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Systematic classification and phylogenetic relationships of the brown-rot fungi within the Polyporales

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Abstract

The brown-rot fungi play an important role in forest ecosystems; they can degrade celluloses and hemicelluloses of wood and maintain nutrient cycling. Some of the brown-rot fungi also have important economic value as medicinal or edible mushrooms. Recent studies showed that the ability to produce brown rot has evolved independently at least five times. Nevertheless, the Polyporales contains the vast majority of the species of the brown-rot fungi. In this study, the classification system of the brown-rot fungi within the Polyporales is revised. Furthermore, the phylogenetic relationships of brown-rot fungi within the Polyporales are analysed based on DNA sequences of multiple loci including the internal transcribed spacer (ITS) regions, the large subunit nuclear ribosomal RNA gene (nLSU), the small subunit nuclear ribosomal RNA gene (nSSU), the small subunit mitochondrial rRNA gene sequences (mtSSU), the translation elongation factor 1-α gene (TEF1), the RNA polymerase II largest subunit (RPB1) and the second subunit of RNA polymerase II (RPB2). The study showed that the brown-rot fungi within the Polyporales formed fourteen lineages, which are assigned at family level, including four new families: Auriporiaceae, Piptoporellaceae, Postiaceae, Taiwanofungaceae, and ten existing families: Adustoporiaceae, Dacryobolaceae, Fibroporiaceae, Fomitopsidaceae, Laetiporaceae, Laricifomitaceae, Phaeolaceae, Pycnoporellaceae, Sarcoporiaceae, and Sparassidaceae. Meanwhile, eleven new genera, viz., *Austroporia*, *Aurantipostia*, *Austropostia*, *Daedalella*, *Nothofagiporus*, *Pseudoantrodia*, *Pseudofomitopsis*, *Rhodoantrodia*, *Tenuipostia*, *Wolfiporiella* and *Wolfiporiopsis* are proposed; eighteen new species, viz., *Amyloporia nivea*, *Antrodia subheteromorpha*, *Aurantipostia macrospora*, *Austropostia hirsuta*, *A. plumbea*, *A. subpunctata*, *Cystidiopostia subhibernica*, *Daedalella micropora*, *Fuscopostia subfragilis*, *Lentoporia subcarbonica*, *Melanoporia tropica*, *Neolentiporus tropicus*, *Phaeolus fragilis*, *Postia crassicontexta*, *Pseudoantrodia monomitica*, *Pseudofomitopsis microcarpa*, *Resinoporia luteola* and *Rhodonia subrancida* are described; and twelve new combinations, viz., *Austroporia stratosa*, *Austropostia brunnea*, *A. pelliculosa*, *A. punctata*, *Nothofagiporus venatus*, *Rhodoantrodia tropica*, *R. yunnanensis*, *Tenuipostia dissecta*, *Wolfiporiella cartilaginea*, *W. curvispora*, *W. dilatohypha* and *Wolfiporiopsis castanopsidis*, are proposed. Illustrated descriptions of the new species are provided. Notes on the genera of brown-rot fungi within the Polyporales are provided.

Keywords Brown-rot fungi · Fomitopsidaceae · Multi-gene phylogeny · New taxa · Taxonomy · Wood-rotting fungi

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Introduction

Wood-rotting fungi produce ligninolytic and cellulolytic enzymes that break down lignins, celluloses, and hemicelluloses, and usually are divided into two types: the white-rot fungi and the brown-rot fungi. The brown-rot fungi can degrade celluloses and hemicelluloses while a little of lignin in wood is modified or degraded and play an important role in forest ecosystems (Wei and Dai 2004; Toljander et al. 2006; Lonsdale et al. 2008; Fukami et al. 2010; Rajala et al. 2012). Some species of the brown-rot fungi are edible or medicinal mushrooms with important economic values (Dai et al. 2006; Wu et al. 2019) while some species are forest pathogens (Dai et al. 2007; Rajchenberg and Robledo 2013; Song et al. 2018).

The brown-rot fungi are distributed in different families and even in different orders of Agaricomycetes, Basidiomycota, i.e. Agaricales Underw., Amylocorticiales K.H. Larss., Manfr. Binder & Hibbett, Boletales E.-J. Gilbert, Gloeophyllales Thorn and Polyporales Gäum. (He et al. 2019), of which, Polyporales contains the vast majority of the species of the brown-rot fungi. Phylogenetically, most of the brown-rot fungi of Polyporales grouped together and formed a monophyletic clade as the antrodia clade (Ortiz-Santana et al. 2013).

The antrodia clade was first proposed by Hibbett and Donoghue (2001) as a subclade within the polyporoid clade (Hibbett and Thorn 2001), and comprised 11 brown-rot genera (*Antrodia* P. Karst., *Auriporia* Ryvarden, *Daedalea* Pers, *Fomitopsis* P. Karst., *Laetiporus* Murrill, *Neolentiporus* Rajchenb., *Oligoporus* Bref., *Phaeolus* (Pat.) Pat., *Piptoporus* P. Karst., *Postia* Fr., *Sparassis* Fr.). Binder et al. (2005) studied the phylogenetic relationships of resupinate Homobasidiomycetes based on ribosomal DNA sequences. In their study, the polyporoid clade was divided into three main groups, viz., the core polyporoid group, the phlebioid group, and the antrodia group which included most of the brown rot taxa. Binder et al. (2013) presented a phylogenetic and phylogenomic overview of the Polyporales in which the Polyporales was divided into four main clades, viz., the antrodia clade, the core polyporoid clade, the phlebioid clade and the residual polyporoid clade; all taxa in the antrodia clade share brown-rot wood decay but have various basidiocarps, such as pileate-stipitate, pileate-sessile, with poroid or daedaleoid hymenophores; and also resupinate forms and cauliflower-like basidiocarps. Binder et al. (2013) proposed that if the antrodia clade is treated as monophyletic, Sparassidaceae Herter is acceptable; if it is treated as polyphyletic, Dacryobolaceae Jülich, Daedaleaceae Jülich, Fomitopsidaceae Jülich, Laricifomitaceae Jülich, Phaeolaceae Jülich, Piptoporaceae Jülich and Sparassidaceae are acceptable. *Leptoporus mollis* (Pers.) Quél. was described as causing a brown cubical rot on dead conifers (Gilbertson and Ryvarden 1986), but it was placed in the phlebioid clade which mostly produce white-rot decay and so the position of this species still needed further study (Binder et al. 2013).

Ortiz-Santana et al. (2013) presented a phylogenetic overview of the antrodia clade based on ITS and nLSU regions in which five moderately to strongly supported main groups grouped, viz., the fibroporia group, the laetiporus group, the laricifomes group, the postia group and the core antrodia group. They also indicated that the genera *Gilbertsonia* Parmasto, *Rhodonia* Niemelä, *Ryvardenia* Rajchenb. and *Taiwanofungus* Sheng H. Wu, Z.H. Yu, Y.C. Dai & C.H. Su represented independent lineages. Han et al. (2016) performed a comprehensive study on *Fomitopsis* and its related genera based on morphological characteristics and phylogenetic evidence. In their study, 34 lineages fell within the antrodia clade, including six new genera, viz., *Fragifomes* B.K. Cui, M.L. Han & Y.C. Dai, *Niveoporofomes* B.K. Cui, M.L. Han & Y.C. Dai, *Rhodofomitopsis* B.K. Cui, M.L. Han & Y.C. Dai, *Piptoporellus* B.K. Cui, M.L. Han & Y.C. Dai, *Rubellofomes* B.K. Cui, M.L. Han & Y.C. Dai and *Ungulidaedalea* B.K. Cui, M.L. Han & Y.C. Dai, but they did not focus on the taxonomic status of *Fomitopsis* and its related genera at family level. Justo et al. (2017) provided a revised family-level classification of the Polyporales based on phylogenetic analyses inferred from nLSU, ITS and RPB1 genes in which Dacryobolaceae, Fomitopsidaceae, Laetiporaceae Jülich, Sparassidaceae, the amyloporia group and the fibroporia group were included in the antrodia clade; *Auriporia aurea* (Peck) Ryvarden and *Taiwanofungus* could not be assigned to a family within the Polyporales; the fibroporia+amyloporia group (*Amyloporia* Singer, *Fibroporia* Parmasto, *Rhodonia*) was given informal name; *Leptoporus* Quél. as one notable exception in Irpicaceae Spirin & Zmitr. was described as causing a brown rot; all of these taxa need further study to calrify their taxonomic position. Moreover, Phaeolaceae was treated as a synonym of Laetiporaceae, but did not receive statistic support (− % ML, − BPP; Justo et al. 2017), therefore, the legitimacy and intergeneric relationships of Laetiporaceae and Phaeolaceae are still controversial.

In recent years, Audet (2017a, b, c, d, e, f, g, h, i, j, 2018a, b, c, d, e, f, g) established some new brown-rot genera and families within the Polyporales. He transferred *Antrodia oleracea* (R.W. Davidson & Lombard) Ryvarden into the new genus *Antrodiopsis* Audet, *Antrodia malicola* (Berk. & M.A. Curtis) Donk and related taxa to *Brunneoporus* Audet, *Antrodia albidoides* A. David & Dequatre to *Dentiporus* Audet, *Antrodia pulvinascens* (Pilát) Niemelä and related taxa to *Flavidoporia* Audet, *Antrodia carbonica* (Overh.) Ryvarden & Gilb. to *Lentoporia* Audet and Lentoporiaceae Audet, *Antrodia serialis* (Fr.) Donk and related taxa to *Neoantrodia* Audet, *Antrodia crassa* (P. Karst.) Ryvarden and related taxa to *Resinoporia* Audet, *Antrodia hyalina* Spirin, Miettinen & Kotir. to *Rhizoporia* Audet, *Antrodia juniperina* (Murrill) Niemelä & Ryvarden and related taxa to *Subantrodia* Audet, *Antrodia sinuosa* (Fr.) P. Karst. to *Adustoporia* Audet and Adustoporiaceae Audet. Species of *Amyloporia* were transferred to the new family Amyloporiaceae Audet; species of *Fibroporia* and *Pseudofibroporia* Yuan Y. Chen, B.K. Cui & Y.C. Dai to Fibroporiaceae Audet; species of *Pycnoporellus* Murrill and *Crustoderma* Parmasto to Pycnoporellaceae Audet; species of *Rhodonia* to Rhodoniaceae Audet, and species of *Sarcoporia* P. Karst. to Sarcoporiaceae Audet. These new genera and families were proposed without new data and adequate phylogenetic analyses; therefore, some mycologists disagreed with the new genera and families proposed by Audet (Runnel et al. 2019). The new genera and new families proposed by Audet need to be further clarified. Shen et al. (2019) carried out the phylogenetic and taxonomic study on *Postia* and related brown-rot fungal genera. In their study, 42 lineages were nested inside the antrodia clade, including four new genera, viz., *Amaropostia* B.K. Cui, L.L. Shen & Y.C. Dai, *Calcipostia* B.K. Cui, L.L. Shen & Y.C. Dai, *Cystidiopostia* B.K. Cui, L.L. Shen & Y.C. Dai and *Fuscopostia* B.K. Cui, L.L. Shen & Y.C. Dai, but they did not focus on the taxonomic status of the postia group at family level. Some genera in the postia group were placed in Fomitopsidaceae in the early years (Kirk et al. 2008; Shen et al. 2014, 2015; Shen and Cui 2014), and in Dacryobolaceae in recent years (Justo et al. 2017; He et al. 2019). In addition, several genera of this group such as *Amaropostia*, *Calcipostia*, *Cyanosporus*, *Cystidiopostia* and *Fuscopostia* remained with uncertain familial placements (He et al. 2019). Therefor, the classifications of the postia group are controversial and need to be emphatically analyzed.

He et al. (2019) provided an outline of all genera of Basidiomycota and the brown-rot fungi are scattered in different orders, such as Agaricales, Amylocorticiales, Boletales, Gloeophyllales and Polyporales. Polyporales contains most brown-rot fungi species, which are distributed in Dacryobolaceae, Fomitopsidaceae, Irpicaceae, Laetiporaceae and Sparassidaceae. Some brown-rot fungal genera of Polyporales such as *Amaropostia*, *Amyloporia*, *Auriporia*, *Cyanosporus* McGinty, *Cystidiopostia*, *Fibroporia*, *Fuscopostia*, *Gilbertsonia*, *Macrohyporia* I. Johans. & Ryvarden, *Piptoporellus*, *Pseudofibroporia*, *Rhodonia*, *Ryvardenia*, *Sarcoporia* and *Taiwanofungus* remained with uncertain familial placements (*incertae sedis*). The new families proposed by Audet were not mentioned or accepted by He et al. (2019).

Recently, taxonomic and phylogenetic studies of the brown-rot fungi in China have been carried out, and many new genera and species within the Polyporales have been described based on morphological characteristics and molecular data (Cui 2013; Cui and Dai 2013; Li and Cui 2013; Li et al. 2013; Cui et al. 2014; Han et al. 2014, 2015, 2016; Shen and Cui 2014; Shen et al. 2014, 2015, 2019; Song et al. 2014, 2018; Chen et al. 2015, 2017; Han and Cui 2015; Chen and Cui 2016; Song and Cui 2017; Liu et al. 2019, 2021a, b, 2022a, b; Zhou et al. 2021). As a continuation of these studies, the current study aims to revise the classification and phylogenetic relationships of the brown-rot fungi within the Polyporales. This study is based on extensive morphological examinations of more specimens from China and some other countries, combined with analyses of multi-gene sequences data. The phylogeny of accepted genera in brown-rot fungi is reconstructed based on DNA sequences of multiple loci including the internal transcribed spacer (ITS) regions, the large subunit nuclear ribosomal RNA gene (nLSU), the small subunit nuclear ribosomal RNA gene (nSSU), the small subunit mitochondrial rRNA gene sequences (mtSSU), the translation elongation factor 1-a gene (TEF1), the RNA polymerase II largest subunit (RPB1) and second largest subunit (RPB2) genes. Due to the Polyporales contains considerable brown-rot fungi species, there are great differences in molecular sequences among the various groups, especially in the ITS gene loci. In order to improve the reliability of character homology and sequence uniformity, and then better infer the intergeneric relationships and interspecific relationships of the brown-rot fungi within the Polyporales, we conducted one additional phylogenetic analysis based on the combined sequences dataset of nLSU+nSSU+mtSSU+TEF1+RPB1+RPB2. In addition, the Fomitopsidaceae group and the postia group contain the largest number of brown-rot fungi species within the Polyporales, and include some new genera and new species described in this study. Therefore, we conducted another two phylogenetic analyses focusing on the Fomitopsidaceae group and the postia group based on the combined sequences dataset of ITS+nLSU+nSSU+mtSSU+TEF1+RPB2, respectively. Based on morphological studies and phylogenetic analyses, 67 brown-rot genera belonging to 14 families are accepted within the Polyporales, including four new families and eleven new genera.

Materials and methods

Morphological studies

The specimens used in this study are mostly deposited at the herbarium of the Institute of Microbiology, Beijing Forestry University, China (BJFC), some specimens loaned from the herbaria of the Institute of Applied Ecology, Chinese Academy of Sciences, China (IFP), the private herbarium of Dr. J. Vlasák of Czech Republic (JV) were also studied and the Botanical Museum of the University of Oslo, Norway (O). The microscopic routines used in this study followed Han et al. (2016) and Cui et al. (2019). Sections were studied at a magnification up to ×1000 using a Nikon E80i microscope and phase contrast illumination (Nikon, Tokyo, Japan). Drawings were made with the aid of a drawing tube. Microscopic features, measurements and drawings were made from slide preparations of dried or fresh material stained with Cotton Blue and Melzer's reagent. Spores were measured from sections cut from the tubes. In presenting the variation in the size of the spores, 5% of measurements were given in parentheses. In the text the following abbreviations were used: IKI = Melzer's reagent, IKI+ = amyloid, IKI− = indextrinoid and inamyloid, KOH = 5% potassium hydroxide, CB = Cotton Blue, CB+ = cyanophilous, CB− = acyanophilous, L = mean spore length (arithmetic average of all spores), W = mean spore width (arithmetic average of all spores), Q = variation in the L/W ratios between the specimens studied, n = number of spores measured from given number of specimens. Special color terms followed Petersen (1996).

DNA extraction, amplification and sequencing

A cetyl trimethylammonium bromide (CTAB) rapid plant genome extraction kit-DN14 (Aidlab Biotechnologies Co., Ltd, Beijing, China) was used to extract total genomic DNA from dried specimens and perform the polymerase chain reaction (PCR) according to the manufacturer's instructions with some modifications following Sun et al. (2020), Sun et al. (2022). The ITS regions were amplified with primer pairs ITS5 and ITS4 (White et al. 1990). The nLSU regions were amplified with primer pairs LR0R and LR7 (http://www.biology.duke.edu/fungi/mycolab/primers.htm). The nSSU regions were amplified with primer pairs NS1 and NS4 (White et al. 1990). The mtSSU regions were amplified with primer pairs MS1 and MS2 (White et al. 1990). Part of TEF1 was amplified with primer pairs EF1-983F and EF1-1567R (Rehner and Buckley 2005). RPB1 was amplified with primer pairs RPB1-Af and RPB1-Cr (Matheny et al. 2002). RPB2 was amplified with primer pairs bRPB2-6F and bRPB2-7R (Matheny 2005). The PCR cycling schedule for ITS, mtSSU and TEF1 included an initial denaturation at 95 ℃ for 3 min, followed by 35 cycles at 94 ℃ for 40 s, 54–57 ℃ (ITS) and 53–55 ℃ (mtSSU, TEF1) for 45 s, 72 ℃ for 1 min, and a final extension at 72 ℃ for 10 min. The PCR cycling schedule for nLSU and nSSU included an initial denaturation at 94 ℃ for 1 min, followed by 35 cycles at 94 ℃ for 30 s, 50 ℃ (nLSU) and 51 ℃ (nSSU) for 1 min, 72 ℃ for 1.5 min, and a final extension at 72 ℃ for 10 min. The PCR cycling schedule for RPB1 and RPB2 included an initial denaturation at 94 ℃ for 2 min, followed by 10 cycles at 94 ℃ for 40 s, 60 ℃ for 40 s and 72 ℃ for 2 min, then followed by 37 cycles at 94 ℃ for 45 s, 54–57 ℃ for 1.5 min and 72 ℃ for 2 min, and a final extension of 72 ℃ for 10 min. The PCR products were purified and sequenced at the Beijing Genomics Institute (BGI), China, with the same primers. All newly generated sequences were deposited at GenBank (Table 1).

Phylogenetic analyses

Additional sequences were downloaded from GenBank (Table 1). All sequences of ITS, nLSU, nSSU, mtSSU, TEF1, RPB1 and RPB2 were aligned in MAFFT 7 (Katoh and Standley 2013; http://mafft.cbrc.jp/alignment/server/) and manually adjusted in BioEdit (Hall 1999). Alignments were spliced in Mesquite (Maddison and Maddison 2017). The missing sequences were coded as ''N''. Ambiguous nucleotides were coded as ''N''.

The phylogenetic analyses used in this study followed the approach of Shen et al. (2019) and Ji et al. (2022). The Maximum Likelihood (ML), Maximum Parsimony (MP) and Bayesian Inference (BI) methods were used to analyze the combined datasets of sequences. The congruences of the seven gene sequences were evaluated with the incongruence length difference (ILD) test (Farris et al. 1994) implemented in PAUP* 4.0b10 (Swofford 2002), under heuristic search and 1000 homogeneity replicates. *Heterobasidion annosum* (Fr.) Bref. and *Stereum hirsutum* (Willd.) Pers. were selected as outgroups for the phylogenetic analyses of the brown-rot fungi within the Polyporales following Binder et al. (2013), Justo et al. (2017) and Chen et al. (2021). The reason for choosing these two species as outgroup taxa is that they belong to Russulales, and is closely related to Polyporales (He et al. 2019), which conforms to the outgroup selection rules. Furthermore, *Oligoporus rennyi* (Berk. & Broome) Donk and *Postia lactea* (Fr.) P. Karst. were selected as outgroups for the phylogenetic analyses of the Fomitopsidaceae group, *Antrodia serpens* (Fr.) P. Karst. and *Fomitopsis betulina* (Bull.) B.K. Cui, M.L. Han & Y.C. Dai were selected as outgroups for the phylogenetic analyses of the postia group. Maximum parsimony analysis was applied to the combined multiple genes dataset and the tree construction procedure was performed in PAUP* version 4.0b10. All characters were equally weighted and gaps were treated as missing data. Trees were inferred using the heuristic search option with TBR branch swapping and 1000 random sequence additions. Max-trees were set to 5000, branches of zero length were collapsed and all parsimonious trees were saved. Clade robustness was assessed using a bootstrap (BT) analysis with 1000 replicates (Felsenstein 1985). Descriptive tree statistics tree length (TL), consistency index (CI), retention index (RI), rescaled consistency index (RC), and homoplasy index (HI) were calculated for each Most Parsimonious Tree (MPT) generated.

The maximum likelihood (ML) and Bayesian Inference (BI) analyses were performed based on the combined multiple genes datasets respectively. ML researches were

Table 1 A list of species, specimens, and GenBank accession number of sequences used for phylogenetic analyses in this study

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Abortiporus biennis	Cui 17845	China	**ON417149**	**ON417197**	**ON417009**	**ON417064**	**ON424821**	**ON424663**	**ON424750**	Present study
Abortiporus biennis	Cui 16986	China	**ON417150**	**ON417198**	**ON417010**	**ON417065**	**ON424822**	**ON424664**	**ON424751**	Present study
Adustoporia sinuosa	Cui 16253	China	**MW377251**	**MW377332**	**MW377410**	**MW382046**	**MW337082**	**MW337153**	**ON424752**	Present study
Adustoporia sinuosa	Cui 16484	China	**MW377252**	**MW377333**	**MW377411**	**MW382047**	**MW337083**	**MW337154**	**ON424753**	Present study
Adustoporia sinuosa	Cui 16252	China	**OM039269**	**OM039169**	**OM039235**	**OM039204**	**OM037791**	**OM037741**	**OM037767**	Present study
Amaropostia hainanensis	Cui 13739	China	KX900909	KX900979	KX901123	KX901053	–	KX901171	KX901223	Shen et al. (2019)
Amaropostia hainanensis	Cui 5367	China	KX900910	KX900980	KX901124	KX901052	–	KX901172	KX901224	Shen et al. (2019)
Amaropostia stiptica	Cui 17037	China	**OK045504**	**OK045510**	**OK045492**	**OK045498**	**OK076958**	**OK076902**	**OK076930**	Present study
Amaropostia stiptica	Cui 18013	China	**OM039270**	**OM039170**	**OM039236**	**OM039205**	**OM037792**	**OM037742**	**OM037768**	Present study
Amylocystis lapponica	HHB 13400	USA	KC585237	KC585059	AF518570	AF518667	–	–	–	Ortiz-Santana et al. (2013)
Amylocystis lapponica	FP-105131	USA	KY948805	KY948879	–	–	–	KY948973	–	Ortiz-Santana et al. (2013)
Amyloporia alpina	FP 105523	USA	KC585266	KC585089	–	–	–	–	–	Ortiz-Santana et al. (2013)
Amyloporia alpina	RLG 6107	USA	KC585267	KC585090	–	–	–	–	–	Ortiz-Santana et al. (2013)
Amyloporia nivea	Cui 16478	Vietnam	**MW377253**	**MW377334**	**MW377412**	**MW382048**	**MW337084**	–	**MW337021**	Present study
Amyloporia nivea	Cui 16,479	Vietnam	**MW377254**	**MW377335**	**MW377413**	**MW382049**	**MW337085**	**MW337155**	**MW337022**	Present study
Amyloporia nivea	Cui 16480	Vietnam	**MW377255**	**MW377336**	**MW377414**	**MW382050**	**MW337086**	**MW337156**	**MW337023**	Present study
Amyloporia subxantha	Cui 17174	China	**MW377256**	**MW377337**	**MW377415**	**MW382051**	**MW337087**	–	**MW337024**	Present study
Amyloporia subxantha	Cui 16487	China	**OM039271**	**OM039171**	**OM039237**	**OM039206**	**OM037793**	**OM037743**	**OM037769**	Present study
Amyloporia subxantha	Cui 17175	China	**OM039272**	**OM039172**	**OM039238**	**OM039207**	**OM037794**	**OM037744**	**OM037770**	Present study
Amyloporia xantha	Cui 11544	China	KR605817	KR605756	KR605918	KR606018	KR610746	**ON424665**	KR610836	Han et al. (2016), Present study
Amyloporia xantha	Dai 19011	China	**OM039273**	**OM039173**	**OM039239**	**OM039208**	**OM037795**	**OM037745**	**OM037771**	Present study
Anthoporia albobrunnea	FP-100514	Unknown	EU232215	EU232299	EU232257	–	–	–	–	Unpublished
Anthoporia albobrunnea	S 4665	Russia	KY948808	KY948880	–	–	–	KY949020	–	Justo et al. (2017)
Antrodia bambusicola	Cui 11280	China	MG787579	MG787620	MG787726	MG787667	MG787845	–	MG787792	Chen (2018)
Antrodia bambusicola	Dai 11901	China	MG787580	MG787621	MG787727	MG787668	MG787846	–	MG787793	Chen (2018)
Antrodia favescens	JV 0309/103	USA	KC543127	MG787622	MG787729	MG787669	KC543178	–	MG787794	Chen (2018)
Antrodia favescens	JV 0412/4-J	USA	KC543129	–	MG787730	MG787670	KC543179	–	MG787795	Chen (2018)
Antrodia griseoflavescens	Spirin 11175	Russia	MK119762	MK119762	–	–	–	MK134850	–	Runnel et al. (2019)
Antrodia griseoflavescens	Kristiansen 2010	Norway	MK119763	MK119763	–	–	–	MK134849	–	Runnel et al. (2019)
Antrodia heteromorpha	Dai 12755	USA	KP715306	KP715322	KR605908	KR606009	KP715336	–	KR610828	Chen and Cui (2016)
Antrodia heteromorpha	Dai 12742	USA	KP715319	**ON417199**	MG787728	MG787671	MG787847	–	KT895887	Chen and Cui (2016), Present study
Antrodia latebrosa	Ryvarden 10031	Tanzania	MK119769	MK119769	–	–	–	–	–	Runnel et al. (2019)
Antrodia macra	Eriksson	Unknown	KR605810	KR605749	KR605909	–	KR610739	–	MG787796	Han et al. (2016)
Antrodia mappa	RP 11756	Finland	KC543113	KC543113	–	–	–	–	–	Spirin et al. (2013a)
Antrodia mappa	TN 2669	Canada	KC543130	KC543130	–	–	–	–	–	Spirin et al. (2013a)
Antrodia multiformis	JV 1209/76	USA	KT381618	KT381618	–	–	–	MK134845	–	Runnel et al. (2019)
Antrodia multiformis	JV 1307 9-J-1	USA	KT381619	KT381619	–	–	–	MK134846	–	Runnel et al. (2019)
Antrodia neotropica	Cui 11141	China	MG787581	MG787623	–	MG787673	MG787848	–	MG787797	Chen (2018)
Antrodia parvula	OM 18226	Indonesia	MK119764	MK119764	–	–	–	–	–	Runnel et al. (2019)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Antrodia parvula	OM 11589	Indonesia	MK119766	MK119766	–	–	–	–	–	Runnel et al. (2019)
Antrodia peregrina	Dai 3026	China	MK119767	MK119767	–	–	–	–	–	Runnel et al. (2019)
Antrodia serpens	Dai 7465	Luxemburg	KR605813	KR605752	KR605913	KR606013	KR610742	**ON424666**	KR610832	Han et al. (2016), Present study
Antrodia serpens	Dai 14850	Poland	MG787582	MG787624	MG787731	MG787674	MG787849	**ON424667**	MG787798	Chen (2018), Present study
Antrodia subheteromorpha	Cui 9617	China	MG787583	MG787625	MG787735	MG787675	MG787850	–	MG787799	Chen (2018)
Antrodia subheteromorpha	Cui 18416	China	**MW377257**	**MW377338**	**MW377416**	**MW382052**	**MW337088**	–	**MW337025**	Present study
Antrodia subserpens	Cui 16210	China	**ON417151**	**ON417200**	**ON417011**	**ON417066**	**ON424823**	**ON424668**	**ON424754**	Present study
Antrodia subserpens	Cui 16285	China	**ON417152**	**ON417201**	**ON417012**	**ON417067**	**ON424824**	**ON424669**	**ON424755**	Present study
Antrodia tanakae	Yuan 1106	China	KP715313	KP715329	KR605916	KR606016	KP715343	–	KR610835	Han et al. (2016)
Antrodia tanakae	Cui 9743	China	KR605814	KR605753	KR605914	KR606014	KR610743	–	KR610833	Han et al. (2016)
Antrodia tenerifensis	Kout 1412/2	Spain	KY446065	KY446065	–	–	–	MK134847	–	Runnel et al. (2019)
Antrodia tenerifensis	Kout 13129	Spain	KY446066	KY446066	–	–	–	MK134848	–	Runnel et al. (2019)
Aurantipostia macrospora	Cui 16604	Australia	**MW377258**	**MW377339**	**MW377417**	–	**MW337089**	**MW337157**	**MW337026**	Present study
Aurantipostia macrospora	Cui 16634	Australia	**MW377259**	**MW377340**	**MW377418**	–	**MW337090**	**MW337158**	**MW337027**	Present study
Aurantipostia macrospora	Cui 16671	Australia	**MW377260**	**MW377341**	**MW377419**	–	**MW337091**	**MW337159**	**MW337028**	Present study
Auriporia aurea	FP 98524	USA	KC585316	KC585141	–	–	–	KY948984	–	Ortiz-Santana et al. (2013), Justo et al. (2017)
Auriporia aurea	Cui 10665	China	KX966182	KX966183	–	–	KX966184	–	–	Shen et al. (2019)
Auriporia aurulenta	Dai 6922	China	**MW377261**	**MW377342**	–	**MW382053**	–	–	–	Present study
Auriporia aurulenta	Cui 2545	China	**MW377262**	**ON417202**	**MW377420**	**MW382054**	–	–	–	Present study
Austroporia stratosa	FF 461	Australia	KY948806	KY948881	–	–	–	KY949014	–	Justo et al. (2017)
Austroporia stratosa	Cui 16612	Australia	**MW377263**	**MW377343**	**MW377421**	–	**MW337092**	**MW337160**	**MW337029**	Present study
Austroporia stratosa	Cui 16613	Australia	**MW377264**	**MW377344**	**MW377422**	–	**MW337093**	**MW337161**	**MW337030**	Present study
Austroporia stratosa	Cui 16618	Australia	**MW377265**	**MW377345**	**MW377423**	–	**MW337094**	**MW337162**	**MW337031**	Present study
Austroporia stratosa	Cui 16619	Australia	**MW377266**	**MW377346**	**MW377424**	–	**MW337095**	**MW337163**	**MW337032**	Present study
Austropostia brunnea	NLB 1135	Australia	MT536995	MT524530	–	–	–	–	–	Unpublished
Austropostia brunnea	Dai 18591A	Australia	**MW377272**	**MW377352**	**MW377430**	–	**MW337101**	**MW337169**	**MW337038**	Present study
Austropostia hirsuta	Cui 16660	Australia	**MW377267**	**MW377347**	**MW377425**	**MW382055**	**MW337096**	**MW337164**	**MW337033**	Present study
Austropostia hirsuta	Cui 16661	Australia	**MW377268**	**MW377348**	**MW377426**	**MW382056**	**MW337097**	**MW337165**	**MW337034**	Present study
Austropostia hirsuta	Cui 16662	Australia	**MW377269**	**MW377349**	**MW377427**	**MW382057**	**MW337098**	**MW337166**	**MW337035**	Present study
Austropostia pelliculosa	MR 10671	Argentina	JX090101	JX090123	–	–	–	–	–	Pildain and Rajchenberg (2013)
Austropostia pelliculosa	MR 10592	Argentina	JX090102	JX090124	–	–	–	–	–	Pildain and Rajchenberg (2013)
Austropostia plumbea	Cui 16550	Australia	**MW377270**	**MW377350**	**MW377428**	**MW382058**	**MW337099**	**MW337167**	**MW337036**	Present study
Austropostia plumbea	Cui 16639	Australia	**MW377271**	**MW377351**	**MW377429**	**MW382059**	**MW337100**	**MW337168**	**MW337037**	Present study
Austropostia punctata	MR 12398	Chile	JX090111	JX090127	–	–	–	–	–	Pildain and Rajchenberg (2013)
Austropostia punctata	MR 11100	Argentina	JX090112	JX090128	–	–	–	–	–	Pildain and Rajchenberg (2013)
Austropostia subpunctata	Cui 16675	Australia	**MW377273**	**MW377353**	**MW377431**	**MW382060**	**MW337102**	**MW337170**	**MW337039**	Present study
Austropostia subpunctata	Cui 16685	Australia	**MW377274**	**MW377354**	**MW377432**	**MW382061**	**MW337103**	**MW337171**	**MW337040**	Present study

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Austropostia subpunctata	Cui 16686	Australia	**MW377275**	**MW377355**	**MW377433**	**MW382062**	**MW337104**	**MW337172**	**MW337041**	Present study
Brunneoporus cyclopis	Miettinen 9166.1	Indonesia	KU866249	MG787627	MG787737	MG787679	KU866242	–	MG787802	Chen (2018), Spirin et al. (2016)
Brunneoporus kuzyana	Spirin 6771	Russia	KU866265	MG787629	MG787739	MG787681	KU866218	–	MG787804	Chen (2018), Spirin et al. (2016)
Brunneoporus kuzyana	JV 0909/37	Czech Republic	KU866267	MG787628	MG787738	MG787680	KU866221	–	MG787803	Chen (2018), Spirin et al. (2016)
Brunneoporus malicola	Cui 7258	China	MG787586	MG787631	MG787741	MG787683	MG787853	**ON424670**	MG787806	Chen (2018), Present study
Brunneoporus malicola	Cui 16272	China	**OK045505**	**OK045511**	**OK045493**	**OK045499**	**OK076959**	**OK076903**	**OK076931**	Present study
Brunneoporus minuta	Spirin 3477	Russia	KU866250	MG787633	MG787743	MG787685	KU866243	**ON424671**	MG787808	Chen (2018), Present study
Brunneoporus minuta	JV 0211/1A	Czech Republic	KU866257	MG787632	MG787742	MG787684	KU866233	–	MG787807	Chen (2018), Spirin et al. (2016)
Brunneoporus tuvensis	Kotiranta 26735-1	Russia	KU866258	–	–	–	KU866236	–	–	Spirin et al. (2016)
Buglossoporus americanus	JV 1707/9J	Costa Rica	MN318452	–	–	–	–	–	–	Unpublished
Buglossoporus eucalypticola	Dai 13660	China	KR605808	KR605747	KR605906	KR606007	KR610736	–	KR610825	Han et al. (2016)
Buglossoporus eucalypticola	Dai 13660A	China	KR605809	KR605748	KR605907	KR606008	KR610737	–	KR610826	Han et al. (2016)
Buglossoporus pulvinus	CBS 858.72	Germany	DQ491419	MH872316	–	DQ491446	–	–	DQ491392	Kim et al. (2007)
Buglossoporus quercinus	JV 0906/15-J	USA	KR605800	KR605739	KR605898	KR606001	KR610729	–	KR610819	Han et al. (2016)
Cabalodontia delicata	MCW 564/17	Brazil	MT849295	MT849295	–	–	MT833934	MT833947	–	Westphalen et al. (2021)
Calcipostia guttulata	Cui 10018	China	KF727432	KJ684978	KX901138	KX901065	KX901276	KX901181	KX901236	Shen et al. (2019)
Calcipostia guttulata	Cui 10028	China	KF727433	KJ684979	KX901139	KX901066	KX901277	KX901182	KX901237	Shen et al. (2019)
Calcipostia guttulata	Cui 16274	China	**OM039274**	**OM039174**	**OM039240**	**OM039209**	**OM037796**	**OM037746**	**OM037772**	Present study
Calcipostia guttulata	Cui 16281	China	**OM039275**	**OM039175**	**OM039241**	**OM039210**	**OM037797**	**OM037747**	**OM037773**	Present study
Cartilosoma ramentacea	Cui 16256	China	**OK045506**	**OK045512**	**OK045494**	**OK045500**	**OK076960**	**OK076904**	**OK076932**	Present study
Cartilosoma ramentacea	Dai 19005	China	**OK045507**	**OK045513**	**OK045495**	**OK045501**	**OK076961**	**OK076905**	**OK076933**	Present study
Cartilosoma rene-hentic	PRM 944766	Czech Republic	MK558725	–	–	–	–	–	–	Zíbarová et al. (2019)
Cerrena unicolor	He 6082	China	OM100740	OM083972	–	**ON417068**	**ON424825**	**ON424672**	**ON424756**	Present study
Cerrena zonata	Cui 16578	Australia	**ON417153**	**ON417203**	**ON417013**	**ON417069**	**ON424826**	**ON424673**	**ON424757**	Present study
Cerrena zonata	Cui 18502	China	**ON417154**	**ON417204**	**ON417014**	**ON417070**	**ON424827**	**ON424674**	**ON424758**	Present study
Crustoderma dryinum	FP 105487	USA	KC585320	KC585145	–	–	–	–	–	Ortiz-Santana et al. (2013)
Crustoderma dryinum	HHB 7517	USA	KC585322	KC585147	–	–	–	–	–	Ortiz-Santana et al. (2013)
Cyanosporus alni	Cui 7185	China	KX900879	KX900949	KX901092	KX901017	KX901254	KX901155	KX901202	Shen et al. (2019)
Cyanosporus alni	Dai 14845	Poland	KX900880	KX900950	KX901093	KX901018	KX901255	KX901156	KX901203	Shen et al. (2019)
Cyanosporus arbuti	Spirin 8327	USA	MG137039	–	–	–	MG137132	–	–	Miettinen et al. (2018)
Cyanosporus auricomus	Cui 13518	China	KX900887	KX900957	KX901100	KX901025	–	–	KX901209	Shen et al. (2019)
Cyanosporus auricomus	Cui 13519	China	KX900888	KX900958	KX901101	KX901026	–	–	–	Shen et al. (2019)
Cyanosporus bifarius	Cui 17534	China	**OL423598**	**OL423608**	**OL423620**	**OL437195**	**OL444994**	**OL444985**	**OL446999**	Present study
Cyanosporus bifarius	Cui 16277	China	**OL423599**	**OL423609**	**OL423621**	**OL437196**	**OL444995**	**OL444986**	**OL447000**	Present study
Cyanosporus bubalinus	Cui 16976	China	MW182172	MW182225	MW182189	MW182208	MW191530	MW191547	MW191563	Liu et al. (2021b)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Cyanosporus bubalinus	Cui 16985	China	MW182173	MW182226	MW182190	MW182209	MW191531	MW191548	MW191564	Liu et al. (2021b)
Cyanosporus caesiosimulans	Miettinen 16976	USA	MG137054	–	–	–	MG137137	–	–	Miettinen et al. (2018)
Cyanosporus caesiosimulans	Spirin 4199	Russia	MG137061	–	–	–	MG137140	–	–	Miettinen et al. (2018)
Cyanosporus caesius	Miettinen 141562	Finland	MG137048	MG137048	–	–	MG137134	–	–	Miettinen et al. (2018)
Cyanosporus caesius	Cui 18630	France	OL423600	OL423610	OL423622	OL437197	OL444996	–	–	Liu et al. (2022b)
Cyanosporus coeruleivirens	Dai 19220	China	MW182174	MW182227	MW182191	MW182210	MW191532	MW191549	–	Liu et al. (2021b)
Cyanosporus comatus	Cui 18388	China	MW182175	MW182228	MW182192	**ON417071**	MW191533	–	MW191550	Liu et al. (2021b), Present study
Cyanosporus cyanescens	Miettinen 13602	Finland	MG137067	–	–	–	MG137142	–	–	Miettinen et al. (2018)
Cyanosporus cyanescens	Miettinen 15919	Spain	MG137071	–	–	–	MG137144	–	–	Miettinen et al. (2018)
Cyanosporus flavus	Cui 18547	China	MW448564	MW448561	MW448557	ON417072	MW452601	MW452596	MW452599	Liu et al. (2022b)
Cyanosporus flavus	Cui 18562	China	MW448565	MW448562	MW448558	ON417073	MW452602	MW452597	MW452600	Liu et al. (2022b)
Cyanosporus fusiformis	Dai 15036	China	KX900867	KX900937	KX901080	KX901005	KX901244	–	KX901190	Shen et al. (2019)
Cyanosporus fusiformis	Cui 10775	China	KX900868	KX900938	KX901081	KX901006	KX901245	–	KX901191	Shen et al. (2019)
Cyanosporus glaucus	Spirin 5317	Russia	MG137078	–	–	–	–	–	–	Miettinen et al. (2018)
Cyanosporus glaucus	Spirin 6580	Russia	MG137081	–	–	–	MG137145	–	–	Miettinen et al. (2018)
Cyanosporus gossypinus	LY BR 6658	France	–	–	–	–	MG137146	–	–	Miettinen et al. (2018)
Cyanosporus hirsutus	Cui 17050	China	MW182176	MW182230	MW182194	MW182211	MW191535	MW191551	MW191565	Liu et al. (2021b)
Cyanosporus hirsutus	Cui 17055	China	MW182178	MW182232	MW182196	MW182213	MW191537	MW191553	MW191567	Liu et al. (2021b)
Cyanosporus livens	Miettinen 17177	USA	MG137082	–	–	–	MG137147	–	–	Miettinen et al. (2018)
Cyanosporus livens	Spirin 8728	USA	MG137090	–	–	–	MG137150	–	–	Miettinen et al. (2018)
Cyanosporus luteocaesia	LY BR 2605	France	MG137091	–	–	–	–	–	–	Miettinen et al. (2018)
Cyanosporus magnus	Cui 16983	China	MW182180	MW182234	MW182198	MW182215	MW191539	MW191555	MW191569	Liu et al. (2021b)
Cyanosporus magnus	Dai 21105	China	OL423603	OL423613	OL423625	OL437200	OL444999	OL444989	OL447003	Liu et al. (2022b)
Cyanosporus mediterraneocaesius	LY BR 4274	France	KX900886	–	KX901099	KX901024	–	–	–	Shen et al. (2019)
Cyanosporus microporus	Dai 11717	China	KX900877	KX900947	KX901090	KX901015	–	–	KX901200	Shen et al. (2019)
Cyanosporus microporus	Cui 11014	China	KX900878	KX900948	KX901091	KX901016	–	–	KX901201	Shen et al. (2019)
Cyanosporus nothofagicola	Cui 16697	Australia	MW182181	MW182235	MW182199	MW182216	MW191540	MW191556	MW191570	Liu et al. (2021b)
Cyanosporus nothofagicola	Dai 18765	Australia	MW182182	MW182236	MW182200	MW182217	MW191541	MW191557	**ON424759**	Liu et al. (2021b), Present study
Cyanosporus piceicola	Cui 10626	China	KX900862	KX900932	KX901075	KX901001	**ON424828**	–	KX901185	Shen et al. (2019), Present study
Cyanosporus piceicola	Cui 12158	China	KX900866	KX900936	KX901079	KX901004	KX901243	KX901153	KX901189	Shen et al. (2019)
Cyanosporus populi	Dai 18934	China	OL423604	OL423614	OL423626	OL437201	OL445000	OL444990	OL447004	Liu et al. (2022b)
Cyanosporus populi	Cui 17557	China	OL423605	OL423615	OL423627	OL437202	OL445001	OL444991	OL447005	Liu et al. (2022b)
Cyanosporus rigidus	Cui 17032	China	OL423606	OL423617	OL423629	OL437204	OL445003	OL444993	–	Liu et al. (2022b)
Cyanosporus simulans	Miettinen 20422	Finland	MG137110	–	–	–	MG137160	–	–	Miettinen et al. (2018)
Cyanosporus subcaesius	JV 0110/24	Czech Republic	MG137117	–	–	–	MG137164	–	–	Miettinen et al. (2018)
Cyanosporus subhirsutus	Dai 14892	China	KX900871	KX900941	KX901084	KX901009	KX901248	–	KX901194	Shen et al. (2019)
Cyanosporus subhirsutus	Cui 11330	China	KX900873	KX900943	KX901086	KX901011	KX901250	–	KX901196	Shen et al. (2019)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Cyanosporus submicroporus	Cui 16306	China	MW182184	MW182239	MW182203	MW182220	MW191544	MW191560	MW191573	Liu et al. (2021b)
Cyanosporus submicroporus	Cui 18156	China	MW182186	MW182241	MW182205	MW182222	**ON424829**	–	MW191574	Liu et al. (2021b), Present study
Cyanosporus subungulatus	Cui 18046	China	MW448566	MW448563	MW448559	MW448560	MW452603	MW452598	–	Liu et al. (2022b)
Cyanosporus subungulatus	Zhao 10833	China	MW742586	OL423616	OL423628	OL437203	OL445002	OL444992	–	Liu et al. (2022b)
Cyanosporus subviridis	Spirin 8774a	USA	MG137120	–	–	–	MG137166	–	–	Miettinen et al. (2018)
Cyanosporus tenuicontextus	Zhao 813	China	MG231802	OL423619	OL423631	OL437206	OL445005	–	–	Liu et al. (2022b)
Cyanosporus tenuicontextus	Cui 16280	China	OL423607	OL423618	OL423630	OL437205	OL445004	–	–	Liu et al. (2022b)
Cyanosporus tenuis	Dai 12974	China	KX900884	KX900954	KX901097	KX901022	KX901258	KX901160	KX901207	Shen et al. (2019)
Cyanosporus tenuis	Cui 10788	China	KX900885	KX900955	KX901098	KX901023	**ON424830**	KX901161	KX901208	Shen et al. (2019), Present study
Cyanosporus tricolor	Cui 10780	China	KX900874	KX900944	KX901087	KX901012	KX901251	–	KX901197	Shen et al. (2019)
Cyanosporus tricolor	Cui 10790	China	KX900875	KX900945	KX901088	KX901013	KX901252	–	KX901198	Shen et al. (2019)
Cyanosporus ungulatus	Dai 12897	China	KX900869	KX900939	KX901082	KX901007	KX901246	KX901154	KX901192	Shen et al. (2019)
Cyanosporus ungulatus	Cui 10778	China	KX900870	KX900940	KX901083	KX901008	KX901247	–	KX901193	Shen et al. (2019)
Cyanosporus yanae	HK 27454	Russia	MG137121	–	–	–	MG137167	–	–	Miettinen et al. (2018)
Cyanosporus yanae	HK 27606	Russia	MG137122	–	–	–	MG137168	–	–	Miettinen et al. (2018)
Cymatoderma elegans	Dai 17511	China	**ON417155**	**ON417205**	–	–	–	–	–	Present study
Cymatoderma sp.	OMC 1427	USA	KY948826	KY948872	–	–	–	KY948971	–	Justo et al. (2017)
Cystidiopostia hibernica	Cui 2658	China	KX900905	KX900975	KX901118	KX901045	–	–	KX901218	Shen et al. (2019)
Cystidiopostia hibernica	Cui 17624	China	**MW377277**	**MW377357**	**MW377435**	**MW382064**	**MW337105**	**MW337173**	–	Present study
Cystidiopostia inocybe	LY BR 3703	France	KX900903	KX900973	KX901116	KX901044	KX901267	–	–	Shen et al. (2019)
Cystidiopostia pileata	Cui 5721	China	KF699127	KX900960	KX901121	KX901049	KX901268	KX901169	KX901221	Shen et al. (2019)
Cystidiopostia pileata	Cui 10034	China	KX900908	KX900956	KX901122	KX901050	KX901269	KX901170	KX901222	Shen et al. (2019)
Cystidiopostia subhibernica	Cui 17095	China	**MW377278**	**MW377358**	**MW377436**	**MW382065**	**MW337106**	**MW337174**	**MW337042**	Present study
Cystidiopostia subhibernica	Dai 17621	China	**OM039276**	**OM039176**	**OM039242**	**OM039211**	**OM037798**	**OM037749**	**OM037774**	Present study
Dacryobolus gracilis	Dai 14943	China	MH048972	MH048985	**ON417015**	**ON417074**	–	–	–	Xu et al. (2018), Present study
Dacryobolus gracilis	He 5995	China	**ON417156**	**ON417206**	**ON417016**	**ON417075**	**ON424831**	–	**ON424760**	Present study
Dacryobolus karstenii	Dai 15047	China	MH048971	MH048984	–	–	–	–	–	Xu et al. (2018)
Dacryobolus karstenii	Miettinen-18685	USA	KY948743	KY948900	–	–	–	KY948955	–	Justo et al. (2017)
Dacryobolus montanus	He 6314	China	**ON417157**	**ON417207**	**ON417017**	**ON417076**	**ON424832**	–	**ON424761**	Present study
Dacryobolus sudans	FP 101996	USA	KC585332	KC585157	–	–	–	–	–	Ortiz-Santana et al. (2013)
Dacryobolus sudans	FP 150381	Jamaica	KC585333	KC585158	–	–	–	–	–	Ortiz-Santana et al. (2013)
Daedalea africana	O 15372	Kenya	KP171196	KP171216	KR605871	KR605974	KR610704	–	KR610795	Han et al. (2016)
Daedalea allantoidea	Dai 13612A	China	KR605795	KR605734	KR605892	KR605995	KR610723	–	KR610813	Han et al. (2016)
Daedalea americana	JV 0909/19	USA	KP171198	KP171218	KR605873	KR605976	KR610706	–	KR610797	Han et al. (2016)
Daedalea americana	JV 0909/20	USA	KP171199	KP171219	KR605874	KR605977	KR610707	–	KR610798	Han et al. (2016)
Daedalea circularis	Cui 10134	China	JQ314352	KP171221	KR605876	KR605979	KR610709	–	KR610800	Han et al. (2016)
Daedalea circularis	Cui 10125	China	JQ780411	KP171220	KR605875	KR605978	KR610708	–	KR610799	Han et al. (2016)
Daedalea dickinsii	Yuan 2685	China	KP171201	KP171223	KR605879	KR605982	KR610712	–	KR610803	Han et al. (2016)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Daedalea dickinsii	Yuan 2707	China	KP171202	KP171224	KR605880	KR605983	KR610713	–	KR610804	Han et al. (2016)
Daedalea dochmia	CBS 426.84	Thailand	DQ491401	AY515326	–	DQ491428	–	–	DQ491374	Kim et al. (2007)
Daedalea hydnoides	O 14083	Costa Rica	KP171203	KP171225	KR605881	KR605984	–	–	–	Han et al. (2016)
Daedalea modesta	Cui 10151	China	KP171205	KP171227	KR605883	KR605986	KR610716	–	KR610806	Han et al. (2016)
Daedalea modesta	Cui 10124	China	KR605791	KR605730	KR605882	KR605985	KR610715	–	KR610805	Han et al. (2016)
Daedalea neotropica	DLC04-100	Belize	FJ403218	–	–	–	–	–	–	Lindner et al. (2011)
Daedalea pseudodochmia	10533	China	FJ403210	–	–	–	–	–	–	Lindner et al. (2011)
Daedalea quercina	Dai 12152	Czech Republic	KP171207	KP171229	KR605886	KR605989	KR610717	**ON424675**	KR610809	Han et al. (2016), Present study
Daedalea quercina	Dai 2260	Sweden	KR605792	KR605731	KR605885	KR605988	KR610718	–	KR610808	Han et al. (2016)
Daedalea quercina	Dai 12659	Finland	KP171208	KP171230	KR605887	KR605990	KR610719	**ON424676**	KR610810	Han et al. (2016), Present study
Daedalea radiata	Cui 8575	China	KP171210	KP171233	KR605888	KR605991	KR610720	–	KR610811	Han et al. (2016)
Daedalea radiata	Cui 8624	China	KR605793	KR605732	KR605889	KR605992	KR610721	–	**ON424762**	Han et al. (2016), Present study
Daedalea sprucei	O 10546	China	KR605794	KR605733	KR605890	KR605993	KR610722	–	KR610812	Han et al. (2016)
Daedalea stereoides	10551	Ethiopia	FJ403215	–	–	–	–	–	–	Lindner et al. (2011)
Daedalea stevensonii	O 10543	Borneo	KP171212	KP171235	KR605891	KR605994	–	–	–	Han et al. (2016)
Daedalella micropora	E 7389	Indonesia	AJ542527	–	–	–	–	–	–	Unpublished
Daedalella micropora	Dai 18509	Malaysia	**MW377286**	**MW377365**	**MW377444**	**MW382073**	**MW337113**	–	**MW337049**	Present study
Dentiporus albidoides	X 1433	Italy	KC543147	KC543147	–	–	–	–	–	Spirin et al. (2013a)
Dentiporus albidoides	X 1510	France	KC543168	–	–	–	–	–	–	Spirin et al. (2013a)
Fibroporia albicans	Cui 9495	China	KC456252	KU550484	KU550524	KU550505	KU550557	–	KU550542	Chen et al. (2017)
Fibroporia albicans	Cui 16486	Vietnam	**OM039277**	**OM039177**	**OM039243**	**OM039212**	**OM037799**	**OM037750**	**OM037775**	Present study
Fibroporia bambusa	Dai 16211	China	KU550480	KU550487	KU550527	KU550507	KU550560	–	KU550545	Chen et al. (2017)
Fibroporia bambusa	Dai 16212	China	KU550481	KU550488	KU550528	KU550508	KU550561	–	KU550546	Chen et al. (2017)
Fibroporia bohemica	PRM 859138	Czech Republic	KT895883	KU550489	KU550529	KU550509	KU550562	–	KT895900	Chen et al. (2017)
Fibroporia ceracea	Cui 16299	China	**MW377293**	**MW377372**	**MW377451**	**MW382079**	**MW337120**	**MW337186**	**MW337054**	Present study
Fibroporia ceracea	Cui 16300	China	**MW377294**	**MW377373**	**MW377452**	**MW382080**	**MW337121**	**MW337187**	**MW337055**	Present study
Fibroporia citrina	LY BR 4205	Luxemburg	KT895884	KU550493	–	KU550513	KU550566	–	KT895901	Chen et al. (2017)
Fibroporia gossypium	LY BR 3994	Argentina	KT895885	KU550496	KU550535	KU550516	KU550570	–	KT895902	Chen et al. (2017)
Fibroporia gossypium	Cui 9472	China	KU550474	KU550494	KU550534	KU550514	KU550567	**ON424677**	KU550550	Chen et al. (2017), Present study
Fibroporia norrlandica	4122	Finland	KC595908	KC595908	–	–	–	–	–	Ortiz-Santana et al. (2013)
Fibroporia norrlandica	4151	Finland	KC595909	KC595909	–	–	–	–	–	Ortiz-Santana et al. (2013)
Fibroporia pseudorennyi	LY BR 3914	France	KU550475	KU550495	–	KU550515	KU550569	**ON424678**	KU550552	Chen et al. (2017), Present study
Fibroporia radiculosa	Cui 16485	Vietnam	**OM039278**	**OM039178**	**OM039244**	**OM039213**	**OM037800**	**OM037751**	**OM037776**	Present study
Fibroporia radiculosa	Cui 11404	China	KP145011	KR605760	KR605922	KR606022	KR610751	**ON424679**	KR610840	Chen et al. (2017), Present study
Fibroporia vaillantii	FP 90877	USA	KC585345	KC585170	–	–	–	KY949035	–	Ortiz-Santana et al. (2013)
Fibroporia vaillantii	Dai 23467	China	**ON417158**	**ON417208**	**ON417018**	**ON417077**	**ON424833**	**ON424680**	**ON424763**	Present study
Flavidoporia mellita	VS 3315	Russia	KC543140	KC543140	–	–	–	KY948994	–	Spirin et al. (2013a)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Flavidoporia pulverulenta	LY BR 3450	France	JQ700280	JQ700280	–	–	–	–	–	Spirin et al. (2013b)
Flavidoporia pulvinascens	Cui 9542	China	MG787589	MG787635	MG787746	**ON417078**	MG787856	–	**ON424764**	Chen (2018), Present study
Flavidoporia pulvinascens	Cui 10441	China	MG787590	MG787636	**ON417019**	MG787688	MG787857	–	MG787811	Chen (2018), Present study
Fomitopsis abieticola	Cui 10532	China	MN148230	OL621246	–	OL621757	MN161745	–	MN158174	Liu et al. (2021a)
Fomitopsis abieticola	Cui 10521	China	MN148231	OL621245	–	OL621756	MN161746	–	**ON424765**	Liu et al. (2021a), Present study
Fomitopsis bambusae	Dai 22110	China	MW937874	MW937881	MW937867	MW937888	MZ082980	**ON424681**	MZ082974	Zhou et al. (2021), Present study
Fomitopsis bambusae	Dai 22116	China	MW937876	MW937883	MW937869	MW937890	**ON424834**	**ON424682**	**ON424766**	Zhou et al. (2021), Present study
Fomitopsis betulina	Cui 17121	China	OL621853	OL621242	OL621779	OL621753	OL588982	**ON424683**	OL588969	Liu et al. (2022a), Present study
Fomitopsis betulina	Dai 11449	China	KR605798	KR605737	KR605895	KR605998	KR610726	**ON424684**	KR610816	Han et al. (2016), Present study
Fomitopsis bondartsevae	X 1059	China	JQ700275	JQ700275	–	–	–	–	–	Spirin et al. (2013b)
Fomitopsis bondartsevae	X 1207	China	JQ700277	JQ700277	–	–	–	–	–	Spirin et al. (2013b)
Fomitopsis cana	Dai 9611	China	JX435776	JX435774	KR605825	KR605933	KR610660	–	KR610762	Han et al. (2016)
Fomitopsis cana	Cui 6239	China	JX435777	JX435775	KR605826	KR605934	KR610661	–	KR610761	Han et al. (2016)
Fomitopsis caribensis	Cui 16871	Puerto Rico	MK852559	MK860108	MK860124	MK860116	MK900482	–	MK900474	Liu et al. (2019)
Fomitopsis durescens	O 10796	Venezuela	KF937292	KF937294	KR605834	KR605940	KR610669	–	KR610766	Han et al. (2016)
Fomitopsis durescens	Overholts 4215	USA	KF937293	KF937295	KR605835	KR605941	–	–	–	Han et al. (2016)
Fomitopsis eucalypticola	Cui 16594	Australia	MK852560	MK860110	MK860126	MK860118	MK900483	**ON424685**	MK900476	Liu et al. (2019), Present study
Fomitopsis eucalypticola	Cui 16598	Australia	MK852562	MK860113	MK860129	MK860121	MK900484	**ON424686**	MK900479	Liu et al. (2019), Present study
Fomitopsis ginkgonis	Cui 17170	China	MK852563	MK860114	MK860130	MK860122	MK900485	–	MK900480	Liu et al. (2019)
Fomitopsis ginkgonis	Cui 17171	China	MK852564	MK860115	MK860131	MK860123	MK900486	–	MK900481	Liu et al. (2019)
Fomitopsis hemitephra	O 10808	Australia	KR605770	KR605709	KR605841	KR605947	KR610675	–	–	Han et al. (2016)
Fomitopsis hengduanensis	Cui 16259	China	MN148232	OL621247	OL621782	OL621758	MN161747	–	MN158175	Liu et al. (2021a)
Fomitopsis hengduanensis	Cui 17056	China	MN148233	OL621248	OL621783	OL621759	MN161748	–	MN158176	Liu et al. (2021a)
Fomitopsis iberica	O 10811	Italy	KR605772	KR605711	KR605843	–	KR610677	–	KR610772	Han et al. (2016)
Fomitopsis iberica	Dai 6614	China	MG787591	MG787637	MG787747	MG787689	MG787858	–	MG787812	Chen (2018)
Fomitopsis kesiyae	Cui 16437	Vietnam	MN148234	OL621249	OL621784	OL621760	MN161749	**ON424687**	MN158177	Liu et al. (2021a), Present study
Fomitopsis kesiyae	Cui 16466	Vietnam	MN148235	OL621250	OL621785	OL621761	MN161750	**ON424688**	MN158178	Liu et al. (2021a), Present study
Fomitopsis massoniana	Cui 11288	China	MN148238	OL621252	–	OL621763	MN161753	–	MN158179	Liu et al. (2021a)
Fomitopsis massoniana	Cui 11304	China	MN148239	OL621251	–	OL621762	MN161754	–	**ON424767**	Liu et al. (2021a), Present study
Fomitopsis meliae	Roberts GA863	United Kingdom	KR605775	KR605714	KR605848	KR605953	KR610682	–	–	Han et al. (2016)
Fomitopsis meliae	Ryvarden 16893	Unknown	KR605776	KR605715	KR605849	KR605954	KR610681	–	KR610775	Han et al. (2016)
Fomitopsis mounceae	DR-366	USA	KF169624	–	–	–	KF178349	–	KF169693	Haight et al. (2019)
Fomitopsis mounceae	JAG-08-19	USA	KF169626	–	–	–	KF178351	–	KF169695	Haight et al. (2019)
Fomitopsis nivosa	JV 0509/52-X	China	KR605779	KR605718	KR605853	KR605957	KR610686	–	KR610777	Han et al. (2016)
Fomitopsis nivosa	Man 09	Brazil	MF589766	MF590166	–	–	–	–	–	Soares et al. (2017)
Fomitopsis ochracea	ss 5	Canada	KF169609	–	–	–	KF178334	–	KF169678	Haight et al. (2019)
Fomitopsis ochracea	ss 7	Canada	KF169610	–	–	–	KF178335	–	KF169679	Haight et al. (2019)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Fomitopsis ostreiformis	Cui 18217	Malaysia	OL621855	OL621244	OL621781	OL621755	OL588984	**ON424689**	OL588970	Liu et al. (2022a), Present study
Fomitopsis palustris	Cui 7597	China	KP171213	KP171236	KR605854	KR605958	KR610687	–	KR610778	Han et al. (2016)
Fomitopsis palustris	Cui 7615	China	KR605780	KR605719	KR605855	KR605959	KR610688	–	KR610779	Han et al. (2016)
Fomitopsis pinicola	LT 319	Estonia	KF169652	–	–	–	KF178377	–	KF169721	Haight et al. (2019)
Fomitopsis pinicola	AT Fp 1	Sweden	MK208852	–	–	–	MK236359	–	MK236362	Haight et al. (2019)
Fomitopsis resupinata	Cui 6697	China	OL621842	OL621231	OL621768	OL621745	OL588971	–	OL588960	Liu et al. (2022a)
Fomitopsis resupinata	Dai 10819	China	OL621843	OL621232	OL621769	OL621746	OL588972	–	OL588961	Liu et al. (2022a)
Fomitopsis roseoalba	AS 1496	Brazil	KT189139	KT189141	–	–	–	–	–	Soares et al. (2017)
Fomitopsis roseoalba	AS 1566	Brazil	KT189140	KT189142	–	–	–	–	–	Soares et al. (2017)
Fomitopsis schrenkii	JEH-144	USA	KF169621	–	–	–	MK236355	–	MK208857	Haight et al. (2019)
Fomitopsis schrenkii	JEH-150	USA	KF169622	–	–	–	MK236356	–	MK208858	Haight et al. (2019)
Fomitopsis srilankensis	Dai 19528	Sri Lanka	OL621844	OL621233	OL621770	OL621747	OL588973	–	OL588962	Liu et al. (2022a)
Fomitopsis srilankensis	Dai 19539	Sri Lanka	OL621845	OL621234	OL621771	OL621748	OL588974	–	OL588963	Liu et al. (2022a)
Fomitopsis submeliae	Dai 18559	Malaysia	OL621848	OL621237	OL621774	OL621751	OL588977	–	OL588964	Liu et al. (2022a)
Fomitopsis submeliae	Cui 6305	China	OL621849	OL621238	OL621775	OL621752	OL588978	–	OL588965	Liu et al. (2022a)
Fomitopsis subpinicola	Cui 9836	China	MN148249	OL621253	–	OL621764	MN161764	–	MN158181	Liu et al. (2021a)
Fomitopsis subpinicola	Dai 11206	China	MN148252	OL621254	–	OL621765	MN161767	–	MN158183	Liu et al. (2021a)
Fomitopsis subtropica	Cui 10578	China	KR605787	KR60572	KR605867	KR605971	KR610698	**ON424690**	KR610791	Han et al. (2016), Present study
Fomitopsis subtropica	Dai 18566	China	OL621854	OL621243	OL621780	OL621754	OL588983	**ON424691**	**ON424768**	Liu et al. (2022a), Present study
Fomitopsis tianshanensis	Cui 16821	China	MN148258	OL621255	OL621786	OL621766	MN161773	–	**ON424769**	Liu et al. (2021a), Present study
Fomitopsis tianshanensis	Cui 16823	China	MN148259	OL621256	OL621787	OL621767	MN161774	–	**ON424770**	Liu et al. (2021a), Present study
Fomitopsis yimengensis	Cui 5027	China	OL621850	OL621239	OL621776	OL621839	OL588979	–	OL588966	Liu et al. (2022a)
Fomitopsis yimengensis	Cui 5111	China	OL621852	OL621241	OL621778	OL621841	OL588981	–	OL588968	Liu et al. (2022a)
Fragifomes niveomarginatus	Wei 5583	China	HQ693994	KC507175	KR605852	KR605956	KR610685	–	**ON424771**	Han et al. (2016), Present study
Fragifomes niveomarginatus	Cui 10108	China	KR605778	KR605717	KR605851	KR605955	KR610684	–	KR610776	Han et al. (2016)
Fragiliporia fragilis	Dai 13080	China	KJ734260	KJ734264	–	KJ734268	KJ790245	–	KJ790248	Zhao et al. (2014)
Fragiliporia fragilis	Dai 13559	China	KJ734261	KJ734265	–	KJ734269	KJ790246	–	KJ790249	Zhao et al. (2014)
Fragiliporia fragilis	Dai 13561	China	KJ734262	KJ734266	–	KJ734270	KJ790247	–	KJ790250	Zhao et al. (2014)
Fragiliporia fragilis	Yuan 5516	China	KJ734263	KJ734267	–	KJ734271	–	–	–	Zhao et al. (2014)
Fuscopostia duplicata	Cui 10366	China	KF699124	KJ684975	KR605927	KR606026	KR610755	KX901173	KR610844	Han et al. (2016)
Fuscopostia duplicata	Dai 13411	China	KF699125	KJ684976	KR605928	KR606027	KR610756	KX901174	KR610845	Han et al. (2016)
Fuscopostia fragilis	Cui 10088	China	KF699120	KJ684977	KX901127	KT893749	KT893747	**ON424692**	KT893745	Han et al. (2016), Present study
Fuscopostia fragilis	Cui 10020	China	KX900912	KX900982	KX901126	KX901054	KX901270	**ON424693**	KX901226	Shen et al. (2019), Present study
Fuscopostia lateritia	KUO 0211531	Finland	JF950567	–	–	–	–	–	–	Vampola et al. (2014)
Fuscopostia lateritia	Dai 2652	China	KX900913	KX900983	–	–	–	–	–	Shen et al. (2019)
Fuscopostia leucomallella	Cui 9599	China	KF699123	KJ684983	KX901129	KX901056	KX901272	KX901176	KX901228	Shen et al. (2019)
Fuscopostia leucomallella	Cui 9577	China	KF699122	KJ684982	KX901128	KX901055	KX901271	KX901175	KX901227	Shen et al. (2019)
Fuscopostia subfragilis	Cui 16282	China	**MW377296**	**MW377375**	**MW377454**	**MW382082**	**MW337123**	**MW337189**	**MW337057**	Present study

