palenz., Sánchez-Castro & G.A. Silva 2015, *Archaeosporaceae*, *Archaeosporales*, *Archaeosporomycetes*, *Glomeromycota*, one species, type: *P. spainiae* Oehl, Palenz., Sánchez-Castro & G.A. Silva, arbuscular mycorrhizal, terrestrial, known from Switzerland, see Oehl et al. (2015b; taxonomy, phylogeny), cultures and sequences are available.

Paradentiscutata B.T. Goto, Oehl & G.A. Silva 2012, *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, two species, type: *P. bahiana* Oehl, Magna, B.T. Goto & G.A. Silva, arbuscular mycorrhizal, terrestrial, known from Brazil, see Goto et al. (2012b; taxonomy), Redecker et al. (2013; phylogeny, suggested as designated from inadequate data and described as "orphan taxon"), multi-species cultures and sequences from multi-species cultures are available.

Paraglomus J.B. Morton & D. Redecker 2001, *Paraglomeraceae*, *Paraglomerales*, *Paraglomeromycetes*, *Glomeromycota*, c. eight species, type: *P. occultum* (C. Walker) J.B. Morton & D. Redecker, arbuscular mycorrhizal, terrestrial, worldwide, see Oehl et al. (2011c, 2016; new combinations, new species), Błaszkowski et al. (2012; new species), Krüger et al. (2012; phylogeny), de Mello et al. (2013; new species), Redecker et al. (2013; notes, phylogeny), cultures and sequences are available.

Pervetustus Błaszk., Chwat, Kozłowska, Symanczik & Al-Yahya'ei 2017, *Pervetustaceae*, *Paraglomerales*, *Paraglomeromycetes*, *Glomeromycota*, one species, type: *P. simplex* Błaszk., Chwat, Kozłowska, Crossay, Symanczik & Al-Yahya'ei, arbuscular mycorrhizal, terrestrial, known from Europe, Northern Africa, New Caledonia, Oman, see

Błaszkowski et al. (2017; taxonomy), cultures and sequences are available.

Racocetra Oehl, F.A. Souza & Sieverd. 2009 [2008], *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, c. 13 species, type: *R. coralloidea* (Trappe, Gerd. & I. Ho) Oehl, F.A. Souza & Sieverd., arbuscular mycorrhizal, terrestrial, known from Africa, North and South America, Asia, see Oehl et al. (2008; taxonomy), Morton and Msiska (2010; recognised the genus, Redecker et al. (2013; accepted three species *viz. R. tropicana*, *R. undulata* and *R. beninensis*, and, with reservation, accepted *Racocetra* as a genus), cultures and sequences are available.

Redeckera C. Walker & A. Schüßler 2010, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, three species, type: *R. megalocarpum* (D. Redecker) C. Walker & A. Schüßler, arbuscular mycorrhizal, terrestrial, worldwide, see Schüßler and Walker (2010; taxonomy), Krüger et al. (2012; phylogeny), Redecker et al. (2013; relationship to other genera), cultures are unavailable and sequences available.

Rhizophagus P.A. Dang. 1896 (= *Endogone* p. p. Link. 1809; = *Rhizoglomus* p. p. Sieverd., G.A. Silva & Oehl 2015; = *Stigeosporium* C. West 1916), *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 19 species, type: *R. populinus* P.A. Dang., arbuscular mycorrhizal, terrestrial, worldwide, see Schüßler and Walker (2010; new combinations), Redecker et al. (2013; new combination), Symanczik et al. (2014; new species), Walker et al. (2017; nomenclature, designate neotype), Crossay et al. (2018; new species), cultures and sequences are available.

Sacculospora Oehl, Sieverd., G.A. Silva, B.T. Goto, I.C. Sánchez & Palenz. 2011, *Sacculosporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, two species, type: *S. baltica* (Błaszk., Madej & Tadych) Oehl, Palenz., I.C. Sánchez, B.T. Goto, G.A. Silva & Sieverd., arbuscular mycorrhizal, terrestrial, known from Europe, India, North and South America, see Redecker et al. (2013; retained genus, but phylogenetic position is unclear), Willis et al. (2016; new species), culture availability unknown, sequences are available.

Sclerocystis Berk. & Broome 1873 [1875] (= *Ackermannia* Pat. 1902; = *Xenomyces* Ces. 1879) *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 5 species, type: *S. coremioides* Berk. & Broome, arbuscular mycorrhizal, terrestrial, worldwide, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Scutellospora C. Walker & F.E. Sanders 1986 (= *Fuscutata* p. p. Oehl, F.A. Souza & Sieverd. 2009; = *Orbispora* p. p. Oehl, G.A. Silva & D.K. Silva 2011; = *Parascutellospora* Nom. inval. S.P. Gautam & U.S. Patel 2007; = *Quatunica* p. p. F.A. Souza, Sieverd. & Oehl 2009), *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, c. 33 species, type: *S. calospora* (T.H. Nicolson & Gerd.) C. Walker & F.E. Sanders, arbuscular mycorrhizal, terrestrial, worldwide, see Krüger et al. (2012; phylogeny), de Pontes et al. (2013; new species), Redecker et al. (2013; notes, phylogeny), De Andrade et al. (2017; new species), Crossay et al. (2018; new species), cultures and sequences are available.

Septoglomus Sieverd., G.A. Silva & Oehl 2011 (= *Viscospora* p. p. (T.H. Nicolson) Sieverd., Oehl & G.A. Silva 2011), *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. ten species, type: *S. constrictum* (Trappe) Sieverd., G.A. Silva & Oehl, arbuscular mycorrhizal, terrestrial, worldwide, see Krüger et al. (2012; phylogeny), Błaszkowski and Chwat (2013; new species), Błaszkowski et al. (2013, 2014; new species, phylogeny), Palenzuela et al. (2013a, b; new species), Redecker et al. (2013; phylogeny, genus accepted), cultures and sequences are available.

Tricispora Oehl, Sieverd., G.A. Silva & Palenz. 2011, *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one species, type: *T. nevadensis* (Palenz., N. Ferrol, Azcón-Aguilar & Oehl) Oehl, Palenz., G.A. Silva & Sieverd., arbuscular mycorrhizal, terrestrial, Europe, see Oehl et al. (2011e; taxonomy), Redecker et al. (2013; phylogeny, mentioning genus as questionable), culture availability unlikely, sequences available but might be dubious.

Kickxellomycota Tedersoo et al.

Subphylum *Kickxellomycotina* Benny was upgraded to *Kickxellomycota* by Tedersoo et al. (2016). Tedersoo et al. (2016) introduced new class *Kickxellomycetes* Tedersoo et al. to accommodate *Kickxella* Coem. (in *Kickxellaceae*, *Kickxellales*) along with another five classes (viz. *Asellariomycetes*, *Barbatosporomycetes*, *Dimargaritomycetes Harpellomycetes*, and *Ramicandelaberomycetes*).

We accept *Kickxellomycota* with six classes, six orders, seven families and 65 genera

Notes for genera

Asellaria R.A. Poiss. 1932, *Asellariaceae*, *Asellariales*, *Asellariomycetes*, *Kickxellomycota*, c. seven species, type: *A. caulleryi* R.A. Poiss., associated with Isopoda, worldwide, see Guardia Valle and Cafaro (2008, new species, biology, zygospore production), Lichtwardt (2012; Trichomycete gut fungi from tropical regions), Kirk et al. (2013; genus accepted), Tretter et al. (2014; DNA, phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Austrosmittium Lichtw. & M.C. Williams 1990, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, five species, type: *A. kiwiorum* M.C. Williams & Lichtw. (Name is invalid as in Index Fungorum 2018; Art.

40.5 (Melbourne), in insects, worldwide, see Siri and López Lastra (2010; new species), Kirk et al. (2013; genus accepted), Hoffmann et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Bactromyces William & Strongman 2012, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *B. fluminalis* William & Strongman, in *Paracapnia angulata* nymphs, Canada, see William and Strongman (2014; taxonomy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Baetimyces L.G. Valle & Santam. 2002, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *B. ancorae* L.G. Valle & Santam., in hindgut of *Baetis* nymp, Spain, see Valle (2013a; Galicia), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Ballocephala Drechsler 1951, *Kickxellomycotina* genera *incertae sedis*, *Kickxellomycota*, one species, type: *B. sphaerospora* Drechsler, on tardigrades, worldwide, see Humber (2012; classification), Gryganskyi et al. (2013a, b; notes), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Baltomyces Cafaro 1999, *Asellariales* genera *incertae sedis*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *B. styrax* Cafaro, in Isopoda, USA, see Oman and White (2012; USA), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Barbatospora M.M. White, Siri & Lichtw. 2006, *Barbatosporaceae*, *Barbatosporales*, *Barbatosporomycetes*, *Kickxellomycota*, one species, type: *B. ambicaudata* M.M. White, Siri & Lichtw., in hindgut of larval *Simuliidae*, USA, see Hussain et al. (2014; mycoinsecticide), Tretter et al. (2014; DNA, phylogeny), Corsaro et al. (2018; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Bojamyces Longcore 1989, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *B. repens* Longcore, cosmopolitan, see Hoffmann et al. (2013; classification), Kirk et al. (2013; genus accepted), Sato et al. (2013; Japan), Benny et al. (2016b; classification), cultures and sequences are available.

Capniomyces S.W. Peterson & Lichtw. 1983, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *C. stellatus* S.W. Peterson & Lichtw., in insects, cosmopolitan, see Bench and White (2012; new species), Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), Hussain et al. (2014; mycopesticide), Benny et al. (2016b; classification), Corsaro et al (2018, phylogeny), Wang et al. (2016a, b; genome sequencing of *C. stellatus*), cultures and sequences are available, genomes available: *C. stellatus* [PMID: 27491991] available at NCBI.

Carouxella Manier, Rioux & Whisler 1965, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, two species, type: *C. scalaris* Manier, Rioux & Whisler (Index Fungorum 2018 listed the type species as invalid), in insects, cosmopolitan, see Tretter et al. (2013; notes), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are available.

Caudomyces Lichtw., Kobayasi & Indoh 1988, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *C. japonicus* Lichtw., Kobayasi & Indoh, on insects, cosmopolitan, see Tretter et al. (2013; notes), Kirk et al. (2013; genus accepted), Strongman and Wang (2015; new species), Benny et al. (2016b; classification), cultures and sequences are available.

Coemansia Tiegh. & G. Le Monn. 1873, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, c. 20 species, type: *C. reversa* Tiegh. & G. Le Monn., saprobes, worldwide, see Kurihara et al. (2008; Indonesia, new species), Chuang and Ho (2011; Taiwan), Kirk et al. (2013; genus accepted), Tretter et al. (2013; phylogeny), Healy et al. (2014; mitosis), Benny et al. (2016b; classification), Chuang et al. (2018; phylogeny), cultures and sequences are available, *C. reversa* NRRL 1564 [25977457] at NCBI.

Coleopteromyces Ferrington, Lichtw. & López-Lastra 1999, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *C. amnicus* Ferrington, Lichtw. & López-Lastra, in insects, cosmopolitan, see Tretter et al. (2013; notes), Kirk et al. (2013; genus accepted), Wang et al. (2014b; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available

Dacryodiomyces Lichtw. 2011, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *D. oklahomensis* Lichtw., in insects, USA, see Lichtwardt et al. (2011a, b; taxonomy), Benny et al. (2016b; classification), cultures and sequences are available

Dimargaris Tiegh. 1875, *Dimargaritaceae*, *Dimargaritales*, *Dimargaritomycetes*, *Kickxellomycota*, seven species, type: *D. cristalligena* Tiegh., coprophilous, fungicolous, cosmopolitan, see de Santiago et al. (2009; first record in S. America), De Godoi and Rafael (2013; new species, key), Gryganskyi et al. (2013a, b; notes), Kirk et al. (2013; genus accepted), Tretter et al. (2013; DNA), Nováková and Vaughan (2016; cave), Benny et al. (2016b; classification), cultures and sequences are available.

Dipsacomyces R.K. Benj. 1961, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *D. acuminosporus* R.K. Benj., saprobes, Honduras, see Kirk et al. (2013; genus accepted), Tretter et al. (2014;

phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Dispira Tiegh. 1875, *Dimargaritaceae*, *Dimargaritales*, *Dimargaritomycetes*, *Kickxellomycota*, four species, type: *D. cornuta* Tiegh., mycoparasites, cosmopolitan, see Ho and Chuang (2010; Taiwan), Kirk et al. (2013; genus accepted), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Ejectosporus S.W. Peterson, Lichtw. & M.C. Williams 1991, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *C. spica* (S.W. Peterson & Lichtw.) Strongman, in insects, North America, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable

Ephemerellomyces M.M. White & Lichtw. 2004, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *E. aquilonius* M.M. White & Lichtw., from insects, cosmopolitan, see Kandel and White (2012; new species), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Furculomyces Lichtw. & M.C. Williams 1992, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *F. boomerangus* (M.C. Williams & Lichtw.) M.C. Williams & Lichtw., in insects, Australia, Nothern America, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Gauthieromyces Lichtw. 1983, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *G. microsporus* Lichtw., in insects, cosmopolitan, see Misra and Tiwari (2008; new species, India), Valle et al. (2008; new species), Strongman et al. (2010; China), Lichtwardt (2011; tropics), Kirk et al. (2013; genus accepted), Valle et al. (2013; records from Italy), Strongman and Wang (2015; notes, China), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Genistelloides S.W. Peterson, Lichtw. & B.W. Horn 1981, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, five species, type: *G. hibernus* S.W. Peterson, Lichtw. & B.W. Horn, in insects, cosmopolitan, see Kirk et al. (2013; genus accepted), Strongman and Wang (2015; new species, China), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Genistellospora Lichtw. 1972, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, six species, type: *G. homothallica* Lichtw., in insects, cosmopolitan, see Lichtwardt (2011, 2012; tropics, new species), Hoffmann et al. (2013; classification, notes), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Glotzia M. Gauthier ex Manier & Lichtw. 1970, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, seven species, type: *G. centroptili* M. Gauthier ex Manier & Lichtw., in insects, cosmopolitan, see Strongman and White (2008; new species), Kirk et al. (2013; genus accepted), Valle et al. (2013; new species, Italy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Graminella L. Léger & M. Gauthier ex Manier 1962, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *G. bulbosa* L. Léger & M. Gauthier ex Manier, symbiote in insects, cosmopolitan, see Chen et al. (2012, 2015; plant virus vector, genome sequences), Kirk et al. (2013; genus accepted), Cassone et al. (2014; genetic studies), Benny et al. (2016b; classification), Heady and Nault (2017; acoustic signals), cultures and sequences are unavailable.

Harpella L. Léger & Duboscq 1929, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, seven species, type: *H. melusinae* L. Léger & Duboscq, in insects, cosmopolitan, see Misra and Tiwari (2008; India), Hapsari et al. (2009; new species), Nelder et al. (2009; ecology prediction), Percival and Harvey (2011; UK), Bench and White (2012; new species), Tretter et al. (2013; notes), Kirk et al. (2013; genus accepted), Wilson et al. (2014; effect of fungicides), Benny et al. (2016b; classification), cultures and sequences are available.

Harpellomyces Lichtw. & S.T. Moss 1984, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, four species, type: *H. eccentricus* Lichtw. & S.T. Moss, in insects, cosmopolitan, see Valle et al. (2013; new species, Italy), Kirk et al. (2013; genus accepted), Jamali (2015; Iran), Tretter et al. (2014; notes), Benny et al. (2016b; classification), cultures and sequences are available.

Kickxella Coem. 1862, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *K. alabastrina* Coem., saprobes, cosmopolitan, see Hoffman et al. (2013; notes), Kirk et al. (2013; genus accepted), Tretter et al. (2014; phylogeny), Wang et al. (2014b; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Klastostachys Lichtw., M.C. Williams & M.M. White 2011, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *K. reflexa* (Lichtw. & M.C. Williams) Lichtw., M.C. Williams & M.M. White, saprobes, cosmopolitan, see Lichtwardt et al. (2011; taxonomy), Benny et al. (2016b; classification, accepted as in *Legeriomycetaceae*), cultures and sequences are unavailable

Laculus William & Strongman 2012, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *L. insecticola* William & Strongman, in insects, Canada, see William and Strongman (2012; taxonomy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Lancisporomyces Santam. 1997, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, five species, type: *L. vernalis* Santam., in insects, cosmopolitan, see Bench and White (2012; new species), Lichtwardt (2012; tropics), Kirk et al. (2013; genus accepted), Wang et al. (2014a, b, c; DNA), Benny et al. (2016b; classification), cultures not available but sequences are available

Legerioides M.M. White 1999, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *L. tumidus* M.M. White, in insects, North America, see Kirk et al. (2013; genus accepted), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Legeriomyces Pouzar 1972, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, eleven species, type: *L. ramosus* (L. Léger & M. Gauthier) Pouzar, in insects, cosmopolitan, see Misra and Tiwari (2008; India), Strongman and White (2008; new species), Siri and López Lastra (2010; new species), Strongman (2010; Newfoundland), Strongman et al. (2010; new species), Lichtwardt (2012; tropics), Kirk et al. (2013; genus accepted), Valle (2013a; Portugal), Misra et al. (2014; new species), Tretter et al. (2014; DNA), Wang et al. (2014b; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Legeriosimilis M.C. Williams, Lichtw., M.M. White & J.K. Misra 1999, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, eight species, type: *L. tricaudata* M.C. Williams, Lichtw., M.M. White & J.K. Misra, in insects, cosmopolitan, see Strongman et al. (2010; new species), Strongman and White (2008, 2011; new species), White and Strongman (2012a; new species), Kirk et al. (2013; genus accepted), Tretter et al. (2013; DNA), Valle (2013b; France), Hussain et al. (2014; mycoinsecticide), Wang et al. (2014b; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Linderina Raper & Fennell 1952, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, two species, type: *L. pennispora* Raper & Fennell, saprobes, worldwide, see Kurihara et al. (2008; Indonesia), Chuang and Ho (2009; Taiwan), Zain et al. (2012; development of merosporangia), Kirk et al. (2013; genus accepted), Tretter et al. (2014; phylogeny), Benny et al. (2016b; classification), Chiranjeevi et al. (2017; anti-oxidant activity), cultures and sequences are available, genomes available: *L. pennispora* ATCC 12442 (unpublished) available at NCBI genomes.

