Global Diversity And Systematics of Hymenochaetaceae With Poroid Hymenophore

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Abstract

Taxonomy and phylogeny of poroid Hymenochaetaceae based on the most comprehensive phylogenetic analyses are presented. A phylogeny based on a combined dataset of ITS and nLSU sequences for accepted genera of Hymenochaetaceae was analyzed and multigene phylogenies for most species of ten large genera including *Clotricia*, *Fomitiporella*, *Fomitiporia*, *Fulvifomes*, *Fuscoporia*, *Inonotus*, *Phylloporia*, *Porodaedalea*, *Sanghuangporus* and *Tropicoporus*, were carried out. Based on samples from 37 countries of five continents, seven new genera, *Meganotus, Neophellinus, Nothonotus, Pachynotus, Perenninotus, Pseudophylloporia* and *Rigidonotus,* are introduced, 37 new species, *Coltricia tibetica*, *Fomitiporella crassa*, *F. queenslandica*, *Fomitiporia eucalypti, F. gatesii*, *F. ovoidospora*, *Fulvifomes azonatus, F. caligoporus*, *F. costaricense*, *F. floridanus*, *F. jouzaii*, *F. nakasoneae*, *F. subindicus*, *Fuscoporia sinuosa*, *F. submurina*, *Inonotus subradiatus*, *I. vietnamensis*, *Neomensularia castanopsidis*, *Pachynotus punctatus*, *Phellinus cuspidatus*, *P. subellipsoideus*, *Phylloporia minutissima*, *P. tabernaemontanae*, *Porodaedalea occidentiamericana*, *P. orientoamericana*, *P. qilianensis*, *P. schrenkianae*, *Pseudophylloporia australiana*, *Sanghuangporus australianus*, *S. lagerstroemiae*, *Tropicoporus angustisulcatus*, *T. hainanicus*, *T. lineatus*, *T. minus*, *T. ravidus*, *T. substratificans* and *T. tenuis,* are described, and 108 new combinations are proposed. In addition, one illegitimate name and two invalid names are renamed. The taxonomic relevance and limits of the new taxa are discussed. Photos and illustrations for 37 new species are presented, and a full description for each new species is given. Eventually, this study recognizes 672 species in 34 genera and provides a modern treatment of the poroid Hymenochaetaceae in the world. A key to the accepted poroid genera of Hymenochaetaceae is provided, and identification keys to the accepted species of 32 poroid genera worldwide are given. A synopsis description of each species is included in these keys.

Introduction

Hymenochaetaceae is a family of Agaricomycetes. Species in this family are characterized by annual to perennial, brownish basidiocarps with a xanthochroic reaction in KOH, poroid or corticioid hymenophore, generative hyphae without clamp connections and setal elements present or absent. Some species of the family were the earliest fungal species recorded by Linnaeus, e.g., *Coltricia perennis* (L.) Murrill (≡ *Boletus perennis* L., Species Plantarum: 1177, 1753) and *Phellinus igniarius* (L.) Quél. (≡ *Boletus igniarius* L. Species Plantarum: 1176, 1753). Many members of the family are economically important organisms: some species are forest pathogens, e.g., species in *Coniferiporia, Onnia* and *Pyrrhoderma* (Zhou et al. 2016a, 2018; Ji et al. 2017a); and some species have therapeutic properties, e.g., *Inonotus obliquus* and *Sanghuangporus sanghuang* (Sheng H. Wu et al.) Sheng H. Wu et al. (Wu et al. 2019c).

Fourteen poroid genera were accepted in Hymenochaetaceae based on morphological taxonomy (Kirk et al. 2001), but additional ten poroid genera, *Coniferiporia* L.W. Zhou & Y.C. Dai (Zhou et al. 2016a)*, Cylindrosporus* L.W. Zhou (Zhou 2015a), *Fulvoderma* L.W. Zhou & Y.C. Dai (Zhou et al. 2018a)*, Neomensularia* F. Wu et al. (Wu et al. 2016)*, Nothophellinus* Rajchenb. (Rajchenberg et al. 2015), *Phellinopsis* Y.C. Dai (Niemelä et al. 2001), *Phellopilus* Niemelä et al. (Wagner and Fischer 2001),

Pseudoinonotus T. Wagner & M. Fisch. (Wagner and Fischer 2001), *Sanghuangporus* Sheng H. Wu et al. (Zhou et al. 2016b) and *Tropicoporus* L.W. Zhou et al. (Zhou et al. 2015b), have been erected based on molecular analyses. Some genera, e.g., *Fomitiporia*, *Fulvifomes*, *Fuscoporia*, *Porodaedalea*, *Flaviporellus* Murrill, *Ochrosporellus* (Bondartseva & S. Herrera) Bondartseva & S. Herrera, *Onnia* and *Mensularia* etc., long considered as synonyms of *Phellinus sensu lato* or *Inonotus sensu lato* (Gilbertson and Ryvarden 1986, 1987; Ryvarden and Gilbertson 1993, 1994), were later confirmed as monophyletic genera (Wagner and Fischer 2001); some other genera, e.g., *Aurificaria* D.A. Reid*, Cyclomyces* Kunze ex Fr., *Hydnochaete* Bres. and *Hymenochaetopsis* S.H. He & Jiao Yang etc., formerly accepted as independent genera (Gilbertson and Ryvarden 1986; Ryvarden 1991; Dai and Li 2010; Yang et al. 2016), were merged as synonyms of *Fulvifomes* Murrill, *Hymenochaete* Lév. and *Hydnoporia* Murrill based on phylogenetic analyses (Fischer and Wagner 2001; Wagner and Fischer 2002a; Baltazar et al. 2014; Liu et al. 2020; Miettinen et al. 2019).

Hymenochaetaceae is a species-rich family with 487 species worldwide, as that in the latest version of Dictionary of the Fungi (Kirk et al. 2008). *Phellinus sensu lato*, *Hymenochaete* and *Inonotus sensu lato* are the three major genera of Hymenochaetaceae with 220, 131 and 101 species, respectively (Larsen and Cobb-Poulle 1990; Léger 1998; Parmasto 2005; Ryvarden 2005). However, recent investigations and phylogenetic analyses have discovered many new taxa in the family (Rajchenberg et al. 2015; Zhou et al. 2016b; Morera et al. 2017; Ryvarden 2018; Miettinen et al. 2019; Wu et al. 2020a). Therefore, the diversity of the Hymenochaetaceae is likely underestimated.

Extensive taxonomic changes in the Hymenochaetaceae, intensified in recent years by the use of sequence-based taxonomy, are supported by both improved morphological inspection methods (such as, hyphal structure and spore walls etc.) and molecular studies, but the strength of these two types of data varies depending on the researcher. This may lead to over- or under-estimation of differences and features that define genera and species, when focusing, as usual, on only one section of the family. For example, *Aurificaria luteoumbrina* (Romell) D.A. Reid seemed to be firmly settled in its own genus, because of its unique morphology. Sequence comparison with *Fulvifomes* species, however, revealed a close relationship and we had to accept it as *Fulvifomes* with a unique combination of features occurring in different species of *Fulvifomes*. In general, after analysis of a broader set of species, some of the newly described genera or species may turn out to be superfluous and some species may deserve a new or another genus. In addition, recent inventories and studies on the poroid hymenochaetoid fungi have yielded numerous new species and combinations, but they have been published in different papers. A monograph of poroid Hymenochaetaceae is therefore a tool to bring these data together in one publication. The aim of the present paper is to compile data for the phylogenetic analysis of a broad selection of Hymenochaetaceae species, covering all 34 genera accepted presently in the family, and to arrange the current Hymenochaetaceae taxonomy in accordance with phylogenetic results.

In this study we aim to investigate the diversity and taxonomy of poroid Hymenochaetaceae based primarily on our samples from 37 countries of Asia, Europe, Oceania, and America. Seven new genera and 108 new combinations are proposed, and 37 new species are described. The study on corticioid

(*Hymenochaete*) and hydnoid (*Hydnoporia*) Hymenochaetaceae will be published in a forthcoming paper.

Material And Methods

Morphological studies The studied materials are authors' collections from China, Republic Korea, Japan, Uzbekistan, Vietnam, Thailand, Malaysia, Singapore, Sri Lanka, Australia, New Zealand, Russia, Estonia, Latvia, Finland, Sweden, Norway, United Kingdom, Belgium, Germany, France, Italy, Spain, Poland, Hungary, Romania, Czech Republic, Belarus, Canada, USA, Mexico, Costa Rica, Puerto Rico, French Guiana, Brazil, South Africa, Kenya. These specimens are deposited in the herbaria of Beijing Forestry University (BJFC) and the Institute of Applied Ecology of the Chinese Academy of Sciences (IFP). Some collections loaned from MHAS, KUN, HMIGD, SWFC, NMNS, TNS, TFM, O, H, E, K, LE, PRM, TAA, UPS, BPI, CUP, NY, NYS, CFMR, MEL, PDD, URM, CIEFAP were examined to support the studies. These abbreviations of fungarium and herbarium follow Thiers (2014). The depositions of other studied specimens are listed after each species. All materials were examined under a Nikon 80i microscope. Drawings were made with the aid of a drawing tube. The measurements and drawings were made from slide preparations stained with Cotton Blue (0.1 mg aniline blue dissolved in 60 g pure lactic acid), Melzer's reagent (1.5 g potassium iodide, 0.5 g crystalline iodine, 22 g chloral hydrate, aq. dest. 20 ml) and 5% potassium hydroxide. Spores were measured from sections cut from the tubes; in presenting spore size data, 5% of the measurements excluded from each end of the range are shown in parentheses. The following abbreviations were used: KOH = 5% potassium hydroxide, IKI = Melzer's reagent, IKI– = both inamyloid and non-dextrinoid, IKI[+] = dextrinoid, CB = Cotton Blue, CB+ = cyanophilous; CB(+) = weakly cyanophilous, CB– = acyanophilous, L = mean spore length (arithmetic average of all spores), W = mean spore width (arithmetic average of all spores), Q = L/W ratio for each specimen studied, n (a/b) = number of spores (a) measured from given number of specimens (b). The width of a basidium (cystidium, cystidiole, hyphoid seta, mycelial seta and hymenial seta) was measured at the thickest part; the length of a basidium (cystidium, cystidiole) was measured from the apex (sterigmata excluded for cystidium) to the basal septum. The length of a hymenial seta (hyphoid seta, mycelial seta) was measured from the apex to its approximate base. Color, texture, taste and odor of basidiocarps are mostly based on authors' field trip investigations. Color terms follow Rayner (1970) and Petersen (1996). The abbreviations of authors of scientific names follow the recent edition of Authors of Fungal Names (available in internet http://www.indexfungorum.org/Names/Names.asp).

Genera and species are alphabetically placed according to their recent taxonomy. For new species, a full description is given based on studied material, and important microscopic characteristics are illustrated; cystidia, cystidioles, basidia, basidioles, hymenial setae, hyphoid setae, mycelial setae and rhomboid crystals were drawn with the same scale, basidiospores were drawn twice as large, molecular data are provided. For the new combinations, some well-known traditional synonyms are listed after the basionym, molecular data are provided for some new combinations, but other new combinations are based on morphology only because molecular data are not available. For existing species, a condensed description

of each species is included in keys to species, and the most important characteristics are outlined in the condensed description. In addition, type locality and distribution data of each species are supplied.

The major members of *Hymenochaete* and *Hydnoporia* are corticioid and hydnoid species, respectively. Although a few species with poroid or lamellate hymenophore are members of these two genera, all taxa in the two genera are excluded from the present monograph.

The terminology of the structures in the Hymenochaetaceae is variable, and we use the term 'hyphoid setae' proposed by Corfixen (1990) for the long setae in context or trama; such elements were called 'setal hyphae' by most mycologists, or 'setoid skeletal hyphae' (Kotlaba 1968), or 'extrahymenial setae' (Corner 1991). Setae or hymenial setae are situated for the most part in the hymenial layer; they arise from subhymenium or trama and project into the tubes. Mycelial setae are situated at the margins of resupinate basidiocarps, and they are occasionally present in the subiculum or in the mycelium in the wood. Most publications report that only cystidioles are present in Hymenochaetaceae; in the present monograph we treat such thin-walled sterile elements as cystidia if they exceed twice the length of the basidia. In some species, e.g., species in *Phellinus* sensu stricto, the sterile old parts of the tubes become stuffed with hyphae, which differ from the original hyphae of the basidiocarps. These hyphae are treated as secondary hyphae. Usually they are thinner, much branched and unpigmented, if compared with the hyphae of the trama, context or subiculum. 'Monomitic' is used in present study if all hyphae are frequently simple septate even if they are distinctly thick-walled, e.g., species in *Phylloporia* and *Pyrroderma.*

For the synopsis description of each species in the identification keys, we use 'annual' if the original description is 'annual to biennial'; 'basidiocarps effused-reflexed' if the original description is 'basidiocarps resupinate, effused-reflexed'; 'basidiocarps pileate' if the original description is 'basidiocarps effused-reflexed to distinctly pileate'; 'hyphal system monomitic' if the original description is 'hyphal system dimitic with skeletal hyphae frequently septate'; 'hymenial setae curved' if the original description is 'hymenial setae straight to curved', 'basidiospores yellowish' if the original description is 'basidiospores hyaline to yellowish'. The distribution of each species is mostly based on the literature, but some, according to our study, e.g., *Fulvifomes fastuosus* (Lév.) Bondartseva & S. Herrera and *F. merrillii* (Murrill) Baltazar & Gibertoni were reported from the Neotropics (Ryvarden 2004), but they most probably have a distribution in tropical Asia only. Some synonyms are listed in parentheses after the accepted name, e.g., *F. pseudopunctata* (A. David et al.) Fiasson (= *F. mediterranea* M. Fisch.).

Molecular phylogeny A CTAB-based rapid plant genome extraction kit (Aidlab Biotechnologies Co., Ltd, Beijing) was used to obtain genomic DNA from dried specimens. The primer pair ITS4 and ITS5 was used for amplification of the ITS region (White et al. 1990), while the primer pair LR0R and LR7 (http://www.biology.duke.edu/fungi/mycolab/primers.htm) was used for providing the nuclear large subunit ribosomal DNA (nLSU), and EF1-983F and EF1-1567R for TEF1 (Rehner 2001). The PCR procedure for ITS and *tef1* was as follows: initial denaturation at 95°C for 3 min, followed by 35 cycles at 94°C for 40 s, 54°C for 45 s and 72°C for 1 min, and a final extension of 72°C for 10 min. The PCR

procedure for nLSU was as follows: initial denaturation at 94°C for 1 min, followed by 35 cycles at 94°C for 30 s, 50°C for 1 min and 72°C for 1.5 min, and a final extension of 72°C for 10 min. The PCR products were purified and sequenced at the Beijing Genomics Institute, China, with the same primers. Reference ITS, nLSU and *tef1* sequences from various species of Hymenochaetaceae, available from GenBank, were compiled and complemented with sequences generated by this study. To correctly delimit each genus in Hymenochaetaceae, a combined dataset of ITS and nLSU region including all genera of Hymenochaetaceae was employed (Supplementary Table 1). For convenient, other gene region sequences used for phylogenies of genera are included in Supplementary Table 1, too. In addition, another species *Rigidoporus populinus* (Schumach.) Pouzar from Oxyporaceae, Hymenochaetales was also included as an additional ingroup taxon to show the monophyly of Hymenochaetaceae, while *Lenzitopsis daii* L.W. Zhou & Kõljalg from Thelephorales and *Donkioporiella mellea* L.W. Zhou from Polyporales were selected as the outgroup taxa (Zhou et al. 2018b). The datasets employed to explore interspecific relationships within certain genera of Hymenochaetaceae were described in the corresponding legends of phylogenetic trees. Gene regions in each dataset were separately aligned using MAFFT 7.110 (Katoh and Standley 2013) under the G-INS-i option (Katoh et al. 2005), and then concatenated as a single alignment that was deposited in TreeBASE (http://www.treebase.org; accession number S28493; Reviewer access URL: http://purl.org/phylo/treebase/phylows/study/TB2:S28493). The best-evolutionary model of each alignment was estimated using jModelTest (Guindon and Gascuel 2003; Posada 2008) under Akaike information criterion. Following the best-evolutionary models of alignments, phylogenetic analyses were performed using Maximum Likelihood (ML) and Bayesian Inference (BI) methods. The ML method was conducted using raxmlGUI 2.0 (Stamatakis 2014; Edler et al. 2019) with calculation of bootstrap (BS) replicates under the auto FC option (Pattengale et al. 2010). The BI method was conducted using MrBayes 3.2 (Ronquist et al. 2012). Two independent runs, each with four chains and starting from random trees, were employed. Trees were sampled every 1000th generation from a total of ten million generations. The first 25% of trees were removed, while the other 75% of trees were retained for constructing a 50% majority consensus tree and calculating Bayesian Posterior Probabilities (BPPs). Chain convergence was determined using Tracer 1.5 (http://tree.bio.ed.ac.uk/software/tracer/). The topologies inferred from the ML method were presented along with bootstrap values from the ML method, when above 50% and BPPs from the BI methods when above 0.8 at the nodes. The sequences were aligned using ClustalX 1.83 (Chenna et al. 2003) and alignments were curated manually in BioEdit 7.0.5.3 (Hall 1999). Prior to phylogenetic analyses, ambiguous regions at the start and the end were deleted.

Phylogeny

The dataset used to delimit generic circumscription had 244 collections with 231 ITS and 211 nLSU sequences. The concatenated alignment of this dataset included 3037 characters with GTR + I + G as the best-fit evolutionary model. The ML search stopped after 200 BS replicates. In BI, after 15 million generations all chains converged with an average standard deviation of split frequencies of 0.007982, where all effective sample sizes (ESSs) were above 1380 and all potential scale reduction factors

(PSRFs) were equal to 1.000. The current phylogeny (Fig. 1) supports Hymenochaetaceae as a monophyletic family in Hymenochaetales. Within Hymenochaetaceae, a total of 36 genera including two non-poroid genera were recovered with strong support, and they are monophyletic in the phylogeny. Seven new genera, viz. *Meganotus, Neophellinus, Nothonotus, Pachynotus, Perenninotus, Pseudophylloporia* and *Rigidonotus*, were newly introduced below. Noteworthily, *Coltricia* and *Coltriciella* were synonymized with the former as the priority.

Taxonomy

Key to genera

1. Basidiocarps annual to perennial, coriaceous to woody hard; hyphal structure monomitic——— 2

1. Basidiocarps mostly perennial, woody hard; hyphal structure dimitic at least in trama———— 23

2. Basidiocarps stipitate, mostly terrestrial, fragile or brittle when dry———————— *Coltricia*

2. Basidiocarps resupinate, effused-reflexed or pileate, lignicolous, hard corky to woody when dry if stipitate——————————————————————————————————— 3

3. Basidiospores hyaline——————————————————————————— 4

3. Basidiospores colored——————————————————————————— 13

4. Basidiospores IKI[+]———————————————————————— *Pseudoinonotus*

4. Basidiospores IKI–——————————————————————————— 5

5. Basidiocarps with extensive rhizomorphs———————————————— *Inonotopsis*

5. Basidiocarps without rhizomorphs————————————————————— 6

6. Basidiocarps becoming vivid deep red in KOH———————————— *Flaviporellus*

6. Basidiocarps becoming black in KOH———————————————————— 7

7. Context with a black line; basidiospores thin-walled———————————— 8

7. Context or subiculum without a black line in most species; basidiospores thick-walled if black line present——————————————————————————————————— 9

8. Basidiospores > 3 µm wide; hymenial setae mostly hooked———————————— *Onnia*

8. Basidiospores < 3 µm wide, hymenial setae straight———————————— *Cylindrosporus*

9. Pileal surface with a cuticle or crust———————————————————— 10

9. Pileal surface without a cuticle or crust---------- 11

10. Pileal surface yellowish to yellowish brown---------- *Fulvoderma*

10. Pileal surface reddish brown, dark brown to black---------- *Pyrrhoderma*

11. Basidiocarps pileate; hymenial setae present if resupinate---------- *Inonotus*

11. Basidiocarps resupinate; hymenial setae absent---------- 12

12. Basidiospores ellipsoid to subglobose ---------- *Coniferiporia*

12. Basidiospores oblong-ellipsoid to cylindrical---------- *Phellinidium*

13. Basidiospores CB+, setae hooked---------- *Mensularia*

13. Basidiospores CB– or CB(+), setae straight if present---------- 14

14. Basidiocarps with a granular core or tissue---------- 15

14. Basidiocarps without granular core or tissue---------- 16

15. Basidiocarps annual; hymenial setae absent---------- *Inocutis*

15. Basidiocarps perennial; hymenial setae present---------- *Meganotus*

16. Basidiospores usually collapsed when mature---------- 17

16. Basidiospores not collapsed when mature---------- 18

17. Basidiocarps duplex; basidiospores usually < 5 µm long---------- *Phylloporia*

17. Basidiocarps homogeneous; basidiospores > 5 µm long---------- *Nothonotus*

18. Basidiocarps perennial; hyphoid setae and hymenial setae absent---------- 19

18. Basidiocarps annual, hyphoid setae or hymenial setae present if perennial---------- 20

19. Basidiocarps resupinate, cushion-shaped---------- *Pachynotus*

19. Basidiocarps pileate---------- *Perenninotus*

20. Basidiocarps annual---------- 21

20. Basidiocarps perennial---------- 22

21. Sterile conk present; basidiocarps rigid, effused-reflexed---------- *Rigidonotus*

21. Sterile conk absent; basidiocarps corky and resupinate if conk present—— *Inonotus*

22. Basidiocarps pileate, context duplex—— *Ochrosporellus*

22. Basidiocarps resupinate, context homogeneous if pileate—— *Inonotus*

23. Basidiospores IKI[+], strongly CB+—— *Fomitiporia*

23. Basidiospores IKI–, CB– or moderately CB+—— 24

24. Context duplex and setae hooked—— *Neomensularia*

24. Setae straight or context homogeneous if setae hooked—— 25

25. Hyphal system trimitic, skeletal hyphae ramified as skeleton-binding hyphae—— 26

25. Hyphal system dimitic, binding hyphae absent—— 27

26. Pileal surface with a cuticle; hymenial setae absent—— *Nothophellinus*

26. Pileal surface without cuticle; hymenial setae present—— *Phellopilus*

27. Generative hyphae bearing crystals, basidiospores hyaline, thin-walled—— *Fuscoporia*

27. Generative hyphae smooth, basidiospores hyaline to brown, thick-walled—— 28

28. Basidiospores hyaline to pale yellowish with age, setae present—— 29

28. Basidiospores yellowish to brown, setae present or absent—— 32

29. Setae arising from subhymenium, usually not exceeding 25 µm long—— *Phellinus*

29. Setae mostly arising from tramal hyphae, usually longer than 25 µm—— 30

30. Hymenial setae hooked—— *Neophellinus*

30. Hymenial setae straight—— 31

31. Context duplex when juvenile, upper layer strigose; on gymnosperm—— *Porodaedalea*

31. Context homogeneous, pileal surface velutinate; on angiosperm—— *Phellinopsis*

32. Setae absent—— 33

32. Setae present—— 35

33. Basidiocarps resupinate—— *Fomitiporella*

33. Basidiocarps pileate---------- 34

34. Context monomitic, basidiospores > 4 um long---------- *Fulvifomes*

34. Context dimitic, basidiospores < 3 um long---------- *Pseudophylloporia*

35. Basidiocarps perennial, effused-reflexed to pileate; distribution in boreal and temperate areas----------
---------- *Sanghuangporus*

35. Basidiocarps annual to perennial, resupinate, effused-reflexed to pileate; distribution in tropical areas--
---------- *Tropicoporus*

Inonotus is a polyphyletic genus, and it is keyed out three times in the key.

4.1 *Coltricia* Gray, *Nat. Arr. Brit. Pl.* (London) 1: 644 (1821), (Figs. 1, 2)

Type species: *Coltricia perennis* (L.) Murrill.

Basidiocarps annual, stipitate, soft or leathery when fresh, corky or brittle and light-weight when dry; pileal surface yellowish to rust brown, or grayish with age in a few species, tomentose or velutinate, concentrically zonate or azonate; hymenophore grayish cinnamon to rust brown, mostly poroid, rarely lamellate; pores angular; context brown, coriaceous; hyphal system monomitic; generative hyphae simple septate; tissue darkening in KOH; basidiospores cylindrical, ellipsoid, subglobose or globose, slightly to distinctly thick-walled in most species, golden brown or rust brown when mature, smooth or finely verrucose, IKI– in most species, mostly CB–, some CB(+); on ground or on decayed angiosperm wood, rarely on gymnosperm wood. Traditional species with unsequenced types such as *C. perennis, C. cinnamomea, C. montagnei* may be in fact species complexes. The absence of specialized hymenial organs and a similar morphology in most *Coltricia* species makes it difficult to establish for sure the identity with the type.

Tedersoo et al. (2007) demonstrated that some species of *Coltricia* form ectomycorrhiza with the native trees in the Seychelles. Their study provides further evidence that the fruiting on wood does not indicate a saprotrophic lifestyle, but further studies are needed to confirm the lifestyle of other *Coltricia* species.

Coltriciella Murrill resembles *Coltricia* by brownish and stipitate basidiocarps with a monomitic hyphal system. The main difference is that *Coltriciella* has finely verrucose basidiospores, while they are smooth in *Coltricia*. Phylogenetically these two genera form one strongly supported clade (Wagner and Fischer 2002a; Larsson et al. 2006). Tedersoo et al. (2007) demonstrated that *Coltriciella* was placed in a monophyletic clade within *Coltricia*. Our current phylogeny confirmed the above conclusion (Fig. 2), and we treat *Coltriciella* as a synonym of *Coltricia*, and the following taxa are described or proposed.

Coltricia tibetica Y.C. Dai & F. Wu, **sp. nov.** (Figs. 2, 3, 4)

MycoBank: MB 839903.

Type. — **CHINA**. Xizang Autonomous Region (Tibet), Bomi County, on dead tree of *Picea*, 19.IX.2014, Cui 12208 (holotype, BJFC 017122).

Etymology. — *Tibetica* (Lat.): referring to the location of Tibet in China.

Fruiting body. — Basidiocarps annual, laterally stipitate, solitary, erect, soft and without distinctive odor or taste when fresh, becoming soft corky when dry. Pilei fan-shaped, projecting up to 2.5 cm, 3 cm wide, and 0.3 cm thick at base. Pileal surface honey yellow to deep olive when dry, concentrically zonate and radially aligned; margin thin and obtuse, lobed with age. Pore surface buff to honey yellow upon drying; pores angular, 1–3 per mm; dissepiments thin, lacerate. Context grayish brown to deep olive, coriaceous, up to 1 mm thick. Tubes cream to buff yellow, distinctly paler than context, fragile or slightly brittle when dry, up to 2 mm long. Stipe reddish brown, corky, finely velutinate, up to 2 cm long, 4 mm in diam.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Contextual hyphae buff to honey yellow, thick-walled with a wide lumen, occasionally branched, frequently simple septate, straight, more or less regularly arranged, 5–7 µm in diam; hyphae in stipe similar to context, parallel along the stipe, rarely branched, 5–7 µm in diam.

Trama of the tubes. — Tramal hyphae buff to curry yellow, slightly thick-walled with a wide lumen, moderately branched, frequently simple septate, straight, subparallel along the tubes, 4–5 µm in diam. Cystidia and cystidioles absent; basidia broadly clavate, sometimes constricted at middle, with four sterigmata and a simple septum at the base, 20–25 × 9–10 µm; basidioles in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid to mango-shaped, tapering at the apex, curry yellow, fairly thick-walled, finely verrucose, IKI–, CB–, (8–)8.2–9.8 × (4.8–)5–5.5(–5.8) µm, L = 8.88 µm, W = 5.18 µm, Q = 1.71–1.76 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA.** Yunnan Province, Yongping County, Baotai Mountain Forest Park, on rotten wood in mixed forest, 7.XI.2018, Dai 19359 (BJFC 027827).

Remarks. — Phylogenetically the represented specimen of *Coltriciella tibetica* formed an independent lineage nested in the *Coltricia* clade (Fig. 2) distantly related to other members of the genus. *C. tibetica* has laterally stipitate and fan-shaped basidiocarps, large pores, and finely verrucose basidiospores. These features are also shared by *Coltriciella pusilla* (Imazeki & Kobayasi) Corner. But the latter has smaller pilei (< 1 cm wide) and smaller basidiospores (7.5–8.5 × 4.5–5 µm vs. 8.2–9.8 × 5–5.5 µm, Núñez and Ryvarden 2000).

Coltricia sinoperennis Y.C. Dai & F. Wu, **nom. nov.**

MycoBank: MB 839904.

Basionym: *Coltricia subperennis* Y.C. Dai, in Dai, Yuan & Cui, *Sydowia* 62(1): 14 (2010).

Non *Coltricia subperennis* (Z.S. Bi & G.Y. Zheng) G.Y. Zheng & Z.S. Bi, in Bi, Zheng & Li, *Macrofungus Flora of China's Guangdong Province* (Hong Kong): 132 (1997).

Coltricia subperennis Y.C. Dai was described from South China (Dai et al. 2010), but it is illegitimate because of its earlier homonym name *Coltricia subperennis* (Z.S. Bi & G.Y. Zheng) G.Y. Zheng & Z.S. Bi which in fact is a synonym of *Coltricia dependens* (Dai and Yuan 2007). So, we propose *Coltricia sinoperennis* as a new name.

Coltricia baoshanensis (Y.C. Dai & B.K. Cui) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2)

Basionym: *Coltriciella baoshanensis* Y.C. Dai & B.K. Cui, in Dai, Cui, He & Dmitry, *Mycosystema* 33: 618 (2014).

MycoBank: MB 839906.

Coltricia corticicola (Corner ex Y.C. Dai & Hai J. Li) Y.C. Dai & F. Wu, **comb. nov.**

Basionym: *Coltriciella corticicola* Corner ex Y.C. Dai & Hai J. Li, *Mycoscience* 53: 344 (2012). ≡ *Coltriciella corticicola* Corner, *Beihefte zur Nova Hedwigia* 101: 43 (1991).

MycoBank: MB 839907.

Coltricia globosa (L.S. Bian & Y.C. Dai) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2) Basionym: *Coltriciella globosa* L.S. Bian & Y.C. Dai, *Mycoscience* 56: 194 (2015).

MycoBank: MB 839909.

Coltricia minuscula (Susan, Retnowati & Sukarno) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

Basionym: *Coltriciella minuscula* Susan, Retnowati & Sukarno, *Mycoscience* 59: 50 (2017).

MycoBank: MB 839910.

Coltricia naviculiformis (Y.C. Dai & Niemelä) Y.C. Dai & F. Wu, **comb. nov.**

Basionym: *Coltriciella naviculiformis* Y.C. Dai & Niemelä, *Acta Botanica Fennica* 179: 21 (2006).

MycoBank: MB 839911.

Coltricia navispora (T.W. Henkel, Aime & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2)

Basionym: *Coltriciella navispora* T.W. Henkel, Aime & Ryvarden, *Mycologia* 95: 617 (2003).

MycoBank: MB 839912.

Coltricia pseudodependens (L.S. Bian & Y.C. Dai) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2)

Basionym: *Coltriciella pseudodependens* L.S. Bian & Y.C. Dai, *Mycoscience* 56: 194 (2015).

MycoBank: MB 839913.

Coltricia sonorensis (R. Valenz., Esqueda & Decock) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2)

Basionym: *Coltriciella sonorensis* R. Valenz., Esqueda & Decock, *Mycological Progress* 11: 184 (2011).

MycoBank: MB 839914.

Coltricia subglobosa (Y.C. Dai) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 2)

Basionym: *Coltriciella subglobosa* Y.C. Dai, *Fungal Diversity* 45: 160 (2010).

MycoBank: MB 839915.

Coltricia tasmanica (Cleland & Rodway) Y.C. Dai & F. Wu, **comb. nov.**

Basionym: *Poria tasmanica* Cleland & Rodway, *Pap. Proc. R. Soc. Tasm.*: 43 (1930). ≡ *Coltriciella tasmanica* (Cleland & Rodway) D.A. Reid, *Kew Bulletin* 17: 292 (1963).

MycoBank: MB 839916.

Coltricia fragilissima (Mont.) Ryvarden (= *C. pyrophila* (Wakef.) Ryvarden) was described from West Africa, and it grows on charred wood. The species was recorded on ground in China and Thailand, and the Asian samples may present the taxa other than *Coltricia fragilissima* (Fig. 2). According to the literature, *Coltricia dependens* (Berk. & M.A. Curtis) Imazeki and *C. oblectabilis* (Lloyd) Ryvarden have a wide distribution, we did not exam the represented samples and no DNA data available from their types or specimens from type locality, and they are treated as *sensu lato* in the present study.

Key to species of *Coltricia*

1. Basidiospores smooth..... 2

1. Basidiospores finely ornamented or verrucose..... 47

2. Hymenophore concentrically lamellate..... *C. montagnei* (Fr.) Murrill

Basidiocarps annual, centrally stipitate; hymenophore mostly concentrically lamellate, occasionally with pores; lamellae 1–2 per mm; pores 0.5–1 per mm, decurrent on stipe; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, (8.8–)9–12(–12.7) × (5–)5.4–7(–7.7) µm (Dai 2010); type locality in France; distribution: Europe, North America and Asia.

2. Hymenophore poroid..... 3

3. Basidiocarps resupinate to effused-reflexed..... *C. truncicola* Corner

Basidiocarps resupinate to effused-reflexed, rather gibbous at the base, slightly descending, scabrous towards the margin; pores angular, 2–3 per mm; dissepiments thin, entire; hyphal system monomitic, two kind of hyphae present; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 8–9.5 × 4.7–6 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

3. Basidiocarps stipitate..... 4

4. Basidiocarps pendent and stipitate..... *C. tsugicola* Y.C. Dai & B.K. Cui

Basidiocarps annual, centrally stipitate and pendent; pores angular or sometimes sinuous to irregular, 1–2 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid to oblong-ellipsoid, smooth, 8.5–11.9 × 5.6–6.9 µm (Dai 2010); type locality in China; distribution: China.

4. Basidiocarps erectly stipitate..... 5

5. On dead roots and culms of sugar cane or bamboo..... *C. bambusicola* (Henn.) D.A. Reid

Basidiocarps annual, laterally to centrally stipitate; pilei spathulate, semicircular to dimidiate, bright yellowish to cinnamon; pores angular, 6–7 per mm; dissepiments entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores globose to subglobose, smooth, weakly IKI[+], 4.5–6 µm in diam (Ryvarden and Johansen 1980); on dead roots and culms of sugar cane or bamboo; type locality in India; distribution: India and Pakistan.

5. On ground, gymnosperm or dicotyledonous wood..... 6

6. Basidiocarps laterally stipitate..... 7

6. Basidiocarps eccentrically to centrally stipitate..... 14

7. Pores 7–8 per mm..... *C. rigida* L.S. Bian & Y.C. Dai

Basidiocarps annual, laterally stipitate, woody hard to rigid; pilei fan-shaped; pores angular, 7–8 per mm; sterile margin distinct; hyphal system monomitic to pseudodimitic; sclerified hyphae present, thick-walled to subsolid; setae or other sterile hymenial elements absent; basidiospores subglobose to globose, smooth, 6–7 × 5–6.5 µm (Bian and Dai 2017); type locality in China; distribution: China.

7. Pores 2–5 per mm..... 8

8. Basidiospores > 9 µm long..... 9

8. Basidiospores < 9 µm long..... 10

9. Pileal surface dull, azonate; basidiospores 9–10.3 µm long..... *C. duportii* (Pat.) Ryvarden

Basidiocarps annual, laterally stipitate; pores round to angular, 2–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 9–10.3 × 5.7–6.8 µm (Dai 2010); type locality in French Guiana; distribution: South America and China.

9. Pileal surface composed of pointed radially oriented bundles; basidiospores 10–11 µm long

..... *C. fibrosa* Aime & Ryvarden

Basidiocarps annual, laterally stipitate; pilei flabellate to spathulate, striate with bristle-like bundles of hyphae; pores angular, 2–3 per mm; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 10–11 × 5–7 µm (Aime et al. 2007); type locality in Guyana; distribution: Guyana.

10. Basidiospores 5–6.5 µm wide..... 11

10. Basidiospores 3.5–5 µm wide..... 12

11. Pileal surface velutinate with indistinct concentric zones..... *C. lateralis* L.S. Bian & Y.C. Dai

Basidiocarps annual, laterally stipitate; pilei semicircular to fan-shaped, projecting up to 1.2 cm,

1.5 cm wide, and 2.5 mm thick, velutinate, indistinct concentric zones; pores angular, 2–4 per mm; dissepiments thin, lacerate; stipe velutinate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 7–8 × 5–6 µm (Bian and Dai 2017); type locality in China; distribution: China.

11. Pileal surface fibrillose with stiff hyphal bundles, azonate..... *C. oboensis* Decock

Basidiocarps annual, laterally stipitate; pilei dimidiate, plane to slightly convex, projecting 3–6 mm, 5–8 mm wide and up to 3.5 mm thick; pileal surface fibrillose with stiff hyphal bundles; pores 2–3 per mm; dissepiments entire to slightly lacerate; stipe hirsute; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, smooth, 6.8–9 × 5–6 µm (Decock 2012); type locality in São Tomé; distribution: São Tomé.

12. Basidiospores 3.5–4 µm wide; pilei < 5 mm in largest dimension..... *C. minor* Y.C. Dai

Basidiocarps annual, laterally stipitate; pilei fan-shaped to spathulate, < 5 mm in largest dimension and less than 1 mm thick; pores round to angular, 2–3 per mm; dissepiments thin, entire or slightly lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores mostly oblong-

ellipsoid, smooth, 5.5–6.8 × 3.5–4 µm (Dai et al. 2010); type locality in China; distribution: China and Malaysia.

12. Basidiospores 4–5 µm wide; pilei > 10 mm in largest dimension..... 13

13. Pores 2–3 per mm; lignicolous species..... *C. kinabaluensis* Corner ex Y.C. Dai & Hai J. Li

Basidiocarps annual, laterally stipitate; pilei up to 5 cm long, 3 cm wide, and 18 mm thick; pileal surface concentrically zonate; pores angular, 2–3 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 6–7.8 × 4–4.9 µm (Dai and Li 2012); on wood; type locality in Malaysia; distribution: Malaysia.

13. Pores 3–5 per mm; terrestrial species..... *C. salpincta* (Cooke) G. Cunn.

Basidiocarps annual, lateral stipitate; pilei flabelliform or spatulate, up to 2.5 cm long, 2 cm wide, and 2 mm thick; pileal surface radially striate, indistinctly concentrically zonate; pores angular, 3–5 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 6–8 × 4–5 µm (Cunningham 1965); on ground; type locality in New Zealand; distribution: Malaysia and New Zealand.

14. Stipe duplex; on fallen trunk of *Abies*..... *C. abieticola* Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 1–4 per mm; dissepiments thin, lacerate; stipe duplex, swollen near the base; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 7–8 × 5.7–6.5 µm (Dai 2010); on *Abies*; type locality in China; distribution: China.

14. Stipe homogeneous; terrestrial species..... 15

15. Hyphae strongly pruinate..... 16

15. Hyphae smooth..... 17

16. Pores 2–3 per mm; basidiospores 4.8–5 µm wide..... *C. verrucata* Aime et al.

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 2–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphae strongly pruinate; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 7.5–9 × 4.8–5.1 µm (Dai 2010); type locality in Guyana; distribution: Guyana and China.

16. Pores 0.5–2 per mm; basidiospores 6–7 µm wide..... *C. subverrucata* L.S. Bian & Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 0.5–2 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphae strongly pruinate; setae or other sterile hymenial elements

absent; basidiospores broadly ellipsoid, smooth, 7.8–9 × 6–7 µm (Bian and Dai 2020); type locality in China; distribution: China.

17. Dendrohyphidia-like hyphae present..... *C. crassa* Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular, up to 2 cm thick; pores angular, 0.5–2 per mm; dissepiments thin, entire to lacerate; hyphal system monomitic; dendrohyphidia-like hyphae present; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 9–12 × 5.9–7 µm (Dai 2010); type locality in China; distribution: Southeast Asia.

17. Dendrohyphidia-like hyphae absent..... 18

18. Stipe bearing numerous spines..... *C. strigosipes* Corner

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 3–5 per mm; dissepiments thin, lacerate; stipe bearing plenty of spines; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, smooth, 5.5–6.5 × 4.8–5.5 µm (Dai 2010); type locality in Malaysia; distribution: Southeast Asia.

18. Stipe smooth or velutinate..... 19

19. Basidiocarps eccentrically stipitate, with unpleasant odor..... *C. macropora* Y.C. Dai

Basidiocarps annual, eccentrically stipitate, usually imbricate, with strong unpleasant odor upon drying; pores angular, 1–2 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 7.2–8.5 × 5.1–6 µm (Dai 2010); type locality in China; distribution: South China.

19. Basidiocarps centrally stipitate, without odor..... 20

20. Pileal surface with tufts or hairs..... 21

20. Pileal surface without tufts and hairs..... 24

21. Pores 1–3 per mm..... 22

21. Pores 4–9 per mm..... 23

22. Basidiospores cylindrical..... *C. cylindrospora* Ryvarden

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface with scattered forked hairs; pores angular, 1–2 per mm; stipe homogenous; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores cylindrical, hyaline, thin-walled, smooth, 5–7 × 2.8–3.2 µm (Ryvarden 2007); type locality in Belize; distribution: Belize.

22. Basidiospores subglobose, globose or slightly obovate..... *C. strigosa* G. Cunn.

Basidiocarps annual or biennial, centrally stipitate; pilei circular, not umbilicate; pileal surface strigose with coarse vertical hairs in the center; pores angular, 2–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores subglobose, globose or slightly obovate, 5–7 × 5–6 µm (Cunningham 1948); type locality in New Zealand; distribution: New Zealand.

23. Pileal surface glabrous; basidiospores non-dextrinoid..... *C. barbata* Ryvarden & de Meijer

Basidiocarps annual, centrally stipitate; pilei circular, infundibuliform, shiny; pileal surface glabrous; margin with 1–2 mm long tufts; pores round to angular, 4–9 per mm; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores subglobose, smooth, IKI–, 5–6 µm in diam (Ryvarden 2004); type locality in Brazil; distribution: Brazil.

23. Pileal surface velutinate to tomentose; basidiospores weakly to distinctly IKI[+].....

..... *C. velutina* Baltazar & Gibertoni

Basidiocarps annual, centrally stipitate; pilei circular to semicircular; pileal surface velutinate to tomentose; margin entire to incised, with tufts; pores round to angular, 5–7 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, smooth, 5.5–6.5 × 4.5–5.5 µm (Baltazar et al. 2010a); type locality in Brazil; distribution: Brazil.

24. Stipe branched..... *C. hirtipes* Corner

Basidiocarps annual, centrally stipitate; pilei circular, indistinctly concentrically zonate; pores angular, 4 per mm; dissepiments thin, entire; stipe branched, villose to hirsute; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, often collapsed, smooth, 5.2–6.2 × 4.7–5.5 µm (Dai and Li 2012); type locality in Singapore; distribution: Singapore.

24. Stipe unbranched..... 25

25. Setal hyphae present in lower context and trama..... *C. hamata* (Romell) Ryvarden

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform, rigid and brittle when dry; pores round to slightly angular, 2–3 per mm; dissepiments entire; stipe swollen at the base, finely velutinate, duplex; hyphal system monomitic; setal hyphae present in lower context and trama; basidiospores broadly ellipsoid, smooth, 8–10 × 5.5–6.5 µm (Ryvarden 2004); type locality in Brazil; distribution: South America.

25. Setal hyphae absent..... 26

26. Basidiospores cylindrical..... 27

26. Basidiospores ellipsoid to globose..... 28

27. Pileal surface rust brown to cinnamon..... *C. focicola* (Berk. & M.A. Curtis) Murrill

Basidiocarps annual, centrally stipitate; pilei circular; pileal surface first rust brown to cinnamon, becoming grayish to brownish gray from center to margin with age; pores angular, 1–2 per mm; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores cylindrical, weakly IKI[+], 8–11 × 4–5 µm (Ryvarden and Gilbertson 1993); type locality in USA; distribution: North America.

27. Pileal surface pale fuscous to almost black..... *C. arenicola* Corner ex Y.C. Dai & Hai J. Li

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface pale fuscous to almost black; pores angular, 3 per mm; dissepiments thin, entire to slightly lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores cylindrical, fairly thick-walled, smooth, 10.2–13 × 4–5.1 µm (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

28. Pores 6–8 per mm..... 29

28. Pores 0.5–6 per mm..... 31

29. Basidiospores globose..... *C. globispora* Gomes-Silva et al.

Basidiocarps annual, centrally stipitate; pilei circular to slightly infundibuliform; pores angular, 7–8 per mm; dissepiments thin and entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores globose, smooth, weakly IKI[+], usually bearing one large guttule, 5.5–6.6 µm in diam (Gomes-Silva et al. 2009); type locality in Brazil; distribution: Brazil.

29. Basidiospores oblong-ellipsoid to broadly ellipsoid..... 30

30. Basidiospores 4–4.5 µm wide..... *C. africana* Masuka & Ryvarden

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface concentrically zonate with narrow zones; pores 6–7 per mm; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, slightly IKI[+], 4.5–6 × 4–4.5 µm (Masuka and Ryvarden 1993); type locality in Malawi; distribution: Malawi.

30. Basidiospores 2.5–3 µm wide..... *C. fonsecoensis* W.B. Cooke & Bonar

Basidiocarps annual, stipitate; pilei circular, flat to infundibuliform; pores round, 6–8 per mm; dissepiments thin; context duplex; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid to broadly ellipsoid, thin- to thick-walled, smooth, 4–5 × 2.5–3 µm (Ryvarden 2004); type locality in Nicaragua; distribution: Central America.

31. Basidiospores > 10 µm long..... *C. grandispora* Ryvarden & Hauskn.

Basidiocarps annual, centrally or slightly eccentrically stipitate; pilei circular to infundibuliform; pores slightly angular, slightly decurrent, up to 2 mm wide; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 11.4–14 × 7–9 µm (Ryvarden et al. 2006); type locality in Seychelles; distribution: Seychelles.

31. Basidiospores < 10 µm long..... 32

32. Growing in gymnosperm forests..... *C. perennis* (L.) Murrill

Basidiocarps annual, centrally stipitate; pilei circular; pileal surface densely zonate; pores angular, 2–3 per mm; dissepiments thin; hyphal system monomitic; hyphae on pileal surface with dichotomous antler-like branching; setae and other sterile hymenial elements absent; basidiospores ellipsoid to oblong-ellipsoid, smooth, 6.8–8.4 × 4–5 µm; on the ground in conifer forests (Niemelä 2005); type locality in Sweden; distribution: Europe, North America and Asia.

32. Growing in angiosperm forests..... 33

33. Basidiospores 3–3.5 µm wide..... 34

33. Basidiospores > 4 µm wide..... 35

34. Pores 4–6 per mm; basidiospores ellipsoid; on ground.....

..... *C. stuckertiana* (Speg.) Rajchenb. & J.E. Wright

Basidiocarps annual, centrally stipitate; pilei dimidiate to semicircular; pores angular, 4–6 per mm; dissepiments thin; stipe up to 2 cm long, 4 mm in diam; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, golden yellow, thick-walled, smooth, 4–4.5 × 3–3.5 µm (Rajchenberg and Wright 1998); on ground; type locality in Argentina; distribution: Argentina and Paraguay.

34. Pores 2–4 per mm; basidiospores oblong-ellipsoid; on charred wood.....

..... *C. fragilissima* (Mont.) Ryvarden (= *C. pyrophila* (Wakef.) Ryvarden)

Basidiocarps annual, laterally to centrally stipitate; pilei flat to infundibuliform, up to 8.5 cm in diam; pores angular, 2–4 per mm, decurrent on stipe; dissepiments thin; stipe short and expanded both towards the base and the pileus, 5–30 mm in diam, 2–6.5 cm long; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid, smooth, 4–5.5 × 3–3.5 µm (Ryvarden 2004); on charred wood; type locality in Nigeria; distribution: Venezuela and West Africa.

35. Basidiospores mostly > 8 µm long..... 36

35. Basidiospores < 8 µm long..... 41

36. Pores 3–5 per mm..... *C. sinoperennis* Y.C. Dai & F. Wu

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 3–5 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, some collapsed, 7.8–9 × 5.3–6.1 µm (Dai 2010); type locality in China; distribution: China.

36. Pores 0.5–3 per mm..... 37

37. Basidiocarps usually confluent..... 38

37. Basidiocarps usually solitary..... 39

38. Dichotomously branched hyphae present at pileal surface; European species.....

..... *C. confluens* P.-J. Keizer

Basidiocarps annual, centrally stipitate; pilei circular to irregularly infundibuliform, confluent; pileal surface dark or light rust brown, indistinctly zonate; pores circular or polygonal, 1–2 per mm; mostly several stipes under a cluster of confluent pilei; hyphal system monomitic; hyphae at pileal surface dichotomously branched; setae or other sterile hymenial elements absent; basidiospores ellipsoid, smooth, 7.9–8.7 × 4.9–5.8 µm (Niemelä 2005); type locality in Netherlands; distribution: North and Central Europe.

38. Dichotomously branched hyphae absent; Asian species..... *C. progressus* Corner ex Y.C. Dai & Hai J. Li

Basidiocarps annual, centrically or laterally stipitate; pilei circular, confluent; pores angular, variable, 0.5–2 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, thick-walled, often collapsed, smooth, 8–9.8 × 5–6.5 µm (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

39. Basidiocarps spongy; Neotropical species..... *C. permollis* Baltazar & Gibertoni

Basidiocarps annual, centrally stipitate, solitary, spongy; pilei circular, centrally depressed; pileal surface slightly to strongly concentrically ridged; pores angular, 0.5–1.5 per mm; dissepiments thin, entire to lacerate; hyphal system monomitic, often collapsed; contextual hyphae 4–10 µm in diam; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid to broadly ellipsoid, olive in KOH, smooth, 8–9.5 × 5.5–6.5 µm (Baltazar et al. 2010a); type locality in Brazil; distribution: Brazil.

39. Basidiocarps soft corky; Asian species..... 40

40. Pileal surface without radially aligned lines..... *C. subcinnamomea* L.S. Bian & Y.C. Dai

Basidiocarps annual, centrally stipitate, solitary, corky to fragile; pilei circular with bristles in center; pileal surface distinctly concentrically zonate and sulcate; pores angular, 2–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; contextual hyphae 11–14 µm in diam; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, smooth, 8–9.5 × 6.2–6.8 µm (Bian and Dai 2020); type locality in China; distribution: China.

40. Pileal surface with radially aligned lines..... *C. austrosinensis* L.S. Bian & Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface with indistinct concentric zones and radially aligned lines; pores angular, 1–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; contextual hyphae 8–9 µm in diam; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 8.2–9.8 × 5.5–6.5 µm (Bian et al. 2016a); type locality in China; distribution: South China.

41. Pores 0.5–2 per mm..... *C. wenshanensis* L.S. Bian & Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular, grayish brown to deep olive upon drying; pores angular, 0.5–2 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to subglobose, smooth, 7.5–8 × 6–7 µm (Bian and Dai 2017); type locality in China; distribution: South China.

41. Pores 2–6 per mm..... 42

42. Basidiospores subglobose to globose..... *C. albidipes* Corner ex Y.C. Dai & Hai J. Li

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface with indistinct concentric zones, glabrous; pores round, 4–6 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores subglobose to globose, smooth, 5–6 × 4.7–5.2 µm (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

42. Basidiospores ellipsoid to broadly ellipsoid..... 43

43. Dichotomously branched hyphae present at pileal surface..... *C. weii* Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform; pileal surface with distinct concentric zones, finely velutinate; pores round to angular, slightly decurrent on stipe, 3–4 per mm; dissepiments thin, entire to slightly lacerate; hyphal system monomitic; pileipellis hyphae in parallel bundles, with short double branching at the tip; basidiospores broadly ellipsoid, smooth, 5.6–7.2 × 4.3–5.5 µm (Dai et al. 2010); type locality in China; distribution: China.

43. Dichotomously branched hyphae absent at pileal surface..... 44

44. Basidiospores mostly 4–5 µm wide..... 45

44. Basidiospores mostly 5–6 µm wide..... 46

45. Dissepiments lacerate; Asian species..... *C. minima* L.S. Bian & Y.C. Dai

Basidiocarps annual, centrally stipitate; pilei tiny, circular, up to 13 mm in diam; pileal surface velutinate to glabrous; pore surface dark grayish blue when fresh; pores angular, 3–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 6–7 × 4–5 µm (Bian et al. 2016a); type locality in China; distribution: South China.

45. Dissepiments entire; Australian species..... *C. australica* L.W. Zhou et al.

Basidiocarps annual, centrally stipitate, gregarious; pilei circular to infundibuliform, up to 30 mm in diam; pileal surface concentrically zonate, glabrous; pores angular, 3–4 per mm; dissepiments thin, entire; hyphal system monomitic; hyphae at pileal surface unbranched; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid to ellipsoid, smooth, 6–7.3 × 4.1–5.2 µm (Zhou and Tedersoo 2012); type locality in Australia; distribution: Australia.

46. Pores 2–4 per mm; temperate species..... *C. cinnamomea* (Jacq.) Murrill

Basidiospores annual, centrally stipitate; pilei circular, flat to infundibuliform; pileal surface shiny to glossy; pores angular, 2–4 per mm; dissepiments thin; hyphal system monomitic; hyphae at pileal surface unbranched; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid to broadly ellipsoid, smooth, weakly IKI[+], 6.5–8 × 5–6 µm (Ryvarden 2004); type locality in Austria; distribution: Europe, North America and Asia.

46. Pores 4–5 per mm; tropical species..... *C. robusta* Vlasák & Ryvarden

Basidiocarps annual, centrally stipitate; pilei circular to infundibuliform, up to 8 cm in diam; pores angular, 4–5 per mm; stipe cylindrical, up to 7 mm in diam, 4 cm long; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, smooth, 5.5–7 × 5–6 µm (Vlasák et al. 2020b); type locality in Costa Rica; distribution: Costa Rica.

47. Basidiocarps resupinate to effused-reflexed or substipitate..... 48

47. Basidiocarps stipitate..... 51

48. Basidiocarps resupinate..... *C. tasmanica* (Cleland & Rodway) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate, soft and cottony; easily separable from the substrate; pores angular, 1–2 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, verrucose, 7–8 × 5–5.5 µm (Núñez and Ryvarden 2000); type locality in Australia; distribution: Australia and Southeast Asia.

48. Basidiocarps effused-reflexed to pileate..... 49

49. Basidiospores narrowly ellipsoid to mango-shaped.....

..... *C. corticicola* (Corner ex Y.C. Dai & Hai J. Li) Y.C. Dai & F. Wu

Basidiocarps annual, effused-reflexed; pilei circular; pores angular, 2–3 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores narrowly ellipsoid to mango-shaped, verrucose, 8–10 × 4.8–5.8 µm (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

49. Basidiospores broadly ellipsoid to subglobose..... 50

50. Hyphae at dissepiment edge mostly moniliform; cystidioles present.....

..... *C. subglobosa* (Y.C. Dai) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate to effused-reflexed; pilei usually fused laterally, sometimes imbricate; pores round, 3–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphae at dissepiment edge mostly moniliform; cystidioles present; basidiospores subglobose, verrucose, 6.3–7.8 × 5.2–6.5 µm (Dai 2010); type locality in China; distribution: China.

50. Hyphae at dissepiment edge uniform; cystidioles absent.....

..... *C. baoshanensis* (Y.C. Dai & B.K. Cui) Y.C. Dai & F. Wu

Basidiocarps annual, effused-reflexed to substipitate; pilei usually fused laterally and sometimes imbricate; pores round to angular, 2–3 per mm; dissepiments thin, entire to lacerate; sterile margin up to 1 mm wide; hyphal system monomitic; hyphae at dissepiment edge uniform; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, verrucose, 6–8.5 × 5.2–7 µm (Dai et al. 2014); type locality in China; distribution: China.

51. Basidiocarps pendent..... 52

51. Basidiocarps erect..... 54

52. Basidiospores 9–11.8 µm long... *C. pseudodependens* (L.S. Bian & Y.C. Dai) Y.C. Dai & F. Wu

Basidiocarps annual, stipitate, pendent, solitary or a few fused; pores angular, 1–3 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid to oblong-ellipsoid, verrucose, usually collapsed with age, 9–11.8 × 5–6.2 µm (Bian and Dai 2015); type locality in China; distribution: China.

52. Basidiospores 5–9 µm long..... 53

53. Pileal surface with zones; basidia 4-sterigmata..... *C. dependens* (Berk. & M.A. Curtis) Imazeki

Basidiocarps annual, stipitate, pendent, solitary or a few fused; pileal surface with zones; pores angular, 2–3 per mm; dissepiments thin, entire; hyphal system monomitic; setae or other sterile hymenial elements absent; basidia with four sterigmata; basidiospores ellipsoid, verrucose, 6–9 × 4–5.5 µm (Dai 2010); type locality in USA; distribution: tropical Asia, Africa, Oceania and USA.

53. Pileal surface without zones; basidia 2-sterigmata..... *C. minuscula* (Susan et al.) Y.C. Dai & F. Wu

Basidiocarps annual, stipitate, pendent; pilei peltate; pileal surface brown, fibrillose tomentose without zones; pore surface light brown; pores 2–3 per mm; dissepiments thin, entire; hyphal system monomitic; contextual hyphae verruculose; setae or other sterile hymenial elements absent; basidia with two sterigmata; basidiospores ellipsoid, golden brown, thick-walled, verrucose, (5.7–)5.8–7.2(–7.3) × (3.7–)3.8–4.8(–5.1) µm (Susan et al. 2017); type locality in Indonesia; distribution: Indonesia.

54. Basidiocarps laterally stipitate..... 55

54. Basidiocarps centrally stipitate..... 58

55. Basidiospores navicular..... *C. navispora* (T.W. Henkel et al.) Y.C. Dai & F. Wu

Basidiocarps annual, laterally stipitate; pilei slightly infundibuliform; margin thin; pores angular, 1–2 per mm; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores navicular, verrucose, usually collapsed with age, 10–12 × 4–5 µm (Aime et al. 2003); type locality in Guyana; distribution: Guyana.

55. Basidiospores ellipsoid, oblong-ellipsoid to cylindrical or mango-shaped..... 56

56. Pilei semicircular to reniform; basidiospores oblong-ellipsoid to cylindrical.....

..... *C. sonorensis* (R. Valenz. et al.) Y.C. Dai & F. Wu

Basidiocarps annual, laterally stipitate; pilei semicircular to reniform; pores round to elongate, 2–3 per mm; dissepiments thick; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid to cylindrical, verrucose, 8–10.4 × 4–5 µm (Valenzuela et al. 2011b); type locality in Mexico; distribution: Mexico.

56. Pilei fan-shaped; basidiospores ellipsoid or mango-shaped..... 57

57. Mature pilei up to 1 cm long; basidiospores 4.5–5 µm wide..... *C. pusilla* Imazeki & Kobayasi

Basidiocarps annual, laterally stipitate; pilei fan-shaped, up to 1 cm long; pores angular, 2–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent;

basidiospores ellipsoid, verrucose, 7.5–8.5 × 4.5–5 µm (Núñez and Ryvarden 2000); type locality in Japan; distribution: warm-temperate Asia.

57. Mature pilei up to 2.5 cm long, basidiospores 5–5.5 µm wide..... *C. tibetica* Y.C. Dai & F. Wu

Basidiocarps annual, laterally stipitate, erect; pilei fan-shaped, up to 2.5 cm long; pores angular, 1–3 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid to mango-shaped, verrucose, 8.2–9.8 × 5–5.5 µm, Q = 1.71; type locality in China; distribution: China.

58. Basidiospores ellipsoid..... 59

58. Basidiospores naviculate or subglobose to globose..... 61

59. Pores 1–2 per mm; basidiospores oblong-ellipsoid..... *C. oblectabilis* (Lloyd) Ryvarden

Basidiocarps annual, centrally stipitate; pilei infundibuliform, indistinctly zonate; pores angular, 1–2 per mm; dissepiments thin; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores oblong-ellipsoid with rounded base and somewhat tapering at the other end, verrucose, 7–10 × 4–5 um (Ryvarden 2004); type locality in Brazil; distribution: Southeast Asia, warm-temperate and tropical America.

59. Pores 2–4 per mm; basidiospores ellipsoid to broadly ellipsoid..... 60

60. Basidiospores reddish brown, 3.5–5 µm wide..... *C. pseudocinnamomea* Burds.

Basidiocarps annual, centrally stipitate; pilei zonate; pileal surface shiny, radially silky fibrillose; pores round to angular, 2–3 per mm, decurrent on stipe; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores ellipsoid, apiculate, with one large guttule, reddish brown, verrucose, 6–9 × 3.5–5 µm (Burdsall 1969); type locality in USA; distribution: USA.

60. Basidiospores hyaline, 4.7–5.4 µm wide..... *C. subpicta* (Lloyd) Imazeki & Kobayasi

Basidiocarps annual, centrally stipitate; pilei infundibuliform, up to 1 cm in diam; pores round to angular, 3–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; basidiospores broadly ellipsoid, hyaline, verrucose, 6.5–7.8 × 4.7–5.4 µm (Dai 2010); type locality in Japan; distribution: Southeast Asia.

61. Basidiospores naviculate, 8–11 µm long.....

..... *C. naviculiformis* (Y.C. Dai & Niemelä) Y.C. Dai & F. Wu

Basidiocarps annual, centrally stipitate; pores round to angular, 1–2 per mm; dissepiments thin, entire; stipe tip swollen up to 5 mm in diam; hyphal system monomitic; setae or other sterile hymenial elements

absent; basidiospores naviculate, verrucose, 8–11 × 5–6.2 µm (Dai 2010); type locality in China; distribution: China.

61. Basidiospores subglobose to globose, 6–7 µm long.....

..... *C. globosa* (L.S. Bian & Y.C. Dai) Y.C. Dai & F. Wu

Basidiocarps annual, centrally stipitate; pilei circular; pores angular, 2–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; setae or other sterile hymenial elements absent; fusoid cystidioles present; basidiospores globose, verrucose, 6–7 × 5.8–7 µm (Bian and Dai 2015); type locality in China; distribution: China.

4.2 *Coniferiporia* L.W. Zhou & Y.C. Dai, *Fungal Biology* 120 (8): 993 (2016), (Fig. 1)

Type species: *Coniferiporia qilianensis* (B.K. Cui et al.) L.W. Zhou & Y.C. Dai.

Basidiocarps annual to perennial, resupinate, soft corky and without distinctive odor or taste when fresh, becoming corky to fibrous upon drying; hyphal system monomitic; hyphoid setae abundant, subulate, sharply pointed, parallel along the tubes, sometimes apically encrusted; hymenial setae absent; cystidia present; cystidioles absent; basidiospores ellipsoid to subglobose, hyaline, thin-walled, smooth, IKI–, CB– or CB(+); on gymnosperm trees; causing a white rot.

Coniferiporia was recently derived from *Phellinidium*, and all species of *Coniferiporia* are forest pathogens on gymnosperm trees (Larsen et al. 1994; Dai and Qin 1998; Cui et al. 2015; Zhou et al. 2016a; Wang et al. 2021).

Key to species of *Coniferiporia*

1. Basidiocarps annual, pores 4–5 per mm, dissepiments strongly lacerate; on species of Pinaceae *C. sulphurascens* (Pilát) L.W. Zhou & Y.C. Dai (=*Phellinidium cryptocystidiatum* Spirin & Zmitr.)

Basidiocarps annual, resupinate; pore surface yellowish brown to dark brown; pores 4–5 per mm; dissepiments strongly lacerate; hyphal system monomitic; hyphoid setae dominant, 120–270 × 5–8 µm; subulate to ventricose cystidia present, 18–36 × 3.5–5 µm; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB(+), (3.5–)3.7–4.6(–4.8) × (2.8–)2.9–3.6 (–3.8) µm, L = 4.17 µm, W = 3.17 µm, Q = 1.26–1.37 (Dai 2010); on species of Pinaceae; type locality in Russia; distribution: Northern Asia.

1. Basidiocarps perennial, pores 5–8 per mm; dissepiments entire or slightly lacerate; on species of Cupressaceae———————————————————————————— 2

2. Dissepiments entire; hyphoid setae smooth; on *Thuja* in North America————————

———————————————— *C. weirii* (Murrill) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, resupinate; pore surface dark brown; pores 5–7 per mm; dissepiments entire; hyphal system monomitic; hyphoid setae smooth, dominant, 130–270 × 4–6 µm; cystidia present, 15–24 × 4–5 µm; basidiospores ovoid, hyaline, thin-walled, IKI–, CB–, 4.9–5.3 × 3.2–3.8 µm (Cui et al. 2015); on species of Cupressaceae; type locality in USA; distribution: North America.

2. Dissepiments lacerate; hyphoid setae apically encrusted; on *Sabina* or *Juniperus* in Asia——— 3

3. Basidiospores 3.7–4.3 µm long; on *Sabina* in China————————————————————

———————————————————— *C. qilianensis* (B.K. Cui et al.) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, resupinate; pore surface grayish brown; pores 5–8 per mm; dissepiments entire; hyphal system monomitic; hyphoid setae apically encrusted, dominant, 110–260 × 5–10 µm; subulate to ventricose cystidia present, 17–30 × 3–5 µm; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI–, CB–, (3.5–)3.7–4.3(–4.4) × 2.8–3.3 (–3.5) µm, L = 3.93 µm, W = 3.06 µm, Q = 1.27–1.3 (Cui et al. 2015); on *Sabina*; type locality in China; distribution: Northwest China.

3. Basidiospores 4.3–5.1 µm long; on *Juniperus* in Uzbekistan– *C. uzbekistanensis* L.W. Zhou et al.

Basidiocarps perennial, resupinate; pore surface grayish brown; pores 5–6 per mm; dissepiments slightly lacerate; hyphal system monomitic; hyphoid setae apically encrusted, dominant, several hundreds µm long and 6–8 µm in diam; clavate cystidia present, 30–35 × 4.5–5.5 µm; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (4.2–)4.3–5.1(–5.2) × (2.6–)2.7–3.7(–3.8) µm, L = 4.69 µm, W = 3.28 µm, Q = 1.4–1.45 (Wang et al. 2021); on *Juniperus*; type locality in Uzbekistan; distribution: Uzbekistan.

4.3 *Cylindrosporus* L.W. Zhou, *Phytotaxa* 219: 279 (2015), (Fig. 1)

Type species: *Cylindrosporus flavidus* (Berk.) L.W. Zhou.

Basidiocarps annual, pileate; pileal surface velutinate, azonate; context duplex, with a black line between upper tomentum and lower context; hyphal system monomitic; generative hyphae simple septate, hyaline, thin-walled to yellowish, thick-walled, branched; hyphoid setae absent; hymenial setae subulate to ventricose; basidiospores cylindrical, hyaline, IKI–, CB–; on angiosperm wood; causing a white rot.

Cylindrosporus was erected as a monotypic genus on the basis of *Polyporus flavidus* Berk. (Zhou 2015a). This species was successively treated as a member of *Inonotus* (Hjortstam and Ryvarden 1984) and *Onnia* (Dai and Niemelä 2006). However, the exclusively pileate basidiocarps and cylindrical basidiospores distinguished it from these two genera. Besides, phylogenetic evidence inferred from ITS and nLSU regions also supported *C. flavidus* as a distinct clade (Fig. 1).

Cylindrosporus flavidus (Berk.) L.W. Zhou, *Phytotaxa* 219: 279 (2015).

Basidiocarps annual, pileate; pileal surface velutinate, azonate; pores 5–6 per mm; context duplex, with a black line between upper tomentum and lower context; hyphal system monomitic; hyphoid setae absent;

hymenial setae subulate to ventricose, 16–28 × 6–9 µm; basidiospores cylindrical, hyaline, IKI–, CB–, (5–)5.7–6.8(–7.2) × (1.6–)1.7–2.2(–2.3) µm, L = 6.16 µm, W = 1.92 µm, Q = 3.21 (Dai 2010); on angiosperm wood; type locality in Nepal; distribution: Asia.

4.4 *Flaviporellus* Murrill, Bull. *Torrey bot. Club* 32(9): 485 (1905), (Fig. 1)

Type species: *Flaviporellus splitgerberi* (Mont.) Murrill.

Basidiocarps annual, pileate, becoming vivid deep red in KOH; pileal surface radially striate, zonate; pore surface yellow to deep rust brown; dissepiments lacerate; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores pale brown, often collapsed, IKI–, CB–; on angiosperm wood; causing a white rot.

Flaviporellus is characterized by basidiocarps becoming vivid deep red in KOH, homogeneous context, a monomitic hyphal system, the absence of setal element, colored and usually collapsed basidiospores. Morphologically *Flaviporellus* resembles *Phylloporia* by a monomitic hyphal system, the absence of setal elements, and colored and usually collapsed basidiospores, but most species in the latter genus have duplex context that becomes black in KOH. Phylogenetically *Flaviporellus* distinctly formed a separated lineage from *Phylloporia* (Fig. 1).

Flaviporellus splitgerberi (Mont.) Murrill, *Bull. Torrey bot. Club* 32(9): 486 (1905).

Basidiocarps annual, pileate, imbricate, becoming vivid deep red in KOH; pilei applanate, fan-shaped, lobed; pileal surface rust to dark brown, radially striate, zonate; pore surface yellow to deep rust brown; pores 4–6 per mm; dissepiments lacerate; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores oblong-ellipsoid, pale brown, often collapsed, 4–5(–6) × 3–4.5 µm (Ryvarden 2005); type locality in Surinam; distribution: tropical America.

4.5 *Fomitiporella* Murrill, *North American Flora* 9(1): 12 (1907), (Figs. 1, 5)

Type species: *Fomitiporella umbrinella* (Bres.) Murrill.

Basidiocarps annual to perennial, resupinate in most species, rarely effused-reflexed to pileate, without distinctive odor or taste when fresh, hard corky to brittle when dry; pore surface ferruginous to rust brown, glancing; pores circular to angular; subiculum very thin to almost lacking; hyphal system dimitic at least in trama; generative hyphae frequent in trama; skeletal hyphae dominant in context and trama; setal elements absent; cystidioles present or absent; basidia barrel-shaped, with four sterigmata and a simple basal septum; basidioles similar to basidia in shape, but slightly smaller; basidiospores subglobose, broadly ellipsoid, smooth, fairly thick-walled, IKI–, CB– or CB(+); on angiosperm wood; causing a white rot.

Fomitiporella as a genus within the Hymenochaetaceae was accepted by Wagner and Fischer (2002a) based on nLSU sequences, and it produces mostly resupinate basidiocarps. The genus is similar to

Fulvifomes and *Phylloporia* in sharing colored basidiospores and the absence of setae; but *Fulvifomes* and *Phylloporia* are characterized by distinctly pileate basidiocarps except for *Phylloporia parasitica* Murrill which has a resupinate basidiocarp (Hattori et al. 2014; Zhou 2014a, 2014b), but until now no molecular data has been available for *Phylloporia parasitica,* and its relationships with other species are unknown. In addition, *Phylloporia* has a duplex context and grows on living plants, while *Fulvifomes* has a homogeneous context and occurs mostly on dead wood. Furthermore, *Fomitiporella*, *Fulvifomes* and *Phylloporia* form three clades in phylogeny of Hymenochaetaceae (Fig. 1).

Arambarria Rajchenb. & Pildain, *Phellinotus* Drechsler-Santos et al. and *Rajchenbergia* Salvador-Montoya were recently established and the type species are *Arambarria destruens* Rajchenb. & Pildain, *Phellinotus neoaridus* Drechsler-Santos & Robledo and *Rajchenbergia pertenuis* (Xavier de Lima & Oliveira-Filho) Salvador-Montoya, respectively (Rajchenberg et al. 2015; Drechsler-Santos et al. 2016; Salvador-Montoya et al. 2020). However, according to our phylogeny (Fig. 5), these type taxa are nested into *Fomitiporella* clade, and we treated them as synonyms of *Fomitiporella* in the present study.

Fomitiporella crassa Y.C. Dai & F. Wu, **sp. nov.** (Figs. 5, 6, 7)

MycoBank: MB 839917.

Type. — **AUSTRALIA.** Tasmania, Arve River, Streamside Nature Reserve, on fallen trunk of *Eucalyptus*, 15.V.2018, Dai 18787 (holotype, BJFC 027255; isotype in MEL).

Etymology. — *Crassa* (Lat.): referring to the species having thick basidiocarps.

Fruiting body. — Basidiocarps perennial, resupinate, inseparable from substrate, without distinctive odor or taste and wood hard when fresh, woody hard to bone hard and light in weight when dry, up to 25 cm long, 8 cm wide and 1.3 cm thick at center, distinctly cushion-shaped with age; margin receding, black when dry, up to 10 mm wide. Pore surface cinnamon to brick when fresh, becoming umber to bay and cracking when dry, slightly glancing; pores circular, 6–7 per mm; dissepiments thin and entire. Subiculum very thin to almost lacking, cinnamon, woody hard, up to 0.2 mm thick. Tubes fulvous when dry, paler than pore surface, indistinctly stratified, usually filled with white mycelial strands in old tubes, up to 13 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae infrequent, pale yellow, slightly thick-walled, rarely branched and frequently simple septate, 2–2.5 µm in diam; skeletal hyphae dominant, golden yellow, thick-walled with a narrow to medium lumen, unbranched, aseptate, flexuous, interwoven, 2–3.2 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, slightly thick-walled, occasionally branched, frequently septate, 2–2.5 µm in diam; skeletal hyphae dominant, yellowish, thick-walled with a narrow lumen, unbranched, aseptate, flexuous, interwoven, 2–2.8 µm in diam. Setal elements absent;

cystidioles present, fusoid, hyaline, thin-walled, 9–14 × 3–5 µm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 12–14 × 7–8 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller; big rhomboid crystals abundant.

Spores. — Basidiospores broadly ellipsoid, golden yellow, thick-walled, smooth, some collapsed, IKI–, CB–, (4.2–)4.4–5(–5.2) × (3.3–)3.5–4.1(–4.2) µm, L = 4.79 µm, W = 3.84 µm, Q = 1.23–1.24 (n = 60/2).

Additional specimen (paratype) examined. — **AUSTRALIA**. Hobart, Mt. Wellington, on fallen trunk of *Olearia*, 13.V.2018, Dai 18716 (BJFC027185).

Remarks. — *Fomitiporella crassa* is distinct from other species of *Fomitiporella* by its resupinate, thick and cushion-shaped basidiocarps with receding, black margin. It is similar to *F. subinermis* Y.C. Dai & Vlasák by sharing almost the same dimensions of pores and basidiospores, but *F. subinermis* has uniform, resupinate, uncracked basidiocarps, yellowish brown margin, and a distribution so far in China. In addition, *F. crassa* and *F. subinermis* form two independent lineages in our phylogeny (Fig. 5).

Fomitiporella queenslandica Y.C. Dai & F. Wu, **sp. nov.** (Figs. 5, 8, 9)

MycoBank: MB 839918.

Type. — **AUSTRALIA**. Queensland, Cairns, Crater Lake National Park, on fallen angiosperm trunk, 17.V.2018, Dai 18849 (holotype, BJFC 027317; isotype in MEL).

Etymology. — *Queenslandica* (Lat.): referring to the state of Queensland in Australia where the species was found.