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Fuscopostia subfragilis	Cui 16302	China	**MW377297**	**MW377376**	**MW377455**	**MW382083**	**MW337124**	**MW337190**	**MW337058**	Present study
Gelatoporia subvermispora	Cui 17120	China	**ON417159**	**ON417209**	**ON417020**	–	**ON424835**	**ON424694**	**ON424772**	Present study
Gelatoporia subvermispora	Dai 22847	China	**ON417160**	**ON417210**	**ON417021**	–	**ON424836**	**ON424695**	**ON424773**	Present study
Gilbertsonia angulopora	FP 133019	USA	KC585354	KC585182	–	–	–	–	–	Ortiz-Santana et al. (2013)
Grifola frondosa	AFTOL 701	Unknown	AY854084	AY629318	AY705960	–	AY885153	AY864876	–	Lutzoni et al. (2004)
Grifola frondosa	Dai 19172	Canada	**ON417161**	**ON417211**	**ON417022**	–	**ON424837**	**ON424696**	**ON424774**	Present study
Grifola frondosa	Dai 19175	Canada	**ON417162**	**ON417212**	**ON417023**	–	**ON424838**	**ON424697**	**ON424775**	Present study
Heterobasidion annosum	Dai 20962	Belarus	**ON417163**	**ON417213**	**ON417024**	**ON417079**	**ON529284**	**ON424698**	**ON424776**	Present study
Hyphoderma litschaueri	FP 101740	USA	KP135295	KP135219	–	–	–	KP134868	KP134965	Floudas and Hibbett (2015)
Hyphoderma medioburiense	FD-335	USA	KP135298	KP135220	–	–	–	KP134869	KP134966	Floudas and Hibbett (2015)
Hyphoderma mutatum	HHB 15479	USA	KP135296	KP135221	–	–	–	KP134870	KP134967	Floudas and Hibbett (2015)
Hyphoderma setigerum	FD 312	USA	KP135297	KP135222	–	–	–	KP134871	–	Floudas and Hibbett (2015)
Irpex flavus	Wu 0705-1	China	MZ636988	MZ637149	–	–	MZ913683	MZ748432	OK136087	Chen et al. (2021)
Ischnoderma benzoinum	Cui 17058	China	**ON417164**	**ON417214**	**ON417025**	**ON417080**	**ON424839**	**ON424699**	**ON424777**	Present study
Ischnoderma benzoinum	Cui 17700	China	**ON417165**	**ON417215**	**ON417026**	**ON417081**	**ON424840**	**ON424700**	**ON424778**	Present study
Ischnoderma resinosum	FD 328	USA	KP135303	KP135225	–	–	–	KP134884	KP134972	Floudas and Hibbett (2015)
Jahnoporus brachiatus	X 3232	Russia	KU165781	–	–	–	–	–	–	Spirin et al. (2015b)
Jahnoporus hirtus	AFTOL ID 1687	USA	DQ911605	DQ911606	DQ911607	–	–	–	DQ911608	Lutzoni et al. (2004)
Jahnoporus hirtus	Spinosa 10X2014	USA	KU165784	–	–	–	–	KY949044	–	Spirin et al. (2015b)
Jahnoporus oreinus	X 3241	Russia	KU165785	–	–	–	–	–	–	Spirin et al. (2015b)
Kusaghiporia usambarensis	JMH 01	Tanzania	–	MH010044	MH010046	–	MH048871	–	MH048870	Hussein et al. (2018)
Kusaghiporia usambarensis	JMH 02	Tanzania	–	MH010045	–	–	MH048869	–	–	Hussein et al. (2018)
Laetiporus ailaoshanensis	Dai 13256	China	KF951289	KF951317	KX354537	KX354579	KX354625	–	KT894786	Song et al. (2018)
Laetiporus ailaoshanensis	Dai 13567	China	KX354470	KX354498	KX354535	KX354577	KX354623	–	KX354665	Song et al. (2018)
Laetiporus caribensis	PR 914	Puerto Rico	JN684762	EU402526	–	EU402482	–	–	–	Banik et al. (2012)
Laetiporus caribensis	PR 6521	Unknown	JN684771	–	–	–	–	–	–	Banik et al. (2012)
Laetiporus cincinnatus	JV 0709/168 J	USA	KF951290	KF951305	KX354517	KX354559	KX354606	–	KX354651	Song et al. (2018)
Laetiporus cincinnatus	Dai 12811	USA	KF951291	KF951304	KX354516	KX354558	KX354605	–	KT894788	Song et al. (2018)
Laetiporus conifericola	CA 8	USA	EU402575	EU402523	–	EU402487	AB472663	–	–	Lindner and Banik (2008)
Laetiporus conifericola	JAM 1	USA	EU402577	EU402524	–	EU402486	AB472664	–	–	Lindner and Banik (2008)
Laetiporus cremeiporus	Cui 10586	China	KF951277	KF951297	KX354513	KX354555	KX354602	–	KX354648	Song et al. (2018)
Laetiporus cremeiporus	Cui 10991	China	KF951279	KF951298	**ON417027**	KX354595	KX354641	–	KX354679	Song et al. (2018), Present study
Laetiporus gilbertsonii	CA 13	USA	EU402549	EU402527	–	EU402496	AB472666	–	–	Lindner and Banik (2008)
Laetiporus gilbertsonii	TJV 2000101	USA	EU402553	EU402528	–	EU402493	AB472668	–	–	Lindner and Banik (2008)
Laetiporus huroniensis	HMC 3	USA	EU402571	EU402540	–	–	–	–	–	Lindner and Banik (2008)
Laetiporus huroniensis	MI 14	USA	EU402573	EU402539	–	EU402489	AB472672	–	–	Lindner and Banik (2008)
Laetiporus medogensis	Cui 12240	China	KX354473	KX354501	KX354539	KX354581	KX354627	–	KX354668	Song et al. (2018)
Laetiporus medogensis	Cui 12390	China	KX354474	KX354502	KX354540	KX354582	KX354628	–	KX354669	Song et al. (2018)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Laetiporus montanus	Cui 10015	China	KF951273	KF951311	KX354529	KX354571	KX354618	**ON424701**	KT894791	Song et al. (2018), Present study
Laetiporus montanus	Cui 10011	China	KF951274	KF951315	KX354528	KX354570	KX354617	MG867670	KT894790	Song et al. (2018)
Laetiporus persicinus	HHB 9564	USA	EU402579	EU402513	–	–	–	KY949027	–	Lindner and Banik (2008)
Laetiporus persicinus	RLG 14725	USA	EU402581	EU402512	–	EU402502	–	–	–	Lindner and Banik (2008)
Laetiporus sulphureus	Cui 12388	China	KR187105	KX354486	KX354518	KX354560	KX354607	MG867671	KX354652	Song et al. (2018)
Laetiporus sulphureus	Cui 12389	China	KR187106	KX354487	KX354519	KX354561	KX354608	**ON424702**	KX354653	Song et al. (2018), Present study
Laetiporus versisporus	Dai 13160	China	KF951266	KF951320	**ON417028**	KX354597	KX354643	–	KT894785	Song et al. (2018)
Laetiporus versisporus	Cui 7882	China	KF951269	KF951323	**ON417029**	KX354596	KX354642	–	KT894783	Song et al. (2018)
Laetiporus xinjiangensis	Dai 15953	China	KX354460	KX354488	KX354522	KX354564	KX354611	–	KX354656	Song et al. (2018)
Laetiporus xinjiangensis	Dai 15828	China	KX354461	KX354489	KX354523	KX354565	KX354612	–	KX354657	Song et al. (2018)
Laetiporus zonatus	Cui 10403	China	KF951282	KF951307	KX354550	KX354592	KX354638	–	**ON424779**	Song et al. (2018), Present study
Laetiporus zonatus	Cui 10404	China	KF951283	KF951308	KX354551	KX354593	KX354639	–	KT894797	Song et al. (2018)
Laricifomes officinalis	JV 0309/49-J	USA	KR605821	KR605764	KR605929	–	KR610757	–	KR610846	Han et al. (2016)
Laricifomes officinalis	JV 9010/14	Slovak Republic	KR605822	KR605765	KR605930	–	KR610758	–	KR610847	Han et al. (2016)
Lentoporia carbonica	Zabel-40GLN	USA	KC585243	KC585065	–	–	–	KY949013	–	Ortiz-Santana et al. (2013)
Lentoporia carbonica	DAOM F 8281	Canada	KC585239	KC585061	–	–	–	–	–	Ortiz-Santana et al. (2013)
Lentoporia subcarbonica	Cui 12212	China	MG787593	MG787639	MG787749	MG787691	MG787859	–	–	Chen (2018)
Lentoporia subcarbonica	Dai 20175	China	**OM039283**	**OM039183**	**OM039250**	**OM039218**	**OM037806**	–	–	Present study
Lentoporia subcarbonica	Dai 20177	China	**OM039284**	**OM039184**	**OM039251**	**OM039219**	**OM037807**	–	–	Present study
Leptoporus mollis	RLG-7163-Sp	USA	KY948794	MZ637155	–	–	MZ913693	KY948956	OK136101	Chen et al. (2021), Justo et al. (2017)
Luteoporia albomarginata	GC 1702-1	China	LC379003	LC379155	–	–	LC387377	LC379160	LC387358	Chen et al. (2021)
Luteoporia lutea	GC 1409-1	China	MZ636998	MZ637158	–	–	MZ913656	MZ748467	OK136050	Chen et al. (2021)
Macrohyporia dictyopora	NLB 1383	Australia	MT537069	MT537069	–	–	–	–	–	Unpublished
Macrohyporia dictyopora	Dai 18878	Australia	**OK036736**	**OK036735**	**OK036737**	**OK044507**	**OK076964**	–	–	Present study
Melanoporella carbonacea	JV 1704/16	Costa Rica	MN392908	MN392908	–	–	–	–	–	Unpublished
Melanoporella carbonacea	JV 1704/2	Costa Rica	MN392909	MN392909	–	–	–	–	–	Unpublished
Melanoporia castanea	X 1284	China	KC595926	KC595926	–	–	–	–	–	Ortiz-Santana et al. (2013)
Melanoporia condensa	JV 1312/E15-J	Costa Rica	KT156690	–	–	–	–	–	–	Unpublished
Melanoporia condensa	JV 1407/72-J	Costa Rica	KT156693	–	–	–	–	–	–	Unpublished
Melanoporia nigra	CBS 341.63	Unknown	DQ491420	–	–	DQ491447	–	–	DQ491393	Kim et al. (2007)
Melanoporia nigra	FP-90888	USA	KC585357	KC585186	–	–	–	–	–	Ortiz-Santana et al. (2013)
Melanoporia tropica	Cui 16444	Vietnam	**MW377306**	**MW377384**	**MW377463**	**MW382087**	**ON424841**	–	**MW337065**	Present study
Melanoporia tropica	Cui 16455	Vietnam	**MW377307**	**MW377385**	**MW377464**	**MW382088**	**MW337132**	–	**MW337066**	Present study
Meripilus giganteus	FP 135344	United Kingdom	KP135307	KP135228	–	–	–	KP134873	–	Floudas and Hibbett (2015)
Metuloidea reniforme	MCW 542/17	Brazil	MT849303	MT849303	–	–	MT833940	MT833950	–	Westphalen et al. (2021)
Neoantrodia alaskan	JV 0309/13	USA	KT995122	KT995145	MG787753	–	KU052719	–	–	Chen (2018), Spirin et al. (2017)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Neoantrodia alaskan	VS 8791	USA	KT995123	KT995146	MG787754	–	KU052720	–	MG787816	Chen (2018), Spirin et al. (2017)
Neoantrodia angusta	Cui 17068	China	**ON417166**	**ON417216**	**ON417030**	**ON417082**	**ON424842**	**ON424703**	**ON424780**	Present study
Neoantrodia angusta	Cui 17072	China	**ON417167**	**ON417217**	**ON417031**	**ON417083**	**ON424843**	**ON424704**	**ON424781**	Present study
Neoantrodia angusta	Cui 17077	China	**ON417168**	**ON417218**	**ON417032**	–	**ON424844**	**ON424705**	**ON424782**	Present study
Neoantrodia calcitrosa	VS 8610	USA	KT995125	KT995147	MG787757	MG787697	KU052723	–	MG787819	Chen (2018), Spirin et al. (2017)
Neoantrodia flavimontis	JV 1307/17-J-1	USA	KU052739	MG787643	MG787758	MG787698	KU052738	–	–	Chen (2018), Spirin et al. (2017)
Neoantrodia infirma	TN 7426	Finland	JQ700294	JQ700294	–	–	–	–	–	Spirin et al. (2013b)
Neoantrodia infirma	TN 7644	Finland	KC595895	KC595895	–	–	–	–	–	Ortiz-Santana et al. (2013)
Neoantrodia kmetii	JV 9610/13	Slovak Republic	KC886708	MG787644	MG787759	–	KU052733	–	–	Chen (2018), Vlasák et al. (2013)
Neoantrodia kmetii	PRM 837474	Croatia	KC886710	KT995153	–	–	KU052734	–	–	Vlasák et al. (2013)
Neoantrodia leucaena	Pennanen 927	Finland	JQ700278	JQ700278	–	–	–	–	–	Spirin et al. (2013b)
Neoantrodia leucaena	Dai 2910	China	JQ700281	JQ700281	–	–	–	–	–	Spirin et al. (2013b)
Neoantrodia morganii	TN 4119	USA	KT995130	–	MG787760	–	KU052721	–	–	Chen (2018), Spirin et al. (2017)
Neoantrodia primaeva	Miettinen 177	Russia	JQ700272	JQ700272	–	–	–	–	–	Spirin et al. (2013b)
Neoantrodia primaeva	Dai 11156	China	MG787598	MG787645	MG787761	MG787699	–	–	MG787820	Chen (2018)
Neoantrodia serialiformis	JV 0809/132-1	USA	MG787599	MG787646	MG787762	–	MG787864	–	–	Chen (2018)
Neoantrodia serialiformis	Dai 19181	Canada	**ON417169**	**ON417219**	**ON417033**	–	**ON424845**	**ON424706**	**ON424783**	Present study
Neoantrodia serialis	JV 1509/5	Czech Republic	KT995120	KT995143	–	–	KU052726	–	–	Spirin et al. (2017)
Neoantrodia serrata	Dai 7626	China	KR605812	KR605751	KR605912	KR606012	KR610740	–	KR610831	Han et al. (2016)
Neoantrodia serrata	JV 0809/72	USA	KT995118	KT995141	MG787763	–	KU052730	–	–	Chen (2018), Spirin et al. (2017)
Neoantrodia variiformis	JV 0809/96	USA	KT995131	KT995154	MG787766	MG787701	KU052736	–	MG787821	Chen (2018), Spirin et al. (2017)
Neoantrodia variiformis	JV 0509/182	USA	MG787600	MG787647	MG787765	–	–	–	–	Chen (2018)
Neolentiporus maculatissimus	CIEFAP 92	Argentina	JX090121	–	–	–	–	–	–	Pildain and Rajchenberg (2013)
Neolentiporus maculatissimus	CIEFAP 93	Argentina	JX090122	–	–	–	–	–	–	Pildain and Rajchenberg (2013)
Neolentiporus tropicus	Cui 13915	China	**MW377308**	**MW377386**	**MW377465**	**MW382089**	**ON424846**	**ON424707**	**ON424784**	Present study
Neolentiporus tropicus	Cui 13923	China	**MW377309**	**MW377387**	**MW377466**	**MW382090**	**ON424847**	**ON424708**	**ON424785**	Present study
Niveoporofomes globosporus	M.C. Aime 3413	Belize	KC017760	KC017762	–	–	–	–	–	Ryvarden et al. (2009)
Niveoporofomes globosporus	S-20	Mexico	KR135353	–	–	–	–	–	–	Unpublished
Niveoporofomes oboensis	MUCL 53518	Sao Tome	OM366266	OM366267	–	–	OM329949	–	OM329950	Decock et al. (2022)
Niveoporofomes spraguei	Cui 8969	China	KR605785	KR605724	KR605863	KR605967	KR610695	**ON424709**	KR610787	Han et al. (2016), Present study
Niveoporofomes spraguei	JV 0509/62	USA	KR605786	KR605725	KR605864	KR605968	KR610697	**ON424710**	KR610788	Han et al. (2016), Present study
Niveoporofomes spraguei	4638	France	KR605784	KR605723	KR605862	KR605966	KR610696	–	KR610786	Han et al. (2016)
Nothofagiporus venatus	CIEFAP 346	Chile	JX090113	JX090133	–	–	–	–	–	Pildain and Rajchenberg (2013)
Nothofagiporus venatus	Cui 16616	Australia	**MW377310**	**MW377388**	**MW377467**	**MW382091**	**MW337133**	**MW337196**	**MW337067**	Present study
Nothofagiporus venatus	Cui 16617	Australia	**MW377311**	**MW377389**	**MW377468**	**MW382092**	**MW337134**	**MW337197**	**MW337068**	Present study
Nothofagiporus venatus	Cui 16644	Australia	**ON417170**	**ON417220**	**ON417034**	**ON417084**	**ON424848**	–	**ON424786**	Present study
Obba rivulosa	Cui 16483	Vietnam	**ON417171**	**ON417221**	**ON417035**	–	**ON424849**	**ON424711**	**ON424787**	Present study

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Obba rivulosa	Cui 16482	Vietnam	**ON417172**	**ON417222**	**ON417036**	–	**ON424850**	**ON424712**	**ON424788**	Present study
Oligoporus podocarpi	Dai 22042	China	MW937877	MW937884	MW937870	MW937891	MZ082982	MZ005579	MZ082976	Zhou et al. (2021)
Oligoporus podocarpi	Dai 22043	China	MW937878	MW937885	MW937871	MW937892	MZ082983	MZ005580	MZ082977	Present study
Oligoporus rennyi	Cui 17054	China	**OK045508**	**OK045514**	**OK045496**	**OK045502**	**OK076962**	**OK076906**	**OK076934**	Present study
Oligoporus rennyi	Dai 21016	Belarus	**ON417173**	**ON417223**	**ON417037**	**ON417085**	**ON424851**	**ON424713**	**ON424789**	Present study
Oligoporus romellii	Dai 21034	Belarus	**MW377312**	**MW377390**	**MW377469**	**MW382093**	**MW337135**	**MW337198**	**ON424790**	Present study
Oligoporus romellii	Dai 23576	China	**ON417174**	**ON417224**	**ON417038**	**ON417086**	**ON424852**	**ON424714**	**ON424791**	Present study
Oligoporus sericeomollis	Cui 9560	China	KX900919	KX900989	KX901140	KX901067	**ON424853**	KX901183	**ON424792**	Shen et al. (2019), Present study
Oligoporus sericeomollis	Dai 23473	China	**ON417175**	**ON417225**	**ON417039**	**ON417087**	**ON424854**	**ON424715**	**ON424793**	Present study
Osteina obducta	Cui 10074	China	KX900924	KX900994	KX901144	KX901071	–	–	KX901240	Shen et al. (2019)
Osteina obducta	Cui 9959	China	KX900923	KX900993	KX901143	KX901070	–	–	KX901239	Shen et al. (2019)
Osteina undosa	Dai 7105	China	KX900921	KX900991	KX901142	KX901069	–	–	KX901238	Shen et al. (2019)
Osteina undosa	Cui 16651	Australia	**MW377313**	**MW377391**	**MW377470**	**MW382094**	**MW337136**	**MW337199**	**MW337069**	Present study
Panus conchatus	Dai 23421	China	**ON417176**	**ON417226**	**ON417040**	**ON417088**	**ON424855**	**ON424716**	**ON424794**	Present study
Panus fragilis	HHB 11042	USA	KP135328	KP135233	–	–	–	KP134877	–	Floudas and Hibbett (2015)
Phaeolus fragilis	Dai 8025	China	KX354457	KX354511	KX354553	–	KX354686	–	–	Song and Cui (2017)
Phaeolus fragilis	Cui 16579	Australia	**MW377314**	**MW377392**	**MW377471**	**MW382095**	**MW337137**	–	**MW337070**	Present study
Phaeolus schweinitzii	FP 133218	USA	KC585369	KC585198	–	–	–	–	–	Ortiz-Santana et al. (2013)
Phaeolus schweinitzii	OKM 4435-T	USA	KC585370	KC585199	–	–	–	–	–	Ortiz-Santana et al. (2013)
Phaeophlebiopsis himalayensis	Chen 3143	China	MZ637013	MZ637174	–	–	MZ913633	MZ748359	OK135992	Chen et al. (2021)
Phanerochaete sordida	Wu 1109-55	China	MZ422829	MZ637213	–	–	MZ913638	MZ748389	OK136017	Chen et al. (2021)
Phanerochaetella angustocystidiata	Wu 9606-39	China	MZ637020	GQ470638	–	–	MZ913687	MZ748422	OK136082	Chen et al. (2021), Wu et al. (2010)
Phanerochaetella leptoderma	Chen 1362	China	MZ637025	GQ470646	–	–	MZ913689	MZ748423	OK136083	Chen et al. (2021), Wu et al. (2010)
Phlebia tomentopileata	GC 1602-67	China	MZ637040	MZ637244	–	–	MZ913702	MZ748457	OK136064	Chen et al. (2021)
Phlebiopsis gigantea	FCUG 1417	Norway	MZ637051	AF141634	–	–	MZ913623	MZ748370	OK135996	Parmasto and Hallenberg (2000), Chen et al. (2021)
Physisporinus longicystidius	Cui 16630	Australia	**ON417177**	**ON417227**	**ON417041**	–	**ON424856**	**ON424717**	**ON424795**	Present study
Physisporinus longicystidius	Cui 16725	Australia	**ON417178**	**ON417228**	**ON417042**	–	**ON424857**	**ON424718**	**ON424796**	Present study
Piptoporellus hainanensis	Dai 13714	China	KR605806	KR605745	KR605904	KR606005	KR610735	–	KR610824	Han et al. (2016)
Piptoporellus soloniensis	Cui 16932	China	**OM039285**	**OM039185**	**OM039252**	**OM039220**	**OM037808**	**OM037752**	**OM037781**	Present study
Piptoporellus soloniensis	Cui 11390	China	KR605803	KR605742	KR605901	KR606003	KR610733	**ON424721**	KR610822	Han et al. (2016), Present study
Piptoporellus soloniensis	LY BR 5463	France	KR605805	KR605744	KR605903	–	KR610734	–	–	Han et al. (2016)
Piptoporellus triqueter	Dai 13121	China	KR605807	KR605746	KR60590	–	KR610738	–	KR610827	Han et al. (2016)
Podoscypha venustula	Cui 16923	Puerto Rico	**ON417181**	**ON417231**	**ON417045**	**ON417089**	**ON424860**	**ON424722**	**ON424799**	Present study
Polyporus squamosus	Cui 10595	China	KU189778	KU189809	KU189840	KU189960	KU189925	KU189892	KU189988	Zhou et al. (2016)
Polyporus varius	Cui 12249	China	KU507581	KU507583	KU189838	KU507585	KU507591	KU507589	KU507592	Zhou et al. (2016)
Postia amurensis	Cui 1044	China	KX900902	KX900972	–	KX901043	–	–	–	Shen et al. (2019)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Postia amurensis	Dai 903	China	KX900901	KX900971	–	KX901042	–	–	–	Shen et al. (2019)
Postia carbophila	MR 10758	Argentina	JX090114	JX090132	–	–	–	–	–	Pildain and Rajchenberg (2013)
Postia carbophila	MR 12281	Argentina	JX090115	–	–	–	–	–	–	Pildain and Rajchenberg (2013)
Postia crassicontexta	Cui 16637	Australia	**MW377315**	**MW377393**	**MW377472**	**MW382096**	**MW337138**	**MW337200**	**MW337071**	Present study
Postia cylindrica	Dai 23087	China	**ON417182**	**ON417232**	**ON417046**	**ON417090**	**ON424861**	–	–	Present study
Postia cylindrica	Dai 17941	China	**ON417183**	**ON417233**	**ON417047**	**ON417091**	**ON424862**	–	–	Present study
Postia hirsuta	Cui 11237	China	KJ684970	KJ684984	KX901113	KX901038	KX901266	–	–	Shen and Cui (2014), Shen et al. (2019)
Postia hirsuta	Cui 18347	China	**OM039286**	**OM039186**	**OM039253**	**OM039221**	**OM037809**	–	**ON424800**	Present study
Postia lactea	Cui 17334	China	**OM039287**	**OM039187**	**OM039254**	**OM039222**	**OM037810**	**OM037753**	**OM037782**	Present study
Postia lactea	Cui 17790	China	**OM039288**	**OM039188**	**OM039255**	**OM039223**	**OM037811**	**OM037754**	**OM037783**	Present study
Postia lowei	Cui 9585	China	KX900898	KX900968	KX901110	KX901035	–	–	–	Shen et al. (2019)
Postia lowei	Cui 18366	China	**OM039289**	**OM039189**	**OM039256**	**OM039224**	**ON424863**	–	**ON424801**	Present study
Postia ochraceoalba	Cui 17044	China	**OM039290**	**OM039190**	**OM039257**	**OM039225**	**OM037812**	**OM037755**	**OM037784**	Present study
Postia ochraceoalba	Cui 17047	China	**OM039291**	**OM039191**	**OM039258**	**OM039226**	**OM037813**	**OM037756**	**OM037785**	Present study
Postia sublowei	Cui 9352	China	KX900899	KX900969	KX901111	KX901036	KX901264	**ON424723**	–	Present study
Postia sublowei	Cui 17460	China	**OM039294**	**OM039194**	**OM039261**	**OM039229**	**ON424864**	**OM037759**	**ON424802**	Present study
Postia tephroleuca	Cui 17329	China	**OK045509**	**OK045515**	**OK045497**	**OK045503**	**OK076963**	**OK076907**	**OK076935**	Present study
Postia tephroleuca	Cui 17560	China	**OM039295**	**OM039195**	**OM039262**	**OM039230**	**OM037816**	**OM037760**	**OM037788**	Present study
Pseudoantrodia monomitica	Dai 10828	China	MG787601	MG787648	MG787767	–	MG787865	–	**ON424803**	Present study
Pseudoantrodia monomitica	Dai 13381	China	MG787602	**ON417234**	MG787768	–	MG787866	–	MG787822	Present study
Pseudofibroporia citrinella	He 20120721	China	KU550477	KU550500	KU550539	KU550520	KU550574	–	KU550555	Chen et al. (2017)
Pseudofibroporia citrinella	Yuan 6181	China	KU550478	KU550501	KU550540	KU550521	KU550575	–	KU550556	Chen et al. (2017)
Pseudofomitopsis microcarpa	Cui 16404	Vietnam	**MW377316**	**MW377394**	**MW377473**	**MW382097**	**MW337139**	–	–	Present study
Pseudofomitopsis microcarpa	Cui 16406	Vietnam	**MW377317**	**MW377395**	**MW377474**	**MW382098**	**ON424865**	–	–	Present study
Ptychogaster ptychogaster	Dai 23618	China	**OM039292**	**OM039192**	**OM039259**	**OM039227**	**OM037814**	**OM037757**	**OM037786**	Present study
Ptychogaster ptychogaster	Dai 21035	Belarus	**OM039293**	**OM039193**	**OM039260**	**OM039228**	**OM037815**	**OM037758**	**OM037787**	Present study
Ptychogaster ptychogaster	Dai 23535	China	**ON417184**	**ON417235**	**ON417048**	**ON417092**	**ON424866**	**ON424724**	**ON424804**	Present study
Pycnoporellus fulgens	CA-20	USA	KC585385	KC585218	–	–	–	KY949040	–	Justo et al. (2017), Ortiz-Santana et al. (2013)
Pycnoporellus fulgens	Cui 10033	China	KX354458	KX354512	KX354554	–	KX354687	**ON424726**	KX354684	Song and Cui (2017), Present study
Pycnoporellus fulgens	Cui 16463	Vietnam	**MW377318**	**MW377396**	**MW377475**	–	**ON424867**	**ON424725**	**ON424805**	Present study
Radulodon casearius	Cui 17979	China	**ON417185**	**ON417236**	**ON417049**	**ON417093**	**ON424868**	**ON424727**	–	Present study
Resinoporia cincta	Dai 12739	USA	MG787603	MG787651	MG787769	MG787703	MG787870	–	–	Chen (2018)
Resinoporia cincta	JV 1009/12	USA	MG787604	KT711029	–	–	KT711072	–	–	Chen (2018), Spirin et al. (2015a)
Resinoporia crassa	Junninen 6446	Finland	KJ028071	KT711030	–	–	KT711069	–	–	Runnel et al. (2014)
Resinoporia crassa	Kinnunen 3476	Finland	KJ028073	KT711031	–	–	KT711070	–	–	Runnel et al. (2014)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Resinoporia cretacea	JV 1207/1	Czech Republic	KT711010	–	MG787771	–	–	–	–	Chen (2018), Spirin et al. (2015a)
Resinoporia ferox	JV 1209/75	USA	KT711011	KT711035	MG787772	MG787704	KT711074	–	MG787827	Chen (2018), Spirin et al. (2015a)
Resinoporia ignobilis	JV 1209/36	USA	KT711013	KT711038	MG787773	MG787705	KT711061	–	–	Chen (2018), Spirin et al. (2015a)
Resinoporia ladiana	JV 1008/65	USA	KT711015	KT711040	MG787774	MG787706	KT711073	–	MG787828	Chen (2018), Spirin et al. (2015a)
Resinoporia luteola	Cui 16472	Vietnam	**MW377319**	**MW377397**	**MW377476**	**MW382099**	**MW337140**	**ON424728**	**MW337072**	Present study
Resinoporia luteola	Cui 16473	Vietnam	**MW377320**	**MW377398**	**MW377477**	**MW382100**	**ON424869**	**ON424729**	**MW337073**	Present study
Resinoporia luteola	Cui 16474	Vietnam	**MW377321**	**MW377399**	**MW377478**	**MW382101**	**MW337141**	**MW337201**	**MW337074**	Present study
Resinoporia piceata	JV 1110/14	Czech Republic	KT711018	KT711047	MG787775	–	KT711055	–	–	Chen (2018), Spirin et al. (2015a)
Resinoporia pinea	Cui 6522	China	KC951148	MG787649	MG787776	**ON417094**	MG787872	–	–	Cui and Dai (2013), Present study
Resinoporia pinea	Cui 6529	China	KC951149	MG787650	MG787777	MG787707	MG787871	–	MG787830	Chen (2018), Cui and Dai (2013)
Resinoporia pini-cubensis	JV 1008/66	USA	KT711020	KT711049	–	–	KT711076	–	–	Spirin et al. (2015a)
Resinoporia sitchensis	VS 8782	USA	KT711024	KT711051	–	–	–	–	–	Spirin et al. (2015a)
Resinoporia sitchensis	JV 1008/67	USA	KT711025	KT711052	–	–	–	–	–	Spirin et al. (2015a)
Resinoporia sordida	Miettinen 16954	USA	KT711026	KT711053	–	–	–	–	–	Spirin et al. (2015a)
Resinoporia sordida	Cui 16469	Vietnam	**ON417186**	**ON417237**	**ON417050**	**ON417095**	**ON424870**	**ON424730**	**ON424806**	Present study
Rhizochaete chinensis	Wu 0910-45	China	LC387335	MF110294	–	–	LC270925	LC387348	LC387370	Chen et al. (2018), Wu et al. (2018)
Rhizoporia hyalina	VS 2772	Russia	JQ700283	JQ700283	–	–	–	–	–	Spirin et al. (2013b)
Rhizoporia hyalina	Kotiranta-19668	Russia	JQ700284	JQ700284	–	–	–	KY949008	–	Spirin et al. (2013b)
Rhodoantrodia tropica	Dai 13428	China	MG787605	MG787652	MG787778	MG787708	–	–	MG787823	Chen (2018)
Rhodoantrodia tropica	Dai 13434	China	MG817481	MG817479	MG787779	MG787709	–	–	MG787824	Chen (2018)
Rhodoantrodia yunnanensis	Han 1157	China	MT497886	MT497884	–	–	–	–	–	Han et al. (2020)
Rhodoantrodia yunnanensis	Zhao 4566	China	MT497887	MT497885	–	–	–	–	–	Han et al. (2020)
Rhodofomes cajanderi	Cui 9888	China	KC507156	KC507166	KR605828	KR605936	KR610662	–	KR610764	Han and Cui (2015), Han et al. (2016)
Rhodofomes cajanderi	JV 0410/14 a,b-J	USA	KR605768	KR605707	KR605829	KR605937	KR610664	–	–	Han et al. (2016)
Rhodofomes carneus	O 15519	Tanzania	KC507155	KC507165	KR605830	–	KR610665	–	–	Han and Cui (2015), Han et al. (2016)
Rhodofomes carneus	Ryvarden 10118	Tanzania	KF999921	KF999925	KR605831	–	KR610666	–	–	Han et al. (2016)
Rhodofomes incarnatus	Cui 10348	China	KC844848	KC844853	KR605844	KR605949	KR610679	–	KR610773	Han and Cui (2015), Han et al. (2016)
Rhodofomes incarnatus	Yuan 2653	China	KC844849	KC844854	KR605845	KR605950	KR610678	–	–	Han and Cui (2015), Han et al. (2016)
Rhodofomes roseus	Cui 17046	China	**ON417187**	**ON417238**	**ON417051**	**ON417096**	**ON424871**	**ON424731**	**ON424807**	Present study
Rhodofomes roseus	Cui 17081	China	**ON417188**	**ON417239**	**ON417052**	**ON417097**	**ON424872**	**ON424732**	**ON424808**	Present study
Rhodofomes subfeei	Dai 11887	China	KC507160	KC507170	KR605870	KR605973	KR610703	–	KR610794	Han and Cui (2015), Han et al. (2016)
Rhodofomes subfeei	Cui 9229	China	KR605789	KR605728	KR605869	**ON417098**	KR610701	–	KR610793	Han et al. (2016), Present study

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Rhodofomitopsis africana	Cui 16362	Vietnam	**ON417189**	**ON417240**	**ON417053**	**ON417099**	**ON424873**	**ON424733**	**ON424809**	Present study
Rhodofomitopsis cupreorosea	CBS 236.87	Costa Rica	DQ491400	AY515325	–	DQ491427	–	–	DQ491373	Kim et al. (2007)
Rhodofomitopsis feei	Ryvarden 37603	Venezuela	KC844850	KC844855	KR605838	KR605944	KR610670	–	KR610768	Han and Cui (2015). Han et al. (2016)
Rhodofomitopsis feei	Oinonen 6011906	Brazil	KC844851	KC844856	KR605837	KR605943	KR610671	–	KR610767	Han and Cui (2015). Han et al. (2016)
Rhodofomitopsis lilacinogilva	Schigel 5193	Australia	KR605773	KR605712	KR605846	KR605945	KR610680	–	KR610774	Han et al. (2016)
Rhodofomitopsis monomitic	Dai 10630	China	KY421732	KY421734	MG787780	MG787710	MG787868	–	MG787825	Chen (2018)
Rhodofomitopsis monomitic	Dai 16894	China	KY421733	KY421735	MG787781	MG787711	MG787869	–	MG787826	Chen (2018)
Rhodofomitopsis oleracea	RLG 3818	Unknown	EU232198	EU232291	EU232249	–	–	–	–	Unpublished
Rhodofomitopsis oleracea	MD 177	USA	KC585296	KC585120	–	–	–	–	–	Ortiz-Santana et al. (2013)
Rhodofomitopsis pseudofeei	Cui 16794	Australia	MK461952	MK461956	MK461964	MK461960	MK463986	**ON424735**	MK463984	Yuan et al. (2021), Present study
Rhodofomitopsis pseudofeei	Cui 16803	Australia	MK461953	MK461957	MK461965	MK461961	MK463987	**ON424734**	**ON424810**	Yuan et al. (2021), Present study
Rhodonia obliqua	Cui 17704	China	**OM039297**	**OM039197**	**OM039263**	–	**ON424874**	**ON424736**	–	Present study
Rhodonia obliqua	Dai 23399	China	**ON417190**	**ON417241**	**ON417054**	–	**ON424875**	**ON424737**	–	Present study
Rhodonia obliqua	Dai 23436	China	**ON417191**	**ON417242**	**ON417055**	–	**ON424876**	**ON424738**	–	Present study
Rhodonia placenta	TN 7609	Finland	JX109846	JX109846	–	–	JX109900	–	JX109872	Binder et al. (2013)
Rhodonia placenta	Wei 1406	China	KF699129	KT893750	–	–	KT893748	**ON424739**	KT893746	Shen et al. (2015), Present study
Rhodonia rancida	Cui 12317	China	KX900928	KX900998	KX901147	–	KX901278	–	KX901241	Shen et al. (2019)
Rhodonia rancida	Cui 12339	China	KX900929	KX900999	KX901148	KX901072	KX901279	–	KX901242	Shen et al. (2019)
Rhodonia subplacenta	Cui 9818	China	KX900930	KX901000	KX901149	KX901073	–	–	–	Shen et al. (2019)
Rhodonia subplacenta	Dai 13456	China	KX900931	KX900974	KX901150	KX901074	–	–	–	Shen et al. (2019)
Rhodonia subrancida	Cui 16462	Vietnam	**MW377322**	**ON417243**	**MW377479**	–	**ON424877**	**MW337202**	**MW337075**	Present study
Rhodonia tianshanensis	Dai 15915	China	MF462023	MG210493	–	–	–	–	MG199963	Yuan and Shen (2017)
Rhodonia tianshanensis	Dai 15934	China	MF462024	MG210494	–	–	–	–	–	Yuan and Shen (2017)
Rigidoporus sp.	Cui 16852	Puerto Rico	**ON417179**	**ON417229**	**ON417043**	–	**ON424858**	**ON424719**	**ON424797**	Present study
Rigidoporus sp.	Cui 16859	Puerto Rico	**ON417180**	**ON417230**	**ON417044**	–	**ON424859**	**ON424720**	**ON424798**	Present study
Rigidoporus undatus	Miettinen 13591	Finland	KY948731	KY948870	–	–	–	KY948945	–	Justo et al. (2017)
Rubellofomes cystidiatus	Cui 5481	China	KF937288	KF937291	KR605832	KR605938	KR610667	–	KR610765	Han et al. (2016)
Rubellofomes cystidiatus	Yuan 6304	China	KR605769	KR605708	KR605833	KR605939	KR610668	–	–	Han et al. (2016)
Rubellofomes minutisporus	Rajchenberg 10661	Argentina	KR605777	KR605716	KR60585	–	–	–	–	Han et al. (2016)
Ryvardenia campyla	CIEFAP 200	Argentina	JX090119	JX090140	–	–	–	–	–	Pildain and Rajchenberg (2013)
Ryvardenia campyla	Cui 16674	Australia	**MW377323**	**MW377400**	**MW377480**	–	**MW337143**	**MW337203**	**MW337076**	Present study
Ryvardenia cretacea	Cui 16731	Australia	**MW377324**	**MW377401**	**MW377481**	**MW382102**	**MW337144**	**MW337204**	**MW337077**	Present study
Ryvardenia cretacea	Cui 16732	Australia	**MW377325**	**MW377402**	**MW377482**	**MW382103**	**MW337145**	**MW337205**	**MW337078**	Present study
Sarcoporia polyspora	23436	USA	KC585392	KC585225	–	–	–	–	–	Ortiz-Santana et al. (2013)
Sarcoporia polyspora	Cui 16977	China	**MW377326**	**MW377403**	**MW377483**	–	**MW337146**	**MW337206**	**MW337079**	Present study
Sarcoporia polyspora	Cui 16995	China	**OM039299**	**OM039199**	**OM039264**	–	**OM037817**	**OM037761**	**ON424811**	Present study

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Sarcoporia polyspora	Cui 17165	China	**ON417192**	**ON417244**	**ON417056**	–	**ON424878**	**ON424740**	**ON424812**	Present study
Scopuloides allantoidea	Wei 16-060	China	MZ637081	MZ637279	–	–	MZ913664	MZ748463	OK136047	Chen et al. (2021)
Skeletocutis coprosmae	Cui 16623	Australia	**ON417193**	**ON417245**	**ON417057**	**ON417100**	**ON424879**	**ON424741**	**ON424813**	Present study
Skeletocutis yuchengii	FBCC 1132	China	KY953045	KY953045	–	KY953142	KY953109	KY953143	–	Korhonen et al. (2018)
Sparassis crispa	MBUH DORISL	Germany	AY218442	AY218404	–	–	–	–	–	Wang et al. (2004)
Sparassis crispa	AFTOL ID 703	Unknown	DQ250597	AY629321	AY705962	–	DQ056289	–	DQ408122	Lutzoni et al. (2004)
Sparassis radicata	SS 29	Unknown	AY218446	AY218408	–	–	–	–	DQ270672	Wang et al. (2004)
Sparassis radicata	TENN 52558	USA	AY218450	AY218411	–	–	–	–	AY218547	Wang et al. (2004)
Sparassis radicata	OKM-4756	USA	KC987580	KF053407	–	–	–	KY949023	–	Justo et al. (2017)
Spongiporus balsameus	Dai 22714	China	**ON417194**	**ON417246**	**ON417058**	**ON417101**	**ON424880**	–	**ON424814**	Present study
Spongiporus balsameus	Cui 9835	China	KX900916	KX900986	KX901134	KX901061	–	–	KX901233	Shen et al. (2019)
Spongiporus floriformis	Cui 10292	China	KM107899	KM107904	KX901131	KX901058	KX901274	KX901178	KX901230	Shen et al. (2019)
Spongiporus floriformis	Dai 13887	China	KX900914	KX900984	KX901130	KX901057	KX901273	KX901177	KX901229	Shen et al. (2019)
Spongiporus floriformis	Cui 17066	China	**OM039300**	**OM039200**	**OM039265**	**OM039231**	**OM037818**	**OM037762**	**ON424815**	Present study
Spongiporus gloeoporus	Cui 10401	China	KX900915	KX900985	KX901133	KX901060	**ON424881**	**ON424742**	KX901232	Shen et al. (2019)
Spongiporus gloeoporus	Cui 17813	China	**OM039301**	**OM039201**	**OM039266**	**OM039232**	**OM037819**	**OM037763**	**ON424816**	Present study
Spongiporus zebra	Dai 7131	China	KF727430	KM190902	KX901136	KX901063	–	KX901180	KX901235	Shen et al. (2019)
Spongiporus zebra	Cui 9973	China	KX900917	KX900987	KX901135	KX901062	–	KX901179	KX901234	Shen et al. (2019)
Steccherinum larssonii	MCW 593/17	Unknown	MT849306	MT849306	–	–	MT833941	MT833956	–	Westphalen et al. (2021)
Steccherinum meridionale	Cui 16691	Australia	**ON417195**	**ON417247**	**ON417059**	**ON417102**	**ON424882**	**ON424743**	**ON424817**	Present study
Stereum hirsutum	FPL-8805	Unknown	–	AF393078	AF026588	U27076	–	–	–	Lutzoni et al. (2004)
Stereum hirsutum	AFTOL-ID 492	Unknown	AY854063	–	–	–	AY885159	AY864885	AY218520	Lutzoni et al. (2004)
Subantrodia juniperina	03010/1a	USA	MG787606	MG787653	MG787782	MG787712	MG787873	**ON424744**	MG787831	Chen (2008), Present study
Subantrodia juniperina	SRM-403	USA	KC585285	KC585109	–	–	–	KY948991	–	Ortiz-Santana et al. (2013), Justo et al. (2017)
Subantrodia uzbekistanica	Dai 17104	Uzbekistan	KX958182	KX958186	–	**ON417103**	**ON424883**	**ON424745**	–	Yuan et al. (2017), Present study
Subantrodia uzbekistanica	Dai 17105	Uzbekistan	KX958183	KX958187	–	**ON417104**	**ON424884**	**ON424746**	–	Yuan et al. (2017), Present study
Taiwanofungus camphoratus	Cui 17234	China	**MW377327**	**MW377404**	**MW377484**	**MW382104**	**MW337147**	**ON424747**	–	Present study
Taiwanofungus camphoratus	Cui 17235	China	**MW377328**	**MW377405**	**MW377485**	**MW382105**	**MW337148**	**ON424748**	–	Present study
Taiwanofungus salmoneus	B 147	China	EU232202	EU232278	–	–	–	–	–	Ortiz-Santana et al. (2013)
Taiwanofungus salmoneus	B 492	China	EU232203	EU232279	–	–	–	–	–	Ortiz-Santana et al. (2013)
Tenuipostia dissecta	MR 12423	Argentina	JX090107	JX090135	–	–	–	–	–	Pildain and Rajchenberg (2013)
Tenuipostia dissecta	Cui 16555	Australia	**MW377330**	**MW377406**	**MW377487**	**MW382106**	**MW337149**	**MW337207**	**ON424818**	Present study
Tenuipostia dissecta	Cui 16560	Australia	**MW377331**	**MW377407**	**MW377488**	**MW382107**	**MW337150**	**MW337208**	**ON424819**	Present study
Tenuipostia dissecta	Cui 16653	Australia	**OM039302**	**OM039202**	**OM039267**	**OM039233**	**OM037820**	**OM037764**	**OM037789**	Present study
Tenuipostia dissecta	Dai 18747	Australia	**OM039303**	**OM039203**	**OM039268**	**OM039234**	**OM037821**	**OM037765**	**OM037790**	Present study
Trametes cinnabarina	Dai 14386	China	KX880629	KX880667	MG847264	KX880712	KX880885	KX880818	KX880854	Cui et al. (2019)
Trametes sanguinea	Cui 7091	China	KX880628	KX880666	MG847266	KX880711	KX880884	KX880817	MG867689	Cui et al. (2019)

Table 1 (continued)

Species name	Sample no.	Locality	GenBank accessions							References
			ITS	nLSU	nSSU	mtSSU	tef1	rpb1	rpb2	
Tyromyces chioneus	FD 4	USA	KP135311	KP135291	–	–	–	KP134891	KP134977	Floudas and Hibbett (2015)
Tyromyces sp.	Cui 16652	Australia	**ON417196**	**ON417248**	**ON417060**	–	**ON424885**	**ON424749**	**ON424820**	Present study
Ungulidaedalea fragilis	Cui 10919	China	KF937286	KF937290	KR605840	KR605946	KR610674	–	KR610770	Han et al. (2014), Han et al. (2016)
Wolfiporia cocos	MRM 011	USA	MT241733	–	–	–	–	–	–	Unpublished
Wolfiporia cocos	CBS 279.55	USA	MW251869	MW251858	–	–	MW250253	–	MW250264	Wu et al. (2020)
Wolfiporia hoelen	CBK 1	China	KX354453	KX354689	KX354690	–	KX354688	–	KX354685	Song and Cui (2017)
Wolfiporia hoelen	Dai 20036	China	MW251877	MW251866	**ON417061**	–	MW250261	–	–	Present study
Wolfiporiella cartilaginea	O 913120	Japan	KX354455	–	–	–	–	–	–	Unpublished
Wolfiporiella cartilaginea	Dai 3764	China	KX354456	–	–	–	–	–	–	Unpublished
Wolfiporiella dilatohypha	CS 635913-AR	USA	KC585400	KC585234	–	–	–	–	–	Lindner and Banik (2008)
Wolfiporiella dilatohypha	FP 94089	USA	KC585401	KC585236	–	–	–	–	–	Ortiz-Santana et al. (2013)
Wolfiporiopsis castanopsidis	Cui 16295	China	–	**MW377408**	**MW377489**	**MW382108**	**MW337151**	**MW337209**	**MW337080**	Present study
Wolfiporiopsis castanopsidis	Cui 16296	China	–	**MW377409**	**MW377490**	**MW382109**	**MW337152**	**MW337210**	**MW337081**	Present study

New sequences are shown in bold

conducted with RAxML-HPC v. 8.2.3 (Stamatakis 2014) involved 1000 ML searches under the GTRGAMMA model, and only the maximum likelihood best tree from all searches was kept. In addition, 1000 rapid bootstrap replicates were run with the GTRCAT model to assess ML bootstrap values (ML) of the nodes. The best-fit evolutionary models for each gene region in all datasets were selected by hierarchical likelihood ratio tests (hLRT) and Akaike information criterion (AIC) in MrModeltest2 v. 2.3 (Nylander 2008) after scoring 24 models of evolution by PAUP* v. 4.0b10., and these models were applied in BI analyses for the combined datasets. BI were performed using MrBayes v. 3.2 (Ronquist and Huelsenbeck 2003) with four simultaneous independent chains for all datasets, performing ten million generations until the split deviation frequencies reached appropriate levels, and sampled every 100th generation. The first 25% sampled trees were discarded as burn-in, while the remaining ones were used to calculate Bayesian posterior probabilities (BPP) of the clades. The ML bootstrap (ML) ≥ 50% and Bayesian posterior probabilities (BPP) ≥ 0.95 were presented on topologies from ML analyses, respectively.

Trees were viewed in FigTree v1.4.2 (http://tree.bio.ed.ac.uk/software/figtree/). Branches that received bootstrap supports for maximum parsimony (MP), maximum likelihood (ML) and Bayesian posterior probabilities (BPP) greater than or equal to 75% (MP and ML) and 0.95 (BPP) were considered as significantly supported, respectively.

Results

Phylogeny

In this study, phylogenetic analyses contain sequences from 598 fungal samples representing 331 species. Among them, there are 285 brown-rot species, belonging to 67 genera within the Polyporales. 2977 sequences derived from seven gene loci (ITS, nLSU, nSSU, mtSSU, TEF1, RPB1 and RPB2) were used to reconstruct phylogenetic trees, including 592 sequences of ITS, 546 of nLSU, 397 of nSSU, 367 of mtSSU, 437 of TEF1, 254 of RPB1 and 384 of RPB2; 1070 of them were newly generated, including 152 sequences of ITS, 156 of nLSU, 158 of nSSU, 131 of mtSSU, 159 of TEF1, 167 of RPB1 and 147 of RPB2. The phylogenetic relationships of the brown-rot fungi within the Polyporales were analyzed by the datasets of combined ITS+nLSU+nSSU+mtSSU+TEF1+RPB1+RPB2 sequences and nLSU+nSSU+mtSSU+TEF1+RPB1+RPB2 sequences. In addition, further phylogenentic analyses focusing on the Fomitopsidaceae group and the postia group, respectively, were carried out based on two additional multi-gene datasets of combined ITS+nLSU+nSSU+mtSSU+TEF1+RPB2 sequences with a larger sampling of taxa. The alignment property (i.e., the number of samples, species and characters, and the percentage of parsimony informative sites), the nucleotide substitution model for BI analyses and outgroups of four datasets are shown in Table 2.

The combined seven-gene dataset (ITS, nLSU, nSSU, mtSSU, TEF1, RPB1 and RPB2) to infer the phylogeny of the brown-rot fungi within the Polyporales contains sequences from 451 fungal samples representing 253 species. The dataset has an aligned length of 6215 total characters including gaps, of which 2373 are constant, 397 are variable and parsimony-uninformative, and 3445 are parsimony-informative. MP analysis yielded 172 equally parsimonious trees (TL = 57,871, CI = 0.137, RI = 0.725, RC = 0.099, HI = 0.863). The best-fit evolutionary models applied in Bayesian analyses were selected by MrModeltest2 v. 2.3 for each region of the seven genes, the model for ITS, nLSU, nSSU, TEF1, RPB1 and RPB2 was GTR+I+G with equal frequency of nucleotides, while the model for mtSSU was HKY+I+G with equal frequency of nucleotides. ML analysis resulted in a similar topology as MP and Bayesian analyses, and only the ML topology is shown in Fig. 1.