Martensella Coem. 1863, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *M. pectinata* Coem., mycoparasites, worldwide, see Zain et al. (2012; development of merosporangia), Kirk et al. (2013; genus accepted), Tretter et al. (2014; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Martensiomyces J.A. Mey. 1957, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *M. pterosporus* J.A. Mey., mycoparasites, worldwide, see Zain et al. (2012; comparison of merosporangia with *Linderina*), Kirk et al. (2013; genus accepted), Tretter et al. (2014; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Mycoemilia Kurihara, Degawa & Tokum. 2004, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *M. scoparia* Kurihara, Degawa & Tokum., saprobes, Asia, see Tretter et al. (2014; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Myconymphaea Kurihara, Degawa & Tokum. 2001, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *M. yatsukahoi* Kurihara, Degawa & Tokum., saprobes, Asia, see Hoffmann et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Orphella L. Léger & M. Gauthier 1931, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, c. ten species, type: *O. coronata* L. Léger & M. Gauthier, in insects, cosmopolitan, see Kirk et al. (2013; genus accepted), Tretter et al. (2013; DNA), Valle et al. (2013, 2014; new species), Strongman and Wang (2015; new species), Benny et al. (2016b; classification), Corsaro et al (2018, phylogeny), cultures and sequences are available.

Pennella Manier 1968, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, eight species, type: *P. hovassei* Manier, in insects, cosmopolitan, see Strongman and White (2008; new species), Kirk et al. (2013; genus accepted), Tretter et al. (2013; DNA), Benny et al. (2016b; classification), cultures and sequences are available for unidentified species.

Pinnaticoemansia Kurihara & Degawa 2006, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *P. coronantispora* Kurihara & Degawa, from soil, Asia, see Hoffmann et al. (2013; notes), Benny et al. (2016b; classification), cultures and sequences are available.

Plecopteromyces Lichtw., Ferrington & López-Lastra 1999, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *P. patagoniensis* Lichtw., Ferrington & López-Lastra, cosmopolitan, see Kirk et al. (2013; genus accepted), Hoffmann et al. (2013; DNA), Benny et al. (2016b; classification), cultures and sequences are available for unidentified species.

Pseudoharpella Ferrington, M.M. White & Lichtw. 2003, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *P. arcolamylica* Ferrington,

M.M. White & Lichtw., saprobes, USA, see Tretter et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Pteromaktron Whisler 1963, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, two species, type: *P. protrudens* Whisler, saprobes, USA, see Williams and Strongman (2012; new species), Tretter et al. (2013; phylogeny), Wang et al. (2014b; DNA, phylogeny), Benny et al. (2016b; classification), cultures and sequences are available for unidentified species.

Ramicandelaber Y. Ogawa, S. Hayashi, Degawa & Yaguchi 2001, *Ramicandelaberaceae*, *Ramicandelaberales*, *Ramicandelaberomycetes*, *Kickxellomycota*, four species, type: *R. longisporus* Y. Ogawa, S. Hayashi, Degawa & Y. Yaguchi, from soil, from soybean cyst nematodes, Asia, see Hoffmann et al. (2013; notes), Chuang et al. (2009, 2013; new species, Taiwan), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Simuliomyces Lichtw. 1972, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *S. microsporus* Lichtw., in insect larva, USA, see Benny et al. (2016b; classification), cultures and sequences are unavailable.

Sinotrichium Juan Wang, S.Q. Xu & Strongman 2010, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *S. chironomidarum* Juan Wang, S.Q. Xu & Strongman, in insect larva, China, see Wang et al. (2010; taxonomy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Smittium R.A. Poiss. 1937, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, c. 80 species, type: *S. arvernense* R.A. Poiss., in insect larva, China, see Vojvodic and McCreadie (2008, 2009; species interaction, morphological difference), Wang et al. (2010, 2013b, 2014a, b, c; taxonomy, overview, phylogeny), Lichtwardt and White (2011; typification), Misra (2012; systemics), White and Strongman (2012b; new species), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), genomes available: *S. culicis* GSMNP and ID-206-W2, *S. mucronatum* strain ALG-7-W6 [27343289] are available at NCBI genomes.

Spartiella Tuzet & Manier ex Manier 1968, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *S. barbata* Tuzet & Manier ex Manier, in insect larva, Europe, Canada, see White and Strongman (2012a; new species), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are available.

Spinalia Vuill. 1904, *Dimargaritales* genera *incertae sedis*, *Dimargaritomycetes*, one species, type: *S. radians* Vuill., mycoparasites, Europe, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Spirodactylon R.K. Benj. 1959, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, one species, type: *S. aureum* R.K. Benj., saprobes, USA, see Hoffmann et al. (2013; notes), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Spiromyces R.K. Benj. 1963, *Kickxellaceae*, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*, two species, type: *S. minutus* R.K. Benj., saprobes, USA, see Hoffmann et al. (2013; notes), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), Corsaro et al (2018, phylogeny), cultures and sequences are available.

Stachylina L. Léger & M. Gauthier 1932, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, 40 species, type: *S. macrospora* L. Léger & M. Gauthier, saprobes, cosmopolitan, Strongman (2010; new species), Wang et al. (2010, 2014a, b, c; new species, phylogeny), Misra (2012; systemics), White and Strongman (2012b; new species), Kirk et al. (2013; genus accepted), William and Strongman (2013; new species), Valle (2013a; new species), cultures and sequences are unavailable.

Stachylinoides Lichtw. & López-Lastra 1999, *Harpellaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *S. arctata* Ferrington, Lichtw. & López-Lastra, in insects, South America, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Stipella L. Léger & M. Gauthier 1932, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, two species, type: *S. vigilans* L. Léger & M. Gauthier, in insect larva, Europe, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are available, the genus is treated as a synonym of *Stypomyces* Doweld in Index Fungorum (2018).

Stypomyces Doweld 2014, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, two species, type: *S. vigilans* (L. Léger & M. Gauthier) Doweld, replaced synonym of *Stipella* L. Léger & M. Gauthier 1932 (see Index Fungorum 2018).

Tectimyces L.G. Valle & Santam. 2002, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, three species, type: *T. leptophlebiidarum* L.G. Valle & Santam., in insect larva, Europe, see Valle (2010, 2013a, b; zygospore description, new species), Benny et al. (2016b; classification), cultures and sequences are available.

Tieghemiomyces R.K. Benj. 1959, *Dimargaritaceae*, *Dimargaritales*, *Dimargaritomycetes*, *Kickxellomycota*, two species, type: *T. californicus* R.K. Benj., mycoparasites, cosmopolitan, see Kirk et al. (2013; genus accepted), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Trichozygospora Lichtw. 1972, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *T. chironomidarum* Lichtw., in insects, cosmopolitan, see Kirk et al. (2013; genus accepted), Tretter et al. (2013; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Trifoliellum Strongman & M.M. White 2011, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *T. bioblitzii* Strongman & M.M. White., in insects, cosmopolitan, see Strongman and White (2011; taxonomy), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Trissocladomyces Doweld 2013, *Harpellales* genera *incertae sedis*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *T. digitatus* (L. Léger & M. Gauthier) Doweld, ?in insects, cosmopolitan, see Doweld (2013a).

Zancudomyces Yan Wang, Tretter, Lichtw. & M.M. White 2013, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one species, type: *Z. culisetae* (Lichtw.) Yan Wang, Tretter, Lichtw. & M.M. White, in insects, worldwide, see Tretter et al. (2013; DNA), Ellenberger et al. (2014; genetics), Benny et al. (2016b; classification), Wang et al. (2016a, b; genetics, gene transferring), *Z. culisetae* [27343289] is available at NCBI genomes.

Zygnemomyces K. Miura 1973, *Kickxellomycotina* genera *incertae sedis*, *Kickxellomycota*, two species, type: *Z. mexicana echinulatus* K. Miura., in nematode, ?human pathogens, south America, see Humber (2012; excluded from *Meristacraceae*), Gryganskyi et al. (2013a, b; accepted as in *Kickxellomycotina*), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Zygopolaris S.T. Moss, Lichtw. & Manier 1975, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, two species, type: *Z. ephemeridarum* S.T. Moss, Lichtw. & Manier, in insects, cosmopolitan, see Hoffman et al. (2013; notes), Benny et al. (2016b; classification), cultures and sequences are available.

Monoblepharomycota Doweld

Doweld (2001) introduced *Monoblepharomycota* based on *Monoblepharis* Cornu. Tedersoo et al. (2016) accepted *Monoblepharomycota* and introduced *Sanchytriomycetes* Tedersoo et al.

We accept three classes, three orders, seven families and eight genera in *Monoblepharomycota.*

Notes for genera

Amoeboradix Karpov, Lopez-Garcia, Mamkaeva & Moreira 2018, *Sanchytriaceae*, *Sanchytriales*, *Sanchytriomycetes*, *Monoblepharomycota*, one species, type: *A. gromovi* Karpov, Lopez-Garcia, Mamkaeva & Moreira, parasite, aquatic, Russia, see Karpov et al. (2018; light microscopy, electron microscopy, molecular phylogeny), sequences are available.

Gonapodya A. Fisch. 1892, *Gonapodyaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, one species, type: *G. prolifera* (Cornu) Fisch., saprobes, cosmopolitan, see Kirk et al. (2013, genus accepted), cultures and sequences are available.

Harpochytrium Lagerh. 1890 (= *Fulminaria* Gobi et al. 1891; = *Rhabdium* P.A. Dang.), *Harpochytriaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, c. ten species, type: *H. hyalothecae* Lagerh., on green algae, marine, South America, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Hyaloraphidium Korshikov 1931, *Hyaloraphidiaceae*, *Hyaloraphidiales*, *Hyaloraphidiomycetes*, *Monoblepharomycota*, one species, type: *H. curvatum* Korshikov, saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Monoblepharella Sparrow 1940, *Gonapodyaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, five species, type: *M. taylorii* (Sparrow) Sparrow, saprobes, cosmopolitan, see Kirk et al. (2013, genus accepted), cultures and sequences are available.

Monoblepharis Cornu 1871 (= *Diblepharis* Lagerh. 1900 [1899]; = *Monoblephariopsis* Laib. 1927), *Monoblepharidaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, five species, type: *M. sphaerica* Cornu, saprobes, cosmopolitan, see Kirk et al. (2013, genus accepted), cultures and sequences are available.

Oedogoniomyces Kobayasi & M. Ôkubo 1954, *Oedogoniomycetaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, one species, type: *O. lymnaeae* Kobayasi & M. Ôkubo, on shells of *Lymnaea* spp., Asia, see Kirk et al. (2013; genus accepted), Zhang et al. (2015; population study), cultures and sequences are available.

Sanchytrium Karpov & Aleoshin 2017, *Sanchytriaceae*, *Sanchytriales*, *Sanchytriomycetes*, *Monoblepharomycota*, one species, type: *S. tribonematis* Karpov & Aleoshin, fresh water, Russia, see Karpov et al. (2017a; taxonomy), cultures and sequences are available.

Telasphaerula Longcore & T.Y. James 2017, *Telasphaerulaceae*, *Monoblepharidales*, *Monoblepharidomycetes*, *Monoblepharomycota*, one species, type: *T. gracilis* Longcore & T.Y. James, saprobes, fresh water, USA, see Karpov et al. (2017a; taxonomy), cultures and sequences are available.

Mortierellomycota Tedersoo et al.

Tedersoo et al. (2016) upgraded *Mortierellomycotina* Kerst. Hoffm. to a phylum. Currently the phylum comprises one class, one order, one family and six genera.

Notes for genera

Aquamortierella Embree & Indoh 1967, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, one species, type: *A. elegans* Embree & Indoh, on midge larva, aquatic, New Zealand, Japan, see Hoffmann et al. (2013; classification, notes), Kirk et al. (2013; genus accepted), Wagner et al. (2013; classification), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Dissophora Thaxt. 1914, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, three species, type: *D. decumbens* Thaxt., saprobes, worldwide, see Takó et al. (2012; production of lipase), Hoffmann et al. (2013; classification, notes), Kirk et al. (2013; genus accepted), Wagner et al. (2013; treated as a synonym of *Dissophora*), Benny et al. (2016b; classification), cultures and sequences are available.

Gamsiella (R.K. Benj.) Benny & M. Blackw. 2004, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, one species, type: *G. multidivaricata* (R.K. Benj.) Benny & M. Blackw., saprobes, North America, see Petkovits et al. (2011; DNA), Hoffmann et al. (2013; classification, phylogeny), Wagner et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Mortierella Coem. 1863, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, c. 100 species, type: *M. polycephala* Coem., saprobes, in soil, worldwide, see acid, Sakuradani et al. (2009; hybrid for oil production), Sato et al. (2010; interactions with bacteria), Wang et al. (2011a, b, 2013a; metabolism, genomic studies), Petkovits et al. (2011; notes, classification), Ruan et al. (2012; application), Hoffmann et al. (2013; classification, notes), Kirk et al. (2013; genus accepted), Smith et al. (2013; DNA, phylogeny), Wagner et al. (2013; classification), Edgington et al. (2014; insecticides), Hao et al. (2014a, b, 2015; enzymes, metabolism), Ariyawansa et al. (2015; new species), Benny et al. (2016b; classification), Werner et al. (2016; biology), Hyde et al. (2017b; new species), Ge et al. (2018, biotechnology), Luo et al. (2017; biotechnology), Uehling et al. (2017; comparative genomics), Zhang et al. (2017; biotechnology), cultures and sequences are available, genome available: *M. alpina* CDC-B6842 (Etienne et al. 2014), CCTCC M207067 and ATCC 32222 [22174787], *M. elongata* AG-77 [28076891], *M. verticillata* NRRL 6337 available at NCBI genomes.

Modicella Kanouse 1936, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, two species, type: *M. malleola* (Harkn.) Gerd. & Trappe, saprobes, in soil, water, worldwide, see Petkovits et al. (2011; classification), Hoffmann et al. (2013; classification, notes), Kirk et al. (2013; genus accepted), Smith et al. (2013; DNA, phylogeny), Wagner et al. (2013; classification), Benny et al. (2016b; classification), cultures and sequences are available.

Lobosporangium M. Blackw. & Benny 2004, *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*, one species, type: *L. transversale* (Malloch) M. Blackw. & Benny, saprobes, North America, see Petkovits et al. (2011; DNA), Hoffmann et al. (2013; classification), Wagner et al. (2013; DNA), Benny et al. (2016b; classification), cultures and sequences are available, genomes available: *L. transversale* strain NRRL 3116 (unpublished) available at NCBI genomes.

Mucoromycota Doweld

Doweld (2001) introduced *Mucoromycota* but Kirk et al. (2008) accepted the subphylum *Mucoromycotina* to accommodate *Mucor* Fresen. However, Spatafora et al. (2016) accepted *Mucoromycota* as a distinct phylum with three subphyla viz. *Glomeromycotina* (in this study we do not accept this rank under *Mucoromycota*), *Mortierellomycotina* and *Mucoromycotina*. The members of *Mucoromycota* occur as saprobes and rarely as facultative parasites (Figs. 5 and 6) (Kirk et al. 2008).

We accept three class, three orders, 16 families and 66 genera in *Mucoromycota.*

Notes for genera

Absidia Tiegh. 1878, *Cunninghamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, c. 20 species, type: *A. reflexa* Tiegh., saprobes, in soil, animal dung, worldwide, see Hoffmann and Voigt (2009; introduced *Lentamyces* for *A. parricida* and *A. zychae*), Richardson (2009; notes), Hoffmann (2010; generic revision), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Ariyawansa et al. (2015; new species, phylogeny), Li et al. (2016; new species), Wang et al. (2017e; fermentation), cultures and sequences are available,), genomes available: *A. padenii* NRRL 2977 (unpublished) at JGI portal (Grigoriev et al. 2014), *A. repens* NRRL 1336 (Mondo et al. 2017) genomes at JGI portal (Grigoriev et al. 2014).

Actinomucor Schostak. 1898, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species and three varieties, type: *A. elegans* (Eidam) C.R. Benj. & Hesselt., opportunistic pathogens of human and animals, in soil, on human, worldwide, see Li et al. (2008; debittering effect), Tully et al. (2009; human pathogens), Gomes et al. (2011; mucormycosis, review), Mahmud et al. (2012; case of mucormycosis), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Kia et al. (2014; mutulism with *Abutilon theophrasti*), Mou et al. (2014; biotransformation of

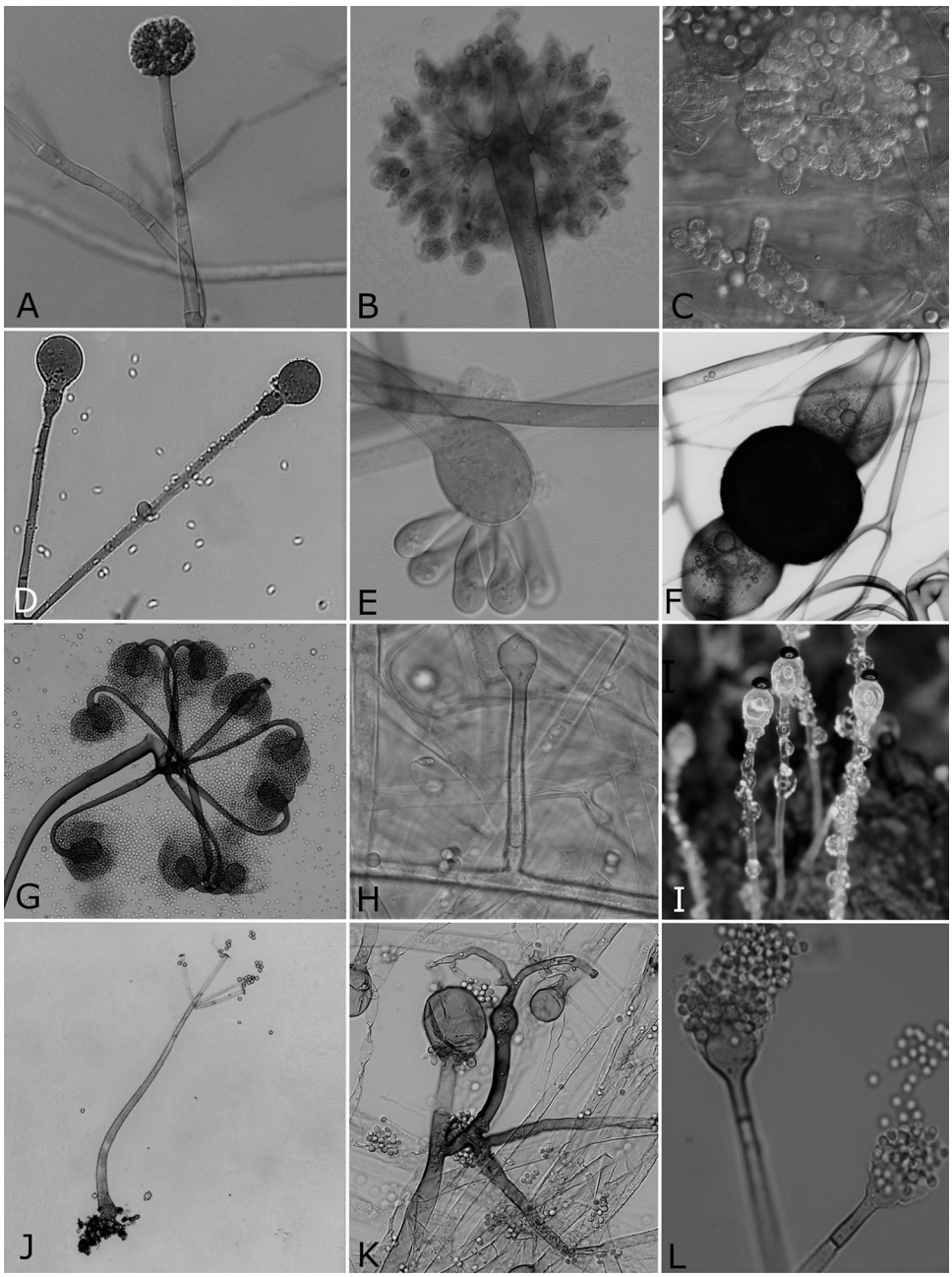

Fig. 5 Mucoromycota:
A *Umbelopsis* sp.
B *Thamnostylum piriforme*.
C *Syncephalastrum racemosum*.
D *Gongronella* sp.
E *Cunninghamella* sp.
F Zygospore of *Syzygites* ***megalocarpus***. **G** *Circinella umbellata*. **H** *Lichtheimia* sp.
I *Pilobolus* sp. **J** *Mortierella* sp.
K *Rhizomucor pusillus*.
L *Absidia* sp

resibufogenin), Wang et al. (2014a, c; enhanced glucosamine production and biotransformation of resibufogenin), Zhou et al. (2014; biotechnology), Karimi et al. (2015, pathogen of chafer beetle), Dorin et al. (2017; diagnosis methods combining molecular tools, mucormycosis), Li et al. (2018; biotechnology), genomes available: *A. elegans* JCM_22485 at NCBI genomes.