Fruiting body. — Basidiocarps perennial, pileate, a few imbricate, hard corky and without distinctive odor or taste when fresh, woody hard and medium in weight when dry; pilei dimidiate, projecting up to 4 cm, 12 cm wide, and 1.5 cm thick at base; pileal surface black when fresh, becoming cigar brown to fuscous when dry, concentrically sulcate, velutinate to glabrous, encrusted; margin acute. Pore surface date brown when fresh, becoming umber when dry, glancing; sterile margin yellowish brown, up to 2 mm wide; pores circular to angular, 8–9 per mm; dissepiments thin, entire. Context very thin to almost lacking, cinnamon, woody hard, up to 1 mm thick. Tubes concolorous with pore surface, hard corky to brittle, up to 1.4 cm long, annual layers distinct.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, pale yellow, slightly thick-walled, occasionally branched, frequently simple septate, 2.2–3.5 µm in diam; skeletal hypahe golden yellow, thick-walled with a narrow lumen, rarely branched, aseptate, flexuous, interwoven, 2.5–4.5 µm in diam.

Trama of the tubes. — Generative hyphae frequent, pale yellowish, slightly thick- to distinctly thick-walled, rarely branched, frequently septate, 2–3 µm in diam; skeletal hyphae frequent, not dominant, yellow, thick-

walled with a narrow lumen, unbranched, aseptate, straight, more or less parallel along the tubes, 2.5–4 µm in diam. Setae absent; cystidioles present, fusoid, hyaline, thin-walled, 9–17 × 3–4.5 µm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 9–11 × 5–6 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores broadly ellipsoid, golden yellow, thick-walled, smooth, IKI–, CB–, (4.1–)4.2–5 × (3–)3.2–3.9(–4) µm, L = 4.5 µm, W = 3.49 µm, Q = 1.26–1.30 (n = 90/3).

Additional specimens (paratypes) examined. — **AUSTRALIA**. Queensland, Cairns, Crater Lake National Park, on angiosperm stump, 17.V.2018, Dai 18844 (BJFC027312); Whitfield Conservation Park, on angiosperm stump, 18.V.2018, Dai 18872 (BJFC027340).

Remarks. — *Fomitiporella queenslandica* resembles *F. caryophyllii* (Racib.) T. Wagner & M. Fisch. by perennial, pileate basidiocarps and the same size of pores, but the latter has smaller basidiospores (4.2–5 × 3.2–3.9 µm vs. 3–4 × 2.5–3 µm, Ryvarden and Johansen 1980). *F. queenslandica* is phylogenetically related to *F. austroasiana* Y.C. Dai et al. (Fig. 5), but the latter species has subglobose and shorter basidiospores (3.8–4.1 × 3–3.5 µm vs. 4.2–5 × 3.2–3.9 µm, Ji et al. 2018).

Fomitiporella coruscans (Murrill) Salvador-Montoya & Popoff is an earlier name for *Fomitiporella micropora* Y.C. Dai et al. (Salvador-Montoya et al. 2020), that is now treated as a synonym of *F. coruscans.* In addition, the following taxa described in *Phellinus* have morphological characteristics fitting *Fomitiporella*, and the combinations are proposed:

Fomitiporella adhaerens (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839919.

Basionym: *Phellinus adhaerens* J.E. Wright & Blumenf., *Mycotaxon* 21: 416 (1984).

Fomitiporella cyclobalanopsidis (T.T. Chang & W.N. Chou) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839921.

Basionym: *Phellinus cyclobalanopsidis* T.T. Chang & W.N. Chou [as 'cyclobalanopsis'], *Mycologia* 92: 802 (2000).

Fomitiporella destruens (Rajchenb. & Pildain) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 5)

MycoBank: MB 839922.

Basionym: *Arambarria destruens* Rajchenb. & Pildain, in Rajchenberg, Bianchinotti, Barroetaveña & Pildain, *Mycologia* 107: 759 (2015).

Fomitiporella membranacea (Wright & Blumenf.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839924.

Basionym: *Phellinus membranaceus* J.E. Wright & Blumenf., *Mycotaxon* 21: 422 (1984).

Specimens examined. — **BRAZIL**. Municipio de Ubatuba, 18.01.1987, Ryvarden 24181, SP 212979.

Fomitiporella neoarida (Drechsler-Santos & Robledo) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 5)

MycoBank: MB 839925.

Basionym: *Phellinotus neoaridus* Drechsler-Santos & Robledo, *Phytotaxa* 261: 224 (2016).

Fomitiporella shoushana (T.T. Chang & W.N. Chou) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839927.

Basionym*: Phellinus shoushanus* T.T. Chang & W.N. Chou, *Mycologia* 92: 803 (2000).

Fomitiporella tenuicula (B.K. Cui) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839928.

Basionym*: Phellinus tenuiculus* B.K. Cui, in Wang, Cui, Li, Du & Jia, *Ann. bot. fenn.* 48: 242 (2011).

Key to species of *Fomitiporella*

1. Basidiocarps pileate to effused-reflexed..... 2

1. Basidiocarps resupinate..... 11

2. Basidiocarps distinctly pileate..... 3

2. Basidiocarps effused-reflexed..... 6

3. Pores 8–9 per mm; basidiospores 4–5 µm long..... *F. queenslandica* Y.C. Dai & F. Wu
Basidiocarps perennial, pileate; pilei dimidiate; pileal surface black when fresh, becoming cigar brown to fuscous when dry, concentrically sulcate, velutinate to glabrous, encrusted; pore surface date brown to umber, glancing; pores 8–9 per mm; hyphal system dimitic; setal elements absent; cystidioles present; basidiospores broadly ellipsoid, golden yellow, (4.1–)4.2–5 × (3–)3.2–3.9(–4) µm, L = 4.5 µm, W = 3.49 µm, Q = 1.26–1.30; on angiosperm wood; type locality in Australia; distribution: Australia.

3. Pores 3–6 per mm; basidiospores 5–7.5 µm long..... 4

4. Context with a granular core, black line absent..... *F. neoarida* (Drechsler-Santos & Robledo) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary or in groups; pilei ungulate to triquetrous; pileal surface reddish yellow to black, concentrically sulcate, azonate, strongly rimose, with a thick black crust; pore surface reddish yellow to dark brown; pores 3–6 per mm; dissepiments thick, entire; context homogeneous without a black line, with a granular core; dissepiment thick, entire; hyphal system dimitic in trama, monomitic in context; setal elements absent; basidiospores broadly ellipsoid to ellipsoid, IKI–, CB(+), 5–6.5(–7) × 4–5(–5.5) µm, L = 5.8 µm, W = 4.7 µm (Drechsler-Santos et al. 2016); mostly on *Caesalpinia*; type locality in Brazil; distribution: Brazil.

4. Context without a granular core, black line present..... 5

5. Basidiospores 5–5.5 × 3.5–4.5 µm..... *F. piptadeniae* (Teixeira) Teixeira

Basidiocarps perennial, pileate, solitary; pilei applanate to triquetrous; pileal surface reddish yellow to grayish black, concentrically zonate, cracked, with a thick black crust; pore surface reddish yellow to dark brown; pores 3–6 per mm; context homogeneous, with a black line; dissepiment thick, entire; hyphal system dimitic in trama, monomitic in context; setal elements absent; basidiospores broadly ellipsoid to ellipsoid, IKI–, CB(+), (4.5–)5–5.5(–6) × 3.5–4.5(–5) µm, L = 5.1 µm, W = 3.9 µm (Drechsler-Santos et al. 2016); mostly on *Piptadenia*; type locality in Brazil; distribution: Brazil and Mexico.

5. Basidiospores 7–7.5 × 5.5–6 µm..... *F. badia* (Cooke) Teixeira

Basidiocarps perennial, pileate; pilei ungulate; pileal surface brownish black, glabrous, azonate, indurate; pore surface dark brown, glancing; pores 5–6 per mm; context homogeneous with a black line at pileal surface; hyphal system dimitic; setal elements absent; basidiospores subglobose, brown, thick-walled, IKI–, CB–, (6.5–)7–7.5 × 5.5–6(–6.5) µm (Larsen 1990); type locality unknown, perhaps in Australia; distribution: Pantropical.

6. Basidiocarps annual to biennial..... 7

6. Basidiocarps perennial..... 8

7. Context homogeneous; hyphal system monomitic; Neotropical species.....

..... *F. destruens* (Rajchenb. & Pildain) Y.C. Dai

Basidiocarps annual to biennial, resupinate to effused-reflexed; pilei broadly attached and semicircular; pileal surface dark brown, pubescent to strigose; pore surface tobacco brown to chestnut brown; pores 3–4 per mm; hyphal system monomitic; context homogeneous; setal elements absent; basidiospores broadly ellipsoid to ovoid, thick-walled, yellowish, IKI–, CB–, 5.5–6.5 × 4–5 µm, Q = 1.37 (Rajchenberg et al. 2015); type locality in Argentina; distribution: Argentina.

7. Context duplex; hyphal system dimitic; Asian species..... *F. chinensis* (Pilát) Y.C. Dai et al.

Basidiocarps biennial, effused-reflexed, sometimes imbricate; pileal surface brown to dark gray, concentrically sulcate with narrow zones; pore surface buff brown when fresh, dark brick when dry, glancing; pores 3–4 per mm; dissepiments thin; context duplex, two layers separated by a thin black line; hyphal system dimitic; setal elements absent; basidiospores broadly ellipsoid, fairly thick-walled, yellowish, IKI–, CB+, (4.2–)4.6–5.7(–6) × (3.5–)3.8–4.4 (–4.8) µm, L = 5.19 µm, W = 3.99 µm, Q = 1.27–1.33 (Dai 2010); on angiosperm tree; type locality in China; distribution: China.

8. Pores 1–4 per mm..... 9

8. Pores 4–9 per mm..... 10

9. Basidiospores 5.2–6.5 µm long..... *F. cyclobalanopsidis* (T.T. Chang & W.N. Chou) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface yellowish brown to dark brown, concentrically sulcate and zonate, tomentose; pore surface dark yellowish brown to chocolate brown, glancing; pores hexagonal, 2–4 per mm; hyphal system dimitic; setal elements absent; basidiospores allantoid, yellowish brown, IKI–, 5.2–6.5 × 3–3.5 µm (Chang and Chou 2000); on angiosperm tree; type locality in China; distribution: Taiwan of China.

9. Basidiospores 7.5–9.5 µm long..... *F. shoushana* (T.T. Chang & W.N. Chou) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface yellowish brown, glabrous; pore surface yellowish brown; pores 1–3 per mm; hyphal system dimitic; setal elements absent; basidiospores ellipsoid, yellowish brown, IKI–, 7.5–9.5 × 4.5–6 µm (Chang and Chou 2000); type locality in China; distribution: Taiwan of China.

10. Pores 7–9 per mm; basidiospores 3–4 µm long..... *F. caryophyllii* (Racib.) T. Wagner & M. Fisch.

Basidiocarps perennial, effused-reflexed; pilei applanate or even sub-ungulate, semicircular and broadly attached to dimidiate with a contracted base; pileal surface ferruginous to rust brown, velvety, with concentric, narrow, black zones; pore surface rust brown to grayish brown, glancing; pores 7–9 per mm; hyphal system dimitic; setal elements absent; basidiospores ellipsoid, pale rust brown, 3–4 × 2.5–3 µm (Ryvarden and Johansen 1980); on hardwoods; type locality in Indonesia; distribution: Southeast Asia and Australia.

10. Pores 4–7 per mm; basidiospores 4–4.8 µm long..... *F. vietnamensis* Y.C. Dai et al.

Basidiocarps perennial, effused-reflexed, imbricate; pileal surface curry yellow with black zones when fresh, becoming deep olive when dry; pore surface bluish gray to ash gray when fresh, becoming dark brick when dry, glancing; pores 4–7 per mm; dissepiments thin, slightly lacerate; hyphal system dimitic; setal elements absent; cystidioles ventricose with elongated apical portion, 7–14 × 3–5 µm; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB+, 4–4.8(–5) × (3–)3.2–3.7(–4)

μm, L = 4.41 μm, W = 3.52 μm, Q = 1.23–1.28 (Ji et al. 2018); on angiosperm tree; type locality in Vietnam; distribution: Vietnam.

11. Basidiocarps annual..... 12

11. Basidiocarps perennial..... 17

12. Basidiospores 3–4 μm long..... *F. membranacea* (Wright & Blumenf.) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface pale brown to grayish brown; pores 4–6 per mm; hyphal system dimitic; setal elements absent; basidiospores ellipsoid, pale yellow, IKI–, 3–4 × 2.5–3 μm (Wright and Blumenfeld 1984); on angiosperm wood; type locality in Argentina; distribution: Neotropics.

12. Basidiospores 4–6 μm long..... 13

13. Pores 5–8 per mm..... 14

13. Pores 3–5 per mm..... 15

14. Black line absent between subiculum and tubes; hyphal system dimitic, cystidioles present.....

..... *F. tenuicula* (B.K. Cui) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface yellowish brown to fawn brown, glancing; pores 5–8 per mm; dissepiments thin, entire; subiculum homogeneous without a lack line between subiculum and tubes; hyphal system dimitic; setal elements absent; cystidioles fusoid, 10–16 × 3–4 μm; basidiospores ellipsoid, yellowish brown, fairly thick-walled, IKI–, CB(+) to moderately CB+, collapsed when mature, (3.8–)4–5.1(–5.4) × (2–)2.3–4.3(–4.5) μm, L = 4.56 μm, W = 3.4 μm (Wang et al. 2011); type locality in China; distribution: East China.

14. A black line present between subiculum and tubes; hyphal system monomitic, cystidioles absent .....

---------- *F. pertenuis* Xavier de Lima & Oliveira-Filho (≡ *Rajchenbergia pertenuis*)

Basidiocarps annual, resupinate; pore surface hazel when dry; pores 6–8 per mm; dissepiments thin, entire; subiculum homogeneous, less than 0.5 mm thick, with a dark line separating from the tubes; hyphal system monomitic; cystidioles absent; basidiospores ellipsoid to ovoid, thick-walled, rusty brown IKI–, 4–5.5 × 3–4 μm (Crous et al. 2016); type locality in Brazil; distribution: Brazil.

15. Basidiospores 5.5–6 μm long..... *F. mangrovei* Y.C. Dai et al.

Basidiocarps annual, resupinate, inseparable from substrate; pore surface ash gray to bluish gray when fresh, becoming pale clay buff to pale brown when dry; pores 3–5 per mm; dissepiments thin, entire to slightly lacerate; hyphal system monomitic; setal elements absent; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (5–)5.5–6(–6.3) × (4–)4.2–4.8(–5) μm, L = 5.82 μm, W = 4.47

μm, Q = 1.26–1.31 (Ji et al. 2018); on *Conocarpus*; type locality in USA; distribution: USA and Guadeloupe.

15. Basidiospores 4–5 μm long..... 16

16. Pore surface dark brown, margin irregular, dissepiments lacerate; Neotropical species..... *F. adhaerens* (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu Basidiocarps annual, resupinate; margin irregular, undulate; pore surface dark brown; pores 3–4 per mm; dissepiments lacerate; subiculum homogeneous; hyphal system dimitic; setal elements absent; basidiospores ellipsoid, brown, IKI–, CB–, 4.1–4.6 × 2.6–3.6 μm (Wright and Blumenfeld 1984); type locality in Argentina; distribution: Argentina.

16. Pore surface pale brown, margin regular, dissepiments entire; Asian species.....

..... *F. tenuissima* (H.Y. Yu et al.) Y.C. Dai et al.

Basidiocarps annual, resupinate, adnate; margin regular; pore surface vinaceous gray to grayish brown when fresh, pale brown upon drying; pores 3–4 per mm; dissepiments thin, entire; hyphal system mono- to di-mitic; basidiospores ellipsoid, yellowish, thick-walled, IKI–, CB–, (4–)4.3–5(–5.2) × (3–)3.2–4(–4.2) μm, L = 4.8 μm, W = 3.6 μm, Q = 1.31–1.38 (Yu et al. 2013); on angiosperm wood; type locality in China; distribution: South China.

17. Basidiocarps distinctly cushion-shaped..... *F. crassa* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped, up to 13 mm thick; margin black; pore surface cinnamon to umber, glancing; pores 6–7 per mm; dissepiments thin, entire; hyphal system dimitic; setal elements absent; cystidioles ventricose with elongated apical portion, 9–24 × 3–5 μm; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (4.2–)4.4–5(–5.2) × (3.3–)3.5–4.1(–4.2) μm, L = 4.79 μm, W = 3.84 μm, Q = 1.23–1.24; on fallen angiosperm trunk; type locality in Australia; distribution: Tasmania, Australia.

17. Basidiocarps even..... 18

18. Subiculum duplex with a black zone..... *F. resupinata* (Douanla-Meli & Ryvarden) Y.C. Dai et al.

Basidiocarps perennial, resupinate, even; pore surface dark brown, glancing; pores 7–10 per mm; dissepiments thick; subiculum duplex with a black zone between subiculum and tubes; hyphal system dimitic; setal elements absent; cystidia and cystidioles absent; basidiospores broadly ellipsoid to subglobose, pale yellowish to yellow, slightly thick-walled, IKI–, (3–)3.5–4 × (2.5–)2.7–3 μm, L = 3.86 μm, W = 2.81 μm (Douanla-Meli et al. 2007); on dead tree of *Entandrophragma*; type locality in Cameroon; distribution: Cameroon.

18. Subiculum homogeneous..... 19

19. Pores 8–10 per mm..... 20

19. Pores 5–8 per mm..... 21

20. Cystidioles present, basidiospores 3–3.5 µm wide; Asian species..... *F. austroasiana* Y.C. Dai et al.

Basidiocarps perennial, resupinate, even; pore surface ash gray to grayish brown when fresh, becoming grayish brown to olivaceous, glancing; pores 8–10 per mm; dissepiments thick, entire; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidioles ventricose with elongated apical portion, 7–12 × 3–4 µm; basidiospores subglobose, yellowish brown, thick-walled, IKI–, CB(+), (3.6–)3.8–4.1(–4.3) × 3–3.5 µm, L = 4 µm, W = 3.29 µm, Q = 1.2–1.21 (Ji et al. 2018); on fallen angiosperm trunk; type locality in China; distribution: South Asia.

20. Cystidioles absent, basidiospores 2.5–3 µm wide; American species.....

..... *F. coruscans* (Murrill) Salvador-Montoya & Popoff (= *Fomitiporella micropora* Y.C. Dai et al.)

Basidiocarps perennial, resupinate, inseparable from substrate, even; pore surface olivaceous buff to yellowish brown, glancing; pores 8–10 per mm; dissepiments thin, entire or slightly lacerate; subiculum very thin to almost lacking, homogeneous; hyphal system dimitic; setal elements absent; cystidia and cystidioles absent; basidiospores broadly ellipsoid, yellowish brown, thick-walled, usually collapsed when mature, IKI–, CB(+), (3–)3.5–4(–4.5) × (2–)2.5–3.2(–3.5) µm, L = 3.8 µm, W = 3 µm, Q = 1.27–1.3 (Ji et al. 2017b); on dead wood of living angiosperm tree; type locality in USA; distribution: USA, Costa Rica and French Guiana.

21. Basidiospores 3–3.5 µm wide..... *F. sinica* Y.C. Dai et al.

Basidiocarps perennial, resupinate, even; pore surface rust brown to dull brown, glancing; pores 6–8 per mm; dissepiments thin, almost entire; subiculum very thin to almost lacking; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidia and cystidioles absent; basidiospores broadly ellipsoid to subglobose, yellowish brown, thick-walled, IKI–, CB(+), mostly collapsed when mature, 4–4.5 × 3–3.5 µm, L = 4.1 µm, W = 3.3 µm, Q = 1.23–1.28 (Ji et al. 2017b); on dead *Rhododendron*; type locality in China; distribution: China.

21. Basidiospores 3.5–5 µm wide..... 22

22. Cystidioles absent; growing in wood cavity..... 23

22. Cystidioles present; growing on wood surface..... 24

23. Pores 5–6 per mm; basidiospores 4–4.5 µm wide; European species..... *F. cavicola* (Kotl. & Pouzar) T. Wagner & M. Fisch.

Basidiocarps perennial, growing in wood cavity, resupinate, even; pore surface dark brown, glancing; pores 5–6 per mm; dissepiments thick, entire; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidia and cystidioles absent; small or big rhomboid crystals abundant; basidiospores

ellipsoid, brown, thick-walled, IKI–, 4.7–5.5 × 4–4.5 µm (Kotlaba and Pouzar 1995); on angiosperm tree; type locality in Czech Republic; distribution: Europe.

23. Pores 6–8 per mm; basidiospores 3.4–4 µm wide; Asian species..... *F. caviphila* L.W. Zhou

Basidiocarps perennial, growing in wood cavity, resupinate, inseparable from substrate, even; pore surface dark brown, distinctly glancing; pores 6–8 per mm; dissepiments thick, entire; white mycelial strands present in old tubes; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidia and cystidioles absent; basidiospores broadly ellipsoid, sometimes one side collapsed, brown, thick-walled, IKI–, CB(+), (4.1–)4.2–5(–5.2) × (3.3–)3.4–4(–4.2) µm, L = 4.72 µm, W = 3.75 µm, Q = 1.26 (Zhou 2014a); on the base of living *Quercus*; type locality in China; distribution: China.

24. Basidiospores CB–, subiculum monomitic.....

..... *F. umbrinella* (Bres.) Murrill (=*F. americana* Y.C. Dai et al.)

Basidiocarps perennial, growing on wood surface, resupinate, even; pore surface dark brown; pores 5–6 per mm; dissepiments entire; white mycelia strands present in the old tubes; subiculum homogeneous; hyphal system monomitic in the subiculum and dimitic in the trama; setal elements absent; cystidioles lageniform, 8–25 × 2.5–4 µm; basidiospores broadly ellipsoid to ellipsoid, with the ventral side flattened, IKI–, CB–, (3.5–)4–5.5(–6) × (3–)3.5–4(–4.5) µm, L = 4.7 µm, W = 3.5 µm, Q = 1.16–1.17 (Salvador-Montoya et al. 2020); on angiosperm tree; type locality in Brazil; distribution: subtropical North America to South America.

24. Basidiospores CB(+), subiculum dimitic..... 25

25. Basidiocarps up to 3 mm thick at center; American species..... *F. inermis* (Ellis & Everh.) Murrill

Basidiocarps perennial, growing on wood surface, resupinate, even, up to 3 mm thick at center; pore surface dark brick, glancing; pores 5–7 per mm; dissepiments thin, entire to slightly lacerate; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidioles ventricose with elongated apical portion, 13–21 × 3–6 µm; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB(+), 4.5–5.3(–5.5) × 3.5–4.3(–4.5) µm, L = 5 µm, W = 4 µm, Q = 1.26–1.28; type locality in USA; distribution: North America.

25. Basidiocarps up to 10 mm thick at center; Asian species..... *F. subinermis* Y.C. Dai et al.

Basidiocarps perennial, growing on wood surface, resupinate, even, up to 10 mm thick at center; pore surface yellowish brown, glancing; pores 6–7 per mm; dissepiments thick, entire; subiculum homogeneous; hyphal system dimitic; setal elements absent; cystidioles ventricose with elongated apical portion, 11–17 × 3–5 µm; small or big rhomboid crystals abundant; basidiospores subglobose, yellowish brown, thick-walled, IKI–, CB(+), usually collapsed when mature, (4–)4.5–5(–5.5) × 3.5–4 µm, L = 4.7 µm,

W = 3.8 µm, Q = 1.23–1.27 (Ji et al. 2017b); on angiosperm wood; type locality in China; distribution: South China.

4.6 *Fomitiporia* Murrill, *North American Flora* (New York) 9(1): 7 (1907), (Figs. 1, 10)

Type species: *Fomitiporia langloisii* Murrill.

Basidiocarps mostly perennial, pileate or resupinate; pileal surface velutinate to smooth, zonate or azonate; context homogeneous; hyphal system dimitic; generative hyphae hyaline to pale yellowish, thin- to fairly thick-walled; skeletal hyphae brown, thick-walled, unbranched, aseptate; hymenial setae absent in most species; cystidioles present or absent; basidiospores broadly ellipsoid, subglobose or globose, hyaline, thick-walled, smooth, mostly dextrinoid (IKI[+]) and cyanophilous; on angiosperms and gymnosperms; causing a white rot.

Fomitiporia has been called the '*Phellinus robustus* complex', and it is evidently a homogeneous genus in Hymenochaetaceae. The genus is characterized by mostly the subglobose, hyaline, thick-walled, smooth, dextrinoid and cyanophilous basidiospores. It was re-confirmed by Wagner and Fischer (2001) based on molecular data, and more taxa in the genus have been described recently from tropics (Fischer et al. 2005; Decock et al. 2005; Fischer 2006; Coelho et al. 2009; Decock and Amalfi 2014; Robledo et al. 2014; Chen and Cui 2017; Morera et al. 2017).

Fomitiporia eucalypti Y.C. Dai & X.H. Ji, **sp. nov.** (Figs. 10, 11, 12)

MycoBank: MB 835631.

Type. — **AUSTRALIA**. Melbourne, Royal Botanical Garden, on living tree of *Eucalyptus*, 8.V.2018, Dai 18586A (holotype BJFC027055; isotype in MEL).

Etymology. — *Eucalypti* (Lat.): referring to the species growing on *Eucalyptus.*

Fruiting body. — Basidiocarps perennial, pileate, a few imbricate, woody hard and without distinctive odor or taste when fresh, woody hard and heavy in weight when dry; pilei ungulate, triquetrous, projecting up to 16 cm, 25 cm wide, and 15 cm thick at base; pileal surface grayish dark, concentrically sulcate, glabrous, slightly cracked with age; margin blunt. Pore surface dark brown when fresh, becoming sepia when dry, not glancing; sterile margin yellowish brown, up to 5 mm wide; pores circular, 7–8 per mm; dissepiments thin, entire. Context yellowish brown, woody hard, up to 5 mm thick; tubes yellowish brown, paler than pore surface, woody hard, up to 14.5 cm long, annual layers indistinct.

Hyphal structure. — Hyphal system dimitic, generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, hyaline to pale yellow, slightly thick-walled, rarely branched, frequently septate, 2–3.5 µm in diam; skeletal hyphae dominant, yellowish brown with a narrow to medium lumen, more or less straight, regularly arranged, agglutinate, 2.5–4 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, slightly thick-walled, occasionally branched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, yellowish, thick-walled with a medium lumen, unbranched, more or less straight, parallel along the tubes, 2.5–3.5 µm in diam. Hymenial setae present, ventricose, dark brown, 20–28 × 6–9.5 µm; cystidioles present, fusoid, hyaline, thin-walled, 10–19 × 3–5.5 µm; basidia subglobose to capitate, with four sterigmata and a simple septum at the base, 13–16.5 × 7–9.5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller; big rhomboid crystals present in the hymenium.

Spores. — Basidiospores globose, hyaline, thick-walled, smooth, IKI[+], CB+, (5.5–)6–7.5(–8) × (4.8–)5.5–7(–7.2) µm, L = 6.56 µm, W = 6.04 µm, Q = 1.08–1.09 (n = 60/2).

Additional specimen (paratype) examined. — **AUSTRALIA**. Melbourne, Dandenong Ranges Botanical Garden, on living tree of *Eucalyptus,* 12.V.2018, Dai 18682 (BJFC027151).

Remarks. — In our phylogeny (Fig. 10), *Fomitiporia eucalypti* is closely related to *F. tasmanica* which also has a distribution in Australia. *However, F. tasmanica has resupinate* basidiocarps, a trimitic hyphal structure in the subiculum, *and small pores* measuring 10–12 per mm (Chen et al. 2021). Morphologically *Fomitiporia eucalypti* is similar to *F. castilloi* Decock & Amalfi by sharing perennial and pileate basidiocarps with pores 7–8 per mm, a dimitic hyphal structure, the presence of hymenial setae and cystidioles, but the latter has narrower basisiospores 5.8–6.5 × 5–5.5 µm vs. 6–7.5 × 5.5–7 µm) and a distribution in French Guyana, and South America (Amalfi and Decock 2013).

Fomitiporia gatesii Y.C. Dai & F. Wu, **sp. nov.** (Figs. 10, 13, 14)

MycoBank: MB835634.

Type. — **AUSTRALIA**. Melbourne, Dandenong Ranges Botanical Garden, on fallen trunk of *Eucalyptus*, 1.V.2018, Dai 18680 (holotype, BJFC027149; isotype in MEL).

Etymology. — *Gatesii* (Lat.): in honor of Australian mycologist, Dr. Genevieve Gates.

Fruiting body. — Basidiocarps perennial, resupinate, inseparable from substrate, without distinctive odor or taste when fresh, consistency woody hard, light in weight when dry, up to 20 cm long, 5 cm wide and 8 mm thick at center, becoming cushion-shaped with age; margin slightly receding, dark brick brown when dry, up to 2 mm wide. Pore surface dark brown and uncracked when fresh, becoming umber and cracked upon drying, glancing; pores circular, 7–8 per mm; dissepiments thin and entire. Subiculum dark brown, up to 0.5 mm thick. Tubes yellowish brown when dry, paler than pore surface, stratified, up to 7.5 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae occasionally present, hyaline to pale yellow, slightly thick-walled, unbranched, frequently septate, 2.5–3.5 µm in diam; skeletal hyphae dominant, yellowish brown, with a narrow lumen, rarely branched, flexuous, loosely interwoven, 3–4.5 µm in diam.

Trama of the tubes. — Tramal generative hyphae occasionally present, hyaline to pale yellowish, slightly thick-walled, rarely branched, frequently septate, 2.5–3.5 µm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a medium lumen, rarely branched, straight, subparallel along the tubes, 3–4 µm in diam. Setae absent; cystidioles present, fusoid, hyaline, thin-walled, 7–12 × 3–5 µm; basidia subglobose to capitate, with four sterigmata and a simple septum at the base, 10–14 × 7–9 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores globose, hyaline, thick-walled, smooth, some with a guttule, IKI[+], CB+, (5–)5.5–7(–7.2) × 5–6.3(–6.5) µm, L = 6.14 µm, W = 5.63 µm, Q = 1.07–1.09 (n = 60/2).

Additional specimen (paratype) examined. — **AUSTRALIA.** Melbourne, Dandenong Ranges Botanical Garden, on fallen trunk of *Eucalyptus,* 12.V.2018, Dai 18681 (BJFC027150).

Remarks. — The phylogenetic analysis of ITS and nLSU sequences (Fig. 10) shows that *Fomitiporia gatesii* is closely related to *Fomitiporia australiensis* M. Fisch. et al, and both species lack hymenial setae (Fischer et al. 2005). However, *Fomitiporia australiensis* has resupinate to effused-reflexed or pileate basidiocarps, the absence of cystidioles, larger pores (2–5 per mm) and ellipsoid to subglobose basidiospores (Fischer et al. 2005). Morphologically, *Fomitiporia gatesii* is most similar to *Fomitiporia subtropica* B.K. Cui & Hong Chen by sharing perennial, resupinate basidiocarps, approximately the same size pores, the presence of cystidioles, and the absence of hymenial setae (Chen and Cui 2017). However, *Fomitiporia subtropica* has smaller and subglobose to obovoid basidiospores measuring 5.2–6 × 4.4–5 µm, and grows on an angiosperm wood other than *Eucalyptus* (Chen and Cui 2017).

Fomitiporia ovoidospora Y.C. Dai & F. Wu, **sp. nov.** (Figs. 10, 15, 16)

MycoBank: MB835632.

Type. — **VIETNAM**. Hochiminh City, a park near Tan Son Nhat Hotel, on root of living *Khaya*, 10.X.2017, Dai 18283 (holotype, BJFC 025806).

Etymology. — *Ovoidospora* (Lat.): referring to the species having ovoid basidiospores.

Fruiting body. — Basidiocarps perennial, pileate, solitary or a few imbricate, hard corky and without distinctive odor or taste when fresh, woody hard and medium in weight when dry; pilei dimidiate, triquetrous, projecting up to 9 cm, 18 cm wide, and 7 cm thick at base; pileal surface grayish dark with yellowish brown zones, concentrically sulcate, glabrous and slightly cracked when dry; margin acute. Pore surface buff when fresh, becoming clay buff when dry, not glancing; sterile margin yellowish brown, up to 2 mm wide; pores circular, 9–10 per mm; dissepiments entire. Context cinnamon, zonate, woody hard, up

to 5.5 cm thick. Tubes grayish brown, paler than context, hard corky to brittle, up to 1.5 cm long, annual layers distinct.

Hyphal structure. — Hyphal system dimitic in trama, monomitic in context; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae pale yellow to yellow, thick-walled with a wide lumen, unbranched, frequently septate, regularly ranged, 3–5 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish, slightly thick-walled, rarely branched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, yellowish, thick-walled with a medium lumen, unbranched, aseptate, flexuous, interwoven, 2.5–3.5 µm in diam. Setae absent; cystidioles present, fusoid, hyaline, thin-walled, 9–24 × 3–5 µm; basidia capitate, with four sterigmata and a simple septum at the base, 12–14 × 7–8 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ovoid, hyaline, thick-walled, smooth, IKI[+], strongly CB+, (4.5–)4.7–5.5(–6.0) × (3.5–)3.8–5(–5.2) µm, L = 4.99 µm, W = 4.44 µm, Q = 1.09–1.16 (n = 60/2).

Additional specimen (paratype) examined. — **VIETNAM**. Dong Nai Province, Dimh Quan District, Thac Mai Perservation Park, on rotten angiosperm wood, 14.X.2017, Dai 18349 (BJFC025872).

Remarks. — Phylogenetically *Fomitiporia ovoidospora* is closely related to *Fomitiporia* sp. MUCL 53798, *F. texana* (Murrill) Nuss and *F. deserticola* Vlasák (Fig. 10), but *F. texana* differs from *F. ovoidospora* by bigger pores (4–6 per mm), bigger and subglobose basidiospores (7–9 × 6.5–9 µm), the presence of hymenial setae, and occurrence in a dry environment in North America (Gilbertson and Ryvarden 1987). *F. deserticola* Vlasák is distiguished from *Fomitiporia* sp. MUCL 53798 (Fig. 10), and it is different from *F. ovoidospora* by bigger pores 4–6 per mm and wider basidiospores (6–7.5 × 5.5–7 um vs. 4.7–5.5 × 3.8–5 µm, Vlasák and Vlasák Jr. 2016). *Fomitiporia* sp. MUCL 53798 is different from *F. ovoidospora* by its subglobose basidiospores, and it has a distribution in French Guiana, South America (Amalfi and Decock 2013). Morphologically *Fomitiporia ovoidospora* resembles *F. australiensis* in macromorphology, but the latter has ellipsoid to subglobose basidiospores.

The following taxon described in *Phellinus* has morphological characteristics that fit *Fomitiporia*, and the following combinations are proposed:

Fomitiporia lukinsii (N. Walters) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839929.

Basionym: *Phellinus lukinsii* N. Walters, *Trans. Br. mycol. Soc.* 52: 499 (1969).

In addition, there are several species complexes including several morphological similar species in *Fomitiporia,* and the taxa in the species complex are phylogenetically related, e.g., the *Fomitiporia*

maxonii Murrill complex includes *F. maxonii, F. sonorae* (Gilb.) Y.C. Dai and *F. ignea* A.A. Brown et al., these three species are very closed related (Fig. 10), and morphologically they share almost the same size pores and basidiospores. We treat them as independent species because we did not study their type materials.

Key to species of *Fomitiporia*

1. Basidiocarps pileate, pseudopileate, resupinate to effused-reflexed..... 2

1. Basidiocarps strictly resupinate..... 46

2. Basidiocarps annual..... 3

2. Basidiocarps perennial..... 5

3. Hymenial setae absent..... *F. pentaphylacis* L.W. Zhou

Basidiocarps annual, effused-reflexed to pileate, solitary; pilei triquetrous; pileal surface yellowish brown to cinnamon, velutinate or glabrous, concentrically sulcate; pore surface clay buff; pores 6–9 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae absent; cystidioles frequent, subulate, 15–25 × 4–6 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (5.8–)5.9–7.6(–7.9) × 5.4–6.5(–6.8) µm, L = 6.61 µm, W = 5.86 µm, Q = 1.13 (Zhou and Xue 2012); type locality in China; distribution: South China.

3. Hymenial setae present..... 4

4. Basidiospores 4.9–6.6 µm long..... *F. rosmarini* (Bernicchia) Ghob.-Nejh. & Y.C. Dai

Basidiocarps annual, pileate; pileal surface yellowish brown, velutinate, slightly tuberculate to rugose; pore surface yellowish brown; pores 5–8 per mm; dissepiments entire; hyphal system dimitic; hymenial setae subulate, 17–50 × 5–7 µm; cystidioles present; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, (4.2–)4.9–6.6(–7) × 4–6(–6.4) µm (Ghobad-Nejhad and Dai 2007); type locality in Italy; distribution: South Europe and Iran.

4. Basidiospores 6.5–7.5 µm long..... *F. erecta* (A. David et al.) Fiasson

Basidiocarps annual, pileate; pilei fan-shaped or semi-clavate; pileal surface golden brown, tuberculate, with a black crust; pore surface grayish to rust brown; pores 5–6 per mm; dissepiments thin; hyphal system dimitic; hymenial setae common in bottom of tubes, slender subulate, 20–45 × 5–7 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, 6.5–7.5 × 5.5–6.5 µm (Ryvarden and Gilbertson 1994); type locality in France; distribution: Mediterranean area.

5. Hymenial setae rarely to frequently present..... 6

5. Hymenial setae completely absent..... 19

6. Basidiocarps resupinate to effused-reflexed..... 7

6. Basidiocarps distinctly pileate..... 11

7. Pores 8–10 per mm..... *F. ignea* A.A. Brown et al.

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface antique brown to raw umber; pore surface raw sienna to antique brown; pores 8–10 per mm; dissepiments thick, entire; context amber brown, up to 1 cm thick; hyphal system dimitic; hymenial setae ventricose, 35–55.6 × 4.5–8 µm; cystidioles fusiform to lageniform; basidiospores subglobose, slightly obovoid, hyaline, IKI[+], 4–8 × 3–6.5 µm, L = 6.34 µm, W = 4.56 µm, Q = 1.45 (Brown et al. 2020); on *Vitis*; type locality in USA; distribution: West USA.

7. Pores 4–7 per mm..... 8

8. Basidiospores 3–4 µm wide..... *F. repanda* (Overh.) Ginns

Basidiocarps perennial, resupinate, effused-reflexed or rarely pileate; pileal surface reddish brown to blackish, glabrous, encrusted, sulcate; pore surface light yellowish to dark reddish brown; pores 4–5 per mm; dissepiments thin, lacerate; hyphal system dimitic; hymenial setae rare, subulate or ventricose, 20–25 × 6–7 µm; basidiospores broadly ellipsoid to subglobose, hyaline, IKI–, 4–5.5 × 3–4 µm (Lombard et al. 1972); on gymnosperm wood; type locality in USA; distribution: Northwest USA.

8. Basidiospores > 4.5 µm wide..... 9

9. Basidiospores 5–5.5 µm long..... *F. sonorae* (Gilb.) Y.C. Dai

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface golden brown, velutinate to smooth; pore surface golden brown, glancing; pores 5–7 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae rare, ventricose with long slender apical portion, 35–55 × 5–8 µm; cystidioles ventricose with elongated apical portion, 15–100 × 3.5–6 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 5–5.5 × 4.5–5 µm (Gilbertson 1979); exclusively on *Dodonaea viscosa*; type locality in USA; distribution: USA.

9. Basidiospores > 6.5 µm long..... 10

10. Basidiospores 5.5–6.5 µm wide; North American species..... *F. polymorpha* M. Fisch.

Basidiocarps perennial, resupinate to effused-reflexed, sometimes pileate; pileal surface pale brown to dark brown, rimose; pore surface pale brown to golden brown; pores 4–7 per mm; dissepiments thick, entire; hyphal system monomitic to dimitic; hymenial setae rare, ventricose, 18–57 × 4–12 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thick-walled, IKI[+], CB+, (6–)6.5–7.5(–8) × (5–)5.5–6.5(–7) µm (Fischer and Binder 2004); mostly on *Salix*; type locality in USA; distribution: North America.

10. Basidiospores 6.5–7.5 µm wide; African species..... *F. tsitsikamensis* Tchotet et al.

Basidiocarps perennial, resupinate to pseudopileate; pseudopilei drop-shaped to hoof-shaped; pileal surface dark brown to blackish, glabrous, sulcate; pore surface brown; pores 4–6 per mm; dissepiments thick; context with black lines at pileal surface and close to substrate; hyphal system dimitic; hymenial setae infrequent, 20–30 × 4–9 µm; cystidioles absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, 7–8 × 6.6–7.5 µm, L = 7.5 µm, W = 7 µm, Q = 1.06–1.09 (Tchotet Tchoumi et al. 2020); type locality in South Africa; distribution: South Africa.

11.. Pores 3 per mm; basidiospores > 10 µm long..... *F. lukinsii* (N. Walters) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei ungulate; pileal surface grayish olive, strongly rimose; pore surface umber; pores 3 per mm; dissepiments thick; hyphal system dimitic; hymenial setae infrequent, subulate; basidiospores globose, hyaline, thick-walled, strongly CB+, 10.5–14 um in diam (Larsen and Cobb-Poulle 1990); on *Melaleuca* and *Eucalyptus*; type locality in Australia; distribution: Australia.

11.. Pores > 4 per mm; basidiospores < 10 µm long..... 12

12. Basidiospores 3.4–5 µm wide..... 13

12. Basidiospores > 5 µm wide..... 14

13. Basidiocarps not pendant; South American species..... *F. bambusipileata* Alves-Silva et al.

Basidiocarps perennial, pileate; pilei semicircular, triquetrous; pileal surface dull blackish, glabrous, sulcate; pore surface grayish brown to cinnamon; pores 6–9 per mm; dissepiments thick, entire; context with a thin black line near the surface; hyphal system dimitic; hymenial setae infrequent, 21–30 × 4.5–5 µm; cystidioles infrequent; basidiospores subglobose to globose, hyaline, thick-walled, slightly to moderately IKI[+], CB+, 4–6(–6.5) × 4–5(–5.5) µm, L = 5.2 µm, W = 4.5 µm, Q = 1.2–1.4 (Alves-Silva et al. 2020a); on bamboo; type locality in Brazil; distribution: South Brazil.

13. Basidiocarps usually pendent; East Asian species..... *F. pusilla* (Lloyd) Y.C. Dai

Basidiocarps perennial, pileate, distinctly pendent, solitary; pilei ungulate; pileal surface grayish brown, dark brown to black, concentrically sulcate, zonate, glabrous; pore surface dark brown to fuscous black, glancing; pores 8–9 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae rare to frequent, ventricose, 15–22 × 5.5–9 µm; cystidioles ventricose with an elongated apical portion, 22–34 × 3.5–4.5 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, (3.9–)4–4.9(–5.1) × (3.3–)3.4–4.6(–4.9) µm, L = 4.44 µm, W = 3.98 µm, Q = 1.11–1.12 (Dai 2010); type locality in Japan; distribution: East Asia.

14. Hymenial setae very infrequent..... 15

14. Hymenial setae frequent..... 16

15. Pileal surface encrusted, glabrous; European species..... *F. robusta* (P. Karst.) Fiasson & Niemelä

Basidiocarps perennial, pileate; pilei ungulate to applanate; pileal surface brown to blackish, encrusted, rimose, sulcate, glabrous; pore surface yellowish to grayish brown; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae rarely present, subulate to ventricose, 18–50 × 5–8 µm; cystidioles abundant, ventricose, 25–50 × 5–8 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, (5.5–)5.8–7.3(–8.2) × (4.8–)5.3–6.8(–7.3) µm, L = 6.6 µm, W = 6.1 µm, Q = 1.1 (Niemelä 2005); type locality in Finland; distribution: Europe.

15. Pileal surface tomentose; North American species..... *F. deserticola* Vlasák

Basidiocarps perennial, pileate; pilei ungulate; pileal surface dark brown to black, tomentose, rimose; pore surface pale brown; pores 4–6 per mm; dissepiments thin to thick, entire; hyphal system dimitic; hymenial setae rarely present, of the same size and shape as cystidioles; cystidioles abundant, 10–30 × 2 um; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 6–7.5 × 5.5–7 um (Vlasák and Vlasák Jr. 2016); on living cacti and desert shrubs; type locality in USA; distribution: Arizona of USA.

16. Pores 4–6 per mm..... *F. texana* (Murrill) Nuss

Basidiocarps perennial, pileate; pilei ungulate; pileal surface pale brown to dark brown, matted, rimose, sulcate; pore surface pale brown; pores 4–6 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae 25–60 × 10 µm; cystidioles present; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 7–9 × 6.5–9 µm (Larsen and Cobb-Poulle 1990); type locality in USA; distribution: Southwest USA.

16. Pores 6–8 per mm..... 17

17. Basidiospores 5–5.5 µm wide; South American species..... *F. castilloi* Decock & Amalfi

Basidiocarps perennial, pileate, solitary; pilei sub-dimidiate to ungulate; pileal surface grayish black, roughly sulcate, glabrous; pore surface light brown to brownish orange; pores oblique, 7–8 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae subulate or ventricose, straight to occasionally curved, 22–35 × 6–10 µm; cystidioles rare, fusoid, 10–13.5 × 9–10 µm; basidiospores subglobose to obovoid, hyaline, thick-walled, IKI[+], CB+, (5.5–)5.8–6.5(–6.8) × (4.5–)5–5.5(–5.5) µm (Amalfi and Decock 2013); type locality in French Guiana; distribution: French Guiana.

17. Basidiospores 5.4–7 µm wide; Asian or Australian species 18

18. Tubes distinctly thicker than context; on *Eucalyptus*; Australian species..... *F. eucalypti* Y.C. Dai & X.H. Ji

Basidiocarps perennial, pileate, imbricate; pilei ungulate; pileal surface grayish dark, concentrically sulcate, glabrous, cracked; pore surface dark brown to sepia, not glancing; pores 7–8 per mm; dissepiments thin, entire; tubes distinctly thicker than context; hyphal system dimitic; hymenial setae

ventricose, 20–28 × 6–9.5 µm; cystidioles fusoid, 10–19 × 3–5.5 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, (5.5–)6–7.5(–8) × (4.8–)5.5–7(–7.2) µm, L = 6.56 µm, W = 6.04 µm, Q = 1.08–1.09 (n = 60/2); on living tree of *Eucalyptus*; type locality in Australia; distribution: Australia.

18. Context distinctly thicker than tubes; on an angiosperm other than *Eucalyptus*; Asian species.....

..... *F. tenuitubus* L.W. Zhou

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface orange-brown to fawn, velutinate to glabrous, azonate; pore surface reddish brown to fawn; pores 6–8 per mm; dissepiments thin, entire; context distinctly thicker than tubes; hyphal system dimitic; hymenial setae subulate to ventricose, 14–25 × 7–10 µm; cystidioles frequent, subulate, sharp-pointed, 11–25 × 3–4 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (5.8–)6–6.9(–7.1) × (5.4–)5.5–6.6(–6.9) µm, L = 6.44 µm, W = 6.02 µm, Q = 1.07 (Zhou and Xue 2012); type locality in China; distribution: South China.

19. Basidiocarps resupinate to effused-reflexed pseudopileate..... 20

19. Basidiocarps distinctly pileate..... 22

20. Pileal surface rimose; cystidioles present..... *F. tabaquilio* (Urcelay et al.) Decock & Robledo

Basidiocarps perennial, resupinate, effused-reflexed, pendent; pilei ungulate; pileal surface sulcate, tuberculate, rimose; pore surface golden brown, glancing; pores 4–6 per mm; hyphal system dimitic; hymenial setae absent; cystidioles fusoid, 16–29 × 3–5 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 6–7.5 × (4.5–)4.8–6.5 µm (Urcelay et al. 2000); on *Polylepis* spp.; type locality in Argentina; distribution: Argentina.

20. Pileal surface smooth; cystidioles absent..... 21

21. Basidiospores 6–8 µm wide; on *Tsuga*; North American species..... *F. tsugina* Murrill

Basidiocarps perennial, resupinate to pseudopileate; pileal surface smooth; pore surface ferruginous to subfuliginous, with a grayish pruina; pores 4–5 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores globose, hyaline, 6–8 µm in diam (Murrill 1907); on *Tsuga*; type locality in USA; distribution: North America.

21. Basidiospores 5–6.5 µm wide; on *Vitis*; Australian species..... *F. australiensis* M. Fisch. et al.

Basidiocarps perennial, resupinate to effused-reflexed or pileate; pileal surface golden brown, smooth; pore surface grayish brown to ferruginous; pores 3–5 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores ellipsoid to subglobose, hyaline, thick-walled, IKI[+], CB+, 6–8 × 5–6.5 µm (Fischer et al. 2005); on *Vitis*; type locality in Australia; distribution: South Australia.

22. Context duplex..... *F. baccharidis* (Pat.) Decock et al.

Basidiocarps perennial, pileate, imbricate; pilei dimidiate, triquetrous; pileal surface golden brown to dark brown, concentrically sulcate, velutinate; pore surface opaque brown to copper brown, strongly glancing; pores 9–11 per mm; dissepiments thin, entire; context duplex with a black line; hyphal system dimitic; hymenial setae absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, 5.5–6.5 × 4.8–5.8(–6) µm, L = 5.92 µm, W = 5.28 µm, Q = 1.12 (based on specimen JV 1506/P7 from Ecuador); type locality in Ecuador; distribution: Neotropics.

22. Context homogeneous..... 23

23. On gymnosperm wood..... 24

23. On angiosperm wood..... 26

24. On wood of Cupressaceae..... *F. cupressicola* Amalfi et al.

Basidiocarps perennial, pileate, solitary; pilei semicircular to applanate; pileal surface yellowish brown to dark brown, velutinate to glabrous, concentrically sulcate, rimose; pore surface yellowish brown to light brown; pores 5–6 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles fusoid, 10.5–13 × 3.5–5 µm; basidiospores subglobose, globose to ovoid, hyaline, thick-walled, IKI[+], CB+, (6.5–)7–7.5(–8.3) × (5.8–)6.5–7(–7.5) µm, L = 7 µm, W = 6.6 µm, Q = 1.05–1.18 (Amalfi et al. 2012); on *Cupressus*; type locality in Mexico; distribution: Mexico.

24. On wood of Pinaceae..... 25

25. Cystidioles present, tramal hyphae interwoven *F. hartigii* (Allesch. & Schnabl) Fiasson & Niemelä

Basidiocarps perennial, pileate; pilei ungulate; pileal surface gray, reddish black to grayish black, concentrically sulcate with wide zones, cracked; pore surface yellowish brown to umber brown, glancing; pores 4–6 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; tramal hyphae interwoven; hymenial setae absent; cystidioles ventricose, 18–28 × 3.6–5 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (5.8–)6–8.2(–8.5) × (4.9–)5.2–7.8(–8.2) µm, L = 7 µm, W = 6.42 µm, Q = 1.05–1.17 (Dai 2010); mostly on *Abies* and *Tsuga*; type locality in Germany; distribution: coniferous forests in Northern Hemisphere.

25. Cystidioles absent, tramal hyphae subparallel..... *F. alpina* B.K. Cui & Hong Chen

Basidiocarps perennial, pileate; pilei ungulate; pileal surface grayish brown to dark brown, smooth; pore surface yellow brown to pale brown, glancing; pores 5–7 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; tramal hyphae subparallel; hymenial setae absent; cystidioles absent; basidiospores globose to subglobose, hyaline, thick-walled, IKI[+], CB+, (6–)6.5–8(–8.4) × (5–)6–8(–8.4) µm, L = 7.1 µm, W = 6.8 µm, Q = 1.01–1.08 (Chen and Cui 2017); on *Picea*; type locality in China; distribution: Southwest China.

26. On *Hippophae*..... 27

26. On an angiosperm other than *Hippophae*..... 30

27. Pores 11–13 per mm..... *F. rhamnoides* T.Z. Liu & F. Wu

Basidiocarps perennial, pileate, solitary or a few imbricate; pilei dimidiate to ungulate; pileal surface yellowish brown to dark brown, concentrically sulcate, velutinate to glabrous, cracked; pore surface clay buff to orange-brown, glancing; pores 11–13 per mm; dissepiments entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles ventricose, 12–20 × 3–6 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, (5.2–)5.8–7(–7.3) × (5–)5.5–6.5(–6.8) µm, L = 6.47 µm, W = 6.06 µm, Q = 1.06–1.08 (Liu et al. 2018); on *Hippophae*; type locality in China; distribution: North China.

27. Pores 6–10 per mm..... 28

28. Cystidioles infrequent to absent..... *F. norbulingka* B.K. Cui & H. Chen

Basidiocarps perennial, pileate; pilei ungulate; pileal surface yellowish brown, grayish brown to dark brown, cracked; pore surface yellowish brown to dark brown, glancing; pores 6–9 per mm; dissepiments thin to slightly thick, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles rare to absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (6–)6.5–7(–8) × (5–)5.5–7 mm, L = 6.9 mm, W = 6 mm, Q = 1.16 (Chen et al. 2016). on *Hippophae*; type locality in China; distribution: West China.

28. Cystidioles frequent..... 29

29. Pores 8–10 per mm..... *F. subhippophaëicola* B.K. Cui & H. Chen

Basidiocarps perennial, effused-reflexed to distinctly pileate; pilei ungulate; pileal surface yellowish brown to dark brown, cracked; pore surface brown to dark brown, glancing; pores 8–10 per mm; dissepiments thin, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles present, ventricose to fusoid, 12–15 × 4–6 mm; basidiospores subglobose to obovoid, hyaline, thick-walled, IKI[+], CB+, 6–8(–9) × 5.5–7 mm, L = 6.6 mm, W = 5.8 mm, Q = 1.13 (Chen et al. 2016); on *Hippophae*; type locality in China; distribution: West China.

29. Pores 6–7 per mm..... *F. hippophaeicola* (H. Jahn) Fiasson & Niemelä

Basidiocarps perennial, pileate; pilei ungulate to dimidiate; pileal surface yellow brown to dark brown, velutinate to glabrous, concentrically sulcate, rimose; pore surface dark brown to grayish brown; pores 6–7 per mm; dissepiments thin, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles ventricose; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, (4.7–)5–6.8(–8) × (4.3–)4.6–6(–7) µm, L = 5.8 µm, W = 5.4 µm, Q = 1.1 (Niemelä 2005); on *Hippophäe*; type locality in Sweden; distribution: Europe and West Asia.

30. Basidiospores non-dextrinoid to moderately dextrinoid..... 31

30. Basidiospores distinctly dextrinoid..... 33

31. Pilei subdimidiate to pseudostipitate; Neotropical species..... *F. subtilissima* Alves-Silva et al.

Basidiocarps perennial, pileate; pilei subdimidiate to pseudostipitate, semicircular, flabelliform; pileal surface light brown to dark brown, glabrous, concentrically zonate, sulcate; pore surface grayish brown to cinnamon; pores 5–9 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; basidiospores subglobose to globose, hyaline, thick-walled, slightly to moderately IKI[+], CB+, 4–5 × 4–4.5(–5) µm, L = 4.5 µm, W = 4 µm, Q = 1.13 (Li et al. 2016); type locality in Brazil; distribution: Brazil.

31. Pilei applanate to semicircular; African species..... 32

32. Context > 20 mm thick..... *F. nobilissima* Decock & Yombiy

Basidiocarps perennial, pileate, solitary; pilei applanate to semi-circular; pileal surface grayish orange to almost black, tuberculate, glabrous, concentrically sulcate, rimose; pore surface grayish; pores 6–8 per mm; dissepiments thick, entire; context up to 35 mm thick, homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores globose to subglobose, hyaline, thick-walled, non-dextrinoid to moderately IKI[+], CB+, (4–)4.3–5.5(–6) × (3.5–)3.7–5 µm, L = 4.9 µm, W = 4.3 µm, Q = 1.05–1.2 (Amalfi et al. 2010); type locality in Gabon; distribution: Gabon.

32. Context < 10 mm thick..... *F. gabonensis* Amalfi & Decock

Basidiocarps perennial, pileate, solitary to imbricate; pilei subapplanate to semi-circular; pileal surface light brown to blackish brown, concentrically sulcate; pore surface brown to dark brown; pores 6–7 per mm; dissepiments thin to thick; context up to 5 mm thick, homogeneous; hyphal system dimitic; hymenial setae absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI– to moderately IKI[+], CB+, (4–)4.2–5.3(–6) × (3.5–)3.5–4.5(–4.8) µm, L = 4.7 µm, W = 4.1 µm, Q = 1–1.3 (Amalfi et al. 2010); type locality in Gabon; distribution: Gabon.

33. Pileal surface tomentose to glabrous..... *F. bakeri* (Murrill) Vlasák & Kout

Basidiocarps perennial, pileate; pilei ungulate, triquetrous; pileal surface yellowish brown to blackish brown, tomentose to glabrous, sulcate, encrusted, rimose, zonate; pore surface pale brown to golden brown; pores 5–6 per mm; dissepiments thin to thick; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles ventricose with an elongated hyphoid apex; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 6–8 × 5.5–6.5 µm µm (Vlasák and Kout 2011); on *Betula*; type locality in USA; distribution: USA.

33. Pileal surface distinctly glabrous..... 34

34. On *Eucalyptus*..... *F. murrillii* Alves-Silva et al.

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface dark brown to black, glabrous, sulcate, zonate, cracked; pore surface grayish brown to cinnamon; pores 5–7 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores globose, hyaline, thick-walled, strongly IKI[+], strongly CB+, 5–6(–7) × 5–6(–7) µm, L = 6 µm, W = 5.3 µm (Alves-Silva et al. 2020b); growing on *Eucalyptus* spp.; type locality in Brazil; distribution: Brazil.

34. On an angiosperm other than *Eucalyptus*..... 35

35. Pores 4–6 per mm..... 36

35. Pores 6–10 per mm..... 37

36. Cystidioles absent; on *Quercus*; North American species..... *F. fissurata* Vlasák

Basidiocarps perennial, pileate; pilei ungulate; pileal surface yellowish brown to dark brown, sulcate, zonate, cracked, smooth; pore surface yellowish brown; pores 4–6 per mm; dissepiments thin to thick, entire; context homogeneous; hyphal system dimitic; cystidioles absent; hymenial setae absent; basidiospores subglobose, hyaline, thick-walled, IKI[+], 6–7 × 5–6(–6.5) um (Vlasák and Vlasák Jr. 2016); on living tree of *Quercus*; type locality in USA; distribution: Western North America.

36. Cystidioles present; on an angiosperm other than *Quercus*; Asian species.....

.... *F. punicata* Y.C. Dai et al.

Basidiocarps perennial, pileate, solitary to imbricate; pilei triquetrous to ungulate; pileal surface dark brown, coarse, azonate, cracked; pore surface pale yellowish brown to cinnamon brown, glancing; pores 4–6 per mm; dissepiments thin, entire; context homogeneous; hyphal system dimitic; hymenial setae absent; cystidioles fusoid to subulate, 5.5–11 × 3.5–6 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (5.4–)5.8–7(–7.4) × (4.1–)4.5–6.2(–6.6) µm, L = 6.42 µm, W = 5.42 µm, Q = 1.14–1.24 (Dai 2010); on *Punica*, *Robinia*; type locality in China; distribution: North China.

37. Pilei nodulose, context with concentric thin black lines..... *F. atlantica* Alves-Silva et al.

Basidiocarps perennial, pileate, usually imbricate; pilei nodulose; pilei grayish brown to dark brown, glabrous, concentrically zonate, sulcate, cracked; pore surface grayish brown to cinnamon; pores 6–8 per mm; dissepiments thick, entire; context homogeneous with concentric thin black lines; hyphal system dimitic; hymenial setae absent; basidiospores subglobose, globose to obovoid, hyaline, thick-walled, IKI[+], CB+, (4.5–)5–5.5(–6) × 4–5.5 µm, L = 5.1 µm, W = 4.8 µm, Q = 1–1.25 (Li et al. 2016); type locality in Brazil; distribution: South Brazil.

37. Pilei applanate, dimidiate or triquetrous, context without concentric thin black lines..... 38

38. Basidiospores 3.8–5 µm wide..... 39

38. Basidiospores 5–7.4 µm wide..... 41

39. Pores 9–10 per mm; basidiospores ovoid..... *F. ovoidospora* Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary or a few imbricate; pilei dimidiate, triquetrous; pileal surface grayish dark with yellowish brown zones, concentrically sulcate, glabrous, cracked; pore surface buff to clay buff, not glancing; pores 9–10 per mm; dissepiments entire; context homogeneous without concentric black lines; hyphal system dimitic in trama, monomitic in context; hymenial setae absent; cystidioles fusoid, 9–24 × 3–5 µm; basidiospores ovoid, hyaline, thick-walled, IKI[+], CB+, (4.5–)4.7–5.5(–6) × (3.5–)3.8–5(–5.2) µm, L = 4.99 µm, W = 4.44 µm, Q = 1.09–1.16 (n = 60/2); on *Khaya* or other angiosperm wood; type locality in Vietnam; distribution: Vietnam.

39. Pores 6–8 per mm; basidiospores subglobose to globose..... 40

40. Pilei applanate; African species..... *F. ivindoensis* Decock et al

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface dark brown to black, concentrically sulcate; pore surface honey-colored to light brown, glancing; pores 7–8 per mm; dissepiments thin to thick; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (4.2–)4.4–5.5(–5.5) × (3.5–)3.9–4.7(–5) µm, L = 4.8 µm, W = 4.3 µm, Q = 1–1.2 (Amalfi et al. 2010); type locality in Gabon; distribution: Gabon.

40. Pilei triquetrous; Neotropical species..... *F. conyana* Alves-Silva & Drechsler-Santos

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface dark brown to black, glabrous, sulcate, zonate, cracked; pore surface grayish brown to cinnamon; pores 6–8 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores globose, hyaline, thick-walled, strongly IKI[+], strongly CB+, 4.5–5.5(–6) × 4–5(–6) µm, L = 4.9 µm, W = 4.4 µm (Alves-Silva et al. 2020b); type locality in Brazil; distribution: Brazil, Ecuador and French Guiana.

41. Pileal surface uncracked..... 42

41. Pileal surface cracked..... 44

42. On *Ocotea*; South American species..... *F. elegans* (J.E. Wright and Blumenf.) Alves-Silva et al.

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface dark brown to black, glabrous, sulcate, zonate, uncracked; pore surface brownish gray; pores 7–9 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles present; basidiospores subglobose, hyaline, thick-walled, strongly IKI[+], strongly CB+, (5–)6–7

× 5–6.5 µm, L = 6.2 µm, W = 5.5 µm (Alves-Silva et al. 2020b); growing on *Ocotea* spp.; type locality in Argentina; distribution: Argentina and Brazil.

42. On an angiosperm other than *Ocotea*; Asian species..... 43

43. Basidiospores 6.1–7.4 µm wide..... *F. gaoligongensis* B.K. Cui & Hong Chen

Basidiocarps perennial, pileate; pilei semicircular; pileal surface grayish brown to dark brown, concentrically sulcate with wide zones, smooth, uncracked; pore surface grayish brown to dark brown, glancing; pores 6–8 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles fusoid to subulate, 13–20 × 4–7 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (6.3–)6.5–7.6(–8.2) × (6–)6.1–7.4(–8) µm, L = 7.1 µm, W = 6.8 µm, Q = 1.05 (Chen and Cui 2017); on angiosperm wood; type locality in China; distribution: Southwest China.

43. Basidiospores 5.2–6 µm wide..... *F. subrobusta* B.K. Cui & Hong Chen

Basidiocarps perennial, pileate; pilei triquetrous; pileal surface yellowish brown to cinnamon brown, concentrically zonate, smooth, uncracked; pore surface yellowish brown, glancing; pores 6–9 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles subulate to ventricose, 11–16 × 3–7 µm; basidiospores subglobose to obovoid, hyaline, thick-walled, IKI[+], CB+, (5.2–)6.2–6.8(–7) × (5–)5.2–6(–6.3) µm, L = 6.3 µm, W = 5.5 µm, Q = 1.12–1.14 (Chen and Cui 2017); on angiosperm wood; type locality in China; distribution: Southwest China.

44. Pileal surface brown or rusty brown; usually on *Quercus*..... *F. calkinsii* (Murrill) Vlasák & Kout

Basidiocarps perennial, pileate; pilei ungulate to applanate; pileal surface brown or rusty brown, glabrous, sulcate, zonate, encrusted, cracked; pore surface reddish dark to grayish brown; pores 6–8 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles ventricose with elongated hyphoid apex, 13–16 × 5–7 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, 5–6.5(–7) × 5–6 µm (Vlasák and Kout 2011); usually on *Quercus*; type locality in USA; distribution: USA.

44. Pileal surface dark brown to black; on an angiosperm other than *Quercus*..... 45

45. Growing on *Drimys* ..... *F. nubicola* Alves-Silva et al.

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface dark brown to black, glabrous, sulcate, zonate, cracked; pore surface grayish brown to cinnamon; pores 6–8 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles present; basidiospores globose, hyaline, thick-walled, strongly IKI[+], strongly CB+, 5–

6(–7) × (4–)5–6(–6.5) µm, L = 5.9 µm, W = 5.4 µm (Alves-Silva et al. 2020b); growing on *Drimys* spp.; type locality in Brazil; distribution: Brazil, Ecuador and French Guiana.

45. Growing on palms, wood of Lauraceae and Myrtaceae..... *F. apiahyna* (Speg.) Robledo et al.

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface dark brown to black, glabrous, sulcate, zonate, cracked; pore surface grayish brown; pores 6–8 per mm; dissepiments thick, entire; context homogeneous without concentric black lines; hyphal system dimitic; hymenial setae absent; cystidioles present; basidiospores globose, hyaline, thick-walled, strongly IKI[+], strongly CB+, 5–6.5(–7) × (4–)5–6(–7) µm, L = 5.7 µm, W = 5.3 µm (Alves-Silva et al. 2020b); growing on wood of Lauraceae and Myrtaceae; type locality in Brazil; distribution: Brazil and southern North America.

46. Hymenial setae present..... 47

46. Hymenial setae absent..... 58

47. Basidiocarps annual to biennial..... 48

47. Basidiocarps perennial..... 51

48. Hymenial setae with spines..... *F. spinescens* (J.E. Wright & G. Coelho) G. Coelho et al.

Basidiocarps annual, resupinate; pore surface cinnamon, ferruginous to dark brown; pores 4–6 per mm; subiculum up to 0.5 mm thick; hyphal system dimitic; hymenial setae ventricose, spiny, 27–51 × 7–10 µm; cystidioles ventricose, 12–32 × 5–9 µm; basidiospores globose to subglobose, hyaline, thick-walled, IKI[+], CB+, 5.5–7 × 5–6 µm, L = 6.3 µm, W = 5.66 µm, Q = 1.11 (Coelho and Wright 1996; Coelho et al. 2009), on bamboo; type locality in Brazil; distribution: South America.

48. Hymenial setae smooth..... 49

49. Pores 3–4 per mm..... *F. sancti-champagnatii* G. Coelho et al.

Basidiocarps annual, resupinate; pore surface golden yellow to ferruginous brown or cinnamon brown; pores 3–4 per mm; dissepiments velutinate; subiculum homogeneous, up to 1 mm thick; hyphal system dimitic; hymenial setae scattered, straight to ventricose, 16.8–32 × 4.4–8 µm; cystidioles present, ventricose, 9.6–16 × 2.4–4.4 µm; basidiospores globose to subglobose, hyaline, thick-walled, IKI[+], CB+, (4.4–)5.2–6.4(–6.8) × (4.4–)4.8–5.8(–6.4) µm, L = 5.4 µm, W = 5.17 µm, Q = 1.05 (Coelho et al. 2009); on bamboo; type locality in Brazil; distribution: Brazil.

49. Pores 5–9 per mm..... 50

50. Pores 5–6 per mm; hymenial setae hooked..... *F. uncinata* (Rajchenb.) G. Coelho et al.

Basidiocarps annual to biennial, resupinate; pore surface pale umber to isabelline or grayish brown; pores 5–6 per mm; dissepiments entire; subiculum very thin to almost lacking; hyphal system dimitic; hymenial

setae abundant, ventricose, hooked, 25–35 × 6–12 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, 5.5–7 × 5–6.5 µm (Coelho et al. 2009); on bamboo; type locality in Argentina; distribution: North Argentina and South Brazil.

50. Pores 6–9 per mm; hymenial setae straight..... *F. neotropica* Camp.-Sant. et al.

Basidiocarps annual, resupinate; pore surface yellowish brown to dark brown; pores 6–9 per mm; dissepiments thin to thick, entire; hyphal system dimitic; hymenial setae absent to abundant, fusiform to ventricose, 10–30 × 3.5–6.5 µm; basidiospores subglobose to broadly obovoid, hyaline, thick-walled, IKI[+], CB+, 5–7 × 4.5–7 µm, L = 5.9 µm, W = 5.7 µm, Q = 1.05 (Campos Santana et al. 2014); type locality in Argentina; distribution: Argentina.

51. Basidiocarps cushion-shaped..... 52

51. Basidiocarps even..... 53

52. Basidiospores 6.5–7.5 µm long..... *F. pseudopunctata* (A. David et al.) Fiasson (= *F. mediterranea* M. Fisch.)

Basidiocarps perennial, resupinate, cushion-shaped; margin receding; pore surface yellowish brown to umber brown; pores 6–8 per mm; dissepiments thick, entire; subiculum up to 2 mm thick; hyphal system dimitic; hymenial setae ventricose, 15–28 × 7–10 µm; cystidioles present; basidiospores broadly ovoid to subglobose, hyaline, thick-walled, IKI[+], CB+, 6.5–7.5 × 5.5–7 µm (Ryvarden and Gilbertson 1994); type locality in France; distribution: South Europe and East Africa.

52. Basidiospores 5–6 µm long..... *F. lagerstroemiae* X.H. Ji et al.

Basidiocarps perennial, resupinate, cushion-shaped; pore surface snuff brown, glancing; pores 7–9 per mm; dissepiments thin, entire; subiculum very narrow to almost lacking; hyphal system dimitic; hymenial setae frequent, ventricose, 15–22 × 5–7 µm; cystidioles absent; basidiospores subglobose, hyaline, thick-walled, IKI[+], CB+, (4.8–)5–6(–6.2) × (4–)4.5–5.5(–6) µm, L = 5.86 µm, W = 5.13 µm, Q = 1.14 (Hyde et al. 2019); on *Lagerstroemia*; type locality in Vietnam; distribution: Vietnam.

53. Basidiospores weakly dextrinoid..... *F. bannaensis* Y.C. Dai

Basidiocarps perennial, resupinate; pore surface yellowish brown to grayish brown, glancing; pores 8–10 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae abundant, subulate to ventricose, 17–23 × 6–8 µm; cystidioles subulate with sharp point or obtuse at apex, 14–18 × 4–5 µm; basidiospores subglobose, hyaline, slightly thick-walled, weakly IKI[+], CB+, (4–)4.2–5.2(–5.5) × (3.6–)3.8–4.9(–5) µm, L = 4.68 µm, W = 4.24 µm, Q = 1.08–1.13 (Dai 2010); type locality in China; distribution: Southeast Asia.

53. Basidiospores moderately to distinctly dextrinoid..... 54

54. Pores 10–12 per mm..... 55

54. Pores 5–9 per mm..... 56

55. Subiculum dimitic; on liana; African species..... *F. tenuis* Decock et al.

Basidiocarps perennial, resupinate; pore surface brown, glancing; pores 10–11 per mm; dissepiments thin, entire; subiculum very thin, up to 0.2 mm; hyphal system dimitic; hymenial setae rare, scattered, ventricose, 18–21 × 5.5–7 µm; cystidioles rare, fusiform to ventricose with elongated hyphoid apex, 16–20 × 4.0–5.5 µm; basidiospores subglobose to globose, hyaline, slightly thick-walled, IKI[+], CB+, 4.8–6 × 4.3–5.5 µm, L = 5.3 µm, W = 4.9 µm, Q = 1.1 (Decock et al. 2005); type locality in Ethiopia; distribution: Ethiopia.

55. Subiculum trimitic; on *Nothofagus*; Australian species..... *F. tasmanica* X.H. Ji & Jia J Chen

Basidiocarps perennial, resupinate; pore surface clay pink to clay buff, glancing; pores 10–12 per mm; dissepiments thin, entire; subiculum up to 5 mm thick; hyphal system trimitic in subiculum, dimitic in tube trama; skeleto-binding present; hymenial setae present, ventricose, 16–24 × 5–7.5 µm; cystidioles present, fusoid, 9–17 × 3–5 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, (5.2–)5.5–6.6(–7) × 5–6(–6.5) µm, L = 6.04 µm, W = 5.6 µm, Q = 1.06–1.08 (Chen et al. 2021); type locality in Australia; distribution: Tasmania, Australia.

56.. Basidiospores 4–5 µm long..... *F. hainaniana* B.K. Cui & Hong Chen

Basidiocarps perennial, resupinate; pore surface yellowish brown to pale brown, glancing; pores 6–9 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae subulate to ventricose, 18–27 × 6–10 µm; cystidioles absent; basidiospores subglobose to globose, hyaline, thick-walled, moderately IKI[+], CB+, (3.8–)4–5(–5.5) × (3.6–)3.8–4.4(–5) µm, L = 4.4 µm, W = 4 µm, Q = 1.04–1.06 (Chen and Cui 2017); type locality in China; distribution: South China.

56.. Basidiospores 5–7 µm long..... 57

57. Basidiospores 5–6 µm long; South American species..... *F. bambusarum* (Rick) Camp.-Sant. & Decock

Basidiocarps perennial, resupinate; pore surface yellowish to grayish brown; pores 6–8 per mm; dissepiments thick, entire; subiculum up to 1 mm thick; hyphal system dimitic; hymenial setae rare, straight to ventricose, 13–25 × 6–8 µm; basidiospores globose to subglobose, hyaline, thick-walled, IKI[+], 5–6 × 5 µm (Larsen and Cobbe-Poulle 1990); on bamboo; type locality in Brazil; distribution: South Brazil.

57. Basidiospores 6.5–7 µm long; Australian species.. *F. sublaevigata* (Cleland & Rodway) Y.C. Dai

Basidiocarps perennial, resupinate; pore surface yellowish brown to brown; pores 5–7 per mm; subiculum very thin; hyphal system dimitic; hymenial setae rare, ventricose to subulate, 21–30 × 4.5–8.5 µm;

basidiospores subglobose, hyaline, thick-walled, IKI[+], 6.5–7 × 5–6 µm (Buchanan and Ryvarden 1993); type locality in Australia; distribution: South Australia.

58. Basidiocarps annual..... *F. aethiopica* Decock et al.

Basidiocarps annual, resupinate; pore surface grayish orange to golden brown, glancing; pores 5–6 per mm; dissepiments thick, entire; subiculum up to 0.75 mm; hyphal system dimitic; hymenial setae absent; cystidioles scattered, fusiform to slightly ventricose, 17–20 × 3.5–6 µm; basidiospores globose to subglobose, hyaline, slightly thick-walled, IKI[+], CB+, 6–8.8 × 5.5–7.2(–7.5) µm, L = 7.2 µm, W = 6.5 µm, Q = 1.1 (Decock et al. 2005); type locality in Ethiopia; distribution: Ethiopia.

58. Basidiocarps perennial..... 59

59. Basidiocarps cushion-shaped..... 60

59. Basidiocarps even..... 65

60. Cystidioles present..... 61

60. Cystidioles absent..... 63

61. A black line present between subiculum and substrate..... *F. chilensis* Rajchenb. & Pildain

Basidiocarps perennial, resupinate, cushion-shaped; a black line present between subiculum and substrate; pore surface yellowish brown to dark brown, receding; pore 6–8 per mm; dissepiments thick, entire; hymenial setae absent; cystidioles fusiform; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, 6–6.8 × 5.4–6.2 µm, L = 6.4 µm, W = 5.8 µm; Q = 1.1 (Rajchenberg et al. 2019); on living tree of Lauraceae and Monimiaceae; type locality in Chile; distribution: Chile.

