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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. (MycKeys 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, 607 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 (separated by '-') Invalid genera - *Nephridiophagaceae* fam. nov. - Outline - Phylogeny - Validation

Footnote Information



1 **Notes for genera: basal clades of Fungi (including *Aphelidiomycota*,**
2 ***Basidiobolomycota*, *Blastocladiomycota*, *Calcarisporiellomycota*,**
3 ***Caulochytriomycota*, *Chytridiomycota*, *Entomophthoromycota*,**
4 ***Glomeromycota*, *Kickxellomycota*, *Monoblepharomycota*,**
5 ***Mortierellomycota*, *Mucoromycota*, *Neocallimastigomycota*,**
6 ***Olpidiomycota*, *Rozellomycota* and *Zoopagomycota*)**

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15 **Abstract**

16 **AQ1** Compared to the higher fungi (Dikarya), taxonomic and evolutionary studies on the basal clades of fungi are fewer in
17 number. Thus, the generic boundaries and higher ranks in the basal clades of fungi are poorly known. Recent DNA based
18 taxonomic studies have provided reliable and accurate information. It is therefore necessary to compile all available
19 information since basal clades genera lack updated checklists or outlines. Recently, Tedersoo et al. (MycKeys 13:1–20,
20 2016) accepted *Aphelidiomycota* and *Rozellomycota* in Fungal clade. Thus, we regard both these phyla as members in
21 Kingdom Fungi. We accept 16 phyla in basal clades viz. *Aphelidiomycota*, *Basidiobolomycota*, *Blastocladiomycota*,
22 *Calcarisporiellomycota*, *Caulochytriomycota*, *Chytridiomycota*, *Entomophthoromycota*, *Glomeromycota*, *Kickxellomy-*
23 *cota*, *Monoblepharomycota*, *Mortierellomycota*, *Mucoromycota*, *Neocallimastigomycota*, *Olpidiomycota*, *Rozellomycota*
24 **AQ7** and *Zoopagomycota*. Thus, 607 genera in 153 families, 43 orders and 18 classes are provided with details of classification,
25 synonyms, life modes, distribution, recent literature and genomic data. Moreover, *Catenariaceae* Couch is proposed to be
26 conserved, *Cladochytriales* Mozl.-Standr. is emended and the family *Nephridiophagaceae* is introduced.
27

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

29
30 **Introduction**

31 Classification and understanding the evolution of fungi has
32 become one of the recent hot topics for research in
33 mycology (Hyde et al. 2017a). DNA based systematic and
34 evolutionary studies have become fundamental among
35 mycologists and taxonomists as these provide a strong

foundation for understanding the kingdom Fungi. There 36
have been numerous taxonomic studies on the Ascomycota 37
(e.g. Hyde et al. 2013, 2017b; Ariyawansa et al. 2015; Li 38
et al. 2016; Wijayawardene et al. 2016, 2018), Basid- 39
iomycota (E.g. Justo and Hibbett 2011; Justo et al. 2011; 40
Millanes et al. 2011; He and Dai 2012; Ortiz-Santana et al. 41
2013) (i.e. Dikarya) and in the basal clades of fungi (e.g. 42
Spatofora et al. 2016; Seto et al. 2017; Radek et al. 2017), 43
which are important sources for dictionaries, outlines, 44
checklists, various databases and the basic study of the 45
fungi (Kirk et al. 2008, 2013; Lumbsch and Huhndorf 46

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2010; Hyde et al. 2011, 2013; 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.

60 Distribution, life modes, applications

61 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 *vide* Pinho et al. 2014; Cruz-Lachica et al. 2016); pathogens of humans and other mammals (e.g. mucormycosis caused by *Apophysomyces* spp. *vide* Kennedy et al. 2016; mucormycosis caused by *Rhizopus arrhizus*), mycoparasites (e.g. *Syncephalis* *vide* Lazarus et al. 2017), amoebae endoparasites (e.g. *Amoebophilus* *vide* Mrva 2011). Moreover, some taxa have been used in biotechnological biodegradation, biosorption, bioremediation and biotransformations (Benny et al. 2016a, b).

78 Classification

79 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/ sub phyla 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 *vide* 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 (2011)	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	Sub phylum Entomophthoromycotina	Sub phylum 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	Phylum	Class Neozygitomycetes/or as the phylum	Phylum	Phylum	
In this study	Phylum	Phylum	Phylum	Phylum	Phylum	

Type: *Catenaria* Sorokin, 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.**

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

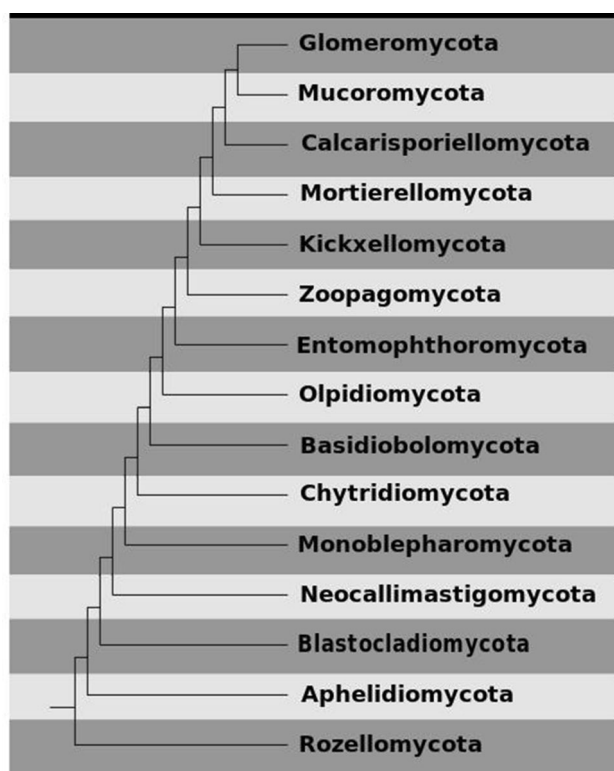


Fig. 1 Cladogram showing relationships between basal clades following taxonomy proposed by Tedersoo et al. (2016)

185	<i>Aphelidiaceae</i> Tedersoo, Koljalg, Bahram, Doring, Schigel, T. May, Sanchez-Ramirez, M. Ryberg & Abarenkov
186	<i>Amoebophilidium</i> Scherff.
187	<i>Aphelidium</i> Zopf
188	<i>Paraphelidium</i> Karpov, Moreira, Lopez-Garcia
189	<i>Pseudaphelidium</i> Schweikert & Schnepf
190	
191	BASIDIOBOLOMYCOTA Doweld
192	<i>Basidiobolomycetes</i> Humber
193	<i>Basidiobolales</i> Caval.-Sm.
194	<i>Basidiobolaceae</i> Claussen
195	<i>Basidiobolus</i> Eidam
196	<i>Schizangiella</i> J. Dwyer, B. Burwell, Humber, C. Mcleod,
197	M. Fleetwood & T. Johnson bis
198	BLASTOCLADIOMYCOTA T.Y. James
199	<i>Blastocladiomycetes</i> Doweld
200	<i>Blastocladiiales</i> H.E. Petersen
201	<i>Blastocladiaceae</i> H.E. Petersen
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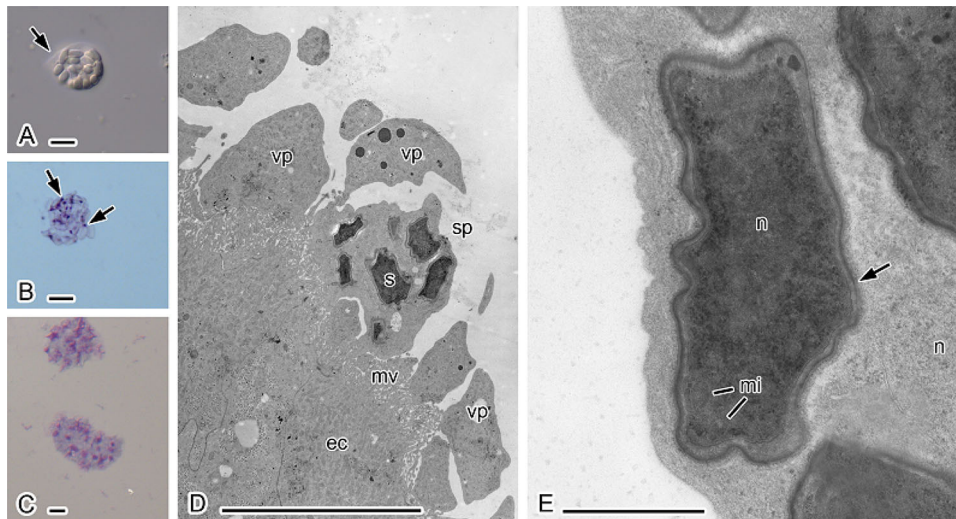


Fig. 2 A, B: *Nephridiophaga archimandrita*, C–E: *N. lucihormetica*. Bars A–D = 10 μ m, E = 1 μ m. A Sporogenic plasmodium with mature spores. Arrow = plasma membrane of plasmodium. Differential interference contrast (DIC). B Giemsa stained microscopic smear; sporogenic plasmodium. Arrows point to residual 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 (sp) 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

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990	<i>Culicospora</i> Weiser	<i>Ormieresia</i> C.P. Vivarès, G. Bouix & Manier	1033
991	<i>Culicosporella</i> Weiser	<i>Orthothelohania</i> Codreanu & Codreanu-Balcescu	1034
992	<i>Dimeiospora</i> Simakova, Pankova & Issi	<i>Paradoxium</i> G.D. Stentiford, S.H. Ross, R. Kerr, D. Bass &	1035
993	<i>Edhazardia</i> Becnel, V. Sprague & Fukuda	K.S. Bateman	1036
994	<i>Hyalinocysta</i> Hazard & Oldacre	<i>Pegmatheca</i> Hazard & Oldacre	1037
995	<i>Intrapredatorus</i> Chen, Kuo & Wu 1998	<i>Resiomeria</i> Larsson	1038
996	<i>Novothelohania</i> Andreadis, Simakova, Vossbrinck, Shep-	<i>Sphaerospora</i> J.J. Garcia	1039
997	ard & Yurchenko	<i>Thelohania</i> Henneguy	1040
998	<i>Parastempellia</i> Khodzhaeva	<i>Toxoglugea</i> Léger & Hesse	1041
999	<i>Parathelohania</i> Codreanu		
1000	<i>Trichoctosporea</i> Larsson	Microsporidea families <i>incertae sedis</i> ,	1042
1001	<i>Tricornia</i> Pell & Canning	Areosporiidae G.D. Stentiford, S. Bateman, Feist, S.	1043
1002	Burenelliidae Jouvenaz & Hazard	Oyarzún, J.C. Uribe, M. Palacios & D.M. Stone	1044
1003	<i>Burenella</i> Jouvenaz & Hazard	<i>Areospora</i> G.D. Stentiford, S. Bateman, Feist, S. Oyarzún,	1045
		J.C. Uribe, M. Palacios & D.M. Stone	1046
		Berwaldiidae Simakova, Tokarev, Issi	1047
		<i>Berwaldia</i> Larsson	1048

- 1049 *Fibrillanosema* Slothouber Galbreath, Smith, Terry, Becnel, & Dunn 1091
- 1051 **Cougourdellidae** Poisson 1092
- 1052 *Cougourdella* E. Hesse 1093
- 1053 **Facilisporidae** Jones, Prosperi-Porta & Kim 1094
- 1054 *Facilispora* Jones, Prosperi-Porta & Kim 1095
- 1055 **Heterovesiculidae** Lange, Macvean, Henry & Streett 1096
- 1056 *Heterovesicula* Lange, Macvean, Henry & Streett 1097
- 1057 **Myosporidae** Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck 1098
- 1058 *Myospora* Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck 1099
- 1059 *Myospora* Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck 1100
- 1060 *Myospora* Stentiford, Bateman, Small, Moss, Shields, Reece & Tuck 1101
- 1061 **Neonosemoidiidae** Faye, Toguebaye & Bouix 1102
- 1062 *Neonosemoides* Faye & Toguebaye 1103
- 1063 **Ordosporidae** Larsson, Ebert & Vávra 1104
- 1064 *Ordospora* Larsson, Ebert & Vávra 1105
- 1065 **Pleistosporidiidae** Codreanu-Balcescu & Codreanu 1106
- 1066 *Pleistosporidium* Codreanu-Balcescu & Codreanu 1107
- 1067 **Neopereziidae**. Voronin 1108
- 1068 *Bacillidium* Janda 1109
- 1069 *Bryonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1110
- 1070 *Bryonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1111
- 1071 *Neoperezia* Issi & Voronin 1112
- 1072 *Pseudonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1113
- 1073 *Pseudonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1114
- 1074 *Schroedera* D.J. Morris & A. Adams 1115
- 1075 *Trichonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1116
- 1076 *Trichonosema* Canning, Refardt, Vossbrinck, Okamura & Curry 1117
- 1077 **Telomyxidae** Léger & Hesse 1118
- 1078 *Telomyxa* Léger & Hesse 1119
- 1079 **Toxoglugeidae** Larsson 1120
- 1080 *Toxospora* Voronin 1121
- 1081 **Tubulinosematidae** Franzen, Fischer, Schröder, Schölmerich & Schneuwly 1122
- 1082 *Tubulinosematidae* Franzen, Fischer, Schröder, Schölmerich & Schneuwly 1123
- 1083 *Anncaliia* Issi, Krylova & Nikolaeva 1124
- 1084 *Kneallhazia* Sokolova & Fuxa 1125
- 1085 *Tubulinosema* Franzen, Fischer, Schröder, Schölmerich & Schneuwly 1126
- 1086 *Tubulinosema* Franzen, Fischer, Schröder, Schölmerich & Schneuwly 1127
- 1087 **Microsporidea** genera *incertae sedis* 1128
- 1088 *Alfvenia* Larsson 1129
- 1089 *Anisofilariata* Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova, Ignatieva & Issi 1130
- 1090 *Anisofilariata* Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova, Ignatieva & Issi 1131
- Auraspora* Weiser & K. Purrini 1132
- Baculea* Loubès & Akbarieh 1133
- Campanulospora* Issi, Radishcheva & Dolzhenko 1134
- Caulleryetta* Dogiel 1135
- Chytridioides* Tregouboff 1136
- Ciliatosporidium* Foissner & Foissner 1137
- Crispospora* Tokarev, Voronin, Seliverstova, Pavlova & Issi 1138
- Cryptosporina* Hazard & Oldacre 1139
- Cystosporogenes* Canning, Barker, Nicholas & Page 1140
- Endoreticulatus* Brooks, Becnel & Kennedy 1141
- Enterocytopora* Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab, Michalakakis, Agnew, Vivarés & Lenormand 1142
- Evlachovaia* Voronin 1143
- Geusia* Rühl & Korn 1144
- Globulispora* Vávra, Hylis, Viala, Nebesarova 1145
- Glugoides* (Chatton) Larsson, Ebert, Vávra & Voronin 1146
- Gurleyides* Voronin 1147
- Hamiltosporidium* Haag, Larsson, Refardt, and Ebert 1148
- Hazardia* Weiser 1149
- Hirsutosporos* Batson 1150
- Holobispora* Voronin 1151
- Issia* Weiser 1152
- Janacekia* Larsson 1153
- Kinorhynchospora* Adrianov & Rybakov 1154
- Liebermannia* Sokolova, Lange & Fuxa 1155
- Mariona* Stempell 1156
- Merocinta* Pell & Canning 1157
- Microsporidium* Balbiani 1158
- Multilamina* Becnel, Scheffrahn, Vossbrinck & Bahder 1159
- Myxocystis* Mrazek 1160
- Nematocinator* Sapir, Dillman, Connon, Grupe, Ingels, Mundo-Ocampo, Levin, Bladwin, Orphan & Sternberg 1161
- Nematocida* Troemel, Félix, Whiteman, Barrière & Ausubel 1162
- Nosemoides* Vinckier 1163
- Orthosomella* Canning, Wigley & Barker 1164
- Sheriffia* Larsson 1165
- Spiroglugea* Léger & Hesse 1166
- Sporanauta* Ardila-Garcia & Fast 1167
- Stempellia* Léger & Hesse 1168
- Systemostrema* Hazard & Oldacre 1169
- Takaokaspora* Andreadis, Takaoka, Otsuka & Vossbrinck 1170
- Trichotuzetia* Vávra, Larsson & Baker 1171
- Triwangia* Wang, Nai, Chih Wang, Solter, Hsu, Wang & Lo 1172
- Vittaforma* Silveira & Canning 1173
- Wittmannia* Czaker 1174
- Rudimicrosporea** Sprague 1175
- Metchnikovellida** Vivier 1176
- Amphiacanthidae** Larsson 1177
- Amphiacantha* Caullery & Mesnil 1178
- Amphiamblys* Caullery & Mesnil 1179

1142	<i>Metchnikovellidae</i> Caullery & Mesnil	NOTES FOR GENERA	1188
1143	<i>Desportesia</i> Issi & Voronin	In this section we provide an introduction for each phylum	1189
1144	<i>Metchnikovella</i> Caullery & Mesnil	and entries for each genus with taxonomic placements,	1190
1145	<i>Microsporidiopsis</i> Schereschewsky	habitat, recent references etc.	1191
1146	<i>Rozellomycota</i> genera <i>incertae sedis</i>	<i>Aphelidiomycota</i> Tedersoo et al.	1192
1147	<i>Mitosporidium</i> Haag, James, Pombert, Larsson, Schaer,	Tedersoo et al. (2016) introduced <i>Aphelidiomycota</i>	1193
1148	Refardt & Ebert	which comprises one class, one order and one family.	1194
1149	<i>Paramicrosporidium</i> Corsaro, Walochnik, Venditti, Stein-	Currently, we accept four genera belonging in	1195
1150	mann, Müller & Michel	<i>Aphelidiomycota</i> .	1196
1151	ZOOPAGOMYCOTA Gryganskyi, M.E. Sm., Spatafora &	Notes for genera	1197
1152	Stajich	<i>Amoebophilium</i> Scherff. 1925, <i>Aphelidiaceae</i> , <i>Aphelidiales</i> ,	1198
1153	<i>Zoopagomycetes</i> Doweld	<i>Aphelidiomycetes</i> , <i>Aphelidiomycota</i> , five species,	1199
1154	<i>Zoopagales</i> Bessey ex R.K. Benj.	type: <i>A. achnanthidis</i> Scherff., parasites, aquatic, cos-	1200
1155	<i>Cochlonemataceae</i> Dudd.	mopolitan, see Letcher et al. (2015b; new species), Karpov	1201
1156	<i>Amoebophilus</i> P.A. Dang.	et al. (2016; phylogeny), sequences are available.	1202
1157	<i>Aplectosoma</i> Drechsler	<i>Aphelidium</i> Zopf 1885, <i>Aphelidiaceae</i> , <i>Aphelidiales</i> ,	1203
1158	<i>Bdellospora</i> Drechsler	<i>Aphelidiomycetes</i> , <i>Aphelidiomycota</i> , seven species, type: <i>A.</i>	1204
1159	<i>Cochlonema</i> Drechsler	<i>deformans</i> Zopf, parasites of algae, aquatic, worldwide, see	1205
1160	<i>Endocochlus</i> Drechsler	Karpov et al. (2016; phylogeny), Letcher et al. (2017; new	1206
1161	<i>Euryancale</i> Drechsler	species), sequences are available.	1207
1162	<i>Helicocephalidaceae</i> Boedijn	<i>Paraphelidium</i> Karpov, Moreira, Lopez-Garcia 2017b,	1208
1163	<i>Brachymyces</i> G.L. Barron	<i>Aphelidiaceae</i> , <i>Aphelidiales</i> , <i>Aphelidiomycetes</i> , <i>Aphelid-</i>	1209
1164	<i>Helicocephalum</i> Thaxt.	<i>iomycota</i> , two species, type: <i>P. tribonemae</i> Karpov, Mor-	1210
1165	<i>Rhopalomyces</i> Corda	eira, Lopez-Garcia, parasites of <i>Tribonema gayanum</i> ,	1211
1166	<i>Verrucocephalum</i> Degawa	aquatic, Russia, see Karpov et al. (2017b, c; taxonomy,	1212
1167	<i>Piptocephalidaceae</i> J. Schröt.	phylogeny), sequences are available.	1213
1168	<i>Kuzuhaea</i> R.K. Benj.	<i>Pseudaphelidium</i> Schweikert & Schnepf 1996, <i>Aphelidi-</i>	1214
1169	<i>Piptocephalis</i> de Bary	<i>aceae</i> , <i>Aphelidiales</i> , <i>Aphelidiomycetes</i> , <i>Aphelidiomycota</i> ,	1215
1170	<i>Syncephalis</i> Tiegh. & G. Le Monn.	one species, type: <i>P. drebesii</i> Schweikert & Schnepf, par-	1216
1171	<i>Sigmoideomycetaceae</i> Benny, R.K. Benj. & P.M. Kirk	asite, marine, Germany, see Schweikert and Schnepf (1996,	1217
1172	<i>Reticulocephalis</i> Benny, R.K. Benj. & P.M. Kirk	1997; description, light microscopy, electron microscopy),	1218
1173	<i>Sigmoideomyces</i> Thaxt.	sequences are unavailable.	1219
1174	<i>Sphondylocephalum</i> Stalpers	<i>Basidiobolomycota</i> Doweld	1220
1175	<i>Thamnocephalis</i> Blakeslee	Doweld (2011) introduced <i>Basidiobolomycota</i> based on	1221
1176	<i>Zoopagaceae</i> Drechsler	<i>Basidiobolus</i> Eidam. Taxonomic placement of <i>Basidiobo-</i>	1222
1177	<i>Acaulopage</i> Drechsler	<i>lus</i> (including higher taxonomic ranks i.e. <i>Basidiobolaceae</i> , AQ3	1223
1178	<i>Cystopage</i> Drechsler	<i>Basidiobolales</i> , <i>Basidiobolomycetes</i>) was doubtful since	1224
1179	<i>Lecophagus</i> M.W. Dick	different publications accommodated it in different place-	1225
1180	<i>Stylopage</i> Drechsler	ments in Kingdom Fungi. Nagahama et al. (1995) and	1226
1181	<i>Tentaculophagus</i> Doweld	James et al. (2000) showed that <i>Basidiobolus</i> grouped with	1227
1182	<i>Zoopage</i> Drechsler	<i>Chytridiomycetes</i> based on 18S rDNA sequence analyses.	1228
1183	<i>Zoophagus</i> Sommerst.	However, James et al. (2006), for the first time, accepted	1229
1184	<i>Zoopagales</i> genera <i>incertae sedis</i>	<i>Basidiobolus</i> belongs in <i>Entomophthoromycota</i> . The	1230
1185	<i>Massartia</i> De Wild.	placement in James et al. (2006) was followed by Humber	1231
1186	<i>Zoopagomycotina</i> genus <i>incertae sedis</i>	(2012) and Gryganskyi et al. (2013a, b). Nevertheless,	1232
1187	<i>Basidiolum</i> Cienk.	Hibbett et al. (2007) provided contrary conclusion with all	1233
		above placements on <i>Basidiobolus</i> , and placed it in	1234
		uncertain placement in Kingdom Fungi. Nevertheless,	1235

1236 Tedersoo et al. (2016) accepted *Basidiobolomycota* (fide
1237 Doweld 2011) as a distinct phylum in their newly proposed
1238 classification of fungi. Our phylogenetic analyses also
1239 agree with this placement thus in here, we conclude *Basidiobolomycota*
1240 as a distinct phylum which comprises
1241 *Basidiobolus* and *Schizangiella* J. Dwyer et al. (Fig. 1).

1242 Notes for genera

1243 ***Basidiobolus*** Eidam 1886, *Basidiobolaceae*, *Basidiobolales*,
1244 *Basidiobolomycetes*, *Entomophthoromycota*, four
1245 species, type: *B. ranarum* Eidam, on dung, human patho-
1246 gen, worldwide, see Rabie et al. (2011; Basidiobolomy-
1247 cosis), Sharma et al. (2011; human pathogen), Humber
1248 (2012; classification), Kumar Verma et al. (2012; subcu-
1249 taneous zygomycosis), Kwon-Chung (2012; human
1250 pathogen), Gryganskyi et al. (2013a; notes), Kirk et al.
1251 (2013; genus accepted), Al-Maani et al. (2014; gastroin-
1252 testinal basidiobolomycosis), Mendoza et al. (2015; human
1253 pathogen), Almoosa et al. (2017; pediatric gastrointestinal
1254 basidiobolomycosis), cultures and sequences are available,
1255 genomes available: *B. meristosporus* CDC-B9252 and CBS
1256 931.73 (Chibucos et al. 2016) available at NCBI genomes,
1257 *B. heterosporus* CDC-B8920 (Chibucos et al. 2016)
1258 available at NCBI genomes.

1259 ***Schizangiella*** J. Dwyer, B. Burwell, Humber, C. Mcleod,
1260 M. Fleetwood & T. Johnson bis 2006, *Basidiobolaceae*,
1261 *Basidiobolales*, *Basidiobolomycetes*, *Entomophthoromy-*
1262 *cota*, one species, type: *S. serpentis* J. Dwyer, B. Burwell,
1263 Humber, C. Mcleod, M. Fleetwood & T. Johnson bis, snake
1264 pathogen, cosmopolitan, see Gryganskyi et al. (2013a;
1265 notes, phylogeny), Hoffmann et al. (2013; notes), Humber
1266 (2016; classification), cultures and sequences are available.

1267 *Blastocladiomycota* T.Y. James

1268 James et al. (2006) elevated the order *Blastocladales*,
1269 which was traditionally treated as in *Chytridiomycota*, to a
1270 phylum *Blastocladiomycota*. The members of *Blastocla-*
1271 *diomycota* show different life modes such as saprobic,
1272 invertebrate parasites (e.g. *Callimastix* Weissenb., *Coelo-*
1273 *omyces* Keilin), and fungal and algal parasites (Hoffman
1274 et al. 2008; James et al. 2011). In evolution perspective,
1275 *Blastocladales* differs from the chytrids which have
1276 zygotic meiosis while most *Blastocladales* have a life
1277 cycle with sporic meiosis (James et al. 2006). Subsequent
1278 studies by Hibbett et al. (2007), Porter et al. (2011), James
1279 et al. (2012, 2014), Jones et al. (2016), Seto et al. (2017)
1280 and Krings et al. (2016) also recognized *Blastocladiomy-*
1281 *cota* as a distinct phylum of fungi.

1282 In this study, we accept one class, three orders, eight
1283 families and 14 genera in *Blastocladiomycota*.

Notes for genera

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

Blastocladia Reinsch 1877, *Blastocladiaceae*, *Blastocladi-*
ales, *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.

Blastocladopsis Sparrow 1950, *Blastocladiaceae*, *Blasto-*
cladales, *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*, *Calli-*
mastigales, *Blastocladiomycetes*, *Blastocladiomycota*, one
species, type: *C. cyclopis* Weissenb., on crustaceans, ter-
restrial, cosmopolitan, see Kirk et al. (2013; genus accep-
ted), cultures and sequences are unavailable.

Catenomyces A.M. Hanson 1944, *Catenomycetaceae*,
Catenomycetales, *Blastocladiomycetes*, *Blastocladiomy-*
cota, two species, type: *C. persicinus* A.M. Hanson, sap-
robes, 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, *Blastocladales*, *Blastocladiomycetes*,
Blastocladiomycota, two species, type: *C. variabilis* (Kar-
ling) Karling, saprobes, worldwide, see Kirk et al. (2013;
genus accepted), cultures and sequences are available.

Coelomyces Keilin 1921, *Coelomomycetaceae*, *Calli-*
mastigales, *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*, *Blastocla-*
diomycetes, *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, *Blastocladales* genera
incertae sedis, *Blastocladiomycetes*, *Blastocladiomycota*,
one species, type: *E. caulleryi* Codreanu, saprobes, cos-
mopolitan, see Kirk et al. (2013; genus accepted), cultures
and sequences are available for unidentified species.

1336 *Microallomyces* R. Emers. & J.A. Robertson 1974, *Blasto-*
1337 *tocladiomycetes* genera *incertae sedis*, *Blastocladiomycota*,
1338 two species, type: *M. dendroideus* R. Emers. & J.A.
1339 Robertson, saprobes, aquatic, Costa Rica, see Kirk et al.
1340 (2013; genus accepted), cultures and sequences are
1341 unavailable.

1342 *Nematoceromyces* Doweld 2013, *Catenariaceae*, *Blasto-*
1343 *cladiales*, *Blastocladiomycetes*, *Blastocladiomycota*, three
1344 species, type: *N. spinosus* (W. Martin) Doweld, parasitic in
1345 eggs of insects, cosmopolitan, see Doweld et al. (2014k;
1346 genus accepted), cultures and sequences are unavailable.

1347 *Paraphysoderma* Boussiba, Zarka & T.Y. James 2011,
1348 *Paraphysodermataceae*, *Blastocladales*, *Blastocla-*
1349 *diomycetes*, *Blastocladiomycota*, three species, type: *P.*
1350 *sedebokerense* Boussiba, Zarka & T.Y. James, parasitic on
1351 *Haematococcus pluvialis*, Israel, see James et al. (2011;
1352 taxonomy), Letcher et al. (2016; ultrastructure studies),
1353 Strittmatter et al. (2016; flagellated dispersion stage), cul-
1354 tures and sequences are available.

1355 *Physoderma* Wallr. 1833 (= *Oedomyces* Sacc. ex Trab.
1356 1894; = *Physopella* G. Poirault 1905; = *Urophlyctis* J.
1357 Schröt. (1886) [1889]), *Physodermataceae*, *Physoder-*
1358 *matales*, *Physodermatomycetes*, *Blastocladiomycota*, c. 60
1359 species, type: *P. maculare* Wallr., saprobes, worldwide, see
1360 Kirk et al. (2013; genus accepted), cultures and sequences
1361 are available.

1362 *Sorochytrium* Dewel 1985, *Sorochytriaceae*, *Blastocla-*
1363 *diales*, *Blastocladiomycetes*, *Blastocladiomycota*, one spe-
1364 cies, type: *S. milnesiophthora* Dewel, saprobes, USA, see
1365 Kirk et al. (2013; genus accepted), cultures and sequences
1366 are unavailable.

1367 *Caulochytriomycota* Doweld

1368 Doweld (2014g) introduced *Caulochytriomycota* based
1369 on *Caulochytrium* Voos & L.S. Olive. *Caulochytrium*
1370 *gloeosporii* Voos & L.S. Olive, the type species of *Cau-*
1371 *lochytrium* was isolated from dead leguminous pods and
1372 treated as in *Chytridiales* (Voos and Olive 1968). The
1373 genus lacks DNA sequences in GenBank (accession date
1374 29.06.2018) thus the erection was based only on mor-
1375 phology and habitat. Currently the phylum comprises one
1376 class, one order, one family and one genus.

1377 Note for genus

1378 *Caulochytrium* Voos & L.S. Olive 1968, *Caulochytri-*
1379 *aceae*, *Caulochytriales*, *Caulochytriomycetes*,
1380 *Caulochytriomycota*, two species, type: *C. gloeosporii*
1381 Voos & L.S. Olive, saprobes, USA, see Kirk et al. (2013;
1382 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 *Chytrid-*
iomycota 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. *Chytrid-*
iomycetes Caval.-Sm. (including three orders) and *Mono-*
blepharidomycetes 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 *incer-*
tae sedis, one species, type: *A. entophytum* Schenk, para-
sitic, aquatic, cosmopolitan, see Kirk et al. (2013; genus
accepted), cultures and sequences are unavailable.

Algochytrrops Doweld 2014i, *Lobulomycetales* genera *in-*
certae 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 (= *Al-*
lochytridium 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, *Alogomyc-*
etaceae, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomy-*
cota, one species, type: *A. tanneri* D.R. Simmons &
Letcher, from horse manure, USA, see Simmons et al.
(2012; taxonomy), Doweld (2014b; introduced *Alogomyc-*
etaceae), cultures and sequences are available.

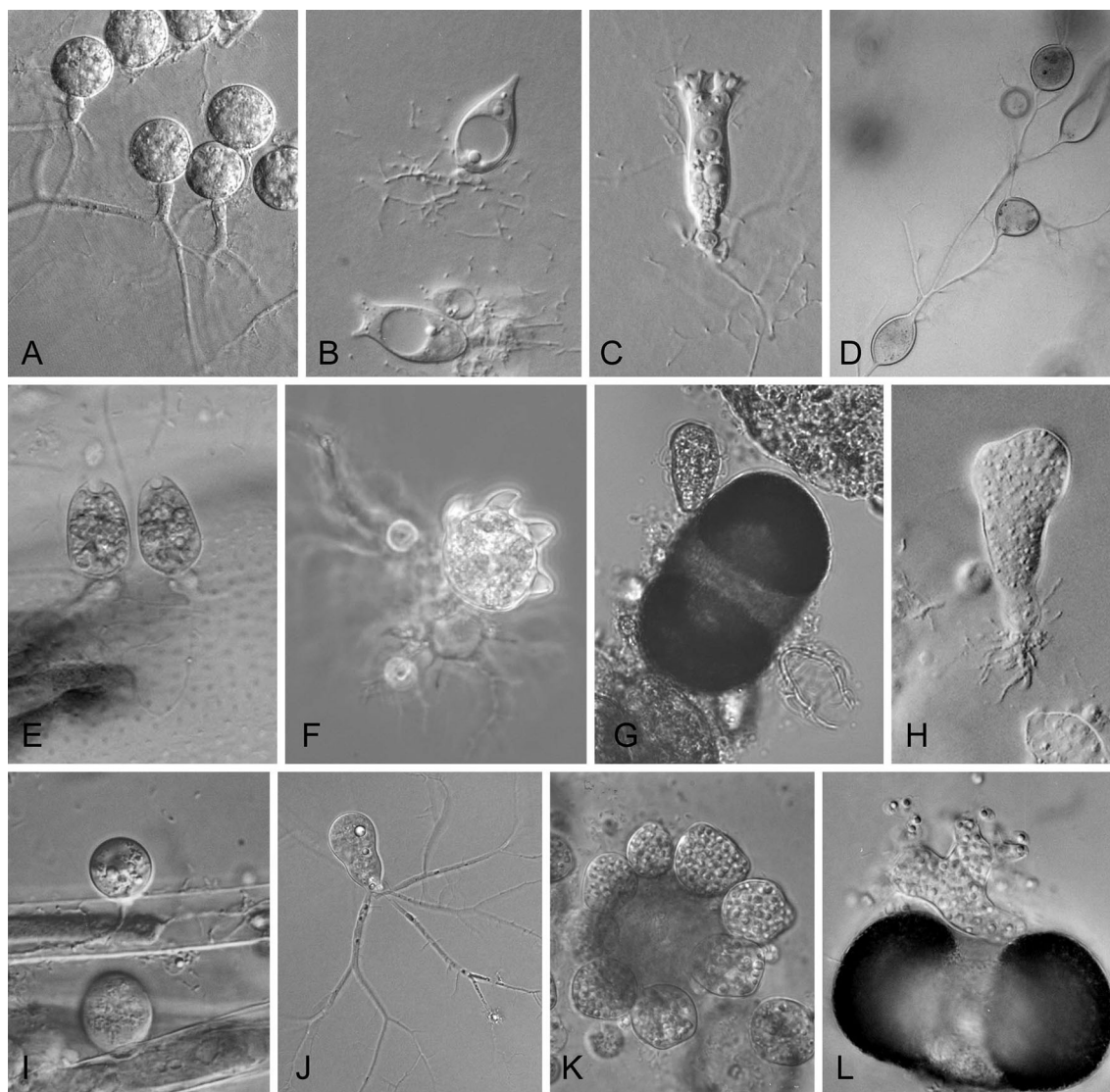


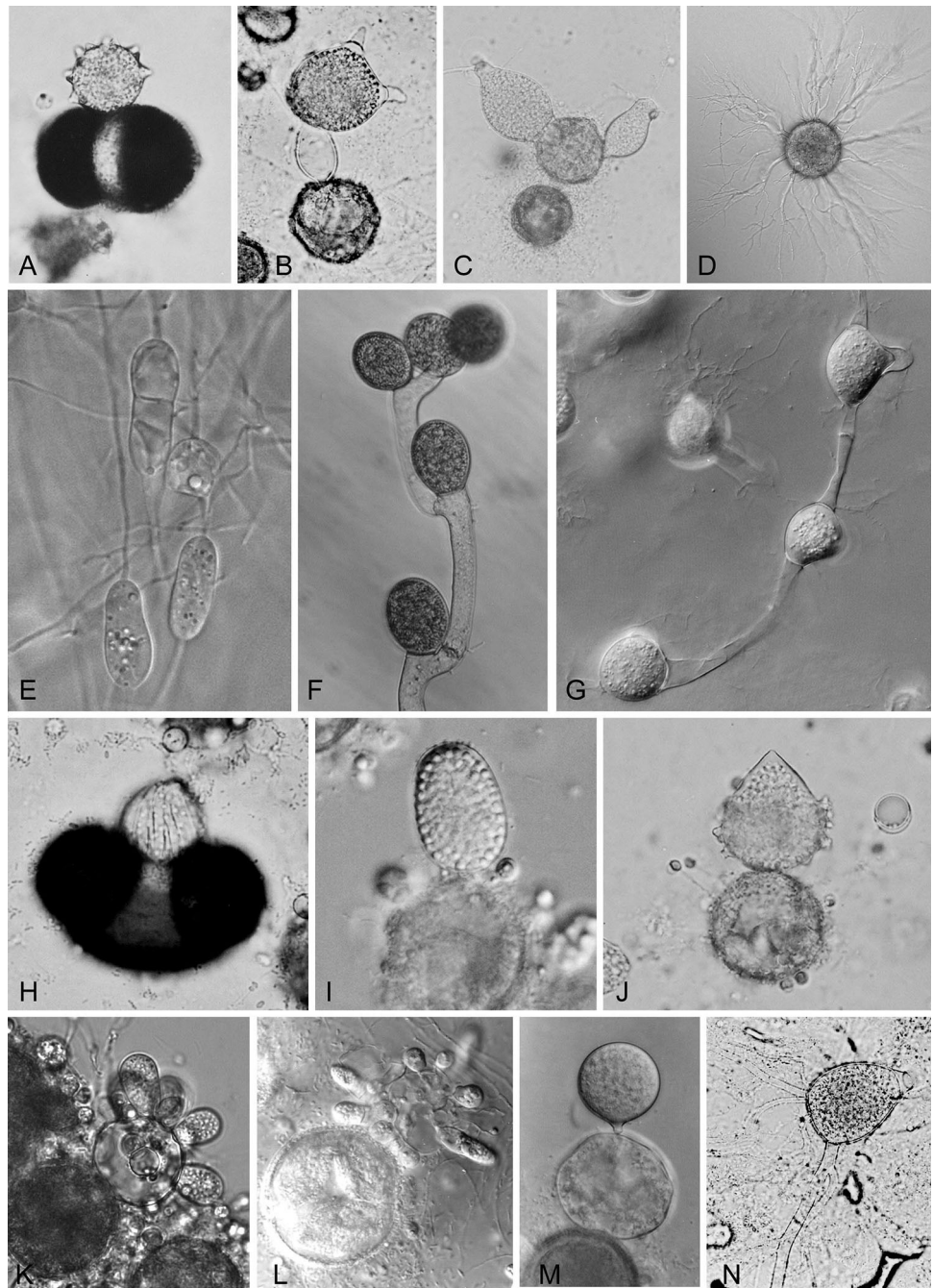
Fig. 3 A–D Chytriomycetaceae, Chytridiales. A *Chytriomycetes hyalinus*. B *Obelidium mucronatum*. C *Podochytrium dentatum*. D *Physocladia obscura*. E, F Chytridiaceae, Chytridiales. E *Phlyctochytrium planicorne*. F *Phlyctochytrium bullatum*. G, H Lobulomycetales.