The combined six-gene dataset (nLSU, nSSU, mtSSU, TEF1, RPB1 and RPB2) to infer the phylogeny of the brown-rot fungi within the Polyporales contains sequences from 409 fungal samples representing 235 species. The dataset has an aligned length of 5441 total characters including gaps, of which 2266 are constant, 373 are variable and parsimony-uninformative, and 2802 are parsimony-informative. MP analysis yielded 147 equally parsimonious trees (TL = 45,629, CI = 0.138, RI = 0.717, RC = 0.099, HI = 0.862). The best-fit evolutionary models applied in Bayesian analyses were selected by MrModeltest2 v. 2.3 for each region of the six genes, the model for nLSU, nSSU, mtSSU, TEF1, RPB1 and RPB2 was GTR+I+G with equal frequency of nucleotides. ML analysis resulted in a similar topology as MP and Bayesian analyses, and only the ML topology is shown in Fig. 2.

The combined six-gene dataset (ITS, nLSU, nSSU, mtSSU, TEF1 and RPB2) to infer the phylogeny of the Fomitopsidaceae group contains sequences from 215 fungal samples representing 125 species. The dataset has an aligned length of 4553 total characters including gaps, of which 2834 are constant, 226 are variable and parsimony-uninformative, and 1493 are parsimony-informative. MP analysis yielded 65 equally parsimonious trees (TL = 12,434, CI = 0.240, RI = 0.755, RC = 0.181, HI = 0.760). The best-fit evolutionary models applied in Bayesian analyses were selected by MrModeltest2 v. 2.3 for each region of the six genes, the model for ITS, nLSU, nSSU, mtSSU, TEF1 and RPB2 was GTR+I+G with equal frequency of nucleotides. ML analysis resulted in a similar topology as MP and Bayesian analyses, and only the ML topology is shown in Fig. 3.

The combined six-gene dataset (ITS, nLSU, nSSU, mtSSU, TEF1 and RPB2) to infer the phylogeny of the postia group contains sequences from 160 fungal samples representing 83 species. The dataset has an aligned length of 4495 total characters including gaps, of which 2961 are constant, 204 are variable and parsimony-uninformative, and 1330 are parsimony-informative. MP analysis yielded 304 equally parsimonious trees (TL = 7833, CI = 0.317, RI = 0.814, RC = 0.258, HI = 0.683). The best-fit evolutionary models applied in Bayesian analyses were selected by MrModeltest2 v. 2.3 for each region of the six genes, the model for ITS, nLSU, nSSU, mtSSU and RPB2 was GTR+I+G with equal frequency of nucleotides, while the model for TEF1 was HKY+I+G with equal frequency of nucleotides. ML

Table 2 Alignment properties, nucleotide substitution models and outgroups of four datasets

Datasets	Brown-rot fungi within the Polyporales (7-gene)	Brown-rot fungi within the Polyporales (6-gene)	The Fomitopsidaceae group (6-gene)	The postia group (6-gene)
Samples number	451	409	215	160
Species number	253	235	125	83
Characters for each locus	ITS (774), nLSU (1295), nSSU (1009), mtSSU (528), TEF1 (622), RPB1 (1302), RPB2 (685)	nLSU (1295), nSSU (1009), mtSSU (528), TEF1 (622), RPB1 (1302), RPB2 (685)	ITS (600), nLSU (1290), nSSU (1009), mtSSU (528), TEF1 (481), RPB2 (645)	ITS (573), nLSU (1299), nSSU (1008), mtSSU (489), TEF1 (478), RPB2 (648)
Characters included (with gaps)	6215	5441	4553	4495
Parsimony informative sites (%)	3445(55)	2802(51)	1493(33)	1330(30)
Nucleotide substitution models for BI analyses	GTR+I+G for ITS, nLSU, nSSU, TEF1, RPB1 and RPB2, HKY+I+G for mtSSU	GTR+I+G for all loci	GTR+I+G for all loci	GTR+I+G for ITS, nLSU, nSSU, mtSSU and RPB2, HKY+I+G for TEF1
Outgroups	*Heterobasidion annosum*, *Stereum hirsutum*	*Heterobasidion annosum*, *Stereum hirsutum*	*Oligoporus rennyi*, *Postia lactea*	*Antrodia serpens*, *Fomitopsis betulina*

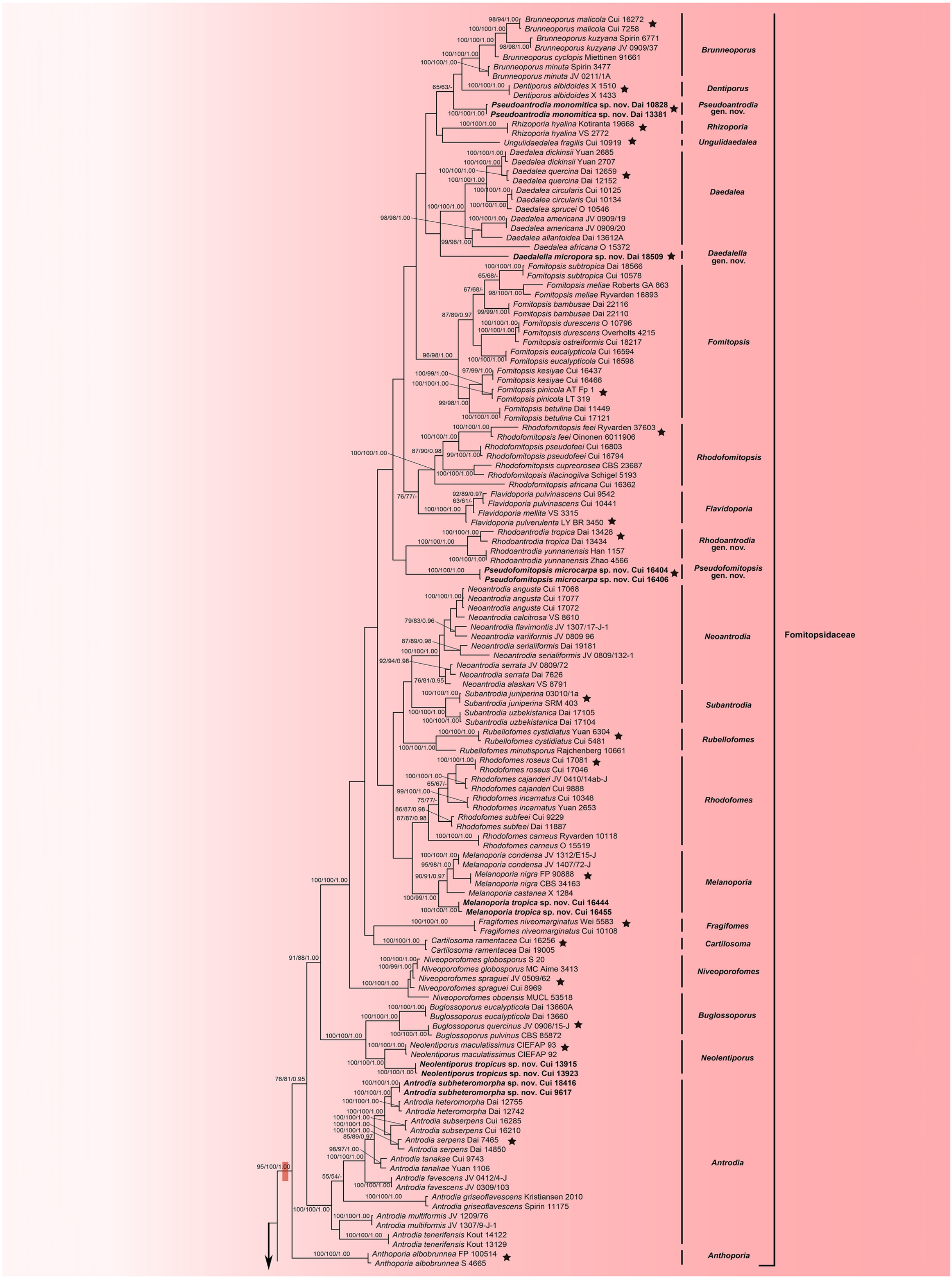


Fig. 1 Maximum likelihood tree illustrating the phylogeny of the brown-rot fungi within the Polyporales based on the combined sequence dataset of ITS+nLSU+nSSU+mtSSU+TEF1+RPB1+RPB2. Branches are labeled with parsimony bootstrap proportions higher than 50%, maximum likelihood bootstrap higher than 50% and Bayesian posterior probabilities more than 0.95 respectively. Bold names = New species. Black stars (★) represent for generic type. Red rectangle ( ) represent for family node

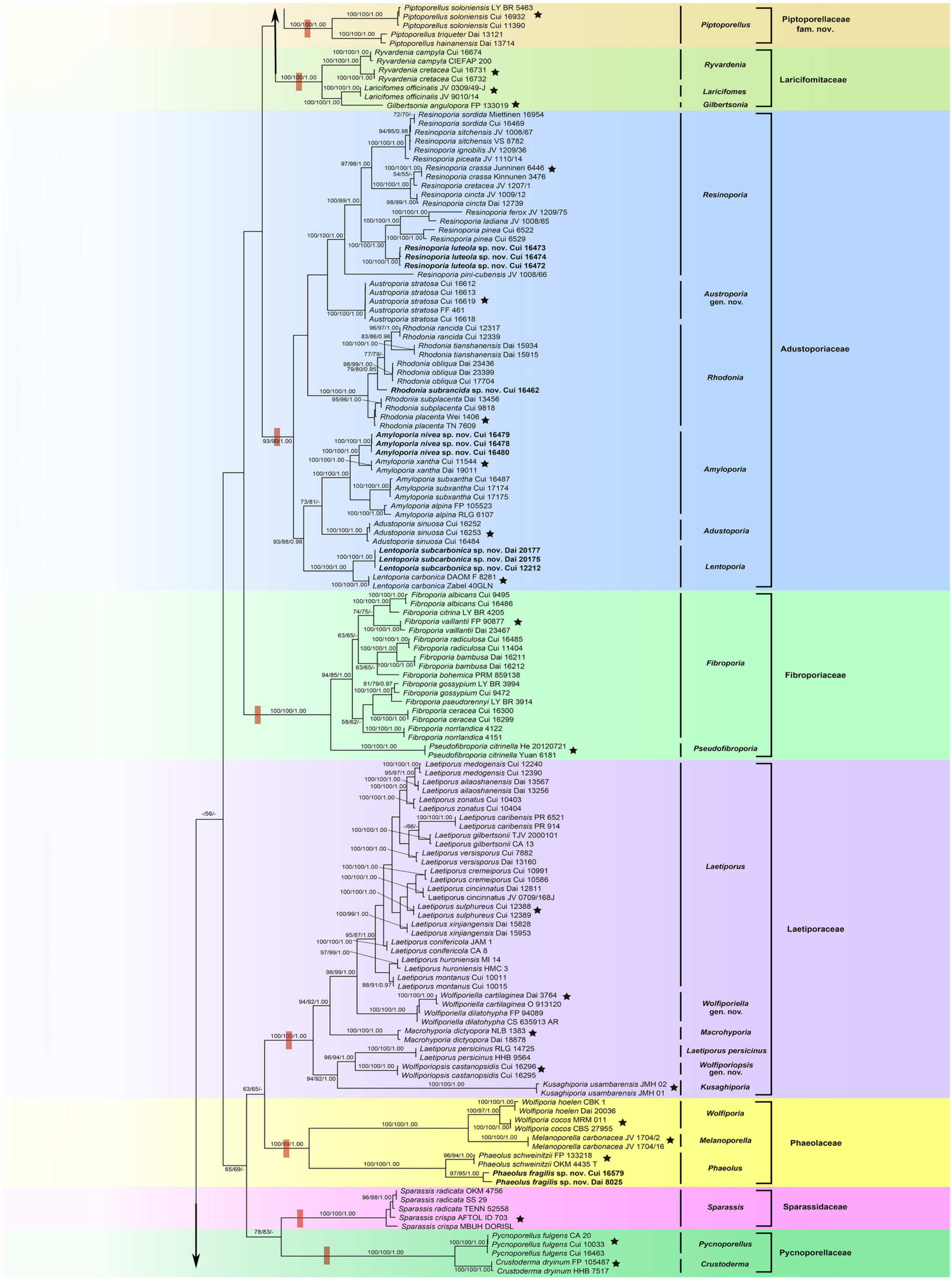
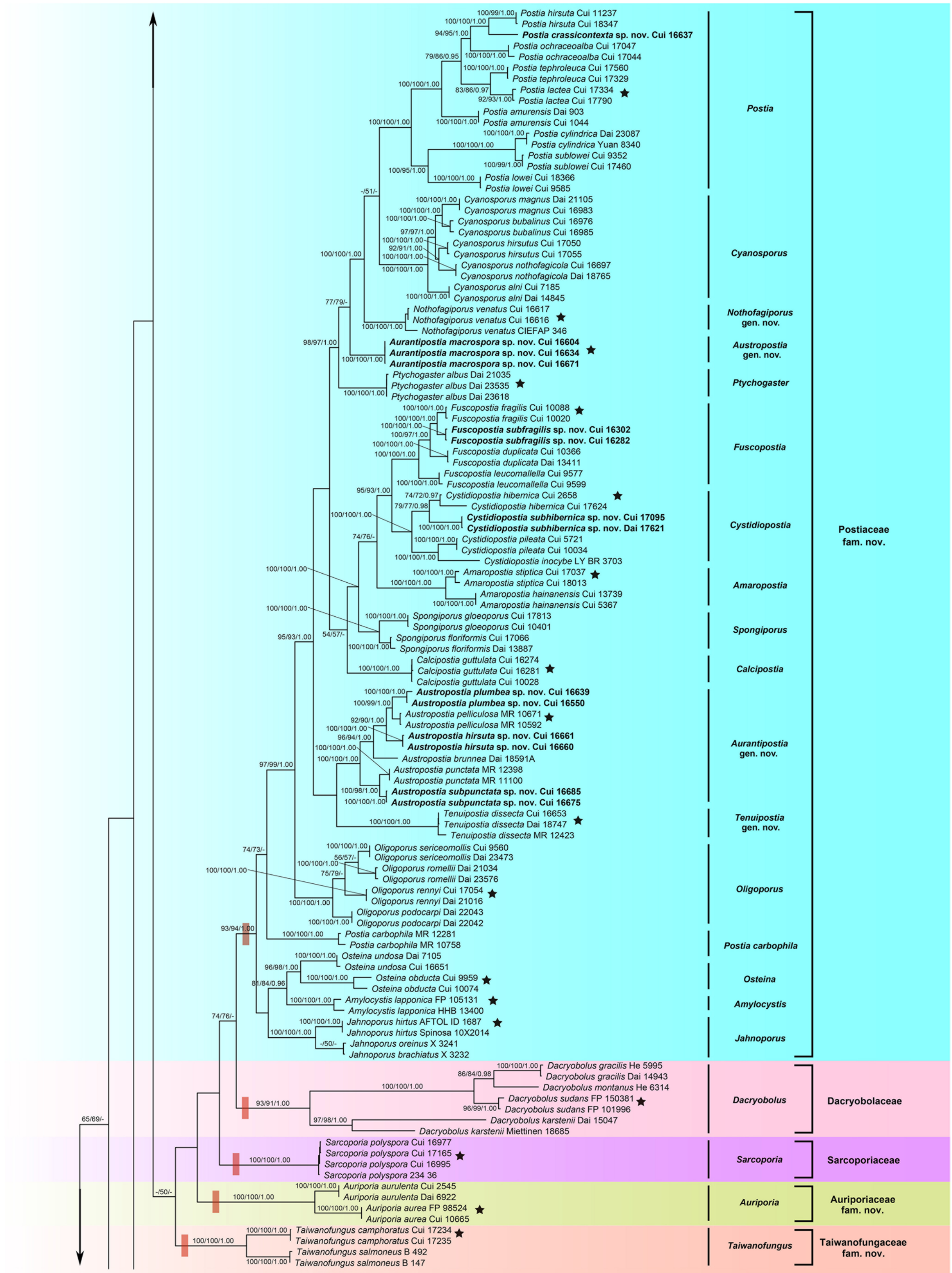


Fig. 1 (continued)



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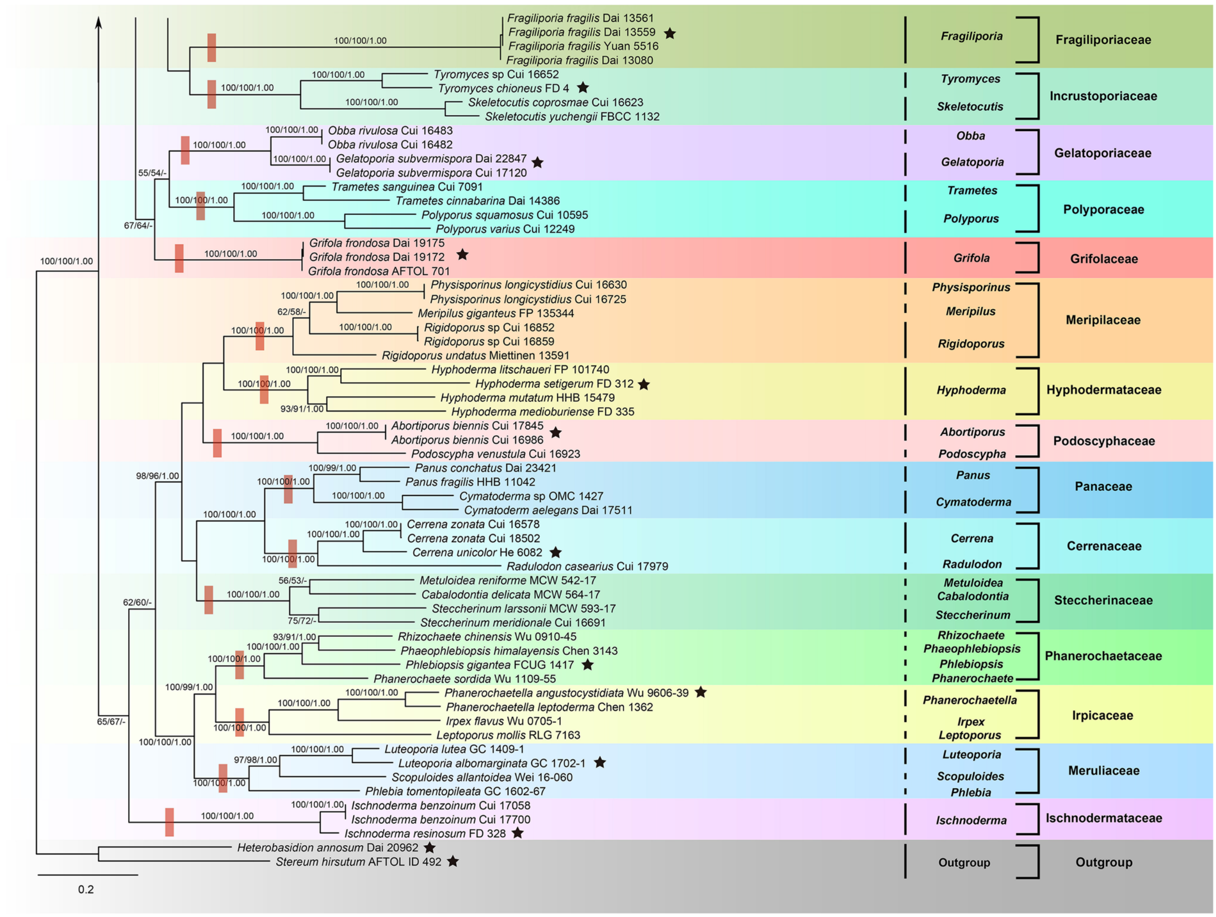


Fig. 1 (continued)

analysis resulted in a similar topology as MP and Bayesian analyses, and only the ML topology is shown in Fig. 4.

In this study, members of the brown-rot fungi within the Polyporales were grouped into fourteen lineages at family level including four new families (Figs. 1, 2), viz., Adustoporiaceae, Auriporiaceae fam. nov., Dacryobolaceae, Fibroporiaceae, Fomitopsidaceae, Laetiporaceae, Laricifomitaceae, Phaeolaceae, Piptoporellaceae fam. nov., Postiaceae fam. nov., Pycnoporellaceae, Sarcoporiaceae, Sparassidaceae and Taiwanofungaceae fam. nov. Four new families of the brown-rot fungi (Auriporiaceae, Piptoporellaceae, Postiaceae and Taiwanofungaceae; Figs. 1, 2) are supported in the phylogenetic analyses.

Taxonomy

Adustoporiaceae Audet, Mushrooms nomenclatural novelties 12: 1, 2018.

MycoBank: MB 554246

Synonym: Amyloporiaceae Audet, Mushrooms nomenclatural novelties 13: 1, 2018.

Synonym: Lentoporiaceae Audet, Mushrooms nomenclatural novelties 15: 1, 2018.

Synonym: Rhodoniaceae Audet, Mushrooms nomenclatural novelties 17: 1, 2018.

Type genus: *Adustoporia* Audet.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused-reflexed, corky to woody. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae bearing clamp connections. Cystidia absent, cystidioles present or absent. Basidiospores allantoid, cylindrical to oblong ellipsoid, sometimes slightly curved, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Adustoporia*, *Amyloporia*, *Austroporia* B.K. Cui & Shun Liu, *Lentoporia*, *Rhodonia*, *Resinoporia*.

Notes. The genera *Adustoporia*, *Lentoporia* and *Resinoporia* were recently established by Audet (2017e, g, j), later on, Adustoporiaceae, Amyloporiaceae, Lentoporiaceae and Rhodoniaceae were proposed as new families by Audet (2018a, b, d, f). In the current phylogenetic analyses, *Adustoporia*, *Amyloporia*, *Austroporia*, *Lentoporia*, *Resinoporia* and *Rhodonia* grouped together with moderate support (93% MP, 90% ML, 1.00 BPP in Fig. 1; 91% MP, 87% ML, 0.97

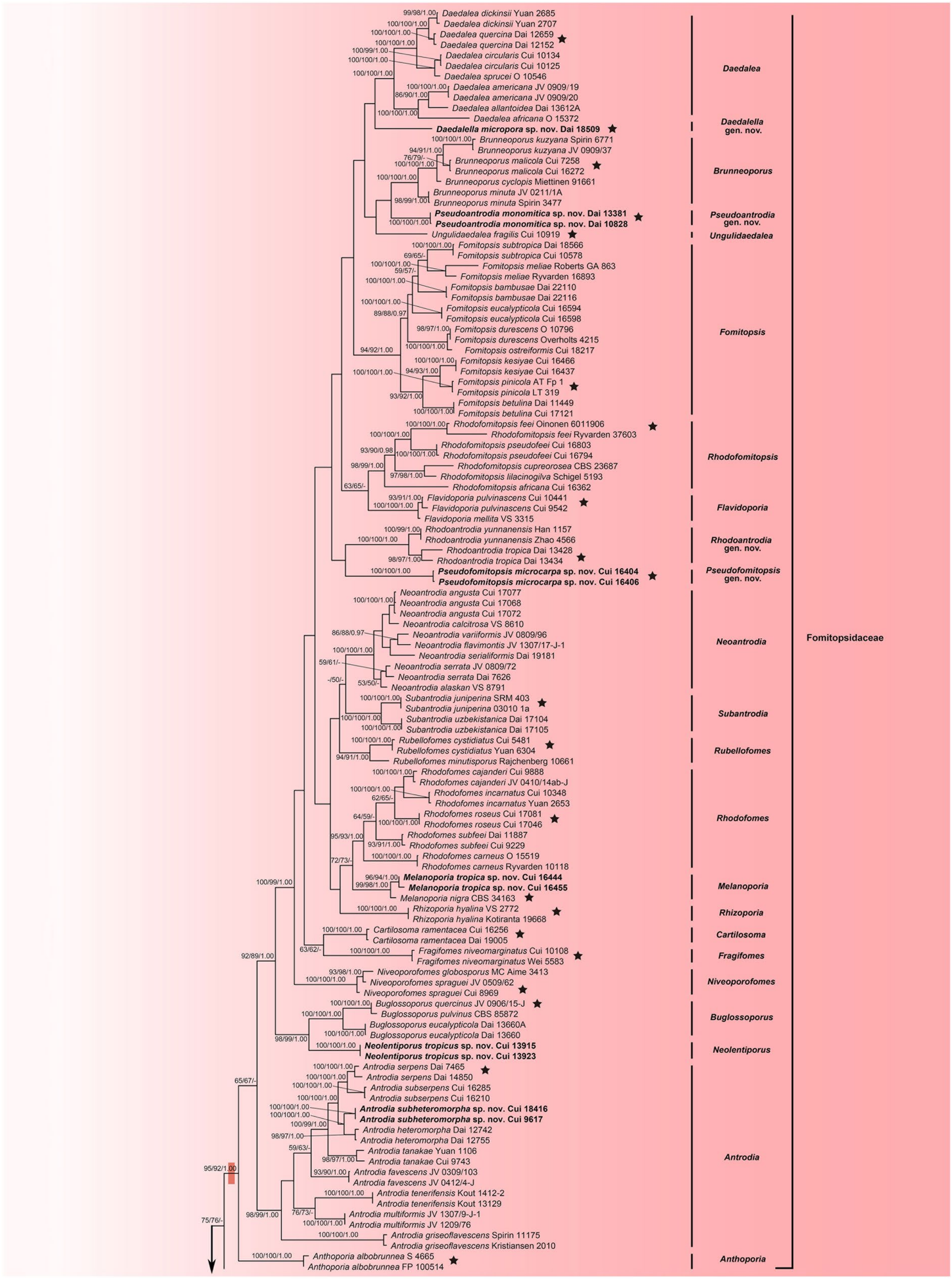


Fig. 2 Maximum likelihood tree illustrating the phylogeny of the brown-rot fungi within the Polyporales based on the combined sequence dataset of nLSU+nSSU+mtSSU+TEF1+RPB1+RPB2. Branches are labeled with parsimony bootstrap proportions higher than 50%, maximum likelihood bootstrap higher than 50% and Bayesian posterior probabilities more than 0.95 respectively. Bold names = New species. Black stars (★) represent for generic type. Red rectangle ( ) represent for family node

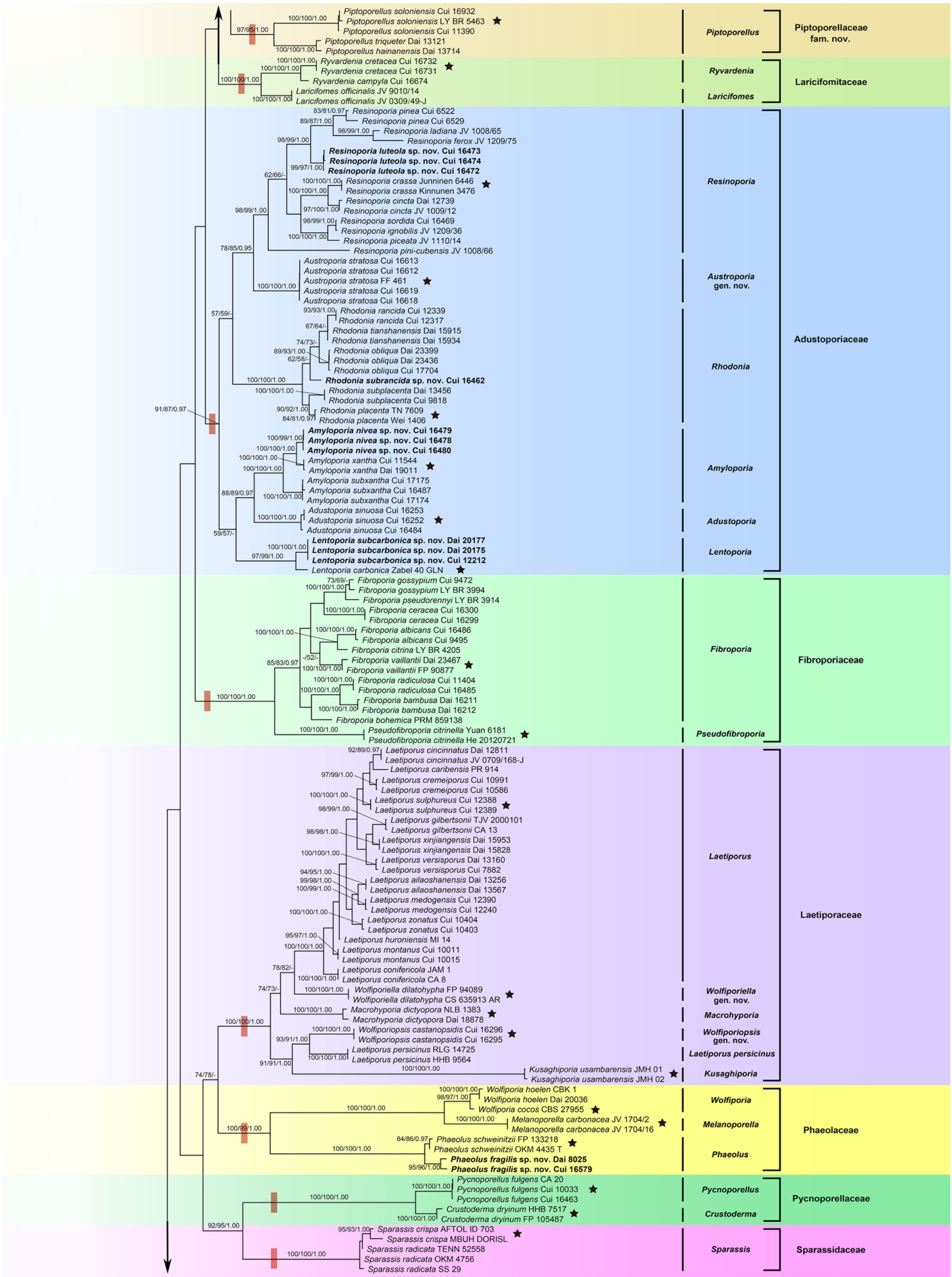
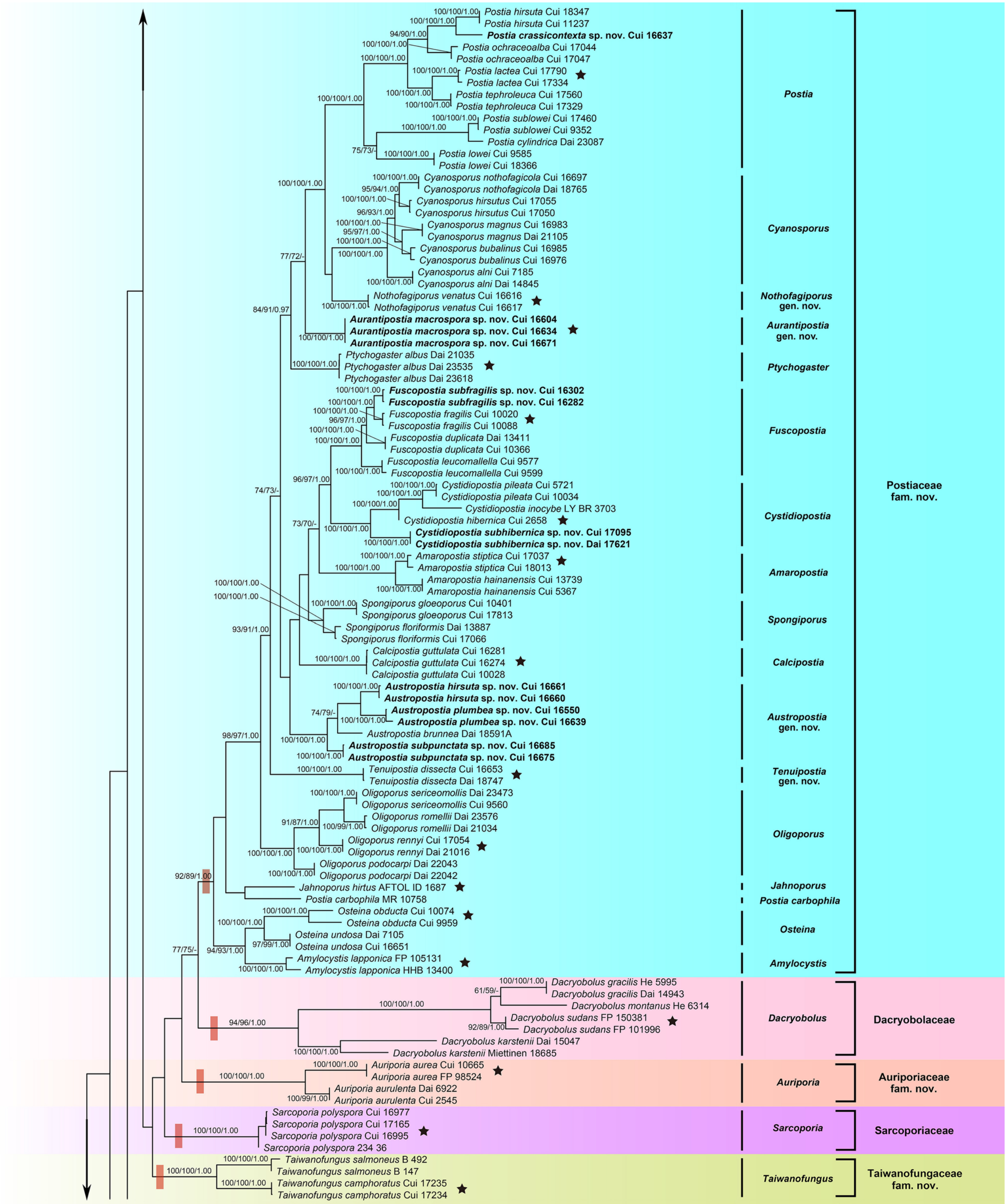


Fig. 2 (continued)



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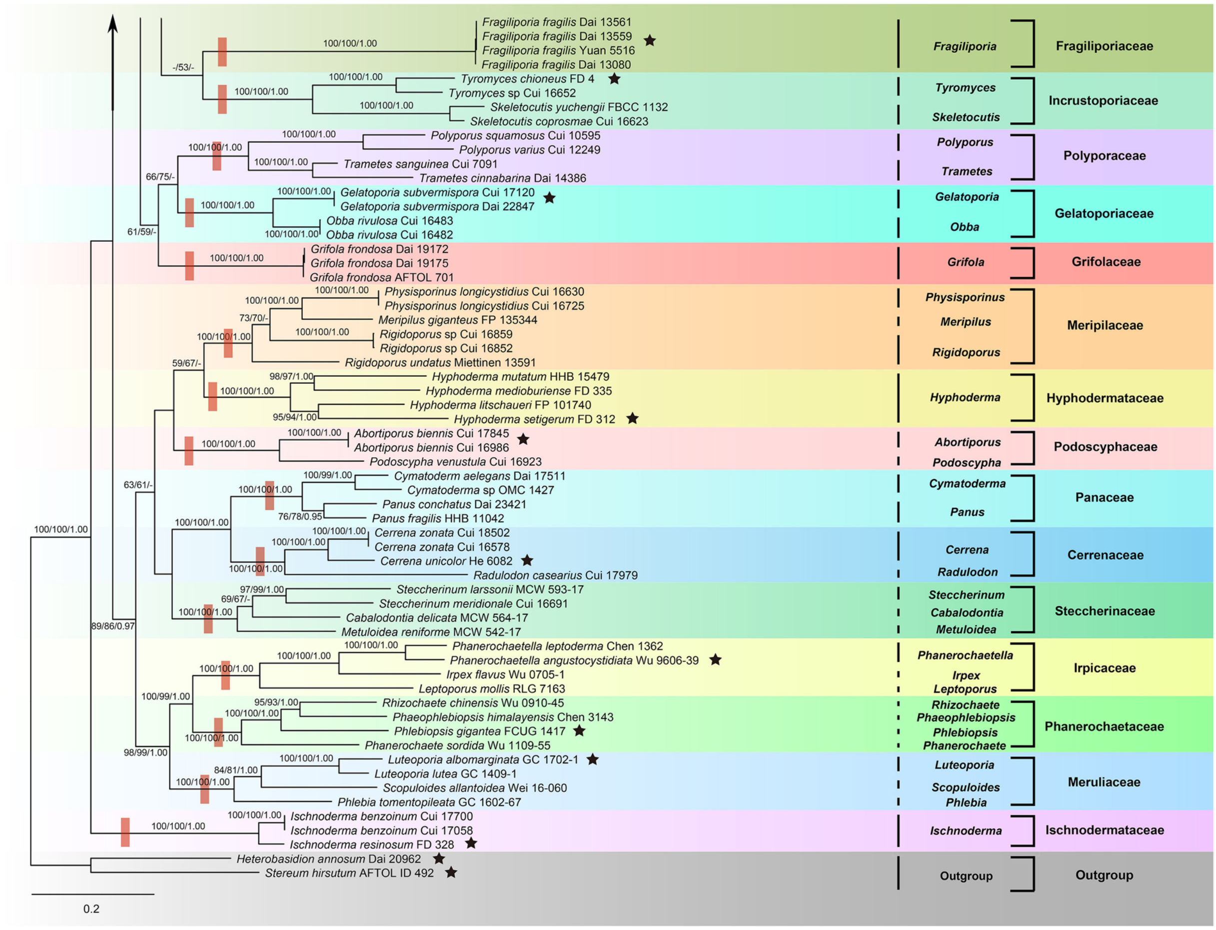

Fig. 2 (continued)

BPP in Fig. 2). Our results are basically consistent with the previous studies, such as in Binder et al. (2013), this group includes 6 species, viz., *Amyloporia alpina* (*Amyloporia*), *Amyloporia carbonica* (*Lentoporia*), *Amyloporia sordida* (*Resinoporia*), *Amyloporia xantha* (*Amyloporia*), *Antrodia sinuosa* (*Adustoporia*) and *Rhodonia placenta* (*Rhodonia*) (− ML, − BPP); in Ortiz-Santana et al. (2013), this group includes 5 species, viz., *Amyloporia carbonica* (*Lentoporia*), *Amyloporia sinuosa* (*Adustoporia*), *Amyloporia sordida* (*Resinoporia*), *Amyloporia xantha* (*Amyloporia*) and *Postia placenta* (*Rhodonia*) (− % MP, − % BS, − BPP) and in Justo et al. (2017), this group includes 4 species, viz., *Amyloporia xantha* (*Amyloporia*), *Amyloporia carbonica* (*Lentoporia*), *Amyloporia stratosa* (*Austroporia*) and *Rhodonia placenta* (*Rhodonia*) (71% ML, 1.00 BPP). Morphologically, these six genera share resupinate to effused-reflexed basidiocarps, clamped generative hyphae and allantoid or cylindrical to oblong-ellipsoid basidiospores. Previously, taxa belonging to these six genera were usually treated in *Antrodia* s.l.; they could be separated at genus level but could not be separated at family level by morphological and phylogenetic evidence. Therefore, based on nomenclatural priority, only the family Adustoporiaceae could be supported, while Amyloporiaceae, Lentoporiaceae and Rhodoniaceae are treated here as synonyms of Adustoporiaceae.

Key to genera of Adustoporiaceae

1. Hyphal system dimitic……………………………………2
1. Hyphal system monomitic……………………*Rhodonia*
2. Skeletal hyphae IKI+…………………………………..3
2. Skeletal hyphae IKI−…………………………………..4
3. Basidiospores allantoid or cylindrical…………………. …………………………………………….*Amyloporia*
3. Basidiospores ellipsoid to oblong…………*Lentoporia*
4. Basidiospores cylindrical to oblong-ellipsoid; abundant resinous matter occurs in the context and tubes……… …………………………………………*Resinoporia*

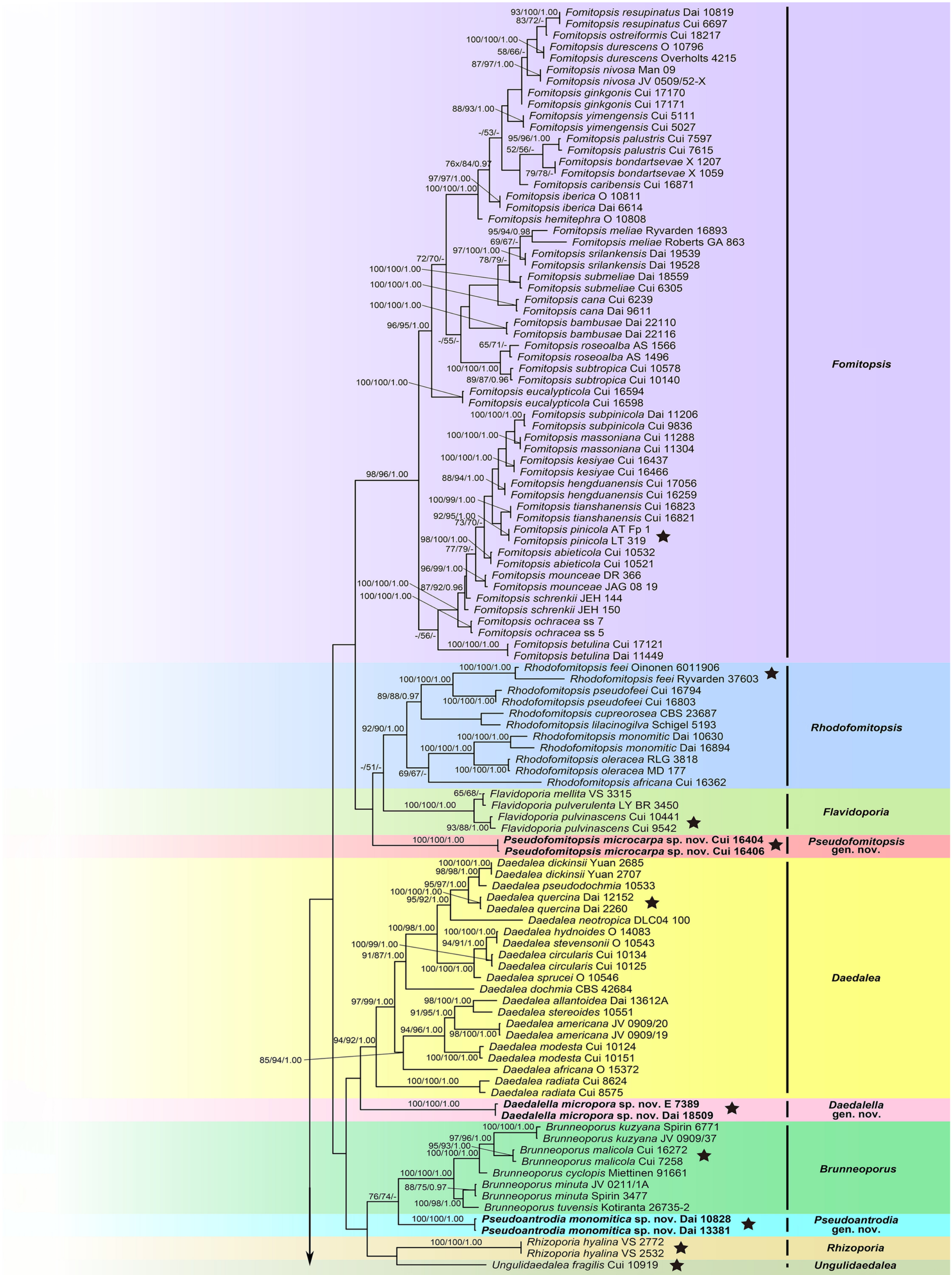

Fig. 3 Maximum likelihood tree illustrating the phylogeny of the Fomitopsidaceae group based on the combined sequence dataset of ITS+nLSU+nSSU+mtSSU+TEF1+RPB2. Branches are labeled with parsimony bootstrap proportions higher than 50%, maximum likelihood bootstrap higher than 50% and Bayesian posterior probabilities more than 0.95 respectively. Bold names = New species. Black stars (★) represent for generic type

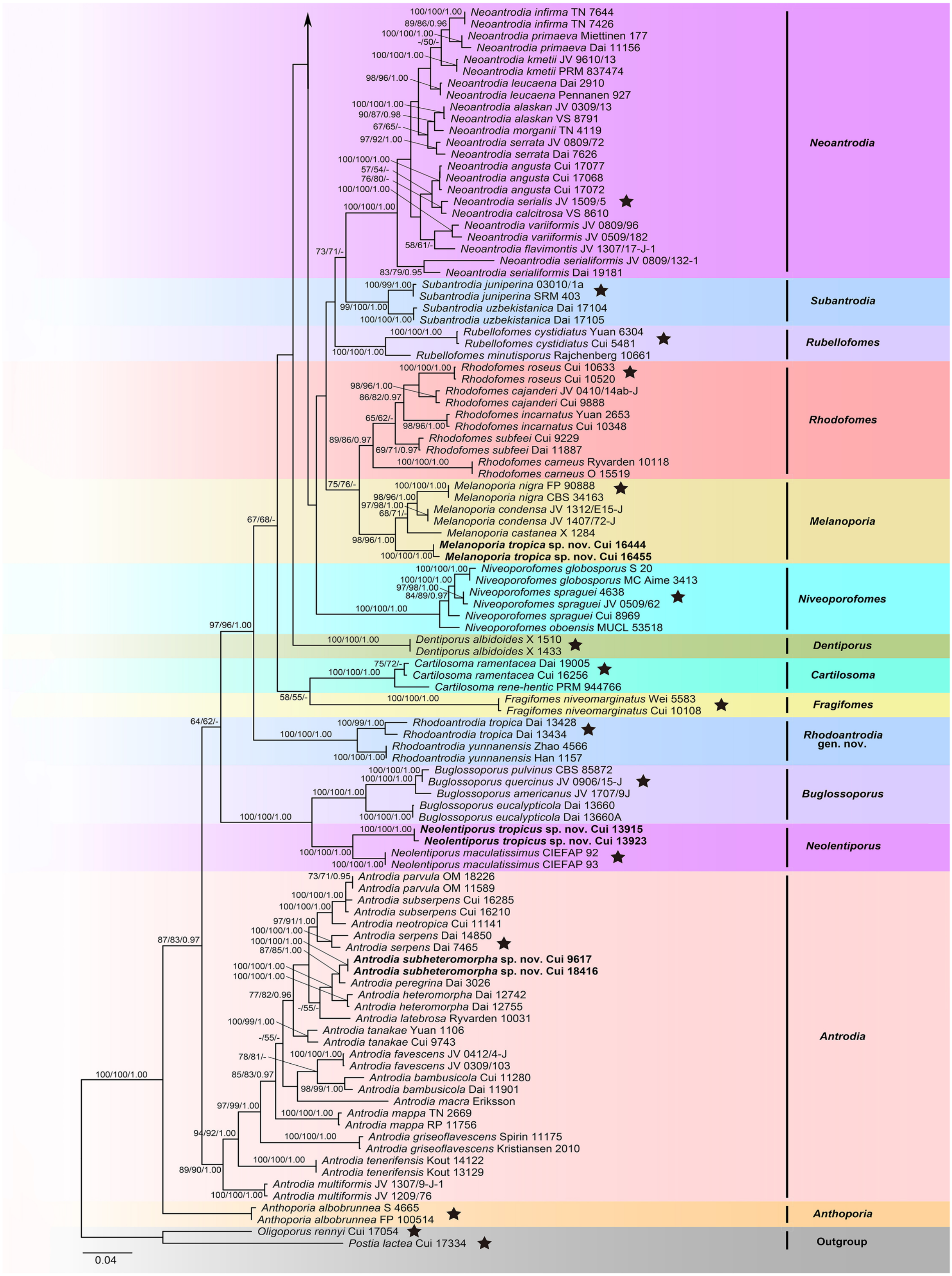

Fig. 3 (continued)

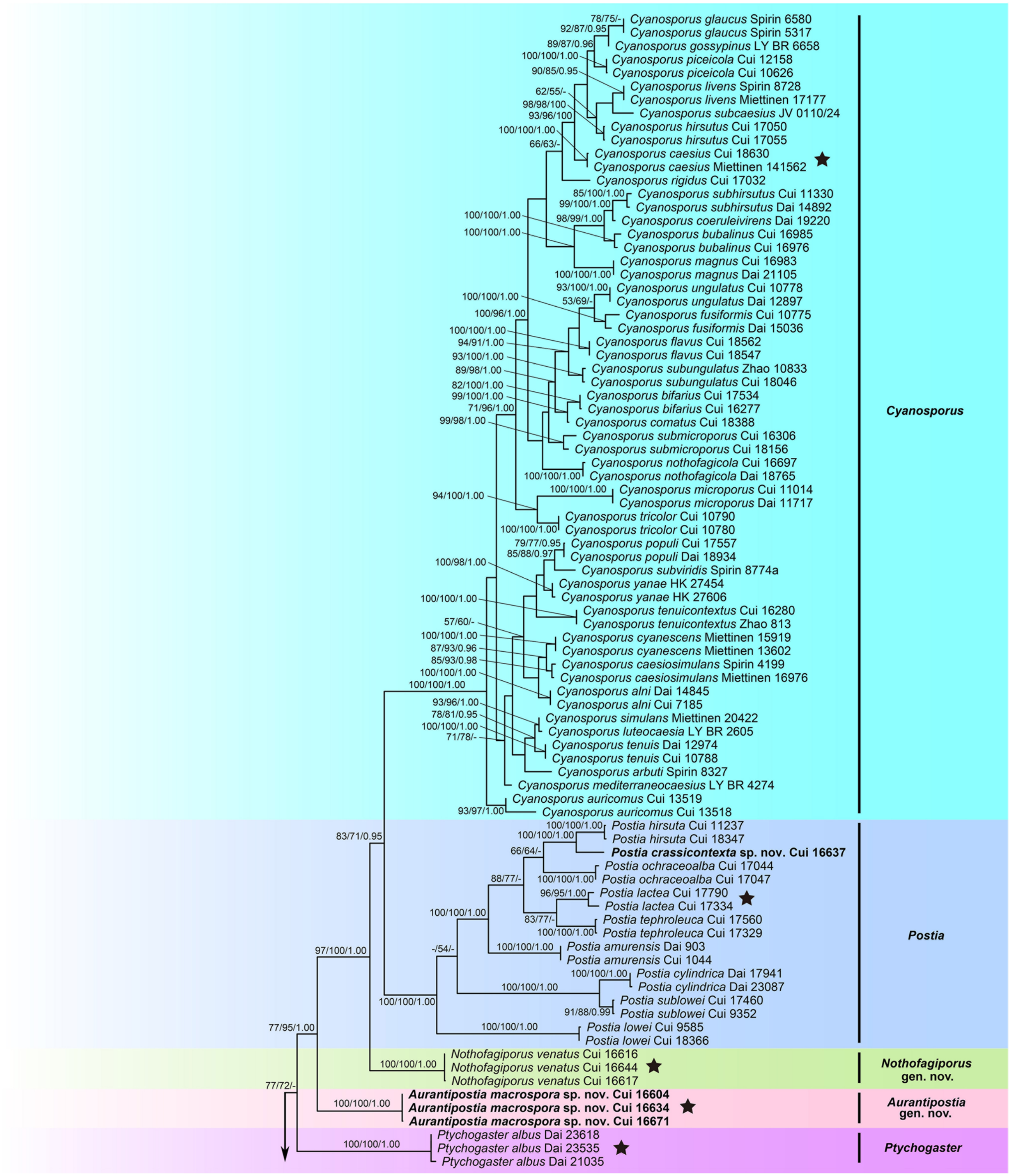

Fig. 4 Maximum likelihood tree illustrating the phylogeny of the postia group based on the combined sequence dataset of ITS+nLSU+nSSU+mtSSU+TEF1+RPB2. Branches are labeled with parsimony bootstrap proportions higher than 50%, maximum likelihood bootstrap higher than 50% and Bayesian posterior probabilities more than 0.95 respectively. Bold names = New species. Black stars (★) represent for generic type

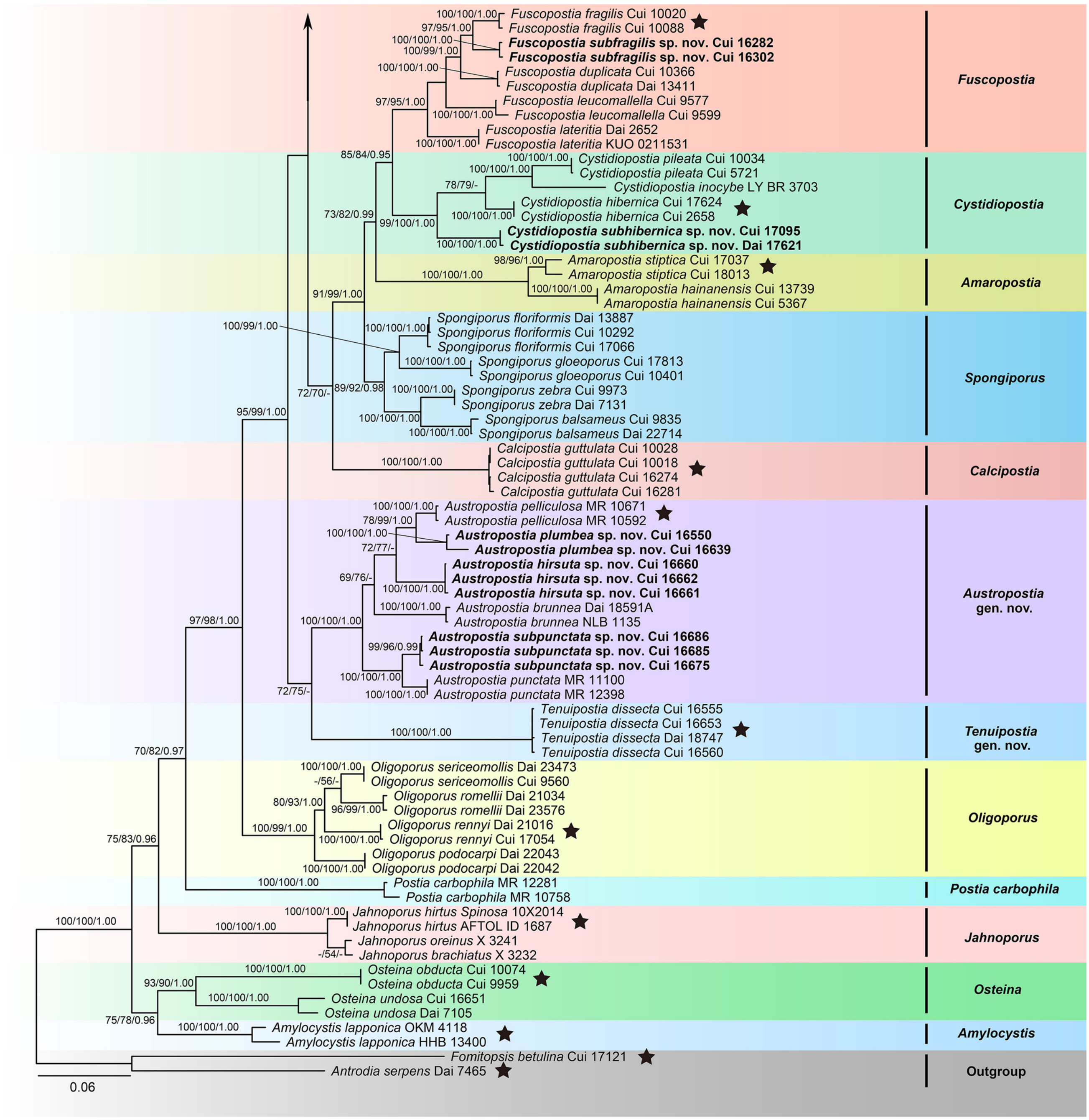

Fig. 4 (continued)

4. Basidiospores cylindrical to allantoid; rare or no resinous matter occurs in the context and tubes 5
5. Pores bigger, 1–4 per mm; growing on gymnosperm trees....................................*Adustoporia*
5. Pores smaller, 4–6 per mm; growing on angiosperm trees.....................................*Austroporia*

Adustoporia Audet, Mushrooms nomenclatural novelties 11: 1, 2017.

MycoBank: MB 553972.

Type species: *Adustoporia sinuosa* (Fr.) Audet.

Diagnosis: Basidiocarps annual, resupinate. Pore surface cream to buff brown; pores angular. Subiculum cream to brownish yellow, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, fusoid cystidioles present. Basidiospores cylindrical to allantoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Adustoporia* was separated from *Antrodia* s.l. by Audet (2017e). It differs from *Antrodia* s.s. by having resupinate basidiocarps with a pale brown pore surface when fresh, small basidia and small basidiospores. So far, only one species, *A. sinuosa*, is accepted in this genus.

Previous phylogenetic studies (Chiu 2007; Yu et al. 2010) indicated that *Antrodia sinuosa* (Fr.) P. Karst. has a position outside the core "*Antrodia* group". Rajchenberg et al. (2011) transferred *A. sinuosa* to *Amyloporia*, but *Amyloporia* has a citrous, sulphurous yellow to cream pore surface when fresh, almost pure white or pale cream when dry, and amyloid skeletal hyphae (Gilbertson and Ryvarden 1986; Ryvarden and Gilbertson 1993; Núñez and Ryvarden 2001). In this study, *Adustoporia* formed a single lineage and distant from *Antrodia* s. s, so the independence of the genus was confirmed.

Antrodia hingganensis Y.C. Dai & Penttilä was described from the Hinggan Mountains of China by Dai and Penttilä (2006), merely based on morphological characters. We checked the type specimen and sequenced the specimen from the type locality of *A. hingganensis*, and both morphological characters and DNA sequences support that *A. hingganensis* is a synonym of *A. sinuosa*.

Specimens examined: ***Adustoporia sinuosa***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on rotten wood of *Picea* sp., 19 October 2019, *Dai 21065* (BJFC); on fallen trunk of *Picea* sp., 19 October 2019, *Dai 21069* (BJFC). **CHINA**. Gansu Province, Zhangye, Qilianshan Nature Reserve, Sidalong Forest Farm, on rotten wood of *Picea* sp., 4 September 2018, *Dai 18998*, *19003* (BJFC). Inner Mongolia Autonomous Region, Ewenki, Honghuaerji Forest Park, on fallen trunk of *Pinus* sp., 24 July 2019, *Dai 20122*, *20123* (BJFC). Yunnan Province, Lanping County, Tongdian, Luoguqing, on charred wood of *Pinus* sp., 18 September 2017, *Cui 16252*, *16253* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on charred wood of *Pinus* sp., 15 October 2017, *Cui 16461* (BJFC).

Amyloporia Bondartsev & Singer ex Singer, Mycologia 36 (1): 67, 1944.

MycoBank: MB 17070

Type species: *Amyloporia xantha* (Fr.) Bondartsev & Singer.