Ambomucor R.Y. Zheng & X.Y. Liu 2014, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species and three varieties, type: *A. seriatoinflatus* X.Y. Liu & R.Y. Zheng, in soil, China, see Zheng and Liu (2014; taxonomy), Liu and Zheng (2015; new species), cultures and sequences are available.

Amylomyces Calmette 1892, *Rhizopodaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *A. rouxii* Calmette, use in food production, cosmopolitan, see Kito et al. (2009; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny, in *Rhizopus arrhizus var. arrhizus*), Benny et al. (2016b; classification), cultures and sequences are available.

Apophysomyces P.C. Misra 1979, *Saksenaeaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, five species, type: *A. elegans* P.C. Misra, K.J. Srivast. & Lata, in soil, human

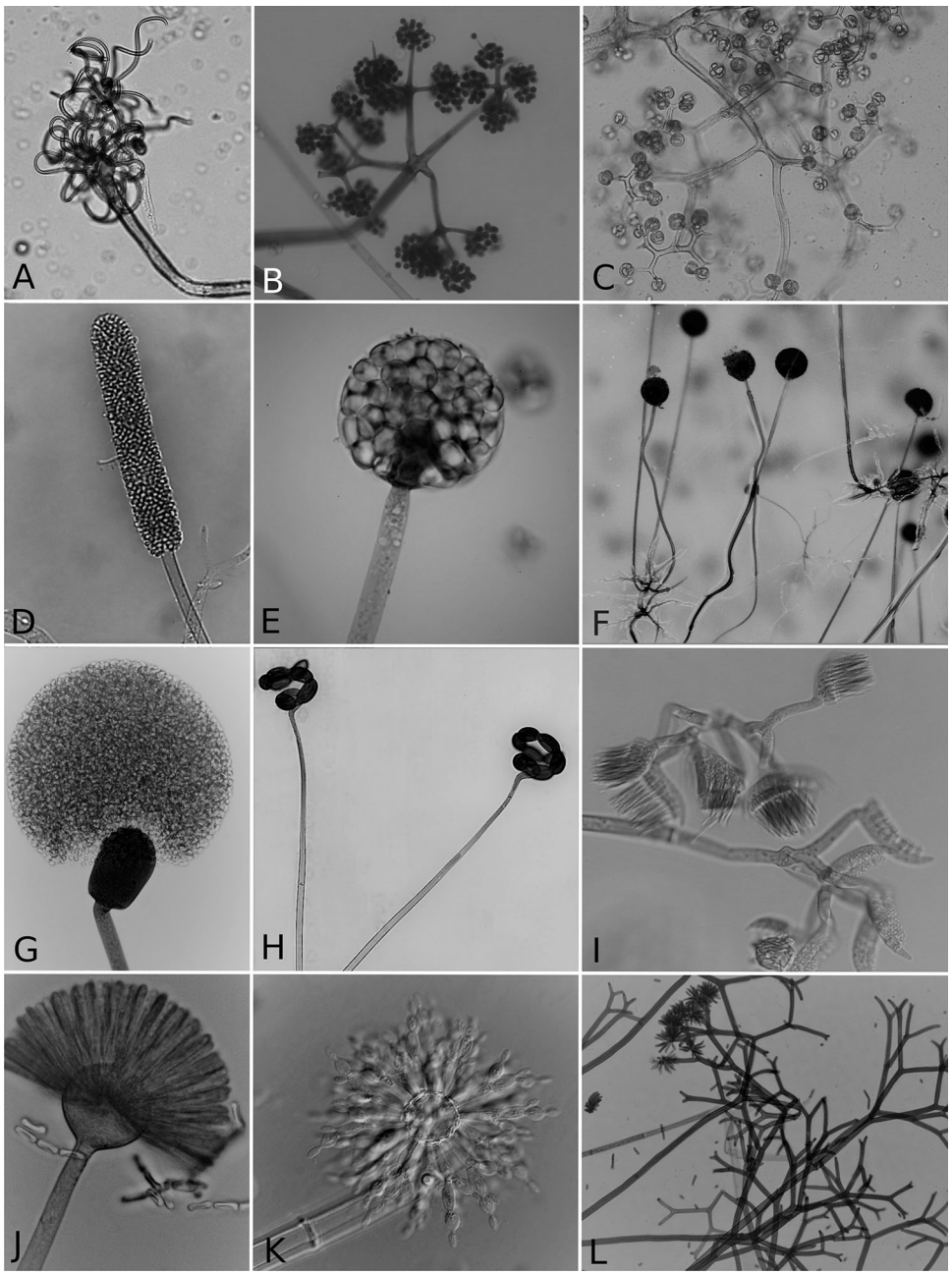

Fig. 6 **A**–**G** Mucoromycota: **A** *Cokeromyces recurvatus.* **B** *Chaetocladium* sp. **C** *Thamnidium elegans.* **D** *Mycotypha microspora.* **E** *Mucor* sp. **F** *Rhizopus* sp. **G** *Mucor* sp. **H**–**L** Zoopagomycota: **H** *Helicocephalum* sp. **I** *Coemansia* sp. **J** *Syncephalis* sp. **K** *Dimargaris* sp. **L** *Piptocephalis* sp

and animal pathogens, cosmopolitan, see Álvarez et al. (2010b; new species, human pathogens, phylogeny), Guarro et al. (2011; human pathogens), Etienne et al. (2012; genome), Hoffmann et al. (2013; phylogeny, notes), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Bonifaz et al. (2014; new species, Mexico), Dave et al. (2014; novel cause of endogenous endophthalmitis), Al-Zaydani et al. (2015; pathogenic on a child), Benny et al. (2016b; classification), Bertumen et al. (2016; clinical diagnosis difficulties), Kennedy et al. (2016; mucormycosis in Australia), Prakash et al. (2016, 2017; environmental sources, genome sequencing), Wolkow et al. (2017; chronic orbital and calvarial fungal infection), cultures and sequences are available, genomes available: *A. elegans* CDC-B7760 (Chibucos et al. 2016), and *A. trapeziformis* CDC-B9324 (Chibucos et al. 2016) and A. variabilis NCCPF 102052 [PMID: 28923009] available at NCBI genomes.

Backusella Hesselt. & J.J. Ellis 1969, *Backusellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, 14 species, type: *B. circina* J.J. Ellis & Hesselt., in soil, in excrements of animals, worldwide, see Nyilasi et al. (2008; molecular identification), Santiago et al. (2011b; in excrement of non-ruminant), Li et al. (2012; biodiversity), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny),

Hoffmann et al. (2013; phylogeny), de Souza et al. (2014; new species), Benny et al. (2016b; classification), Lima et al. (2016; new species), cultures and sequences are available, genomes available: *Backusella circina* FSU 941 unpublished genome at JGI portal (Grigoriev et al. 2014).

Benjaminiella Arx 1981, *Mycotyphaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species, type: *B. poitrasii* (R.K. Benj.) Arx, in soil, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Joshi et al. (2013; dimorphism mechanism), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Mane et al. (2017; Chitosan production), Pathan et al. (2017; reference genes for quantitative real-time RT-PCR), cultures and sequences are available.

Bifiguratus Torr.-Cruz & Porras-Alfaro 2017, *Mucoromycotina* genera *incertae sedis*, one species, type: *B. adelaidae* Torr.-Cruz & Porras-Alfaro, from photosynthetic tissue of *Leucobryum* in Arizona, USA, see Torres-Cruz et al. (2017), cultures and sequences are available, genomes available: *B. adelaidae* strain AZ0501 [28876195] genome available at NCBI.

Blakeslea Thaxt. 1914, *Choanephoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *B. trispora* Thaxt., worldwide, see Choudhari et al. (2008; β-carotene and lycopene), Mantzouridou et al. (2008; glycerol in media), Schachtschabel et al. (2008; trisporoid synthesis), Sun et al. (2012; metabolites), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Sahadevan et al. (2013; biotechnology), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *B. trispora* NRRL 2456 unpublished genome at JGI portal (Grigoriev et al. 2014)

Chaetocladium Fresen. 1863, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *C. jonesiae* (Berk. & Broome) Fresen., fungicolous, cosmopolitan, see Ho et al. (2008; Taiwan), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Chlamydoabsidia Hesselt. & J.J. Ellis 1966, *Cunninghamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *A. padenii* Hesselt. & J.J. Ellis, saprobes, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), cultures and sequences are available.

Choanephora Curr. 1873, *Choanephoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *C. infundibulifera* (Curr.) D.D. Cunn., worldwide, however, disease development is more common in tropical and subtropical regions characterized by high temperatures and humidity, see Siddiqui et al. (2008, 2009; control by Trichoderma, Tea), Kagiwada et al. (2010; infection in *Mesembryanthemum crystallinum*, Japan), Saroj et al. (2012; infection in Withania somnifera, India), Sun et al. (2012; metabolites), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Min et al. (2017; genome analyses of *C. cucurbitarum*), cultures and sequences are available, genome available: *C. cucurbitarum* KUS-F28377 at NCBI genomes [28091548].

Circinella Tiegh. & G. Le Monn. 1873, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, eleven species, type: *C. umbellata* Tiegh. & G. Le Monn., saprobes, coprophilous, worldwide, see Alpat et al. (2008; biosensor), Gonzalez et al. (2010; Mexico), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Lima et al. (2017; taxonomy), de Souza et al. (2017; notes), Zheng et al. (2017; new species), cultures and sequences are available, genome available, *C. umbellata* NRRL1351 unpublished genome at JGI portal (Grigoriev et al. 2014)

Cokeromyces Shanor 1950, *Mycotyphaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *C. recurvatus* Poitras, saprobes and human pathogen, worldwide, see Ryan et al. (2011; fatal pneumonia), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Gade et al. (2016; molecular diagnostics), Benny et al. (2016b; classification), Chibucos et al. (2016; mucomycosis causing fungi), Paquette et al. (2016; a case report of *C. recurvatus*), Sharma et al. (2018; *Cokeromyces recurvatus* in Papanicolaou test), cultures and sequences are available, *C. recurvatus* NRRL 2243 (CBS 158.50) unpublished genome at JGI portal (Grigoriev et al. 2014) and CDC-B5483 (Chibucos et al. 2016) available at NCBI.

Cunninghamella Matr. 1903, *Cunninghamellaceae*, *Mucorales, Mucoromycetes*, *Mucoromycota*, c. 14 species, type: *C. echinulata* (Thaxt.) Thaxt. ex Blakeslee, saprobes, human pathogen, cosmopolitan, see Asha and Vidyavathi (2009; review), Fakas et al. (2009; substrates for oil production), Pastor et al. (2010; antifungal properties), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Berger et al. (2014; biotechnology), Ganjali Dashti et al. (2014; biosynthesis of lipase), Saad et al. (2014; Lipid and Gamma Linolenic Acid Production), Silva et al. (2014; metabolites), Zawadzka et al. (2015; Carbazole hydroxylation), Yu et al. (2015; barcoding of clinically important species), Dube and Kumar (2017; biotransformation), Siddiqui et al. (2017; biotransformation), cultures and sequences are available, available genomes: *C. echinulata* NRRL 1382 unpublished genome at JGI portal (Grigoriev et al. 2014), *C. elegans* CDC-B9769 and *C. bertholletiae* 175 and CDC-B7461 (Chibucos et al. 2016) available at NCBI genomes.

Densospora McGee 1996, *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, nine species, type: *D.*

tubiformis (P.A. Tandy) McGee, mycorrhizal, Australia, Northern Hemisphere, see Kirk et al. (2013; genus accepted), Desirò et al. (2017 ecology and phylogeny), Truong et al. (2017; phylogeny), Yamamoto et al. (2017a, b; reported from Northern Hemisphere), cultures unavailable, sequences available.

Dichotomocladium Benny & R.K. Benj. 1975, *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, five species, type: *D. elegans* Benny & R.K. Benj., saprobes, worldwide, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available, genome available *D. elegans* RSA 919 unpublished genome at JGI portal (Grigoriev et al. 2014)

Dicranophora J. Schröt. 1886, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *D. fulva* J. Schröt., saprobes, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Ellisomyces Benny & R.K. Benj. 1975, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *E. anomalus* (Hesselt. & P. Anderson) Benny & R.K. Benj., saprobes, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Endogone Link 1809 (= *Youngiomyces* Y.J. Yao 1995 fide Desirò et al. 2017), *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, c. 21 species, type: *E. pisiformis* Link, in mycorrhiza, cosmopolitan, see Bidartondo et al. (2011; symbiosis with plants), Schüßler et al. (2011; arbuscular mycorrhizal fungi), Desirò et al. (2013, 2015, 2017; phylogeny, endobacteria, symbioses with hornworts), Kirk et al. (2013; genus accepted), Yamamoto et al. (2015, 2017a, b; morphology, phylogeny, oak forests, new species), Benny et al. (2016b; classification), Benitez et al. (2017; species in rhizosphere), cultures and sequences are available.

Fennellomyces Benny & R.K. Benj. 1975, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, four species, type: *F. linderi* (Hesselt. & Fennell) Benny & R.K. Benj., saprobes, coprophilous, worldwide, see Xess et al. (2012; phylogeny, De Azevedo Santiago et al. (2013; coprophilous, Brazil), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *Fennellomyces* sp. T-0311 unpublished genome at JGI portal (Grigoriev et al. 2014)

Gilbertella Hesselt. 1960, *Choanephoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *G. persicaria* (E.D. Eddy) Hesselt., worldwide, plant pathogen, see Amiri et al. (2011; abiotic factors effect), Guo et al. (2012; rot in dragon fruit), Sun et al. (2012; metabolites), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Karthikeyan and Gopalakrishnan (2014; infection on shrimp), Uloth et al. (2015; associated with calcium oxalate crystals), Benny et al. (2016b; classification), Cruz-Lachica et al. (2016; papaya fruit rot), cultures and sequences are available, genome available: *G. persicaria* var. *persicaria* CBS 190.32-T unpublished genome at JGI portal (Grigoriev et al. 2014)

Gongronella Ribaldi 1952, *Cunninghamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, six species, type: *G. butleri* (Lendn.) Peyronel & Dal Vesco, saprobes, cosmopolitan, see Nwe et al. (2009; chitosan for tissue regeneration), Ghizelini et al. (2012; record from Brazil), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Zhang et al. (2013; enhancement of chitosanase production), Adamčík et al. (2015; new species), Ariyawansa et al. (2015; new species), Babu et al. (2015; *G. butleri* from Korea), Li et al. (2016; new species), Santos et al. (2016; application), Cavalheiro et al. (2017; enzymes produced by *G. butleri*), Tibpromma et al. (2017; new species), cultures and sequences are available., genome available, *G. butleri* CBS 227.36 unpublished genome at JGI portal (Grigoriev et al. 2014), *Gongronella* sp. W5 (unpublished) available at NCBI.

Halteromyces Shipton & Schipper 1975, *Cunninghamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *H. radiatus* Shipton & Schipper, saprobes, Australia, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), cultures and sequences are available.

Helicostylum Corda 1842, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, c. two species, type: *H. elegans* Corda., saprobes, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Hesseltinella H.P. Upadhyay 1970, *Cunninghamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *H. vesiculosa* H.P. Upadhyay, saprobes, South America, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Spatafora et al. (2016; phylogeny), cultures and sequences are available, *H. vesiculosa* NRRL3301 (Mondo et al. 2017)

Hyphomucor Schipper & Lunn 1986, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *H. assamensis* (B.S. Mehrotra & B.R. Mehrotra) Schipper & Lunn., saprobes, cosmopolitan, see Hoffmann

et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Isomucor J.I. Souza, Pires-Zottar. & Harakava 2012, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *I. trufemiae* J.I. Souza, Pires-Zottar. & Harakava, from soil, Brazil, see de Souza et al. (2012; taxonomy), Benny et al. (2016b; classification), cultures and sequences are available.

Jimgerdemannia Trappe, Desirò, M.E. Sm., Bonito & Bidartondo 2017, *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, two species, type: *J. flammicorona* (Trappe & Gerd.) Trappe, Desirò, M.E. Sm., Bonito & Bidartondo, Desirò et al. (2017; phylogeny), cultures unavailable, sequences available.

Kirkiana L.S. Loh, Kuthub. & Nawawi 2001, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *K. ramosa* L.S. Loh, Kuthub. & Nawawi, saprobes, cosmopolitan, see Benny et al. (2016b; classification), cultures and sequences are unavailable.

Kirkomyces Benny 1996, *Mycotyphaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *K. cordensis* (B.S. Mehrotra & B.R. Mehrotra) Benny, saprobes, Asia, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Satari and Karimi (2017; biologically active molecule production), cultures and sequences are unavailable.

Lentamyces Kerst. Hoffm. & K. Voigt 2008 [2009], *Lentamycetaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, four species, type: *L. parricidus* (Renner & Muskat ex Hesselt. & J.J. Ellis) Kerst. Hoffm. & K. Voigt, mycoparasites, cosmopolitan, see Hoffmann and Voigt (2009; taxonomy), Budziszewska et al. (2010a; Poland), Hoffmann et al. (2013; phylogeny), Walther et al. (2013; phylogeny), Gebremariam et al. (2014; notes), Tretter et al. (2014; DNA), Benny et al. (2016b; classification), cultures and sequences are available.