G *Lobulomyces poculatus*. H *Lobulomyces angularis*. I–L Rhizophydiales. I *Rhizophydium globosum*. J *Operculomyces laminatus*. K *Terramyces subangulosus*. L *Coralloidiomyces digitatus*

1431 **Alphamyces** Letcher 2008, *Alphamycetaceae*, *Rhizophydiales*, *Rhizophyidiomycetes*, *Chytridiomycota*, one species, 1445
 1432 type: *A. chaetifer* (Sparrow) Letcher, on pollen, Argentina, 1446
 1433 see Letcher et al. (2008c, 2012a, b; taxonomy), Akinwole 1447
 1434 et al. (2014; fatty acids), cultures and sequences are 1448
 1435 available. 1449
 1436
 1437 **Amoebochytrium** Zopf 1884, *Amoebochytriaceae*, 1450
 1438 *Chytridiomycetes* families *incertae sedis*, *Chytridiomycota*, 1451
 1439 one species, type: *A. rhizidioides* Zopf, from soil, cosmopolitan, see Kirk et al. (2013; genus accepted), Doweld 1452
 1440 (2014c; introduced *Amoebochytriaceae*), cultures and 1453
 1441 sequences are unavailable. 1454
 1442
 1443 **Angulomyces** Letcher 2008, *Angulomycetaceae*, *Rhizophydiales*, *Rhizophyidiomycetes*, *Chytridiomycota*, one 1455
 1444 species, type: *A. argentinensis* Letcher, from submersed 1456
 1445 mud, cosmopolitan, see Letcher et al. (2008b; taxonomy), 1457
 1446 Davis et al. (2013; from Alabama), cultures and sequences 1458
 1447 are available, ITS of the type culture NR_119644.

1449 **Aphanistis** Sorokĭn 1883, *Chytridiomycetes* genera *incertae sedis*, *Chytridiomycota*, two species, type: needs typification, Asia, see Kirk et al. (2013; genus accepted), cultures and sequences are unavailable. 1452
 1453 **Aquamyces** Letcher 2008, *Aquamycetaceae*, *Rhizophydiales*, *Rhizophyidiomycetes*, *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. 1457
 1458

Fig. 4 **A, B** *Spizellomyces* -etaceae, *Spizellomycetales*.
A *Spizellomyces punctatus*.
B *Phlyctochytrium reinboldiae*.
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 *Blyttomyces helicis*.
I *Polyphlyctis cystofera*.
J *Phlyctochytrium mucronatum*.
K *Chytridium rhizophydii*.
L *Septosperma rhizophydii*.
M *Rhizophyidium obpyriformis*.
N *Rhizophlyctis ingoldii*



1459 *Arizonaphlyctis* Letcher 2008, *Arizonaphlyctidaceae*, *Rhi-*
 1460 *zophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomycota*,
 1461 one species, type: *A. lemmonensis* Letcher, USA, see
 1462 Letcher et al. (2008a; taxonomy, phylogeny), cultures and
 1463 sequences are available, ITS of the type culture EU379214.
 1464 *Arkaya* Longcore & D.R. Simmons 2012, *Arkayaceae*,
 1465 *Polychytriales*, *Polychytriomycetes*, *Chytridiomycota*, two
 1466 species, type: *A. lepida* Longcore & D.R. Simmons, USA,
 1467 see Longcore and Simmons (2012; taxonomy, phylogeny),
 1468 cultures and sequences are available.

Asterophlyctis H.E. Petersen 1903, *Asterophlyctaceae*,
 1469 *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, two
 1470 species, type species. *A. sarcoptoides* H.E. Petersen, see
 1471 Vélez et al. (2011, taxonomy, phylogeny), Doweld (2014e;
 1472 introduced *Asterophlyctaceae*), cultures and sequences
 1473 available.

Avachytrium Vélez & Letcher 2013, *Chytriomycetaceae*,
 1475 *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, two
 1476 species, type: *A. platense* Vélez & Letcher, USA, see Vélez
 1477 et al. (2013; taxonomy, phylogeny), Letcher et al. (2014;
 1478

- 1479 DNA), cultures and sequences are available, ITS of the
1480 type culture NR_111808.
- 1481 **Barromyces** M.J. Powell & Letcher 2018, *Spizellomyc-*
1482 *etaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomy-*
1483 *cota*, one species, type: *B. tenuis* (D.J.S. Barr) M.J. Powell
1484 & Letcher, from soil, USA, see Powell et al. (2018; tax-
1485 onomy), ITS of type culture FJ827713.
- 1486 **Batrachochytrium** Longcore, Pessier & D.K. Nichols
1487 1999, *Batrachochytriaceae*, *Rhizophydiales*, *Rhizophy-*
1488 *diomycetes*, *Chytridiomycota*, two species, type: *B. den-*
1489 *drobatidis* Longcore, Pessier & D.K. Nichols, from skin of
1490 amphibians, USA, The Netherlands, see Fisher et al. (2009;
1491 amphibian chytridiomycosis), Van Rooij et al. (2012;
1492 amphibian pathogens), Blooi et al. (2013; real time PCR),
1493 Doweld (2013b; *Batrachochytriaceae*), Martel et al. (2013;
1494 new species, phylogeny), Dillon et al. (2017; pathogens),
1495 cultures and sequences are available.
- 1496 **Bertramia** Mesnil & Caullery 1897, *Chytridiomycetes*
1497 *genera incertae sedis*, *Chytridiomycota*, six species, type:
1498 *B. capitellae* Mesnil & Caullery, in annelids, Europe, see
1499 Kirk et al. (2013; genus accepted), cultures and sequences
1500 are unavailable.
- 1501 **Betamyces** Letcher 2011, *Alphamycetaceae*, *Rhizophydi-*
1502 *ales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species,
1503 type: *A. americaemerdionalis* Letcher, Vélez, Schultz &
1504 M.J. Powell, on pollen, Argentina, see Letcher et al. (2011;
1505 taxonomy), cultures and sequences are available, ITS of the
1506 type culture EF585664.
- 1507 **Blyttomyces** A.F. Bartsch 1939, *Chytridiomycetes* *genera*
1508 *incertae sedis*, *Chytridiomycota*, eleven species, type: *B.*
1509 *spinulosus* (A. Blytt) A.F. Bartsch, saprobes, aquatic,
1510 worldwide, see Blackwell et al. (2011; reported from
1511 Alabama and Argentina, notes), Kirk et al. (2013; genus
1512 accepted), cultures and sequences are unavailable.
- 1513 **Boothiomyces** Letcher 2006, *Terramycetaceae*, *Rhizophy-*
1514 *diales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species,
1515 type: *B. macroporosum* (Karling) Letcher, from soil, ter-
1516 restrial, New Zealand, see Davis et al. (2013; DNA,
1517 reported from Alabama), cultures and sequences are
1518 available, ITS of the type culture NR_119591.
- 1519 **Borealophlyctis** Letcher 2008, *Borealophlyctidaceae*,
1520 *Rhizophlyctidales*, *Rhizophlyctidomycetes*, *Chytridiomy-*
1521 *cota*, two species, type: *B. paxensis* Letcher, from soil, on
1522 pollen, terrestrial, USA, see Letcher et al. (Letcher et al.
1523 2008c; taxonomy), Davis et al. (2016a, b; new species),
1524 cultures and sequences are available, ITS of the type cul-
1525 ture NR_111314.
- 1526 **Brevicalcar** Letcher & M.J. Powell 2018, *Spizellomyc-*
1527 *etaceae*, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomy-*
1528 *cota*, one species, type: *B. kilaueaense* Letcher and M.J.
1529 Powell, from soil, on pollen, terrestrial, Hawaii, see
1530 Letcher and Powell (2018; taxonomy), cultures and
1531 sequences are available.
- Bulbosomyces** Letcher & Longcore 2018, *Spizellomyc-*
etaceae, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomy-*
cota, 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), cul-
tures 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.
- Chytriomycetes** 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*, *Lobu-*
lomycetales, *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 spe-
cies, type: *C. consuens* K.N. Deckenb., saprobes, cos-
mopolitan, see Kirk et al. (2013; genus accepted), cultures
and sequences are available.
- Coleospora** Gibbs 1959, *Nephridiophagaceae*, *Nephridio-*
phagales, *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),

- 1585 Doweld (2014d; introduced *Coralloidiomycetaceae*),
1586 Powell et al. (2015; phylogeny), cultures and sequences are
1587 available.
- 1588 **Cyclopsomyces** K. Seto & Degawa 2015, *Lobulomyc-*
1589 *etaceae*, *Lobulomycetales*, *Lobulomycetes*, *Chytridiomy-*
1590 *cota*, one species, type: *C. plurioperculatus* K. Seto &
1591 Degawa, saprobes, Asia, see Seto et al. (2015; taxonomy,
1592 phylogeny), cultures and sequences are available.
- 1593 **Cylindrochytridium** Karling 1941, *Cladochytriales* genera
1594 *incertae sedis*, *Cladochytriomycetes*, *Chytridiomycota*, two
1595 species, type: *C. johnstonii* Karling, saprobes, cosmopoli-
1596 tan, see Kirk et al. (2008) accepted the genus but Kirk et al.
1597 (2013) did not list the genus, Steiger et al. (2012; phy-
1598 logeny, accepted as in *Cladochytriales*).
- 1599 **Dangeardia** Schröd. 1898, *Chytridiomycetes* genera *in-*
1600 *certae sedis*, *Chytridiomycota*, six species, type: *D.*
1601 *mamillata* Schröd., saprobes, cosmopolitan, see Kirk et al.
1602 (2013; genus accepted), cultures and sequences are
1603 unavailable.
- 1604 **Dangeardiana** Valkanov ex A. Batko 1970 (= *Dangear-*
1605 *diana* Valkanov 1964), *Chytridiomycetes* genera *incertae*
1606 *sedis*, *Chytridiomycota*, two species, type: *D. eudorinae*
1607 Valkanov ex A. Batko, saprobes, Europe, see Kirk et al.
1608 (2013; genus accepted), cultures and sequences are
1609 unavailable.
- 1610 **Delfinachytrium** Vélez & Letcher 2013, *Chytridiales*
1611 genera *incertae sedis*, *Chytridiomycetes*, *Chytridiomycota*,
1612 one species, type: *D. mesopotamicum* Vélez & Letcher,
1613 from marsh of semipermanent stream, Argentina, see Vélez
1614 et al. (2013; genus accepted), cultures and sequences are
1615 available.
- 1616 **Dendrochytridium** Letcher, Longcore & M.J. Powell 2014,
1617 *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytrid-*
1618 *iomycota*, one species, type: *D. crassum* Letcher, Longcore
1619 & M.J. Powell, saprobes, Argentina, see Letcher et al.
1620 (2014; taxonomy, phylogeny), cultures and sequences are
1621 available.
- 1622 **Dictyomorpha** Mullins 1961, *Chytridiomycetes* genera *in-*
1623 *certae sedis*, *Chytridiomycota*, two species, type: *D. dioica*
1624 Couch ex Mullins, insect pathogens, USA, see Kirk et al.
1625 (2013; genus accepted), Blackwell et al. (2017; taxonomy),
1626 cultures and sequences are unavailable.
- 1627 **Dinomyces** Karpov & Guillou 2014, *Dinomycetaceae*,
1628 *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*,
1629 one species, type: *D. arenysensis* Karpov & Guillou, from
1630 *Alexandrium*, Europe, see Lepelletier et al. (2014; taxon-
1631 omy), Gleason et al. (2015; parasitic on harmful algal
1632 blooms), Jephcott et al. (2016; impact on harmful algal
1633 blooms), cultures and sequences are available.
- 1634 **Diplophlyctis** J. Schröt. 1892 (= *Asterophlyctis* H.E.
1635 Petersen 1903), *Endochytriaceae*, *Cladochytriales*,
1636 *Cladochytriomycetes*, *Chytridiomycota*, twelve species,
1637 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*, *Synchytri-*
ales, *Synchytriomycetes*, *Chytridiomycota*, one species,
type: *E. formosum* Canter, parasitic on desmids, cos-
mopolitan, 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 accep-
ted), Wang et al. (2017b; in soil), cultures and sequences
are available.
- Fayochytriomycetes** 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. (2015a, b; taxonomy),
cultures and sequences are available.
- Fimicolochytrium** D.R. Simmons & Longcore 2012,
Powellomycetaceae, *Spizellomycetales*, *Spizellomycetes*,
Chytridiomycota, one species, type: *F. jonesii* D.R. Sim-
mons & Longcore, on manure, USA, see Simmons and
Longcore (2012; taxonomy), cultures and sequences are
available.
- Gaertneriomycetes** 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, *Spizellomyc-*
etaceae, *Spizellomycetales*, *Spizellomycetes*, *Chytridiomy-*
cota, 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*, *Rhizophy-*
diales, *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.

- 1691 **Geranomyces** D.R. Simmons 2011, *Powellomycetaceae*,
1692 *Spizellomycetales*, *Spizellomyces*, *Chytridiomycota*, four
1693 species, type: *G. variabilis* (Longcore, D.J.S. Barr &
1694 Désauln.) D.R. Simmons, from soil, on manure, USA, see
1695 Simmons (2011; taxonomy, phylogeny), Simmons and
1696 Longcore (2012; new species), cultures and sequences are
1697 available.
- 1698 **Globomyces** Letcher 2008, *Globomycetaceae*, *Rhizophy-*
1699 *diales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species,
1700 type: *G. pollinis-pini* (A. Braun) Letcher, saprobes, cos-
1701 mopolitan, see Letcher et al. (2008c; taxonomy, phy-
1702 logeny), Davis et al. (2013; in Alabama), cultures and
1703 sequences are available.
- 1704 **Gorgonomyces** Letcher 2008, *Gorgonomycetaceae*, *Rhi-*
1705 *zophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one
1706 species, type: *G. haynaldii* (Schaarschm.) Letcher, sap-
1707 robes, cosmopolitan, see Letcher et al. (2008c; taxonomy,
1708 phylogeny), Davis et al. (2013; in Alabama), Powell et al.
1709 (2015; phylogeny), cultures and sequences are available.
- 1710 **Gromochytrium** Karpov & Aleoshin 2014, *Gromochytri-*
1711 *aceae*, *Gromochytriales*, *Mesochytriomycetes*, *Chytrid-*
1712 *iomycota*, one species, type: *G. mamkaevae* Karpov &
1713 Aleoshin, parasites, Russia, see Karpov et al. (2014; tax-
1714 onomy, phylogeny), cultures and sequences are available,
1715 ITS of the type species NR_132054.1.
- 1716 **Halomyces** Letcher & M.J. Powell 2015, *Halomycetaceae*,
1717 *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*,
1718 one species, type: *H. littoreus* (Amon) Letcher & M.J.
1719 Powell, saprobes, marine, cosmopolitan, see Letcher et al.
1720 (2015a; taxonomy, phylogeny), cultures and sequences are
1721 available.
- 1722 **Homolaphlyctis** Longcore, Letcher & T.Y. James 2011,
1723 *Rhizophydiales* genera *incertae sedis*, *Rhizophydiomycetes*,
1724 *Chytridiomycota*, one species, type: *H. polyrhiza* Longcore,
1725 Letcher & T.Y. James, saprobes, from acidic lake, USA,
1726 see Longcore et al. (2011; taxonomy), cultures and
1727 sequences are available.
- 1728 **Ichthyochytrium** Plehn 1920, *Chytridiomycetes* genera
1729 *incertae sedis*, *Chytridiomycota*, one species, type: *I. vul-*
1730 *gare* Plehn, saprobes, Europe, see Kirk et al. (2013; genus
1731 accepted), cultures and sequences are unavailable.
- 1732 **Irineochytrium** Letcher, Longcore & M.J. Powell 2014,
1733 *Chytridiaceae*, *Chytridiales*, *Chytridiomycetes*, *Chytrid-*
1734 *iomycota*, one species, type: *I. annulatum* (Dogma)
1735 Letcher, Longcore & M.J. Powell, saprobes, see Letcher
1736 (2014; nomenclature correction), cultures and sequences
1737 are available.
- 1738 **Johnkarlingia** Pavgi & S.L. Singh 1979, *Synchytriaceae*,
1739 *Synchytriales*, *Synchytriomycetes*, *Chytridiomycota*, one
1740 species, type: *J. brassicae* S.L. Singh & Pavgi, saprobes,
1741 India, see Kirk et al. (2013; genus accepted), cultures and
1742 sequences are unavailable.
- Kappamyces** Letcher & M.J. Powell 2005, *Kappamyc-*
etaceae, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytrid-*
iomycota, 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.
- Karlingomyces** Sparrow 1960, *Polychytriaceae*, *Polychy-*
triales, *Polychytriomycetes*, *Chytridiomycota*, c. six spe-
cies, 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, *Spizellomyces*, *Chytridiomycota*, one
species, type: *K. dichotomus* (Umphlett) D.J.S. Barr, sap-
robes, 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*, *Poly-*
chytriales, *Polychytriomycetes*, *Chytridiomycota*, one spe-
cies, 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, phy-
logeny), 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

- 1796 Karpov et al. (2010, 2014; phylogeny), cultures and
1797 sequences are available.
- 1798 **Micromyces** P.A. Dang. 1889 (= *Micromycopsis* Scherff.
1799 1926), *Synchytriales* genera *incertae sedis*, *Synchytri-*
1800 *omycetes*, *Chytridiomycota*, c. 13 species, type: *M.*
1801 *zygonii* P.A. Dang., on algae, Europe, see Kirk et al.
1802 (2013; genus accepted), cultures and sequences are
1803 unavailable.
- 1804 **Mitochytridium** P.A. Dang. 1911, *Chytridiomycetes* genera
1805 *incertae sedis*, *Chytridiomycota*, two species, type: *M.*
1806 *ramosum* P.A. Dang., cosmopolitan, see Kirk et al. (2013;
1807 genus accepted), cultures and sequences are unavailable.
- 1808 **Mucophilus** Plehn 1920, *Chytridiomycetes* genera *incertae*
1809 *sedis*, *Chytridiomycota*, one species, type: *M. cyprini*
1810 Plehn, in fishes, Europe, see Kirk et al. (2013; genus
1811 accepted), cultures and sequences are unavailable.
- 1812 **Myiophagus** Thaxt. ex Sparrow 1939, *Chytridiales* genera
1813 *incertae sedis*, *Chytridiomycetes*, *Chytridiomycota*, one
1814 species, type: *M. ucrainicus* (Wize) Sparrow, in fishes,
1815 Europe, USA, Colombia, see Kirk et al. (2013; genus
1816 accepted), cultures and sequences are unavailable.
- 1817 **Neokarlingia** Longcore & D.R. Simmons 2012, *Polychy-*
1818 *triaceae*, *Polychytriales*, *Polychytriomycetes*, *Chytrid-*
1819 *iomycota*, one species, type: *N. chitinophila* (Karling)
1820 Longcore & D.R. Simmons, USA, see Longcore and
1821 Simmons (2012; taxonomy), cultures and sequences are
1822 available
- 1823 **Nephridiophaga** Ivanić 1937, *Nephridiophagaceae*,
1824 *Nephridiophagales*, *Chytridiomycetes*, *Chytridiomycota*,
1825 13 species, type: *N. apis* Ivanić, insect parasites, world-
1826 wide, see Radek et al. (2011, 2017; new species), cultures
1827 of infected hosts and sequences are available
- 1828 **Nephrochytrium** Karling 1938, *Cladochytriales* genera
1829 *incertae sedis*, *Cladochytriomycetes*, *Chytridiomycota*,
1830 three species, type: *N. appendiculatum* Karling, cos-
1831 mopolitan, see Mozley-Standridge et al. (2009; DNA),
1832 Kirk et al. (2013; genus accepted), cultures and sequences
1833 are available
- 1834 **Nowakowskia** Borzí 1885, *Chytridiomycetes* genera *in-*
1835 *certae sedis*, *Chytridiomycota*, one species, type: *N. hor-*
1836 *mothecae* Borzí, saprobes, Europe, see Kirk et al. (2013;
1837 genus accepted), cultures and sequences are unavailable
- 1838 **Nowakowskiella** J. Schröt. 1893, *Nowakowskiellaceae*,
1839 *Cladochytriales*, *Cladochytriomycetes*, *Chytridiomycota*, c.
1840 15 species, type: *N. elegans* (Nowak.) J. Schröt., saprobes,
1841 Europe, see Kirk et al. (2013; genus accepted), cultures and
1842 sequences are available
- 1843 **Obelidium** Nowak. 1877, *Chytriomycetaceae*, *Chytridi-*
1844 *ales*, *Chytridiomycetes*, *Chytridiomycota*, three species,
1845 type: *O. mucronatum* Nowak., on mosquito larva, Europe,
1846 see Blackwell et al. (2012; review), Kirk et al. (2013; genus
1847 accepted), cultures and sequences are available
- Odontochytrium** Vélez & Letcher 2013, *Chytriomyc-*
etaceae, *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 *in-*
certae sedis, *Chytridiomycota*, three species, type: *O. brassi-*
cae (Woronin) Doweld, parasitic, cosmopolitan, see
Doweld et al. (2014; taxonomy), cultures and sequences
are unavailable.
- Operculomyces** M.J. Powell, Letcher & Longcore 2011,
Operculomycetaceae, *Rhizophydiales*, *Rhizophy-*
diomycetes, *Chytridiomycota*, one species, type: *O. lami-*
natus 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, *Halomyc-*
etaceae, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytrid-*
iomycota, one species, type: *P. mangrovei* (Ulken) Letcher
& M.J. Powell, marine, see Letcher et al. (2015a; taxon-
omy), cultures and sequences are available, ITS of the type:
NR_138404.
- Paranomyces** Letcher & M.J. Powell 2015, *Halomyc-*
etaceae, *Rhizophydiales*, *Rhizophydiomycetes*, *Chytrid-*
iomycota, 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*, *Rhizophy-*
diales, *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*, *Nephridi-*
ophagales, *Chytridiomycetes*, *Chytridiomycota*, one species,
type: *P. hyalinus* Léger, insect parasites, cultures and
sequences are unavailable.
- Pendulichytrium** K. Seto & Degawa 2017, *Chytriomyc-*
etaceae, *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*,
one species, type: *P. sphaericum* K. Seto & Degawa,
saprobes, Japan, see Seto and Degawa (2017; taxonomy),
cultures and sequences are available, ITS of the type:
LC223124.
- Perolpidium** Doweld 2014, *Chytridiomycetes* genera *in-*
certae sedis, *Chytridiomycota*, one species, type: *P. sac-*
catum (Sorokīn) Doweld, saprobes, see Doweld (2014m;
taxonomy), cultures and sequences are unavailable.

- 1901 **Phlyctochytrium** J. Schröt. 1892, *Phlyctochytriaceae*
 1902 *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, c. 35
 1903 species, type: *P. hydrodictyi* (A. Braun) J. Schröt., sap-
 1904 robes, see Letcher et al. (2012a, b; DNA), Kirk et al. (2013;
 1905 genus accepted), cultures and sequences are available.
- 1906 **Phlyctorhiza** A.M. Hanson 1946, *Phlyctorhizaceae*,
 1907 *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one
 1908 species, type: *P. endogena* A.M. Hanson, saprobes, on
 1909 insect remains, USA, see Kirk et al. (2013; genus accep-
 1910 ted), cultures and sequences are available.
- 1911 **Physocladia** Sparrow 1932, *Chytriomycetaceae*, *Chytridi-*
 1912 *ales*, *Chytridiomycetes*, *Chytridiomycota*, one species,
 1913 type: *P. obscura* (Sparrow) Sparrow, saprobes, on insect
 1914 remains, USA, see Picard et al. (2009; phylogeny), Kirk
 1915 et al. (2013; genus accepted), cultures and sequences are
 1916 available.
- 1917 **Physorhizophidium** Scherff. 1926, *Chytridiomycetes* genera
 1918 *incertae sedis*, *Chytridiomycota*, one species, type: *P.*
 1919 *pachydermum* Scherff., on diatoms, USA, see Kirk et al.
 1920 (2013; genus accepted), cultures and sequences are
 1921 unavailable.
- 1922 **Plasmophagus** De Wild. 1895, *Chytridiomycetes* genera
 1923 *incertae sedis*, *Chytridiomycota*, one species, type: *P.*
 1924 *oedogoniorum* De Wild., in algae, Europe, see Kirk et al.
 1925 (2013; genus accepted), cultures and sequences are
 1926 unavailable.
- 1927 **Podochytrium** Pfitzer 1870, *Chytriomycetaceae*, *Chytridi-*
 1928 *ales*, *Chytridiomycetes*, *Chytridiomycota*, seven species,
 1929 type: *P. clavatum* Pfitzer, worldwide, see Kirk et al. (2013;
 1930 genus accepted), Blooi et al. (2013; growing media), cul-
 1931 tures and sequences are available.
- 1932 **Polychytrium** Ajello 1942, *Polychytriaceae*, *Polychytri-*
 1933 *ales*, *Polychytriomycetes*, *Chytridiomycota*, one species,
 1934 type: *P. aggregatum* Ajello, saprobes, USA, see Kirk et al.
 1935 (2013; genus accepted), cultures and sequences are avail-
 1936 able, ITS from reference material NR_119549 (*vide* James
 1937 et al. 2006).
- 1938 **Polyphagus** Nowak. 1877, *Polyphagaceae*, *Polyphagales*,
 1939 *Chytridiomycetes*, *Chytridiomycota*, ten species, type: *P.*
 1940 *euglenae* (Bail) Nowak., saprobes, worldwide, see Kirk
 1941 et al. (2013; genus accepted), Doweld (2014n; new spec-
 1942 ies), cultures and sequences are unavailable.
- 1943 **Polyphlyctis** Karling 1968, *Chytridiaceae*, *Chytridiales*,
 1944 *Chytridiomycetes*, *Chytridiomycota*, two species, type: *P.*
 1945 *unispina* (R.A. Paterson) Karling, saprobes, cosmopolitan,
 1946 see Vélez et al. (2011; DNA), Kirk et al. (2013; genus
 1947 accepted), cultures and sequences are available.
- 1948 **Powellomyces** Longcore, D.J.S. Barr & Désauln. 1995,
 1949 *Powellomycetaceae*, *Spizellomycetales*, *Spizellomycetes*,
 1950 *Chytridiomycota*, one species, type: *P. hirtus* Longcore,
 1951 D.J.S. Barr & Désauln., saprobes, Canada, see Simmons
 1952 (2011; DNA, phylogeny, proposed *Powellomycetaceae*),
 Kirk et al. (2013; genus accepted), cultures and sequences
 are available.
- Protrudomyces** Letcher 2008, *Protrudomycetaceae*, *Rhi-*
zophydiales, *Rhizophyidiomycetes*, *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 *in-*
certae 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 *in-*
certae sedis, *Chytridiomycota*, one species, type: *R. ana-*
nasi Sideris, saprobes, Hawaii, see Kirk et al. (2013; genus
 accepted), cultures and sequences are unavailable.
- Rhizidium** A. Braun 1856, *Chytriomycetaceae*, *Chytridi-*
ales, *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*, *Rhi-*
zophlyctidiales, *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, *Rhizophydiales*,
Rhizophyidiomycetes, *Chytridiomycota*, c.
 110 species, type: *R. globosum* (A. Braun) Rabenh., sap-
 robes, 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 & 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 *in-*
certae sedis, *Chytridiomycota*, three species, type: *R.*
crassum Scherff., parasitic, worldwide, see Kirk et al.

- 2006 (2013; genus accepted), Doweld (2014o; new species),
2007 cultures and sequences are unavailable.
- 2008 **Rhopalophlyctis** Karling 1945, *Chytridiomycetes* genera
2009 *incertae sedis*, *Chytridiomycota*, one species, type: *R.*
2010 *sarcoptoides* Karling, parasitic, America, see Kirk et al.
2011 (2013; genus accepted), cultures and sequences are
2012 unavailable.
- 2013 **Riethophlyctis** Doweld 2014, *Chytridiomycetes* genera *in-*
2014 *certae sedis*, *Chytridiomycota*, one species, type: *R. vau-*
2015 *cheriae* Doweld, Europe, see Doweld (2014p; taxonomy),
2016 cultures and sequences are unavailable.
- 2017 **Saccomyces** Serbinow 1907, *Chytridiomycetes* genera *in-*
2018 *certae sedis*, *Chytridiomycota*, two species, type: *S. dan-*
2019 *geardii* Serbinow, Europe, see Kirk et al. (2013; genus
2020 accepted), cultures and sequences are unavailable.
- 2021 **Saccopodium** Sorokīn 1877, *Saccopodiaceae*, *Saccopodi-*
2022 *ales*, *Chytridiomycetes*, *Chytridiomycota*, one species,
2023 type: *S. gracile* Sorokīn, Asia, see Kirk et al. (2013; genus
2024 accepted), cultures and sequences are unavailable.
- 2025 **Sagittospora** Lubinsky 1955, *Chytridiomycetes* genera *in-*
2026 *certae sedis*, *Chytridiomycota*, one species, type: *S.*
2027 *cameronii* Lubinsky, on *Eudiplodinium*, Asia, see Kirk
2028 et al. (2013; genus accepted), cultures and sequences are
2029 unavailable.
- 2030 **Scherffeliomyces** Sparrow 1934, *Scherffeliomycetaceae*,
2031 *Chytridiales*, *Chytridiomycetes*, *Chytridiomycota*, one
2032 species, type: *S. parasitans* (Sparrow) Sparrow, cos-
2033 mopolitan, see Kirk et al. (2013; genus accepted), cultures
2034 and sequences are unavailable.
- 2035 **Scherffeliomycopsis** Geitler 1962, *Chytridiomycetes* gen-
2036 *era incertae sedis*, *Chytridiomycota*, one species, type: *S.*
2037 *coleochaetes* Geitler, on algae, Europe, see Kirk et al.
2038 (2013; genus accepted), cultures and sequences are
2039 unavailable.
- 2040 **Schizolpidium** Doweld 2014, *Chytridiomycetes* genera *in-*
2041 *certae sedis*, *Chytridiomycota*, one species, type: *S. majus*
2042 (Ivimey Cook & W.B. Collins) Doweld, on cucumber, see
2043 Doweld et al. (2014q; taxonomy), cultures and sequences
2044 are unavailable.
- 2045 **Septochytrium** Berdan 1939, *Septochytriaceae*, *Cladochy-*
2046 *triales*, *Cladochytriomycetes*, *Chytridiomycota*, five spe-
2047 cies, type: *S. variabile* Berdan, on grass, USA, see Kirk
2048 et al. (2013; genus accepted), cultures and sequences are
2049 available.
- 2050 **Septolpidium** Sparrow 1933, *Chytridiomycetes* genera *in-*
2051 *certae sedis*, *Chytridiomycota*, one species, type: *S. lineare*
2052 Sparrow, in diatoms, Europe, see Kirk et al. (2013; genus
2053 accepted), cultures and sequences are available.
- 2054 **Septosperma** Whiffen ex R.L. Seym. 1971, *Chytrid-*
2055 *iomycetes* genera *incertae sedis*, *Chytridiomycota*, four
2056 species, type: *S. anomalum* (Couch) Whiffen ex R.L.
2057 Seym., on chytrids, Europe, see Kirk et al. (2013; genus
2058 accepted), cultures and sequences are unavailable.
- Siphonaria** H.E. Petersen 1903, *Chytriomycetaceae*, 2059
Chytridiales, *Chytridiomycetes*, *Chytridiomycota*, three 2060
species, type: *S. variabilis* H.E. Petersen, on chytrids, 2061
Europe, see Kirk et al. (2013; genus accepted), cultures and 2062
sequences are unavailable. 2063
- Solutoparies** Whiffen ex W.H. Blackw. & M.J. Powell 2064
1998, *Chytridiomycetes* genera *incertae sedis*, *Chytrid-*
2065 *iomycota*, four species, type: *S. pythii* Whiffen ex W.H.
2066 Blackw. & M.J. Powell, on chytrids, Europe, see Kirk et al.
2067 (2013; genus accepted), cultures and sequences are 2068
unavailable. 2069
- Sonoraphlyctis** Letcher 2008, *Sonoraphlyctidaceae*, *Rhi-*
2070 *zophlyctidiales*, *Rhizophlyctidomycetes*, *Chytridiomycota*,
2071 one species, type: *S. ranzonii* Letcher, saprobes, USA, see
2072 Letcher et al. (2008a; taxonomy), cultures and sequences
2073 are available, ITS of the type NG_042454. 2074
- Sorokinocystis** Doweld 2014, *Chytridiomycetes* genera
2075 *incertae sedis*, *Chytridiomycota*, one species, type: *S.*
2076 *mirabilis* (Sorokīn) Doweld, saprobes, see Doweld et al.
2077 (2014r; taxonomy), cultures and sequences are unavailable. 2078
- Sparrowia** Willoughby 1963, *Sparrowiaceae*, *Chytrid-*
2079 *iomycetes* families *incertae sedis*, *Chytridiomycota*, four
2080 species, type: *S. parasitica* Willoughby, on fungi, Europe,
2081 see Kirk et al. (2013; genus accepted), cultures and
2082 sequences are unavailable. 2083
- Spizellomyces** D.J.S. Barr 1980, *Spizellomycetaceae*,
2084 *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, eight
2085 species, type: *S. punctatus* (W.J. Koch) D.J.S. Barr, sap-
2086 robes, worldwide, see Freeman et al. (2009; occurrence),
2087 Kirk et al. (2013; genus accepted), Russ et al. (2016;
2088 genome sequence), Ahrendt et al. (2017; biotechnology),
2089 Hérivaux et al. (2017; biotechnology), cultures and
2090 sequences are available, ITS of the type: NR_111189. 2091
- Sporophlyctidium** Sparrow 1933, *Chytridiomycetes* genera
2092 *incertae sedis*, *Chytridiomycota*, two species, type: *S.*
2093 *africanum* Sparrow, on algae, Morocco, see Kirk et al.
2094 (2013; genus accepted), cultures and sequences are
2095 unavailable. 2096
- Sporophlyctis** Serbinow 1900, *Chytridiomycetes* genera
2097 *incertae sedis*, *Chytridiomycota*, one species, type: *S. ros-*
2098 *trata* Serbinow, on algae, Asia, see Kirk et al. (2013; genus
2099 accepted), cultures and sequences are unavailable. 2100
- Staurastromyces** S. Van den Wyngaert, K. Seto & K.
2101 Rojas-Jimenez 2017, *Staurastromycetaceae*, *Rhizophydi-*
2102 *ales*, *Rhizophydiomycetes*, *Chytridiomycota*, one species,
2103 type: *S. oculus* S. Van den Wyngaert, K. Seto & K. Rojas-
2104 Jimenez, Germany, see Van den Wyngaert et al. (2017:
2105 taxonomy, phylogeny), sequences available, ITS of the
2106 type culture KY350146. 2107
- Synchytrium** de Bary & Woronin 1863 [1865], *Synchy-*
2108 *triaceae*, *Synchytriales*, *Synchytriomycetes*, *Chytridiomy-*
2109 *cota*, c. 100 species, type: *S. taraxaci* de Bary & Woronin,
2110 saprobes, Europe, see Ballvora et al. (2011; pathogenicity), 2111

- 2112 Yun et al. (2011; new report from Korea), Kirk et al. (2013; 2164
 2113 genus accepted), Smith et al. (2014; taxonomy and 2165
 2114 molecular detection), Obidiegwu et al. (2015; pathogenicity), 2166
 2115 Longcore et al. (2016; new species), cultures and 2167
 2116 sequences are available. 2168
- 2117 **Terramyces** Letcher 2006, *Terramycetaceae*, *Rhizophydiales*, 2169
 2118 *Chytridiomycetes*, *Rhizophydiomycetes*, one species, 2170
 2119 type: *T. subangulosus* (A. Braun) Letcher, on diatoms, 2171
 2120 Europe, see Letcher et al. (2008b; phylogeny), Gleason 2172
 2121 et al. (2011; physiology), cultures and sequences are 2173
 2122 available, ITS of the type: NR_119592. 2174
- 2123 **Tetrachytrium** Sorokīn 1874, *Tetrachytriaceae*, *Chytridiomycetes* 2175
 2124 families incertae sedis, *Chytridiomycota*, one 2176
 2125 species, type: *T. triceps* Sorokīn, saprobes, Asia, see Kirk 2177
 2126 et al. (2013; genus accepted), cultures and sequences are 2178
 2127 unavailable. 2179
- 2128 **Thalassochytrium** Nyvall, M. Pedersén & Longcore 1999, 2180
 2129 *Thalassochytriaceae*, *Chytridiomycetes* families incertae 2181
 2130 sedis, *Chytridiomycota*, one species, type: *T. gracilariopsisidis* 2182
 2131 Nyvall, M. Pedersén & Longcore, saprobes, China, 2183
 2132 see Kirk et al. (2013; genus accepted), cultures and 2184
 2133 sequences are available. 2185
- 2134 **Thoreauomyces** D.R. Simmons & Longcore 2012, *Powellomycetaceae*, 2186
 2135 *Spizellomycetales*, *Spizellomycetes*, 2187
 2136 *Chytridiomycota*, one species, type: *T. humboldtii* D.R. 2188
 2137 Simmons & Longcore, in soil, USA, see Simmons and 2189
 2138 Longcore (2012; taxonomy), cultures and sequences are 2190
 2139 available. 2191
- 2140 **Trematophlyctis** Pat. 1918, *Chytridiomycetes* genera incertae 2192
 2141 sedis, *Chytridiomycota*, one species, type: *T. leptodesmiae* Pat., 2193
 2142 saprobes, Madagascar, see Simmons and 2194
 2143 Longcore (2012; taxonomy), cultures and sequences are 2195
 2144 unavailable. 2196
- 2145 **Tripartalcar** D.J.S. Barr 1980, *Spizellomycetaceae*, 2197
 2146 *Spizellomycetales*, *Spizellomycetes*, *Chytridiomycota*, one 2198
 2147 species, type: *T. arcticum* (D.J.S. Barr) D.J.S. Barr, cultures 2199
 2148 and sequences are available. 2200
- 2149 **Truttella** Karling 1949, *Chytridiomycetes* genera incertae 2201
 2150 sedis, *Chytridiomycota*, one species, type: *T. setifera* Karling, 2202
 2151 saprobes, USA, see Kirk et al. (2013; genus accepted), 2203
 2152 cultures and sequences are unavailable. 2204
- 2153 **Uebelmesseromyces** M.J. Powell & Letcher 2015, *Uebelmesseromycetaceae*, 2205
 2154 *Rhizophlyctidiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one 2206
 2155 species, type: *U. harderi* 2207
 2156 M.J. Powell & Letcher, saprobes, USA, see Kirk et al. 2208
 2157 (2013; genus accepted), cultures and sequences are 2209
 2158 unavailable. 2210
- 2159 **Ulkenomyces** Letcher & M.J. Powell 2015, *Halomycetaceae*, 2211
 2160 *Rhizophydiales*, *Rhizophydiomycetes*, *Chytridiomycota*, one 2212
 2161 species, type: *U. aestuarii* (Ulken) Letcher 2213
 2162 & M.J. Powell, saprobes, USA, see Letcher et al. (2015a; 2214
 2163 taxonomy), cultures and sequences are available. 2215
- 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. (2013a, b, c, d; 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.
- 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 2187
 2188
 2189
 2190 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*. 2191
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 2197 We accept one class, one order, one family and two 2198
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2215 taxonomy), Benny et al. (2016b; classification), cultures and
2216 sequences are unavailable.