61. Black line absent..... 62

62. Pores 7–8 per mm; on *Eucalyptus*; Australian species..... *F. gatesii* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped; a black line absent between subiculum and substrate; pore surface dark brown to umber, cracked, glancing; pores 7–8 per mm; dissepiments thin, entire; subiculum up to 0.5 mm thick; hyphal system dimitic; hymenial setae absent; cystidioles fusoid, 7–12 × 3–5 µm; basidiospores globose, hyaline, thick-walled, IKI[+], CB+, (5–)5.5–7(–7.2) × 5–6.3(–6.5) µm, L = 6.14 µm, W = 5.63 µm, Q = 1.07–1.09 (n = 60/2); on *Eucalyptus*; type locality in Australia; distribution: South Australia.

62. Pores 4–6 per mm; on *Carpinus*; Asian species..... *F. carpinea* X.H. Ji et al.

Basidiocarps perennial, resupinate, cushion-shaped; a black line absent between subiculum and substrate; pore surface dark brown to umber, glancing; pores 4–6 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae absent; cystidioles ventricose, 10–18 × 3–5 µm; basidiospores

globose, hyaline, thick-walled, IKI[+], CB+, (6.1–)6.5–7.8(–8) × (5.5–)6–7.5(–7.8) µm, L = 7.06 µm, W = 6.7 µm, Q = 1.05 (Hyde et al. 2019); on *Carpinus*; type locality in China; distribution: West China.

63. Tube layers with a thin context; basidiospores 5–6 µm long..... *F. impercepta* Morera et al.

Basidiocarps perennial, resupinate, cushion-shaped; margin buckthorn brown; pore surface buffy brown to mouse gray; pores 5–7 per mm; dissepiments thin to thick, entire; tubes multi-layered, separated by a thin context; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidiospores globose to subglobose, hyaline, thick-walled, IKI[+], (4–)5–6(–7) × 4–6(–7) µm, L = 5.58 µm, W = 5.08 µm, Q = 1.11 (Morera et al. 2017); type locality in Argentina; distribution: Argentina and Ecuador (JV 1906/P1-J).

63. Tube layers without a thin context; basidiospores 6–8 µm long..... 64

64. Basidiocarps with blackish indurate margin; pore surface grayish orange to pale brown.....

..... *F. dryophila* Murrill

Basidiocarps perennial, resupinate, cushion-shaped to pseudopileate, with blackish indurate margin; pore surface grayish orange to pale brown, receding; pores 7 per mm; dissepiments thin, entire; tube layers without a thin context; hymenial setae absent; cystidioles absent; basidiospores globose to subglobose, hyaline, thick-walled, strongly IKI[+], strongly CB+, (5.5–)6.2–8(–8.5) × (5–)5.7–7.3(–7.5) µm, L = 7 µm, W = 6.5 µm (Decock et al. 2007); type locality in USA; distribution: Southeastern USA and Mexico.

64. Basidiocarps without blackish indurate margin; pore surface yellowish brown to dark brown.....

..... *F. punctata* (P. Karst.) Murrill

Basidiocarps perennial, resupinate, cushion-shaped, blackish indurate margin absent; pore surface yellowish brown to dark brown, receding; pores 5–6 per mm; dissepiments thick, entire; tube layers without a thin context; hymenial setae absent; cystidioles absent; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (6–)6.2–7.5(–8) × (5.5–)6–7(–7.5) µm, L = 6.9 µm, W = 6.2 µm (Decock et al. 2007); type locality in Norway; distribution: temperate forests of Northern Hemisphere.

65. Cystidioles absent..... 66

65. Cystidioles present..... 67

66. Basidiospores 6.5–7.5 µm long..... *F. capensis* M. Fisch. et al.

Basidiocarps perennial, resupinate; pore surface yellowish brown to rust brown; pores 4–6 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae essentially absent; cystidioles absent; basidiospores ovoid to globose, hyaline, thick-walled, IKI[+], (6–)6.5–7.5(–8) × (5–)5.5–7(–7.5) µm (Cloete et al. 2014); on *Vitis*; type locality in South Africa; distribution: South Africa.

66. Basidiospores 5.5–6.3 µm long..... *F. expansa* Decock & Amalfi

Basidiocarps perennial, resupinate, up to 100 cm long and 30 cm wide; pore surface bright grayish to light brown; pore 5–6 per mm; dissepiments entire, pruinose; subiculum homogeneous; hymenial setae absent; cystidioles absent; basidia pyriform to subglobose, 7–10 × 6–9 µm, basidiospores subglobose to broadly obovoid, hyaline, thick-walled, IKI[+], CB+, 5.5–6.3(–6.6) × 5–5.7 µm, L = 6 µm, W = 5.5 µm, Q = 1–1.2 (Decock and Amalfi 2014); type locality in French Guiana; distribution: French Guiana.

67. On *Juniperus*..... *F. juniperina* (Murrill) T. Hatt. & Y. Ota

Basidiocarps perennial, resupinate; pore surface yellowish brown, glancing; pores 8–10 per mm; subiculum very thin to almost lacking; hyphal system dimitic; hymenial setae absent; cystidioles rarely present, ventricose; basidiospores subglobose, hyaline, slightly thick-walled, IKI[+], 4.5–5.5 × 4–5.5 µm (Ota et al. 2014); on *Juniperus*; type locality in USA; distribution: USA.

67. On angiosperms..... 68

68. Pores 4–6 per mm..... *F. torreyae* Y.C. Dai & B.K. Cui

Basidiocarps perennial, resupinate; pore surface grayish brown to rust brown, glancing; pores 4–6 per mm; dissepiments thin, entire; subiculum up to 0.5 mm thick; hyphal system dimitic; hymenial setae absent; cystidioles frequent, subulate, 14–19.7 × 2.8–4 µm; basidiospores subglobose to globose, hyaline, thick-walled, IKI[+], CB+, (4.5–)5–5.9(–6) × (4–)4.4–5.3(–5.9) µm, L = 5.46 µm, W = 4.9 µm, Q = 1.11 (Dai 2010); on angiosperm wood; type locality in China; distribution: East Asia.

68. Pores 6–10 per mm..... 69

69. Pore surface cracked; context layer absent in tube layers; Asian species ..... *F. subtropica* B.K. Cui & Hong Chen

Basidiocarps perennial, resupinate; pore surface yellowish brown, glancing, cracked; pores 6–10 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae absent; cystidioles frequent, subulate to ventricose, 13–17 × 3–6 µm; basidiospores subglobose to obovoid, hyaline, thick-walled, IKI[+], CB+, (4.8–)5.2–6(–6.6) × (4–)4.4–5(–6) µm, L = 5.5 µm, W = 4.8 µm, Q = 1.08–1.11 (Chen and Cui 2017)); on angiosperm wood; type locality in China; distribution: South China.

69. Pore surface uncracked, tubes separated with a context layer; American species..... 70

70. Pore surface chocolate brown; Central and South American species..... *F. maxonii* Murrill

Basidiocarps perennial, resupinate; margin brilliant yellowish; pore surface chocolate brown; pores 7–9 per mm; dissepiments thin, entire; tubes separated with a context layer; hyphal system dimitic; hymenial setae absent; cystidioles present, fusiform, 7.5–11.5 × 3–5.5 µm; basidiospores globose to subglobose, hyaline, thick-walled, strongly IKI[+], strongly CB+, (4.5–)5.3–6.5(–7) × (4–)4.8–6(–6.7) µm, L = 6 µm, W = 5.5 µm (Decock et al. 2007); on angiosperm wood; type locality in Costa Rica; distribution: Central and South America.

70. Pores grayish to light brown; North American species..... *F. langloisii* Murrill (= *F. hesleri* M. Fisch.)

Basidiocarps perennial, resupinate; pores grayish to light brown; pores 7–8 per mm; dissepiments thin, entire; tubes separated with a context layer; hymenial setae absent; cystidioles present, 10–18 × 3–5 µm; basidiospores hyaline, thick-walled, subglobose to globose, strongly IKI[+], strongly CB+, (4.7–)5.3–6.7(–7.3) × (4–)4.8–6(–6.5) µm, L =6 µm, W = 5.5 µm (Decock et al. 2007); on angiosperm wood; type locality in USA; distribution: Southern USA.

4.7 *Fulvifomes* Murrill, *North. Polyp.*: 49 (1914), (Figs. 1, 17)

Type species: *Fulvifomes robiniae* (Murrill) Murrill.

Basidiocarps annual to perennial, pileate, effused-reflexed or substipitate with a contracted base, solitary or imbricate, corky to woody hard; pileal surface tomentose or glabrous, with or without a crust; context homogenous or duplex; hyphal system monomitic or dimitic; generative hyphae simple septate; setal elements absent; basidiospores subglobose to ellipsoid, yellowish to brown, fairly thick- to thick-walled, smooth, IKI−, CB−, CB(+) or CB+; mostly on angiosperms; causing a white rot.

Fulvifomes was treated as a synonym of *Phellinus* Quél. for several decades (Ryvarden and Johansen 1980; Gilbertson and Ryvarden 1987; Larsen and Cobb-Poulle 1990; Ryvarden 1991; Núñez and Ryvarden 2000) until Wagner and Fischer (2002b) re-erected *Fulvifomes* as a distinct genus in Hymenochaetaceae based on nuclear-encoded large subunit rRNA gene (28S) sequences. Because of rather uniform macromorphology, hyphal system, basidiospores, and lack of setae, traditional *Fulvifomes* classification is based on only a few distinct features, enabling definition of a limited number of species. Dai (2010) and Hattori et al. (2014) described some *Fulvifomes* species based on morphological evidence. Based on molecular and morphological analyses, Zhou (2014b) revised the definition of *Fulvifomes* and two species from tropical China were described. Recently *Fulvifomes* was widely accepted as a genus and several species have been placed in it based on molecular and morphological evidence (Zhou 2015c; Ji et al. 2017c; Salvador-Montoya et al. 2018b). Most species of *Fulvifomes* grow on dead angiosperm trees or wood although a few can inhabit living trees. The majority of the species of the genus have been found in tropical or subtropical areas (Larsen and Cobb-Poulle 1990; Ryvarden 2004); only one species, *Fulvifomes rimosus*, has been recorded in Europe (Ryvarden and Melo 2014). However, the type locality of *F. rimosus* is in Australia, and the European taxon is very probably different from *Fulvifomes rimosus.*

Fulvifomes is phylogenetically related to *Phylloporia* and *Flaviporellus*, the three genera share the absence of setae and thicked, colored basidiospores. However, *Phylloporia* grows almost parasitically on living plants and has a duplex context, *Flaviporellus* has basidiocarps becoming vivid deep red in KOH and collapsed basidiospores when mature, while *Fulvifomes* usually grows on dead wood, has basidiocarps with homogeneous context and becoming blackish brown in KOH, and its mature basidiospores are mostly not collapsed.

Fulvifomes azonatus Y.C. Dai & X.H. Ji, **sp. nov.** (Figs. 17, 18, 19)

MycoBank: MB 825573.

Type. — **CHINA**. Yunnan Province, Mengla County, Lvshilin Park, on dead angiosperm tree, 19.VI.2017, Dai 17470 (holotype, BJFC025003).

Etymology. — *Azonatus* (Lat.): referring to the azonate pileal surface of the species.

Fruiting body. — Basidiocarps perennial, pileate, solitary, without distinctive odor or taste and woody hard when fresh, light in weight when dry. Pilei applanate, projecting up to 20 cm, 12 cm wide and 4 cm thick at base. Pileal surface cigar brown, encrusted, uncracked; margin luteous, obtuse. Pore surface date brown; sterile margin distinct, cinnamon buff, up to 10 mm wide; pores circular, 7–9 per mm; dissepiments thick, entire. Context buff, woody hard, up to 1 cm thick, with a distinct thin black line near pileal surface. Tubes grayish brown to deep olive, woody hard, up to 8 cm long, tube layers distinctly stratified, individual tube layer up to 5 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae dominant; tissue becoming blackish brown in KOH.

Context. — Generative hyphae occasionally present, yellowish, slightly thick-walled, rarely branched, frequently simple septate, 2–3.5 µm in diam; skeletal hyphae dominant, pale yellow to brown, thick-walled with a wide lumen, unbranched, aseptate, flexuous, interwoven, 3–6 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellow, thin- to slightly thick-walled, occasionally branched, frequently simple septate, 1.5–3 mm in diam; skeletal hyphae dominant, pale yellow, thick-walled with a wide lumen, rarely branched, aseptate, flexuous, interwoven, 2–4 mm in diam. Setae or setal hyphae absent; cystidioles ventricose, 10–13 × 3–5 µm; basidia barrel-shaped, with four sterigmata and a simple basal septum, 8–10 × 4–6 µm; basidioles similar to basidia in shape, but slightly smaller.

Spores. — Basidiospores subglobose to ovoid, yellowish brown, thick-walled, smooth, IKI–, CB–, (4–)4.2–4.6(–5) × (3.2–)3.5–3.8(–4) µm, L = 4.37 µm, W = 3.69 µm, Q = 1.17–1.2 (n = 90/3).

Additional specimens (paratypes) examined. — **CHINA**. Hubei Province, Shennongjia, Guanmenshan, on dead tree of *Lagerstroemia indica*, 16.X.2016, Dai 17203 (BJFC023301). Yunnan Province, Mengla County, Lvshilin Park, on angiosperm tree, 1.XI.2009, Cui 8452 (BJFC006941).

Remarks. — *Fulvifomes azonatus* is related to *F. rigidus* (B.K. Cui & Y.C. Dai) X.H. Ji & Jia J Chen and *F. rhytiphloeus* (Mont.) Camp.-Sant. & Robledo in our phylogeny (Fig. 17). However, *F. rigidus* differs from *F. azonatus* by annual basidiocarps and a monomitic hyphal system; *F. rhytiphloeus* differs from *F. azonatus* by the absence of cystidioles, and wider basidiospores measuring 4–5 × 4–5 µm (Ryvarden 2004). Macroscopically, *Fulvifomes azonatus* is similar to *F. submerrillii* X.H. Ji & Jia J Chen in sharing

perennial, pileate basidiocarps, encrusted, uncracked pileal surface, and a dimitic hyphal system. However, *F. submerrillii* has larger pores (6–7 per mm) and broadly ellipsoid basidiospores measuring 4.7–5 × 3.7–4 µm.

Fulvifomes caligoporus Y.C. Dai & X.H. Ji, **sp. nov.** (Figs. 17, 20, 21)

MycoBank: MB 825574.

Type. — **CHINA**. Hainan Province, Baoting County, Qixianling Forest Park, on fallen angiosperm trunk, 8.VI.2017, Dai 17660 (holotype, BJFC025192).

Etymology. — *Caligoporus* (Lat.): referring to the black pore surface of the species.

Fruiting body. — Basidiocarps perennial, pileate, broadly attached, without distinctive odor or taste and corky when fresh, light in weight when dry. Pilei applanate, projecting up to 15 cm, 14 cm wide and 2 cm thick at base. Pileal surface snuff brown to sepia, glabrous, uncracked; margin honey yellow, acute. Pore surface black when fresh, becoming grayish brown to cigar brown upon drying; sterile margin narrow, buff yellow, up to 2 mm wide; pores circular, 4–6 per mm; dissepiments thin, entire. Context lemon yellow, woody hard, up to 0.5 cm thick, with a distinct thin black line near pileal surface. Tubes deep olive, woody hard, up to 1.5 cm long, tube layers distinctly stratified, individual tube layer up to 5 mm long.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae yellowish, thick-walled with a wide lumen, occasionally branched, frequently simple septate, interwoven, 4–6 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellow, thin- to slightly thick-walled, occasionally branched, frequently simple septate, loosely interwoven to subparallel along the tubes, 3–4 mm in diam. Setae or setal hyphae absent; cystidioles ventricose, 12–15 × 3–5 µm; basidia barrel-shaped, with four sterigmata and a simple basal septum, 11–16 × 4–6 µm; basidioles similar to basidia in shape, but slightly smaller.

Spores. — Basidiospores ellipsoid to ovoid, yellowish brown, thick-walled, smooth, IKI–, CB–, (4.5–)5–5.4(–5.6) × (3–)3.3–4 µm, L = 5.08 µm, W = 3.56 µm, Q = 1.35–1.52 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA**. Hainan Province, Baoting County, Qixianling Forest Park, on fallen angiosperm trunk, 8.VI.2017, Dai 17668 (BJFC025200).

Remarks. — Fulvifomes caligoporus is distinct from other species of *Fulvifomes* by its black pore surface when fresh. Besides, *F. caligoporus formed a distinct* lineage *in our* phylogeny (Fig. 17). Morphologically, *Fulvifomes caligoporus* is similar to *F. lloydii* (Cleland) Y.C. Dai, X.H. Ji. Both species share the perennial, pileate basidiocarps and a monomitic hyphal system (Buchanan and Ryvarden 1993). However, *F.*

lloydii has subglobose and olivaceous brown to dark brown basidiospores measuring 5–6 × 4.3–5.3 µm (Buchanan and Ryvarden 1993).

Fulvifomes costaricense Y.C. Dai & Vlasák, **sp. nov.** (Figs. 17, 22, 23)

MycoBank: MB 825575.

Type. — **COSTA RICA.** Guanacaste Province, Rincon de la Vieja, on the living angiosperm tree, 29.VII.2016, J Vlasák Jr. 1607/103-J (holotype PRM 946695; isotypes in JV and BJFC032891).

Etymology. — *Costaricense* (Lat.): referring to the distribution of the species in Costa Rica.

Fruiting body. — Basidiocarps perennial, pileate, broadly to narrowly attached, a few imbricate, without distinctive odor or taste and woody hard when fresh, light in weight when dry. Pilei applanate, later sub-ungulate, projecting up to 14 cm, 30 cm wide and 6 cm thick at base. Pileal surface deep brown with reddish tint at first, becoming black with age, concentrically sulcate with narrow zones, velutinate in juvenile basidiocarps and near the margin, later with thick, glabrous, uncracked or only indistinctly cracked crust; margin brown, acute. *Pore surface* grayish brown to olivaceous brown, glancing; sterile margin distinct, bright yellow at first, later cinnamon buff, up to 3 mm wide; pores circular, 9–11 per mm; dissepiments thick, entire. Context deep olive, woody hard, up to 0.5 cm thick, with a distinct black line near pileal surface. Bulbous context outgrowths of strikingly bright yellow color often developed around pileus base. *Tubes* grayish brown, woody, up to 5.5 cm long, tube layers distinctly stratified, individual tube layer up to 3 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae dominant; tissue becoming blackish brown in KOH.

Context. — Generative hyphae occasionally present, yellowish, slightly thick-walled, rarely branched, frequently simple septate, 3–5 µm in diam; skeletal hyphae dominant, pale yellow to brown, thick-walled with a wide to narrow lumen, unbranched, aseptate, flexuous, interwoven, 4–6 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellow, thin- to slightly thick-walled, occasionally branched, frequently simple septate, 2–3.5 mm in diam; skeletal hyphae dominant, yellow, thick-walled with a wide to narrow lumen, unbranched, aseptate, flexuous, interwoven, 3–4 mm in diam. Setae or setal hyphae absent; hymenium collapsed in the studied material; basidia and basidioles not seen.

Spores. — Basidiospores subglobose, yellowish brown, thick-walled, smooth, IKI–, CB–, (3.8–)4–4.3(–4.8) × (3.3–)3.7–4(–4.2) µm, L = 4.2 µm, W = 3.8 µm, Q = 1.09–1.11 (n = 60/2).

Additional specimens (paratypes) examined. — **COSTA RICA**. Guanacaste Province, Rincon de la Vieja, on the living angiosperm tree, 1.VIII.2014, Vlasák 1408/14 (JV, BJFC020700); Bagaces, on the living

angiosperm tree, 30.VII.2014, Vlasák 1407/87 (PRM 946696, JV, BJFC020703); Puntarenas Prov., Golfito, Playa Nicuesa, 17.IV.2017, Vlasák 1704/19 (JV); 19.IV.2017, Vlasák 1704/58 (PRM 946697, JV).

Remarks. — *Fulvifomes costaricense* is characterized by the perennial, pileate basidiocarps, thick black line under reddish brown tomentum which wears off soon and exposes black, uncracked crust on pileal surface, small pores (9–11 per mm), a dimitic hyphal system and subglobose basidiospores under 5 µm in diam. Its juvenil basidiocarps resemble those of *Ochrosporellus portoricensis* (Overh.) Bondartseva & S. Herrera. because of narrowly sulcate pileal surface with mixed black and brown sulcate zones, olivaceous pores and bright yellow pileus margin, but *O. portoricensis* has very distinct setae. *Fulvifomes centroamericanus* Y.C. Dai et al. is also similar to *F. costaricense*, but it has a thick context without a black line near pileal surface (Ji et al. 2017c). In our phylogeny (Fig. 17), *Fulvifomes costaricense* is closely related to *F. imbricatus* L.W. Zhou and *F. fastuosus* (Lév.) Bondartseva & S. Herrera, *but F. imbricatus has relatively larger pores* (8–9 per mm) and larger basidiospores (4.4–5.3 × 3.5–4.5 µm, Zhou 2015c); *F. fastuosus* has relatively bigger pores 7–9 per mm and distinctly larger basidiospore 5–6.1 × 4.2–5.6 µm (Dai 2010).

Fulvifomes floridanus Y.C. Dai & Vlasák, **sp. nov.** (Figs. 17, 24, 25)

MycoBank: MB 825576.

Type. — **USA**. Florida, Key Largo, John Pennekamp Coral Reef State Park, on the living tree of *Lysiloma latisiliqua* (wild tamarind), IV.2004, Vlasák 0904/76 (holotype, PRM 946698; isotypes in JV and BJFC032885).

Etymology. — *Floridanus* (Lat.): referring to the distribution of the species in the state of Florida, USA.

Fruiting body. — Basidiocarps perennial, pileate, broadly attached, solitary, without distinctive odor or taste and woody hard when fresh, light in weight when dry. Pilei applanate to triquetrous with a flat upper part, projecting up to 13 cm, 12 cm wide and 5 cm thick at base. Pileal surface deep brown, becoming black with age, nodulose, zonate towards the margin and partly velutinate, quickly disintegrating, insect-damaged, up to 10 mm thick tomentum in older parts, uncracked; margin brown, obtuse to sharp. *Pore surface* brown, glancing; sterile margin distinct, cinnamon buff, up to 4 mm wide; pores circular, 7–8 per mm; dissepiments thick, entire. Context clay buff, woody hard, up to 4 cm thick, with a thin but distinct black line near pileal surface. Tubes grayish brown, woody hard, up to 1 cm long, tube layers distinctly stratified, individual tube layer up to 2 mm long.

Hyphal structure. — Hyphal system dimitic in trama, monomitic in context; generative hyphae simple septate; skeletal hyphae infrequent; tissue becoming blackish brown in KOH.

Context. — Generative hyphae yellowish, slightly thick-walled with a wide lumen, unbranched, frequently simple septate, more or less regularly arranged, 4–7 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellow, thin- to slightly thick-walled, rarely branched, frequently simple septate, 2–4.5 µm in diam; skeletal hyphae infrequent, pale yellow, thick-walled with a narrow lumen, unbranched, aseptate, interwoven, 3.5–6 µm in diam. Setae or setal hyphae absent; hymenium collapsed in the studied material; basidia and basidioles not seen.

Spores. — Basidiospores globose, yellowish brown, thick-walled, smooth, IKI–, CB–, (4.6–)4.9–5.1(–5.3) × (4.2–)4.5–4.8(–5) µm, L = 5 µm, W = 4.7 µm, Q = 1.03–1.07 (n = 60/2).

Additional specimens (paratypes) examined. — **USA**. Florida, Key Largo, John Pennekamp Coral Reef State Park, on living tree of *Lysiloma latisiliquum*, 21.IV.2009, Vlasák 0904/65 (JV and BJFC032906); XII.2003, Vlasák 0312/23.1-J (PRM 946699, JV and BJFC020627).

Remarks. — *Fulvifomes floridanus* is characterized by a pileal surface with thick, quickly disintegrating tomentum over a black line, which hardly ever becomes exposed, and growing on the base of living *Lysiloma latisiliquum*. It was up to now found only in the Florida Keys, where it is however quite common. Although *Fulvifomes floridanus* has a monomitic hyphal structure in the context which is unusual for *Fulvifomes*, there is no doubt that the species belongs to *Fulvifomes* in our phylogeny (Fig. 17). *F. floridanus* is similar to *F. subindicus*, but the latter has subglobose to broadly ellipsoid and cyanophilous basidiospores.

Fulvifomes jouzaii Y.C. Dai, F. Wu & Vlasák, **sp. nov.** (Figs. 17, 26, 27)

MycoBank: MB 825577.

Type. — **COSTA RICA**. Puntarenas Province, La Gamba, on the base of uprooted dead angiosperm tree, 20.IV.2015, Vlasák Jr. 1504/39-J (holotype, PRM 946700; isotypes in JV and BJFC032904).

Etymology. — *Jouzaii* (L.): in honor of the Czech mycologist, Dr. Jouza Vlasák.

Fruiting body. — Basidiocarps perennial, pileate, solitary, without distinctive odor or taste and woody hard when fresh, light in weight when dry. Pilei ungulate, projecting up to 11 cm, 18 cm wide and 3.5 cm thick at base. Pileal surface black to dark bay at the margin, rough, narrowly concentrically sulcate, uncracked, glabrous, with a very hard black crust 1–3 mm thick; pileal margin thin, sharp in juvenile basidiocarps, thick and obtuse later. Pore surface grayish brown to deep olive; sterile margin only 1–2 mm broad; pores circular, 9–10 per mm; dissepiments thick, entire. Context brown, woody hard, up to 0.5 cm thick, with distinct black lines and streaks near pileal surface which often merge with pileal crust. Tubes grayish brown, woody hard, up to 3 cm long, tube layers distinctly stratified, individual tube layer up to 3 mm thick.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae dominant; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, yellowish, thick-walled with a wide lumen, unbranched, frequently simple septate, 2.5–3.5 µm in diam; skeletal hyphae dominant, pale yellow to brown, thick-walled with a wide to narrow lumen, unbranched, aseptate, flexuous, interwoven, 3–4 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellow, thin- to slightly thick-walled, rarely branched, frequently simple septate, 2–3 mm in diam; skeletal hyphae dominant, yellow, thick-walled with a narrow to medium lumen, unbranched, aseptate, flexuous, interwoven, 2–3.5 mm in diam. Setae or setal hyphae absent; hymenium collapsed in the studied material; basidia and basidioles not seen. Rhomboid crystals frequently present in trama.

Spores. — Basidiospores broadly ellipsoid to subglobose, yellowish brown, thick-walled, smooth, IKI–, CB(+), 4–4.3(–4.7) × (3–)3.2–3.7(–4) µm, L = 4.15 µm, W = 3.49 µm, Q = 1.18–1.25 (n = 60/2).

Additional specimen (paratype) examined. — **COSTA RICA**. Puntarenas Province, Tarcoles, on the base of the dead standing angiosperm tree, 18.IV.2015, Vlasák Jr. 1504/16-J (PRM 946701, JV).

Remarks. — *Fulvifomes jouzaii* resembles *F. centroamericanus* in morphology, but the latter has acyanophilous basidiospores, and lacks a black line or crust on the pileal surface (Ji et al. 2017c). *Fulvifomes allardii* (Bres.) Bondartseva & S. Herrera is also similar to *F. jouzaii*, but it has a tomentose pileal surface when juvenile, larger pores (7–8 per mm), and acyanophilous basidiospores (Bondartseva et al. 1992). In addition, *F. jouzaii formed a distinct* lineage with strong support in our phylogeny (Fig. 17).

Fulvifomes nakasoneae Y.C. Dai & Vlasák, **sp. nov.** (Figs. 17, 28, 29)

MycoBank: MB 825578.

Type. — **USA**. Texas, Hidalgo County, on the tree of *Texas ebony*, 27.IX.2011, J Vlasák 1109/62 (holotype, PRM 946702; isotypes in JV and BJFC020616).

Etymology. — *Nakasoneae* (L.): in honor of the American mycologist, Dr. Karen K. Nakasone.

Fruiting body. — Basidiocarps perennial, pileate, solitary, without distinctive odor or taste and woody hard. Pilei ungulate, projecting up to 6 cm, 11 cm wide and 7 cm thick at base. Pileal surface in juvenile basidiocarps entire, brown, tomentose in broad concentric zones, later indurate, vinaceous brown or black, rough, radially and concentrically cracked, showing broad V-shaped fissures; margin thick and dull. Pore surface hazel to sepia; sterile margin distinct, grayish brown, up to 3 mm wide; pores circular, 5–7 per mm; dissepiments thick, entire. Context brown, becoming crusty near the pileal surface, woody hard, up to 2 cm thick. No black line in the context. Tubes grayish brown, woody hard, up to 5 cm long, tube layers distinctly stratified, individual tube layer up to 3 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; skeletal hyphae dominant; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, yellowish, thick-walled with a wide lumen, unbranched, frequently simple septate, 3–4 µm in diam; skeletal hyphae dominant, pale yellow to brown, thick-walled with a narrow to wide lumen, unbranched, aseptate, interwoven, 3.5–4.5 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellow, thin- to slightly thick-walled, rarely branched, frequently simple septate, 2–3 µm in diam; skeletal hyphae dominant, pale yellow, thick-walled with a wide to narrow lumen, unbranched, aseptate, flexuous, interwoven, 2.5–3.5 µm in diam. Setae or setal hyphae absent; cystidioles ventricose with elongated apical portion, 9–19 × 3–5 µm; basidia not seen; basidioles barrel-shaped to pyriform, 8–12 × 4–6 µm. Rhomboid crystals frequently present in trama.

Spores. — Basidiospores globose, yellowish brown, thick-walled, smooth, IKI–, CB–, 5–5.6(–5.8) × (4.5–)4.9–5.1(–5.5) µm, L = 5.3 µm, W = 5 µm, Q = 1.03–1.07 (n = 60/2).

Additional specimens (paratypes) examined. — **MEXICO**. Baja California Sur, Santiago, Fox Canyon, VII.2017, Vlasák Jr.1707/20-J (JV); Los Cabos, Las Manitas, VII.2017, Vlasák Jr. 1707/34-J (JV); Sierra de la Laguna, VII.2017, Vlasák Jr. 1707/36-J (JV). **USA**. Florida, Key Largo, John Pennekamp Coral Reef State Park, on angiosperm wood, IV.2009, Vlasák 0904/68 (PRM 946703, JV and BJFC032907); Windley Key, Fossil Reef Geological State Park, on angiosperm wood, XII.2003, Vlasák Jr. 0312/22.11-J (PRM 946704, JV and BJFC032897). Texas, Brownsville, Resaca de la Palma State Park, on tree of *Condalia hookeri*, IX.2011, Vlasák 1109/77 (JV, BJFC020622).

Remarks. — *F. nakasoneae* is relatively common and widely distributed along the southern USA border from Florida to California and Mexico. In western USA and Mexico, it often grows together with *Fomitiporella badia* which, however, has distinctly larger pores 3–4 per mm and differently cracked pileal surface - showing deep but narrow fissures, with vertical walls. *Fulvifomes nakasoneae* is similar to *F. thailandicus* L.W. Zhou *morphologically, but* the latter has applanate basidiocarps, broadly ellipsoid and cyanophilous basidiospores measuring 5–5.8 × 4.1–4.8 µm (Zhou 2015c).

Fulvifomes subindicus Y.C. Dai & X.H. Ji, **sp. nov.** (Figs. 17, 30, 31)

MycoBank: MB 825579.

Type. — **CHINA**. Hainan Province, Ledong County, Jianfengling National Forest Park, on angiosperm tree, 13.VI.2017, Dai 17743 (holotype, BJFC025275).

Etymology. — *Subindicus* (Lat.): referring to the species similar to *Fulvifomes indicus.*

Fruiting body. — Basidiocarps perennial, pileate, solitary, without distinctive odor or taste and woody hard when fresh, light in weight when dry. Pilei applanate, projecting up to 7 cm, 6 cm wide and 3 cm thick at base. Pileal surface umber, glabrous with some tuberculae or warts, uncracked; pileal margin buff, obtuse. Pore surface grayish brown; sterile margin distinct, buff, up to 5 mm wide; pores circular, 5–8 per

mm; dissepiments thick, entire. Context fulvous, woody hard, up to 2.5 cm thick. Tubes snuff brown, woody hard, up to 1 cm long, tube layers distinctly stratified, individual tube layer up to 2 mm long.

Hyphal structure. — Hyphal system dimitic in trama, monomitic in context; generative hyphae simple septate; skeletal hyphae infrequent; tissue becoming blackish brown in KOH.

Context. — Generative hyphae yellowish, slightly thick-walled with a wide lumen, occasionally branched, frequently simple septate, flexuous, interwoven, 3–8 µm in diam.

Trama of the tubes. — Generative hyphae dominant, hyaline to pale yellow, thin- to slightly thick-walled, rarely branched, frequently simple septate, 2.5–5 µm in diam; skeletal hyphae infrequent, pale yellow, thick-walled with a narrow lumen, unbranched, aseptate, flexuous, interwoven, 3–5 µm in diam. Setae or setal hyphae absent; cystidioles absent; basidia barrel-shaped, with four sterigmata and a simple basal septum, 12–15 × 7–9 µm; basidioles capitate to globose, slightly smaller than basidia.

Spores. — Basidiospores subglobose to broadly ellipsoid, yellowish brown, thick-walled, smooth, IKI–, CB+, (4.5–)4.7–5.3(–5.7) × 4–4.8(–5) µm, L = 5.04 µm, W = 4.46 µm, Q = 1.12–1.13 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA**. Hainan Province, Ledong County, Jianfengling National Forest Park, on angiosperm stump, 19.VI.2016, Cui 13908 (BJFC028774).

Remarks. — Fulvifomes subindicus is characterized by applanate basidiocarps, uncracked pileal surface, a monomitic hyphal system in context, and subglobose to broadly ellipsoid basidiospores. *Fulvifomes cedrelae* (Murrill) Murrill is similar to *F. subindicus* in micro-morphology, but it has ungulate basidiocarps, and a cracked pileal surface (Murrill 1915). *F. subindicus* is closely related to *F. indicus* (Massee) L.W. Zhou in our phylogeny (Fig. 17), but the latter has annual basidiocarps, a monomitic hyphal system in trama, and larger basidiospores (5.4–6.5 × 4.7–5.5 µm; Zhou 2014b).

In addition, the following taxa previously treated in *Phellinus* have morphological characteristics that fit *Fulvifomes*, and the following combinations are proposed:

Fulvifomes acontextus (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839930.

Basionym: *Phellinus acontextus* Ryvarden, in Hjortstam & Ryvarden, *Mycotaxon* 20: 147 (1984).

This is the sole species of *Fulvifomes* growing on gymnosperm wood, and further studies, especially the phylogenetical relationship with other members in the genus, are needed.

Fulvifomes aureobrunneus (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839931.

Basionym: *Phellinus aureobrunneus* J.E. Wright & Blumenf., *Mycotaxon* 21: 417 (1984).

Fulvifomes coffeatoporus (Kotl. & Pouzar) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839932.

Basionym: *Phellinus coffeatoporus* Kotl. & Pouzar, *Folia geobot. phytotax.* 14: 259 (1979).

Fulvifomes crocatus (Fr.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839933.

Basionym: *Polyporus crocatus* Fr., *Epicr. syst. mycol.* (Upsaliae): 477 (1838) [1836-1838].

≡ *Phellinus crocatus* (Fr.) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

Fulvifomes fushanianus (T.T. Chang) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839934.

Basionym: *Phellinus fushanianus* T.T. Chang [as 'fushanus'], *Mycol. Res.* 101: 1003 (1997).

Fulvifomes kravtzevii (Schwarzman) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839936.

Basionym: *Phellinus kravtzevii* Schwarzman, *Trudy Inst. Bot., Alma-Ata* 9: 31 (1961).

Fulvifomes lloydii (Cleland) Y.C. Dai, X.H. Ji, **comb. nov.** (Fig. 17)

MycoBank: MB 825581.

Basionym: *Fomes lloydii* Cleland, *Trans. & Proc. Roy. Soc. S. Australia* 59: 219 (1936).

≡ *Phellinus lloydii* (Cleland) G. Cunn., *Bull. N.Z. Dept. Sci. Industr. Res.* 164: 234 (1965).

≡ *Inonotus lloydii* (Cleland) P.K. Buchanan & Ryvarden, *Aust. Syst. Bot.* 6: 217 (1993).

Specimens examined. — **CHINA**. Hainan Province, Changjiang County, Bawangling National Reserve, on the rotten wood of *Litchi chinensis*, 9 May 2009, Dai 10809 (BJFC005052); Tunchang County, Poxin Town, on angiosperm stump, 23 November 2010, Dai 11978 (BJFC009066); Wuzhishan County, Wuzhishan National Reserve, on dead angiosperm tree, 25 May 2008, Dai 9642 (IFP007906).

Fulvifomes luteoumbrinus (Romell) Y.C. Dai & Vlasák, **comb. nov.** (Fig. 17)

MycoBank: MB 825582.

Basionym: *Phaeoporus luteoumbrinus* Romell, *K. svenska Vetensk-Akad. Handl., ny följd* 26: 27 (1901).

≡ *Aurificaria luteoumbrina* (Romell) D.A. Reid, *Kew Bulletin* 17: 279 (1963).

≡ *Inonotus luteoumbrinus* (Romell) Ryvarden, *Syn. Fung.* 21: 79 (2005).

= *Inonotus porrectus* Murrill, *Tropical Polypores*: 68 (1915).

= *Inocutis porrecta* (Murrill) Baltazar, *Sydowia* 62: 4 (2010).

Specimens examined. — **COSTA RICA**. Guanacaste Province, Lomas Bardubal, on living angiosperm tree, December 2014, JV 1412/6-J (PRM, JV and BJFC); 10 July 1984, R. Alfaro 145 (O 5954). **MEXICO**. San Pedro Soteapa, 7 September 1976, JP Ortin 391 (O 5895). **PUERTO RICO.** Yauco, Bosque Estatal de Susua, on living angiosperm tree, December 2012, JV 1212/6-J (JV).

Fulvifomes minutiporus (Bond. & Herrera) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839937.

Basionym: *Phellinus minutiporus* Bond. & Herrera, *Mikol. Fitopatol.* 14:479 (1980).

Fulvifomes resinaceus (Kotl. & Pouzar) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839938.

Basionym: *Phellinus resinaceus* Kotl. & Pouzar, *Folia geobot. phytotax.* 14: 261 (1979).

Fulvifomes newtoniae (Niemelä & Mrema) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839939.

Basionym: *Phellinus newtoniae* Niemelä & Mrema, *Karstenia* 42: 52 (2002).

Fulvifomes scaber (Berk.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839940.

Basionym: *Polyporus igniarius* var. *scabe*r Berk., *Ann. nat. Hist., Mag. Zool. Bot. Geol.* 3: 324 (1839).

≡ *Phellinus scaber* (Berk.) M.J. Larsen, *Mycotaxon* 37: 356 (1990).

Fulvifomes nilgheriensis (Mont.) Bondartseva & S. Herrera was originally described from India, but no sequences from Asian materials are available, the representatives of this species in our phylogeny are from America, and they are treated as '*Fulvifomes nilgheriensis'* because the American taxon may be different from *Fulvifomes nilgheriensis.*

Key to species of *Fulvifomes*

1. Basidiocarps annual..... 2

1. Basidiocarps perennial..... 5

2. Pores 4–5 per mm..... *F. indicus* (Massee) L.W. Zhou

Basidiocarps annual, pileate or substipitate; pilei applanate to flabelliform; pileal surface brownish orange to dark brown, concentrically sulcate with narrow zones, laccate to velutinate; pore surface yellowish brown to fawn, glancing; pores 4–5 per mm; dissepiments thin, entire; hyphal system monomitic; setae or setal elements absent; basidiospores ellipsoid to subglobose, yellowish brown, slightly thick-walled, some collapsed, CB+, (5.2–)5.4–6.5(–6.8) × (4.5–)4.7–5.5(–5.7) µm, *L* = 5.95 µm, *W* = 5.01 µm, *Q* = 1.19 (Zhou 2014b); type locality in India; distribution: Southeast Asia, Australia.

2. Pores 7–10 per mm..... 3

3. Basidiocarps resupinate; basidiospores ellipsoid.....

..... *F. rigidus* (B.K. Cui & Y.C. Dai) X.H. Ji & Jia J Chen

Basidiocarps annual, resupinate; pore surface honey yellow, glancing; pores round, 8–9 per mm; dissepiments thick, entire; hyphal system monomitic; setae or setal elements absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB(+), (3.8–)3.9–4.5(–4.7) × (2.8–)2.9–3.7(–3.8) µm, L = 4.18 µm, W = 3.26 µm, Q = 1.28 (Cui et al. 2011); type locality in China; distribution: tropical China.

3. Basidiocarps pileate; basidiospores globose to subglobose..... 4

4. Pileal surface without a black cuticle; hyphal system dimitic.....

..... *F. aureobrunneus* (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu

Basidiocarps annual, pileate, imbricate; pilei dimidiate; pileal surface dark yellowish brown, concentrically sulcate, azonate; pore surface golden brown, glancing; pores 8–9 per mm; context heterogeneous with a black line at base; hyphal system dimitic; setae or setal hyphae absent; basidiospores globose, brown, IKI–, CB–, 4.1–5.2 × 3.6–5.2 µm (Wright and Blumenfeld 1984); type locality in Argentina; distribution: Argentina.

4. Pileal surface with a black cuticle; hyphal system monomitic.....

..... *F. luteoumbrinus* (Romell) Y.C. Dai et al.

Basidiocarps annual, pileate with a contracted base; pilei conchate to applanate; pileal surface cinnamon brown to blackish, tomentose to glabrous, with a thin black cuticle below the tomentum, sulcate, zonate; pore surface cinnamon to pale rust brown; pores 7–8 per mm; context homogeneous; hyphal system monomitic; setae or setal elements absent; basidiospores globose to subglobose, yellowish brown to olivaceous brown, 4–5 × 3.5–4.5 µm (Ryvarden 2004); type locality Brazil; distribution: Brazil to South USA.

5. Chlamydospores present..... 6

5. Chlamydospores absent..... 9

6. Basidiospores 5–8 µm long..... 7

6. Basidiospores 4–5 µm long..... 8

7. Pilei ungulate, tube layers separated by a thin context layer..... *F. scaber* (Berk.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei ungulate; pileal surface brownish gray to grayish black, cracked; pore surface dull chocolate brown; pores 5–6 per mm; tube layers separated by a thin context layer; hyphal system monomitic in trama and context; setae or setal hyphae absent; basidiospores broadly ellipsoid to subglobose, yellowish brown, thick-walled, 7–7.5(–7.7) × (5–)5.5–6 µm (Larsen 1990); chlamydospores present in context, 10–14 × 7–10 µm; type locality in Australia; distribution: South Australia.

7. Pilei globose, tubes indistinctly stratified without context layer..... *F. kravtzevii* (Schwarzman) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei globose; pileal surface cinnamon to pale brown, glabrous, rimose; pores 4–6 per mm; tubes indistinctly stratified without context layer; hyphal system dimitic; setae or setal hyphae absent; basidiospores broadly ellipsoid to globose, hyaline to pale yellow, 5–8 × 4–8 µm (Larsen and Cobb-Poulle 1990); chlamydospores present, 10–16 × 5–8 µm (Schwarzman and Karvtzeva 1961); on living tree of *Calligonum aphyllum*; type locality in Kazakhstan; distribution: Kazakhstan.

8. Basidiocarps imbricate, pileal surface with a cuticle.....

..... *F. kawakamii* (M.J. Larsen et al.) T. Wagner & M. Fisch.

Basidiocarps perennial, pileate, imbricate; pilei applanate; pileal surface ferruginous brown to dull brown, with a cuticle separated from context by a black line; pore surface yellowish brown; pores 5–7 per mm; hyphal system dimitic; setae or setal hyphae absent; basidiospores ellipsoid, yellowish brown, thick-walled, 4–5 × 3–4 µm; chlamydospores present (Larsen et al. 1985); on *Casuarina*; type locality in America; distribution: Hawaii, USA.

8. Basidiocarps solitary, pileal surface without a cuticle... *F. durissimus* (Lloyd) Bondartseva & S. Herrera

Basidiocarps perennial, pileate, solitary; pilei circular to infundibuliform; pileal surface pale grayish brown to rust brown, concentrically zonate, finely velvety; pore surface yellowish brown to dark umber brown; pores 6–7 per mm; dissepiments thin, entire; hyphal system monomitic in context and trama; setae or setal hyphae absent; basidiospores subglobose, thick-walled, rust brown, IKI–, CB–, often collapsed, (3.9–)4–5(–5.2) × (3.3–)3.6–4.4(–4.6) µm, L = 4.42 µm, W = 3.68 µm; chlamydospores subglobose, distinctly thick-walled, rust brown, IKI–, CB–, 7–8 × 6–7 µm (Dai 2010); type locality in Angola; distribution: tropical Africa and Asia.

9. Basidiospores oblong-ellipsoid..... 10

9. Basidiospores ellipsoid, broadly ellipsoid, ovoid, subglobose or globose..... 11

10. Pores 5–6 per mm; basidiospores 4.2–5.1 µm long..... *F. collinus* (Y.C. Dai & Niemelä) Y.C. Dai

Basidiocarps perennial, effused-reflexed, imbricate; pilei triquetrous; pileal surface dark brown, concentrically sulcate, a distinct black crust present; pore surface apricot orange to dull brown, glancing; pores 5–6 per mm; dissepiments thin, entire; hyphal system dimitic; setae or setal hyphae absent; basidiospores oblong-ellipsoid, golden yellow, thick-walled, IKI–, CB(+); collapsed, (4–)4.2–5.1(–5.2) ´ (2.8–)3–3.5(–3.7) µm, L = 4.69 µm, W = 3.1 µm, Q = 1.42–1.58 (Dai 2010); type locality in China; distribution: China.

10. Pores 7–8 per mm; basidiospores 3–3.6 µm long..... *F. fushanianus* (T.T. Chang) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei applanate; pileal surface grayish to brown or blackish, concentrically zonate, sulcate, with a black cuticle; pore surface light cinnamon to pinkish brown; pores 7–8 per mm; hyphal system dimitic; setae or setal hyphae absent; basidiospores oblong-ellipsoid, yellowish, thick-walled, IKI–, 3–3.6 × 2–3 µm (from type TFRI685); on *Persea zuilhoensis*; type locality in China; distribution: Taiwan, China.

11. Tramal hyphae monomitic..... 12

11. Tramal hyphae dimitic..... 14

12. Basdiospores ellpsoid, < 4 µm wide..... *F. caligoporus* Y.C. Dai & X.H. Ji

Basidiocarps perennial, pileate; pilei applanate; pileal surface snuff brown to sepia, glabrous, uncracked; pore surface black to cigar brown; pores 4–6 per mm; dissepiments thin, entire; hyphal system monomitic in context and trama; setae or setal hyphae absent; cystidioles ventricose with elongated apical portion; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (4.5–)5–5.4(–5.6) × (3–)3.3–4 µm, L = 5.08 µm, W = 3.56 µm, Q = 1.35–1.52; type locality in China; distribution: South China.

12. Basdiospores ovoid or subgolobose, > 4 µm wide..... 13

13. Context without a granular core, pores 5–7 per mm..... *F. lloydii* (Cleland) Y.C. Dai & X.H. Ji

Basidiocarps perennial, pileate; solitary; pilei applanate; pileal surface dark mouse gray to black, glabrous with some tubercles or warts, concentrically sulcate with wide zones; pore surface dull brown; pores circular, 5–7 per mm; dissepiments thin to fairly thick, entire; context up to 14 mm thick, a distinct thin black crust present above the context; hyphal system monomitic in context and trama; setae or setal hyphae absent; basidiospores subglobose, thick-walled, olivaceous brown to dark brown, IKI–, CB–, (4.8–)5–6(–6.2) × (4.2–)4.3–5.3(–5.8) µm, L = 5.52 µm, W = 4.94 µm, Q = 1.11–1.13 (Dai 2010); type locality in Australia; distribution: Australia, New Zealand and Southeast Asia.

13. Context with a granular core, pores 3–4 per mm..... *F. resinaceus* (Kotl. & Pouzar) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface dirty brown to black, glabrous, concentrically zonate, cracked, with brownish black resinous substance; pore surface rust brown; pores 3–4 per mm; context with a granular core; hyphal system monomitic in context and trama; setae or setal hyphae absent; basidiospores ovoid yellowish, thick-walled, 6–7.2 × 4.6–6.1 µm (Kotlaba and Pouzar 1979); type locality in Papua New Guinea; distribution: Papua New Guinea and Australia.

14. Hyphae monomitic in context..... 15

14. Hyphae dimitic or subdimitic in context..... 25

15. Pileal surface uncracked..... 16

15. Pileal surface cracked or rimose..... 20

16. Hyphae at pileal surface with thin-walled and septate tips; on *Newtonia buchananii*; African species

..... *F. newtoniae* (Niemelä & Mrema) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pileal surface dark clay buff to rust tawny, matted, concentrically zonate, uncracked; pore surface cinnamon brown; pores 6–8 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic in trama, monomitic in context; hyphae at pileal surface with thin-walled and septate tips; setae or setal hyphae absent; basidiospores subglobose, brown, thick-walled, IKI–, CB– or juveniles CB+, (4.8–)5.1–5.9(–6.3) × (4.4–)4.5–5.4(–5.8) µm, L = 5.42 µm, W = 4.87 µm (Niemelä and Mrema 2002); on *Newtonia buchananii*; type locality in Tanzania; distribution: Tanzania.

16. Hyphae at pileal surface without thin-walled and septate tips; on an angiosperm other than *Newtonia*; Asian or American species..... 17

17. Basidiospores > 5.5 µm long..... *F. mangrovicus* (Imazeki) T. Hatt.

Basidiocarps perennial, pileate, broadly attached; pilei applanate to convex; pileal surface grayish brown, ferruginous, tuberculose, sulcate, uncracked; pore surface grayish brown, not glancing; pores 5–6 per mm; dissepiments entire; hyphal system dimitic in trama, monomitic in context; hyphae at pileal surface without thin-walled and septate tips; setae or setal hyphae absent; basidiospores broadly ellipsoid to subglobose, pale brown, thick-walled, 5.5–7 × 4.5–6 µm (Hattori et al 2014); type locality in Japan; distribution: Japan.

17. Basidiospores < 5.5 µm long..... 18

18. On *Dracaena*..... *F. dracaenicola* Z.B. Liu & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface yellowish brown to vinaceous brown, encrusted, glabrous, concentrically sulcate and zonate, uncracked; pore surface yellowish brown

to honey yellow, glancing; pores 5–7 per mm; dissepiments thin, entire; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; cystidioles absent; basidiospores subglobose, yellowish brown, thick-walled, IKI–, CB–, 4.8–5(–5.5) × 4–4.1 µm, L = 5.02 µm, W = 4.04 µm, Q = 1.22–1.25 (Du et al. 2021); on *Dracaena*; type locality in China; distribution: tropical China.

18. On an angiosperm other than *Dracaena*..... 19

19. Pore surface not glancing; basidiospores CB+; Asian species..... *F. subindicus* Y.C. Dai & X.H. Ji

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface umber, glabrous with some tuberculae or warts, uncracked; pore surface grayish brown; pores 5–8 per mm; dissepiments thick, entire; hyphal system dimitic in trama, monomitic in context; hyphae at pileal surface without thin-walled and septate tips; setae or setal hyphae absent; basidiospores subglobose to broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (4.5–)4.7–5.3(–5.7) × 4–4.8(–5) µm, L = 5.04 µm, W = 4.46 µm, Q = 1.12–1.13; type locality in China; distribution: South China.

19. Pore surface glancing; basidiospores CB–; American species..... *F. floridanus* Y.C. Dai & Vlasák

Basidiocarps perennial, pileate, solitary; pilei applanate to triquetrous; pileal surface deep brown to black, uncracked; pore surface brown, glancing; pores 7–8 per mm; dissepiments thick, entire; hyphal system dimitic in trama, monomitic in context; hyphae at pileal surface without thin-walled and septate tips; setae or setal hyphae absent; basidiospores globose, yellowish brown, thick-walled, IKI–, CB–, (4.6–)4.9–5.1(–5.3) × (4.2–)4.5–4.8(–5) µm, L = 5 µm, W = 4.7 µm, Q = 1.03–1.07; on living Tamarind; type locality in USA; distribution: Southeast USA.

20. Pileal surface squamose with long scales..... *F. squamosus* Salvador-Montoya & Drechsler-Santos

Basidiocarps perennial, pileate, solitary; pilei applanate to triquetrous; pileal surface grayish brown to dark brown, glabrous, cracked, squamose with long scales, concentrically sulcate; pore surface yellowish dark brown; pores 5–6 per mm; dissepiment entire; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; basidiospores subglobose to broadly ellipsoid, thick-walled, pale yellow, 4.5–6 × 4–5 µm (Salvador-Montoya et al. 2018b); on living tree of *Acacia*; type locality in Peru; distribution: northern Peru.

20. Pileal surface glabrous or tomentose without long scales..... 21

21. Basidiospores globose, > 5 µm wide..... *F. cedrelae* (Murrill) Murrill

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface fulvous to black, tomentose, deeply sulcate, rimose; pores 5–6 per mm; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; basidiospores globose, CB–, 5–6 µm in diam (Murrill 1908a); on living *Cedrela*; type locality in Jamaica; distribution: South America.

21. Basidiospores ovoid, broadly ellipsoid to subglobose, < 5 µm wide..... 22

22. Pileal surface with a black crust..... 23

22. Pileal surface without crust..... 24

23. Pores 4–7 per mm; basidiospores 3–4 µm wide..... *F. grenadensis* (Murrill) Murrill

Basidiocarps perennial, pileate, solitary; pilei semicircular to ungulate; pileal surface rust velvety with a black crust, concentrically zonate and sulcate, cracked; pore surface fulvous to dark reddish brown; pores 4–7 per mm; tubes distinctly stratified with a thin context; hyphal system dimitic in trama, monomitic in context (based on specimens URM 80580, URM 89674, URM 89675); contextual hyphae up to 8 µm wide; setae or setal hyphae absent; basidiospores broadly ellipsoid, rust brown, thick-walled, 4–6 × 3–4 µm (Ryvarden 2004); type locality in Grenada; distribution: Neotropics and Africa.

23. Pores 7–8 per mm; basidiospores 4–5 µm wide..... *F. siamensis* T. Hatt. et al.

Basidiocarps perennial, pileate, solitary; pilei semicircular, applanate to convex; pileal surface dark brown, velutinate to glabrous with a black crust, rimose; pore surface yellowish brown, glancing; pores 7–8 per mm; dissepiments thin, entire; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; basidiospores subglobose, yellowish brown, thick-walled, 4.5–6 × 4–5 µm (Hattori et al 2014); on *Xylocarpus*; type locality in Thailand; distribution: Thailand.

24. Pore surface dull chocolate brown, pores 4–5 per mm..... *F. rimosus* (Berk.) Fiasson & Niemelä

Basidiocarps perennial, pileate, broadly attached; pilei ungulate; pileal surface grayish black, glabrous, with a black crust, cracked; pore surface dull chocolate brown; pores 4–5 per mm; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; basidiospores broadly ellipsoid to subglobose, rust brown, thick-walled, IKI–, CB–, (4.5–)4.8–6.2(–6.3) × (3.9–)4.1–5(–5.1) µm, L = 5.54 µm, W = 4.54 µm, Q = 1.15–1.21 (Dai 2010); type locality in Australia; distribution: Mediterranean and Black Sea areas, Africa, Asia and Australia.

24. Pore surface yellowish to reddish brown, pores 7–8 per mm..... *F. robiniae* (Murrill) Murrill

Basidiocarps perennial, pileate, solitary; pilei semicircular to ungulate; pileal surface yellowish brown to black, glabrous, cracked; pore surface reddish brown; pores 7–8 per mm; hyphal system dimitic in trama, monomitic in context; setae or setal hyphae absent; basidiospores ovoid to subglobose, brown, thick-walled, 5–6 × 4.5–5 µm (Gilbertson and Ryvarden 1987); on living *Robinia*; type locality in USA; distribution: USA.

25. Pileal surface azonate..... 26

25. Pileal surface concentrically zonate..... 28

26. Basisiospores 4.5–6 µm wide..... *F. crocatus* (Fr.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei applanate to semicircular; pileal surface cinnamon to fulvous brown, glabrous, azonate; pore surface snuff brown; pores 7–8 per mm; hyphal system dimitic; basidiospores globose, hyaline to golden yellow, thick-walled, 4.5–6 µm in diam (Larsen and Cobb-Poulle 1990); on angiosperm wood; type locality in Mexico; distribution: Mexico.

26. Basidiospores 3–4 µm wide..... 27

27. Pore surface not glancing, pores 7–9 per mm..... *F. azonatus* Y.C. Dai & X.H. Ji

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface cigar brown, encrusted, azonate, uncracked; pore surface date brown; pores 7–9 per mm; dissepiments thick, entire; hyphal system dimitic; setae or setal hyphae absent; cystidioles ventricose with elongated apical portion, 10–13 × 3–5 µm; basidiospores subglobose to broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (4–)4.2–4.6(–5) × (3.2–)3.5–3.8(–4) µm, L = 4.37 µm, W = 3.69 µm, Q = 1.17–1.2; type locality in China; distribution: South China.

27. Pore surface glancing, pores 5–7 per mm..... *F. swieteniae Murrill*

Basidiocarps perennial, pileate; pilei applanate to ungulate; pileal surface yellowish brown to reddish brown, matted, azonate, without crust, partly rimose near the base; pore surface golden brown, glancing; pores 5–7 per mm; hyphal system dimitic in trama, subdimitic to dimitic in context; basidiospores ellipsoid to ovoid, thick-walled, brown, 4–5 × 3–4 µm (Hattori et al. 2014); type locality in Cuba; distribution: Central America and Florida of USA.

28. Pileal surface cracked..... 29

28. Pileal surface uncracked..... 36

29. Pores 7–11 per mm..... 30

29.Pores 4–7 per mm..... 31

30. Pilei triquetrous, pore surface dark brown, not glancing..... *F. minutiporus* (Bond. & Herrera) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface black, concentrically zonate, rimose; pore surface dark brown; pores 8–11 per mm; hyphal system dimitic; setae or setal hyphae absent; basidiospores subglobose, rust brown, thin-walled, 4.2–5 × 2–4.6 µm (Larsen and Cobb-Poulle 1990); type locality in Cuba; distribution: Cuba.

30. Pilei ungulate, pore surface grayish brown, glancing..... *F. krugiodendri* Y.C. Dai et al.

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface dark gray, encrusted, concentrically sulcate with narrow zones, cracked; pore surface grayish brown, glancing; pores 7–9 per mm;

dissepiments thick, entire; hyphal system dimitic; basidiospores subglobose, yellowish brown, thick-walled, collapsed, IKI–, CB–, (4–)4.3–5(–5.1) × (3.7–)4–4.5(–4.8) µm, L = 4.6 µm, W = 4.21 µm, Q = 1.08–1.09 (Ji et al. 2017c); on living tree of *Krugiodendron*; type locality in USA; distribution: Florida, USA.

31. Growing on *Pseudocedrela* or *Elaeodendron*; African species..... 32

31. Growing on an angiosperm other than *Pseudocedrela* and *Elaeodendron*; Asian and American species 33

32. Context with a black line; on *Elaeodendron croceum*..... *F. elaeodendri* Tchotet et al.

Basidiocarps perennial, pileate, solitary; pilei applanate to ungulate; pileal surface pale brown to dark brown, velutinate to glabrous, concentrically sulcate, zonate, cracked; pore surface golden brown to brown; pores 5–7 per mm; dissepiments thick, entire; context with a black line, a thin context layer present along tubes layers; hyphal system dimitic in lower context and trama; setae or setal hyphae absent; basidiospores broadly ellipsoid to ovoid, yellowish brown, thick-walled, IKI–, CB–, 6–6.5 × 5–5.5 µm, L = 6.15 µm, W = 5.08 µm, Q = 1.2–1.25 (Tchotet Tchoumi et al. 2020); on living tree of *Elaeodendron croceum*; type locality in South Africa; distribution: South Africa.

32. Context without a black line; on *Pseudocedrela kotschyi*..... *F. yoroui* Olou & F. Langer

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface dark reddish brown to black, glabrous, concentrically zonate, cracked; pore surface dull brown; pores 6–7 per mm; dissepiments thick, entire; hyphal system dimitic; cystidioles fusoid, 10–20 × 4–5 µm; basidiospores subglobose to globose, thick-walled, yellowish, IKI–, CB–, (5–)5.3–6.5(–6.6) × (4.3–)4.5–5.8(–5.9) µm, L = 5.97 µm, W = 5.18 µm, Q = 1.04–1.27 (Olou et al. 2019); on living tree of *Pseudocedrela kotschyi*; type locality in Benin; distribution: Benin.

33. Basidiospores mostly 5–6 µm wide..... *F. coffeatoporus* (Kotl. & Pouzar) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei semicircular to ungulate; pileal surface rust brown, concentrically zonate, cracked, with a resinous black crust; pore surface dark coffee brown, glancing; pores 6–7 per mm; hyphal system dimitic; setae or setal hyphae absent; basidiospores globose, brown, thick-walled, 5–6.2 × 5–6 µm (Kotlaba and Pouzar 1979); type locality in USA; distribution: USA.

33. Basidiospores mostly 3.5–5 µm wide..... 34

34. Pore surface not glancing; American species..... *F. nakasoneae* Y.C. Dai & Vlasák

Basidiocarps perennial, pileate; pilei ungulate; pileal surface vinaceous brown or black, rough, concentrically zonate, radially and concentrically cracked; pore surface hazel to sepia; pores 5–7 per mm; dissepiments thick, entire; hyphal system dimitic; setae or setal hyphae absent; cystidioles ventricose with elongated apical portion, 9–19 × 3–5 µm; basidiospores globose, yellowish brown, thick-walled, IKI–,

CB−, 5−5.6(−5.8) × (4.5−)4.9−5.1(−5.5) µm, L = 5.3 µm, W = 5 µm, Q = 1.03−1.07; on living tree of *Texas*; type locality in USA; distribution: USA and Mexico.

34. Pore surface glancing; Asian species..... 35

35. Pileal surface matted, not encrusted; cystidioles absent..... *F. xylocarpicola* T. Hatt. et al.

Basidiocarps perennial, pileate to effused-reflexed, solitary to imbricate; pilei semicircular to ungulate; pileal surface brown to dark brown, glabrous, matted, concentrically zonate, sulcate, rimose; pore surface yellowish brown, glancing; pores 4−6 per mm; dissepiments entire; hyphal system dimitic; basidiospores broadly ellipsoid to ovoid, thick-walled, yellowish, 4−5.5 × 3.5−4.5 µm (Hattori et al. 2014); type locality in Thailand; distribution: Thailand.

35. Pileal surface encrusted; cystidioles present..... *F. thailandicus L.W. Zhou*

Basidiocarps perennial, pileate, solitary; pilei applanate to dimidiate; pileal dark gray, encrusted, concentrically sulcate with narrow zones, cracked; pore surface dark brown, glancing; pores 6−7 per mm; dissepiments thick, entire; hyphal system dimitic; setae or setal hyphae absent; cystidioles fusoid, 15−35 × 3−8 µm; basidiospores ellipsoid, yellow, slightly thick-walled, sometimes collapsed, IKI−, CB+, 5−5.8(−6) × (4−)4.1−4.8(−5) µm, L = 5.37 µm, W = 4.45 µm, Q = 1.21 (Zhou 2015c); type locality in Thailand; distribution: Thailand.

36. Pores 3−4 per mm..... *F. hainanensis* L.W. Zhou

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface orange-brown, velutinate, concentrically sulcate with narrow zones, uncracked; pore surface cinnamon buff to clay buff, glancing; pores 3−4 per mm; dissepiments thin, entire; context duplex; hyphal system dimitic; basidiospores ellipsoid, yellowish, slightly thick-walled, collapsed, IKI−, CB+, (5−)5.2−6.2(−6.4) × 4−4.8(−5.1) µm, L = 5.71 µm, W = 4.37 µm, Q = 1.31 (Zhou 2014b); type locality in China; distribution: South China.

36. Pores 4−11 per mm..... 37

37. Cystidioles present..... 38

37. Cystidioles absent..... 40

38. A thin black line present between context and substrate.... *F. allardii* (Bres.) Bondartseva & S. Herrera

Basidiocarps perennial, pileate, subpendent; pilei triquetrous; pileal surface reddish brown, concentrically zonate, uncracked, sometimes indurated to make up a thin crust; pore umber brown, glancing; pores 7−8 per mm; a thin black line present between context and substrate; context very thin to almost lacking; hyphal system dimitic; setae or setal hyphae absent; cystidioles present; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI−, CB−, (4−)4.2−5.1(−5.5) × (2.9−)3.3−4.2(−4.4) µm, L = 4.59 µm, W = 3.65 µm, Q = 1.22−1.3 (Dai 2010); type locality in Congo; distribution: Africa, Asia and France.

38. A thin black line absent..... 39

39. Pores 4–5 per mm; basidiospores ellipsoid to reniform..... *F. merrillii* (Murrill) Baltazar & Gibertoni

Basidiocarps perennial, pileate, solitary; pilei subungulate to applanate; pileal surface reddish brown to fuscous brown, matted, indistinctly concentrically zonate, uncracked, encrusted; pore surface yellowish brown, glancing; pores 4–5 per mm; dissepiments thick, entire; hyphal system dimitic in trama, subdimitic in context; setae or setal hyphae absent; fusoid cystidioles present; basidiospores ellipsoid to reniform, yellowish brown, thick-walled, 4.5–6 × 3–4.5 (Hattori et al. 2014); type locality in Philippines; distribution: most probably in Southeast Asia.

39. Pores 6–7 per mm; basidiospores ellipsoid..... *F. submerrillii* X.H. Ji & Jia J Chen

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface cigar brown to black, encrusted, glabrous, concentrically sulcate with narrow zones, uncracked; pore surface snuff brown; pores 6–7 per mm; dissepiments thick, entire; hyphal system dimitic; setae or setal hyphae absent; cystidioles ventricose with elongated apical portion, 8–15 × 4–6 µm; basidiospores broadly ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (4.4–)4.7–5(–5.2) × (3.5–)3.7–4(–4.2) µm, L = 4.88 µm, W = 3.86 µm, Q = 1.17–1.3 (Liu et al. 2020); type locality in China; distribution: China.

40. Growing on *Abies*; context very thin to almost lacking..... *F. acontextus* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, pendant; pilei ungulate; pileal surface dark brown to almost black, glabrous, concentrically zonate, uncracked, with a black cuticle; pore surface dark rust to umber brown; pores 6–8 per mm; context very thin to almost lacking; hyphal system dimitic; setae or setal hyphae absent; cystidioles absent; basidiospores ellipsoid, rust brown, thick-walled, 5.5–6.5 × 3.5–4 µm (Hjortstam and Ryvarden 1984); on *Abies*; type locality in Nepal; distribution: Nepal.

40. Growing angiosperm wood; distinct context present..... 41

41. Basidiocarps usually effused-reflexed to pileate..... 42

41. Basidiocarps distinctly pileate..... 43

42. Pileal surface dark brown to black; growing exclusively on *Xylocarpus*..... *F. halophilus* T. Hatt. et al.

Basidiocarps perennial, effused-reflexed to pileate; pilei semicircular to applanate; pileal surface dark brown to black, concentrically sulcate and zonate, glabrous, encrusted, uncracked; pore surface yellowish brown, glancing; pores 5–8 per mm; dissepiments thin, entire; distinct context present; hyphal system dimitic in trama, subdimitic in context; cystidioles absent; basidiospores subglobose to broadly ellipsoid, thick-walled, yellowish brown, 4–5.5 × 3.5–5 µm (Sakayaroj et al. 2012); on *Xylocarpus*; type locality in Thailand; distribution: Thailand and Borneo (JV 1502/4-Zuz).

42. Pileal surface luteous brown; growing on an angiosperm other than *Xylocarpus*.....

..... *F. mcgregorii* (Bres.) Y.C. Dai

Basidiocarps perennial, effused-reflexed, imbricate; pilei circular; pileal surface luteous brown, concentrically sulcate and zonate, velutinate, uncracked; pore surface orange-yellow to umber brown, glancing; pores 5–7 per mm; dissepiments thick, entire; distinct context present; hyphal system dimitic both in context and trama; setae or setal hyphae absent; cystidioles absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (4.2–)4.7–5.8(–6) × (3.3–)3.7–4.6(–4.8) µm, L = 5.19 µm, W = 4.09 µm (Dai 2010); on angiosperm wood; type locality in Philippines; distribution: Southeast Asia.

43. Basidiospores 5–6 µm long..... *F. fastuosus* (Lév.) Bondartseva & S. Herrera

Basidiocarps perennial, pileate, solitary or imbricate; pilei ungulate to applanate; pileal surface lemon yellow to dark brown, concentrically sulcate with wide zones, uncracked, encrusted; pore surface umber brown; pores 7–9 per mm; dissepiments thin, entire; distinct context present; hyphal system dimitic; cystidioles absent; basidiospores subglobose, thick-walled, rust brown, IKI–, CB–, (4.9–)5–6.1(–6.3) × (4.2–)4.2–5.6(–5.8) µm, L = 5.43 µm, W = 4.85 µm, Q = 1.08–1.17 (Dai 2010); type locality in Singapore; distribution: most probably in tropical Asia.

43. Basidiospores 4–5 µm long..... 44

44. Basidiospores globose..... *F. rhytiphloeus* (Mont.) Camp.-Sant. & Robledo

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface dark brown to pale brown, concentrically sulcate and zonate, uncracked, glabrous, separate from the context by a dark line; pore surface dark brown; pores 7–9 per mm; distinct context present; hyphal system dimitic; cystidioles absent; basidiospores globose, thick-walled, rust brown, 4–5 × 4–5 µm (Ryvarden 2004); type locality in Brazil; distribution: Neotropics.

44. Basidiospores broadly ellipsoid to subglobose..... 45

45. Pilei ungulate; basidiospores < 3.7 µm wide..... *F. jouzaii* Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface black to dark bay, rough, narrowly concentrically sulcate and zonate, uncracked, glabrous, with a very hard black crust; pore surface grayish brown to deep olive; pores 9–10 per mm; distinct context present; dissepiments thick, entire; hyphal system dimitic; setae or setal hyphae absent; cystidioles absent; basidiospores broadly ellipsoid to subglobose, yellowish brown, thick-walled, IKI–, CB(+), 4–4.3(–4.7) × (3–)3.2–3.7(–4) µm, L = 4.15 µm, W = 3.49 µm, Q = 1.18–1.25; type locality in Costa Rica; distribution: Costa Rica.

45. Pilei applanate, dimidiate or semicircular; basidiospores > 3.7 µm wide..... 46

46. Pileal surface encrusted..... 47

46. Pileal surface not encrusted..... 48

47. Basidiospores 3.9–4.5 µm long; Central American species..... *F. centroamericanus* Y.C. Dai et al.

Basidiocarps perennial, pileate, solitary; pilei dimidiate to applanate; pileal surface dark gray, concentrically zonate, encrusted, uncracked; pore surface pale yellow, glancing; pores 8–10 per mm; dissepiments thick, entire; distinct context present; hyphal system dimitic; setae or setal hyphae absent; cystidioles absent; basidiospores subglobose, yellowish brown, thick-walled, collapsed, IKI–, CB–, (3.8–)3.9–4.5(–4.6) × (3.5–)3.7–4.2 µm, L = 4.11 µm, W = 3.92 µm, Q = 1.04–1.05 (Ji et al. 2017c); on living angiosperm tree; type locality in Guatemala; distribution: Central America.

47. Basidiospores 4.6–5.1 µm long; Asian species..... *F. imbricatus* L.W. Zhou

Basidiocarps perennial, pileate, imbricate; pilei dimidiate, semicircular; pileal surface curry yellow to vinaceous gray, velutinate, nodulose, concentrically sulcate with wide zones, encrusted, uncracked; pore surface honey yellow to reddish brown, glancing; pores 8–9 per mm; dissepiments thick, entire; hyphal system dimitic; cystidioles absent; basidiospores broadly ellipsoid, yellow, slightly thick-walled, collapsed, IKI–, CB+, (4.4–)4.6–5.1(–5.3) × (3.5–)3.7–4.3(–4.5) µm, L = 4.88 µm, W = 4 µm, Q = 1.2–1.23 (Zhou 2015c); on living tree of *Shorea*; type locality in Thailand; distribution: Thailand.

48. Pores 9–11 per mm..... *F. costaricense* Y.C. Dai & Vlasák

Basidiocarps perennial, pileate; pilei applanate to subungulate; pileal surface deep brown to black, concentrically sulcate with narrow zones, glabrous, not encrusted, uncracked; *pore surface* grayish brown to olivaceous brown, glancing; pores 9–11 per mm; dissepiments thick, entire; distinct context present; hyphal system dimitic; setae or setal hyphae absent; cystidioles absent; basidiospores subglobose, yellowish brown, thick-walled, IKI–, CB–, (3.8–)4–4.3(–4.8) × (3.3–)3.7–4(–4.2) µm, L = 4.2 µm, W = 3.8 µm, Q = 1.09–1.11; type locality in Costa Rica; distribution: Costa Rica.

48. Pores 7–9 per mm..... *F. nilgheriensis* (Mont.) Bondartseva & S. Herrera

Basidiocarps perennial, pileate, solitary; pilei applanate to semicircular; pileal surface reddish brown to blackish brown, glabrous, concentrically sulcate and zonate, not encrusted, uncracked; pore surface dark yellow brown to umber; pores 7–9 per mm; hyphal system dimitic; cystidioles absent; basidiospores subglobose, thick-walled, rust brown, 4–5 × 4–4.5 µm (Cunningham1965; Sakayaroj et al. 2012); type locality in India; distribution: tropical Asia.

4.8 *Fulvoderma* L.W. Zhou & Y.C. Dai, in Zhou, Ji, Vlasák & Dai, *Mycologia* 110(5): 876 (2018), (Fig. 1)

Type species: *Fulvoderma australe* L.W. Zhou & Y.C. Dai.

Basidiocarps annual, pileate to laterally stipitate, solitary or imbricate, without distinctive odor or taste when fresh, hard corky; pileal surface yellowish brown, with a cuticle or crust, indistinctly concentrically zonate, tuberculate and warty; hyphal system monomitic; generative hyphae simple septate, hyaline, pale yellowish to yellowish, thin- to thick-walled with a wide lumen; hyphoid and hymenial setae absent;

basidiospores broadly ellipsoid, hyaline, thin-walled, IKI−, CB− or CB(+); an angiosperm wood, causing a white rot.

Fulvoderma was segregated from *Pyrrhoderma* and accommodates two species (Zhou et al. 2018a). The genus has pileate to laterally stipitate basidiocarps with yellowish brown pileal surfaces, whereas *Pyrrhoderma* sensu Zhou et al. bears effused-reflexed, pileate to laterally stipitate basidiocarps with dark pileal surfaces (Zhou et al. 2018). *Coltricia*, *Coltriciella*, *Onnia* and *Phylloporia* also accommodate certain species bearing pileate to stipitate basidiocarps with yellowish brown pileal surfaces; however, *Onnia* differs from *Fulvoderma* in the presence of hymenial setae (Ji et al. 2017a), while the other three genera differ in having colored and thick-walled basidiospores (Dai 2010).