Lichtheimia Vuill. 1903, *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, c. eight species, type: *L. corymbifera* (Cohn) Vuill., worldwide, saprobes and pathogens, see Kirk et al. (2008; treated as a synonym of *Absidia*), Garcia-Hermoso et al. (2009; taxonomy of clinical species), Alastruey-Izquierdo et al. (2010a, b; taxonomy), Hoffmann et al. (2009a, b, 2013; introduction of family, phylogeny), Bellanger et al. (2010; farmer lung disease), Borrás et al. (2010; clinical), Gomes et al. (2011; human pathogens), Neves et al. (2011; enzyme production), Schrödl et al. (2011; MALDI ToF), Schwartze et al. (2012, 2014a, b; pathogenicity, genomics), Woo et al. (2012; mucormycosis), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), André et al. (2014; new species), Leung et al. (2014; mitochondrial genome sequence of *L. ramosa*), Linde et al. (2014; whole genome sequence), Garcia et al. (2015; β-glucosidase production), Benny et al. (2016b; classification), cultures and sequences are available (Ex-neotype of type: CBS 429.75; sequence of type: NR_111413), genome available: *L. corymbifera* JMRC:FSU:9682 (Schwartze et al. 2014a, b), *L. corymbifera* strains CDC-B2541 and 008-049 (Chibucos et al. 2015), *L. hyalospora* unpublished genome at JGI portal (Grigoriev et al. 2014), *L. ramosa* strains CDC-B5399 and CDC-B5792 (Chibucos et al. 2015) and JMRC FSU:6197 (Linde et al. 2014)

Mucor Fresen. 1850, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, c. 60 species, type: *M. mucedo* Fresen., worldwide, saprobes, in soil, human pathogens, see Jacobs and Botha (2008; new species), Álvarez et al. (2011; new species), Hermet et al. (2012; molecular systematic), Madden et al. (2012; new species), Hoffmann et al. (2013; classification, phylogeny), Karimi and Zamani (2013; *Mucor indicus*: biology and industrial application), Kirk et al. (2013; genus accepted), Lu et al. (2013; Taxonomy and epidemiology of *Mucor irregularis*), Walther et al. (2013; phylogeny), Kang et al. (2014; infection), Aziz et al. (2016; medicinal nanobiology), Benny et al. (2016b; classification), Behnam et al. (2016; xylanase production), Kroll et al. (2016; mutations), Pawłowska et al. (2016; evolution of carbon assimilation abilities), Racsa et al. (2016; blood infection), Tang et al. (2016; proteomics), Voglmayr and Clémençon (2016; endoparasites of basidiomes of Hysterangium spp.), Calo et al. (2017; molecular pathway disruption), Garcia et al. (2017; recyclable genetic marker), Morin-Sardin et al. (2017; applications), Taj-Aldeen et al. (2017; molecular parasitology), cultures and sequences are available, genomes available, *M. ambiguus* NBRC 6742, *M. circinelloides* CBS277.49 (Corrochano et al. 2016) and WJ11 [26352831], 1006PhL (no publication), CDC-B8987 (Shelburne et al. 2015) and JCM 22480 are available at NCBI genomes, *M. irregularis* B50 (no publication) is available at NCBI genomes, *M. cordense* RSA 1222 unpublished genome at JGI portal (Grigoriev et al. 2014), *M. heterogamus* NRRL 1489 unpublished genome at JGI portal (Grigoriev et al. 2014), *M. indicus* CDC-B7402 (Shelburne et al. 2015), *M. racemosus* CDC-B9645 (Shelburne et al. 2015), *M. velutinous* CDC-B5328 (Shelburne et al. 2015)

Mycocladus Beauverie 1900, *Mycocladaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *M. verticillatus* Beauverie, worldwide, see Hoffmann et al. (2009a, b, 2013; accepted in *Mucoraceae*), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Mycotypha Fenner 1932, *Mycotyphaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species, type: *M. microspora* Fenner, insect symbionts, saprobes, or human pathogen (rare), from soil, worldwide, see Jayachandra et al. (2011; Biomethanation), De Azevedo Santiago et al. (2013; in Brazil), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Woodbury and Gries (2013; ecology), Benny et al. (2016b; classification), cultures and sequences are available, *M. africana* NRRL 2978 unpublished genome at JGI portal (Grigoriev et al. 2014).

Nawawiella L.S. Loh & Kuthub. 2001, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *N. apophysa* L.S. Loh & Kuthub., saprobes, in soil, South East Asia, see Benny et al. (2016b; classification), cultures and sequences are unavailable.

Nothadelphia Degawa & W. Gams 2004, *Mucoromycota* genera *incertae sedis*, one species, type: *N. mortierellicola* Degawa & W. Gams, mycoparasite of *Mortierella*, on bat dung, Japan, see Benny et al. (2016b; classification), cultures and sequences are available.

Palaeoendogone Strullu-Derr., Kenrick, Pressel, Duckett, J.P. Rioult & Strullu 2014, *Mucoromycotina* genera *incertae sedis*, one species, type: *O. gwynne-vaughaniae* Strullu-Derr., Kenrick, Pressel, Duckett, J.P. Rioult & Strullu, in plants (fossil fungi), UK, see Strullu-Derrien et al. (2014; taxonomy), cultures and sequences are unavailable.

Parasitella Bainier 1903, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *P. parasitica* (Bainier) Syd., mycoparasites, cosmopolitan, see Burmester et al. (2013; gene transferring), Hoffmann et al. (2013; phylogeny), Walther et al. (2013; phylogeny), Ellenberger et al. (2014; complete mitochondrion sequence), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *P. parasitica* genome at NCBI genomes.

Peridiospora C.G. Wu & Suh J. Lin 1997, *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, two species, type: *P. tatachia* C.G. Wu & Suh J. Lin, in mycorrhiza, Taiwan, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), Benitez et al. (2017; species in rhizosphere), cultures and sequences are unavailable.

Phascolomyces Boedijn ex Benny & R.K. Benj. 1976, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *P. articulosus* Boedijn ex Benny & R.K. Benj., ?coprophilous, saprobes, worldwide, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *P. articulosus* unpublished genome at JGI portal (Grigoriev et al. 2014).

Phycomyces Kunze 1823, *Phycomycetaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species, type: *P. nitens* (C. Agardh) Kunze, saprobes, worldwide, see Sanz et al. (2009, 2011; interactions with the environment, functional analysis), Chaudhary et al. (2013; genetic linkage map), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Shakya and Idnurm (2014; uniparental mitochondrial inheritance), Žižić et al. (2014; vanadate influence on metabolism), Camino et al. (2015; diversity, ecology, and evolution), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *P. blakesleeanus* NRRL1555 (Corrochano et al. 2016), *P. nitens* S607, S608 and S609 unpublished genome at JGI portal (Grigoriev et al. 2014)

Pilaira Tiegh. 1875, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, seven species and one subspecies, type: *P. anomala* (Ces.) J. Schröt., saprobes, coprophilous, cosmopolitan, see Zheng and Liu (2009; taxa in China), Hoffmann et al. (2013; phylogeny), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), Urquhart et al. (2017; new species), cultures and sequences are available, genome available: *P. anomala* RSA1997 unpublished genome at JGI portal (Grigoriev et al. 2014).

Pilobolus Tode 1784, *Pilobolaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, ten species and one subspecies, type: *P. crystallinus* (F.H. Wigg.) Tode, saprobes, coprophilous, cosmopolitan, see Foos et al. (2011; phylogeny), Kubo (2011; gene expression), Kubo (2012; asexual reproduction), Pierce and Foos (2011; species associated with horses), Hoffmann et al. (2013; phylogeny), Walther et al. (2013; phylogeny), Greaves (2014; in Britain), Rajachan et al. (2014; depsidone), Aluoch et al. (2015, 2017; dung inhabiting species), Benny et al. (2016b; classification), cultures and sequences are available, genome available: *P. umbonatus* NRRL 6349 unpublished genome at JGI portal (Grigoriev et al. 2014).

Pirella Bainier 1882, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *P. circinans* Bainier, saprobes, coprophilous, cosmopolitan, see Bridge et al. (2008; new host), Clum et al. (2009; genomics), Hoffmann et al. (2013; phylogeny), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Poitrasia P.M. Kirk 1984, *Choanephoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *G. circinans* (H. Nagan. & N. Kawak.) P.M. Kirk, worldwide, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Qi et al. (2016; population study), Benny et al. (2016b; classification), cultures and sequences are available.

Protomycocladus Schipper & Samson 1994, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *P. faisalabadensis* (J.H. Mirza, S.M. Khan, S. Begum & Shagufta) Schipper & Samson, saprobes, Asia, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Radiomyces Embree 1959, *Radiomycetaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species, type: *R. spectabilis* Embree, saprobes, USA, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), *R. spectabilis* NRRL 2753 unpublished genome at JGI portal (Grigoriev et al. 2014).

Rhizomucor Lucet & Costantin 1900, *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, four species, type: *R. pusillus* (Lindt) Schipper, saprobes, human pathogens, cosmopolitan, see Lu et al. (2009; endemic zygomycosis), Zheng et al. (2009; new species), Budziszewska et al. (2010b; taxonomic revision), Rodrigues and Fernandez-Lafuente (2010; lipase as biocatalyst), Tajdini et al. (2010; Chitosan), Tawil et al. (2010; α-amylase), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Martinez et al. (2013; biotransformation of fatty acid), Walther et al. (2013; phylogeny), Bard et al. (2014, pathogenicity) Benny et al. (2016b; classification), *R. variabilis* (Chibucos et al. 2016), Andrey et al. (2017; Cerebral infection), Sun et al. (2018, enzymes), *R. miehei* CAU432 [24746234] and *R. pusillus* (no publication) available at NCBI genomes.

Rhizopodopsis Boedijn 1959, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *R. javensis* Boedijn, saprobes, Indonesia, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Rhizopus Ehrenb. 1821, *Rhizopodaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, c. ten species, type: *R. stolonifer* (Ehrenb.) Vuill., saprobes, worldwide, in soil, plant pathogen, human pathogen, see monograph with key (Zheng et al. 2017), Hernandez-Lauzardo et al. (2008; Chitosan effect), Qin et al. (2008; biodiesel production), Abedinifar et al. (2009; ethanol production), Ma et al. (2009; Genomics), Abe et al. (2010; molecular phylogeny), Gryganskyi et al. (2010; phylogeny), Xu et al. (2010; fumaric acid production), Das et al. (2012; gold nanoparticles), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Dolatabadi et al. (2014; nomenclature of *Rhizopus arrhizus*), Kaerger et al. (2015; virulence), Mendoza et al. (2015; human pathogens), Benny et al. (2016b; classification), Li et al. (2016; new species), Zhang et al. (2013, xylanase production), Wu et al. (2018, fumaric acid production), Canet et al. (2017; biodiesel synthesis), Liu et al. (2016; food waste fermentation), Baggio et al. (2017; phytopathology), Gryganskyi et al (2018; phylogenomics), NRRL 21446, NRRL 21477, NRRL 21447, NRRL 21789 (Chibucos et al. 2016) available at NCBI genomes, *R. microsporus* CDC-B7455 and CDC-B9738 (Chibucos et al. 2016), available at NCBI genomes, *R. microsporus* ATCC 11559, ATCC 52813, ATCC 52814, B9738 and B7455 available at NCBI genomes, *R. microsporus* CCTCC M201021 (Wang et al. 2013a, b, c, d) available at NCBI genomes, *R. oryzae* 99-892, CDC-B7407, HUMC 02, NRRL 13440, NRRL 18148, NRRL 21396 (Chibucos et al. 2016), 99-133 and 97-1192 available at NCBI genomes, *R. stolonifer* CDC-B9770 (Chibucos et al. 2016) available at NCBI genomes, cultures and sequences are available.

Saksenaea S.B. Saksena 1953, *Saksenaeaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, five species, type: *S. vasiformis* S.B. Saksena, human pathogen, cosmopolitan, see García-Martínez et al. (2008; human pathogen), Lechevalier et al. (2008; molecular diagnosis), Baradkar and Kumar (2009; cutaneous zygomycosis), Alvarez et al. (2010a, b; new species), Hospenthal et al. (2011; fatal infection), Salas et al. (2012; disseminated infection by *Saksenaea vasiformis*), Kirk et al. (2013; genus accepted), Tretter et al. (2014; notes), Benny et al. (2016b; classification), Crous et al. (2016, 2017; new species), Chander et al. (2017; infecting human), Singh and Kushwaha RKS (2017; biology and significance of *S. vasiformis*), *S. oblongispora* B3353 and S. vasiformis B4078 (Chibucos et al. 2016) available at NCBI genomes.

Sclerogone Warcup 1990, *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, one species, type: *S. eucalypti* Warcup, in mycorrhiza, Australia, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), Desirò et al. (2017; notes, provisionally accepted as in *Endogonaceae*), cultures and sequences are unavailable.

Sphaerocreas Sacc. & Ellis 1882, *Endogonaceae*, *Endogonales*, *Endogonomycetes*, *Mucoromycota*, type: *S. pubescens* Sacc. & Ellis, four species, plant related, Hirose et al. (2014; classification), Desirò et al. (2017; phylogeny), cultures unavailable, sequences available.

Spinellus Tiegh. 1875, *Phycomycetaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, five species, type: *S. fusiger* (Link) Tiegh., mycoparasites, worldwide, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), *S. fusiger* NRRL 22323 unpublished genome at JGI portal (Grigoriev et al. 2014).

Sporodiniella Boedijn 1959, *Rhizopodaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *S. umbellata* Boedijn, saprobes, mild (and minor) entomopathogen, worldwide, see Hoffmann et al. (2013;

phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), *S. umbellata* MES 1446 unpublished genome at JGI portal (Grigoriev et al. 2014).

Syncephalastrum J. Schröt. 1886, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *S. racemosum* Cohn ex J. Schröt., saprobes, human pathogens, worldwide, see Baradkar et al. (2008; infection), Amatya et al. (2010; species producing mycetoma-like lesions), Mathur et al. (2010; emulsification), Batista et al. (2013; wastewater treatment), Fu et al. (2013; Biotransformation of ursolic acid), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), cultures and sequences are available, genomes available: Mathuram et al. (2013; infection), Walther et al. (2013; phylogeny), Huang et al. (2014; nematicide), Mangaraj et al. (2014; subcutaneous mucormycosis due to *S. racemosum*), Baby et al. (2015; Onychomycosis by *S. racemosum*), Benny et al. (2016b; classification), Huang et al. (2016; *S. racemosum* as bio control agent), Rodríguez-Gutiérrez et al. (2015; human infection),*S. racemosum* NRRL 2496 (Mondo et al. 2017), *S. racemosum* B6101 and *S. monosporum* B8922 (Chibucos et al. 2016) available at NCBI genomes.

Syzygites Ehrenb. 1818 (= *Sporodinia* Link), *Rhizopodaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *S. megalocarpus* Ehrenb., mycoparasites, saprobes, cosmopolitan, see Beyer et al. (2013; on button mushroom), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Thamnidium Link 1809, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *T. elegans* Link, saprobes, cosmopolitan, see Papanikolaou et al. (2010; lipid production), Akar et al. (2013; environmental clean-up), Hoffmann et al. (2013; notes), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), *T. elegans* unpublished genome at JGI portal (Grigoriev et al. 2014).

Thamnostylum Arx & H.P. Upadhyay 1970, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, four species, type: *T. piriforme* (Bainier) Arx & H.P. Upadhyay, coprophilous, human pathogens, worldwide, see Xess et al. (2012; human pathogen), De Azevedo et al. (2013; coprophilous), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Thermomucor Subrahm., B.S. Mehrotra & Thirum. 1977, *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *T. indicae-seudaticae* Subrahm., B.S. Mehrotra & Thirum., saprobes, India, see Martin et al. (2010; Pectinase production by T. indicae-seudaticae), Merheb-Dini et al. (2010; enzymes), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Taha et al. (2014; new species), Benny et al. (2016b; classification), *T. indicae-seudaticae* HACC 243 available at NCBI genomes.

Tortumyces L.S. Loh 2001, *Mucoraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species, type: *T. fimicola* L.S. Loh, saprobes, Asia, see Benny et al. (2016b; classification), cultures and sequences are unavailable.

Umbelopsis Amos & H.L. Barnett 1966, *Umbelopsidaceae*, *Umbelopsis*, *Umbelopsidomycetes*, *Mucoromycota*, 16 species, type: *T. versiformis* Amos & H.L. Barnett, saprobes, in soil, worldwide, see Meeuwse et al. (2011; lipid accumulation), Ogawa et al. (2011; polyphyly), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Wang et al. (2013c, 2015; new species, taxonomy), Takeda et al. (2014; genome sequence), Benny et al. (2016b; classification), Janicki et al. (2016; endocrine disruptors' degradation), Crous et al. (2017; new species), cultures and sequences are available, genome available: *U. isabellina* NBRC 7784 [24578268] and B7317 (Chibucos et al. 2016) available at NCBI genomes, *U. isabellina* AD026 unpublished genome at JGI portal (Grigoriev et al. 2014), *U. ramanniana* AG unpublished genome at JGI portal (Grigoriev et al. 2014), *Umbelopsis* sp. nov. AD052 unpublished genome at JGI portal (Grigoriev et al. 2014).

Utharomyces Boedijn ex P.M. Kirk & Benny 1980, *Pilobolaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species and one sub-species, type: *U. epallocaulus* Boedijn ex P.M. Kirk & Benny, saprobes, coprophilous, cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Zychaea Benny & R.K. Benj. 1975, *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, type: *Z. mexicana* Benny & R.K. Benj., coprophilous, ?human pathogens, South America, see Xess et al. (2012; phylogeny, represent *Thamnostylum* spp.), Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), *Z. mexicana* RSA 1403 unpublished genome at JGI portal (Grigoriev et al. 2014).

Neocallimastigomycota M.J. Powell

Hibbett et al. (2007) introduced *Neocallimastigomycota*, with *Neocallimastix* Vávra & Joyon ex I.B. Heath as the type genus. The phylum comprises anaerobic taxa (including gut fungi, coprophilous taxa) and the phylum was accepted in several subsequent studies since Hibbett et al.

(2007), (Griffith et al. 2010; Liggenstoffer et al. 2010; Gruninger et al. 2014).

We accept one class, one order, three families and ten genera in *Neocallimastigomycota*.