2217 *Entomophthoromycota* Humber

2218 Introduction

2219 Humber (2012) introduced the phylum *Entomoph-*
2220 *thoromycota* to accommodate subphylum Entomoph-
2221 *thoromycotina* Humber which was introduced by Hibbett
2222 et al. (2007). The phylum comprises obligate parasites of
2223 animals which are distributed worldwide. Spatafora et al.
2224 (2016) did not accept Humber (2012) and proposed to
2225 maintain the subphylum *Entomophthoromycotina* under
2226 *Zoopagomycota*.

2227 We accept *Entomophthoromycota* as a distinct phylum
2228 which comprises two classes, two orders, five families and
2229 21 genera.

2230 Notes for genera

2231 *Ancylistes* Pfitzer 1872, *Ancylistaceae*, *Entomophthorales*,
2232 *Entomophthoromycetes*, *Entomophthoromycota*, five spe-
2233 cies, type: *A. closterii* Pfitzer, pathogens of desmid algae,
2234 cosmopolitan, see Humber (2012; classification), Kirk et al.
2235 (2013; genus accepted), Gryganskyi et al. (2013a; notes),
2236 cultures and sequences are unavailable.

2237 *Apterivorax* S. Keller 2005, *Neozygitaceae*, *Neozygiales*,
2238 *Neozygitomycetes*, *Entomophthoromycota*, two species,
2239 type: *A. sminthuri* (S. Keller & Steenb.) S. Keller, patho-
2240 gens, worldwide, see Humber (2012; classification), Gry-
2241 ganskyi et al. (2013a; notes), cultures and sequences are
2242 unavailable.

2243 *Batkoa* Humber 1989, *Entomophthoraceae*, *Entomophtho-*
2244 *rales*, *Entomophthoromycetes*, *Entomophthoromycota*, ten
2245 species, type: *B. apiculata* (Thaxt.) Humber, pathogens of
2246 insects, cosmopolitan, see Rocha et al. (2009; Brazil), Hum-
2247 ber (2012; classification), Hoffmann et al. (2013; phylogeny),
2248 Kirk et al. (2013; genus accepted), Gryganskyi et al. (2013a;
2249 notes), cultures and sequences are unavailable.

2250 *Completozia* Lohde 1874, *Completoziaceae*, *Entomoph-*
2251 *thorales*, *Entomophthoromycetes*, *Entomophthoromycota*,
2252 one species, type: *C. complens* Lohde, on pteridophyta,
2253 worldwide, see Humber (2012, 2016; classification),
2254 Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus
2255 accepted), Gryganskyi et al. (2013a; notes), cultures and
2256 sequences are unavailable.

2257 *Conidiobolus* Bref. 1884, *Ancylistaceae*, *Entomophtho-*
2258 *rales*, *Entomophthoromycetes*, *Entomophthoromycota*, c.
2259 40 species, type: *C. utriculosus* Bref., pathogens or sap-
2260 robes, worldwide, see Shankar et al. (2010; recovering
2261 silver from X ray film), Vilela et al. (2010; infection on
2262 sheep), Wüppenhorst et al. (2010; human pathogen),
2263 Kimura et al. (2011), Subramanian and Sobel (2011;
2264 human conidiobolomycosis), Humber (2012; classifica-
2265 tion), Nie et al. (2012; new species), Hoffmann et al. (2013;

2266 notes), Kirk et al. (2013; genus accepted), Gryganskyi et al.
2267 (2013a; notes), Mackey et al. (2015; dog pathogens), John
2268 et al. (2016; human pathogen), Yong et al. (2016; new
2269 species), cultures and sequences are available, *C. incon-*
2270 *gruus* CDC-B7586 (Chibucos et al. 2016) available at
2271 NCBI, *C. coronatus* NRRL 28638 [25977457] available at
2272 NCBI.

2273 *Entomophaga* A. Batko 1964, *Entomophthoraceae*, *Ento-*
2274 *mophthorales*, *Entomophthoromycetes*, *Entomoph-*
2275 *thoromycota*, c. 17 species, type: *E. grylli* (Fresen.) A.
2276 Batko, on insects, saprobes, cosmopolitan, see Kereselidze
2277 et al. (2011; Georgia), Tabaković-Tošić et al. (2012; Ser-
2278 bia), Gryganskyi et al. (2013a; phylogeny), Kirk et al.
2279 (2013; genus accepted), cultures and sequences are
2280 available.

2281 *Entomophthora* Fresen. 1856, *Entomophthoraceae*, *Ento-*
2282 *mophthorales*, *Entomophthoromycetes*, *Entomoph-*
2283 *thoromycota*, c. 30 species, type: *E. muscae* (Cohn)
2284 Fresen., on insects, saprobes, cosmopolitan, see Jensen
2285 et al. (2009; differential divergence), Lihme et al. (2009;
2286 epidemics), Gryganskyi et al. (2013a, b; phylogeny, species
2287 complex), Kirk et al. (2013; genus accepted), Mendoza
2288 et al. (2015; human pathogens), cultures and sequences are
2289 available, genome available: *Entomophthora muscae*
2290 [27717247] at NCBI.

2291 *Erynia* (Nowak. ex A. Batko) Remaud. & Hennebert 1980,
2292 *Entomophthoraceae*, *Entomophthorales*, *Entomoph-*
2293 *thoromycetes*, *Entomophthoromycota*, c. 20 species, type:
2294 *E. ovispora* (Nowak.) Remaud. & Hennebert, on insects,
2295 cosmopolitan, see Gryganskyi et al. (2012, 2013a; phy-
2296 logeny), Hoffman et al. (2013; notes), Kirk et al. (2013;
2297 genus accepted), cultures and sequences are available.

2298 *Eryniopsis* Humber 1984, *Entomophthoraceae*, *Ento-*
2299 *mophthorales*, *Entomophthoromycetes*, *Entomoph-*
2300 *thoromycota*, five species, type: *E. lampyridarum* (Thaxt.)
2301 Humber, on insects, cosmopolitan, see Gryganskyi et al.
2302 (2013a; phylogeny), Hoffman et al. (2013; notes), Kirk
2303 et al. (2013; genus accepted), Steinkraus et al. (2017; insect
2304 pathogens), cultures and sequences are available.

2305 *Furia* (A. Batko) Humber 1989, *Entomophthoraceae*, *Ento-*
2306 *mophthorales*, *Entomophthoromycetes*, *Entomoph-*
2307 *thoromycota*, c. 18 species, type: *F. virescens* (Thaxt.)
2308 Humber, on insects, cosmopolitan, see Tkaczyk et al.
2309 (2011; Poland, Austria), Humber (2012; classification),
2310 Gryganskyi et al. (2013a; phylogeny), Kirk et al. (2013;
2311 genus accepted), cultures and sequences are available.

2312 *Macrobotophthora* Reukauf 1912, *Ancylistaceae*, *Ento-*
2313 *mophthorales*, *Entomophthoromycetes*, *Entomoph-*
2314 *thoromycota*, two species, type: *M. vimariensis* Reukauf, in
2315 soil, pathogens of nematodes, Europe, see Humber (2012;
2316 classification), Kirk et al. (2013; genus accepted), Gry-
2317 ganskyi et al. (2013a; notes phylogeny), Hussain et al.
2318 (2014; mycoinsecticide), a sequence is available.

- 2319 **Massospora** Peck 1878, *Entomophthoraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*,
2320 c. 14 species, type: *M. cicadina* Peck, on insects, cosmopolitan, see Humber (2012; classification), Gryganskyi
2321 et al. (2013a, 2017; phylogeny, insect pathogens), Hoffman
2322 et al. (2013; notes), Kirk et al. (2013; genus accepted),
2323 Cooley et al. (2018; host sexual signal hijack), cultures and
2324 sequences are available.
- 2325 **Meristacrum** Drechsler 1940, *Meristacraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*,
2326 c. 15 species, type: *M. asterospermum* Drechsler, on
2327 nematodes, cosmopolitan, see Humber (2012; classifica-
2328 tion), Gryganskyi et al. (2013a; classification), Hoffman
2329 et al. (2013; notes), Kirk et al. (2013; genus accepted),
2330 cultures and sequences are unavailable.
- 2331 **Neozygites** Wiltaczil 1885, *Neozygitaceae*, *Neozygiales*,
2332 *Neozygitomycetes*, *Entomophthoromycota*, 24 species,
2333 type: *N. fresenii* (Nowak.) Remaud. & S. Keller, insects,
2334 mites and springtails pathogens, worldwide, see Simelane
2335 et al. (2008; host control), Agboton et al. (2011, 2013;
2336 phylogeny, interaction with predatory mite *Typhlodromalus aripo*),
2337 Gryganskyi et al. (2013a; DNA), Kirk et al. (2013;
2338 genus accepted), Zhou et al. (2017; new species),
2339 cultures and sequences are available.
- 2340 **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.
- 2341 **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.
- 2342 **Tabanomyces** Couch, R.V. Andrejeva, Laird & Nolan 1979, *Meristacraceae*, *Entomophthorales*, *Entomophthoromycetes*, *Entomophthoromycota*, c. 15 species, type: *T. milkoii* (Dudka & Koval) Couch, R.V. Andrejeva, Laird & Nolan, from larva of horse flies, Ukraine, see Humber (2012; classification), cultures and sequences are unavailable.
- 2343 **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.
- 2344 **Thaxterosporium** Ben Ze'ev & R.G. Kenneth 1987, *Neozygitaceae*, *Neozygiales*, *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 *vide* Species Fungorum (2018).
- 2345 **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*.

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), Furrázola et al. (2013; new species), Goto et al. (2013; new species), Redecker et al. (2013; notes, phylogeny), Błaszowski 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), Crossay et al. (2018; new species), cultures and sequences are available.

- 2422 **Ambispora** C. Walker, Vestberg & A. Schüßler 2007
2423 (= *Appendicispora* Spain, Oehl & Sieverding
2424 2006; = *Paracaulospora* S.P. Gautam & U.S. Patel
2425 2007; = *Pseudoglomerus* S.P. Gautam & U.S. Patel 2007),
2426 *Ambisporaceae*, *Archaeosporales*, *Archaeosporomycetes*,
2427 *Glomeromycota*, c. 3-10 species depending on taxonomic
2428 opinion, type: *A. fennica* C. Walker, Vestberg & A.
2429 Schüßler, arbuscular mycorrhizal, terrestrial, worldwide,
2430 see Goto et al. (2008; new species), Walker (2008; resur-
2431 rected the family, new species), Palenzuela et al. (2011;
2432 new species), Krüger et al. (2012; phylogeny), Oehl et al.
2433 (2012a; new species), Redecker et al. (2013; notes, phy-
2434 logeny), Bills and Morton (2015; accepted only three
2435 species viz.: *A. leptoticha*, *A. gerdemanni* and
2436 *A. granatensis*, phylogeny), cultures and sequences are
2437 available.
- 2438 **Archaeospora** J.B. Morton & D. Redecker 2001 (= *In-
2439 traspora* p. p. Oehl & Sieverd. 2006), *Archaeosporaceae*,
2440 *Archaeosporales*, *Archaeosporomycetes*, *Glomeromycota*,
2441 c. three species, type: *A. trappei* (R.N. Ames & Linderman)
2442 J.B. Morton & D. Redecker, arbuscular mycorrhizal, ter-
2443 restrial, worldwide, see Schüßler and Walker (2010; new
2444 combination), Oehl et al. (2011d; new combinations),
2445 cultures and sequences are available.
- 2446 **Bulbospora** Oehl & G.A. Silva 2014, *Gigasporaceae*,
2447 *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, one
2448 species, type: *B. minima* Oehl, Marinho, B.T. Goto & G.A.
2449 Silva, mycorrhizal status unknown, terrestrial, Brazil, see
2450 Marinho et al. (2014; taxonomy, described from field col-
2451 lected spores), cultures are unavailable and sequences from
2452 multi-species soil trap cultures available.
- 2453 **Cetraspora** Oehl, F. A. Souza & Sieverd. 2009, *Gigaspo-
2454 raceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromy-
2455 cota*, c. four species, type: *C. gilmorei* (Trappe & Gerd.)
2456 Oehl, F.A. Souza & Sieverd, arbuscular mycorrhizal, ter-
2457 restrial, North and South America, Azores, Europe, see
2458 Schüßler and Walker (2010; taxonomy), Oehl et al. (2011f;
2459 new species), Redecker et al. (2013; accepted three spe-
2460 cies), Lima et al. (2014; new species), cultures and
2461 sequences are available.
- 2462 **Claroideoglomerus** C. Walker & A. Schüßler 2010 (= *Al-
2463 bahypha* p. p. Oehl, G.A. Silva, B.T. Goto & Sieverd.
2464 2011), *Claroideoglomeraceae*, *Glomerales*, *Glom-
2465 eromycetes*, *Glomeromycota*, eight species, type: *C. clar-
2466 oideum* (N.C. Schenck & G.S. Sm.) C. Walker & A.
2467 Schüßler, arbuscular mycorrhizal, terrestrial, worldwide,
2468 see Schüßler and Walker (2010; taxonomy), Krüger et al.
2469 (2012; phylogeny), Redecker et al. (2013; phylogeny),
2470 cultures and sequences are available.
- 2471 **Corymbiglomerus** Błaszk. & Chwat 2012, *Diversisporaceae*,
2472 *Diversisporales*, *Glomeromycetes*, *Glomeromycota*, four
2473 species, type: *C. corymbiforme* Błaszk. & Chwat, arbus-
2474 cular 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*, *Glom-
eromycota*, c. five species, type: *D. nigra* (J.F. Redhead)
Sieverd., F.A. Souza & Oehl, arbuscular mycorrhizal, ter-
restrial, worldwide, see Oehl et al. (2008; taxonomy),
Redecker et al. (2013; epitype, rejection of *Fuscutata* and
Quatunica and their combination with *Dentiscutata*), cul-
tures 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) Symanc-
zik, Błaszk., Kozłowska & Al-Yahya'ei, arbuscular myc-
orrhizal, terrestrial, Oman, see Symanczik et al. (2018;
taxonomy), cultures and sequences are available.
- Diversispora** C. Walker & A. Schüßler 2004, *Diversispo-
raceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromy-
cota*, 17 species, type: *D. spurca* (C.M. Pfeiff., C. Walker
& Bloss) C. Walker & A. Schüßler, arbuscular mycor-
rhizal, 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. (2011, b; 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 spe-
cies, type: *D. minuta* (Błaszk., Tadych & Madej) Błaszk.,
Chwat & Kovács, arbuscular mycorrhizal, terrestrial,
worldwide, see Błaszkowski et al. (2015c, d, 2016; tax-
onomy, 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, world-
wide, 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, *Glomer-
aceae*, *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.

- 2527 **Geosiphon** F. Wettst. 1915 (= *Geosiphonomyces* Cif. & 2580
2528 Tomas. 1957), *Geosiphonaceae*, *Archaeosporales*, *Glom-* 2581
2529 *eromycetes*, *Glomeromycota*, one species, type: *G. pyri-* 2582
2530 *formis* (Kütz.) F. Wettst., symbiosis with *Nostoc*, 2583
2531 terrestrial, central Europe, see Krüger et al. (2012; phy- 2584
2532 logeny), Ellerbeck et al. (2013; ammonium transporters), 2585
2533 cultures and sequences are available. 2586
2534 **Gigaspora** Gerd. & Trappe 1974, *Gigasporaceae*, *Diver-* 2587
2535 *sisporales*, *Glomeromycetes*, *Glomeromycota*, seven spe- 2588
2536 cies, type: *G. gigantea* (T.H. Nicolson & Gerd.) Gerd. & 2589
2537 Trappe, arbuscular mycorrhizal, terrestrial, worldwide, see 2590
2538 Kirk et al. (2013; genus), cultures and sequences are 2591
2539 available, but not for type species. 2592
- 2540 **Glomus** Tul. & C. Tul. 1844 (= *Endogone* p. p. Link 2593
2541 1809; =*Parapseudoglomus* p. p. S.P. Gautam & U.S. Patel, 2594
2542 2007; = *Paurocotylis* p. p. Berk. & Broome 1855; = *Sclero-* 2595
2543 *cystis* p. p. Berk. & Broome 1873; = *Simiglomus* p. p. Sieverd. 2596
2544 2011; = *Sphaeroceas* p. p. Sacc. & Ellis 1882), *Glomer-* 2597
2545 *aceae*, *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 60 2598
2546 species (most are *Glomus sensu lato* and may belong in other 2599
2547 genera), type: *G. macrocarpum* Tul. & C. Tul., arbuscular 2600
2548 mycorrhizal, terrestrial, worldwide, see Khade (2009; new 2601
2549 species), Baszkowski (2010; new species), Baszkowski et al. 2602
2550 (2010; new species), Furrázola et al. (2011; new species), 2603
2551 Goto et al. (2012a; new species), Cai et al. (2013; new spe- 2604
2552 cies), Błaszowski et al. (2015b; new species), cultures and 2605
2553 sequences are available. 2606
- 2554 **Innospora** Błaszki., Kovács, Chwat & Kozłowska 2017, 2607
2555 *Paraglomeraceae*, *Paraglomerales*, *Paraglomeromycetes*, 2608
2556 *Glomeromycota*, one species, type: *I. majewskii* (Błaszki. & 2609
2557 Kovács) Błaszki., Kovács, Chwat & Kozłowska, arbuscular 2610
2558 mycorrhizal, terrestrial, worldwide, see Błaszowski et al. 2611
2559 (2017; taxonomy, transfer of *Paraglomus majewskii* to 2612
2560 *Innospora*), cultures and sequences are available. 2613
- 2561 **Intraornatospora** B.T. Goto, Oehl & G.A. Silva 2012a, 2614
2562 *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glom-* 2615
2563 *eromycota*, one species, type: *I. intraornata* (B.T. Goto & 2616
2564 Oehl) B.T. Goto, Oehl & G.A. Silva, arbuscular mycor- 2617
2565 rhizal, terrestrial, Brazil, see Goto et al. (2012b; taxon- 2618
2566 omy), Redecker et al. (2013; phylogeny, discussed the 2619
2567 genus as “orphan taxon”), multi-species cultures avail- 2620
2568 ability unknown and sequences from multi-species cultures 2621
2569 are available. 2622
- 2570 **Kamienskia** Błaszki., Chwat & Kovács 2015, *Glomeraceae*, 2623
2571 *Glomerales*, *Glomeromycetes*, *Glomeromycota*, three spe- 2624
2572 cies, type: *K. bistrata* (Błaszki., D. Redecker, Koegel, 2625
2573 Symanczik, Oehl & Kovács) Błaszki., Chwat & Kovács, 2626
2574 arbuscular mycorrhizal, terrestrial, worldwide, see 2627
2575 Błaszowski et al. (2015c, 2016; taxonomy, phylogeny, 2628
2576 new species), cultures and sequences are available. 2629
- 2577 **Oehlia** Błaszki., Kozłowska, Niezgodna, B.T.Goto & Dalpé 2630
2578 2018, *Glomeraceae*, *Glomerales*, *Glomeromycetes*, *Glom-* 2631
2579 *eromycota*, one species, type species: *O. diaphana* (J.B. 2631
- Morton & C. Walker) Błaszki., Kozłowska & Dalpé, 2580
arbuscular mycorrhizal, terrestrial, worldwide, see 2581
Błaszowski et al. (2018; taxonomy, phylogeny), cultures 2582
and sequences are available. 2583
- Otospora** Oehl, Palenz. & N. Ferrol 2008, *Diversispor-* 2584
raceae, *Diversisporales*, *Glomeromycetes*, *Glomeromy-* 2585
cota, one species, type: *O. bareae* Palenz., N. Ferrol & 2586
Oehl, arbuscular mycorrhizal, terrestrial, known from 2587
Spain, see Palenzuela et al. (2008; taxonomy), Oehl et al. 2588
(2011g; notes), Redecker et al. (2013; phylogeny, men- 2589
tioning genus as questionable), cultures are unavailable, 2590
sequences available are from multi-species soil trap 2591
cultures. 2592
- Pacispora** Sieverd. & Oehl 2004, *Pacisporaceae*, *Diver-* 2593
sisporales, *Glomeromycetes*, *Glomeromycota*, seven spe- 2594
cies, type: *P. scintillans* (S.L. Rose & Trappe) Sieverd. & 2595
Oehl ex C. Walker, Vestberg & A. Schübler, arbuscular 2596
mycorrhizal, terrestrial, known from Europe, North and 2597
South America, Asia, see Krüger et al. (2012; phylogeny), 2598
Redecker et al. (2013; notes, phylogeny), cultures are 2599
unavailable and sequences available. 2600
- Palaeospora** Oehl, Palenz., Sánchez-Castro & G.A. Silva 2601
2015, *Archaeosporaceae*, *Archaeosporales*, *Ar-* 2602
chaeosporomycetes, *Glomeromycota*, one species, type: *P.* 2603
spainiae Oehl, Palenz., Sánchez-Castro & G.A. Silva, 2604
arbuscular mycorrhizal, terrestrial, known from Switzer- 2605
land, see Oehl et al. (2015b; taxonomy, phylogeny), cul- 2606
tures and sequences are available. 2607
- Paradentiscutata** B.T. Goto, Oehl & G.A. Silva 2012, 2608
Gigasporaceae, *Diversisporales*, *Glomeromycetes*, *Glom-* 2609
eromycota, two species, type: *P. bahiana* Oehl, Magna, 2610
B.T. Goto & G.A. Silva, arbuscular mycorrhizal, terrestrial, 2611
known from Brazil, see Goto et al. (2012b; taxonomy), 2612
Redecker et al. (2013; phylogeny, suggested as designated 2613
from inadequate data and described as “orphan taxon”), 2614
multi-species cultures and sequences from multi-species 2615
cultures are available. 2616
- Paraglomus** J.B. Morton & D. Redecker 2001, *Para-* 2617
glomeraceae, *Paraglomerales*, *Paraglomeromycetes*, 2618
Glomeromycota, c. eight species, type: *P. occultum* (C. 2619
Walker) J.B. Morton & D. Redecker, arbuscular mycor- 2620
rhizal, terrestrial, worldwide, see Oehl et al. (2011c, 2016; 2621
new combinations, new species), Krüger et al. (2012; 2622
phylogeny), de Mello et al. (2013; new species), Redecker 2623
et al. (2013; notes, phylogeny), cultures and sequences are 2624
available. 2625
- Pervetustus** Błaszki., Chwat, Kozłowska, Symanczik & Al- 2626
Yahya’ei 2017, *Pervetustaceae*, *Paraglomerales*, *Para-* 2627
glomeromycetes, *Glomeromycota*, one species, type: *P.* 2628
simplex Błaszki., Chwat, Kozłowska, Crossay, Symanczik 2629
& Al-Yahya’ei, arbuscular mycorrhizal, terrestrial, known 2630
from Europe, Northern Africa, New Caledonia, Oman, see 2631

- 2632 Błaszowski et al. (2017; taxonomy), cultures and
2633 sequences are available.
- 2634 **Racocetra** Oehl, F.A. Souza & Sieverd. 2009 [2008], *Gi-*
2635 *gasporaceae*, *Diversisporales*, *Glomeromycetes*, *Glom-*
2636 *eromycota*, c. 13 species, type: *R. coralloidea* (Trappe,
2637 Gerd. & I. Ho) Oehl, F.A. Souza & Sieverd., arbuscular
2638 mycorrhizal, terrestrial, known from Africa, North and
2639 South America, Asia, see Oehl et al. (2008; taxonomy),
2640 Morton and Msiska (2010; recognised the genus, Redecker
2641 et al. (2013; accepted three species viz. *R. tropicana*, *R.*
2642 *undulata* and *R. beninensis*, and, with reservation, accepted
2643 *Racocetra* as a genus), cultures and sequences are
2644 available.
- 2645 **Redeckera** C. Walker & A. Schüßler 2010, *Diversispor-*
2646 *raceae*, *Diversisporales*, *Glomeromycetes*, *Glomeromy-*
2647 *cota*, three species, type: *R. megalocarpum* (D. Redecker)
2648 C. Walker & A. Schüßler, arbuscular mycorrhizal, terres-
2649 trial, worldwide, see Schüßler and Walker (2010; taxon-
2650 omy), Krüger et al. (2012; phylogeny), Redecker et al.
2651 (2013; relationship to other genera), cultures are unavail-
2652 able and sequences available.
- 2653 **Rhizophagus** P.A. Dang. 1896 (= *Endogone* p. p. Link.
2654 1809; = *Rhizoglossum* p. p. Sieverd., G.A. Silva & Oehl
2655 2015; = *Stigeosporium* C. West 1916), *Glomeraceae*,
2656 *Glomerales*, *Glomeromycetes*, *Glomeromycota*, c. 19 spe-
2657 cies, type: *R. populinus* P.A. Dang., arbuscular mycor-
2658 rhizal, terrestrial, worldwide, see Schüßler and Walker
2659 (2010; new combinations), Redecker et al. (2013; new
2660 combination), Symanczik et al. (2014; new species),
2661 Walker et al. (2017; nomenclature, designate neotype),
2662 Crossay et al. (2018; new species), cultures and sequences
2663 are available.
- 2664 **Sacculospora** Oehl, Sieverd., G.A. Silva, B.T. Goto, I.C.
2665 Sánchez & Palenz. 2011, *Sacculosporaceae*, *Diversispor-*
2666 *ales*, *Glomeromycetes*, *Glomeromycota*, two species, type:
2667 *S. baltica* (Błasz., Madej & Tadych) Oehl, Palenz., I.C.
2668 Sánchez, B.T. Goto, G.A. Silva & Sieverd., arbuscular
2669 mycorrhizal, terrestrial, known from Europe, India, North
2670 and South America, see Redecker et al. (2013; retained
2671 genus, but phylogenetic position is unclear), Willis et al.
2672 (2016; new species), culture availability unknown,
2673 sequences are available.
- 2674 **Sclerocystis** Berk. & Broome 1873 [1875] (= *Ackermannia*
2675 Pat. 1902; = *Xenomyces* Ces. 1879) *Glomeraceae*, *Glom-*
2676 *erales*, *Glomeromycetes*, *Glomeromycota*, c. 5 species,
2677 type: *S. coremioides* Berk. & Broome, arbuscular mycor-
2678 rhizal, terrestrial, worldwide, see Kirk et al. (2013; genus
2679 accepted), cultures and sequences are available.
- 2680 **Scutellospora** C. Walker & F.E. Sanders 1986 (= *Fuscu-*
2681 *tata* p. p. Oehl, F.A. Souza & Sieverd. 2009; = *Orbispora*
2682 p. p. Oehl, G.A. Silva & D.K. Silva 2011; = *Parascutel-*
2683 *lospora* Nom. inval. S.P. Gautam & U.S. Patel
2684 2007; = *Quatunica* p. p. F.A. Souza, Sieverd. & Oehl
2009), *Gigasporaceae*, *Diversisporales*, *Glomeromycetes*,
2685 *Glomeromycota*, c. 33 species, type: *S. calospora* (T.H.
2686 Nicolson & Gerd.) C. Walker & F.E. Sanders, arbuscular
2687 mycorrhizal, terrestrial, worldwide, see Krüger et al. (2012;
2688 phylogeny), Pontes et al. (2013; new species), Redecker
2689 et al. (2013; notes, phylogeny), De Andrade et al. (2017;
2690 new species), Crossay et al. (2018; new species), cultures
2691 and sequences are available.
- 2692 **Septoglossum** Sieverd., G.A. Silva & Oehl 2011 (= *Vis-*
2693 *cospora* p. p. (T.H. Nicolson) Sieverd., Oehl & G.A. Silva
2694 2011), *Glomeraceae*, *Glomerales*, *Glomeromycetes*,
2695 *Glomeromycota*, c. ten species, type: *S. constrictum*
2696 (Trappe) Sieverd., G.A. Silva & Oehl, arbuscular mycor-
2697 rhizal, terrestrial, worldwide, see Krüger et al. (2012;
2698 phylogeny), Błaszowski et al. (2013, 2014; new species,
2699 phylogeny), Palenzuela et al. (2013a, b; new species),
2700 Redecker et al. (2013; phylogeny, genus accepted), cultures
2701 and sequences are available.
- 2702 **Tricispora** Oehl, Sieverd., G.A. Silva & Palenz. 2011,
2703 *Diversisporaceae*, *Diversisporales*, *Glomeromycetes*,
2704 *Glomeromycota*, one species, type: *T. nevadensis* (Palenz.,
2705 N. Ferrol, Azcón-Aguilar & Oehl) Oehl, Palenz., G.A.
2706 Silva & Sieverd., arbuscular mycorrhizal, terrestrial, Eur-
2707 ope, see Oehl et al. (2011e; taxonomy), Redecker et al.
2708 (2013; phylogeny, mentioning genus as questionable),
2709 culture availability unlikely, sequences available but might
2710 be dubious.
- 2711 **Kickxellomycota** Tedersoo et al. 2712
2713 Subphylum *Kickxellomycotina* Benny was upgraded to
2714 *Kickxellomycota* by Tedersoo et al. (2016). Tedersoo et al.
2715 (2016) introduced new class *Kickxellomycetes* Tedersoo
2716 et al. to accommodate *Kickxella* Coem. (in *Kickxellaceae*,
2717 *Kickxellales*) along with another five classes (viz. *Asel-*
2718 *lariomycetes*, *Barbatosporomycetes*, *Dimargaritomycetes*
2719 *Harpellomycetes*, and *Ramicandelaberomycetes*). We
2720 accept *Kickxellomycota* with six classes, six orders, seven
2721 families and 65 genera
- 2722 **Notes for genera** 2723
2724 **Asellaria** R.A. Poiss. 1932, *Asellariaceae*, *Asellariales*,
2725 *Asellariomycetes*, *Kickxellomycota*, c. seven species, type:
2726 *A. caulleryi* R.A. Poiss., associated with Isopoda, world-
2727 wide, see Guardia Valle and Cafaro (2008, new species,
2728 biology, zygosporangium production), Lichtwardt (2012; Tri-
2729 chomycete gut fungi from tropical regions), Kirk et al.
2730 (2013; genus accepted), Tretter et al. (2014; DNA, phy-
2731 logeny), Benny et al. (2016b; classification), cultures and
2732 sequences are available.
- 2733 **Austrosmithium** Lichtw. & M.C. Williams 1990, *Legeri-*
2734 *omycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomy-*
2735 *cota*, five species, type: *A. kiwiorum* M.C. Williams &
2736 Lichtw. (Name is invalid as in Index Fungorum 2018; Art. 2735