Diagnosis: Basidiocarps annual or perennial, resupinate, adnate, crumbly to chalky when dry. Pore surface cream to citrous to sulphurous yellow. Subiculum white to cream, chalky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI+, CB−. Cystidia absent, cystidioles usually present. Basidiospores allantoid or cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Amyloporia* was established by Bondartsev and Singer (Singer 1944) with *Polyporus calceus* (Fr.) Schwein. as the type species. On account of the white basidiocarps and amyloid skeletal hyphae in Melzer's reagent, *P. crassus* Fr. and *P. lenis* Lév. were transferred to *Amyloporia*. Later studies found that the type specimen of *P. calceus* had been incorrectly identified as *Poria xantha* (Fr.) Cooke, so Ryvarden (1991) redefined *P. xantha* as the type of *Amyloporia* and treated *Polyporus calceus* as a synonym of *Poria xantha*. Currently, six species are accepted in *Amyloporia*, including *A. alpina* (Litsch.) Domański, *A. nothofaginea* Rajchenb. & Gorjón, *A. subxantha* (Y.C. Dai & X.S. He) B.K. Cui & Y.C. Dai, *A. xanthan*, *A. turkestanica* (Pilát) Bondartsev and the new species *A. nivea*.

Specimens examined: ***Amyloporia xantha.*** **CHINA.** Hubei Province, Fang County, Shennongjia Nature Reserve, on fallen trunk of *Pinus* sp., 16 October 2016, *Dai 17258* (BJFC). Gansu Province, Zhangye, Qilianshan Nature Reserve, Sidalong Forest Farm, on rotten wood of *Picea* sp., 4 September 2018, *Dai 19011* (BJFC). Xinjiang Autonomous Region, Hami, Baishitou Nature Reserve, on rotten wood of *Salix* sp., 14 September 2018, *Dai 19081* (BJFC). ***Amyloporia subxantha.*** **CHINA.** Sichuan Province, Jiange County, Cuiyunlang Nature Reserve, on living tree of *Cupressus* sp., 9 November 2018, *Cui 17174*, *17175* (BJFC). Yunnan Province, Kunming, Xishan Park, on living tree of *Thuja* sp., 25 October 2017, *Cui 16487* (BJFC).

Amyloporia nivea B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5a, 7)

MycoBank: MB 840311

Differs from other *Amyloporia* spp. by its white to cream pore surface, round to angular pores (6–9 per mm), cylindrical basidiospores (4–4.4 × 1.5–1.8 µm), distribution in tropical areas and usually grow on charred wood of *Pinus* species (Figs. 6, 7).

Type. **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on charred wood of *Pinus* sp., 16 October 2017, *Cui 16478* (holotype, BJFC).

Etymology. *Nivea* (Lat.): refers to the white basidiocarps.

Fruiting body. Basidiocarps annual, resupinate, adnate, not easily separated from the substrate, soft-corky, without odor or taste when fresh, corky upon drying; up to 5 cm long, 2.6 cm wide, and 6 mm thick at center. Pore surface

Fig. 5 Basidiocarps of new species. **a** *Amyloporia nivea* (Cui 16478); **b** *Lentoporia subcarbonica* (Cui 10614); **c** *Resinoporia luteola* (Cui 16474); **d** *Rhodonia subrancida* (Cui 16462); **e** *Antrodia subheteromorpha* (Cui 18416); **f** *Daedalella micropora* (Dai 18509); **g** *Melanoporia tropica* (Cui 16444); **h** *Neolentiporus tropicus* (Cui 13915); **i** *Pseudoantrodia monomitica* (Dai 21129); **j** *Pseudofomitopsis microcarpa* (Cui 16404); **k**, **l** *Phaeolus fragilis* (Cui 16579). Bars: **a**, **b** = 1 cm; **c**, **h** = 2 cm; **d**, **e**, **f**, **i**, **j**, **k**, **l** = 3 cm; g = 4 cm

white to cream; pores usually round, occasionally angular, 6–9 per mm; dissepiments thin to slightly thick, mostly entire, occasionally lacerate. Subiculum cream to buff, thin, up to 2 mm thick. Tubes concolorous with pore surface, corky, up to 2.3 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI+, CB−; tissues unchanged in KOH.

Subiculum. Generative hyphae infrequent, colorless, thin-walled, infrequently branched, 2–3.8 µm in diam; skeletal hyphae dominant, yellowish brown to cinnamon brown,

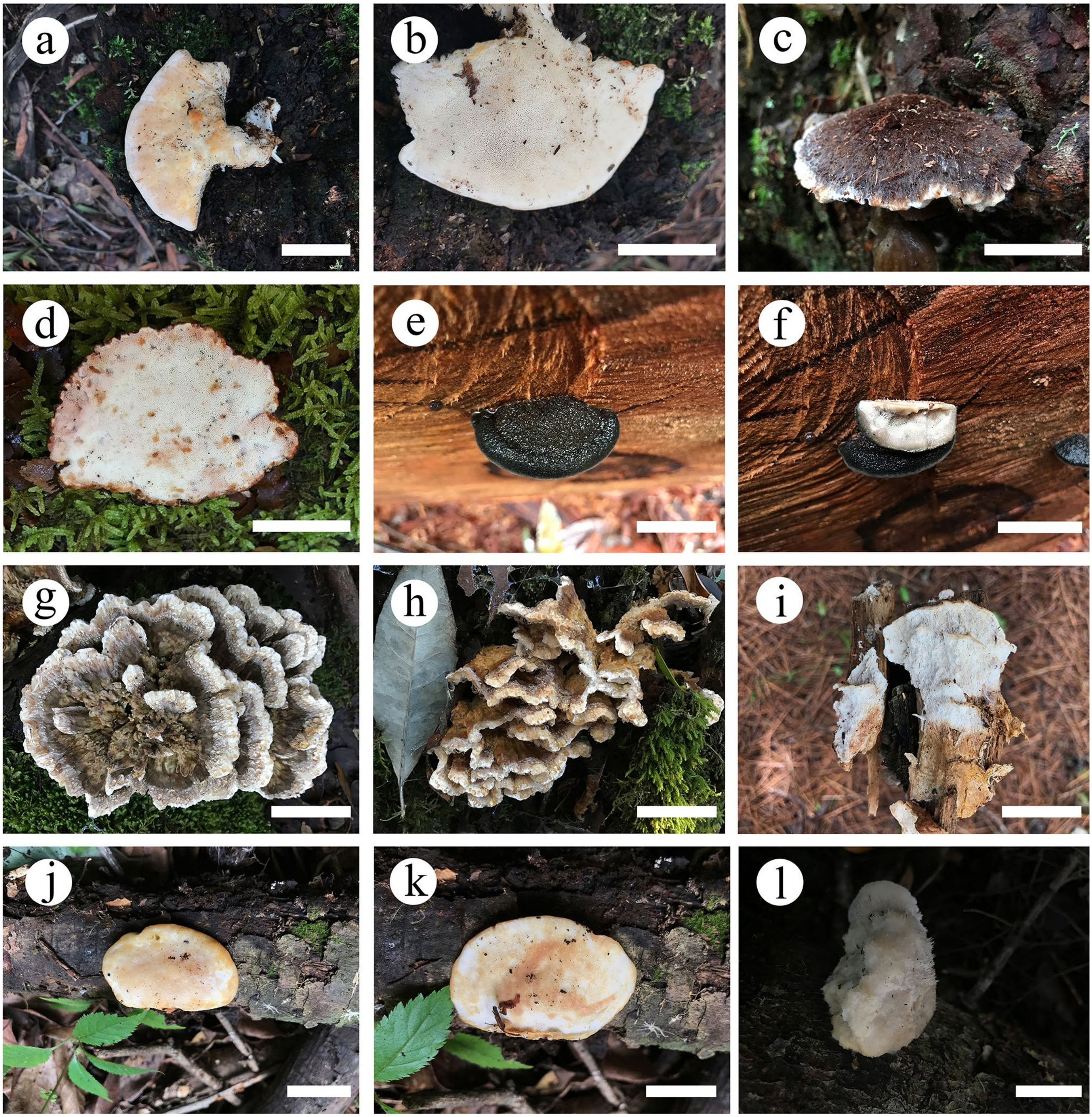

Fig. 6 Basidiocarps of new species. **a**, **b** *Aurantipostia macrospora* (Cui 16604); **c**, **d** *Austropostia hirsuta* (Cui 16660); **e**, **f** *Austropostia plumbea* (Cui 16550); **g**, **h** *Austropostia subpunctata* (Cui 16675); **i** *Cystidiopostia subhibernica* (Cui 17095); **j**, **k**. *Fuscopostia subfragilis* (Cui 16302); **l** *Postia crassicontexta* (Cui 16637). Bars: **c**, **d**, **e**, **l** = 2 cm; **a**, **b**, **f**, **g**, **h**, **i**, **j**, **k** = 3 cm

thick-walled with a narrow lumen to subsolid, occasionally branched, interwoven, 2.2–6.2 µm in diam.

Tubes. Generative hyphae frequent, colorless, thin-walled, occasionally branched, 1.7–3 µm in diam; skeletal hyphae dominant, colorless, thick-walled with a wide to narrow lumen, infrequently branched, interwoven, 2–5 µm in diam. Cystidia absent, fusoid cystidioles present, colorless, thin-walled, 13.2–25.5 × 4.2–6.2 µm. Basidia clavate, 4-sterigmate, clamped at base, 11.5–22.4 × 3.4–5.5 µm.

Spores. Basidiospores cylindrical, tapering at apiculus, colorless, thin-walled, smooth, IKI–, CB–, (3.9–)4–4.4(–4.7) × (1.3–)1.5–1.8(–2) µm, L = 4.15 µm, W = 1.58 µm, Q = 2.53–2.74 (n = 90/3) (*Cui 16478*, *16479* and *16480*).

Notes. Phylogenetically, *A. nivea* is closely related to *A. xantha* (Figs. 1, 2). Morphologically, both *A. nivea* and *A.*

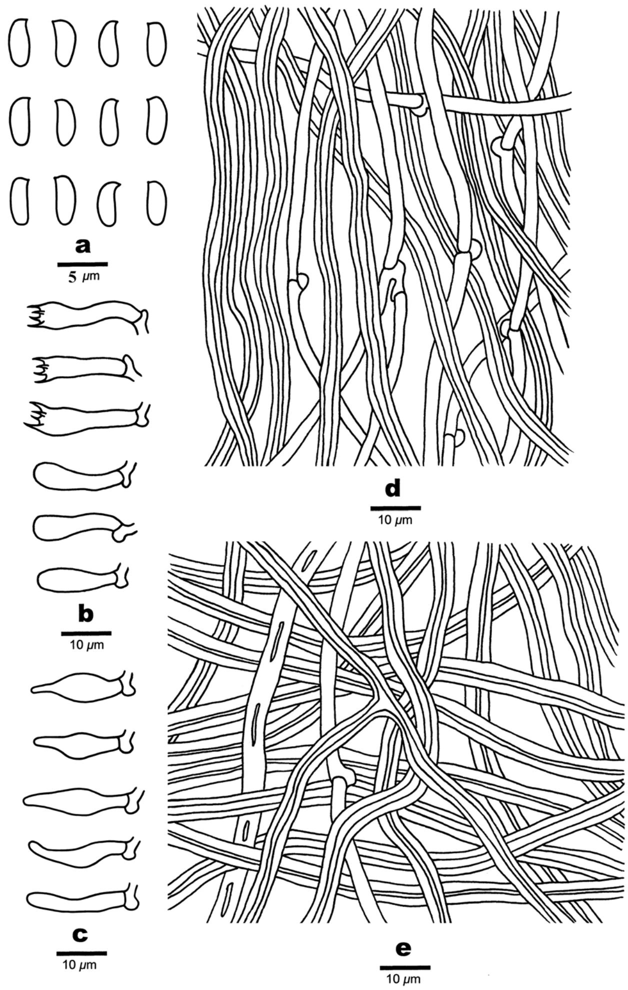

Fig. 7 Microscopic structures of *Amyloporia nivea* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

xantha produce resupinate basidiocarps and similarly sized basidiospores, but *A. xantha* differs by its citrous to sulphurous yellow pore surface when fresh, fading on drying (Gilbertson and Ryvarden 1986; Ryvarden and Gilbertson 1993; Núñez and Ryvarden 2001). Morphologically, *A. alpina*, *A. subxantha* and *A. nivea* share similar resupinate basidiocarps, but *A. alpina* has larger pores (2–5 per mm) and wider basidiospores (4–5 × 2–2.5 µm; Domanski 1974), and is distributed in high mountains in Europe and North America (Gilbertson and Ryvarden 1986; Ryvarden and Gilbertson 1993); *A. subxantha* differs in its straw-yellow to lemon-yellow pore surface when dry and its tramal hyphae are dominant by generative hyphae (Dai et al. 2012).

Additional specimens (paratypes) examined: **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on charred wood of *Pinus* sp., 16 October 2017, *Cui 16479*, *16480* (BJFC).

Austroporia B.K. Cui & Shun Liu, **gen. nov.**
MycoBank: MB 840312

Etymology. *Austroporia* (Lat.): refers to the type species of this genus occurring in Australia and producing resupinate polyporoid basidiocarps.

Type species: *Austroporia stratosa* (J.E. Wright & J.R. Deschamps) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps perennial, resupinate, hard corky. Pore surface white to cream to greyish brown. Subiculum honey yellow to greyish brown, corky, almost absent. Tubes stratified, cinnamon brown to dark brown, hard corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae unchanged in Melzer's reagent and KOH. Cystidia absent, cystidioles present. Basidiospores cylindrical to slightly allantoid, colorless, thin-walled, smooth, IKI–, CB–.

Notes. Phylogenetically, specimens of *Austroporia* formed a well-supported clade that is related to *Adustoporia*, *Amyloporia*, *Lentoporia*, *Resinoporia* and *Rhodonia* (Figs. 1, 2). Morphologically, *Adustoporia* differs by having annual and thin basidiocarps with pale brown pore surface when fresh, larger pores and mainly grows on gymnosperm trees (Chiu 2007; Yu et al. 2010; Rajchenberg et al. 2011); *Amyloporia* differs by having amyloid skeletal hyphae (Singer 1944; Rajchenberg et al. 2011); *Lentoporia* differs by having amyloid skeletal hyphae and ellipsoid to oblong basidiospores (Vampola and Pouzar 1993; Ryvarden and Melo 2014); *Resinoporia* differs by its skeletal hyphae dissolving in KOH, abundant resinous matter in the subiculum and tubes, cylindrical to oblong-ellipsoid basidiospores and mainly grows on the gymnosperm trees (Trass et al. 1999; Niemelä 2005; Dai 2012; Cui and Dai 2013; Spirin et al. 2015a; Audet 2017g); *Rhodonia* differs by its white to red-brown subiculum and a monomitic hyphal system (Ryvarden and Gilbertson 1994; Bernicchia 2005; Niemelä et al. 2005; Shen et al. 2019).

In this study, *Austroporia* is described as a new genus based on phylogenetic analyses and morphological characters. Only one species, *Austroporia stratosa*, is accepted in this genus now.

Austroporia stratosa (J.E. Wright & J.R. Deschamps) B.K. Cui & Shun Liu, **comb. nov.**
MycoBank: MB 840314

Basionym: *Amyloporia stratosa* (J.E. Wright & J.R. Deschamps) Rajchenb., Gorjón & Pildain, Australian Systematic Botany 24: 118, 2011.

≡ *Antrodia stratosa* (J.E. Wright & J.R. Deschamps) Rajchenb., Boletín de la Sociedad Argentina de Botánica 22: 42, 1983.

For a detailed description of *Amyloporia stratosa*, see Rajchenberg (2006).

Notes. Rajchenberg et al. (2011) evaluated the phylogenetic relationships of *Antrodia* s.l., and transferred *A. stratosa* to the genus *Amyloporia*. *Amyloporia stratosa* has perennial basidiocarps and a heterocytic nuclear behaviour with bipolar mating system (Rajchenberg and Greslebin 1995), while other *Amyloporia* spp. are tetrapolar (Rajchenberg et al. 2011). Moreover, it has a coriaceous consistency, not chalky as in *A. xantha.* Furthermore, *A. stratosa* is distinct from *A. xantha* based on molecular sequences (Rajchenberg et al. 2011).

In the current phylogenetic analyses, samples of *Austroporia stratosa* from Tasmania, Australia clustered together and formed a strongly supported monophyletic lineage (100% MP, 100% ML, 1.00 BPP; Figs. 1, 2).

Specimens examined: **AUSTRALIA**. Tasmania, Hobart, Mount Wellington, on fallen trunk of *Eucalyptus* sp., 13 May 2018, *Cui 16612*, *16613*, *16618*, *16619* (BJFC).

Lentoporia Audet, Mushrooms nomenclatural novelties 5: 1, 2017.

MycoBank: MB 552854

Type species: *Lentoporia carbonica* (Overh.) Audet.

Diagnosis: Basidiocarps annual, resupinate, tough and corky when dry. Pore surface white, cream to peach-coloured; pores round, sometimes elongated. Subiculum white and cottony. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae strongly IKI+, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid to oblong, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Lentoporia* was established as separated from *Antrodia* s.l. by Audet (2017e). Morphologically, *Lentoporia* differs in having round pores, sometimes elongated, amyloid skeletal hyphae, ellipsoid to oblong basidiospores (Vampola and Pouzar 1993; Ryvarden and Melo 2014; Audet 2017e). In this study, species of *Lentoporia* formed a single lineage distant from *Antrodia* s.s. (Figs. 1, 2), so the independence of the genus was confirmed. Currently, two species are accepted in *Lentoporia*, *L. carbonica* and the new species *L. subcarbonica*.

Lentoporia subcarbonica B.K. Cui, Y.Y. Chen & Shun Liu, **sp. nov.** (Figs. 5b, 8)

MycoBank: MB 840315

Differs from *Lentoporia carbonica* by its larger pores (2–3 per mm) and smaller basidiospores (4–5.5 × 2.2–3 µm).

Type. **CHINA**. Sichuan Province, Jiuzhaigou County, Jiuzhaigou Nature Reserve, on fallen trunk of *Picea* sp., 11 October 2012, *Cui 10614* (holotype, BJFC).

Etymology. *Subcarbonica* (Lat.): refers to the new species resembling *Lentoporia carbonica* in morphology.

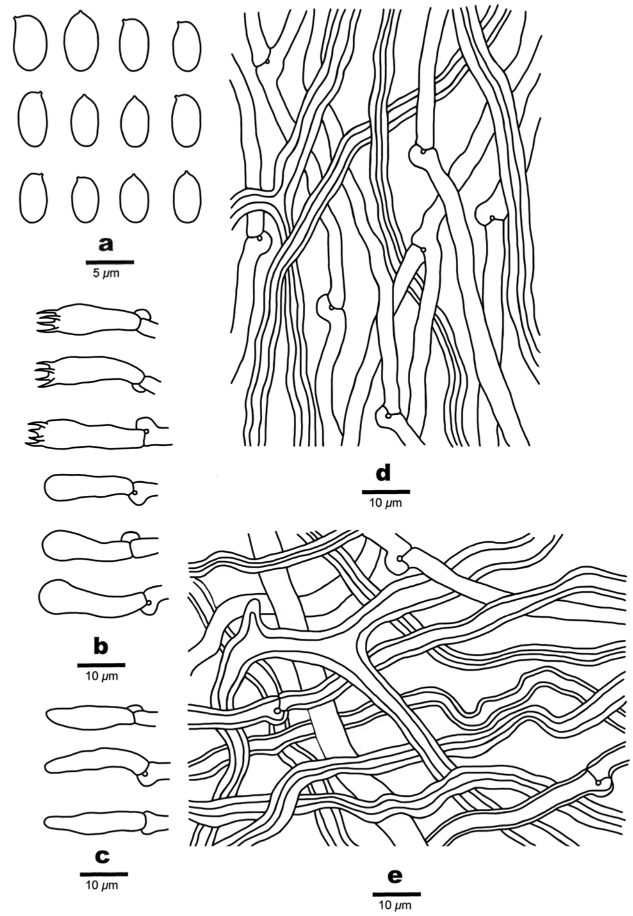

Fig. 8 Microscopic structures of *Lentoporia subcarbonica* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Fruiting body. Basidiocarps annual, resupinate, without odor or taste when fresh, tough to corky when dry, 10 cm or more in length, 4.5 cm or more in width, up to 6 mm thick, margin thin and white, irregular. Pore surface white to cream when fresh, becoming cream to salmon pink when dry; pores round, sometimes elongated, 2–3 per mm; dissepiments thin, entire to slightly lacerate and one side open. Subiculum white and cottony when dry, up to 2 mm thick. Tubes concolorous with pore surface, corky when dry, up to 4 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae strongly IKI+, CB−; tissues becoming blue-black in Melzer's reagent, unchanged in KOH.

Subiculum. Generative hyphae frequent, colorless, thin- to thick-walled with a wide lumen, rarely branched, 2–6 µm in diam; skeletal hyphae dominant, colorless, thick-walled with a narrow lumen, often branched, flexuous, interwoven, 3–7 µm in diam.

Tubes. Generative hyphae dominating, colorless, thin-walled, often branched, 2–5 µm in diam; skeletal hyphae colorless, thick-walled with a distinctly wide or narrow lumen, occasionally branched, flexuous, interwoven, 2.5–6 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 13–20 × 4–5 µm. Basidia clavate, 4-sterigmate, clamped at base, 18–21 × 5–6 µm.

Spores. Basidiospores oblong ellipsoid to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, 4–5.5 × 2.2–3(−3.3) µm, L = 4.71 µm, W = 2.65 µm, Q = 1.75–1.84 (n = 60/2) (*Cui 10614* and *Dai 20175*).

Notes. *Lentoporia carbonica* and *L. subcarbonica* share resupinate basidiocarps with a white to cream to pinkish pore surface when fresh, strongly amyloid skeletal hyphae and oblong-ellipsoid to ellipsoid basidiospores, but *L. carbonica* differs from *L. subcarbonica* by its smaller pores and larger basidiospores (3–5 per mm, 6–7.5 × 2.8–4 µm; Ryvarden and Melo 2014).

Additional specimens (paratypes) examined: **CHINA**. Xizang Autonomous Region (Tibet), Linzhi, Bomi County, Bulang, on fallen gymnosperm trunk, 21 July 2019, *Dai 20204* (BJFC); Zhamu, on stump of *Abies* sp., 19 September 2014, *Cui 12212* (BJFC); Bomi County, on gymnosperm stump, 18 July 2019, *Dai 20175* (BJFC); on stump of *Abies* sp., 18 July 2019, *Dai 20177* (BJFC).

Resinoporia Audet, Mushrooms nomenclatural novelties 7: 1, 2017.
MycoBank: MB 552866
Type species: *Resinoporia crassa* (P. Karst.) Audet.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused-reflexed. Pore surface cream, buff, curry yellow to tawny; pores round to angular. Subiculum cream to buff, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−, occasionally dissolving in KOH. Cystidia absent, cystidioles present. Basidiospores cylindrical to oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Resinoporia* was established as separated from *Antrodia* s.l. by Audet (2017g), and eleven species were proposed as new combinations. Morphologically, *Resinoporia* differs from *Antrodia* s.s. by its skeletal hyphae occasionally dissolving in KOH, and abundant resinous matter in the subiculum and tubes (Audet 2017g). Currently, twelve species are accepted in *Resinoporia*, including *R. cincta* (Spirin, Vlasák & Miettinen) Audet, *R. crassa*, *R. cretacea* (K. Runnel, Spirin & A. Lõhmus) Audet, *R. ferox* (Long & D.V. Baxter) Audet, *R. ignobilis* (Spirin & Vlasák) Audet, *R. ladiana* (Spirin & Runnel) Audet, *R. piceata* (K. Runnel, Spirin & Vlasák) Audet, *R. pinea* (B.K. Cui & Y.C. Dai) Audet, *R. pini-cubensis* (Vampola, Kotl. & Pouzar) Audet, *R. sitchensis* (D.V. Baxter) Audet, *R. sordida* (Ryvarden & Gilb.) Audet and the new species *R. luteola*.

Specimens examined: ***Resinoporia crass***. **CHINA**. Heilongjiang Province, Yichun, Wuying, Fenglin Nature Reserve, on *Picea* sp., 31 July 2000, *Penttilä 13040* (BJFC); 14 August 2000, *Penttilä 13510* (BJFC). Jilin Province, Antu county, Changbaishan Nature Reserve, Huangsongpu, on rotten wood of *Pinus* sp., 21 September 2019, *Dai 20860* (BJFC). ***Resinoporia pinea***. **CHINA**. Hainan Province, Changjiang County, Bawangling Nature Reserve, on fallen trunk of *Pinus latteri*, 10 May 2009, *Cui 6522* (holotype, BJFC), *Cui 6529*, *Dai 10827* (BJFC). Taiwan, Hualon, Tailuge Forest Park, on fallen trunks of *Pinus* sp., 21 November 2009, *Dai 11557*, *11562* (BJFC). ***Resinoporia sitchensis***. **CHINA**. Heilongjiang Province, Yichun, Wuying, Fenglin Nature Reserve, on fallen trunk of *Picea* sp., 31 July 2000, *Penttilä 13049* (BJFC). Jilin Province, Antu county, Changbaishan Nature Reserve, Huangsongpu, on fallen trunk of *Larix* sp., 13 September 2007, *Dai 9111* (BJFC).

Resinoporia luteola B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5c, 9)
MycoBank: MB 840317
Differs from other *Resinoporia* spp. by its buff-yellow pore surface when fresh, buff to curry yellow upon drying, smaller pores (7–9 per mm), and distribution in tropical areas and growth on charred wood of *Pinus* sp.

Type. **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on charred wood of *Pinus* sp., 16 October 2017, *Cui 16474* (holotype, BJFC).

Etymology. *Luteola* (Lat.): refers to the buff-yellow pore surface when fresh.

Fruiting body. Basidiocarps annual, resupinate, not easily separated from substrate, soft corky, without odor or taste when fresh, corky upon drying, up to 8.5 cm long, 2 cm wide, 2 mm thick at center. Pore surface buff-yellow when fresh, turning buff to curry yellow upon drying; pores usually round, occasionally angular, 7–9 per mm; dissepiments thin to slightly thick, mostly entire, occasionally lacerate. Subiculum cream to buff, thin, up to 1 mm thick. Tubes concolorous with pore surface, corky, up to 1.8 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues unchanged in KOH.

Subiculum. Generative hyphae infrequent, colorless, thin- to slightly thick-walled, occasionally branched, 2–4 µm in diam; skeletal hyphae dominant, colorless, slightly thick-walled to thick-walled with a wide to narrow lumen, occasionally branched, straight to flexuous, interwoven, 2.2–4.3 µm in diam.

Tubes. Generative hyphae colorless, thin-walled, occasionally branched, 1.7–2.7 µm in diam; skeletal hyphae

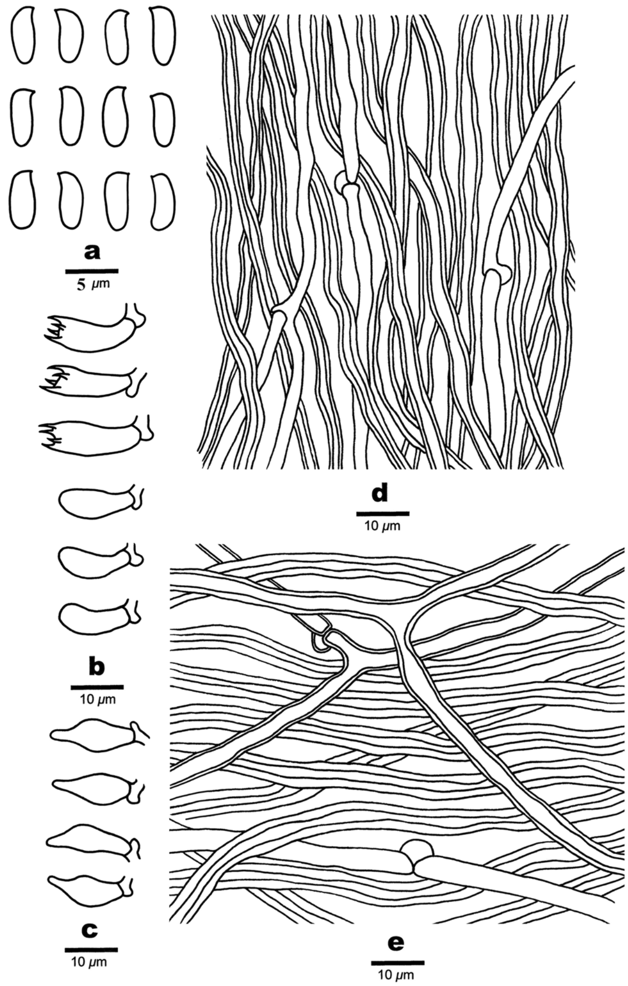

Fig. 9 Microscopic structures of *Resinoporia luteola* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 μm; **b–e** = 10 μm

dominant, colorless, slightly thick-walled, occasionally branched, straight to flexuous, interwoven, 2–3.3 μm in diam. Cystidia absent, fusoid cystidioles present, colorless, thin-walled, 11.3–15.7 × 3.6–5.5 μm. Basidia clavate, 4-sterigmate, clamped at base, 11–16.6 × 3.4–6.2 μm.

Spores. Basidiospores cylindrical, tapering at apiculus, colorless, thin-walled, smooth, IKI−, CB−, (4.3−)4.6–5.3(−5.5) × (1.7−)1.9–2.3(−2.5) μm, L = 4.94 μm, W = 2.11 μm, Q = 2.15–2.54 (n = 90/3) (*Cui 16473*, *16474* and *16475*).

Notes. Phylogenetically, specimens of *Resinoporia luteola* formed a highly supported lineage (Figs. 1, 2) and closely related to *R. pinea*. Morphologically, both *R. luteola* and *R. pinea* have an annual growth habit and resupinate basidiocarps, but *R. pinea* differs in having a cream to yellowish buff pore surface when fresh, yellowish brown to clay-buff upon drying, larger pores (5–7 per mm) and longer basidiospores (5–6 × 1.9–2.1 μm; Cui and Dai 2013).

Additional specimens (paratypes) examined: **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on charred wood of *Pinus* sp., 16 October 2017, *Cui 16472* (BJFC); on fallen trunk of *Pinus* sp., *Cui 16473*, *16475* (BJFC).

Rhodonia Niemelä, Karstenia 45 (2): 79, 2005.
MycoBank: MB 500978
Type species: *Rhodonia placenta* (Fr.) Niemelä, K.H. Larss. & Schigel.

Diagnosis: Basidiocarps annual, resupinate, soft and watery when fresh, corky to brittle when dry. Pore surface white, cream, pale rose pink to brownish; pores round to angular. Subiculum white to red-brown, corky. Tubes cream to reddish brown, brittle. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–. Cystidia or cystidioles absent. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI–, CB–. Causing a brown rot. For a detailed description of *Rhodonia*, see Shen et al. (2019).

Notes. *Rhodonia* was established by Niemelä et al. (2005) based on previous phylogenetic studies (Boidin et al. 1998; Kim et al. 2001; Binder et al. 2005), in which *R. placenta* was distinct from *Postia*. Recent studies also support the establishment of the genus (Ortiz-Santana et al. 2013; Pildain and Rajchenberg 2013; Shen et al. 2019).

In the current phylogenetic analyses, *Rhodonia* spp. grouped together and formed a well-supported lineage (Figs. 1, 2). Morphologically, *Rhodonia* differs from *Postia* s.s. by its fairly large and thick resupinate basidiocarps and bigger cylindrical basidiospores (Niemelä et al. 2005; Shen et al. 2019). Currently, six species are accepted in *Rhodonia*, including *R. obliqua* (Y.L. Wei & W.M. Qin) B.K. Cui, L.L. Shen & Y.C. Dai, *R. placenta*, *R. rancida* (Bres.) B.K. Cui, L.L. Shen & Y.C. Dai, *R. subplacenta* (B.K. Cui) B.K. Cui, L.L. Shen & Y.C. Dai, *R. tianshanensis* Yuan Yuan & L.L. Shen and the new species *R. subrancida*.

Specimens examined: ***Rhodonia placenta***. **BELARUS**. Mahilyowskaya, Svislach-Byarezina Projecting National Park, on stump of *Picea* sp., 14 October 2019, *Dai 20929* (BJFC). **CHINA**. Sichuan Province, Jiulong County, Wuxuhai Park, on fallen trunk of *Picea* sp., 13 September 2019, *Cui 17704* (BJFC). Xinjiang Autonomous Region, Buerjin County, Kanasi Nature Reserve, on stump of *Larix* sp., 12 August 2004, *Wei 1406* (BJFC). ***Rhodonia rancida***. **CHINA**. Xizang Autonomous Region (Tibet), Linzhi, Kadinggou Forest Park, on stump of *Pinus* sp., 24 September 2014, *Cui 12317*, *12339* (BJFC).

Rhodonia subrancida B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5d, 10)
MycoBank: MB 840319

Differs from other *Rhodonia* spp. by its white to cream pore surface when fresh, pale brown to brown upon

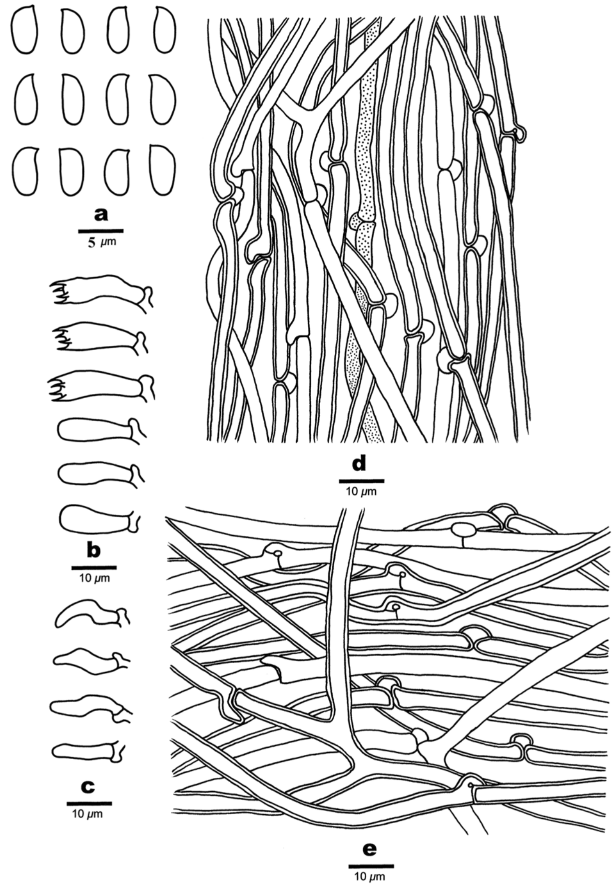

Fig. 10 Microscopic structures of *Rhodonia subrancida* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 μm; **b**–**e** = 10 μm

drying, slightly thick-walled generative hyphae dominant in subiculum and tubes, and cylindrical basidiospores (5.2–6.2 × 2.2–3 μm).

Type. **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on fallen trunk of *Pinus* sp., 16 October 2017, *Cui 16462* (holotype, BJFC).

Etymology. *Subrancida* (Lat.): refers to the new species being morphologically similar to *Rhodonia rancida* (Bres.) B.K. Cui, L.L. Shen & Y.C. Dai.

Fruiting body. Basidiocarps annual, resupinate, soft corky, without odor or taste when fresh, becoming corky to fragile upon drying, up to 13 cm long, 5.5 cm wide and 1.5 cm thick at center, not easily separated from the substrate. Pore surface white to cream when fresh, becoming pale brown to brown upon drying; sterile margin narrow to almost lacking; pores angular, 3–4 per mm; dissepiments thin, entire to lacerate. Subiculum white when fresh, cream when dry, corky, very thin. Tubes clay-buff, fragile, up to 1.5 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Subiculum. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 1.9–7.2 μm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, 1.9–5.5 μm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 11.5–18.5 × 2.5–3.5 μm. Basidia clavate, colorless, 4-sterigmate clamped at base, 10.5–19.5 × 4.5–7.5 μm.

Spores. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−, (5−)5.2–6.2(−6.5) × (2−)2.2–3 μm, L = 5.74 μm, W = 2.68 μm, Q = 2.16 (n = 30/1) (*Cui 16462*).

Notes. Phylogenetically, *Rhodonia subrancida* grouped with *R. obliqua*, *R. placenta*, *R. rancida*, *R. subplacenta* and *R. tianshanensis* (Figs. 1, 2). Morphologically, these six species have resupinate basidiocarps and similar cylindrical basidiospores, but *R. obliqua* differs from *R. subrancida* by its oblique tubes, thin-walled generative hyphae dominant in subiculum and tubes, and absence of cystidioles (Wei and Qin 2010); *R. placenta* is distinguished by a salmon pink pore surface when fresh, and thin-walled generative hyphae dominant in subiculum and tubes (Ryvarden and Melo 2014); *R. rancida* can be easily separated from *R. subrancida* by the rancid taste when fresh, and longer basidiospores (6–8 × 2–3 μm; Ryvarden and Melo 2014); *R. subplacenta* differs from *R. subrancida* by its cream-buff to pale cinnamon brown to buff pore surface (Cui and Li 2012); *R. tianshanensis* Yuan Yuan & L.L. Shen differs from *R. subrancida* by its thin-walled generative hyphae dominant in subiculum and tubes, and larger fusoid cystidioles (25–38 × 4–6 μm; Yuan and Shen 2017).

Auriporiaceae B.K. Cui, Shun Liu & Y.C. Dai, **fam. nov.**
MycoBank: MB 840320
Type genus: *Auriporia* Ryvarden.

Diagnosis: Basidiocarps annual, resupinate or pileate, corky to fragile. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae clamped. Cystidia usually present, cystidioles present or absent. Basidiospores allantoid, cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Justo et al. (2017) and He et al. (2019) indicated that *Auriporia* could not be assigned to any recognized family of Polyporales, and its classification at family level was treated as *incertae sedis* (He et al. 2019).

In the current phylogenetic analyses, species of *Auriporia* grouped and formed a single lineage with high support (100% MP, 100% ML, 1.00 BPP; Figs. 1, 2) within the Polyporales, but it could not be placed in any recognized family. Morphologically, it was characterized by resupinate or pileate basidiocarps with a yellowish pore surface; a monomitic to dimitic hyphal system, clamped generative hyphae; smooth cystidia with short side branches or protuberances, usually apically incrusted; ellipsoidal or allantoid basidiospores; and associated with a brown wood rot (Ryvarden 1973; Ryvarden and Gilbertson 1993). *Auriporia* spp. have different morphology from any of the presently known families of the Polyporales, thus, a new family is proposed to accommodate this genus. Currently, only one genus is accepted in the Auriporiaceae.

Auriporia Ryvarden, Norwegian Journal of Botany 20 (1): 2, 1973.

MycoBank: MB 17137

Type species: *Auriporia aurea* (Peck) Ryvarden.

Diagnosis: Basidiocarps annual, resupinate or pileate, corky to fragile. Pileal surface yellow-ochre to brownish yellow when present, darkening from the base to the margin. Pore surface cream to golden-yellow; pores round to angular. Context ochre to brownish ochre, corky. Tubes concolorous with pore surface, corky. Hyphal system monomitic to dimitic; generative hyphae clamped; skeletal hyphae IKI– CB–. Cystidia present, cystidioles present or absent. Basidiospores allantoid, cylindrical to ellipsoid, with applanated supra-apicular region, colorless, thin-walled, IKI–, CB–. Causing a brown rot.

Notes. *Auriporia* is a small and well-defined poroid genus restricted to the temperate areas of the Northern Hemisphere (Ryvarden 1991; Ryvarden and Gilbertson 1993; Teixeira 1994; Núñez and Ryvarden 2001). The genus was established by Ryvarden (1973) with *Poria aurea* Peck as the type species. The second species, *A. aurulenta* A. David, Tortič & Jelić, was described by David et al. (1974). Parmasto (1980) described the third species, *A. pileata* Parmasto, and emended the genus for the second time including additional characters of a pileate basidiocarps and allantoid basidiospores. The fourth species, *A. brasilica* G. Coelho, was described and illustrated based on specimens collected from southern Brazil by Coelho (2005).

Specimens examined: ***Auriporia aurea***. **CHINA**. Sichuan Province, Songpan County, Huanglong Nature Reserve, on stump of *Abies* sp., 14 October 2012, *Cui 10665* (BJFC). Hunan Province, Yizhang County, Mangshan Nature Reserve, on angiosperm wood, 26 June 2007, *Dai 8164* (IFP). Liaoning Province, Kuandian County, on angiosperm wood, 26 September 1995, *Dai 2191* (IFP). ***Auriporia aurulenta***. **CHINA**. Anhui Province, Huangshan, Huangshan Mountain, on fallen angiosperm trunk, 13 October 2004, *Dai 6178* (BJFC). Guangxi Autonomous Region, Nanning, Qingxiushan Park, on fallen trunk of *Pinus* sp., 13 August 2005, *Dai 6922* (BJFC). Zhejiang Province, Lin'an County, Tianmushan Nature Reserve, on angiosperm wood, 9 October 2005, *Cui 2545* (BJFC); Jiuxi Forest Park, on fallen angiosperm trunk, 17 October 2010, *Dai 11808* (BJFC). ***Auriporia pileata***. **CHINA**. Anhui Province, Huangshan, Huangshan Mountain, on fallen angiosperm trunk, 13 October 2004, *Dai 6183* (BJFC).

Dacryobolaceae Jülich, Bibliotheca Mycologica 85: 363, 1981.

MycoBank: MB 81762

Type genus: *Dacryobolus* Fr.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed, adnate, membranaceous to coriaceous. Hymenophores usually odontioid, aculei conical to cylindrical. Hyphal system monomitic or dimitic; generative hyphae clamped. Cystidia usually present, cystidioles present or absent. Basidiospores allantoid, colorless, thin- to thick-walled, smooth or sometimes ornamented, IKI–, CB–. Causing a brown rot.

Genus: *Dacryobolus*.

Notes. Dacryobolaceae was established by Jülich (1981) with *Dacryobolus* as the type genus. Justo et al. (2017) treated *Amylocystis* Bondartsev & Singer, *Oligoporus*, *Postia* and *Spongiporus* Murrill in Dacryobolaceae. However, in some other studies, *Dacryobolus* did not group with these genera (Ortiz-Santana et al. 2013; Han et al. 2016; Shen et al. 2019), our phylogenetic results are consistent with these studies. Morphologically, *Dacryobolus* differs from the postia group by its membranaceous to coriaceous basidiocarps and mostly odontioid, aculei conical to cylindrical hymenophore and monomitic or dimitic hyphal system (Eriksson and Ryvarden 1975; Maekawa 1993; Bernicchia and Gorjón 2010). Currently, only one genus is accepted in the Dacryobolaceae.

Dacryobolus Fr., Summa vegetabilium Scandinaviae 2: 404, 1849.

MycoBank: MB 17458

Type species: *Dacryobolus sudans* (Alb. & Schwein.) Fr.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed, adnate, membranaceous to coriaceous. Hymenial surface whitish to pale ochraceous, fertile to the abrupt margin. Hymenium smooth or conspicuously odontioid with small conical, separated teeth on the smooth. Hyphal system monomitic or dimitic; generative hyphae clamped. Cystidia or cystidioles absent. Basidiospores allantoid, colorless, thin- to thick-walled, smooth or rarely ornamented, IKI–, CB–. Causing a brown rot.

Notes. *Dacryobolus* is characterized by long and narrow basidia, cystidia projecting conspicuously above the hymenial layer, and allantoid basidiospores (Yuan et al. 2016; Xu et al. 2018). Currently, eight species are accepted in *Dacryobolus*, including *D. angiospermarum* S.H. He, *D. costratus* (Rehill & B.K. Bakshi) S.S. Rattan, *D. gracilis* H.S. Yuan, *D. incarnatus* Quél., *D. karstenii* (Bres.) Oberw.

Ex Parmasto, *D. montanus* X.Z. Wan & H.S. Yuan, *D. phalloides* Manjón, Hjortstam & G. Moreno and *D. sudans*.

Specimens examined: ***Dacryobolus sudans***. **CHINA**. Guizhou Province, Leishan County, Leigongshan Forest Park, on dead tree of *Cerasus tomentosa*, 13 June 2016, *He 3749* (BJFC); Libo County, Maolan Nature Reserve, on dead angiosperm branch, 14 June 2016, *He 3769* (BJFC). Hainan Province, Qiongzhong County, Limushan Nature Reserve, on dead angiosperm branch, 8 June 2016, *He 3863* (BJFC); Wuzhishan County, Wuzhishan Nature Reserve, on dead angiosperm branch, 10 June 2016, *He 3918* (BJFC). Jiangxi Province, Anyuan County, Sanbaishan Nature Reserve, on fallen angiosperm trunk, 15 August 2016, *He 4421* (BJFC); Lianping County, Jiulianshan Nature Reserve, on dead angiosperm branch, 14 August 2016, *He 4353* (BJFC); Yifeng County, Gongshan Nature Reserve, on dead angiosperm branch, 10 August 2016, *He 4258* (BJFC).

Fibroporiaceae Audet, Mushrooms nomenclatural novelties 14: 1, 2018.
MycoBank: MB 554248
Type genus: *Fibroporia* Parmasto.

Diagnosis: Basidiocarps annual, resupinate or pileate, when resupinate margin often fimbriate with rhizomorphs. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae mostly clamped, occasionally with simple-septa. Cystidia absent, cystidioles present or absent. Basidiospores oblong to broadly ellipsoid, colorless, slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Fibroporia*, *Pseudofibroporia*.

Notes. Fibroporiaceae was established by Audet (2018c) and typified by *Fibroporia*. In the current phylogenetic analyses, Fibroporiaceae is closely related to Adustoporiaceae (Figs. 1, 2). Morphologically, Adustoporiaceae differs from Fibroporiaceae by rarely with rhizomorphs, occasionally having amyloid skeletal hyphae which usually dissolve in KOH, allantoid or cylindrical to oblong ellipsoid and thin-walled basidiospores.

Key to genera of Fibroporiaceae

1. Basidiocarps resupinate.. *Fibroporia*
1. Basidiocarps pileate.. *Pseudofibroporia*

Fibroporia Parmasto, Conspectus Systematis Corticiacearum: 176, 1968.
MycoBank: MB 17585
Type species: *Fibroporia vaillantii* (DC.) Parmasto.

Diagnosis: Basidiocarps annual, resupinate, margin often fimbriate with rhizomorphs. Pore surface white to apricot orange; pores circular to angular. Subiculum white to apricot orange, soft and cottony. Tubes concolorous with pore surface, corky. Hyphal system monomitic to dimitic; generative hyphae mostly clamped, rarely with simple-septa; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores oblong to broadly ellipsoid, colorless, slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Fibroporia*, see Chen et al. (2017).

Notes. *Fibroporia* was described by Parmasto (1968), with *Polyporus vaillantii* (DC.) Fr. as the generic type, to accommodate species with a fimbriate to rhizomorphic margin and ellipsoid and slightly thick-walled basidiospores. However, Ryvarden (1991) regarded the rhizomorphs as an adaptive character, which is not enough to justify a generic separation, and synonymised *Fibroporia* with *Antrodia*.

Recent molecular studies support the separation of *Fibroporia* as a distinct genus from *Antrodia* and several new *Fibroporia* spp. have been described (Rajchenberg et al. 2011; Bernicchia et al. 2012; Ortiz-Santana et al. 2013; Spirin et al. 2013a; Chen et al. 2015, 2017). Currently, eleven species are accepted in *Fibroporia*, including *F. albicans* B.K. Cui & Yuan Y. Chen, *F. bambusae* Yuan Y. Chen & B.K. Cui, *F. bohemica* Bernicchia, Vampola & Prodi, *F. ceracea* Yuan Y. Chen & B.K. Cui, *F. citrina* (Bernicchia & Ryvarden) Bernicchia & Ryvarden, *F. destructor* (Schrad.) Parmasto, *F. gossypium* (Speg.) Parmasto, *F. norrlandica* (Berglund & Ryvarden) Niemelä, *F. pseudorennyi* (Spirin) Spirin, *F. radiculosa* (Peck) Parmasto and *F. vaillantii*.

Specimens examined: ***Fibroporia albicans***. **CHINA**. Hubei Province, Shiyan, Saiwudang Nature Reserve, on fallen trunk of *Pinus* sp., 6 August 2019, *Dai 20268*, *20271* (BJFC). Xizang Autonomous Region (Tibet), Bomi County, Yupu, on stump of *Pinus* sp., 19 September 2010, *Cui 9464*, *9495*, *9504* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on fallen trunk of *Pinus* sp., 16 October 2017, *Cui 16486* (BJFC); on rotten wood of *Pinus* sp., 16 October 2017, *Dai 18407*, *18429* (BJFC). ***Fibroporia ceracea***. **CHINA**. Yunnan Province, Kunming, on bark of *Pinus* sp., 22 April 2012, *Dai 13013* (holotype, BJFC); Chuxiong, Zixishan Nature Reserve, on fallen angiosperm branch, 20 September 2017, *Cui 16299*, *16300* (BJFC). ***Fibroporia vaillantii***. **CHINA**. Jilin Province, Antu County, Changbaishan Nature Reserve, on rotten wood of *Quercus* sp., 26 August 2005, *Dai 7002* (BJFC).

Pseudofibroporia Yuan Y. Chen & B.K. Cui, Mycological Progress 16: 527, 2017.
MycoBank: MB 816306
Type species: *Pseudofibroporia citrinella* Yuan Y. Chen & B.K. Cui.

Diagnosis: Basidiocarps annual, pileate. Pileal surface white to lemon yellow or cinnamon brown to buff. Pore surface lemon yellow, cinnamon brown buff to clay buff; pores angular. Context white to lemon yellow, cottony or corky. Tubes concolorous with pore surface, crumbly or chalky. Hyphal system dimitic in context, monomitic in trama; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles occasionally present. Basidiospores oblong to broadly ellipsoid, colorless, slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Pseudofibroporia*, see Chen et al. (2017).

Notes. *Pseudofibroporia* was described by Chen et al. (2017) with *P. citrinella* as the generic type. Phylogenetically, *Pseudofibroporia* is closely related to *Fibroporia*; morphologically, the former differs from the latter by its distinct pileate basidiocarps with entire margin, and absence of rhizomorphs (Chen et al. 2017). Only one species, *Pseudofibroporia citrinella*, is accepted in this genus.

Specimens examined: **CHINA**. Guangxi Autonomous Region, Longzhou, Nonggang Nature Reserve, on dead angiosperm tree, 21 July 2012, *He 20120721-15* (BJFC); *Yuan 6181* (IFP).

Fomitopsidaceae Jülich, Bibliotheca Mycologica 85: 367, 1981.
MycoBank: MB 81772
Synonym: Daedaleaceae Jülich, Bibliotheca Mycologica 85: 363, 1981.
Synonym: Piptoporaceae Jülich, Bibliotheca Mycologica 85: 385, 1981.
Type genus: ***Fomitopsis*** P. Karst.

Diagnosis: Basidiocarps annual to perennial, stipitate, pileate, resupinate or effused-reflexed, mostly corky to hard corky, sometimes fragile or coriaceous. Hymenophores mostly poroid, occasionally hydnoid, lamellate or daedaleoid/labyrinthiform. Hyphal system dimitic or trimitic, more rarely monomitic; generative hyphae mostly clamped. Cystidia occasionally present, cystidioles present or absent. Basidiospores cylindrical to fusiform or ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Anthoporia* Karasiński & Niemelä, *Antrodia*, *Brunneoporus*, *Buglossoporus* Kotl. & Pouzar, *Cartilosoma* Kotl. & Pouzar, *Daedalea*, *Daedalella* B.K. Cui & Shun Liu, *Dentiporus*, *Flavidoporia*, *Fomitopsis*, *Fragifomes*, *Melanoporia* Murrill, *Neoantrodia*, *Neolentiporus*, *Niveoporofomes*, *Pseudoantrodia* B.K. Cui, Y.Y. Chen & Shun Liu, *Pseudofomitopsis* B.K. Cui & Shun Liu, *Rhizoporia*, *Rhodoantrodia* B.K. Cui, Y.Y. Chen & Shun Liu, *Rhodofomes* Kotl. & Pouzar, *Rhodofomitopsis*, *Rubellofomes*, *Subantrodia*, *Ungulidaedalea*.

Notes. Fomitopsidaceae was established by Jülich (1981) with *Fomitopsis* as the type genus. This family belongs to the Polyporales and causes a brown rot. In this study, Fomitopsidaceae received high support (95% MP, 100% ML, 1.00 BPP in Fig. 1; 95% MP, 92% ML, 1.00 BPP in Fig. 2), 24 genera are accepted in this family, including four new genera: *Daedalella*, *Pseudoantrodia*, *Pseudofomitopsis* and *Rhodoantrodia*. In Justo et al. (2017), 14 genera are accepted in Fomitopsidaceae, all these genera are included in our current concept of Fomitopsidaceae. Our study is consistent with other studies, such as Binder et al. (2013), Han et al. (2016), Justo et al. (2017) and Shen et al. (2019).

Key to genera of Fomitopsidaceae

1. Skeletal hyphae frequently simple-septate……… …………………………………… *Ungulidaedalea*
1. Skeletal hyphae without or rarely simple-septate ……………...……………………………………2
2. Generative hyphae irregularly thick-walled……… ……………………………………… *Neolentiporus*
2. Generative hyphae without regularly thick-walled……………………………………………..3
3. Hymenophores mostly irregularly poroid, hydnoid, lamellate or daedaleoid/labyrinthiform……………… ……………………………………………………4
3. Hymenophores mostly regularly poroid……………… ……………………………………………………5
4. Context mostly brownish; cystidioles present……… …………………………………………… *Daedalea*
4. Context mostly rose pink, lilac, or pinkish brown; cystidioles absent……………………………………… …………………………………… *Rhodofomitopsis*
5. Context whitish pink, purple-pink, pinkish brown………………………………………………6
5. Context white, cream, greyish, straw yellow, ochraceous or brown……………………………………8
6. Basidiocarps mostly resupinate to effused-reflexed; basidiospores > 6 μm in length……………………… ……………………………………… *Rhodoantrodia*
6. Basidiocarps mostly pileate; basidiospores < 6 μm in length……………………………………………7
7. Pore surface white to cream or purple-pink when fresh, straw yellow to cinnamon brown when dry……… ……………………………………… *Rubellofomes*
7. Pore surface pinkish to vinaceous when fresh, clay-pink to brownish vinaceous when dry……………… ………………………………………… *Rhodofomes*
8. Basidiospores ovoid to broadly ellipsoid……… …………………………………… *Niveoporofomes*
8. Basidiospores cylindrical to oblong-ellipsoid or ellipsoid………………………………………………9
9. Basidiocarps mostly pileate…………………… ……………………………………………………10
9. Basidiocarps mostly resupinate to effused-reflexed……………………………………… …15

10. Hyphal system mostly monomitic in trama...*Buglossoporus*
10. Hyphal system mostly dimitic or trimitic in trama..11
11. Basidiocarps soft corky to fragile..*Fragifomes*
11. Basidiocarps mostly hard corky to woody hard...12
12. Hyphal system dimitic to trimitic; grows on angiosperm and gymnosperm trees..*Fomitopsis*
12. Hyphal system dimitic; grows only on angiosperm trees..13
13. Basidiocarps annual; pore surface cream, buff to olivaceous...14
13. Basidiocarps annual to perennial; pore surface dark chocolate brown to dark purplish brown...*Melanoporia*
14. Basidiocarps laterally stipitate to substipitate; pores 7–8 per mm..*Pseudofomitopsis*
14. Basidiocarps laterally stipitate to substipitate; pores 7–8 per mm..*Pseudofomitopsis*
14. Basidiocarps sessile; pores 8–11 per mm...*Daedalella*
14. Basidiocarps sessile; pores 8–11 per mm...*Daedalella*
15. Skeletal hyphae sandy beige...*Brunneoporus*
15. Skeletal hyphae colorless..16
16. With pleasant floral smell...*Anthoporia*
16. Without pleasant floral smell..17
17. Sterile margin byssoid, sometimes with rhizomorphs; pore surface translucent when fresh...*Rhizoporia*
17. Basidiocarps without rhizomorphs; pore surface opaque when fresh.......................................18
18. Chlamydospores present...19
18. Chlamydospores absent...20
19. Basidiocarps resupinate to effused-reflexed; basidiospores cylindrical...*Subantrodia*
19. Basidiocarps resupinate to pseudopileate; basidiospores oblong to ellipsoid...*Flavidoporia*
20. Cystidioles mostly encrusted by crystal crown...*Neoantrodia*
20. Cystidioles absent, or when present, not encrusted by crystal crown...21
21. Hyphal system monomitic...*Pseudoantrodia*
21. Hyphal system dimitic...22
22. Cystidioles absent; basidiospores allantoid, cylindrical to narrowly ellipsoid...*Cartilosoma*
22. Cystidioles usually present; basidiospores cylindrical to ellipsoid...23
23. Pore surface usually with rose pink tint; basidia clearly thick-walled....................................*Dentiporus*
23. Pore surface without rose pink tint; basidia usually thin-walled......................................*Antrodia*

Anthoporia Karasiński & Niemelä, Polish Botanical Journal 61 (1): 8, 2016.

MycoBank: MB 816285

Type species: *Anthoporia albobrunnea* (Romell) Karasiński & Niemelä.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused-reflexed, soft, with cottony subiculum and fimbriate margin. Rhizomorphs present but inconspicuous. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia or cystidioles absent. Basidiospores cylindrical to suballantoid, colorless, thin-walled, smooth, IKI–, CB–. Causing a brown rot. For a detailed description of *Anthoporia*, see Karasiński and Niemelä (2016).

Notes. The genus *Anthoporia* was proposed for *Polyporus albobrunneus* Romell (Karasiński and Niemelä 2016). It was shown as distant from *Antrodia* s.s. in recent phylogenetic studies (Bernicchia et al. 2012; Rajchenberg et al. 2011; Binder et al. 2013; Ortiz-Santana et al. 2013; Spirin et al. 2013a; Chen et al. 2015). In this study, *Anthoporia* formed a monophyletic lineage within Fomitopsidaceae (Fig. 3). Only one species, *Anthoporia albobrunnea*, is accepted in this genus.

Specimens examined: ***Anthoporia albobrunnea***. **FINLAND**. Perä-Pohjanmaa, South Pisavaara National Park, on fallen trunk of *Pinus* sp., 14 September 1997, *Dai 2647* (BJFC); 15 September 1997, *Dai 2663* (BJFC); Koillissmaa, Oulanka National Park, on fallen trunk of *Picea* sp., 18 September 1997, *Dai 2686* (BJFC).

Antrodia P. Karst., Meddelanden af Societas pro Fauna et Flora Fennica 5: 40, 1879.