Key to species of *Fulvoderma*

1. Contextual hyphae 3.5–8 μm wide, tramal hyphae interwoven.....

..... *F. australe* L.W. Zhou & Y.C. Dai

Basidiocarps annual, laterally stipitate, solitary or imbricate; pileal surface yellowish brown, indistinctly concentrically zonate, tuberculate and warty; pore surface buff yellow to cinnamon buff, glancing; pores 5–6 per mm; context honey yellow, with a distinct cuticle on the pileal surface; hyphal system monomitic; contextual hyphae 3.5–8 μm wide, tramal hyphae interwoven; cystidioles fusoid; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI−, CB−, 4.5–5.5(−6) × (3.5−)4–4.5(−5) μm, L = 5.04 μm, W = 4.23 μm, Q = 1.19–1.21 (Zhou et al. 2018a); type locality in China; distribution: South China.

1. Contextual hyphae 7–12 μm wide, tramal hyphae parallel along the tubes.....

..... *F. scaurum* (Lloyd) L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate or laterally stipitate, solitary or imbricate; pileal surface bright yellow to golden brown, with indistinct concentric zones, sometimes with irregular tubercles or warts, matted to glabrous with age; pore surface umber, glancing; pores 4–5 per mm; context yellowish brown, with a distinct cuticle on the pileal surface; hyphal system monomitic; contextual hyphae 7–12 μm wide, tramal hyphae parallel along the tubes; cystidioles fusoid; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI−, CB(+), (4.5−)5–6(−6.2) × (3.8−)4–4.6(−5) μm, L = 5.15 μm, W = 4.18 μm, Q = 1.22–1.24 (Dai 2010); type locality in Japan; distribution: Northeast Asia.

4.9 *Fuscoporia* Murrill, *North American Flora* (New York) 9(1): 3 (1907), (Figs. 1, 32)

Type species: *Fuscoporia ferruginosa* (Schrad.) Murrill.

Basidiocarps annual to perennial, resupinate, effused-reflexed, pileate or laterally stipitate, corky to woody hard; pileal surface tomentose to velutinate, rarely encrusted; context homogeneous; pores usually small; hyphal system dimitic; generative hyphae simple septate, usually covered by crystals at dissepiment edge or hymenium; hymenial setae present in most species, usually arising from tramal hyphae, subulate,

mostly straight, or hooked in a few species; some species bearing mycelial setae; fusoid cystidioles present in most species; basidiospores cylindric, oblong-ellipsoid, broadly ellipsoid or subglobose, hyaline, thin-walled, smooth, IKI–, CB– or CB(+); on angiosperm and gymnosperm wood; causing a white rot.

The genus *Fuscoporia* is characterized by annual to perennial, resupinate to pileate basidiocarps, a dimitic hyphal system with generative hyphae bearing crystals, presence of hymenial setae in most species, and hyaline, thin-walled, smooth basidiospores.

The recent studies demonstrated some traditional species of *Fuscoporia* are in fact the species complex, for example, *Fuscoporia contigua* (Pers.) G. Cunn. was considered as a single species with variable basidiospores (oblong-ellipsoid or cylindric), but two Asian species were derived from *F. contigua* (Chen et al. 2019). A more comprehensive study on the genus was recently published and nine new species were described (Chen et al. 2020).

Two new species are found in *Fuscoporia*, and they are described as follows.

Fuscoporia sinuosa Y.C. Dai & F. Wu, **sp. nov.** (Figs. 32, 33, 34)

MycoBank: MB 839943.

Type. — **CHINA.** Yunnan Province, Mengla County, Tropical Rain Forest, on rotten bamboo, 18.VIII.2019, Dai 20498 (holotype, BJFC032166).

Etymology. — *Sinuosa* (Lat.): referring to the species having sinuous pores.

Fruiting body. — Basidiocarps annual, resupinate, inseparable from substrate, leathery and without distinctive odor or taste when fresh, corky when dry, up to 40 cm long, 5 cm wide and 1 mm thick. Pore surface fawn to reddish brown when fresh, color almost unchanged when dry, not glancing; margin narrow yellowish brown, paler than pores, thinning out , up to 1 mm wide, usually with abundant mycelial setae; pores angular in juvenile, becoming distinctly sinuous, 1–2 per mm; dissepiments thin, lacerate to dentate, abundant setae seen in tube cavities (under lens). Subiculum umber brown, corky, very thin, about 0.1 mm thick. Tubes pale gray, distinctly paler than subiculum, brittle, up to 0.9 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue darkening otherwise unchanged in KOH.

Subiculum. — Generative hyphae infrequent, hyaline, thin-walled, frequently branched and simple septate, 2–3 μm in diam; skeletal hyphae dominant, rust brown, thick-walled with a medium to narrow lumen, unbranched, aseptate, flexuous, strongly interwoven, 2.5–4 μm in diam; mycelial setae present, dark brown, thick-walled, tapering to apex, 100–160 × 8–13 μm.

Trama of the tubes. — Generative hyphae frequent, mostly seen at dissepiment edge and subhymenium, hyaline, thin- to slightly thick-walled, occasionally branched, frequently septate, 2–3 μm in diam, some of them at dissepiment edge and hymenium strongly encrusted with stellate crystals; skeletal hyphae

dominant, yellowish brown to rust brown, thick-walled with a narrow to medium lumen, unbranched, rarely septate, flexuous, loosely interwoven, 2.5–3.5 µm in diam; mycelial setae present, dark brown, thick-walled, tapering to apex, 100–140 × 8–12 µm; hymenial setae frequent, mostly originating from hymenium, narrowly subulate, dark brown, thick-walled, 70–105 × 7–12 µm; fusoid cystidioles present, 10–18 × 2.5–4.5 µm; basidia clavate, with four sterigmata and a simple septum at the base, 10–12 × 4–5 µm; basidioles dominating in hymenium, pyriform, but slightly smaller than basidia

Spores. — Basidiospores oblong-ellipsoid to cylindrical, tapering at apiculus, hyaline, thin-walled, smooth, bearing a medium size guttule, usually glued in tetrads, sometimes glued on hymenial setae, IKI–, CB–, (4.6–)5–6 × (2.1–)2.2–2.8(–3) µm, L = 5.45 µm, W = 2.55 µm, Q = 2.12–2.15 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA.** Yunnan Province, Mengla County, Tropical Rain Forest, on rotten bamboo, 18.VIII.2019, Dai 20499 (BJFC032167)

Remarks. — Phylogenetically *Fuscoporia sinuosa* is closely related to *F. submurina* Y.C. Dai & F. Wu (Fig. 32), which however, has angular and smaller pores measuring (3–4 per mm vs. 1–2 per mm), and grows on an angiosperm wood other than bamboo. In addition, nucleotide differences in the ITS regions between the two species are up to 4.2%.

Fuscoporia submurina Y.C. Dai & F. Wu, **sp. nov.** (Figs. 32, 35, 36)

MycoBank: MB 839944.

Type. — **SRI LANKA**. Mitirigala, Nissarana Vanaga Forest, on fallen angiosperm branch, 4.III.2019, Dai 19655 (holotype, BJFC031332).

Etymology. — *Submurina* (Lat.): referring to the species having pale mouse gray fresh pores.

Fruiting body. — Basidiocarps annual, resupinate, inseparable from substrate, leathery and without distinctive odor or taste when fresh, corky when dry, up to 30 cm long, 4 cm wide and 0.6 mm thick. Pore surface pale mouse gray when fresh, becoming clay buff to snuff brown when dry, not glancing; margin narrow to almost lacking, paler than pores, usually with abundant mycelial setae; pores angular to irregular, 3–4 per mm; dissepiments thin, lacerate to dentate, abundant setae seen in tube cavities (under lens). Subiculum umber, corky, very thin, < 0.1 mm thick. Tubes pale gray, distinctly paler than subiculum, brittle, up to 0.5 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue darkening otherwise unchanged in KOH.

Subiculum. — Generative hyphae infrequent, hyaline, thin-walled, frequently branched and simple septate, 2.2–3.2 µm in diam; skeletal hyphae dominant, rust brown, thick-walled with a medium to narrow lumen, unbranched, aseptate, flexuous, strongly interwoven, 2.5–3 µm in diam; mycelial setae present, dark brown, thick-walled, tapering to apex, 80–100 × 8–10 µm.

Trama of the tubes. — Generative hyphae frequent, mostly seen at dissepiment edge and subhymenium, hyaline, thin- to slightly thick-walled, occasionally branched, frequently septate, 2–3 µm in diam, some of them at dissepiment edge and hymenium strongly encrusted with stellate crystals; skeletal hyphae dominant, yellowish brown to rust brown, thick-walled with a medium lumen, unbranched, aseptate, flexuous, strongly interwoven, 2–3 µm in diam; mycelial setae present, dark brown, thick-walled, tapering to apex, 80–100 × 8–11 µm in diam; hymenial setae frequent, mostly originating from hymenium, narrowly subulate, dark brown, thick-walled, 50–86 × 8–12 µm; fusoid cystidioles present, 11–24 × 2–4.5 µm; basidia short clavate, with four sterigmata and a simple septum at the base, 8.5–12 × 4.5–6 µm; basidioles dominating in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores oblong-ellipsoid, tapering at apiculus, sometimes slightly curved, hyaline, thin-walled, smooth, IKI–, CB–, (4.5–)4.8–5.8(–6) × (2–)2.1–3 µm, L = 5.13 µm, W = 2.5 µm, Q = 2.04–2.07 (n = 60/2).

Additional specimens (paratypes) examined. — **SRI LANKA**. Colombo, Dombagaskarda Forest Reserve, on fallen angiosperm branch, 27.II.12019, Dai 19501 (BJFC031180); Mitirigala, Nissarana Vanaga Forest, on fallen angiosperm branch, 4.III.2019, Dai 19656 (BJFC031333), Dai 19657 (BJFC031334).

Remarks. — *Fuscoporia submurina* is characterized by a pale mouse gray pore surface when fresh, presence of both mycelial setae and hymenial setae, and oblong-ellipsoid basidiospores measuring 4.8–5.8 × 2.1–3 µm.

Inonotus adversus Corner (Corner 1991) was reported from Malaysia and it has characteristics fit *Fuscoporia*, but the name was published invalidly. So the species is renamed as following:

Fuscoporia adversa Y.C. Dai & F. Wu, **sp. nov.**

MycoBank: MB 840524.

Type. — **MALAYSIA**. Pahang, Ckeka River, on a dead fallen trunk, 12.VI.1931 Sin. F.N. 28216 (holotype, E).

Inonotus adversus Corner (nom. inval.), Beih. Nova Hedwigia 101: 52, 1991. This name was published invalidly because no type was designated. For the description of *Fuscoporia adversa* see *Inonotus adversus* by Corner (1991).

In addition, the following taxa described in *Inonotus* and *Phellinus* have morphological characteristics that fit *Fuscoporia*, and the following combinations are proposed:

Fuscoporia amanii (Niemelä) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839946.

Basionym: *Phellinus amanii* Niemelä, in Härkönen, Niemelä & Mwasumbi, *Norrlinia* 10: 189 (2003).

≡ *Mucronoporus amanii* (Niemelä) Zmitr., Malysheva & Spirin, *Nov. sist. Niz. Rast.* 40: 183 (2006).

Fuscoporia bambusina (Pat.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839947.

Basionym: *Polyporus bambusinus* Pat., *Bull. Soc. mycol. Fr.* 7: 101 (1891).

≡ *Phellinus bambusinus* (Pat.) Pat., *Essai Tax. Hyménomyc.* (Lons-le-Saunier): 97 (1900).

Fuscoporia breviseta (Læssøe & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839948.

Basionym: *Phellinus brevisetus* Læssøe & Ryvarden [as 'brevisetulus'], *Syn. Fung.* 27: 35 (2010).

Fuscoporia chocolata (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839949.

Basionym: *Phellinus chocolatus* Corner, *Beih. Nova Hedwigia* 101: 63 (1991).

Fuscoporia cylindrospora (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839950.

Basionym: *Phellinus cylindrosporus* Ryvarden, *Mycotaxon* 28: 536 (1987).

Fuscoporia daedaliformis **(**J.E. Wright & Blumenf.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839951.

Basionym: *Phellinus daedaliformis* J.E. Wright & Blumenf., *Mycotaxon* 21: 418 (1984).

Fuscoporia discipodoides (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839952.

Basionym: *Phellinus discipodoides* Corner, *Beih. Nova Hedwigia* 101: 77 (1991).

Fuscoporia fenea (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839953.

Basionym: *Phellinus feneus* Corner, *Beih. Nova Hedwigia* 101: 85 (1991).

Fuscoporia garuhapensis (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839954.

Basionym: *Phellinus garuhapensis* J.E. Wright & Blumenf., *Mycotaxon* 21: 420 (1984).

Fuscoporia griseopora (Reid) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839955.

Basionym: *Phellinus griseoporus* Reid, *Mem. N. Y. bot. Gdn* 28 (1): 192 (1976).

Fuscoporia incrustaticeps (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839956.

Basionym: *Phellinus incrustaticeps* Corner, *Beih. Nova Hedwigia* 101: 100 (1991).

Fuscoporia irregularis (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839957.

Basionym: *Phellinus irregularis* Ryvarden, *Syn. Fung.* 39: 68 (2019).

Fuscoporia labyrinthica (Soares, Gomes-Silva & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839958.

Basionym: *Phellinus labyrinthicus* Soares, Gomes-Silva & Ryvarden, in Soares, Oliveira-Filho, Gomes-Silva, Ryvarden & Gibertoni, *Syn. Fung.* 38: 57 (2018).

Fuscoporia leiomita (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839959.

Basionym: *Phellinus leiomitus* Corner, *Beih. Nova Hedwigia* 101: 108 (1991).

Fuscoporia lutea (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839960.

Basionym: *Phellinus luteus* Ryvarden, *Syn. Fung.*19: 185 (2004).

Fuscoporia luctuosa (Ces.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839961.

Basionym: *Polyporus luctuosus* Ces., *Atti Accad. Sci. fis. mat. Napoli* 8(3): 7 (1879).

≡ *Phellinus luctuosus* (Ces.) Ryvarden, *Norw. Jl Bot.* 19: 235 (1972).

Fuscoporia macrospora (Gibertoni & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839962.

Basionym: *Phellinus macrosporus* Gibertoni & Ryvarden, *Syn. Fung.* 18: 48, 2004.

Fuscoporia neocallimorpha (Gibertoni & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839963.

Basionym: *Phellinus neocallimorphus* Gibertoni & Ryvarden, in Gibertoni, Ryvarden & Cavalcanti, *Syn. Fung.* 18: 53 (2004).

Fuscoporia orientalis (Bondartseva & S. Herrera) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839964.

Basionym: *Phellinus orientalis* Bondartseva & S. Herrera, *Mikol. Fitopatol.*: 478 (1980).

Specimen examined. — **BRAZIL.** Municipio de Bebedouro, 08.05.2008, Gugliotta 1356, SP 416144.

Fuscoporia rufa (Bres.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839965.

Basionym: *Fomes rufus* Bres., *Annls mycol.* 18(1/3): 36 (1920).

≡ *Phellinus rufus* (Bres.) Ryvarden, *Mycotaxon* 33: 321 (1988).

Fuscoporia semihispida (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839966.

Basionym: *Phellinus semihispidus* Ryvarden, *Syn. Fung.* 19: 208 (2004).

Fuscoporia subcontigua (Cleland & Rodway) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839967.

Basionym: *Polyporus subcontiguus* Cleland & Rodway [as 'subcontigua'], *Pap. Proc. R. Soc. Tasm.*: 35 (1930) [1929].

≡ *Phellinus subcontiguus* (Cleland & Rodway) P.K. Buchanan & Ryvarden, *Aust. Syst. Bot.* 6: 227 (1993).

Fuscoporia terminaliae (S. Ito & S. Imai) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839968.

Basionym: *Fomes terminaliae* S. Ito & S. Imai, *Trans. Sapporo nat. Hist. Soc.* 16: 125 (1940)

≡ *Phellinus terminaliae* (S. Ito & S. Imai) M.J. Larsen, in Larsen & Cobb-Poulle, *Syn. Fung.* 3: 135 (1990).

Fuscoporia velutina (T. Hatt. & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839969.

Basionym: *Phellinus velutinus* T. Hatt. & Ryvarden, *Mycotaxon* 58: 131 (1996).

Key to species of *Fuscoporia*

1. Basidiocarps completely resupinate..... 2

1. Basidiocarps pileate, effused-reflexed or substipitate..... 40

2. Basidiocarps perennial..... 3

2. Basidiocarps annual to biennial..... 17

3. Basidiocarps cushion-shaped, margin dinstinctly receding..... 4

3. Basidiocarps more or less even, margin not dinstinctly receding..... 7

4. Mycelial setae present..... *F. breviseta* (Læssøe & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped, margin distinctly receding; pore surface dark chocolate brown; pores 6–8 per mm; a black line present between subiculum and substrate; hyphal system dimitic; mycelial setae present in subiculum, 200 × 8 µm; hymenial setae present, with an obtuse apex, in parts with scattered apical crystals, 35–60 × 8–15 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thin-walled, 3–3.2 × 2–2.3 µm (Læssøe and Ryvarden 2010); on angiosperm wood; type locality in Ecuador; distribution: Ecuador.

4. Mycelial setae absent..... 5

5. Black line present between subiculum and substrate..... *F. pulviniformis* Tchotet et al.

Basidiocarps perennial, resupinate, cushion-shaped, margin distinctly receding; a black line present between subiculum and substrate; pore surface brown to tobacco brown; pores 5–7 per mm; a thin context layer present between tube layers; dissepiments thick, entire; skeletal hyphae aseptate; mycelial setae absent; hymenial setae lanceolate, 25–45 × 5–7 µm; basidiospores not seen (Tchotet Tchoumi et al. 2020); type locality in South Africa; distribution: South Africa.

5. Black line absent..... 6

6. Basidiospores 4–6 µm long..... *F. kamahi* G. Cunn.

Basidiocarps perennial, resupinate, cushion-shaped, margin receding; pore surface bay to umber; pores 6–7 per mm; hyphal system dimitic; mycelial setae absent; hymenial setae subulate, 20–26 × 6–8 µm; basidiospores, narrowly obovate, hyaline, 4–6 × 1.5–2 µm (Larsen and Cobb-Poulle 1990); type locality New Zealand; distribution: New Zealand.

6. Basidiospores 6.5–8.2 µm long..... *F. montana* Y.C. Dai & Niemelä

Basidiocarps perennial, resupinate, cushion-shaped, margin distinctly receding ; pore surface cigar brown to fawn; pores 7–8 per mm; dissepiments entire; mycelial setae absent; hymenial setae 24–37 × 5–8 µm; cystidioles present; basidiospores narrowly ovoid to narrow ellipsoid, hyaline, thin-walled, CB–, IKI–, (6–)6.5–8.2(–9)8 × (2.9–)3.2–4.2(–4.4) µm, L = 7.22 µm, W = 3.76 µm, Q = 1.79–2.08 (Niemelä et al. 2001); type locality in China; distribution: Southwest China.

7. Mycelial setae present..... 8

7. Mycelial setae absent..... 14

8. Hymenial setae absent.. *F. longisetulosa* (Bondartseva & S. Herrera) Bondartseva & S. Herrera

Basidiocarps perennial, resupinate, more or less even; pore surface yellowish brown to tobacco brown; pores 5–7 per mm; dissepiments entire; skeletal hyphae aseptate; mycelial setae 78–123 × 6–9 µm; hymenial setae absent; cystidioles present; basidiospores ellipsoid, 4–5.6 × 2.8–3.3 µm (Larsen and Cobb-Poulle 1990); type locality in Cuba; distribution: Central America.

8. Hymenial setae present..... 9

9. Hymenial setae hooked..... *F. macrospora* (Gibertoni & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, more or less even; pore surface dark rust brown; pores 7–8 per mm; dissepiments thin; hyphal system dimitic; mycelial setae present, 50–80 × 9–12 µm; hymenial setae hooked, 25–35 × 8–10 µm; cystidioles absent; basidiospores globose, 6.3–7.2 µm in diam (Gibertoni et al. 2004); type locality in Brazil; distribution: Southeast Brazil.

9. Hymenial setae straight..... 10

10. Basidiospores subglobose..... *F. xerophila* Raymundo et al.

Basidiocarps perennial, resupinate, more or less even; pore surface grayish brown to dark brown; pores irregular, 4–5 per mm; dissepiments lacerate; mycelial setae 88–180 × 12–20 µm; hymenial setae straight, 40–52 × 6.4–8 µm; cystidioles absent; basidiospores subglobose, 5.1–5.5 × 4–4.5 µm (Raymundo et al. 2013b); type locality in Mexico; distribution: Mexico.

10. Basidiospores ellipsoid..... 11

11. Pores 2–3 per mm..... *F. contigua* (Pers.) G. Cunn.

Basidiocarps perennial, resupinate, more or less even; pore surface grayish brown to fulvous; pores 2–3 per mm; dissepiments thin, lacerate; skeletal hyphae sometimes collapsed; mycelial setae 40–120 × 5–12 µm; hymenial setae straight, 40–60 × 6–10 µm; cystidioles present; basidiospores oblong-ellipsoid, 4.8–6 × 2.5–3.6 µm, Q = 1.7–1.87 (Chen et al. 2019); type locality probably in France; distribution: Northern Hemisphere.

11. Pores 5–7 per mm..... 12

12. Dissepiments lacerate; cystidioles present..... *F. ferruginosa* (Schrad.) Murrill

Basidiocarps perennial, resupinate, more or less even; pore surface fulvous to umber brown; pores 6–7 per mm; dissepiments thin, lacerate; mycelial setae 200–300 × 6–12 µm; hymenial setae straight, 25–65 × 6–8 µm; cystidioles present; basidiospores ellipsoid, 4.1–5.2 × 2.8–3.2 µm, Q = 1.55–1.61 (Chen et al. 2020); type locality in Germany; distribution: Europe and Northern Asia.

12. Dissepiments entire; cystidioles absent..... 13

13. Hymenial setae > 60 µm long..... *F. costaricana* Y.C. Dai et al.

Basidiocarps perennial, resupinate, more or less even; pore surface clay buff to grayish brown; margin paler than pore surface; pores 5–6 per mm, sometimes sinuous to daedaleoid; dissepiments thick, entire; skeletal hyphae septate; mycelial setae 150 × 9–13 µm; hymenial setae straight, 66–82 × 7–12 µm; cystidioles absent; basidiospores ellipsoid, 4.3–5.1 × 2.8–3.2 µm, Q = 1.56 (Chen et al. 2019); type locality in Costa Rica; distribution: Central America.

13. Hymenial setae < 45 µm long..... *F. karsteniana* Q. Chen et al.

Basidiocarps perennial, resupinate, more or less even; pore surface rust brown to fawn; margin paler than pore surface; pores 5–7 per mm; dissepiments thin, entire; mycelial setae 265 × 5–9 µm; hymenial setae straight, 34–45 × 5–7.5 µm; cystidioles absent; basidiospores ellipsoid, 4.5–5.6 × 3–3.8 µm, Q = 1.5–1.65 (Chen et al. 2020); type locality in China; distribution: China.

14. Basidiospores ellipsoid, 3–4 µm wide.....

F. altocedronensis (Murrill) Bondartseva & S. Herrera

Basidiocarps perennial, resupinate, more or less even; pore surface rust brown, glancing; pores 7–8 per mm; dissepiments thick, entire; mycelial setae absent; hymenial setae straight, 30–50 × 7–10 µm; cystidioles absent; basidiospores ellipsoid, 4–4.5 × 3–4 µm (Larsen and Cobb-Poulle 1990); type locality in Cuba; distribution: Central America.

14. Basidiospores cylindrical to fusiform, 1.5–2.8 µm wide..... 15

15. Basidiospores fusiform, hymenial setae infrequent..... *F. insolita* Spirin et al.

Basidiocarps perennial, resupinate or nodulose, more or less even; pores 6–7 per mm; mycelial setae absent; hymenial setae scarce and short, straight, 14–32 × 5–7 μm; skeletal hyphae septate; cystidioles present; basidiospores fusiform, 4.7–7.2 × 1.9–2.4 μm, L = 5.66 μm, W = 2.11 μm (Spirin et al. 2014); type locality in Russia; distribution: East Asia.

15. Basidiospores cylindrical, hymenial setae frequent..... 16

16. Basidiospores 1.5–2 μm wide..... *F. punctatiformis* (Murrill) Zmitr. et al.

Basidiocarps perennial, resupinate, more or less even; pore surface yellowish brown; pores 6–7 per mm; mycelial setae absent; hymenial setae frequent, straight, 18–25 × 4–8 μm; cystidioles present; skeletal hyphae aseptate; basidiospores cylindric to subcylindrical, 4–6 × 1.5–2 μm (Larssen and Cobb-Poulle 1990); type locality in USA; distribution: tropical America.

16. Basidiospores 2–2.5 μm wide..... *F. ferrea* (Pers.) G. Cunn

Basidiocarps perennial, resupinate, more or less even; pore surface yellowish brown; pores 6–7 per mm; mycelial setae absent; hymenial setae abundant, straight, 22–45 × 6–8 μm; cystidioles present; skeletal hyphae aseptate; basidiospores cylindric, 5–7.5 × 2–2.5 μm (Ryvarden and Melo 2017); type locality in France; distribution: Northern Hemisphere.

17. Mycelial setae present..... 18

17. Mycelial setae absent..... 31

18. Tubes soft spongy..... *F. velutina* (T. Hatt. & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface yellowish to yellowish brown; pores 6–7 per mm; dissepiments thick, entire; tubes soft spongy; mycelial setae abundant in subiculum and trama, 170–220 × 6–7 μm; hymenial setae abundant, 50–75 × 7.5–10 μm; cystidioles absent; basidiospores ellipsoid, hyaline, 4–5 × 2.2–3 μm (Hattori and Ryvarden 1996); type locality in Japan; distribution: Bonin Island, Japan.

18. Tubes corky..... 19

19. Pores 7–9 per mm..... 20

19. Pores 1–7 per mm..... 21

20. Hymenial setae > 40 μm long, cystidioles absent..... *F. subchrysea* Q. Chen et al.

Basidiocarps annual, resupinate; pore surface fuscous to honey yellow; margin paler than pore surface; pores 8–9 per mm; dissepiments thin, entire; tubes corky; skeletal hyphae septate; mycelial setae 130 × 6–9 μm; hymenial setae 40–68 × 5–8 μm; cystidioles absent; basidiospores ellipsoid 3.8–4.4 × 2.6–3.2 μm, Q = 1.31–1.42 (Chen et al. 2020); type locality in China; distribution: South China.

20. Hymenial setae < 35 µm long, cystidioles present.....

..... *F. rufitincta* (Berk. & M.A. Curtis ex Cooke) Murrill

Basidiocarps annual to biennial, resupinate; pore surface cinnamon to deep reddish brown; pores 7–9 per mm; dissepiments entire; tubes corky; mycelial setae 80 × 6–9 µm in subiculum, 50–130 × 6–12 µm in trama; hymenial setae 20–35 × 5–8 µm; cystidioles present; basidiospores ellipsoid, 3–4 × 2–2.5 µm (Larsen and Cobb-Poulle 1990); type locality in Cuba; distribution: Neotropics.

21. Basidiospores ellipsoid to broadly ellipsoid or subglobose..... 22

21. Basidiospores cylindrical to oblong-ellipsoid..... 27

22. Pores 5–7 per mm..... 23

22. Pores 2–5 per mm..... 24

23. Pore surface not glancing; on bamboo..... *F. bambusae* Q. Chen et al.

Basidiocarps annual, resupinate; pore surface grayish brown to fawn; margin paler than pores; pores 5–7 per mm; dissepiments thin, entire to slightly lacerate; tubes corky; mycelial setae 240 × 5–9 µm; hymenial setae septate, 45–96 × 5–9 µm; cystidioles present; basidiospores ellipsoid, 4.3–5.3 × 2.8–3.6 µm, Q = 1.47–1.54 (Chen et al. 2020); on bamboo; type locality in Thailand; distribution: Southeast Asia.

23. Pore surface glancing; on angiosperm wood other than bamboo..... *F. ambigua* P. Du et al.

Basidiocarps annual, resupinate; pore surface grayish brown to rust brown, glancing; margin paler than pore surface; pores 5–6 per mm; dissepiments thin, entire; tubes corky; mycelial setae 160 × 5–9 µm; hymenial setae septate, 45–75 × 5–8 µm; fusoid cystidioles present; basidiospores ellipsoid, 4.2–5.2 × 2.8–3.3 µm, L = 4.77 µm, W = 3.08 µm, Q = 1.53–1.59 (Du et al. 2020); on angiosperm wood; type locality in USA; distribution: North America and China.

24. Basidiospores subglobose..... *F. orientalis* (Bondartseva & S. Herrera) Y.C. Dai & F. Wu

Basidiocarps, annual to biennial, resupinate; pore surface golden yellow to dark brown; pores 3–5 per mm; tube corky; hyphal system dimitic; mycelial setae absent in trama, present in subiculum; hymenial seate subulate, straight, 26–52 × 4.5–7.3 µm; cystidioles absent; basidiospores subglobose, hyaline, thin-walled, 4.5–6 × 3.5–5.5 µm (Larsen and Cobb-Poulle 1990); type locality in Cuba; distibution: Cuba.

24. Basidiospores broadly ellipsoid..... 25

25. Margin paler than pore surface; on bamboo.....

F. bambusicola (L.W. Zhou & B.S. Jia) Q. Chen et al.

Basidiocarps annual, resupinate; pore surface clay buff to pale fawn; pores 3–5 per mm; dissepiments thin, lacerate; margin paler than pore surface; tubes corky; skeletal hyphae sometimes collapsed; mycelial setae present in subiculum, 110 × 6.5–10.5 µm; hymenial setae present 32–55 × 9–14. µm; cystidioles present; basidiospores broadly ellipsoid, 4.2–5 × 3.1–4 µm, Q = 1.31 (Zhou and Jia 2010); on bamboo; type locality in China; distribution: South China.

25. Margin darker than pore surface; on angiosperm wood other than bamboo..... 26

26. Pore surface cracked when dry; basidiospores 4.8–6 µm long..... *F. americana* Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface fawn and cracked; pores 2–4 per mm; margin darker than pore surface; dissepiments thin, entire to lacerate; tubes corky; mycelial setae with a swollen base, 110 × 7–13 µm; hymenial setae 33–61 × 6–13 µm; cystidioles present; basidiospores broadly ellipsoid, 4.8–6 × 3.2–4.2 µm, Q = 1.34–1.53 (Chen et al. 2019); on angiosperm wood; type locality in USA; distribution: North America.

26. Pore surface uncracked when dry; basidiospores 4–5 µm long..... *F. latispora* Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface ochraceous to umber, uncracked; pores 3–4 per mm; margin darker than pore surface; dissepiments thin to thick, lacerate; tubes corky; mycelial setae 110 × 6–10 µm; hymenial setae 55–72 × 6–9 µm; cystidioles present; basidiospores broadly ellipsoid, 4–5 × 2.8–3.5 µm, Q = 1.47–1.57 (Chen et al. 2019); on angiosperm wood; type locality in Mexico; distribution: UAS and Central America.

27. Pores 5–6 per mm..... *F. centroamericana* Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface clay buff; pores 5–6 per mm, somewhat sinuous or daedaleoid; margin paler than pore surface; dissepiments entire to lacerate; tubes corky; mycelial setae 300 × 14 µm; hymenial setae 50–65 × 7–9 µm; cystidioles absent; basidiospores cylindric, 4.8–6 × 2.8–3.2 µm, Q = 1.82–1.87 (Chen et al. 2019); type locality in Costa Rica; distribution: Central America.

27. Pores 1–4 per mm..... 28

28. Hymenial setae apically encrusted, mycelial setae septate..... *F. septiseta* Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface grayish brown to clay buff; pores 2–3 per mm; margin paler than pore surface; dissepiments entire to lacerate; tubes corky; mycelial setae frequently simple septate, 130 × 5–6 µm; hymenial setal tips encrusted, 35–90 × 6–9 µm; cystidioles present; basidiospores cylindric, 6–7 × 2–3 µm, Q = 2.33–2.57 (Chen et al. 2019); type locality in USA; distribution: North America.

28. Hymenial setae smooth, mycelial setae aseptate..... 29

29. Margin darker than pore surface; basidiospores cylindrical..... *F. sinica* Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface deep olive to dark brown; pores 3–4 per mm; margin darker than pore surface; dissepiments thin, lacerate; tubes corky; mycelial setae aseptate,150 × 5–8 µm; hymenial setae 60–85 × 4–9 µm; cystidioles present; basidiospores cylindric, 5.8–7 × 2.4–3 µm, Q = 2.32–2.38 (Chen et al. 2019); type locality in China; distribution: China.

29. Margin paler than pore surface; basidiospores oblong-ellipsoid..... 30

30. Pores 1–2 per mm..... *F. sinuosa* Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface reddish brown, not glancing; pores sinuous, 1–2 per mm; dissepiments lacerate to dentate; margin paler than pore surface; tubes corky; mycelial setae aseptate,100–160 × 8–13 µm; hymenial setae 70–105 × 7–12 µm; cystidioles present; basidiospores oblong-ellipsoid to cylindrical, (4.6–)5–6 × (2.1–)2.2–2.8(–3) µm, L = 5.45 µm, W = 2.55 µm, Q = 2.12–2.15; type locality in China; distribution: South China.

30. Pores 3–4 per mm..... *F. submurina* Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface mouse gray to snuff brown, not glancing; pores angular to irregular, 3–4 per mm; dissepiments lacerate to dentate; margin paler than pore surface; tubes corky; mycelial setae aseptate, 80–100 × 8–11 µm; hymenial setae 50–86 × 8–12 µm; cystidioles present; basidiospores oblong-ellipsoid, (4.5–)4.8–5.8(–6) × (2–)2.1–3 µm, L = 5.13 µm, W = 2.5 µm, Q = 2.04–2.07; type locality in Sri Lanka; distribution: Sri Lanka.

31. Hymenial setae absent..... 32

31. Hymenial setae present..... 33

32. Basidiospores globose; on bamboo; South American species.....

..... *F. garuhapensis* (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; margin undulate; pore surface golden brown; pores 6–8 per mm; hyphal system dimitic; mycelial setae and hymenial setae absent; cystidioles present, 6.5–10 × 4.5–5.7 µm; basidiospores globose, hyaline, slightly thick-walled, IKI–, CB–, 3.1–5.2 µm in diam (Wright and Blumenfeld 1984.); on bamboo; type locality in Argentina; distribution: Argentina.

32. Basidiospores ellipsoid, on angiosperm wood other than bamboo; Asian species.....

..... *F. adversa* (Corner) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface fuscous fulvous; pores 5–7 per mm; hyphal system dimitic; setal hyphae and hymenial setae absent; basidiospores broadly ellipsoid, hyaline, thin-walled, 3.5–4 × 2.5–3 µm (Corner 1991); on angiosperm wood; type locality in Malaysia; distribution: Malaysia.

33. Hymenial setae hooked..... *F. chocolata* (Corner) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface dull chocolate to fuscous umber; pores 6–9 per mm; mycelial setae absent; hymenial setae ventricose, hooked, 18–40 × 4–8 µm; cystidioles present; basidiospores oblong-ellipsoid to subcylindric, hyaline, thin-walled, 4–6 × 2–2.5 µm (Corner 1991); type locality in Singapore; distribution: Malaysia and Singapore.

33. Hymenial setae straight..... 34

34. Pores 6–10 per mm..... 35

34. Pores 1–5 per mm..... 37

35. Pores 6–7 per mm..... *F. ramulicola* Y.C. Dai & Q. Chen

Basidiocarps annual, resupinate; pore surface grayish brown, fawn; pores 6–7 per mm; mycelial setae absent; hymenial setae straight, 35–60 × 4.5–7 µm; cystidioles present; basidiospores cylindric, 5.8–7 × 2–2.5 µm, Q = 2.57–2.88 (Chen and Dai 2019); type locality in China; distribution: Southwest China.

35. Pores 7–10 per mm..... 36

36. Basidiospores cylindrical, 2–2.6 µm wide..... *F. subferrea* Q. Chen & Yuan Yuan

Basidiocarps annual, resupinate; pore surface mouse gray to fawn; pores 7–10 per mm; mycelial setae absent; hymenial setae straight, 18–34 × 4–7 µm; cystidioles present; basidiospores cylindric, 4.2–6.2 ×2–2.6 µm, Q = 2.15–2.27 (Chen and Yuan 2017); type locality in China; distribution: China.

36. Basidiospores ovoid, 3.5–4 µm wide..... *F. luctuosa* (Ces.) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface cinnamon to deep umber brown; pores 8–10 per mm; mycelial setae absent; hymenial seate frequent, ventricose, 10–15 × 5–8 µm; cystidioles absent; basidiospores ovoid to subglobose, 4–4.5 × 3.5–4 µm (Núñez and Ryvarden 2000); type locality in Borneo; distibution: southeast tropical and subtropical Asia.

37. Basidiospores cylindrical to allantoid..... 38

37. Basidiospores ellipsoid..... 39

38. Pores 1–3 per mm; basidiospores 1.6–2 µm wide..... *F. contiguiformis* (Pilát) Raymundo et al.

Basidiocarps annual, resupinate; pore surface brown to dark brown; margin paler than pore surface; pores 1–3 per mm; dissepiments thin, lacerate; mycelial satae absent; hymenial setae straight, 50–70 × 5–7 µm; cystidioles present; basidiospores cylindrical to allantoid, 7–8 × 1.6–2 µm (Larsen and Cobb-Poulle 1990); type locality in Russia; distribution: Siberia, Russia.

38. Pores 3–4 per mm; basidiospores 2.4–3 µm wide..... *F. yunnanensis* Y.C. Dai

Basidiocarps annual, resupinate; pore surface cinnamon to clay buff, glancing; pores 3–4 per mm; mycelial setae absent; hymenial setae lanceolate, straight, 49–78 × 5–9 µm; cystidioles present; basidiospores cylindric, 6–8.3 × 2.4–3 µm, Q = 2.63 (Dai 2010); type locality in China; distribution: Southwest China.

39. Basidiospores 6–7 µm long; Neotropical species .....

..... *F. palmicola* (Berk. & M.A. Curtis) Bondartseva & S. Herrera

Basidiocarps annual, resupinate; pore surface reddish brown to golden yellow; pores 1–2 per mm; subiculum thin; hymenial setae subulate, straight; 50–70 × 5–7 µm basidiospores ellipsoid, hyaline, thin-walled, 6–7 × 3–5 µm (Lowe 1966); type locality in Cuba; distribution: Central America.

39. Basidiospores 4–5 µm long; African species..... *F. irregularis* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface grayish brown; pores irregular to semi-labyrinthine,1–3 per mm; a thin black zone present between subiculum and substrate; hyphal system dimitic; hymenial setae subulate, straight, 25–75 × 6–10 µm; basidiospores ellipsoid, hyaline, thin-walled, 4–5 × 3–3.5 µm (Ryvarden 2019); on angiosperm wood; type locality in Zimbabwe; distribution: Zimbabwe.

40. Basidiocarps annual to biennial..... 41

40. Basidiocarps perennial..... 61

41. Basidiocarps effused-reflexed..... 42

41. Basidiocarps distinctly pileate or substipitate..... 51

42. Pileal surface strigose, tomentose, radially rugose..... 43

42. Pileal surface velutinate to glabrous..... 46

43. Pileal surface strigose or tomentose, pores 2–4 per mm..... 44

43. Pileal surface radially rugose, pores 6–8 per mm..... 45

44. Pileal surface tomentose, pores 2 per mm..... *F. palomari* Vlasák & Ryvarden

Basidiocarps annual, effused-reflexed; pileal surface tomentose; pore surfacebrown, glancing; pores 2 per mm; hymenial setae 40–75 × 5–8 µm; cystidioles rarely present; skeletal hyphae septate; basidiospores cylindric, 8–10 × 2.7–3.5 µm, Q = 2.43 (Vlasák et al. 2012); type locality in USA; distribution: North America.

44. Pileal surface strigose, pores 3–4 per mm..... *F. setifera* (T. Hatt.) Y.C. Dai

Basidiocarps annual, effused-reflexed; pilei narrow; pileal surface yellowish brown to dark brown, hispid; pore surface yellowish brown; pores 3–4 per mm; dissepiments thin; entire; margin acute; hymenial setae 26–62 × 6–7.5 µm; cystidioles present; skeletal hyphae aseptate; basidiospores cylindric, 5.8–7 × 2–2.5 µm, Q = 2.97 (Dai 2010); type locality in Japan; distribution: East Asia.

45. Pores 6 per mm..... *F. chrysea* (Lév.) Baltazar & Gibertoni

Basidiocarps annual, effused-reflexed; pileal surface dark brown, radially rugose; pore surface yellowish brown; pores 6 per mm; skeletal hyphae up to 8 µm wide in subiculum; mycelial setae absent; hymenial setae frequent, 25–40 × 5–8 µm; basidiospores broadly ellipsoid to drop-shaped, 3.5–4.5 × 2.5–3 µm (Ryvarden 2004); type locality in Colombia; distribution: South America.

45. Pores 7–8 per mm..... *F. chinensis* Q. Chen et al.

Basidiocarps annual, effused-reflexed; pilei dimidiate to conchate; pileal surface radially rugose; pore surface grayish brown to dark reddish brown, glancing; margin paler than pore surface; pores 7–8 per mm; dissepiments thin, slightly lacerate; margin obtuse; mycelial setae absent; hymenial setae 20–40 × 4–8 µm; cystidioles present; basidiospores ellipsoid, 3–4 × 2–2.5 µm, Q = 1.45–1.65 (Chen et al. 2020); type locality in China; distribution: China.

46. Pores distinctly daedaloid.... *F. daedaliformis* (J.E. Wright & Blumenf.) Y.C. Dai & F. Wu

Basidiocarps annual, effused-reflexed; pileal surafce velutinate, pale brown; pore surface pale brown; pores, daedaloid, 4–5 per mm; dissepiments lacerate; mycelial setae absent; hymenial setae subulate to ventricose 35–50 × 3–6 µm; basidiospores ellipsoid, hyaline, thin-walled, 3.6–5.2 × 2.6–3.6 µm (Wright and Blumenf 1984); type locality in Argentina; distribution: Argentina.

46. Pores angular, circular or rarely labyrinthine..... 47

47. Setae with bifurcate apex..... *F. bifurcata* Baltazar et al.

Basidiocarps annual, effused-reflexed; pilei semicircular to applanate; pileal surface yellow, concentrically zonate, rugose to glabrous; pores 4–8 per mm; dissepiments thin, slightly thick; mycelial setae absent; hymenial setae frequent, with bifurcate or spiny apex, 28–52 × 6–9 µm; cystidioles present; basidiospores cylindric, 6–8.5 × 2–4 µm (Baltazar et al. 2009); type locality in Brazil; distribution: Brazil.

47. Setae unbranched..... 48

48. Pores 3–7 per mm; basidiospores cylindric..... 49

48 Pores 7–10 per mm; basidiospores ellipsoid..... 50

49. Pores 3–5 per mm; basidiospores 5.5–7 µm long.....

..... *F. subcontigua* (Cleland & Rodway) Y.C. Dai & F. Wu

Basidiocarps annual, effused-reflexed; pileal surface grayish brown with a hint of red, velutinate to glabrous; pore surface yellow brown; pores 3–5 per mm, angular to sublabyrinthine; hymenial setae 26–47 × 6–9 µm; cystidioles absent; basidiospores cylindric, 5.5–7 × 2–2.5 µm (Buchanan and Ryvarden 1993); type locality in Australia; distribution: South Australia.

49. Pores 5–7 per mm; basidiospores 7.5–9 µm long..... *F. acutimarginata* Y.C. Dai & Q. Chen

Basidiocarps annual, effused-reflexed; pilei conchate; pileal surface yellowish brown to dark brown, velutinate, concentrically sulcate and zonate; pore surface yellowish brown, glancing; pores 5–7 per mm; dissepiments thin, entire; margin acute; hymenial setae 20–40 × 3–7 µm; cystidioles present; skeletal hyphae aseptate; basidiospores cylindric, 7.5–9 × 2.5–3.2 µm, Q = 2.73–2.95 (Chen and Dai 2019); type locality in China; distribution: China.

50. Setae hooked; basidiospores 3–3.5 µm wide..... *F. atlantica* Motato-Vásq. et al.

Basidiocarps annual, effused-reflexed; pilei broadly attached to semicircular; pileal surface matted, dark brown, encrusted at the base, glabrous; pore surface golden yellow to ferruginous; pores 7–9 per mm; margin obtuse; skeletal hyphae septate; hymenial setae mostly hooked, 20–45 × 7–10 µm; cystidioles present; basidiospores broadly ellipsoid to ellipsoid, 4–4.5 × 3–3.5 µm, Q = 1.3–2 (Pires et al. 2015); type locality in Brazil; distribution: Brazil and Caribbean Area.

50. Setae straight; basidiospores 2.1–2.4 µm wide..... *F. rhabarbarina* (Berk.) Groposo et al.

Basidiocarps perennial, effused-reflexed, imbricate; pilei conchate; pileal surface clay-buff brown or black with age, concentrically sulcate with zones, glabrous; pore surface reddish brown to umber; pores 7–10 per mm; dissepiments thin to thick; entire; skeletal hyphae septate and swollen in KOH; hymenial setae straight, 21–34 × 5–8 µm; cystidioles present; basidiospores broadly ellpsoid, (3.2–)3.3–4.1(–4.2) × (2–)2.1–2.4(–2.5) µm, L = 3.71 µm, W = 2.26 µm, Q = 1.64 (Dai 2010); type locality unknown, probably in Brazil; distribution: South America and subtropical and tropical Asia.

51. Chlamydospores present; setae spiniform..... *F. bambusina* (Pat.) Y.C. Dai & F. Wu

Basidiocarps annual? pileate; pilei semicircular to applanate; pileal surface dull ochraceous, tuberculate, sulcate; pore surface ochraceous brown, glancing; pores very small; dissepiments thin, entire; mycelial setae present at pileal surface; hymenial setae spiniform; basidiospores broadly ovoid, hyaline, 5 × 4 µm (Larsen and Cobb-Poulle 1990); chlamydospores present; on *Bambusa;* type locality in Vietnam; distribution: Vietnam.

51. Chlamydospores absent; setae smooth or absent..... 52

52. Pores 3–5 per mm..... *F. formosana* (T.T. Chang & W.N. Chou) T. Wagner & M. Fisch.

Basidiocarps annual, pileate; pilei dimidiate to applanate; pileal surface coarsely tomentose to hispid; pores 3–5 per mm; hyphal system monomitic; hymenial setae 18–30 × 5–7 µm; cystidioles absent;

basidiospores broadly ellipsoid, 3.5–4 × 1.5–2.5 µm (Chang and Chou 1998); type locality in China; distribution: East China.

52. Pores 7–10 per mm..... 53

53. Hymenial setae absent..... *F. shoreae* Q. Chen et al.

Basidiocarps annual, pileate, solitary; pilei dimidiate; pileal surface grayish brown, concentrically sulcate and zonate; pore surface curry yellow to olivaceous buff; pores 9–10 per mm; dissepiments entire; skeletal hyphae septate; mycelial and hymenial setae absent; cystidioles present; basidiospores broadly ellipsoid, 3.8–4.8 × 3–3.8 µm, Q = 1.24–1.3 (Chen et al. 2020); type locality in Singapore; distribution: tropical Asia.

53. Hymenial setae present..... 54

54. Pileal surface tuberculate or nodulose..... 55

54. Pileal surface glabrous to rugose or hispid..... 56

55. Basidiocarps pileate to substipitate, pileal surface tuberculate.....

..... *F. leiomita* (Corner) Y.C. Dai & F. Wu

Basidiocarps annual, pileate to substipitate, imbricate; pilei dimidiate; pileal surface chestnut brown to cinnamon umber, azonate, velutinate, tuberculate; pore surface fuscous; pores 7–10 per mm; skeletal hyphae aseptate; hymenial setae ventricose, 13–25 × 5–7 µm; cystidioles ventricose, 16–25 × 2–3.5 µm; basidiospores ellipsoid, hyaline, thin-walled, 3.5–4 × 2.5 µm (Corner 1991); type locality in Malaysia; distribution: Sarawak, Malaysia.

55. Basidiocarps pileate, pileal surface nodulose..... *F. plumeriae* Q. Chen et al.

Basidiocarps annual, pileate; pilei dimidiate to conchate; pileal surface grayish brown, nodulose; pore surface fuscous, glancing; margin paler than pore surface; pores 8–10 per mm; dissepiments thin, entire to slightly lacerate; margin obtuse; skeletal hyphae septate; mycelial setae absent; hymenial setae 15–25 × 5–6 µm; cystidioles present; basidiospores ellipsoid, 3–3.8 × 2.2–2.8 µm, Q = 1.31–1.4 (Chen et al. 2020); type locality in Australia; distribution: Australia.

56. Pileal surface hirsute to hispid or rugose..... 57

56. Pileal surface glabrous..... 59

57. Pileal surface distinctly sulcate and zonate.....

..... *F. semiarida* Lima-Júnior et al.

Basidiocarps annual to biennial, pileate; pilei applanate; pileal surface pale grayish to dark brown, hirsute, concentricaly sulcate and zonate; margin acute; pore surface dark brown; pores 7–9 per mm; dissepiments thick, entire; context homogeneous; skeletal hyphae aseptate; hymenial setae lanceolate to ventricose, 18–26 × 5–7 µm; basidiospores ellipsoid, hyaline, thin-walled, 4–5 × 2–3 µm, L = 4.4 µm, W = 2.55 µm, Q = 1.73 (Yuan et al. 2020); occurence in dry forest; type locality in Brazil; distribution: Brazil.

57. Pileal surface indistinctly sulcate and zonate..... 58

58. Australian species..... *F. australiana* Q. Chen et al.

Basidiocarps annual to biennial, pileate; pilei dimidiate to conchate; pileal surface olivaceous buff to clay buff, hispid to rugose, indistinctly zonate; margin paler than pore surface; pores 7–9 per mm; dissepiments thin, entire to slightly lacerate; margin obtuse; mycelial setae absent; hymenial setae 20–35 × 5–7 µm; cystidioles present; basidiospores ellipsoid, 4–4.8 × 2.5–3 µm, Q = 1.56–1.64 (Chen et al. 2020); type locality in Australia; distribution: Australia.

58. American species..... *F. sarcites* (Fr.) Bittencourt, Vlasák & Drechsler-Santos

Basidiocarps annual, pileate, solitary; pilei applanate to dimidiate; pileal surface dark reddish brown, hispid, not encrusted; pore surface yellow brown; pores 7–8 per mm; hymenial setae ventricose, straight, 15–25 × 5–10 µm; basidiospores broadly ellipsoid, hyaline, thin-walled, 3–4.8 × 2–3.5 µm (Ryvarden and Johansen 1980; specimen Daemmrich 8947 from Honduras); type locality in Colombia; distribution: Central and South America.

59. Pileal surface concentrically sulcate; African species..... *F. callimorpha* (Lév.) Groposo et al.

Basidiocarps annual, pileate; pilei applanate to dimidiate; pileal surface reddish brown, concentrically sulcate, glabrous; pore surface yellowish brown to brown; pores 9–10 per mm; skeletal hyphae septate; mycelial setae absent; hymenial setae 20–30 × 5–8 µm; cystidioles present; basidiospores oblong-ellipsoid to almost subcylindrical, 3.5–4.5 × 2–3 µm, Q = 1.43–1.53 (Groposo et al. 2007); type locality in Madagascar; distribution: Africa.

59. Pileal surface not sulcate; American or Asian species..... 60

60. Basidiospores oblong-ellipsoid, < 3 µm wide. *F. licnoides* (Mont.) Oliveira-Filho & Gibertoni

Basidiocarps annual, pileate; pilei applanate; pileal surface pale grayish brown, glabrous, concentricaly zonate with narrow zones; margin acute; pore surface dark brown; pores 7–9 per mm; dissepiments thick, entire; context homogeneous; skeletal hyphae aseptate; hymenial setae lanceolate to ventricose, 20.6 × 4.6 µm; basidiospores oblong-ellipsoid, hyaline, thin-walled, 4 × 2.27 µm (Yuan et al. 2020); occurrence in a wet tropical forest; type locality in French Guiana; distribution: USA, French Guiana and Brazil.

60. Basidiospores ellipsoid, > 3 µm wide .....

..... *F. gilva* (Schwein.) T. Wagner & M. Fisch. (= *F. scruposa* (Fr.) Gibertoni & Oliveira-Filho

Basidiocarps annual, effused-reflexed to pileate; pilei dimidiate to semicircular; pileal surface glabrous to rugose sometimes with nodulose, not sulcate, azonate, not encrusted, uncracked; margin even, acute; pores 6–8 per mm; dissepiments thin, lacerate; margin obtuse or acute; skeletal hyphae septate; mycelial setae absent; hymenial setae straight, 20–35 × 5–7 µm; cystidioles present; basidiospores ellipsoid, 4–5 × 3–3.5 µm, Q = 1.42–1.50 (Chen et al. 2020); type locality in USA; distribution: America and Asia.

61. Hymenial setae absent..... 62

61. Hymenial setae present..... 68

62. Basidiospores cylindrical or oblong-ellipsoid..... 63

62. Basidiospores broadly ellipsoid to globose..... 64

63. Pileal surface without cuticle..... *F. discipes* (Berk.) Y.C. Dai & Ghob.-Nejh.

Basidiocarps perennial, pileate, solitary to imbricate; pilei flabelliform or spatulate; pileal surface umber to fuscous, radially striate, concentrically zonate, glabrous; pore surface ferruginous; pores 6–8 per mm; dissepiments entire and fairly thick; margin acute; hymenial setae and mycelial setae absent; cystidioles present; basidiospores ellipsoid, (4–)4.5–5.4 × (2.6–)2.7–3.3(–3.5) µm, Q = 1.63 (Dai 2010); type locality in Sri Lanka; distribution: tropical Asia and Australia.

63. Pileal surface with a cuticle.....

..... *F. neocallimorpha* (Gibertoni & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei applanate to dimidiate; pileal surface dark reddish brown to black, velutinate to glabrous, with a thin cuticle; pore surface cinnamon to deep umber; pores 7–9 per mm; mycelial setae and hymenial setae absent; basidiospores oblong-ellipsoid to subcylindrical, slightly thick-walled, hyaline to slightly pale yellow, 3.5–4.5 × 2–2.5 µm (Gibertoni et al. 2004); type locality in Brazil; distribution: Brazil.

64. Pores 2–5 per mm..... 65

64. Pores 5–9 per mm..... 66

65. Basidiocarps pileate, imbricate; basidiospores 2.7–3.1 µm wide.....

..... *F. amanii* (Niemelä) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei semicircular; pileal surface pale brown, glabrous, concentrically zonate; pore surface umber, glancing; pores 4–5 per mm; dissepiments thin, lacerate; mycelial setae and hymenial setae absent; basidiospores broadly ellipsoid, hyaline, thin-walled, 4.6–6 ×

2.7–3.1 μm (Härkönen et al. 2003); on wood of *Allanblackia stuhlamnii;* type locality in Tanzania; distribution: Tanzania.

65. Basidiocarps pileate, stipitate; basidiospores 4 μm wide.....

..... *F. discipodoides* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, stipitate; pilei subdiscoid; pileal surface fawn ferruginous to fuscous ferruginous, rugulose, without crust and cuticle; pores 2–5 per mm; hymenial setae, mycelial setae and cystidioles absent; basidiospores broadly ellipsoid, hyaline, thin-walled, 5.5–6 × 4 μm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

66. Cystidioles present, basidiospores broadly ellipsoid, 3–3.5 μm wide.....

..... *F. incrustaticeps* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei applanate; pileal surface dull chestnut or raw umbe, matted, glabrous, concentrically zonate, with a thin crust; pore surface cinnamon ferruginous; pores 5–9 per mm; mycelial setae and hymenial setae absent; cystidioles present; basidiospores broadly ellipsoid, hyaline, thin-walled, 4–4.5 × 3–3.5 μm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

66. Cystidioles absent, basidiospores subglobose to globose, 3.7–5.5 μm wide..... 67

67. Basidiocarps imbricate, pileal surface not encrusted..... *F. fenea* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate to effused-reflexed, imbricate; pileal surface dull ferruginous brown, concentrically sulcate and zonate, velutinate to glabrous; pore surface dark dingy fulvous cinnamon; pores 5–7 per mm; mycelial setae, hymenial setae and cystidioles absent; basidiospores subglobose or broadly pip-shaped, hyaline, thin-walled, 4.5–5.5 × 3.7–4.5 μm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

67. Basidiocarps pendent, pileal surface encrusted..... *F. griseopora* (Reid) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, pendent, solitary; pileal surface yellowish brown to black, glabrous, concentrically sulcate, encrusted; pore surface ashy gray to brown; pores 7 per mm; hyphal system dimitic; mycelial setae, hymenial setae and cystidioles absent; basidiospores globose, hyaline, 4–5.5 μm in diam (Reid 1976); type locality in Costa Rica; distribution: Costa Rica.

68. Basidiocarps effused-reflexed..... 69

68. Basidiocarps distinctly pileate or pendent..... 79

69. Hymenial setae hooked..... 70

69. Hymenial setae straight..... 72

70. Setae infrequent, basidiospores oblong-ellipsoid, 5–6 µm long.....

..... *F. rufa* (Bres.) Y.C. Dai & F. Wu

Basidiocarps perennial, effused-reflexed; pileal surface black, glabrous and sulcate, without cuticle; pore surface dark brown; pores 5–6 per mm; hyphal system dimitic; mycelial setae absent; hymenial seate rare, hooked, 32–45 × 6.5–8 µm; cystidioles absent; basidiospores oblong-ellipsoid, hyaline, 5–6 × 4–4.5 µm (Larsen and Cobb-Poulle 1990); type locality in Spain; distibution: Canary Islands, Spain.

70. Setae frequent, basidiospores subglobose, 4–5.5 µm long..... 71

71. Pileal surface tomentose..... *F. wahlbergii* (Fr.) T. Wagner & M. Fisch.

Basidiocarps perennial, effused-reflexed; pilei semicircular to shelf-like; pileal surface reddish brown to umber, tomentose; pore surface deep rust to chestnut brown; pores 7–9 per mm; dissepiments thin, entire; margin obtuse; skeletal hyphae septate; hymenial setae hooked, 28–49 × 6–8 µm; cystidioles present; basidiospores subglobose, 4–5.2 × 3.3–4.2 µm, Q = 1.24–1.32 (Dai 2010); type locality in South Africa; distribution: Africa, Europe and Asia.

71. Pileal surface glabrous..... *F. eucalypti* Q. Chen et al.

Basidiocarps perennial, effused-reflexed to pileate; pilei dimidiate; pileal surface blackish brown to black, concentrically sulcate with zones, velutinate to glabrous; pore surface grayish brown to fawn, glancing; pores 6–8 per mm; dissepiments thin, entire; margin obtuse; skeletal hyphae septate; hymenial setae hooked, 25–45 × 5–8 µm; cystidioles present; basidiospores subglobose, 4.3–5.5 × 4–4.5 µm, Q = 1.16–1.22 (Chen et al. 2020); type locality in Australia; distribution: Australia.

72. Pores 2–3 per mm, irregular, sinuous to labyrinthine..... 73

72. Pores 4–8 per mm, regular, angular to round..... 74

73. Basidiospores globose..... *F. labyrinthica* (Soares et al.) Y.C. Dai & F. Wu

Basidiocarps perennial, effused-reflexed or pileate; pilei semicircular; pileal surface dark chocolate brown, velutinate, concentrically sulcate and zonate; pore surface dark chocolate brown; pores labyrinthine and irregular, 2–3 per mm; hyphal system dimitic; hymenial setae subulate, straight, 40–60 × 7–9 µm; basidiospores, globose, hyaline, 5–6 µm in diam (Soares et al. 2018); type locality in Brazil; distribution: Brazil.

73. Basidiospores cylindrical..... *F. caymanensis* Vlasák

Basidiocarps perennial, effused-reflexed; pileal surface yellow-brown, zonate and sulcate; pore surface olivaceous buff to cinnamon; pores irregular, angular to sinuous, 2–3 per mm; dissepiments thin, lacerate to dentate; hyphal system dimitic; mycelial setae absent; hymenial setae subulate, straight, 40–55 × 5–7

µm; cystidioles absent; basidia urniform; basidiospores cylindrical, hyaline, thin-walled, smooth, usually glued in tetrads, IKI–, CB–, (4.3–)4.5–5 × (1.8–)2–2.4(–2.5) µm, L = 4.7 µm, W = 2.2 µm, Q = 2.19 (Vlasák et al. 2020a); type locality in French Guiana; distribution: French Guiana and Costa Rica.

74. Pileal surface cracked, margin lobed..... *F. tawhai* G. Cunn.

Basidiocarps perennial, resupinate to effused-reflexed, imbricate; pileal surface umber to black, glabrous, concentrically sulcate, cracked; margin lobed; pore surface grayish brown to umber; pores 5–7 per mm; hyphal system dimitic; mycelial setae absent; hymenial seate subulate, straight, 30–40 × 6–8 µm; cystidioles present, 6–11 × 3.5–4 µm; basidiospores cylindrical, hyaline, 5–6 × 1.5–2 µm (Larsen and Cobb-Poulle 1990); type locality in New Zealand; distibution: New Zealand.

74. Pileal surface uncracked, margin even..... 75

75. Basidiospores cylindrical..... 76

75. Basidiopsores ellipsoid to subglobose..... 77

76. Setae mostly > 40 µm long, basidiospores 1.5–2 µm wide..... *F. viticola* (Schwein.) Murrill

Basidiocarps perennial, effused-reflexed, often resupinate; pilei dimidiate or shelf-like; pileal surface reddish brown to blackish, sulcate, uncracked; margin even; pore surface yellowish brown; pores 4–7 per mm; mycelial setae absent; hymenial setae straight, 39–55 × 5.5–7 µm; basidiospores cylindric, straight or curved, 5.9–7.7 × 1.6–2 µm (Niemelä 2005); type locality in USA; distribution: North America and Europe.

76. Setae < 40 µm long, basidiospores 2–2.5 µm wide.....

..... *F. macroferrea* (T. Hatt. & Ryvarden) Zmitr. et al.

Basidiocarps perennial, effused-reflexed; pilei ungulate to triquetrous; pileal surface brown to almost black, glabrous, not sulcate, smooth, encrusted, uncracked; margin even; pore surface yellowish to grayish brown; pores 6–8 per mm; dissepiments entire; hymenial setae subulate, straight, 25–40 × 6.5–9 µm; basidiospores cylindric, hyaline, 6.5–7.5 × 2–2.5 µm (Hattori and Ryvarden 1996); type locality in Japan; distribution: Bonin Island, Japan.

77. Setae < 20 µm long; chlamydospores present.... *F. flavomarginata* (Murrill) Groposo et al.

Basidiocarps perennial, effused-reflexed to pileate; pileal surface yellow to dark reddish brown, glabrous, uncracked; margin even; pore surface yellow to yellowish brown; pores 6–7 per mm; dissepiments thick, entire; mycelial satae absent; hymenial setae straight, 16–18 × 6.5–7.5 µm; cystidioles absent; basidiospores ellipsoid, 3.2–4.3 × 2.5–3.2 µm (Larsen and Cobb-Poulle 1990; Groposo et al. 2007); chlamydospores present; type locality in Cuba; distribution: Central America.

77. Setae > 20 µm long; chlamydospores absent..... 78

78. Pileal surface encrusted..... *F. roseocinerea* (Murrill) Q. Chen et al.

Basidiocarps perennial, effused-reflexed; pileal surface yellowish to reddish brown, encrusted with concentrically sulcate, uncracked; margin even; pore surface yellowish brown; pores 5–6 per mm; dissepiments entire; hymenial setae straight, 20–30 × 4–5 µm; cystidioles absent; basidiospores broadly ellipsoid, 4–5 × 3–3.6 µm, Q = 1.3–1.35 (Chen et al. 2020); type locality in Cuba; distribution: Central America.

78. Pileal surface not encrusted..... *F. mesophila* Raymundo et al.

Basidiocarps perennial, effused-reflexed to pileate; pilei triquetrous to conchate; pileal surface brown to grayish brown, velutinous to tomentose, concentrically zonate to sulcate, not encrusted, uncracked; margin even; pores 6–8 per mm; dissepiments thick, entire; hymenial setae straight, 28–40 × 6.5–9 µm; cystidioles absent; basidiospores subglobose to broadly elipsoid, 4–4.8 × 3.2–4 µm (Raymundo et al. 2013a); type locality in Mexico; distribution: Mexico.

79. Hymenial setae hooked..... 80

79. Hymenial setae straight..... 82

80. Pileal surface hispid; basidiospores 2–2.5 µm wide.....

..... *F. semihispida* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei applanate to dimidiate; pileal surface yellowish brown, hispid to scrupose, azonate; pore surface cinnamon to yellow-brown; pores 5–6 per mm; hymenial setae hooked, 30–55 × 7–12 µm; basidiospores subcylindrical, hyaline, thin-walled, 4.5–5 × 2–2.5 µm (Ryvarden 2004); type locality in Dominican Republic; distribution: Dominican Republic.

80. Pileal surface glabrous; basidiospores 3–4 µm wide..... 81

81. Pores 6–8 per mm; Asian species..... *F. australasica* Q. Chen et al.

Basidiocarps perennial, pileate; pilei dimidiate; pileal surface reddish brown, concentrically sulcate with zones, glabrous; margin paler than pore surface; pore surface honey yellow to olivaceous buff, glancing; pores 6–8 per mm; dissepiments thin, entire; margin obtuse to slightly acute; skeletal hyphae septate; hymenial setae hooked, 30–45 × 6–9 µm; cystidioles present; basidiospores broadly ellipsoid to subglobose, 4–5 × 3.3–4 µm, Q = 1.12–1.15 (Chen et al. 2020); type locality in China; distribution: Southern Asia.

81. Pores 8–9 per mm; South American species..... *F. marquesiana* Gibertoni & C.R.S. de Lira

Basidiocarps perennial, pileate; pilei applanate; pileal surface dark brown, glabrous, concentrically sulcate, zonate; margin acute; pore surface pale brown; pores 8–9 per mm; dissepiments thick, entire; context homogeneous; skeletal hyphae aseptate; hymenial setae hooked, 20–30 × 5–11 µm; basidiospores broadly ellipsoid, hyaline, 4–6 × 3–4 µm, L = 4.95 µm, W = 3.85 µm, Q = 1.29 (Yuan et al. 2020); type locality in Brazil; distribution: Brazil.

82. Basidiocarps becoming cherry red in KOH..... *F. lutea* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pileal surface yellowish brown, glabrous, a dark cuticle present; pore surface pale yellowish brown; pores 7–8 per mm; dissepiments thick; context homogeneous, becoming cherry red in KOH; skeletal hyphae aseptate; hymenial setae subulate, straight, 20–30 × 6–8 µm; basidiospores cylindrical to slightly navicular, hyaline, thin-walled, 6.5–8 × 3–3.5 µm (Ryvarden 2004); type locality in Costa Rica; distribution: Costa Rica.

82. Basidiocarps becoming black in KOH..... 83

83. Pores 4–5 per mm, pileal surface encrusted.....

..... *F. terminaliae* (S. Ito & S. Imai) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate to applanate; pileal surface subvelutinous to tomentose, zonate, sulcate, glabrous, encrusted; pores 4–5 per mm; hyphal system dimitic; mycelial setae absent; hymenial seate present, straight; basidiospores oblong-ellipsoid, hyaline, 5–6 × 3–4 µm (Larsen and Cobb-Poulle 1990); type locality in Japan; distibution: Japan.

83. Pores 5–8 per mm, pileal surface not encrusted..... 84

84. Basidiospores cylindrical..... 85

84. Basidiospores broadly ellipsoid..... 86

85. Basidiospores 2.5–3.5 µm wide..... *F. cinchonensis* (Murrill) Bondartseva & S. Herrera

Basidiocarps perennial, pileate; pilei semi-applanate to ungulate; pileal surface reddish brown, glabrous, concentrically sulcate, not encrusted; pore surface golden brown to reddish brown; pores 6–8 per mm; hymenial setae straight, 20–32 × 4–8 µm; basidiospores cylindrical to subcylindrical, hyaline, thin-walled, 6–8 × 2.5–3.5 µm (Ryvarden and Johansen 1980); type locality in Jamaica; distribution: Central America.

85. Basidiospores 2–2.5 µm wide..... *F. cylindrospora* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei flabelliform to semicircular; pileal surface rust brown, glabrous, zonate, not encrusted; pore surface dark brown; pores 6–8 per mm; hymenium setae subulate, straight, 25–35 × 5–12 µm; basidiospores cylindrical to subnavicular, hyaline, thin-walled, 6.5–7 × 2–2.5 µm (Ryvarden 1987); type locality in Panama; distribution: Central America.

86. Basidiocarps subungulate..... *F. torulosa* (Pers.) T. Wagner & M. Fisch.

Basidiocarps perennial, usually pileate; pilei subungulate; pileal surface grayish brown, concentrically sulcate with wide zones, not encrusted; pore surface yellowish brown; pores 6–8 per mm; skeletal hyphae occasionally septate; hymenial setae straight, 27–41 × 5.5–10 µm; cystidioles present; basidiospores broadly ellipsoid, 3.9–5 × 3–4 µm, Q = 1.21–1.28 (Dai 2010); type locality in France; distribution: Europe and Asia.

86. Basidiocarps usually applanate..... 87

87. Pores 7–9 per mm..... *F. senex* (Nees & Mont.) Ghob.-Nejh.

Basidiocarps perennial, pileate; pilei applanate; pileal surface fuscous to black, not encrusted; pore surface ferruginous to almost bay; pores 7–9 per mm; skeletal hyphae septate; mycelial setae absent; hymenial setae straight, 28–37 × 6–10 µm; cystidioles present; basidiospores broadly ellipsoid, 4–4.9 × 3.2–4 µm, Q = 1.13–1.32 (Dai 2010); type locality in Chile; distribution: Pantropical.

87. Pores 5–7 per mm..... *F. coronadensis* (Rizzo et al.) Raymundo et al.

Basidiocarps perennial, pileate, solitary to imbricate; pilei applanate; pileal surface yellowish brown to black, concentrically zonate to sulcate, glabrous to tomentose, not encrusted; pore surface yellowish brown; pores 5–7 per mm; dissepiments thick, entire; hymenial setae straight, 20–32 × 6.4–9 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thin-walled, 3.2–5.6(–6) × 3.2–4 µm (Raymundo et al. 2013a); type locality in USA; distribution: Mexico and North America.

4.10 *Inocutis* Fiasson & Niemelä**,** *Karstenia* 24(1): 24 (1984), (Fig. 1)

Type species: *Inocutis rheades* (Pers.) Fiasson & Niemelä.

Basidiocarps annual, pileate; pileal surface yellowish to brown, hispid, velutinate to rough or glabrous; pore surface yellow to brown; context brown, granular core present in most species; hyphal system monomitic; hymenial setae absent; basidiospores ellipsoid, yellowish to brownish, thick-walled, smooth, IKI–, CB– or CB+ when juvenile; on angiosperm wood; causing a white rot.

Inocutis was, for a long time, included in *Inonotus sensu lato* (Gilbertson and Ryvarden 1986; Ryvarden and Gilbertson 1993; Dai et al. 1997; Ryvarden 2005), but it is a homogeneous genus of its own closely related to *Fomitiporella* (Fig. 1). Both genera have colored and thick-walled basidiospores and lack setae. Characteristics of *Inocutis* are the presence of a granular core in the context and absence of setae, which are deviating features among *Inonotus sensu lato.* Most species of *Inocutis* were transferred from taxa previously treated in *Inonotus* (Fiasson and Niemelä 1984; Dai 2000; Gottlieb et al. 2002; Wagner and Fischer 2002a; Martinez 2006; Baltazar et al. 2010b), while *I. subdryophila* Y.C. Dai & H.S. Yuan was directly described in *Inocutis* (Dai and Yuan 2005). No DNA sequences are available for some species.

The following taxa previously treated in *Inonotus* have morphological characteristics that fit *Inocutis*, and the following combinations are proposed:

Inocutis dentata (Decock & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839970.

Basionym: *Inonotus dentatus* Decock & Ryvarden, in Ryvarden, *Syn. Fung.* 15: 73 (2002).

Inocutis mikadoi (Lloyd) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839971.

Basionym: *Polyporus mikadoi* Lloyd, *Mycol. Writ.* 4(Letter 43): 3 (1912).

≡ *Inonotus mikadoi* (Lloyd) Gilb. & Ryvarden, *in Núñez & Ryvarden, Syn. Fung.*13: 79 (2000).

Inocutis tenuicarnis (Pegler & D.A. Reid) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839972.

Basionym: *Inonotus tenuicarnis* Pegler & D.A. Reid, *Trans. Br. mycol. Soc.* 47(2): 172 (1964).

Key to species of *Inocutis*

1. Context with a granular core———————————————————————— 2

1. Context without a granular core———————————————————————— 9

2. Basidiospores mostly < 4 µm wide———————— *I. ludoviciana* (Pat.) T. Wagner & M. Fisch.

Basidiocarps annual, pileate; pilei triquetrous to flabelliform; pileal surface rust brown, warted; pore surface cinnamon to clay buff; pores 2–3 per mm; dissepiments thin, entire; context with a granular core; hyphal system monomitic; basidiospores ellipsoid, rust brown, thick-walled, IKI–, CB–, (4.8–)5–6(–6.2) × (3–)3.2–4(–4.2) µm, L = 5.48 µm, W = 3.67 µm, Q = 1.49 (Dai 2010); type locality in USA; distribution: North America and Asia.

2. Basidiospores mostly > 4 µm wide———————————————————————— 3

3. Context with a rudimentary core———————————— *I. jamaicensis* (Murrill) A.M. Gottlieb et al.

Basidiocarps annual, pileate, effused-reflexed, solitary or imbricate; pilei semicircular or elongated, broadly attached; pileal surface reddish brown to dark reddish brown, velutinate to glabrous, encrusted; pores 3–5 mm; context with a rudimentary core; hyphal system monomitic; basidiospores broadly ellipsoid, reddish brown to chestnut, thick-walled, IKI–, CB–, 6.5–7.3 × 4.4–5 µm, Q = 1.45 (Rajchenberg and Wright 1998); type locality in Jamaica; distribution: Jamaica and Arizona, USA.

3. Context with a distinct granular core---------- 4

4. Gloeoplerous hyphae present---------- *I. dryophila* (Berk.) Fiasson & Niemelä

Basidiocarps annual, pileate, usually solitary; pilei ungulate; pileal surface buff to reddish brown, tomentose or glabrous, zonate; pore surface buff to dark reddish brown; pores l–3 per mm; dissepiments thin, lacerate; context with a hard granular core; hyphal system monomitic; gloeoplerous hyphae present; basidiospores ellipsoid, brownish, thick-walled, 6–8 × 4.5–6 µm (Ryvarden and Melo 2017); type locality in USA; distribution: Northern Hemisphere.

4. Gloeoplerous hyphae absent---------- 5

5. Pileal surface radially cracked---------- *I. texana* (Murrill) Seb. Martínez

Basidiocarps annual, pileate; pilei ungulate to applanate; pileal surface pale brown to buff, glabrous to radially cracked; pore surface yellowish brown to black; pores 1–3 per mm; dissepiments lacerate; context with a granular core; hyphal system monomitic; gloeoplerous hyphae absent; basidiospores broadly ellipsoid, yellowish brown, thick-walled, 7–10 × 4.5–6 µm (Gilbertson and Ryvarden 1986-1987); type locality in USA; distribution: North America.

5. Pileal surface uncracked---------- 6

6. Basidiospores mostly < 4.8 µm wide, fairly thick-walled---------- 7

6. Basidiospores mostly > 4.8 µm wide, distinctly thick-walled---------- 8

7. Basidiocarps ungulate, pileal surface velutinate---------- *I. subdryophila* Y.C. Dai & H.S. Yuan

Basidiocarps annual, pileate, solitary; pilei ungulate; pileal surface grayish brown to yellowish brown, velutinate to glabrous, uncracked; pore surface grayish brown to yellowish brown; pores 2–4 per mm; dissepiments thin, slightly lacerate; context with a granular core; hyphal system monomitic; gloeoplerous hyphae absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB+ when juvenile, (5.6–)5.7–6.6(–6.8) ´ (3.9–)4–4.8(–4.9) µm, L = 6.08 µm, W = 4.28 µm, Q = 1.38–1.47 (Dai 2010); type locality in China; distribution: West China.