- 2736 40.5 (Melbourne), in insects, worldwide, see Siri and
 2737 López Lastra (2010; new species), Kirk et al. (2013; genus
 2738 accepted), Hoffmann et al. (2013; phylogeny), Benny et al.
 2739 (2016b; classification), cultures and sequences are
 2740 available.
- 2741 **Bactromyces** William & Strongman 2012, *Legeriomyc-*
 2742 *etaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*,
 2743 one species, type: *B. fluminalis* William & Strongman, in
 2744 *Paracapnia angulata* nymphs, Canada, see William and
 2745 Strongman (2014; taxonomy), Benny et al. (2016b; clas-
 2746 sification), cultures and sequences are unavailable.
- 2747 **Baetimyces** L.G. Valle & Santam. 2002, *Legeriomyc-*
 2748 *etaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*,
 2749 one species, type: *B. ancorae* L.G. Valle & Santam., in
 2750 hindgut of *Baetis* nymf, Spain, see Valle (2013a; Galicia),
 2751 Benny et al. (2016b; classification), cultures and sequences
 2752 are unavailable.
- 2753 **Ballocephala** Drechsler 1951, *Kickxellomycotina* genera
 2754 *incertae sedis*, *Kickxellomycota*, one species, type: *B.*
 2755 *sphaerospora* Drechsler, on tardigrades, worldwide, see
 2756 Humber (2012; classification), Gryganskyi et al. (2013a, b;
 2757 notes), Kirk et al. (2013; genus accepted), Benny et al.
 2758 (2016b; classification), cultures and sequences are
 2759 unavailable.
- 2760 **Baltomyces** Cafaro 1999, *Asellariales* genera *incertae*
 2761 *sedis*, *Kickxellomycetes*, *Kickxellomycota*, one species,
 2762 type: *B. styrax* Cafaro, in Isopoda, USA, see Oman and
 2763 White (2012; USA), Kirk et al. (2013; genus accepted),
 2764 Benny et al. (2016b; classification), cultures and sequences
 2765 are unavailable.
- 2766 **Barbatospora** M.M. White, Siri & Lichtw. 2006, *Bar-*
 2767 *batosporaceae*, *Barbatosporales*, *Barbatosporomycetes*,
 2768 *Kickxellomycota*, one species, type: *B. ambicquadata* M.M.
 2769 White, Siri & Lichtw., in hindgut of larval *Simuliidae*,
 2770 USA, see Hussain et al. (2014; mycoinsecticide), Tretter
 2771 et al. (2014; DNA, phylogeny), Corsaro et al. (2018;
 2772 phylogeny), Benny et al. (2016b; classification), cultures
 2773 and sequences are available.
- 2774 **Bojamyces** Longcore 1989, *Legeriomycetaceae*, *Harpel-*
 2775 *lales*, *Harpellomycetes*, *Kickxellomycota*, three species,
 2776 type: *B. repens* Longcore, cosmopolitan, see Hoffmann
 2777 et al. (2013; classification), Kirk et al. (2013; genus
 2778 accepted), Sato et al. (2013; Japan), Benny et al. (2016b;
 2779 classification), cultures and sequences are available.
- 2780 **Capniomyces** S.W. Peterson & Lichtw. 1983, *Legeri-*
 2781 *omycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomy-*
 2782 *cota*, three species, type: *C. stellatus* S.W. Peterson &
 2783 Lichtw., in insects, cosmopolitan, see Bench and White
 2784 (2012; new species), Hoffman et al. (2013; notes), Kirk
 2785 et al. (2013; genus accepted), Hussain et al. (2014;
 2786 mycopesticide), Benny et al. (2016b; classification), Cor-
 2787 saro et al (2018, phylogeny), Wang et al. (2016a, b; gen-
 2788 ome sequencing of *C. stellatus*), cultures and sequences are
 available, genomes available: *C. stellatus* [PMID: 2789
 27491991] available at NCBI. 2790
- Carouxella** Manier, Rioux & Whisler 1965, *Harpellaceae*, 2791
Harpellales, *Harpellomycetes*, *Kickxellomycota*, two spe- 2792
 cies, type: *C. scalaris* Manier, Rioux & Whisler (Index 2793
 Fungorum 2017 listed the type species as invalid), in 2794
 insects, cosmopolitan, see Tretter et al. (2013; notes), Kirk 2795
 et al. (2013; genus accepted), Benny et al. (2016b; classi- 2796
 fication), cultures and sequences are available. 2797
- Caudomyces** Lichtw., Kobayasi & Indoh 1988, *Legeri-* 2798
omycetaceae, *Harpellales*, *Harpellomycetes*, *Kickxellomy-* 2799
cota, three species, type: *C. japonicus* Lichtw., Kobayasi & 2800
 Indoh, on insects, cosmopolitan, see Tretter et al. (2013; 2801
 notes), Kirk et al. (2013; genus accepted), Strongman and 2802
 Wang (2015; new species), Benny et al. (2016b; classifi- 2803
 cation), cultures and sequences are available. 2804
- Coemansia** Tiegh. & G. Le Monn. 1873, *Kickxellaceae*, 2805
Kickxellales, *Kickxellomycetes*, *Kickxellomycota*, c. 20 2806
 species, type: *C. reversa* Tiegh. & G. Le Monn., saprobes, 2807
 worldwide, see Kurihara et al. (2008; Indonesia, new spe- 2808
 cies), Chuang and Ho (2011; Taiwan), Kirk et al. (2013; 2809
 genus accepted), Tretter et al. (2013; phylogeny), Healy 2810
 et al. (2014; mitosis), Benny et al. (2016b; classification), 2811
 Chuang et al. (2018; phylogeny), cultures and sequences 2812
 are available, *C. reversa* NRRL 1564 [25977457] at NCBI. 2813
- Coleopteromyces** Ferrington, Lichtw. & López-Lastra 2814
 1999, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, 2815
Kickxellomycota, one species, type: *C. amnicus* Ferrington, 2816
 Lichtw. & López-Lastra, in insects, cosmopolitan, see 2817
 Tretter et al. (2013; notes), Kirk et al. (2013; genus 2818
 accepted), Wang et al. (2014a, b, c; phylogeny), Benny 2819
 et al. (2016b; classification), cultures and sequences are 2820
 available 2821
- Dacryodiomyces** Lichtw. 2011, *Legeriomycetaceae*, 2822
Harpellales, *Harpellomycetes*, *Kickxellomycota*, one spe- 2823
 cies, type: *D. oklahomensis* Lichtw., in insects, USA, see 2824
 Lichtwardt et al. (2011a, b; taxonomy), Benny et al. 2825
 (2016b; classification), cultures and sequences are 2826
 available 2827
- Dimargaris** Tiegh. 1875, *Dimargaritaceae*, *Dimargari-* 2828
tales, *Dimargaritomycetes*, *Kickxellomycota*, seven spe- 2829
 cies, type: *D. cristalligena* Tiegh., coprophilous, 2830
 fungicolous, cosmopolitan, see de Santiago et al. (2009; 2831
 first record in S. America), De Godoi and Rafael (2013; 2832
 new species, key), Gryganskyi et al. (2013a, b; notes), Kirk 2833
 et al. (2013; genus accepted), Tretter et al. (2013; DNA), 2834
 Nováková and Vaughan (2016; cave), Benny et al. (2016b; 2835
 classification), cultures and sequences are available. 2836
- Dipsacomycetes** R.K. Benj. 1961, *Kickxellaceae*, *Kickxel-* 2837
lales, *Kickxellomycetes*, *Kickxellomycota*, one species, 2838
 type: *D. acuminosporus* R.K. Benj., saprobes, Honduras, 2839
 see Kirk et al. (2013; genus accepted), Tretter et al. (2014; 2840

- 2841 phylogeny), Benny et al. (2016b; classification), cultures
2842 and sequences are available.
- 2843 **Dispira** Tiegh. 1875, *Dimargaritaceae*, *Dimargaritales*,
2844 *Dimargaritomyces*, *Kickxellomycota*, four species, type:
2845 *D. cornuta* Tiegh., mycoparasites, cosmopolitan, see Ho
2846 and Chuang (2010; Taiwan), Kirk et al. (2013; genus
2847 accepted), Tretter et al. (2014; DNA), Benny et al. (2016b;
2848 classification), cultures and sequences are available.
- 2849 **Ejectosporus** S.W. Peterson, Lichtw. & M.C. Williams
2850 1991, *Legeriomycetaceae*, *Harpellales*, *Harpellomyces*,
2851 *Kickxellomycota*, one species, type: *C. spica* (S.W. Peter-
2852 son & Lichtw.) Strongman, in insects, North America, see
2853 Kirk et al. (2013; genus accepted), Benny et al. (2016b;
2854 classification), cultures and sequences are unavailable
- 2855 **Ephemerellomyces** M.M. White & Lichtw. 2004, *Legeri-*
2856 *omycetaceae*, *Harpellales*, *Harpellomyces*, *Kickxellomy-*
2857 *cota*, one species, type: *E. aquilonius* M.M. White &
2858 Lichtw., from insects, cosmopolitan, see Kandel and White
2859 (2012; new species), Benny et al. (2016b; classification),
2860 cultures and sequences are unavailable.
- 2861 **Furculomyces** Lichtw. & M.C. Williams 1992, *Legeri-*
2862 *omycetaceae*, *Harpellales*, *Harpellomyces*, *Kickxellomy-*
2863 *cota*, three species, type: *F. boomerangus* (M.C. Williams
2864 & Lichtw.) M.C. Williams & Lichtw., in insects, Australia,
2865 Northern America, see Hoffmann et al. (2013; phylogeny),
2866 Kirk et al. (2013; genus accepted), Benny et al. (2016b;
2867 classification), cultures and sequences are unavailable.
- 2868 **Gauthieromyces** Lichtw. 1983, *Legeriomycetaceae*,
2869 *Harpellales*, *Harpellomyces*, *Kickxellomycota*, three
2870 species, type: *G. microsporus* Lichtw., in insects, cos-
2871 mopolitan, see Misra and Tiwari (2008; new species,
2872 India), Valle et al. (2008; new species), Strongman et al.
2873 (2010; China), Lichtwardt (2011; tropics), Kirk et al.
2874 (2013; genus accepted), Valle et al. (2013; records from
2875 Italy), Strongman and Wang (2015; notes, China), Benny
2876 et al. (2016b; classification), cultures and sequences are
2877 unavailable.
- 2878 **Genistelloides** S.W. Peterson, Lichtw. & B.W. Horn 1981,
2879 *Legeriomycetaceae*, *Harpellales*, *Harpellomyces*, *Kickx-*
2880 *ellomycota*, five species, type: *G. hibernus* S.W. Peterson,
2881 Lichtw. & B.W. Horn, in insects, cosmopolitan, see Kirk
2882 et al. (2013; genus accepted), Strongman and Wang (2015;
2883 new species, China), Benny et al. (2016b; classification),
2884 cultures and sequences are unavailable.
- 2885 **Genistellospora** Lichtw. 1972, *Legeriomycetaceae*,
2886 *Harpellales*, *Harpellomyces*, *Kickxellomycota*, six spe-
2887 cies, type: *G. homothallica* Lichtw., in insects, cos-
2888 mopolitan, see Lichtwardt (2011, 2012; tropics, new
2889 species), Hoffmann et al. (2013; classification, notes), Kirk
2890 et al. (2013; genus accepted), Benny et al. (2016b; classi-
2891 fication), cultures and sequences are unavailable.
- 2892 **Glotzia** M. Gauthier ex Manier & Lichtw. 1970, *Legeri-*
2893 *omycetaceae*, *Harpellales*, *Harpellomyces*,
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*, *Harpellomyces*, *Kickx-*
ellomycota, 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; classi-
fication), Heady and Nault (2017; acoustic signals), cul-
tures and sequences are unavailable.
- Harpella** L. Léger & Duboscq 1929, *Harpellaceae*,
Harpellales, *Harpellomyces*, *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, *Harpellomyces*, *Kickxellomycota*, four spe-
cies, 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; classi-
fication), cultures and sequences are available.
- Kickxella** Coem. 1862, *Kickxellaceae*, *Kickxellales*, *Kick-*
xellomyces, *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. (2014a, b, c;
DNA), Benny et al. (2016b; classification), cultures and
sequences are available.
- Klastostachys** Lichtw., M.C. Williams & M.M. White
2011, *Harpellaceae*, *Harpellales*, *Harpellomyces*, *Kick-*
xellomycota, one species, type: *K. reflexa* (Lichtw. & M.C.
Williams) Lichtw., M.C. Williams & M.M. White, sap-
robes, cosmopolitan, see Lichtwardt et al. (2011a, b; tax-
onomy), Benny et al. (2016b; classification, accepted as in
Legeriomycetaceae), cultures and sequences are
unavailable
- Laculus** William & Strongman 2012, *Legeriomycetaceae*,
Harpellales, *Harpellomyces*, *Kickxellomycota*, one spe-
cies, type: *L. insecticola* William & Strongman, in insects,
Canada, see William and Strongman (2012; taxonomy),
Benny et al. (2016b; classification), cultures and sequences
are unavailable.

- 2947 **Lancisporomyces** Santam. 1997, *Legeriomycetaceae*,
2948 *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, five spe-
2949 cies, type: *L. vernalis* Santam., in insects, cosmopolitan,
2950 see Bench and White (2012; new species), Lichtwardt
2951 (2012; tropics), Kirk et al. (2013; genus accepted), Wang
2952 et al. (2014a, b, c; DNA), Benny et al. (2016b; classifica-
2953 tion), cultures not available but sequences are available
2954 **Legerioides** M.M. White 1999, *Legeriomycetaceae*,
2955 *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one spe-
2956 cies, type: *L. tumidus* M.M. White, in insects, North
2957 America, see Kirk et al. (2013; genus accepted), Tretter
2958 et al. (2014; DNA), Benny et al. (2016b; classification),
2959 cultures and sequences are available.
- 2960 **Legeriomyces** Pouzar 1972, *Legeriomycetaceae*, *Harpel-*
2961 *lales*, *Harpellomycetes*, *Kickxellomycota*, eleven species,
2962 type: *L. ramosus* (L. Léger & M. Gauthier) Pouzar, in
2963 insects, cosmopolitan, see Misra and Tiwari (2008; India),
2964 Strongman and White (2008; new species), Siri and López
2965 Lastra (2010; new species), Strongman (2010; Newfound-
2966 land), Strongman et al. (2010; new species), Lichtwardt
2967 (2012; tropics), Kirk et al. (2013; genus accepted), Valle
2968 (2013a; Portugal), Misra et al. (2014; new species), Tretter
2969 et al. (2014; DNA), Wang et al. (2014a, b, c; DNA), Benny
2970 et al. (2016b; classification), cultures and sequences are
2971 available.
- 2972 **Legeriosimilis** M.C. Williams, Lichtw., M.M. White &
2973 J.K. Misra 1999, *Legeriomycetaceae*, *Harpellales*,
2974 *Harpellomycetes*, *Kickxellomycota*, eight species, type: *L.*
2975 *tricaudata* M.C. Williams, Lichtw., M.M. White & J.K.
2976 Misra, in insects, cosmopolitan, see Strongman et al.
2977 (2010; new species), Strongman and White (2008, 2011;
2978 new species), White and Strongman (2012a; new species),
2979 Kirk et al. (2013; genus accepted), Tretter et al. (2013;
2980 DNA), Valle (2013b; France), Hussain et al. (2014;
2981 mycoinsecticide), Wang et al. (2014a, b, c; DNA), Benny
2982 et al. (2016b; classification), cultures and sequences are
2983 available.
- 2984 **Linderina** Raper & Fennell 1952, *Kickxellaceae*, *Kickxel-*
2985 *lales*, *Kickxellomycetes*, *Kickxellomycota*, two species,
2986 type: *L. pennispora* Raper & Fennell, saprobes, worldwide,
2987 see Kurihara et al. (2008; Indonesia), Chuang and Ho
2988 (2009; Taiwan), Zain et al. (2012; development of
2989 merosporangia), Kirk et al. (2013; genus accepted), Tretter
2990 et al. (2014; phylogeny), Benny et al. (2016b; classifica-
2991 tion), Chiranjeevi et al. (2017; anti-oxidant activity), cul-
2992 tures and sequences are available, genomes available: *L.*
2993 *pennispora* ATCC 12442 (unpublished) available at NCBI
2994 genomes.
- 2995 **Martensella** Coem. 1863, *Kickxellaceae*, *Kickxellales*,
2996 *Kickxellomycetes*, *Kickxellomycota*, one species, type: *M.*
2997 *pectinata* Coem., mycoparasites, worldwide, see Zain et al.
2998 (2012; development of merosporangia), Kirk et al. (2013;
2999 genus accepted), Tretter et al. (2014; phylogeny), Benny
et al. (2016b; classification), cultures and sequences are
available.
- Martensiomycetes** J.A. Mey. 1957, *Kickxellaceae*, *Kickxel-*
lales, *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, *Kickxel-*
laceae, *Kickxellales*, *Kickxellomycetes*, *Kickxellomycota*,
one species, type: *M. scoparia* Kurihara, Degawa &
Tokum., saprobes, Asia, see Tretter et al. (2014; phy-
logeny), Benny et al. (2016b; classification), cultures and
sequences are available.
- Myconymphaea** Kurihara, Degawa & Tokum. 2001,
Kickxellaceae, *Kickxellales*, *Kickxellomycetes*, *Kickxel-*
lomycota, 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, *Legeriomyc-*
etaceae, *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.*
hovasseyi 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, *Kickxel-*
laceae, *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*, *Kick-*
ellomycota, one species, type: *P. arcolamylica* Ferrington,

- 3053 M.M. White & Lichtw., saprobes, USA, see Tretter et al.
 3054 (2013; phylogeny), Benny et al. (2016b; classification),
 3055 cultures and sequences are available.
- 3056 **Pteromaktron** Whisler 1963, *Legeriomycetaceae*, *Harpel-*
 3057 *lales*, *Harpellomycetes*, *Kickxellomycota*, two species,
 3058 type: *P. protrudens* Whisler, saprobes, USA, see Williams
 3059 and Strongman (2012; new species), Tretter et al. (2013;
 3060 phylogeny), Wang et al. (2014a, b, c; DNA, phylogeny),
 3061 Benny et al. (2016b; classification), cultures and sequences
 3062 are available for unidentified species.
- 3063 **Ramicandelaber** Y. Ogawa, S. Hayashi, Degawa &
 3064 Yaguchi 2001, *Ramicandelabraceae*, *Ramicande-*
 3065 *laberales*, *Ramicandelaberomycetes*, *Kickxellomycota*, four
 3066 species, type: *R. longisporus* Y. Ogawa, S. Hayashi,
 3067 Degawa & Y. Yaguchi, from soil, from soybean cyst
 3068 nematodes, Asia, see Hoffmann et al. (2013; notes),
 3069 Chuang et al. (2009, 2013; new species, Taiwan), Tretter
 3070 et al. (2014; DNA), Benny et al. (2016b; classification),
 3071 cultures and sequences are available.
- 3072 **Simuliumyces** Lichtw. 1972, *Legeriomycetaceae*, *Harpel-*
 3073 *lales*, *Harpellomycetes*, *Kickxellomycota*, one species,
 3074 type: *S. microsporus* Lichtw., in insect larva, USA, see
 3075 Benny et al. (2016b; classification), cultures and sequences
 3076 are unavailable.
- 3077 **Sinotrichium** Juan Wang, S.Q. Xu & Strongman 2010,
 3078 *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickx-*
 3079 *ellomycota*, one species, type: *S. chironomidarum* Juan
 3080 Wang, S.Q. Xu & Strongman, in insect larva, China, see
 3081 Wang et al. (2010; taxonomy), Benny et al. (2016b; clas-
 3082 sification), cultures and sequences are unavailable.
- 3083 **Smittium** R.A. Poiss. 1937, *Legeriomycetaceae*, *Harpel-*
 3084 *lales*, *Harpellomycetes*, *Kickxellomycota*, c. 80 species,
 3085 type: *S. arvernense* R.A. Poiss., in insect larva, China, see
 3086 Vojvodic and McCreadie (2008, 2009; species interaction,
 3087 morphological difference), Wang et al.
 3088 (2010, 2013b, 2014a, b, c; taxonomy, overview, phy-
 3089 logeny), Lichtwardt and White (2011; typification), Misra
 3090 (2012; systemics), White and Strongman (2012b; new
 3091 species), Kirk et al. (2013; genus accepted), Benny et al.
 3092 (2016b; classification), genomes available: *S. culicis*
 3093 GSMNP and ID-206-W2, *S. mucronatum* strain ALG-7-
 3094 W6 [27343289] are available at NCBI genomes.
- 3095 **Spartiella** Tuzet & Manier ex Manier 1968, *Legeriomyc-*
 3096 *etaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*,
 3097 three species, type: *S. barbata* Tuzet & Manier ex Manier,
 3098 in insect larva, Europe, Canada, see White and Strongman
 3099 (2012a; new species), Kirk et al. (2013; genus accepted),
 3100 Benny et al. (2016b; classification), cultures and sequences
 3101 are available.
- 3102 **Spinalia** Vuill. 1904, *Dimargaritales* genera *incertae sedis*,
 3103 *Dimargaritomycetes*, one species, type: *S. radians* Vuill.,
 3104 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*, *Kickxel-*
lales, *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 spe-
 cies, type: *S. macrospora* L. Léger & M. Gauthier, sap-
 robes, 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, *Harpel-*
laceae, *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), cul-
 tures and sequences are unavailable.
- Stipella** L. Léger & M. Gauthier 1932, *Legeriomycetaceae*,
Harpellales, *Harpellomycetes*, *Kickxellomycota*, two spe-
 cies, 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 *Sty-*
pomyces Doweld in Index Fungorum (2018).
- Stypomyces** Doweld 2014, *Legeriomycetaceae*, *Harpel-*
lales, *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).
- Tectomyces** L.G. Valle & Santam. 2002, *Legeriomyc-*
etaceae, *Harpellales*, *Harpellomycetes*, *Kickxellomycota*,
 three species, type: *T. leptophlebiidarum* L.G. Valle &
 Santam., in insect larva, Europe, see (2010, 2013; zygos-
 pore description, new species), Benny et al. (2016b; clas-
 sification), cultures and sequences are available.
- Tieghemiomyces** R.K. Benj. 1959, *Dimargaritaceae*, *Di-*
margaritales, *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; classifi-
 cation), cultures and sequences are available.

- 3158 **Trichozygospora** Lichtw. 1972, *Legeriomycetaceae*,
3159 *Harpellales*, *Harpellomycetes*, *Kickxellomycota*, one spe-
3160 cies, type: *T. chironomidarum* Lichtw., in insects, cos-
3161 mopolitan, see Kirk et al. (2013; genus accepted), Tretter
3162 et al. (2013; DNA), Benny et al. (2016b; classification),
3163 cultures and sequences are available.
- 3164 **Trifoliellum** Strongman & M.M. White 2011, *Legeri-*
3165 *omycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomy-*
3166 *cota*, one species, type: *T. bioblitzii* Strongman & M.M.
3167 White., in insects, cosmopolitan, see Strongman and White
3168 (2011; taxonomy), Benny et al. (2016b; classification),
3169 cultures and sequences are unavailable.
- 3170 **Trissocladomyces** Doweld 2013, *Harpellales* genera *in-*
3171 *certae sedis*, *Harpellomycetes*, *Kickxellomycota*, one spe-
3172 cies, type: *T. digitatus* (L. Léger & M. Gauthier) Doweld,
3173 ?in insects, cosmopolitan, see Doweld (2013a).
- 3174 **Zancudomyces** Yan Wang, Tretter, Lichtw. & M.M. White
3175 2013, *Legeriomycetaceae*, *Harpellales*, *Harpellomycetes*,
3176 *Kickxellomycota*, one species, type: *Z. culisetae* (Lichtw.)
3177 Yan Wang, Tretter, Lichtw. & M.M. White, in insects,
3178 worldwide, see Tretter et al. (2013; DNA), Ellenberger
3179 et al. (2014; genetics), Benny et al. (2016b; classification),
3180 Wang et al. (2016a, b; genetics, gene transferring), *Z.*
3181 *culisetae* [27343289] is available at NCBI genomes.
- 3182 **Zygnemyces** K. Miura 1973, *Kickxellomycotina* genera
3183 *incertae sedis*, *Kickxellomycota*, two species, type: *Z.*
3184 *mexicana echinulatus* K. Miura., in nematode, ?human
3185 pathogens, south America, see Humber (2012; excluded
3186 from *Meristacraceae*), Gryganskyi et al. (2013a, b;
3187 accepted as in *Kickxellomycotina*), Kirk et al. (2013; genus
3188 accepted), Benny et al. (2016b; classification), cultures and
3189 sequences are unavailable.
- 3190 **Zygotoparis** S.T. Moss, Lichtw. & Manier 1975, *Legeri-*
3191 *omycetaceae*, *Harpellales*, *Harpellomycetes*, *Kickxellomy-*
3192 *cota*, two species, type: *Z. ephemeridarum* S.T. Moss,
3193 Lichtw. & Manier, in insects, cosmopolitan, see Hoffman
3194 et al. (2013; notes), Benny et al. (2016b; classification),
3195 cultures and sequences are available.
- 3196 **Monoblepharomycota** Doweld
3197 Doweld (2001) introduced *Monoblepharomycota* based
3198 on *Monoblepharis* Cornu. Tedersoo et al. (2016) accepted
3199 *Monoblepharomycota* and introduced *Sanchytriomycetes*
3200 Tedersoo et al. We accept three classes, three orders, seven
3201 families and eight genera in *Monoblepharomycota*.
- 3202 **Notes for genera**
- 3203 **Amoeboradix** Karpov, Lopez-Garcia, Mamkaeva & Mor-
3204 eira 2018, *Sanchytriaceae*, *Sanchytriales*, *Sanchytri-*
3205 *omycetes*, *Monoblepharomycota*, one species, type: *A.*
3206 *gromovi* Karpov, Lopez-Garcia, Mamkaeva & Moreira,
3207 parasite, aquatic, Russia, see Karpov et al. (2018; light
microscopy, electron microscopy, molecular phylogeny),
sequences are available.
- 3208 **Gonapodya** A. Fisch. 1892, *Gonapodyaceae*, *Monoble-*
3209 *pharidales*, *Monoblepharidomycetes*, *Monoblepharomy-*
3210 *cota*, one species, type: *G. prolifera* (Cornu) Fisch.,
3211 saprobes, cosmopolitan, see Kirk et al. (2013, genus
3212 accepted), cultures and sequences are available.
- 3213 **Harpochytrium** Lagerh. 1890 (= *Fulminaria* Gobi et al.
3214 1891; = *Rhabdium* P.A. Dang.), *Harpochytriaceae*,
3215 *Monoblepharidales*, *Monoblepharidomycetes*, *Monoble-*
3216 *pharomycota*, c. ten species, type: *H. hyalothecae* Lagerh.,
3217 on green algae, marine, South America, see Kirk et al.
3218 (2013; genus accepted), cultures and sequences are
3219 available.
- 3220 **Hyaloraphidium** Korshikov 1931, *Hyaloraphidiaceae*,
3221 *Hyaloraphidiales*, *Hyaloraphidiomycetes*, *Monoble-*
3222 *pharomycota*, one species, type: *H. curvatum* Korshikov,
3223 saprobes, cosmopolitan, see Kirk et al. (2013; genus
3224 accepted), cultures and sequences are available.
- 3225 **Monoblepharella** Sparrow 1940, *Gonapodyaceae*, *Mono-*
3226 *blepharidales*, *Monoblepharidomycetes*, *Monoble-*
3227 *pharomycota*, five species, type: *M. taylorii* (Sparrow)
3228 Sparrow, saprobes, cosmopolitan, see Kirk et al. (2013,
3229 genus accepted), cultures and sequences are available.
- 3230 **Monoblepharis** Cornu 1871 (= *Diblepharis* Lagerh. 1900
3231 [1899]; = *Monoblephariopsis* Laib. 1927), *Monoblephari-*
3232 *daceae*, *Monoblepharidales*, *Monoblepharidomycetes*,
3233 *Monoblepharomycota*, five species, type: *M. sphaerica*
3234 Cornu, saprobes, cosmopolitan, see Kirk et al. (2013, genus
3235 accepted), cultures and sequences are available.
- 3236 **Oedogoniomyces** Kobayasi & M. Ôkubo 1954, *Oedogo-*
3237 *niomycetaceae*, *Monoblepharidales*, *Monoblephar-*
3238 *idomycetes*, *Monoblepharomycota*, one species, type: *O.*
3239 *lymnaeae* Kobayasi & M. Ôkubo, on shells of *Lymnaea*
3240 spp., Asia, see Kirk et al. (2013; genus accepted), Zhang
3241 et al. (2015; population study), cultures and sequences are
3242 available.
- 3243 **Sanchytrium** Karpov & Aleoshin 2017, *Sanchytriaceae*,
3244 *Sanchytriales*, *Sanchytriomycetes*, *Monoblepharomycota*,
3245 one species, type: *S. tribonematis* Karpov & Aleoshin,
3246 fresh water, Russia, see Karpov et al. (2017a; taxonomy),
3247 cultures and sequences are available.
- 3248 **Telasphaerula** Longcore & T.Y. James 2017, *Telas-*
3249 *phaerulaceae*, *Monoblepharidales*, *Monoblephar-*
3250 *idomycetes*, *Monoblepharomycota*, one species, type: *T.*
3251 *gracilis* Longcore & T.Y. James, saprobes, fresh water,
3252 USA, see Karpov et al. (2017a; taxonomy), cultures and
3253 sequences are available.
- 3254 **Mortierellomycota** Tedersoo et al.
3255 Tedersoo et al. (2016) upgraded *Mortierellomycotina*
3256 Kerst. Hoffm. to a phylum. Currently the phylum com-
3257 prises one class, one order, one family and six genera.

3260 **Notes for genera**

- 3261 **Aquamortierella** Embree & Indoh 1967, *Mortierellaceae*,
 3262 *Mortierellales*, *Mortierellomycetes*, *Mortierellomycota*,
 3263 one species, type: *A. elegans* Embree & Indoh, on midge
 3264 larva, aquatic, New Zealand, Japan, see Hoffmann et al.
 3265 (2013; classification, notes), Kirk et al. (2013; genus
 3266 accepted), Wagner et al. (2013; classification), Benny et al.
 3267 (2016b; classification), cultures and sequences are
 3268 unavailable.
- 3269 **Dissophora** Thaxt. 1914, *Mortierellaceae*, *Mortierellales*,
 3270 *Mortierellomycetes*, *Mortierellomycota*, three species,
 3271 type: *D. decumbens* Thaxt., saprobes, worldwide, see Takó
 3272 et al. (2012; production of lipase), Hoffmann et al. (2013;
 3273 classification, notes), Kirk et al. (2013; genus accepted),
 3274 Wagner et al. (2013; treated as a synonym of *Dissophora*),
 3275 Benny et al. (2016b; classification), cultures and sequences
 3276 are available.
- 3277 **Gamsiella** (R.K. Benj.) Benny & M. Blackw. 2004,
 3278 *Mortierellaceae*, *Mortierellales*, *Mortierellomycetes*,
 3279 *Mortierellomycota*, one species, type: *G. multidivariata*
 3280 (R.K. Benj.) Benny & M. Blackw., saprobes, North
 3281 America, see Petkovits et al. (2011; DNA), Hoffmann et al.
 3282 (2013; classification, phylogeny), Wagner et al. (2013;
 3283 phylogeny), Benny et al. (2016b; classification), cultures
 3284 and sequences are available.
- 3285 **Mortierella** Coem. 1863, *Mortierellaceae*, *Mortierellales*,
 3286 *Mortierellomycetes*, *Mortierellomycota*, c. 100 species,
 3287 type: *M. polycephala* Coem., saprobes, in soil, worldwide,
 3288 see Fakas et al. (2009a; single cell oil production, fatty acid
 3289 composition), Sakuradani et al. (2009; hybrid for oil pro-
 3290 duction), Sato et al. (2010; interactions with bacteria),
 3291 Wang et al. (2011a, b, 2013a; metabolism, genomic stud-
 3292 ies), Petkovits et al. (2011; notes, classification), Hoffmann
 3293 et al. (2013; classification, notes), Kirk et al. (2013; genus
 3294 accepted), Smith et al. (2013; DNA, phylogeny), Wagner
 3295 et al. (2013; classification), Edgington et al. (2014; insecti-
 3296 cides), Hao et al. (2014a, b, 2015; enzymes, metabolism),
 3297 Ariyawansa et al. (2015; new species), Benny et al. (2016b;
 3298 classification), Werner et al. (2016; biology), Hyde et al.
 3299 (2017b; new species), Ge et al. (2018, biotechnology), Luo
 3300 et al. (2017; biotechnology), Uehling et al. (2017; com-
 3301 parative genomics), Zhang et al. (2017; biotechnology),
 3302 cultures and sequences are available, genome available: *M.*
 3303 *alpina* CDC-B6842 (Etienne et al. 2014), CCTCC
 3304 M207067 and ATCC 32222 [22174787], *M. elongata* AG-
 3305 77 [28076891], *M. verticillata* NRRL 6337 available at
 3306 NCBI genomes.
- 3307 **Modicella** Kanouse 1936, *Mortierellaceae*, *Mortierellales*,
 3308 *Mortierellomycetes*, *Mortierellomycota*, two species, type:
 3309 *M. malleola* (Harkn.) Gerd. & Trappe, saprobes, in soil,
 3310 water, worldwide, see Petkovits et al. (2011; classification),
 3311 Hoffmann et al. (2013; classification, notes), Kirk et al.

- (2013; genus accepted), Smith et al. (2013; DNA, phy- 3312
 logeny), Wagner et al. (2013; classification), Benny et al. 3313
 (2016b; classification), cultures and sequences are 3314
 available. 3315
- Lobosporangium** M. Blackw. & Benny 2004, *Mortierel- 3316*
laceae, *Mortierellales*, *Mortierellomycetes*, *Mortierel- 3317*
lomycota, one species, type: *L. transversale* (Malloch) M. 3318
 Blackw. & Benny, saprobes, North America, see Petkovits 3319
 et al. (2011; DNA), Hoffmann et al. (2013; classification), 3320
 Wagner et al. (2013; DNA), Benny et al. (2016b; classifi- 3321
 cation), cultures and sequences are available, genomes 3322
 available: *L. transversale* strain NRRL 3116 (unpublished) 3323
 available at NCBI genomes. 3324

Mucoromycota Doweld 3325

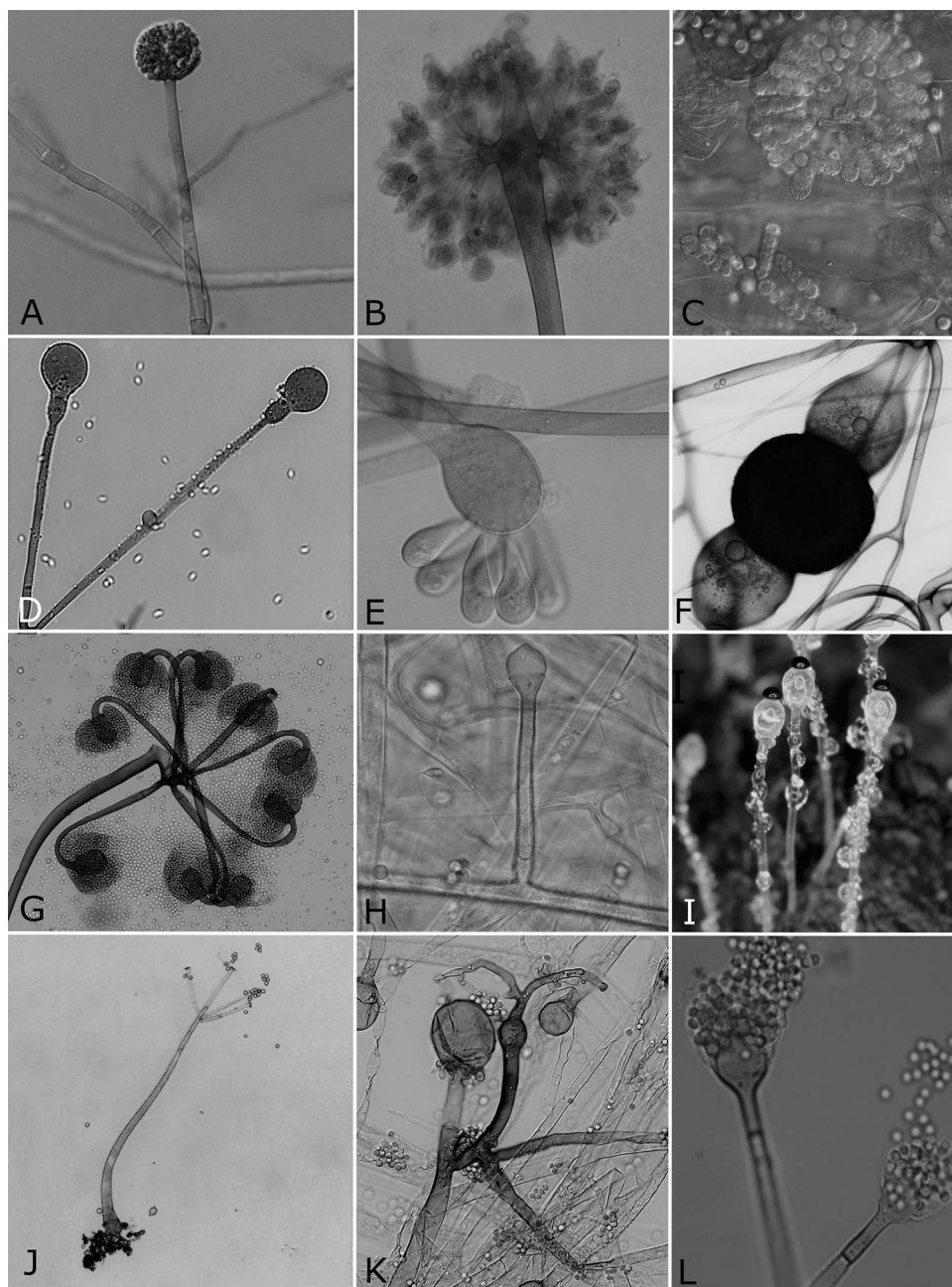
- Doweld (2001) introduced *Mucoromycota* but Kirk et al. 3326
 (2008) accepted the subphylum *Mucoromycotina* to 3327
 accommodate *Mucor* Fresen. However, Spatafora et al. 3328
 (2016) accepted *Mucoromycota* as a distinct phylum with 3329
 three subphyla viz. *Glomeromycotina* (in this study we do 3330
 not accept this rank under *Mucoromycota*), *Mortierel- 3331*
lomycotina and *Mucoromycotina*. The members of *Mu- 3332*
coromycota occur as saprobes and rarely as facultative 3333
 parasites (Figs. 5 and 6) (Kirk et al. 2008). 3334

We accept three class, three orders, 16 families and 66 3335
 genera in *Mucoromycota*. 3336

Notes for genera 3337

- Absidia** Tiegh. 1878, *Cunninghamellaceae*, *Mucorales*, 3338
Mucoromycetes, *Mucoromycota*, c. 20 species, type: *A.* 3339
reflexa Tiegh., saprobes or pathogens of human and ani- 3340
 mals, in soil, animal dung, worldwide, see Hoffmann and 3341
 Voigt (2009; introduced *Lentamyces* for *A. parvicida* and 3342
A. zychae), Richardson (2009; notes), Hoffmann et al. 3343
 (2013; phylogeny), Kirk et al. (2013; genus accepted), 3344
 Walther et al. (2013; phylogeny), Ariyawansa et al. (2015; 3345
 new species, phylogeny), Li et al. (2016; new species), 3346
 Wang et al. (2017e; fermentation), cultures and sequences 3347
 are available, genomes available: *A. padenii* NRRL 2977 3348
 (unpublished) at JGI portal (Grigoriev et al. 2014), *A.* 3349
repens NRRL 1336 (Mondo et al. 2017) genomes at JGI 3350
 portal (Grigoriev et al. 2014). 3351
- Actinomucor** Schostak. 1898, *Mucoraceae*, *Mucorales*, 3352
Mucoromycetes, *Mucoromycota*, one species and three 3353
 varieties, type: *A. elegans* (Eidam) C.R. Benj. & Hesselt., 3354
 opportunistic pathogens of human and animals, in soil, on 3355
 human, worldwide, see Li et al. (2008; debittering effect), 3356
 Tully et al. (2009; human pathogens), Gomes et al. (2011; 3357
 mucormycosis, review), Mahmud et al. (2012; cause of 3358
 mucormycosis), Hoffmann et al. (2013; phylogeny), Kirk 3359
 et al. (2013; genus accepted), Walther et al. (2013; phy- 3360
 logeny), Kia et al. (2014; mutualism with *Abutilon theo- 3361*
phrasti), Mou et al. (2014; biotransformation of 3362

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



3363 resibufogenin), Wang et al. (2014a, c; enhanced glu-
 3364 cosamine production and biotransformation of resibufo-
 3365 genin), Zhou et al. (2014; biotechnology), Karimi et al.
 3366 (2015, pathogen of chafer beetle), Dorin et al. (2017;
 3367 diagnosis methods combining molecular tools, mucormy-
 3368 cosis), Li et al. (2018; biotechnology), genomes available:
 3369 *A. elegans* JCM_22485 at NCBI genomes.
 3370 **Ambomucor** R.Y. Zheng & X.Y. Liu 2014, *Mucoraceae*,
 3371 *Mucorales*, *Mucoromycetes*, *Mucoromycota*, three species
 3372 and three varieties, type: *A. seriatoinflatus* X.Y. Liu & R.Y.
 3373 Zheng, in soil, China, see Zheng and Liu (2014;

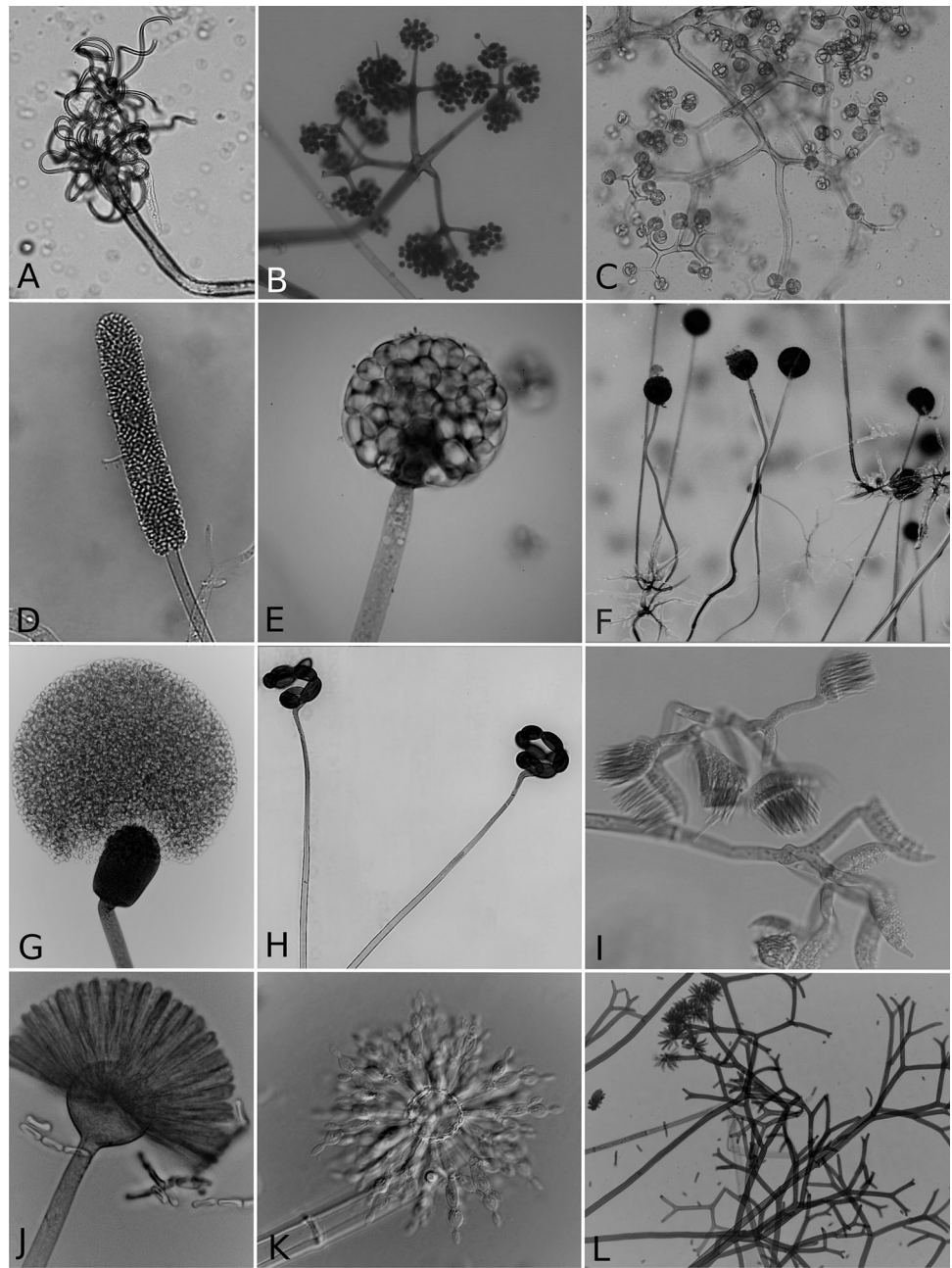
taxonomy), Liu and Zheng (2015; new species), cultures
 and sequences are available.