MycoBank: MB 17200

Type species: *Antrodia serpens* (Fr.) P. Karst.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed or rarely pileate, soft corky, fragile to corky. Pileal surface glabrous or villous, white, cream to dark gray. Pore surface white to cream or pale brown to brown upon drying; pores round to angular. Context white to cream, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Antrodia*, typified with *Polyporus serpens* Fr. (=*Antrodia albida* (Fr.) Donk (Donk 1960; Ryvarden 1991), is a highly heterogeneous genus which is closely related to *Daedalea*, *Fomitopsis* and *Oligoporus* (Kim et al. 2003; Yu et al. 2010; Rajchenberg et al. 2011; Bernicchia et al. 2012; Spirin et al. 2013b). Some studies have divided *Antrodia* s.l. into three genera, viz., *Amyloporia*, *Antrodia* s.s. and *Fibroporia* (Yu et al. 2010; Rajchenberg et al. 2011; Bernicchia et al. 2012; Cui 2013; Cui and Dai 2013; Spirin et al. 2013a, b; Chen et al. 2015; Chen and Cui 2016). Recently, additional new genera of *Antrodia* s.l. have been proposed, i.e., *Adustoporia*, *Antrodiopsis*, *Brunneoporus*, *Dentiporus*, *Flavidoporia*, *Lentoporia*, *Neoantrodia*, *Resinoporia*, *Rhizoporia* and *Subantrodia* (Audet 2017a, b, c, d, e, f, g, h, i, j). In this study, species of *Antrodia* s.s. formed a highly supported lineage (Fig. 3), which was distant from other brown-rot genera within Fomitopsidaceae. Currently, eighteen species are accepted in *Antrodia*, including *A. afrosinuosa* Ryvarden, *A. bambusicola* Y.C. Dai & B.K. Cui, *A. favescens* (Schwein.) Vlasák & Spirin, *A. griseoflavescens* (Litsch.) Runnel, Spirin & K.H. Larss., *A. heteromorpha* (Fr.) Donk, *A. latebrosa* Spirin, Ryvarden & Miettinen, *A. macra* (Sommerf.) Niemelä, *A. madronae* Vlasák & Ryvarden, *A. mappa* (Overh. & J. Lowe) Miettinen & Vlasák, *A. multiformis* Vlasák, *A. neotropica* Kaipper-Fig., Robledo & Drechsler-Santos, *A. parvula* (Bres.) Ryvarden, *A. peregrina* Spirin, Y.C. Dai & Vlasák, *A. serpens*, *A. subserpens* B. K. Cui & Yuan Y. Chen, *A. tanakae* (Murrill) Spirin & Miettinen, *A. tenerifensis* Kout & Vlasák and the new species *A. subheteromorpha*.

Specimens examined: ***Antrodia heteromorpha***. **CHINA**. Sichuan Province, Daocheng County, Haizi Mountain, on stump of *Picea* sp., 10 August 2019, *Cui 17383* (BJFC); Xiangcheng County, Shuiwa, Fozhuxia, on fallen branch of *Pinus* sp., 12 August 2019, *Cui 17429* (BJFC); on stump of *Pinus* sp., 12 August 2019, *Cui 17433*, *17436*, *17437* (BJFC); Xiaoxue Mountain, on stump of *Pinus* sp., 12 August 2019, *Cui 17449* (BJFC); on fallen branch of *Pinus* sp., 12 August 2019, *Cui 17458* (BJFC). Yunnan Province, Shangri-La, Pudacuo National Park, on fallen trunk of *Acer* sp., 13 August 2019, *Cui 17491* (BJFC). ***Antrodia serpens***. **LUXENBURG**. On angiosperm stump, 5 July 2005, *Dai 7465* (BJFC). **POLAND**. Brynica Mcrow, on fallen trunk of *Fagus* sp., 3 October 2014, *Dai 14850* (BJFC). ***Antrodia subserpens***. **CHINA**. Yunnan Province, Baoshan, Gaoligongshan Nature Reserve, on fallen angiosperm trunk, 16 September 2017, *Cui 16210* (BJFC); Jingdong County, Ailaoshan Nature Reserve, on dead angiosperm tree, 12 July 2013, *Dai 13233* (BJFC); Lanping County, Tongdian, Luoguqing, on fallen trunk of *Pinus* sp., 19 September 2017, *Cui 16285* (BJFC). ***Antrodia tanakae***. **CHINA**. Sichuan Province, Batang County, on fallen trunk of *Picea* sp., 8 August 2019, *Cui 17348* (BJFC); Jiulong County, Wuxuhai Park, on fallen branch of *Pinus* sp., 13 September 2019, *Cui 17708* (BJFC); Litang County, Jiawa, Haizi Mountain, on fallen trunk of *Picea* sp., 10 August 2019, *Cui 17366* (BJFC). Yunnan Province, Dali, Cangshan Park, on fallen branch of *Pinus* sp., 14 September 2017, *Cui 16168* (BJFC); on fallen trunk of *Pinus* sp., 14 September 2017, *Cui 16169*, *16170*, *16171* (BJFC); Lanping County, Tongdian, Luoguqing, on fallen trunk of *Pinus* sp., 19 September 2017, *Cui 16269*, *16284* (BJFC); on fallen branch of *Pinus* sp., 19 September 2017, *Cui 16279* (BJFC).

Antrodia subheteromorpha B.K. Cui, Y.Y. Chen & Shun Liu, **sp. nov.** (Figs. 5e, 11)
MycoBank: MB 840322

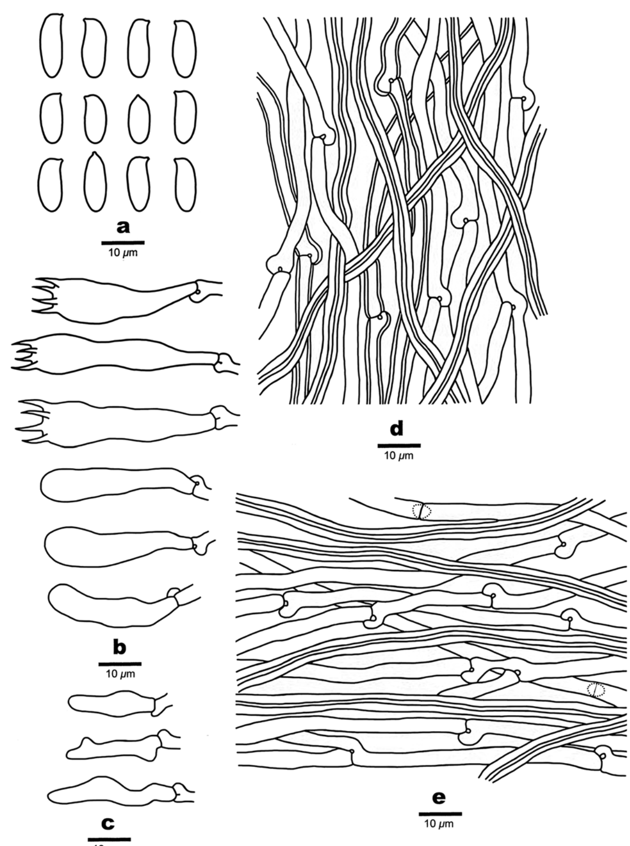

Fig. 11 Microscopic structures of *Antrodia subheteromorpha* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a**–**e** = 10 µm

Differs from other *Antrodia* spp. by its olivaceous buff to orange-yellow pileal surface, cream to pinkish buff pore surface, generative hyphae dominant in context and tubes, and cylindrical basidiospores (10–13 × 4–5.2 µm).

Type. **CHINA**. Xizang Autonomous Region (Tibet), Chayu County, on stump of *Picea* sp., 10 September 2020, *Cui 18416* (holotype, BJFC).

Etymology. *Subheteromorpha* (Lat.): refers to the new species being morphologically similar to *Antrodia heteromorpha* (Fr.) Donk.

Fruiting body. Basidiocarps annual, pileate to effused-reflexed, without odor or taste when fresh, corky when dry. Pilei semicircular to flabelliform, projecting up to 6 cm, 12 cm wide and 2.5 cm thick at base. Pileal surface olivaceous buff to orange-yellow; margin obtuse. Pore surface cream to pinkish buff; pores angular, 0.5–1.5 per mm, usually fusing together forming secondary larger pores; dissepiments thin, lacerate. Subiculum cream to buff, corky, up to 0.3 cm thick. Tubes concolorous with pore surface, corky, up to 1 cm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues unchanged in KOH.

Subiculum. Generative hyphae dominant, colorless, thin-walled, often branched, 2–4 µm in diam; skeletal hyphae colorless, thick-walled with a narrow lumen, rarely branched, 2.5–5 µm in diam.

Tubes. Generative hyphae dominant, colorless, thin- to thick-walled with a wide lumen, occasionally branched, 2.5–4 µm in diam; skeletal hyphae colorless, thick-walled with a narrow lumen, rarely branched, interwoven, 2–5 µm in diam. Cystidia absent; fusoid cystidioles present, thin-walled, 30–40 × 7.5–10 µm. Basidia clavate, 4-sterigmate, clamped at base, 33–42 × 8–11 µm.

Spores. Basidiospores cylindrical, bent near apiculus, colorless, thin-walled, smooth, IKI−, CB−, 10–13(−14.5) × 4–5.2(−5.5) µm, L = 11.6 µm, W = 4.6 µm, Q = 2.48–2.54 (n = 60/2) (*Cui 9617* and *18,416*).

Notes. In the current phylogenetic analyses, *Antrodia subheteromorpha* is closely related to *A. heteromorpha* and *A. peregrina* Spirin, Y.C. Dai & Vlasák (Fig. 3). Morphologically, *A. heteromorpha* differs by its skeletal hyphae dominating in context and tubes (Spirin et al. 2013a); *A. peregrina* differs by the unusually soft tubes and smaller pores (1.5–3 per mm; Runnel et al. 2019).

Additional specimens (paratypes) examined: **CHINA**. Xizang Autonomous Region (Tibet), Chayu County, on stump of *Picea* sp., 10 September 2020, *Cui 18417* (BJFC); Leiwuqi County, on fallen trunk of *Picea* sp., 22 September 2010, *Cui 9617* (BJFC); Nianlashan Nature Reserve, on stump of *Picea* sp., 23 September 2010, *Cui 9623* (BJFC).

Brunneoporus Audet, Mushrooms nomenclatural novelties 2: 1, 2017.
MycoBank: MB 552843
Type species: *Brunneoporus malicola* (Berk. & M.A. Curtis) Audet.

Diagnosis: Basidiocarps annual, pileate or effused-reflexed. Pileal surface uneven, finely pubescent, pale ochraceous. Pore surface cream to pale ochraceous; pores angular, sometimes elongated. Context pale ochraceous, leathery. Tubes concolorous with context, leathery. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Brunneoporus* was established as separated from *Antrodia* s.l. by Audet (2017b). *Brunneoporus* differs from *Antrodia* in having brownish basidiocarps, distinctly brownish interwoven skeletal hyphae and short basidia. Zmitrovich (2018) proposed two new combinations, *Brunneoporus hyalinus* (Spirin, Miettinen & Kotir.) Zmitr. and *B. juniperinus* (Murrill) Zmitr., respectively for *Antrodia hyalina* and *A. juniperina* (Murrill) Niemelä & Ryvarden. But *A. hyalina* was transferred to *Rhizoporia* by Audet (2017h), while *A. juniperina* was transferred to *Subantrodia* by Audet (2017i). Currently, five species are accepted in *Brunneoporus*, including *B. cyclopis* (Miettinen & Spirin) Audet, *B. kuzyanus* (Pilát) Audet, *B. minutus* (Spirin) Audet, *B. malicola* and *B. tuvensis* (Spirin, Vlasák & Kotir.) Audet.

Specimens examined: ***Brunneoporus malicola***. **CHINA**. Sichuan Province, Muli County, Liziping, on fallen angiosperm trunk, 18 September 2019, *Cui 17879* (BJFC). Yunnan Province, Baoshan, Gaoligongshan Nature Reserve, on fallen angiosperm trunk, 7 November 2019, *Cui 18109* (BJFC); Binchuan County, Jizu Mountain, on fallen angiosperm branch, 28 October 2017, *Dai 18451* (BJFC); Gongshan County, on angiosperm stump, 12 September 2020, *Cui 18475* (BJFC); Lushui County, on fallen angiosperm branch, 13 September 2020, *Cui 18487* (BJFC); on living angiosperm tree,13 September 2020, *Cui 18488* (BJFC).

Buglossoporus Kotl. & Pouzar, Česká Mykol. 20: 82, 1966.
MycoBank: MB 17200
Type species: *Buglossoporus quercinus* (Schrad.) Kotl. & Pouzar.

Diagnosis: Basidiocarps annual, pileate, sessile to substipitate or stipitate, corky to fragile when dry. Pileal surface pink, cinnamon brown, orange to brown. Pore surface white, cream, buff to brown; pores round to angular. Context white, cream, orange to brown, corky. Tubes concolourous with pore surface, fragile. Hyphal system dimitic in context, monomitic in trama; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles usually present. Basidiospores ellipsoid, cylindrical to fusiform, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Buglossoporus*, see Han et al. (2016).

Notes. *Buglossoporus* was proposed by Kotlába and Pouzar (1966) and later treated as a synonym of *Piptoporus* (Ryvarden 1991; Hattori 2000). Recently, *Piptoporus* was treated as a synonym of *Fomitopsis*, and *Buglossoporus* was confirmed as an independent genus (Han et al. 2016). Phylogenetically, *B. americanus* D.A. Reid, *B. eucalypticola* M.L. Han, B.K. Cui & Y.C. Dai, *B. pulvinus* (Pers.) Donk and *B. quercinus* formed a well-supported lineage (100% MP, 100% ML, 1.00 BPP; Fig. 3), and closely related to *Neolentiporus* (Fig. 3). However, *Neolentiporus* has a dimitic hyphal system in the trama with irregularly thick-walled generative hyphae and metachromatic skeletal hyphae (Rajchenberg 1995a). Currently, eleven species are accepted in *Buglossoporus*, including *B. americanus*, *B. brunneiflavus* Corner, *B. eucalypticola*, *B. flavus* Corner, *B. heritierae* Corner, *B. magnus* Corner, *B. malesianus* Corner, *B. marmoratus* Corner, *B. persicinus* (Berk. & M.A. Curtis) Corner, *B. pulvinus* and *B. quercinus*.

Specimens examined: ***Buglossoporus eucalypticola***. **CHINA**. Hainan Province, Danzhou, Danzhou Tropical Botanical Garden, on dead tree of *Eucalyptus* sp., 15 June 2014, *Dai 13660* (holotype, BJFC), *Dai 13660A* (paratype, BJFC). ***Buglossoporus quercinus***. **CZECH REPUBLIC**. Hluboka, Bezdrev pond dam, on *Quercus* sp., 16 June 2014, *J. Vlasák 1406/1* (JV). **USA**. Cayo District, Pennsylvania, Norristown, Valley Forge, on *Quercus* sp., 28 June 2009, *J. Vlasák 0906/15-J* (JV).

Cartilosoma Kotlába & Pouzar, Ceská Mykologie 12 (2): 101, 1958.
MycoBank: MB 17241
Type species: *Cartilosoma ramentacea* (Berk. & Broome) Teixeira.

Diagnosis: Basidiocarps annual, resupinate, soft and fleshy when fresh, corky when dry. Pore surface white, buff to straw-colored or brown; pores angular. Subiculum white, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia and cystidioles absent. Basidiospores allantoid, cylindrical to narrowly ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Kotlaba and Pouzar (1958) established the genus *Cartilosoma* for *Trametes subsinuosa* Bres. Donk (1966a) indicated that the name *T. subsinuosa* is synonymous with *Polyporus ramentaceus* Berk. & Broome, which was included in *Antrodia*. However, some characters of *P. ramentaceus* do not fit well the genus *Antrodia*, viz., its soft basidiocarps when fresh, and gelatinous hymenophore (Spirin 2007). Spirin (2007) regarded *Cartilosoma* as a separate genus.

Phylogenetically, specimens of *C. ramentacea* formed a highly supported monophyletic lineage (Fig. 3), which is distant from *Antrodia* s.s. and other genera in Fomitopsidaceae. Currently, two species are accepted in *Cartilosoma*, including *C. ramentaceum* and *C. rene-hentic* B. Rivoire, Trichies & Vlasák.

Specimens examined: ***Cartilosoma ramentacea***. **CHINA**. Gansu Province, Zhangye, Qilianshan Nature Reserve, Sidalong Forest Farm, on fallen trunk of *Picea* sp., 4 September 2018, *Dai 19005* (BJFC). Jilin Province, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Picea* sp., 9 August 2011, *Cui 10024* (BJFC). Yunnan Province, Lanping County, Tongdian, Luoguqing, on fallen angiosperm trunk, 18 September 2017, *Cui 16258* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on fallen trunk of *Pinus* sp., 16 October 2017, *Dai 18404* (BJFC).

Daedalea Pers., Synopsis methodica fungorum (Göttingen) 2: 500, 1801.
MycoBank: MB 17465

Synonym: *Ranadivia* Zmitr., Folia Cryptogamica Petropolitana (Sankt-Peterburg) 6: 87, 2018.
Type species: *Daedalea quercina* (L.) Pers.

Diagnosis: Basidiocarps annual to perennial, pileate or effused-reflexed, coriaceous to corky or hard corky when dry. Pileal surface cream, curry yellow to fawn. Hymenophore surface ochraceous to dark brown or grey; hymenophores irregular, labyrinthine or daedaleoid to lamellate, hydnoid or poroid. Context more or less brownish, corky or hard corky. Tubes concolorous with hymenophore surface, coriaceous to corky or hard corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia occasionally present, cystidioles usually present. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Daedalea*, see Han et al. (2016).

Notes. *Daedalea* was established by Persoon (1801) and typified by *D. quercina*, then it was treated as a collective genus for all species with a daedaleoid to labyrinthine hymenophore (Fries 1821). With more microscopic and chemical characters applied in the taxonomy of this genus, many *Daedalea* spp. have been transferred to other genera (Singer 1944; Donk 1966a; Ryvarden 1984). Recently, a few species were described in this genus based on morphological characters and molecular data (Lindner et al. 2011; Li and Cui 2013; Han et al. 2015, 2016). Currently, sixteen species are accepted in *Daedalea*, including *D. africana* I. Johans. & Ryvarden, *D. allantoidea* M.L. Han, B.K. Cui & Y.C. Dai, *D. americana* M.L. Han, Vlasák & B.K. Cui, *D. circularis* B.K. Cui & Hai J. Li, *D. dickinsii* Yasuda, *D. dochmia* (Berk. & Broome) T. Hatt., *D. fulvirubida* (Corner) T. Hatt., *D. hydnoides* I. Lindblad & Ryvarden, *D. modesta* (Kunze ex

Fr.) Aoshima, *D. neotropica* D.L. Lindner, Ryvarden & T.J. Baroni, *D. pseudodochmia* (Corner) T. Hatt., *D. quercina*, *D. radiata* B.K. Cui & Hai J. Li, *D. sprucei* Berk., *D. stereoides* Fr., *D. stevensonii* Petr.

In our six-gene phylogenetic study (Fig. 3), *Daedalea circularis*, *D. dickinsii*, *D. dochmia*, *D. hydnoides*, *D. neotropica*, *D. pseudodochmia*, *D. quercina*, *D. sprucei* and *D. stevensonii*, grouped together with moderate support (91% MP, 87% ML, 1.00 BPP; Fig. 3); *D. africana*, *D. allantoidea*, *D. americana*, *D. modesta* and *D. stereoides*, grouped with high support (85% MP, 94% ML, 1.00 BPP; Fig. 3); two samples of *D. radiata* formed a separate lineage (100% MP, 100% ML, 1.00 BPP; Fig. 3). These species grouped together and formed the core group of *Daedalea* s.s. (94% MP, 92% ML, 1.00 BPP; Fig. 3).

Zmitrovich (2018) separated *Ranadivia* from *Daedalea*, and transferred *D. africana*, *D. allantoidea*, *D. modesta*, and *D. stereoides* to *Ranadivia*. However, there are no significant differences could be found between *Ranadivia* and *Daedalea* in morphology, and they grouped together in phylogeny (Fig. 3). Thus, *Ranadivia* is not supported as an independent genus, and is considered as a synonym of *Daedalea*.

Specimens examined: ***Daedalea americana***. **COSTA RICA**. Rincon de la Vieja, Las Pilas Ranger Station, on angiosperm trunk, 1 August 2014, *J. Vlasák 1408/3* (paratype, BJFC; JV). **USA**. Florida, Miami, Matheson Hammock, on angiosperm trunk, 19 April 2009, *J. Vlasák 0904/20* (holotype, BJFC), *J. Vlasák 0904/19* (paratype, BJFC). ***Daedalea circularis***. **CHINA**. Guangdong Province, Heyuan, Daguishan Forest Park, on angiosperm stump, 18 August 2011, *Cui 10125*, *10134* (BJFC). Yunnan Province, Baoshan, Gaoligongshan Nature Reserve, on angiosperm stump, 7 November 2019, *Cui 18093* (BJFC); Mengla County, Wangtianshu Park, on fallen angiosperm trunk, 2 November 2009, *Cui 8488* (holotype, BJFC). ***Daedalea dickinsii***. **CHINA**. Shanxi Province, Zhouzhi County, Taibaishan Nature Reserve, on fallen angiosperm trunk, 24 October 2006, *Yuan 2685*, *2707* (BJFC). Sichuan Province, Jiuzhaigou County, Jiuzhaigou Nature Reserve, on fallen trunk of *Quercus* sp., 20 September 2020, *Cui 18560* (BJFC). ***Daedalea hydnoides***. **CHINA**. Yunnan Province, Baoshan, Gaoligongshan Nature Reserve, on fallen angiosperm trunk, 7 November 2019, *Cui 18101* (BJFC). ***Daedalea modesta***. **CHINA**. Guangdong Province, Heyuan, Daguishan Forest Park, on fallen angiosperm trunk, 18 August 2011, *Cui 10124* (BJFC); Guangzhou, Tianluhu Forest Park, on fallen angiosperm trunk, 19 August 2011, *Cui 10151* (BJFC). Hainan Province, Ledong County, Jianfengling Nature Reserve, on fallen trunk of *Cyclobalanopsis* sp., 11 May 2009, *Dai 10844* (BJFC). ***Daedalea quercina***. **CZECH REPUBLIC**. Lednice Vallage Castce Park, on fallen trunk of *Quercus* sp., 6 May 2011, *Dai 12152* (BJFC). **FINLAND**. Helsinki, Vantaa, Tamisto Nature Reserve, on fallen trunk of *Quercus* sp., 5 November 2011, *Dai 12659* (BJFC). ***Daedalea radiata***. **CHINA**. Yunnan Province, Mengla County, Wangtianshu Park, on fallen angiosperm trunk, 16 September 2007, *Yuan 3629* (holotype, IFP; BJFC); 2 November 2009, *Cui 8575* (paratype, BJFC); 3 November 2009, *Cui 8624* (paratype, BJFC).

Daedalella B.K. Cui & Shun Liu, **gen. nov.**

MycoBank: MB 840326

Etymology. *Daedalella* (Lat.): refers to the genus resembling *Daedalea* in morphology.

Type species: *Daedalella micropora* B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate, corky when fresh, hard corky when dry. Pileal surface cream, buff to pinkish buff, glabrous. Pore surface white, cream to buff; pores round to angular. Context cream to buff, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. In this study, *Daedalella* formed a monophyletic lineage and was closely related to *Daedalea* (Fig. 3). They share corky or hard corky basidiocarps, usually applanate to semicircular pileus and grow on angiosperm wood, but *Daedalea* is different from *Daedalella* by its usually irregularly poroid, labyrinthine/daedaleoid to lamellate or hydnoid hymenophore and catahymenium formed by skeletal hyphae penetrating into the hymenium (Ryvarden and Johansen 1980; Gilbertson and Ryvarden 1986; Núñez and Ryvarden 2001; Ryvarden and Melo 2014; Han et al. 2016).

The sequence of a polypore sample (E7389, GenBank: ITS = AJ542527) collected from rainforest tree wood in Indonesia are similar to *Daedalella micropora*, and phylogenetically, E7389 grouped with *D. micropora* with high support (100% MP, 100% ML, 1.00 BPP; Fig. 3). Thus, the sample (E7389) is identified as *D. micropora*. Only one species, *Daedalella micropora*, is accepted in this genus.

Daedalella micropora B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5f, 12)

MycoBank: MB 840327

Type. **MALAYSIA**. Selangor, Taman Botani Negara Shah Alam, on angiosperm trunk, 12 April 2018, *Dai 18509* (holotype, BJFC).

Etymology. *Micropora* (Lat.): refers to the small pores.

Fruiting body. Basidiocarps annual, pileate, solitary, corky, without odor or taste when fresh, hard corky when dry. Pileus applanate to semicircular, projecting up to 5 cm long, 9 cm wide, 0.6 cm thick at base. Pileal surface cream to buff when fresh, becoming buff to pinkish buff upon drying, glabrous, concentrically sulcate and zonate. Pileal margin cream, acute to slightly obtuse. Pore surface white to cream when fresh, becoming cream to buff upon drying;

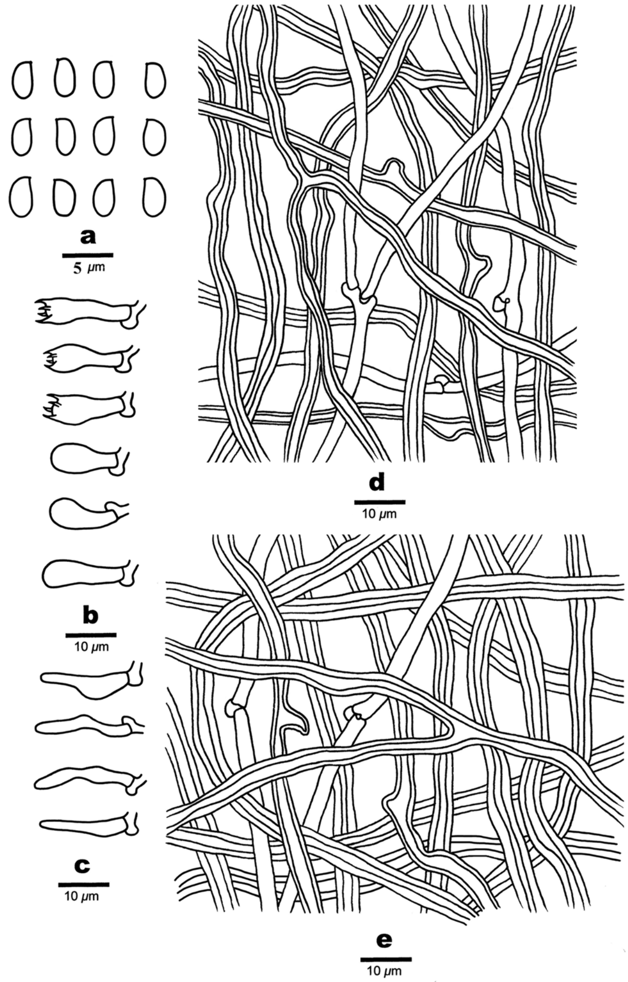

Fig. 12 Microscopic structures of *Daedalella micropora* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 μm; **b**–**e** = 10 μm

pores round or in parts irregular, 8–11 per mm; dissepiments thick, entire. Context buff-yellow to pinkish buff, corky, up to 4 mm thick. Tubes concolorous with pore surface, corky, up to 2 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae infrequent, colorless, thin-walled, unbranched, 2–3.5 μm in diam; skeletal hyphae dominant, colorless to pale yellowish, thick-walled with a wide to narrow lumen, occasionally branched, straight to flexuous, interwoven, 2.2–6.2 μm in diam.

Tubes. Generative hyphae infrequent, colorless, thin-walled, occasionally branched, 1.9–3 μm in diam; skeletal hyphae dominant, colorless to pale yellowish, thick-walled with a wide to narrow lumen, occasionally branched, straight to flexuous, interwoven, 2–5.8 μm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 15.5–20.2 × 2.3–3.2 μm. Basidia clavate, 4-sterigmate, clamped at base, 12.7–18.5 × 4.5–6.2 μm.

Spores. Basidiospores oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, (2.6−)2.9–3.2(−3.4) × (1.9−)2–2.2(−2.4) μm, L = 3.08 μm, W = 2.04 μm, Q = 1.51 (n = 30/1) (*Dai 18509*).

Dentiporus Audet, Mushrooms nomenclatural novelties 3: 1, 2017.

MycoBank: MB 552848

Type species: *Dentiporus albidoides* (A. David & Dequatre) Audet.

Diagnosis: Basidiocarps annual, often resupinate, very rarely effused-reflexed, soft corky to corky. Pore surface cream to brownish, usually with rose pink tint; pores angular, elongated to daedaleoid or irpicoid. Subiculum white to pale cream, soft corky. Tubes pale ochraceous to pale brownish, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores cylindrical, colorless, thin-walled, smooth, CB−, IKI−. Causing a brown rot.

Notes. *Dentiporus* was separated from *Antrodia* s.s. by Audet (2017c) with *D. albidoides* as the type species. It differs from *Antrodia* s.s. by its often resupinate basidiocarps usually with rose pink tinted pore surface and round to irpicoid pores. Only one species, *Dentiporus albidoides*, is accepted in this genus.

Antrodia albidoides A. David & Dequatre was described from the Mediterranean based on cultural and morphological characters that distinguished it from *A. albida* (Fr.) Donk; *A. subalbidoides* A. David & Dequatre was described on the basis of it being heterothallic (David and Dequatre 1985). Bernicchia and De Dominicis described *A. macrospora* Bernicchia & De Domincis from Italy (Bernicchia 1990). Pieri and Rivoire (2005) proposed that *A. macrospora* is a synonym of *A. albidoides*. Spirin et al. (2013a) concluded that *A. macrospora* and *A. subalbidoides* are synonyms of *A. albidoides.*

In this study, specimens of *Dentiporus albidoides* formed a highly supported monophyletic lineage (Fig. 3), which was distant from *Antrodia* s.s. and other genera in Fomitopsidaceae.

Specimens examined: ***Dentiporus albidoides*****.** **FRENCE**. On wood of *Populus* sp., 26 October 2002, *2228* (BJFC); on dead tree of *Corylus* sp., 11 November 2004, *2596* (BJFC).

Flavidoporia Audet, Mushrooms nomenclatural novelties 4: 1, 2017.

MycoBank: MB 552850

Type species: *Flavidoporia pulvinascens* (Pilát) Audet.

Diagnosis: Basidiocarps annual to perennial, resupinate to pseudopileate, soft corky to fragile. Pore surface pale cream to straw yellow; pores circular to angular. Subiculum cream, soft corky to corky. Tubes concolorous with pore surface, corky to fragile. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae slightly IKI+, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Flavidoporia* was separated from *Antrodia* s.l. by Audet (2017d) with *F. pulvinascens* as the generic type. In this study, *Flavidoporia* spp. formed a highly supported monophyletic lineage (Fig. 3), which was distant from *Antrodia* s.s. Morphologically, *Flavidoporia* differs from *Antrodia* s.s. by its resupinate to pseudopileate basidiocarps, ellipsoidal and small basidiospores and presence of chlamydospores (Audet 2017d). Currently, three species are accepted in *Flavidoporia*, including *F. mellita* (Niemelä & Penttilä) Audet, *F. pulverulenta* (B. Rivoire) Audet and *F. pulvinascens*.

Specimens examined: ***Flavidoporia pulverulenta***. **CHINA**. Xinjiang Autonomous Region, Buerjin County, Kanasi Nature Reserve, on fallen trunk of *Picea* sp., 11 September 2015, *Dai 15877* (BJFC). Xizang Autonomous Region (Tibet), Bomi County, on fallen branch of *Pinus* sp., 20 September 2010, *Cui 9542* (BJFC). Yunnan Province, Weixi County, Laojun Mountain, on fallen angiosperm trunk, 21 September 2011, *Cui 10441* (BJFC).

Fomitopsis P. Karst., Meddelanden af Societas pro Fauna et Flora Fennica 6: 9, 1881.
MycoBank: MB 17612
Type species: *Fomitopsis pinicola* (Sw.) P. Karst.

Diagnosis: Basidiocarps annual to perennial, mostly pileate, occasionally effused-reflexed or substipitate, soft, corky, tough to woody hard. Pileal surface white to greyish, yellowish or brown. Pore surface white, cream to greyish or tan; pores round to angular. Context white to greyish or straw yellow, fibrous to corky. Tubes concolorous with pore surface, corky to woody hard. Hyphal system mostly dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia occasionally present, cystidioles usually present. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Fomitopsis*, see Han et al. (2016).

Notes. *Fomitopsis* was typified by *F. pinicola* (Karsten 1881). Recently, the taxonomy and phylogeny of *Fomitopsis* have been carried out and several new species have been described (Li et al. 2013; Han et al. 2014, 2016; Han and Cui 2015; Soares et al. 2017; Haight et al. 2019; Liu et al. 2019, 2021a, 2022a; Zhou et al. 2021). Han et al. (2016) indicated that species previously placed in *Fomitopsis* were embedded in seven lineages, viz., *Fomitopsis* s.s., *Fragifomes*, *Niveoporofomes*, *Rhodofomes*, *Rhodofomitopsis*, *Rubellofomes*, and *Ungulidaedalea*. Phylogenetically, species of *Fomitopsis* grouped together and formed a well-supported lineage (98% MP, 96% ML, 1.00 BPP; Fig. 3). Currently, 30 species are accepted in *Fomitopsis*, including *F. abieticola* B.K. Cui, M.L. Han & Shun Liu, *F. bambusae* Y.C. Dai, Meng Zhou & Yuan Yuan, *F. betulina*, *F. bondartsevae* (Spirin) A.M.S. Soares & Gibertoni, *F. cana* B.K. Cui, Hai J. Li & M.L. Han, *F. caribensis* B.K. Cui & Shun Liu, *F. durescens* (Overh. Ex J. Lowe) Gilb. & Ryvarden, *F. eucalypticola* B.K. Cui & Shun Liu, *F. ginkgonis* B.K. Cui & Shun Liu, *F. hemitephra* (Berk.) G. Cunn., *F. hengduanensis* B.K. Cui & Shun Liu, *F. iberica* Melo & Ryvarden, *F. kesiyae* B.K. Cui & Shun Liu, *F. massoniana* B.K. Cui, M.L. Han & Shun Liu, *F. meliae* (Underw.) Gilb., *F. mounceae* Haight & Nakasone, *F. nivosa* (Berk.) Gilb. & Ryvarden, *F. ochracea* Ryvarden & Stokland, *F. ostreiformis* (Berk.) T. Hatt., *F. palustris* (Berk. & M.A. Curtis) Gilb. & Ryvarden, *F. pinicola*, *F. resupinata* B.K. Cui & Shun Liu, *F. roseoalba* A.M.S. Soares, Ryvarden & Gibertoni, *F. schrenkii* Haight & Nakasone, *F. srilankensis* B.K. Cui & Shun Liu, *F. submeliae* B.K. Cui & Shun Liu, *F. subpinicola* B.K. Cui, M.L. Han & Shun Liu, *F. subtropica* B.K. Cui & Hai J. Li and *F. tianshanensis* Shun Liu & B.K. Cui, *F. yimengensis* B.K. Cui & Shun Liu.

Specimens examined: ***Fomitopsis betulina***. **CHINA**. Sichuan Province, Jiulong County, on fallen trunk of *Betula* sp., 12 September 2019, *Cui 17688*, *17693* (BJFC). Yunnan Province, Shangri-La, Pudacuo National Park, on living tree of *Betula* sp., 17 September 2018, *Cui 17121* (BJFC); 13 August 2019, *Cui 17470* (BJFC). ***Fomitopsis cana***. **CHINA**. Hainan Province, Qiongzhong County, Limushan Forest Park, on fallen angiosperm trunk, 24 May 2008, *Dai 9611* (holotype, BJFC); Chengmai County, on dead part of living *Delonix* sp., 6 May 2009, *Cui 6239* (paratype, BJFC). ***Fomitopsis meliae***. **CHINA**. Hainan Province, Ledong County, Jianfengling Nature Reserve, on angiosperm trunk, 3 June 2008, *Dai 10035* (IFP). **VIETNAM**. Hochiminh, Botanical Garden, on angiosperm stump, 13 October 2017, *Dai 18319* (BJFC). ***Fomitopsis palustris***. **CHINA**. Guangdong Province, Ruyang County, Nanling Nature Reserve, on living angiosperm tree, 16 September 2009, *Cui 7597*, *7615* (BJFC). Sichuan Province, Xichang, Wild Mushroom Manor, on living tree of *Amygdalus* sp., 16 September 2019, *Cui 17830* (BJFC). ***Fomitopsis pinicola***. **FINLAND**. Helsinki, Vantaa, Tamisto Nature Reserve, on fallen trunk of *Picea* sp., 16 August 2012, *Dai 12870* (BJFC). **ITALY**. Roma, Trentino Altoadie, Trento, Molveno, on stump of *Picea* sp., 28 April 2005, *Dai 6553* (IFP). ***Fomitopsis subtropica***. **CHINA**. Guangdong Province, Guangzhou, Tianluhu Forest Park, on fallen trunk of *Castanopsis* sp., 19 August 2011, *Cui 10154* (holotype, BJFC); Maofengshan Forest Park, on fallen angiosperm trunk, 19 August 2011, *Cui 10140* (paratype, BJFC). **MALAYSIA**. Selangor, Taman Botani Negara Shah Alam, on fallen angiosperm trunk, 12 April 2018, *Dai 18541* (BJFC); Forest Research Institute of

Malaysia, on fallen angiosperm trunk, 15 April 2018, *Dai 18566* (BJFC).

Fragifomes B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 360, 2016.
MycoBank: MB 812649
Type species: *Fragifomes niveomarginatus* (L.W. Zhou & Y.L. Wei) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps perennial, pileate, soft corky to fragile. Pileal surface white, greyish white or greyish brown. Pore surface white to yellowish brown; pores round. Context cream, fragile. Tubes fragile, distinctly stratified. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Fragifomes*, see Han et al. (2016).

Notes. *Fragifomes* was established by Han et al. (2016) and typified by *F. niveomarginatus*. In this study, samples of *F. niveomarginata* formed a single lineage (Fig. 3), which was distant from *Fomitopsis* s.s. Morphologically, *Fragifomes* differs from *Fomitopsis* s.s. by its soft corky to fragile basidiocarps. Currently, only one species, *Fragifomes niveomarginatus*, is accepted in this genus now.

Specimens examined: ***Fragifomes niveomarginatus.*** **CHINA**. Jinlin Province, Antu County, Changbaishan Nature Reserve, Huangsongpu, on rotten wood of *Tilia* sp., 14 September 2007, *Dai 9175* (holotype, IFP); on fallen angiosperm branch, 24 August 2007, *Wei 3072* (paratype, IFP); on fallen branch of *Acer* sp., 14 July 2010, *Wei 5583* (paratype, IFP); Fusong County, Lushuihe Forest Farm, on fallen angiosperm trunk, 11 August 2011, *Cui 10108* (BJFC).

Melanoporia Murrill, North American Flora 9 (1): 14, 1907.
MycoBank: MB 18035
Type species: *Melanoporia nigra* (Berk.) Murrill.

Diagnosis: Basidiocarps annual to perennial, pileate or effused-reflexed to resupinate, corky to hard corky. Pileal surface salmon pink, brownish vinaceous to fuscous. Pore surface dark chocolate brown to dark purplish brown; pores round to angular. Context dark purplish brown, corky. Tubes concolorous with pore surface, corky to hard corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Melanoporia* was established by Murrill and typified by *M. nigra* (Murrill 1907). *Melanoporia* was treated as a synonym of *Nigrofomes* Murrill in He et al. (2019), but *Nigrofomes* as a monotypic genus was accommodated in Nigrofomitaceae (Jülich 1981). Therefore, in this study, *Melanoporia* is recognized as an independent genus. Currently, four species are accepted in *Melanoporia*, including *M. castanea* (Imazeki) T. Hatt. & Ryvarden, *M. condensa* Ryvarden & Vlasák, *M. nigra* and the new species *M. tropica*.

Specimens examined: ***Melanoporia castanea*. CHINA**. Jilin Province, Antu County, Changbaishan Nature Reserve, on rotten wood of *Quercus* sp., 11 September 2014, *Dai 14785* (BJFC); 14 September 2014, *Dai 14808* (BJFC); 19 September 2019, *Dai 20837* (BJFC); on fallen trunk of *Quercus* sp., 7 August 2011, *Cui 9952* (BJFC); Fusong County, Lushuihe Forest Farm, on fallen angiosperm trunk, 11 August 2011, *Cui 10115* (BJFC). ***Melanoporia nigra*. USA**. On fallen trunk of *Quercus* sp., 15 July 2012, *Dai 12729*, *12732*, *12733* (BJFC).

Melanoporia tropica B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5g, 13)
MycoBank: MB 840328

Differs from other *Melanoporia* spp. by its salmon pink to brownish vinaceous pileal surface when fresh, honey yellow

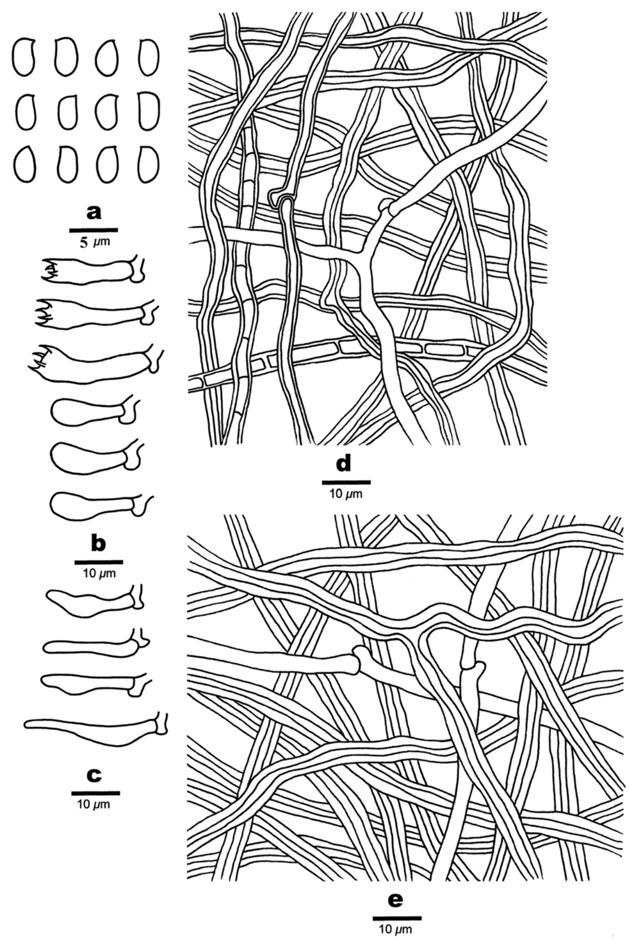

Fig. 13 Microscopic structures of *Melanoporia tropica* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

to fuscous upon drying, small and round to angular pores (7–10 per mm), yellowish brown to cinnamon brown skeletal hyphae becoming dark brown at first, then fading into grayish brown in KOH, and distribution in tropical areas.

Type. **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on living angiosperm tree, 15 October 2017, *Cui 16444* (holotype, BJFC).

Etymology. Tropica (Lat.): refers to the distribution of the new species in tropical areas.

Fruiting body. Basidiocarps annual to perennial, pileate to effused-reflexed, easily separable from the substrate, corky, without odor or taste when fresh, hard corky and light in weight upon drying. Pileus applanate to semicircular, projecting up to 6.2 cm long, 7.3 cm wide, 1.8 cm thick at base. Pileal surface salmon pink to brownish vinaceous when fresh, becoming honey yellow to fuscous upon drying, glabrous, sulcate, azonate; margin cream, obtuse to acute. Pore surface cream to pale mouse grey when fresh, becoming honey yellow to greyish brown upon drying; sterile margin indistinct; pores round to angular, 7–10 per mm; dissepiments thick, entire. Context cream to pinkish buff, corky, up to 2 cm thick. Tubes concolorous with pore surface, corky, up to 2.5 cm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues becoming dark brown firstly, then fading into grayish brown in KOH.

Context. Generative hyphae infrequent, colorless, thin-walled, rarely branched, 2–3.5 µm in diam; skeletal hyphae dominant, yellowish brown to cinnamon brown, thick-walled with a narrow lumen, occasionally branched, straight to flexuous, interwoven, 2.2–6.2 µm in diam.

Tubes. Generative hyphae infrequent, colorless, thin- to slightly thick-walled, occasionally branched, 1.8–3.2 µm in diam; skeletal hyphae dominant, occasionally simple-septate, yellowish brown to cinnamon brown, thick-walled with a wide to narrow lumen, occasionally branched, straight to flexuous, interwoven, 2–5.2 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 19–25.5 × 2.7–5.5 µm. Basidia clavate, 4-sterigmate, clamped at base, 17–22.4 × 4.2–6 µm.

Spores. Basidiospores oblong to oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, (3.4−)3.5–4(−4.2) × (2−)2.3–2.9(−3) µm, L = 3.67 µm, W = 2.63 µm, Q = 1.39–1.43 (n = 60/2) (*Cui 16,444* and *16,455*).

Notes. Phylogenetically, *Melanoporia tropica* is closely related to *M. castanea*, *M. condensa* and *M. nigra* (Fig. 3). Morphologically, *M. castanea* may be confused with *M. tropica* in having brown pileal and pore surfaces when dry; however, *M. castanea* differs by its triquetrous, ungulate or irregular pileus (up to 30 cm long, 15 cm thick), and larger and circular pores (5–6 per mm; Hattori and Ryvarden 1994). *Melanoporia tropica* is similar to *M. condensa* and *M. nigra* as they share ellipsoid basidiospores, but *M. condensa* differs by having effused-reflexed and large basidiocarps (up to 30 × 20 cm and 11 cm thick), larger and round pores (6–7 per mm; Vlasák et al. 2016); *M. nigra* differs by its resupinate basidiocarps, and thin and lacerate dissepiments (Lowe 1966).

Additional specimen (paratype) examined: **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on living angiosperm tree, 15 October 2017, *Cui 16455* (BJFC).

Neoantrodia Audet, Mushrooms nomenclatural novelties 6: 1, 2017.

MycoBank: MB 552856

Type species: *Neoantrodia serialis* (Fr.) Audet.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused-reflexed, corky to hard corky. Pore surface white to cream or ochre brown; pores round to angular. Context white to cream, corky. Tubes concolorous with pore surface, corky to hard corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores subfusiform to cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Neoantrodia* was segregated from *Antrodia* s.l. by Audet (2017f). Morphologically, *Neoantrodia* differs from *Antrodia* s.l. by its smaller pores and basidia, hyphoid to bullet- or bottle-shaped cystidioles encrusted with a crystal crown (Spirin et al. 2017; Audet 2017f).

Antrodia serialis (Fr.) Donk is one of the most common polypore species in boreal conifer forests of Europe (Spirin et al. 2017). The taxonomy and phylogeny of the *A. serialis* group were revised based on morphological, ecological, and geographic data by Spirin et al. (2017), and the results showed that this group contains 13 species found in boreal and temperate zones of the Northern Hemisphere.

In this study, *Neoantrodia* spp. formed a single lineage and was distant from *Antrodia* s.s. (Fig. 3), so the independence of the *Neoantrodia* was confirmed. Currently, 13 species are accepted in *Neoantrodia*, including *N. alaskana* (D.V. Baxter) Audet, *N. angusta* (Spirin & Vlasák) Audet, *N. calcitrosa* (Spirin & Miettinen) Audet, *N. flavimontis* (Vlasák & Spirin) Audet, *N. infirma* (Renvall & Niemelä) Audet, *N. kmetii* (Vlasák) Audet, *N. leucaena* (Y.C. Dai & Niemelä) Audet, *N. morganii* (Lloyd) Audet, *N. primaeva* (Renvall & Niemelä) Audet, *N. serialiformis* (Kout & Vlasák) Audet, *N. serialis*, *N. serrata* (Vlasák & Spirin) Audet and *N. variiformis* (Peck) Audet.

Specimens examined: ***Neoantrodia leucaena***. **CHINA**. Heilongjiang Province, Anning County, Jingbohu Park, on fallen trunk of *Populus* sp., 10 September 2007, *Dai 8900* (BJFC). Jilin Province, Antu county, Changbaishan Nature Reserve, Huangsongpu, on fallen branch of *Acer* sp., 19

September 2002, *Dai 3832* (BJFC); on stump of *Populus* sp., 9 October 2009, *Dai 11398* (BJFC). ***Neoantrodia primaeva***. **CHINA**. Jilin Province, Antu county, Changbaishan Nature Reserve, Huangsongpu, on fallen trunk of *Abies* sp., 19 September 2002, *Dai 801*, *815* (BJFC). ***Neoantrodia serialis***. **CHINA**. Jilin Province, Antu county, Changbaishan Nature Reserve, on fallen trunk of *Abies* sp., 10 August 2011, *Cui 10064* (BJFC). **FINLAND**. Helsinki, Vantaa, Tamisto Nature Reserve, on fallen trunk of *Picea* sp., 3 November 2011, *Dai 12659* (BJFC).

Neolentiporus Rajchenb., Nordic Journal of Botany 15 (1): 105, 1995.
MycoBank: MB 27722
Type species: *Neolentiporus maculatissimus* (Lloyd) Rajchenb.

Diagnosis: Basidiocarps annual, centrally stipitate or rarely laterally stipitate, corky to fragile. Pileal surface cream to cinnamon brown. Pore surface cream to honey yellow; pores round to angular. Context cream to buff, corky. Tubes concolorous with the pore surface, fragile. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles occasionally present. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Neolentiporus* was established by Rajchenberg (1995a) and typified by *N. maculatissimus*. It was segregated from the white wood-rotting *Lentinus* Fr. based on its association with a brown wood-rot, a dimitic hyphal system, cylindrical basidiospores, bipolarity and astatocoenocytic nuclear behavior which were similar criteria separately the brown rot agaricoid genus *Neolentinus* Redhead & Ginns from *Lentinus* (Kuhner et al. 1962; Redhead and Ginns 1985; Lamoure 1989). Currently, three species are accepted in *Neolentiporus*, including *N. maculatissimus*, *N. squamosellus* (Bernicchia & Ryvarden) Bernicchia & Ryvarden and the new species *N. tropicus*.

Phylogenetically, *N. maculatissimus* and *N. tropicus* formed a well-supported lineage (Fig. 3), which was distant from *Fomitopsis* s.s., and closely related to *Buglossoporus*. However, *Buglossoporus* has a monomitic hyphal system in the trama (Kotlába and Pouzar 1966).

Neolentiporus tropicus B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5h, 14)
MycoBank: MB 840329

Differs from other *Neolentiporus* spp. by its cream to buff-yellow pileal surface when fresh, pinkish buff to cinnamon brown upon drying, cream to buff pore surface when fresh, buff to honey yellow when dry, cylindrical to fusiform basidiospores (8–9.2 × 3–4 µm) and distribution in tropical areas.

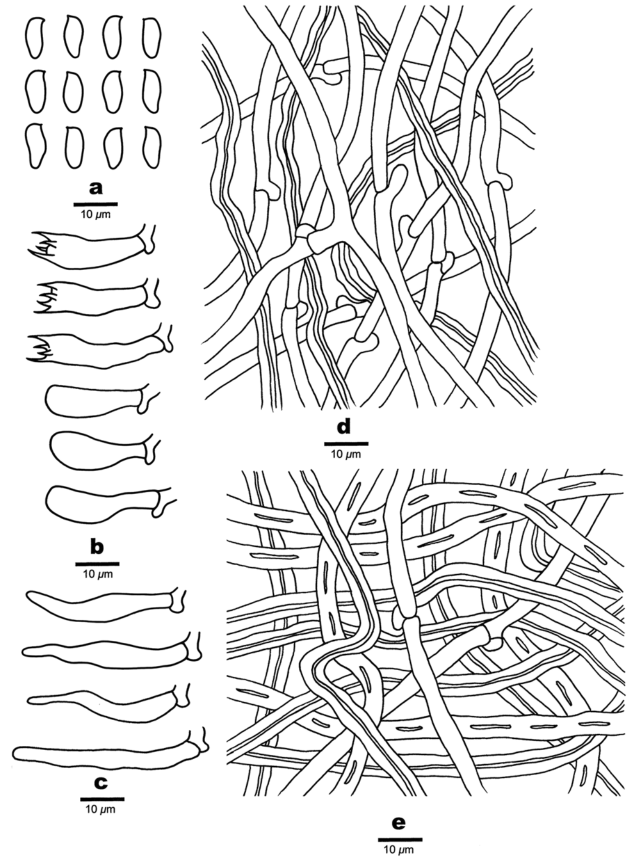

Fig. 14 Microscopic structures of *Neolentiporus tropicus* (drawn from the holotype). **a.** Basidiospores; **b.** Basidia and basidioles; **c.** Cystidioles; **d.** Hyphae from trama; **e.** Hyphae from context. Bars: **a**–**e** = 10 µm

Type. **CHINA**. Hainan Province, Ledong County, Jianfengling Nature Reserve, on fallen angiosperm trunk, 19 June 2016, *Cui 13915* (holotype, BJFC).

Etymology. *Tropicus* (Lat.): refers to the distribution of the new species in tropical China.

Fruiting body. Basidiocarps annual, centrally stipitate, solitary, without odor or taste when fresh, corky and light in weight upon drying. Pileus applanate, flabelliform to circular, convex, projecting up to 8 cm, 9.3 cm wide and 0.8 cm thick at base. Pileal surface cream to buff-yellow when fresh, becoming pinkish buff to cinnamon brown upon drying, glabrous; margin cream, acute. Pore surface cream to buff when fresh, becoming buff to honey yellow when dry; sterile margin buff-yellow to buff, up to 1 mm wide; pores angular, 2–4 per mm; dissepiments thick, entire to lacerate. Context cream to buff, corky, up to 3 mm thick. Tubes concolorous with pore surface, corky, up to 1.5 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae infrequent, colorless, thin- to slightly thick-walled, rarely branched, 2–4.5 µm in diam; skeletal hyphae dominant, colorless, thick-walled with a narrow lumen to subsolid, rarely branched, straight to flexuous, interwoven, 2.2–6.7 µm in diam.

Tubes. Generative hyphae dominant, colorless, thin- to slightly thick-walled, usually branched, 1.9–4.2 µm in diam; skeletal hyphae frequent, colorless, thick-walled with a narrow lumen to subsolid, occasionally branched, straight to flexuous, interwoven, 2–5 µm in diam. Cystidia absent, but fusoid cystidioles occasionally present, colorless, thin-walled, 25.3–42.2 × 3.5–6 µm. Basidia clavate, 4-sterigmate, clamped at base, 20–32.5 × 4.5–9 µm.

Spores. Basidiospores cylindrical to fusiform, colorless, thin-walled, smooth, IKI−, CB−, (7.6−)8–9.2(−10) × (2.8−)3–4 µm, L = 8.68 µm, W = 3.59 µm, Q = 2.25–2.64 (n = 60/2) (*Cui 13915* and *13923*).

Notes. Phylogenetically, *Neolentiporus tropicus* is closely related to *N. maculatissimus* (Fig. 3). Morphologically, both *N. tropicus* and *N. maculatissimus* have stipitate basidiocarps with applanate, flabelliform to circular pileus, angular pores and cylindrical basidiospores, but *N. maculatissimus* differs in having larger basidia (32–65 × 5.5–8.5 µm) and basidiospores (12–14 × 4–5 µm; Rajchenberg 1995a). *Neolentiporus tropicus* and *N. squamosellus* (Bernicchia & Ryvarden) Bernicchia & Ryvarden share similar-sized pores; however, *N. squamosellus* differs by having dimidiate to laterally semistipitate basidiocarps, larger basidia (25–40 × 6–9 µm) and basidiospores (10–12 × 4.5–5.5 µm; Bernicchia and Ryvarden 1998).

Additional specimen (paratype) examined: **CHINA**. Hainan Province, Ledong County, Jianfengling Nature Reserve, on fallen angiosperm trunk, 19 June 2016, *Cui 13,923* (BJFC).

Niveoporofomes B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 360, 2016.
MycoBank: MB 812651
Type species: *Niveoporofomes spraguei* (Berk. & M.A. Curtis) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual, pileate, tough to hard corky. Pileal surface ivory white to ochraceous or black-brown. Pore surface white, cream to pale buff brown; pores round to angular. Context white to ochraceous, tough corky. Tubes concolorous with pore surface, hard corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ovoid to broadly ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Niveoporofomes*, see Han et al. (2016).

Notes. *Niveoporofomes* was established by Han et al. (2016) and typified by *N. spraguei*. This genus differs from *Fomitopsis* s.s. in having annual growth habit and ovoid to broadly ellipsoid basidiospores (Han et al. 2016). Decock et al. (2022) confirmed that *Niveoporofomes* is an independent genus based on multiple loci dataset (ITS, nLSU, nSSU, TEF1, RPB2). They described one new species, *N. oboensis* Decock, Amalfi & Ryvarden and proposed two new combinations, *N. globosporus* (Ryvarden & Aime) Decock, Amalfi & Ryvarden and *N. widdringtoniae* (Masuka & Ryvarden) Decock & Ryvarden. Currently, four species are accepted in *Niveoporofomes*, including *N. globosporus*, *N. oboensis*, *N. spraguei* and *N. widdringtoniae*.

Specimens examined: ***Niveoporofomes spraguei***. **CANADA**. Ontario, Hamilton, McMaster University, Botanical Garden, on angiosperm wood, 18–20 July 2017, *Dai 19169* (BJFC); on living angiosperm tree, 18–20 July 2017, *Dai 19177* (BJFC). **CHINA**. Guangdong Province, Zhaoqing, Dinghushan Nature Reserve, on fallen angiosperm trunk, 30 June 2010, *Cui 8969* (BJFC). Hunan Province, Zhangjiajie Forest Park, on dead tree of *Castanea* sp., 17 August 2010, *Dai 11676* (BJFC).

Pseudoantrodia B.K. Cui, Y.Y. Chen & Shun Liu, **gen. nov.**
MycoBank: MB 840330

Etymology. *Pseudoantrodia* (Lat.): refers to its close phylogenetic relationship and similar resupinate basidiocarps with *Antrodia*.
Type species: *Pseudoantrodia monomitica* B.K. Cui, Yuan Y. Chen & Shun Liu.

Diagnosis: Basidiocarps annual, resupinate, corky to chalky. Pore surface white, olivaceous buff to greyish brown. Subiculum white to cream, chalky. Tubes concolorous with pore surface, corky to chalky. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores cylindrical to ellipsoidal, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. In the current phylogenetic analyses, samples of *Pseudoantrodia monomitica* formed a separate lineage (Fig. 3), which was distant from *Antrodia* s.s. Morphologically, *Pseudoantrodia* differs from *Antrodia* s.s. by a monomitic hyphal system and smaller basidiospores. *Buglossoporus* and *Pseudoantrodia* share a monomitic hyphal system in trama, but *Buglossoporus* differs by having pileate, sessile to substipitate or stipitate basidiocarps, a dimitic hyphal system in context (Han et al. 2016); *Cartilosoma*, *Rhodoantrodia* and *Pseudoantrodia* share similar character by having resupinate basidiocarps, but *Cartilosoma* and *Rhodoantrodia* have a dimitic hyphal system (Spirin 2007). Therefore, *Pseudoantrodia* is proposed as a new genus based on phylogenetic analyses and morphological characters. Only one species, *Pseudoantrodia monomitica*, is accepted in this genus.