Notes for genera

Anaeromyces Breton, Bernalier, Dusser, Fonty, B. Gaillard & J. Guillot 1990, *Anaeromycetaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, four species, type: *A. mucronatus* Breton, Bernalier, Dusser, Fonty, B. Gaillard & J. Guillot, inside animal colon, in dung, cosmopolitan, see Kirk et al. (2013; new species, genus accepted), Doweld (2014a; introduced *Anaeromycetaceae*), Li et al. (2016; new species), cultures and sequences are available, ITS of the type culture NR_111156.1.

Buwchfawromyces T.M. Callaghan & G.W. Griff. 2015, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, one species, type: *B. eastonii* T.M. Callaghan & G.W. Griff., from buffalo dung, anaerobic, terrestrial, Europe, see Callaghan et al. (2015; taxonomy), Wang et al. (2017a, b, c, d, e; phylogeny), cultures and sequences are available, ITS of the type culture NR_132002.

Caecomyces J.J. Gold 1988, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, five species, type: *C. f equi* J.J. Gold, in caecum animals, cosmopolitan, see Kirk (2012; new species), Kirk et al. (2013; genus accepted), Henske et al. (2018; new species), Li et al. (2016; new species), cultures and sequences are available.

Cyllamyces Ozkose, B.J. Thomas, D.R. Davies, G.W. Griff. & Theodorou 2001, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, one species, type: *C. aberensis* Ozkose, B.J. Thomas, D.R. Davies, G.W. Griff. & Theodorou, from cow faeces, UK, see Sridhar et al. (2014; new species), cultures and sequences are available.

Neocallimastix Vávra & Joyon ex I.B. Heath 1983, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, seven species, type: *N. frontalis* (R.A. Braune) Vávra & Joyon ex I.B. Heath, coprophilous, in rumen of cattle, sheep, worldwide, see Kirk et al. (2013; genus accepted), Ariyawansa et al. (2015; new species), Li et al. (2016; new species), cultures and sequences are available.

Oontomyces Dagar, Puniya & G.W. Griff. 2015, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, one species, type: *O. anksri* Dagar, Puniya & G.W. Griff., in rumen of camel, Asia, see Dagar et al. (2015; taxonomy), cultures and sequences are available, ITS of the type: NR_132022.

Orpinomyces D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng 1989, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, two species, type: *O. bovis* D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng, in digestive tract of Holstein, Canada, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Pecoramyces Hanafy, N.H. Youssef, G.W. Griff. & Elshahed 2017, *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, one species, type: *P. ruminantium* Hanafy, N.H. Youssef, G.W. Griff. & Elshahed, USA, see Hanafy et al. (2017; taxonomy), cultures and sequences are available, ITS of the type: NR_152323.

Piromyces J.J. Gold, I.B. Heath & Bauchop 1988 (= *Piromonas* E. Liebet. 1910), *Neocallimastigaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, six species, type: *P. communis* J.J. Gold, I.B. Heath & Bauchop, worldwide, see Kirk (2012; new species), Kirk et al. (2013; genus accepted), Ariyawansa et al. (2015; new species), Li et al. (2016; DNA), cultures and sequences are available.

Sphaeromonas E. Liebet. 1910, *Sphaeromonadaceae*, *Neocallimastigales*, *Neocallimastigomycetes*, *Neocallimastigomycota*, four species, type: *S. communis* E. Liebet., stomach of ruminant, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Olpidiomycota Doweld

Doweld (2013c) introduced *Olpidiomycota* to accommodate *Olpidiales* which was accepted in *Chytridiomycetes* (Kirk et al. 2008). The members of *Olpidiomycota* showed broad range of life modes as saprobes and parasites (in algae, aquatic fungi, rotifers *fide* Kirk et al. 2008).

We accept one class, one order, one family and four genera in *Olpidiomycota*.

Notes for genera

Chytridhaema Moniez 1887, *Olpidiaceae*, *Olpidiales*, *Olpidiomycetes*, *Olpidiomycota*, one species, type: *C. cladocerarum* Moniez, saprobes, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Cibdelia Juel 1925, *Olpidiaceae*, *Olpidiales*, *Olpidiomycetes*, *Olpidiomycota*, one species, type: *C. infestans* Juel, Europe, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Leiolpidium Doweld 2014, *Olpidiaceae*, *Olpidiales*, *Olpidiomycetes*, *Olpidiomycota*, five species, type: *L. cucurbitacearum* (D.J.S. Barr & Dias) Doweld, intracellular parasites of roots, cosmopolitan, see Doweld (2014j; nomenclature), cultures and sequences are unavailable.

Olpidium (A. Braun) J. Schröt. 1886, *Olpidiaceae*, *Olpidiales*, *Olpidiomycetes*, *Olpidiomycota*, c. 50 species, type: *O. endogenum* (A. Br.) Schroet., parasitic,

cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are available.

Rozellomycota Doweld

Doweld (2013d) introduced *Rozellomycota* which mostly comprises aquatic parasites. Tedersoo et al. (2016) accepted *Microsporidea* Corliss & Levine as a class in *Rozellomycota.* However, the classification of *Rozellomycota* is still poorly known thus, we follow Catalogue of Life (2018) (http://www.catalogueoflife.org).

Notes for genera

Abelspora Azevedo 1987, *Abelsporidae, Glugeida, Microsporidea*, *Rozellomycota*, one species, type: *A. portucalensis* C. Azevedo, parasites of crabs, aquatic, South America, see Azevedo (1987a, b; generic description), Sprague et al. (1992; taxonomic review), sequences are unavailable.

Acarispora Radek and Alberti 2015, *Chytridiopsidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *I. acarivora* Larsson, M.Y. Steiner & Bjørnson, parasites of mites, Europe, see Radek et al. (2015; taxonomy), sequences are unavailable.

Aedispora Kilochitskii 1997, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota* one species, type: *A. dorsalis* Kilochitskii, parasites of mosquitoes, aquatic, Europe, see Kilochitskii (1997; taxonomy), Andreadis (2007; reported on mosquito larva), sequences are unavailable.

Agglomerata Larsson & Yan 1988, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*,five species, type: *A. sidae* (Jírovec) Larsson & Yan, parasites of crustaceans, aquatic, worldwide, see Larsson and Yan (1988; taxonomy), Larsson et al. (1996a, b; new species), Larsson and Voronin (2000; new species), Bronnvall (2001; microscopic cytology), Ovcharenko and Wita (2001; new species), Sokolova et al. (2016; *Agglomerata cladocera* from Siberian microcrustaceans, phylogeny), sequences are available.

Agmasoma Hazard & Oldacre 1975, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, three species, type: *A. penaei* (Sprague) Hazard & Oldacre, parasites of shrimps, aquatic, North America, see Laisutisan et al. (2009; ultrastructure), Sokolova et al. (2015; phylogeny), sequences are available.

Alfvenia Larsson 1983, *Microsporidea* genera incertae sedis, *Rozellomycota*, four species, type: *A. nuda* Larsson, parasites of crustaceans, aquatic, Eurasia, see Sokolova et al. (2016; new species), sequences are available.

Alloglugea Paperna & Lainson 1995, *Glugeidae*, *Glugeida*, *Haplophasea*, *Rozellomycota*, one species, type: *A. bufonis* Paperna & Lainson, parasites of fishes and amphibia, aquatic, worldwide, see Paperna and Lainson (1995a, b; taxonomy), Lom and Dyková (2005; on fishes), sequences are unavailable.

Amazonspora Azevedo & Matos 2003, *Glugeidae*, *Glugeida*, *Microsporidea, Rozellomycota*, one species, type: *A. portucalensis* C. Azevedo, parasites of fishes, aquatic, South America, Azevedo (2003a, b; taxonomy), sequences are unavailable.

Amblyospora Hazard & Oldacre 1975, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, c. 90 species, type: *A. californica* (Kellen & Lipa) Hazard & Oldacre, parasites of mosquitoes, aquatic, worldwide, see Andreadis et al. (2012; taxonomy), Simakova (2014; phylogeny), sequences are available.

Ameson Sprague 1977, *Pereziidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, five species, type: *A. michaelis* (Sprague) Sprague, parasites of crustaceans, aquatic, worldwide, Wang et al. (2017d; new species), sequences are available.

Amphiacantha Caullery & Mesnil 1914, *Amphiacanthidae*, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, two species, type: *A. longa* Caullery & Mesnil, parasites of gregarines, aquatic, Europe, see Larsson (2014a, b; notes), Paskerova et al. (2016; notes), sequences are available for unidentified species.

Amphiamblys Caullery & Mesnil 1914, *Amphiacanthidae*, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, two species, type: *A. capitellides* (Caullery & Mesnil) Caullery & Mesnil, parasites of gregarines, aquatic, Europe, see Larsson (2014a, b; notes), Mikhailov et al. (2016; genomic study), sequences are available for unidentified species.

Andreanna Simakova, Vossbrinck & Andreadis 2008, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *A. caspii* Simakova, C.R. Vossbrinck & Andreadis, parasites of mosquitoes, aquatic, Asia, see Simakova et al. (2008; taxonomy), sequences are available.

Anisofilariata Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova, Ignatieva & Issi 2010, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *A. chironomi* Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova, Ignatieva & Issi, parasites of chironomids, aquatic, Europe, see Tokarev et al. (2010a, b, taxonomy), sequences are available.

Anncaliia Issi, Krylova & V.M. Nikolaeva 1993, *Tubulinosematidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, six species, type: *A. meligethi* (Issi & Radishcheva) Issi, Krylova & V.M. Nikolaeva, parasites of insects and humans, worldwide, see Cali et al. (2010; human infection of *A. algerae*), Monaghan et al. (2011; in-vitro growth of *A. algerae*), Panek et al. (2014; *A. algerae* as a parasite), Watts et al. (2014; *A. algerae* microsporidial myositis), sequences are available.

Anostracospora Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand 2013, *Mrazekiidae*, *Dissociodihaplophasida*,

Microsporidea, *Rozellomycota*, one species, type: *A. rigaudi* N Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand, parasites of shrimps, aquatic, Europe, see Rode et al. (2013; taxonomy), sequences are available.

Antonospora Fries, Paxton, Tengo, Slemenda, da Silva, & Pieniazek 1999, *Ovavesiculidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* two species, type: *A. scoticae* Fries, Paxton, Tengo, Slemenda, da Silva, & Pieniazek, parasites of insects, worldwide, see Sokolova et al. (2010a, b; new species), sequences are available.

Areospora Stentiford, Bateman, Feist, Oyarzún, Uribe, Palacios & Stone 2014, *Areosporiidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, one species, type: *A. rohanae* Stentiford, Bateman, Feist, Oyarzún, Uribe, Palacios & Stone, parasites of king crabs, aquatic, South America, see Stentiford et al. (2014; taxonomy), Simakova et al. (2011; identification), sequences are available.

Auraspora Weiser & K. Purrini 1980, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *A. canningae* Weiser & K. Purrini, parasites of springtails, Europe, see Weiser and Purrini (1980; taxonomy), sequences are unavailable.

Bacillidium Janda 1928, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, five species, type: *B. criodrili* Janda, parasites of invertebrates, aquatic, worldwide, see Nielsen (1999) sequences are available.

Baculea Loubès & Akbarieh 1978, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *B. daphniae* Loubès & Akbarieh, parasites of cladocerans, aquatic, Europe, see Loubès and Akbarieh (1978; taxonomy), sequences are unavailable.

Becnelia Tonka & Weiser 2000, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. sigarae* Tonka & Weiser, parasites of bugs, aquatic, Europe, see Tonka and Weiser (2000; taxonomy), sequences are unavailable.

Berwaldia Larsson 1981, *Berwaldiiae, Microsporidea* families incertae sedis, *Rozellomycota*, four species, type: *B. singularis* Larsson, parasites of crustaceans, worldwide, see Larsson (1981; taxonomy), Vávra et al. (2017; new species, biology), Simakova et al. (2018a, b: new species, taxonomy), sequences are available.

Binucleata Refardt, Decaestecker, Johnson & Vávra 2008, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. daphniae* Decaestecker, Johnson & Vávra, parasites of daphniids, aquatic, Europe, see Refardt et al. (2008; taxonomy), sequences are available.

Binucleospora A.M. Bronnvall & Larsson 1995, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. elongata* A.M. Bronnvall & Larsson, parasites of ostracods, aquatic, Europe, see Stentiford et al. (2013; emergent pathogens in aquatic systems), sequences are unavailable.

Bohuslavia Larsson 1985, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. asterias* (Weiser) Larsson, parasites of chironomids, aquatic, Europe, see Larsson (1985; taxonomy), sequences are unavailable.

Bryonosema Canning, Refardt, Vossbrinck, Okamura & Curry 2002, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, *Rozellomycota*, two species, type: *B. plumatellae* Canning, Refardt, Vossbrinck, Okamura & Curry, parasites of bryozoans, aquatic, Europe, see Canning et al. (2002a, b, 2004; taxonomy, correction of the type species), sequences are available.

Burenella Jouvenaz & Hazard 1978, *Burenellidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. dimorpha* Jouvenaz & Hazard, parasites of ants, North America, see Jouvenaz and Hazard (1978; taxonomy), sequences are unavailable.

Burkea Sprague 1977, *Burkeidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, two species, type: *B. gatesi* (de Puytorac & Tourret) Sprague, parasites of oligochaetes, aquatic, worldwide, see Sprague (1977a, b: taxonomy), sequences are unavailable.

Buxtehudea Larsson 1980, *Buxtehudiidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *B. scaniae* Larsson, parasites of bristletails, Europe, see Larsson (1980, 2014a, b; taxonomy, notes), sequences are unavailable.

Campanulospora Issi, Radishcheva & Dolzhenko 1983, *Microsporidea* genera *incertae sedis, Rozellomycota*, one species, type: *C. denticulata* Issi, Radishcheva & Dolzhenko, parasites of flies, Europe, see Issi et al. (1983; taxonomy), Sokolova et al. (2018; Microsporidia described in the Former Soviet Union and Russia in twentieth century), sequences are unavailable.

Canningia Weiser Wegensteiner & Žižka 1995, *Unikaryonidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, two species, type: *C. spinidentis* Weiser, Wegensteiner & Žižka, parasites of beetles, Europe, see Weiser et al. (1995; taxonomy), sequences are unavailable.

Caudospora Weiser 1946, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. simulii* Weiser, parasites of blackflies, see Vossbrinck and Debrunner-Vossbrinck (2005: phylogeny), sequences are available.

Caulleryetta Dogiel 1922, *Microsporidea* genera *incertae sedis, Rozellomycota*, one species, type: *C. mesnili* Dogiel, parasites of gregarines, aquatic, Europe, sequences are unavailable.

Chapmanium Hazard & Oldacre 1975, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, four species, type: *C. cirritus* Hazard & Oldacre, parasites of

phantom midges, aquatic, North America, see Hazard and Oldacre (1975; taxonomy), sequences are unavailable.

Chytridioides Tregouboff 1913, *Microsporidea* genera *incertae sedis, Rozellomycota*, one species, type: *C. schizophylli* Tregouboff, parasites of millipedes, Europe, sequences are unavailable.

Chytridiopsis Schneider 1884, *Chytridiopsidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, eleven species, type: *C. socia* Schneider, parasites of insects, Europe, see Burjanadze and Goginashvili (2009; infections on *Ips typographus*), Takov and Pilarska (2009; infections on *Ips typographus*), Tonka et al. (2010; development of *C. typographi*), Larsson (2014a, b; taxonomy, notes), sequences are unavailable.

Ciliatosporidium Foissner & Foissner 1995, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *C. platyophryae* I. Foissner & W. Foissner, parasites of ciliates, aquatic, North America, see Foissner and Foissner (1995; taxonomy), sequences are unavailable.

Coccospora Kudo 1925, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. micrococcus* (Léger & Hesse) Kudo, parasites of chironomids, aquatic, Europe, sequences are unavailable.

Cougourdella Hesse 1935, *Cougourdellidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, seven species, type: *C. magna* Hesse, parasites of daphniids, aquatic, worldwide, see Heilveil et al. (2001; life cycle and transmission), Hyliš et al. (2007; phylogeny), sequences are available.

Crepidulospora Simakova, Pankova & Issi 2004, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. beklemishevi* (Simakova, Pankova & Issi) Simakova, Pankova & Issi, parasites of mosquitoes, aquatic, Asia, see Simakova et al. (2004; taxonomy), sequences are unavailable.

Crispospora Tokarev, Voronin, Seliverstova, Pavlova & Issi 2010, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *C chironomi* Tokarev, Voronin, Seliverstova, Pavlova & Issi, parasites of chironomids, aquatic, Europe, see Tokarev et al. (2010a, b, taxonomy), sequences are available.

Cryptosporina Hazard & Oldacre 1975, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *C. brachyfila* Hazard & Oldacre, parasites of spiders, North America, sequences are unavailable.

Cristulospora Khodzhaeva & Issi 1989, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, three species, type: *C. sherbani* Khodzhaeva & Issi, parasites of blackflies, Asia, see Khodzhaeva & Issi (1989; taxonomy), sequences are unavailable.

Cucumispora Ovcharenko, Bacela, Wilkinson, Ironside, Rigaud & Wattier 2010, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *C. dikerogammari* (Ovcharenko & Kurandina) Ovcharenko, Bacela, Wilkinson, Ironside, Rigaud & Wattier, parasites of crustaceans, aquatic, Europe, see Ovcharenko et al. (2010; taxonomy), Bojko et al. (2015; new species), sequences are available.

Culicospora Weiser 1977, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *C. magna* (Kudo) Weiser, parasites of mosquitoes, worldwide, see Simakova (2014; comparison with other mosquito parasitic *Microsporidea*), sequences are available.

Culicosporella Weiser 1977, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. lunata* (Hazard & Savage) Hazard & Savage, parasites of insects, Europe, sequences are available.

Cylindrospora Issi & Voronin 1986, *Cylindrosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *C. chironomi* Issi & Voronin, parasites of insects, aquatic, Europe, see Sokolova et al. (2018; Microsporidia from USSR in twentieth Century), sequences are unavailable.

Cystosporogenes Canning, Barker, Nicholas & Page 1984, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, four species, type: *C. operophterae* (Canning) Canning, Barker, Nicholas & Page, parasites of insects, worldwide, sequences are unavailable.

Dasyatispora Diamant, Goren, Yokeş, Galil, Klopman, Huchon, Szitenberg & Karhan, 2010, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *D. levantinae* Diamant, Goren, Yokes, Galil, Klopman, Huchon, Szitenberg & Karhan, parasites of stringrays, aquatic, Europe, see Diamant et al. (2010: taxonomy), sequences are available.

Desmozoon Freeman & Sommerville 2009, *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *D. lepeophtherii* Freeman & Sommerville, parasites of sea lice, Europe, see Freeman and Sommerville (2009, 2011; taxonomy), Matthews et al. (2013; pathology), Tokarev et al. (2016: synonymy with Paranucleospora), Gunnarsson et al. (2017; pathology), Weli et al. (2017; pathology), sequences are available.