7. Basidiocarps applanate, pileal surface hispid---------- *I. rheades* (Pers.) Fiasson & Niemelä

Basidiocarps annual, pileate, solitary or imbricate; pilei applanate; pileal surface yellowish brown, hispid to rough or glabrous, with indistinct concentric zones, uncracked; pore surface pale yellowish brown to dark brown; pores 2–3 per mm; dissepiments thin, lacerate; context with a granular core; hyphal system monomitic; gloeoplerous hyphae absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (5–)5.5–6.8(–7) ´ (3.7–)4–4.7(–5) µm, L = 6.11 µm, W = 4.14 µm, Q = 1.43–1.52 (Dai 2010); type locality in France; distribution: Northern Hemisphere.

8. Pileal surface yellowish brown; mature basidiospores CB–; on *Tamarix*———————————

———————————————————————————— *I. tamaricis* (Pat.) Fiasson & Niemelä

Basidiocarps annual, pileate, solitary to imbricate; pilei dimidiate or semicircular; pileal surface yellowish brown, hispid to villose, uncracked; pore surface rust brown to dark brown; pores 2–3 per mm; dissepiments thin, lacerate; context with a granular core; hyphal system monomitic; gloeoplerous hyphae absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB–, (6–)6.8–8.2(–8.8) ´ (4.5–)4.8–5.8(–6) µm, L = 7.27 µm, W = 5.17 µm, Q = 1.34–1.46 (Dai 2010); on *Tamarix*; type locality in Algeria; distribution: South Europe, North Africa and Asia.

8. Pileal surface dark umber brown; mature spores CB+; on *Populus*– *I. levis* (P. Karst.) Y.C. Dai

Basidiocarps annual, pileate, solitary; pilei ungulate; pileal surface dark umber brown, villose or rough, uncracked; pore surface pale grayish brown; pores 2–3 per mm; dissepiments fairly thick, entire; context with a granular core; hyphal system monomitic; gloeoplerous hyphae absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (7–)7.3–9.5(–10) ´ (4.7–)5–6.5(–6.8) µm, L = 8.38 µm, W = 5.67 µm, Q = 1.44–1.51 (Dai 2010); on *Populus*; type locality in Kazakhstan; distribution: Central Asia.

9. Basidiocarps becoming cherry red in KOH———— *I. dentata* (Decock & Ryvarden) Y.C. Dai

Basidiocarps annual, pileate with contracted base, becoming cherry red in KOH; pilei dimidiate to semicircular; pileal surface golden brown, velutinate, uncracked; pore surface golden yellow; pores irregular, 1–3 per mm; dissepiments thin, lacerate; context without a granular core; hyphal system monomitic; gloeoplerous hyphae absent; setal elements absent; basidiospores ellipsoid, slightly thick-walled, golden yellow, 4.5–5 × 3–3.5 µm (Ryvarden 2002); type locality in French Guiana; distribution: French Guiana.

9. Basidiocarps becoming black in KOH———————————————————————— 10

10. Dissepiments entire———————————————— *I. mikadoi* (Lloyd) Y.C. Dai & F. Wu

Basidiocarps annual, pileate, imbricate, becoming black in KOH; pilei dimidiate; pileal surface ochraceous brown, radially strigose, concentrically zonate, uncracked; pore surface yellowish brown, slightly glancing; pores 3–5 per mm; dissepiments thin, entire; context without granular core; hyphal system monomitic; gloeoplerous hyphae absent; setal elements absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB(+), (4.8–)4.9–5.4(–5.8) × (3.2–)3.3–4 µm, L = 5.1 µm, W = 3.67 µm, Q = 1.39 (Dai 2010); type locality in Japan; distribution: East Asia.

10. Dissepiments lacerate———————— *I. tenuicarnis* (Pegler & D.A. Reid) Y.C. Dai & F. Wu

Basidiocarps annual, pileate, solitary or imbricate, becoming black in KOH; pilei applanate, flabelliform or dimidiate; pileal surface reddish brown to umber, concentrically zonate, radially striate, glabrous, uncracked; pore surface yellowish brown to umber brown; pores 2–4 mm; dissepiments thin, lacerate;

context without granular core; hyphal system monomitic; gloeoplerous hyphae absent; setal elements absent; basidiospores broadly ellipsoid, rust brown, thick-walled, 5–7(–7.5) × 3.5–4.5 µm (Ryvarden 2005); type locality in India; distribution: tropical Asia.

4.11 ***Inonotopsis*** Parmasto, *Folia Cryptog. Estonica* 2: 12 (1973), (Fig. 1)

Type species: *Inonotopsis subiculosa* (Peck) Parmasto.

Basidiocarps annual, resupinate with extensive rhizomorphs; pore surface grayish brown to brown; hyphal system monomitic; setae absent; basidiospores ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–; on gymnosperm wood; causing a white rot.

Inonotopsis differs from *Inonotus sensu stricto* by its hyaline and thin-walled basidiospores. These characters are present in the genus of *Onnia*, which, however, has pileate to stipitate basidiocarps and robust setae. The phylogenetic position of *Inonotopsis* is very close to *Phellinidium* (Kotl.) Fiasson & Niemelä, as shown by Wagner and Fischer (2002a) with rDNA sequence data. Previously *Inonotopsis exilispora* (Y.C. Dai & Niemelä) Y.C. Dai was addressed in the genus according to morphology, but recent phylogenetic analysis conformed it is a member of Polyporales (Yuan et al. 2017). So far *Inonotopsis* is a monotypic genus.

Inonotopsis subiculosa (Peck) Parmasto, *Folia Cryptog. Estonica* 2: 12 (1973).

Basidiocarps annual, resupinate, soft, easily broken when dry; pore surface hazel brown; margin thinning out, yellowish brown to umber brown, radially fibrous or soft cottony, bearing extensive rhizomorphs; pores 2–4 per mm; dissepiments mostly thin, entire or slightly lacerate; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (5.9–)6.1–7.8(–8) × (3.8–)4–5.1(–5.5) µm, L = 6.8 µm, W = 4.42 µm, Q = 1.44–1.65 (Dai 2010); type locality in USA; distribution: boreal zone of Northern Hemisphere.

4.12 ***Inonotus*** P. Karst., *Meddn Soc. Fauna Flora Fenn.* 5: 39 (1879), (Figs. 1, 37)

Type species: *Inonotus cuticularis* (Bull.) P. Karst.

Basidiocarps annual, rarely perennial, resupinate, effused-reflexed or pileate; pilei yellowish to brown, hispid, velutinate to rough, or glabrous; pore surface brown; context or subiculum homogeneous, brown, corky; hyphal system monomitic in most species; generative hyphae simple septate; tissues darkening in KOH; hymenial setae present or absent, hyphoid setae present in some species; basidiospores ellipsoid to subglobose, hyaline to yellowish or brownish, thin- to thick-walled, smooth, IKI–, CB– or CB+; on angiosperm and gymnosperm wood; causing a white rot.

In this study, *Cylindrosporus, Flaviporellus, Inocutis, Inonotopsis, Mensularia, Nothonotus, Onnia*, *Pachynotus*, *Pseudoinonotus* and *Rigidonotus* are derived from *Inonotus sensu lato,* and species in the former ten genera are nested into ten clades. In addition, these genera can be distinguished by

morphological characteristics. In our phylogeny (Fig. 1), species in *Inonotus* formed a monophyletic clade, however, *Inonotus* may still be a polyphyletic genus because most species of the genus have not been phylogenetically analyzed.

Inonotus subradiatus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 37, 38, 39)

MycoBank: MB 839973.

Type. — **CHINA**. Xizang Autonomous Region (Tibet), Bomi, on fallen angiosperm trunk, 20.VII.2019, Dai 20201 (holotype, BJFC031872).

Etymology. — *Subradiatus* (Lat.): referring to the species similar to *Mensularia radiata.*

Fruiting body. — Basidiocarps annual, pileate, imbricate, soft corky and without distinctive odor or taste when fresh, hard corky and light in weight when dry. Pilei dimidiate to triquetrous, projecting up to 3 cm, 7 cm wide and 1.6 cm thick at base. Pileal surface luteous to buff when fresh, becoming cinnamon, honey yellow to black at base when dry, azonate, velutinate to glabrous; margin rounded. Pore surface cream to pale buff when fresh, clay buff when dry; pores circular to angular, 4–5 per mm; dissepiments fairly thick, matted, entire. Context fulvous, woody hard, azonate, up to 1.5 cm thick, a thick black crust present at pileal surface. Tubes clay buff, hard corky when dry, up to 0.6 mm long.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue darkening but otherwise unchanged in KOH.

Context. — Generative hyphae yellowish, slightly thick-walled with a wide lumen, frequently simple septate, occasionally branched, often collapsed, regularly arranged, 5–10 µm in diam; hyphoid setae absent.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin-walled, frequently simple septate, occasionally branched, strongly flexuous, strongly interwoven, 3–5 µm in diam; hyphae at dissepiments sometimes with a globose cap; hyphoid setae prominent, thick-walled with a narrow lumen and a sharply pointed tip, embedded in trama, not penetrating into hymenium, 95–147 × 9–14 µm; hymenial setae ventricose, thick-walled, golden brown, 25–35 × 7–10 µm; fusoid cystidioles present, hyaline, 10–14 × 2.5–4 µm; basidia pyriform, with four sterigmata and a simple basal septum, 9–16 × 5.5–8 µm; basidioles in shape similar to basidia, but smaller.

Spores. — Basidiospores oblong-ellipsoid, yellowish, thick-walled, smooth, sometimes with a guttule, IKI–, CB–, 5.3–6.5 × 3.8–4.2 µm, L = 5.95 µm, W = 4.02 µm, Q = 1.48 (n = 30/1).

Remarks. — Inonotus subradiatus resembles *Mensularia radiata* in the field, but the latter species lacks hyphoid setae, and has hooked hymenial setae and cyanophilous basidiospores measuring 3.8–5 × 2.6–3.5 µm. Phylogenetically *I. subradiatus* is related to *I. hispidus* which, however, has coarsely hispid pileal surface and distinctly bigger basidiospores measuring 8.3–10 × 7.2–8.8 µm (Dai 2010).

Inonotus vietnamensis Y.C. Dai & F. Wu, **sp. nov.** (Figs. 37, 40, 41)

MycoBank: MB 839974.

Type. — **VIETNAM**. Hochiminh, Independent Palace, on living tree of *Prunus*, 10.X.2017, Dai 18288 (holotype, BJFC025811).

Etymology. — *Vietnamensis* (Lat.): referring to the country of Vietnam.

Fruiting body. — Basidiocarps perennial, pileate, a few imbricate, hard corky and without distinctive odor or taste when fresh, woody hard and medium in weight when dry. Pilei ungulate to triquetrous, projecting up to 3 cm, 4 cm wide and 2 cm thick at base. Pileal surface cinnamon to fulvous when dry, concentrically zonate, glabrous; margin blunt, saffron when dry. Pore surface fulvous when dry; pores circular, 9–10 per mm; dissepiments thin, entire. Context umber, woody hard, distinctly zonate, up to 1 cm thick, a thick crust present at pileal surface. Tubes fulvous, brittle when dry, up to 1.5 cm long, indistinctly stratified, white mycelial strands present in old tubes.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae yellowish, fairly thick-walled with a wide lumen, frequently simple septate, unbranched, regularly arranged, 3–4 µm in diam; hyphoid setae prominent but not dominant, dark brown, distinctly thick-walled with a narrow lumen to subsolid, apex sharply pointed, up to a few hundreds of µm long, 15–25 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to yellowish, fairly thick-walled, frequently simple septate, occasionally branched, parallel along the tubes, 2.5–3 µm in diam; hyphoid setae prominent, thick-walled with a narrow to wide lumen and a sharply pointed tip, embedded in trama, not penetrating into hymenium, up to 200 µm long, and 10–35 µm in diam at the widest part; hymenial setae present, ventricose, thick-walled, dark brown, 16–27 × 6–8.5 µm; fusoid cystidioles present, 7.5–10 × 3–4 µm; basidia barrel-shaped, with four sterigmata and a simple basal septum, 9–12 × 6–8 µm; basidioles in shape similar to basidia, but smaller.

Spores. — Basidiospores subglobose, hyaline to very pale yellowish, slightly thick-walled, smooth, IKI–, CB–, (4.8–)5–5.8(–6) × (4.2–)4.3–5.3(–5.6) µm, L = 5.23 µm, W = 4.68 µm, Q = 1.06–1.09 (n = 60/2).

Additional specimens (paratypes) examined. — **VIETNAM**. Hochiminh, Independent Palace, on living tree of *Prunus*, 10.X.2017 Dai 18287 (BJFC025810); City Park, on living tree of *Hopea odorata*, 12.X.2017, Dai 18310 (BJFC025833), Dai 18311 (BJFC025834).

Remarks. — *Inonotus vietnamensis* is readily distinguished from other species in the genus by a perennial growing habit, homogeneous context, hyphoid setae present in both context and trama, the presence of hymenial setae, and hyaline to pale yellowish, slightly thick-walled basidiospores. Phylogenetically

Inonotus vietnamensis is related to *I. ungulatus* Ryvarden and *I. henanensis* Juan Li & Y.C. Dai (Fig. 37). However, *I. ungulatus* has annual basidiocarps with big pores 4–5 per mm and lacks setal elements (Ryvarden 2005); *I. henanensis* has annual and resupinate basidiocarps (Li et al. 2007).

Key to species of *Inonotus*

Condensed key

1. Basidiocarps resupinate to nodulose---------- 2

1. Basidiocarps effused-reflexed, pileate or stipitate---------- 3

2. Hyphoid setae absent---------- Key A

2. Hyphoid setae present---------- Key B

3. Hyphoid setae absent---------- 4

3. Hyphoid setae present---------- 5

4. Hymenial setae absent---------- Key C

4. Hymenial setae present---------- Key D

5. Hymenial setae present---------- Key E

5. Hymenial setae absent---------- Key F

Key A. Basidiocarps resupinate, hyphoid setae absent

1. Hymenial setae present---------- 2

1. Hymenial setae absent---------- 4

2. Pores 6–7 per mm; basidiospores 8–9.7 µm long---------- *I. obliquus* (Fr.) Pilát

Basidiocarps annual, resupinate, developing under bark of tree; pore surface brown to dark reddish brown; pores 6–7 per mm; dissepiments entire; subiculum up to 1 mm thick; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 11–24 × 5–8 µm; basidiospores broadly ellipsoid, hyaline, fairly thick-walled, IKI–, CB(+), (7.9–)8–9.7(–9.8) × (4.9–)5–5.7(–6) µm, L = 8.67 µm, W = 5.14 µm, Q = 1.69 (Dai 2010); type locality in Sweden; distribution: Northern Hemisphere.

2. Pores 1–4 per mm; basidiospores 4.5–7.2 µm long---------- 3

3. Pores 1–2 per mm; basidiospores 6.1–7 µm long---------- *I. krawtzewii* (Pilát) Pilát

Basidiocarps annual, resupinate, developing under bark of tree; pore surface grayish brown to dark brown, cracked when dry; pores 1–2 per mm; dissepiments thin, strongly lacerate; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 13–28 × 5–10 µm; basidiospores ellipsoid, yellowish, thick-walled, IKI–, CB– (juvenile ones CB+), (6–)6.1–7(–7.2) × (4.9–)5–5.8(–5.9) µm, L = 6.56 µm, W = 5.33 µm, Q = 1.23 (Zhou et al. 2014b); type locality in Russia; distribution: Europe and North Asia.

3. Pores 2–4 per mm; basidiospores 4.5–5.5 µm long———— *I. japonicus* Ryvarden

Basidiocarps annual, resupinate; pore surface deep reddish brown; pores 2–4 per mm; subiculum up to 1 mm thick; hyphal system monomitic; hyphoid setae absent; hymenial setae present, subulate 17–25 × 5–9 um; basidiospores ellipsoid, hyaline, 4.5–5.5 × 4–4.5 um (Ryvarden 2005); type locality in Japan; distribution: Japan.

4. Basidiospores ellipsoid———— 5

4. Basidiospores subglobose to globose———— 6

5. Pores 3–4 per mm; pore surface glancing———— *I. venezuelicus* Ryvarden

Basidiocarps annual, resupinate, oblique with a pseudopileus, hard and brittle; pore surface dark brown, glancing; pores 3–4 pores per mm; subiculum homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid to ovoid, rust brown, 5–6 × 4.5–5 µm (Ryvarden 1987); type locality in Venezuela; distribution: Venezuela and Panama.

5. Pores 4–6 per mm; pore surface not glancing———— *I. truncatisporus* Corner

Basidiocarps resupinate; pore surface pale rust brown to ochraceous; pores round, 4–6 per mm; subiculum with a distinct black line towards the wood; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, almond-shaped to slightly truncate, pale yellow, 5–6.5 ´ 4–5 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

6. Basidiospores 3–4 µm in diam———— *I. pusillosporus* Ryvarden

Basidiocarps resupinate; pore surface dark brown; pores 6–8 pores per mm; subiculum homogeneous with a black line; hyphal system monomitic; setal elements absent; basidiospores globose, hyaline, 3–4 µm in diam (Ryvarden 2016); type locality in Brazil; distribution: Brazil.

6. Basidiospores 4–6.5 µm in diam or long———— 7

7. Basidiospores 3.5–4.5 µm wide———— *I. galapagosensis* Ryvarden

Basidiocarps annual, resupinate; pore surface yellowish brown to dark brown, glancing; pores 6–8 per mm; subiculum thin; hyphal system monomitic; setal elements absent; basidiospores subglobose, hyaline to very pale yellow, 4–5 × 3.5–4.5 µm (Ryvarden 2012); type locality in Ecuador; distribution: Ecuador.

7. Basidiospores > 4.5 µm wide---------- 8

8. Basidiocarps cushion-shaped with white margin---------- *I. niveomarginatus* H.Y. Yu et al.

Basidiocarps annual, resupinate, cushion-shaped with white margin; pore surface deep olive to dark brown; pores 6–8 per mm; dissepiments thin, entire; hyphal system monomitic; setal elements absent; basidiospores subglobose, yellowish, thick-walled, IKI–, CB–, (4.5–)4.9–5.7(–6) × (4.2–) 4.5–5.2(–5.5) µm, L = 5.35 µm, W = 4.95 µm, Q = 1.06 (Yu et al. 2013); type locality in China; distribution: tropical China.

8. Basidiocarps even with yellow margin ---------- 9

9. Pore surface glancing, pores 7–8 per mm---------- *I. costaricensis* Ryvarden

Basidiocarps annual, resupinate; pore surface grayish brown, glancing; margin yellow; pores 7–8 per mm; subiculum very thin to almost lacking; hyphal system monomitic; setal elements absent; basidiospores globose, pale yellow, slightly thick-walled, 5.5–6.5(–7) µm in diam (Ryvarden 2002); type locality in Costa Rica; distribution: Costa Rica.

9. Pore surface not glancing, pores 5–7 per mm---------- *I. globosporus* Ryvarden

Basidiocarps annual, resupinate; pore surface cinnamon to rust brown; margin yellow; pores 5–7 per mm; subiculum very thin to almost lacking; hyphal system monomitic; setal elements absent; basidiospores globose, hyaline, slightly thick-walled, 4.5–6 µm (Ryvarden 2018); type locality in Mozambique; distribution: Mozambique.

Key B. Resupinate, hyphoid setae present

1. Hymenial setae absent---------- 2

1. Hymenial setae present---------- 4

2. Basidiospores globose---------- *I. sousae* (Ryvarden et al.) Oliveira-Filho & Gibertoni

Basidiocarps perennial, resupinate; pore surface dark umber brown; pores 7–8 per mm; hyphal system dimitic; hyphoid setae abundant in trama, 85 × 4–6 µm; hymenial setae absent; basidiospores globose, yellow, thick-walled, IKI–, CB–, 4.5–5 µm in diam (Gomes-Silva et al. 2012); type locality in Brazil; distribution: Brazil.

2. Basidiospores ellipsoid or navicular---------- 3

3. Pores 5–7 per mm---------- *I. navisporus* Ryvarden

Basidiocarps annual, resupinate; pore surface rust brown; pores 5–7 per mm; hyphal system monomitic; hyphoid setae scattered in the trama, 200 × 8–15 µm; hymenial setae absent; basidiospores ellipsoid to

navicular, pale yellowish, slightly thick-walled, 9–11 × 4.8–6 µm (Ryvarden 2005); type locality in Australia; distribution: Australia.

3. Pores 3–4 per mm———— *I. boninensis* T. Hatt. & Ryvarden

Basidiocarps resupinate, woody hard; pore surface dark brown; pores 3–4 per mm; dissepiments thin; subiculum up to 1 mm thick; hyphal system monomitic; hyphoid setae present in trama and subiculum, 100–300 × 10–25 µm; hymenial setae absent; basidiospores ellipsoid, hyaline to pale brown, 9.5–12 × 5–7.5 µm, Q = 1.5–2 (Hattori and Ryvarden 1993); type locality in Japan; distribution: Japan.

4. Pores 1–4 per mm———— 5

4. Pores 4–9 per mm———— 7

5. Pores daedaloid; growing at wood surface———— *I. chihshanyenus* T.T. Chang & W.N. Chou

Basidiocarps annual, resupinate; pore surface pale to dark brown; pores irregular and daedaloid, 1–3 per mm; hyphal system monomitic; hyphoid setae present subiculum and trama, 100–280 × 10–30 µm; hymenial setae fusiform, 25–60 × 5–10 µm; basidiospores broadly ellipsoid to subglobose, hyaline to pale brown, 6.5–9 × 5–6.5 µm (Chang and Chou 1998); on *Melicope*; type locality in China; distribution: East China.

5. Pores angular; growing inside tree cavities or under bark———— 6

6. Growing under bark of *Quercus*———— *I. andersonii* (Ellis & Everh.) Černý

Basidiocarps annual, resupinate, developing under bark of tree; pore surface grayish brown to dark brown, cracked when dry; pores 2–4 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphoid setae present, 4–8 µm in diam; hymenial setae subulate to ventricose, 12–26 × 5–9 µm; basidiospores ellipsoid, yellowish, thick-walled, IKI–, CB– (juvenile ones CB+*),* 5–8 × 4–5.5 µm (Lowe 1966); on *Quercus*; type locality in USA; distribution: North America.

6. Growing inside tree cavities of *Populus*———— *I. iliensis* Kravtzev

Basidiocarps perennial, resupinate, growing inside tree cavities; pore surface tobacco brown; pores 3–4 per mm; hyphal system monomitic; hyphoid setae present in subiculum, 80–120 × 8–10 µm; hymenial setae 20–40 × 4–6 µm; basidiospores ellipsoid, pale yellowish, 4–7.5 × 4–5.5 µm (Ryvarden 2005); on *Populus*; type locality in Kazakhstan; distribution: Central Asia.

7. Basidiospores 4–4.5 µm long———— *I. magnisetus* Y.C. Dai

Basidiocarps annual, resupinate; pore surface cinnamon to cinnamon buff; pores 5–6 per mm; dissepiments entire to lacerate; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae scanty in subiculum, prominent but not dominant in trama, 300 × 9–15 µm; hymenial setae 22–43

× 7–8 μm; basidiospores subglobose to globose, yellowish, fairly thick-walled, IKI–, CB–, (3.9–)4–4.5(–4.9) × (3.6–)3.7–4(–4.1) μm, L = 4.24 μm, W = 3.91 μm, Q = 1.06–1.07 (Dai 2010); type locality in China; distribution: South China.

7. Basidiospores > 5 μm long---------- 8

8. Basidiospores ellipsoid to broadly ellipsoid---------- 9

8. Basidiospores subglobose to globose---------- 12

9. Pores 4–6 per mm; basidiospores 6.3–7.2 μm wide---------- *I. griseus* L.W. Zhou

Basidiocarps annual, resupinate; pore surface grayish brown to dark gray, glancing, cracked; pores 4–6 per mm; dissepiments thick, entire; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present, 100–200 × 4–10 μm; hymenial setae 12–32 × 5.5–11 μm; basidiospores ellipsoid, hyaline, slightly thick-walled, IKI–, CB+, (8.5–)9–10.5(–11) × (6–)6.3–7.2 μm, L = 9.7 μm, W = 6.74 μm, Q = 1.44 (Zhou and Wang 2015); type locality in China; distribution: China.

9. Pores 6–8 per mm; basidiospores 4.3–6 μm wide---------- 10

10. Basidiocarps perennial; African species---------- *I. rwenzorianus* Balezi & Decock

Basidiocarps perennial, resupinate; pore surface umbrinous; pores 6–7 per mm; hyphal system monomitic; hyphoid setae present in trama, 135–240 μm long; hymenial setae ventricose, 13–20 × 4.5–8 μm; basidiospores ellipsoid, hyaline to pale yellow, thick-walled, IKI–, (6.5–)6.5–8.5(–8.8) × (4.3–)4.3–5.5(–5.5) μm (Balezi and Decock 2009); type locality in Congo; distribution: Congo.

10. Basidiocarps annual; Asian or Australian species---------- 11

11. Hyphoid setae present in subiculum and trama; basidiospores 7–8.5 μm long----------

---------- *I. setulosocroceus* (Cleland & Rodway) P.K. Buchanan & Ryvarden

Basidiocarps annual, resupinate; pore surface deep yellowish brown; pores 6–8 per mm; subiculum homogeneous; hyphal system monomitic; hyphoid setae present in subiculum and trama, 250 × 5–14 μm; hymenial setae ventricose, 17–30 × 5.5–11.5 μm; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI–, 7–8.5 × 5–6 μm (Núñez and Ryvarden 2000); type locality in Australia; distribution: Australia and Japan.

11. Hyphoid setae present in trama only; basidiospores 5–7 μm long---- *I. perchocolatus* Corner

Basidiocarps annual, resupinate; pore surface fuscous chocolate brown; pores 6–9 per mm; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present in trama, 40–110 × 4–10 μm; hymenial setae present, 10–25 × 5–10 μm; basidiospores ellipsoid, thin-walled, pale yellow, 5–7 × 4.5–5.5 μm (Corner 1991); type locality Singapore; distribution: Singapore.

12. Basidiospores 8–12 µm wide---------- 13

12. Basidiospores 4.5–8 µm wide---------- 14

13. Hymenial setae present at dissepiments only---------- *I. multisetifer* Abrahão & Gugliotta

Basidiocarps annual, resupinate; pore surface ochraceous to brown; pores 6–9 per mm; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present, 100–200 × 9–16 µm; hymenial setae present at dissepiments, 34–45 × 9–10 µm; basidiospores globose to subglobose, pale yellow, thick-walled, 8.8–11.3 × 8.8–10 µm (Abrahão and Gugliotta 2012); type locality in Brazil; distribution: Brazil.

13. Hymenial setae present in dissepiments and trama---------- *I. micantissimus* (Rick) Rajchenb.

Basidiocarps annual, resupinate; pore surface dark sienna to chestnut, often with a bluish tint; pores 5–7 per mm; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present in trama and dissepiments, 160–300 × 10–15 µm, swelling up to 25 µm wide in KOH; hymenial setae lanceolate, 20–32 × 5–9 µm; basidiospores globose to subglobose, drop-shaped, yellowish, thick-walled, 10–13 × 8–12 µm (Rajchenberg 1987); type locality in Brazil; distribution: Neotropics.

14. Growing on wood surface---------- 15

14. Growing under bark or inside tree cavities---------- 17

15. Pores 4–5 per mm---------- *I. pegleri* Ryvarden

Basidiocarps annual, resupinate; pore surface umber; pores 4–5 per mm; dissepiments thick; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present in trama, 120–500 × 5–25 µm; hymenial setae present, 18–30 × 6–9 µm; basidiospores globose, pale yellowish, slightly thick-walled, 6–7 µm in diam (Ryvarden 2005); type locality in Tanzania; distribution: East Africa.

15. Pores 6–9 per mm---------- 16

16. Pores 7–9 per mm; basidiospores 7–8 µm in diam---------- *I. adnatus* Ryvarden

Basidiocarps annual, resupinate; pore surface ochraceous; pores 7–9 per mm; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present, 150 × 10–25 µm; hymenial setae ventricose, 20–45 × 7–16 µm; basidiospores globose, slightly thick-walled, 7–8 µm in diam (Ryvarden 2004); type locality in Costa Rica; distribution: Costa Rica and Brazil.

16. Pores 6–7 per mm; basidiospores 5.5–6.5 µm long---------- *I. henanensis* Juan Li & Y.C. Dai

Basidiocarps annual, resupinate; pore surface ash gray to yellowish brown, glancing; pores 6–7 per mm; dissepiments thin, entire; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae prominent, 200–300 × 8–13 µm; hymenial setae 16–22 × 6.5–8 µm; cystidioles present; basidiospores

subglobose, hyaline, thin-walled, CB–, IKI–, (5–)5.5–6.5(–7) × 4.5–5.7(–6) µm, L = 5.9 µm, W = 5.15 µm, Q = 1.13–1.16 (Li et al. 2007); type locality in China; distribution: China.

17. Hyphoid setae embedded in hymenium---------- *I. ulmicola* Corfixen

Basidiocarps annual, resupinate, growing under bark of tree; pore surface brown to grayish brown, glancing; pores 5–6 per mm; subiculum up to 1 mm; hyphal system monomitic; hyphoid setae present, 230 × 7–15 µm; hymenial setae ventricose, 13–28 × 5–10 µm; tramal setae present in the dissepiments, 18–45 × 4–6 µm; basidiospores subglobose, pale yellow, (8.2–)8.8–10.3(–11.1) × (6.3–)6.7–7.8(–8) µm, L = 9.6 µm, W = 7.2 µm, Q = 1.3 (Niemelä 2005); type locality in Sweden; distribution: Europe.

17. Hyphoid setae projecting out of hymenium---------- *I. nidus-pici* Pilát

Basidiocarps annual, resupinate, growing on the ceiling in tree cavities developed by fungal rot, with a hole opening crowned with yellow, later black, sterile conks; pore surface olivaceous to brown; pores 5–6 per mm; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae present, 100–400 × 5–15 µm; hymenial setae few, fusiform, 20–25 × 8–10 µm; basidiospores subglobose, pale brown, 6.5–9 × 5.5–7 µm; chlamydospores present (Ryvarden 2005); type locality in Croatia; distribution: Europe.

Key C. Pileate or stipitate, setal elements absent

1. Context duplex---------- 2

1. Context homogeneous---------- 4

2. Pores 1–3 per mm; basidiospores 9.6–11 µm long------ *I. plorans* (Pat.) Bondartsev & Singer

Basidiocarps annual, pileate, solitary; pilei applanate or dimidiate; pileal surface cinnamon, velutinate; pore surface dark brown to umber brown; pores 1–3 per mm; dissepiments thin, lacerate; context duplex; hyphal system monomitic; setal elements absent; basidiospores broadly ellipsoid, golden brown, thick-walled, IKI–, CB–, (9–)9.6–11(–11.5) ´ (7.8–)8–9.1(–9.4) µm, L = 10.2 µm, W = 8.34 µm, Q = 1.21–1.22 (Dai 2010); type locality in Algeria; distribution: North Africa and Central Asia.

2. Pores 4–6 per mm; basidiospores 4.5–7.2 µm long---------- 3

3. Basidiocarps pileate; basidiospores 4.5–5 µm long----- *I. ryvardenii* J.R. Sharma & D. Mishra

Basidiocarps annual, pileate, solitary or imbricate; pilei dimidiate to ungulate; pileal surface yellowish brown to dark brown, coarsely hispid, tomentose; pore surface chestnut brown; pores 5–6 per mm; context duplex; hyphal system monomitic; setal elements absent; basidiospores broadly ellipsoid, hyaline to pale yellowish, thin- to moderately thick-walled, 4.5–5(–5.5) × 3–4 um (Sharma et al. 2013); type locality in India; distribution: India.

3. Basidiocarps effused-reflexed; basidiospores 5.5–7.2 µm long------ *I. serranus* Robledo et al.

Basidiocarps annual, effused-reflexed; pilei small; pileal surface dark chocolate brown, velutinate to tomentose; pore surface dark brown, glancing; pores 4–6 per mm; dissepiments thin, entire; context duplex, present a black line; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, pale brown, thick walled, IKI–, 5.5–7.2 × 4–5 µm (Robledo et al. 2003); type locality in Argentina; distribution: Argentina.

4. Pores 8–12 per mm———— 5

4. Pores 0.5–6 per mm———— 6

5. Basidiocarps pileate, pores 10–12 per mm———— *I. minutoporus* Ryvarden

Basidiocarps annual, pileate, solitary; pilei dimidiate to spatulate; pileal surface deep rust brown, dull, velutinate; pore surface dark brown; pores 10–12 per mm; context homogenous; hyphal system monomitic; setal elements absent; basidiospores globose, rust brown, thick-walled, 5.5–6.5 µm in diam (Ryvarden 2005); type locality in Thailand; distribution: Thailand.

5. Basidiocarps pileate to stipitate, pores 8–10 per mm———— *I. novoguineensis* Ryvarden

Basidiocarps annual, pileate to stipitate, solitary to imbricate; pileal surface deep umber to rust brown, fibrose, tuberculate to warted; stipe up to 4 cm long; pore surface deep grayish to rust brown; pores 8–10 per mm; context homogenous; hyphal system monomitic; setal elements absent; basidiospores globose, rust brown, thick-walled, 6–7 µm in diam (Ryvarden 2005, 2020a); type locality in Papua New Guinea; distribution: Papua New Guinea.

6. Basidiospores hyaline———— 7

6. Basidiospores colored———— 10

7. Basidiocarps stipitate, pores 1–2 per mm———— *I. magnus* Y.C. Dai & Hai J. Li

Basidiocarps annual, centrally stipitate; pilei circular; pileal surface cinnamon to fuscous, velutinate; pore surface yellowish brown to cinnamon; pores 1–2 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, hyaline, slightly thick-walled, IKI–, CB–, 6–8.9(–9) × (4.5–)4.9–6(–6.5) µm, L = 8.19 µm, W = 5.49 µm, Q = 1.49 (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

7. Basidiocarps pileate, pores 2–5 per mm———— 8

8. Pileal surface without a cuticle; basidiospores 5–6.5 µm long———— *I. pirisporus* Pegler

Basidiocarps annual, pileate, solitary or imbricate; pilei applanate to dimidiate; pileal surface yellowish brown to cinnamon, glabrous, without a cuticle; pore surface rust to umber brown; pores 2–4 per mm; dissepiments thin; context homogeneous; hyphal system monomitic; setal elements absent;

basidiospores subglobose to pyriform, hyaline, thin-walled, 5–6.5 × 3.5–4.5 µm (Pegler 1964); type locality in Australia; distribution: Australia.

8. Pileal surface with a cuticle; basidiospores 4–5 µm long---------- 9

9. Pores 3–5 per mm; basidiospores 3–3.5 µm wide---------- *I. albomarginatus* Corner

Basidiocarps annual, pileate; pilei applanate to dimidiate; pileal surface fawn brown to blackish, subtuberculate with small warts, matted with a thin cuticle; pore surface fuscous brown; pores 3–5 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, hyaline, thin-walled, 4–5 × 3–3.5 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

9. Pores 2–3 per mm; basidiospores 2.5–3 µm wide---------- *I. zimbabwensis* Ryvarden

Basidiocarps annual, pileate; pileal surface cinnamon to dark brown, velutinate or tomentose, a thin black cuticle present at pileal surface; pore surface dark brown; pores 2–3 per mm; dissepiments slightly lacerate; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores subcylindrical to oblong-ellipsoid, hyaline, 4–5 ´ 2.5–3 um (Ryvarden 2019); type locality in Zimbabwe; distribution: Zimbabwe.

10. Basidiospores < 3 µm wide---------- 11

10. Basidiospores > 3 µm wide---------- 13

11. Pileal surface with a cuticle; pores 2–4 per mm---------- *I. shoreae* (Wakef.) Ryvarden

Basidiocarps annual, pileate, solitary to imbricate; pilei dimidiate to flabelliform; pileal surface dark brown, glabrous with scattered tubercles, with a cuticle; pore surface gray to yellowish brown; pores 2–4 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, golden brown, thin-walled, 3.5–5 × 2.5–3 µm (Ryvarden 2005); type locality in India; distribution: India.

11. Pileal surface without a cuticle; pores 4–6 per mm---------- 12

12. Basidiospores 2.5–3 µm wide ---------- *I. austropusillus* Ryvarden

Basidiocarps minute, pileate; pilei flabelliform to semipendent; pileal surface yellowish brown, glabrous; pore surface rust to umber; pores 4–6 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, hyaline to pale yellow, 3–4.5 × 2.5–3 µm (Ryvarden 2005); type locality in Japan; distribution: Japan.

12. Basidiospores 1.8–2 µm wide---------- *I. microsporus* Ryvarden

Basidiocarps annual, pileate, imbricate; pileal surface yellowish brown, velutinate, zonate; pore surface yellowish brown; pores 4–6 per mm; context homogeneous; hyphal system monomitic; setal elements

absent; basidiospores ovoid, pale yellowish, thin-walled, 3–3.5 × 1.8–2 µm (Ryvarden 1999); type locality in Zimbabwe; distribution: Zimbabwe.

13. Pores 4–6 per mm---------- 14

13. Pores 0.5–4 per mm---------- 20

14. Context with a mycelial core---------- *I. ungulatus* Ryvarden

Basidiocarps annual, pileate, solitary or imbricate; pilei applanate; pileal surface reddish brown, glabrous, with a thin black cuticle; pore surface yellowish brown, glancing; pores 4–5 per mm; context with a mycelial core; hyphal system monomitic; setal elements absent;

basidiospores ellipsoid, brownish, thick-walled, 5–6 × 4–5 µm (Ryvarden 2005); type locality in Australia; distribution: Australia.

14. Context without a mycelial core---------- 15

15. Basidiospores 7–8 µm long---------- *I. neotropicus* Ryvarden

Basidiocarps annual, pileate; pilei dimidiate to semicircular; pileal surface rust brown, tomentose, concentrically zonate; pore surface rust brown; pores 4–5 per mm; dissepiments entire; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores subglobose, brown, thick-walled, 7–8 × 6–7 µm (Ryvarden 2002); type locality in Panama; distribution: Central America.

15. Basidiospores 4–7 µm long---------- 16

16. Pileal surface striate---------- *I. pusillus* Murrill

Basidiocarps annual, pileate, minute; pilei flabelliform, up to 2 mm wide; pileal surface rust to dark brown, striate; pore surface rust to umber; pores 4–6 per mm; context very thin to almost lacking; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, pale yellow, 4.5–6 × 3.5–4.5 µm (Ryvarden 2005). Type locality in Mexico; distribution: Mexico and Belize.

16. Pileal surface with a cuticle---------- 17

17. Basidiocarps pileate to stipitate; basidiospores 5–7 µm long---------- 18

17. Basidiocarps pileate; basidiospores 4.5–5.5 µm long---------- 19

18. Basidiospores 4.5–6 µm wide---------- *I. euphoriae* (Pat.) Ryvarden

Basidiocarps pileate to stipitate, solitary to imbricate; pilei dimidiate to flabelliform; pileal surface grayish brown to dark brown, sulcate, with a cuticle; stipe with decurrent pores; pore surface yellowish brown to dark brown; pores 4–6 per mm; dissepiments thick; context homogeneous; hyphal system monomitic;

setal elements absent; basidiospores broadly ellipsoid to subglobose, pale brown, thin-walled, IKI–, (4–)5–7 × (4–)4.5–6 µm (Ryvarden 2005); type locality in Vietnam; distribution: tropical Asia and Africa.

18. Basidiospores 3–4 µm wide---------- *I. flammans* (Berk.) Ryvarden

Basidiocarps pileate to stipitate, solitary or imbricate; pilei dimidiate to flabelliform; pileal surface dark brown to black, sulcate, with a cuticle; stipe with strongly decurrent pores; pore surface yellowish brown to gray-brown; pores 4–5 per mm; dissepiments thick; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores broadly ellipsoid, pale brown, thin-walled, 6–7 × 3–4 µm (Ryvarden 2005); type locality in India; distribution: Asia and Africa.

19. Pileal surface without cream-white zone; cystidioles absent------ *I. poncei* (Lloyd) Ryvarden

Basidiocarps annual, pileate, solitary; pilei dimidiate to flabelliform; pileal surface dark brown with a black cuticle; pore surface gray to yellowish brown; pores 4–6 per mm; context homogeneous; hyphal system monomitic; setal elements absent; cystidioles absent; basidiospores subglobose, golden brown, thick-walled, 4.5–5.5 × 3.5–4.5 µm (Ryvarden 2005); type locality in Philippines; distribution: tropical Asia and Australia.

19. Pileal surface with cream-white zone; cystidioles present---------- *I. cremeicinctus* Corner

Basidiocarps annual, pileate, solitary or imbricate; pilei applanate to dimidiate; pileal surface ferruginous with a black cuticle, broad cream-white zone present; pores 4–6 per; context homogeneous; hyphal system monomitic; setal elements absent; cystidioles present, 10–18 × 4–7 µm; basidiospores broadly ellipsoid, dark ferruginous, slightly thick-walled, 4.5–5.5 × 4–4.5 µm (Corner 1991); type locality in Singapore; distribution: Singapore.

20. Basidiospores oblong-ellipsoid to cylindrical---------- *I. fushanianus* T.T. Chang

Basidiocarps annual, pileate to stipitate, solitary; pilei ungulate to dimidiate; pileal surface yellow to pale brown, glabrous, sulcate with zones; pore surface dark cinnamon brown; pores 1–3 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores oblong-ellipsoid to cylindrical, brown, 6.5–8 × 3–4 µm (Chang 1997); type locality in China; distribution: East China.

20. Basidiospores ellipsoid to subglobose---------- 21

21. Pileal surface with a cuticle, pores 0.5–1 per mm---------- *I. palmicola* Ryvarden

Basidiocarps annual, pileate; pilei dimidiate to triquetrous; pileal surface dark brown, velutinate, tuberculate, a cuticle present; pore surface brown; pores 0.5–1 per mm; dissepiments thin; context homogenous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, rust brown, thick-walled, 7.5–8.5 × 5–6 µm (Ryvarden 1999); type locality in Zimbabwe; distribution: tropical Africa.

21. Pileal surface without a cuticle, pores 1–4 per mm---------- 22

22. Basidiospores 7.2–8.8 µm wide---------- *I. hispidus* (Bull.) P. Karst.

Basidiocarps annual, pileate, solitary; pilei applanate or dimidiate; pileal surface bright brown or golden brown to dark brown, coarsely hispid; pore surface brownish to dark brown; pores 1–3 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores subglobose to broadly ellipsoid, golden brown, distinctly thick-walled, IKI–, CB–, (8–)8.3–10(–11) × (6.5–)7.2–8.8(–9) µm, L = 9.64 µm, W = 7.62 µm, Q = 1.17–1.38 (Dai 2010); type locality in Sweden; distribution: Northern Hemisphere.

22. Basidiospores < 7.2 µm wide---------- 23

23. Basidiocarps fragile---------- *I. clemensiae* Murrill

Basidiocarps annual, pileate, solitary to imbricate, fragile when dry; pilei dimidiate or applanate; pileal surface dark brown to chestnut, velutinate to glabrous, without a cuticle; pores 2–4 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, rust brown to fulvous brown, thick-walled, 5–8 × 4–5.5 µm (Murrill 1908b); type locality in Philippines; distribution: tropical Asia.

23. Basidiocarps corky to brittle or fibrous---------- 24

24. Basidiospores mostly < 7 µm long---------- 25

24. Basidiospores mostly > 7 µm long---------- 26

25. Pileal surface not encrusted; on angiosperm---------- *I. hainanensis* H.X. Xiong & Y.C. Dai

Basidiocarps annual, pileate, imbricate, corky to brittle when dry; pilei dimidiate; pileal surface yellowish brown to umber brown, matted to glabrous, without a cuticle, uncrusted; pore surface yellowish to brownish; pores 3–4 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB(+), 6–7(–7.8) × (3.5–)3.9–4.9(–5.8) µm, L = 6.55 µm, W = 4.19 µm, Q = 1.56 (Xiong and Dai 2008); on angiosperm; type locality in China; distribution: tropical China.

25. Pileal surface encrusted; on *Juniperus*---------- *I. juniperinus* Murrill

Basidiocarps annual, pileate to substipitate, brittle when dry; pilei dimidiate to flabelliform; pileal surface rust to umber brown, glabrous with age, zonate, without a cuticle, encrusted; pore surface deep rust to umber brown; pores 3–4 per mm; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, rust brown, 5–6 × 4–5.5 µm (Ryvarden 2005); on *Juniperus*; type locality in USA; distribution: USA.

26. Context with white to yellow flecks---------- *I. subhispidus* Pegler & D.A. Reid

Basidiocarps annual, pileate; pilei applanate to ungulate, corky when dry; pileal surface rust brown to umber brown, tomentose to hispid; pore surface umber to bay; pores 2–3 per mm; dissepiments thin; context homogeneous, with white to yellow flecks; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, fulvous to rust brown, thick-walled, 7–9 × 5–6.5 µm (Ryvarden 2005); type locality in India; distribution: India, Pakistan and Russia.

26. Context without white to yellow flecks---------- 27

27. Basidiospores mostly 8–10.2 µm long---------- *I. sublevis* Y.C. Dai & Niemelä

Basidiocarps annual, pileate, solitary, corky when dry; pilei applanate or dimidiate; pileal surface grayish brown to dull brown, tomentose to matted; pore surface dark brown; pores 3–4 per mm; dissepiments thick, entire; context homogeneous, without white to yellow flecks; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, brown, thick-walled, IKI–, CB– (juvenile ones CB+), (7–)8–10.2(–11) × (5.5–)6–7.2(–7.7) µm, L = 9.97 µm, W = 6.5 µm, Q = 1.54 (Dai and Niemelä 2006); type locality in China; distribution: tropical China.

27. Basidiospores 7.5–8 µm long---------- *I. afromontanus* Ryvarden

Basidiocarps annual, effused-reflexed, imbricate, brittle when dry; pileal surface reddish brown, hirsute to glabrous with black zones, without a cuticle; pore surface reddish brown; pores 2–3 per mm; dissepiments thin; context homogeneous; hyphal system monomitic; setal elements absent; basidiospores ellipsoid, rust brown, thick-walled, 7.5–8 × 4.5–5 µm (Ryvarden 1999); type locality in Zimbabwe; distribution: East Africa.

Key D. Pileate, hyphoid setae absent, hymenial setae present

1. Context duplex---------- *I. hamusetulus* Ryvarden

Basidiocarps annual, pileate; pilei fan-shaped to flabellate; pileal surface rust to dark brown, tomentose to glabrous; pore surface dark rust brown; pores 5–7 per mm; context duplex with a thin black line below the tomentum; hyphal system monomitic; hyphoid setae absent; hymenial setae present, hooked, 20–30 µm long; basidiospores ellipsoid, yellow, 3–4 × 3–3.5 µm (Hjortstam and Ryvarden 1984); type locality in Nepal; distribution: Nepal.

1. Context homogeneous---------- 2

2. Pores 5–8 per mm---------- 3

2. Pores 1–5 per mm---------- 7

3. Basidiocarps becoming cherry red in KOH---------- 4

3. Basidiocarps becoming black in KOH---------- 5

4. Basidiocarps effused-reflexed, pores 5–6 per mm; basidiospores hyaline———————————

———————————————————————————————— *I. xanthoporus* Ryvarden

Basidiocarps annual, effused-reflexed, cherry red in KOH; pilei semicircular to applanate; pileal surface rust to dark brown, hispid; pore surface yellow; pores 5–6 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, subulate, 30–40 × 4–7 µm; basidiospores oblong-ellipsoid, hyaline, 4–5 × 3–3.5 µm (Lindblad and Ryvarden 1999); type locality in Costa Rica; distribution: Neotropics.

4. Basidiocarps pileate, pores 7–8 per mm; basidiospores golden yellow–– *I. papyrinus* Ryvarden

Basidiocarps annual, pileate, cherry red in KOH; pilei dimidiate to semicircular; pileal surface golden brown, velutinate; pore surface golden yellow; pores 7–8 per mm; context homogenous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 30–55 × 6–12 µm; basidiospores ellipsoid, golden yellow, thick-walled, 3–4 × 2.5 µm (Ryvarden 2005); type locality in Costa Rica; distribution: Costa Rica.

5. Basidiospores 4.2–5 µm long———————————————— *I. acutus* B.K. Cui & Y.C. Dai

Basidiocarps annual, pileate to substipitate, imbricate; pilei applanate to dimidiate; pileal surface cinnamon brown to brownish orange, concentrically zonate with wide zones, glabrous; pore surface grayish brown to fuscous brown, glancing; pores 5–6 per mm; dissepiments thin, entire; context homogeneous; hyphoid setae absent; hymenial setae present, ventricose, 17–30 × 7–12 µm; basidiospores ellipsoid, yellowish to yellow brown, slightly thick-walled, IKI–, CB(+), (4.1–)4.2–5(–5.2) × (2.9–)3–3.8(–3.9) µm, L = 4.6 µm, W = 3.22 µm, Q = 1.4–1.47 (Cui et al. 2011); type locality in China; distribution: tropical China.

5. Basidiospores 5–7.5 µm long———————————————————————————— 6

6. Basidiocarps brittle when dry, pileal surface encrusted; Asian species- *I. diverticuloseta* Pegler

Basidiocarps annual, pileate or attached by a constricted base, imbricate, brittle when dry; pilei dimidiate or fan-shaped; pileal surface reddish brown to dirty reddish brown, hispid or radially strigose, zonate, encrusted; pore surface umber brown to dark brown; pores 5–7 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, ventricose to lanceolate, 24–48 ´ 7–11 µm; basidiospores ellipsoid, pale yellowish, thick-walled, IKI–, CB+, (5.1–)5.5–7.5(–8) ´ (4–)4.2–5.5(–5.6) µm, L = 6.55 µm, W = 4.87 µm, Q = 1.3–1.4 (Dai 2010); type locality in India; distribution: Asia.

6. Basidiocarps fragile when dry, pileal surface not encrusted; American species———————————

———————————————————————————————— *I. pertenuis* Murrill

Basidiocarps annual, pileate, imbricate, fragile when dry; pilei very thin, applanate, dimidiate; pileal surface fulvous to rust brown, radially striate, concentrically zonate, not encrusted; pore surface dark brown; pores 5–8 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 25–45 × 8–15 µm; basidiospores ellipsoid, dark brown, 5–6.5 × 3.5–4.5 µm (Ryvarden 2005); type locality in Cuba; distribution: Central America.

7. Basidiospores hyaline———— 8

7. Basidiospores colored———— 11

8. Pores 1–3 per mm———— 9

8. Pores 3–5 per mm———— 10

9. Basidiocarps with a strong odor when fresh; basidiospores 3–6 µm long————————

———— *I. vitis* A.A. Brown et al.

Basidiocarps annual, effused-reflexed to pileate, imbricate, with strong odor when fresh; pileal surface raw umber to black; pore surface tawny to cinnamon brown, slightly glancing; pores 1–3 per mm, sometimes elongated up to 2.5 mm; dissepiments thin, entire; context homogeneous; tubes usually with several context layers; hyphoid setae absent; hymenial setae present, 18–36 × 4–15 µm; cystidioles fusoid, 13– 19 × 5–7 µm; basidiospores broadly ellipsoid, ellipsoid to subglobose, hyaline, slightly thick-walled, 3–6 × 2–4 µm, L = 3.45 µm, W = 2.4 µm, Q = 1.44 (Brown et al. 2020); on *Vitis*; type locality in USA; distribution: West USA.

9. Basidiocarps without odor when fresh; basidiospores 6.5–8 µm long————————

———— *I. luteocontextus* D.A. Reid

Basidiocarps annual, pileate; pilei ungulate to triquetrous; pileal surface yellow to ochraceous, tomentose, with a cuticle under tomentum; pore surface ochraceous; pores 2–3 per mm; context homogeneous; hyphal system monomitic, gloeoplerous hyphae present; hyphoid setae absent; hymenial setae present, 50–70 × 6–8 µm; basidiospores ellipsoid, hyaline, 6.5–8 × 4–5 µm (Ryvarden 2005); type locality in Australia; distribution: Australia.

10. Pilei flabellate to fan-shaped, pore surface not glancing—— *I. pseudoradiatus* (Pat.) Ryvarden

Basidiocarps annual, pileate; pilei flabellate to fan-shaped; pileal surface rust brown, radially folded, velutinate to glabrous; pore surface dark rust brown; pores 3–5 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 20–40 × 8–12 µm; basidiospores ellipsoid, hyaline, 4–5 × 3–3.5 µm (Ryvarden 2004); type locality in Ecuador; distribution: South America.

10. Pilei flabellate to dimidiate, pore surface glancing————————————

———————————————————— *I. chilanshanus* T.T. Chang & W.N. Chou

Basidiocarps annual, effused-reflexed to pileate, solitary to imbricate; pilei dimidiate; pileal surface brown to chocolate brown, tomentose, velutinate to glabrous, concentrically zonate and sulcate; pore surface chocolate brown to dark brown, glancing; pores 3–5 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 11–20 × 5.5–10 µm; basidiospores broadly ellipsoid, hyaline, 3.5–4.5 × 2.5–3.5 µm (Chang and Chou 2000); type locality in China; distribution: East China.

11. Pores sinuous to daedaloid———————————————— *I. mexicanus* Ryvarden

Basidiocarps annual, pileate; pilei dimidiate to semicircular; pileal surface dark rust brown, radially coarsely fibrous, concentrically zonate; pore surface dark rust brown; pores sinuous to daedaloid, irregular, 1–3 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 15–40 × 5–10 µm; basidiospores ellipsoid, pale yellowish, 6 × 3 µm (Spirin and Ryvarden 2016); type locality in Mexico; distribution: Mexico.

11. Pores angular to circular———————————————————————————— 12

12. Hymenial setae straight———————————————————— *I. agathidis* Corner

Basidiocarps annual, pileate; pilei applanate to dimidiate; pileal surface dark rust brown, strigose villose; pore surface rust brown; pores 3–4 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, straight, 25–40 × 6–10 µm; basidiospores ellipsoid, pale yellow, thin-walled, 5–7 × 4–5.5 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

12. Hymenial setae hooked———————————————————————————— 13

13. Basidiospores 5–6 µm long, dissepiment hyphae encrusted————————————————

———————————————————— *I. fimbriatus* L.D. Gómez & Ryvarden

Basidiocarps annual, pileate; pileal surface deep golden brown, strongly hispid to fimbriate; pore surface deep golden brown; pores 3–4 per mm; context homogeneous; hyphal system monomitic, dissepiment hyphae encrusted; hyphoid setae absent; hymenial setae hooked, 40–50 × 6–11 µm; basidiospores ellipsoid, pale brown, thick-walled, 5–6 × 4–4.5 µm (Gomez and Ryvarden 1985); type locality in Costa Rica; distribution: South America.

13. Basidiospores 6–7.5 µm long, dissepiment hyphae smooth———————— *I. fulvomelleus* Murrill

Basidiocarps annual, pileate; pilei semicircular to applanate; pileal surface rust to dark brown, densely strigose to hispid, zonate; pore surface yellowish to cinnamon brown; pores 4–5 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae hooked, 30–55 × 8–14

µm; basidiospores ellipsoid to short cylindric, golden yellow, 6–7.5 × 4–5 µm (Ryvarden 2005); type locality in Jamaica; distribution: Central America.

Key E. Pileate, hyphoid setae present, hymenial setae present

1. Hyphoid setae branched---------- 2

1. Hyphoid setae unbranched---------- 3

2. Hymenial setae hooked---------- *I. cuticularis* (Bull.) P. Karst.

Basidiocarps annual, pileate, solitary or imbricate; pilei dimidiate to applanate; pileal surface yellowish brown, tomentose to glabrous, rimose, sulcate; pore surface pale brown, glancing; pores 4–5 per mm; dissepiments thin, entire; context duplex, upper tomentum delimited by a darker compact layer; hyphal system monomitic; hyphoid setae present at upper surface, branched; hymenial setae hooked, 16–30 × 6–11 µm; basidiospores broadly ellipsoid, yellowish brown, 6–8 × 4.5–5.5 µm (Ryvarden and Melo 2017); type locality in France; distribution: Northern Hemisphere.

2. Hymenial setae straight---------- *I. farlowii* (Lloyd) Gilb.

Basidiocarps annual, pileate; pilei dimidiate; pileal surface brown, hispid, rimose; pore surface bright yellowish to black; pores 2–4 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; hyphoid setae present at upper surface, branched; hymenial setae present, straight, 27–50 × 8–11 µm; basidiospores broadly ellipsoid, golden yellowish brown, thick-walled, 6–8 × 4.5–6 µm (Gilbertson 1976); on *Salix*; type locality in USA; distribution: Mexico and USA.

3. Context duplex---------- 4

3. Context homogeneous---------- 6

4. Pileal surface encrusted---------- *I. ochroporus* (Van der Byl) Pegler

Basidiocarps annual, pileate, solitary; pilei dimidiate; pileal surface pale brown to dark brown, encrusted; pore surface clay buff to dark brown; pores 5–7 per mm; dissepiments thin, entire; context duplex when young and homogeneous when mature; hyphal system monomitic; hyphoid setae present in context and trama, prominent, 200–300 × 4–17 µm; hymenial setae present, 14–25 × 6–9 µm; basidiospores broadly ellipsoid to subglobose, pale yellowish, thick-walled, IKI–, CB(+), (5.3–)5.8–7 × (4.5–)4.9–6.2(–6.8) µm, L = 6.32 µm, W = 5.43 µm, Q = 1.16 (Dai 2010); type locality in South Africa; distribution: Africa and tropical Asia.

4. Pileal surface not encrusted---------- 5

5. Basidiospores broadly ellipsoid to subglobose, 8.8–10 µm long---------- *I. macrosporus* Ginns

Basidiocarps annual, pileate, solitary; pilei dimidiate to applanate; pileal surface yellowish brown, hirsute, not encrusted; pore surface brown; pores 2–3 per mm; dissepiments thin, lacerate; context duplex; hyphal system monomitic; hyphoid setae present, 87–270 × 10–12 µm; hymenial setae present, 22–37 × 8–10 µm; basidiospores broadly ellipsoid to subglobose, yellowish, thick-walled, (8.4–)8.8–10 × (6.6–) 6.8–8 µm, L = 9.3 µm, W = 7.3 µm, Q = 1.3 (Ginns 2011); type locality in USA; distribution: North America.

5. Basidiospores ellipsoid, 7–9 µm long---------- *I. hemmesii* Gilb. & Ryvarden

Basidiocarps annual, pileate; pileal surface brown, sulcate and zonate, tomentose to glabrous, rimose, not encrusted; pore surface yellowish brown to dark brown; pores 3–4 per mm; context duplex; hyphal system monomitic; hyphoid setae present in trama, absent in context, 170 × 7–10 µm; hymenial setae present, 20–25 × 7.5–10 µm; basidiospores ellipsoid, golden brown, thick-walled, 7–9 × 5.5–7 µm (Gilbertson and Ryvarden 2002); type locality in USA; distribution: Hawaii, USA.

6. Hymenial setae hooked---------- *I. casuarinae* L.S. Bian

Basidiocarps annual, pileate; pilei ungulate; pileal surface lemon yellow to gray, smooth to cracked; pore surface fawn to cinnamon brown; pores 4–6 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama; 250 × 9–12 µm; hymenial setae hooked, 18–28 × 8–10 µm; basidiospores globose to subglobose, hyaline to pale yellowish, slightly thick-walled, IKI–, CB–, (4–)4.5–5.5(–5.7) × (3.8–)4–5 µm, L = 5.05 µm, W = 4.77 µm, Q = 1.07 (Bian et al. 2016b); type locality in China; distribution: tropical China.

6. Hymenial setae straight---------- 7

7. Pores 1–3 per mm---------- 8

7. Pores 4–10 per mm---------- 9

8. Basidiocarps pileate to stipitate, pore surface not pruinose----------

---------- *I. albertinii* (Lloyd) P.K. Buchanan & Ryvarden

Basidiocarps annual, pileate to semistipitate with an eccentric stipe, solitary; pilei dimidiate; pileal surface deep rust brown to umber, hispid to villose or papery; pore surface deep rust brown; pores 1–3 per mm; context homogeneous; hyphal system monomitic; hyphoid setae present in context, trama and dissepiments, 120–140 × 8–12 µm; hymenial setae present, 12–15 × 5–7 µm; basidiospores ellipsoid, brownish, slightly thick-walled, 7–9 × 4.5–5.5 µm (Buchanan and Ryvarden 1988); type locality in Australia; distribution: Australia.

8. Basidiocarps pileate, pore surface pruinose---------- *I. rodwayi* D.A. Reid

Basidiocarps annual, pileate, solitary to imbricate; pilei flabelliform; pileal surface glabrous or tomentose, radially wrinkled or lined; pore surface grayish brown and pruinose; pores 1–2 per mm; context

homogeneous; hyphal system monomitic; hyphoid setae present in trama, up to 13 µm wide; hymenial setae present, 16–26 × 6–9 µm; basidiospores broadly ellipsoid, rust brown, 6–9 × 4.5–6.5 µm (Reid 1957); type locality in Australia; distribution: tropical Asia and Australia.

9. Basidiocarps effused-reflexed———————————————————————————— 10

9. Basidiocarps pileate———————————————————————————————— 11

10. Basidiocarps perennial, pores 7–10 per mm————————————————————

———————————————— *I. fibrosus* (Ryvarden et al.) Oliveira-Filho & Gibertoni

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface brown to black, glabrous, sulcate; pore surface umber to rust brown; pores 7–10 per mm; dissepiment thin; context fibrous, a black zone present between context and the substrate; hyphal system dimitic; hyphoid setae present in trama with a swollen middle part, 90 × 8–15 µm; hymenial setae present, 12–24 × 5–10 µm; basidiospores subglobose to ellipsoid, yellowish, slightly thick-walled, 4–5 × 3–3.5 µm (Gomes-Silva et al. 2012); type locality in Brazil; distribution: Brazil.

10. Basidiocarps annual; pores 5–7 per mm———————————— *I. indurescens* Y.C. Dai

Basidiocarps annual, usually effused-reflexed, imbricate, bone hard when dry; pilei shelf-shaped; pileal surface dark reddish brown to chestnut black, concentrically zonate, glabrous; pore surface chestnut brown to black; pores 5–7 per mm; dissepiments thin, irregularly lacerate; context homogeneous; hyphal system monomitic; hyphoid setae present in trama, prominent but not dominant, 160 × 8–12 µm; hymenial setae present, 21–32 × 6–9 µm; basidiospores ellipsoid, yellowish to rust brown, thick-walled, IKI–, CB+ when juvenile, (3.8–)4–5.7(–6) × (2.8–)3.2–4.1(–4.4) µm, L = 4.76 µm, W = 3.52 µm, Q = 1.31–1.38 (Dai and Zhou 2000); type locality in China; distribution: Southwest China.

11. Basidiospores 7.1–8.7 µm long, hymenial setae infrequent *I. latemarginatus* Y.C. Dai (=*I. canariicola* Y.C. Dai)

Basidiocarps annual, pileate, solitary; pilei applanate to semicircular; pileal surface fuscous to brick, matted tomentose to velutinate, encrusted; pore surface curry yellow to cinnamon buff; pores 4–6 per mm; dissepiments thin, matted, slightly lacerate; context homogeneous; hyphal system monomitic; hyphoid setae absent in context, occasionally present in trama, 200 × 8–15 µm; hymenial setae very rarely present, ventricose, 16–18 × 6–9 µm; basidiospores subglobose, pale yellowish, fairly thick-walled, IKI–, CB(+), (7–)7.1– 8.7(–9.3) × (5.9–)6.2–7.8(–8.8) µm, L = 7.85 µm, W = 7.05 µm, Q = 1.11 (Dai et al. 2011); type locality in China; distribution: tropical China.

11. Basidiospores 4–6.5 µm long, hymenial setae frequent———————————————— 12

12. Basidiocarps perennial, pores 9–10 per mm———————————— *I. vietnamensis* Y.C. Dai

Basidiocarps perennial, pileate, solitary; pilei ungulate to triquetrous; pileal surface cinnamon to fulvous, concentrically zonate, glabrous, encrusted; pore surface fulvous; pores 9–10 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama, 200 × 10–35 µm; hymenial setae frequently present, 16–27 × 6–8.5 µm; basidiospores subglobose, hyaline to pale yellowish, fairly thick-walled, IKI–, CB–, (4.8–)5–5.8(–6) × (4.2–)4.3–5.3(–5.6) µm, L = 5.23 µm, W = 4.68 µm, Q = 1.06–1.09; type locality in Vietnam; distribution: Vietnam.

12. Basidiocarps annual, pores 4–7 per mm---------- 13

13. Pileal surface azonate; basidiospores oblong-ellipsoid---------- *I. subradiatus* Y.C. Dai

Basidiocarps annual, pileate, imbricate; pilei dimidiate to triquetrous; pileal surface honey yellow to black, azonate, glabrous; pore surface clay buff; pores 4–5 per mm; dissepiments thick, entire; context homogeneous; hyphal system monomitic; hyphoid setae present in trama, prominent but not dominant, 95–147 × 9–14 µm; hymenial setae present, 25–35 × 7–10 µm; basidiospores oblong-ellipsoid, yellowish, thick-walled, IKI–, CB–, 5.3–6.5 × 3.8–4.2 µm, L = 5.95 µm, W = 4.02 µm, Q = 1.48; type locality in China; distribution: Southwest China.

13. Pileal surface concentrically sulcate and zonate; basidiospores ellipsoid----------

---------- *I. pseudoglomeratus* Ryvarden

Basidiocarps annual, pileate; pilei dimidiate with contracted base; pileal surface deep brown, glabrous, concentrically sulcate, with a black cuticle with age; pore surface deep rust brown; pores 4–6 per mm; context homogenous; hyphal system monomitic; hyphoid setae present, 150 × 5–14 µm; hymenial setae present, 15–25 × 6–10 µm; basidiospores ellipsoid, yellow, thick-walled, 5–6 × 4–4.3 µm diam (Ryvarden 2005); type locality in Venezuela; distribution: Venezuela and Costa Rica.

Key F. Pileate to stipitate, hyphoid setae present, hymenial setae absent

1. Context duplex---------- 2

1. Context homogeneous---------- 6

2. Hyphoid setae branched---------- 3

2. Hyphoid setae unbranched---------- 4

3. Basidiocarps stipitate; basidiospores 9–12 µm long----------

---------- *I. duostratosus* (Lloyd) P.K. Buchanan & Ryvarden

Basidiocarps annual, stipitate, solitary; pilei fan-shaped to spathulate; pileal surface rust brown, velutinate to glabrous; pore surface ochraceous to rust brown; pores 1–2 per mm; dissepiments thin; context duplex; hyphal system monomitic; hyphoid setae present in trama, forked dicho- or trichotomously at the tip, 250

× 8–14 μm; hymenial setae absent; basidiospores broadly ellipsoid, golden brown, thick-walled, 9–12 × 7–9 μm (Corner 1991); type locality in Singapore; distribution: Singapore and Seychelles.

3. Basidiocarps pileate; basidiospores 6–8 μm long———— *I. munzii* (Lloyd) Gilb.

Basidiocarps annual, pileate, imbricate; pilei applanate to ungulate; pileal surface bright yellowish brown to reddish brown, tomentose to glabrous, rimose; pore surface yellowish brown; pores 2–4 per mm; dissepiments thin, lacerate; context duplex; hyphal system monomitic; hyphoid setae present at upper surface, branched; hymenial setae absent; basidiospores broadly ellipsoid, golden brown, thick-walled, 6–8 × 4.5–6 μm (Gilbertson and Ryvarden 1986); type locality in USA; distribution: USA and Mexico.

4. Hyphoid setae with curved tips———— *I. tramisetifer* Harpr. Kaur et al.

Basidiocarps annual, pileate, solitary to imbricate; pilei dimidiate to applanate; pileal surface brown to dark brown, glabrous to velutinate; pore surface grayish yellow to brown; pores 3–5 per mm; dissepiments thin, entire; context duplex; hyphal system monomitic; hyphoid setae of two types: pileal hyphoid setae with curved tips, up to 11 μm diam; tramal hyphoid setae with curved tips, up to 6 μm in diam; hymenial setae absent; basidiospores broadly ellipsoid, thick-walled, yellowish brown, IKI–, CB–, 5.9–6.5 ´ 3.5–4.7 μm (Kaur et al. 2013); type locality in India; distribution: India.

4. Hyphoid setae with straight tips———— 5

5. Pileal surface sulcate———— *I. amazonicus* Gibertoni & Ryvarden

Basidiocarps annual, pileate; pileal surface deep rust brown, velutinate to tomentose, sulcate; pore surface rust brown; pores 7–10 per mm; context duplex with a black line; hyphal system monomitic; hyphoid setae present in trama and dissepiments, tips straight, 30–120 × 10–35 μm; hymenial setae absent; basidiospores subglobose, pale yellowish, thin-walled, 5–5.5 × 4–4.5 μm (Gomes-Silva et al. 2013); type locality in Brazil; distribution: Brazil.

5. Pileal surface zonate———— *I. millmanii* Ryvarden

Basidiocarps annual, pileate, soft when fresh, hard when dry; pileal surface dark brown to yellowish brown, velutinate, concentrically zonate; pore surface light brown to dark brown; pores 7–8 per mm; context duplex with a black line; hyphal system monomitic; hyphoid setae present, parallel along the tubes, tip straight, 50–130 × 5–18 μm; hymenial setae absent; basidiospores subglobose to ovoid, hyaline to pale yellow, thick walled, 5–6 × 4–5 μm (Ryvarden 2020b); type locality in Puerto Rico; distribution: Puerto Rico.

6. Basidiocarps stipitate; hyphae encrusted———— *I. parvulus* Y.C. Dai & Hai J. Li

Basidiocarps annual, laterally stipitate; pilei flabelliform; pileal surface yellowish brown to cinnamon, velutinate; pore surface cinnamon to fuscous; pores 3–4 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; generative hyphae sometimes covered with crystals; hyphoid

setae present in trama, 200 × 6–9 µm, swollen up to 14 µm in diam in KOH; hymenial setae absent; basidiospores ellipsoid to broadly ellipsoid, yellowish, thick-walled, IKI–, CB–, 8–9.5(–9.6) × (6–)6.1–7.1(–8) µm, L = 8.75 µm, W = 6.71 µm, Q = 1.3 (Dai and Li 2012); type locality in Malaysia; distribution: Malaysia.

6. Basidiocarps pileate; hyphae smooth---------- 7

7. Basidiospores cylindrical---------- *I. gracilis* Ryvarden

Basidiocarps annual, pileate, solitary; pilei dimidiate to applanate; pileal surface glabrous, zonate with black and reddish brown zones; pore surface deep yellowish brown; pores 4–5 per mm; context homogeneous; hyphal system monomitic; hyphoid setae present in trama, 90 × 12 µm; hymenial setae absent; basidiospores cylindrical, pale yellowish, slightly thick-walled, 6–7 × 3–3.3 µm (Ryvarden 2005); type locality in Costa Rica; distribution: Costa Rica.

7. Basidiospores ellipsoid, subglobose or ovoid---------- 8

8. Basidiospores 9–12 µm long---------- 9

8. Basidiospores 4–8.1 µm long---------- 10

9. Pores 5–7 per mm, pileal surface radially fibrous---------- *I. pacificus* Ryvarden

Basidiocarps annual, pileate, solitary; pilei semicircular to ungulate; pileal surface rust brown, radially fibrous; pore surface rust brown; pores 5–7 per mm; context homogeneous; hyphal system monomitic; hyphoid setae present in trama and context, 250 × 8–20 µm; hymenial setae absent; basidiospores ellipsoid, pale yellowish, slightly thick-walled, 9–12 × 7–8 µm (Ryvarden 2005); type locality in New Caledonia; distribution: New Caledonia.

9. Pores 3–5 per mm, pileal surface hispid---------- *I. quercustris* M. Blackw. & Gilb.

Basidiocarps annual, pileate, solitary to imbricate; pilei ungulate to applanate; pileal surface golden yellow to rust brown, hispid; pore surface golden yellow; pores 3–5 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; hyphoid setae present in trama, 200 × 8–10 µm; hymenial setae absent; basidiospores ellipsoid, yellow, thick-walled, 9–10 × 6–8 µm (Ryvarden 2005); type locality in USA; distribution: USA.

10. Basidiospores 7.1–8.1 µm long---------- 11

10. Basidiospores 4–7.2 µm long---------- 12

11. Hyphoid setae present in trama, chlamydospores absent---------- *I. patouillardii* (Rick) Imazeki

Basidiocarps annual, pileate, solitary; pilei semicircular; pileal surface chestnut to dark brown, cracked; pore surface reddish brown to chestnut brown; pores 3–5 per mm; dissepiments thin, entire; context

homogeneous; hyphal system monomitic; hyphoid setae present in trama, 200–300 × 7–12 µm; hymenial setae absent; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (6.5–)7.5–8.1(–8.5) × (4.5–)4.9–5.8(–6.5) µm, L = 7.19 µm, W = 5.28 µm, Q = 1.33–1.39 (Dai 2010); type locality in Brazil; distribution: Pantropical.

11. Hyphoid setae present in context and trama, chlamydospores present———————————

———————————————————————————————— *I. rickii* (Pat.) D.A. Reid

Basidiocarps annual, pileate, solitary; pilei applanate; pileal surface dark yellowish brown, velutinate; pore surface yellowish brown to dark brown; pores 3–4 per mm; dissepiments thick, entire; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama, conspicuous, 200–300 × 7–12 µm; hymenial setae absent; basidiospores ellipsoid to broadly ellipsoid, yellowish, thick-walled, IKI–, CB(+), (7–)7.1– 8.1(–8.2) × (5.3–)5.5–6.2(–6.3) µm, L = 7.57 µm, W = 5.92 µm, Q = 1.28; ptychogastric stage and chlamydospores present (Dai 2010); type locality in Brazil; distribution: tropical America, tropical Asia and South Europe.

12. Context with several black lines———————————— *I. brasiliensis* Xavier de Lima & Ryvarden

Basidiocarps annual, pileate; pilei semicircular; pileal surface yellowish brown to dark, velutinate; pore surface yellowish to cinnamon brown; pores 7–9 per; context homogeneous with several black lines; hyphal system monomitic; hyphoid seate abundant, parallel along tube or projecting out of hymenium; hymenial setae absent; basidiospores subglobose, pale yellowish, slightly thick-walled, 4–5.5 × 3.5–4.5 µm (Xavier de Lima and Ryvarden 2020); type locality in Brazil; distribution: Brazil.

12. Context without a black line———————————————————————————————— 13

13. Dissepiments entire; basidiospores 6–7.2 µm long————————— *I. compositus* Han C. Wang

Basidiocarps annual, pileate, imbricate; pilei semicircular to dimidiate; pileal surface lemon chrome yellow to dark brown, matted, concentrically sulcate; pore surface reddish brown; pores 2–3 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae occasionally present, 50–400 × 8.5–18 µm; hymenial setae absent; basidiospores ellipsoid, yellowish, thick-walled, IKI–, CB+, (5.5–)6–7.2 (–7.5) × 4–4.9(–5) µm, L = 6.6 µm, W = 4.31 µm, Q = 1.5–1.56 (Dai 2010); type locality in China; distribution: West China.