Pseudoantrodia monomitica B.K. Cui, Y.Y. Chen & Shun Liu, **sp. nov.** (Figs. 5i, 15)

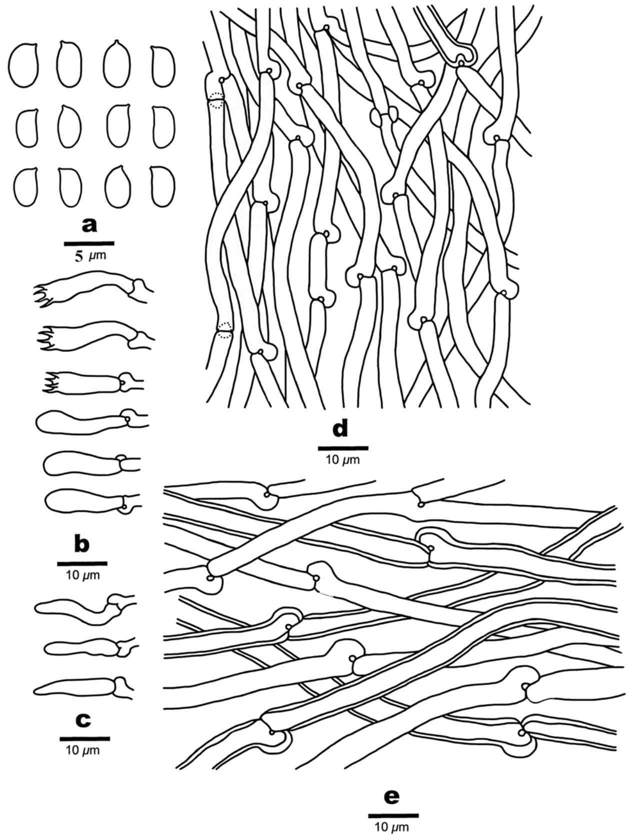

Fig. 15 Microscopic structures of *Pseudoantrodia monomitica* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

MycoBank: MB 840332

Type. **CHINA**. Fujian Province, Fuzhou, Gushan Forest Park, on stump of *Pinus* sp., 29 November 2019, *Dai 21129* (holotype, BJFC).

Etymology. *Monomitica* (Lat.): refers to the monomitic hyphal system of the species.

Fruiting body. Basidiocarps annual, resupinate, up to 10 cm long, 5 cm wide and 2 cm thick at center; corky when fresh, chalky upon drying. Pore surface buff to pinkish buff when fresh, light yellow to grey-brown upon drying; sterile margin buff, very narrow to almost lacking; pores round to angular, 3–5 per mm; dissepiments thin, entire to slightly lacerate. Subiculum white to cream, chalky, less than 1 mm thick. Tubes concolorous with the pore surface, corky when fresh, turning to chalky upon drying, up to 4 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Subiculum. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, straight to flexuous, interwoven, 3–5 µm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, straight to flexuous, interwoven, 2–3.6 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 14–18 × 3–4 µm. Basidia clavate, 4-sterigmate, clamped at base, 12–17 × 4.4–5.6 µm.

Spores. Basidiospores cylindrical to oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, (3.7−)4–5(−5.3) × 2–2.4 µm, L = 4.33 µm, W = 2.10 µm, Q = 2.01–2.17 (n = 60/2) (*Dai 18136* and *21129*).

Additional specimens (paratypes) examined: **CHINA**. Anhui Province, Qimen county, Guniujiang Nature Reserve, on rotten angiosperm wood, 9 August 2013, *Dai 13381* (BJFC). Hainan Province, Changjiang County, Bawangling Nature Reserve, on rotten trunk of *Pinus* sp., 10 May 2009 *Dai 10828* (BJFC). Guangdong Province, Renghua County, Danxiashan Nature Reserve, on rotten wood of *Pinus* sp., 17 September 2017, *Dai 18136* (BJFC); Zhaoqing, Dinghushan Nature Reserve, on fallen angiosperm trunk, 10 July 2019, *Dai 19715* (BJFC).

Pseudofomitopsis B.K. Cui & Shun Liu, **gen. nov.**

MycoBank: MB 840333

Etymology. *Pseudofomitopsis* (Lat.): refers to its close phylogenetic relationship and similar basidiocarps with *Fomitopsis*.

Type species: *Pseudofomitopsis microcarpa* B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate, sessile to substipitate, solitary, corky to hard corky. Pileal surface straw yellow to honey yellow, sometimes turning to reddish brown to black near the base. Pore surface cream to olivaceous; pores round or irregular. Context cream to pinkish buff, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Phylogenetically, specimens of *Pseudofomitopsis* formed a single lineage (Fig. 3), which was distant from *Fomitopsis* s.s. Morphologically, *Fomitopsis* s.s. differs from *Pseudofomitopsis* by its white to tan or pinkish pore surface with mostly small and regular pores, and a dimitic to trimitic hyphal system (Ryvarden and Johansen 1980; Gilbertson and Ryvarden 1986; Núñez and Ryvarden 2001; Han et al. 2016; Liu et al. 2019, 2022a). Morphologically, *Pseudofomitopsis* is similar to *Daedalella* and *Ungulidaedalea* by having annual and pileate basidiocarps and dimitic hyphal system with clamped generative hyphae. However, *Daedalella* differs by its applanate to semicircular pileus, smaller pores (8–11 per mm) and smaller basidiospores (2.9–3.2 × 2–2.2 µm); *Ungulidaedalea* differs by its ungulate, fragile basidiocarps and densely septate skeletal hyphae (Han et al. 2016).

In this study, *Pseudofomitopsis* is proposed as a new genus based on phylogenetic analyses and morphological characters. Only one species, *Pseudofomitopsis microcarpa*, is accepted in this genus.

Pseudofomitopsis microcarpa B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5j, 16)
MycoBank: MB 840334

Type. **VIETNAM**. Dong Nai, Thac Mai, Tan Phu Forest Enterprise, on fallen angiosperm trunk, 14 October 2017, *Cui 16404* (holotype, BJFC).

Etymology. *Microcarpa* (Lat.): refers to the small basidiocarps.

Fruiting body. Basidiocarps annual, pileate, laterally stipitate to substipitate, solitary, corky, without odor or taste when fresh, corky to hard corky upon drying. Pileus applanate to semicircular or irregular, projecting up to 2.8 cm long, 3.8 cm wide, 0.8 cm thick at base. Pileal surface straw yellow to honey yellow when dry, sometimes turning to reddish brown to black near the base, glabrous, sulcate, azonate; margin cream, obtuse to acute. Pore surface cream to olivaceous when dry; sterile margin indistinct; pores round to angular, 7–8 per mm; dissepiments thick, entire. Context cream to pinkish buff, corky, up to 6 mm thick. Tubes concolorous with pore surface, corky, up to 2 mm long.

Hyphal structure. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae infrequent, colorless, thin- to slightly thick-walled, rarely branched, 2–3.6 µm in diam; skeletal hyphae dominant, colorless to pale yellowish, thick-walled with a narrow lumen to subsolid, occasionally branched, straight to flexuous, interwoven, 2.2–6.2 µm in diam.

Tubes. Generative hyphae infrequent, colorless, thin-walled, occasionally branched, 1.9–3 µm in diam; skeletal hyphae dominant, colorless to pale yellowish, thick-walled with a wide to narrow lumen, occasionally branched, straight to flexuous, interwoven, 2–4.5 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 19–35.5 × 2.5–3.8 µm. Basidia clavate, 4-sterigmate, clamped at base, 12.7–22.5 × 4–5.2 µm.

Spores. Basidiospores cylindrical to oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, (4−)4.2–4.8(−5) × (2−)2.3–3.2(−3.6) µm, L = 4.53 µm, W = 2.73 µm, Q = 1.65–1.7 (n = 60/2) (*Cui 16404* and *16406*).

Additional specimen (paratype) examined: **VIETNAM**. Dong Nai, Thac Mai, Tan Phu Forest Enterprise, on fallen angiosperm trunk, 14 October 2017, *Cui 16406* (BJFC).

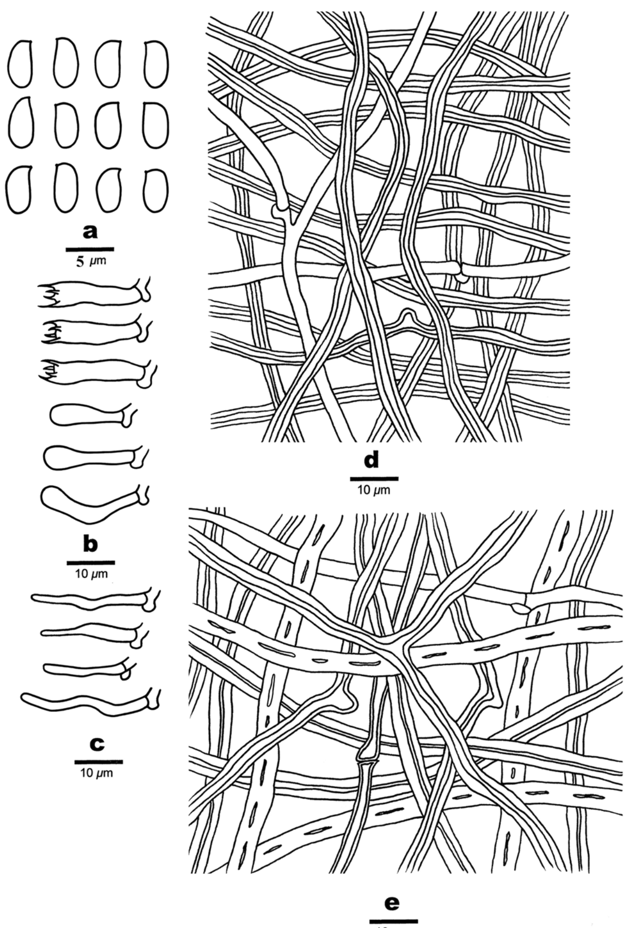

Fig. 16 Microscopic structures of *Pseudofomitopsis microcarpa* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Rhizoporia Audet, Mushrooms nomenclatural novelties 8: 1, 2017.
MycoBank: MB 552878

Type species. *Rhizoporia hyalina* (Spirin, Miettinen & Kotir.) Audet.

Diagnosis: Basidiocarps annual, resupinate, effused, soft leathery to corky. Sterile margin well developed in young specimens, byssoid, sometimes with poorly developed rhizomorphs. Pore surface white to cream, translucent when fresh, light ochraceous grey to tan and opaque when dry; pores angular. Subiculum cream to pale buff, soft leathery. Tubes concolorous with pore surface, soft leathery. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Antrodia hyalina* was described from Russia based on morphological and molecular data (Spirin et al. 2013b). *Rhizoporia* was established by Audet (2017h) and typified by *R. hyalina*. It differs from *Antrodia* s.s. by developed rhizomorphic basidiocarps, fleshy to soft leathery tubes, smaller basidia, and cylindrical basidiospores (Audet 2017h). Recent studies also supported the establishment of the genus (Ortiz-Santana et al. 2013; Spirin et al. 2016). Only one species, *R. hyalina*, is accepted in this genus.

Rhodoantrodia B.K. Cui, Y.Y. Chen & Shun Liu, **gen. nov**.
MycoBank: MB 840335

Etymology. *Rhodoantrodia* (Lat.): refers to its violaceous pore surface and close relationship with *Antrodia*.

Type species: *Rhodoantrodia tropica* (B.K. Cui) B.K. Cui, Y.Y. Chen & Shun Liu.

Diagnosis: Basidiocarps annual, resupinate, soft corky to corky. Pore surface light purple, violaceous to pinkish buff; pores angular. Subiculum cream to buff, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia and cystidioles absent. Basidiospores cylindrical to subfusiform, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Phylogenetically, specimens of *Rhodoantrodia* formed a single lineage (Fig. 3), and was distant from *Antrodia* s.s. Morphologically, it differs from *Antrodia* s.s. by its light purple to violaceous pore surface when fresh, greyish to pinkish buff upon drying, and cylindrical to subfusiform basidiospores.

In this study, *Rhodoantrodia* is proposed as a new genus based on phylogenetic analyses and morphological characters. Currently, two species are accepted in *Rhodoantrodia*, including *R. tropica* and *R. yunnanensis*.

Rhodoantrodia tropica (B.K. Cui) B.K. Cui, Y.Y. Chen & Shun Liu, **comb. nov.**
MycoBank: MB 840336

Basionym: *Antrodia tropica* B.K. Cui, Mycological Progress 12: 226, 2013.

For a detailed description of *Antrodia tropica*, see Cui (2013).

Notes. *Antrodia tropica* was described from tropical China (Cui 2013). It is characterized by resupinate basidiocarps, light purple to violaceous pore surface when fresh, greyish to pinkish buff when dry and cylindrical to subfusiform basidiospores. The hymenophoral trama is dominated by generative hyphae while skeletal hyphae are dominant in the subiculum.

Specimens examined: **CHINA**. Hainan Province, Changjiang County, Bawangling Nature Reserve, on dead tree of *Engelhardtia hainanensis*, 9 May 2009, *Cui 6471* (holotype, BJFC); *Cui 6490* (paratype, BJFC). Hubei Province, Yichang, Wufeng County, Chaibuxi Geological Park, on rotten angiosperm wood, 15 August 2017, *Dai 17938* (BJFC). Jiangxi Province, Tonggu County, Guanshan Nature Reserve, on rotten angiosperm wood, 10 August 2016, *Dai 17169* (BJFC). Yunnan Province, Yibin County, Jizu Mountain, on fallen angiosperm trunk 30 August 2015, *Dai 15703* (BJFC).

Rhodoantrodia yunnanensis (M.L. Han & Q. An) B.K. Cui & Shun Liu, **comb. nov.**
MycoBank: MB 841181

Basionym: *Antrodia yunnanensis* M.L. Han & Q. An, Phytotaxa 460: 6, 2020.

For a detailed description of *Antrodia yunnanensis*, see Han et al. (2020).

Notes. *Antrodia yunnanensis* was described from Yunnan Province, southwestern China, and closely related to *A. tropica* with a well support (Han et al. 2020). Based on morphological characters and phylogenetic analyses, we transferred *A. yunnanensis* to *Rhodoantrodia* as a new combination.

Specimens examined: **CHINA.** Yunnan Province, Baoshan, Gaoligongshan Nature Reserve, on fallen angiosperm branch, 8 November 2019, *Cui 18173* (BJFC).

Rhodofomes Kotl. & Pouzar, Ceská Mykologie 44: 235, 1990.
MycoBank: MB 25482
Type species: *Rhodofomes roseus* (Alb. & Schwein.) Kotl. & Pouzar.

Diagnosis: Basidiocarps perennial, mostly pileate, leathery to hard corky. Pileal surface rose pink, brown or black. Pore surface pinkish, vinaceous to brownish vinaceous; pores round to angular. Context whitish pink, pinkish brown or brown, hard corky. Tubes concolorous with pore surface, leathery. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Rhodofomes*, see Han et al. (2016).

Notes. *Fomitopsis cajanderi* (P. Karst.) Kotl. & Pouzar and *Daedalea* spp. Share several important morphological characters (Nobles 1971). Donk (1974) suggested transferring *F. cajanderi* to *Daedalea* or another related group. Subsequently, *Rhodofomes* was proposed by Kotlába and Pouzar (1990, 1998) with *R. rosea* as type species. But the concept of the *Rhodofomes* has been controversial and remained insufficiently resolved (Kim et al. 2005, 2007; Ortiz-Santana et al. 2013; Han et al. 2014; Ryvarden and Melo 2014). Han et al. (2016) recognized *Rhodofomes* as an independent genus.

In this study, *Rhodofomes* spp. formed a well-supported lineage (Fig. 3), which was distant from *Fomitopsis*. Currently, five species are accepted in *Rhodofomes*, including *R. cajanderi* (P. Karst.) B.K. Cui, M.L. Han & Y.C. Dai, *R. carneus* (Blume & T. Nees) B.K. Cui, M.L. Han & Y.C. Dai, *R. incarnatus* (K.M. Kim, J.S. Lee & H.S. Jung) B.K. Cui, M.L. Han & Y.C. Dai, *R. roseus* (Alb. & Schwein.) Kotl. & Pouzar and *R. subfeei* (B.K. Cui & M.L. Han) B.K. Cui, M.L. Han & Y.C. Dai.

Specimens examined: ***Rhodofomes roseus***. **CHINA**. Sichuan Province, Batang County, on fallen trunk of *Abies* sp., 7 September 2020, *Cui 18370*, *18372* (BJFC); Daocheng County, Yading Natural Reserve, on fallen trunk of *Larix* sp., 11 August 2019, *Cui 17409*, *17410* (BJFC); Songpan County, Mounigou Park, on fallen trunk of *Picea* sp., 23 September 2020, *Cui 18584* (BJFC). Xizang Autonomous Region (Tibet), Zuogong County, Dongda Mountain, on stump of *Abies* sp., 9 September 2020, *Cui 18401* (BJFC). Yunnan Province, Shangri-La County, Pudacuo National Park, on fallen trunk of *Picea* sp., 17 September 2018, *Cui 17115* (BJFC); 13 August 2019, *Cui 17479* (BJFC); Lijiang, Yulong Xueshan Park, on fallen trunk of *Abies* sp., 16 September 2018, *Cui 17046*, *17059* (BJFC); on fallen trunk of *Picea* sp., 16 September 2018, *Cui 17081* (BJFC). ***Rhodofomes subfeei***. **CHINA**. Anhui Province, Huangshan Mountain, on rotten wood of *Cunninghamia* sp., 21 October 2010, *Dai 11887* (paratype, BJFC). Sichuan Province, Dujiangyan, Qingcheng Mountain, on stump of *Cunninghamia* sp., 13 September 2010, *Cui 9231* (holotype, BJFC).

Rhodofomitopsis B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 365, 2016.
MycoBank: MB 812660

Synonym: *Antrodiopsis* Audet, Mushrooms nomenclatural novelties 1: 1, 2017.

Type species: *Rhodofomitopsis feei* (Fr.) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual to perennial, mostly sessile, coriaceous to woody hard when dry. Pileal surface straw yellow, brownish pink, rosy brown to blackish brown. Pore surface cream, rose, pinkish brown or dirty brown; pores round to angular, or slightly labyrinthiform, subdaedaleoid to sinuous-daedaleoid. Context cream, rose, lilac, or pinkish brown, woody hard. Tubes concolorous with pore surface, indistinctly stratified, corky. Hyphal system mostly dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia or cystidioles absent. Basidiospores cylindrical, ellipsoid or navicular, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Rhodofomitopsis*, see Han et al. (2016).

Notes. *Rhodofomitopsis* was established by Han et al. (2016) and typified by *R. feei*. Soares et al. (2017) studied the genus *Fomitopsis* and *Rhodofomitopsis*, and described *R. roseomagna* Nogueira-Melo, A.M.S. Soares & Gibertoni from the Brazilian Atlantic Forest; they also proposed *R. flabellata* (A.M.S. Soares & Gibertoni) A.M.S. Soares & Gibertoni as a new combination. *Antrodiopsis* was established by Audet (2017a) and typified by *Antrodia oleracea*. But in Yuan et al. (2020), *Antrodia oleracea* and *A. monomitica* Yuan Y. Chen grouped with *Rhodofomitopsis* and were transferred to *Rhodofomitopsis*. This study is consistent with Yuan et al. (2020). Therefore, *Antrodiopsis* is treated as a synonym of *Rhodofomitopsis*. Currently, nine species are accepted in *Rhodofomitopsis*, including *R. africana* (Mossebo & Ryvarden) B.K. Cui, M.L. Han & Y.C. Dai, *R. cupreorosea* (Berk.) B.K. Cui, M.L. Han & Y.C. Dai, *R. feei*, *R. flabellata*, *R. lilacinogilva* (Berk.) B.K. Cui, M.L. Han & Y.C. Dai, *R. monomitica* (Yuan Y. Chen) B.K. Cui, Yuan Y. Chen & Shun Liu, *R. oleracea* (R.W. Davidson & Lombard) B.K. Cui, Yuan Y. Chen & Shun Liu, *R. pseudofeei* B.K. Cui & Shun Liu and *R. roseomagna*.

Specimens examined: ***Rhodofomitopsis africana***. **VIETNAM**. Hochiminh, on fallen angiosperm trunk, 10 October 2017, *Cui 16362* (BJFC). ***Rhodofomitopsis monomitica***. **CHINA**. Heilongjiang Province, Harbin, the Campus of Harbin University of Science and Technology, on rotten wood of *Morus* sp., 6 August 2016, *Dai 16894* (holotype, BJFC). Jiangxi Province, Nanchang, Forest Park of Jiangxi Academy of Forestry, on rotten angiosperm wood, 24 September 2008, *Dai 10630* (paratype, BJFC). ***Rhodofomitopsis pseudofeei*. AUSTRALIA.** Queensland, Cairns, Crater Lakes National Park, on fallen angiosperm branch, 17 May 2018, *Cui 16762* (BJFC); Mount Whitfield Conservation Park, on fallen angiosperm trunk, 18 May 2018, *Cui 16794*, *16803*, *16807* (BJFC).

Rubellofomes B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 366, 2016.
MycoBank: MB 812665
Type species: *Rubellofomes cystidiatus* (B.K. Cui & M.L. Han) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual or perennial, resupinate to pileate, coriaceous to woody hard. Pileal surface orange-brown to dark brown. Pore surface white or purple-pink to cinnamon brown. Context purple-pink to light pinkish brown, corky or woody hard. Tubes concolorous with pore surface, woody hard. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia present or absent, cystidioles present. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Rubellofomes*, see Han et al. (2016).

Notes. *Rubellofomes* was established by Han et al. (2016) and typified by *R. cystidiatus*. In the current phylogenetic study (Fig. 3), *Rubellofomes* was closely related to *Subantrodia*. However, the latter has mostly resupinate to effused-reflexed basidiocarps, with a white, cream to wood-colored pore surface (Núñez and Ryvarden 2001; Ryvarden and Melo 2014; Audet 2017i). Two species are accepted in *Rubellofomes*, including *R. cystidiatus* and *R. minutisporus* (Rajchenb.) B.K. Cui, M.L. Han & Y.C. Dai.

Specimens examined: ***Rubellofomes cystidiatus***. **CHINA**. Guangxi Autonomous Region, Shangsi County, Shiwandashan National Forest Park, on fallen angiosperm trunk, 26 July 2012, *Yuan 6328* (paratype, BJFC); on living angiosperm tree, 6 July 2016, *Cui 13983*, *13990*, *14009* (BJFC). Hainan Province, Baoting County, Qixianling National

Forest Park, on fallen angiosperm trunk, 27 November 2007, *Cui 5481* (holotype, BJFC); 20 November 2015, *Cui 13703*, *13706* (BJFC).

Subantrodia Audet, Mushrooms nomenclatural novelties 9: 1, 2017.
MycoBank: MB 552880
Type species: *Subantrodia juniperina* (Murrill) Audet.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed, corky to hard corky. Pore surface white to cream; pores round to angular. Subiculum cream to straw yellow, corky. Tubes concolorous with pore surface, corky. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Subantrodia* was separated from *Antrodia* s.l. by Audet (2017i). Morphologically, *Subantrodia* differs from *Antrodia* s.s. by its smaller basidia and presence of chlamydospores (Audet 2017i). Phylogenetically, *Subantrodia* is closely related to *Rubellofomes* (Fig. 3). However, *Rubellofomes* differs by its purple-pink to light pinkish brown context (Han et al. 2016). Currently, two species are accepted in *Subantrodia*, including *S. juniperina* and *S. uzbekistanica* (Yuan Yuan, Gafforov & F. Wu) Audet.

Specimens examined: ***Subantrodia juniperina***. **ETHIOPIA**. On rotten wood of *Juniperus procera*, 12 July 1990, *Ryvarden 15052* (O). ***Subantrodia uzbekistanica***. **UZBEKISTAN**. Dzizak, on rotten wood of *Juniperus seravschanica*, 8 September 2016, *Dai 17104* (holotype, BJFC), *Dai 17105* (paratype, BJFC).

Ungulidaedalea B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 366, 2016.
MycoBank: MB 814711
Type species: *Ungulidaedalea fragilis* (B.K. Cui & M.L. Han) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual, pileate, corky to fragile. Pileal surface brown to dark fuscous. Pore surface white, cream to brown; pores angular. Context buff to clay-buff, fragile. Tubes concolorous with pore surface, fragile. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae frequently simple-septate, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong-ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Ungulidaedalea*, see Han et al. (2016).

Notes. *Fomitopsis fragilis* B.K. Cui & M.L. Han was originally described from China (Han et al. 2014). *Ungulidaedalea* was established by Han et al. (2016) to accommodate *F. fragilis*. Only one species, *Ungulidaedalea fragilis*, is accepted in this genus.

Specimens examined: ***Ungulidaedalea fragilis***. **CHINA**. Hainan Province, Ledong County, Jianfengling National Nature Reserve, on fallen angiosperm trunk, 7 November 2012, *Cui 10919* (holotype, BJFC); 17 November 2007, *Dai 9292* (paratype, BJFC; IFP); on wood, 18 November 2007, *Yuan 4081* (IFP).

Laetiporaceae Jülich, Bibliotheca Mycologica 85: 375, 1981.
MycoBank: MB 81720
Type genus: *Laetiporus* Murrill.

Diagnosis: Basidiocarps annual, resupinate or pileate, sessile to laterally substipitate or centrally stipitate, chalky to corky or hard corky. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae simple-septate. Cystidia absent, cystidioles present or absent. Basidiospores ellipsoid to pyriform or drop-shaped, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Kusaghiporia* J. Hussein, S. Tibell & Tibuhwa, *Laetiporus*, *Macrohyporia*, *Wolfiporiella* B.K. Cui & Shun Liu, *Wolfiporiopsis* B.K. Cui & Shun Liu.

Notes. Laetiporaceae was established by Jülich with *Laetiporus* as the type genus (Jülich 1981). This family belongs to antrodia clade within the Polyporales, with species that cause a brown rot. *Laetiporus* was placed in Fomitopsidaceae for a long time (Kirk et al. 2008; Song et al. 2018). MycoBank cites Laetiporaceae as an invalid name, but after consulting the original publication, Justo et al. (2017) found no reason to consider the name invalid. In Justo et al. (2017), three genera included in Laetiporaceae, viz., *Laetiporus*, *Phaeolus* and *Wolfiporia*, and Phaeolaceae was treated as a synonymy of Laetiporaceae, but it did not receive support in phylogenetic analysis (− % ML, − BPP); furthermore, *Wolfiporia dilatohypha* (*Wolfiporiella*), *Laetiporus conifericola* Burds. & Banik (*Laetiporus*), *Laetiporus sulphureus* (*Laetiporus*) and *Laetiporus persicinus* formed a highly supported group (100% ML, 1.00 BPP; Justo et al. 2017), which are accepted in our current concept of Laetiporaceae. He et al. (2019) also defined Laetiporaceae as the valid name. In this study, five genera are accepted in Laetiporaceae, including two new genera, *Wolfiporiella* and *Wolfiporiopsis*.

Key to genera of Laetiporaceae

1. Hyphal system monomitic to dimitic; basidiospores thin- to slightly thick-walled.....................*Macrohyporia*
1. Basidiocarps system dimitic; basidiospores thin-walled...2

2. Basidiocarps mostly pileate, occasionally with laterally substipitate or centrally stipe……………………………3
2. Basidiocarps resupinate……………………………………...4
3. Pileal surface pinkish buff to pale yellow; pore surface white to buff-yellow…………………………*Laetiporus*
3. Pileal surface dark brown; pore surface cream to brown……………………………………*Kusaghiporia*
4. Pores 1–3 per mm; all hyphae unchanged in KOH……… ………………………………………*Wolfiporiopsis*
4. Pores > 3 per mm; all hyphae weakly inflated in KOH… …………………………………………….*Wolfiporiella*

Kusaghiporia J. Hussein, S. Tibell & Tibuhwa, Mycology 9 (2): 139, 2018. MycoBank: MB 824537

Type species: *Kusaghiporia usambarensis* J. Hussein, S. Tibell & Tibuhwa.

Diagnosis: Basidiocarps annual, centrally stipitate, fleshy when fresh, becoming tough or woody hard when dry. Pileal surface dark brown. Pore surface cream to brown; pores angular to round. Hyphal system dimitic; generative hyphae simple-septate; skeletal hyphae IKI−, CB−; gloeplerous hyphae present. Cystidia and cystidioles absent. Basidiospores globose to subglobose, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Kusaghiporia*, see Hussein et al. (2018).

Notes. *Kusaghiporia* was established by Hussein et al. (2018) and typified by *K. usambarensis*. In this study, species of *Kusaghiporia* formed a well-supported lineage (Figs. 1, 2), and grouped together with *Laetiporus*, *Macrohyporia*, *Wolfiporiella* and *Wolfiporiopsis*. Only one species, *Kusaghiporia usambarensis*, is accepted in this genus.

Laetiporus Murrill, Bulletin of the Torrey Botanical Club 31 (11): 607, 1904.
MycoBank: MB 17899

Type species: *Laetiporus sulphureus* (Bull.) Murrill.

Diagnosis: Basidiocarps annual, pileate, sessile to laterally substipitate, solitary or imbricate, fleshy to crumbly. Pileal surface pinkish buff to pale yellow. Pore surface white to buff-yellow; pores angular. Context white to pale yellow, crumbly or chalky. Tubes concolorous with pore surface, crumbly or chalky. Hyphal system dimitic; generative hyphae simple-septate; skeletal hyphae IKI−, CB−. Cystidia and cystidioles absent. Basidiospores ellipsoid to ovoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Laetiporus* is a cosmopolitan genus, causing a brown rot on living hardwoods and conifers (Murrill 1904). Some species of the genus are known as forest pathogens and some are edible with medicinal functions (Dai et al. 2007, 2009). According to previous studies, 18 species have been accepted in the genus worldwide and 13 species have been confirmed in the *L. sulphureus* complex by phylogenetic analyses, including *L. ailaoshanensis* B.K. Cui & J. Song, *L. caribensis* Banik & D.L. Lindner, *L. conifericola*, *L. cremeiporus* Y. Ota & T. Hatt., *L. discolor* (Klotzsch) Corner, *L. flos-musae* Overeem, *L. gilbertsonii* Burds., *L. huroniensis* Burds. & Bani, *L. lobatus* J. Vlasák, J. Kout & D.L. Lindner, *L. medogensis* J. Song & B.K. Cui, *L. miniatus* (P. Karst.) Overeem, *L. montanus* Černý ex Tomšovský & Jankovský, *L. portentosus* (Berk.) Rajchenb., *L. squalidus* R.M. Pires, Motato-Vásq. & Gugliottta, *L. sulphureus* (Bull.) Murrill, *L. versisporus* (Lloyd) Imazeki, *L. xinjiangensis* J. Song, Y.C. Dai & B.K. Cui and *L. zonatus* B.K. Cui & J. Song, of which eight have been reported from China, viz., *L. ailaoshanensis*, *L. cremeiporus*, *L. medogensis*, *L. montanus*, *L. sulphureus*, *L. versisporus*, *L. xinjiangensis* and *L. zonatus* (Tomšovský and Jankovský 2008; Ota et al. 2009; Banik et al. 2012; Song et al. 2014, 2018; Song and Cui 2017).

Species of *Laetiporus* s.s. appeared more closely related to *Wolfiporiella* than to *Laetiporus persicinus* (Berk. & M.A. Curtis) Gilb (Figs. 1, 2). Morphologically, *L. persicinus* differs from *Laetiporus* s.s by darker basidiocarps (Burdsall and Banik 2001). Although *L. persicinus* and *Wolfiporiopsis* formed a well-supported lineage (Figs. 1, 2), *L. persicinus* differs from *Wolfiporiopsis* by its centrally or excentrically stipitate basidiocarps and smaller basidiospores (6.5–8 × 4–5 µm; Burdsall and Banik 2001), thus, the placement of *L. persicinus* is unclear.

Specimens examined: ***Laetiporus cremeiporus***. **CHINA**. Hunan Province, Sangzhi County, Badagong Mountain, on living angiosperm tree, 16 September 2020, *Cui 18591* (BJFC). Shanxi Province, Qinshui County, Lishan Nature Reserve, on living tree of *Toxicodendron vernicifluum*, 24 August 2016, *Dai 17008* (BJFC). Sichuan Province, Batang County, on living tree of *Pyrus* sp., 8 August 2019, *Cui 17346* (BJFC). ***Laetiporus medogensis.*** **CHINA**. Xizang Autonomous Region (Tibet), Medog County, on living tree of *Abies* sp., 21 September 2014, *Cui 12240* (holotype, BJFC); 20 September 2014, *Cui 12218*, *12219* (BJFC). ***Laetiporus montanus***. **CHINA**. Heilongjiang Province, Huzhong County, Huzhong Nature Reserve, on fallen trunk of *Larix* sp., 9 August 2015, *Dai 15762* (BJFC). Xinjiang Autonomous Region, Buerjin County, Kanasi Nature Reserve, on dead tree of *Larix* sp., 11 September 2015, *Dai 15888* (BJFC). ***Laetiporus sulphureus***. **CHINA**. Xinjiang Autonomous Region, Burqin County, on living tree of *Salix* sp., 23 August 2019, *Cui 17683*, *17684* (BJFC); on living tree of *Salix* sp., 9 September 2015, *Dai 15836*, *15838* (BJFC).

Macrohyporia I. Johans. & Ryvarden, Transactions of the British Mycological Society 72: 192, 1979.

MycoBank: MB 18006

Type species: *Macrohyporia dictyopora* (Sacc.) I. Johans. & Ryvarden.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused-reflexed or pileate, brittle to woody hard when dry. Pore surface cream to ochraceous or pale brown; pores round to angular. Subiculum cream to straw yellow, corky. Tubes concolorous with pore surface, corky. Hyphal system monomitic to dimitic; generative hyphae simple-septate; skeletal hyphae IKI−, CB−. Cystidia and cystidioles absent. Basidiospores subglobose to ellipsoid, colorless to pale yellow, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Macrohyporia* was established by Johansen and Ryvarden (1979) and typified by *M. dictyopora*. In this study, species of *Macrohyporia* formed a well-supported lineage (Figs. 1, 2), and related to *Kusaghiporia*, *Laetiporus*, *Wolfiporiella* and *Wolfiporiopsis* within Laetiporaceae. Currently, three species are accepted in *Macrohyporia*, including *M. dictyopora*, *M. inflata* I. Johans. & Ryvarden, and *M. pileata* Ryvarden & Núñez.

Specimen examined: ***Macrohyporia dictyopora.*** **AUSTRALIA.** Sydney, Sydney Botanical Garden, on rotten wood of *Pinus* sp., 20 May 2018, *Dai 18878* (BJFC).

Wolfiporiella B.K. Cui & Shun Liu, **gen. nov**.

MycoBank: MB 840337

Etymology. *Wolfiporiella* (Lat.): refers to a morphological similarity to *Wolfiporia* Ryvarden & Gilb. But with smaller pores.

Type species: *Wolfiporiella dilatohypha* (Ryvarden & Gilb.) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, resupinate, corky to fragile. Pore surface cream to cinnamon brown to buff; pores round. Context cinnamon brown to buff, corky. Tubes buff, corky to fragile. Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid to broadly ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Wolfiporia dilatohypha* Ryvarden & Gilb. Usually grouped with *W. cartilaginea* Ryvarden, which was distant from *W. cocos* (F.A. Wolf) Ryvarden & Gilb. And *W. pseudococos* F. Wu, J. Song & Y.C. Dai, and appeared more closely related to species of *Laetiporus* (Binder et al. 2013; Ortiz-Santana et al. 2013; Justo et al. 2017; Tibpromma et al. 2017). The current study is consistent with these studies. *Wolfiporia curvispora* Y.C. Dai was described based on morphological characters from northeast China (Dai 1998), but the DNA sequences data of *W. curvispora* are not available. Morphologically, *Wolfiporia cartilaginea*, *W. curvispora* and *W. dilatohypha* have annual and resupinate basidiocarps, and a dimitic hyphal system with generative hyphae bearing simple septa (Lowe 1966; Ryvarden and Gilbertson 1984; Ryvarden et al. 1986; Dai 1998). These three species differ from *Wolfiporia cocos* and *W. pseudococos* by small pores and small basidiospores (1–2 per mm and 7–8 × 3–3.5 µm in *W. cocos*, Zhao and Zhang 1992; 1–3 per mm and 7.9–9.5 × 3–3.8 µm in *W. pseudococos*, Tibpromma et al. 2017; 5–7 per mm and 3.2–4.5 × 2.2–3 µm in *W. cartilaginea*, Ryvarden et al. 1986; 4–5 per mm and 3.3–4.1 × 1.2–1.8 µm in *W. curvispora*, Dai 1998; 4–5 per mm and 3.8–4.7 × 2.9–3.1 µm in *W. dilatohypha*, Dai et al. 2011). Phylogenetically, *Wolfiporiella* was closely related to *Kusaghiporia*, *Laetiporus*, *Macrohyporia* and *Wolfiporiopsis* (Figs. 1, 2). However, *Kusaghiporia* differs in its centrally stipitate basidiocarps and globose to subglobose basidiospores (Hussein et al. 2018); *Laetiporus* differs by having pileate, sessile to laterally substipitate basidiocarps (Tomšovský and Jankovský 2008; Ota et al. 2009; Song et al. 2018); *Macrohyporia* differs in its resupinate to effused-reflexed or pileate basidiocarps and monomitic to dimitic hyphal system (Johansen and Ryvarden 1979); *Wolfiporiopsis* differs in its larger pores (1–3 per mm) and unchanged hyphae in KOH.

Based on morphological characters and phylogenetic analyses, *Wolfiporiella* is established as a new genus, and *Wolfiporia cartilaginea*, *W. curvispora* and *W. dilatohypha* are transferred to *Wolfiporiella* as new combinations.

Wolfiporiella cartilaginea (Ryvarden) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840338

Basionym: *Wolfiporia cartilaginea* Ryvarden, Acta mycol. Sin.: 231, 1986.

For a detailed description of *Wolfiporia cartilaginea*, see Ryvarden et al. (1986).

Specimens examined: **CHINA**. Jilin Province, Antu County, on rotten wood of *Ouerus* sp., 8 September 1995, *Dai 1974* (IFP); 18 September 2002, *Dai 3764* (BJFC).

Wolfiporiella curvispora (Y.C. Dai) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840339

Basionym: *Wolfiporia curvispora* Y.C. Dai, Annales Botanici Fennici 35 (2): 151, 1998.

For a detailed description of *Wolfiporia curvispora*, see Dai (1998).

Specimens examined: **CHINA**. Jilin Province, Huinan County, Hongqi, on rotten wood of *Pinus koraiensis*, 13 October 1993, *Dai 1592* (holotype, IFP).

Wolfiporiella dilatohypha (Ryvarden & Gilb.) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840340

Basionym: *Wolfiporia dilatohypha* Ryvarden & Gilb., Mycotaxon 19: 141, 1984.

For a detailed description of *Wolfiporia dilatohypha*, see Ryvarden and Gilbertson (1984).

Specimens examined: **CHINA**. Jilin Province, Antu County, Baoma, on *Acer* sp., 24 August 2007, *Wei 3122* (IFP); on gymnosperm, 31 July 2008, *Dai 10059* (IFP). Hubei Province, Fang County, Shennongjia Nature Reserve, on fallen angiosperm branch, 29 August 2006, *Li 1193* (IFP).

Wolfiporiopsis B.K. Cui & Shun Liu, **gen. nov**.
MycoBank: MB 840341

Etymology. *Wolfiporiopsis* (Lat.): refers to the morphological similarity to *Wolfiporia*.

Type species: *Wolfiporiopsis castanopsidis* (Y.C. Dai) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, resupinate, corky to fragile. Pore surface cream, buff, ash grey to pale brown; pores round. Subiculum cream to buff, corky. Tubes buff, corky to fragile. Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid to broadly ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Wolfiporia castanopsis* Y.C. Dai was described from Yunnan Province of China (Dai et al. 2011). In this study, specimens of *Wolfiporiopsis* formed a single lineage (Figs. 1, 2), and it was distant from *Wolfiporia.* Morphologically, *Wolfiporia* differs from *Wolfiporiopsis* by its sclerotia, globose or irregularly-shaped basidiocarps and cylindrical to ellipsoid basidiospores. Phylogenetically, *Wolfiporiopsis* is closely related to *Laetiporus persicinus* (Figs. 1, 2). Morphologically, *Laetiporus persicinus* differs by being centrally or excentrically stipitate with a single pileus or several arising from a central stipe (Gilbertson 1981). *Wolfiporiopsis* is proposed as a new genus based on phylogenetic analyses and morphological characters. Only one species, *Wolfiporiopsis castanopsidis*, is accepted in this genus.

Wolfiporiopsis castanopsidis (Y.C. Dai) B.K. Cui & Shun Liu, **comb. nov.**
MycoBank: MB 840342

Basionym: *Wolfiporia castanopsis* Y.C. Dai, Mycosystema 30 (5): 678, 2011.

For a detailed description of *Wolfiporia castanopsis*, see Dai et al. (2011).

Specimens examined: **CHINA**. Yunnan Province, Chuxiong, Zixishan Nature Reserve, on rotten wood of *Castanopsis orthacantha*, 4 November 2006, *Dai 8022* (holotype, IFP); on fallen trunk of *Castanopsis* sp., 20 September 2017, *Cui 16295*, *16296* (BJFC).

Laricifomitaceae Jülich, Bibliotheca Mycologica 85: 375, 1981.
MycoBank: MB 81725
Type genus: *Laricifomes* Kotlába & Pouzar.

Diagnosis: Basidiocarps annual to perennial, pileate, resupinate or effused-reflexed, mostly corky, sometimes fragile to woody hard. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae mostly clamped. Cystidia absent, cystidioles present. Basidiospores ellipsoid, short-cylindric to drop-shaped, colorless, thin- to thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Gilbertsonia* Parmasto, *Laricifomes*, *Ryvardenia* Rajchenb.

Notes. Laricifomitaceae was established by Jülich (1981) with *Laricifomes* as the type genus. This family belongs to the antrodia clade within the Polyporales and causes a brown rot. Three genera are accepted in Laricifomitaceae.

Key to genera of Laricifomitaceae

1. Basidiocarps perennial; sclerids present in context..*Laricifomes*
1. Basidiocarps annual; sclerids absent in context.........2
2. Basidiocarps pileate; basidiospores thick-walled......... ....*Ryvardenia*
2. Basidiocarps resupinate; basidiospores thin- to slightly thick-walled....*Gilbertsonia*

Gilbertsonia Parmasto, Harvard Papers in Botany 6 (1): 179, 2001.

MycoBank: MB 28834

Type species: *Gilbertsonia angulopora* (M.J. Larsen & Lombard) Parmasto.

Diagnosis: Basidiocarps annual, resupinate, corky to fragile. Pore surface whitish or yellowish, brownish; pores angular. Subiculum thin, whitish, chalky when dry. Tubes cheesy or waxy, tender and fragile, horny but very brittle when dry. Hyphal system dimitic; generative hyphae clamped; binding hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Gilbertsonia*, see Parmasto (2001).

Notes. *Gilbertsonia* was established by Parmasto and typified by *G. angulopora* (Parmasto 2001). Only one species, *Gilbertsonia angulopora*, is accepted in this genus.

Laricifomes Kotlába & Pouzar, Ceská Mykologie 11 (3): 158, 1957.
MycoBank: MB 17905

Type species: *Laricifomes officinalis* (Vill.) Kotl. & Pouzar.

Diagnosis: Basidiocarps annual to perennial, sessile, solitary, chalky or crumbly. Pileal surface chalky white or discolouring to tan. Pore surface white to tan; pores circular to angular. Context chalky white, chalky or crumbly. Tubes concolorous with the context or pale brownish. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Kotlába and Pouzar (1957) established the genus *Laricifomes* and transferred *Fomitopsis officinalis* (Vill.) Bondartsev & Singer to *Laricifomes* on account of its chalky context, crumbly consistency, pileal surface without a resinous crust and presence of inflated, very thick-walled sclerids (Kotlába and Pouzar 1957, 1998). Recent phylogenetic studies demonstrated that *Laricifomes officinalis* formed a separate lineage, distant from *Fomitopsis* s.s. and appeared closely related to the genera *Ryvardenia* and *Gilbertsonia* (Kim et al. 2005; Ortiz-Santana et al. 2013; Han et al. 2016; Shen et al. 2019).

The current study also confirmed that *Laricifomes* is monophyletic, and it is closely related to the genera *Ryvardenia* and *Gilbertsonia* within Laricifomitaceae (Figs. 1, 2). Only one species, *Laricifomes officinalis*, is accepted in this genus.

Specimens examined: ***Laricifomes officinalis.*** **CHINA.** Heilongjiang Province, Yichun, Fenglin Nature Reserve, on fallen trunk of *Larix* sp., 7 July 1999, *Dai 3122* (BJFC). Jilin Province, Antu County, Changbaishan Nature Reserve, Huangsongpu, on dead tree of *Larix* sp., 12 September 2007, *Dai 9055* (BJFC); 9 September 2013 *Dai 13489* (BJFC).

Ryvardenia Rajchenb., Nordic Journal of Botany 14 (4): 436, 1994.

MycoBank: MB 27723

Type species: *Ryvardenia cretacea* (Lloyd) Rajchenb.

Diagnosis: Basidiocarps annual, pileate, solitary, fleshy when fresh, crumbly or chalky when dry. Pileal surface white or slightly yellowish. Pore surface whitish to yellowish tan; pores circular to angular. Context chalk white, crumbly or chalky. Tubes white, chalky. Hyphal system monomitic to dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores ellipsoid to drop-shaped, colorless, thick-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Ryvardenia*, see Rajchenberg (1994).

Notes. *Ryvardenia* was proposed to accommodate *Polyporus cretaceus* Lloyd and *Polyporus campylus* Berk. (Rajchenberg 1994). In this study, species of *Ryvardenia* formed a single lineage (Figs. 1, 2) within Laricifomitaceae. Two species are accepted in *Ryvardenia*, including *R. campyla* (Berk.) Rajchenb. and *R. cretacea*.

Specimen examined: ***Ryvardenia campyla***. **AUSTRALIA**. Tasmania, Timbs Track, on living tree of *Nothofagus cunninghamii*, 14 October 2018, *Cui 16674* (BJFC). ***Ryvardenia cretacea*****. AUSTRALIA**. Tasmania, Arve River Streamside Reserve, on stump of *Eucalyptus* sp., 15 May 2018, *Cui 16731*, *16732* (BJFC).

Phaeolaceae Jülich, Bibliotheca Mycologica 85: 384, 1981. MycoBank: MB 80023

Type genus: *Phaeolus* (Pat.) Pat.

Diagnosis: Basidiocarps annual, stipitate, resupinate, corky or fragile. Hymenophores poroid. Hyphal system monomitic to dimitic; generative hyphae simple-septate. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical, ellipsoid to ovoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Melanoporella* Murrill, *Phaeolus*, *Wolfiporia* Ryvarden & Gilb.

Notes. Phaeolaceae was established by Jülich (1981) with *Phaeolus* as type genus. *Phaeolus* clustered with *Laetiporus* in many studies (Kim and Jung 2001; Hibbett and Binder 2002; Ortiz-Santana et al. 2013), therefore, the name Phaeolaceae was usually treated as a synonym of Laetiporaceae. In Justo et al. (2017), *Wolfiporia dilatohypha* (*Wolfiporiella*), *Laetiporus conifericola* (*Laetiporus*), *Laetiporus sulphureus* (*Laetiporus*) and *Laetiporus persicinus* formed a highly supported group (100% ML, 1.00 BPP; Justo et al. 2017) and grouped with *Wolfiporia cocos* (*Wolfiporia*) with no significant support (− % ML, − BPP; Justo et al. 2017).

Phylogenetically, *Melanoporella*, *Phaeolus* and *Wolfiporia* grouped together and received a high support (100% MP, 99% ML, 1.00 BPP in Fig. 1; 100% MP, 99% ML, 1.00 BPP in Fig. 2). In this study, Phaeolaceae is considered as an independent family including three genera.

Key to genera of Phaeolaceae

1. Basidiocarps stipitate; hyphal system monomitic……… ……………………………………………..*Phaeolus*
1. Basidiocarps resupinate or resupinate to effused; hyphal system dimitic…………………………………………2
2. Basidiocarps margin with radially fine-strigose and fimbriate………………………………*Melanoporella*
2. Basidiocarps margin without radially fine-strigose or fimbriate…………………………………..*Wolfiporia*

Melanoporella Murrill, North American Flora 9: 14, 1907. MycoBank: MB 18034

Type species: *Melanoporella carbonacea* (Berk. & M.A. Curtis) Murrill.

Diagnosis: Basidiocarps annual to perennial, resupinate to effused, corky to rigid, margin with radially fine-strigose and fimbriate. Pore surface pale grayish brown to purplish black; pores round or elongated. Subiculum pale brownish to purplish brown, soft to fibrous. Tubes pale grayish brown, corky to rigid. Hyphal system dimitic; generative hyphae simple septate; skeletal IKI−, CB−. Cystidia and cystidioles absent. Basidiospores oblong and apiculate to subfusiform, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Melanoporella* was established by Murrill (1907) and typified by *Poria carbonacea* (Berk. & M.A. Curtis) Sacc. *Melanoporella carbonaceous* usually grows on angiosperm trees and has been found in Cuba (type locality), Brazil, Nigeria and Sierra Leone (Royes and Loveless 1960; Ryvarden 2015). Recently, this species was reported as a new record to Costa Rica (Vlasák et al. 2020). In the current phylogenetic analyses, *Melanoporella* is closely related to *Wolfiporia* (Figs. 1, 2). Morphologically, *Melanoporella* and *Wolfiporia* share similar-sized pores and a dimitic hyphal system with simple septate generative hyphae. However, *Melanoporella* differs by its radially fine-strigose and fimbriate basidiocarps margin, tissue blackening with a slight yellowish-brown stain in KOH (Murrill 1907).

Phaeolus (Pat.) Pat., Essai taxonomique sur les familles et les genres des Hyménomycètes: 86, 1900.
MycoBank: MB 18229

Type species: *Phaeolus schweinitzii* (Fr.) Pat.

Diagnosis: Basidiocarps annual, stipitate, fragile to fibrous or corky. Pileal surface orange to brown. Pore surface orange to greenish brown; pores round to angular. Context orange to brown, fibrous. Tubes concolorous with pore surface, fragile. Hyphal system monomitic; generative hyphae simple septate; gloeoplerous hyphae usually present. Cystidia or cystidioles absent. Basidiospores ellipsoid to cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Phaeolus* was established by Patouillard (1900) and typified by *P. schweinitzii* Patouillard. It is characterized by a monomitic hyphal system with gloeopleurous tramal hyphae and simple septate hyphae (Ryvarden and Melo 2014). In this study, *Phaeolus* spp. formed a single lineage and clustered with *Wolfiporia*; the main difference is *Wolfiporia* spp. have a dimitic hyphal system (Ryvarden and Gilbertson 1984). Five species are accepted in *Phaeolus*, including *P. amazonicus* M.A. De Jesus & Ryvarden, *P. manihotis* R. Heim, *P. schweinitzii* (Fr.) Pat., *P. sharmae* Hembrom, A. Parihar, K. Das & A. Ghosh, and the new species *P. fragilis*.

Phaeolus fragilis B.K. Cui & Shun Liu, **sp. nov.** (Figs. 5k–l, 17)
MycoBank: MB 840345

Differs from other *Phaeolus* spp. by its centrally stipitate and fragile basidiocarps with greyish brown to deep olive pileal surface when fresh, clay-buff to dark reddish brown upon drying, pale mouse grey to dark grey pore surface when fresh, ochraceous to rusty brown upon drying, fawn to snuff brown context, oblong-ellipsoid basidiospores (7–11 × 3.8–5 µm).

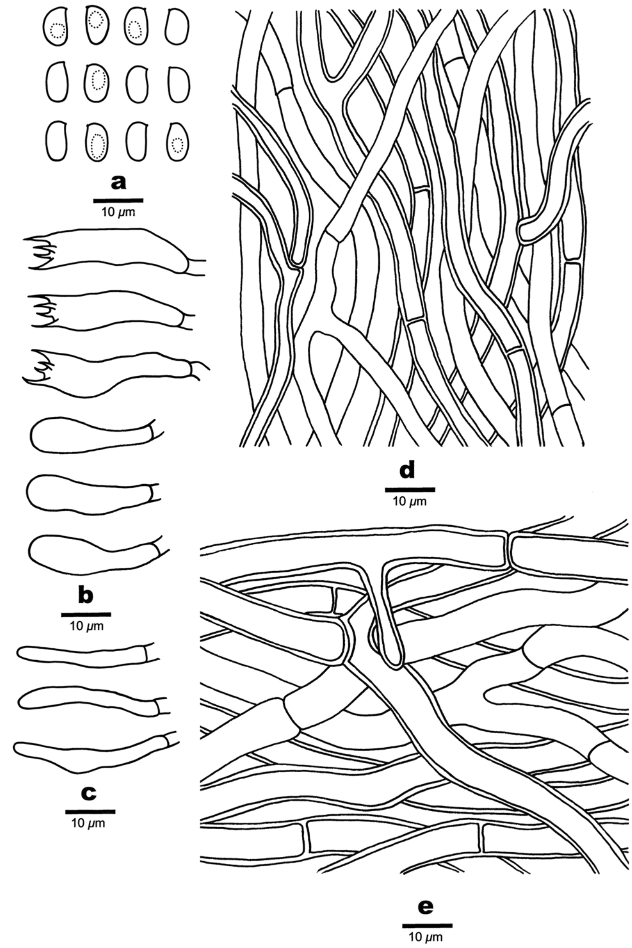

Fig. 17 Microscopic structures of *Phaeolus fragilis* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a**–**e** = 10 µm

Type. **AUSTRALIA**. Victoria, Fernshaw, Yarra Ranges National Park, on ground of mixed forest, 11 May 2018, *Cui 16579* (BJFC).

Etymology. *Fragilis* (Lat.): refers to the fragile basidiocarps.

Fruiting body. Basidiocarps annual, centrally stipitate, solitary, corky, without odor or taste when fresh, corky to fragile and light in weight when dry. Pileus circular, projecting up to 9.5 cm, 10.8 cm wide, and 1.7 cm thick at base. Pileal surface greyish brown to deep olive when fresh, becoming clay-buff to dark reddish brown upon drying; glabrous, indistinctly concentrically zonate or sulcate; margin cinnamon brown to buff, slightly obtuse to acute. Pore surface pale mouse grey to dark grey when fresh, becoming ochraceous to rusty brown upon drying; pores round to angular, 1–3 per mm; dissepiments thick, entire to lacerate. Context fawn to snuff brown, fragile, up to 1.3 cm thick. Tubes concolorous with pore surface, fragile, up to 4 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae simple-septate, IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae colorless to pale yellowish-brown, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 10–15 µm in diam.

Tubes. Generative hyphae colorless to pale yellowish-brown, thin- to slightly thick-walled, occasionally branched, 1.9–5.5 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 14.7–32.5 × 2.8–5 µm. Basidia clavate, 4-sterigmate, not clamped at base, 15.5–31.4 × 4.7–8.2 µm.

Spores. Basidiospores oblong ellipsoid, colorless, thin-walled, smooth, IKI−, CB−, 7–11 × 3.8–5 µm, L = 8.43 µm, W = 4.23 µm, Q = 1.99 (n = 30/1) (*Cui 16579*).

Notes. Specimens of *Phaeolus fragilis* formed a highly-supported lineage (Figs. 1, 2) closely related to *P. schweinitzii*. Morphologically, both *P. fragilis* and *P. schweinitzii* have clay-buff to dark reddish brown pileal surface when dry, but *P. schweinitzii* differs in having smaller basidiospores (6–9 × 4.5–5 µm; Ryvarden and Gilbertson 1994). *Phaeolus fragilis* and *P. sharmae* share similar-sized pores, but *P. sharmae* differs by having sessile basidiocarps, ellipsoid to ovoid basidiospores (6–11 × 6–7.8 µm), and grows on *Abies densa* at high altitude in the Himalayas (Buyck et al. 2022).

Wolfiporia Ryvarden & Gilb., Mycotaxon 19: 141, 1984.
MycoBank: MB 25605

Type species: *Wolfiporia cocos* (F.A. Wolf) Ryvarden & Gilb.

Diagnosis: Basidiocarps annual, resupinate, corky to fragile. Pore surface cream, ash grey to cinnamon brown to buff; pores round. Subiculum cream to cinnamon brown to buff, corky. Tubes cream to buff, corky to fragile. Hyphal system dimitic; generative hyphae simple septate; skeletal IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong-ellipsoid to cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Wolfiporia* was introduced by Ryvarden and Gilbertson (1984) to accommodate the type species *Poria cocos* F.A. Wolf. *Wolfiporia cocos* was distinguished by the production of large sclerotia. It is an edible fungus in North America, and is used in traditional medicine in Asia and in certain pharmacological studies (Wang et al. 2012). Wu et al. (2020) confirmed that the widely cultivated "Fuling" *Pachyma hoelen* Fr. in East Asia is not conspecific with the North American *Wolfiporia cocos*, and proposed to use *Pachyma* Fr. rather than *Wolfiporia*, but given the greater use and greater number of names, Stalpers et al. (2021) recommend *Wolfiporia* for protection.

In this study, *Wolfiporia cocos* and *W. hoelen* formed a well-supported lineage (100% MP, 97% ML, 1.00 BPP in Fig. 1; 98% MP, 97% ML, 1.00 BPP in Fig. 2), which was distant from *Laetiporus* and *Wolfiporiella*, and closely related to *Melanoporella* and *Phaeolus*. However, *Melanoporella* usually with radially fine-strigose and fimbriate, pale grayish brown to purplish black pore surface and the tissue blackening with a slight yellowish-brown stain in KOH (Murrill 1907); *Phaeolus* has a monomitic hyphal system with gloeopleurous tramal hyphae (Ryvarden and Melo 2014). Three species are accepted in *Wolfiporia*, including *W. cocos*, *W. hoelen* and *W. pseudococos*.

Specimens examined: ***Wolfiporia hoelen***. **CHINA**. Guangxi Autonomous Region, Baise, Baise Uprising Memorial Park, on stump of *Pinus* sp., 1 July 2019, *Dai 20034*, *20036*, *20041* (BJFC). ***Wolfiporia pseudococos***. **CHINA**. Hainan Province, Ledong County, Jianfengling Nature Reserve, on dead angiosperm tree, 1 June 2015, *Dai 15269* (BJFC, holotype).

Piptoporellaceae B.K. Cui, Shun Liu & Y.C. Dai, **fam. nov.**
MycoBank: 842480

Type genus: *Piptoporellus* B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual, pileate, substipitate, corky or soft fibrous. Hymenophores poroid. Hyphal system dimitic; generative hyphae clamped. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Recent studies have shown that *Piptoporellus* falls outside the Fomitopsidaceae, and its relations with other brown-rot fungi of the Polyporales remain unresolved (Han et al. 2016; Justo et al. 2017; Shen et al. 2019), furthermore, its classification at family level was treated as *incertae sedis* (He et al. 2019).

In the current phylogenetic analyses, species of *Piptoporellus* grouped together and formed a single lineage with high support (100% MP, 100% ML, 1.00 BPP in Fig. 1; 97% MP, 95% ML, 1.00 BPP in Fig. 2) in the antrodia clade of Polyporales, but it could not be placed in any recognized family. Morphologically, it was characterized by pileate to substipitate and corky or soft fibrous basidiocarps with a cream, buff, cinnamon brown to orange pileal surface; a dimitic hyphal system; thick-walled skeletal hyphae with a distinct wide lumen; cylindrical to ellipsoid basidiospores and associated with a brown wood rot (Han et al. 2016). *Piptoporellus* spp. Have different morphology from any of the presently known families of the Polyporales, thus, a new family is proposed to accommodate this genus. Currently, only one genus is accepted in the Piptoporellaceae.