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, *Saksenaaceae*, *Muco-*
rales, *Mucoromycetes*, *Mucoromycota*, five species, type:

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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**–
 Zoopagomycota:
H *Helicocephalum* sp.
I *Coemansia* sp. **J** *Syncephalis*
 sp. **K** *Dimargaris* sp.
L *Piptocephalis* sp



3385 *A. elegans* P.C. Misra, K.J. Srivast. & Lata, in soil, human
 3386 and animal pathogens, cosmopolitan, see Álvarez et al.
 3387 (2010b; new species, human pathogens, phylogeny),
 3388 **3388** Guarro et al. (2011; human pathogens), Hoffmann et al.
 3389 (2013; phylogeny, notes), Kirk et al. (2013; genus accep-
 3390 ted), Walther et al. (2013; phylogeny), Bonifaz et al. (2014;
 3391 new species, Mexico), Dave et al. (2014; novel cause of
 3392 endogenous endophthalmitis), Al-Zaydani et al. (2015;
 3393 pathogenic on a child), Benny et al. (2016b; classification),
 3394 Bertumen et al. (2016; clinical diagnosis difficulties),
 3395 Kennedy et al. (2016; mucormycosis in Australia), Prakash
 3396 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;

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- 3409 genus accepted), Walther et al. (2013; phylogeny), Hoff- 3462
 3410 mann et al. (2013; phylogeny), de Souza et al. (2014; new 3463
 3411 species), Benny et al. (2016b; classification), Lima et al. 3464
 3412 (2016; new species), cultures and sequences are available, 3465
 3413 genomes available: *Backusella circina* FSU 941 unpub- 3466
 3414 lished genome at JGI portal (Grigoriev et al. 2014). 3467
 3415 **Benjaminiella** Arx 1981, *Mycotyphaceae*, *Mucorales*, 3468
 3416 *Mucoromycetes*, *Mucoromycota*, three species, type: *B.* 3469
 3417 *poitrasii* (R.K. Benj.) Arx, in soil, cosmopolitan, see 3470
 3418 Hoffmann et al. (2013; classification), Joshi et al. (2013; 3471
 3419 dimorphism mechanism), Kirk et al. (2013; genus accep- 3472
 3420 ted), Walther et al. (2013; classification), Benny et al. 3473
 3421 (2016b; classification), Mane et al. (2017; Chitosan pro- 3474
 3422 duction), Pathan et al. (2017; reference genes for quanti- 3475
 3423 tative real-time RT-PCR), cultures and sequences are 3476
 3424 available. 3477
 3425 **Bifiguratus** Torr.-Cruz & Porras-Alfaro 2017, *Mucoromy-* 3478
 3426 *cotina* genera *incertae sedis*, one species, type: *B. ade-* 3479
 3427 *laidae* Torr.-Cruz & Porras-Alfaro, from photosynthetic 3480
 3428 tissue of *Leucobryum* in Arizona, USA, see Torres-Cruz 3481
 3429 et al. (2017), cultures and sequences are available, genomes 3482
 3430 available: *B. adelaidae* strain AZ0501 [28876195] genome 3483
 3431 available at NCBI. 3484
 3432 **Blakeslea** Thaxt. 1914, *Choanephoraceae*, *Mucorales*, 3485
 3433 *Mucoromycetes*, *Mucoromycota*, two species, type: *B.* 3486
 3434 *trispورا* Thaxt., worldwide, see Choudhari et al. (2008; β - 3487
 3435 carotene and lycopene), Mantzouridou et al. (2008; glycerol 3488
 3436 in media), Schachtschabel et al. (2008; trisporoid 3489
 3437 synthesis), Sun et al. (2012; metabolites), Hoffmann et al. 3490
 3438 (2013; classification), Kirk et al. (2013; genus accepted), 3491
 3439 Sahadevan et al. (2013; biotechnology), Benny et al. 3492
 3440 (2016b; classification), cultures and sequences are avail- 3493
 3441 able, genome available: *B. trispورا* NRRL 2456 unpub- 3494
 3442 lished genome at JGI portal (Grigoriev et al. 2014). 3495
 3443 **Chaetocladium** Fresen. 1863, *Mucoraceae*, *Mucorales*, 3496
 3444 *Mucoromycetes*, *Mucoromycota*, two species, type: *C.* 3497
 3445 *jonesiae* (Berk. & Broome) Fresen., fungicolous, cos- 3498
 3446 mopolitan, see Ho et al. (2008; Taiwan), Hoffmann et al. 3499
 3447 (2013; notes), Kirk et al. (2013; genus accepted), Walther 3500
 3448 et al. (2013; phylogeny), Benny et al. (2016b; classifica- 3501
 3449 tion), cultures and sequences are available. 3502
 3450 **Chlamydoabsidia** Hesselt. & J.J. Ellis 1966, *Cunning-* 3503
 3451 *hamellaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, 3504
 3452 two species, type: *A. padenii* Hesselt. & J.J. Ellis, saprobes, 3505
 3453 cosmopolitan, see Hoffmann et al. (2013; phylogeny), Kirk 3506
 3454 et al. (2013; genus accepted), Walther et al. (2013; phy- 3507
 3455 logeny), cultures and sequences are available. 3508
 3456 **Choanephora** Curr. 1873, *Choanephoraceae*, *Mucorales*, 3509
 3457 *Mucoromycetes*, *Mucoromycota*, two species, type: *C.* 3510
 3458 *infundibulifera* (Curr.) D.D. Cunn., worldwide, however, 3511
 3459 disease development is more common in tropical and 3512
 3460 subtropical regions characterized by high temperatures and 3513
 3461 humidity, see Siddiqui et al. (2008, 2009; control by 3514
 Trichoderma, Tea), Kagiwada et al. (2010; infection in 3462
Mesembryanthemum crystallinum, Japan), Saroj et al. 3463
 (2012; infection in *Withania somnifera*, India), Sun et al. 3464
 (2012; metabolites), Hoffmann et al. (2013; classification), 3465
 Kirk et al. (2013; genus accepted), Walther et al. (2013; 3466
 phylogeny), Benny et al. (2016b; classification), Min et al. 3467
 (2017; genome analyses of *C. cucurbitarum*), cultures and 3468
 sequences are available, genome available: *C. cucur-* 3469
bitarum KUS-F28377 at NCBI genomes [28091548] 3470
Circinella Tiegh. & G. Le Monn. 1873, *Syncephalas-* 3471
traceae, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, ele- 3472
 ven species, type: *C. umbellata* Tiegh. & G. Le Monn., 3473
 saprobes, coprophilous, worldwide, see Alpat et al. (2008; 3474
 biosensor), Gonzalez et al. (2010; Mexico), Hoffmann 3475
 et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), 3476
 Walther et al. (2013; phylogeny), Benny et al. (2016b; 3477
 classification), Lima et al. (2017; taxonomy), de Souza 3478
 et al. (2017; notes), Zheng et al. (2017; new species), 3479
 cultures and sequences are available, genome available, *C.* 3480
umbellata NRRL1351 unpublished genome at JGI portal 3481
 (Grigoriev et al. 2014). 3482
Cokeromyces Shanor 1950, *Mycotyphaceae*, *Mucorales*, 3483
Mucoromycetes, *Mucoromycota*, one species, type: *C.* 3484
recurvatus Poitras, human pathogen, worldwide, see Ryan 3485
 et al. (2011; fatal pneumonia), Hoffmann et al. (2013; 3486
 notes), Kirk et al. (2013; genus accepted), Walther et al. 3487
 (2013; phylogeny), Gade et al. (2016; molecular diagnos- 3488
 tics), Benny et al. (2016b; classification), Chibucos et al. 3489
 (2016; mucromycosis causing fungi), cultures and sequen- 3490
 ces are available, *C. recurvatus* NRRL 2243 (CBS 158.50) 3491
 unpublished genome at JGI portal (Grigoriev et al. 2014) 3492
 and CDC-B5483 (Chibucos et al. 2016) available at NCBI. 3493
Cunninghamella Matr. 1903, *Cunninghamellaceae*, *Mu-* 3494
corales, *Mucoromycetes*, *Mucoromycota*, two species, 3495
 type: *C. echinulata* (Thaxt.) Thaxt. ex Blakeslee, saprobes, 3496
 human pathogen, cosmopolitan, see Asha and Vidyavathi 3497
 (2009; review), Fakas et al. (2009b; substrates for oil 3498
 production), Pastor et al. (2010; antifungal properties), 3499
 Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus 3500
 accepted), Walther et al. (2013; phylogeny), Berger et al. 3501
 (2014; biotechnology), Ganjali Dashti et al. (2014; 3502
 biosynthesis of lipase), Saad et al. (2014; Lipid and 3503
 Gamma Linolenic Acid Production), Silva et al. (2014; 3504
 metabolites), Zawadzka et al. (2015; Carbazole hydroxy- 3505
 lation), Dube and Kumar (2017; in biotransformation), 3506
 Siddiqui et al. (2017; biotransformation), cultures and 3507
 sequences are available, available genomes: *C. echinulata* 3508
 NRRL 1382 unpublished genome at JGI portal (Grigoriev 3509
 et al. 2014), *C. elegans* CDC-B9769 and *C. bertholletiae* 3510
 175 and CDC-B7461 (Chibucos et al. 2016) available at 3511
 NCBI genomes. 3512
Densospora McGee 1996, *Endogonaceae*, *Endogonales*, 3513
Endogonomycetes, *Mucoromycota*, nine species, type: *D.* 3514

- 3515 *tubiformis* (P.A. Tandy) McGee, mycorrhizal, Australia, 3568
 3516 Northern Hemisphere, see Kirk et al. (2013; genus accep- 3569
 3517 ted), Desirò et al. (2017ecology and phylogeny), Truong 3570
 3518 et al. (2017; phylogeny), Yamamoto et al. (2017a, b; 3571
 3519 reported from Northern Hemisphere), cultures unavailable, 3572
 3520 sequences available. 3573
 3521 **Dichotomocladium** Benny & R.K. Benj. 1975, 3574
 3522 *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromy-* 3575
 3523 *cota*, five species, type: *D. elegans* Benny & R.K. Benj., 3576
 3524 saprobes, worldwide, see Hoffmann et al. (2013; phy- 3577
 3525 logeny), Kirk et al. (2013; genus accepted), Walther et al. 3578
 3526 (2013; phylogeny), Benny et al. (2016b; classification), 3579
 3527 cultures and sequences are available, genome available *D.* 3580
 3528 *elegans* RSA 919 unpublished genome at JGI portal 3581
 3529 (Grigoriev et al. 2014) 3582
 3530 **Dicranophora** J. Schröt. 1886, *Mucoraceae*, *Mucorales*, 3583
 3531 *Mucoromycetes*, *Mucoromycota*, one species, type: *D.* 3584
 3532 *fulva* J. Schröt., saprobes, cosmopolitan, see Hoffmann 3585
 3533 et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), 3586
 3534 Benny et al. (2016b; classification), cultures and sequences 3587
 3535 are unavailable. 3588
 3536 **Ellisomyces** Benny & R.K. Benj. 1975, *Mucoraceae*, *Mu-* 3589
 3537 *corales*, *Mucoromycetes*, *Mucoromycota*, one species, 3590
 3538 type: *E. anomalus* (Hesselt. & P. Anderson) Benny & R.K. 3591
 3539 Benj., saprobes, cosmopolitan, see Hoffmann et al. (2013; 3592
 3540 phylogeny), Kirk et al. (2013; genus accepted), Walther 3593
 3541 et al. (2013; phylogeny), Benny et al. (2016b; classifica- 3594
 3542 tion), cultures and sequences are available. 3595
 3543 **Endogone** Link 1809 (= *Youngiomyces* Y.J. Yao 1995 fide 3596
 3544 Desirò et al. 2017), *Endogonaceae*, *Endogonales*, *Endo-* 3597
 3545 *gonomycetes*, *Mucoromycota*, c. 21 species, type: *E. pisi-* 3598
 3546 *formis* Link, in mycorrhiza, cosmopolitan, see Bidartondo 3599
 3547 et al. (2011; symbiosis with plants), Schüßler et al. (2011; 3600
 3548 arbuscular mycorrhizal fungi), Desirò et al. 3601
 3549 (2013, 2015, 2017; phylogeny, endobacteria, symbioses 3602
 3550 with hornworts), Kirk et al. (2013; genus accepted), 3603
 3551 Yamamoto et al. (2015, 2017a, b; morphology, phylogeny, 3604
 3552 oak forests, new species), Benny et al. (2016b; classifica- 3605
 3553 tion), Benitez et al. (2017; species in rhizosphere), cultures 3606
 3554 and sequences are available. 3607
 3555 **Fennellomyces** Benny & R.K. Benj. 1975, *Syncephalas-* 3608
 3556 *tracaeae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, four 3609
 3557 species, type: *F. linderi* (Hesselt. & Fennell) Benny & R.K. 3610
 3558 Benj., saprobes, coprophilous, worldwide, see Xess et al. 3611
 3559 (2012; phylogeny, De Azevedo Santiago et al. (2013; 3612
 3560 coprophilous, Brazil), Hoffmann et al. (2013; phylogeny), 3613
 3561 Kirk et al. (2013; genus accepted), Walther et al. (2013; 3614
 3562 phylogeny), Benny et al. (2016b; classification), cultures 3615
 3563 and sequences are available, genome available: *Fennel-* 3616
 3564 *lomyces* sp. T-0311 unpublished genome at JGI portal 3617
 3565 (Grigoriev et al. 2014) 3618
 3566 **Gilbertella** Hesselt. 1960, *Choanephoraceae*, *Mucorales*, 3619
 3567 *Mucoromycetes*, *Mucoromycota*, two species, type: *G.* 3620
persicaria (E.D. Eddy) Hesselt., worldwide, plant patho- 3621
 3568 gen, see Amiri et al. (2011; abiotic factors effect), Guo 3622
 3569 et al. (2012; rot in dragon fruit), Sun et al. (2012; 3623
 3570 metabolites), Hoffmann et al. (2013; phylogeny), Kirk 3624
 3571 et al. (2013; genus accepted), Walther et al. (2013; phy- 3625
 3572 logeny), Karthikeyan and Gopalakrishnan (2014; infection 3626
 3573 on shrimp), Uloth et al. (2015; associated with calcium 3627
 3574 oxalate crystals), Benny et al. (2016b; classification), Cruz- 3628
 3575 Lachica et al. (2016; papaya fruit rot), cultures and 3629
 3576 sequences are available, genome available: *G. persicaria* 3630
 3577 var. *persicaria* CBS 190.32-T unpublished genome at JGI 3631
 3578 portal (Grigoriev et al. 2014) 3632
 3579 **Gongronella** Ribaldi 1952, *Cunninghamellaceae*, *Muco-* 3633
 3580 *rales*, *Mucoromycetes*, *Mucoromycota*, six species, type: *G.* 3634
 3581 *butleri* (Lendn.) Peyronel & Dal Vesco, saprobes, cos- 3635
 3582 mopolitan, see Nwe et al. (2009; chitosan for tissue 3636
 3583 regeneration), Ghizelini et al. (2012; record from Brazil), 3637
 3584 Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus 3638
 3585 accepted), Walther et al. (2013; phylogeny), Zhang et al. 3639
 3586 (2013; Enhancement of chitosanase production), Adamčík 3640
 3587 et al. (2015; new species), Ariyawansa et al. (2015; new 3641
 3588 species), Babu et al. (2015; *G. butleri* from Korea), Li et al. 3642
 3589 (2016; new species), Tibpromma et al. (2017; new species), 3643
 3590 cultures and sequences are available., genome available, *G.* 3644
 3591 *butleri* CBS 227.36 unpublished genome at JGI portal 3645
 3592 (Grigoriev et al. 2014), *Gongronella* sp. W5 (unpublished) 3646
 3593 available at NCBI. 3647
 3594 **Halteromyces** Shipton & Schipper 1975, *Cunninghamel-* 3648
 3595 *laceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one 3649
 3596 species, type: *H. radiatus* Shipton & Schipper, saprobes, 3650
 3597 Australia, see Hoffmann et al. (2013; phylogeny), Kirk 3651
 3598 et al. (2013; genus accepted), Walther et al. (2013; phy- 3652
 3599 logeny), cultures and sequences are available. 3653
 3600 **Helicostylum** Corda 1842, *Mucoraceae*, *Mucorales*, *Mu-* 3654
 3601 *coromycetes*, *Mucoromycota*, c. two species, type: *H. ele-* 3655
 3602 *gans* Corda., saprobes, cosmopolitan, see Hoffmann et al. 3656
 3603 (2013; phylogeny), Kirk et al. (2013; genus accepted), 3657
 3604 Walther et al. (2013; phylogeny), Benny et al. (2016b; 3658
 3605 classification), cultures and sequences are available. 3659
 3606 **Hesseltinella** H.P. Upadhyay 1970, *Cunninghamellaceae*, 3660
 3607 *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species, 3661
 3608 type: *H. vesiculosa* H.P. Upadhyay, saprobes, South 3662
 3609 America, see Hoffmann et al. (2013; phylogeny), Kirk 3663
 3610 et al. (2013; genus accepted), Walther et al. (2013; phy- 3664
 3611 logeny), Benny et al. (2016b; classification), Spatafora 3665
 3612 et al. (2016; phylogeny), cultures and sequences are 3666
 3613 available, *H. vesiculosa* NRRL3301 (Mondo et al. 2017) 3667
 3614 **Hyphomucor** Schipper & Lunn 1986, *Mucoraceae*, *Mu-* 3668
 3615 *corales*, *Mucoromycetes*, *Mucoromycota*, one species, 3669
 3616 type: *H. assamensis* (B.S. Mehrotra & B.R. Mehrotra) 3670
 3617 Schipper & Lunn., saprobes, cosmopolitan, see Hoffmann 3671
 3618 et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), 3672

- 3620 Walther et al. (2013; phylogeny), Benny et al. (2016b;
3621 classification), cultures and sequences are available.
- 3622 **Isomucor** J.I. Souza, Pires-Zottar. & Harakava 2012, *Mu-*
3623 *coraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two
3624 species, type: *I. truffemiae* J.I. Souza, Pires-Zottar. & Har-
3625 akava, from soil, Brazil, see de Souza et al. (2012; taxon-
3626 omy), Walther et al. (2013; phylogeny), Benny et al.
3627 (2016b; classification), cultures and sequences are
3628 available.
- 3629 **Jingerdemannia** Trappe, Desirò, M.E. Sm., Bonito &
3630 Bidartondo 2017, *Endogonaceae*, *Endogonales*, *Endogon-*
3631 *omycetes*, *Mucoromycota*, two species, type: *J. flammi-*
3632 *corona* (Trappe & Gerd.) Trappe, Desirò, M.E. Sm., Bonito
3633 & Bidartondo, Desirò et al. (2017; phylogeny), cultures
3634 unavailable, sequences available.
- 3635 **Kirkiana** L.S. Loh, Kuthub. & Nawawi 2001, *Mucoraceae*,
3636 *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one species,
3637 type: *K. ramosa* L.S. Loh, Kuthub. & Nawawi, saprobes,
3638 cosmopolitan, see Benny et al. (2016b; classification),
3639 cultures and sequences are unavailable.
- 3640 **Kirkomyces** Benny 1996, *Mycotyphaceae*, *Mucorales*,
3641 *Mucoromycetes*, *Mucoromycota*, one species, type: *K.*
3642 *cordensis* (B.S. Mehrotra & B.R. Mehrotra) Benny, sap-
3643 robes, Asia, see Hoffmann et al. (2013; phylogeny), Kirk
3644 et al. (2013; genus accepted), Walther et al. (2013; phy-
3645 logeny), Benny et al. (2016b; classification), Satari and
3646 Karimi (2017; biologically active molecule production),
3647 cultures and sequences are unavailable.
- 3648 **Lentamyces** Kerst. Hoffm. & K. Voigt 2008 [2009], *Lent-*
3649 *amyacetaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromy-*
3650 *cota*, four species, type: *L. parricidus* (Renner & Muskat ex
3651 Hesselt. & J.J. Ellis) Kerst. Hoffm. & K. Voigt, pathogens,
3652 cosmopolitan, see Hoffmann and Voigt (2009; taxonomy),
3653 Budziszewska et al. (2010a; Poland), Hoffmann et al.
3654 (2013; phylogeny), Walther et al. (2013; phylogeny),
3655 Gebremariam et al. (2014; notes), Tretter et al. (2014;
3656 DNA), Benny et al. (2016b; classification), cultures and
3657 sequences are available.
- 3658 **Lichtheimia** Vuill. 1903, *Lichtheimiaceae*, *Mucorales*,
3659 *Mucoromycetes*, *Mucoromycota*, c. wight species, type: *L.*
3660 *corymbifera* (Cohn) Vuill., worldwide, saprobes and
3661 pathogens, see Kirk et al. (2008; treated as a synonym of
3662 *Absidia*), Garcia-Hermoso et al. (2009; molecular Parasitology),
3663 Alastruey-Izquierdo et al. (2010a, b; clinical), Hoffmann et al.
3664 (2009a, b, 2013; introduction of family, phylogeny), Bellanger et al.
3665 (2010; farmer lung disease), Borrás et al. (2010; clinical),
3666 Gomes et al. (2011; human pathogens), Neves et al. (2011;
3667 enzyme production), Schrödl et al. (2011; MALDI ToF),
3668 Schwartz et al. (2012, 2014a, b; pathogenicity, genomics),
3669 Kirk et al. (2013; genus accepted), Walther et al. (2013; DNA),
3670 André et al. (2014; new species), Linde et al. (2014; whole
3671 genome sequence), Garcia et al. (2015; β -glucosidase
3672 production), Benny et al. (2016b; classification), cultures
3673 and sequences are available (Ex-neotype of type: CBS
3674 429.75; sequence of type: NR_111413), genome available:
3675 *L. corymbifera* JMRC:FSU:9682 (Schwartz et al. 2014a, b),
3676 *L. corymbifera* strains CDC-B2541 and 008-049
3677 (Chibucos et al. 2015), *L. hyalospora* unpublished genome
3678 at JGI portal (Grigoriev et al. 2014), *L. ramosa* strains
3679 CDC-B5399 and CDC-B5792 (Chibucos et al. 2015) and
3680 JMRC FSU:6197 (Linde et al. 2014)
- 3681 **Mucor** Fresen. 1850, *Mucoraceae*, *Mucorales*, *Mu-*
3682 *coromycetes*, *Mucoromycota*, c. 60 species, type: *M.*
3683 *mucedo* Fresen., worldwide, saprobes, in soil, human
3684 pathogens, see Hoffmann et al. (2013; classification, notes),
3685 Kirk et al. (2013; genus accepted), Walther et al. (2013;
3686 phylogeny), Aziz et al. (2016; medicinal nanobiology),
3687 Benny et al. (2016b; classification), Behnam et al. (2016;
3688 xylanase production), Kroll et al. (2016; mutations), Racsá
3689 et al. (2016; blood infection), Tang et al. (2016; pro-
3690 teomics), Calo et al. (2017; molecular pathway disruption),
3691 Garcia et al. (2017; recyclable genetic marker), Taj-Aldeen
3692 et al. (2017; molecular parasitology), cultures and
3693 sequences are available, genomes available, *M. ambiguus*
3694 NBRC 6742, *M. circinelloides* CBS277.49 (Corrochano
3695 et al. 2016) and WJ11 [26352831], 1006PhL (no publica-
3696 tion), CDC-B8987 (Shelburne et al. 2015) and JCM 22480
3697 are available at NCBI genomes, *M. irregularis* B50 (no
3698 publication) is available at NCBI genomes, *M. cordense*
3699 RSA 1222 unpublished genome at JGI portal (Grigoriev
3700 et al. 2014), *M. heterogamus* NRRL 1489 unpublished
3701 genome at JGI portal (Grigoriev et al. 2014), *M. indicus*
3702 CDC-B7402 (Shelburne et al. 2015), *M. racemosus* CDC-
3703 B9645 (Shelburne et al. 2015), *M. velutinous* CDC-B5328
3704 (Shelburne et al. 2015)
- 3705 **Mycocladius** Beauverie 1900, *Mycocladaeae*, *Mucorales*,
3706 *Mucoromycetes*, *Mucoromycota*, one species, type: *M.*
3707 *verticillatus* Beauverie, human pathogens, worldwide, see
3708 Alvarez et al. (2009; clinical importance), Hoffmann et al.
3709 (2009a, b, 2013; accepted in *Mucoraceae*), Alastruey-
3710 Izquierdo et al. (2010a, b; accepted as a synonym of
3711 *Lichtheimia*), Kirk et al. (2013; genus accepted), Schofield
3712 et al. (2013; human pathogens), Benny et al. (2016b;
3713 classification), cultures and sequences are unavailable.
- 3714 **Mycotypha** Fenner 1932, *Mycotyphaceae*, *Mucorales*,
3715 *Mucoromycetes*, *Mucoromycota*, three species, type: *M.*
3716 *microspora* Fenner, insect symbionts, saprobes, or human
3717 pathogen (rare), from soil, worldwide, see Jayachandra
3718 et al. (2011; Biomethanation), De Azevedo Santiago et al.
3719 (2013; in Brazil), Hoffmann et al. (2013; notes), Kirk et al.
3720 (2013; genus accepted), Walther et al. (2013; phylogeny),
3721 Woodbury and Gries (2013; ecology), Benny et al. (2016b;
3722 classification), cultures and sequences are available, *M.*
3723 *africana* NRRL 2978 unpublished genome at JGI portal
3724 (Grigoriev et al. 2014).

- 3726 **Nawawiella** L.S. Loh & Kuthub. 2001, *Mucoraceae*, *Mu-* 3779
 3727 *corales*, *Mucoromycetes*, *Mucoromycota*, one species, 3780
 3728 type: *N. apophysa* L.S. Loh & Kuthub., saprobes, in soil, 3781
 3729 South East Asia, see Walther et al. (2013; phylogeny), 3782
 3730 Benny et al. (2016b; classification), cultures and sequences 3783
 3731 are unavailable. 3784
 3732 **Nothadelphia** Degawa & W. Gams 2004, *Mucoromycota* 3785
 3733 genera *incertae sedis*, one species, type: *N. mortierellicola* 3786
 3734 Degawa & W. Gams, mycoparasite of *Mortierella*, on bat 3787
 3735 dung, Japan, see Benny et al. (2016b; classification), cul- 3788
 3736 tures and sequences are available. 3789
 3737 **Palaeoendogone** Strullu-Derr., Kenrick, Pressel, Duckett, 3790
 3738 J.P. Rioult & Strullu 2014, *Mucoromycotina* genera *in-* 3791
 3739 *certae sedis*, one species, type: *O. gwynne-vaughaniae* 3792
 3740 Strullu-Derr., Kenrick, Pressel, Duckett, J.P. Rioult & 3793
 3741 Strullu, in plants (fossil fungi), UK, see Strullu-Derrien 3794
 3742 et al. (2014; taxonomy), cultures and sequences are 3795
 3743 unavailable. 3796
 3744 **Parasitella** Bainier 1903, *Mucoraceae*, *Mucorales*, *Mu-* 3797
 3745 *coromycetes*, *Mucoromycota*, one species, type: *P. para-* 3798
 3746 *sitica* (Bainier) Syd., parasites, cosmopolitan, see Burmeste 3799
 3747 et al. (2013; gene transferring), Hoffmann et al. (2013; 3800
 3748 phylogeny), Walther et al. (2013; phylogeny), Ellenberger 3801
 3749 et al. (2014; complete mitochondrion sequence), Benny 3802
 3750 et al. (2016b; classification), cultures and sequences 3803
 3751 are available, genome available: *P. parasitica* genome at NCBI 3804
 3752 genomes. 3805
 3753 **Peridiospora** C.G. Wu & Suh J. Lin 1997, *Endogonaceae*, 3806
 3754 *Endogonales*, *Endogonomycetes*, *Mucoromycota*, two spe- 3807
 3755 cies, type: *P. tatchia* C.G. Wu & Suh J. Lin, in mycor- 3808
 3756 rhiza, Taiwan, see Kirk et al. (2013; genus accepted), 3809
 3757 Benny et al. (2016b; classification), Benitez et al. (2017; 3810
 3758 species in rhizosphere), cultures and sequences are 3811
 3759 unavailable. 3812
 3760 **Phascolomyces** Boedijn ex Benny & R.K. Benj. 1976, 3813
 3761 *Syncephalastraceae*, *Mucorales*, *Mucoromycetes*, *Mu-* 3814
 3762 *coromycota*, one species, type: *P. articulatus* Boedijn ex 3815
 3763 Benny & R.K. Benj., ?coprophilous, saprobes, worldwide, 3816
 3764 see Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; 3817
 3765 genus accepted), Walther et al. (2013; phylogeny), Benny 3818
 3766 et al. (2016b; classification), cultures and sequences are 3819
 3767 available, genome available: *P. articulatus* unpublished 3820
 3768 genome at JGI portal (Grigoriev et al. 2014). 3821
 3769 **Phycomyces** Kunze 1823, *Phycomycetaceae*, *Mucorales*, 3822
 3770 *Mucoromycetes*, *Mucoromycota*, three species, type: *P.* 3823
 3771 *nitens* (C. Agardh) Kunze, saprobes, worldwide, see Sanz 3824
 3772 et al. (2009, 2011; interactions with the environment, 3825
 3773 functional analysis), Chaudhary et al. (2013; genetic link- 3826
 3774 age map), Hoffmann et al. (2013; phylogeny), Kirk et al. 3827
 3775 (2013; genus accepted), Walther et al. (2013; phylogeny), 3828
 3776 Shakya and Idnurm (2014; uniparental mitochondrial 3829
 3777 inheritance), Žižić et al. (2014; vanadate influence on 3830
 3778 metabolism), Benny et al. (2016b; classification), cultures 3830
 and sequences are available, genome available: *P. bla-* 3779
 3780 *kesleeanus* NRRL1555 (Corrochano et al. 2016), *P. nitens* 3780
 3781 S607, S608 and S609 unpublished genome at JGI portal 3781
 3782 (Grigoriev et al. 2014) 3782
 3783 **Pilaira** Tiegh. 1875, *Mucoraceae*, *Mucorales*, *Mu-* 3783
 3784 *coromycetes*, *Mucoromycota*, seven species and one sub- 3784
 3785 species, type: *P. anomala* (Ces.) J. Schröt., saprobes, 3785
 3786 coprophilous, cosmopolitan, see Zheng and Liu (2009; taxa 3786
 3787 in China), Hoffmann et al. (2013; notes), Walther et al. 3787
 3788 (2013; phylogeny), Benny et al. (2016b; classification), 3788
 3789 Urquhart et al. (2017; new species), cultures and sequences 3789
 3790 are available, genome available: *P. anomala* RSA1997 3790
 3791 unpublished genome at JGI portal (Grigoriev et al. 2014). 3791
 3792 **Pilobolus** Tode 1784, *Pilobolaceae*, *Mucorales*, *Mu-* 3792
 3793 *coromycetes*, *Mucoromycota*, ten species and one sub- 3793
 3794 species, type: *P. crystallinus* (F.H. Wigg.) Tode, saprobes, 3794
 3795 coprophilous, cosmopolitan, see Kubo (2011; gene 3795
 3796 expression), Pierce and Foos (2011; species associated with 3796
 3797 horses), Hoffmann et al. (2013; notes), Walther et al. 3797
 3798 (2013; phylogeny), Rajachan et al. (2014; depsidone), 3798
 3799 Benny et al. (2016b; classification), cultures and sequences 3799
 3800 are available, genome available: *P. umbonatus* NRRL 6349 3800
 3801 unpublished genome at JGI portal (Grigoriev et al. 2014). 3801
 3802 **Pirella** Bainier 1882, *Mucoraceae*, *Mucorales*, *Mu-* 3802
 3803 *coromycetes*, *Mucoromycota*, two species, type: *P. circi-* 3803
 3804 *nans* Bainier, saprobes, coprophilous, cosmopolitan, see 3804
 3805 Bridge et al. (2008; new host), Clum et al. (2009; geno- 3805
 3806 mics), Hoffmann et al. (2013; notes), Walther et al. (2013; 3806
 3807 phylogeny), Benny et al. (2016b; classification), cultures 3807
 3808 and sequences are available. 3808
 3809 **Poitrasia** P.M. Kirk 1984, *Choanephoraceae*, *Mucorales*, 3809
 3810 *Mucoromycetes*, *Mucoromycota*, one species, type: *G.* 3810
 3811 *circinans* (H. Nagan. & N. Kawak.) P.M. Kirk, worldwide, 3811
 3812 see Hoffmann et al. (2013; notes), Kirk et al. (2013; genus 3812
 3813 accepted), Walther et al. (2013; phylogeny), Qi et al. 3813
 3814 (2016; population study), Benny et al. (2016b; classifica- 3814
 3815 tion), cultures and sequences are available. 3815
 3816 **Protomyocladus** Schipper & Samson 1994, *Syncephala-* 3816
 3817 *lastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, 3817
 3818 one species, type: *P. faisalabadensis* (J.H. Mirza, S.M. 3818
 3819 Khan, S. Begum & Shagufta) Schipper & Samson, sap- 3819
 3820 robes, Asia, see Hoffmann et al. (2013; phylogeny), Kirk 3820
 3821 et al. (2013; genus accepted), Walther et al. (2013; phy- 3821
 3822 logeny), Benny et al. (2016b; classification), cultures and 3822
 3823 sequences are available. 3823
 3824 **Radiomyces** Embree 1959, *Radiomycetaceae*, *Mucorales*, 3824
 3825 *Mucoromycetes*, *Mucoromycota*, three species, type: *R.* 3825
 3826 *spectabilis* Embree, saprobes, USA, see Hoffmann et al. 3826
 3827 (2013; phylogeny), Kirk et al. (2013; genus accepted), 3827
 3828 Walther et al. (2013; phylogeny), Benny et al. (2016b; 3828
 3829 classification), *R. spectabilis* NRRL 2753 unpublished 3829
 3830 genome at JGI portal (Grigoriev et al. 2014). 3830