13. Dissepiments dentate; basidiospores 5.5–6 µm long————————— *I. dentiporus* Ryvarden

Basidiocarps annual, pileate, solitary or imbricate; pilei pendent to dimidiate with distinctly tapering base; pileal surface yellowish to blackish, glabrous, slightly zonate; pore surface deep yellowish olivaceous brown, glancing; pores 3–4 per mm; dissepiments dentate; context homogeneous; hyphal system monomitic, hyphoid setae present in trama, 180 × 10–20 µm; hymenial setae absent; basidiospores

ellipsoid, yellowish brown, thick-walled, 5.5–6 × 4–5 µm (Ryvarden 2002); type locality in Costa Rica; distribution: Costa Rica.

4.13 *Meganotus* Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 839975.

Type species: *Meganotus everhartii* (Ellis & Galloway) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Meganotus* (Lat.): referring to the type species of the genus having similar microscopic characteristics as *Inonotus*, but producing big basidiocarps.

Basidiocarps perennial, pileate; pileal surface yellowish brown to blackish, tomentose to glabrous, encrusted, concentrically sulcate, cracked; pore surface golden yellow to reddish brown; context with masses of hard granular tissue; hyphal system monomitic; generative hyphae thick-walled, frequently septate; hymenial setae frequent; basidiospores ovoid to subglobose, dark reddish brown, thick-walled, IKI−, CB−; on angiosperm wood; causing a white rot.

Remarks. — *Meganotus* is similar to *Sanghuangporus* by the perennial and pileate basidiocarps, presence of hymenial setae and colored subglobose basidiospores. The latter genus lacks hard granular tissue in the context, and it has a dimitic hyphal structure at least in the tube trama. In addition, both genera are distantly related phylogenetically (Fig. 1).

Meganotus everhartii (Ellis & Galloway) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 839976.

Basionym: *Mucronoporus everhartii* Ellis & Galloway, *J. Mycol.* 5(3): 141 (1889).

≡ *Phellinus everhartii* (Ellis & Galloway) A. Ames, *Annls mycol.* 11(3): 246 (1913).

Basidiocarps perennial, pileate; pilei ungulate; pileal surface yellowish brown to blackish, tomentose to glabrous, encrusted, concentrically sulcate, cracked; pore surface golden yellow to reddish brown, glancing; pores 5–6 per mm; dissepiments thick, entire; context with masses of hard granular tissue; hyphal system monomitic; generative hyphae thick-walled, frequently septate; hymenial setae frequent, 16–36 × 5–9 µm; basidiospores ovoid to subglobose, dark brown, thick-walled, IKI−, 4–5 × 3–4 µm (Gilbertson 1979); on living tree of *Quercus*; type locality in USA; distribution: North America.

Specimens examined. — **USA**. Connecticut, New Harford, 12.12.2015, Dai 16401 (BJFC020489); New Jersey, Hammonton, Wharton State Forest 4.4.2013 Vlasák Jr 1304/2-J; Pennsylvania, Schwenkswille, 8.9.2010 Vlasák Jr. 1009/79-J; Virginia, Virginia Beech, 10.6.2010 Vlasák Jr. 1006/12-J.

4.14 *Mensularia* Lázaro Ibiza, *Rev. Acad. Ci. Madrid* 14: 736 (1916), (Fig. 1)

Type species: *Mensularia radiata* (Sowerby) Lázaro Ibiza.

Basidiocarps annual, pileate; pilei yellowish brown, dark brown or reddish brown, velutinate to rough; pore surface golden yellow to yellowish brown; context brown, corky, zonate; hyphal system monomitic; basidiospores ellipsoid, pale yellowish, thick-walled, smooth, IKI–, strongly CB+; on angiosperm wood; causing a white rot.

Mensularia is a homogeneous genus, even if it was for a long time regarded as a part of *Inonotus*. *M. hastifera* (Pouzar) T. Wagner & M. Fisch., *M. nodulosa* (Fr.) T. Wagner & M. Fisch. and *M. radiata* (Sowerby) Lázaro Ibiza were transferred to the genus (Wagner and Fisher 2001). *M. lithocarpi* L.W. Zhou and *M. rhododendri* F. Wu et al. were recently described from China (Zhou 2014c; Wu et al. 2015b). *Mensularia crocitincta* (Berk. & M.A. Curtis) T. Wagner & M. Fisch. was proposed by Wagner and Fisher (2002), but further molecular analysis indicated it is only distantly related to *Mensularia*, and it was transferred to *Neomensularia* Wu et al. (Wu et al. 2016). Currently, species in the genus form an independent monophyletic clade (Fig. 1).

Key to species of *Mensularia*

1. Hymenial setae hooked---------- *M. radiata* (Sowerby) Lázaro Ibiza

Basidiocarps annual, pileate, imbricate; pilei dimidiate or semicircular; pileal surface yellowish brown to dark brown, velutinate to glabrous with concentric zones; pore surface umber brown, glancing; pores 5–7 per mm; dissepiments thin, lacerate; hyphal system monomitic; hymenial setae hooked, 18–32 × 8–12 µm; basidiospores ellipsoid, hyaline to pale yellowish, fairly thick-walled, IKI–, strongly CB+, (3.5–)3.8–5(–5.2) ´ (2.5–)2.6–3.5(–3.8) µm, L = 4.27 µm, W = 3 µm, Q = 1.38–1.51 (Dai 2010); type locality in Germany; distribution: temperate zone of Northern Hemisphere.

1. Hymenial setae absent or straight if present---------- 2

2. Hyphoid setae absent---------- *M. nodulosa* (Fr.) T. Wagner & M. Fisch.

Basidiocarps annual, resupinate to nodulose-pileate with numerous small and rounded pilei; pileal surface tomentose to warted; pore surface cinnamon to rust brown, glancing; pores 3–4 per mm, in decurrent parts more irregular, split to elongated, 1–2 per mm; hyphal system monomitic; hyphoid setae absent; hymenial setae present mostly at the bottom of the tubes, always straight, acute, 15–40 × 6–12 µm; basidiospores ellipsoid to subglobose, hyaline to pale brown, IKI–, CB+, 4.5–5 × 3.5–4 µm (Ryvarden 2005); on *Fagus*; type locality in Sweden; distribution: Europe.

2. Hyphoid setae present---------- 3

3. Hymenial setae absent---------- *M. lithocarpi* L.W. Zhou

Basidiocarps annual, resupinate to nodulose-pileate; pileal surface glabrous, straw yellow; pore surface straw yellow to honey yellow; pores 4–6 per mm; dissepiments thin, entire to occasionally lacerate; hyphal system monomitic; hyphoid setae prominent, up to several hundred µm long and 15 µm in diam;

hymenial setae absent; cystidia and cystidioles absent; basidiospores ellipsoid, hyaline, slightly thick-walled, IKI–, strongly CB+, (3.8–)3.9–4.6(–4.9) ´ (2.8–)2.9–3.5(–3.7) µm, L = 4.19 µm, W = 3.19 µm, Q = 1.31 (Zhou 2014c); type locality in China; distribution: China.

3. Hymenial setae present---------- 4

4. Pores 3–4 per mm; on *Fagus* and *Carpinus*----------

---------- *M. hastifera* (Pouzar) T. Wagner & M. Fisch.

Basidiocarps annual, resupinate to nodulose without true pilei; pore surface rust to dark brown; pores 3–4 per mm, larger and incised on oblique surfaces; hyphal system monomitic; hyphoid setae present in the dissepiments, acute, sometimes forked at tip, up to 300 µm long, 7–15 µm in diam; hymenial setae rare to abundant, 12–30 ´ 5–10 µm; basidiospores ellipsoid, hyaline to pale yellowish, slightly thick-walled, IKI–, strongly CB+, 4.5–5.2 ´ 3–4 µm (Ryvarden 2005); on *Fagus* and *Carpinus*; type locality in Czech Republic; distribution: Europe, Caucasus and Turkey.

4. Pores 5–6 per mm; on *Rhododendron*---------- *M. rhododendri* F. Wu et al.

Basidiocarps annual, resupinate to effused-reflexed; pileal surface yellowish brown, finely velutinate to glabrous; pore surface pink-yellow to grayish yellow, glancing; pores 5–6 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphoid setae infrequent, 50–110 × 8–13 µm; hymenial setae frequent, sharply pointed, 16–40 × 6.5–8 µm; cystidia and cystidioles absent; basidiospores ellipsoid, hyaline to pale yellowish, fairly thick-walled, IKI–, CB+, (4.5–)4.6–5.1 × 3–4 µm, L = 4.89 µm, W = 3.54 µm, Q = 1.38 (Wu et al. 2015b); on *Rhododendron*; type locality in China; distribution: China.

4.15 *Neomensularia* F. Wu, L.W. Zhou & Y.C. Dai, *Mycologia* 108: 892 (2016), (Fig. 1)

Type species: *Neomensularia duplicata* F. Wu, L.W. Zhou & Y.C. Dai.

Basidiocarps annual, pileate, hard corky to woody hard; pileal surface dark reddish brown to fuscous; pore surface cinnamon buff to dark brown; context duplex with a distinct black zone; hyphal system dimitic; hymenial setae hooked; basidiospores ellipsoid, golden yellow, thick-walled, smooth, IKI–, CB–; on angiosperm wood; causing a white rot.

Neomensularia was recently established mostly based on the phylogenetic perspective (Wu et al. 2016), and it differs from other genera in the Hymenochaetaceae by imbricate basidiocarps with duplex context, a dimitic hyphal structure, hooked hymenial setae, and golden, thick-walled basidiospores. *Neomensularia* is similar to *Fulvifomes* in sharing a dimitic hyphal structure and golden yellow, thick-walled basidiospores. However, species in *Fulvifomes* have a homogeneous context and lack setae (Murrill 1914). Two species including *N. crocitincta* (Berk. & M.A. Curtis) F. Wu et al. and *N. kanehirae* (Yasuda) F. Wu et al. were transferred into *Neomensularia* and another two species including *N. duplicata*

F. Wu et al. and *N. rectiseta* X.H. Ji et al. were recently described in the genus (Wu et al. 2016; Ji and Wu 2017).

Neomensularia castanopsidis Y.C. Dai & F. Wu, **sp. nov.** (Figs. 1, 42, 43)

MycoBank: MB 839977.

Type. — **CHINA**. Yunnan Province, Pingbian County, Daweishan National Forest Park, on dead tree of *Castanopsis*, 27.VI.2019, Dai 19907 (holotype, BJFC031581).

Etymology. — *Castanopsidis* (Lat.): referring to the species growing on *Castanopsis*.

Fruiting body. — Basidiocarps annual, effused-reflexed, a few imbricate, corky and without distinctive odor or taste when fresh, hard corky to woody hard when dry. Pilei triquetrous, projecting up to 2.5 cm, 5 cm wide, and 2 cm thick at base. Pileal surface fulvous, azonate, velutinate to matted; margin acute, buff yellow when dry. Pore surface fulvous to rust tawny when dry; sterile margin distinct, yellowish brown, up to 2 mm wide; pores circular, 4–5 per mm; dissepiments thin, entire. Context reddish brown, up to 19 mm thick, indistinctly duplex, one black line present between upper thin corky layer and lower woody hard layer. Tubes concolorous with pore surfaces, distinctly paler than context, up to 1 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue darkening otherwise unchanged in KOH.

Context. — Generative hyphae in the lower context pale yellowish, thick-walled with a wide lumen, frequently simple septate, rarely branched, 3–4 µm diam; skeletal hyphae yellowish to dark brown, thick-walled with a narrow to wide lumen, unbranched, flexuous, interwoven, 3–5 µm diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin- to slightly thick-walled, frequently simple septate, occasionally branched, 2–3.5 µm diam; skeletal hyphae dominant, golden yellow to dark brown, thick-walled with a narrow to wide lumen, occasionally branched, flexuous, interwoven, 3.5–4 µm diam; hymenial setae frequent, subulate to ventricose with a distinct hooked tip, some with a septum, arising from subhymenium, dark brown, thick-walled, 25–34 × 7–12 µm; cystidia absent; fusoid cystidioles present; basidia clavate, with four sterigmata and a simple septum at the base, 12–15 × 4–4.5 µm; basidioles in shape similar to basidia, but slightly shorter.

Spores. — Basidiospores ellipsoid, yellowish, slightly thick-walled, smooth, some collapsed, IKI–, CB–, (3.2–)3.5–4.2(–4.5) × 2.8–3.2 µm, L = 3.92 µm, W = 2.98 µm, Q = 1.31 (n = 30/1).

Remarks. — *Neomensularia castanopsidis* is closely related to *N. arizonica* (Gilb.) Y.C. Dai & F. Wu and *N. kanehirae* in the phylogeny (Fig. 1), but it differs from other species in the genus by its septate hymenial setae.

Neomensularia arizonica (Gilb.) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839978.

Basionym: *Inonotus arizonicus* Gilb., *Southwest Naturalist* 14: 123 (1969).

Neomensularia arizonica has a monomitic hyphal system, and it was described in *Inonotus* (Gilbertson 1969), but it has hooked hymenial setae, and phylogenetically it nested in *Neomensularia* clade (Fig. 1). So, the above combination is proposed.

Key to species of *Neomensularia*

1 Hymenial setae straight---------- *N. rectiseta* X.H. Ji et al.

Basidiocarps perennial, pileate; pilei fan-shaped; pileal surface dark gray with concentric zones in different shades; pore surface dark brown to fuscous; pores 8–9 per mm; dissepiments thick, entire; context duplex with a black line; hyphal system dimitic; skeletal hyphae unbranched, aseptate; hymenial setae frequent, subulate with a straight tip, 15–25 × 6–12 µm; fusoid cystidioles present; basidiospores ellipsoid, yellowish brown, thick-walled, IKI–, CB+, (3.4–)3.5–4(–4.2) × (2.5–)2.7–3(–3.1) µm, L = 3.79 µm, W = 2.79 µm, Q = 1.30–1.42 (Ji and Wu 2017); type locality in China; distribution: China.

1 Hymenial setae hooked---------- 2

2. Pores 7–10 per mm---------- 3

2. Pores 3–7 per mm---------- 4

3 Pileal surface glabrous; basidiospores 4–4.5 µm long----------

---------- *N. crocitincta* (Berk. & M.A. Curtis) F. Wu et al.

Basidiocarps annual, pileate; pilei dimidiate; pileal surface dark cinnamon, glabrous, basal portion becoming reddish brown, laccate; pore surface cinnamon; pores 7–9 per mm; context dense, homogeneous; hyphal system monomitic; hymenial setae hooked, 20–50 × 7–15 µm; basidiospores broadly ellipsoid, hyaline to pale yellowish, IKI–, moderately CB+, 4–4.5 × 3–3.5 µm (Ryvarden 2004); type locality in Cuba; distribution: Central America.

3 Pileal surface tomentose to velutinate; basidiospores 3.5–4 µm long----------

---------- *N. duplicata* F. Wu et al.

Basidiocarps annual, pileate, imbricate; pilei dimidiate to fan-shaped; pileal surface dark reddish brown with distinct concentric zones in different shades, tomentose to velutinate; pore surface cinnamon buff to dark brown; pores 8–10 per mm; dissepiments thick, entire to slightly lacerate; context duplex with a black line; hyphal system dimitic; hymenial setae infrequent, hooked, 30–40 × 11–15 µm; fusoid cystidioles present; basidiospores ellipsoid, golden yellow, thick-walled, IKI–, CB–, (3–)3.5–4(–4.5) × 2.5–3(–3.5) µm, L = 3.82 µm, W = 2.9 µm, Q = 1.31–1.33 (Wu et al. 2016); type locality in China; distribution: China.

4. Basidiocarps perennial, pores 6–7 per mm---------- *N. kanehirae* (Yasuda) F. Wu et al.

Basidiocarps perennial, pileate to laterally stipitate; pilei flabelliform to applanate; pileal surface grayish brown to umber brown, zonate and sulcate, hirsute to tomentose; pore surface chestnut to black, slightly glancing; pores 6–7 per mm; dissepiments thin, entire to lacerate; context duplex with a thin black line; hyphal system dimitic; hymenial setae frequent, hooked, 17–28 × 6–11 µm; basidiospores broadly ellipsoid, pale yellowish, fairly thick-walled, IKI–, moderately CB+, (3–)3.1–3.9(–4) × (2.1–)2.3–3(–3.1) µm, L = 3.37 µm, W = 2.61 µm, Q = 1.25–1.35 (Dai 2010); type locality in China; distribution: East Asia.

4. Basidiocarps annual, pores 3–5 per mm---------- 5

5. Hyphal system monomitic---------- *N. arizonica* (Gilb.) Y.C. Dai

Basidiocarps annual, effused-reflexed to pileate, solitary to imbricate; pilei ungulate to applanate; pileal surface snuff brown to warm buff, matted tomentose to glabrous, rimose; pore surface dark brown to brown, glancing; pores 3–5 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; hymenial setae hooked, 20–50 × 12–20 µm; basidiospores ellipsoid, golden yellow, 4–6 × 3–4 µm (Gilbertson 1969); type locality in USA; distribution: North America.

5. Hyphal system dimitic---------- *N. castanopsidis* Y.C. Dai

Basidiocarps annual, effused-reflexed; pilei triquetrous; pileal surface fulvous, azonate, velutinate to matted; pore surface fulvous to rust tawny, not glancing; pores 4–5 per mm; dissepiments thin, entire; context duplex with a black line; hyphal system dimitic; hymenial setae frequent, hooked, 25–34 × 7–12 µm; basidiospores ellipsoid, yellowish, slightly thick-walled, smooth, some collapsed, IKI–, CB–, 3.5–4.2 × 2.8–3.2 µm, L = 3.92 µm, W = 2.98 µm, Q = 1.31; type locality in China; distribution: South China.

4.16 *Neophellinus* Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 839979.

Type species: *Neophellinus uncisetus* (Robledo, Urcelay & Rajchenb.) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Neophellinus* (Lat.): referring to its similarity with *Phellinus* but phylogenetically distant each other, and distribution in Neotropics.

Basidiocarps perennial, pileate; pileal surface glabrous, rimose, concentrically sulcate; pore surface golden brown; hyphal system dimitic; hymenial setae frequent, monoradicate with one root and a long apical part, uncinate or hooked; basidiospores subglobose, thick-walled, hyaline, IKI–; causing a white rot.

Remarks. — *Neophellinus* is phylogenetically related to *Fomitiporia* (Fig. 1), but the latter genus has dextrinoid and cyanophilous basidiospores. Morphologically, *Neophellinus* is similar to *Phellinus* (Robledo et al. 2003), but both genera are phylogenetically distant.

Neophellinus uncisetus (Robledo, Urcelay & Rajchenb.) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 839980.

Basionym: *Phellinus uncisetus* Robledo, Urcelay & Rajchenb., *Mycologia* 95: 349 (2003).

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface grayish to black, glabrous, rimose, concentrically sulcate; pore surface golden brown, glancing; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae frequent, ventricose, monoradicate with one root and a long apical part, uncinate or hooked, 26–50 × 5–10 µm; cystidioles ventricose, 56 × 5–6 µm; basidiospores subglobose, thick-walled, hyaline, IKI–, 6–7 × 5.5–6 µm (Robledo et al. 2003); type locality in Argentina; distribution: Argentina.

4.17 ***Nothonotus*** Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 839981.

Type species: *Nothonotus nothofagi* (G. Cunn.) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Notho-* (Gr.), similar to or false; *Nothonotus* (Lat.)*:* referring to its similarity with *Inonotus*.

Basidiocarps annual, pileate; pileal surface with a black cuticle; pore surface rust brown to umber; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present; basidiospores ellipsoid, rust brown; on *Nothofagus*; causing a white rot.

Remarks. —Morphologically *Nothonotus* is similar to *Inonotus* by annual basidiocarps and a monomitic hyphal structure, and *Nothonotus* resembles *Phylloporia* by the similar hyphal structure, colored and usually collapsed basidiospores, but phylogenetically these three genera formed three independent clades in Hymenochaetaceae (Fig. 1).

Nothonotus nothofagi (G. Cunn.) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 839982.

Basionym: *Inonotus nothofagi* G. Cunn., *Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 78: 1 (1948).

Basidiocarps annual, pileate, imbricate; pilei applanate to flabelliform; pileal surface rust brown to black, with a black cuticle, glabrous, concentrically zonate; pore surface rust brown to umber; pores 2–4 per mm; context homogeneous; hyphal system monomitic; hyphoid setae absent; hymenial setae present, 20–30 × 10–12 µm; basidiospores ellipsoid, rust brown, 5–6 × 3–3.5 µm (Ryvarden 2005); on *Nothofagus*; type locality in New Zealand; distribution: Oceania.

Specimen examined. — **NEW ZEALAND**. South Island, Fjordland National Park, on *Nothofagus,* 1.V.1997, Ryvarden 39828 (O).

4.18 *Nothophellinus* Rajchenb. & Pildain, *Mycologia* 107 (4): 761 (2015), (Fig. 1)

Type species: *Nothophellinus andinopatagonicus* (J.E. Wright & J.R. Deschamps) Rajchenb. & Pildain.

Basidiocarps perennial, pileate; pileal surface with a cuticle; pore surface tawny gray, cracked; hyphal system trimitic with skeletal-binding hyphae; hymenial setae or hyphoid setae absent; basidiospores cylindrical to obclavate, thin-walled, IKI–, CB–; on angiosperm wood; causing a white rot.

Nothophellinus resembles *Phellopilus* Niemelä et al. by the similar hyphal structure and obclavate, hyaline, thin-walled basidiospores, but the latter has hymenial setae and lacks a pileal surface cuticle, and both genera are phylogentically distant related (Rajchenberg et al. 2015; Fig. 1). In addition, according to our study, the generative hyphae of *Nothophellinus* bear rosette-like crystals, this is a unique characteristic in the Hymenochaetaceae. *Nothophellinus* is so far a monotypic genus.

Nothophellinus andinopatagonicus (J.E. Wright & J.R. Deschamps) Rajchenb. & Pildain Mycologia 107 (4): 761 (2015).

Basidiocarps perennial, pileate; pileal surface with a cuticle; pore surface tawny gray, cracked; white hyphal cords present in context; hyphal system trimitic with skeletal-binding hyphae; hymenial setae or hyphoid setae absent; cystidioles present, lageniform, fusiform or mammiform; basidiospores cylindrical to obclavate, thin-walled, IKI–, CB–, 8.2–10.8 × 2.8–3.2 µm (Rajchenberg et al. 2015); on *Nothofagus*; type locality in Argentina; distribution: Argentina and Chile (Vlasák Jr. 1911/21-J).

4.19 *Ochrosporellus* (Bondartseva & S. Herrera) Bondartseva & S. Herrera, Mikol. Fitopatol. 26(1): 13 (1992), (Fig. 1)

Type species: *Ochrosporellus portoricensis* (Overh.) Bondartseva & S. Herrera.

Basidiocarps mostly perennial, pileate; pilei applanate; pileal surface concentrically zonate, sulcate; pore surface chocolate brown to dark umber; context duplex in most species; hyphal system monomitic; generative hyphae simple septate; hyphoid setae present; hymenial setae present in most species; basidiospores broadly ellipsoid to subglobose, brownish, thick-walled, IKI–, CB–; on angiosperms; causing a white rot.

Specimen examined. — **BRAZIL**. Trilha atras do casarao, 07.07.2008, Baltazar 504 (URM81298). **GUADELOUPE**. Basse-Terre, 25.12.2016 Vlasák Jr. 1612/1-J.

The following nine taxa were previously accepted either in *Inonotus* or *Phellinus*, but their morphological characteristics fit *Ochrosporellus* well, and some of them nested in the *Ochrosporellus* clade, so, the following combinations are proposed:

***Ochrosporellus chrysomarginatus* (**B.K. Cui & Y.C. Dai) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839983.

Basionym: *Inonotus chrysomarginatus* B.K. Cui & Y.C. Dai, *Mycol. Progr.* 10(1): 109 (2011).

Ochrosporellus dingleyae (P.K. Buchanan & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839984.

Basionym: *Phellinus dingleyae* P.K. Buchanan & Ryvarden, *N.Z. Jl Bot.* 38(2): 257 (2000).

Ochrosporellus hoehnelii (Bres.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839985.

Basionym: *Fomes hoehnelii* Bres., Annls mycol. 10(5): 499 (1912).

≡ *Phellinus hoehnelii* (Bres.) Ryvarden, in Ryvarden & Johansen, *Prelim. Polyp. Fl. E. Afr.* (Oslo): 173 (1980).

≡ *Pseudoinonotus hoehnelii* (Bres.) Zmitr., Malysheva & Spirin, *Nov. sist. Niz. Rast.* 40: 163 (2006).

Ochrosporellus hymenonitens (G. Coelho & Yurchenko) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 37)

MycoBank: MB 839986.

Basionym: *Inonotus hymenonitens* G. Coelho & Yurchenko, in Crous et al., *Persoonia* 37: 251 (2016).

Ochrosporellus melanodermus (Pat.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839988.

Basionym: *Xanthochrous melanodermus* Pat., *Ann. Jard. Bot. Buitenzorg, suppl.* 1: 113 (1897).

≡ *Phellinus melanodermus* (Pat.) M. Fidalgo, *Mem. N. Y. bot. Gdn* 17: 135 (1968).

Ochrosporellus neonoxius (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839989.

Basionym: *Phellinus neonoxius* Ryvarden, *Syn. Fung.* 19: 191 (2004).

Ochrosporellus pachyphloeus (Pat.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839990.

Basionym: *Polyporus pachyphloeus* Pat., *J. Bot., Paris* 3: 257 (1889).

≡ *Inonotus pachyphloeus* (Pat.) T. Wagner & M. Fisch., *Mycologia* 94: 1009 (2002).

≡ *Phellinus pachyphloeus* (Pat.) Pat., *Essai Tax. Hyménomyc.* (Lons-le-Saunier): 97 (1900).

Ochrosporellus puerensis (Hai J. Li & S.H. He) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839991.

Basionym: *Inonotus puerensis* Hai J. Li & S.H. He, *Mycotaxon* 121: 286 (2013) [2012].

Ochrosporellus tricolo*r* (Bres.) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839992.

Basionym: *Poria tricolor* Bres., *Hedwigia* 51(4): 316 (1912).

≡ *Inonotus tricolor* (Bres.) Y.C. Dai, *Fungal Diversity* 45: 290 (2010).

≡ *Phellinus tricolor* (Bres.) Kotl., *Česká Mykol.* 22(3): 177 (1968).

Ochrosporellus taiwanensis (Sheng H. Wu et al.) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 839993.

Basionym: *Inonotus taiwanensis* Sheng H. Wu et al., *Mycoscience* 59(5): 327 (2018).

Key to species of *Ochrosporellus*

1. Pores 3–4 per mm..... *O. hoehnelii* (Bres.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei subapplanate; pileal surface black to brown, glabrous, rugulose, encrusted; pore surface cinnamon to umber brown; pores 3–4 per mm; hyphal system monomitic; hyphoid setae prominent in trama, 350 × 5–17 µm; hymenial setae present, 34–50 × 6–10 µm; basidiospores subglobose, pale yellow, 7–8 × 6–7.5 µm (Larsen and Cobb-Poulle 1990); type locality in Indonesia; distribution: Indonesia and Philippines.

1. Pores 5–10 per mm..... 2

2. Context duplex..... 3

2. Context homogeneous..... 6

3. Hymenial setae absent..... *O. neonoxius* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary, woody hard; pileal surface pale ferruginous to umber, concentrically zonate, velutinate; pore surface fulvous to dark bay or fuscous; pores 7–9 per mm; dissepiments thick, entire; context duplex with a black zone; hyphal system monomitic; hyphoid setae present in trama, terminally pointed; hymenial setae absent; basidiospores subglobose, pale brown, thin-walled, 4–5 × 3.5–4 µm (Ryvarden 2004; JV 1607/87); type locality in Panama; distribution: Panama and Costa Rica.

3. Hymenial setae present..... 4

4. Basidiocarps annual, pores 5–6 per mm.....

..... *O. hymenonitens* (G. Coelho & Yurchenko) Y.C. Dai & F. Wu

Basidiocarps annual, effused-reflexed; pileal surface brown to dark brown, tomentose, concentrically zonate and sulcate; pore surface yellow to yellowish brown; pores 5–6 per mm; dissepiments velutinate with projecting setae; context duplex with a dark line; hyphal system monomitic; hyphoid setae present in trama and context, 65–330 × 90–25 µm; hymenial setae rarely present, 20–50 × 5.5–10.5 µm; basidiospores broadly ellipsoid to ellipsoid, ferruginous brown, thick-walled, (4–)4.5–5.5(–6.5) × (3.2–)3.6–4(–4.4) µm (Crous et al. 2016); type locality in Brazil; distribution: Brazil.

4. Basidiocarps perennial, pores 8–10 per mm..... 5

5. Pores glancing; Asian species..... *O. puerensis* (Hai J. Li & S.H. He) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface fuscous, velutinate to tomentose, sulcate and zonate; pore surface cinnamon to dark brown, glancing; pores 7–9 per mm; dissepiments thin, entire; context, duplex with a black zone; system monomitic; hyphoid setae prominent in context and trama, 240–400 × 10–13 µm; hymenial setae present, 25–42 × 7–11 µm; basidiospores broadly ellipsoid, yellowish, thick-walled, IKI–, CB–, (4.4–)4.5–5(–5.2) × (3.6–)3.7–4(–4.2) µm, L = 4.78 µm, W = 3.9 µm, Q = 1.23 (Li and He 2012); type locality in China; distribution: Southwest China.

5. Pores not glancing; American species..... *O. portoricensis* (Overh.) Bondartseva & S. Herrera

Basidiocarps perennial, pileate; pilei applanate to triquetrous; pileal surface reddish brown, velutinate, concentrically zonate and sulcate, with older zones becoming black and exposing black cortex, otherwise seen in section below the reddish brown tomentum; pore surface chocolate brown to dark umber; pores 8–10 per mm; context duplex, the lower part dense and yellowish brown; hyphal system monomitic; hyphoid setae present, 250 × 7–15 µm; hymenial setae present, 20–40 × 5–8 µm; basidiospores subglobose, brownish, thick-walled, 3.5–5 × 3–4 µm (Ryvarden and Johansen 1980); type locality in Puerto Rico; distribution: Central America.

6. A black line present between context and tubes..... 7

6. Black line absent between context and tubes..... 8

7. Pores 7–8 per mm; hymenial setae absent..... *O. melanodermus* (Pat.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate to semicircular, applanate; pileal surface dark gray to black, glabrous, concentrically sulcate and zonate, encrusted; pore surface dark brown; pores 7–8 per mm; dissepiments thin, entire; context homogeneous; tubes separated by a thin context layer; hyphal system monomitic; hyphoid setae prominent in context and trama, 400 × 6–15 µm; hymenial setae absent;

basidiospores subglobose, yellowish, 4–5 × 3.5–4.5 µm (Larsen and Cobb-Poulle 1990); type locality in Java; distribution: Southeast Asia.

7. Pores 8–10 per mm; hymenial setae present..... *O. tricolor* (Bres.) Y.C. Dai & F. Wu

Basidiocarps perennial, effused-reflexed to pileate; pileal surface cinnamon to dark brown, concentrically sulcate with narrow zones, velutinate to smooth, encrusted; pore surface umber brown to dark brown; pores 8–10 per mm; dissepiments thin, entire; context homogeneous, a thin black line present between tubes and context; hyphal system monomitic; hyphoid setae prominent, 64–164 × 9–15 µm; hymenial setae present, 32–41 × 8–11 µm; basidiospores broadly ellipsoid to subglobose, yellowish, fairly thick-walled, IKI–, CB–, (3.8–)3.9–4.8(–4.9) × (3–)3.1–4(–4.1) µm, L = 4.26 µm, W = 3.41 µm, Q = 1.25 (Dai 2010); type locality in Philippines; distribution: tropical Asia.

8. Basidiospores 4–7 µm wide---------- 9

8. Basidiospores 2.7–4 µm wide---------- 10

9. Pore surface not glancing; cystidioles present----------

---------- *O. dingleyae* (P.K. Buchanan & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, effused-reflexed, or resupinate; pileal surface yellow brown to black, concentrically sulcate, glabrous, encrusted, cracked; pore surface deep umber brown; pores 6–7 per mm; dissepiments thin; context homogeneous; hyphal system monomitic; hyphoid setae prominent in context and trama, 170–600 × 13–22 µm; hymenial setae rare, with transitions to the tramal hyphoid setae; cystidioles lageniform, 11–23 × 3.5–4.5 µm; basidiospores globose to subglobose, pale brown, fairly thick-walled, IKI–, 5–7.5(–8.5) × 4.5–7(–7.5) µm (Buchanan and Ryvarden 2000); type locality in New Zealand; distribution: New Zealand.

9. Pore surface glancing; cystidioles absent ----------

---------- *O. chrysomarginatus* (B.K. Cui & Y.C. Dai) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary or imbricate; pilei applanate to ungulate; pileal surface cinnamon brown to dark brown, glabrous, cracked; pore surface grayish brown to fawn brown, glancing; pores 5–8 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama, 200 × 10–20 µm; hymenial setae present, 25–45 × 8–15 µm; basidiospores broadly ellipsoid to subglobose, pale yellowish, slightly thick-walled, IKI–, CB(+), (4.3–)4.7–6(–6.4) × (3.8–)4–5(–5.3) µm, L = 5.26 µm, W = 4.34 µm, Q = 1.16–1.25 (Cui et al. 2011); type locality in China; distribution: tropical China.

10. Dissepiments entire; hymenial setae 5–9 µm wide---- *O. pachyphloeus* (Pat.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei ungulate; pileal surface dark brown to almost black, concentrically sulcate, encrusted, cracked; pore surface rust brown to dark brown; pores 7–9 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; hyphoid setae prominent in context and trama, 300 × 8–20 µm in diam; hymenial setae present, 16–24 × 5–9 µm; basidiospores broadly ellipsoid, yellowish, fairly thick-walled, IKI–, CB–, (3.3–)3.7–4.3(–4.9) × (2.6–)2.7–3.9(–4.1) µm, L = 3.95 µm, W = 3.22 µm, Q = 1.22–1.23 (Dai 2010); type locality in Fiji; distribution: tropical Asia.

10. Dissepiments lacerate; hymenial setae 10–18 µm wide———————————————————

———————————————————— *O. taiwanensis* (Sheng H. Wu et al.) Y.C. Dai & F. Wu

Basidiocarps perennial, effused-reflexed to pileate, solitary; pilei applanate to ungulate or semicircular; pileal surface yellowish brown to brown, concentrically sulcate, glabrous to tomentose; pore surface yellowish brown to brownish; pores 7–10 per mm; dissepiments thin, dentate to lacerate; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama, 320 × 8.5–15 µm; hymenial setae present, 20–110 × 10–18 µm; basidiospores broadly ellipsoid to subglobose, pale yellow, thin- to slightly thick-walled, IKI–, CB–, 3.8–4.9 × 2.9–3.7 µm, L = 4.33 µm, W = 3.27 µm, Q = 1.32–1.33 (Wu et al. 2018); type locality in China; distribution: East China.

4.20 *Onnia* P. Karst., *Bidr. Känn. Finl. Nat. Folk* 48: 326 (1889), (Fig. 1)

Type species: *Onnia tomentosa* (Fr.) P. Karst.

Basidiocarps annual, pileate or stipitate; pilei surface yellowish brown or rust brown, tomentose, velutinate to rough; pore surface brown to chestnut brown; context rust brown, duplex with a black line, upper layer spongy, lower layer corky; hyphal system monomitic; hymenial setae present; basidiospores ellipsoid, hyaline, thin-walled, smooth, IKI–, CB–; mostly on gymnosperm wood; causing a white rot.

Onnia is a homogeneous genus and stands out as a definite clade phylogenetically related to *Porodaedalea* (Wagner and Fischer 2002a; Larsson et al. 2006; Fig. 1). A more comprehensive phylogeny on species of *Onnia* growing on gymnosperms was analyzed by Ji et al. (2017a), and several new species were described. In addition, some species of *Onnia* are pathogens on trees of *Picea* and *Pinus* (Sinclair et al. 1987; Hunt and White 1998; Dai et al. 2007; Ryvarden and Melo 2014), which is same with some species of *Porodaedalea* (Dai et al. 2017; Wu et al. 2019a). However, species in *Porodaedalea* have perennial basidiocarps and thick-walled, moderately cyanophilous basidiospores.

Key to species of *Onnia*

1 Pileal surface glabrous; hyphal system dimitic in trama; on angiosperm———————————————

———————————————————————— *O. vallata* (Berk.) Y.C. Dai & Niemelä

Basidiocarps annual, laterally stipitate, solitary; pilei dimidiate or circular; pileal surface golden brown to grayish brown, glabrous, concentrically zonate with a thin cuticle; pore surface rust brown; pores 4–6 per

mm; dissepiments thin, entire; context duplex, a thin black zone present between the upper context and lower context, both upper and lower context hard corky; hyphal system monomitic in in context, dimitic in trama; hymenial setae subulate, sharply pointed, mostly straight, rarely hooked, 24–35 × 6–10 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thin-walled, IKI–, CB–, 4–5(–5.1) × (3–)3.1–4 µm, L = 4.36 µm, W = 3.49 µm, Q = 1.25 (Dai 2010); on angiosperm; type locality in India; distribution: Asia.

1. Pileal surface tomentose to velutinate; hyphal system monomitic in whole basidiocarps; on gymnosperm---------- 2

2. On *Picea*; distribution in Northern Hemisphere---------- 3

2. On *Pinus*; distribution in restricted area of the Northern Hemisphere---------- 4

3. Basidiocarps pileate to laterally stipitate; setae hooked---------- *O. leporina* (Fr.) H. Jahn

Basidiocarps annual, pileate to laterally stipitate, solitary to imbricate; pilei mostly fan-shaped; pileal surface cinnamon or rust brown, velutinate to rough; pore surface rust brown to dark umber brown; pores 3–4 per mm; dissepiments thin, lacerate; context duplex; hyphal system monomitic; hymenial setae hooked, sharply pointed, 50–150 × 11–16 µm; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (6–)6.2–7(–7.5) ´ (3.3–)3.4–4.2(–4.4) µm, L = 6.52 µm, W = 3.79 µm, Q = 1.72 (Dai 2010); usually on *Picea*; type locality in Sweden; distribution: temperate and boreal zone of Northern Hemisphere.

3. Basidiocarps centrally or laterally stipitate; setae straight---------- *O. tomentosa* (Fr.) P. Karst.

Basidiocarps annual, centrally or laterally stipitate, solitary or imbricate; pilei circular to fan-shaped with depression at center; pileal surface yellowish brown to dark brown, with thick tomentum; pore surface yellowish brown to dark brown, glancing; pores 2–4 per mm; dissepiments thin, lacerate; context duplex; hyphal system monomitic; hymenial setae subulate, sharply pointed, 35–60 × 10–15 µm; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (4.5–)4.8–6.3(–6.5) × (2.7–)2.9–3.8(–4) µm, L = 5.43 µm, W = 3.17 µm, Q = 1.7–1.75 (Dai 2010); usually on *Picea*; type locality Sweden; distribution: temperate and boreal zone of Northern Hemisphere.

4. Cystidioles present; distribution in China---------- *O. tibetica* Y.C. Dai & S.H. He

Basidiocarps annual, laterally substipitate, solitary; pilei semicircular to fan-shaped; pileal surface clay buff to fawn, velutinate; pore surface fuscous to dark brown, glancing; pores 2–4 per mm; dissepiments thin, slightly lacerate; context duplex; hyphal system monomitic; hymenial setae hooked, sharply pointed, 70–150 × 10–18 µm; cystidia absent; fusoid cystidioles present; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, 5–6 × 3–4 µm, L = 5.31 µm, W = 3.47 µm, Q = 1.4–1.6 (Ji et al. 2017a); on *Pinus*; type locality in China; distribution: West China.

4. Cystidioles absent; distribution in restricted lowlands of the Northern Hemisphere---------- 5

5. Basidiospores 4–4.7 µm wide---------- *O. kesiya* M. Zhou & F. Wu

Basidiocarps annual, laterally stipitate, solitary; pilei dimidiate to fan-shaped; pileal surface cinnamon buff to olivaceous, velutinate, distinctly concentrically zonate; pore surface grayish white to grayish brown; pores 1–3 per mm; dissepiments thin, lacerate; context duplex; stipe up to 5 cm long and 5 mm in diam; hyphal system monomitic; hymenial setae hooked, sharply pointed, 50–130 × 10–20 µm; cystidioles absent; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (5.3–)5.8–6.5(–7) ´ 4–4.7(–5) µm, L = 6.11 µm, W = 4.37 µm, Q = 1.4 (Zhou and Wu 2018); on *Pinus*; type locality in Vietnam; distribution: Vietnam.

5. Basidiospores 3–4 µm wide---------- 6

6. Pores 3–5 per mm; basidiospores 4–5.4 µm long; distribution in East Asia----------

---------- *O. microspora* Y.C. Dai & L.W. Zhou

Basidiocarps annual, pileate to laterally substipitate or stipitate, solitary; pilei dimidiate to fan-shaped; pileal surface golden brown to cinnamon buff, velutinate; pore surface ashy white to buff yellow; pores 3–5 per mm; dissepiments thin, entire to slightly lacerate; context duplex; hyphal system monomitic; hymenial setae hooked, sharply pointed, 40–80 × 11–23 µm; cystidia and cystidioles absent; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, 4–5.5 × 3–4 µm, L = 4.9 µm, W = 3.5 µm, Q = 1.35–1.45 (Ji et al. 2017a); on *Pinus*; type locality in China; distribution: East China.

6. Pores 2–4 per mm; basidiospores 5.1–6.9 µm long; distribution in Europe or North America---- 7

7. Hymenial setae projecting 50–80 µm outside of hymenium, observed with a 5× lens; basidia longer than basidioles; distribution in East North America---------- *O. subtriquetra* Vlasák & Y.C. Dai

Basidiocarps annual, pileate to laterally substipitate, solitary; pilei dimidiate to fan-shaped; pileal surface cinnamon to yellowish brown, velutinate; pore surface grayish yellow to fawn; pores 2–3 per mm; dissepiments thin, slightly lacerate; context duplex; hyphal system monomitic, tramal hyphae parallel along the tubes; hymenial setae hooked, sharply pointed, 70–80 × 15–25 µm; cystidia and cystidioles absent; basidia longer than basidioles; basidiospores oblong-ellipsoid, hyaline, thin-walled, IKI–, CB–, 5.5–6.5 × 3–4 µm, L = 6.14 µm, W = 3.7 µm, Q = 1.6–1.7 (Ji et al. 2017a); on *Pinus*; type locality in USA; distribution: North America.

7. Hymenial setae projecting 40–50 µm outside of hymenium, not observed using a 5× lens; the same size of basidia and basidioles; distribution in Europe---------- *O. triquetra* (Pers.) Imazeki

Basidiocarps annual, pileate or laterally stipitate; pilei dimidiate; pileal surface rust brown, velutinate; pore surface yellowish brown to umber brown; pores 2–4 per mm; dissepiments thin, slightly lacerate; context duplex; hyphal system monomitic; hymenial setae hooked, sharply pointed, 40–50 × 12–16 µm; cystidia and cystidioles absent; the same size of basidia and basidioles; basidiospores ellipsoid, hyaline, thin-

walled, IKI–, CB–, (4.6–)5.1–6.9(–7.5) ´ (2.9–)3–4(–4.4) µm, L = 5.9 µm, W = 3.5 µm, Q = 1.5–1.8 (Niemelä 2005); on *Pinus*; type locality in Europe; distribution: Europe.

4.21 ***Pachynotus*** Y.C. Dai, F. Wu, L.W. Zhou & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 839994.

Type species: *Pachynotus punctatus* Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Pachynotus* (Lat.): referring to its similarity with *Inonotus* but with a thick basidiocarp.

Basidiocarps perennial, resupinate, cushion-shaped with distinct receding margin, hard corky when fresh, woody hard to bone hard when dry. Pore surface ash to snuff brown; tube layers distinctly stratified with a thin context between tubes; hyphal system monomitic; setal hyphae or hyphoid setae absent; hymenial setae present; basidiospores ellipsoid, pale yellow, slightly thick-walled, smooth, IKI–, CB–; on angiosperm wood; causing a white rot.

Remarks. — Pachynotus differs from *Inonotus* by the reupinate, perennial, thick and bone hard basidiocarps. Phylogenetically it formed a separate lineage in Hymenochaetaceae (Fig. 1).

Pachynotus punctatus Y.C. Dai, F. Wu, L.W. Zhou & B.K. Cui, **sp. nov.** (Figs. 1, 44, 45)

MycoBank: MB 839995.

Type. — **SINGAPORE**. Bukit Forest, on dead angiosperm tree, 18.VII.2017, Dai 17803 (holotype, BJFC025335).

Etymology. — *Punctatus* (Lat.): referring to the species having cushion-shaped basidiocarps.

Fruiting body. — Basidiocarps perennial, resupinate, cushion-shaped; margin distinctly receding, hard corky and without distinctive odor or taste when fresh, consistency woody hard to bone hard and light in weight when dry, up to 14 cm long, 8 cm wide and 2 cm thick at center. Pore surface ash gray when fresh, becoming snuff brown when dry, slightly glancing; margin fulvous when dry, up to 7 mm wide; pores circular, 8–9 per mm; dissepiments thin, entire. Subiculum very thin to almost lacking, snuff brown, hard corky, up to 0.1 mm thick. Tubes clay buff when dry, paler than pore surface and subiculum, bone hard, distinctly stratified, up to 2 cm long.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate, IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae hyaline, pale yellowish to dark brown, thin- to distinctly thick-walled with a medium lumen, unbranched, frequently septate, flexuous, interwoven, 2–3.5 µm in diam.

Trama of the tubes. — Tramal generative hyphae hyaline, pale yellowish to dark brown, fairly thick- to distinctly thick-walled with a narrow to wide lumen, unbranched, frequently septate, subparallel along the

tubes, 2–3.2 µm in diam; hymenial setae ventricose, thick-walled, dark brown, 14–22 × 5.5–8 µm; cystidioles absent; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7–9 × 4–5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid, pale yellow, slightly thick-walled, smooth, some collapsed, IKI–, CB–, (3–)3.1–3.9(–4) × (1.8–)1.9–2.6(–2.7) µm, L = 3.49 µm, W = 2.28 µm, Q = 1.53 (n = 30/1).

Remarks. — *Pachynotus punctatus* is found in type locality only.

4.22 *Perenninotus* Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 839996.

Type species: *Perenninotus shoreicola* (L.W. Zhou, Y.C. Dai & Vlasák) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Perenninotus* (Lat.): referring to its similarity with *Inonotus* but with perennial growing habit.

Basidiocarps perennial, pileate, solitary; woody hard when fresh and dry; pileal surface cracked, concentrically zonate and sulcate; pore surface dark brown; context homogeneous; hyphal system monomitic; setal hyphae or hyphoid setae absent; hymenial setae present; basidiospores ellipsoid, yellowish, thin-walled, IKI–, CB+; on angiosperm wood; causing a white rot.

Remarks. — *Perenninotus* is similar to *Inonotus* by a monomitic hyphal structure and thin-walled, colored basidiospores, but *Inonotus* usually has an annual growing habit, and corky to hard corky basidiocarps. *Perenninotus* resembles *Phellinus* sensu stricto by the perennial and woody hard basidiocarps, but the latter has a dimitic hyphal system and hyaline basidiospores. In addition, phylogenetically these three genera are distantly related (Fig. 1).

Perenninotus shoreicola (L.W. Zhou, Y.C. Dai & Vlasák) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 839997.

Basionym: *Inonotus shoreicola* L.W. Zhou, Y.C. Dai & Vlasák, in Li et al., *Fungal Diversity* 78: 169 (2016).

Basidiocarps perennial, pileate, solitary; woody hard when fresh and dry; pilei ungulate; pileal surface pale mouse gray to vinaceous gray, radially cracked, concentrically zonate and sulcate; pore surface dark brown, slightly glancing; pores 7 per mm; dissepiments thin, entire; context homogeneous; hyphal system monomitic; setal hyphae or hyphoid setae absent; hymenial setae present, 15–38 × 13–28 µm; cystidia and cystidioles absent; basidiospores broadly ellipsoid, yellowish, thin-walled, IKI–, CB+, (4.4–)4.6–5.1(–5.4) × (3.2–)3.5–3.9(–4) µm, L = 4.86 µm, W = 3.75 µm, Q = 1.29–1.3 (Li et al. 2016); on Shorea; type locality in Thailand; distribution: Thailand.

4.23 *Phellinidium* (Kotl.) Fiasson & Niemelä, *Karstenia* 24: 25 (1984) emend. L.W. Zhou & Y.C. Dai, *Fungal Biology* 120: 995 (2016), (Fig. 1)

Type species: *Phellinidium ferrugineofuscum* (P. Karst.) Fiasson & Niemelä.

Basidiocarps annual to perennial, resupinate, corky when fresh, becoming woody upon drying; hyphal system monomitic; hyphoid setae abundant, subulate, sharply pointed, parallel along the tubes, sometimes apically encrusted; hymenial setae absent; cystidia present to absent; cystidioles absent; basidiospores cylindrical to oblong-ellipsoid or allantoid, hyaline, thin-walled, IKI–, CB–; on angiosperm or gymnosperm wood; causing a white rot.

Phellinus subg. *Phellinidium* was proposed by Kotlaba (1968a), and Fiasson and Niemelä (1984) raised it to the generic level. *Phellinidium* was re-defined by Zhou et al. (2016a). The differences between *Phellinidium* and related genera are discussed by Fiasson and Niemelä (1984), Dai (1995) and Zhou et al. (2016a). *Phellinidium noxium* (Corner) Bondartseva & S. Herrera*, P. rufitinctum* (Berk. & M.A. Curtis ex Cooke) Bondartseva & S. Herrera, *P. lamaënse* (Murrill) Y.C. Dai, *P. orientale* (Bondartseva & S. Herrera) Bondartseva & S. Herrera were placed in *Phellinidium*, but based on the phylogenetic analyses, *Phellinidium noxium* was transferred to *Pyrroderma* (Zhou et al. 2018a), and *P. rufitinctum* was placed in *Fuscoporia* (Chen et al. 2020). Although no DNA data is available for *P. lamaënse* and *P. orientale,* their morphology and ecology are closer to *Pyrroderma* and *Fuscoporia,* and we treat them in *Pyrroderma* and *Fuscoporia*, respectively. New species and phylogeny of *Phellinidium* have been published by Dai (1995) and Zhou et al. (2014, 2016).

Key to species of *Phellinidium*

1. Basidiospores allantoid, mostly > 4 µm long———————————————————

—— ——————————————— *P. ferrugineofuscum* (P. Karst.) Fiasson & Niemelä

Basidiocarps annual to biennial, resupinate, up to 1 m long and with a yellowish brown sterile margin up to 1 cm wide; pore surface purplish brown; pores 5–8 per mm; dissepiments lacerate; hyphal system monomitic; hyphoid setae dominant, some encrusted with fine crystals, apex usually pointed, up to 100 µm long, 4–6 µm in diam; cystidia frequent, subulate, sharply pointed, 16–26 × 3.9–5 µm; basidiospores allantoid, hyaline, thin-walled, IKI–, CB–, (3.6–)4.1–5.1(–5.3) × (1.4–)1.5–1.9(–2) µm, L = 4.53 µm, W = 1.61 µm, Q = 2.82–2.98 (Dai 2010); on gymnosperm; type locality in Finland; distribution: temperate zone of Northern Hemisphere.

1. Basidiospores cylindric to oblong-ellipsoid, mostly < 4 µm long———————————— 2

2. Basidiocarps without odor or taste; conidia absent———————— *P. aciferum* Y.C. Dai

Basidiocarps perennial, resupinate, consistency woody hard, without distinctive odor or taste when fresh; pore surface grayish brown to umber brown, glancing; pores 4–6 per mm; dissepiments thick, entire;

hyphal system monomitic; hyphoid setae dominant, usually pointed with crystals, several hundreds of μm long, 5–6.5 μm in diam near apex; cystidia frequent, sharply pointed, 18–27 × 3–5 μm; basidiospores cylindrical, hyaline, thin-walled, IKI–, CB–, (2.8–)3–4(–4.2) × (1–)1.1–1.5(–1.8) μm, L = 3.52 μm, W = 1.24 μm, Q = 2.74–3 (Dai 1995); on *Quercus*; type locality in China; distribution: Northeast China.

2. Basidiocarps with fragrant odor; conidia present---------- 3

3. Pores 3–5 per mm; on *Abies*; European species---------- *P. pouzarii* (Kotl.) Fiasson & Niemelä

Basidiocarps perennial, resupinate, pulvinate, up to 10 mm thick, with strong fragrant odor; pore surface rust brown; pores 3–5 per mm; dissepiments thin, lacerate; hyphal system monomitic; hyphoid setae present, acute or with rounded apex, 4–6 μm in diam; hymenial setae or other sterile hymenial elements absent; cystidia present; basidiospores cylindrical to oblong-ellipsoid, hyaline, thin-walled, IKI–, CB–, 2.8–4 × 1.5–2 μm (Dai 1995); conidia present; on *Abies*; type locality in Czech Republic; distribution: Europe.

3. Pores 5–7 per mm; on angiosperm; Asian or American species---------- 4

4. Basidiocarps perennial; hyphoid setae sharply pointed; Asian species- *P. asiaticum* Spirin et al.

Basidiocarps perennial, resupinate, with strong fragrant odor; pore surface snuff brown to bright ferruginous brown; pores 5–7 per mm; dissepiments entire; hyphal system monomitic; hyphoid setae dominant, sometimes apically encrusted, sharply pointed, several hundreds of μm long, 4.2–6.2 μm in diam; hymenial setae absent; cystidia absent to rarely present; basidiospores oblong-ellipsoid to cylindrical, hyaline, thin-walled, IKI–, CB–, (2.2–)2.4–3.2(–3.3) × (1.4–)1.5–2(–2.1) μm, L = 2.94 μm, W = 1.77 μm, Q = 1.64–1.69 (Zhou et al. 2014a). Conidia mostly present in subiculum; on angiosperm wood; type locality in China; distribution: Northeast Asia.

4. Basidiocarps annual to biennial; hyphoid setae round-pointed; North American species------

---------- *P. fragrans* (M.J. Larsen & Lombard) Nuss

Basidiocarps annual to biennial, resupinate, with strong fragrant odor; pore surface snuff brown to bright ferruginous brown; pores 5–7 per mm; dissepiments lacerate; hyphal system dimitic; hyphoid setae dominant in trama, sometimes apically encrusted, tapering obtuse, several hundreds of μm long, 4–6 μm in diam; hymenial setae absent; cystidia absent to rarely present; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, 2.3–3 × 1.5–2 μm, L = 2.9 μm, W = 1.8 μm, Q = 1.6 (Larsen and Lombard1976; Dai 1995); conidia mostly present in subiculum; on angiosperm wood; type locality in USA; distribution: USA.

4.24 *Phellinopsis* Y.C. Dai, *Fungal Diversity* 45: 309 (2010), (Fig. 1)

Type species: *Phellinopsis conchata* (Pers.) Y.C. Dai.

Basidiocarps annual to perennial, resupinate, effused-reflexed to pileate, hard corky to woody hard when dry; pileal surface velutinate to glabrous; context homogeneous, or duplex with a thin black line; hyphal

system dimitic; generative hyphae simple septate; hymenial setae absent or present, mostly originating from tramal hyphae; basidiospores oblong-ellipsoid to broadly ellipsoid or subglobose, hyaline, becoming pale yellowish with age, moderately thick- to thick-walled, smooth, IKI–, CB– or slightly CB+; on angiosperm and gymnosperm wood; causing a white rot.

Phellinopsis was erected to accommodate *P. conchata*, as the generic type, and *P. occidentalis* Y.C. Dai, and was originally characterized by effused-reflexed to pileate and perennial basidiocarps, setae in hymenium arising from tramal hyphae and hyaline, thick-walled basidiospores that becoming pale yellowish with age (Dai 2010). Along with the inclusion of more species in *Phellinopsis*, the concept of this genus was emended and broadened (Zhou 2015d). Moreover, the illegitimate name, *P. occidentalis*, was replaced by *P. overholtsii* (Ginns) L.W. Zhou & Ginns (Zhou and Ginns 2014).

In addition, *Phellinus subsanfordii* T. Hatt. has characteristics fitting *Phellinopsis* well. So, the following combination is proposed:

Phellinopsis subsanfordii (T. Hatt.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 839998.

Basionym: *Phellinus subsanfordii* T. Hatt., in Hattori, Adhikari, Suda & Doi, *Bull. natn. Sci. Mus., Tokyo,* B 28(2): 31 (2002).

Key to species of *Phellinopsis*

1. Pores 2–4 per mm..... 2

1. Pores 4–8 per mm..... 3

2. Context duplex; on *Crataegus*..... *P. overholtsii* (Ginns) L.W. Zhou & Ginns

... Basidiocarps perennial, effused-reflexed to pileate; pileal surface blackish to grayish, faintly sulcate and zonate, encrusted, glabrous; pore surface light brown; pores 2–4 per mm; context duplex with a thin black line; hyphal system dimitic; hymenial setae subulate to ventricose; basidiospores ovoid to subglobose, hyaline, becoming brown with age, 5–6.5 × 4.5–5.5 µm (Lombard et al. 1972); on *Crataegus*; type locality in USA; distribution: Western USA.

2. Context homogeneous; on *Lonicera*..... *P. lonicericola* L.W. Zhou

... Basidiocarps annual, resupinate, occasionally effused-reflexed; pileal surface vinaceous brown to mouse gray, concentrically sulcate with narrow zones, glabrous, encrusted; pore surface brown, not glancing; pores 3–4 per mm; context homogeneous; hyphal system dimitic; hymenial setae subulate to ventricose, acute; basidiospores broadly ellipsoid, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB(+), 5–6.5(–7) × (4–)4.5–5.5(–6) µm, L = 5.93 µm, W = 4.94 µm, Q = 1.18–1.23 (Zhou and Song 2017); on *Lonicera*; type locality in China; distribution: China.

3. Basidiocarps resupinate completely..... 4

3. Basidiocarps resupinate, effused-reflexed to pileate..... 6

4. Basidiospores 5.5–7 µm wide..... *P. andina* (Plank & Ryvarden) Rajchenb. & Pildain

... Basidiocarps resupinate; pore surface umber; pores circular, 6–7 per mm; hyphal system dimitic; hymenial setae from tramal hyphae; basidiospores subglobose to broadly ellipsoid, golden brown when maturity, thick-walled, 7–9 × 5.5–7 µm (Larsen and Cobb-Poulle 1990); type locality in Argentina; distribution: Argentina.

4. Basidiospores 4–5.1 µm wide..... 5

5. Basidiospores 4.6–5.3 µm long..... *P. resupinata* L.W. Zhou

Basidiocarps perennial, resupinate; pore surface honey yellow, glancing; pores 5–7 per mm; hyphal system dimitic; hymenial setae subulate to ventricose; basidiospores broadly ellipsoid to subglobose, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB– or CB(+), (4.5–)4.6–5.3(–5.4) × (3.8–)4–4.7(–4.8) µm, L = 4.94 µm, W = 4.29 µm, Q = 1.14–1.17 (Zhou and Qin 2013); type locality in China; distribution: China.

5. Basidiospores 6.1–7.2 µm long..... *P. asetosa* L.W. Zhou

Basidiocarps annual resupinate, inseparable from substrate; pore surface reddish brown when fresh, dark brown when dry, glancing; pores 5–6 per mm; subiculum homogeneous; hyphal system dimitic; basidiospores oblong-ellipsoid to ellipsoid, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB– or slightly CB+, (6–)6.1–7.2(–7.7) × (4.3–)4.5–5.1(–5.3) µm, L = 6.74 µm, W = 4.8 µm, Q = 1.4 (Zhou 2015d); type locality in China; distribution: China.

6. Context homogeneous..... 7

6. Context duplex..... 8

7. Basidiospores mostly < 5 µm wide, skeletal hyphae unbranched; usually on *Salix*.....

..... *P. conchata* (Pers.) Y.C. Dai

... Basidiocarps perennial, resupinate, effused-reflexed to pileate; pileal surface dark gray to black, obscurely concentrically sulcate with narrow zones, velutinate to glabrous, encrusted; pore surface isabelline to umber brown, glancing; pores 5–7 per mm; context homogeneous; hyphal system dimitic; skeletal hyphae unbranched; hymenial setae subulate; basidiospores broadly ellipsoid, hyaline, becoming pale yellowish with age, fairly thick-walled, IKI–, CB– or slightly CB+, (4.9–)5–6(–6.2) × (3.9–)4.1–5(–5.1) µm, L = 5.41 µm, W = 4.48 µm, Q = 1.17–1.22 (Dai 2010); usually on *Salix*; type locality in Germany; distribution: Northern Hemisphere.

7. Basidiospores mostly > 5 μm wide, skeletal hyphae branched; on *Helwingia*.....

..... *P. helwingiae* L.W. Zhou & W.M. Qin

Basidiocarps perennial, resupinate, effused-reflexed to pileate; pileal surface dark brown to black with age, concentrically sulcate with narrow zones, velutinate to glabrous, encrusted; pore surface yellowish brown, not glancing; pores 6–7 per mm; context homogeneous; hyphal system dimitic; skeletal hyphae branched; hymenial setae subulate; basidiospores broadly ellipsoid to subglobose, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB– or CB(+), (5–)5.2–6 × (4.5–)4.7–5.5(–5.8) μm, L = 5.64 μm, W = 5.03 μm, Q = 1.12 (Qin and Zhou 2013); on *Helwingia*; type locality in China; distribution: China.

8. Hyphoid setae present..... *P. subsanfordii* (T. Hatt.) Y.C. Dai

Basidiocarps perennial, effused-reflexed; pilei semicircular; pileal surface brown, velutinate to tomentose, sulcate, encrusted; pore surface brown, glancing; pores 5–6 per mm; dissepiments entire; context duplex with a black zone; hyphal system dimitic; hyphoid setae present in trama, projecting out of hymenium; basidiospores subglobose, hyaline to pale yellow, thick-walled, IKI–, slightly CB+, 5.5–6.5 × 4.5–5.5 μm (Hattori et al. 2002); type locality in Nepal; distribution: Nepal.

8. Hyphoid setae absent..... 9

9. Pore surface not glancing; on *Juniperus* ..... *P. junipericola* L.W. Zhou

Basidiocarps annual, effused-reflexed to pileate; pileal surface mouse gray, concentrically sulcate with narrow zones, velutinate to glabrous, encrusted; pore surface honey yellow, not glancing; pores 4–5 per mm; context duplex with a thin black line; hyphal system dimitic; hymenial setae subulate to ventricose; basidiospores broadly ellipsoid to ovoid, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB– or CB(+), (5.6–)5.7–6.6(–6.8) × 4.7–5.7(–5.8) μm, L = 6.16 μm, W = 5.16 μm, Q = 1.19 (Zhou and Qin 2013); on *Juniperus*; type locality in China; distribution: China.

9. Pore surface glancing; on angiosperm..... *P. tibetica* L.W. Zhou

Basidiocarps perennial, pileate, imbricate; pileal surface yellowish brown to dark gray, concentrically sulcate with narrow zones, velutinate to glabrous, encrusted; pore surface brown, glancing; pores 5–7 per μm; context duplex with a thin black line; hyphal system dimitic; hymenial setae subulate, acute; basidiospores broadly ellipsoid to subglobose, hyaline, becoming pale yellowish with age, thick-walled, IKI–, CB(+), 5–6(–6.5) × (4–)4.5–5.5 μm, L = 5.56 μm, W = 4.82 μm, Q = 1.15–1.16 (Zhou and Song 2017); on angiosperm; type locality in China; distribution: China.

4.25 *Phellinus* Quél., *Enchir. Fung.* (Paris): 172 (1886), (Fig. 1)

Type species: *Phellinus igniarius* (L.) Quél.

Basidiocarps perennial, resupinate or effused-reflexed, pileate, solitary or imbricate; pileal surface usually encrusted if pileate; context homogeneous; hyphal system dimitic; generative hyphae simple septate, smooth; skeletal hyphae brown, thick-walled; hymenial setae present, arising from subhymenium; cystidioles present or absent; basidiospores subglobose to broadly ellipsoid or ovoid hyaline, fairly thick-walled, smooth, IKI–, CB–, slightly to moderately CB+; on angiosperm and gymnosperm; causing a white rot.

Coniferiporia, Fulvifomes, Fomitiporella, Fomitiporia, Fuscoporia, Neomensularia, Nothophellinus, Ochrosporellus, Phellinidium, Phellinopsis, Phellopilus, *Porodaedalea, Sanghuangporus* and *Tropicoporus* were derived from *Phellinus sensu lato* (Niemelä et al. 2001; Wagner and Fischer 2001; Wagner and Fischer 2002a, 2002b; Larsson et al. 2006; Dai 2010; Rajchenberg et al. 2015; Wu et al. 2016; Zhou et al. 2016a, 2016b, 2018) and confirmed by molecular data (Fig. 1). In the present study *Phellinus* is considered as *sensu stricto.*

Species of *Phellinus sensu stricto* in Europe are well known (Fischer 1995; Fischer and Binder 1995; Sell 2008), and recently a more comprehensive study was published by Zhou et al. (2016c).

Phellinus cuspidatus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 1, 46, 47)

MycoBank: MB 839999.

Type. — **CHINA**. Yunnan Province, Pingbian County, Daweishan National Forest Park, on fallen angiosperm trunk, 26.VI.2019, Dai 19837 (holotype, BJFC031512).

Etymology. — *Cuspidatus* (Lat.): referring to the species having pointed hymenial setae.

Fruiting body. — Basidiocarps perennial, resupinate, cushion-shaped, inseparable from substrate, hard corky and without distinctive odor or taste when fresh, consistency woody hard when dry, up to 10 cm, 4.5 cm wide, and 5 mm thick at center. Pore surface fulvous to fawn, glancing when dry; margin receding, yellowish brown, up to 1 mm wide; pores circular to angular, 5–7 per mm; dissepiments thin, entire. Subiculum umber, woody hard, up to 1 mm thick. Tubes fulvous, paler than pore surface and subiculum, woody hard, up to 4 mm long, indistinctly stratified, usually filled with white mycelial strands in old tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae occasionally present, hyaline, thin-walled, rarely branched and frequently simple septate, 2–3 µm in diam; skeletal hyphae dominant, golden brown, thick-walled with a narrow to medium lumen, unbranched, a septate, flexuous, interwoven, 2–3.8 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched and frequently simple septate, 1.5–2.8 µm in diam; skeletal hyphae dominant, yellowish brown to rust brown, thick-walled with a narrow lumen, unbranched, aseptate, flexuous, interwoven, 2–3.5 µm in diam;

hymenial setae present, strongly ventricose with pointed tips, thick-walled, dark brown, 18–30 ´ 10–14 µm; cystidioles present, fusoid, 9–12 ×3.5–4 µm; basidia long barrel-shaped, with four sterigmata and a simple septum at the base, 9.5–12 ´ 5.5–6.5 µm; basidioles pyriform, slightly smaller than basidia; big rhomboid crystals abundant in hymenia and trama.

Spores. — Basidiospores broadly ellipsoid to ovoid, hyaline, thin-walled, smooth, IKI–, CB+, (4.5–)4.7–5.2(–5.5) ´ (3.2–)3.5–4.2(–4.3) µm, L = 4.90 µm, W = 3.86 µm, Q = 1.28–1.32 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA**. Yunnan Province, Pingbian County, Daweishan National Forest Park, on fallen angiosperm trunk, 26.VI.2019, Dai 19834 (BJFC031509).

Remarks. — Phylogenetically *Phellinus cuspidatus* is closely related to *P. retulosus*(Lloyd) Imazeki (Fig. 1), but the latter has effused-reflexed to pileate basidiocarps, and pale yellowish, thick-walled basidiospores measuring 5–7 × 4–6 µm (Ryvarden and Johansen 1980; Robledo et al. 2003).

Phellinus subellipsoideus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 1, 48, 49)

MycoBank: MB 840000.

Type. — **SRI LANKA**. Avissawella, Salgala Forest, on fallen angiosperm trunk, 3.III.2019, Dai 19623 (holotype, BJFC031300).

Etymology. — *Subellipsoideus* (Lat.): referring to the species similar to *Phellinus ellipsoideus***.**

Fruiting body. — Basidiocarps perennial, resupinate, cushion-shaped, inseparable from substrate, woody hard and without distinctive odor or taste when fresh, consistency bone hard and heavy in weight when dry, up to 40 cm, 15 cm wide, and 2 cm thick at center. Pore surface milky coffee, distinctly glancing when fresh, becoming snuff brown and less glancing when dry; margin distinctly receding, black, up to 1 cm wide; pores circular to angular, 7–8 per mm; dissepiments thin, slightly lacerate. Subiculum umber, woody hard, very thin, less than 0.2 mm thick, a black line present between subiculum and substrate. Tubes concolorous with the pore surface, bone hard, up to 19.8 mm long, distinctly stratified, usually filled with white mycelial strands in old tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae infrequent, pale yellowish, fairly thick-walled, rarely branched and frequently simple septate, 2–3.5 µm in diam; skeletal hyphae dominant, golden brown to rust brown, thick-walled with a narrow to wide lumen, rarely branched, agglutinated, flexuous, interwoven, 2.5–3.8 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched and frequently simple septate, 1.8–2.8 µm in diam; skeletal hyphae dominant, yellowish brown to rust brown, thick-walled with a narrow lumen to subsolid, unbranched, flexuous,

slightly agglutinated, interwoven, 2.5–3.5 µm in diam; hymenial setae present, usually subulate to ventricose, straight, dark brown, thick-walled, 15–22 ´ 5–8 µm; cystidia and cystidioles absent; basidia long barrel-shaped, with four sterigmata and a simple septum at the base, 8–10 ´ 4–5 µm; basidioles capitate, slightly smaller than basidia.

Spores. — Basidiospores ellipsoid to oblong-ellipsoid, hyaline, slightly thick-walled, smooth, IKI–, CB–, (2.9–)3.2–4(–4.5) ´ (2–)2.1–2.6(–2.8) µm, L = 3.7 µm, W = 2.36 µm, Q = 1.56 (n = 30/1).

Remarks. — In the field *Phellinus subellipsoideus* can be confused with *Phellinus ellipsoideus,* but the latter species has hooked hymenial setae and bigger basidiospores (4.9–6 × 3.9–4.8 µm vs. 3.2–4 ´ 2.1–2.6 µm, Dai 2010), and they are distantly related in the phylogeny (Fig. 1).

Key to species of *Phellinus*

1. Subtropical to tropical species; basidiospores hyaline to pale yellowish, sometimes slightly dextrinoid, setae hooked or straight..... 2

1. Boreal to temperate species; basidiospores consistently hyaline, non dextrinoid, setae always straight 16

2. Basidiocarps resupinate..... 3

2. Basidiocarps pileate or effused-reflexed..... 14

3. Hymenial setae hooked or curved at tip..... 4

3. Hymenial setae straight..... 11

4. African species..... *P. gabonensis* Decock & Yombiy.

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface yellowish brown to rust brown, glancing; pores 6–8 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae ventricose, hooked, 16–26 × 6–10 µm; cystidioles absent; basidiospores ellipsoid to broadly ellipsoid, hyaline, slightly thick-walled, IKI–, (4.3–)4.5–5.5 × 3.5–4.3(–4.5) µm, L = 5 µm, W = 3.9 µm (Yombiyeni et al. 2010); type locality in Gabon; distribution: Gabon.

4. Asian or American species..... 5

5. Asian species..... 6

5. American species..... 8

6. Pores 10–13 per mm..... *P. transversus* Corner

Basidiocarps perennial, resupinate; pore surface dull dark brown; pores 10–13 per mm; hymenial setae ventricose, slightly curved, 15–35 × 5–10 µm; basidiospores subglobose, hyaline, thick-walled, 5.5–6.5 × 4.5–5.5 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

6. Pores 5–8 per mm..... 7

7. Basidiocarps annual, even..... *P. castanopsidis* B.K. Cui et al.

Basidiocarps annual, resupinate, woody hard; pore surface pale grayish brown to cinnamon brown or fuscous, glancing; pores 5–8 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose, hooked, 21–33 × 10–14 µm; cystidioles absent; basidiospores ovoid to broadly ellipsoid, hyaline, slightly thick-walled, weakly IKI[+], CB+, 5–6 × (4.5–)4.5–5(–5.2) µm, L = 5.4 µm, W = 4.77 µm, Q = 1.11–1.19 (Cui and Decock 2012); type locality in China; distribution: South China.

7. Basidiocarps perennial, cushion-shaped..... *P. ellipsoideus* (B.K. Cui & Y.C. Dai) B.K. Cui et al.

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface yellowish brown to rust brown, glancing; pores 5–8 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae ventricose, hooked, 20–30 × 10–14 µm; cystidioles absent; basidiospores ellipsoid to broadly ellipsoid, hyaline, slightly thick-walled, weakly IKI[+], CB+, (4.5–)4.9–6(–6.1) × (3.5–)3.9–4.8(–5) µm, L = 5.26 µm, W = 4.14 µm, Q = 1.22–1.32 (Dai 2010); type locality in China; distribution: South China.

8. Hymenial setae bicuspidate..... *P. bicuspidatus* Lombard & M.J. Larsen

Basidiocarps perennial, resupinate; pore surface dull ferruginous brown; margin darker than pores; pores 5–7 per mm; dissepiments entire; hyphal system dimitic; hymenial setae bicuspidate, curved, 16–24 × 8–14 µm; cystidioles absent; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI–, CB–, 4–6 × 3–4 µm (Lombard and Larsen 1985); on *Quercus*; type locality in USA; distribution: USA (JV 0904/156).

8. Hymenial setae with one tip only..... 9

9. Basidiocarps annual; basidiospores 3.5–4.5 µm long..... *P. undulatus* (Murrill) Ryvarden

Basidiocarps annual, resupinate; pore surface grayish brown, glancing; pores 4–6 per mm; context up to 1 mm thick; hymenial setae hooked; basidiospores broadly ellipsoid, hyaline, CB+, 3.5–4.5 × 2.5–3.5 µm (Ryvarden 2004); type locality in Belize; distribution: Central America (JV 1212/1-J from Puerto Rico)

9. Basidiocarps perennial; basidiospores 4.5–5.7 µm long..... 10

10. Pores 6–7 per mm; on *Quercus*..... *P. caribaeo-quercicola* Decock & S. Herrera

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface dark brown to chocolate brown, glancing; margin rimose with age; pores 6–7 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose, hooked, 15–28 × 6–11 µm; cystidioles absent; basidiospores ellipsoid

to broadly ellipsoid, hyaline to pale yellowish, thin-walled, IKI–, 4.5–5.7(–6) × 3.5–4.3(–4.7) µm, L = 5.2 µm, W = 3.9 µm (Decock et al. 2006); on *Quercus*; type locality in Cuba; distribution: Cuba, USA (JV 0904/28), Guadeloupe (JV 1612/18) .

10. Pores 7–10 per mm; on an angiosperm other than *Quercus*.....

..... *P. amazonicus* Camp.-Sant. & Decock

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface chocolate brown, glancing; pores 7–10 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose, curved, 15–23 × 5–10 µm; cystidioles absent; basidiospores ovoid to broadly ellipsoid, hyaline, slightly thick-walled, IKI–, 4.5–5.5 × (3.5–)4–5(–5.5) µm, L = 5 µm, W = 4.3 µm (Campos-Santana et al. 2016); type locality in French Guiana; distribution: French Guiana, Costa Rica (JV 1704/109).

11. Basidiospores < 2.6 µm wide..... 12

11. Basidiospores > 3 µm wide..... 13

12. Pores 8–10 per mm..... *P. austrosinensis* L.S. Bian

Basidiocarps perennial, resupinate, cushion-shaped; pore surface cinnamon to fawn to brown, glancing; pores 8–10 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae subulate to ventricose, 14–17 × 4.5–5.5 µm; basidiospores oblong-ellipsoid, hyaline, thin-walled, IKI–, moderately CB+, (2.7–)2.8–3.6 × 2–2.5 µm, L = 3.20 µm, W = 2.14 µm (Bian et al. 2016b); type locality in China; distribution: South China.