Piptoporellus B.K. Cui, M.L. Han & Y.C. Dai, Fungal Diversity 80: 361, 2016.
MycoBank: MB 812653

Type species. *Piptoporellus soloniensis* (Dubois) B.K. Cui, M.L. Han & Y.C. Dai.

Diagnosis: Basidiocarps annual, pileate, substipitate, corky or soft fibrous. Pileal surface cream, buff, cinnamon brown to orange. Pore surface cream, buff, yellow to light brown; pores round to angular. Context cream to pinkish buff, corky or soft fibrous. Tubes concolorous with pore surface, fibrous to fragile. Hyphal system dimitic; generative hyphae clamped; skeletal hyphae IKI−, CB−; generative hyphae and skeletal hyphae mostly dissolved in KOH. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical to ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Piptoporellus*, see Han et al. (2016).

Notes. *Piptoporellus* was established by Han et al. (2016) and typified by *P. soloniensis*, three species of *Piptoporellus* were accepted in their study. Tibuhwa et al. (2020) proposed *Piptoporellus baudonii* (Pat.) Tibuhwa, Ryvarden & S. Tibell as a new combination based on morphological and molecular features. In this study, *Piptoporellus* spp. formed a highly supported monophyletic lineage, which was closely related to Fomitopsidaceae (Figs. 1, 2). Morphologically, it differs from species of Fomitopsidaceae by corky or soft-fibrous basidiocarps with a cream, buff, cinnamon brown to orange pileal surface, moreover, its skeletal hyphae are thick-walled with a distinctly wide lumen and mostly dissolved in KOH (Han et al. 2016). Four species are accepted in *Piptoporellus*, including *P. baudonii*, *P. hainanensis* M.L. Han, B.K. Cui & Y.C. Dai, *P. soloniensis* and *P. triqueter* M.L. Han, B.K. Cui & Y.C. Dai.

Specimens examined: ***Piptoporellus hainanensis***. **CHINA**. Hainan Province, Ledong County, Jianfengling Nature Reserve, on angiosperm stump, 17 June 2014, *Dai 13714* (holotype, BJFC), *Dai 13725* (paratype, BJFC). ***Piptoporellus soloniensis***. **CHINA**. Fujian Province, Fuzhou, Fuzhou Botanical Garden, on dead angiosperm tree, 28 October 2013, *Dai 11386* (BJFC). Shandong Province, Pingyi County, Dawa Forest Park, on living tree of *Castanea* sp., 26 August 2015, *Cui 12421*, *12422*, *12423*, *12424* (BJFC); Zaozhuang, Taierzhuang Ancient Town Scenic Spot, on living tree of *Quercus* sp., 14 August 2018, *Cui 16932* (BJFC). ***Piptoporellus triqueter***. **CHINA**. Guangdong Province, Fengkai County, Heishiding Nature Reserve, on fallen angiosperm trunk, 21 October 2014, *Cui 17199*, *17200* (BJFC). Yunnan Province, Yingjiang County, Tongbiguan Nature Reserve, on fallen trunk of *Castanopsis* sp., 29 October 2012, *Dai 13121* (holotype, BJFC).

Postiaceae B.K. Cui, Shun Liu & Y.C. Dai, **fam. nov.**
MycoBank: MB 840347

Type genus: *Postia* Fr.

Diagnosis: Basidiocarps annual, stipitate, pileate or effused-reflexed to resupiante, corky, fragile to woody hard when dry. Hymenophores poroid. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia occasionally present, cystidioles present or absent. Basidiospores allantoid to cylindrical to oblong to ellipsoid, colorless, thin- to thick-walled, smooth, IKI−, occasionally CB+. Causing a brown rot.

Genera: *Amaropostia*, *Amylocystis* Bondartsev & Singer, *Aurantipostia* B.K. Cui & Shun Liu, *Austropostia* B.K. Cui & Shun Liu, *Calcipostia* B.K. Cui, L.L. Shen & Y.C. Dai, *Cyanosporus* McGinty, *Cystidiopostia* B.K. Cui, L.L. Shen & Y.C. Dai, *Fuscopostia* B.K. Cui, L.L. Shen & Y.C. Dai, *Jahnoporus* Nuss, *Nothofagiporus* B.K. Cui & Shun Liu, *Oligoporus* Bref., *Osteina* Donk, *Postia*, *Ptychogaster* Corda, *Spongiporus* Murrill, *Tenuipostia* B.K. Cui & Shun Liu.

Notes. Phylogenetically, species of *Postia* s.l. grouped together and formed a single lineage with moderate to high support (93% MP, 94% ML, 1.00 BPP in Fig. 1; 92% MP, 89% ML, 1.00 BPP in Fig. 2). Our results were consistent with previous phylogenetic studies of *Postia* s.l. (Pildain and Rajchenberg 2013; Justo et al. 2017; Shen et al. 2019). Based on morphological characters and molecular evidence, a new family Postiaceae is established for *Postia* s.l. In this study, 16 genera are accepted in Postiaceae, including four new genera, viz., *Austropostia*, *Aurantipostia*, *Nothofagiporus* and *Tenuipostia*.

Key to genera of Postiaceae

1. Basidiocarps mostly with blue tint……*Cyanosporus*
1. Basidiocarps without blue tint……………………..2
2. Pileal surface and pore surface turning brownish when bruised………………………………….*Fuscopostia*
2. Pileal surface and pore surface unchanged when bruised……………………………………………..3
3. Basidiocarps with calcareous texture…...*Calcipostia*
3. Basidiocarps without calcareous texture……………4
4. Basidiospores allantoid to cylindrical………………5

4. Basidiospores oblong, ellipsoid, fusoid to navicular11
5. Cystidia encrusted…………………………………...6
5. Cystidia absent, or not encrusted if present…………..7
6. Generative hyphae IKI+…………………..*Amylocystis*
6. Generative hyphae IKI−……………...*Cystidiopostia*
7. Basidiocarps woody hard or bone hard when dry…….8
7. Basidiocarps corky or fragile when dry……………..9
8. Basidiocarps sessile; taste bitter…………*Amaropostia*
8. Basidiocarps effused-reflexed to pileate or stipitate; taste mild……………………………………*Osteina*
9. Basidiocarps usually imbricate; basidiospores mostly 2–3 µm in width…………………………*Spongiporus*
9. Basidiocarps usually solitary; basidiospores mostly < 2 µm in width……………………………..10
10. Pileal surface usually with dark hairs or veins; hyphae swollen in KOH………………………*Nothofagiporus*
10. Pileal surface usually without dark hairs or veins; hyphae unchanged in KOH……………………*Postia*
11. Basidiocarps resupinate; basidiospores strongly CB+……………………………………*Oligoporus*
11. Basidiocarps mostly pileate, effused-reflexed; basidiospores CB−………………………………………..12
12. Chlamydospores absent……………………………13
12. Chlamydospores present……………….*Ptychogaster*
13. Basidiocarps stipitate……………………*Jahnoporus*
13. Basidiocarps sessile or effused-reflexed……………..14
14. Basidiocarps thin, corky when dry………*Tenuipostia*
14. Basidiocarps thick, brittle to hard corky or woody hard…15
15. Pileal surface pale-buff to apricot orange……………… ………………………………………...*Aurantipostia*
15. Pileal surface white, cream to cinnamon brown to buff……………………………………*Austropostia*

Amaropostia B.K. Cui, L.L. Shen & Y.C. Dai, Persoonia 42: 110, 2018.

MycoBank: MB 819256

Type species: *Amaropostia stiptica* (Pers.) B.K. Cui, L.L. Shen & Y.C. Dai.

Diagnosis: Basidiocarps annual, sessile, soft corky when fresh, woody hard when dry, taste bitter. Pileal surface white, cream to buff. Pore surface white, cream or with yellowish tint; pores round to angular. Context white, woody hard. Tubes white to cream, brittle. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Amaropostia*, see Shen et al. (2019).

Notes. *Amaropostia* was established by Shen et al. (2019) with *A. stiptica* as the type species. Morphologically, it differs from *Postia* s.s. by woody hard basidiocarps when dry, relatively small pores, bitter taste, and cylindrical basidiospores. Currently, two species are accepted in *Amaropostia*, including *A. hainanensis* B.K. Cui, L.L. Shen & Y.C. Dai and *A. stiptica*.

Specimens examined: ***Amaropostia hainanensis***. **CHINA**. Hainan Province, Lingshui County, Diaoluoshan Forest Park, on fallen angiosperm branch, 22 November 2007, *Cui 5367* (BJFC); Qiongzhong County, Limushan Forest Park, on fallen angiosperm branch, 30 May 2015, *Dai 15208* (BJFC). ***Amaropostia stiptica***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on stump of *Picea* sp., 18 October 2019, *Dai 21033* (BJFC). **CHINA**. Sichuan Province, Longhua, on fallen trunk of *Cunninghamia* sp., 20 September 2019, *Cui 17938* (BJFC). Yunnan Province, Chuxiong, Wuding County, Shizishan Nature Reserve, on fallen trunk of *Pinus* sp., 15 August 2019, *Dai 20323* (BJFC); Gongshan County, on fallen angiosperm trunk, 12 September 2020, *Cui 18469* (BJFC); Jianchuan County, Shibao Mountain, on stump of *Pinus* sp., 5 November 2019, *Cui 18013* (BJFC).

Amylocystis Bondartsev & Singer ex Singer, Mycologia 36 (1): 66, 1944.

MycoBank: MB 17065

Type species: *Amylocystis lapponica* (Romell) Bondartsev & Singer.

Diagnosis: Basidiocarps annual, pileate or effused-reflexed, corky. Pileal surface light buff, dirty whitish to dark reddish. Pore surface white to dark reddish brown; pores angular. Context pale buff, corky. Tubes slightly darker than the context, corky. Hyphal system monomitic; generative hyphae clamped, IKI+, CB−. Cystidia present, cystidioles present or absent. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Morphologically, *Amylocystis* is similar to *Oligoporus*, but it has a tomentose to hispid pileal surface, a monomitic hyphal system with amyloid and thick-walled generative hyphae, and amyloid, apically encrusted cystidia (Singer 1944; Ryvarden and Melo 2014). Only one species, *Amylocystis lapponica*, is accepted in this genus.

Specimen examined: ***Amylocystis lapponica***. **CHINA**. Heilongjiang Province, Huzhong County, Huzhong Nature Reserve, on fallen trunk of *Larix* sp., 9 August 2015, *Dai 4771* (IFP). Jilin Province, Antu County, Changbaishan

Nature Reserve, on fallen trunk of *Picea* sp., 18 September 1998, *Dai 2973b* (BJFC).

Aurantipostia B.K. Cui & Shun Liu, **gen. nov.**
MycoBank: MB 840348

Etymology. *Aurantipostia* (Lat.): refers to the new genus resembling *Postia* but with aurantia-colored fruiting body.

Type species: *Aurantipostia macrospora* B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate or effused-reflexed, corky to woody hard. Pileal surface pale-buff to apricot orange. Pore surface cream to orange-yellow; pores round to angular. Context cream, corky. Tubes concolorous with pore surface, corky to woody hard. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Aurantipostia* is characterized by its flabelliform to irregular pileus, pale-buff to apricot orange pileal surface and cream to orange-yellow pore surface, ellipsoid and thin-walled basidiospores.

In the current phylogenetic analyses, specimens of *Aurantipostia* formed a well-supported clade distinct from *Postia* s.s. (Fig. 4). Morphologically, *Postia* differs from *Aurantipostia* by its white or greyish to pale greyish brown pileal surface, allantoid to cylindrical and thin-walled basidiospores (Jülich 1982; Wei and Dai 2006; Shen et al. 2015). Phylogenetically, *Nothofagiporus* and *Ptychogaster* are closely related to *Aurantipostia* (Fig. 4), but *Nothofagiporus* differs by having clay-buff to vinaceous grey pileal surface, white to buff pore surface and allantoid basidiospores; *Ptychogaster* differs by having soft, corky to fragile basidiocarps, white to cream pileal surface, white to buff pore surface and ellipsoid basidiospores. In this study, *Aurantipostia* is proposed as a new genus based on phylogenetic analyses and morphological characters. Only one species, *Aurantipostia macrospora*, is accepted in this genus.

Aurantipostia macrospora B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6a–b, 18).
MycoBank: MB 840349

Type. **AUSTRALIA**. Tasmania, Hobart, Mount Wellington, on dead part of living of *Eucalyptus* sp., 13 May 2018, *Cui 16604* (holotype, BJFC).

Etymology. *Macrospora* (Lat.): refers to the large basidiospores.

Fruiting body. Basidiocarps annual, pileate or effused-reflexed, solitary, corky, without odor or taste when fresh, hard corky and light in weight when dry. Pileus flabelliform to irregular, projecting up to 5.5 cm, 8.5 cm wide, and 3.5 cm thick at base. Pileal surface buff to buff-yellow when fresh, becoming lemon-chrome to apricot orange upon drying,

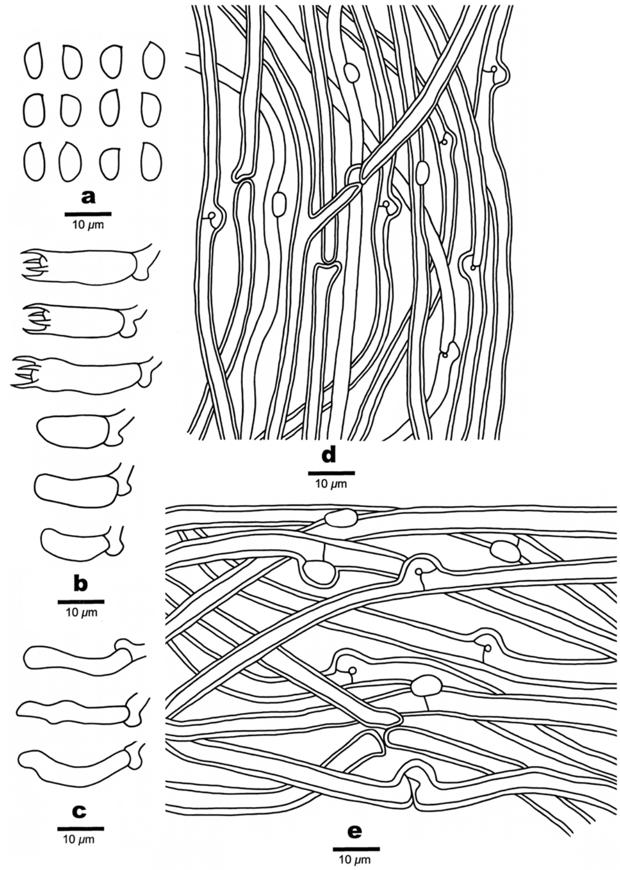

Fig. 18 Microscopic structures of *Aurantipostia macrospora* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a**–**e** = 10 μm

glabrous when dry; margin obtuse. Pore surface cream to pinkish buff when fresh, becoming buff to orange-yellow upon drying; sterile margin cream to buff, up to 2 mm wide; pores round to angular, 3–4 per mm; dissepiments slightly thick, entire to lacerate. Context cream, corky, up to 1.8 cm thick. Tubes concolorous with pore surface, corky to woody hard, up to 1.7 cm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae colorless, slightly thick-walled with a wide lumen, occasionally branched, loosely interwoven, 3–7.8 μm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 2.9–7.8 μm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 9.7–24.5 × 2.9–4.5 μm. Basidia clavate, 4-sterigmate, clamped at base, 12–18 × 4–6 μm.

Spores. Basidiospores oblong ellipsoid to ellipsoid, colorless, thin- walled, smooth, IKI−, CB−, (6.8−)7–9.

8(−10) × (3.5−)4–4.9(−5) µm, L = 7.96 µm, W = 4.47 µm, Q = 1.73–1.84 (n = 90/3) (*Cui 16604*, *16634* and *16671*).

Additional specimens (paratypes) examined: **AUSTRALIA**. Tasmania, Hobart, Mount Wellington, on dead part of living of *Eucalyptus* sp., 13 May 2018, *Cui 16634* (BJFC); Timbs Track, on fallen trunk of *Eucalyptus* sp., 14 May 2018, *Cui 16671* (BJFC); Mount Field Forest, close to Mount National Park, on fallen trunk of *Eucalyptus* sp., 14 May 2018, *Dai 18736* (BJFC).

Austropostia B.K. Cui & Shun Liu, **gen. nov.**

MycoBank: MB 840350

Etymology. *Austropostia* (Lat.): refers to this genus resembling *Postia* and distribution in Australia.

Type species: *Austropostia pelliculosa* (Berk.) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate, rarely effused-reflexed, solitary or imbricate, fleshy or corky when fresh, brittle to hard corky when dry. Pileal surface white, cream to cinnamon brown to buff. Pore surface cream, lemon yellow to clay buff; pores round to angular. Context white to lemon yellow, corky. Tubes concolorous with pore surface, corky. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong to ellipsoid, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. Phylogenetically, species of *Austropostia* formed a well-supported lineage, distant from *Postia* s.s. and other related genera within Postiaceae (Fig. 4).

Morphologically, genera in Postiaceae, such as *Amaropostia*, *Calcipostia*, *Cyanosporus*, *Cystidiopostia*, *Fuscopostia*, *Oligoporus*, *Postia*, *Spongiporus* and the new genus *Austropostia*, have annual growth habit, a monomitic hyphal system with clamped generative hyphae. But *Amaropostia* differs from *Austropostia* by its small pores and cylindrical basidiospores (Shen et al. 2019); *Calcipostia* differs from *Austropostia* by its circular guttulate depressions on the pileal surface and short-cylindrical to oblong basidiospores (Shen et al. 2019); *Cyanosporus* differs from *Austropostia* by its blue-tinted basidiocarps and narrow, allantoid to cylindrical basidiospores (McGinty 1909; Shen et al. 2019; Liu et al. 2021b); *Cystidiopostia* differs from *Austropostia* by its resupinate basidiocarps and presence of apically encrusted cystidia (Shen et al. 2019); *Fuscopostia* differs from *Austropostia* by its white, cream to brownish pore surface and cylindrical to allantoid basidiospores (Shen et al. 2019); *Oligoporus* differs from *Austropostia* by its resupinate basidiocarps and subglobose to ellipsoidal chlamydospores occasionally present (Erkkilä and Niemelä 1986; Renvall 1992); *Postia* differs from *Austropostia* by its allantoid to cylindrical basidiospores (Shen et al. 2015, 2019); *Spongiporus* differs from *Austropostia* by its whitish to buff pore surface, and cylindrical to allantoid basidiospores (Murrill 1905; David 1980).

In this study, *Austropostia* is proposed as a new genus based on phylogenetic analyses and morphological characters. Six species are accepted in *Austropostia*, including *A. brunnea*, *A. hirsuta*, *A. plumbea*, *A. subpunctata*, *A. pelliculosa* and *A. punctata*.

Austropostia hirsuta B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6c–d, 19)

MycoBank: MB 840351

Differs from other *Austropostia* spp. by its hirsute, greyish brown to brown pileal surface when fresh, clay-buff to fawn upon drying.

Type. **AUSTRALIA**. Tasmania, Hobart, Mount Wellington, on fallen trunk of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16660* (holotype, BJFC).

Etymology. *Hirsuta* (Lat.): refers to the hirsute pileal surface.

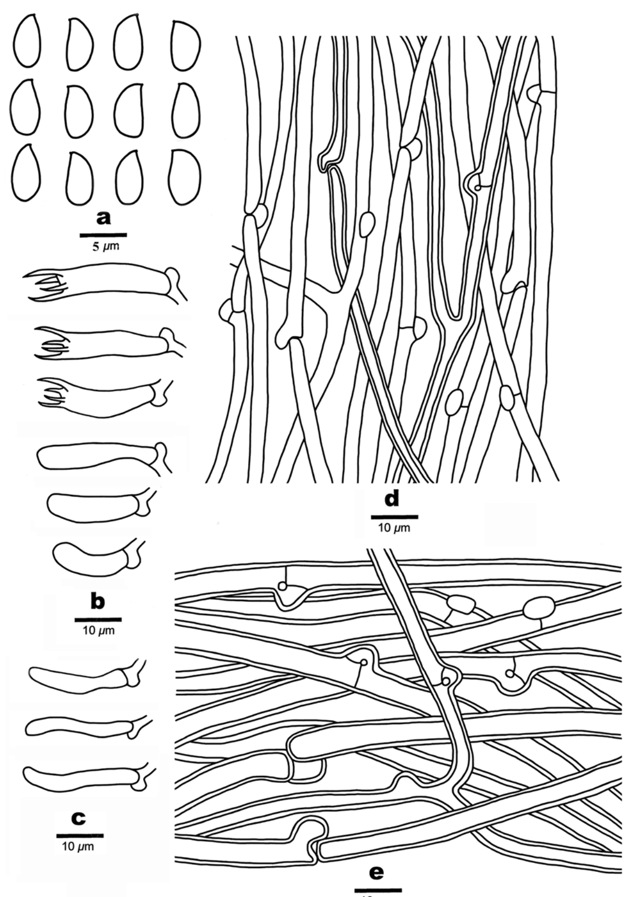

Fig. 19 Microscopic structures of *Austropostia hirsuta* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Fruiting body. Basidiocarps annual, pileate, solitary, soft corky when fresh, corky to slightly fragile when dry. Pileus flabelliform to semicircular, projecting up to 4.5 cm, 6 cm wide, and 1.2 cm thick at base. Pileal surface greyish brown to brown when fresh, hirsute, becoming clay-buff to fawn upon drying; margin acute. Pore surface white to cream when fresh, becoming buff to clay-buff upon drying; sterile margin narrow, concolorous with pore surface; pores angular, 3–6 per mm; dissepiments thin, entire to slightly lacerate. Context buff to buff yellow, corky, up to 1 cm thick. Tubes white to cream, corky to fragile, up to 5 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, loosely interwoven, 3–7.2 µm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 1.9–5.5 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 17.2–25.3 × 2.7–4.5 µm. Basidia clavate, 4-sterigmate, clamped at base, 19.5–35.5 × 4.5–7.5 µm.

Spores. Basidiospores oblong ellipsoid, colorless, thin-walled, smooth, occasionally bearing one guttule, IKI−, CB−, (5−)5.5–6.1(−6.5) × (2.5−)2.9–3.7(−3.9) µm, L = 5.75 µm, W = 3.12 µm, Q = 2.10–2.48 (n = 150/5) (*Cui 16625*, *16660*, *16,661*, *16662* and *16693*).

Notes. Phylogenetically, specimens of *Austropostia hirsuta* formed a highly supported lineage (Fig. 4). Morphologically, *A. hirsuta* and *A. pelliculosa* share an annual growth habit, similar pore surface and pores, but *A. pelliculosa* differs in having red-brown to dark brown pileus surface, greyish brown context, thick-walled and colorless to pale yellow basidiospores (Buchanan and Hood 1992).

Additional specimens (paratypes) examined: **AUSTRALIA**. Tasmania, Hobart, Mount Wellington, on fallen trunk of *Eucalyptus* sp., 13 May 2018, *Cui 16603* (BJFC); on stump of *Eucalyptus* sp., 13 May 2018, *Cui 16621* (BJFC); on dead tree of *Eucalyptus* sp., 13 May 2018, *Cui 16625*, *16626* (BJFC); on base of living *Eucalyptus* sp., 13 May 2018, *Cui 16631* (BJFC); Timbs Track, on dead tree of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16647*, *16648*, *16662* (BJFC); on stump of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16661* (BJFC); The Look-in Look-out Track, on living tree of *Nothofagus cunninghamii*, 15 May 2018, *Cui 16693* (BJFC); on fallen trunk of *Nothofagus cunninghamii*, 15 May 2018, *Cui 16703* (BJFC); Arve River Streamside Reserve, on fallen trunk of *Eucalyptus* sp., 15 May 2018, *Cui 16728* (BJFC).

Austropostia plumbea B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6e–f, 20)
MycoBank: MB 840352

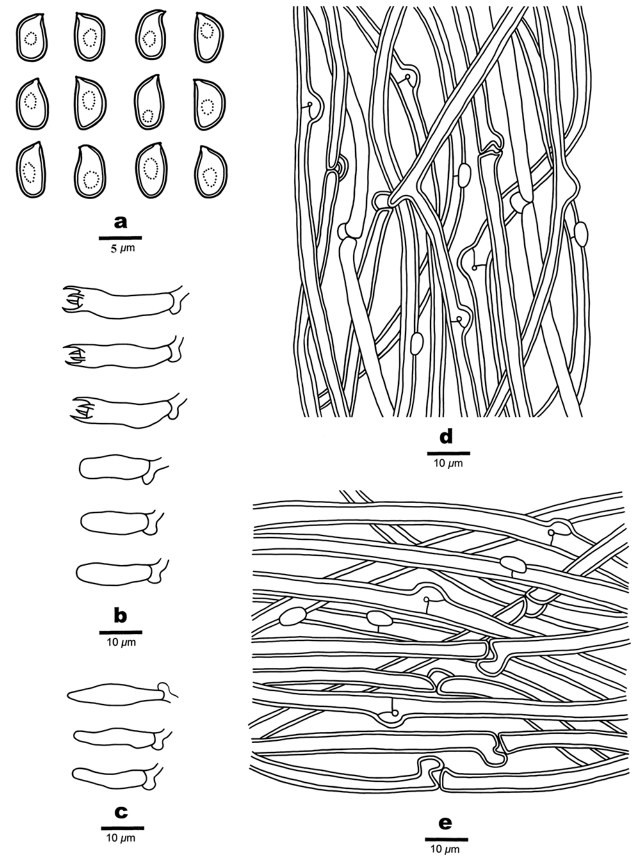

Fig. 20 Microscopic structures of *Austropostia plumbea* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Differs from other *Austropostia* spp. by its dark bluish grey pileal surface when fresh, greyish brown to vinaceous grey when dry, and slightly thick-walled basidiospores (6.2–7 × 3–3.8 µm).

Type. **AUSTRALIA**. Victoria, Yarra Ranges National Park, Cora Lynn Falls, on fallen trunk of *Eucalyptus* sp., 10 May 2018, *Cui 16550* (holotype, BJFC).

Etymology. *Plumbea* (Lat.): refers to the dark bluish grey pileal surface when fresh.

Fruiting body. Basidiocarps annual, pileate, solitary, soft corky, without odor or taste when fresh, becoming corky to fragile upon drying. Pileus dish-shaped to semicircular, projecting up to 2.3 cm, 3.2 cm wide, and 0.9 cm thick at base. Pileal surface dark bluish grey when fresh, hirsute, becoming greyish brown to vinaceous grey upon drying; margin acute, concolorous with pileal surface. Pore surface white to cream when fresh, becoming cream to buff upon drying; sterile margin narrow, cream, up to 1.2 mm wide; pores angular, 3–5 per mm; dissepiments thin, entire to slightly lacerate. Context vinaceous grey to pale mouse grey, corky, up to 4 mm thick. Tubes concolorous with pore surface, fragile, up to 3 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Context. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, loosely interwoven, 3–7.8 μm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 2–5.5 μm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 15.7–26.8 × 2.9–4.8 μm. Basidia clavate, 4-sterigmate, clamped at base, 17.5–31.5 × 4.3–6.2 μm.

Spores. Basidiospores oblong to ellipsoid, colorless, slightly thick-walled, smooth, usually bearing one guttule, IKI–, CB–, (5.9–)6.2–7(–7.3) × 3–3.8(–4) μm, L = 6.54 μm, W = 3.4 μm, Q = 1.82–2.18 (n = 60/2) (*Cui 16550* and *16639*).

Notes. Phylogenetically, specimens of *Austropostia plumbea* formed a highly supported lineage (Fig. 4) closely related to *A. pelliculosa*. Morphologically, both *A. plumbea* and *A. pelliculosa* have an annual growth habit, and a white to cream pore surface, but *A. pelliculosa* differs by having a red-brown to dark brown pileal surface, greyish brown context and smaller basidia (14–24 × 6–7.5 μm; Buchanan and Hood 1992).

Additional specimen (paratype) examined: **AUSTRALIA**. Tasmania, Timbs Track, on fallen trunk of *Eucalyptus* sp., 14 May 2018, *Cui 16639* (BJFC).

Austropostia subpunctata B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6g–h, 21)

MycoBank: MB 840353

Differs from other *Austropostia* spp. by its imbricate basidiocarps with a pale mouse grey to greyish brown pileal surface when fresh, pale vinaceous grey when dry, and thin-walled basidiospores (5.2–6.2 × 3–3.4 μm).

Type. **AUSTRALIA**. Tasmania, Mount Field National Park, on stump of *Eucalyptus* sp., 14 May 2018, *Cui 16675* (holotype, BJFC).

Etymology. *Subpunctata* (Lat.): refers to the morphological similarity to *Austropostia punctata* (Rajchenb. & P.K. Buchanan) B.K. Cui & Shun Liu.

Fruiting body. Basidiocarps annual, pileate, imbricate, corky when fresh, corky to woody hard when dry. Pileus flabelliform, projecting up to 4.5 cm, 8 cm wide, and 1.2 cm thick at base. Pileal surface pale mouse grey to greyish brown, undulate when fresh, pale vinaceous grey when dry, glabrous, margin slightly obtuse to acute. Pore surface cream to buff; sterile margin narrow, greyish brown, up to 0.5 mm wide; pores angular, 3–5 per mm; dissepiments thin, entire to slightly lacerate. Context white, woody hard, up to 1 cm thick. Tubes white to cream, corky, up to 2 cm long.

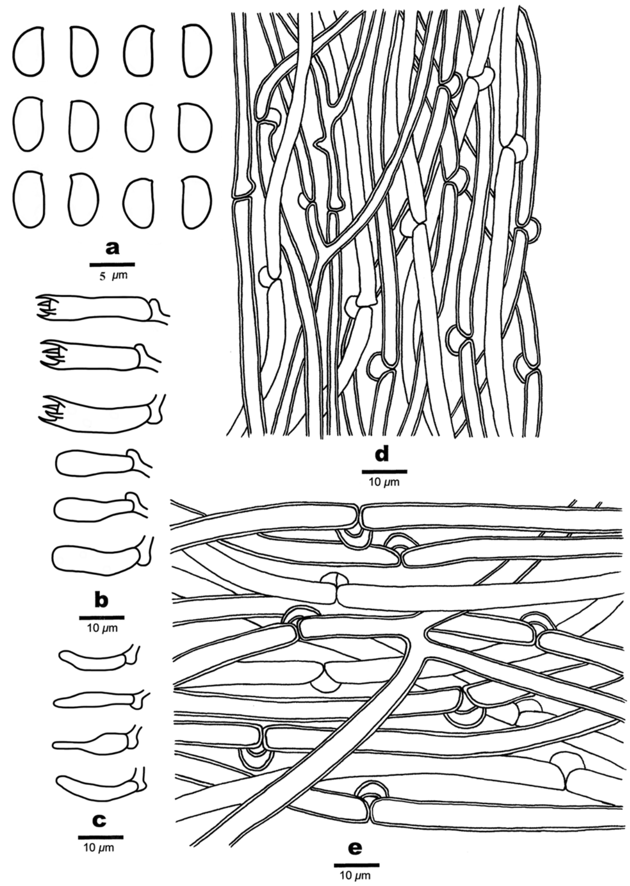

Fig. 21 Microscopic structures of *Austropostia subpunctata* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 μm; **b**–**e** = 10 μm

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Context. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, loosely interwoven, 3.3–9.8 μm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 1.9–5.5 μm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 9.7–24.5 × 2.9–4.5 μm. Basidia clavate, 4-sterigmate, clamped at base, 9–24 × 2–5 μm.

Spores. Basidiospores oblong to ellipsoid, colorless, thin-walled, smooth, IKI–, CB–, (4.9–)5.2–6.2(–6.6) × (2.8–)3–3.4(–3.6) μm, L = 5.77 μm, W = 3.12 μm, Q = 1.72–1.88 (n = 150/5) (*Cui 16528*, *16675*, *16685*, *16712* and *16723*).

Notes. Phylogenetically, specimens of *Austropostia subpunctata* formed a highly supported lineage (Fig. 4) and closely related to *A. punctata*. Morphologically, both *A. subpunctata* and *A. punctata* have an annual growth habit, imbricate basidiocarps and white context, but *A. punctata* differs in having "water-soaked" spots on the pileal surface, and larger pores (2–3 per mm) (Rajchenberg and Buchanan 1996).

Additional specimens (paratypes) examined: **AUSTRALIA**. Victoria, Marysville, Michaeldene trail, on fallen burnt wood of *Eucalyptus* sp., 9 May 2018, *Cui 16528* (BJFC); Tasmania, Mount Field National Park, on stump of *Eucalyptus* sp., 14 May 2018, *Cui 16685*, *16686* (BJFC); the Look-in Look-out Track, on living tree of *Eucalyptus* sp., 15 May 2018, *Cui 16712* (BJFC); Arve River Streamside Reserve, on stump of *Eucalyptus* sp., 15 May 2018, *Cui 16723* (BJFC).

Austropostia brunnea (Rajchenb. & P.K. Buchanan) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 842438

Basionym: *Postia brunnea* Rajchenb. & P.K. Buchanan, Australian Systematic Botany 9: 877, 1997.

For a detailed description of *Postia brunnea*, see Rajchenberg and Buchanan (1996).

Specimen examined: **AUSTRALIA**. Victoria, Yarra Ranges National Park, on charred wood of *Eucalyptus* sp., 9 May 2018, *Dai 18591A* (BJFC).

Austropostia pelliculosa (Berk.) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840354

Basionym: *Postia pelliculosa* (Berk.) Rajchenb., Sydowia 40: 248, 1988.

≡ *Tyromyces pelliculosus* (Berk.) G.H. Cunn., New Zealand DSIR bull. 164:124, 1965.

For a detailed description of *Postia pelliculosa*, see Buchanan and Hood (1992).

Austropostia punctata (Rajchenb. & P.K. Buchanan) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840355

Basionym: *Postia punctata* Rajchenb. & P.K. Buchanan, Australian Systematic Botany 9 (6): 880, 1996.

For a detailed description of *Postia punctata*, see Rajchenberg and Buchanan (1996).

Calcipostia B.K. Cui, L.L. Shen & Y.C. Dai, Persoonia 42: 111, 2018.

MycoBank: MB 819259

Type species: *Calcipostia guttulata* (Sacc.) B.K. Cui, L.L. Shen & Y.C. Dai.

Diagnosis: Basidiocarps annual, pileate or laterally substipitate, fleshy when fresh, fragile to hard fibrous when dry. Pileal surface white, buff to pale brown. Pore surface white, cream to pale buff; pores round to angular. Context white to cream, hard fibrous. Tubes cream, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores short-cylindrical to oblong, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Calcipostia*, see Shen et al. (2019).

Notes. *Calcipostia* was established by Shen et al. (2019) and typified by *C. guttulata*. Morphologically, *Calcipostia* differs from *Postia* s.s. by big basidiocarps with calcareous texture, circular guttulate depressions on the pileal surface, bitter taste, and short-cylindrical to oblong basidiospores (Shen et al. 2019). Only one species, *Calcipostia guttulata*, is accepted in this genus.

Specimens examined: ***Calcipostia guttulata***. **CHINA**. Yunnan Province, Lanping County, Tongdian, Luoguqing, on stump of *Pinus* sp., 19 September 2017, *Cui 16274* (BJFC); on fallen trunk of *Pinus* sp., 19 September 2017, *Cui 16281* (BJFC), 18 September 2018, *Cui 17150* (BJFC). **POLAND**. Opole, Stawmatmloy, on fallen trunk of *Fagus* sp., 4 October 2014, *Dai 14864* (BJFC).

Cyanosporus McGinty, Mycol. Notes (Cincinnati) 33: 436, 1909.

MycoBank: MB 819263

Type species: *Cyanosporus caesius* (Schrad.) McGinty.

Diagnosis: Basidiocarps annual, pileate or resupinate to effused-reflexed, soft corky when fresh, corky to fragile when dry. Pileal surface white, cream, to greyish brown, usually with blue tint. Pore surface white to cream, frequently bluish; pores round to angular. Context white to cream, corky. Tubes cream, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia usually absent, cystidioles occasionally present. Basidiospores narrow, allantoid to cylindrical, colorless, usually slightly thick-walled, smooth, IKI−, weakly CB+. Causing a brown rot.

Notes. The name *Cyanosporus* was proposed in 1909 as a monotypic genus for *Polyporus caesius* (Schrad.) Fr. (McGinty 1909), but it was not accepted in subsequent studies (Donk 1960; Jahn 1963; Lowe 1975). Then the *Postia caesia* complex was mentioned based on recent molecular phylogenetic studies (Ţura et al. 2008; Miettinen et al. 2018). Papp (2014) proposed the combination *Postia* subg. *Cyanosporus* (McGinty) V. Papp for the *Postia caesia* complex. Recent phylogenetic studies supported *Cyanosporus* as an independent genus (Shen et al. 2019; Liu et al. 2021b; 2022b). The current multiple loci study also confirms *Cyanosporus* as an independent genus which contains the *Postia caesia* complex. Currently, 35 species are accepted in *Cyanosporus*, *C. alni* (Niemelä & Vampola) B.K. Cui, L.L. Shen & Y.C. Dai, *C. arbuti* (Spirin) B.K. Cui & Shun Liu, *C. auricomus* (Spirin & Niemelä) B.K. Cui & Shun Liu, *C. bifarius* (Spirin) B.K. Cui & Shun Liu, *C. bubalinus* B.K. Cui & Shun Liu, *C. caesiosimulans* (G.F. Atk.) B.K. Cui & Shun Liu, *C. caesius* (Schrad.) McGinty, *C. coeruleivirens* (Corner) B.K. Cui, Shun Liu & Y.C. Dai, *C. comatus* (Miettinen) B.K. Cui & Shun Liu, *C. cyanescens* (Miettinen) B.K.

Cui & Shun Liu, *C. flavus* B.K. Cui & Shun Liu, *C. fusiformis* B.K. Cui, L.L. Shen & Y.C. Dai, *C. glaucus* (Spirin & Miettinen) B.K. Cui & Shun Liu, *C. gossypinus* (Moug. & Lév.) B.K. Cui & Shun Liu, *C. hirsutus* B.K. Cui & Shun Liu, *C. livens* (Miettinen & Vlasák) B.K. Cui & Shun Liu, *C. luteocaesius* (A. David) B.K. Cui, L.L. Shen & Y.C. Dai, *C. magnus* (Miettinen) B.K. Cui & Shun Liu, *C. mediterraneocaesius* (M. Pieri & B. Rivoire) B.K. Cui, L.L. Shen & Y.C. Dai, *C. microporus* B.K. Cui, L.L. Shen & Y.C. Dai, *C. nothofagicola* B.K. Cui, Shun Liu & Y.C. Dai, *C. piceicola* B.K. Cui, L.L. Shen & Y.C. Dai, *C. populi* (Miettinen) B.K. Cui & Shun Liu, *C. rigidus* B.K. Cui & Shun Liu, *C. simulans* (P. Karst.) B.K. Cui & Shun Liu, *C. subcaesius* (A. David) B.K. Cui, L.L. Shen & Y.C. Dai, *C. subhirsutus* B.K. Cui, L.L. Shen & Y.C. Dai, *C. submicroporus* B.K. Cui & Shun Liu, *C. subungulatus* B.K. Cui & Shun Liu, *C. subviridis* (Ryvarden & Guzmán) B.K. Cui & Shun Liu, *C. tenuicontextus* B.K. Cui & Shun Liu, *C. tenuis* B.K. Cui, Shun Liu & Y.C. Dai, *C. tricolor* B.K. Cui, L.L. Shen & Y.C. Dai, *C. ungulatus* B.K. Cui, L.L. Shen & Y.C. Dai and *C. yanae* (Miettinen & Kotir.) B.K. Cui & Shun Liu.

Specimens examined: ***Cyanosporus alni***. **CHINA**. Guizhou Province, Suiyang County, Kuankuoshui Nature Reserve, on fallen angiosperm trunk, 26 June 2014, *Dai 15060* (BJFC). Hebei Province, Xinglong County, Wulingshan Nature Reserve, on fallen angiosperm trunk, 29 August 2009, *Cui 7185* (BJFC). ***Cyanosporus caesius***. **FINLAND**. Uusimaa, Vantaa, Tamisto Nature Reserve, on fallen trunk of *Picea* sp., 3 November 2011, *Dai 12605* (BJFC). **SPAIN**. Cadiz, Sierra Grazalema Natural Park, on fallen trunk of *Abies* sp., 22 November 2005, *Dai 7438* (BJFC). ***Cyanosporus subcaesius***. **FINLAND**. Uusimaa, Helsinki, Arabia, on angiosperm stump, 23 November 1996, *Dai 2345* (IFP); Vantaa, on fallen trunk of *Prunus* sp., 4 October 1997, *Dai 2725* (IFP). ***Cyanosporus tricolor***. **CHINA**. Xizang Autonomous Region (Tibet), Motuo County, on fallen branch of *Abies* sp., 20 September 2014, *Cui 12233* (holotype, BJFC). Sichuan Province, Luding County, Hailuogou Forest Park, on fallen trunk of *Abies* sp., 20 October 2012, *Cui 10790* (BJFC). ***Cyanosporus ungulatus***. **CHINA**. Sichuan Province, Mianning County, Lingshan Temple, on fallen branch of *Castanopsis* sp., 17 September 2012, *Dai 12897* (BJFC); Luding County, Hailuogou Forest Park, on fallen trunk of *Abies* sp., 20 October 2012, *Cui 10778* (BJFC).

Cystidiopostia B.K. Cui, L.L. Shen & Y.C. Dai, Persoonia 42: 118, 2018.

MycoBank: MB 819279

Type species: *Cystidiopostia hibernica* (Berk. & Broome) B.K. Cui, L.L. Shen & Y.C. Dai.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed, or pileate, soft when fresh, fragile when dry. Pileal surface white, cream to buff. Pore surface white, cream or with yellowish tint; pores round to angular. Context white, soft corky. Tubes white to cream, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia or cystidioles absent. Basidiospores allantoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Cystidiopostia*, see Shen et al. (2019).

Notes. *Cystidiopostia* was established by Shen et al. (2019) with *C. hibernica* as the type species. It is morphologically separated from *Postia* s.s. by mostly having resupinate basidiocarps and presence of apically encrusted cystidia. Four species are accepted in *Cystidiopostia*, including *C. hibernica*, *C. inocybe* (A. David & Malençon) B.K. Cui, L.L. Shen & Y.C. Dai, *C. pileata* (Parmasto) B.K. Cui, L.L. Shen & Y.C. Dai and the new species *C. subhibernica*.

Specimens examined: ***Cystidiopostia hibernica***. **CHINA**. Jilin Province, Antu county, Changbaishan Nature Reserve, Huangsongpu, on fallen branch of *Acer* sp., 21 September 2019, *Dai 20862* (BJFC). Sichuan Province, Xichang, Luojishan Park, on fallen branch of *Alnus*, 17 August 2019, *Cui 17624* (BJFC). ***Cystidiopostia pileata***. **CHINA**. Jilin Province, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Abies* sp., 9 August 2011, *Cui 10034* (BJFC). Yunnan Province, Binchuan County, Jizu Mountain, on rotten wood of *Juniperus* sp., 6 September 2018, *Dai 19324* (BJFC).

Cystidiopostia subhibernica B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6i, 22)

MycoBank: MB 840356

Differs from other *Cystidiopostia* spp. by its buff, pale yellowish brown to yellowish brown pore surface when dry, slightly thick-walled generative hyphae dominant in tubes, and allantoid basidiospores (3.9–4.2 × 1–1.4 µm).

Type. **CHINA**. Yunnan Province, Shangri-La, on fallen trunk of *Pinus* sp., 17 September 2018, *Cui 17095* (holotype, BJFC).

Etymology. *Subhibernica* (Lat.): refers to the new species being morphologically similar to *Cystidiopostia hibernica*.

Fruiting body. Basidiocarps annual, resupinate to effused-reflexed, soft corky, without odor or taste when fresh, corky upon drying, up to 3 cm long, 4.5 cm wide, 3 mm thick at center. Pore surface white to cream when fresh, becoming buff, pale yellowish brown to yellowish brown when dry; sterile margin just present; pores round to angular, 4–6 per mm; dissepiments thin, entire to lacerate. Subiculum cream to buff, up to 1.5 mm thick. Tubes concolorous with pore surface, corky, up to 7.2 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Subiculum. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, unbranched, loosely interwoven, 3.2–6 µm in diam.

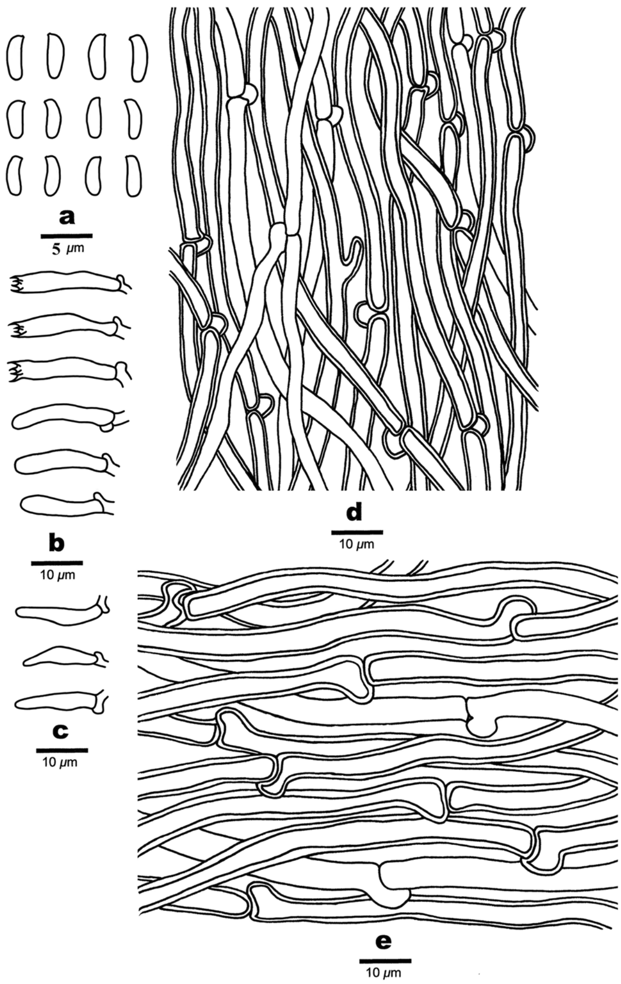

Fig. 22 Microscopic structures of *Cystidiopostia subhibernica* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Tubes. Generative hyphae colorless, thin- to slightly thick-walled, occasionally branched, loosely interwoven, 1.8–4 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 13.2–20.5 × 2–3.2 µm. Basidia clavate, 4-sterigmate, clamped at base, 12.5–22.5 × 3.8–4.7 µm.

Spores. Basidiospores allantoid, colorless, thin-walled, smooth, IKI−, CB−, 3.9–4.2(−4.4) × 1–1.4(−1.5) µm, L = 4.1 µm, W = 1.18 µm, Q = 3.49 (n = 60/2) (*Cui 17095* and *17621*).

Notes. Phylogenetically, specimens of *Cystidiopostia subhibernica* formed a highly-supported lineage (Fig. 4), closely related to *C. hibernica*. Morphologically, both *C. subhibernica* and *C. hibernica* have an annual growth habit, white to cream pore surface when fresh and similar pores (4–5 per mm; Ryvarden and Melo 2014), but *C. hibernica* differs in having thin-walled generative hyphae in the trama, smaller basidia (10–12 × 3–4 µm) and longer basidiospores (4.9–5.5 × 1–1.2 µm; Ryvarden and Melo 2014).

Additional specimen (paratype) examined: **CHINA**. Yunnan Province, Yuxi, Xinping County, Mopanshan Forest Park, on fallen branch of *Pinus* sp., 15 June 2017, *Dai 17621* (BJFC).

Fuscopostia B.K. Cui, L.L. Shen & Y.C. Dai, Persoonia 42: 118, 2018.
MycoBank: MB 819283
Type species. *Fuscopostia fragilis* (Fr.) B.K. Cui, L.L. Shen & Y.C. Dai.

Diagnosis: Basidiocarps annual, resupinate, effused-reflexed or pileate, soft when fresh, fragile when dry. Pileal surface white, cream to brownish. Pore surface whitish, buff to rusty brown; pores round to angular. Context white, corky. Tubes brownish, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical to allantoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Fuscopostia*, see Shen et al. (2019).

Notes. *Fuscopostia* was established by Shen et al. (2019) with *F. fragilis* as the type species. It is morphologically separated from *Postia* s.s. by the pileal surface and pore surface becoming brownish when bruised. Five species are accepted in *Fuscopostia*, including *F. duplicata* (L.L. Shen, B.K. Cui & Y.C. Dai) B.K. Cui, L.L. Shen & Y.C. Dai, *F. fragilis*, *F. lateritia* (Renvall) B.K. Cui, L.L. Shen & Y.C. Dai, *F. leucomallella* (Murrill) B.K. Cui, L.L. Shen & Y.C. Dai and the new species *F. subfragilis*.

Specimens examined: ***Fuscopostia duplicata***. **CHINA**. Zhejiang Province, Qingyuan County, Baishanzu Nature Reserve, on rotten angiosperm wood, 14 August 2013, *Dai 13411* (holotype, BJFC). Yunnan Province, Lanping County, Tongdian, Luoguqing, on stump of *Pinus* sp., 19 September 2011, *Cui 10366* (paratype, BJFC). ***Fuscopostia fragilis***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on rotten wood of *Picea* sp., 18 October 2019, *Dai 21040* (BJFC); Mahilyowskaya, Svislach-Byarezina projecting National Park, on fallen trunk of *Pinus* sp., 15 October 2019, *Dai 20956* (BJFC). ***Fuscopostia leucomallella***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on rotten wood of *Picea* sp., 18 October 2019, *Dai 21038* (BJFC). **CHINA**. Sichuan Province, Xiangchen County, Xiaoxue Mountain, on stump of *Pinus* sp., 12 August 2019, *Cui 17446* (BJFC). Yunnan Province, Binchuan County, Jizu Mountain, on fallen trunk of *Pinus* sp., 14 September 2018, *Cui 17004* (BJFC).

Fuscopostia subfragilis B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6j–k, 23)
MycoBank: MB 840357

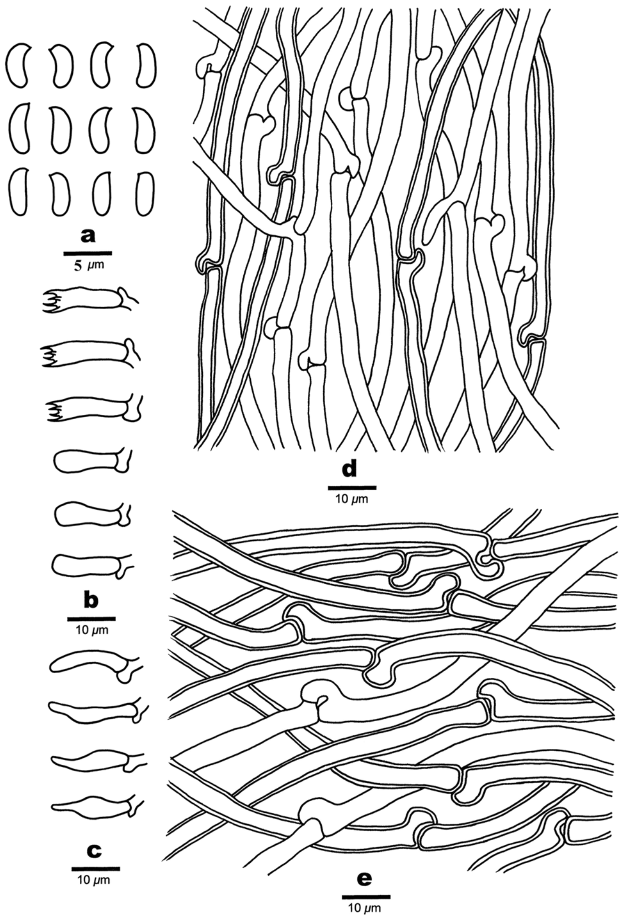

Fig. 23 Microscopic structures of *Fuscopostia subfragilis* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

Differs from other *Fuscopostia* spp. by its buff-yellow to apricot orange pileal surface when fresh, buff to honey yellow upon drying, thin- to slightly thick-walled generative hyphae.

Type. **CHINA**. Yunnan Province, Chuxiong, Zixishan Nature Reserve, on fallen angiosperm branch, 20 September 2017, *Cui 16302* (BJFC).

Etymology. *Subfragilis* (Lat.): refers to the morphological similarity to *Fuscopostia fragilis.*

Fruiting body. Basidiocarps annual, pileate, solitary, soft and watery, without odor or taste when fresh, becoming soft corky to fragile and light in weight upon drying. Pileus flabelliform, projecting up to 2.5 cm, 4.2 cm wide and 0.7 cm thick at base. Pileal surface buff-yellow to apricot orange when fresh, becoming buff to honey yellow upon drying. Pore surface buff to flesh pink when fresh, becoming olivaceous buff to honey yellow when dry; sterile margin up to 1 mm wide, concolorous with pore surface; pores round to angular, 4–6 per mm; dissepiments thin to slightly thick, entire. Context cream to buff, corky, up to 4 mm thick. Tubes cream to buff-yellow, corky to fragile, up to 3 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−; tissues unchanged in KOH.

Context. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, interwoven, 2–7.2 µm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, interwoven, 1.9–4.8 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled, 14.2–18.4 × 2.6–5.3 µm. Basidia clavate, 4-sterigmate, clamped at base, 13.4–18.5 × 3.8–6.5 µm.

Spores. Basidiospores allantoid to cylindrical, colorless, thin-walled, smooth, IKI−, CB−, (4.2−)4.3–5.2(−5.6) × (1.6−)1.7–2.5(−2.7) µm, L = 4.85 µm, W = 2 µm, Q = 2.32–2.6 (n = 60/2) (*Cui 16282* and *16302*).

Notes. Phylogenetically, specimens of *Fuscopostia subfragilis* formed a highly-supported lineage closely related to *F. fragilis* (Fig. 4). Morphologically, both *F. subfragilis* and *F. fragilis* have an annual growth habit, similar pores (4–6 per mm), but *F. fragilis* differs from *F. subfragilis* by its white to cream pileal surface when fresh, slightly thick-walled generative hyphae in context, thin-walled generative hyphae dominant in the tubes, and larger basidia (20–22 × 4–5 µm) (Lowe 1975; Ryvarden and Melo 2014).

Additional specimens (paratypes) examined: **CHINA**. Sichuan Province, Jiulong County, Wuxuhai Park, on fallen trunk of *Picea* sp., 13 September 2019, *Cui 17706* (BJFC). Yunnan Province, Lanping County, Tongdian, Luoguqing, on fallen trunk of *Pinus* sp., 19 September 2017, *Cui 16282* (BJFC); Mouding County, Huafoshan Nature Reserve, on fallen angiosperm trunk, 11 August 2016, *Cui 14255* (BJFC); Yuxi, Xinping County, Mopanshan Forest Park, on rotten wood of *Pinus* sp., 15 June 2017, *Dai 17617* (BJFC).

Jahnoporus Nuss, Hoppea Denkschrift der Regensburgischen Naturforschenden Gesellschaft 39: 176, 1980.
MycoBank: MB 17869
Type species: *Jahnoporus hirtus* (Cooke) Nuss.

Diagnosis: Basidiocarps annual, stipitate, fleshy to soft corky when fresh, corky to fragile when dry. Pileal surface gray to pale purplish brown, hispid to tomentose, becoming glabrous. Pore surface white to cream; pores angular. Stipe smooth or covered by incomplete pores or scattered hairs, pale ochraceous to pale gray. Context white, corky. Tubes concolorous with pore surface, corky to fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia and cystidioles absent. Basidiospores fusoid to navicular, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Jahnoporus* was described as a monotypic genus based on *J. hirtus* and characterized by stipitate basidiocarps, a monomitic hyphal structure and fusiform basidiospores (Nuss 1980; Spirin et al. 2015b). In the current phylogenetic analyses, *Jahnoporus* spp. formed a single lineage with high support (Fig. 4) within Postiaceae. Four species are accepted in *Jahnoporus*, including *J. brachiatus* Spirin, Vlasák & Miettinen, *J. hirtus*, *J. oreinus* Spirin, Vlasák & Miettinen and *J. pekingensis* (J.D. Zhao & L.W. Xu) Y.C. Dai.

Specimens examined: ***Jahnoporus brachiatus***. **CHINA**. Heilongjiang Province, Yichun, Wuying, Fenglin Nature Reserve, on fallen trunk of *Betula* sp., 2 August 2011, *Cui 9873* (BJFC). ***Jahnoporus hirtus***. **CHINA**. Shannxi Province, Mei County, Taibaishan Nature Reserve, on fallen angiosperm branch, 5 August 2006, *Dai 7694* (IFP).

Nothofagiporus B.K. Cui & Shun Liu, **gen. nov.**
MycoBank: MB 840358

Etymology. *Nothofagiporus* (Lat.): refers to species in the new genus is segregated from *Postia* with pileate polyporoid basidiocarps, and grows on *Nothofagus* species.

Type species: *Nothofagiporus venatus* (Rajchenb. & Wright) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate, solitary, soft corky when fresh, corky when dry. Pileal surface clay-buff to vinaceous grey, usually developing abundant strands of dark vinaceous or blackish hairs. Pore surface white to buff; pores angular. Context white, corky to slightly fragile. Tubes concolorous with pore surface, corky. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores allantoid, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. In this study, *Nothofagiporus* spp. formed a single lineage (Fig. 4) and was distant from *Postia* s.s. Morphologically, *Nothofagiporus* differs from *Postia* s.s. by its clay-buff to vinaceous grey pileal surface, developing abundant strands of dark vinaceous or blackish veins. Phylogenetically, *Nothofagiporus* is closely related to *Aurantipostia* spp., *Cyanosporus* spp. and *Postia* spp. (Fig. 4), while *Aurantipostia* differs in its pale-buff to apricot orange pileal surface, cream to orange-yellow pore surface and oblong ellipsoid basidiospores; *Cyanosporus* has resupinate to effused-reflexed or pileate basidiocarps, cream to greyish pileal surface usually with blue tint when fresh, grey to greyish brown when dry (McGinty 1909; Shen et al. 2019; Liu et al. 2021b, 2022b); *Postia* differs in having white or greyish to pale greyish brown pileal surface (Shen et al. 2019).

Based on phylogenetic analyses and morphological characters, *Nothofagiporus* is proposed as a new genus. So far, this monotypic genus was only found on *Nothofagus* trees.

Nothofagiporus venatus (Rajchenb. & Wright) B.K. Cui & Shun Liu, **comb. nov.**
MycoBank: MB 840359

Basionym: *Postia venata* (Rajchenb. & Wright) Rajchenb., Sydowia 40:248, 1987.

≡ *Tyromyces venatus* Rajchenb. & J.E. Wright, Boletín de la Sociedad Argentina de Botánica 22 (1–4): 51, 1983.

For a detailed description of *Postia venata*, see Rajchenberg (1995b).

Notes. *Postia venata* was first described based on a single collection from southern Argentina, growing on a fallen trunk of *Nothofagus dombeyi* (Rajchenberg 1983). Since then, it has been found frequently in the *Nothofagus* forests of Argentina (Rajchenberg 1993) and New Zealand (Rajchenberg 1995b).