Desportesia Issi & Voronin 1986, *Metchnikovellidae*, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, one species, type: *D. laubieri* (Desportes & Théodorides) Issi & Voronin, parasites of gregarines, aquatic, Europe, sequences are unavailable.

Dictyocoela Terry, Smith, Sharpe, Rigaud, Littlewood, Ironside, Rollinson, Bouchon, MacNeil, Dick & Dunn 2004, *Unikaryonidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, eight species, type: need typification, parasites of gammarids, aquatic, worldwide, see Wilkinson et al. (2011; genetic diversity), Winters and Faisal (2014; new species), sequences are available.

Dimeiospora Simakova, Pankova & Issi 2003, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. palustris* Simakova, Pankova & Issi, parasites of mosquitoes, aquatic, Asia, see Simakova et al. (2003; taxonomy), sequences are unavailable.

Duboscqia Pérez 1908, *Duboscqiidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, eleven species, type: *D. legeri* Pérez, parasites of arthropods, Europe, sequences are unavailable.

Edhazardia Becnel, Sprague & Fukuda 1989, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *E. aedis* (Kudo) Becnel, Sprague & Fukuda, parasites of mosquitoes, aquatic, worldwide, see Becnel et al. (1989; taxonomy), Williams et al. (2008; genome sequencing), sequences are available.

Encephalitozoon Levaditi, Nicolau & Schoen 1923, *Encephalitozoonidae, Glugeida, Microsporidea, Rozellomycota,* twelve species, type: *E. cuniculi* Levaditi, Nicolau & Schoen, parasites of insects and vertebrates, worldwide, see Levaditi et al. (1923; generic description), Wilson (1979; review), Sprague et al. (1992; taxonomic review), Vossbrinck et al. (1993; phylogeny), Didier et al. (1995; identification), Moss et al. (1999; flow cytometry), Vivarès and Méténier (2000; review on genome), Vivarès and Méténier (2001; review), Akerstedt (2002; ELISA-based detection), Wolk et al. (2002; Real-time PCR), Hoffman et al. (2003; populations of *E. intestinalis*), Menotti et al. (2003; real-time PCR assay), Valencáková et al. (2005; diagnosis), Furuya (2009; review), Corradi et al. (2010; whole genome), Valencakova et al. (2012; molecular identification), Němejc et al. (2013; diversity), Tsukada et al. (2013; parasitology), Myšková et al. (2014; in archaeological material), sequences are available.

Endoreticulatus Brooks, Becnel & Kennedy 1988, *Microsporidea* genera *incertae sedis, Rozellomycota,* five species, type: *E. fidelis* (Hostounský & Weiser) Brooks, Becnel & Kennedy, parasites of insects, worldwide, see Brooks et al. (1988; generic description), Sprague et al. (1992; taxonomic revision), Dong et al. (2010a, b; phylogeny), Xu et al. (2012; phylogeny), Pilarska et al. (2015; taxonomic review), sequences are available.

Enterocytozoon Desportes, Le Charpentier, Galian, Bernard, Cochand-Priollet, Lavergne, Ravisse & Modigliani 1985, *Enterocytozoonidae*, *Chytridiopsidae*, *Microsporidea*, *Rozellomycota*, two species, type: *E. bieneusi* Desportes, Le Charpentier, Galian, Bernard, Cochand-Priollet, Lavergne, Ravisse & Modigliani, parasites of shrimps, mammals and humans, worldwide, see Fayer et al. (2007: in mature dairy cattle), Thellier and Breton (2008: laboratory identification and molecular epidemiology), Lanternier et al. (2009: Microsporidiosis in solid organ transplant recipients), Tourtip et al. (2009: new species), Santín and Fayer (2011: microsporidiosis in domesticated and wild animals), Biju et al. (2016: high prevalence in shrimps), Leśniańska and Perec-Matysiak (2017: environmental reservoir), Wang et al. (2018: prevalence and genotypes in China), sequences are available.

Enterocytospora Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota,* one species, type: *E. artemiae* Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand, parasites of shrimps, aquatic, Europe, see Rode et al. (2013; taxonomy), sequences are available.

Enterospora Stentiford, Bateman, Longshaw & Feist 2007, *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, two species, type: *E. canceri* Stentiford, Bateman, Longshaw & Feist, parasites of crabs, aquatic, Europe, see Stentiford et al. (2017; taxonomy), Palenzuela et al. (2014; new species), sequences are available.

Episeptum Larsson 1986, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, six species, type: *E. inversum* Larsson, parasites of caddisflies, aquatic, Europe, see Larsson (1986a, b; taxonomy), Hyliš et al. (2007; phylogeny), sequences are available.

Euplotespora Fokin, Di Giuseppe, Erra & Dini 2008, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *E. binucleata* Fokin, Di Giuseppe, Erra & Dini, parasites of ciliates, aquatic, Europe, see Fokin et al. (2008; taxonomy), sequences are available.

Evlachovaia Voronin 1986, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *E. chironomi* Voronin & Issi, parasites of chironomids, aquatic, Europe, see Sokolova et al. (2018; Microsporidia described from USSR in twentieth century), sequences are unavailable.

Facilispora Jones, Prosperi-Porta & Kim 2012, *Facilisporidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, one species, type: *F. margolisi* Prosperi-Porta & Kim, parasites of sea lice, worldwide, see Jones et al. (2012a, b; taxonomy), Poley et al. (2017; biology, reported as parasites of pacific salmon louse), sequences are available.

Fibrillanosema Slothouber Galbreath, Smith, Terry, Becnel, & Dunn 2004, *Berwaldiiae, Microsporidea* families incertae sedis, *Rozellomycota*, two species, type: *F. crangonycis* Slothouber Galbreath, Smith, Terry, Becnel, & Dunn, parasites of crustaceans, Europe, see Slothouber Galbreath et al. (2004; taxonomy), Simakova et al. (2018a; phylogeny), sequences are available.

Flabelliforma Canning, Killick-Kendrick & Killick-Kendrick 1991, *Caudosporidae, Dissociodihaplophasida*, *Microsporidea, Rozellomycota*, four species, type: *F. montana* Canning, Killick-Kendrick & Killick-Kendrick, parasites

of sand flies, aquatic, Europe, see Canning et al. (1991; taxonomy), sequences are available.

Geusia Rühl & Korn 1979, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *G. gamocystis* Rühl & Korn, parasites of mayflies, aquatic, Europe, sequences are unavailable.

Globulispora Vávra, Hylis, Viala, Nebesarova 2016, *Microsporidea* genera *incertae sedis, Rozellomycota,* one species, type: *G. mitoportans* Vávra, Hylis, Viala, Nebesarova, parasites of daphniids, aquatic, Europe, see Vavra et al. (2016: taxonomy), sequences are available.

Glugea Thélohan 1891, *Glugeidae*, *Glugeida*, *Microsporidea, Rozellomycota,* 40 species, type: *G. microspora* Thélohan, parasites of fishes, aquatic, worldwide, see Thélohan (1891; generic description), Voronin (1976; type description), Sprague et al. (1992; taxonomic revision), Lovy et al. (2009; new species, phylogeny), Su et al. (2014; new species, phylogeny), Abdel-Baki et al. (2015; new species, phylogeny), Azevedo et al. (2016; new species, phylogeny), sequences are available.

Glugoides (Chatton) Larsson, Ebert, Vávra & Voronin 1996, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *G. intestinalis* (Chatton) Larsson, Ebert, Vávra & Voronin, parasites of daphniids, Europe, see Larsson et al. (1996a, b; generic description), Refardt et al. (2002; phylogeny), Refardt and Ebert (2006; quantitative PCR), Refardt and Mouton (2007; phylogeny), sequences are available.

Golbergia Weiser 1977, *Golbergiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *G. spinosa* (Golberg) Weiser, parasites of insects, aquatic, Europe, sequences are unavailable.

Gurleya Doflein 1898, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, c. 10 species, type: G. tetraspora Doflein, 1898, parasites of trematodes, water mites and insects, aquatic, worldwide, see Refardt et al. (2002: phylogeny), Sokolova et al. (2018: Microsporidia described in the Former Soviet Union and Russia in 20th century), sequences are available.

Gurleyides Voronin 1986, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *G. biformis* Voronin, parasites of crustaceans, aquatic, Europe, see Voronin (1986a, b; taxonomy), Sokolova et al. (2018; Microsporidia described from USSR in twentieth century), sequences are unavailable.

Hamiltosporidium Haag, Larsson, Refardt, and Ebert, 2011, *Microsporidea* genera *incertae sedis*, *Rozellomycota,* two species, type: *H. tvaerminnensis* Haag, Larsson, Refardt, and Ebert, 2011. Parasites of daphniids, see Haag et al. (2011: taxonomy), sequences are available.

Hazardia Weiser 1977, *Microsporidea* genera incertae sedis, *Rozellomycota*, two species, type: *H. milleri* (Hazard & Fukuda) Weiser, parasites of mosquitoes, aquatic, worldwide, see Simakova (2014; comparison with other mosquito parasitic *Microsporidea*), sequences are available.

Helmichia Larsson 1982, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, five species, type: *H. aggregata* Larsson, parasites of dipterans, aquatic, worldwide, see Tokarev et al. (2012; phylogeny of *H. lacustris*), sequences are available.

Hepatospora Stentiford, Bateman, Dubuffet, Chambers & Stone 2011, *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *H. eriocheir* (Wang & Chen) Stentiford, Bateman, Dubuffet, Chambers & Stone, parasites of crabs, aquatic, Asia, see Stentiford et al. (2011; taxonomy), Bateman et al. (2016; phylogeny), Ding et al. (2017, 2018; PCR assays for the detection, metabolic consequences), sequences are available.

Hessea Ormières & Sprague 1973, *Hesseidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *H. squamosa* Ormières & Sprague, parasites of gnats, France, sequences are unavailable.

Heterosporis Schubert 1969, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, four species, type: *H. finki* Schubert., parasites of fishes, aquatic, worldwide, see Al-Quraishy et al. (2012; new species), Phelps et al. (2015; new species), Saleh et al. (2016a, b; in-vitro studies on antimicrosporidial activity of gold nanoparticles against *H. saurida*, in-vitro gene slicing), sequences are available.

Heterovesicula Lange, Macvean, Henry & Streett 1995, *Heterovesiculidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, one species, type: *H. cowani* Lange, Macvean, Henry & Streett, parasites of Mormon crickets, *Anabrus simplex*, North America, see Lange et al. (1995; taxonomy), Sokolova et al. (2008; phylogeny), sequences are available.

Hirsutosporos Batson 1983, *Microsporidea* genera incertae sedis, *Rozellomycota*, one species, type: *H. austrosimulii* Batson, parasites of blackflies, Australasia, see Batson (1983; taxonomy), sequences are unavailable.

Holobispora Voronin 1986, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *H. thermocyclopis* Voronin, parasites of cyclops, aquatic, Europe, see Voronin (1986a, b; taxonomy), Sokolova et al. (2018; Microsporidia described from USSR in twentieth century), sequences are unavailable.

Hrabyeia Lom & Dyková 1990, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *H. xerkophora* Lom & Dyková, parasites of oligochaetes, aquatic, Europe, see Stentiford et al. (2013; pathogens in aquatic systems), sequences are available.

Hyalinocysta Hazard & Oldacre 1975, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *C. chapmani* Hazard & Oldacre, parasites of

mosquitoes, aquatic, North America, see Hazard and Oldacre (1975; taxonomy), sequences are available.

Hyperspora Stentiford, Ramilo, Abollo, Kerr, Bateman, Feist, Bass & Villalba 2017, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *H. aquatica* Stentiford, Ramilo, Abollo, Kerr, Bateman, Feist, Bass & Villalba, parasites of paramyxids, aquatic, Europe, see Stentiford et al. (2017; taxonomy), sequences are available.

Ichthyosporidium Caullery & Mesnil 1905, *Glugeidae, Glugeida, Microsporidea, Rozellomycota,* five species, type: *I. giganteum* (Thélohan) Swarczewsky, parasites of fishes, aquatic, worldwide, see Verma (2008; diagnosis, treatment), Sanders et al. (2012; new species), sequences are available.

Inodosporus Overstreet & Weidner 1974, *Spragueidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* two species, type: *C. spraguei* Overstreet & Weidner, parasites of crustaceans, aquatic, worldwide, see Overstreet and Weidner (1974; taxonomy), Stentiford et al. (2018; trophic transfer, synonymy with *Kabatana*), sequences are available.

Intexta Larsson, Steiner & Bjørnson 1997, *Chytridiopsidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *I. acarivora* Larsson, Steiner & Bjørnson, parasites of mites, Europe, see Larsson et al. (1997a, b; taxonomy), Larsson (2014a, b; taxonomy, notes), Radek et al. (2015; compare with *Acarispora*), sequences are unavailable.

Intrapredatorus Chen, Kuo & Wu 1998, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *I. barri* Chen, Kuo & Wu, parasites of mosquitoes, Asia, see Chen et al. (1998; taxonomy), sequences are available.

Issia Weiser 1977, *Microsporidea* genera *incertae sedis, Rozellomycota,* three species, type: *I. trichopterae* (Weiser) Weiser, parasites of caddisflies, aquatic, Europe, see Weiser (1977; taxonomy), Sokolova et al. (2018; Microsporidia described in the Former Soviet Union and Russia in twentieth century), sequences are unavailable.

Janacekia Larsson 1983, *Microsporidea* genera *incertae sedis, Rozellomycota*, six species, type: *J. debaisieuxi* (Jírovec) Larsson, parasites of insects, Europe, see Larsson (1983; taxonomy), sequences are available.

Jirovecia Weiser 1977, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, seven species, type: *J. caudata* (L. Léger & Hesse) Weiser, parasites of invertebrates, Europe, sequences are unavailable.

Jiroveciana Larsson 1981, *Buxtehudiidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *J. limnodrili* (Jírovec) Larsson, parasites of oligochaetes, Europe, sequences are unavailable.

Johenrea Lange, Becnel, Razafindratiana, Przybyszewski & Razafindrafara 1996, *Glugeidae, Glugeida, Microsporidea, Rozellomycota,* one species, type: *J. locustae* Lange, Becnel, Razafindratiana, Przybyszewski & Razafindrafara, parasites of locusts, Africa, see Lange et al. (1996; generic description), sequences are unavailable.

Kabatana Lom, Dyková & Tonguthai 2000, *Spragueidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* four species, type: *K. arthuri* Lom, Dyková & Tonguthai, parasites of fishes, aquatic, worldwide, sequences are available.

Kinorhynchospora Adrianov & Rybakov 1991, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *K. japonica* Adrianov & Rybakov, parasites of fishes, aquatic, Asia, see Adrianov and Rybakov (1991; taxonomy), sequences are unavailable.

Kneallhazia Y.Y. Sokolova & Fuxa 2008 *Tubulinosematidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, two species, type: *K. solenopsae* (J.D. Knell, G.E. Allen & Hazard) Y.Y. Sokolova & Fuxa, parasites of ants, North America, see Sokolova and Fuxa (2008; taxonomy), Oi et al. (2009; decapitating flies as vectors), Ascunce et al. (2010; molecular diversity), Valles et al. (2011; new species), sequences are available.

Krishtalia Kilochitskii 1997, *Golbergiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *K. pipiens* Kilochitskii, parasites of mosquitoes, aquatic, Europe, see Kilochitskii (1997; taxonomy), Andreadis (2007; as biological control agent of mosquitoes), sequences are unavailable.

Lanatospora Voronin 1986, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*,four species, type: *L. macrocyclopis* (Voronin) Voronin, parasites of crustaceans, aquatic, Europe, see Voronin (1986a, b; taxonomy), Vávra et al. (2016; new species), sequences are available.

Larssonia Vidtmann & Sokolova 1994, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, two species, type: *L. obtusa* (Moniez) Vidtmann & Sokolova, parasites of daphniids, aquatic, Europe, see Vidtmann and Sokolova (1994; taxonomy), sequences are available.

Larssoniella Weiser & David 1997, *Unikaryonidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, two species, type: *L. resinellae* Weiser & David, parasites of insects, Europe, see Weiser and David (1997; taxonomy), Lukášová and Holuša (2013; host specificity of *L. duplicati*), sequences are unavailable.

Liebermannia Sokolova, Lange & Fuxa 2006, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, three species, type: *L. patagonica* Sokolova, Lange & Fuxa, parasites of orthopterans, South America, see Sokolova et al. (2009; new species), sequences are available.

Loma Morrison & Sprague (1981), *Glugeidae, Glugeida, Microsporidea, Rozellomycota,* twelve species, type: *L.*

branchialis (Nemeczek) Morrison & Sprague, parasites of fishes, aquatic, worldwide, see Morrison and Sprague (1981; generic description), Sprague et al. (1992; taxonomic revision), Casal et al. (2009; new species), Brown et al. (2010; new species, phylogeny, species boundaries), sequences are available.

Mariona Stempell 1909, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *M. marionis* (Thélohan, 1895) Stempell, parasites of myxosporeans, aquatic, Europe, sequences are unavailable.

Marssoniella Lemmermann 1900, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *M. elegans* Lemmermann, parasites of cyclops, aquatic, Europe, see Dong et al. (2010a, b; phylogeny), González-Tortuero et al. (2016; compare with *Daphnia*), sequences are available.

Merocinta Pell & Canning 1993, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *M. davidii* Pell & Canning, parasites of mosquitoes, aquatic, Africa, see Pell and Canning (1993; taxonomy), sequences are unavailable.

Metchnikovella Caullery & Mesnil 1897, *Metchnikovellidae*, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, 21 species, type: *M. spionis* Caullery & Mesnil, parasites of gregarines, worldwide, see Sokolova et al. (2013, 2014; fine structure of *Metchnikovella incurvata*, new species), sequences are unavailable.

Microfilum Faye, Toguebaye & Bouix 1991, *Microfilidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *M. lutjani* Faye, Toguebaye & Bouix, parasites of fihes, aquatic, Europe, see Faye et al. (1991; taxonomy), sequences are unavailable.

Microgemma Ralphs & Matthews 1986, *Sprague idae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* six species, type: *M. hepaticus* Ralphs & Matthews, parasites of fishes, aquatic, worldwide, see Ralphs and Matthews (1986; generic description), Sprague et al. (1992; taxonomic review), Amigó et al. (1996; reassignment of the genus), Pomport-Castillon et al. (1997; ribotyping), Leiro et al. (1999; new combination, phylogeny), Cheney et al. (2000; phylogeny), Canning et al. (2005; new species), Mansour et al. (2005; new species), Casal et al. (2012; new species, phylogeny), sequences are available.

Microsporidiopsis Schereschewsky 1925, *Metchnikovellidae*, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, one species, type: *M. nereidis* Schereschewsky, parasites of gregarines, aquatic, Europe, sequences are unavailable.