12. Pores 7–8 per mm..... *P. subellipsoideus* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface milky coffee to snuff brown, glancing; pores 7–8 per mm; dissepiments thin, lacerate; hyphal system dimitic; hymenial setae ventricose, straight, 15–22 ´ 5–8 µm; cystidioles absent; basidiospores ellipsoid to oblong-ellipsoid, hyaline, slightly thick-walled, IKI–, CB–, (2.9–)3.2–4(–4.5) ´ (2–)2.1–2.6(–2.8) µm, L = 3.7 µm, W = 2.36 µm, Q = 1.56; type locality in Sri Lanka; distribution: Sri Lanka.

13. Basidiospores 3–3.5 µm wide; African species..... *P. resupinatus* M. Fisch. et al.

Basidiocarps perennial, resupinate, cushion-shaped; pore surface bright reddish brown to dark yellowish, cracked; pores 7–8 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae infrequent, ventricose, 12–25 × 5–8 µm; basidiospores ellipsoid, hyaline, IKI–, (4–)4.5–5(–5.5) × 3–3.5 µm (Cloete et al. 2016); on *Vitis*; type locality in South Africa; distribution: South Africa.

13. Basidiospores 3.5–4.2 µm wide; Asian species..... *P. cuspidatus* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped, woody hard; pore surface fulvous to fawn, not glancing; pores 5–7 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose, straight, 18–30 ´ 10–14 µm; cystidioles present; basidiospores broadly ellipsoid, hyaline, thin-walled, IKI–, CB+, (4.5–)4.7–5.2(–5.5) ´ (3.2–)3.5–4.2(–4.3) µm, L = 4.9 µm, W = 3.86 µm, Q = 1.28–1.32; type locality in China; distribution: South China.

14. Hymenial setae with curved tips..... *P. setulosus* (Lloyd) Imazeki

Basidiocarps perennial, effused-reflexed to pileate; pilei dimidiate to ungulate; pileal surface reddish brown to blackish brown, concentrically sulcate and zonate, tomentose to glabrous; margin becoming blood red with KOH; pore surface fulvous to ferruginous; pores 5–8 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae frequent, ventricose with a short apical part, multiradicate with two, three or four roots, tip curved, 15–40 × 5–16 µm; cystidioles ventricose, 16–30 × 3–5 µm; basidiospores globose to subglobose, pale yellowish, thick-walled, 5–7 × 4–6 µm (Ryvarden and Johansen 1980; Robledo et al. 2003); type locality in Sri Lanka; distribution: topical Asia.

14. Hymenial setae straight..... 15

15. Basidiospores drop-shaped to turbinate; American species..... *P. turbinatus* Ryvarden

Basidiocarps perennial, pileate; pilei dimidiate; pileal surface yellowish brown to with a black cuticle, glabrous to velutinate, concentrically sulcate and zonate; pore surface dark reddish brown to fulvous; pores 7–9 per mm; dissepiments thick, entire; hymenial setae subulate to ventricose, 15–25 × 6–10 µm; basidiospores drop-shaped to turbinate, hyaline, thin-walled, 6–8 × 5–6 µm (Ryvarden 2004); type locality in Costa Rica; distribution: Costa Rica.

15. Basidiocarps subglobose to globose; African species..... *P. guttiformis* Tchotet et al.

Basidiocarps perennial, pileate, drop-shaped or hoof-shaped and pendent; solitary; pilei triquetrous; pileal surface dull brown to dark brown, velutinate to glabrous, concentrically zonate, encrusted, cracked; pore surface chocolate brown; pores 6–8 per mm; dissepiments thick, entire; hyphal system dimitic; hymenial setae ventricose, straight, 12–25 × 4–9 µm; cystidioles absent; basidiospores subglobose to globose, hyaline to pale yellowish, thick-walled, IKI–, 5.5–6.1 × 4.8–5.4 µm, L = 5.81 µm, W = 5.09 µm (Tchotet Tchoumi et al. 2020); type locality in South Africa; distribution: South Africa.

16. Basidiocarps resupinate..... 17

16. Basidiocarps pileate or effused-reflexed..... 23

17. On *Betula*..... 18

17. On an angiosperm other than *Betula*..... 20

18. Basidiospore 3–4 µm long; Asian species..... *P. parmastoi* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, resupinate; pore surface dark reddish brown to blackish brown, glancing; pores 7–8 per mm; dissepiments thin, entire; hyphal system dimitic; tramal hyphae subparallel; hymenial setae frequent, subulate to ventricose 13–19 × 3–5 µm; cystidioles infrequent, fusoid, 13–16 × 3–5 µm; basidiospores broadly ellipsoid, hyaline, thick-walled, IKI–, moderately CB+, 3–4 × (2–)2.5–3 µm, L = 3.56 µm, W = 2.74 µm, Q = 1.3 (Zhou et al. 2016c); on *Betula*; type locality in China; distribution: China.

18. Basidiospore 4–5.5 µm long; European or American species..... 19

19. Pores 5–6 per mm; basidiospores 4–4.4 µm long; American species..... *P. betulinus* (Murrill) Parmasto

Basidiocarps perennial, resupinate; pore surface dark brown, glancing; pores 5–6 per mm; dissepiments thin, entire; hyphal system dimitic; tramal hyphae parallel; hymenial setae frequent, subulate, 13.2–18.6 × 5.3–6.8 µm; cystidioles absent; basidiospores ellipsoid, hyaline, thick-walled, IKI–, CB–, 4–4.4 × 2.8–3.6 µm (Parmasto 2007); on *Betula*; type locality in USA; distribution: North America.

19. Pores 6–8 per mm; basidiospores 4.6–5.5 µm long; European species..... ..... *P. laevigatus* (P. Karst.) Bourdot & Galzin

Basidiocarps perennial, resupinate; pore surface dark brown to deep brown, glancing; pores 6–8 per mm; dissepiments thin, entire to lacerate; hyphal system dimitic; tramal hyphae parallel; hymenial setae frequent, subulate to onion-shaped, 13–17 × 6–8 µm; cystidioles absent; basidiospores ellipsoid, hyaline, thick-walled, IKI–, CB–, 4.6–5.5 × 3.6–4.2 µm (Parmasto 2007); on *Betula*; type locality in Finland; distribution: Europe.

20. Basidiocarps even..... 21

20. Basidiocarps cushion-shaped..... 22

21. Basidiospores 2.5–3.5 µm wide..... *P. prunicola* (Murrill) Gilb.

Basidiocarps perennial, resupinate, even; pore surface reddish brown, rimose; pores 6–8; dissepiments thick, entire; hyphal system dimitic; hymenial setae frequent, ventricose, 15–18 × 5–6.5 µm; cystidioles absent; basidiospores ovoid to subglobose, hyaline, IKI–, 3.5–5 × 2.5–3.5 µm (Gilbertson 1979); on *Prunus*; type locality in USA; distribution: North America

21. Basidiospores 3.6–4.9 µm wide..... *P. spiculosus* (W.A. Campb. & R.W. Davidson) Niemelä

Basidiocarps perennial, resupinate, even; margin distinct, up to 10 mm wide; pore surface yellowish brown to purplish brown, cracked; pores 7–9 per mm; hyphal system dimitic; hymenial setae ventricose to subulate, 10–16 × 6–7.5 µm; cystidioles absent; basidiospores ovoid, hyaline, IKI–, 5–6 × 3.6–4.9 µm (Niemelä 1972); mostly on *Quercus*; type locality in USA; distribution: North America.

22. On *Morus*; basidiospores 4.3–5.2 × 3.8– 4.6 µm..... *P. mori* Y.C. Dai & B.K. Cui

Basidiocarps perennial, resupinate, cushion-shaped; pore surface cinnamon brownish to clay buff, strongly glancing, cracked; pores 7–8 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae frequent, ventricose to subulate,11–24 × 5–8.5 µm; fusoid cystidioles present, 8.7–14.7 × 3.4–5.2 µm; basidiospores ovoid to subglobose, hyaline, thick-walled, IKI–, moderately CB+, (4–)4.3–5.2(–5.4) × (3.5–)3.8– 4.6(–4.8) µm, L = 4.74 µm, W = 4.16 µm (Dai et al. 2008); on *Morus;* type locality in China; distribution: North China.

22. On *Rhamnus;* basidiospores 5.5–5.8 × 4.2–4.8 µm..... *P. rhamni* (Bondartseva) H. Jahn

Basidiocarps perennial, resupinate, cushion-shaped; pore surface dark to grayish brown, cracked; margin narrow, receding; pores 6–7 per mm; hyphal system dimitic; hymenial setae frequent, ventricose, 17–30 × 7.7–8.4 µm; cystidioles absent; basidiospores broadly ellipsoid to subglobose, hyaline, IKI–, 5.5–5.8 × 4.2–4.8 µm (Parmasto 2007); mostly on *Rhamnus*; type locality in Kazakhstan; distribution: Europe and Asia.

23. Hymenial setae > 30 µm long..... *P. arctostaphyli* (Long) Niemelä

Basidiocarps perennial, pileate; pilei applanate to ungulate; pileal surface grayish black, glabrous, sulcate, rimose; pore surface pale grayish brown to dark rust brown; pores 5–6 per mm; dissepiments thick, entire; context with a core; hyphal system dimitic; hymenial setae infrequent, subulate, 30–50 × 6–8.5 µm; basidiospores ovoid, hyaline, thick-walled, IKI–, CB–, 5–6 × 3.5–4.5 µm, (Larsen and Cobb-Poulle 1990): on *Arctostaphylos* and *Cercocarpus*; type locality in USA; distribution: West USA.

23. Hymenial setae < 30 µm long..... 24

24. Basidiospores < 3 µm wide; on *Picea*..... *P. piceicola* B.K. Cui & Y.C. Dai

Basidiocarps perennial, effused-reflexed to pileate; pilei ungulate; pileal surface black, concentrically sulcate and zonate, glabrous, encrusted, cracked; pore surface yellowish brown to grayish brown; pores 6–8 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose to subulate, 13–26 × 5–7 µm; cystidioles present, subulate to ventricose, 8–33 × 4–5 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thick-walled, IKI–, moderately CB+, (3–)3.2–4 × (2.6–)2.7–3(–3.2) µm, L = 3.59 µm, W = 2.92 µm (Cui and Dai 2012): on *Picea*; type locality in China; distribution: West China.

24. Basidiospores > 3 µm wide; on angiosperm wood..... 25

25. Pileal surface not encrusted..... *P. artemisiae* Vlasák & Vlasák Jr.

Basidiocarps perennial, effused-reflexed; pileal surface pale grayish brown to blackish brown, velutinate, without cuticle and crust, rimose; pore surface brown to dark grayish brown, cracked; pores 3–4 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae ventricose, 13–28 × 7–10 µm; basidiospores broadly ellipsoid to subglobose, hyaline, IKI–, 4–5 × 3–4 µm (Vlasák and Vlasák Jr. 2017); on *Artemisia*; type locality in USA; distribution: Western USA.

25. Pileal surface encrusted..... 26

26. Tramal hyphae parallel or subparallel..... 27

26. Tramal hyphae interwoven..... 30

27. Contextual skeletal hyphae occasionally septate, some collapsed..... 28

27. Contextual skeletal hyphae aseptate or rarely septate, not collapsed..... 29

28. Pores 6–9 per mm; basidiospores 4–5 µm long..... *P. pomaceoides* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, effused-reflexed to pileate, solitary; pilei triquetrous; pileal surface pale gray, velutinate to glabrous, indistinctly encrusted, cracked; pore surface grayish brown, glancing; pores 6–9 per mm; dissepiments thick, entire; hyphal system dimitic; contextual skeletal hyphae occasionally septate, some collapsed; tramal hyphae parallel; hymenial setae infrequent, subulate, 13–20 × 4–6 µm; cystidioles absent; basidiospores broadly ellipsoid, hyaline, slightly thick-walled, IKI–, moderately CB+, (3.5–)4–5 × 3–4(–4.5) µm, L = 4.3 µm, W = 3.47 µm, Q = 1.22–1.25 (Zhou et al. 2016c); mostly on *Prunus*; type locality in USA; distribution: USA.

28. Pores 5–6 per mm; basidiospores 5.8–6.4 µm long..... *P. pomaceus* (Pers.) Maire

Basidiocarps perennial, effused-reflexed to pileate, solitary or a few imbricate; pilei triquetrous; pileal surface cinnamon to dark gray, concentrically zonate, glabrous, indistinctly encrusted, cracked; pore surface golden brown to grayish brown; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae subparallel; contextual skeletal hyphae occasionally septate, usually collapsed; hymenial setae infrequent, subulate, 16–20 × 6–7 µm; cystidioles absent; basidiospores ellipsoid, hyaline, slightly thick-walled, IKI–, moderately CB+, (5–)5.8–6.4(–7) × (4–)4.6–5(–5.4) µm (Niemelä 1977); mostly on *Prunus* and *Malus*; type locality in Germany; distribution: Europe.

29. Pores 6–7 per mm; on *Padus*..... *P. padicola* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, effused-reflexed to pileate, solitary; pilei triquetrous; pileal surface ash gray to dark gray, concentrically sulcate, glabrous, encrusted, cracked; pore surface grayish brown, glancing; pores 6–7 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae subparallel; hymenial setae frequent, subulate, 16–26 × 5–8 µm; cystidioles fusoid, 9–15 × 3–4 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thick-walled, IKI–, moderately CB+, 4–5 × 3–4 µm, L = 4.41 µm, W = 3.43 µm, Q = 1.27–1.31 (Zhou et al. 2016c); on *Padus*; type locality in China; distribution: West China.

29. Pores 5–6 per mm; on *Populus*..... *P. tremulae* (Bondartsev) Bondartsev & P.N. Borisov

Basidiocarps perennial, pileate; pilei ungulate; pileal surface grayish black to black, obscurely concentrically sulcate, zonate, velutinate to glabrous, encrusted, rimose; pore surface deep brown to cocoa brown; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae

parallel; hymenial setae frequent, ventricose to subulate, 11–20 × 5–7 µm; fusoid cystidioles occasionally present; basidiospores broadly ellipsoid, hyaline, thick-walled, IKI–, moderately CB+, (4.2–)4.6–5.5(–5.8) × (3–)3.2–4.3(–4.5) µm, L = 4.95 µm, W = 3.76 µm, Q = 1.29–1.34 (Dai 2010); mostly on *Populus*; type locality in Russia; distribution: temperate zone of Northern Hemisphere.

30. Basidiospores 4–5 µm long..... 31

30. Basidiospores 5–7 µm long..... 32

31. Basidiospores 3–3.5 µm wide..... *P. monticola* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface ash gray, mouse gray to black, concentrically zonate, sulcate, glabrous, encrusted, cracked; pore surface clay buff to fawn, glancing; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae frequent, ventricose, 10–16.5 × 4.5–6 µm; cystidioles present, 8–12 × 3–5 µm; basidiospores broadly ellipsoid to subglobose, hyaline, thick-walled, IKI–, moderately CB+, 4–5 × (2.5–)3–3.5(–4) µm, L = 4.35 µm, W = 3.27 µm, Q = 1.29–1.39 (Zhou et al. 2016c); type locality in China; distribution: West China.

31. Basidiospores 3.5–4.5 µm wide..... *P. orientoasiaticus* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, effused-reflexed to pileate, often imbricate; pilei hemispherical or subungulate; pileal surface pale grayish brown to dark brown, velutinate to glabrous, encrusted, cracked; pore surface grayish brown; pores 5–7 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae frequent, ventricose, 12–16 × 4–6 µm; cystidioles infrequent, 11–15 × 3.5–5 µm; basidiospores broadly ellipsoid, hyaline, slightly thick-walled, IKI–, moderately CB+, 4.5–5(–5.5) × 3.5–4.5(–5) µm, L = 4.84 µm, W = 3.97 µm, Q = 1.21–1.23 (Zhou et al. 2016c); type locality in China; distribution: West China.

32. Basidiospores 3.9–4.8 µm wide, mostly on *Populus* or *Betula*..... 33

32. Basidiospores 4.6–6.5 µm wide, mostly on *Alnus* or *Salix*..... 34

33. Basidiocarps usually effused-reflexed; mostly on *Betula*..... *P. lundellii* Niemelä

Basidiocarps perennial, effused-reflexed; pilei triquetrous; pileal surface deep brown dark brown to grayish brown, concentrically zonate, glabrous, sulcate, encrusted, rimose; pore surface dark reddish brown; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae frequent, subulate to ventricose, 17–24 × 3.8–5.7 µm; basidiospores ellipsoid, hyaline, thick-walled, IKI–, CB–, (4.4–)4.9–6(–6.1) × (3.7–)3.9–4.9(–5.2) µm (Niemelä 2005); on *Betula*; type locality in Finland; distribution: Northern Hemisphere.

33. Basidiocarps usually pileate; mostly on *Populus*..... *P. populicola* Niemelä

Basidiocarps perennial, pileate, usually solitary or a few imbricate; pilei ungulate; pileal surface grayish brown to black, concentrically zonate, glabrous, encrusted, rimose; pore surface leather brown to cinnamon brown; pores 4–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae infrequent, subulate, 15–21 × 6–8 µm; cystidioles absent; basidiospores broadly ellipsoid, hyaline, slightly thick-walled, IKI–, (4.8–)5.1–5.7(–6) × (3.8–)4–4.8(–5) µm (Niemelä 1975); on *Populus*; type locality in Finland; distribution: Europe.

34. Exclusively on *Salix*..... *P. igniarius* (L.) Quél.

Basidiocarps perennial, pileate, solitary or in groups; pilei applanate to ungulate; pileal surface dark gray to black, concentrically zonate, sulcate, encrusted, cracked; pore surface olivaceous brown to light cinnamon brown; pores 4–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae frequent, subulate, 14–18 × 5–8 µm; basidiospores subglobose, hyaline, thick-walled, IKI–, CB–, (5–)5.6–6.8(–7) × (4.1–)4.6–6(–6.2) µm (Niemelä 1975); on *Salix*; type locality in Sweden; distribution: Europe and Asia.

34. On an angiosperm other than *Salix*..... 35

35. Pores 5–6 per mm; on *Betula*..... *P. nigricans* (Fr.) P. Karst.

Basidiocarps perennial, pileate, solitary; pilei triquetrous; pileal surface brownish gray to black, concentrically zonate, sulcate, encrusted, cracked; pore surface cinnamon brown to deep rust brown; pores 5–6 per mm; dissepiments thick, entire; hyphal system dimitic; tramal hyphae interwoven; hymenial setae frequent, bottle-shaped to subulate, 15–18 × 6–8 µm; basidiospores subglobose, hyaline, thick-walled, IKI–, CB–, (5.8–)6.2–7(–7.3) × (4.9–)5.5–6.5(–6.7) µm (Niemelä 1975); mostly on *Betula* and *Alnus*; type locality in Sweden; distribution: temperate zone of Northern Hemisphere.

35. Pores 4–5 per mm; mostly on *Alnus* except for *Betula*..... *P. alni* (Bondartsev) Parmasto

Basidiocarps perennial, pileate, solitary; pilei applanate; pileal surface dark brown to black, concentrically zonate, sulcate, encrusted, cracked; pore surface cinnamon brown to grayish brown; pores 4–5 per mm; hyphal system dimitic; skeletal hyphae interwoven; hymenial setae frequent, 15–24 × 6–7 µm; basidiospores subglobose, hyaline, thick-walled, IKI–, CB–, 6–6.4 × 5.4–6 µm (Parmasto 1976); mostly on *Alnus*; type locality in Russia; distribution: temperate zone of Northern Hemisphere.

4.26 *Phellopilus* Niemelä, T. Wagner & M. Fisch.**,** in Niemelä, Wagner, Fischer & Dai, *Ann. Bot. Fenn.* 38(1): 53 (2001), (Fig. 1)

Type species: *Phellopilus nigrolimitatus* (Romell) Niemelä, T. Wagner & M. Fisch.

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface tomentose to velutinate; context duplex, a black line (or lines) present in context; hyphal system trimitic; skeletal hyphae dichotomously

branched like the so-called skeleto-binding hyphae; hymenial setae present; basidiospores narrowly obclavate, hyaline, thin-walled, smooth, IKI–, slightly CB+; on gymnosperm wood; causing a white rot.

Phellopilus is characterized by duplex context, trimitic hyphal structure, and narrowly obclavate (carrot-shaped), hyaline, thin-walled basidiospores (Niemelä et al. 2001). Morphologically it resembles *Fuscoporia* by sharing hyaline and thin-walled spores, but molecular data showed that *Phellopilus* clustered as an independent clade (Fig. 1).

Phellopilus nigrolimitatus (Romell) Niemelä et al., in Niemelä, Wagner, Fischer & Dai, *Ann. Bot. Fenn.* 38(1): 54 (2001).

Basidiocarps perennial, resupinate, effused-reflexed to pileate; pileus spongy at first, bright yellow-brown, exuding brownish droplets, later corky, dark reddish brown to grayish black, obscurely zonate, tomentose to velutinate; pore surface yellowish brown to dull brown, glancing; pores 6–7 per mm; dissepiments thin, entire; context duplex with a thin black line; hyphal system trimitic with skeleto-binding hyphae in context; hymenial setae subulate, 18–35 × 4–6.5 µm; basidiospores narrowly obclavate to cylindric, tapering at the apex, hyaline, thin-walled, IKI–, CB–, (4–)4.8–6(–6.4) × (1.5–)1.6–2 µm, L = 5.17 µm, W = 1.88 µm, Q = 2.75 (Dai 2010); type locality in Sweden; distribution: temperate zone of Northern Hemisphere.

4.27 *Phylloporia* Murrill, *Torreya* 4: 141 (1904), (Figs. 1, 50)

Type species: *Phylloporia parasitica* Murrill.

Basidiocarps annual or perennial, effused-reflexed or pileate, soft corky to hard corky; pileal surface tomentose to velutinate; context mostly duplex with a black line between upper tomentum and lower context layer; hyphal system mostly monomitic, some dimitic; generative hyphae hyaline and thin-walled to yellowish brown and thick-walled, frequently simple septate; setal elements absent; basidiospores subglobose, ellipsoid or cylindric, yellowish, fairly thick-walled, usually glued in tetrads, collapsed when mature, IKI–, CB– to CB(+), < 6 µm in greatest dimension; on living angiosperm trees; causing a white rot.

Phylloporia is morphologically similar to *Flaviporellus* and *Fulvifomes* by sharing colored basidiospores and the absence of setae, and these three genera are phylogenetically related (Fig. 1), but *Flaviporellus* and *Fulvifomes* have mostly homogeneous context.

Most species of *Phylloporia* grow on living parts of trees or bushes, including roots, trunks, branches, petioles or leaves, with high levels of host specificity (Wagner and Ryvarden 2002), but some species develop from dead wood (Wagner and Ryvarden 2002; Ipulet and Ryvarden 2005; Zhou and Dai 2012; Zhou 2015b; Ferreira-Lopes et al. 2016). The particular feature of *Phylloporia* is that likely it does not decay the wood itself but rather feeds on the sap whereas most other taxa in the Hymenochaetaceae are wood-decaying species. Nonetheless, the potential pathogenicity of *Phylloporia* species and their impact on the plant fitness need to be further studied (Ryvarden and Johansen 1980; Decock et al. 2015; Yombiyeni et al. 2015). *Phylloporia* is widely distributed mostly in the tropical areas, but several species

are also found in the temperate zone (Ryvarden and Johansen 1980; Gilbertson and Ryvarden 1986-1987; Ryvarden and Gilbertson 1994; Núñez and Ryvarden 2001; Dai 2010; Wu et al. 2019b).

Phylloporia minutissima Y.C. Dai & F. Wu, **sp. nov.** (Figs. 50, 51, 52)

MycoBank: MB 840001.

Type. — **CHINA**. Yunnan Province, Mengla County, Xishuangbanna Tropical Botanical Garden, on living angiosperm shrub, 28.XII.2019, Dai 21223 (holotype, BJFC032877).

Etymology. — *Minutissima* (Lat.): referring to the species having very small basidiocarps.

Fruiting body. — Basidiocarps annual, pileate, solitary, corky and without distinctive odor or taste when fresh, becoming hard corky and light in weight when dry. Pilei dimidiate or semicircular, projecting up to 0.5 cm, 1 cm wide, and 1.5 mm thick at base. Pileal surface cinnamon to rust tawny when dry, distinctly concentrically zonate, velutinate to glabrous; margin acute, incurved when dry. Pore surface fulvous; sterile margin very narrow to almost lacking; pores circular to angular, 12–13 per mm; dissepiments thick, entire. Context duplex, with a thin black line separating an upper tomentum and a lower context; upper tomentum brick, up to 0.2 mm thick at the base; lower context corky, rust tawny, up to 0.3 mm thick at the base. Tubes concolorous with pore surface, hard corky, up to 1 mm long.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Hyphae in the lower context golden yellow, thick-walled with a wide lumen, unbranched, frequently simple septate, more or less regularly arranged, 3–4.5 µm diam; hyphae in the upper tomentum yellowish brown, thick-walled, unbranched, simple septate, loosely interwoven, 3.5–4 µm diam.

Trama of the tubes. — Tramal hyphae pale yellow to golden yellow, thick-walled with a narrow to wide lumen, unbranched, frequently simple septate, loosely interwoven to subparallel along the tubes, 2–3 µm diam; cystidia and cystidioles absent; basidia broadly barrel-shaped, with four sterigmata and a simple septum at the base, 8–10 × 3.5–4 µm; basidioles in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid to oblong-ellipsoid, yellowish, thick-walled, most collapsed, smooth, IKI–, CB–, (2.9–)3–3.5(–3.6) × (1.8–)2–2.3(–2.5) µm, L = 3.16 µm, W = 2.09 µm, Q = 1.51 (n = 30/1).

Remarks. — *Phylloporia minutissima* is characterized by its very small basidiocarps (less than 5 mm in the largest dimension) with small pores as 12–13 per mm, duplex context, a monomitic hyphal structure, absence of cystidioles, and ellipsoid to oblong-ellipsoid basidiospores measuring 3–3.5 × 2–2.3 µm, and growing on a small shrub. *P. tabernaemontanae* Y.C. Dai & F. Wu is microscopically similar to *P. minutissima,* but its basidiocarps reach 30 mm in the largest fruiting body and it grows on living trees of *Tabernaemontana.* In addition, both species are phylogenetically distantly related (Fig. 50).

Phylloporia tabernaemontanae Y.C. Dai & F. Wu, **sp. nov.** (Figs. 50, 53, 54)

MycoBank: MB 840002.

Type. — **AUSTRALIA**. Queensland, Cairns, Mt. Whitfield, on living tree of *Tabernaemontana*, 18.V.2018, Dai 18852 (holotype, BJFC027320; isotype in MEL).

Etymology. — *Tabernaemontanae* (Lat.): referring to the species growing on *Tabernaemontanae.*

Fruiting body. — Basidiocarps perennial, pileate, imbricate, corky and without odor or taste when fresh, becoming bone hard and light in weight when dry. Pilei mostly conchate, projecting up to 2 cm, 3 cm wide, and 3 mm thick at base. Pileal surface velutinate to hispid, becoming glabrous with age, cigar brown to black when fresh, color almost unchanged when dry, distinctly concentrically zonate; margin acute, incurved when dry. Pore surface brick to chestnut when fresh, cigar brown when dry; sterile margin pale yellow to luteous when fresh, yellowish brown when dry, up to 0.5 mm wide; pores round, 11–12 per mm; dissepiments thick, entire. Context duplex, with a thin black line separating an upper tomentum and a lower context, upper tomentum dark brown, up to 0.2 mm thick at the base; lower context woody hard, dark brown, up to 0.3 mm thick at the base. Tubes snuff brown, paler than context and pore surface, brittle, up to 2.5 mm long.

Hyphal structure. — Hyphal system monomitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Hyphae in the lower context yellowish to golden brown, thick-walled with a wide lumen, occasionally branched, frequently simple septate, regularly arranged, 3–4 µm diam; hyphae in the upper tomentum yellow-brown, thick-walled, unbranched, simple septate, loosely interwoven, 3.5–4 µm diam.

Trama of the tubes. — Tramal hyphae pale yellow to golden yellow, thick-walled with a medium lumen, unbranched, frequently simple septate, parallel along the tubes, 2–3.5 µm diam; cystidia and cystidioles absent; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7–9 × 4–4.5 µm; basidioles in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid, yellowish, thick-walled, smooth, some collapsed, IKI–, CB–, (2.8–)2.9–3.2(–3.5) × (1.8–)1.9–2.3(–2.5) µm, L = 3.04 µm, W = 2.06 µm, Q = 1.47–1.49 (n = 60/2).

Additional specimen (paratype) examined. — **AUSTRALIA**. Queensland, Cairns, Mt. Whitfield, on living tree of *Tabernaemontana,* 18.V.2018 Dai 18853 (BJFC027321).

Remarks. — Phylloporia tabernaemontanae has perennial, imbricate basidiocarps with similar pores and basidiospores as *P. pectinata* (Klotzsch) Ryvarden, but the latter species has a dimitic hyphal structure (Dai 2010). In addition, phylogentically *P. tabernaemontanae* and *P. pectinata* are distantly related (Fig. 50).

Inonotus insolens Corner (Corner 1991) was reported from Malaysia and it has duplex context, a monomitic hyphal structure, colored basidiospores, and lack setae. It characteristics fit *Phylloporia* well,

but the name was published invalidly. So the species is renamed as following:

Phylloporia insolens Y.C. Dai & F. Wu, **sp. nov.**

MycoBank: MB 840525.

Type. — **MALAYSIA**. Pahang, Tembeling, on fallen wood, 17.XI.1930 Sin. F.N. 28245 (holotype, E).

Inonotus insolens Corner (nom. inval.), Beih. Nova Hedwigia 101: 104, 1991. This name was published invalidly because no type was designated. For the description of *Phylloporia insolens* see *Inonotus insolen* by Corner (1991).

Phellinus minimus N. Walters (Walters 1969) was reported from Australia and has duplex context, a monomitic hyphal structure, colored basidiospores, and lack setae. Its characteristics fit *Phylloporia*, too, and the following combination is proposed. In addition, *Inonotus amplectens* Murrill was described from USA, and treated as a synonym of *Phylloporia fruticum* (Berk. & M.A. Curtis) Ryvarden by Overholts (1953) and Ryvarden (1985). As mentioned by Overholts (1953) that the basidiospores of *Inonotus amplectens* are more cylindric than those in *Phylloporia fruticum*, so, we treat it as an independent species of *Phylloporia* because recent phylogenetic analyses (Wu et al. 2019b) demonstrated that species in *Phylloporia* have high levels of host specificity.

Phylloporia amplectens (Murrill) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840003.

Basionym: *Inonotus amplectens* Murrill, *Bull. Torrey bot. Club* 31(11): 600 (1904).

Phylloporia minima (N. Walters) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840005.

Basionym: *Phellinus minimus* N. Walters, *Trans. Br. mycol. Soc.* 52 (3): 499 (1969).

Phylloporia peristrophidis (S. Ahmad) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840006.

Basionym: *Inonotus peristrophidis* S. Ahmad, *Basidiomyc. W. Pakist.*: 47 (1972).

Ryvarden (2005) treated *Inonotus peristrophidis* as a synonym of *Phylloporia bibulosa* (Lloyd) Ryvarden, but the latter species was originally described from Singapore, and has a distribution in tropical Asia. In addition, *P. bibulosa* has pores measuring 5–7 per mm and oblong-ellipsoid basidiospores, while *P. peristrophidis* has pores measuring 7–8 per mm and ellipsoid basidiospores (Ahmad 1972).

Phylloporia sancti-georgii (Pat.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840007.

Basionym: *Polyporus sancti-georgii* Pat., in Patouillard & Lagerheim, *Bull. Soc. mycol. Fr.* 11(4): 207 (1895).

≡ *Phellinus sancti-georgii* (Pat.) Ryvarden, *Norw. Jl Bot.* 19: 235 (1972).

Key to species of *Phylloporia*

1. Basidiocarps resupinate to effused-reflexed..... 2

1. Basidiocarps pileate or stipitate..... 4

2. Basidiocarps annual, completely resupinate; on leaves..... *P. parasitica* Murrill

Basidiocarps annual, resupinate; pores 5–6 per mm; hyphal system monomitic; cystidia and cystidioles absent, basidiospores broadly ellipsoid, 3.7–4.5 × 2.2–3 µm (Murrill 1904a); on living leaves; type locality in Colombia; distribution: Neotropics and East Africa.

2. Basidiocarps perennial, resupinate to effused-reflexed; on wood..... 3

3. Hymenial setae present..... *P. mori* Sheng H. Wu

Basidiocarps perennial, resupinate to effused-reflexed; pores 7–9 per mm; context homogeneous; hyphal system dimitic; hymenial setae present, ventricose, 27–37 × 8–17 µm; cystidioles present; basidia 8–12 × 4–5 µm; basidiospores broadly ellipsoid, (3.8–)4–4.7(–5) × 3.1–3.6(–4) µm, L = 4.4 µm, W = 3.4 µm, Q = 1.27–1.28 (Wu et al. 2020a); on fallen trunk of *Morus*; type locality in Taiwan of China; distribution: East China.

3. Hymenial setae absent..... *P. moricola* Sheng H. Wu

Basidiocarps perennial, resupinate to effused-reflexed; pores 7–9 per mm; context duplex with a black line; hyphal system dimitic; hymenial setae absent; cystidioles absent; basidia 8–10 × 4.5–5 µm; basidiospores broadly ellipsoid, (3.2–)3.5–4 × (2.5–)2.8–3.1(–3.3) µm, L = 3.73 µm, W = 2.96 µm, Q = 1.26 (Wu et al. 2021); on living tree of *Morus*; type locality in China; distribution: South China.

4. Basidiocarps stipitate..... 5

4. Basidiocarps pileate..... 12

5. Basidiospores 4–4.5 µm long..... *P. verae-crucis* (Berk. ex Sacc.) Ryvarden

Basidiocarps annual, stipitate; pores 7–9 per mm; context duplex; hyphal system monomitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid, 4–4.5 × 3–3.5 µm (Ryvarden 2004); on the ground with buried wood beneath; type locality in Mexico; distribution: southern North America.

5. Basidiospores < 4 μm long..... 6

6. Context homogeneous..... *P. minutispora* Ipulet & Ryvarden

Basidiocarps annual, stipitate; pores 7–9 per mm; context homogeneous; hyphal system monomitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid to subglobose, 2–3 × 2.5 μm (Ipulet and Ryvarden 2005); on the ground; type locality in Uganda; distribution: East Africa.

6. Context duplex..... 7

7. Cystidia present..... 8

7. Cystidia absent..... 9

8. Stipe straight; basidia 7–8 × 4–5 μm..... *P. elegans* Ferreira-Lopes et al.

Basidiocarps seasonal to reviving, stipitate; pores 8–12 per mm; context duplex with a black line; hyphal system monomitic; cystidia present; cystidioles absent; basidia 7–8 × 4–5 μm; basidiospores broadly ellipsoid to ellipsoid, 2.5–3.5 × 2–3 μm (Ferreira-Lopes et al. 2016); on living angiosperm; type locality in Brazil; distribution: South America.

8. Stipe flexuous; basidia 10–15 × 4–5 μm..... *P. nodostipitata* Ferreira-Lopes & Drechsler-Santos

Basidiocarps seasonal to reviving, stipitate; pores 8–10 per mm; context duplex with a black line; hyphal system monomitic; cystidia present; cystidioles absent; basidia 10–15 × 4–5 μm; basidiospores broadly ellipsoid, 2.5–3.5 × 2–3 μm (Ferreira-Lopes et al. 2016); on living angiosperm; type locality in Brazil; distribution: tropical Brazil.

9. Pores 7–9 per mm..... *P. spathulata* (Hook.) Ryvarden

Basidiocarps seasonal, stipitate; pores 7–9 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 10 × 4 μm; basidiospores broadly ellipsoid, 3–4 × 2–3 μm (Ryvarden 2004); on living angiosperm; type locality in Ecuador; distribution: South America and southern North America.

9. Pores 9–14 per mm..... 10

10. Stipe up to 4 mm in diam, pores 10–14 per mm..... *P. terrestris* L.W. Zhou

Basidiocarps annual, stipitate; pores 10–14 per mm; context duplex with a black line; stipe up to 4 mm in diam; hyphal system monomitic; cystidia and cystidioles absent; basidia 4.5–6 × 3.5–5 μm; basidiospores ellipsoid, 2.5–3.3 × 1.8–2.5 μm (Zhou 2015e); on ground; type locality in China; distribution: subtropical China.

10. Stipe up to 2 mm in diam, pores 9–11 per mm..... 11

11. Basidiospores 2.5–3 µm long..... *P. solicola* Oliveira-Filho & Gibertoni

Basidiocarps annual, stipitate; pores 9–11 per mm; context duplex with a black line; stipe up to 1 mm in diam; hyphal system monomitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid, 2.5–3 × 2–3 µm (Wu et al. 2019b); on the ground; type locality in Brazil; distribution: tropical Brazil.

11. Basidiospores 3.3–4 µm long..... *P. afrospathulata* Yombiy. & Decock

Basidiocarps annual, stipitate; pores 10–11 per mm; context duplex with a black line; stipe up to 2 mm in diam; hyphal system monomitic; cystidia and cystidioles absent; basidiospores ellipsoid, 3.3–4 × 2.2–2.7 µm (Yombiyeni et al. 2015); on the ground; type locality in Gabon; distribution: tropical West Africa.

12. Hyphal system dimitic (at least in trama)..... 13

12. Hyphal system monomitic..... 30

13. Pores > 12 per mm..... 14

13. Pores < 12 per mm..... 15

14. Basidiocarps perennial; basidiospores 1.9–2.1 µm wide..... *P. subpulla* F. Wu et al.

Basidiocarps perennial, pileate; pores 13–16 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 11–13 × 4–5 µm; basidiospores ellipsoid, 2.7–3 × 1.9–2.1 µm (Wu et al. 2019b); on living angiosperm; type locality in China; distribution: tropical China.

14. Basidiocarps annual; basidiospores 2–2.4 µm wide..... *P. minutipora* L.W. Zhou

Basidiocarps annual, pileate; pores 12–15 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 5–7 × 3–4 µm; basidiospores broadly ellipsoid, 2.5–3 × 2–2.4 µm (Zhou 2016); on living angiosperm; type locality in China; distribution: tropical China.

15. Basidiocarps perennial..... 16

15. Basidiocarps annual..... 23

16. Pores 4–6 per mm; basidiospores > 5 µm long..... *P. boldo* Rajchenb. & Pildain

Basidiocarps perennial, pileate; pores 4–5 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid to subglobose, 5.4–6 × 4.4–4.9 µm, L = 5.67 µm, W = 4.67 µm, Q = 1.21 (Rajchenberg et al. 2019); on living *Peumus boldus*; type locality in Chile; distribution: Chile.

16. Pores 6–11 per mm; basidiospores mostly < 5 µm long..... 17

17. Basidiocarps pendent..... 18

17. Basidiocarps not pendent..... 20

18. Cystidioles absent, basidiospores > 2.8 µm wide..... *P. murrayae* Sheng H. Wu

Basidiocarps perennial, pileate, pendent; pores 8–10 per mm; context duplex with a black line; hyphal system dimitic; cystidioles absent; basidia 7–18 × 3–5 µm; basidiospores subglobose to broadly ellipsoid, (3–)3.2–3.7 × (2.5–)2.8–3(–3.2) µm, L = 3.34 µm, W = 2.88 µm, Q = 1.16 (Wu et al. 2020a); on living *Murraya paniculata*; type locality in Taiwan of China; distribution: East China.

18. Cystidioles present, basidiospores < 2.8 µm wide..... 19

19. Basidiocarps solitary; basidia 10–25 µm long..... *P. alyxiae* Sheng H. Wu

Basidiocarps perennial, pileate, solitary, pendent; pores 6–8 per mm; context duplex with a black line; hyphal system dimitic; cystidioles present; basidia 10–25 × 3.5–5 µm; basidiospores broadly ellipsoid to ellipsoid, (2.8–)3–3.2(–3.5) × (2–)2.2–2.7 µm, L = 3.08 µm, W = 2.34 µm, Q = 1.32 (Wu et al. 2020a); on living *Alyxia insularis*; type locality in Taiwan of China; distribution: East China.

19. Basidiocarps imbricate; basidia 8–10 µm long..... *P. rubiacearum* Sheng H. Wu

Basidiocarps perennial, pileate, imbricate, pendent; pores 7–9 per mm; context duplex with a black line; hyphal system dimitic; cystidioles present; basidia 8–10 × 5 µm; basidiospores broadly ellipsoid, 3–3.5 × (2.2–)2.3–2.8(–2.9) µm, L = 3.23 µm, W = 2.55 µm, Q = 1.28 (Wu et al. 2020a); on living trees of Rubiaceae; type locality in Taiwan of China; distribution: East China.

20. Basidiospores 3.5–4 µm wide..... *P. sancti-georgii* (Pat.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei dimidiate to ungulate; pileal surface rust brown, concentrically sulcate, tomentose; pore surface rust brown; pores 6–8 per mm; tubes fragile to papery; context duplex with a black line separating upper tomentum; hyphal system dimitic; hymenial setae absent; basidiospores globose to broadly ellipsoid, 4–5(–6) × 3.5–4 µm (Ryvarden 2004); type locality in Venezuela; distribution: Venezuela.

20. Basidiospores 1.8–2.5 µm wide..... 21

21. Basidiospores 2–2.5 µm wide, cystidioles absent ..... *P. pectinata* (Klotzsch) Ryvarden

Basidiocarps perennial, pileate; pores 8–11 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 7–10 × 3.2–5 µm; basidiospores broadly ellipsoid, 2.4–3.3 × 2–2.5 µm (Dai 2010); on living angiosperm; type locality in India; distribution: Asia.

21. Basidiospores 1.8–2.1 µm wide, cystidioles present..... 22

22. Upper tomentum up to 2 mm thick; basidiospores 2.5–2.9 µm long..... *P. perangusta* F. Wu et al.

Basidiocarps perennial, pileate; tomentum up to 2 mm thick; pores 9–11 per mm; context duplex with a black line; hyphal system dimitic; cystidia absent; cystidioles present; basidiospores ellipsoid, 2.5–2.9 × 1.8–2 µm (Wu et al. 2019b); on living angiosperm; type locality in China; distribution: subtropical China.

22. Upper trichoderm up to 0.5 mm thick; basidiospores 2.9–3.1 µm long .....

..... *P. rattanicola* F. Wu et al.

Basidiocarps perennial, pileate; tomentum up to 0.5 mm thick; pores 9–11 per mm; context duplex with a black line; hyphal system dimitic; cystidia absent; cystidioles present; basidia 8–9 × 4–5 µm; basidiospores ellipsoid, 2.9–3.1 × 2–2.1 µm (Wu et al. 2019b); on lianas; type locality in China; distribution: subtropical China.

23. Basidiospores oblong-ellipsoid, 4–5 µm long..... *P. rinoreae* Decock et al.

Basidiocarps annual, pileate, solitary; pores 9–10 per mm; context duplex with thick tomentum; hyphal system dimitic; cystidia and cystidioles absent; basidiospores oblong-ellipsoid, (3.8–)4–4.5(–5) × 2.5–3(–3.2) µm, L = 4.3 µm, W = 2.7 µm (Jerusalem et al. 2019); on living tree of *Rinorea*; type locality in Gabon; distribution: Gabon.

23. Basidiospores ellipsoid to subglobose or ovoid, < 4 µm long..... 24

24. Pores 9–12 per mm..... 25

24. Pores 6–9 per mm..... 27

25. Basidiospores 1.5–2 µm wide..... *P. minima* (N. Walters) Y.C. Dai & F. Wu

Basidiocarps annual, pileate, imbricate; pilei ungulate; pores 10 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 8 × 3–5 µm; basidiospores ovoid, 2.5–3 × 1.5–2 µm (Walters 1969); on living *Vitis*; type locality in Australia; distribution: Northeast Australia.

25. Basidiospores 2.3–2.8 µm wide..... 26

26. Pileal surface grayish orange to pale cinnamon, pores 9–11 per mm.....

..... *P. fulva* Yombiy. & Decock

Basidiocarps annual, pileate, gregarious; pileal surface grayish orange to pale cinnamon; pores 9–11 per mm; context duplex with a black line; hyphal system dimitic; cystidia absent; cystidioles present; basidiospores broadly ellipsoid to subglobose, 3–3.5 × 2.5–2.8 µm (Yombiyeni et al. 2015); on living angiosperm; type locality in Gabon; distribution: tropical West Africa.

26. Pileal surface yellowish brown to dark brown; pores 11–12 per mm.....

..... *P. pulla* (Mont. & Berk.) Decock & Yombiy.

Basidiocarps annual, pileate; pileal surface yellowish brown to dark brown; pores 11–12 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 5–7 × 3.5–5 µm; basidiospores broadly ellipsoid to subglobose, 2.8–3.3 × 2.3–2.8 µm (Yombiyeni et al. 2015); type locality in Java; distribution: East Asia and Madagascar.

27. Basidiocarps pendent; basidiospores 3.5–4 µm long..... *P. pendula* Yuan Y. Chen & B.K. Cui

Basidiocarps annual, pileate, pendent; pores 7–9 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 8–14 × 5–5.5 µm; basidiospores ellipsoid, 3.5–4 × 2.5–3 µm (Chen et al. 2017); on living angiosperm; type locality in China; distribution: tropical China.

27. Basidiocarps not pendent; basidiospores 3–3.5 µm long..... 28

28. Pores 6–8 per mm; on *Lonicera*..... *P. lonicerae* W.M. Qin et al.

Basidiocarps annual, pileate; upper tomentum up to 1 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 13–15 × 4–5 µm; basidiospores ellipsoid, 3–3.3 × 2.1–2.5 µm (Qin et al. 2018); on living *Lonicera*; type locality in Japan; distribution: East Asia.

28. Pores 8–9 per mm; on an angiosperm species other than *Lonicera*..... 29

29. Basidiocarps solitary; basidia 10–12.5 × 5.5–6.5 µm..... *P. nouraguensis* Decock & G. Castillo

Basidiocarps annual, pileate, solitary; pores 8–9 per mm; context duplex with a black line; hyphal system dimitic; cystidia absent; cystidioles present; basidia 10–12.5 × 5.5–6.5 µm; basidiospores broadly ellipsoid to obovoid, 3–3.5 × 2.5–2.8 µm (Decock et al. 2013); on living *Myrcia*; type locality in French Guiana; distribution: South America.

29. Basidiocarps imbricate; basidia 7–10 × 4–4.5 µm.. *P. pseudopectinata* Yuan Y. Chen & B.K. Cui

Basidiocarps annual, pileate, imbricate; pores 8–9 per mm; context duplex with a black line; hyphal system dimitic; cystidia and cystidioles absent; basidia 7–10 × 4–4.5 µm; basidiospores subglobose, 3–3.5 × 2–3 µm (Chen et al. 2017); on living angiosperm; type locality in China; distribution: tropical China.

30. Context homogeneous..... 31

30. Context duplex..... 36

31. Basidiospores broadly ellipsoid to subglobose..... 32

31. Basidiospores ellipsoid to oblong-ellipsoid..... 34

32. Pores 7–9 per mm..... *P. dependens* Y.C. Dai

Basidiocarps perennial, pileate to pendent; pores 7–9 per mm; context homogenous; hyphal system monomitic; cystidia absent; cystidioles present; basidia 9–12 × 4–5 µm; basidiospores broadly ellipsoid, 3–3.4 × 2.7–3 µm (Liu et al. 2015); on living angiosperm; type locality in China; distribution: tropical China.

32. Pores 5–6 per mm..... 33

33. Margin of pilei entire..... *P. flabelliformis* Decock & Yombiy.

Basidiocarps annual, pileate, gregarious; pilei margin entire; pores 5–6 per mm; context homogenous, up 0.5 mm thick; hyphal system monomitic; cystidia absent; cystidioles present; basidia 9–11 × 4–5 µm; basidiospores ellipsoid to broadly ellipsoid to subglobose, 3.3–4 × 2.5–2.8 µm (Decock et al. 2015); on living angiosperm; type locality in Gabon; distribution: West Africa.

33. Margin of pilei dentate to lobed..... *P. gabonensis* Decock & Yombiy.

Basidiocarps annual, pileate, gregarious; pilei margin dentate to lobed; pores 5–6 per mm; context homogenous, 0.25 mm thick; hyphal system monomitic; cystidia absent; cystidioles present; basidiospores broadly ellipsoid, 3.7–4.2 × 2.7–3 µm (Decock et al. 2015); on living angiosperm; type locality in Gabon; distribution: tropical West Africa.

34. Pores 4–6 per mm; basidiospores 2.5–3 µm wide..... *P. homocarnica* L.W. Zhou

Basidiocarps annual, pileate; pores 4–6 per mm; context homogenous; hyphal system monomitic; cystidia and cystidioles absent; basidia 6–9 × 4–6 µm; basidiospores ellipsoid to oblong-ellipsoid, 4–4.9 × 2.5–3 µm (Zhou 2015b); on dead angiosperm; type locality in China; distribution: subtropical China.

34. Pores 2–4 per mm; basidiospores 2–2.5 µm wide..... 35

35. Context < 1 mm thick; cystidioles absent..... *P. oblongospora* Y.C. Dai & H.S. Yuan

Basidiocarps annual, pileate; pores 2–4 per mm; context homogenous, < 1 mm thick; hyphal system monomitic; cystidia and cystidioles absent; basidia 10–15 × 4.5–5.5 µm; basidiospores oblong-ellipsoid, 4–4.8 × 2–2.5 µm (Cui et al. 2010); on living angiosperm; type locality in China; distribution: subtropical China.

35. Context > 2 mm thick; cystidioles present..... *P. inonotoides* Yombiy. & Decock

Basidiocarps annual, pileate; pores 2–3 per mm; context homogenous, > 2 mm thick; hyphal system monomitic; cystidia absent; cystidioles present; basidia 10–15 × 5.5–6.5 µm; basidiospores oblong-ellipsoid, 4.5–5.5 × 2–2.5 µm (Yombiyeni et al. 2015); on living angiosperm; type locality in Gabon; distribution: West Africa.

36. Black line absent in context..... 37

36. Black line present in context..... 42

37. Pores 8–10 per mm..... *P. capucina* (Mont.) Ryvarden

Basidiocarps annual, pileate; pores 8–10 per mm; context duplex without black line; hyphal system monomitic; cystidia and cystidioles absent; basidiospores ellipsoid, 4–5 × 3–3.5 µm; type locality in Brazil; distribution: tropical Brazil.

37. Pores 2–7 per mm..... 38

38. Basidiospores 2–2.5 µm wide..... *P. nandinae* L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate; pores 5–6 per mm; context duplex without black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 13–18 × 4.5–5 µm; basidiospores ellipsoid to oblong-ellipsoid, 3.5–4.2 × 2–2.5 µm (Zhou and Dai 2012); on living *Nandina*; type locality in China; distribution: subtropical China.

38. Basidiospores 2.5–4 µm wide..... 39

39. Pores 2–4 per mm..... 40

39. Pores 4–7 per mm..... 41

40. Basidiospores 3–4.5 × 2.5–3 µm..... *P. fruticum* (Berk. & M.A. Curtis) Ryvarden

Basidiocarps annual, pileate; pores 2–4 per mm; context duplex without black line; hyphal system monomitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid to subglobose, 3–4.5 × 2.5–3 µm (Ryvarden 2014); on living angiosperm; type locality in Cuba; distribution: North and Central America.

40. Basidiospores 6 × 4 µm..... *P. amplectens* (Murrill) Y.C. Dai & F. Wu

Basidiocarps annual, pileate; pilei hemispherical; pileal surface dark yellowish, velutinate; pore surface honey yellow to umbrinous; pores 2–4 per mm; dissepiment lacerate; context duplex without black line; hyphal system monomitic; basidiospores ellipsoid, hyaline, 6 × 4 µm (Murrill 1904b); on living *Asimina*; type locality in USA; distribution: USA.

41. Basidiospores ellipsoid to broadly ellipsoid, basidia < 10 µm long.....

..... *P. littoralis* Decock & Yombiy.

Basidiocarps annual, pileate; pores 4–6 per mm; context duplex without black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 8.5 × 5 µm; basidiospores ellipsoid to broadly

ellipsoid, 3.8–4.5 × 2.8–3.5 µm (Yombiyeni and Decock 2017); on living *Nichallea*; type locality in Gabon; distribution: West Africa.

41. Basidiospores ellipsoid, basidia 10–12 µm long..... *P. flacourtiae* L.W. Zhou

Basidiocarps annual, pileate; pores 5–7 per mm; context duplex without black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 10–12 × 4–7 µm; basidiospores ellipsoid, 3.7–4.4 × 2.5–3.2 µm (Zhou 2015b); on living *Flacourtia*; type locality in China; distribution: subtropical China.

42. Basidiospores broadly ellipsoid to subglobose..... 43

42. Basidiospores ellipsoid, oblong-ellipsoid to cylindrical..... 56

43. Pores 5–6 per mm..... *P. ampelina* (Bondartsev & Singer) Bondartseva

Basidiocarps annual, pileate; pores 5–6 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidiospores broadly ellipsoid, 3.2–4 × 2.5–2.8 µm (Larsen and Cobb-Poulle 1990); on living *Vitis*; type locality in Russia; distribution: Caucasus.

43. Pores 6–12 per mm..... 44

44. Cystidioles present..... 45

44. Cystidioles absent..... 46

45. Basidiospores broadly ellipsoid, 3.1–3.7 µm long..... *P. lespedezae* G.J. Ren & F. Wu

Basidiocarps annual, pileate; pores 8–9 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 13–14 × 4–5 µm; basidiospores broadly ellipsoid, 3.1–3.7 × 2.2–2.7 µm (Ren and Wu 2017); on living *Lespedeza*; type locality in China; distribution: temperate China.

45. Basidiospores subglobose to broadly ellipsoid, 2.5–3 µm long..... *P. cystidiolophora* F. Wu et al.

Basidiocarps annual, pileate; pores 8–10 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 11–14 × 4–5 µm; basidiospores subglobose to broadly ellipsoid, 2.5–3 × 2.1–2.8 µm (Wu et al. 2019b); on living angiosperm; type locality in China; distribution: subtropical China.

46. Basidiospores > 4 µm long..... *P. atlantica* Oliveira-Filho & Gibertoni

Basidiocarps annual to biennial, pileate; pores 6–7 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae 3–5 µm in diam; cystidia and cystidioles absent; basidiospores broadly ellipsoid, 4–4.2 × 3–3.5 µm (Wu et al. 2019b); on living angiosperm; type locality in Brazil; distribution: tropical Brazil.

46. Basidiospores < 4 µm long..... 47

47. Pores 10–12 per mm..... *P. fontanesiae* L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate; pores 10–12 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae 5.2–6.4 µm in diam; cystidia and cystidioles absent; basidia 6–7 × 3.5–4 µm; basidiospores broadly ellipsoid, 2.5–3 × 2–2.5 µm (Zhou and Dai 2012); on living *Fontanesia*; type locality in China; distribution: subtropical China.

47. Pores < 10 per mm..... 48

48. Upper tomentum > 10 mm thick..... 49

48. Upper tomentum < 10 mm thick..... 50

49. Basidiocarps annual; basidia 14.5–16 µm long..... *P. ulloae* R. Valenz. et al.

Basidiocarps annual, pileate; tomentum up to 25 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae 5.2–6.4 µm in diam; cystidia and cystidioles absent; basidia 14.5–16 × 3–4.5 µm; basidiospores subglobose, 3.2–3.6 × 2.5–3.2 µm (Valenzuela et al. 2011a); on living lianas; type locality in Mexico; distribution: southern North America.

49. Basidiocarps perennial; basidia <5 µm long..... *P. manglietiae* Yuan Y. Chen & B.K. Cui

Basidiocarps perennial, pileate; upper tomentum up to 18 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 3–5.5 × 3–4 µm; basidiospores broadly ellipsoid, 3–3.5 × 2–2.5 µm (Chen et al. 2017); on living *Manglietia*; type locality in China; distribution: tropical China.

50. Basidia 15–20 µm long..... *P. oreophila* L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate; tomentum up to 3.5 mm thick; pores 7–9 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae 3–5 µm in diam; cystidia and cystidioles absent; basidia 15–20 × 4–6 µm; basidiospores broadly ellipsoid to subglobose, 3–3.7 × 2–3 µm (Zhou and Dai 2012); on living angiosperm; type locality in China; distribution: temperate China.

50. Basidia < 15 µm long..... 51

51. On *Ribes*; European species..... *P. ribis* (Schumach.) Ryvarden

Basidiocarps perennial, pileate; tomentum up to 3 mm thick; pores 6–7 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae up to 7 µm in diam; cystidia and cystidioles absent; basidia 10–15 × 4–5 µm; basidiospores broadly ellipsoid, 3.1–3.7 × 2.2–2.9 µm (Niemelä 2005; Ryvarden and Melo 2017); mostly on living *Ribes*; type locality in Denmark; distribution: Europe.

51. On another angiosperm tree or bush other than *Ribes*; Asian or American species 52

52. Basidiospores subglobose..... 53

52. Basidiospores broadly ellipsoid..... 54

53. Basidiospores mostly > 3.5 µm long..... *P. ephedrae* (Woron.) Parmasto

Basidiocarps annual, pileate; tomentum up to 7 mm thick; pores 6–7 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 7–10 × 3.4 µm; basidiospores subglobose, 3.4–3.9 × 2.7–3 µm (Parmasto 1985; Larsen and Cobb-Poulle 1990); on living *Cotoneaster, Ephedra* and *Jasminum*; type locality in Georgia; distribution: Central Asia.

53. Basidiospores mostly < 3.5 µm long..... *P. chrysites* (Berk.) Ryvarden

Basidiocarps annual, pileate; tomentum up to 10 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 7–10 × 3–4 µm; basidiospores subglobose, 2.5–3.5 µm in diam (Gilbertson and Ryvarden 1986-1987); on living angiosperm; type locality in Ecuador; distribution: South and Central America and Florida, USA.

54. Basidiocarps perennial; tramal hyphae interwoven..... *P. crataegi* L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate; tomentum up to 3 mm thick; pores 7–9 per mm; context duplex with a black line; hyphal system monomitic; lower contextual hyphae 3–5 µm in diam; tramal hyphae interwoven; cystidia and cystidioles absent; basidia 8–11 × 3.5–4.5 µm; basidiospores broadly ellipsoid, 2.5–3.3 × 2–2.8 µm (Zhou and Dai 2012); on living *Crataegus*; type locality in China; distribution: temperate China.

54. Basidiocarps annual; tramal hyphae subparallel..... 55

55. Pileal surface not radially striate, two black zones present in context..... *P. clausenae* L.W. Zhou

Basidiocarps annual, pileate; tomentum up to 2 mm thick; pileal surface not radially striate; pores 8–9 per mm; context duplex with two black zones; hyphal system monomitic; lower contextual hyphae 3.5–5 µm in diam; tramal hyphae subparallel; cystidia and cystidioles absent; basidia 7–11 × 3.5–6 µm; basidiospores broadly ellipsoid, 3–3.5 × 2–3 µm (Zhou 2015b); on living *Clausena*; type locality in China; distribution: tropical China.

55. Pileal surface radially striate, one black zone present in context..... *P. radiata* L.W. Zhou

Basidiocarps annual, pileate; tomentum up to 2 mm thick; pileal surface radially striate; pores 8–10 per mm; context duplex with a black zone; hyphal system monomitic; lower contextual hyphae 3–5 µm in diam; tramal hyphae subparallel; cystidia and cystidioles absent; basidia 10–15 × 4–7 µm; basidiospores

broadly ellipsoid, 2.5–3.5 × 2–2.5 µm (Zhou 2016); on living lianas; type locality in China; distribution: subtropical China.

56. Cystidioles present..... 57

56. Cystidioles absent..... 60

57. Basidiospores ellipsoid..... 58

57. Basidiospores oblong-ellipsoid to cylindrical..... 59

58. Pores 7–9 per mm; basidia 7–10 µm long..... *P. osmanthi* L.W. Zhou

Basidiocarps annual, pileate; pores 7–9 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 7–10 × 4–5 µm; basidiospores ellipsoid, 2.9–3.4 × 2–2.6 µm (Zhou 2015e); on living *Osmanthus*; type locality in China; distribution: tropical China.

58. Pores 9–10 per mm; basidia 13–15 µm long..... *P. splendida* F. Wu et al.

Basidiocarps annual, pileate; pores 9–10 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 13–15 × 5–6 µm; basidiospores ellipsoid, 3.2–4 × 2.1–2.8 µm (Wu et al. 2019b); on living angiosperm; type locality in China; distribution: China.

59. Pores 2–3 per mm; basidia 10.5–11.5 × 4–4.8 µm..... *P. rzedowskyi* R. Valenz. & Decock

Basidiocarps annual, pileate; pores 2–3 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 10.5–11.5 × 4–4.8 µm; basidiospores sub-cylindrical to cylindrical, 4.2–6 × 2.4–3.2 µm (Valenzuela et al. 2011a); on living *Hybanthus*; type locality in Mexico; distribution: southern North America.

59. Pores 3–5 per mm; basidia 17–22 × 6–7 µm..... *P. montana* Oliveira-Filho & Gibertoni

Basidiocarps annual, pileate; pores 3–5 per mm; context duplex with a black line; hyphal system monomitic; cystidia absent; cystidioles present; basidia 17–22 × 6–7 µm; basidiospores cylindrical, 4–5 × 2–3 µm; type locality in Brazil (Wu et al. 2019b); distribution: tropical Brazil.

60. Basidiospores mostly > 3 µm wide..... 61

60. Basidiospores mostly < 3 µm wide..... 62

61. Pore surface glancing; dissepiments thin; Asian species..... *P. hainaniana* Y.C. Dai & B.K. Cui

Basidiocarps annual, pileate; pore surface glancing; pores 4–6 per mm; dissepiments thin; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 13–23 × 4–6 µm;

basidiospores ellipsoid, 4.6–5.6 × 3–3.6 µm (Cui et al. 2010); on living angiosperm; type locality in China; distribution: tropical China.

61. Pore surface not glancing; dissepiments thick; Neotropical species.....

..... *P. minuta* Bittencourt & Drechsler-Santos

Basidiocarps annual, pileate, solitary; pileal surface yellowish brown to brown, fibrous, smooth, zonate, concentrically sulcate; pore surface not glancing; pores 3–7 per mm; dissepiments thick, entire; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 17 × 7 µm; basidiospores oblong-ellipsoid, (3.5–)4–5.1(–6) × (2.4–)2.8–3.8(–4) µm, L = 4.5 µm, W = 3.3 µm, Q = 1.4 (Bittencourt et al. 2018); on living tree of *Doliocarpus schottianus*; type locality in Brazil; distribution: Brazil.

62. Basidiospores 1.5–2 µm wide..... *P. cylindrispora* L.W. Zhou

Basidiocarps annual, pileate; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 7–11 × 3–5 µm; basidiospores cylindrical, 3.5–4 × 1.5–2 µm (Zhou 2015b); on living angiosperm; type locality in China; distribution: subtropical China.

62. Basidiospores 2–3 µm wide..... 63

63. Pores 9–13 per mm..... 64

63. Pores 2–9 per mm..... 66

64. Basidia 4–6 µm long; temperate species..... *P. tiliae* L.W. Zhou

Basidiocarps perennial, pileate; pores 9–12 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 4–6 × 3–4.5 µm; basidiospores ellipsoid, 3–3.4 × 2–2.5 µm (Zhou 2013); on living *Tilia*; type locality in China; distribution: temperate China.

64. Basidia 7–10 µm long; tropical species..... 65

65. Basidiocarps up to 30 mm in the largest dimension; Australian species.....

..... *P. tabernaemontanae* Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, up to 30 mm in the largest dimension; pileal surface cigar brown to black, velutinate to glabrous, concentrically zonate; pore surface brick to cigar brown; pores 11–12 per mm; dissepiments thick, entire; context duplex with a black line; hyphal system monomitic; tramal hyphae subparallel; cystidia and cystidioles absent; basidia 7–9 × 4–4.5 µm; basidiospores ellipsoid, yellowish, thick-walled, some collapsed, IKI–, CB–, (2.8–)2.9–3.2(–3.5) × (1.8–)1.9–2.3(–2.5) µm, L = 3.04 µm, W = 2.06 µm, Q = 1.47–1.49; on living tree of *Tabernaemontana*; type locality in Australia; distribution: Australia.

65. Basidiocarps up to 5 mm in the largest dimension; Asian species..... *P. minutissima* Y.C. Dai & F. Wu

Basidiocarps annual, pileate, up to 5 mm in the largest dimension; pileal surface cinnamon to rust tawny, velutinate to glabrous, concentrically zonate; pore surface fulvous; pores 12–13 per mm; dissepiments thick, entire; context duplex with a black line; hyphal system monomitic; tramal hyphae subparallel; cystidia and cystidioles absent; basidia 8–10 × 3.5–4 µm; basidiospores ellipsoid to oblong-ellipsoid, yellowish, thick-walled, most collapsed, IKI–, CB–, (2.9–)3–3.5(–3.6) × (1.8–)2–2.3(–2.5) µm, L = 3.16 µm, W = 2.09 µm, Q = 1.51; on living angiosperm shrub; type locality in China; distribution: South China.

66. Basidiocarps annual..... 67

66. Basidiocarps perennial..... 70

67. Pores 3–5 per mm..... *P. insolens* (Corner) Y.C. Dai & F. Wu

Basidiocarps annual, pileate; pilei subungulate; pileal surface dark fulvous cinnamon, faintly zonate, tomentose; pores 3–5 per mm; dissepiments thick; context duplex with a black line; hyphal system monomitic; basidiospores oblong-ellipsoid to subcylindric, pale yellowish, thin-walled, 3.7–4.7 × 2–2.5 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

67. Pores 5–9 per mm..... 68

68. Context up to 20 mm thick..... *P. weberiana* (Bres. & Henn. ex Sacc.) Ryvarden

Basidiocarps annual, pileate; upper tomentum up to 17 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidiospores ellipsoid, 3.4–4.1 × 2.2–3 µm (Dai 2010) ; on living angiosperm; type locality in Samoa; distribution: Pacific, Asia and Africa.

68. Context up to 3 mm thick..... 69

69. Pores 7–8 per mm; on *Peristrophe*..... *P. peristrophidis* (S. Ahmad) Y.C. Dai & F. Wu

Basidiocarps annual, pileate; upper tomentum up to 2 mm thick; pores 7–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidiospores ellipsoid, 3–4.5 × 2–3 µm (Ahmad 1972); on living *Peristrophe bicalyculata*; type locality in Pakistan; distribution: Pakistan.

69. Pores 5–7 per mm; on an angiospermother than *Peristrophe*..... *P. bibulosa* (Lloyd) Ryvarden

Basidiocarps annual, pileate; upper tomentum up to 3 mm thick; pores 5–7 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 10–14 × 4–5 µm; basidiospores oblong-ellipsoid, 3.9–4.5 × 2.4–3 µm (Dai 2010); on living angiosperm; type locality in Singapore; distribution: Asia.

70. Pilei up to 7 mm thick; basidiospores with one big guttule..... *P. gutta* L.W. Zhou & Y.C. Dai

Basidiocarps perennial pileate; pilei up to 7 mm thick; pores 7–9 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 9–12 × 4–6 μm; basidiospores ellipsoid to oblong-ellipsoid, 3–4 × 2–2.5 μm (Zhou and Dai 2012); on dead *Abelia* and other angiosperm; type locality in China; distribution: subtropical China.

70. Pilei up to 35 mm thick; basidiospores without guttule..... *P. yuchengii* Gafforov et al.

Basidiocarps perennial, pileate; pilei up to 35 mm thick; pores 6–8 per mm; context duplex with a black line; hyphal system monomitic; cystidia and cystidioles absent; basidia 7–9 × 3.5–4.5 μm; basidiospores ellipsoid to oblong-ellipsoid, 3.2–4 × 2.3–3 μm (Gafforov et al. 2014); mostly on *Rosa*; type locality in Uzbekistan; distribution: Central Asia.

4.28 *Porodaedalea* Murrill, *Bull. Torrey Bot. Club* 32(7): 367 (1905), (Figs. 1, 55)

Type species: *Porodaedalea pini* (Brot.) Murrill.

Basidiocarps perennial, pileate or effused-reflexed, hard corky to woody hard; pileal surface encrusted, concentrically sulcate with narrow zones; pore surface rust brown to umber brown; pores circular or angular to labyrinthine; context duplex when juvenile, lower part separated from the upper trichoderm by a thin black line; hyphal system dimitic at least in trama; setae frequent; cystidioles occasionally present; basidia usually distinctly longer than basidioles; basidiospores subglobose, broadly ellipsoid to ovoid, fairly thick-walled, IKI–, moderately CB+; on gymnosperm wood; causing a white rot.

Porodaedalea is taxonomically difficult because of the similar morphology among species. In some cases also, sequence-based phylogeny yields different results when using different genes for phylogeny determination. Evolutionary relationships of European taxa of *Porodaedalea* were demonstrated by Tomšovský et al. (2010a) using a phylogenetic analysis based on ITS and *tef1* sequences, and North American taxa were studied by Brazee and Lindner with a multilocus phylogeny (Brazee and Lindner 2013). Asian species were recently analyzed by molecular data (Tomšovský and Kout 2013; Dai et al. 2017; Wu et al. 2019a).

Based on our phylogenetic analyses and examination on studied samples, four new species of *Porodaedalea* are confirmed, and they are described in the present paper. In addition, *Porodaedalea* sp. 3 (represented by Miettinen 10543 and Spirin 3918) was mentioned in a previous study (Wu et al. 2019a), and it is nested within *Porodaedalea mongolica* in our phylogeny (Fig. 55). There is not a distinct difference between *P. mongolica* and *Porodaedalea* sp. 3. So, *P. mongolica* is the valid name for this species. Another taxon that grows on *Pinus pumila* in the Far East was previously treated as *Porodaedalea* sp. 4 (represented by Spirin 5567 and Spirin 5568-1), and it will be described by other mycologists, so we still treat it as *Porodaedalea* sp. 4 in our phylogeny without a description of the species (Fig. 55).

Porodaedalea niemelaei M. Fisch. was described from Finland on living *Larix sibirica* (Fischer 2000), Niemelä (2005) considered as a synonym of *Porodaedalea laricis*.

Porodaedalea occidentiamericana Y.C. Dai & F. Wu, **sp. nov.** (Figs. 55, 56, 57)

MycoBank: MB 840008.

Type. — **USA.** Arizona, Apache National Forest, *Picea* or *Pseudotsuga*, 29 May 2002 J. Vlasák Jr. (holotype JV0205/8-J, isotype BJFC036335).

Etymology. — *Occidentiamericana* (Lat.): referring to the species having a distribution in West USA.

Fruiting body. — Basidiocarps perennial, pileate, solitary, heavy and woody hard when dry. Pilei projecting up to 5 cm, 8 cm wide and 4 cm thick at base. Pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, becoming encrusted and cracked with age; margin obtuse. Pore surface grayish brown when dry, not glancing; pores regular, angular, 2–3 per mm; dissepiments thin, entire. Context yellowish brown, woody hard, up to 2 mm thick. Old tubes umber brown, new tubes grayish brown, woody hard, up to 3.8 cm long, indistinctly stratified.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched, frequently simple septate, 1.5–2 µm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow lumen, unbranched, aseptate, flexuous, sometimes collapsed, strongly interwoven, 2–4 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched, frequently septate, 2–3.5 µm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow to medium lumen, unbranched, aseptate, flexuous, loosely interwoven, 3–4 µm in diam; hyphae at dissepiment edge smooth; hymenial setae frequent, mostly originating from subhymenium, sometimes embedded in trama but not seen at dissepiment edges, subulate, dark brown, thick-walled, (40–)45–60(–65) × (8–)9–14(–15) µm; cystidioles infrequent, fusoid, hyaline, thin-walled, 16–30 × 4–4.5; basidia clavate, with four sterigmata and a simple septum at the base, 10–14 × 4.2–5.2 µm; basidioles dominating in hymenium, barrel-shaped to clavate, distinctly shorter than basidia.

Spores. — Basidiospores basically ovoid, hyaline, thin- to slightly thick-walled, smooth, without guttule, usually glued in tetrads, IKI–, moderately CB+, (4.5–)5–6(–6.5) × (3.8–)4–5.3(–5.5) µm, L = 5.58 µm, W = 4.54 µm, Q = 1.22–1.24 (n = 60/2).

Additional specimens (paratypes) examined. — **USA**. Arizona, Pima, Summerhaven, Santa Catalina Mts., Coronado National Forest, on living trees of *Pinus strobiformis*, 28.VI.1995, Burdsall/Gilbertson, HHB-5 (CFMR 186), Burdsall/Gilbertson HHB-6 (CFMR 187).

Remarks. — *Porodaedalea occidentiamericana* and *P. orientoamericana* Y.C. Dai & F. Wu were previously treated as *Phellinus pini* (Brot.) Pilát (Gilbertson and Ryvarden 1986-1987), and *Porodaedalea* sp. 2 and *Porodaedalea* sp. 1, respectively (Brazee and Lindner 2013). In our phylogeny both taxa are distantly

related to *Porodaedalea pini* (Brot.) Murrill, and formed two independent lineages (Fig. 55), and therefore we describe them here as two new species. In the phylogeny both of stocks AZ-10T and AZ-14T were isolated on *Pinus strobiformis* from Arizona of USA, but no corresponding dry specimens were available.

Porodaedalea orientoamericana Y.C. Dai & F. Wu, **sp. nov.** (Figs. 55, 58, 59)

MycoBank: MB 840009.

Type. — **USA**. Connecticut, New Haven, Slepping Giant State Park, on living tree of *Pinus*, 24.VII.2012, Dai 12818 (holotype BJFC013123).

Etymology. — *Orientoamericana* (Lat.): referring to the species having a distribution in East USA.

Fruiting body. — Basidiocarps perennial, pileate, solitary, heavy and woody hard when dry. Pilei projecting up to 6 cm, 8 cm wide and 4.5 cm thick at base. Pileal surface brown to dark brown, concentrically sulcate with narrow zones, becoming encrusted with age; margin obtuse. Pore surface fulvous to brown when dry, not glancing; pores regular, angular, 1–2 per mm; dissepiments thick, entire. Context rust brown, woody hard, up to 2 mm thick. Tubes fulvous, woody hard, up to 4.3 cm long, indistinctly stratified.

Hyphal structure. — Hyphal system dimitic in tube trama, monomitic in context; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae pale yellowish, thick-walled with a wide lumen, unbranched, frequently simple septate, straight, regularly arranged, sometimes collapsed, 4–5 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow to wide lumen, unbranched, frequently septate, straight, subparallel along the tubes, 2.5–3.5 µm in diam; hyphae at dissepiment edge smooth; hymenial setae frequent, mostly originating from subhymenium, sometimes embedded in trama but not seen at dissepiment edges, subulate to ventricose, dark brown, thick-walled, (35–)40–60(–65) × (7–)9–16(–18) µm; cystidioles infrequent, fusoid, hyaline, thin-walled, 12–25 × 3–4.5; basidia clavate, with four sterigmata and a simple septum at the base, 15–20 × 5–6 µm; basidioles dominating in hymenium, barrel-shaped to clavate, distinctly shorter than basidia.

Spores. — Basidiospores ovoid, hyaline, thin- to slightly thick-walled, smooth, without guttule, usually glued in tetrads, IKI–, moderately CB+, (4.8–)5–6(–6.1) × (3.9–)4–5(–5.1) µm, L = 5.58 µm, W = 4.45 µm, Q = 1.25–1.26 (n = 60/2).