- 3831 **Rhizomucor** Lucet & Costantin 1900, *Lichtheimiaceae*,
 3832 *Mucorales*, *Mucoromycetes*, *Mucoromycota*, eight species,
 3833 type: *R. pusillus* (Lindt) Schipper, saprobes, human
 3834 pathogens, cosmopolitan, see Lu et al. (2009; endemic
 3835 zygomycosis), Zheng et al. (2009; new species), Budzis-
 3836 zewska et al. (2010b; taxonomic revision), Rodrigues and
 3837 Fernandez-Lafuente (2010; lipase as biocatalyst), Tajdini
 3838 et al. (2010; Chitosan), Tawil et al. (2010; α -amylase),
 3839 Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus
 3840 accepted), Martinez et al. (2013; biotransformation of fatty
 3841 acid), Walther et al. (2013; phylogeny), Bard et al. (2014,
 3842 3843 **3842** pathogenicity) Benny et al. (2016b; classification), *R.*
 3844 *variabilis* (Chibucos et al. 2016), *R. miehei* CAU432
 3845 [24746234] and *R. pusillus* (no publication) available at
 3846 NCBI genomes.
- 3846 **Rhizopodopsis** Boedijn 1959, *Mucoraceae*, *Mucorales*,
 3847 *Mucoromycetes*, *Mucoromycota*, one species, type: *R.*
 3848 *javensis* Boedijn, saprobes, Indonesia, see Hoffmann et al.
 3849 (2013; phylogeny), Kirk et al. (2013; genus accepted),
 3850 Benny et al. (2016b; classification), cultures and sequences
 3851 are unavailable.
- 3852 **Rhizopus** Ehrenb. 1821, *Rhizopodaceae*, *Mucorales*, *Mu-*
 3853 *coromycetes*, *Mucoromycota*, c. ten species, type: *R. sto-*
 3854 *lonifer* (Ehrenb.) Vuill., saprobes, worldwide, in soil, plant
 3855 pathogen, human pathogen, see monograph with key
 3856 (Zheng et al. 2017), Hernandez-Lauzardo et al. (2008;
 3857 Chitosan effect), Qin et al. (2008; biodiesel production),
 3858 Abedinifar et al. (2009; ethanol production), Ma et al.
 3859 (2009; Genomics), Abe et al. (2010; molecular phylogeny),
 3860 Gryganskyi et al. (2010; phylogeny), Xu et al. (2010;
 3861 fumaric acid production), Das et al. (2012; gold nanopar-
 3862 ticles), Hoffmann et al. (2013; notes), Kirk et al. (2013;
 3863 genus accepted), Dolatabadi et al. (2014; nomenclature of
 3864 *Rhizopus arrhizus*), Kaerger et al. (2015; virulence),
 3865 Mendoza et al. (2015; human pathogens), Benny et al.
 3866 (2016b; classification), Li et al. (2016; new species), Zhang
 3867 et al. (2013, xylanase production), Wu et al. (2018, fumaric
 3868 acid production), Canet et al. (2017; biodiesel synthesis),
 3869 Liu et al. (2016; food waste fermentation), Baggio et al.
 3870 (2017; phytopathology), Gryganskyi et al. (2018; phyloge-
 3871 nomics), NRRL 21446, NRRL 21477, NRRL 21447,
 3872 NRRL 21789 (Chibucos et al. 2016) available at NCBI
 3873 genomes, *R. microsporus* CDC-B7455 and CDC-B9738
 3874 (Chibucos et al. 2016), available at NCBI genomes, *R.*
 3875 *microsporus* ATCC 11559, ATCC 52813, ATCC 52814,
 3876 B9738 and B7455 available at NCBI genomes, *R. micro-*
 3877 *sporus* CCTCC M201021 (Wang et al. 2013a, b, c, d)
 3878 available at NCBI genomes, *R. oryzae* 99-892, CDC-
 3879 B7407, HUMC 02, NRRL 13440, NRRL 18148, NRRL
 3880 21396 (Chibucos et al. 2016), 99-133 and 97-1192 avail-
 3881 able at NCBI genomes, *R. stolonifer* CDC-B9770 (Chibu-
 3882 cos et al. 2016) available at NCBI genomes, cultures and
 3883 sequences are available.
- Saksena** S.B. Saksena 1953, *Saksenaaceae*, *Mucorales*,
 3884 *Mucoromycetes*, *Mucoromycota*, five species, type: *S.*
 3885 *vasiformis* S.B. Saksena, human pathogen, cosmopolitan,
 3886 see García-Martínez et al. (2008; human pathogen),
 3887 Lechevalier et al. (2008; molecular diagnosis), Baradkar
 3888 and Kumar (2009; cutaneous zygomycosis), Alvarez et al.
 3889 (2010a, b; new species), Hospenthal et al. (2011; fatal
 3890 infection), Salas et al. (2012; disseminated infection by
 3891 *Saksena* *vasiformis*), Kirk et al. (2013; genus accepted),
 3892 Tretter et al. (2014; notes), Benny et al. (2016b; classifi-
 3893 cation), Crous et al. (2016, 2017; new species), *S.*
 3894 *oblongispora* B3353 and *S. vasiformis* B4078 (Chibucos
 3895 et al. 2016) available at NCBI genomes. 3896
- Sclerogone** Warcup 1990, *Endogonaceae*, *Endogonales*,
 3897 *Endogonomycetes*, *Mucoromycota*, one species, type: *S.*
 3898 *eucalypti* Warcup, in mycorrhiza, Australia, see Kirk et al.
 3899 (2013; genus accepted), Benny et al. (2016b; classifica-
 3900 tion), Desirò et al. (2017; notes, provisionally accepted as
 3901 in *Endogonaceae*), cultures and sequences are unavailable.
 3902
- Sphaeroceas** Sacc. & Ellis 1882, *Endogonaceae*, *Endog-*
 3903 *onales*, *Endogonomycetes*, *Mucoromycota*, type: *S. pub-*
 3904 *escens* Sacc. & Ellis, four species, plant related, Hirose
 3905 et al. (2014; classification), Desirò et al. (2017; phylogeny),
 3906 cultures unavailable, sequences available. 3907
- Spinellus** Tiegh. 1875, *Phycomycetaceae*, *Mucorales*,
 3908 *Mucoromycetes*, *Mucoromycota*, five species, type: *S.*
 3909 *fusiger* (Link) Tiegh., mycoparasites, worldwide, see
 3910 Hoffmann et al. (2013; phylogeny), Kirk et al. (2013; genus
 3911 accepted), Walther et al. (2013; phylogeny), Benny et al.
 3912 (2016b; classification), *S. fusiger* NRRL 22323 unpub-
 3913 lished genome at JGI portal (Grigoriev et al. 2014). 3914
- Sporodiniella** Boedijn 1959, *Rhizopodaceae*, *Mucorales*,
 3915 *Mucoromycetes*, *Mucoromycota*, one species, type: *S.*
 3916 *umbellata* Boedijn, saprobes, mild (and minor) ento-
 3917 mopathogen, worldwide, see Hoffmann et al. (2013; notes),
 3918 Kirk et al. (2013; genus accepted), Walther et al. (2013;
 3919 phylogeny), Benny et al. (2016b; classification), *S.*
 3920 *umbellata* MES 1446 unpublished genome at JGI portal
 3921 (Grigoriev et al. 2014). 3922
- Syncephalastrum** J. Schröt. 1886, *Syncephalastraceae*,
 3923 *Mucorales*, *Mucoromycetes*, *Mucoromycota*, two species,
 3924 type: *S. racemosum* Cohn ex J. Schröt., saprobes, human
 3925 pathogens worldwide, see Baradkar et al. (2008; infection),
 3926 Mathur et al. (2010; emulsification), Batista et al. (2013;
 3927 wastewater treatment), Hoffmann et al. (2013; phylogeny),
 3928 Kirk et al. (2013; genus accepted), cultures and sequences
 3929 are available, genomes available: Walther et al. (2013;
 3930 phylogeny), Huang et al. (2014; nematicide), Benny et al.
 3931 (2016b; classification), *S. racemosum* NRRL 2496 (Mondo
 3932 et al. 2017), *S. racemosum* B6101 and *S. monosporum*
 3933 B8922 (Chibucos et al. 2016) available at NCBI genomes. 3934
- Syzygites** Ehrenb. 1818 (= *Sporodinia* Link), *Rhizopo-*
 3935 *daceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, one
 3936

- 3937 species, type: *S. megalocarpus* Ehrenb., mycoparasites, 3990
 3938 saprobes, cosmopolitan, see Beyer et al. (2013; on button 3991
 3939 mushroom), Hoffmann et al. (2013; notes), Kirk et al. 3992
 3940 (2013; genus accepted), Walther et al. (2013; phylogeny), 3993
 3941 Benny et al. (2016b; classification), cultures and sequences 3994
 3942 are available. 3995
 3943 **Thamnidium** Link 1809, *Mucoraceae*, *Mucorales*, *Mu-* 3996
 3944 *coromycetes*, *Mucoromycota*, one species, type: *T. elegans* 3997
 3945 Link, saprobes, cosmopolitan, see Papanikolaou et al. 3998
 3946 (2010; lipid production), Akar et al. (2013; environmental 3999
 3947 clean-up), Hoffmann et al. (2013; notes), Kirk et al. (2013; 4000
 3948 genus accepted), Walther et al. (2013; phylogeny), Benny 4001
 3949 et al. (2016b; classification), *T. elegans* unpublished gen- 4002
 3950 ome at JGI portal (Grigoriev et al. 2014). 4003
 3951 **Thamnostylum** Arx & H.P. Upadhyay 1970, *Syncephala-* 4004
 3952 *lastraceae*, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, 4005
 3953 four species, type: *T. piriforme* (Bainier) Arx & H.P. 4006
 3954 Upadhyay, coprophilous, human pathogens, worldwide, 4007
 3955 see Xess et al. (2012; human pathogen), De Azevedo et al. 4008
 3956 (2013; coprophilous), Hoffmann et al. (2013; phylogeny), 4009
 3957 Kirk et al. (2013; genus accepted), Walther et al. (2013; 4010
 3958 phylogeny), Benny et al. (2016b; classification), cultures 4011
 3959 and sequences are available. 4012
 3960 **Thermomucor** Subrahm., B.S. Mehrotra & Thirum. 1977, 4013
 3961 *Lichtheimiaceae*, *Mucorales*, *Mucoromycetes*, *Mucoromy-* 4014
 3962 *cota*, one species, type: *T. indicae-seudaticae* Subrahm., 4015
 3963 B.S. Mehrotra & Thirum., saprobes, India, see Hoffmann 4016
 3964 et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), 4017
 3965 Walther et al. (2013; phylogeny), Benny et al. (2016b; 4018
 3966 classification), *T. indicae-seudaticae* HACC 243 available 4019
 3967 at NCBI genomes. 4020
 3968 **Tortumyces** L.S. Loh 2001, *Mucoraceae*, *Mucorales*, *Mu-* 4021
 3969 *coromycetes*, *Mucoromycota*, two species, type: *T. fimicola* 4022
 3970 L.S. Loh, saprobes, Asia, see Benny et al. (2016b; classi- 4023
 3971 fication), cultures and sequences are unavailable. 4024
 3972 **Umbelopsis** Amos & H.L. Barnett 1966, *Umbelopsidaceae*, 4025
 3973 *Umbelopsis*, *Umbelopsidomycetes*, *Mucoromycota*, 16 4026
 3974 species, type: *T. versiformis* Amos & H.L. Barnett, sap- 4027
 3975 robes, in soil, worldwide, see Meeuwse et al. (2011; lipid 4028
 3976 accumulation), Ogawa et al. (2011; polyphyly), Hoffmann 4029
 3977 et al. (2013; phylogeny), Kirk et al. (2013; genus accepted), 4030
 3978 Walther et al. (2013; phylogeny), Wang et al. 4031
 3979 (2013c, 2015; new species, taxonomy), Takeda et al. 4032
 3980 (2014; genome sequence), Benny et al. (2016b; classifica- 4033
 3981 tion), Janicki et al. (2016; endocrine disruptors' degrada- 4034
 3982 tion), Crous et al. (2017; new species), cultures and 4035
 3983 sequences are available, genome available: *U. isabellina* 4036
 3984 NBRC 7784 [24578268] and B7317 (Chibucos et al. 2016) 4037
 3985 available at NCBI genomes, *U. isabellina* AD026 unpub- 4038
 3986 lished genome at JGI portal (Grigoriev et al. 2014), *U.* 4039
 3987 *ramanniana* AG unpublished genome at JGI portal (Grig- 4040
 3988 oriev et al. 2014), *Umbelopsis* sp. nov. AD052 unpublished 4041
 3989 genome at JGI portal (Grigoriev et al. 2014). 4042
- Utharomyces** Boedijn ex P.M. Kirk & Benny 1980, 3990
Pilobolaceae, *Mucorales*, *Mucoromycetes*, *Mucoromycota*, 3991
 one species and one sub-species, type: *U. epallocaulus* 3992
 Boedijn ex P.M. Kirk & Benny, saprobes, coprophilous, 3993
 cosmopolitan, see Hoffmann et al. (2013; notes), Kirk et al. 3994
 (2013; genus accepted), Walther et al. (2013; phylogeny), 3995
 Benny et al. (2016b; classification), cultures and sequences 3996
 are available. 3997
- Zychaea** Benny & R.K. Benj. 1975, *Syncephalastraceae*, 3998
Mucorales, *Mucoromycetes*, *Mucoromycota*, one species, 3999
 type: *Z. mexicana* Benny & R.K. Benj., coprophilous, 4000
 ?human pathogens, South America, see Xess et al. (2012; 4001
 phylogeny, represent *Thamnostylum* spp.), Hoffmann et al. 4002
 (2013; phylogeny), Kirk et al. (2013; genus accepted), 4003
 Walther et al. (2013; phylogeny), Benny et al. (2016b; 4004
 classification), *Z. mexicana* RSA 1403 unpublished gen- 4005
 ome at JGI portal (Grigoriev et al. 2014). 4006
- Neocallimastigomycota** M.J. Powell 4007
 Hibbett et al. (2007) introduced *Neocallimastigomycota*, 4008
 with *Neocallimastix* Vávra & Joyon ex I.B. Heath as the 4009
 type genus. The phylum comprises anaerobic taxa (in- 4010
 cluding gut fungi, coprophilous taxa) and the phylum was 4011
 accepted in several subsequent studies since Hibbett et al. 4012
 (2007), (Griffith et al. 2010; Ligginstoffer et al. 2010; 4013
 Gruninger et al. 2014). 4014
 We accept one class, one order, three families and ten 4015
 genera in *Neocallimastigomycota*. 4016
- Notes for genera** 4017
- Anaeromyces** Breton, Bernalier, Dusser, Fonty, B. Gaillard 4018
 & J. Guillot 1990, *Anaeromycetaceae*, *Neocallimastigales*, 4019
Neocallimastigomycetes, *Neocallimastigomycota*, four 4020
 species, type: *A. mucronatus* Breton, Bernalier, Dusser, 4021
 Fonty, B. Gaillard & J. Guillot, inside animal colon, in 4022
 dung, cosmopolitan, see Kirk et al. (2013; new species, 4023
 genus accepted), Doweld (2014a; introduced *Anaeromyc-* 4024
etaceae), Li et al. (2016; new species), cultures and 4025
 sequences are available, ITS of the type culture 4026
 NR_111156.1. 4027
- Buwchfawromyces** T.M. Callaghan & G.W. Griff. 2015, 4028
Neocallimastigaceae, *Neocallimastigales*, *Neocalli-* 4029
mastigomycetes, *Neocallimastigomycota*, one species, type: 4030
B. eastonii T.M. Callaghan & G.W. Griff., from buffalo 4031
 dung, anaerobic, terrestrial, Europe, see Callaghan et al. 4032
 (2015; taxonomy), Wang et al. (2017a, b, c, d, e; phy- 4033
 logeny), cultures and sequences are available, ITS of the 4034
 type culture NR_132002. 4035
- Caecomyces** J.J. Gold 1988, *Neocallimastigaceae*, *Neo-* 4036
callimastigales, *Neocallimastigomycetes*, *Neocalli-* 4037
mastigomycota, five species, type: *C. f equi* J.J. Gold, in 4038
 caecum animals, cosmopolitan, see Kirk (2012; new spe- 4039
 cies), Kirk et al. (2013; genus accepted), Henske et al. 4040

4041 (2018; new species), Li et al. (2016; new species), cultures
4042 and sequences are available.

4043 **Cyllamyces** Ozkose, B.J. Thomas, D.R. Davies, G.W.
4044 Griff. & Theodorou 2001, *Neocallimastigaceae*, *Neocalli-*
4045 *mastigales*, *Neocallimastigomycetes*, *Neocallimastigomy-*
4046 *cota*, one species, type: *C. aberensis* Ozkose, B.J. Thomas,
4047 D.R. Davies, G.W. Griff. & Theodorou, from cow faeces,
4048 UK, see Sridhar et al. (2014; new species), cultures and
4049 sequences are available.

4050 **Neocallimastix** Vávra & Joyon ex I.B. Heath 1983, *Neo-*
4051 *callimastigaceae*, *Neocallimastigales*, *Neocalli-*
4052 *mastigomycetes*, *Neocallimastigomycota*, seven species,
4053 type: *N. frontalis* (R.A. Braune) Vávra & Joyon ex I.B.
4054 Heath, coprophilous, in rumen of cattle, sheep, worldwide,
4055 see Kirk et al. (2013; genus accepted), Ariyawansa et al.
4056 (2015; new species), Li et al. (2016; new species), cultures
4057 and sequences are available.

4058 **Oontomyces** Dagar, Puniya & G.W. Griff. 2015, *Neocal-*
4059 *limastigaceae*, *Neocallimastigales*, *Neocalli-*
4060 *mastigomycetes*, *Neocallimastigomycota*, one species, type:
4061 *O. anksri* Dagar, Puniya & G.W. Griff., in rumen of camel,
4062 Asia, see Dagar et al. (2015; taxonomy), cultures and
4063 sequences are available, ITS of the type: NR_132022.

4064 **Orpinomyces** D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng
4065 1989, *Neocallimastigaceae*, *Neocallimastigales*, *Neocalli-*
4066 *mastigomycetes*, *Neocallimastigomycota*, two species,
4067 type: *O. bovis* D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng,
4068 in digestive tract of Holstein, Canada, see Kirk et al. (2013;
4069 genus accepted), cultures and sequences are available.

4070 **Pecoramycetes** Hanafy, N.H. Youssef, G.W. Griff. &
4071 Elshahed 2017, *Neocallimastigaceae*, *Neocallimastigales*,
4072 *Neocallimastigomycetes*, *Neocallimastigomycota*, one spe-
4073 cies, type: *P. ruminantium* Hanafy, N.H. Youssef, G.W.
4074 Griff. & Elshahed, USA, see Hanafy et al. (2017; taxon-
4075 omy), cultures and sequences are available, ITS of the type:
4076 NR_152323.

4077 **Piromyces** J.J. Gold, I.B. Heath & Bauchop 1988 (= *Pir-*
4078 *omonas* E. Liebet. 1910), *Neocallimastigaceae*, *Neocalli-*
4079 *mastigales*, *Neocallimastigomycetes*,
4080 *Neocallimastigomycota*, six species, type: *P. communis* J.J.
4081 Gold, I.B. Heath & Bauchop, worldwide, see Kirk (2012;
4082 new species), Kirk et al. (2013; genus accepted), Ariya-
4083 wansa et al. (2015; new species), Li et al. (2016; DNA),
4084 cultures and sequences are available.

4085 **Sphaeromonas** E. Liebet. 1910, *Sphaeromonadaceae*,
4086 *Neocallimastigales*, *Neocallimastigomycetes*, *Neocalli-*
4087 *mastigomycota*, four species, type: *S. communis* E. Liebet.,
4088 stomach of ruminant, Europe, see Kirk et al. (2013; genus
4089 accepted), cultures and sequences are unavailable.

4090 **Olpidiomycota** Doweld
4091 Doweld (2013c) introduced *Olpidiomycota* to accom-
4092 modate *Olpidiales* which was accepted in

Chytridiomycetes (Kirk et al. 2008). The members of *Ol-*
pidiomycota showed broad range of life modes as saprobes
and parasites (in algae, aquatic fungi, rotifers *vide* 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*, *Ol-*
pidiomycetes, *Olpidiomycota*, one species, type: *C. clado-*
cerarum Moniez, saprobes, Europe, see Kirk et al. (2013;
genus accepted), cultures and sequences are unavailable.

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

Leiopidium Doweld 2014, *Olpidiaceae*, *Olpidiales*, *Ol-*
pidiomycetes, *Olpidiomycota*, five species, type: *L. cucur-*
bitacearum (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*, *Ol-*
pidiales, *Olpidiomycetes*, *Olpidiomycota*, c. 50 species,
type: *O. endogenum* (A. Br.) Schroet., parasitic, cos-
mopolitan, 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 *Rozellomy-*
cota 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. por-*
tucalensis 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 spe-
cies, type: *I. acarivora* Larsson, M.Y. Steiner & Bjørnson,
parasites of mites, Europe, see Radek et al. (2015; taxon-
omy), sequences are unavailable.

Aedispora Kilochitskii 1997, *Amblyosporidae*, *Meiodi-*
haplophasida, *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.

- 4143 **Agglomerata** Larsson & Yan 1988, *Gurleyidae*, *Glugeida*,
4144 *Microsporidea*, *Rozellomycota*, five species, type: *A. sidae*
4145 (Jirovec) Larsson & Yan, parasites of crustaceans, aquatic,
4146 worldwide, see Larsson and Yan (1988; taxonomy), Larsson
4147 et al. (1996a, b; new species), Larsson and Voronin
4148 (2000; new species), Bronnvall (2001; microscopic cytology),
4149 Ovcharenko and Wita (2001; new species), Sokolova
4150 et al. (2016; *Agglomerata cladocera* from Siberian
4151 microcrustaceans, phylogeny), sequences are available.
- 4152 **Agmasoma** Hazard & Oldacre 1975, *Mrazekiidae*, *Dissociodihaplophasida*,
4153 *Microsporidea*, *Rozellomycota*, three species, type: *A. penaei* (Sprague)
4154 Hazard & Oldacre, parasites of shrimps, aquatic, North America, see
4155 Laisutisan et al. (2009; ultrastructure), Sokolova et al. (2015;
4156 phylogeny), sequences are available.
- 4157 **Alfvenia** Larsson 1983, *Microsporidea* genera incertae
4158 sedis, *Rozellomycota*, four species, type: *A. nuda* Larsson,
4159 parasites of crustaceans, aquatic, Eurasia, see Sokolova
4160 et al. (2016; new species), sequences are available.
- 4161 **Alloglugea** Paperna & Lainson 1995, *Glugeidae*, *Glugeida*,
4162 *Haplophasea*, *Rozellomycota*, one species, type: *A. bufonis*
4163 Paperna & Lainson, parasites of fishes and amphibia,
4164 aquatic, worldwide, see Paperna and Lainson (1995a, b;
4165 taxonomy), Lom and Dyková (2005; on fishes), sequences
4166 are unavailable.
- 4167 **Amazospora** Azevedo & Matos 2003, *Glugeidae*, *Glugeida*,
4168 *Microsporidea*, *Rozellomycota*, one species, type: *A. portucalensis*
4169 C. Azevedo, parasites of fishes, aquatic, South America, Azevedo
4170 (2003a, b; taxonomy), sequences are unavailable.
- 4171 **Amblyospora** Hazard & Oldacre 1975, *Amblyosporidae*,
4172 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, c. 90
4173 species, type: *A. californica* (Kellen & Lipa) Hazard &
4174 Oldacre, parasites of mosquitoes, aquatic, worldwide, see
4175 Andreadis et al. (2012; taxonomy), Simakova (2014; phylogeny),
4176 sequences are available.
- 4177 **Ameson** Sprague 1977, *Pereziiidae*, *Meiodihaplophasida*,
4178 *Microsporidea*, *Rozellomycota*, five species, type: *A. michaelis*
4179 (Sprague) Sprague, parasites of crustaceans, aquatic, worldwide,
4180 Wang et al. (2017a, b, c, d, e; new species), sequences are available.
- 4181 **Amphiacantha** Caullery & Mesnil 1914, *Amphiacanthidae*,
4182 *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*,
4183 two species, type: *A. longa* Caullery & Mesnil, parasites of
4184 gregarines, aquatic, Europe, see Larsson (2014a, b; notes),
4185 Paskerova et al. (2016; notes), sequences are available for
4186 unidentified species.
- 4187 **Amphiambllys** Caullery & Mesnil 1914, *Amphiacanthidae*,
4188 *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, two
4189 species, type: *A. capitellides* (Caullery & Mesnil) Caullery
4190 & Mesnil, parasites of gregarines, aquatic, Europe, see
4191 Larsson (2014a, b; notes), Mikhailov et al. (2016; genomic
4192 study), sequences are available for unidentified species.
- 4193 **Andreanna** Simakova, Vossbrinck & Andreadis 2008, 4196
4197 *Amblyosporidae*, *Meiodihaplophasida*, *Microsporidea*,
4198 *Rozellomycota*, one species, type: *A. caspii* Simakova, C.R.
4199 Vossbrinck & Andreadis, parasites of mosquitoes, aquatic,
4200 Asia, see Simakova et al. (2008; taxonomy), sequences are
4201 available.
- 4202 **Anisofilariata** Tokarev, Voronin, Seliverstova, Dolgikh,
4203 Pavlova, Ignatieva & Issi 2010, *Microsporidea* genera
4204 *incertae sedis*, *Rozellomycota*, one species, type: *A. chironomi*
4205 Tokarev, Voronin, Seliverstova, Dolgikh, Pavlova,
4206 Ignatieva & Issi, parasites of chironomids, aquatic, Europe,
4207 see Tokarev et al. (2010a, b, taxonomy), sequences are
4208 available.
- 4209 **Annaliia** Issi, Krylova & V.M. Nikolaeva 1993, *Tubulinosematidae*,
4210 *Microsporidea* families *incertae sedis*,
4211 *Rozellomycota*, six species, type: *A. meligethi* (Issi &
4212 Radishcheva) Issi, Krylova & V.M. Nikolaeva, parasites of
4213 insects and humans, worldwide, see Cali et al. (2010;
4214 human infection of *A. algerae*), Monaghan et al. (2011;
4215 in vitro growth of *A. algerae*), Panek et al. (2014; *A. algerae*
4216 as a parasite), Watts et al. (2014; *A. algerae* microsporidial
4217 myositis), sequences are available.
- 4218 **Anostracospora** Rode, Landes, Lievens, Flaven, Segard,
4219 Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand
4220 2013, *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*,
4221 *Rozellomycota*, one species, type: *A. rigaudi*
4222 N Rode, Landes, Lievens, Flaven, Segard, Jabbour-Zahab,
4223 Michalakis, Agnew, Vivarés & Lenormand, parasites of
4224 shrimps, aquatic, Europe, see Rode et al. (2013; taxonomy),
4225 sequences are available.
- 4226 **Antonospora** Fries, Paxton, Tengo, Slemenda, da Silva, &
4227 Pieniazek 1999, *Ovavesiculidae*, *Dissociodihaplophasida*,
4228 *Microsporidea*, *Rozellomycota*, two species, type: *A. scoticcae*
4229 Fries, Paxton, Tengo, Slemenda, da Silva, & Pieniazek,
4230 parasites of insects, worldwide, see Sokolova et al.
4231 (2010a, b; new species), sequences are available.
- 4232 **Areospora** Stentiford, Bateman, Feist, Oyarzún, Uribe,
4233 Palacios & Stone 2014, *Areosporiidae*, *Microsporidea*
4234 families *incertae sedis*, *Rozellomycota*, one species, type:
4235 *A. rohanae* Stentiford, Bateman, Feist, Oyarzún, Uribe,
4236 Palacios & Stone, parasites of king crabs, aquatic, South
4237 America, see Stentiford et al. (2014; taxonomy), Simakova
4238 et al. (2011; identification), sequences are available.
- 4239 **Auraspora** Weiser & K. Purrini 1980, *Microsporidea*
4240 genera *incertae sedis*, *Rozellomycota*, one species, type: *A. canningae*
4241 Weiser & K. Purrini, parasites of springtails,
4242 Europe, see Weiser and Purrini (1980; taxonomy),
4243 sequences are unavailable.
- 4244 **Bacillidium** Janda 1928, *Neopereziiidae*, *Microsporidea*
4245 families *incertae sedis*, *Rozellomycota*, five species, type:
4246 *B. criodrili* Janda, parasites of invertebrates, aquatic,
4247 worldwide, see Nielsen (1999) sequences are available.

- 4248 **Baculea** Loubès & Akbarieh 1978, *Microsporidea* genera
4249 *incertae sedis, Rozellomycota*, one species, type: *B. daph-*
4250 *niae* Loubès & Akbarieh, parasites of cladocerans, aquatic,
4251 Europe, see Loubès and Akbarieh (1978; taxonomy),
4252 sequences are unavailable.
- 4253 **Becnelia** Tonka & Weiser 2000, *Amblyosporidae*,
4254 *Meiodihaplophasida, Microsporidea, Rozellomycota*, one
4255 species, type: *B. sigarae* Tonka & Weiser, parasites of
4256 bugs, aquatic, Europe, see Tonka and Weiser (2000; tax-
4257 onomy), sequences are unavailable.
- 4258 **Berwaldia** Larsson 1981, *Berwaldiidae, Microsporidea*
4259 families *incertae sedis, Rozellomycota*, four species, type:
4260 *B. singularis* Larsson, parasites of crustaceans, worldwide,
4261 see Larsson (1981; taxonomy), Vávra et al. (2017; new
4262 species, biology), Simakova et al. (2018a, b; new species,
4263 taxonomy), sequences are available.
- 4264 **Binucleata** Refardt, Decaestecker, Johnson & Vávra 2008,
4265 *Gurleyidae, Glugeida, Microsporidea, Rozellomycota*, one
4266 species, type: *B. daphniae* Decaestecker, Johnson & Vávra,
4267 parasites of daphniids, aquatic, Europe, see Refardt et al.
4268 (2008; taxonomy), sequences are available.
- 4269 **Binucleospora** A.M. Bronnvall & Larsson 1995, *Cau-*
4270 *dosporidae, Dissociodihaplophasida, Microsporidea,*
4271 *Rozellomycota*, one species, type: *B. elongata* A.M.
4272 Bronnvall & Larsson, parasites of ostracods, aquatic, Eur-
4273 ope, see Stentiford et al. (2013; emergent pathogens in
4274 aquatic systems), sequences are unavailable.
- 4275 **Bohuslavia** Larsson 1985, *Thelohaniidae, Meiodihap-*
4276 *lophasida, Microsporidea, Rozellomycota*, one species,
4277 type: *B. asterias* (Weiser) Larsson, parasites of chirono-
4278 mids, aquatic, Europe, see Larsson (1985; taxonomy),
4279 sequences are unavailable.
- 4280 **Bryonosema** Canning, Refardt, Vossbrinck, Okamura &
4281 Curry 2002, *Neopereziiidae, Microsporidea* families *in-*
4282 *certae sedis, Rozellomycota, Rozellomycota*, two species,
4283 type: *B. plumatellae* Canning, Refardt, Vossbrinck, Oka-
4284 mura & Curry, parasites of bryozoans, aquatic, Europe, see
4285 Canning et al. (2002a, b, 2004; taxonomy, correction of the
4286 type species), sequences are available.
- 4287 **Burenella** Jouvenaz & Hazard 1978, *Burenellidae,*
4288 *Meiodihaplophasida, Microsporidea, Rozellomycota*, one
4289 species, type: *B. dimorpha* Jouvenaz & Hazard, parasites of
4290 ants, North America, see Jouvenaz and Hazard (1978;
4291 taxonomy), sequences are unavailable.
- 4292 **Burkea** Sprague 1977, *Burkeidae, Chytridiopsida, Mi-*
4293 *crosporidea, Rozellomycota*, two species, type: *B. gatesi*
4294 (de Puytorac & Tourret) Sprague, parasites of oligochaetes,
4295 aquatic, worldwide, see Sprague (1977a, b; taxonomy),
4296 sequences are unavailable.
- 4297 **Buxtehudea** Larsson 1980, *Buxtehudiidae, Chytridiopsida,*
4298 *Microsporidea, Rozellomycota*, one species, type: *B. sca-*
4299 *niae* 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 & Dolz-
henko, 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 centu-
ry), sequences are unavailable.
- Canningia** Weiser Wegensteiner & Žižka 1995, *Unikary-*
onidae, 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, Dissociodi-*
haplophasida, Microsporidea, Rozellomycota, one species,
type: *C. simulii* Weiser, parasites of blackflies, see Voss-
brinck 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 *in-*
certae sedis, Rozellomycota, one species, type: *C. schizo-*
phylli Tregouboff, parasites of millipedes, Europe,
sequences are unavailable.
- Chytridiopsis** Schneider 1884, *Chytridiopsidae, Chytrid-*
iopsida, 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, *Mi-*
crosporidea 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, Meiodihap-*
lophasida, Microsporidea, Rozellomycota, one species,
type: *C. micrococcus* (Léger & Hesse) Kudo, parasites of
chironomids, aquatic, Europe, sequences are unavailable.
- Cougourdella** Hesse 1935, *Cougourdellidae, Mi-*
crosporidea families *incertae sedis, Rozellomycota*, seven
species, type: *C. magna* Hesse, parasites of daphniids,
aquatic, worldwide, see Heilveil et al. (2001; life cycle and