Microsporidium Balbiani 1884, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, 118 species epithets are listed in Index Fungorum (2018), type: need typification, parasites of animals, worldwide, sequences are available.

Mitoplistophora Codreanu 1966, *Duboscqiidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *M. angularis* Codreanu, parasites of mayflies, aquatic, worldwide, sequences are unavailable.

Mitosporidium Haag, James, Pombert, Larsson, Schaer, Refardt & Ebert 2014, *Rozellomycota*, genera *incertae sedis*, one species, type: *M. daphniae* Haag, James, Pombert, Larsson, Schaer, Refardt & Ebert, parasites of daphniids, aquatic, Europe, see Haag et al. (2014; taxonomy), Corsaro et al. (2016; phylogeny), sequences are available.

Mockfordia Sokolova, Sokolov & Carlton 2010, *Encephalitozoonidae, Glugeida, Microsporidea, Rozellomycota,* one species, type: *M. xanthocaeciliae* Sokolova, Sokolov & Carlton, parasites of bark lice, North America, see Sokolova et al. (2010a, b; generic description), sequences are available.

Mrazekia Léger & Hesse 1916, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, 17 species, type: *M. argoisi* Léger and Hesse, parasites of crustaceans, aquatic, worldwide, see Issi et al. (2010; new species), sequences are available.

Multilamina Becnel, Scheffrahn, Vossbrinck & Bahder, 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *M.teevani* Becnel, Scheffrahn, Vossbrinck & Bahder, parasites of termites, South America, see Becnel et al. (2013: taxonomy), sequences are available.

Myospora Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck 2010, *Myosporidae, Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *M. metanephrops* Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck, parasites of lobsters, aquatic, Australasia, see Stentiford et al. (2010; taxonomy), sequences are available.

Myosporidium Baquero, Rubio, Moura, Pieniazek & Jordana 2005, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: Baquero, Rubio, Moura, Pieniazek & Jordana, parasite of fishes, aquatic, Africa, see Baquero et al. (2005; taxonomy), sequences are available.

Myrmecomorba Plowes, Becnel, LeBrun, Oi, Valles, Jones, & Gilbert 2015, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *M. nylanderiae* Plowes, Becnel, LeBrun, Oi, Valles, Jones, & Gilbert, parasites of ants, North America, see Plowes et al (2015: taxonomy), sequences are available.

Myxocystis Mrazek, 1897, *Microsporidea* genera incertae sedis, *Rozellomycota,* one species, type: *M. ciliata* Mrazek, 1897, parasites of oligochaetes, aquatic, Europe, sequences are unavailable.

Nadelspora Olson, Tiekotter & Reno 1994, *Pereziidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *N. canceri* Olson, Tiekotter & Reno, parasites of crabs, aquatic, North America, see Olson et al. (1994; taxonomy), sequences are available.

Napamichum Larsson 1990, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, three species,

type: *N. dispersum* (Larsson) Larsson, parasites of chironomids, aquatic, Europe, see Larsson (1990a; taxonomy), sequences are unavailable.

Nelliemelba Larsson 1983, *Tuzetiidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *L. boeckella* (Milner & J.A. Mayer) Larsson, parasites of copepods, aquatic, worldwide, see Larsson (1983; taxonomy), sequences are unavailable.

Nematocenator Sapir, Dillman, Connon, Grupe, Ingels, Mundo-Ocampo, Levin, Bladwin, Orphan & Sternberg 2014, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *N. marisprofundi* Sapir, Dillman, Connon, Grupe, Ingels, Mundo-Ocampo, Levin, Bladwin, Orphan & Sternberg, parasites of nematodes, aquatic, North America, see Sapir et al. (2014: taxonomy, ecology), sequences are available.

Nematocida Troemel, Félix, Whiteman, Barrière & Ausubel 2008, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *N. parisii* Troemel, Félix, Whiteman, Barrière & Ausubel, parasites of nematodes, Europe, see Haag et al. (2014; taxonomy), Corsaro et al. (2016; phylogeny), sequences are available.

Neoflabelliforma Morris & Freeman 2010, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species: type: *N. aurantiae* Morris & Freeman, parasites of myxosporeans and oligochaetes, aquatic, Europe, sequences are available.

Neonosemoides Faye & Toguebaye 1992, *Neonosemoididae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, four species, type: *N. tilapiae* (Sakiti & Bouix) Faye & Toguebaye, parasites of fishes, worldwide, see Faye et al. (1996; taxonomy), Reda (2010; reported from Egypt), sequences are unavailable.

Neoperezia Issi & Voronin 1979, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, two species, type: *N. chironomi* Issi & Voronin, parasites of chironomids, Europe, see Issi et al. (2012; taxonomy, synonymy with *Semenovaia*), sequences are available.

Nolleria Beard, Butler & Becnel 1990, *Chytridiopsidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *N. pulicis* C Beard, Butler & Becnel, parasites of fleas, North America, see Larsson (2014a, b; taxonomy, notes), Radek et al. (2015; compare with *Acarispora*), sequences are unavailable.

Norlevinea Vávra 1984, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *N. daphniae* (Weiser) Vávra, parasites of daphniids, aquatic, Europe, see Vávra (1984; taxonomy), Stentiford et al. (2013; pathogens in aquatic systems), sequences are unavailable.

Nosema Nägeli 1857, *Nosematidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, 20 species, type: *N. bombycis* Nägeli, parasites of insects, worldwide, see Iwano and Ishihara (1991: dimorphic development), Baker et al. (1994: relaltionships with *Vairimorpha*), Ni et al. (1995: new species), Kyei-Poku et al. (2008, 2012: molecular data and phylogeny), Kyei-Poku and Sokolova (2017: spore dimorphism), Tokarev et al. (2015: species redefinition), Hopper and Mills (2016: pathogenicity), Hajek et al. (2018: new species from bugs), Grushevaya et al. (2018: spore dimorphism), sequences are available.

Nosemoides Vinckier 1975, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, five species, type: *N. vivieri* (Vinckier, Devauchelle & Prensier) Vinckier, parasites of gregarines, aquatic, Europe, see Vinckier (1975; taxonomy), sequences are unavailable.

Novothelohania Andreadis, Simakova, Vossbrinck, Shepard & Yurchenko, 2012. *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *N. ovalae* Andreadis, Simakova, Vossbrinck, Shepard & Yurchenko, parasites of mosquitoes, aquatic, Asia, see Andreadis et al. (2012: taxonomy), sequences are available.

Nucleophaga Dangeard 1895, *Rozellomycota*, genera incertae sedis, two species, type: *N. amoebae*, parasites of amoebae, Europe, see Corsaro et al. (2014a: taxonomy; 2016: new species), Bass et al. (2018: taxonomy), sequences are available.

Nucleospora Hedrick, Groff & Baxa 1991, *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, three species, type: *N. salmonis* Hedrick, Groff & Baxa, parasites of fishes, worldwide, see Foltz et al. (2009; detection in in steelhead trout, *Oncorhynchus mykiss*), Sakai et al. (2009; in cutthroat trout (*Oncorhynchus clarki*) and rainbow trout (*Oncorhynchus mykiss*), Freeman and Kristmundsson (2013; infecting the Atlantic lumpfish (*Cyclopterus lumpus*), Freeman et al. (2013; new species), Alarcón et al. (2016; infection in farmed lumpfish, *Cyclopterus lumpus*), sequences are available.

Nudispora Larsson 1990, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *N. biformis* Larsson, parasites of dragonflies, Europe, see Larsson (1990b; taxonomy), sequences are unavailable.

Obruspora Diamant, Rothman, Goren, Galil, Yokes, Szitenberg & Huchon 2014. *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one species, type: *O. papernae* Diamant, Rothman, Goren, Galil, Yokes, Szitenberg & Huchon, parasites of fishes, aquatic, Europe, see Diamant et al. (2010: taxonomy), sequences are available.

Octosporea Flu 1911, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, 18 species, type: *O. muscaedomesticae* Flu, parasites of daphniids, aquatic, worldwide, see Roth et al. (2008; parasites of *Daphnia magna*), Corradi et al. (2009; genome study of *O. bayeri*), Vossbrinck et al. (2010; phylogeny), sequences are available.

Octotetraspora Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova 1990, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *O. paradoxa* Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova, parasites of blackflies, Asia, sequences are unavailable.

Oligosporidium Codreanu-Balcescu, Codreanu & Traciuc 1981, *Nosematidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *O. arachnicolum* (Codreanu-Bălcescu, Codreanu, & Traciuc) Codreanu-Bălcescu, Codreanu, and Traciuc, parasites of spiders and mites, worldwide, see Codreanu-Bălcescu et al. (1981; taxonomy), Becnel et al. (2002; parasites of mites), sequences are available.

Ordospora Larsson, Ebert & Vávra 1997, *Ordosporidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, two species, type: *O. colligata* Larsson, Ebert & Vávra, parasites of crustaceans, aquatic, worldwide, see Larsson et al. (1997a, b; taxonomy), Pombert et al. (2015; genome study), sequences are available.

Ormieresia Vivarès, Bouix & Manier 1977, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *O. carcini* Vivarès, Bouix & Manier, parasites of crabs, aquatic, Europe, see Vivarès et al. (1977; taxonomy), sequences are unavailable.

Orthosomella Canning, Wigley & Barker 1991, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, three species, type: *O. operophterae* (Canning) Canning, Wigley & Barker, parasites of insects, Europe, see Ovcharenko et al. (2013; new species), sequences are available.

Orthothelohania Codreanu & Codreanu-Balcescu 1974, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *O. octospora* (Henneguy) Codreanu & Codreanu-Balcescu, parasites of prawns, aquatic, Europe, see Codreanu et al. (1974), sequences are unavailable.

Ovavesicula Andreadis & Hanula 1987, *Ovavesiculidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* one species, type: *O. popilliae* Andreadis & Hanula, parasites of grubs, North America), see Andreadis and Hanula (1987; taxonomy), Sprague et al. (1992; taxonomic review), Vossbrinck and Andreadis (2007; phylogeny), sequences are available.

Ovipleistophora Pekkarinen, Lom & Nilsen 2002, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, two species, type: *O. mirandellae* (Vaney & Conte) Pekkarinen, Lom & Nilsen, parasites of fishes, Europe, see Pekkarinen et al. (2002; taxonomy), Phelps and Goodwin (2008; vertical transmission), sequences are available.

Pankovaia Simakova, Tokarev & Issi 2009, *Tuzetiidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. semitubulata* Simakova, Tokarev & Issi, parasites of mayflies, aquatic, Asia, see Simakova et al. (2009a, b; taxonomy), sequences are unavailable.

Paradoxium Stentiford, Ross, Kerr, Bass & Bateman 2015, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. irvingi* Stentiford, Ross, Kerr, Bass & Bateman, parasites of shrimps, aquatic, Europe, see Stentiford et al. (2015; taxonomy), sequences are available.

Paraepiseptum Hyliš, Oborník, Nebesářová & Vávra 2007, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, four species, type: *P. plectrocnemiae* Hyliš, Oborník, Nebesářová & Vávra, parasites of insects, aquatic, Europe, see Hyliš et al. (2007, 2013; taxonomy, host taxa), sequences are available.

Paramicrosporidium Corsaro, Walochnik, Venditti, Steinmann, Müller & Michel 2014, *Rozellomycota*, genera *incertae sedis*, two species, type: *P. saccamoebae* Corsaro, Walochnik, Venditti, Steinmann, Müller & Michel, parasites of amoebae, aquatic, Europe, see Corsaro et al. (2014b; taxonomy), Quandt et al. (2017; genome study), sequences are available.

Paranosema Sokolova, Dolgikh, Morzhina, Nassonova, Issi, Terry, Ironside, Smith & Vossbrinck 2003, *Ovavesiculidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* four species, type: *P. grylli* (Sokolova, Selezniov, Dolgikh & Issi) Sokolova, Dolgikh, Morzhina, Nassonova, Issi, Terry, Ironside, Smith & Vossbrinck, parasites of insects, worldwide, see Lange and Azzaro (2008; persistence), Shi et al. (2009; parasites of grasshoppers), Senderskiy et al. (2014; protein secretion in to host cells), Chen et al. (2017; novel wall protein), Pyle et al. (2017; Amalga-like virus), sequences are available.

Paranucleospora Nylund, Watanabe, Nylund, Sævareid, Erik Arnesen & Karlsbakk 2009, *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, three species, type: *N. theridion* Nylund, Watanabe, Nylund, Sævareid, Erik Arnesen & Karlsbakk, parasites of sea lice and fishes, aquatic, worldwide, see Nylund et al. (2010, 2011; taxonomy), Sveen et al. (2012; infection dynamics), sequences are available.

Parapleistophora *Issi*, Kadyrova, Pushkar, Khodzhaeva & Krylova 1990, *Glugeidae, Glugeida, Microsporidea, Rozellomycota,* one species, type: *P. ectospora* Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova, parasites of blackflies, Asia, see Issi et al. (1990; generic description), Sokolova et al. (2018; taxonomic revision), sequences are unavailable.

Parastempellia Khodzhaeva 1988, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *P. odagmiae* Khodzhaeva, parasites of blackflies, Asia, see Sokolova et al. (2018; taxonomy), sequences are unavailable.

Parathelohania Codreanu 1966, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, 25 species, type: *P. legeri* (Hesse) Codreanu, parasites of

mosquitoes, worldwide, see Codreanu (1966; taxonomy), Simakova et al. (2014, phylogeny), sequences are available.

Paratuzetia Poddubnaya, Tokarev & Issi 2006, *Tuzetiidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. kupermani* Poddubnaya, Tokarev & Issi, parasites of cestodes, aquatic, Europe, see Poddubnaya et al. (2006; taxonomy), sequences are unavailable.

Pegmatheca Hazard & Oldacre 1975, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *P. simulii* Hazard & Oldacre, parasites of blackflies, aquatic, North America, see Hazard and Oldacre (1975; taxonomy), sequences are unavailable.

Perezia Léger & Duboscq 1909, *Pereziidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, twelve species, type: *P. lankesteriae* L. Léger & Duboscq, parasites of gregarines and crustaceans, aquatic, worldwide, see Canning et al. (2002a, b: ultrastructure), Stentiford et al. (2010; taxonomy), sequences are available.

Pernicivesicula Bylén & Larsson 1994, *Pereziidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. gracilis* E.K.C. Bylén & Larsson, parasites of chironomids, aquatic, Europe, see Bylén and Larsson (1994; taxonomy), sequences are unavailable.

Pilosporella Hazard & Oldacre 1975, *Burenellidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *P. fishi* Hazard & Oldacre, parasites of insects, North America, see Hazard and Oldacre (1975; taxonomy), sequences are unavailable.

Pleistophora Gurley 1893, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, c. 10 species, type: *P. typicalis* Gurley, parasites of fishes, aquatic, worldwide, see Canning and Hazard (1982: genus redefinition), Sanders et al. (2010; infecting zebrafish), sequences are available.

Pleistosporidium Codreanu-Balcescu and Codreanu 1982, *Pleistosporidiidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, one species, type: *P. hyperparasiticum* (Codreanu-Balcescu and Codreanu) Codreanu-Balcescu and Codreanu, parasites of gregarines, aquatic, Europe, sequences are unavailable.

Polydispyrenia Canning & Hazard 1982, *Caudosporidae, Dissociodihaplophasida*, *Microsporidea, Rozellomycota*, two species, type: *P. simulii* (Lutz & Splendore) Canning & Hazard, parasites of blackflies, aquatic, worldwide, see Canning and Hazard (1982; taxonomy), Vossbrincnk et al. (2004: phylogeny), sequences are available.

Potaspora Casal, Matos, Teles-Grilo & Azevedo 2008, *Spragueidae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* two species, type: *P. morhaphis* Casal, Matos, Teles-Grilo & Azevedo, parasites of fishes, aquatic, South America, see Casal et al. (2008; taxonomy), Videira et al. (2015; new species), sequences are available.

Pseudoloma Matthews, Brown, Larison, Bishop-Stewart, Rogers & Kent 2001, *Glugeidae, Glugeida, Microsporidea, Rozellomycota,* one species, type: *P. neurophilia* Matthews, Brown, Larison, Bishop-Stewart, Rogers & Kent, parasites of fishes, aquatic, worldwide, see Matthews et al. (2001; generic description), Whipps and Kent (2006; PCR detection), Sander and Kent (2011; sensitive assay), Cali et al. (2012; taxonomic revision), Sanders et al. (2016; host range), Ndikumana et al. (2017; genome analysis), sequences are available.

Pseudonosema Canning, Refardt, Vossbrinck, Okamura & Curry 2002, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, one species, type: *P. cristatellae* (Canning, Okamura & Curry) Canning, Refardt, Vossbrinck, Okamura & Curry, parasites of bryozoans, Europe, see Canning et al. (2002a, b; taxonomy), sequences are available.

Pseudopleistophora Sprague 1977, *Pseudopleistophoridae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* one species, type: *P. szollozi* Sprague, parasites of polychaetes, aquatic, North America, see Sprague (1977a, b; taxonomy), Sprague et al. (1992; taxonomic review), sequences are unavailable.

Pulicispora Vedmed, Krylova & Issi 1991, *Duboscqiidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. xenopsyllae* Vedmed, Krylova & Issi, parasites of fleas, Eurasia, see Vedmed et al. (1991; taxonomy), sequences are unavailable.

Pyrotheca Hesse 1935, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, eight species, type: *P. cyclopis* (Leblanc) Poisson, parasites of cyclops, aquatic, Europe, see Hyliš et al. (2007; notes), sequences are unavailable.

Rectispora Larsson 1990, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *R. reticulata* Larsson, parasites of oligochaetes, aquatic, Europe, see Larsson et al. (1990c; taxonomy), sequences are unavailable.

Resiomeria Larsson 1986, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *R. odonatae* Larsson, parasites of dragonflies, aquatic, Europe, see Larsson (1986a, b; taxonomy), sequences are unavailable.

Ringueletium Garcia 1990, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *R. pillosa* Garcia, parasites of blackflies, aquatic, Europe, see Garcia (1990; taxonomy), sequences are unavailable.

Rozella Cornu 1872, *Rozellomycota*, genera incertae sedis, c. 20 species, type: *R. septigena* Cornu, parasites of fungi and green algae, aquatic, worldwide, see James et al. (2013: phylogeny), Letcher et al. (2017b, 2018: new

species), Powell et al. (2017: host-parasite interface), Bass et al. (2018: taxonomy), sequences are available.

Schroedera Morris & Adams 2002, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, two species, type: *S. plumatellae* Morris & Adams, parasites of bryozoans, aquatic, Europe, see Morris and Adams (2002; taxonomy), sequences are available.