Specimens examined: **AUSTRALIA**. Victoria, Yarra Ranges National Park, Cora Lynn Falls, on fallen trunk of *Nothofagus* sp., 10 May 2018, *Cui 16552 & NK 1785* (BJFC); Tasmania, Hobart, Mount Wellington, on fallen branch of *Nothofagus cunninghamii*, 13 May 2018, *Cui 16616*, *16617* (BJFC); Timbs Track, on fallen branch of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16644* (BJFC).

Oligoporus Bref., Untersuchungen aus dem Gesammtgebiete der Mykologie 8: 114, 1888.
MycoBank: MB 18144
Type species: *Oligoporus rennyi* (Berk. & Broome) Donk.

Diagnosis: Basidiocarps annual, resupinate, soft, cottony when fresh, soft corky when dry. Pore surface white, cream to pale brown; pores angular. Context white, soft corky. Tubes white, corky. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia or cystidioles absent. Basidiospores oblong ellipsoid to ellipsoid, colorless, slightly thick-walled, smooth, IKI−, CB+. Causing a brown rot. For a detailed description of *Oligoporus*, see Shen et al. (2019).

Notes. *Oligoporus* was usually treated as a synonym of *Postia*. Some mycologists supported the use of *Oligoporus* (Gilbertson and Ryvarden 1987; Ryvarden and Gilbertson 1994; Núñez and Ryvarden 2001; Bernicchia 2005), while other mycologists preferred to use *Postia* (Renvall 1992; Niemelä et al. 2005; Pildain and Rajchenberg 2013). Shen et al. (2019) proposed the use of *Postia* s.s. for taxa with thin-walled basidiospores and *Oligoporus* s.s. for taxa having thick-walled and cyanophilous basidiospores.

In this study, *Oligoporus* spp. formed a well-supported monophyletic lineage (Fig. 4), which is distant from *Postia* s.s. Four species are accepted in *Oligoporus*, including *O. podocarpi* Y.C. Dai, Chao G. Wang & Yuan Yuan, *O. rennyi*, *O. romellii* (M. Pieri & B. Rivoire) Niemelä and *O. sericeomollis* (Romell) Bondartseva.

Specimens examined: ***Oligoporus podocarpi***. **CHINA**. Hainan Province, Changjiang, Hainan Tropical Rainforest National Park, Bawangling, on rotten wood of *Podocarpus imbricatus*, 10 November 2020, *Dai 22042*, *22043*, *22044* (BJFC). ***Oligoporus rennyi***. **BELARUS**. Brestskaya

Voblasts, Izin Biologgical Sanctuary, on rotten wood of *Pinus* sp., 17 October 2019, *Dai 21015* (BJFC); Belavezhskaya Pushcha National Park, on rotten wood of *Pinus* sp., 18 October 2019, *Dai 21016* (BJFC). **CHINA**. Yunnan Province, Lijiang, Yulong Xueshan Park, on fallen trunk of *Abies* sp., 16 September 2018, *Cui 17054* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on angiosperm stump, 15 October 2017, *Cui 16456* (BJFC). ***Oligoporus romellii***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on rotten wood of *Picea* sp., 18 October 2019, *Dai 21034* (BJFC). **CHINA**. Xizang Autonomous Region (Tibet), Bomi County, on rotten wood of *Abies* sp., 26 October 2010, *Dai 23576* (BJFC). ***Oligoporus sericeomollis***. **CHINA**. Xizang Autonomous Region (Tibet), Bomi County, on fallen trunk of *Pinus* sp., 20 September 2010, *Cui 9560* (BJFC). Heilongjiang Province, Yichun, Fenglin Nature Reserve, on rotten wood of *Picea* sp., 2 August 2011, *Cui 9870* (BJFC).

Osteina Donk, Schweizerische Zeitschrift für Pilzkunde 44: 86, 1966.
MycoBank: MB 18164
Type species: *Osteina obducta* (Berk.) Donk.

Diagnosis: Basidiocarps annual, effused-reflexed to pileate or stipitate, watery to fleshy when fresh, bone hard when dry. Pileal surface white, cream to greyish brown. Pore surface white, cream to yellowish brown; pores angular to irregular. Context white, fleshy to hard corky. Tubes pale white to yellowish brown, fleshy to brittle. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia or cystidioles absent. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Osteina*, see Shen et al. (2019).

Notes Osteina was introduced by Donk (1966b), but this genus was not widely accepted, and was regarded as a synonym of *Oligoporus*. Cui et al. (2014) defined *Osteina obducta* as the valid name of the species, rather than *Oligoporus obductus* (Berk.) Gilb. & Ryvarden. In the current phylogenetic analyses, *Osteina* spp. formed a single lineage with high support (Fig. 4) distinct from *Postia* s.s. Three species are accepted in *Osteina*, including *O. obducta* (Berk.) Donk, *O. rhodophila* (Spirin & Zmitr.) Bernicchia & Gorjón and *O. undosa* (Peck) Zmitr.

Specimens examined: ***Osteina obducta***. **CHINA**. Jilin Province, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Abies* sp., 10 August 2011, *Cui 10074* (BJFC); on living tree of *Pinus* sp., 8 August 2011, *Cui 9959* (BJFC). Yunnan Province, Lanping County, Tongdian, Luoguqing, on fallen trunk of *Pinus* sp., 18. September 2018, *Cui 17142* (BJFC). ***Osteina undosa***. **BELARUS**. Mahilyowskaya, Svislach-Byarezina Projecting National Park, on rotten wood of *Populus* sp., 14 October 2019, *Dai 20914* (BJFC). **AUSTRALIA**. Tasmania, Arve River Streamside Reserve, on stump of *Eucalyptus* sp., 14 May 2018, *Cui 16651* (BJFC).

Postia Fr., Hymenomycetes europaei: 586, 1874.
MycoBank: MB 18356
Type species: *Postia lactea* (Fr.) P. Karst.

Diagnosis: Basidiocarps annual, effused-reflexed to pileate, corky when dry. Pileal surface white or greyish to pale greyish brown. Pore surface white to buff or pale reddish brown; pores round to angular. Context cream, corky. Tubes white to cream, corky to fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Basidiospores allantoid to cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Postia*, see Shen et al. (2019).

Notes. Previously, most species in *Postia* were placed in *Tyromyces* P. Karst.; however, *Tyromyces* is restricted to species causing a white rot (Ryvarden and Gilbertson 1994), while *Postia* spp. Cause a brown rot (Jülich 1982; Niemelä 2005). Phylogenetically, *Postia* spp. formed a monophyletic lineage with high support (100% MP, 100% ML, 1.00 BPP; Fig. 4). Currently, 15 species are accepted in *Postia*, including *P. amurensis* Y.C. Dai & Penttilä, *P. calcarea* Y.L. Wei & Y.C. Dai, *P. cana* H.S. Yuan & Y.C. Dai, *P. cylindrica* H.S. Yuan, *P. gloeocystidiata* Y.L. Wei & Y.C. Dai, *P. hirsuta* L.L. Shen & B.K. Cui, *P. lactea* (Fr.) P. Karst., *P. lowei* (Pilát) Jülich, *P. ochraceoalba* L.L. Shen, B.K. Cui & Y.C. Dai, *P. qinensis* Y.C. Dai & Y.L. Wei, *P. simanii* (Pilát) Jülich, *P. sublowei* B.K. Cui, L.L. Shen & Y.C. Dai, *P. subundosa* Y.L. Wei & Y.C. Dai, *P. tephroleuca* (Fr.) Jülich and the new species *P. crassicontexta*.

Specimens examined: ***Postia hirsuta***. **CHINA**. Guangdong Province, Shixing County, Chebaling Nature Reserve, on fallen trunk of *Pinus* sp., 18 September 2017, *Dai 18203* (BJFC). Hunan Province, Zhangjiajie, Yongding County, Tianmen Mountain, on fallen angiosperm trunk, 12 August 2020, *Cui 18347* (BJFC). Shaanxi Province, Zhashui County, Niubeiliang Forest Park, on fallen angiosperm trunk, 16 September 2013, *Cui 11237* (holotype, BJFC). ***Postia lactea***. **CHINA**. Heilongjiang Province, Tangyuan County, Daliangzihe National Forest Park, on fallen trunk of *Pinus* sp., 25 August 2014, *Cui 11511* (BJFC). Xizang Autonomous Region (Tibet), Linzhi, Sejila Mountain, on fallen trunk of *Picea* sp., 17 September 2014, *Cui 12141* (BJFC). **FINLAND**. Uusimaa, Vantaa, Tamisto Nature Reserve, on fallen trunk of *Betula* sp., 4 November 2011, *Dai 12643* (BJFC). ***Postia lowei***. **CHINA**. Sichuan Province, Yajiang County, on stump of *Abies* sp., 7 September 2020, *Cui 18366* (BJFC); Jiuzhaigou County, Shenxianchi Park, on stump of *Picea* sp., 22 September 2020, *Cui 18579* (BJFC). ***Postia ochraceoalba***. **CHINA**. Sichuan Province, Yajiang County, Gexigou Nature Reserve, on fallen trunk of *Abies* sp., 7 September 2020, *Cui 18352*, *18353*, *18356* (BJFC); on stump of *Abies* sp., 7 September 2020, *Cui 18354* (BJFC); Luding County, Hailuogou Forest Park, on fallen trunk of *Picea* sp., 20 October 2012, *Cui 10802* (holotype, BJFC). Yunnan Province, Lijiang, Yulong Snow Mountain, on stump of *Abies* sp., 16 September 2018, *Cui 17044*, *17047* (BJFC); on fallen trunk of *Picea* sp., 16 September 2018, *Cui 17076*, *17087* (BJFC). ***Postia sublowei***. **CHINA**. Sichuan Province, Xiangchen County, Xiaoxue Mountain, on fallen branch of *Pinus* sp., 12 August 2019, *Cui 17460* (BJFC). Xizang Autonomous Region (Tibet), Bomi County, on fallen trunk of *Picea* sp., 20 September 2010, *Cui 9597*, *9601* (BJFC). ***Postia tephroleuca***. **CHINA**. Sichuan Province, Yajiang County, on fallen trunk of *Pinus* sp., 8 August 2019, *Cui 17329* (BJFC); on fallen trunk of *Picea* sp., 8 August 2019, *Cui 17334* (BJFC); Muli County, Cundonghaizi, on fallen trunk of *Abies* sp., 16 August 2019, *Cui 17560* (BJFC); Xichang, Luoji Mountain, on fallen branch of *Pinus* sp., 17 August 2019, *Cui 17611* (BJFC); Yuexi County, Meihua, on fallen trunk of *Pinus* sp., 15 September 2019, *Cui 17790* (BJFC).

Postia crassicontexta B.K. Cui & Shun Liu, **sp. nov.** (Figs. 6l, 24)

MycoBank: MB 840361

Differs from other *Postia* spp. by its shell-shaped pileus, white pore surface when fresh, sulphur yellow to straw yellow when dry, round pores, thick and white to cream context, cylindrical and slightly curved basidiospores (4.8–6 × 1.2–2 µm).

Type. **AUSTRALIA**. Tasmania, Timbs Track, on fallen trunk of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16637* (holotype, BJFC).

Etymology. *Crassicontexta* (Lat.), refers to the thick context.

Fruiting body. Basidiocarps annual, pileate, solitary, soft corky and watery without odor or taste when fresh, corky and light in weight when dry. Pileus shell-shaped, projecting up to 4.2 cm, 4.8 cm wide, 2 cm thick at the base. Pileal surface white to cream when fresh, becoming straw yellow to buff and glabrous when dry. Pore surface white to cream when fresh, becoming sulphur yellow to straw yellow when dry; sterile margin narrow to almost lacking; pores round, 4–6 per mm; dissepiments thin to slightly thick, entire. Context white to cream, soft corky, up to 1.5 cm thick. Tubes white to ash grey, corky, up to 6 mm long.

Hyphal structure. Hyphal system monomitic; generative hyphae clamped, IKI–, CB–; tissues unchanged in KOH.

Context. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, frequently branched, loosely interwoven, 2–8.5 µm in diam.

Tubes. Generative hyphae colorless, thin- to slightly thick-walled with a wide lumen, occasionally branched, loosely interwoven, 1.9–5.2 µm in diam. Cystidia absent; fusoid cystidioles present, colorless, thin-walled,

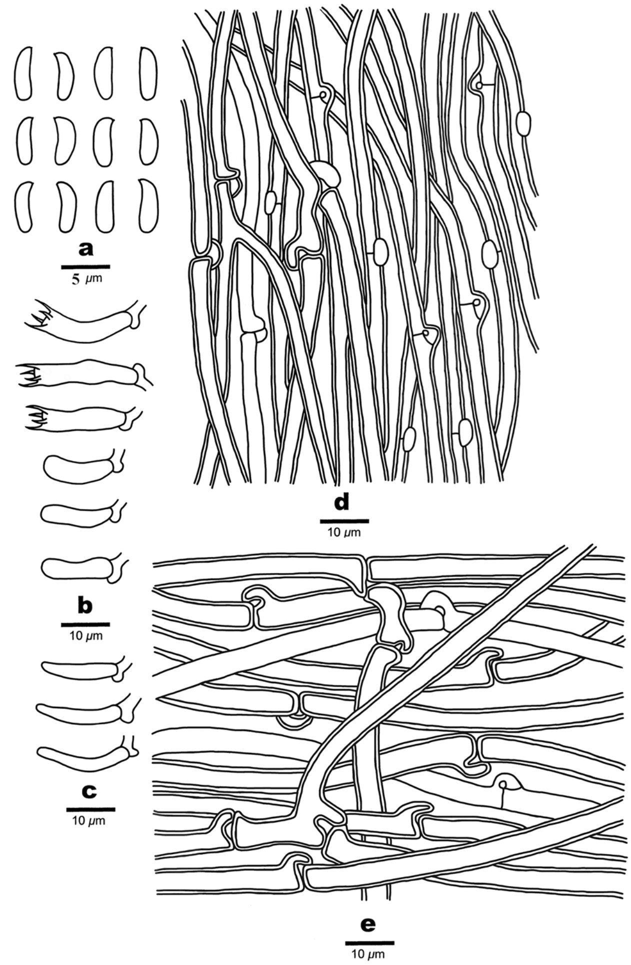

Fig. 24 Microscopic structures of *Postia crassicontexta* (drawn from the holotype). **a** Basidiospores; **b** Basidia and basidioles; **c** Cystidioles; **d** Hyphae from trama; **e** Hyphae from context. Bars: **a** = 5 µm; **b**–**e** = 10 µm

13–19 × 2.5–3.5 µm. Basidia clavate, 4-sterigmate, clamped at base, 14.5–21.5 × 3.5–5 µm.

Spores. Basidiospores cylindrical, slightly curved, colorless, thin-walled, smooth, usually bearing a guttule and tapering at apiculus, IKI−, CB−, 4.8–6(−7) × (1−)1.2–2 µm, L = 5.25 µm, W = 1.62 µm, Q = 3.31 (n = 30/1) (*Cui 16637*).

Notes. *Postia crassicontexta* resembles *P. hirsuta* by having annual and solitary basidiocarps and allantoid to cylindrical basidiospores, but *P. hirsuta* differs in having a mouse grey and hirsute pileal surface, larger and angular pores (3–4 per mm), and smaller basidiospores (4–4.8 × 1–1.2 µm; Shen and Cui 2014).

Ptychogaster Corda, Icones fungorum hucusque cognitorum 2: 23, 1838.

MycoBank: MB 18426

Type species: *Ptychogaster albus* Corda.

Diagnosis: Basidiocarps annual, resupinate to effused-reflexed or rarely pileate, soft when fresh, corky to fragile when dry. Pileal surface white to cream. Pore surface white to buff; pores angular. Context white, soft and cottony. Tubes concolorous with pore surface, corky to fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia and cystidioles absent. Basidiospores ellipsoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Ptychogaster* was established by Corda (1838) and typified by *P. albus* Corda. Later, *Ptychogaster albus* was treated as a synonym of *Postia ptychogaster* (F. Ludw.) Vesterh. (Knudsen and Hansen 1996). Recently, the genus *Ptychogaster* was treated as a synonym of *Postia* by He et al. (2019) and Stalpers et al. (2021).

In the current phylogenetic analyses, samples of *Postia ptychogaster* clustered together and formed a strongly supported monophyletic lineage, which was distant from *Postia* s.s. (Fig. 4). This indicated that *Ptychogaster* should be treated as an independent genus rather than regarded as a synonym of *Postia*. Accordingly, *Ptychogaster albus* was still regarded as the type species of *Ptychogaster*. In this study, only *Ptychogaster albus* is included in the phylogenetic analyses, the taxonomic status for other species of *Ptychogaster* needs to be calrified in future studies.

Specimens examined: ***Ptychogaster albus***. **BELARUS**. Brestskaya Voblasts, Belavezhskaya Pushcha National Park, on rotten wood of *Picea* sp., 18 October 2019, *Dai 21035* (BJFC). **CHINA**. Xizang Autonomous Region (Tibet), Bomi County, on rotten wood of *Pinus yunnanensis*, 25 October 2021, *Dai 23535* (BJFC); on rotten wood of *Pinus* sp., 27 October 2021, *Dai 23618* (BJFC).

Spongiporus Murrill, Bulletin of the Torrey Botanical Club 32 (9): 474, 1905.
MycoBank: MB 18577
Type species: *Spongiporus leucospongia* (Cooke & Harkn.) Murrill.

Diagnosis: Basidiocarps annual, pileate or effused-reflexed, usually imbricate, soft to fibrous when fresh, corky and slightly fragile upon drying. Pileal surface white, buff to brownish. Pore surface whitish to buff; pores round to angular. Context white, corky. Tubes brownish, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia present or not. Basidiospores cylindrical to allantoid, colorless, thin-walled, smooth, IKI−, CB−. Causing a brown rot. For a detailed description of *Spongiporus*, see Shen et al. (2019).

Notes. *Spongiporus* was established by Murrill (1905) and typified by *S. leucospongia*. David (1980) treated it as a genus for all brown-rot species with a monomitic hyphal system. However, it had always been regarded as a synonym of *Oligoporus* or *Postia* (Pildain and Rajchenberg 2013; Ryvarden and Melo 2014).

In the current phylogenetic study, *Spongiporus* spp. formed a separated lineage, distant from other genera in Postiaceae (Fig. 4). Seven species are accepted in *Spongiporus*, including *S. balsameus* (Peck) A. David, *S. cerifluus* (Berk. & M.A. Curtis) A. David, *S. floriformis* (Quél.) Zmitr., *S. gloeoporus* (L.L. Shen, B.K. Cui & Y.C. Dai) B.K. Cui, L.L. Shen & Y.C. Dai, *S. leucospongia*, *S. perdelicatus* (Murrill) Zmitr. And *S. zebra* (Y.L. Wei & W.M. Qin) B.K. Cui, L.L. Shen & Y.C. Dai.

Specimens examined: ***Spongiporus floriformis***. **CHINA**. Yunnan Province, Kunming, Heilongtan Park, on gymnosperm stump, 25 July 2014, *Dai 13887* (BJFC); Lanping County, Changyanshan Nature Reserve, on fallen angiosperm trunk, 18 September 2011, *Cui 10292* (BJFC). **SPAIN**. Cadiz, Sierra Grazalema Natural Park, on fallen trunk of *Abies* sp., 22 November 2005, *Dai 7441* (BJFC). ***Spongiporus gloeoporus***. **CHINA**. Sichuan Province, Zhaojue County, on stump of *Pinus* sp., 16 September 2019, *Cui 17813* (BJFC). Xizang Autonomous Region (Tibet), Bomi County, on stump of *Pinus* sp., 19 September 2010, *Cui 9507* (holotype, BJFC), 20 September 2010, *Cui 9517* (paratype, BJFC).

Tenuipostia B.K. Cui & Shun Liu, **gen. nov.**
MycoBank: MB 840362

Etymology. *Tenuipostia* (Lat.): refers to the new genus resembling *Postia* but with thin basidiocarps.

Type species: *Tenuipostia dissecta* (Cooke) B.K. Cui & Shun Liu.

Diagnosis: Basidiocarps annual, pileate, soft corky when fresh, corky when dry. Pileal surface clay-buff to dirty light brown. Pore surface white to buff. Context white, corky to slightly fragile. Tubes concolorous with pore surface, fragile. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles present. Basidiospores oblong to ellipsoid, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. *Postia dissecta* (Cooke) Rajchenb. is characterized by dimidiate basidiocarps with applanate pileus and cylindrical basidiospores (Rajchenberg 1987). Huckfeldt and Schmidt (2017) transferred it to the genus *Oligoporus*, but in Shen et al. (2019), it was distant from *Oligoporus* and formed a separate lineage.

In the current study, *Tenuipostia* spp. formed a single lineage (Fig. 4), distant from *Postia* s.s. Morphologically, *Tenuipostia* differs from *Postia* s.s. by its thin, pileate basidiocarps dimidiate with a contracted base, oblong to ellipsoid and thin- to slightly thick-walled basidiospores. Based on phylogenetic analyses and morphological characters, *Tenuipostia* is proposed as a new genus. Only one species, *Tenuipostia dissecta*, is accepted in this genus.

Tenuipostia dissecta (Cooke) B.K. Cui & Shun Liu, **comb. nov.**

MycoBank: MB 840363

Basionym: *Postia dissecta* (Cooke) Rajchenb.; Sydowia 40: 247, 1988.

≡ *Polystictis dissectus* Cooke; Grevillea 14(71): 84, 1886.

For a detailed description of *Postia dissecta*, see Rajchenberg (1987).

Specimens examined: **AUSTRALIA**. Tasmania, Timbs Track, on dead tree of *Nothofagus cunninghamii*, 14 May 2018, *Cui 16645* (BJFC); Arve River Streamside Reserve, on fallen trunk of *Eucalyptus* sp., 15 May 2018, *Cui 16717* (BJFC); Victoria, Yarra Ranges National Park, Cora Lynn Falls, on dead tree of *Nothofagus* sp., 10 May 2018, *Cui 16555*, *16560* (BJFC).

Pycnoporellaceae Audet, Mushrooms nomenclatural novelties 16: 1, 2018.

MycoBank: MB 554251

Type genus: *Pycnoporellus* Murrill.

Diagnosis: Basidiocarps pileate, resupinate to effused-reflexed. Hymenophores mostly poroid. Hyphal system monomitic; generative hyphae simple-septate or clamped. Cystidia usually present, cystidioles present or absent. Basidiospores subglobose, ellipsoidal or cylindrical, colorless or yellow, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Genera: *Crustoderma* Parmasto, *Pycnoporellus*.

Notes. Pycnoporellaceae was established by Audet (2018e) with *Pycnoporellus* as type genus. *Pycnoporellus* is phylogenetically closely related to *Crustoderma* (Ortiz-Santana et al. 2013; Han et al. 2016; Justo et al. 2017). In the current phylogenetic analyses, Pycnoporellaceae is closely related to Phaeolaceae and Sparassidaceae (Figs. 1, 2). Morphologically, Phaeolaceae differs by having stipitate, pileate, resupinate or effused-reflexed basidiocarps, a monomitic to dimitic hyphal system with generative hyphae bearing simple septa, thin- to slightly thick-walled basidiospores; Sparassidaceae differs by having cauliflower-like basidiocarps, clamped generative hyphae and broadly ellipsoid to subglobose basidiospores (Light and Woehrel 2009; Zhao et al. 2013).

Key to genera of Pycnoporellaceae

1. Generative hyphae with clamp connections……… …………………………………………..*Crustoderma*
1. Generative hyphae simple-septate……………………… …………………………………………...*Pycnoporellus*

Crustoderma Parmasto, Conspectus Systematis Corticiacearum: 87, 1968.

MycoBank: MB 17410

Type species: *Crustoderma dryinum* (Berk. & M.A. Curtis) Parmasto.

Diagnosis: Basidiocarps annual, resupinate or effused-reflexed, ceraceous to crustaceous. Subiculum yellowish, ochraceous to cinnamon brown. Hyphal system monomitic; generative hyphae clamped. Cystidia or cystidioles absent. Basidiospores subglobose, ellipsoidal or cylindrical, colorless or yellow, slightly thick-walled, IKI−, CB+. Causing a brown rot.

Notes. *Crustoderma* was established by Parmasto (1968) and typified by *C. dryinum*. It is characterized by resupinate or effused basidiocarps, a monomitic hyphal system with clamped generative hyphae, and subglobose, ellipsoidal or cylindrical basidiospores. Nineteen species are accepted in *Crustoderma*, including *C. borbonicum* Boidin & Gilles, *C. carolinense* Nakasone, *C. corneum* (Bourdot & Galzin) Nakasone, *C. cryptocallimon* (B. de Vries) K.H. Larss. & Ryvarden, *C. dryinum*, *C. efibulatum* Kotir. & Saaren., *C. fibuligerum* (K.S. Thind & S.S. Rattan) Duhem, *C. Flavescens* Nakasone & Gilb., *C. fuscatum* Gilb. & Nakasone, *C. gigacystidium* Gilb. & Hemmes, *C. longicystidium* (Litsch.) Nakasone, *C. marianum* Nakasone, *C. nakasoneae* Gilb. & M. Blackw., *C. opuntiae* Nakasone & Gilb., *C. patricium* (G. Cunn.) Nakasone, *C. resinosum* (H.S. Jacks. & Dearden) Gilb., *C. testatum* (H.S. Jacks. & Dearden) Nakasone, *C. triste* (Litsch. & S. Lundell) Duhem and *C. vulcanense* (Gilb. & Adask.) Gilb. & Nakasone.

Pycnoporellus Murrill, Bulletin of the Torrey Botanical Club 32 (9): 489, 1905.

MycoBank: MB 18432

Type species: *Pycnoporellus fulgens* (Fr.) Donk.

Diagnosis: Basidiocarps annual, pileate or resupinate, fibrous, corky to fragile. Pileal surface bright orange to rust. Pore surface orange; pores angular. Context orange to orange-buff, soft to fibrous. Tubes concolorous with pore surface, corky to fragile. Hyphal system monomitic; generative hyphae simple-septate. Cystidia present, cystidioles present or absent. Basidiospores narrowly ellipsoid to cylindrical, thin-walled, smooth, colorless, IKI−, CB−. Causing a brown rot.

Notes. *Pycnoporellus* was described by Murrill (1905) with the generic type *P. fibrillosus*. Species of *Pycnoporellus* are characterized by pileate or resupinate basidiocarps, a monomitic hyphal system with generative hyphae bearing simple septa, all tissues deep red in KOH, narrowly ellipsoid to cylindrical basidiospores. *Aurantiporellus* Murrill was described at the same time by Murrill (1905) with *A. alboluteus* (Ellis & Everh.) Murrill as the generic type, but was treated as a synonym of *Pycnoporellus* by Kotlába and Pouzar (1963). Two species are accepted in *Pycnoporellus*, including *P. alboluteus* (Ellis & Everh.) Kotl. & Pouzar and *P. fulgens*.

Specimens examined: ***Pycnoporellus fulgens***. **BELARUS**. Belavezhskaya Pushcha National Park, on fallen trunk of *Picea* sp., 19 October 2019, *Dai 21050* (BJFC); on stump of *Picea* sp., 19 October 2019, *Dai 21071* (BJFC); Homyelskaya Voblasts, Prypytski National Park Gigant Oak ecological path, on dead tree of *Populus* sp., 16 October 2019, *Dai 21000* (BJFC). **CHINA**. Guangdong Province, Chebaling Nature Reserve, on fallen trunk of *Pinus* sp., 14 June 2019, *Cui 17274* (BJFC); on fallen trunk of *Pinus* sp., 18 September 2017, *Dai 18207* (BJFC); Fengkai County, Heishiding Nature Reserve, on fallen trunk of *Pinus* sp., 30 April 2018, *Dai 18573A*, *18579A* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on living tree of *Pinus* sp., 16 October 2017, *Cui 16463* (BJFC); on dead tree of *Pinus* sp., 16 October 2017, *Dai 18416* (BJFC).

Sarcoporiaceae Audet, Mushrooms nomenclatural novelties 18: 1, 2018.
MycoBank: MB 554252
Type genus: *Sarcoporia* P. Karst.

Diagnosis: Basidiocarps annual, resupinate, downy to brittle. Hymenophores poroid. Hyphal system monomitic; generative hyphae clamped. Cystidia absent, cystidioles present or absent. Basidiospores ellipsoid to oblong-ellipsoid, colorless to brownish, thick-walled, dextrinoid, slightly to strongly cyanophilous. Causing a brown rot.

Genus: *Sarcoporia*.

Notes. Sarcoporiaceae was established by Audet (2018g) and typified by *Sarcoporia*. In the current phylogenetic analyses, Sarcoporiaceae is closely related to Auriporiaceae, Dacryobolaceae and Taiwanofungaceae (Figs. 1, 2). Morphologically, Auriporiaceae differs in its monomitic to dimitic hyphal system and thin-walled basidiospores; Dacryobolaceae differs by having allantoid basidiospores (Eriksson and Ryvarden 1975; Maekawa 1993); Taiwanofungaceae differs by having a dimitic to trimitic hyphal system with slightly amyloid skeletal hyphae and cylindrical basidiospores.

Sarcoporia P. Karst., Hedwigia 33: 15, 1894.
MycoBank: MB 18505
Type species: *Sarcoporia polyspora* P. Karst.

Diagnosis: Basidiocarps annual, resupinate, soft to downy when fresh, brittle when dry. Pore surface cream, reddish-brown to blackish brown; pores circular. Context cream, soft and cottony. Tubes concolorous with pore surface, brittle. Hyphal system monomitic; generative hyphae clamped, IKI−, CB−. Cystidia absent, cystidioles occasionally present. Basidia clavate. Basidiospores ellipsoid to oblong-ellipsoid, colorless to brownish, thick-walled, dextrinoid, slightly to strongly cyanophilous. Causing a brown rot.

Notes. *Sarcoporia* was established by Karsten (1894) and typified by *S. polyspora*, which is a very distinct brown-rot polypore with thick-walled, dextrinoid and cyanophilous basidiospores. In this study, specimens of *Sarcoporia polyspora* formed a well-supported lineage related to *Dacryobolus* (Figs. 1, 2). Morphologically, *Dacryobolus* differs from *Sarcoporia* by having membranaceous to coriaceous basidiocarps and allantoid basidiospores (Eriksson and Ryvarden 1975; Maekawa 1993). Three species are accepted in *Sarcoporia*, including *S. longitubulata* Vlasák & Spirin, *S. neotropica* Ryvarden and *S. polyspora*.

Specimens examined: ***Sarcoporia polyspora***. **CHINA**. Yunnan Province, Binchuan County, Jizu Mountain, on fallen gymnosperm trunk, 14 September 2018, *Cui 16977* (BJFC); on fallen angiosperm trunk, 14 September 2018, *Cui 16995* (BJFC). **VIETNAM**. Dam Dong Province, Da Lat, Bidoup Nui Ba National Park, on rotten wood of *Pinus* sp., 16 October 2017, *Dai 18395* (BJFC).

Sparassidaceae Herter, Kryptogamen-Flora der Mark Brandenburg 6 (1): 167, 1910. MycoBank: MB 82019
Type genus: *Sparassis* Fr.

Diagnosis: Basidiocarps annual, stipitate, consist of branched flabellae arising from a central core, cauliflower-like. Hyphal system monomitic; generative hyphae clamped or simple-septate; gloeoplerous hyphae usually present. Cystidia occasionally present, cystidioles present or absent. Basidiospores broadly ellipsoid to subglobose, colorless, thin- to slightly thick-walled, smooth, IKI–, CB–. Causing a brown rot.

Genus: *Sparassis*.

Notes. Herter (1910) placed *Sparassis* in the family Sparassidaceae Herter. Recent phylogenetic analyses indicated that *Sparassis* belongs to the antrodia clade (Binder et al. 2013; Ortiz-Santana et al. 2013; Justo et al. 2017; Shen et al. 2019). In this study, Sparassidaceae is supported as an independent family (Figs. 1, 2).

Sparassis Fr., Novit. Fl. Suec., V, Part. Cont.: 80, 1819.
MycoBank: MB 18566
Type species: *Sparassis crispa* (Wulfen) Fr.

Diagnosis: Basidiocarps annual, stipitate, usually composed of a group of flabella arising from a poorly developed central whitish stipe. Pileal surface grayish brown to light brown. Context tough, rubbery. Hyphal system monomitic; generative hyphae clamped or simple-septate; gloeoplerous hyphae usually present. Cystidia or cystidioles absent. Basidiospores broadly ellipsoid to subglobose, colorless, thin- to slightly thick-walled, smooth, IKI−, CB−. Causing a brown rot.

Notes. The cauliflower mushrooms (*Sparassis*) include species that produce flabellae with an amphigenous hymenium and a central mass giving rise to the flabellae

(Desjardin et al. 2004; Wang et al. 2004). Recent phylogenetic studies supported that *Sparassis* is placed in the antrodia clade of the Polyporales (Binder et al. 2013; Ortiz-Santana et al. 2013; Han et al. 2016). Fourteen species are accepted in *Sparassis*, including *S. americana* R.H. Petersen, *S. americana* f. *americana* R.H. Petersen, *S. americana* f. *arizonica* R.H. Petersen, *S. brevipes* Krombh., *S. brevipes* f. *nemecii* (Pilát & Veselý) R.H. Petersen, *S. crispa*, *S. cystidiosa* Desjardin & Zheng Wang, *S. cystidiosa* f. *flabelliformis* Q. Zhao, Zhu L. Yang & Y.C. Dai, *S. latifolia* Y.C. Dai & Zheng Wang, *S. minoensis* Blanco-Dios & Zheng, *S. subalpina* Q. Zhao, Zhu L. Yang & Y.C. Dai, *S. spathulata* (Schwein.) Fr., *S. spathulata* f. *herbstii* (Peck) R.H. Petersen and *S. radicata* Weir.

Specimens examined: ***Sparassis cystidiosa***. **CHINA**. Hainan Province, Ledong County, Diaoluoshan Forest Park, on root of angiosperm tree, 29 October 2015, *Dai 15190* (BJFC); on rotten angiosperm wood, 29 October 2015, *Dai 15192* (BJFC). Yunnan Province, Pingbian County, Daweishan Forest Park, on rotten angiosperm stump, 27 September 2019, *Dai 19875* (BJFC). ***Sparassis latifolia***. **CHINA**. Jilin Province, Antu County, Changbaishan Nature Reserve, on the ground in conifer forest, 14 August 1997, *Dai 2441* (holotype, IFP); *Dai 2470*, *2472* (paratypes, IFP).

Taiwanofungaceae B.K. Cui, Shun Liu & Y.C. Dai, **fam. nov.**

MycoBank: MB 840364

Type genus: *Taiwanofungus* Sheng H. Wu, Z.H. Yu, Y.C. Dai & C.H. Su.

Diagnosis: Basidiocarps perennial, resupinate, effused-reflexed or pileate, corky to woody hard. Hymenophores poroid. Hyphal system dimitic to trimitic; generative hyphae nodose-septate. Cystidia absent, cystidioles present or absent. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI–, CB–. Causing a brown rot.

Genus: *Taiwanofungus*.

Notes. *Taiwanofungus camphoratus* is one of the most valuable polypore fungi used for medicinal purposes. It has been famous in Taiwan for several decades and is said to have several medicinal uses including a curative effect on cancer (Wu et al. 1997; Wu et al. 2004; Hseu et al. 2007; Geethangili and Tzeng 2011). Justo et al. (2017) and He et al. (2019) indicated that *Taiwanofungus* could not be assigned to any recognized family within the Polyporales, and its classification at family level was treated as *incertae sedis* (He et al. 2019).

In this study, *Taiwanofungus* is closely related to *Auriporia*, *Dacryobolus* and *Sarcoporia*, respectively represent Auriporiaceae, Dacryobolaceae and Sarcoporiaceae. Morphologically, *Taiwanofungus* differs by having perennial and resupinate-reflexed to pileate basidiocarps, a dimitic to trimitic hyphal system with nodose-septate generative hyphae and slightly amyloid skeletal hyphae (Wu et al. 2004). *Taiwanofungus* spp. have different morphology and are distant from the presently known families of the Polyporales. Thus, a new family is proposed to accommodate this genus.

Taiwanofungus Sheng H. Wu, Z.H. Yu, Y.C. Dai & C.H. Su, Fungal Science 19 (3–4): 110, 2004.

MycoBank: MB 532851

Type species: *Taiwanofungus camphoratus* (M. Zang & C.H. Su) Sheng H. Wu, Z.H. Yu, Y.C. Dai & C.H. Su.

Diagnosis: Basidiocarps perennial, resupinate, effused-reflexed or pileate, taste bitter, corky to woody hard. Pore surface yellowish, orange-red or orange-brown. Hyphal system dimitic to trimitic; generative hyphae nodose-septate; skeletal hyphae slightly IKI+. Cystidia absent, cystidioles present. Basidiospores cylindrical, colorless, thin-walled, smooth, IKI−, CB−. Arthroconidia and chlamydospores uaually present. Causing a brown rot. For a detailed description of *Taiwanofungus*, see Wu et al. (2004).

Notes. *Taiwanofungus* was established by Wu et al. (2004) and typified by *T. camphoratus*. Morphological characteristics of *Taiwanofungus* mostly correspond with *Antrodia* and *Antrodiella* Ryvarden & I. Johans. among the polypore genera (Wu et al. 2004); but *Taiwanofungus* differs from *Antrodia* in having a yellowish, orange-red or orange-brown pore surface, a dimitic to trimitic hyphal system and abundant generative hyphae in the context and differs from *Antrodiella* by having slightly amyloid skeletal hyphae and causing a brown rot (Wu et al. 2004). Two species are accepted: *T. camphoratus* and *T. salmoneus* (T.T. Chang & W.N. Chou) Sheng H. Wu, Z.H. Yu, Y.C. Dai & C.H. Su.

Discussion

Recent studies have shown that the brown-rot fungi within the Polyporales are mainly concentrated in the antrodia clade (Binder et al. 2013; Ortiz-Santana et al. 2013; Han et al. 2016; Justo et al. 2017; Shen et al. 2019). The antrodia clade was firstly introduced according to the morphology, decay mode and mating system characters, it was not strongly support (bootstrap < 50%) in the phylogenetic analyses by Hibbett and Donoghue (2001). It is the largest clade of brown rot fungi, although the ability to produce brown rot has evolved independently at least five times in Basidiomycota (Hibbett and Donoghue 2001; Garcia-Sandoval et al. 2011). The brown-rot fungi species usually grouped together with no significant support (Hibbett and Donoghue 1995; Hibbett and Donoghue 2001; Kim and Jung 2001; Binder et al. 2005; Garcia-Sandoval et al. 2011), or did not form a monophyletic group (Hibbett and Thorn 2001; Binder et al. 2013). In this study, although the brown-rot fungi species within the

Table 3 Comparisons of the main morphological characters of brown-rot fungi in Polyporales

Family	Basidiocarps	Hyphal system	Generative hyphae	Cystidia	Basidiospores		References
Adustoporiaceae	Resupinate to effused-reflexed	Monomitic to dimitic	Clamped	Absent	Allantoid, cylindrical to oblong ellipsoid	Thin-walled	Audet (2018a); Present study
Auriporiaceae	Resupinate or pileate	Monomitic to dimitic	Clamped	Usually present	Allantoid, cylindrical to ellipsoid	Thin-walled	Present study
Dacryobolaceae	Resupinate to effused-reflexed	Monomitic to dimitic	Clamped	Usually present	Allantoid	Thin- to thick-walled	Justo et al. (2017)
Fibroporiaceae	Resupinate or pileate	Monomitic to dimitic	Clamped or simple-septate	Absent	Oblong to broadly ellipsoid	Slightly thick-walled	Audet (2018c); Present study
Fomitopsidaceae	Stipitate, pileate, resupinate or effused-reflexed	Monomitic, dimitic to trimitic	Clamped	Occasionally present	Cylindrical to fusiform or ellipsoid	Thin-walled	Justo et al. (2017); Present study
Laetiporaceae	Resupinate or pileate, sessile to laterally substipitate or centrally stipitate	Monomitic to dimitic	Simple-septate	Absent	Ellipsoid to pyriform or drop-shaped	Thin- to slightly thick-walled	Justo et al. (2017); Present study
Laricifomitaceae	Pileate, resupinate or effused-reflexed	Monomitic to dimitic	Clamped	Absent	Ellipsoid, short-cylindric to drop-shaped	Thin- to thick-walled	Present study
Phaeolaceae	Stipitate, resupinate	Monomitic to dimitic	Simple-septate	Absent	Cylindrical, ellipsoid to ovoid	Thin-walled	Present study
Piptoporellaceae	Pileate, substipitate	Dimitic	Clamped	Absent	Cylindrical to ellipsoid	Thin-walled	Present study
Postiaceae	Stipitate, pileate or effused-reflexed to resupiante	Monomitic	Clamped	Occasionally present	Allantoid to cylindrical to oblong to ellipsoid	Thin- to thick-walled	Present study
Pycnoporellaceae	Pileate, resupinate to effused-reflexed	Monomitic	Clamped or simple-septate	Usually present	Subglobose, ellipsoidal or cylindrical	Thin- to slightly thick-walled	Audet (2018e); Present study
Sarcoporiaceae	Resupinate	Monomitic	Clamped	Absent	Ellipsoid to oblong-ellipsoid	Thick-walled	Audet (2018g); Present study
Sparassidaceae	Stipitate, cauliflower-like	Monomitic	Clamped or simple-septate	Occasionally present	Broadly ellipsoid to subglobose	Thin- to slightly thick-walled	Justo et al. (2017); Present study
Taiwanofungaceae	Resupinate-reflexed to pileate	Dimitic to trimitic	Nodose-septate	Absent	Cylindrical	Thin-walled	Present study

Polyporales grouped together, they did not receive significant support (Figs. 1, 2) as previous studies.

Recently, many studies had focused on the taxonomy and phylogeny of the brown-rot fungi especially those in the antrodia clade of the Polyporales (Ortiz-Santana et al. 2013; Han et al. 2016; Chen et al. 2017; Song and Cui 2017; Shen et al. 2019). However, some brown-rot fungi in the Polyporales, especially at the family level, remained with an uncertain placement (Justo et al. 2017; He et al. 2019). This study provides a revised classification and clarification of the phylogenetic relationships of the brown-rot fungi within the Polyporales. In current phylogenetic analyses, Adustoporiaceae, Auriporiaceae, Dacryobolaceae, Fibroporiaceae, Fomitopsidaceae, Laetiporaceae, Laricifomitaceae, Phaeolaceae, Piptoporellaceae, Postiaceae, Pycnoporellaceae, Sarcoporiaceae, Sparassidaceae and Taiwanofungaceae group together (Figs. 1, 2) and all cause a brown rot. Among the fourteen brown-rot fungal families, Dacryobolaceae, Fomitopsidaceae, Laetiporaceae, Laricifomitaceae, Phaeolaceae and Sparassidaceae were accepted in previous studies (Binder et al. 2013; Justo et al. 2017; He et al. 2019); Adustoporiaceae, Fibroporiaceae, Pycnoporellaceae and Sarcoporiaceae were proposed by Audet (2018a, c, e, g); Auriporiaceae, Piptoporellaceae, Postiaceae and Taiwanofungaceae are proposed as new families in this study. The main morphological characters of brown-rot fungal families in Polyporales are provided in Table 3.

Previously, species of the brown-rot fungi in the antrodia clade within the Polyporales were usually divided into five major groups, viz., the fibroporia, laetiporus, postia, laricifomes and the core antrodia groups (Ortiz-Santana et al. 2013). The fibroporia group was systematically studied by Chen et al. (2017), the postia group was systematically studied by Shen et al. (2019), and the molecular phylogeny and biogeography of the laetiporus group was analyzed by Song and Cui (2017). The laricifomes group is a small group accommodating only five species. The core antrodia group contains several large genera of the brown-rot fungi, viz., *Antrodia*, *Daedalea* and *Fomitopsis*; of which *Fomitopsis* was systematically studied by Han et al. (2016). The genus *Antrodia* is a cosmopolitan brown-rot genus. Ortiz-Santana et al. (2013) revealed the polyphyletic of *Antrodia* s.l. Later, more detailed studies of several *Antrodia* s.l. lineages disclosed several species complexes, such as the *Antrodia* s.s. clade, *A. crassa* clade, *A. malicola* group and *A. serialis* group and *A. heteromorpha* complex (Spirin et al. 2013a, b, 2015a, 2016, 2017; Chen and Cui 2016). Recently, Audet (2017e, g, j, 2018a, b, d, f) established several new genera (*Adustoporia*, *Lentoporia* and *Resinoporia*) and new families (Adustoporiaceae, Amyloporiaceae, Lentoporiaceae and Rhodoniaceae) within *Antrodia* s.l. In this study, *Adustoporia*, *Amyloporia*, *Austroporia*, *Lentoporia*, *Resinoporia* and *Rhodonia* grouped together (Figs. 1, 2), and share resupinate to effused-reflexed basidiocarps, clamped generative hyphae and allantoid or cylindrical to oblong ellipsoid basidiospores. They could not be separated at family level, hence, Amyloporiaceae, Lentoporiaceae and Rhodoniaceae are treated as synonymys of Adustoporiaceae. Nevertheless, the new genera proposed by Audet are confirmed in our current study.

Justo et al. (2017) performed a revised family-level classification of the Polyporales. In their phylogenetic analysis, Dacryobolaceae, Fomitopsidaceae, Laetiporaceae and Sparassidaceae were assigned a family name; Phaeolaceae was regarded as a synonym of Laetiporaceae, but the Laetiporaceae clade did not receive significant support in the phylogenetic analysis (− % ML, − BPP; Justo et al. 2017); *Postia* s.l. was placed in Dacryobolaceae; *Auriporia*, *Crustoderma*, *Pycnoporellus*, *Sarcoporia*, the amyloporia group and the fibroporia group cannot be assigned to any families within the Polyporales. Other members of the brown-rot fungi within the Polyporales, i.e., *Cyanosporus*, *Gilbertsonia*, *Laricifomes*, *Macrohyporia*, *Melanoporella*, *Osteina*, *Piptoporellus*, *Postia ptychogaster*, *Ryvardenia* and *Taiwanofungus* were not included in the phylogenetic analysis by Justo et al. (2017). In our current study, the classifications of Fomitopsidaceae and Sparassidaceae are consistent with Justo et al. (2017). However, the postia group is treated as a new family Postiaceae in our study, since the postia group is quite different from Dacryobolaceae in morphology, in addition, the postia group cluster together with *Dacryobolus* with low support; Phaeolaceae is regarded as an independent family since Phaeolaceae cluster together with *Laetiporus* with low support in our current study, furthermore, *Laetiporus* spp. and *Phaeolus* spp. cannot cluster together in other studies (Hussein et al. 2018; Tibuhwa et al. 2020); *Crustoderma*+*Pycnoporellus*, *Sarcoporia*, the amyloporia clade and the fibroporia clade are confirmed as independent families as Pycnoporellaceae, Sarcoporiaceae, Adustoporiaceae and Fibroporiaceae, respectively, which were established by Audet (2018a, c, e, g); *Cyanosporus*, *Osteina* and *Postia ptychogaster* are transferred to Postiaceae; *Macrohyporia* is transferred to Laetiporaceae; *Melanoporella* is transferred to Phaeolaceae; *Gilbertsonia*, *Laricifomes* and *Ryvardenia* are transferred to Laricifomitaceae; *Auriporia*, *Piptoporellus* and *Taiwanofungus* are established as new families Auriporiaceae, Piptoporellaceae and Taiwanofungaceae, respectively, since they have different features in morphology from any of the known families.

Fomitopsidaceae is an important brown-rot fungal family of the Polyporales. Although there are 67 associated genera records listed in MycoBank (http://www.mycobank.org) and Index Fungorum (http://www.indexfungorum.org). Among them, *Antrodia*, *Brunneoporus*, *Buglossoporus*, *Cartilosoma*, *Daedalea*, *Dentiporus*, *Flavidoporia*, *Fomitopsis*, *Fragifomes*, *Neoantrodia*, *Neolentiporus*, *Niveoporofomes*, *Rhizoporia*, *Rhodofomes*, *Rhodofomitopsis*, *Rubellofomes*, *Subantrodia* and *Ungulidaedalea* are accepted in the current concept of Fomitopsidaceae. Some other genera are invalid records or lack molecular data, such as *Amyloporiella* A. David & Tortič is an invalid record, *Aurantioporellus* Murrill is an orthographic variant and lacking molecular data, *Phaeodaedalea* M. Fidalgo was confirmed as a synonym of *Trichaptum* Murrill which causing a white rot (Figueroa and Decock 2007) and lacking DNA sequences. Some genera previously treated as members of Fomitopsidaceae have been transferred to other families, such as *Amaropostia*, *Amylocystis*, *Calcipostia*, *Cystidiopostia*, *Fuscopostia*, *Osteina* and *Ptychogaster* are transferred to Postiaceae in Polyporales (this study; Figs. 1, 2); *Anomoporia* Pouzar belongs to Amylocorticiaceae Jülich in Amylocorticiales (Binder et al. 2010; Song et al. 2016); *Auriporia* is transferred to Auriporiaceae in Polyporales (this study; Figs. 1, 2); *Gilbertsonia* was proposed to belong to Laricifomitaceae in Polyporales (Justo et al. 2017; this study); *Laetiporus* belongs to Laetiporaceae in Polyporales (Justo et al. 2017); *Piptoporellus* is transferred to Piptoporellaceae in Polyporales (this study; Figs. 1, 2); *Pseudofibroporia* belongs to Fibroporiaceae in Polyporales (Audet 2018c); *Resinoporia* belongs to Adustoporiaceae in Polyporales (this study; Figs. 1, 2). Some genera have been treated as synonyms of other genera, such as *Agaricum* P. Micheli ex Haller was treated as a synonym of *Laricifomes* (Kotlába and Pouzar 1957); *Aurantiporellus* Murrill was treated as a synonym of *Pycnoporellus* (Murrill 1905); *Pilatoporus* Kotl. & Pouzar and *Piptoporus* P. Karst. were treated as synonyms of *Fomitopsis* (Han et al. 2016). According to the morphological characteristics and phylogenetic evidence, *Antrodiopsis* is treated as a synonym of *Rhodofomitopsis*, and *Ranadivia* is treated as a synonym of *Daedalea*. In the current phylogenetic analysis, *Buglossoporus* and *Neolentiporus* formed a highly supported lineage (100% MP, 100% ML, 1.00 BPP; Fig. 3). However, *Buglossoporus* has a monomitic hyphal system in the trama (Kotlába and Pouzar 1966), and *Neolentiporus* has irregularly thick-walled generative hyphae and metachromatic, unbranched skeletal hyphae (Rajchenberg 1995a), so they are supported as independent genera. Genera accepted in Fomitopsidaceae by Justo et al. (2017) include *Anthoporia*, *Antrodia*, *Buglossoporus*, *Cartilosoma* Teixeira, *Daedalea*, *Fomitopsis*, *Fragifomes*, *Melanoporia*, *Neolentiporus*, *Niveoporofomes*, *Rhodofomes*, *Rhodofomitopsis*, *Rubellofomes* and *Ungulidaedalea*. He et al. (2019) provided an outline of all genera of Basidiomycota, and 24 genera were accepted in Fomitopsidaceae, viz., *Adustoporia*, *Anthoporia*, *Antrodia*, *Antrodiopsis*, *Brunneoporus*, *Buglossoporus*, *Daedalea*, *Dentiporus*, *Flavidoporia*, *Fomitopsis*, *Fragifomes*, *Laricifomes*, *Lentoporia*, *Neoantrodia*, *Neolentiporus*, *Niveoporofomes*, *Ranadivia*, *Resinoporia*, *Rhizoporia*, *Rhodofomes*, *Rhodofomitopsis*, *Rubellofomes*, *Subantrodia* and *Ungulidaedalea*. Our current research confirmed that there are 24 genera belonging to Fomitopsidaceae, including *Anthoporia*, *Antrodia*, *Brunneoporus*, *Buglossoporus*, *Cartilosoma*, *Daedalea*, *Daedalella*, *Dentiporus*, *Flavidoporia*, *Fomitopsis*, *Fragifomes*, *Melanoporia*, *Neoantrodia*, *Neolentiporus*, *Niveoporofomes*, *Pseudoantrodia*, *Pseudofomitopsis*, *Rhizoporia*, *Rhodoantrodia*, *Rhodofomes*, *Rhodofomitopsis*, *Rubellofomes*, *Subantrodia* and *Ungulidaedalea*.

Laricifomes officinalis was accepted in *Fomitopsis* by Núñez and Ryvarden (2001) and Zhou and Wei (2012). It appeared closely related to the genera *Gilbertsonia* and *Ryvardenia* (Kim et al. 2005; Ortiz-Santana et al. 2013; Han et al. 2016; Shen et al. 2019). Pildain and Rajchenberg (2013) supported the use of the genus *Ryvardenia*. Justo et al. (2017) placed *Gilbertsonia*, *Laricifomes* and *Ryvardenia* in an unsupported position as sister to Fomitopsidaceae, and agreed that the name Laricifomitaceae, typified by *Laricifomes*, is available. In this study, *Laricifomes* is closely related to *Gilbertsonia* and *Ryvardenia* with strong support (100% MP, 100% ML, 1.00 BPP; Figs. 1, 2). Although these three genera differ in their distribution areas (*Laricifomes* is circumglobal, *Ryvardenia* is from the Southern Hemisphere and *Gilbertsonia* is from North America) as well as in several morphological characters (*Laricifomes* forms perennial pileate basidiocarps, *Ryvardenia* produces annual pileate basidiocarps and *Gilbertsonia* has annual resupinate basidiocarps), species in these three genera usually produce larger pores (<6 per mm), ellipsoid basidiospores, lack hymenial cystidia, produce a dimitic hyphal system and display a bipolar mating system (Kotlába and Pouzar 1957, 1998; Rajchenberg 1994; Parmasto 2001). Therefore, we confirm the family Laricifomitaceae to include *Gilbertsonia*, *Laricifomes* and *Ryvardenia*.

Taxonomy and phylogeny of *Postia* s.l. have been carried out recently, and species in *Postia* s.l. were included in different subclades with other brown-rot genera in the antrodia clade within the Polyporales (Ortiz-Santana et al. 2013; Pildain and Rajchenberg 2013; Cui et al. 2014; Shen and Cui 2014; Shen et al. 2014, 2019; Justo et al. 2017), but its classification at family level has been changing for a long time (Kirk et al. 2008; Shen and Cui 2014; Shen et al. 2014, 2015; Justo et al. 2017; He et al. 2019). The genus *Postia* was placed in Fomitopsidaceae previously (Kirk et al. 2008; Shen et al. 2014, 2015; Shen and Cui 2014), but in terms of morphological characteristics, Fomitopsidaceae differs by having mostly corky to hard corky basidiocarps, a dimitic or trimitic, rarely monomitic hyphal system (Jülich 1981; Justo et al. 2017). Phylogenetically, species in Fomitopsidaceae and Postiaceae are distinct from each other (Figs. 1, 2). Furthermore, *Amylocystis*, *Oligoporus*, *Postia* and *Spongiporus* were proposed belonging to Dacryobolaceae by Justo et al. (2017). However, in Ortiz-Santana et al. (2013), Han et al. (2016) and Shen et al (2019), these genera did not cluster together with the genus *Dacryobolus*. Morphologically, Dacryobolaceae differs by having membranaceous to coriaceous basidiocarps, smooth, odontioid, aculei conical to cylindrical hymenophore, monomitic or dimitic hyphal system and smooth or rarely ornamented basidiospores (Eriksson and Ryvarden 1975; Bernicchia and Gorjón 2010; Xu et al. 2018). Therefore, we transferred *Postia* s.l. to the new family Postiaceae. The phylogenies inferred from the combined datasets of 6-gene sequences strongly support the segregation of *Aurantipostia*, *Austropostia*, *Nothofagiporus* and *Tenuipostia* from *Postia* s.s (Fig. 3). However, the phylogenetic position of *Postia carbophila* Rajchenb. is not resolved because only limited gene sequences are available.

In the phylogenetic analysis, *Kusaghiporia*, *Laetiporus*, *Laetiporus persicinus*, *Macrohyporia*, *Melanoporella*, *Phaeolus*, *Wolfiporia*, *Wolfiporiella* and *Wolfiporiopsis* grouped together (Figs. 1, 2). Species in this group are not only morphologically diverse, but also have highly divergent sequences from the rest of the species of the brown-rot fungi within the Polyporales, forming long branches in all the analyses and topologies (Binder et al. 2013; Ortiz-Santana et al. 2013; Han et al. 2016; Justo et al. 2017). Genera of *Kusaghiporia*, *Laetiporus*, *Macrohyporia*, *Wolfiporiella*, and *Wolfiporiopsis* grouped together and received a high support (100% MP, 100% ML, 1.00 BPP in Fig. 1; 100% MP, 100% ML, 1.00 BPP in Fig. 2); *Melanoporella*, *Wolfiporia* and *Phaeolus* formed a lineage with high support (100% MP, 99% ML, 1.00 BPP in Fig. 1; 100% MP, 99% ML, 1.00 BPP in Fig. 2), but these two lineages grouped with low support in our current study (Figs. 1, 2), thus, Phaeolaceae is considered as an independent family. The classification of *Laetiporus persicinus* is still unclear. Lindner and Banik (2008) and Ortiz-Santana et al. (2013) also reported that *L. persicinus* is not closely related to *Laetiporus* s.s.

Auriporia and *Taiwanofungus* fell in the Polyporales and cause a brown rot. They could not be placed in any of the recognized families (Justo et al. 2017; He et al. 2019). They all have different morphology from the presently known families in Polyporales. In this study, two distinct family-level lineages, Auriporiaceae and Taiwanofungaceae, were established based on morphological characters and molecular data.

The majority of taxa of the phlebioid clade produce a white rot, with one notable exception, *Leptoporus mollis*, which is described as causing a brown rot on dead conifers (Gilbertson and Ryvarden 1986; Binder et al. 2013). Lindner and Banik (2008) noted that *Leptoporus* would represent an independent origin of the brown-rot ecology in the Polyporales outside the antrodia clade (Binder et al. 2013). Justo et al. (2017), He et al. (2019) and Chen et al. (2021) listed *Leptoporus* in Irpicaceae. In the current phylogenetic analyses, *Leptoporus* is closely related to *Ceriporia* within Irpicaceae.

In summary, we performed a comprehensive study on the brown-rot fungi within the Polyporales. In this study, 67 brown-rot genera belonging to 14 families are accepted within the Polyporales, including four new families and eleven new genera. However, some taxa of the brown-rot fungi were still not included in the current phylogenetic analyses due to the lack of DNA sequences. The white-rot fungi group contains more taxa belonging to the Polyporales and further studies are needed to focus on the white rot fungi; more lineages at the family level of the Polyporales might be discovered in the future.

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Author contributions B-KC, SL and Y-YC designed the experiment; B-KC, SL, Y-YC, Y-FS, X-LH, C-GS, JS and GG prepared the samples; SL, Y-YC, Y-FS, X-LH, C-GS and B-KC conducted the molecular experiments and analyzed the data; SL, Y-YC, Y-FS, X-LH, JS, GG and B-KC drafted the manuscript. All the authors approved the manuscript.

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Declarations

Conflict of interest The authors declare that there are no conlict of interest related to this study.

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