- 4353 transmission), Hyliš et al. (2007; phylogeny), sequences
4354 are available.
- 4355 ***Crepidulospora*** Simakova, Pankova & Issi 2004, *Amblyosporidae*,
4356 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one species, type: *C. beklemishevi* (Simakova,
4357 Pankova & Issi) Simakova, Pankova & Issi, parasites of
4358 mosquitoes, aquatic, Asia, see Simakova et al. (2004;
4359 taxonomy), sequences are unavailable.
- 4360 ***Crispospora*** Tokarev, Voronin, Seliverstova, Pavlova &
4361 Issi 2010, *Microsporidea* genera *incertae sedis*, *Rozel-*
4362 *lomycota*, one species, type: *C. chironomi* Tokarev, Vor-
4363 onin, Seliverstova, Pavlova & Issi, parasites of
4364 chironomids, aquatic, Europe, see Tokarev et al. (2010a, b,
4365 taxonomy), sequences are available.
- 4366 ***Cryptosporina*** Hazard & Oldacre 1975, *Microsporidea*
4367 genera *incertae sedis*, *Rozellomycota*, one species, type: *C.*
4368 *brachyfila* Hazard & Oldacre, parasites of spiders, North
4369 America, sequences are unavailable.
- 4370 ***Cristulospora*** Khodzhaeva & Issi 1989, *Amblyosporidae*,
4371 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, three
4372 species, type: *C. sherbani* Khodzhaeva & Issi, parasites of
4373 blackflies, Asia, see Khodzhaeva & Issi (1989; taxonomy),
4374 sequences are unavailable.
- 4375 ***Cucumispora*** Ovcharenko, Bacela, Wilkinson, Ironside,
4376 Rigaud & Wattier 2010, *Thelohaniidae*, *Meiodihap-*
4377 *lophasida*, *Microsporidea*, *Rozellomycota*, two species,
4378 type: *C. dikerogammari* (Ovcharenko & Kurandina)
4379 Ovcharenko, Bacela, Wilkinson, Ironside, Rigaud & Wat-
4380 tier, parasites of crustaceans, aquatic, Europe, see
4381 Ovcharenko et al. (2010; taxonomy), Bojko et al. (2015;
4382 new species), sequences are available.
- 4383 ***Culicospora*** Weiser 1977, *Amblyosporidae*, *Meiodihap-*
4384 *lophasida*, *Microsporidea*, *Rozellomycota*, two species,
4385 type: *C. magna* (Kudo) Weiser, parasites of mosquitoes,
4386 worldwide, see Simakova (2014; comparison with other
4387 mosquito parasitic *Microsporidea*), sequences are
4388 available.
- 4389 ***Culicosporella*** Weiser 1977, *Amblyosporidae*, *Meiodi-*
4390 *haplophasida*, *Microsporidea*, *Rozellomycota*, one species,
4391 type: *C. lunata* (Hazard & Savage) Hazard & Savage,
4392 parasites of insects, Europe, sequences are available.
- 4393 ***Cylindrospora*** Issi & Voronin 1986, *Cylindrosporidae*,
4394 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two
4395 species, type: *C. chironomi* Issi & Voronin, parasites of
4396 insects, aquatic, Europe, see Sokolova et al. (2018;
4397 *Microsporidia* from USSR in twentieth Century), sequen-
4398 ces are unavailable.
- 4399 ***Cystosporogenes*** Canning, Barker, Nicholas & Page 1984,
4400 *Microsporidea* genera *incertae sedis*, *Rozellomycota*, four
4401 species, type: *C. operophterae* (Canning) Canning, Barker,
4402 Nicholas & Page, parasites of insects, worldwide, sequen-
4403 ces are unavailable.
- 4404 ***Dasyatispora*** Diamant, Goren, Yokes, Galil, Klopman,
4405 Huchon, Szitenberg & Karhan, 2010, *Pleistophoridae*,
4406 *Glugeida*, *Microsporidea*, *Rozellomycota*, one species,
4407 type: *D. levantinae* Diamant, Goren, Yokes, Galil, Klop-
4408 man, Huchon, Szitenberg & Karhan, parasites of stringrays,
4409 aquatic, Europe, see Diamant et al. (2010; taxonomy),
4410 sequences are available.
- 4411 ***Desmozoon*** Freeman & Sommerville 2009, *Enterocyto-*
4412 *zoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*,
4413 one species, type: *D. lepeophterii* Freeman & Som-
4414 merville, parasites of sea lice, Europe, see Freeman and
4415 Sommerville (2009, 2011; taxonomy), Matthews et al.
4416 (2013; pathology), Tokarev et al. (2016; synonymy with
4417 *Paranucleospora*), Gunnarsson et al. (2017; pathology),
4418 Weli et al. (2017; pathology), sequences are available.
- 4419 ***Desportesia*** Issi & Voronin 1986, *Metchnikovellidae*,
4420 *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*, one
4421 species, type: *D. laubieri* (Desportes & Théodorides) Issi &
4422 Voronin, parasites of gregarines, aquatic, Europe, sequen-
4423 ces are unavailable.
- 4424 ***Dictyocoela*** Terry, Smith, Sharpe, Rigaud, Littlewood,
4425 Ironside, Rollinson, Bouchon, MacNeil, Dick & Dunn
4426 2004, *Unikaryonidae*, *Glugeida*, *Microsporidea*, *Rozel-*
4427 *lomycota*, eight species, type: need typification, parasites of
4428 gammarids, aquatic, worldwide, see Wilkinson et al. (2011;
4429 genetic diversity), Winters and Faisal (2014; new species),
4430 sequences are available.
- 4431 ***Dimeiospora*** Simakova, Pankova & Issi 2003, *Amblyosporidae*,
4432 *Meiodihaplophasida*, *Microsporidea*, *Rozel-*
4433 *lomycota*, one species, type: *C. palustris* Simakova,
4434 Pankova & Issi, parasites of mosquitoes, aquatic, Asia, see
4435 Simakova et al. (2003; taxonomy), sequences are
4436 unavailable.
- 4437 ***Duboscqia*** Pérez 1908, *Duboscqiidae*, *Meiodihap-*
4438 *lophasida*, *Microsporidea*, *Rozellomycota*, eleven species,
4439 type: *D. legeri* Pérez, parasites of arthropods, Europe,
4440 sequences are unavailable.
- 4441 ***Edhazardia*** Becnel, Sprague & Fukuda 1989, *Amblyosporidae*,
4442 *Meiodihaplophasida*, *Microsporidea*, *Rozel-*
4443 *lomycota*, one species, type: *E. aedis* (Kudo) Becnel,
4444 Sprague & Fukuda, parasites of mosquitoes, aquatic,
4445 worldwide, see Becnel et al. (1989; taxonomy), Williams
4446 et al. (2008; genome sequencing), sequences are available.
- 4447 ***Encephalitozoon*** Levaditi, Nicolau & Schoen 1923, *En-*
4448 *cephalitozoonidae*, *Glugeida*, *Microsporidea*, *Rozellomy-*
4449 *cota*, twelve species, type: *E. cuniculi* Levaditi, Nicolau &
4450 Schoen, parasites of insects and vertebrates, worldwide, see
4451 Levaditi et al. (1923; generic description), Wilson (1979;
4452 review), Sprague et al. (1992; taxonomic review), Voss-
4453 brinck et al. (1993; phylogeny), Didier et al. (1995; iden-
4454 tification), Moss et al. (1999; flow cytometry), Vivarès and
4455 Méténier (2000; review on genome), Vivarès and Méténier
4456 (2001; review), Akerstedt (2002; ELISA-based detection),
4457

- 4458 Wolk et al. (2002; Real-time PCR), Hoffman et al. (2003; 4511
4459 populations of *E. intestinalis*), Menotti et al. (2003; real- 4512
4460 time PCR assay), Valencáková et al. (2005; diagnosis), 4513
4461 Furuya (2009; review), Corradi et al. (2010; whole gen- 4514
4462 ome), Valencakova et al. (2012; molecular identification), 4515
4463 Němejc et al. (2013; diversity), Tsukada et al. (2013; 4516
4464 parasitology), Myšková et al. (2014; in archaeological 4517
4465 material), sequences are available.
- 4466 **Endoreticulatus** Brooks, Becnel & Kennedy 1988, *Mi-* 4518
4467 *crosporidea* genera incertae sedis, *Rozellomycota*, five 4519
4468 species, type: *E. fidelis* (Hostounský & Weiser) Brooks, 4520
4469 Becnel & Kennedy, parasites of insects, worldwide, see 4521
4470 Brooks et al. (1988; generic description), Sprague et al. 4522
4471 (1992; taxonomic revision), Dong et al. (2010a, b; phy- 4523
4472 logeny), Xu et al. (2012; phylogeny), Pilarska et al. (2015; 4524
4473 taxonomic review), sequences are available.
- 4474 **Enterocytopora** Rode, Landes, Lievens, Flaven, Segard, 4525
4475 Jabbour-Zahab, Michalakis, Agnew, Vivarés & Lenormand 4526
4476 2013, *Microsporidea* genera incertae sedis, *Rozellomycota*, 4527
4477 one species, type: *E. artemiae* Rode, Landes, Lievens, 4528
4478 Flaven, Segard, Jabbour-Zahab, Michalakis, Agnew, 4529
4479 Vivarés & Lenormand, parasites of shrimps, aquatic, Eur- 4530
4480 ope, see Rode et al. (2013; taxonomy), sequences are 4531
4481 available.
- 4482 **Enterospora** Stentiford, Bateman, Longshaw & Feist 2007, 4532
4483 *Enterocytozoonidae*, *Chytridiopsida*, *Microsporidea*, 4533
4484 *Rozellomycota*, two species, type: *E. canceri* Stentiford, 4534
4485 Bateman, Longshaw & Feist, parasites of crabs, aquatic, 4535
4486 Europe, see Stentiford et al. (2017; taxonomy), Palenzuela 4536
4487 et al. (2014; new species), sequences are available.
- 4488 **Episeptum** Larsson 1986, *Gurleyidae*, *Glugeida*, *Mi-* 4537
4489 *crosporidea*, *Rozellomycota*, six species, type: *E. inversum* 4538
4490 Larsson, parasites of caddisflies, aquatic, Europe, see 4539
4491 Larsson (1986a, b; taxonomy), Hylíš et al. (2007; phy- 4540
4492 logeny), sequences are available.
- 4493 **Euplotespora** Fokin, Di Giuseppe, Erra & Dini 2008, 4541
4494 *Mrazekiidae*, *Dissociodihaplophasida*, *Microsporidea*, 4542
4495 *Rozellomycota*, one species, type: *E. binucleata* Fokin, Di 4543
4496 Giuseppe, Erra & Dini, parasites of ciliates, aquatic, Eur- 4544
4497 ope, see Fokin et al. (2008; taxonomy), sequences are 4545
4498 available.
- 4499 **Evlachovaia** Voronin 1986, *Microsporidea* genera incertae 4546
4500 sedis, *Rozellomycota*, one species, type: *E. chironomi* 4547
4501 Voronin & Issi, parasites of chironomids, aquatic, Europe, 4548
4502 see Sokolova et al. (2018; Microsporidia described from 4549
4503 USSR in twentieth century), sequences are unavailable.
- 4504 **Facilispora** Jones, Prospero-Porta & Kim 2012, *Facil-* 4550
4505 *isporidae*, *Microsporidea* families incertae sedis, *Rozel-* 4551
4506 *lomycota*, one species, type: *F. margolisi* Prospero-Porta & 4552
4507 Kim, parasites of sea lice, worldwide, see Jones et al. 4553
4508 (2012a, b; taxonomy), Poley et al. (2017; biology, reported 4554
4509 as parasites of pacific salmon louse), sequences are 4555
4510 available.
- Fibrillanosema** Slothouber Galbreath, Smith, Terry, Bec- 4556
nel, & Dunn 2004, *Berwaldiidae*, *Microsporidea* families 4557
incertae sedis, *Rozellomycota*, two species, type: *F. cran-* 4558
gonycis Slothouber Galbreath, Smith, Terry, Becnel, & 4559
Dunn, parasites of crustaceans, Europe, see Slothouber 4560
Galbreath et al. (2004; taxonomy), Simakova et al. (2018a; 4561
phylogeny), sequences are available.
- Flabelliforma** Canning, Killick-Kendrick & Killick-Ken- 4562
drick 1991, *Caudosporidae*, *Dissociodihaplophasida*, *Mi-* 4563
crosporidea, *Rozellomycota*, four species, type: *F. montana* 4564
Canning, Killick-Kendrick & Killick-Kendrick, parasites 4565
of sand flies, aquatic, Europe, see Canning et al. (1991; 4566
taxonomy), sequences are available.
- Geusia** Rühl & Korn 1979, *Microsporidea* genera incertae 4567
sedis, *Rozellomycota*, one species, type: *G. gamocystis* 4568
Rühl & Korn, parasites of mayflies, aquatic, Europe, 4569
sequences are unavailable.
- Globulispora** Vávra, Hylíš, Viala, Nebesarova 2016, *Mi-* 4570
crosporidea genera incertae sedis, *Rozellomycota*, one 4571
species, type: *G. mitoportans* Vávra, Hylíš, Viala, Nebe- 4572
sarova, parasites of daphniids, aquatic, Europe, see Vávra 4573
et al. (2016; taxonomy), sequences are available.
- Glugea** Thélohan 1891, *Glugeidae*, *Glugeida*, *Mi-* 4574
crosporidea, *Rozellomycota*, 40 species, type: *G. micro-* 4575
spora Thélohan, parasites of fishes, aquatic, worldwide, see 4576
Thélohan (1891; generic description), Voronin (1976; type 4577
description), Sprague et al. (1992; taxonomic revision), 4578
Lovy et al. (2009; new species, phylogeny), Su et al. (2014; 4579
new species, phylogeny), Abdel-Baki et al. (2015; new 4580
species, phylogeny), Azevedo et al. (2016; new species, 4581
phylogeny), sequences are available.
- Glugoides** (Chatton) Larsson, Ebert, Vávra & Voronin 4582
1996, *Microsporidea* genera incertae sedis, *Rozellomycota*, 4583
one species, type: *G. intestinalis* (Chatton) Larsson, Ebert, 4584
Vávra & Voronin, parasites of daphniids, Europe, see 4585
Larsson et al. (1996a, b; generic description), Refardt et al. 4586
(2002; phylogeny), Refardt and Ebert (2006; quantitative 4587
PCR), Refardt and Mouton (2007; phylogeny), sequences 4588
are available.
- Golbergia** Weiser 1977, *Golbergiidae*, *Dissociodihap-* 4589
lophasida, *Microsporidea*, *Rozellomycota*, one species, 4590
type: *G. spinosa* (Golberg) Weiser, parasites of insects, 4591
aquatic, Europe, sequences are unavailable.
- Gurleyides** Voronin 1986, *Microsporidea* genera incertae 4592
sedis, *Rozellomycota*, one species, type: *G. biformis* Vor- 4593
onin, parasites of crustaceans, aquatic, Europe, see Voronin 4594
(1986a, b; taxonomy), Sokolova et al. (2018; Microsporidia 4595
described from USSR in twentieth century), sequences are 4596
unavailable.
- Hamiltosporidium** Haag, Larsson, Refardt, and Ebert, 4597
2011, *Microsporidea* genera incertae sedis, *Rozellomycota*, 4598
two species, type: *H. tvaerminnensis* Haag, Larsson, 4599
4562

- 4563 Refardt, and Ebert, 2011. Parasites of daphniids, see Haag
4564 et al. (2011: taxonomy), sequences are available.
- 4565 **Hazardia** Weiser 1977, *Microsporidea* genera incertae
4566 sedis, *Rozellomycota*, two species, type: *H. milleri* (Hazard
4567 & Fukuda) Weiser, parasites of mosquitoes, aquatic,
4568 worldwide, see Simakova (2014; comparison with other
4569 mosquito parasitic *Microsporidea*), sequences are
4570 available.
- 4571 **Helmichia** Larsson 1982, *Mrazekiidae*, *Dissociodihap-*
4572 *lophasida*, *Microsporidea*, *Rozellomycota*, five species,
4573 type: *H. aggregata* Larsson, parasites of dipterans, aquatic,
4574 worldwide, see Tokarev et al. (2012; phylogeny of *H.*
4575 *lacustris*), sequences are available.
- 4576 **Hepatospora** Stentiford, Bateman, Dubuffet, Chambers &
4577 Stone 2011, *Enterocytozoonidae*, *Chytridiopsida*, *Mi-*
4578 *crosporidea*, *Rozellomycota*, one species, type: *H. eri-*
4579 *ocheir* (Wang & Chen) Stentiford, Bateman, Dubuffet,
4580 Chambers & Stone, parasites of crabs, aquatic, Asia, see
4581 Stentiford et al. (2011; taxonomy), Bateman et al. (2016;
4582 phylogeny), Ding et al. (2017, 2018; PCR assays for the
4583 detection, metabolic consequences), sequences are
4584 available.
- 4585 **Hessea** Ormières & Sprague 1973, *Hesseidae*, *Chytrid-*
4586 *iopsida*, *Microsporidea*, *Rozellomycota*, one species, type:
4587 *H. squamosa* Ormières & Sprague, parasites of gnats,
4588 France, sequences are unavailable.
- 4589 **Heterosporis** Schubert 1969, *Pleistophoridae*, *Glugeida*,
4590 *Microsporidea*, *Rozellomycota*, four species, type: *H. finki*
4591 Schubert., parasites of fishes, aquatic, worldwide, see Al-
4592 Quraishy et al. (2012; new species), Phelps et al. (2015;
4593 new species), Saleh et al. (2016a, b; in-vitro studies on
4594 antimicrobial activity of gold nanoparticles against *H.*
4595 *saurida*, in-vitro gene slicing), sequences are available.
- 4596 **Heterovesicula** Lange, Macvean, Henry & Streett 1995,
4597 *Heterovesiculidae*, *Microsporidea* families incertae sedis,
4598 *Rozellomycota*, one species, type: *H. cowani* Lange, Mac-
4599 vean, Henry & Streett, parasites of Mormon crickets,
4600 *Anabrus simplex*, North America, see Lange et al. (1995;
4601 taxonomy), Sokolova et al. (2008; phylogeny), sequences
4602 are available.
- 4603 **Hirsutosporos** Batson 1983, *Microsporidea* genera incertae
4604 sedis, *Rozellomycota*, one species, type: *H. austrosimulii*
4605 Batson, parasites of blackflies, Australasia, see Batson
4606 (1983; taxonomy), sequences are unavailable.
- 4607 **Holobispora** Voronin 1986, *Microsporidea* genera incertae
4608 sedis, *Rozellomycota*, one species, type: *H. thermocyclopi-*
4609 *s* Voronin, parasites of cyclops, aquatic, Europe, see Voronin
4610 (1986a, b; taxonomy), Sokolova et al. (2018; Microsporidia
4611 described from USSR in twentieth century), sequences are
4612 unavailable.
- 4613 **Hrabyeia** Lom & Dyková 1990, *Mrazekiidae*, *Dissociodihap-*
4614 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
4615 type: *H. xerkophora* Lom & Dyková, parasites of
oligochaetes, aquatic, Europe, see Stentiford et al. (2013;
4616 pathogens in aquatic systems), sequences are available. 4617
- Hyalinocysta** Hazard & Oldacre 1975, *Amblyosporidae*,
4618 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two
4619 species, type: *C. chapmani* Hazard & Oldacre, parasites of
4620 mosquitoes, aquatic, North America, see Hazard and Old-
4621 acre (1975; taxonomy), sequences are available. 4622
- Hyperspora** Stentiford, Ramilo, Abollo, Kerr, Bateman,
4623 Feist, Bass & Villalba 2017, *Thelohaniidae*, *Meiodihap-*
4624 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
4625 type: *H. aquatica* Stentiford, Ramilo, Abollo, Kerr, Bate-
4626 man, Feist, Bass & Villalba, parasites of paramyxids,
4627 aquatic, Europe, see Stentiford et al. (2017; taxonomy),
4628 sequences are available. 4629
- Ichthyosporidium** Caullery & Mesnil 1905, *Glugeidae*,
4630 *Glugeida*, *Microsporidea*, *Rozellomycota*, five species,
4631 type: *I. giganteum* (Thélohan) Swarczewsky, parasites of
4632 fishes, aquatic, worldwide, see Verma (2008; diagnosis,
4633 treatment), Sanders et al. (2012; new species), sequences
4634 are available. 4635
- Inodosporus** Overstreet & Weidner 1974, *Spragueidae*,
4636 *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*,
4637 two species, type: *C. spraguei* Overstreet & Weidner,
4638 parasites of crustaceans, aquatic, worldwide, see Overstreet
4639 and Weidner (1974; taxonomy), Stentiford et al. (2018;
4640 trophic transfer, synonymy with *Kabatana*), sequences are
4641 available. 4642
- Intexta** Larsson, Steiner & Bjørnson 1997, *Chytridiopsi-*
4643 *dae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, one
4644 species, type: *I. acarivora* Larsson, Steiner & Bjørnson,
4645 parasites of mites, Europe, see Larsson et al. (1997a, b;
4646 taxonomy), Larsson (2014a, b; taxonomy, notes), Radek
4647 et al. (2015; compare with *Acarispora*), sequences are
4648 unavailable. 4649
- Intrapredatorus** Chen, Kuo & Wu 1998, *Amblyosporidae*,
4650 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two
4651 species, type: *I. barri* Chen, Kuo & Wu, parasites of
4652 mosquitoes, Asia, see Chen et al. (1998; taxonomy),
4653 sequences are available. 4654
- Issia** Weiser 1977, *Microsporidea* genera incertae sedis,
4655 *Rozellomycota*, three species, type: *I. trichopterae* (Weiser)
4656 Weiser, parasites of caddisflies, aquatic, Europe, see Wei-
4657 ser (1977; taxonomy), Sokolova et al. (2018; Microsporidia
4658 described in the Former Soviet Union and Russia in
4659 twentieth century), sequences are unavailable. 4660
- Janacekia** Larsson 1983, *Microsporidea* genera incertae
4661 sedis, *Rozellomycota*, six species, type: *J. debaisieuxi*
4662 (Jírovec) Larsson, parasites of insects, Europe, see Larsson
4663 (1983; taxonomy), sequences are available. 4664
- Jirovecia** Weiser 1977, *Mrazekiidae*, *Dissociodihap-*
4665 *lophasida*, *Microsporidea*, *Rozellomycota*, seven species,
4666 type: *J. caudata* (L. Léger & Hesse) Weiser, parasites of
4667 invertebrates, Europe, sequences are unavailable. 4668

- 4669 **Jiroveciana** Larsson 1981, *Buxtehudiidae*, *Chytridiopsida*,
4670 *Microsporidea*, *Rozellomycota*, one species, type: *J. lim-*
4671 *nodrili* (Jírovec) Larsson, parasites of oligochaetes, Eur-
4672 ope, sequences are unavailable.
- 4673 **Johenrea** Lange, Becnel, Razafindratiana, Przybyszewski
4674 & Razafindrafara 1996, *Glugeidae*, *Glugeida*, *Micro-*
4675 *sporidea*, *Rozellomycota*, one species, type: *J. locustae*
4676 Lange, Becnel, Razafindratiana, Przybyszewski &
4677 Razafindrafara, parasites of locusts, Africa, see Lange et al.
4678 (1996; generic description), sequences are unavailable.
- 4679 **Kabatana** Lom, Dyková & Tonguthai 2000, *Spragueidae*,
4680 *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*,
4681 four species, type: *K. arthuri* Lom, Dyková & Tonguthai,
4682 parasites of fishes, aquatic, worldwide, sequences are
4683 available.
- 4684 **Kinorhynchospora** Adrianov & Rybakov 1991, *Micro-*
4685 *sporidea* genera *incertae sedis*, *Rozellomycota*, one
4686 species, type: *K. japonica* Adrianov & Rybakov, parasites
4687 of fishes, aquatic, Asia, see Adrianov and Rybakov (1991;
4688 taxonomy), sequences are unavailable.
- 4689 **Kneallhazia** Y.Y. Sokolova & Fuxa 2008 *Tubulinose-*
4690 *matidae*, *Microsporidea* families *incertae sedis*, *Rozel-*
4691 *lomycota*, two species, type: *K. solenopsae* (J.D. Knell,
4692 G.E. Allen & Hazard) Y.Y. Sokolova & Fuxa, parasites of
4693 ants, North America, see Sokolova and Fuxa (2008; tax-
4694 onomy), Oi et al. (2009; decapitating flies as vectors),
4695 Ascunce et al. (2010; molecular diversity), Valles et al.
4696 (2011; new species), sequences are available.
- 4697 **Krishtalia** Kilochitskii 1997, *Golbergiidae*, *Dissociodi-*
4698 *haplophasida*, *Microsporidea*, *Rozellomycota*, one species,
4699 type: *K. pipiens* Kilochitskii, parasites of mosquitoes,
4700 aquatic, Europe, see Kilochitskii (1997; taxonomy),
4701 Andreadis (2007; as biological control agent of mosqui-
4702 toes), sequences are unavailable.
- 4703 **Lanatospora** Voronin 1986, *Gurleyidae*, *Glugeida*, *Micro-*
4704 *sporidea*, *Rozellomycota*, four species, type: *L. macro-*
4705 *cyclopis* (Voronin) Voronin, parasites of crustaceans,
4706 aquatic, Europe, see Voronin (1986a, b; taxonomy), Vávra
4707 et al. (2016; new species), sequences are available.
- 4708 **Larssonia** Vidtmann & Sokolova 1994, *Gurleyidae*, *Gluge-*
4709 *ida*, *Microsporidea*, *Rozellomycota*, two species, type: *L.*
4710 *obtusa* (Moniez) Vidtmann & Sokolova, parasites of
4711 daphniids, aquatic, Europe, see Vidtmann and Sokolova
4712 (1994; taxonomy), sequences are available.
- 4713 **Larssoniella** Weiser & David 1997, *Unikaryonidae*, *Gluge-*
4714 *ida*, *Microsporidea*, *Rozellomycota*, two species, type: *L.*
4715 *resinellae* Weiser & David, parasites of insects, Europe,
4716 see Weiser and David (1997; taxonomy), Lukášová and
4717 Holuša (2013; host specificity of *L. duplicati*), sequences
4718 are unavailable.
- 4719 **Liebermannia** Sokolova, Lange & Fuxa 2006, *Micro-*
4720 *sporidea* genera *incertae sedis*, *Rozellomycota*, three
4721 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; tax-
onomic revision), Casal et al. (2009; new species), Brown
et al. (2010; new species, phylogeny, species boundaries),
sequences are available.
- Mariona** Stempel 1909, *Microsporidea* genera *incertae*
sedis, *Rozellomycota*, one species, type: *M. marionis*
(Thélohan, 1895) Stempel, parasites of myxosporeans,
aquatic, Europe, sequences are unavailable.
- Marssoniella** Lemmermann 1900, *Gurleyidae*, *Glugeida*,
Microsporidea, *Rozellomycota*, one species, type: *M. ele-*
gans 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, *Metchnikovelli-*
dae, *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
fishes, aquatic, Europe, see Faye et al. (1991; taxonomy),
sequences are unavailable.
- Microgemma** Ralphs & Matthews 1986, *Spragueidae*,
Dissociodihaplophasida, *Microsporidea*, *Rozellomycota*,
six species, type: *M. hepaticus* Ralphs & Matthews, para-
sites of fishes, aquatic, worldwide, see Ralphs and Mat-
thews (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 spe-
cies), Mansour et al. (2005; new species), Casal et al.
(2012; new species, phylogeny), sequences are available.
- Microsporidiopsis** Schereschewsky 1925, *Metchnikovelli-*
dae, *Metchnikovellida*, *Rudimicrosporea*, *Rozellomycota*,
one species, type: *M. nereidis* Schereschewsky, parasites of
gregarines, aquatic, Europe, sequences are unavailable.
- Microsporidium** Balbiani 1884, *Microsporidea* genera *in-*
certae sedis, *Rozellomycota*, 118 species epithets are listed

- 4775 in Index Fungorum (2018), type: need typification, para- 4828
 4776 sites of animals, worldwide, sequences are available. 4829
 4777 **Mitoplastophora** Codreanu 1966, *Duboscqiidae*, *Meiodi-* 4830
 4778 *haplophasida*, *Microsporidea*, *Rozellomycota*, one species, 4831
 4779 type: *M. angularis* Codreanu, parasites of mayflies, aquatic, 4832
 4780 worldwide, sequences are unavailable. 4833
 4781 **Mitosporidium** Haag, James, Pombert, Larsson, Schaer, 4834
 4782 Refardt & Ebert 2014, *Rozellomycota*, genera *incertae* 4835
 4783 *sedis*, one species, type: *M. daphniae* Haag, James, Pom- 4836
 4784 bert, Larsson, Schaer, Refardt & Ebert, parasites of daph- 4837
 4785 niids, aquatic, Europe, see Haag et al. (2014; taxonomy), 4838
 4786 Corsaro et al. (2016; phylogeny), sequences are available. 4839
 4787 **Mockfordia** Sokolova, Sokolov & Carlton 2010, *En-* 4840
 4788 *cephalitozoonidae*, *Glugeida*, *Microsporidea*, *Rozellomy-* 4841
 4789 *cota*, one species, type: *M. xanthocaeciliae* Sokolova, 4842
 4790 Sokolov & Carlton, parasites of bark lice, North America, 4843
 4791 see Sokolova et al. (2010a, b; generic description), 4844
 4792 sequences are available. 4845
 4793 **Mrazekia** Léger & Hesse 1916, *Mrazekiidae*, *Dissociodi-* 4846
 4794 *haplophasida*, *Microsporidea*, *Rozellomycota*, 17 species, 4847
 4795 type: *M. argoisi* Léger and Hesse, parasites of crustaceans, 4848
 4796 aquatic, worldwide, see Issi et al. (2010; new species), 4849
 4797 sequences are available. 4850
 4798 **Multilamina** Becnel, Scheffrahn, Vossbrinck & Bahder, 4851
 4799 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota*, 4852
 4800 one species, type: *M. teevani* Becnel, Scheffrahn, Voss- 4853
 4801 brinck & Bahder, parasites of termites, South America, see 4854
 4802 Becnel et al. (2013; taxonomy), sequences are available. 4855
 4803 **Myospora** Stentiford, Bateman, Small, Moss, Shields, 4856
 4804 Reece & Tuck 2010, *Myosporidae*, *Microsporidea* genera 4857
 4805 *incertae sedis*, *Rozellomycota*, one species, type: *M.* 4858
 4806 *metanephrops* Stentiford, Bateman, Small, Moss, Shields, 4859
 4807 Reece & Tuck, parasites of lobsters, aquatic, Australasia, 4860
 4808 see Stentiford et al. (2010; taxonomy), sequences are 4861
 4809 available. 4862
 4810 **Myosporidium** Baquero, Rubio, Moura, Pieniazek & Jor- 4863
 4811 dana 2005, *Pleistophoridae*, *Glugeida*, *Microsporidea*, 4864
 4812 *Rozellomycota*, one species, type: Baquero, Rubio, Moura, 4865
 4813 Pieniazek & Jordana, parasite of fishes, aquatic, Africa, see 4866
 4814 Baquero et al. (2005; taxonomy), sequences are available. 4867
 4815 **Myrmecomorba** Plowes, Becnel, LeBrun, Oi, Valles, 4868
 4816 Jones, & Gilbert 2015, *Caudosporidae*, *Dissociodihap-* 4869
 4817 *lophasida*, *Microsporidea*, *Rozellomycota*, one species, 4870
 4818 type: *M. nylanderiae* Plowes, Becnel, LeBrun, Oi, Valles, 4871
 4819 Jones, & Gilbert, parasites of ants, North America, see 4872
 4820 Plowes et al. (2015; taxonomy), sequences are available. 4873
 4821 **Myxocystis** Mrazek, 1897, *Microsporidea* genera *incertae* 4874
 4822 *sedis*, *Rozellomycota*, one species, type: *M. ciliata* Mrazek, 4875
 4823 1897, parasites of oligochaetes, aquatic, Europe, sequences 4876
 4824 are unavailable. 4877
 4825 **Nadelspora** Olson, Tiekotter & Reno 1994, *Pereziiidae*, 4878
 4826 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one 4879
 4827 species, type: *N. canceri* Olson, Tiekotter & Reno, 4828
 parasites of crabs, aquatic, North America, see Olson et al. 4829
 (1994; taxonomy), sequences are available. 4830
Napamichum Larsson 1990, *Thelohaniidae*, *Meiodihap-* 4831
lophasida, *Microsporidea*, *Rozellomycota*, three species, 4832
 type: *N. dispersum* (Larsson) Larsson, parasites of chi- 4833
 ronomids, aquatic, Europe, see Larsson (1990a; taxonomy), 4834
 sequences are unavailable. 4835
Nelliemelba Larsson 1983, *Tuzetiidae*, *Glugeida*, *Mi-* 4836
crosporidea, *Rozellomycota*, one species, type: *L. boeck-* 4837
ella (Milner & J.A. Mayer) Larsson, parasites of copepods, 4838
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Nematocinator Sapir, Dillman, Connon, Grupe, Ingels, 4841
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 one species, type: *N. marisprofundi* Sapir, Dillman, Con- 4844
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 Orphan & Sternberg, parasites of nematodes, aquatic, 4846
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 sequences are available. 4848
Nematocida Troemel, Félix, Whiteman, Barrière & 4849
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Rozellomycota, one species, type: *N. parisii* Troemel, 4851
 Félix, Whiteman, Barrière & Ausubel, parasites of nema- 4852
 todes, Europe, see Haag et al. (2014; taxonomy), Corsaro 4853
 et al. (2016; phylogeny), sequences are available. 4854
Neoflabelliforma Morris & Freeman 2010, *Caudosporidae*, 4855
Dissociodihaplophasida, *Microsporidea*, *Rozellomycota*, 4856
 two species: type: *N. aurantiae* Morris & Freeman, para- 4857
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 sequences are available. 4859
Neonosemoides Faye & Toguebaye 1992, *Neonosemoidi-* 4860
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 chironomids, Europe, see Issi et al. (2012; taxonomy, 4869
 synonymy with *Semenovaia*), sequences are available. 4870
Nolleria Beard, Butler & Becnel 1990, *Chytridiopsidae*, 4871
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 fleas, North America, see Larsson (2014a, b; taxonomy, 4874
 notes), Radek et al. (2015; compare with *Acarispora*), 4875
 sequences are unavailable. 4876
Norlevinea Vávra 1984, *Gurleyidae*, *Glugeida*, *Mi-* 4877
crosporidea, *Rozellomycota*, one species, type: *N. daph-* 4878
niae (Weiser) Vávra, parasites of daphniids, aquatic, 4879
 Europe, see Vávra (1984; taxonomy), Stentiford et al.

- 4880 (2013; pathogens in aquatic systems), sequences are
4881 unavailable.
- 4882 **Nosema** Nägeli 1857, *Nosematidae*, *Dissociodihap-*
4883 *lophasida*, *Microsporidea*, *Rozellomycota*, 20 species,
4884 type: *N. bombycis* Nägeli, parasites of insects, worldwide,
4885 see Iwano and Ishihara (1991: dimorphic development),
4886 Baker et al. (1994: relationships with *Vairimorpha*), Ni
4887 et al. (1995: new species), Kyei-Poku et al. (2008, 2012:
4888 molecular data and phylogeny), Kyei-Poku and Sokolova
4889 (2017: spore dimorphism), Tokarev et al. (2016: species
4890 redefinition), Hopper et al. (1996: pathogenicity), Hajek
4891 et al. (2018: new species from bugs), Grushevaya et al.
4892 (2018: spore dimorphism), sequences are available.
- 4893 **Nosemoides** Vinckier 1975, *Microsporidea* genera *incertae*
4894 *sedis*, *Rozellomycota*, five species, type: *N. vivieri*
4895 (Vinckier, Devauchelle & Prensier) Vinckier, parasites of
4896 gregarines, aquatic, Europe, see Vinckier (1975; taxon-
4897 omy), sequences are unavailable.
- 4898 **Novothelohania** Andreadis, Simakova, Vossbrinck, Shep-
4899 ard & Yurchenko, 2012. *Amblyosporidae*, *Meiodihap-*
4900 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
4901 type: *N. ovalae* Andreadis, Simakova, Vossbrinck, Shepard
4902 & Yurchenko, parasites of mosquitoes, aquatic, Asia, see
4903 Andreadis et al. (2012: taxonomy), sequences are available.
- 4904 **Nucleospora** Hedrick, Groff & Baxa 1991, *Enterocyto-*
4905 *zoonidae*, *Chytridiopsida*, *Microsporidea*, *Rozellomycota*,
4906 three species, type: *N. salmonis* Hedrick, Groff & Baxa,
4907 parasites of fishes, worldwide, see Foltz et al. (2009;
4908 detection in in steelhead trout, *Oncorhynchus mykiss*),
4909 Sakai et al. (2009; in cutthroat trout (*Oncorhynchus clarki*)
4910 and rainbow trout (*Oncorhynchus mykiss*), Freeman and
4911 Kristmundsson (2013; infecting the Atlantic lumpfish
4912 (*Cyclopterus lumpus*), Freeman et al. (2013; new species),
4913 Alarcón et al. (2016; infection in farmed lumpfish, *Cy-*
4914 *clopterus lumpus*), sequences are available.
- 4915 **Nudispora** Larsson 1990, *Thelohaniidae*, *Meiodihap-*
4916 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
4917 type: *N. biformis* Larsson, parasites of dragonflies, Europe,
4918 see Larsson (1990b; taxonomy), sequences are unavailable.
- 4919 **Obruspora** Diamant, Rothman, Goren, Galil, Yokes,
4920 Szitenberg & Huchon 2014. *Enterocytozoonidae*, *Chytrid-*
4921 *iopsida*, *Microsporidea*, *Rozellomycota*, one species, type:
4922 *O. papernae* Diamant, Rothman, Goren, Galil, Yokes,
4923 Szitenberg & Huchon, parasites of fishes, aquatic, Europe,
4924 see Diamant et al. (2010: taxonomy), sequences are
4925 available.
- 4926 **Octosporea** Flu 1911, *Caudosporidae*, *Dissociodihap-*
4927 *lophasida*, *Microsporidea*, *Rozellomycota*, 18 species,
4928 type: *O. muscaedomesticae* Flu, parasites of daphniids,
4929 aquatic, worldwide, see Roth et al. (2008; parasites of
4930 *Daphnia magna*), Corradi et al. (2009; genome study of *O.*
4931 *bayeri*), Vossbrinck et al. (2010; phylogeny), sequences are
4932 available.
- Octotetraspora** Issi, Kadyrova, Pushkar, Khodzhaeva &
Krylova 1990, *Thelohaniidae*, *Meiodihaplophasida*, *Mi-*
crosporidea, *Rozellomycota*, one species, type: *O. para-*
doxa Issi, Kadyrova, Pushkar, Khodzhaeva & Krylova,
parasites of blackflies, Asia, sequences are unavailable.
- Oligosporidium** Codreanu-Balcescu, Codreanu & Traciuc
1981, *Nosematidae*, *Dissociodihaplophasida*, *Mi-*
crosporidea, *Rozellomycota*, two species, type: *O. arach-*
nicolum (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, para-
sites 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, para-
sites of crabs, aquatic, Europe, see Vivarès et al. (1977;
taxonomy), sequences are unavailable.
- Orthosomella** Canning, Wigley & Barker 1991, *Mi-*
crosporidea genera *incertae sedis*, *Rozellomycota*, three
species, type: *O. operophtherae* (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* (Hen-
neguy) 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, para-
sites 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.