Scipionospora Bylén & Larsson 1996, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *R. pillosa* Garcia, parasites of chironomids, aquatic, Europe, see Bylén and Larsson (1996; taxonomy), sequences are unavailable.

Senoma Simakova, Pankova, Tokarev & Issi 2005, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *S. globulifera* (Issi & Pankova) Simakova, Pankova, Tokarev & Issi, parasites of mosquitoes, aquatic, Asia, see Simakova et al. (2005; taxonomy), sequences are available.

Sheriffia Larsson 2014, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *S. brachynema* (Richards and Sheffield) Larsson, parasites of molluscs, aquatic, Europe, see Larsson (2014a, b: taxonomy), sequences are unavailable.

Simuliospora Khodzhaeva, Krylova & Issi 1990, *Golbergiidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *S. uzbekistanica* Khodzhaeva, Krylova & Issi, parasites in insects, Asia, sequences are unavailable.

Spherospora Garcia 1991, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *S. andinae* Garcia, parasites of blackflies, aquatic, South America, see Garcia (1991; taxonomy), sequences are unavailable.

Spiroglugea Léger & Hesse 1924, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *S. octospora* (Léger & Hesse) Léger & Hesse, parasites of biting midges, aquatic, Europe, sequences are available.

Sporanauta Ardila-Garcia & Fast 2012, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *S. perivermis* Ardila-Garcia & Fast, parasites of nematodes, aquatic, North America, see Ardila-Garcia and Fast (2012: taxonomy), sequences are available.

Spraguea Weissenberg 1976, *Sprague idae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* two species, type: *S. lophii* (Doflein) Weissenerg, parasites of fishes, aquatic, worldwide, see Weissenberg (1976; generic description), Sprague et al. (1992; taxonomic review), Pomport-Castillon et al. (2000; phylogenetic reconstruction), Freeman et al. (2004; phylogeny), Campbell et al. (2013; genome of *S. lophii*), Colmenero et al. (2015; *S. lophii* in Mediterranean lophiids), Xiang et al. (2015; comparative genomics), sequences are available.

Steinhausia Sprague, Ormières & Manier 1972, *Pseudopleistophoridae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* four species, type: *S. mytilovum* (Field) Sprague, Ormières & Manier, parasites of molluscs, aquatic, worldwide, see Sprague et al. (1972; generic description), Kalavati and Narasimhamurti (1977; new species), Sprague et al. (1992; taxonomic review), Cunningham and Daszak (1998; Extinction of land snail), Sagristà et al. (1998; ultrastructural data of *S. mytilovum*), sequences are unavailable.

Stempellia Léger & Hesse 1910, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, 19 species epithets are listed in Index Fungorum (2018), type: *S. mutabilis* Léger & Hesse, parasites of mosquitoes, aquatic, worldwide, sequences are unavailable.

Striatospora Issi & Voronin 1986, *Striatosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *S. chironomi* Issi & Voronin, parasites of chironomids, aquatic, Europe, see Sokolova et al. (2018; Microsporidia from USSR in twentieth century, description), sequences are unavailable.

Systenostrema Hazard & Oldacre 1975, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, five species, type: *S. tabani* Hazard & Oldacre, parasites of insects, aquatic, worldwide, see Hazard and Oldacre (1975; taxonomy), Sokolova et al. (2006: phylogeny), sequences are available.

Tabanispora Bykova, Sokolova & Issi 1987, *Burenellidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two species, type: *T. bacillifera* Bykova, Sokolova & Issi, parasites of insects, Europe, see Sokolova et al. (2018; Microsporidia from USSR in twentieth Century), sequences are unavailable.

Takaokaspora Andreadis, Takaoka, Otsuka & Vossbrinck 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *T. nipponicus* T.G. Andreadis, Takaoka, Otsuka & Vossbrinck, parasites of mosquitoes, aquatic, Asia, see Andreadis et al. (2013; taxonomy), sequences are available.

Tardivesicula Larsson & Bylén 1992, *Duboscqiidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *T. duplicata* Larsson & Bylén, parasites of caddisflies, aquatic, Europe, see Larsson and Bylén (1992; taxonomy), sequences are unavailable.

Telomyxa Léger & Hesse 1910, *Telomyxidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, four species, type: *T. glugeiformis* Léger & Hesse, parasites of mayflies, aquatic, Europe, sequences are unavailable.

Tetramicra Matthews & Matthews 1980, *Sprague idae*, *Dissociodihaplophasida*, *Microsporidea, Rozellomycota,* one species, type: *T. brevifilum* Matthews & Matthews, parasites of fishes, aquatic, Europe, see Matthews and Matthews (1980; generic description), Sprague et al. (1992; taxonomic review), Leiro et al. (2002; PCR detection),

Alonso et al. (2013; Real-time PCR assay), Scholz et al. (2017; phylogeny), sequences are available.

Thelohania Henneguy 1892, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, c. 50 species, type: *T. giardi* Henneguy, parasites of arthropods, worldwide, see Vossbrinck and Debrunner-Vossbrinck (2005: phylogeny), sequences are available.

Toxoglugea Léger & Hesse 1924, *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, c. 15 species, type: need typification, parasites of insects, aquatic, Europe, sequences are unavailable.

Toxospora Voronin 1993, *Toxoglugeidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, two species, type: *T. volgae* Voronin, parasites of chironomids, aquatic, Europe, see Voronin (1993; taxonomy), sequences are unavailable.

Trachipleistophora Hollister, Canning, Weidner, Field, Kench & Marriott 1996, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, three species, type: *T. hominis* Hollister, Canning, Weidner, Field, Kench & Marriott, parasites of humans, worldwide, see Hollister et al. (1996; taxonomy), Weinder et al. (1999: mosquito vector competence), Heinz et al. (2012; genome dynamics and reductive evolution), sequences are available.

Trichoctosporea Larsson 1994, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota,* one species, type: *T. pygopellita* Larsson, parasites of mosquitoes and cyclops, aquatic, Eurasia, see Larsson (1994; taxonomy), Simakova et al. (2011; parasites of cyclops), Andreadis et al. (2012: phylogeny), sequences are available.

Trichoduboscqia Léger 1926, *Duboscqiidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *P. epeori* Léger, parasites of mayflies, aquatic, Europe, see Weiser et al. (2015; compare with *Agglomerata*), sequences are unavailable.

Trichonosema Canning, Refardt, Vossbrinck, Okamura & Curry 2002, *Neopereziidae*, *Microsporidea* families *incertae sedis, Rozellomycota*, two species, type: *T. pectinatellae* Canning, Refardt, Vossbrinck, Okamura & Curry, parasites of bryozoans, aquatic, Europe, see Canning et al. (2002a, b; taxonomy), sequences are available.

Trichotuzetia Vávra, Larsson & Baker 1997, *Microsporidea* genera incertae sedis, one species, type: *T. guttata* Vávra, Larsson & Baker, parasites of cyclops, aquatic, Europe, see Vávra et al. (1997; taxonomy), sequences are available.

Tricornia Pell & Canning 1992, *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *T. muhezae* Pell & Canning, parasites of mosquitoes, aquatic, Africe, see Pell and Canning (1992; taxonomy), sequences are unavailable.

Triwangia Wang, Nai, Chih Wang, Solter, Hsu, Wang & Lo 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *T. caridinae* Wang, Nai, Chih Wang, Solter, Hsu, Wang & Lo, parasites of shrimps, aquatic, Asia, see Wang et al. (2013a, b, c, d; taxonomy), sequences are available.

Tubulinosema Franzen, Fischer, Schröder, Schölmerich & Schneuwly 2005, *Tubulinosematidae*, *Microsporidea* families *incertae sedis*, *Rozellomycota*, five species, type: *T. ratisbonensis* Franzen, Fischer, Schröder, Schölmerich & Schneuwly, parasites of insects, worldwide, see Franzen et al. (2005; taxonomy), Vijendravarma et al. (2008; infection of *Drosophila melanogaster*), Bjørnson et al. (2011; new species), Choudhary et al. (2011: human infection), Meissner et al. (2012: human infection), Malysh et al. (2013; new species), sequences are available.

Tuzetia Maurand, Fize, Vernick & Michel 1971, *Tuzetiidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, seven species, type: *Tuzetia infirma* (Kudo 1921) Maurand, Fize, Fenwick, and Michel, 1971parasites of aquatic arthropods, worldwide, see Larsson (1983; taxonomy), Canning et al. (2002a, b: ultrastructure), Simakova et al. (2009b: new species), sequences are unavailable.

Unikaryon Canning, Lai & Lie 1974, *Unikaryonidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, c. 18 species, type: *U. piriformis* Canning, Lai & Lie, parasites of invertebrates, worldwide, see Yaman et al. (2010; new species), sequences are available.

Vairimorpha Pilley 1976, *Nosematidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, 15 species, type: *V. necatrix* (Kramer) Pilley, parasites of insects, worldwide, see Fowler and Reeves (1974: spore dimorphism), Fuxa and Brooks (1979: application in pest control), Mitchell and Cali (1993: ultrastructure), Baker et al. (1994: relationships with *Nosema*), Down et al. (2008: host pathology), Wang et al. (2009; new species), Ironside et al. (2013: genetic diversity), Luo et al. (2014; morphological and molecular study), Baki and Bekircan (2018; new species), sequences are available.

Vavraia Weiser 1977, *Pleistophoridae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, c. 10 species, type: *V. culicis* (Weiser) Weiser, parasites of insects, worldwide, see Weiser (1977; taxonomy), Bargielowski and Koella (2009; application), Lorenz and Koella (2011; mosqitoes biocontrol), sequences are available.

Vittaforma Silveira & Canning 1995, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, one species, type: *V. corneae* (Shadduck, Meccoli, Davis & Font) Silveira & Canning, parasites of human, worldwide, Silveira and Canning (1995; taxonomy), Vossbrinck and Debrunner-Vossbrinck (2005: phylogeny), sequences are available.

Weiseria Doby & Saguez 1964, *Caudosporidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*, three species, type: *W. laurentii* Doby & Saguez, parasite of blackflies, worldwide, see Doby and Saguez (1964;

taxonomy), Vossbrinck and Debrunner-Vossbrinck (2005: phylogeny), sequences are available.

Wittmannia Czaker 1997, *Microsporidea* families *incertae sedis*, *Rozellomycota*, *Rozellomycota*, one species, type: *W. antarctica* Czaker, parasites of mesozoans, Antarctica, see Czaker (1997; taxonomy), sequences are unavailable.

Zelenkaia Hyliš, Oborník, Nebesářová & Vávra 2013, *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, one species, type: *Z. trichopterae* Hyliš, Oborník, Nebesářová & Vávra, parasites of caddisflies, aquatic, Europe, Hyliš et al. (2013; taxonomy), sequences are available.

Zoopagomycota Gryganskyi et al.

Spatafora et al. (2016) introduced the phylum *Zoopagomycota* with *Zoopage* Drechsler (1935) as type genus to accommodate three subphyla: *Entomophthoromycotina* Humber (Hibbett et al. 2007), *Kickellomycotina* Benny (Hibbett et al. 2007), and *Zoopagomycotina* Benny (Hibbett et al. 2007). The phylum comprises early diverging terrestrial fungi mainly associating with animals. However, numerous mycoparasites are also included in this group (Spatafora et al. 2016).

We accept *Zoopagomycota* as a distinct phylum which comprises only two subphyla (we accept *Entomophthoromycota* as a distinct phylum agreeing with Tedersoo et al. 2016), one class, five orders, ten families and 90 genera.

Notes for genera

Acaulopage Drechsler 1935, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, 27 species, type: *A. rhaphidospora* Drechsler, parasitic, aquatic, see Kirk et al. (2008; genus accepted) but Kirk et al. (2013; not listed), Hirotani-Akabane and Saikawa (2010; zygospore germination), Saikawa (2011; ultrastructural information), Seifert et al. (2011; mentioned that the genus resembles hyphomycetes), Michel et al. (2014, 2015; sequences, isolation, prey pattern), Corsaro et al. (2018; DNA, phylogeny), cultures and sequences are available.

Amoebophilus P.A. Dang. 1910, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, four species, type: *A. penardii* P.A. Dang., parasitic on amoeboids, Europe, North America, see Mrva (2011; infect *Mayorella vespertioides*), Saikawa (2011; accepted as in *Cochlonemataceae*), Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Aplectosoma Drechsler 1951, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *A. microsporum* Drechsler, amoebae endoparasites, USA, see Saikawa (2011; accepted as in *Cochlonemataceae*), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Basidiolum Cienk. 1861, *Zoopagomycotina* genera *incertae sedis*, *Kickxellomycetes*, *Zoopagomycota*, one species, type: *B. fimbriatum* Cienk., saprobes?, distribution unknown, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Bdellospora Drechsler 1935, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *B. helicoides* Drechsler, endoparasites, North America, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Brachymyces G.L. Barron 1980, *Helicocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *B. megasporus* G.L. Barron, from soil, Canada, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Cochlonema Drechsler 1935, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, eleven species, type: *C. verrucosum* Drechsler, saprobes, in amoeba, worldwide, see Hirotani-Akabane and Saikawa (2010; morphology and germination of zygospores), Saikawa (2012; morphology), Kirk et al. (2013; genus accepted), Walther et al. (2013; phylogeny), Benny et al. (2016b; classification), cultures and sequences are available.

Cystopage Drechsler 1941, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, nine species, type: *C. lateralis* Drechsler, nematode trapping, worldwide, see Kelly et al. (2009; Ireland), Kirk et al. (2013; genus accepted), Ho et al. (2015; new species), cultures and sequences are unavailable.

Endocochlus Drechsler 1935, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, four species, type: *E. microsporum* Drechsler, endoparasites, cosmopolitan, see Saikawa (2011; accepted as in *Cochlonemataceae*), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Euryancale Drechsler 1939, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, four species, type: *E. sacciospora Drechsler*, endoparasites, cosmopolitan, see Saikawa (2011; accepted as in *Cochlonemataceae*), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Helicocephalum Thaxt. 1891, *Helicocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, six species, type: *H. sarcophilum* Thaxt., parasites, cosmopolitan, see Kirk et al. (2013; genus accepted), Tretter et al. (2014; notes), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Kuzuhaea R.K. Benj. 1985, *Piptocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *K. moniliformis* R.K. Benj., from soil, cosmopolitan, see Hoffmann et al. (2013; notes), Kirk et al. (2013; genus accepted), Penton et al. (2013; diversity), Benny et al.

(2016b; classification), Corsaro et al (2018, phylogeny), cultures unavailable, sequences available.

Lecophagus M.W. Dick 1990, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, three species, type: *L. fasciculatus* M.W. Dick, hyphomycetous, predator, cosmopolitan, see Seifert et al. (2011; morphology), Kirk et al. (2013; genus accepted), Arenz et al. (2014; Antarctica), Magyar et al. (2016; new species), Fiałkowska et al. (2018; interactions with prey), cultures and sequences are available.

Massartia De Wild. 1897, *Zoopagales* genera *incertae sedis*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *M. javanica* De Wild., cosmopolitan, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable.

Piptocephalis de Bary 1865, *Piptocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, c. 25 species, type: *P. freseniana* de Bary, mycoparasites, worldwide, see Ho and Kirk (2009; new species), Hou and Ho (2010; new species), Hoffmann et al. (2013; notes), Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), Corsaro et al. (2018, phylogeny), cultures and sequences are available, genome available: *P. cylindrospora* RSA 2659 unpublished genome at JGI portal (Grigoriev et al. 2014).

Reticulocephalis Benny, R.K. Benj. & P.M. Kirk 1992, *Sigmoideomycetaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, two species, type: *R. gyrosus* Benny, R.K. Benj. & P.M. Kirk, from soil, cosmopolitan, see Hoffmann et al. (2013; notes), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Rhopalomyces Corda 1839, *Helicocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, eleven species, type: *R. elegans* Corda, parasites, cosmopolitan, see Kirk et al. (2013; genus accepted), Tretter et al. (2014; notes), Benny et al. (2016b; classification), Corsaro et al. (2018, phylogeny), cultures unavailable, sequences are available.

Sigmoideomyces Thaxt. 1891, *Sigmoideomycetaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *S. dispiroides* Thaxt., saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Sphondylocephalum Stalpers 1974, *Sigmoideomycetaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *S. verticillatum* (Thaxt.) Stalpers, hyphomycetous, coprophilous, North America, see Seifert et al. (2011; morphology), Kirk et al. (2013; genus accepted), Suyama and Degawa (2013; accepted as in *Sigmoideomycetaceae*), Benny et al. (2016b; notes), cultures and sequences are unavailable.

Stylopage Drechsler 1935, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, 17 species, type: *S. lepte* Drechsler, predator, cosmopolitan, see Kirk et al. (2013; genus accepted), Michel et al. (2014; isolation, characterization), Corsaro et al. (2018; DNA, phylogeny), cultures and sequences are available.

Syncephalis Tiegh. & G. Le Monn. 1873, *Piptocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, c. 55 species, type: *S. cordata* Tiegh. & G. Le Monn., mycoparasites, worldwide, see Ho and Benny (2008; new species), Santiago et al. (2011a, b; new species), Hoffmann et al. (2013; notes), Kirk et al. (2013; genus accepted), Benny et al. (2016a; classification, ecology), Melo et al. (2016; neotropics), Lazarus et al. (2017, systematics) *S. fuscata* S228 unpublished genome at JGI portal (Grigoriev et al. 2014), *S. plumigaleata* NRRL S24 unpublished genome at JGI portal (Grigoriev et al. 2014), *S. pseudoplumigaleata* Benny S71-1 unpublished genome at JGI portal (Grigoriev et al. 2014).

Tentaculophagus Doweld 2014, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *T. karlingii* see Index Fungorum (2018), cultures and sequences are unavailable.

Thamnocephalis Blakeslee 1905, *Sigmoideomycetaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, three species, type: *T. quadrupedata* Blakeslee, saprobes, cosmopolitan, see Kirk et al. (2013; genus accepted), Ho and Chiang (2014; Taiwan), Benny et al. (2016b; classification), Corsaro et al (2018, phylogeny), cultures unavailable, *T. sphaerospora* RSA 1356 unpublished genome at JGI portal (Grigoriev et al. 2014).

Verrucocephalum Degawa 2013, *Helicocephalidaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: *H. latericorvinisporum* Degawa, from dung, nematophagous, Asia, see Degawa (2014; taxonomy), cultures and sequences are unavailable.

Zoopage Drechsler 1935, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, eleven species, type: *Z. phanera* Drechsler, in amoeba, cosmopolitan, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), cultures and sequences are unavailable.

Zoophagus Sommerst. 1911, *Zoopagaceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, four species, type: *Z. insidians* Sommerst., on algae, cosmopolitan, see Kirk et al. (2013; genus accepted), Benny et al. (2016b; classification), Corsaro et al (2018, phylogeny), a sequence is available.

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