- 4986 **Paradoxium** Stentiford, Ross, Kerr, Bass & Bateman 2015, 5039
 4987 *Thelohaniidae*, *Meiodihaplophasida*, *Microsporidea*, 5040
 4988 *Rozellomycota*, one species, type: *P. irvingi* Stentiford, 5041
 4989 Ross, Kerr, Bass & Bateman, parasites of shrimps, aquatic, 5042
 4990 Europe, see Stentiford et al. (2015; taxonomy), sequences 5043
 4991 are available. 5044
 4992 **Paraepiseptum** Hylíš, Oborník, Nebesářová & Vávra 2007, 5045
 4993 *Gurleyidae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, four 5046
 4994 species, type: *P. plectrocnemiae* Hylíš, Oborník, Nebesář- 5047
 4995 ová & Vávra, parasites of insects, aquatic, Europe, see 5048
 4996 Hylíš et al. (2007, 2013; taxonomy, host taxa), sequences 5049
 4997 are available. 5050
 4998 **Paramicrosporidium** Corsaro, Walochnik, Venditti, 5051
 4999 Steinmann, Müller & Michel 2014, *Rozellomycota*, genera 5052
 5000 *incertae sedis*, two species, type: *P. saccamoebae* Corsaro, 5053
 5001 Walochnik, Venditti, Steinmann, Müller & Michel, parasites 5054
 5002 of amoebae, aquatic, Europe, see Corsaro et al. (2014; 5055
 5003 taxonomy), Quandt et al. (2017; genome study), sequences 5056
 5004 are available. 5057
 5005 **Paranosema** Sokolova, Dolgikh, Morzhina, Nasonova, 5058
 5006 Issi, Terry, Ironside, Smith & Vossbrinck 2003, *Ovavesi-* 5059
 5007 *culidae*, *Dissociodihaplophasida*, *Microsporidea*, *Rozel-* 5060
 5008 *lomycota*, four species, type: *P. grylli* (Sokolova, 5061
 5009 Seleznirov, Dolgikh & Issi) Sokolova, Dolgikh, Morzhina, 5062
 5010 Nasonova, Issi, Terry, Ironside, Smith & Vossbrinck, 5063
 5011 parasites of insects, worldwide, see Lange and Azzaro 5064
 5012 (2008; persistence), Shi et al. (2009; parasites of 5065
 5013 grasshoppers), Senderskiy et al. (2014; protein secretion in 5066
 5014 to host cells), Chen et al. (2017; novel wall protein), Pyle 5067
 5015 et al. (2017; Amalga-like virus), sequences are available. 5068
 5016 **Paranucleospora** Nylund, Watanabe, Nylund, Sævareid, 5069
 5017 Erik Arnesen & Karlsbakk 2009, *Enterocytozoonidae*, 5070
 5018 *Chytridiopsida*, *Microsporidea*, *Rozellomycota*, three spe- 5071
 5019 cies, type: *N. theridion* Nylund, Watanabe, Nylund, 5072
 5020 Sævareid, Erik Arnesen & Karlsbakk, parasites of sea lice 5073
 5021 and fishes, aquatic, worldwide, see Nylund et al. 5074
 5022 (2010, 2011; taxonomy), Sveen et al. (2012; infection 5075
 5023 dynamics), sequences are available. 5076
 5024 **Parapleistophora** Issi, Kadyrova, Pushkar, Khodzhaeva & 5077
 5025 Krylova 1990, *Glugeidae*, *Glugeida*, *Microsporidea*, 5078
 5026 *Rozellomycota*, one species, type: *P. ectospora* Issi, 5079
 5027 Kadyrova, Pushkar, Khodzhaeva & Krylova, parasites of 5080
 5028 blackflies, Asia, see Issi et al. (1990; generic description), 5081
 5029 Sokolova et al. (2018; taxonomic revision), sequences are 5082
 5030 unavailable. 5083
 5031 **Parastempellia** Khodzhaeva 1988, *Amblysporidae*, 5084
 5032 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two 5085
 5033 species, type: *P. odagmiae* Khodzhaeva, parasites of 5086
 5034 blackflies, Asia, see Sokolova et al. (1998; taxonomy), 5087
 5035 sequences are unavailable. 5088
 5036 **Parathelohania** Codreanu 1966, *Amblysporidae*, 5089
 5037 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, 25 5090
 5038 species, type: *P. legeri* (Hesse) Codreanu, parasites of 5091
 mosquitoes, worldwide, see Codreanu (1966; taxonomy), 5039
 Simakova et al. (2014, phylogeny), sequences are 5040
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 type: *P. kupermani* Poddubnaya, Tokarev & Issi, parasites 5044
 of cestodes, aquatic, Europe, see Poddubnaya et al. (2006; 5045
 taxonomy), sequences are unavailable. 5046
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 (1975; taxonomy), sequences are unavailable. 5051
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 taxonomy), sequences are available. 5057
Pernicivesicula Bylén & Larsson 1994, *Pereziiidae*, 5058
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 species, type: *P. gracilis* E.K.C. Bylén & Larsson, parasites 5060
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 (1994; taxonomy), sequences are unavailable. 5062
Pilosorella Hazard & Oldacre 1975, *Burenellidae*, 5063
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 species, type: *P. fishi* Hazard & Oldacre, parasites of 5065
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Pleistophora Gurley 1893, *Pleistophoridae*, *Glugeida*, 5068
Microsporidea, *Rozellomycota*, c. 10 species, type: *P.* 5069
typicalis Gurley, parasites of fishes, aquatic, worldwide, 5070
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Pleistosporidiidae, *Microsporidea* families *incertae sedis*, 5075
Rozellomycota, one species, type: *P. hyperparasiticum* 5076
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 and Codreanu, parasites of gregarines, aquatic, Europe, 5078
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Polydispyrenia Canning & Hazard 1982, *Caudosporidae*, 5080
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 two species, type: *P. simulii* (Lutz & Splendore) Canning 5082
 & Hazard, parasites of blackflies, aquatic, worldwide, see 5083
 Canning and Hazard (1982; taxonomy), Vossbrinck et al. 5084
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Rozellomycota, two species, type: *P. morhaphis* Casal, 5088
 Matos, Teles-Grilo & Azevedo, parasites of fishes, aquatic, 5089
 South America, see Casal et al. (2008; taxonomy), Videira 5090
 et al. (2015; new species), sequences are available. 5091

- 5092 **Pseudoloma** Matthews, Brown, Larison, Bishop-Stewart,
5093 Rogers & Kent 2001, *Glugeidae*, *Glugeida*, *Microsporidea*,
5094 *Rozellomycota*, one species, type: *P. neurophilia* Mat-
5095 thews, Brown, Larison, Bishop-Stewart, Rogers & Kent,
5096 parasites of fishes, aquatic, worldwide, see Matthews et al.
5097 (2001; generic description), Whipps and Kent (2006; PCR
5098 detection), Sander and Kent (2011; sensitive assay), Cali
5099 et al. (2012; taxonomic revision), Sanders et al. (2016; host
5100 range), Ndikumana et al. (2017; genome analysis),
5101 sequences are available.
- 5102 **Pseudonosema** Canning, Refardt, Vossbrinck, Okamura &
5103 Curry 2002, *Neoperezziidae*, *Microsporidea* families *in-*
5104 *certae sedis*, *Rozellomycota*, one species, type: *P.*
5105 *cratellae* (Canning, Okamura & Curry) Canning,
5106 Refardt, Vossbrinck, Okamura & Curry, parasites of bry-
5107 ozoans, Europe, see Canning et al. (2002a, b; taxonomy),
5108 sequences are available.
- 5109 **Pseudopleistophora** Sprague 1977, *Pseudopleistophoridae*,
5110 *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*,
5111 one species, type: *P. szollosi* Sprague, parasites of poly-
5112 chaetes, aquatic, North America, see Sprague (1977a, b;
5113 taxonomy), Sprague et al. (1992; taxonomic review),
5114 sequences are unavailable.
- 5115 **Pulicispora** Vedmed, Krylova & Issi 1991, *Duboscqiidae*,
5116 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one
5117 species, type: *P. xenopsyllae* Vedmed, Krylova & Issi,
5118 parasites of fleas, Eurasia, see Vedmed et al. (1991; tax-
5119 onomy), sequences are unavailable.
- 5120 **Pyrotheca** Hesse 1935, *Gurleyidae*, *Glugeida*, *Micro-*
5121 *sporidea*, *Rozellomycota*, eight species, type: *P. cyclo-*
5122 *pis* (Leblanc) Poisson, parasites of cyclops, aquatic,
5123 Europe, see Hyliš et al. (2007; notes), sequences are
5124 unavailable.
- 5125 **Rectispora** Larsson 1990, *Mrazekiidae*, *Dissociodihap-*
5126 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
5127 type: *R. reticulata* Larsson, parasites of oligochaetes,
5128 aquatic, Europe, see Larsson et al. (1990c; taxonomy),
5129 sequences are unavailable.
- 5130 **Resiomeria** Larsson 1986, *Thelohaniidae*, *Meiodihap-*
5131 *lophasida*, *Microsporidea*, *Rozellomycota*, one species,
5132 type: *R. odonatae* Larsson, parasites of dragonflies, aquatic,
5133 Europe, see Larsson (1986a, b; taxonomy), sequences are
5134 unavailable.
- 5135 **Ringueletium** Garcia 1990, *Caudosporidae*, *Dissociodi-*
5136 *haplophasida*, *Microsporidea*, *Rozellomycota*, one species,
5137 type: *R. pillosa* Garcia, parasites of blackflies, aquatic,
5138 Europe, see Garcia (1990; taxonomy), sequences are
5139 unavailable.
- 5140 **Schroedera** Morris & Adams 2002, *Neoperezziidae*, *Micro-*
5141 *sporidea* families *incertae sedis*, *Rozellomycota*, two
5142 species, type: *S. plumatellae* Morris & Adams 2002, par-
5143 asites of bryozoans, aquatic, Europe, see Morris and
5144 Adams (2002; taxonomy), sequences are available.
- Scipionospora** Bylén & Larsson 1996, *Caudosporidae*, 5145
Dissociodihaplophasida, *Microsporidea*, *Rozellomycota*, 5146
one species, type: *R. pillosa* Garcia, parasites of chirono- 5147
mids, aquatic, Europe, see Bylén and Larsson (1996; tax- 5148
onomy), sequences are unavailable. 5149
- Senoma** Simakova, Pankova, Tokarev & Issi 2005, *Gur-* 5150
leyidae, *Glugeida*, *Microsporidea*, *Rozellomycota*, one 5151
species, type: *S. globulifera* (Issi & Pankova) Simakova, 5152
Pankova, Tokarev & Issi, parasites of mosquitoes, aquatic, 5153
Asia, see Simakova et al. (2005; taxonomy), sequences are 5154
available. 5155
- Sheriffia** Larsson 2014, *Microsporidea* genera *incertae* 5156
sedis, *Rozellomycota*, one species, type: *S. brachynema* 5157
(Richards and Sheffield) Larsson, parasites of molluscs, 5158
aquatic, Europe, see Larsson (2014a, b; taxonomy), 5159
sequences are unavailable. 5160
- Simuliospora** Khodzhaeva, Krylova & Issi 1990, *Gol-* 5161
bergiidae, *Dissociodihaplophasida*, *Microsporidea*, *Rozel-* 5162
lomycota, two species, type: *S. uzbekistanica* Khodzhaeva, 5163
Krylova & Issi, parasites in insects, Asia, sequences are 5164
unavailable. 5165
- Spherospora** Garcia 1991, *Thelohaniidae*, *Meiodihap-* 5166
lophasida, *Microsporidea*, *Rozellomycota*, one species, 5167
type: *S. andinae* Garcia, parasites of blackflies, aquatic, 5168
South America, see Garcia (1991; taxonomy), sequences 5169
are unavailable. 5170
- Spiroglugea** Léger & Hesse 1924, *Microsporidea* genera 5171
incertae sedis, *Rozellomycota*, one species, type: *S. octos-* 5172
pora (Léger & Hesse) Léger & Hesse, parasites of biting 5173
midges, aquatic, Europe, sequences are available. 5174
- Sporanauta** Ardila-Garcia & Fast 2012, *Microsporidea* 5175
genera *incertae sedis*, *Rozellomycota*, one species, type: *S.* 5176
perivermis Ardila-Garcia & Fast, parasites of nematodes, 5177
aquatic, North America, see Ardila-Garcia and Fast (2012; 5178
taxonomy), sequences are available. 5179
- Spraguea** Weissenberg 1976, *Spragueidae*, *Dissociodi-* 5180
haplophasida, *Microsporidea*, *Rozellomycota*, two species, 5181
type: *S. lophii* (Doflein) Weissenberg, parasites of fishes, 5182
aquatic, worldwide, see Weissenberg (1976; generic 5183
description), Sprague et al. (1992; taxonomic review), 5184
Pomport-Castillon et al. (2000; phylogenetic reconstruc- 5185
tion), Freeman et al. (2004; phylogeny), Campbell et al. 5186
(2013; genome of *S. lophii*), Colmenero et al. (2015; *S.* 5187
lophii in Mediterranean lophiids), Xiang et al. (2015; 5188
comparative genomics), sequences are available. 5189
- Steinhausia** Sprague, Ormières & Manier 1972, *Pseudo-* 5190
pleistophoridae, *Dissociodihaplophasida*, *Microsporidea*, 5191
Rozellomycota, four species, type: *S. mytilovum* (Field) 5192
Sprague, Ormières & Manier, parasites of molluscs, 5193
aquatic, worldwide, see Sprague et al. (1972; generic 5194
description), Kalavati and Narasimhamurti (1977; new 5195
species), Sprague et al. (1992; taxonomic review), Cun- 5196
ningham and Daszak (1998; Extinction of land snail), 5197

- 5198 Sagristà et al. (1998; ultrastructural data of *S. mytilovum*),
5199 sequences are unavailable.
- 5200 **Stempellia** Léger & Hesse 1910, *Microsporidea* genera
5201 *incertae sedis*, *Rozellomycota*, 19 species epithets are listed
5202 in Index Fungorum (2018), type: *S. mutabilis* Léger &
5203 Hesse, parasites of mosquitoes, aquatic, worldwide,
5204 sequences are unavailable.
- 5205 **Striatospora** Issi & Voronin 1986, *Striatosporidae*,
5206 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one
5207 species, type: *S. chironomi* Issi & Voronin, parasites of
5208 chironomids, aquatic, Europe, see Sokolova et al. (2018;
5209 Microsporidia from USSR in twentieth century, descrip-
5210 tion), sequences are unavailable.
- 5211 **Systemostrema** Hazard & Oldacre 1975, *Microsporidea*
5212 genera *incertae sedis*, *Rozellomycota*, five species, type: *S.*
5213 *tabani* Hazard & Oldacre, parasites of insects, aquatic,
5214 worldwide, see Hazard and Oldacre (1975; taxonomy),
5215 Sokolova et al. (2006; phylogeny), sequences are available.
- 5216 **Tabanispora** Bykova, Sokolova & Issi 1987, *Burenellidae*,
5217 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, two
5218 species, type: *T. bacillifera* Bykova, Sokolova & Issi,
5219 parasites of insects, Europe, see Sokolova et al. (2018;
5220 Microsporidia from USSR in twentieth Century), sequen-
5221 ces are unavailable.
- 5222 **Takaokaspora** Andreadis, Takaoka, Otsuka & Vossbrinck
5223 2013, *Microsporidea* genera *incertae sedis*, *Rozellomycota*,
5224 one species, type: *T. nipponicus* T.G. Andreadis, Takaoka,
5225 Otsuka & Vossbrinck, parasites of mosquitoes, aquatic,
5226 Asia, see Andreadis et al. (2013; taxonomy), sequences are
5227 available.
- 5228 **Tardivesicula** Larsson & Bylén 1992, *Duboscqiidae*,
5229 *Meiodihaplophasida*, *Microsporidea*, *Rozellomycota*, one
5230 species, type: *T. duplicata* Larsson & Bylén, parasites of
5231 caddisflies, aquatic, Europe, see Larsson and Bylén (1992;
5232 taxonomy), sequences are unavailable.
- 5233 **Telomyxa** Léger & Hesse 1910, *Telomyxidae*, *Micro-*
5234 *sporidea* families *incertae sedis*, *Rozellomycota*, four
5235 species, type: *T. glugeiformis* Léger & Hesse, parasites of
5236 mayflies, aquatic, Europe, sequences are unavailable.
- 5237 **Tetramicra** Matthews & Matthews 1980, *Spragueidae*,
5238 *Dissociodihaplophasida*, *Microsporidea*, *Rozellomycota*,
5239 one species, type: *T. brevifilum* Matthews & Matthews,
5240 parasites of fishes, aquatic, Europe, see Matthews and
5241 Matthews (1980; generic description), Sprague et al. (1992;
5242 taxonomic review), Leiro et al. (2002; PCR detection),
5243 Alonso et al. (2013; Real-time PCR assay), Scholz et al.
5244 (2017; phylogeny), sequences are available.
- 5245 **Thelohania** Henneguy 1892, *Thelohaniidae*, *Meiodihap-*
5246 *lophasida*, *Microsporidea*, *Rozellomycota*, c. 50 species,
5247 type: *T. giardi* Henneguy, parasites of arthropods, world-
5248 wide, see Vossbrinck and Debrunner-Vossbrinck (2005;
5249 phylogeny), sequences are available.
- Toxoglugea** Léger & Hesse 1924, *Thelohaniidae*, 5250
Meiodihaplophasida, *Microsporidea*, *Rozellomycota*, c. 15 5251
species, type: need typification, parasites of insects, aqua- 5252
tic, Europe, sequences are unavailable. 5253
- Toxospora** Voronin 1993, *Toxoglugeidae*, *Microsporidea* 5254
families *incertae sedis*, *Rozellomycota*, two species, type: 5255
T. volgae Voronin, parasites of chironomids, aquatic, 5256
Europe, see Voronin (1993; taxonomy), sequences are 5257
unavailable. 5258
- Trachipleistophora** Hollister, Canning, Weidner, Field, 5259
Kench & Marriott 1996, *Pleistophoridae*, *Glugeida*, *Micro-* 5260
sporidea, *Rozellomycota*, three species, type: *T. hominis* 5261
Hollister, Canning, Weidner, Field, Kench & Marriott, 5262
parasites of humans, worldwide, see Hollister et al. (1996; 5263
taxonomy), Weinder et al. (1999; mosquito vector com- 5264
petence), Heinz et al. (2012; genome dynamics and 5265
reductive evolution), sequences are available. 5266
- Trichoctospora** Larsson 1994, *Amblyosporidae*, *Meiodi-* 5267
haplophasida, *Microsporidea*, *Rozellomycota*, one species, 5268
type: *T. pygopellita* Larsson, parasites of mosquitoes and 5269
cyclops, aquatic, Eurasia, see Larsson (1994; taxonomy), 5270
Simakova et al. (2011; parasites of cyclops), Andreadis 5271
et al. (2012; phylogeny), sequences are available. 5272
- Trichoduboscqia** Léger 1926, *Duboscqiidae*, *Meiodihap-* 5273
lophasida, *Microsporidea*, *Rozellomycota*, one species, 5274
type: *P. epeori* Léger, parasites of mayflies, aquatic, Eur- 5275
ope, see Weiser et al. (2015; compare with *Agglomerata*), 5276
sequences are unavailable. 5277
- Trichonosema** Canning, Refardt, Vossbrinck, Okamura & 5278
Curry 2002, *Neopereziiidae*, *Microsporidea* families *in-* 5279
certae sedis, *Rozellomycota*, two species, type: *T. pecti-* 5280
natellae Canning, Refardt, Vossbrinck, Okamura & Curry, 5281
parasites of bryozoans, aquatic, Europe, see Canning et al. 5282
(2002a, b; taxonomy), sequences are available. 5283
- Trichotuzetia** Vávra, Larsson & Baker 1997, *Micro-* 5284
sporidea genera *incertae sedis*, one species, type: *T.* 5285
guttata Vávra, Larsson & Baker, parasites of cyclops, 5286
aquatic, Europe, see Vávra et al. (1997; taxonomy), 5287
sequences are available. 5288
- Tricornia** Pell & Canning 1992, *Amblyosporidae*, 5289
Meiodihaplophasida, *Microsporidea*, *Rozellomycota*, one 5290
species, type: *T. muhezae* Pell & Canning, parasites of 5291
mosquitoes, aquatic, Africa, see Pell and Canning (1992; 5292
taxonomy), sequences are unavailable. 5293
- Triwangia** Wang, Nai, Chih Wang, Solter, Hsu, Wang & 5294
Lo 2013, *Microsporidea* genera *incertae sedis*, *Rozel-* 5295
lomycota, one species, type: *T. caridinae* Wang, Nai, Chih 5296
Wang, Solter, Hsu, Wang & Lo, parasites of shrimps, 5297
aquatic, Asia, see Wang et al. (2013a, b, c, d; taxonomy), 5298
sequences are available. 5299
- Tubulinosema** Franzen, Fischer, Schröder, Schölmerich & 5300
Schneuwly 2005, *Tubulinosematidae*, *Microsporidea* fam- 5301
ilies *incertae sedis*, *Rozellomycota*, five species, type: *T.* 5302

- 5303 *ratisbonensis* Franzen, Fischer, Schröder, Schölmerich & 5355
 5304 Schneuwly, parasites of insects, worldwide, see Franzen 5356
 5305 et al. (2005; taxonomy), Vijendravarma et al. (2008; 5357
 5306 infection of *Drosophila melanogaster*), Bjørnson et al. 5358
 5307 (2011; new species), Choudhary et al. (2011: human 5359
 5308 infection), Meissner et al. (2012: human infection), Malysh
 5309 et al. (2013; new species), sequences are available.
- 5310 **Tuzetia** Maurand, Fize, Vernick & Michel 1971, *Tuzeti-* 5360
 5311 *idae*, *Glugeida*, *Microsporidea*, *Rozellomycota*, seven 5361
 5312 species, type: *Tuzetia infirma* (Kudo 1921) Maurand, Fize, 5362
 5313 Fenwick, and Michel, 1971 parasites of aquatic arthropods, 5363
 5314 worldwide, see Larsson (1983; taxonomy), Canning et al. 5364
 5315 (2002a, b: ultrastructure), Simakova et al. (2009b: new 5365
 5316 species), sequences are unavailable.
- 5317 **Unikaryon** Canning, Lai & Lie 1974, *Unikaryonidae*, 5366
 5318 *Glugeida*, *Microsporidea*, *Rozellomycota*, c. 18 species, 5367
 5319 type: *U. piriformis* Canning, Lai & Lie, parasites of 5368
 5320 invertebrates, worldwide, see Yaman et al. (2010; new 5369
 5321 species), sequences are available.
- 5322 **Vairimorpha** Pilley 1976, *Nosematidae*, *Dissociodihap-* 5370
 5323 *lophasida*, *Microsporidea*, *Rozellomycota*, 15 species, 5371
 5324 type: *V. necatrix* (Kramer) Pilley, parasites of insects, 5372
 5325 worldwide, see Fowler and Reeves (1974: spore dimor- 5373
 5326 phism), Fuxa and Brooks (1979: application in pest con- 5374
 5327 trol), Mitchell and Cali (1993: ultrastructure), Baker et al. 5375
 5328 (1994: relationships with *Nosema*), Down et al. (2008: host 5376
 5329 pathology), Wang et al. (2009; new species), Ironside et al. 5377
 5330 (2013: genetic diversity), Luo et al. (2014; morphological 5378
 5331 and molecular study), Baki and Bekircan (2018; new spe- 5379
 5332 cies), sequences are available.
- 5333 **Vavraia** Weiser 1977, *Pleistophoridae*, *Glugeida*, *Mi-* 5380
 5334 *crosporidea*, *Rozellomycota*, c. 10 species, type: *V. culicis* 5381
 5335 (Weiser) Weiser, parasites of insects, worldwide, see 5382
 5336 Weiser (1977; taxonomy), Bargielowski and Koella (2009; 5383
 5337 application), Lorenz and Koella (2011; mosquitoes biocon- 5384
 5338 trol), sequences are available.
- 5339 **Vittaforma** Silveira & Canning 1995, *Microsporidea* genera 5385
 5340 *incertae sedis*, *Rozellomycota*, one species, type: *V.* 5386
 5341 *corneae* (Shadduck, Meccoli, Davis & Font) Silveira & 5387
 5342 Canning, parasites of human, worldwide, Silveira and 5388
 5343 Canning (1995; taxonomy), Vossbrinck and Debrunner- 5389
 5344 Vossbrinck (2005: phylogeny), sequences are available.
- 5345 **Weiseria** Doby & Saguez 1964, *Caudosporidae*, *Disso-* 5390
 5346 *ciodihaplophasida*, *Microsporidea*, *Rozellomycota*, three 5391
 5347 species, type: *W. laurentii* Doby & Saguez, parasite of 5392
 5348 blackflies, worldwide, see Doby and Saguez (1964; tax- 5393
 5349 onomy), Vossbrinck and Debrunner-Vossbrinck (2005: 5394
 5350 phylogeny), sequences are available.
- 5351 **Wittmannia** Czaker 1997, *Microsporidea* families *incertae* 5395
 5352 *sedis*, *Rozellomycota*, *Rozellomycota*, one species, type: *W.* 5396
 5353 *antarctica* Czaker, parasites of mesozoans, Antarctica, see 5397
 5354 Czaker (1997; taxonomy), sequences are unavailable.
- Zelenkaia** Hylíš, Oborník, Nebesářová & Vávra 2013, 5398
Gurleyidae, *Glugeida*, *Microsporidea*, *Rozellomycota*, one 5399
 species, type: *Z. trichopterae* Hylíš, Oborník, Nebesářová 5400
 & Vávra, parasites of caddisflies, aquatic, Europe, Hylíš 5401
 et al. (2013; taxonomy), sequences are available. 5402
 5403
 5404
- Zoopagomycota Gryganskyi et al.** 5360
 Spatafora et al. (2016) introduced the phylum 5361
Zoopagomycota with *Zoopage* Drechsler (1935) as type 5362
 genus to accommodate three subphyla: *Entomoph-* 5363
thoromycotina Humber (Hibbett et al. 2007), *Kickellomy-* 5364
cotina Benny (Hibbett et al. 2007), and *Zoopagomycotina* 5365
 Benny (Hibbett et al. 2007). The phylum comprises early 5366
 diverging terrestrial fungi mainly associating with animals. 5367
 However, numerous mycoparasites are also included in this 5368
 group (Spatafora et al. 2016). 5369
- We accept *Zoopagomycota* as a distinct phylum which 5370
 comprises only two subphyla (we accept *Entomoph-* 5371
thoromycota as a distinct phylum agreeing with Tedersoo 5372
 et al. 2016), one class, five orders, ten families and 90 5373
 genera. 5374
- Notes for genera** 5375
- Acaulopage** Drechsler 1935, *Zoopagaceae*, *Zoopagales*, 5376
Zoopagomycetes, *Zoopagomycota*, 27 species, type: *A.* 5377
rhapidospora Drechsler, parasitic, aquatic, see Kirk et al. 5378
 (2008; genus accepted) but Kirk et al. (2013; not listed), 5379
 Hirotani-Akabane and Saikawa (2010; zygospore germi- 5380
 nation), Saikawa (2011; ultrastructural information), Sei- 5381
 fert et al. (2011; mentioned that the genus resembles 5382
 hyphomycetes), Michel et al. (2014, 2015; sequences, 5383
 isolation, prey pattern), Corsaro et al. (2018; DNA, phy- 5384
 logeny), cultures and sequences are available. 5385
- Amoebophilus** P.A. Dang. 1910, *Cochlonemataceae*, 5386
Zoopagales, *Zoopagomycetes*, *Zoopagomycota*, four spe- 5387
 cies, type: *A. penardii* P.A. Dang., parasitic on amoeboids, 5388
 Europe, North America, see Mrva (2011; infect *Mayorella* 5389
vespertoides), Saikawa (2011; accepted as in *Cochlone-* 5390
mataceae), Kirk et al. (2013; genus accepted), cultures and 5391
 sequences are unavailable. 5392
- Aplectosoma** Drechsler 1951, *Cochlonemataceae*, *Zoopa-* 5393
gales, *Zoopagomycetes*, *Zoopagomycota*, one species, type: 5394
A. microsporum Drechsler, amoebae endoparasites, USA, 5395
 see Saikawa (2011; accepted as in *Cochlonemataceae*), 5396
 Kirk et al. (2013; genus accepted), Benny et al. (2016b; 5397
 classification), cultures and sequences are unavailable. 5398
- Basidiolum** Cienk. 1861, *Zoopagomycotina* genera *incer-* 5399
tae sedis, *Kickellomycetes*, *Zoopagomycota*, one species, 5400
 type: *B. fimbriatum* Cienk., saprobes?, distribution 5401
 unknown, see Kirk et al. (2013; genus accepted), Benny 5402
 et al. (2016b; classification), cultures and sequences are 5403
 unavailable. 5404

- 5405 **Bdellospora** Drechsler 1935, *Cochlonemataceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: 5406
5407 *B. helicoides* Drechsler, endoparasites, North America, see 5408
5409 Kirk et al. (2013; genus accepted), Benny et al. (2016b; 5410
5411 classification), cultures and sequences are unavailable. 5412
5413 **Brachymyces** G.L. Barron 1980, *Helicocephalidaceae*, 5414
5415 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one spe- 5416
5417 cies, type: *B. megasporus* G.L. Barron, from soil, Canada, 5418
5419 see Kirk et al. (2013; genus accepted), Benny et al. (2016b; 5420
5421 classification), cultures and sequences are unavailable. 5422
5423 **Cystopage** Drechsler 1941, *Zoopagaceae*, *Zoopagales*, 5424
5425 *Zoopagomycetes*, *Zoopagomycota*, nine species, type: *C.* 5426
5427 *lateralis* Drechsler, nematode trapping, worldwide, see 5428
5429 Kelly et al. (2009; Ireland), Kirk et al. (2013; genus 5430
5431 accepted), Ho et al. (2015; new species), cultures and 5432
5433 sequences are unavailable. 5434
5435 **Endocochlus** Drechsler 1935, *Cochlonemataceae*, *Zoopaga-* 5436
5437 *les*, *Zoopagomycetes*, *Zoopagomycota*, four species, 5438
5439 type: *E. microsporium* Drechsler, endoparasites, cosmopoli- 5440
5441 tan, see Saikawa (2011; accepted as in *Cochlonemataceae*), 5442
5443 Kirk et al. (2013; genus accepted), Benny et al. (2016b; 5444
5445 classification), cultures and sequences are unavailable. 5446
5447 **Helicocephalum** Thaxt. 1891, *Helicocephalidaceae*, 5448
5449 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, six species, 5450
5451 type: *H. sarcophilum* Thaxt., parasites, cosmopolitan, see 5452
5453 Kirk et al. (2013; genus accepted), Tretter et al. (2014; 5454
5455 notes), Benny et al. (2016b; classification), cultures and 5456
5457 sequences are unavailable. 5458
5459 **Kuzuhaea** R.K. Benj. 1985, *Piptocephalidaceae*, *Zoopaga-* 5460
5461 *les*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: 5462
5463 *K. moniliformis* R.K. Benj., from soil, cosmopolitan, see 5464
5465 Hoffmann et al. (2013; notes), Kirk et al. (2013; genus 5466
5467 accepted), Penton et al. (2013; diversity), Benny et al. 5468
5469 (2016b; classification), Corsaro et al. (2018, phylogeny), 5470
5471 cultures unavailable, sequences available. 5472
5473 **Lecophagus** M.W. Dick 1990, *Zoopagaceae*, *Zoopagales*, 5474
5475 *Zoopagomycetes*, *Zoopagomycota*, three species, type: *L.* 5476
5477 *fasciculatus* M.W. Dick, hyphomycetous, predator, 5478
5479 cosmopolitan, see Seifert et al. (2011; morphology), Kirk 5480
5481 et al. (2013; genus accepted), Arenz et al. (2014; Antarc- 5482
5483 tica), Magyar et al. (2016; new species), Fialkowska et al. 5484
5485 (2018; interactions with prey), cultures and sequences are 5486
5487 available. 5488
5489 **Massartia** De Wild. 1897, *Zoopagales* genera *incertae* 5490
5491 *sedis*, *Zoopagomycetes*, *Zoopagomycota*, one species, type: 5492
5493 *M. javanica* De Wild., cosmopolitan, see Kirk et al. (2013; 5494
5495 genus accepted), cultures and sequences are unavailable. 5496
5497 **Piptocephalis** de Bary 1865, *Piptocephalidaceae*, *Zoopaga-* 5498
5499 *les*, *Zoopagomycetes*, *Zoopagomycota*, c. 25 species, 5500
5501 type: *P. freseniana* de Bary, mycoparasites, worldwide, see 5502
5503 Ho and Kirk (2009; new species), Hou and Ho (2010; new 5504
5505 species), Hoffmann et al. (2013; notes), Kirk et al. (2013; 5506
5507 genus accepted), Benny et al. (2016b; classification), 5508
5509 Corsaro et al. (2018, phylogeny), cultures and sequences 5510
5511 are available, genome available: *P. cylindrospora* RSA 5512
5513 2659 unpublished genome at JGI portal (Grigoriev et al. 5514
5515 2014). 5516
5517 **Reticulocephalis** Benny, R.K. Benj. & P.M. Kirk 1992, 5518
5519 *Sigmoideomycetaceae*, *Zoopagales*, *Zoopagomycetes*, 5520
5521 *Zoopagomycota*, two species, type: *R. gyrosus* Benny, R.K. 5522
5523 Benj. & P.M. Kirk, from soil, cosmopolitan, see Hoffmann 5524
5525 et al. (2013; notes), Benny et al. (2016b; classification), 5526
5527 cultures and sequences are unavailable. 5528
5529 **Rhopalomyces** Corda 1839, *Helicocephalidaceae*, *Zoopaga-* 5530
5531 *les*, *Zoopagomycetes*, *Zoopagomycota*, eleven species, 5532
5533 type: *R. elegans* Corda, parasites, cosmopolitan, see Kirk 5534
5535 et al. (2013; genus accepted), Tretter et al. (2014; notes), 5536
5537 Benny et al. (2016b; classification), Corsaro et al. (2018, 5538
5539 phylogeny), cultures unavailable, sequences are available. 5540
5541 **Sigmoideomyces** Thaxt. 1891, *Sigmoideomycetaceae*, 5542
5543 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one spe- 5544
5545 cies, type: *S. dispiroides* Thaxt., saprobes, cosmopolitan, 5546
5547 see Kirk et al. (2013; genus accepted), Benny et al. (2016b; 5548
5549 classification), cultures and sequences are unavailable. 5550
5551 **Sphondylocephalum** Stalpers 1974, *Sigmoideomycetaceae*, 5552
5553 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one spe- 5554
5555 cies, type: *S. verticillatum* (Thaxt.) Stalpers, hyphomyce- 5556
5557 tous, coprophilous, North America, see Seifert et al. (2011; 5558
5559 morphology), Kirk et al. (2013; genus accepted), Suyama 5560
5561 and Degawa (2013; accepted as in *Sigmoideomycetaceae*), 5562
5563 Benny et al. (2016b; notes), cultures and sequences are 5564
5565 unavailable. 5566
5567 **Stylopaga** Drechsler 1935, *Zoopagaceae*, *Zoopagales*, 5568
5569 *Zoopagomycetes*, *Zoopagomycota*, 17 species, type: *S.* 5570
5571 *lepte* Drechsler, predator, cosmopolitan, see Kirk et al. 5572
5573 (2013; genus accepted), Michel et al. (2014; isolation, 5574
5575 characterization), Corsaro et al. (2018; DNA, phylogeny), 5576
5577 cultures and sequences are available. 5578
5579 **Syncephalis** Tiegh. & G. Le Monn. 1873, *Piptocephali-* 5580
5581 *daceae*, *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, c. 5582
5583 55 species, type: *S. cordata* Tiegh. & G. Le Monn., 5584
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5511 mycoparasites, worldwide, see Ho and Benny (2008; new
 5512 species), Santiago et al. (2011a, b; new species), Hoffmann
 5513 et al. (2013; notes), Kirk et al. (2013; genus accepted),
 5514 Benny et al. (2016a; classification, ecology), Melo et al.
 5515 (2016; neotropics), Lazarus et al. (2017, systematics) *S.*
 5516 *fuscata* S228 unpublished genome at JGI portal (Grigoriev
 5517 et al. 2014), *S. plumigaleata* NRRL S24 unpublished
 5518 genome at JGI portal (Grigoriev et al. 2014), *S. pseudop-*
 5519 *lumigaleata* Benny S71-1 unpublished genome at JGI
 5520 portal (Grigoriev et al. 2014).
 5521 **Tentaculophagus** Doweld 2014, *Zoopagaceae*, *Zoop-*
 5522 *agales*, *Zoopagomycetes*, *Zoopagomycota*, one species, type:
 5523 *T. karlingii* see Index Fungorum (2018), cultures and
 5524 **AQ5** sequences are unavailable.
 5525 **Thamnocephalis** Blakeslee 1905, *Sigmoideomycetaceae*,
 5526 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, three spe-
 5527 cies, type: *T. quadrupedata* Blakeslee, saprobes, cos-
 5528 mopolitan, see Kirk et al. (2013; genus accepted), Ho and
 5529 Chiang (2014; Taiwan), Benny et al. (2016b; classifica-
 5530 tion), Corsaro et al (2018, phylogeny), cultures unavail-
 5531 able, *T. sphaerospora* RSA 1356 unpublished genome at
 5532 JGI portal (Grigoriev et al. 2014).
 5533 **Verrucocephalum** Degawa 2013, *Helicocephalidaceae*,
 5534 *Zoopagales*, *Zoopagomycetes*, *Zoopagomycota*, one spe-
 5535 cies, type: *H. latericorvinisporum* Degawa, from dung,
 5536 nematophagous, Asia, see Degawa (2014; taxonomy),
 5537 cultures and sequences are unavailable.
 5538 **Zoopage** Drechsler 1935, *Zoopagaceae*, *Zoopagales*, *Zoo-*
 5539 *pagomycetes*, *Zoopagomycota*, eleven species, type: *Z.*
 5540 *phanera* Drechsler, in amoeba, cosmopolitan, see Kirk
 5541 et al. (2013; genus accepted), Benny et al. (2016b; classi-
 5542 fication), cultures and sequences are unavailable.
 5543 **Zoopagus** Sommerst. 1911, *Zoopagaceae*, *Zoopagales*,
 5544 *Zoopagomycetes*, *Zoopagomycota*, four species, type: *Z.*
 5545 *insidians* Sommerst., on algae, cosmopolitan, see Kirk
 5546 et al. (2013; genus accepted), Benny et al. (2016b; classi-
 5547 **AQ6** fication), Corsaro et al (2018, phylogeny), a sequence is
 5548 available.

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