Additional specimens (paratypes) examined. — **USA**. New Jersey, Batsto Village, on living *Chamecypris thyiodes,* VI.2017, Vlasák Jr. 1706/6-J (JV); Virginia, Elizabeth Furnace Campground, George Washington Nat'l Forest, Waterlick, on *Pinus virginiana*, X.1970, Burdsall, HHB-4995 (CFMR); King William County, West Point, on *Pinus virginiana*, 15.VIII.1937, Hawes, FP-71757 (holotype in CFMR).

Remarks. — *Porodaedalea occidentiamericana* is closely related to *P. orientoamericana* (Fig. 55), but the former differs from the latter by thin dissepiments, and a dimitic contextual hyphae with strongly flexuous skeletal hyphae.

Porodaedalea qilianensis Y.C. Dai & F. Wu, **sp. nov.** (Figs. 55, 60, 61)

MycoBank: MB 840010.

Type. — **CHINA**. Gansu Province, Zhangye, Qilianshan National Park, Xishui Station, on living tree of *Picea crassifolia*, 17.IX.2019, Dai 20878 (holotype, BJFC032547).

Etymology. — *Qilianensis* (Lat.): referring to the species having a distribution in Qilian Mts.

Fruiting body. — Basidiocarps perennial, pileate, imbricate, light and woody hard when dry. Pilei projecting up to 4 cm, 9 cm wide and 1.5 cm thick at base. Pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, becoming encrusted and cracked with age; margin sharp. Pore surface brown to grayish brown when dry, not glancing; pores very irregular, angular to daedaloid, 2–3 per mm; dissepiments thin, lacerate. Context yellowish brown, woody hard, up to 2 mm thick. Old tubes umber brown, new tubes grayish brown, woody hard, up to 1.3 cm long, indistinctly stratified.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched, frequently simple septate, 2–3.5 μm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow to wide lumen, rarely branched, aseptate, flexuous, sometimes collapsed, strongly interwoven, 3–4 μm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched, frequently septate, 2–3 μm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow to wide lumen, unbranched, aseptate, straight, subparallel along the tubes, 3–4.5 μm in diam; hyphae at dissepiment edge with crystals; hymenial setae frequent, mostly originating from subhymenium, sometimes embedded in trama but not seen at dissepiment edges, subulate, sometimes with bifurcate tips, dark brown, thick-walled, (35–)40–60(–65) × (7–)8–12(–15) μm; cystidioles frequent, fusoid, hyaline, thin-walled, 11–21 × 3.5–5 μm; basidia clavate, with four sterigmata and a simple septum at the base, 12–20 × 4–5 μm; basidioles dominating in hymenium, barrel-shaped to clavate, distinctly shorter than basidia.

Spores. — Basidiospores subglobose, hyaline, thin- to slightly thick-walled, smooth, without guttule, usually glued in tetrads, IKI–, moderately CB+, (3.8–)4–4.8(–6) × (3.5–)3.7–4(–4.3) μm, L = 4.33 μm, W = 3.94 μm, Q = 1.1 (n = 60/2).

Additional specimens (paratypes) examined. — **CHINA.** Gansu Province, Zhangye, Qilianshan National Park, Xishui Station, on living tree of *Picea crassifolia*, 3.IX.2018, Dai 18971 (BJFC027440), Dai 18988 (BJFC027457); 17.IX.2019, Dai 20879 (BJFC032548), Dai 20880 (BJFC032549).

Remarks. — *Porodaedalea qilianensis* is characterized by a daedaloid hymenophore, thin dissepiment edges, subulate setae sometimes with bifurcate tips, and subglobose basidiospores. Phylogenetically *P. qilianensis* is related to *P. alpicola* S.J. Dai et al. which, however, has smaller pores (4–6 per mm), hymenial setae with one tip only, and bigger basidiospores measuring 4.5–5.5 × 4–4.5 µm (Wu et al. 2019a).

Porodaedalea schrenkianae Y.C. Dai & F. Wu, **sp. nov.** (Figs. 55, 62, 63)

MycoBank: MB 840011.

Type. — **CHINA**. Xinjiang Auto. Reg., Fukang County, Tian Mts Nature Reserve, on living tree of *Picea schrenkiana*, 12.IX.2018, Dai 19060 (holotype, BJFC027530).

Etymology. — *Schrenkianae* (Lat.): referring to the species growing on *Picea schrenkiana*.

Fruiting body. — Basidiocarps perennial, mostly effused-reflexed or pileate, usually imbricate, light and woody hard when dry. Pilei projecting up to 4 cm, 10 cm wide and 2 cm thick at base. Pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, becoming encrusted and cracked with age; margin sharp. Pore surface fulvous to brown when dry, glancing; pores regularly circular, 2–3 per mm; dissepiments thick, entire. Context brown, woody hard, up to 5 mm thick. Old tubes yellowish to grayish brown, woody hard, up to 1.5 cm long, indistinctly stratified.

Hyphal structure. — Hyphal system dimitic in tube trama, monomitic in context; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae pale yellowish, thick-walled with a wide lumen, rarely branched, frequently simple septate, regularly arranged, sometimes collapsed, 4–6 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline, thin-walled, occasionally branched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, yellowish brown, thick-walled with a narrow to wide lumen, unbranched, aseptate, straight, subparallel along the tubes or loosely interwoven, 2.8–4 µm in diam; hyphae at dissepiment edge with irregular crystals. Hymenial setae frequent, mostly originating from subhymenium, sometimes embedded in trama and at dissepiment edges, subulate, dark brown, thick-walled, (35–)43–52(–58) × (7–)8–13 µm; cystidioles frequent, fusoid, hyaline, thin-walled, 12–15 × 3–5 µm; basidia clavate, with four sterigmata and a simple septum at the base, 17–27 × 4–7 µm; basidioles dominating in hymenium, barrel-shaped to clavate, distinctly shorter than basidia.

Spores. — Basidiospores subglobose, hyaline, thin- to slightly thick-walled, smooth, without guttule, usually glued in tetrads, IKI–, CB+, (4.5–)4.8–5.8(–6) × (3.7–)3.8–5(–5.5) µm, L = 5.1 µm, W = 4.2 µm, Q

= 1.21–1.22 (n = 60/2).

Additional specimens (paratypes) examined. — **CHINA.** Xinjiang Auto. Reg., Fukang County, Tian Mts Nature Reserve, on fallen trunk of *Picea schrenkiana*, 12.IX.2018, Dai 19062 (BJFC027532), Dai 19072 (BJFC027542); 23.VIII.2019, Dai 20231 (BJFC031903), Dai 20232 ((BJFC031904), Dai 20233 ((BJFC031905).

Remarks. — Porodaedalea schrenkianae is characterized by a regular poroid hymenophore, very thick dissepiment edges, subulate hymenial setae, sometimes present at dissepiment edges, hyphae at dissepiment edge with irregular crystals and subglobose basidiospores. Phylogenetically, the species formed an independent lineage related to *P. yunanensis*, but *P. yunnanensis* has smooth hyphae at dissepiment edge and grows on living trees of *Pinus* (Wu et al. 2019a).

Key to species of *Porodaedalea*

1. Cystidioles present..... 2

1. Cystidioles absent..... 15

2. Pores 4–7 per mm..... 3

2. Pores 1–4 per mm..... 4

3. On *Abies*..... *P. alpicola* S.J. Dai et al.

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface brown to dull brown, concentrically sulcate with narrow zones, encrusted; pore surface cinnamon buff to honey yellow, glancing; pores 4–6 per mm; dissepiments thick, entire*;* hyphal system dimitic; setae present in hymenium only, bearing with irregular crystals, 32–46 × 5–9 µm; fusoid cystidioles present; basidiospores broadly ellipsoid to subglobose, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+. 4.5–5.5(–6) × 4–4.5(–5) µm, L = 5 µm, W = 4.2 µm, Q = 1.19–1.21 (Wu et al. 2019a); on living *Abies;* type locality in China; distribution: South Asia.

3. On *Picea*..... *P. himalayensis* (Y.C. Dai) Y.C. Dai

Basidiocarps perennial, effused-reflexed to pileate, imbricate; pileal surface dull brown to grayish black, concentrically sulcate with very narrow zones, velutinate, encrusted, cracked; pore surface umber brown to sepia brown, glancing; pores 5–7 per mm; dissepiments thin, entire; hyphal system dimitic; setae present in hymenium only, 27–39 × 6–10 µm; cystidioles present; basidiospores distinctly ovoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4.2–5.2 × 3.7–4.4 µm, L = 4.7 µm, W = 3.95 µm, Q = 1.17–1.2 (Dai 2010); mostly on living and dead trees of *Picea;* type locality in China; distribution: Southwest China.

4. On *Cedrus*..... 5

4. On a gymnosperm other than *Cedrus*..... 6

5. Pores 1–2 per mm; basidiospores 5–6 µm long..... *P. cedrina* Pilát ex Tomšovský & Kout

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface grayish brown, concentrically sulcate with narrow zones, encrusted, cracked; pore surface amber yellow to rust brown, glancing; pores 1–2 per mm; dissepiments thin, entire; hyphal system dimitic; setae present in hymenium only, 30–62 × 6–18 µm; cystidioles present; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, CB+, (4.9–)5–6(–6.3) × (3.8–)4–5.1(–5.5) µm, L = 5.49 µm, W = 4.6 µm, Q = 1.04–1.38 (Tomšovský and Kout 2013); on living tree of *Cedrus*; type locality in Morocco; distribution: the Mediterranean area.

5. Pores 3–4 per mm; basidiospores 4–5 µm long..... *P. indica* Spirin et al.

Basidiocarps perennial, pileate; pileal surface dark gray to blackish, indistinctly sulcate; pore surface ochraceous brown, glancing; pores 3–4 per mm; dissepiments thin, even to wavy; hyphal system dimitic; setae present in hymenium only, with blunt apices, 35–51 × 10–18 µm; hyphoid cystidioles present; basidiospores subglobose, hyaline, slightly thick-walled, IKI–, moderately CB+, 4–5 × 4–4.5 µm, L = 4.7 µm, W = 4.2 µm, Q = 1.12 (Wu et al. 2019a); on living tree of *Cedrus*; type locality in India; distribution: South Asia.

6. Hymenial setae sometimes with bifurcate tips ..... *P. qilianensis* F. Wu & Y.C. Dai

Basidiocarps perennial, pileate, imbricate; pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, encrusted, cracked; pore surface brown to grayish brown, not glancing; pores 2–3 per mm; dissepiments thin, lacerate; hyphal system dimitic; setae present in hymenium and trama, sometimes with bifurcate tips, 40–60 × 8–12 µm; fusoid cystidioles present; basidiospores subglobose, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, (3.8–)4–4.8(–6) × (3.5–)3.7–4(–4.3) µm, L = 4.33 µm, W = 3.94 µm, Q = 1.1 (n = 60/2), on living tree of *Picea crassifolia*; type locality in China; distribution: Northwest China.

6. Hymenial setae without bifurcate tips 7

7. Hyphae at dissepiment edge bearing fine crystals..... 8

7. Hyphae at dissepiment edge smooth..... 9

8. Setae present at dissepiment edge..... *P. schrenkianae* F. Wu & Y.C. Dai

Basidiocarps perennial, effused-reflexed or pileate; pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, encrusted, cracked; pore surface fulvous to brown when dry, glancing; pores 2–3 per mm; dissepiments thick, entire; hyphal system dimitic in trama, monomitic in context; hyphae at dissepiment edge with irregular crystals; setae present at hymenium, trama and dissepiment edges, 43–52 × 8–13 µm; fusoid cystidioles present; basidiospores subglobose, hyaline, thin- to slightly thick-walled, IKI–, CB+, (4.5–)4.8–5.8(–6) × (3.7–)3.8–5(–5.5) µm, L = 5.1 µm, W = 4.2

μm, Q = 1.21–1.22 (n = 60/2); on living trees of *Picea schrenkiana*; type locality in China; distribution: Central Asia.

8. Setae absent at dissepiment edges..... *P. chinensis* S.J. Dai & F. Wu

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface grayish brown to black, concentrically sulcate with narrow zones, encrusted; cracked; pore surface cinnamon to yellowish brown to rust brown, glancing; pores 2–3 per mm; dissepiments thick, entire; hyphal system dimitic; hyphae at dissepiment edge with irregular crystals; setae present in hymenium and trama, absent at dissepiment edges, 35–69 × 5–14 μm; cystidioles present; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, (3.9–)4–6 × 3–4.8 μm, L = 4.95 μm, W = 4 μm, Q = 1.19–1.27 (Dai et al. 2017); on living trees of *Pinus*; type locality in China; distribution: Southwest China.

9. Hyphae in context distinctly dimitic, skeletal hyphae aseptate.....

..... *P. occidentiamericana* F. Wu & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface brown to grayish dark brown, concentrically sulcate with narrow zones, encrusted, cracked; pore surface grayish brown, not glancing; pores 2–3 per mm; dissepiments thin, entire; hyphal system dimitic; skeletal hyphae aseptate, flexuous, interwoven; setae present in hymenium and trama, absent at dissepiment edges, 45–60 × 9–14 μm; fusoid cystidioles present; basidiospores ovoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+,(4.5–)5–6(–6.5) × (3.8–)4–5.3(–5.5) μm, L = 5.58 μm, W = 4.54 μm, Q = 1.22–1.24 (n = 60/2); on living trees of *Pinus*; type locality in USA; distribution: Western North America.

9. Hyphae in context monomitic to dimitic, skeletal hyphae frequently septate if dimitic..... 10

10. Some irregular crystals present in the hymenium..... *P. yamanoi* (Imazeki) Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface dull brown to dark gray, concentrically sulcate with narrow zones, hispid, encrusted, cracked; pore surface rust brown to cinnamon brown, glancing; pores 3–4 per mm; dissepiments thick, entire; hyphal system dimitic; skeletal hyphae frequently septate; some irregular crystals present in the hymenium; setae present in hymenium and trama, absent at dissepiment edges, 35–66 × 8–12 μm; cystidioles present; basidiospores subglobose to broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4.2–5.8 × 3.8–4.5 μm, L = 4.9 μm; W = 4.1 μm, Q = 1.19 (Dai 2010); on living trees of *Picea*; type locality in Japan; distribution: Northeast Asia.

10. Crystals absent in hymenium..... 11

11. Basidiospores ovoid..... *P. orientoamericana* F. Wu & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface brown to dark brown, concentrically sulcate with narrow zones, encrusted; pore surface fulvous to brown, not glancing; pore 1–2 per mm; dissepiments thick, entire; hyphal system dimitic in trama, monomitic in context; irregular crystals absent among

hymenium; setae present in hymenium and trama, absent at dissepiment edges, 40–60 × 9–16 µm; fusoid cystidioles present; basidiospores ovoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, (4.8–)5–6(–6.1) × (3.9–)4–5(–5.1) µm, L = 5.58 µm, W = 4.45 µm, Q = 1.25–1.26 (n = 60/2); on living trees of *Pinus*; type locality in USA; distribution: Eastern North America.

11. Basidiospores ellipsoid to subglobose..... 12

12. Basidiospores 5–6 µm long..... *P. pini* (Brot.) Murrill

Basidiocarps perennial, pileate, solitary; pileal surface ferruginous brown, hirsute, radially cracked, concentrically sulcate; pore surface dull yellowish brown; pores 1–3 per mm; hyphal system dimitic; skeletal hyphae in context frequently septate; irregular crystals absent among hymenium; setae present in hymenium and trama, 36–67 × 8–15 µm; cystidioles present; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 5–6 × 4–5.5 µm, L = 5.9 µm, W = 4.9 µm, Q = 1.2 (Wu et al. 2019a); on living tree of *Pinus*; type locality in Portugal; distribution: Europe.

12. Basidiospores 4–5.5 µm long..... 13

13. Basidiospores basically subglobose..... *P. yunnanensis* S.J. Dai et al.

Basidiocarps perennial, pileate, solitary or imbricate; pileal surface grayish brown to black, concentrically sulcate with narrow zones, encrusted, cracked; pore surface buff to cinnamon buff, glancing; pores 2–3 per mm; dissepiments thick, entire; hyphal system dimitic; skeletal hyphae in context frequently septate; irregular crystals absent among hymenium; setae present in hymenium only, 36–56 × 6–10 µm; fusoid cystidioles present; basidiospores subglobose, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4.5–5.5 × 4–4.5(–5) µm, L = 5 µm, W = 4.4 µm, Q = 1.13–1.15 (Wu et al. 2019a); on living trees of *Pinus*; type locality in China; distribution: South Asia.

13. Basidiospores basically ellipsoid..... 14

14. Basidiospores 4.9–5.5 µm long..... *P. laricis* (Jacz. ex Pilát) Niemelä

Basidiocarps perennial, pileate, solitary; pileal surface dull brown to dark reddish brown or grayish black, concentrically sulcate with narrow zones, tomentose, encrusted, cracked; pore surface yellowish brown to rust brown, glancing; pores 2–3 per mm; dissepiments thin, entire; hyphal system dimitic; skeletal hyphae in context frequently septate; irregular crystals absent among hymenium; setae present in hymenium and trama, 30–58 × 6–12 µm; fusoid cystidioles present; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4.9–5.5 × 3.5–4.2 µm, L = 5 µm, W = 3.9 µm, Q = 1.27 (Wu et al. 2019a); on living tree of *Larix*; type locality in Siberia of Russia; distribution: Eurasia.

14. Basidiospores 4–5.1 µm long..... *P. mongolica* Y.D. Wu & Y. Yuan

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface brown to sepia, concentrically sulcate with narrow zones, encrusted; pore surface buff to brown, not glancing; pores 2–3 per mm; dissepiments

thick, entire; hyphal system dimitic in trama, monomitic in context; irregular crystals absent among hymenium; setae present in hymenium only, 40–65 × 7–11 µm; fusoid cystidioles present; basidiospores ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, (3.9–)4–5.1(–5.2) × (3.5–)3.8–4.5(–5) µm, L = 4.82 µm, W = 4.03 µm, Q = 1.18–1.22 (Wu and Yuan 2020); on living trees of *Larix, Picea* and *Pinus;* type locality in China; distribution: Northeast Asia.

15. Basidiocarps annual, resupinate to effused-reflexed..... *P. chrysoloma* (Fr.) Fiasson & Niemelä

Basidiocarps annual, resupinate to effused-reflexed; pileal surface grayish, concentrically sulcate with narrow zones, tomentose to velutinate, encrusted; pore surface yellowish brown, glancing; pores 1–3 per mm; dissepiments thick, entire; hyphal system dimitic; setae present in hymenium only, 30–60 × 7–11 µm; cystidioles absent; basidiospores subglobose to ovoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4–5.5 × 4–5 µm (Ryvarden and Melo 2017); on living tree and fallen trunk, stump of Pinaceae; type locality in Sweden; distribution: Europe.

15. Basidiocarps perennial, effused-reflexed to pileate..... 16

16. On *Picea* or *Larix*..... 17

16. On *Abies, Pinus* or *Pseudotsuga*..... 18

17. Basidiospores basically ovoid; Asian species ..... *P. microsperma* S.J. Dai & Y.C. Dai

Basidiocarps perennial, pileate, solitary or imbricate; pileal surface grayish brown to black, concentrically sulcate with narrow zones, encrusted, cracked; pore surface clay buff to dull brown, glancing; pores 1–2 per mm; dissepiments thick, entire; hyphal system dimitic; setae present in hymenium only, bearing irregular crystals, 27–46 × 5–8 µm; cystidioles absent; basidiospores ovoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4–5 × 3–4 µm, L = 4.3 µm, W = 3.6 µm, Q = 1.17–1.21 (Wu et al. 2019a); on living trees of *Larix* and fallen trunk of *Picea*; type locality in China; distribution: Northeast Asia.

17. Basidiospores basically broadly ellipsoid; European species.....

..... *P. abietis* (P. Karst.) Bernicchia & Gorjón

Basidiocarps perennial, pileate, imbricate; pileal surface grayish, concentrically sulcate with narrow zones, tomentose to velutinate, encrusted; pore surface yellowish brown, glancing; pores 1–3 per mm; dissepiments thick, entire; hyphal system dimitic; setae present in hymenium only, 30–60 × 7–11 µm; cystidioles absent; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 4–5.5 × 4–5 µm (Ryvarden and Melo 2017); on living tree and fallen trunk, stump of *Picea*; type locality in Finland; distribution: Europe.

18 On *Pinus*; Asian species..... *P. kesiyae* S.J. Dai et al.

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface grayish brown to black, concentrically sulcate with narrow zones, encrusted, cracked; pore surface honey yellow to cinnamon, glancing; pores 3–4 per mm; dissepiments thick, entire; hyphal system dimitic; setae present in hymenium only, 43–58 × 8–11 µm; cystidioles absent; basidiospores subglobose, hyaline, thin- to slightly thick-walled, IKI–, moderately CB+, 5–5.5(–6) × (4–)4.5–5 µm, L = 5.3 µm, W = 4.6 µm, Q = 1.13–1.16 (Wu et al. 2019a); on living trees of *Pinus*; type locality in Vietnam; distribution: Southeast Asia.

18 On *Abies* or *Pseudotsuga*; North American species..... 19

19. Pores 2–3 per mm; on *Pseudotsuga*..... *P. gilbertsonii* (M.J. Larsen) V. Papp

Basidiocarps perennial, pileate, solitary or imbricate; pileal surface yellow to dark ferruginous brown, with radial grooves, hirsute, cracked; pore surface pale yellow to pale tan; pores 2–3 per mm; hyphal system dimitic; setae present in hymenium only, 30–40 × 7–9 µm; cystidioles absent; basidiospores globose to subglobose, thick-walled, IKI–, 5–5.5 × 5 µm (Larsen 2000); on living trees of *Pseudotsuga*; type locality in USA; distribution: North America.

19 Pores 3–5 per mm; on *Abies*..... *P. cancriformans* (M.J. Larsen et al.) T. Wagner & M. Fisch.

Basidiocarps perennial, pileate, imbricate; pileal surface ferruginous brown, concentrically sulcate, velutinate; pore surface dull brown; pores 3–5 per mm; hyphal system dimitic; setae present in hymenium only, 50 × 13 µm; cystidioles absent; basidiospores broadly ellipsoid, hyaline, thin- to slightly thick-walled, IKI–, 4.5–5(–5.5) × 3.5–4 µm (Larsen and Cobb-Poulle 1990); on living trees of *Abies*; type locality in USA; distribution: North America.

4.29 *Pseudoinonotus* T. Wagner & M. Fischer, *Mycol. Res.* 105: 781 (2001), (Fig. 1)

Type species: *Pseudoinonotus dryadeus* (Pers.) T. Wagner & M. Fisch.

Basidiocarps annual, pileate; pileal surface velutinate to smooth, zonate or azonate, cracked in some species; context homogeneous; hyphal system monomitic; hymenial setae present or rarely present; basidiospores subglobose, hyaline, thick-walled, smooth, strongly IKI[+] and very strongly CB+; on angiosperm and gymnosperm wood; causing a white rot.

Pseudoinonotus is evidently a homogeneous genus in the Hymenochaetaceae. It is closely related to *Fomitiporia*, but has an annual habit, and lacks cystidioles (Wagner and Fischer 2001). Eight species have been transferred to the genus (Wagner and Fischer 2001; Spirin et al. 2006; Dai et al. 2008; Rajchenberg et al. 2015), but *Pseudoinonotus hoehnelii* (Bres.) Zmitr. et al. does not fit the definition of the genus and there is no DNA data available for these species. In addition, *Pseudoinonotus poeltii* (Ryvarden) Zmitr. et al. was proposed based on *Phellinus poeltii* Ryvarden. We studied its type, and its basidiospores are yellow to rust brown, non dextrinoid, and the hymenial setae are straight and septate; morphologically it does not fit the definition of *Pseudoinonotus*. So, we exclude these two

species from the genus and transfer them to *Ochrosporellus* and *Tropicoporus* respectively in the present paper.

However, *Inonotus australiensis* Ryvarden (Ryvarden 2005) and *Inonotus brevisporus* (K.S. Thind & Chatr.) J.R. Sharma (Sharma 1995) have annual, pileate basidiocarps, a monomitic hyphal structure, and thick-walled, dextrinoid basidiospores. These characteristics fit the definition of *Pseudoinonotus,* and the following combinations are proposed:

Pseudoinonotus australiensis (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840012.

Basionym: *Inonotus australiensis* Ryvarden [as 'australensis'], *Syn. Fung.* 21: 33 (2005).

Pseudoinonotus brevisporus (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840013.

Basionym: *Polyporus dryadeus* var. *brevisporus* K.S. Thind & Chatr., *Indian Phytopath.* 13: 82 (1960).

Key to species of *Pseudoinonotus*

1. Basidiocarps resupinate---------- *P. crustosus* (Speg.) Rajchenb. & Pildain

Basidiocarps annual, resupinate; pore surface pale brown; pores 2–4 per mm; hyphal system monomitic; hymenial setae subulate to ventricose, straight or curved, 24–30 × 8–14 µm; basidiospores ellipsoid to obovoid, hyaline, thick-walled, IKI[+], CB+, 9–11 × 6.5–8 µm (Wright and Deschamps1975); type locality in Argentina; distribution: Argentina.

1. Basidiocarps pileate---------- 2

2. Context with a granular or mycelial core---------- 3

2. Context without a granular or mycelial core---------- 4

3. Pores 5–6 per mm; on *Juniperus*; European species----------

---------- *P. juniperinus* (Bernicchia & S. Curreli) Zmitr. et al.

Basidiocarps perennial, pileate, solitary; pilei ungulate; pileal surface rust to umber brown, rugose, smooth to tuberculate, azonate; pore surface cinnamon to umber brown; pores 5–6 per mm; context with mycelial core; hyphal system monomitic; hyphoid setae present in trama and dissepiments; hymenial setae subulate, 28–58 ´ 4.5–8 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], 6–7.5 ´ 5.5–6.5 µm (Ryvarden and Gilbertson 1994); on *Juniperus phoenicea*; type locality in Italy; distribution: Italy.

3. Pores 2–4 per mm; on *Eucalyptus*; Australian species----------

———————————————————— *P. chondromyelus* (Pegler) T. Wagner & M. Fisch.

Basidiocarps annual, pileate, imbricate; pilei dimidiate, ungulate to triquetrous; pileal surface cinnamon to rust brown, glabrous, encrusted, rimose or radially rugose; pore surface umber to dark rust brown; pores 2–4 per mm; context with a large granular core; hyphal system monomitic; hymenial setae ventricose to subulate, 22–35 ´ 7–14 µm; basidiospores ellipsoid, hyaline to pale yellowish, 7.5–10 ´ 5.5–7 µm (Pegler 1964); on *Eucalyptus*; type locality in Australia; distribution: Australia.

4. Pores 1–3 per mm; pileal surface encrusted—— *P. victoriensis* (Lloyd) T. Wagner & M. Fisch.

Basidiocarps pileate, solitary; pilei subungulate; pileal surface pale gray to ochraceous with a distinct crust, wrinkled; pore surface cinnamon brown to black; pores 1–3 per mm; context without mycelial core; hyphal system monomitic; hymenial setae abundant, subulate to ventricose, 12–28 ´ 7–12 µm; basidiospores ellipsoid, hyaline, 7–8.5 ´ 5–6.5 µm (Ryvarden 2005); type locality in Australia; distribution: Australia.

4. Pores 4–7 per mm, pileal surface velutinate to glabrous———————————— 5

5. Hymenial setae absent———————————— *P. australiensis* (Ryvarden) Y.C. Dai

Basidiocarps annual, pileate to substipitate, solitary to imbricate; pilei fan-shaped to semicircular; pileal surface rust to ochraceous brown, velutinate; pore surface whitish to pale rust brown; pores 6–7 per mm; context homogeneous without mycelial core; hyphal system monomitic; setal elements absent; basidiospores subglobose, hyaline to pale yellowish, slightly thick-walled, IKI[+], 4–5 × 3–3.5 µm (Ryvarden 2005); type locality in Australia; distribution: Australia.

5. Hymenial setae present———————————————————————————— 6

6. Basidiospores < 5.5 µm long———————————— *P. brevisporus* (Ryvarden) Y.C. Dai

Basidiocarps annual, pileate, solitary or imbricate; pilei applanate to ungulate; pileal surface buff to dark brown, velutinate to glabrous, zonate, radially rimose; pore surface pale brown, with exuding droplets of amber liquid when fresh, cracked; pores 5–7 per mm; dissepiments thin, entire; context homogeneous without mycelial core; hyphal system monomitic; hymenial setae hooked, 10–25 × 4–7 µm; basidiospores subglobose, hyaline, thick-walled, IKI[+], 4.5–5.5 × 3.5–5 µm (Ryvarden 2005); type locality in India; distribution: North India.

6. Basidiospores > 6.8 µm long———————————————————————————— 7

7. Tubes in dry specimens corky, difficult to separate from context; on *Quercus* or other hardwoods

———————————————————— *P. dryadeus* (Pers.) T. Wagner & M. Fisch.

Basidiocarps annual, pileate, solitary; pilei dimidiate; pileal surface yellowish brown to dull brown, velutinate to glabrous; pore surface grayish brown; pores 4–6 per mm; dissepiments thin, entire to slightly lacerate; context without mycelial core; hyphal system monomitic; hymenial setae frequent to rare, ventricose, 23–35 × 10–15 µm; basidiospores globose to ovoid, hyaline, thick-walled, IKI[+], strongly CB+, (6.5–)7–8.5(–9) × (5.5–)6–8(–8.2) µm, L = 7.8 µm, W = 7.2 µm, Q = 1.08 (Dai 2010); type locality in Germany; distribution: temperate zone of Northern Hemisphere.

7. Tubes in dry specimens fragile, separable from context; on *Abies*----------

---------- *P. tibeticus* (Y.C. Dai & M. Zang) Y.C. Dai et al.

Basidiocarps annual, pileate, solitary; pilei dimidiate or applanate; pileal surface deep brown, velutinate, cracked; pore surface grayish brown; pores 4–6 per mm; dissepiments thin, mostly entire; context without mycelial core; hyphal system monomitic; hymenial setae rare to frequent, triquetrous to ventricose, hooked, 21–35 ´ 10–25 µm; basidiospores globose to ovoid, hyaline, thick-walled, IKI[+], strongly CB+, (6.5–)6.8–8(–8.5) ´ (5.5–)6–7.5(–8) µm, L = 7.53 µm, W = 6.8 µm, Q = 1.08–1.13 (Dai 2010); on *Abies*; type locality in China; distribution: Northern Hemisphere.

4.30 ***Pseudophylloporia*** Y.C. Dai, F. Wu, L.W. Zhou & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 840014.

Type species: *Pseudophylloporia australiana* Y.C. Dai, F. Wu, L.W. Zhou & B.K. Cui.

Etymology. — Pseudophylloporia (Lat.): referring to the species resembling *Phylloporia*.

Basidiocarps perennial, pileate, hard corky when fresh, woody hard when dry; pileal surface velutinate to rough, concentrically sulcate; context homogeneous with a black line, a thick crust present at pileal surface; hyphal system dimitic; generative simple septate; skeletal hyphae dominant, brown, thick-walled; setal elements absent; basidiospores globose to subglobose, pale yellowish, fairly thick-walled, smooth, IKI–, CB–; on angiosperm wood; causing a white rot.

Remarks. — Pseudophylloporia differs from *Phylloporia* by bone hard basidiocarps, homogeneous context with a black line and thick crust at pileal surface, and a distinct dimitic hyphal structure. Phylogenetically, *Pseudophylloporia* is not closely related to *Phylloporia* (Fig. 1), and formed a separate clade in Hymenochaetaceae. Because of the above characteristics we propose the new genus.

Pseudophylloporia australiana Y.C. Dai, F. Wu, L.W. Zhou & B.K. Cui, **sp. nov.** (Figs. 1, 64, 65)

MycoBank: MB 840015.

Type. — **AUSTRALIA**. Queensland, Cairns, Crater Lake National Park, on fallen angiosperm trunk, 17V.2018, Dai 18846 (holotype, BJFC027314; isotype in MEL).

Etymology. — *Australiana* (Lat.): referring to the species being found in Australia.

Fruiting body. — Basidiocarps perennial, pileate, solitary, hard corky and without distinctive odor or taste when fresh, becoming bone hard when dry. Pilei mostly applanate to semicircular, projecting up to 5 cm, 7 cm wide and 10 mm thick at base. Pileal surface matted to glabrous, dark reddish to black when fresh, umber to bay when dry, distinctly concentrically sulcate; margin acute. Pore surface umber when fresh, dark umber when dry; sterile margin pale yellow when fresh, yellowish brown when dry, up to 1 mm wide; pores distinctly round, 8–10 per mm; dissepiments thick, entire. Context homogeneous, with a thick black zone separating an upper crust and lower context, upper crust dark brown, up to 0.5 mm thick at the base; lower context woody hard, umber, up to 3 mm thick at the base. Tubes cinnamon, paler than pore surface, brittle, up to 6.5 mm long.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; tissue becoming blackish brown in KOH.

Context. — Generative hyphae frequent, pale yellowish, slightly thick-walled, occasionally branched, frequently simple septate, 2–3 μm diam; skeletal hyphae golden yellow, thick-walled with a narrow lumen, rarely branched, aseptate, flexuous, interwoven, 3–3.5 μm diam; hyphae in the upper crust and black line brown, thick-walled with a narrow lumen, aseptate, unbranched, strongly flexuous and gelatinized, interwoven, 3–4 μm diam.

Tubes. — Generative hyphae hyaline to yellowish, thin- to slightly thick-walled, frequently simple septate, rarely branched, 2–3 μm diam; skeletal hyphae golden yellow, thick-walled with a narrow lumen, rarely branched, aseptate, interwoven, 2.5–3 μm diam; cystidia and cystidioles absent; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7–9 × 3.5–4 μm; basidioles in shape similar to basidia, but slightly smaller; irregular crystals frequently present among hymenium.

*Spor*es. — Basidiospores subglobose to globose, yellowish, thick-walled, smooth, IKI–, CB–, (2–)2.1–2.4(–2.5) × 2–2.2(–2.3) μm, L = 2.21 μm, W = 2.08 μm, Q = 1.05–1.09 (n = 60/2).

Additional specimen (paratype) examined. — **AUSTRALIA**. Queensland, Cairns, the road to Crater Lake National Park, on living angiosperm tree, 17.V.2018, Dai 18845 (BJFC027313).

Remarks. — *Pseudophylloporia australiana* is characterized by the combination of perennial pilei, a homogenous context with a black line separating upper crust and a lower context, a dimitic hyphal system in both of context and tube trama, presence of cystidioles and irregular crystals in hymenium, and very small, globose basidiospores. Morphologically, *Phylloporia pectinata* resembles *Pseudophylloporia australiana* by perennial and pileate basidiocarps, smaller pores (8–11 per mm), but the former has a duplex context, a monomitic hyphal system in tube trama, and broadly ellipsoid basidiospores measuring 2.4–3.3 × 2–2.5 μm (Wu et al. 2019b).

4.31 *Pyrrhoderma* Imazeki, *Trans. Mycol. Soc. Japan* 7: 4 (1966), (Fig. 1)

Type species: *Pyrrhoderma sendaiense* (Yasuda) Imazeki.

Basidiocarps annual to perennial, effused-reflexed, pileate to laterally stipitate, solitary, without distinctive odor or taste when fresh, corky to woody hard when dry; pileal surface reddish brown, vinaceous brown, dark brown to black, with a cuticle or crust, indistinctly concentrically zonate or azonate; hyphal system monomitic; generative hyphae simple septate, hyaline, pale yellowish to brownish, thin- to thick-walled with a wide lumen; hyphoid and hymenial setae present or absent; basidiospores oblong-ellipsoid, ellipsoid, broadly ellipsoid, or subglobose, hyaline, thin-walled, IKI−, CB− or CB+; on angiosperm wood; causing a white rot.

Pyrrhoderma was erected with *P. sendaiense* as the generic type and *P. adamantinum* (Berk.) Imazeki was included in the genus (Imazeki 1966). These two species were considered to be conspecific and *P. adamantinum* is the correct name (Dai 2010). The current concept of *Pyrrhoderma* was emended by Zhou et al. (2018) after transferring *P. scaurum* to *Fulvoderma*, combining *P. lamaoense* and *P. noxium* from *Phellinidium*. In addition, the following species fit the definition of *Pyrrhoderma* well, therefore we propose to combine them to *Pyrrhoderma.*

Pyrrhoderma luteofulvum (Cleland & Rodway) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840016.

Basionym: *Poria luteofulva* Cleland & Rodway [as '*luteo-fulvus*'], *Pap. Proc. R. Soc. Tasm.*: 42 (1930) [1929]

≡ *Phellinus luteofulvus* (Cleland & Rodway) Ryvarden [as '*luteo-fulvus*'], *Norw. Jl Bot*. 19(3-4): 235 (1972).

Pyrrhoderma sublamaensis (Lloyd) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 1)

MycoBank: MB 840017.

Basionym: *Fomes sublamaensis* Lloyd, *Mycol. Writ. 7*(Letter 66): 1128 (1922).

≡ *Phellinus sublamaensis* (Lloyd) Ryvarden, *Mycotaxon* 35(2): 235 (1989)

Fomes sublamaensis Lloyd is a prior name for *Fomes noxius* Corner (Ryvarden 1989), so, we use *P. sublamaensis* instead of *Pyrrhoderma noxium* (Corner) L.W. Zhou & Y.C. Dai.

Key to species of *Pyrrhoderma*

1. Hyphoid setae absent..... 2

1. Hyphoid setae present..... 3

2. Pores 5–6 per mm; basidiospores 6–7 µm long..... *P. adamantinum* (Berk.) Imazeki

Basidiocarps perennial, substipitate, solitary, hard corky when fresh, woody hard when dry; pileal surface grayish brown, dark brown to black, indistinctly concentrically zonate, glabrous; pore surface brown to dull brown; pores 5–6 per mm; context brown, hard corky to hard fibrous, in the basal part with radial white mycelial strands, a distinct black cuticle or crust present at pileal surface; hyphal system monomitic; setal elements absent; basidiospores subglobose hyaline, thin-walled, IKI–, CB(+), (5.6–)6–7(–8) × (4–)4.5–5.9(–6) µm, L = 6.48 µm, W = 5.08 µm, Q = 1.28 (Dai 2010); type locality in Nepal; distribution: Southeast Asia.

2. Pores 3–5 per mm; basidiospores 4–4.5 µm long..... *P. thailandicum* L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate, solitary, fragile, becoming corky when dry; pileal surface reddish brown to vinaceous brown, tuberculate and warty; pore surface buff, glancing; pores 3–5 per mm; context cinnamon buff, corky, distinctly concentrically zonate, with a distinct cuticle at the pileal surface; hyphal system monomitic; setal elements absent; basidiospores ellipsoid to broadly ellipsoid, hyaline, thin-walled, IKI–, CB–, (3.5–)4–4.5(–5) × 3–3.5(–4) µm, L = 4.22 µm, W = 3.29 µm, Q = 1.28 (Zhou et al. 2018a); type locality in Thailand; distribution: Thailand.

3. Pores 2–4 per mm; dissepiments lacerate... *P. luteofulvum* (Cleland & Rodway) Y.C. Dai & F. Wu

Basidiocarps annual, effused reflexed; pileal surface, cinnamon to fulvous, azonate, finely tomentose; pore surface pale grayish brown; pores 2–4 per mm; dissepiments strongly lacerate; hyphal system monomitic; hyphoid setae present in trama, terminally pointed and hooked, 120 × 10–20 µm; hymenial setae absent; basidiospores ellipsoid, hyaline, thin-walled, 6–7.5 × 2.5–3.5 µm (Ryvarden and Johansen 1980); type locality in Australia; distribution: South Australia.

3. Pores 6–9 per mm; dissepiments entire..... 4

4. Hymenial setae present..... *P. yunnanense* L.W. Zhou & Y.C. Dai

Basidiocarps annual, pileate, solitary, woody hard when dry; pileal surface reddish brown to fuscus, distinctly concentrically zonate and sulcate; pore surface grayish brown, glancing; pores 6–8 per mm; dissepiments entire; context yellowish brown, woody hard, indistinctly concentrically zonate, with a distinct cuticle at the pileal surface; hyphal system monomitic; hyphoid setae apex obtuse; hymenial setae ventricose, apex sharp; cystidia subulate to ventricose with an elongated apical portion; basidiospores ellipsoid, hyaline, thin-walled, IKI–, CB–, (3–)3.5–4(–4.5) × 2–3 µm, L = 3.71 µm, W = 2.43 µm, Q = 1.49–1.56 (Zhou et al. 2018a); type locality in China; distribution: China.

4. Hymenial setae absent..... 5

5. Basidiocarps annual; basidiospores 2.5–3 µm wide..... *P. hainanense* L.W. Zhou & Y.C. Dai

Basidiocarps annual, resupinate, woody hard; pore surface grayish brown; pores 7–8 per mm; dissepiments entire; subiculum orange-brown to yellowish brown, woody hard; hyphal system monomitic;

hyphoid setae apex obtuse; hymenial setae absent; basidiospores ellipsoid, hyaline, thin-walled, IKI−, CB−, 3.5–4.5 × 2.5–3(−3.5) µm, L = 3.99 µm, W = 2.88 µm, Q = 1.37–1.39 (Zhou et al. 2018a); type locality in China; distribution: China.

5. Basidiocarps perennial; basidiospores 2–2.4 µm wide..... 6

6. Contextual hyphae interwoven, basidiospores oblong-ellipsoid, 3.2–4.3 µm long.....

..... *P. lamaoense* (Murrill) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, effused-reflexed, woody hard and heavy when fresh, bone hard and light-weight when dry; pilei dimidiate; pileal surface dark brown to black, strongly concentrically sulcate with narrow zones, velutinate; pore surface umber to dark brown, glancing; pores 7–9 per mm; dissepiments entire; context yellowish brown, paler contrasting with tubes, hard corky, azonate, a distinct black cuticle present at pileal surface, several thin black lines and white mycelial strands present in context; hyphal system monomitic; hyphoid setae apically obtuse in context, apex mostly pointed in trama; hymenial setae absent; cystidia subulate; basidiospores oblong-ellipsoid, hyaline, thin-walled, IKI−, CB+, (3−)3.2–4.3(−4.5) × (1.9−)2–2.4 µm, L = 3.54 µm, W = 2.06 µm, Q = 1.71 (Dai 2010); type locality in Philippines; distribution: Southeast Asia.

6. Contextual hyphae regularly arranged, basidiospores ellipsoid, 2.6–3.3 µm long.....

..... *P. sublamaensis* (Lloyd) Y.C. Dai & F. Wu

Basidiocarps perennial, effused-reflexed to distinctly pileate, hard corky when fresh, woody hard when dry; pileal surface dark brown to black, irregularly zonate, glabrous; pore surface grayish brown to dark brown; pores 7–8 per mm; dissepiments entire; context yellowish brown, woody hard to hard corky, concentrically zonate, a distinctly thin black crust present above context, a thin black line seen between context and tubes; hyphal system monomitic; hyphoid setae usually terminally pointed in context, apex obtuse in trama; hymenial setae absent; cystidia clavate, with elongated apical portion; basidiospores ellipsoid, hyaline, thin-walled, IKI−, CB−, (2.5−)2.6–3.3(−3.5) × 2–2.4(−2.5) µm, L = 2.97 µm, W = 2.17 µm, Q = 1.37 (Dai 2010); type locality in Malaysia; distribution: Southeast Asia.

4.32 *Rigidonotus* Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **gen. nov.** (Fig. 1)

MycoBank: MB 840018.

Type species: *Rigidonotus glomeratus* (Peck) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui.

Etymology. — *Rigidonotus* (Lat.): referring to the genus resembling *Inonotus* but with rigid basidiocarps.

Basidiocarps annual, resupinate to effused-reflexed; pileal surface tomentose to glabrous; pore surface grayish brown; context homogeneous; hyphal system monomitic; hyphoid setae present; hymenial setae

present or absent; basidiospores ellipsoid, pale yellowish; on angiosperm wood; producing sterile conks or not; on angiosperm wood; causing a white rot.

Remarks. — *Rigidonotus* is phylogenetically related to *Ochrosporellus* (Fig. 1), and morphologically they share a monomitic hyphal system, presence of hyphoid setae and hymenial setae, and pale yellowish basidiospores. However, species in *Ochrosporellus* have perennial and distinctly pileate basidiocarps, do not produce sterile conks, and have a distribution in the tropics; while *Rigidonotus* has annual, resupinate to effused-reflexed basidiocarps, some species produce sterile conks, and has a distribution in temperate areas. So far two species are nested in the *Rigidonotus* clade, and the combinations are proposed as follows:

Rigidonotus glomeratus (Peck) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 840019.

Basionym: *Polyporus glomeratus* Peck, *Ann. Rep. N.Y. St. Mus.* 24: 78 (1872).

≡ *Inonotus glomeratus* (Peck) Murrill, *Mycologia* 12: 18 (1920).

Rigidonotus pruinosus (Bondartsev) Y.C. Dai, F. Wu, L.W. Zhou, Vlasák & B.K. Cui, **comb. nov.** (Fig. 1)

MycoBank: MB 840020.

Basionym: *Inonotus pruinosus* Bondartsev, *Botanicheskie Materialy* 15: 99 (1962).

Key to species of *Rigidonotus*

1. Hymenial setae present; sterile conk present---------- *R. glomeratus* (Peck) Y.C. Dai et al.

Basidiocarps annual, resupinate to effused-reflexed, imbricate; pileal surface yellowish brown, tomentose to glabrous; pore surface grayish brown, glancing; pores 3–5 per mm; dissepiments thin, lacerate; context homogeneous; hyphal system monomitic; hyphoid setae present in context and trama, 250–500 × 10–15 µm; hymenial setae subulate to ventricose, 16–28 × 5–9 µm; basidiospores broadly ellipsoid, pale yellowish, 4.4–5.2 × 3.5–4 µm (from DAOM 221572); producing sterile conks; type locality in USA; distribution: North America.

1. Hymenial setae absent; sterile conk absent---------- *R. pruinosus* (Bondartsev) Y.C. Dai et al.

Basidiocarps annual, resupinate; pore surface yellowish to dirty brown, strongly pruinose and cracked; pores 2–3 per mm; dissepiments entire; subiculum very thin to almost lacking; hyphal system monomitic; hyphoid setae prominent, 300 × 9–13 µm; hymenial setae absent; basidiospores broadly ellipsoid, golden yellow, thick-walled, IKI–, slightly CB+, (5.8–)6–7.4(–8) × (4.1–)4.5–6(–6.3) µm, L = 6.68 µm, W = 5.08 µm, Q = 1.24–1.40 (Dai 2010); type locality in China; distribution: North China.

4.33 *Sanghuangporus* Sheng H. Wu et al., *Fungal Diversity* 77: 340 (2016), (Figs. 1, 66)

Type species: *Sanghuangporus sanghuang* (Sheng H. Wu et al.) Sheng H. Wu, L.W. Zhou & Y.C. Dai.

Basidiocarps perennial, effused-reflexed to pileate, solitary or imbricate, hard corky to woody hard; pileal surface brown, dark grayish to black, tomentose, velutinate to glabrous with a radially cracked crust; pore surface yellow to brown; context homogeneous to duplex with a black line; hyphal system monomitic to dimitic in context, dimitic in trama; hyphoid setae absent; hymenial setae present; basidiospores ellipsoid, broadly ellipsoid to subglobose, yellowish, slightly thick- to thick-walled, smooth, IKI–, CB– or CB+; on angiosperm wood; causing a white rot.

Sanghuangporus accommodates some important medicinal fungal species generally called "Sanghuang" in China, Korea and Japan. *Sanghuangporus* is taxonomically difficult because of the similar morphology among species. It is also difficult to separate from *Tropicoporus* in morphology. Zhu et al. (2019) showed the molecular phylogeny strongly supports the monophyly of *Sanghuangporus* spp. based on ITS+nLSU+EF1-a+RPB1+RPB2 sequences. They also indicated that the maximum crown age of *Sanghuangporus* is approximately 30.85 million years, and East Asia is the likely ancestral area (Zhu et al. 2019). Before the present study 15 species were accepted in the genus (Wu et al. 2012; Ghobad-Nejhad 2015; Tomsovsky 2015; Zhou et al. 2016b; Zhu et al. 2017; Zhu et al. 2019; Wu et al. 2020b; Shen et al. 2021). Two new species are described based on our study, and a new combination is proposed.

Sanghuangporus australianus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 66, 67, 68)

MycoBank: MB 840021.

Type. — **AUSTRALIA**. Queensland, Cairns, the road to Crater Lake National Park, on rotten angiosperm wood, 17.V.2018, Dai 18847 (holotype, BJFC027315; isotype in MEL).

Etymology. — *Australianus* (Lat.): referring to the species being found in Australia.

Fruiting body. — Basidiocarps perennial, resupinate to slightly effused-reflexed, solitary, hard corky and without distinctive odor or taste when fresh, woody hard to bone hard and medium in weight when dry; pilei projecting up to 1 cm, 8 cm wide, and 1.1 cm thick at base; pileal surface almost black, azonate, velutinate to matted; margin acute. Pore surface buff yellow when fresh, becoming umber when dry, glancing; sterile margin yellowish brown, up to 0.5 mm wide; pores circular, 10–11 per mm; dissepiments thin, entire. Context or subiculum very narrow, dark brown, woody hard, up to 1 mm thick, a distinct black zone present between substrate and subiculum; tubes fulvous, paler than pore surface, bone hard to brittle, up to 1 cm long, annual layers distinct; white mycelial strands present in old tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context or subiculum. — Generative hyphae yellowish, slightly thick-walled, occasionally branched, frequently simple septate, 2–3 µm in diam; skeletal hyphae golden brown to dark brown, thick-walled with

a narrow to medium lumen, agglutinated, rarely branched, aseptate, flexuous, interwoven, 2.5–3.5 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin- to slghtly thick-walled, rarely branched, frequently septate, 2–3.2 µm in diam; skeletal hyphae brownish, thick-walled with a medium lumen, unbranched, aseptate, agglutinated, flexuous, interwoven, 2.5–3.2 µm in diam; hymenial setae frequent, subulate to ventricose, thick-walled, dark brown, 12–25 × 5–8 µm; cystidioles present, fusoid, hyaline, thin-walled, 6–10 × 3–4.5 µm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7–10 × 4–5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid, yellowish, thick-walled, smooth, IKI–, CB–, (3–)3.1–3.6(–3.8) × (2.3–)2.4–2.8(–3) µm, L = 3.32 µm, W = 2.58 µm, Q = 1.29 (n = 30/1).

Remarks. — *Sanghuangporus australianus* is characterized by resupinate basidiocarps with small pores (10–11 per mm) and basidiospores (3.1–3.6 × 2.4–2.8 µm). Phylogenetically it formed an isolated lineage (Fig. 66).

Sanghuangporus lagerstroemiae Y.C. Dai & F. Wu, **sp. nov.** (Figs. 66, 69, 70)

MycoBank: MB 840022.

Type. — **VIETNAM**. Dong Nai Province, Dimh Quan District, Thac Mai Perservation Park, on rotten wood of *Lagerstroemia*, 14.X.2017, Dai 18337 (holotype, BJFC025860).

Etymology. — *Lagerstroemiae* (Lat.): referring to the species growing on *Lagerstroemia*.

Fruiting body. — Basidiocarps perennial, resupinate, becoming cushion-shaped with age, woody hard and without distinctive odor or taste when fresh, bone hard and heavy in weight when dry, up to 17 cm long, 8 cm wide, and 1.8 cm thick at center. Pore surface fulvous when fresh, becoming umber when dry, glancing; sterile margin black, up to 10 mm wide, distinctly receding; pores circular, 6–8 per mm; dissepiments thin, entire. Subiculum very thin to almost lacking, yellowish brown, woody hard, up to 0.2 mm thick, a black line present between substrate and subiculum; tubes concolorous with pore surface, bone hard to brittle, up to 1.8 cm long, annual layers distinct.

Hyphal structure. — Hyphal system dimitic in trama, monomitic in subiculum; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae pale yellow to yellow, thick-walled, rarely branched, frequently septate, flexuous, interwoven, 2.5–4.5 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin- to slightly thick-walled, rarely branched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, yellowish, thick-walled with a medium lumen, unbranched, aseptate, straight, subparallel along the tubes, slightly agglutinated, 2.5–4

μm in diam; hyphae at dissepiments frequently simple septate; hymenial setae abundant, ventricose, thick-walled, dark brown, 16–25 × 6.5–8.5 μm; cystidioles present, fusoid, hyaline, thin-walled, 9.5–12 × 3.5–4 μm; basidia capitate to barrel-shaped, with four sterigmata and a simple septum at the base, 8–11 × 4–5 μm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores ellipsoid, yellowish, thick-walled, smooth, some collapsed, IKI–, CB–, (3.6–)3.7–4.2(–4.5) × (2.8–)2.9–3.4(–3.5) μm, L = 4 μm, W = 3.1 μm, Q = 1.28–1.30 (n = 60/2).

Additional specimen (paratype) examined. — **VIETNAM**. Dong Nai Province, Dinh Quan District, Thac Mai Perservation Park, on stump of *Lagerstroemia,* 14.X.2017, Dai 18333 (BJFC025856).

Remarks. — Sanghuangporus australianus resembles *S. lagerstroemiae* by resupinate basidiocarps, but the former species has smaller pores and basidiospores (10–11 per mm vs. 6–8 per mm; 3.1–3.6 × 2.4–2.8 μm vs. 3.7–4.2 × 2.9–3.4 μm), and phylogenetically both species are distantly related (Fig. 66).

Sanghuangporus johnsonianus (Murrill) Y.C. Dai, F. Wu & Vlasák, **comb. nov.** (Fig. 66)

MycoBank: MB 840023.

Basionym: *Fomitiporella johnsoniana* Murrill, *N. Amer. Fl.* (New York) 9(1): 13 (1907).

≡ *Phellinus johnsonianus* (Murrill) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

≡ *Fulvifomes johnsonianus* (Murrill) Y.C. Dai, *Fungal Diversity* 45: 195 (2010).

The above species has characteristics that fit *Sanghuangporus* well.

Specimens examined. — **USA**. Pennsylvania, Schwenksville, on *Fraxinus*, 08.2008, JV0808/16; Wissahickon, 08.2008. JV0808/43; Minnesota, East Bethel, 19.09.2014, He 2093 (BJFC018752).

Key to species of *Sanghuangporus*

1. Basidiocarps resupinate to slightly effused-reflexed..... 2

1. Basidiocarps distinctly pileate..... 4

2. Pores 2–5 per mm..... *S. pilatii* (Černý) Tomšovský

Basidiocarps perennial, resupinate to nodular, triquetrous; pore surface yellowish brown to dark brown; pores 2–5 per mm; dissepiments thin, entire to occasionally lacerate; hyphal system dimitic; tramal hyphoid setae subulate, 60–120(–160) × 5–10 μm; hymenial setae subulate or ventricose, 20–50 × 5–10 μm; basidiospores ovoid to broadly ellipsoid, rarely subglobose, thick-walled, yellowish, IKI–, moderately CB+, (3.9–)4–4.8(–4.9) × (2.9–)3–3.8 μm, L = 4.45 μm, W = 3.37 μm, Q = 1.29–1.36 (Tomšovský 2015); on *Populus*; type locality in Czech Republic; distribution: Central Europe (JV 0511/15).

2. Pores 6–11 per mm..... 3

3. Pores 10–11 per mm; Australian species..... *S. australianus* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate to slightly effused-reflexed; pileal surface almost black, azonate, velutinate; pore surface buff yellow to umber, glancing; pores 10–11 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae frequent, 12–26 × 5–8 µm; basidiospores ellipsoid, yellowish, thick-walled, smooth, IKI–, CB–, (3–)3.1–3.6(–3.8) × (2.3–)2.4–2.8(–3) µm, L = 3.32 µm, W = 2.58 µm, Q = 1.29 (n = 30/1); on rotten angiosperm wood; type locality in Australia; distribution: Australia.

3. Pores 6–8 per mm; Asian species..... *S. lagerstroemiae* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped; pore surface fulvous to umber, glancing; pores 6–8 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae frequent, 16–25 × 6.5–8.5 µm; basidiospores ellipsoid, yellowish, thick-walled, IKI–, CB–, (3.6–)3.7–4.2(–4.5) × (2.8–)2.9–3.4(–3.5) µm, L = 4 µm, W = 3.10 µm, Q = 1.28–1.3 (n = 60/2); on rotten wood of *Lagerstroemia*; type locality in Vietnam; distribution: Vietnam.

4. On Caprifoliaceae..... 5

4. On angiosperm other than Caprifoliaceae 9

5. Pores 3–5 per mm..... 6

5. Pores 5–10 per mm..... 7

6. Hyphal system monomitic in context; hymenial setae infrequent..... *S. ligneus* Ghob.-Nejh.

Basidiocarps perennial, pileate, ungulate to almost triquetrous, solitary; pileal surface convex, dark brown to grayish black, glabrous, concentrically zonate and radially cracked; pore surface golden brown, glancing; pores 4–5 per mm; dissepiments thick, entire; context homogeneous, up to 35 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae infrequent, ventricose, 10–20 × 4–7 µm; cystidioles present; basidiospores broadly ellipsoid to subglobose, light yellow, thick-walled, IKI–, slightly CB+, 3–4(–4.5) × (2–)2.5–3.5 µm, L = 3.9 µm, W = 2.9 µm, Q = 1.3 (Ghobad-Nejhad 2015); on living tree of *Lonicera*; type locality in Iran; distribution: Iran.

6. Hyphal system dimitic in context; hymenial setae frequent.....

..... *S. lonicerinus* (Bondartsev) Sheng H. Wu et al.

Basidiocarps perennial, pileate, solitary; pileal surface dark brown to grayish brown, concentrically sulcate, cracked; pore surface dark grayish brown, glancing; pores 3–5 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae frequent, 12–25 × 5–8 µm; basidiospores ovoid to broadly ellipsoid, rarely subglobose, pale yellow, faintly thick-walled, IKI–, CB(+), (3.2–)3.5–4.8(–5.1) ×

(2.8–)3–3.6(–3.8) µm, L = 4.53 µm, W = 3.31 µm, Q = 1.31–1.38 (based on Dai 17084, 17085, 17086 from Uzbekistan); on living tree of *Lonicera*; type locality in Central Asia; distribution: Central Asia.

7. Pores 8–10 per mm..... *S. lonicericola* (Parmasto) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface dark grayish to grayish black, concentrically zonate and sulcate, velutinate, matted and irregularly cracked, sometimes covered with mosses; margin obtuse, brownish brown to dull brown; pore surface yellowish brown to rust brown, glancing; pores 8–10 per mm; dissepiments thin, entire; hyphal system monomitic in context, dimitic in trama; hymenial setae ventricose, sharply pointed, 12–22 × 4–8 µm; basidiospores ellipsoid, thick-walled, IKI–, CB–, (3–)3.3–4.1(–4.6) × (2.3–)2.4–3.3(–3.7) µm, L = 3.75 µm, W = 2.76 µm, Q = 1.33–1.4 (Dai 2010); on living tree of *Lonicera*; type locality in Russia Far East; distribution: East Asia.

7. Pores 5–8 per mm..... 8

8. Context duplex; distribution in the warm temperate zones.....

..... *S. weigelae* (T. Hatt. & Sheng H. Wu) Sheng H. Wu et al.

Basidiocarps perennial, pileate, occasionally effused-reflexed, solitary to imbricate; pileal surface brownish to grayish black, densely sulcate, sometimes radially rimose and cracked, velutinate to glabrous, with a thin black crust; margin acute; pore surface brownish yellow to pale brown, glancing; pores 6–8 per mm; dissepiments thin, entire; context duplex, up to 3 mm thick; hyphal system dimitic; hymenial setae ventricose, 15–30 × 6–13 µm; cystidioles present; basidiospores broadly ellipsoid or subglobose, yellowish to pale yellowish brown, slightly thick-walled, IKI–, CB–, (3.7–)3.8–4.2(–4.4) × (2.9–)3–3.6(–3.8) µm, L = 4.1 µm, W = 3.26 µm, Q = 1.26 (Wu et al. 2012); on living tree of *Weigela*; type locality in Japan; distribution: China, Japan and Korea.

8. Context homogeneous; distribution in alpine zones.....

..... *S. alpinus* (Y.C. Dai & X.M. Tian) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface blackish when fresh, mouse gray to black, concentrically zonate and narrowly sulcate, radially cracked, sometimes covered with mosses, velutinate to matted; margin obtuse, dull brown; pore surface honey yellow to yellowish brown, glancing; pores 5–7 per mm; dissepiments thin, entire; context homogeneous, up to 5 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae frequent in the hymenium and dissepiments, subulate to ventricose, 27–43 × 5–10 µm; basidiospores broadly ellipsoid to ellipsoid, slightly yellowish and thick-walled, IKI–, CB–, (3–)3.1–3.9(–4) × (2.5–)2.6–3.2(–3.3) µm, L = 3.46 µm, W = 2.96 µm, Q = 1.13–1.21 (Tian et al. 2013); on living tree of *Lonicera*; type locality in China; distribution: Southwest China.

9. Basidiocarps with a sharp margin..... 10

9. Basidiocarps with an obtuse margin..... 11

10. Basidiospores 3.5–4 µm long..... *S. zonatus* (Y.C. Dai & X.M. Tian) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface yellowish brown to dark brown, concentrically zonate, narrowly sulcate, cracked; margin acute, yellowish brown; pore surface honey yellow to fulvous, glancing; pores 7–8 per mm; dissepiments thin, entire; context homogeneous, up to 15 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae frequent, ventricose or subulate, 15–21 × 5–10 µm; basidiospores broadly ellipsoid to ellipsoid, yellowish and thick-walled, IKI–, CB–, (3.1–)3.5–4(–4.1) × (2.8–)2.9–3.1(–3.5) µm, L = 3.81 µm, W = 2.96 µm, Q = 1.24–1.34 (Tian et al. 2013); on living angiosperm tree; type locality in China; distribution: tropical China and Sri Lanka (BJFC031244).

10. Basidiospores 4.2–4.8 µm long..... *S. vitexicola* Sheng H. Wu

Basidiocarps perennial, pileate, solitary; pilei applanate to triquetrous; pileal brown to blackish brown, tomentose to glabrous, distinctly concentrically sulcate and zonate, radially rimose and cracked; margin acute; pore surface yellowish brown, glancing; pores 6–8 per mm; dissepiments thick, entire; context 7–15 mm thick; hyphal system dimitic; hymenial setae abundant, ventricose or subulate, 18–30 × 5–8 µm; cystidioles present; basidiospores broadly ellipsoid, yellowish to brownish, slightly thick-walled or thick-walled, IKI–, CB–, 4.2–4.8 × 3.2–3.7 µm (Wu et al. 2020b); on living tree of *Vitex negundo*; type locality in China; distribution: East Asia.

11. Basidiospores > 5 µm long; African species..... *S. microcystideus* (Har. & Pat.) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary; pileal surface yellowish brown grayish brown, concentrically zonate, narrowly sulcate, distinctly cracked; margin obtuse; pore surface yellowish brown to pale grayish brown, glancing; pores 6–8 per mm; dissepiments thin, entire; context homogeneous, up to 20 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae frequent, ventricose, 22–32 × 9–12 µm; basidiospores subglobose to broadly ellipsoid, yellowish and thick-walled, IKI–, CB–, (5.1–)5.2–6.5(–7) × (4.1–)4.2–5(–5.1) µm, L = 5.73 µm, W = 4.77 µm, Q = 1.2 (Zhou et al. 2016b); on living tree of *Olea*; type locality in Congo; distribution: Africa.

11. Basidiospores < 5 µm long; Asian and American species..... 12

12. On *Fraxineus* or *Juglans*; North American species..... 13

12. On angiosperm other than *Fraxineus* or *Juglans*; Asian species..... 14

13. Pores 7–9 per mm; restricted to *Fraxineus*.. *S. johnsonianus* (Murrill) Y.C. Dai, F. Wu & Vlasák

Basidiocarps perennial, effused-reflexed to pileate; pileal surface dark brown to almost black, concentrically sulcate; margin obtuse; becoming blood red with KOH; pore surface yellowish brown to pale rust brown, glancing; pores 7–9 per mm; dissepiments thin, entire; context up to 15 mm thick; hyphal

system dimitic; hymenial setae frequent, subulate, 17–27 × 6–9 µm; cystidioles infrequent, subulate to ventricose, 7–14 × 3–4 µm; basidiospores ovoid to ellipsoid, pale yellowish, thick-walled, IKI–, CB–, 3.5–4.5 × 2.5–3 µm (Gilbertson and Ryvarden 1986-1987); mostly on *Fraxinus*; type locality in USA; distribution: North America.

13. Pores 5–7 per mm; mostly on *Juglans*..... *S. weirianus* (Bres.) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate; pileal surface dark brown to grayish brown, concentrically sulcate, cracked; margin obtuse; golden brown; pore surface golden brown, glancing; pores 5–7 per mm; dissepiments thick, entire; context homogeneous, up to 45 mm thick; hyphal system dimitic; setae frequent, subulate to ventricose, 20–52 × 7–14 µm; basidiospores subglobose to ovoid, pale yellow, slightly thick-walled, IKI–, CB–, 4–5 × 3–3.5 µm (Gilbertson 1979); mostly on *Juglans*; type locality in USA; distribution: North America.

14. Margin becoming blood red in KOH; restricted to *Populus*..... *S. vaninii* (Ljub.) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, resupinate, effused-reflexed or pileate; pileal surface reddish brown to grayish black, indistinctly zonate, matted to glabrous, sometimes covered with mosses; margin obtuse, bright yellow, becoming blood red in KOH; pore surface umber brown, glancing; pores 6–8 per mm; dissepiments thin, entire to lacerate; context homogeneous, up to 30 mm thick; hyphal system monomitic in context, dimitic in trama; setae frequent, mostly ventricose, 25–36 × 6–9 µm; basidiospores ovoid to broadly ellipsoid, pale yellowish, fairly thick-walled, IKI–, moderately CB+, (3.5–)3.8–4.4(–4.6) × (2.5–)2.8–3.7(–4) µm, L = 3.99 µm, W = 3.06 µm, Q = 1.29–1.31 (Dai 2010); on living tree of *Populus*; type locality in Russia Far East; distribution: East Asia.

14. Margin becoming dark brown in KOH; on angiosperm other than *Populus*..... 15

15. Contextual hyphae dimitic; on *Morus*.....

..... *S. sanghuang* (Sheng H. Wu et al.) Sheng H. Wu et al.

Basidiocarps perennial, pileate, solitary; pileal surface yellowish brown to blackish brown, velutinate to glabrous; distinctly sulcate, radially rimose and cracked; margin obtuse, lemon yellow to golden yellow becoming dark red with KOH; pore surface golden yellow to yellowish brown, glancing; pores 6–8 per mm; dissepiments thin, entire; context homogeneous, up to 25 mm thick; hyphal system dimitic; hymenial setae variably abundant, ventricose or subulate, 20–35 × 7–14 µm; basidiospores broadly ellipsoid, yellowish to brownish, slightly thick-walled or thick-walled, IKI–, CB–, (3.8–)4–4.9(–5.1) × (3–)3.1–3.9(–4.1) µm, L = 4.27 µm, W = 3.36 µm, Q = 1.27 (Wu et al. 2012); on living tree of *Morus*; type locality in China; distribution: East Asia.

15. Contextual hyphae monomitic; on angiosperm other than *Morus*..... 16

16. Pores 7–9 per mm..... *S. quercicola* Lin Zhu & B.K. Cui

Basidiocarps perennial, pileate; pileal surface yellowish brown, cinnamon brown to dark brown, concentrically zonate and sulcate, velutinate to glabrous and slightly rimose with age; margin obtuse, lemon yellow when juvenile, becoming yellowish brown with age; margin obtuse; pore surface buff yellow to cinnamon brown, glancing; pores 7–9 per mm; dissepiments thin, entire; hyphal system monomitic in context, dimitic in trama; hymenial setae ventricose or subulate, 22–35 × 6–9 µm; cystidioles present; basidiospores subglobose to ovoid, pale yellowish, fairly thick-walled, IKI–, moderately CB+, (2.5–)3–3.9(–4) × (2.2–)2.4–2.8(–3) µm, L = 3.23 µm, W = 2.66 µm, Q = 1.18–1.24 (Zhu et al. 2017; Wu et al. 2020b); on *Quercus, Toxicodendron* and *Diospyros*; type locality in China; distribution: China.

16. Pores 5–7 per mm..... 17

17. Basidiospores CB+; on *Syringa*..... *S. baumii* (Pilát) L.W. Zhou & Y.C. Dai

Basidiocarps perennial, pileate, solitary to imbricate; pileal surface dark grayish to almost black, concentrically zonate and sulcate, matted to glabrous, radially cracked; margin obtuse, dull brownish; pore surface brown to dark brown, glancing; pores 6–7 per mm; dissepiments thin, entire; context homogeneous, up to 10 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae frequent to scanty, ventricose, 14–24 × 5–9 µm; cystidioles present; basidiospores broadly ellipsoid, yellowish, thick-walled, IKI–, CB+, (3–)3.5–4.5(–5) × (3.1–)3.2–3.5(–4.2) µm, L = 4.21 µm, W = 3.34 µm, Q = 1.25–1.4 (Dai 2010); on living tree of *Syringa* and other angiosperms; type locality in Russian Far East; distribution: East Asia.

17. Basidiospores CB–; on *Prunus*..... *S. subbaumii* Shan Shen et al.

Basidiocarps perennial, effused-reflexed to distinctly pileate; pileal surface dark brown to black, velutinate to glabrous, distinctly sulcate and zonate, cracked; margin obtuse, brownish, becoming dark brown in KOH; pore surface yellowish brown, glancing; pores 5–7 per mm; dissepiments thin, entire; context homogeneous, up to 20 mm thick; hyphal system monomitic in context, dimitic in trama; hymenial setae ventricose to subulate, 20–35 × 7–12 µm; cystidioles present; basidiospores broadly ellipsoid to subglobose, yellowish to brownish, slightly thick-walled or thick-walled, IKI–, CB–, (3.8–)4–4.9(–5.2) × 3.1–3.8(–3.9) µm, L = 4.35 µm, W = 3.41 µm, Q = 1.24–1.31 (Shen et al. 2021); on *Prunus* and other angiosperm wood; type locality in China; distribution: North China.

4.34 *Tropicoporus* L.W. Zhou et al., in Zhou, Vlasák, Decock, Assefa, Stenlid, Abate, Wu & Dai, Fungal Diversity 77: 341 (2015), (Figs. 1, 71)

Type species: *Tropicoporus excentrodendri* L.W. Zhou & Y.C. Dai.

Basidiocarps annual and perennial, resupinate, effused-reflexed to distinctly pileate; pileal surface brown to fuscous, velutinate, tomentose to hispid, matted or glabrous, sometimes encrusted, concentrically sulcate; pore surface yellow-brown to umber; context duplex or homogeneous; hyphal system mostly

dimitic at least in trama, a few monomitic; hyphoid setae rarely present; hymenial setae present; cystidioles present or absent; basidiospores ellipsoid to subglobose, yellowish, slightly thick-walled, smooth, usually collapsed, IKI–, CB–; on angiosperm and gymnosperm wood; causing a white rot.

Tropicoporus is very similar to *Sanghuangporus* in morphology, but the former has a distribution in the tropics, while species in the latter mostly occur in the temperate zone. In addition, both genera nested in two independent clades (Zhou et al. 2015).

Tropicoporus melleoporus (Murrill) Salvador-Montoya & Drechsler-Santos was recently combined into *Tropicoporus* by Salvador-Montoya et al. (2020) based on type study and phylogenetic analysis. It was often reported as setaeless species, but setae are in fact sometimes present according to Salvador-Montoya et al. (2020) and our study on specimens (URM 89677, Brazil; JV 1008/55, USA, Florida; JV 1109/30, USA, Texas). So, all species of the genus have hymenial setae.

Tropicoporus angustisulcatus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 72, 73)

MycoBank: MB 840024.

Type. — **BRAZIL**. Manaus, parque Municipal Cachoeira das Orquideas, on dead angiosperm tree, 12.V.2017, Dai 17409 (holotype, BJFC024943).

Etymology. — *Angustisulcatus* (Lat.): referring to the species having narrowly sulcate pileal surface.

Fruiting body. — Basidiocarps perennial, pileate, sometimes densely imbricated, hard corky and without distinctive odor or taste when fresh, woody hard and light in weight when dry; pilei dimidiate to triquetrous, projecting up to 5 cm, 8 cm wide, and 2.5 cm thick at base; pileal surface mouse gray to black when fresh, becoming snuff brown when dry, concentrically sulcate with narrow zones, velutinate to glabrous, encrusted with age, uncracked; margin obtuse. Pore surface cigar brown when fresh, becoming snuff brown to umber when dry, not glancing; sterile margin buff when fresh, cinnamon when dry, distinctly paler than pores, up to 7 mm wide; pores circular, 11–12 per mm; dissepiments thick, entire. Context fulvous, zonate, woody hard, up to 2.2 cm thick, a black crust present at pileal surface. Tubes concolorous with pore surface, hard corky to brittle, up to 3 mm long, annual layers indistinct.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae pale yellowish, slightly thick-walled, occasionally branched, frequently septate, 2–2.5 µm in diam; skeletal hyphae dominant, yellowish to brown, thick-walled with a narow to medium lumen, unbranched, aseptate, straight, more or less regularly arranged, 3–4 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched, frequently septate, 1.8–2.5 µm in diam; skeletal hyaphae thick-walled with a medium lumen, unbranched, aseptate, straight, subparallel along the tubes, 2–3.5 µm in diam; hymenial

setae ventricose, thick-walled, dark brown, 12.5–37 × 5–7 μm; cystidioles present, fusoid, hyaline, thin-walled, 10–20 × 3.5–5 μm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7.5–9 × 4–5 μm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, mostly collapsed, IKI–, CB–, 3–3.8(–4) × 2–3 μm, L = 3.36 μm W = 2.54 μm, Q = 1.32–1.33 (n = 60/2).

Additional specimen (paratype) examined. — **FRENCH GUIANA**. Cayenne, Coralie, Sentier Molokoi, 26VIII.2018, Vlasák 1808/83 (JV, duplicate in BJFC032921).

Remarks. — *Tropicoporus angustisulcatus* is closely related to *T. lineatus* Y.C. Dai & F. Wu (Fig. 71), and both species share similar basidiospores, but *T. lineatus* has larger pores (8–10 per mm vs. 11–12 per mm) and several black lines present in context. In addition, nucleotide differences in the ITS regions between the two species are up to 4.9%.

Tropicoporus hainanicus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 74, 75)

MycoBank: MB 840025.

Type. — **CHINA**. Hainan Province, Baisha County, Yinggeling Nature Reserve, on fallen angiosperm trunk, 10.VI.2017, Dai 17705 (holotype, BJFC025237).

Etymology. — *Hainanicus* (Lat.): referring to the species being found in Hainan Province of South China.

Fruiting body. — Basidiocarps annual to biennial, resupinate, firmly attached to the substrate, corky and without distinctive odor or taste when fresh, hard corky when dry, up to 9 cm long, 3 cm wide, and 5 mm thick at center. Pore surface umber to bay when dry, distinctly glancing; sterile margin yellowish brown when dry, up to 1 mm wide; pores angular, 8–10 per mm; dissepiments thin, lacerate. Subiculum very thin to almost lacking, yellowish brown, corky, less than 0.2 mm thick. Tubes concolorous with pore surface, hard corky, up to 4.8 mm thick, a thin context present between tube layers.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae pale yellow to brownish, slightly thick-walled, rarely branched, frequently septate, 2–3 μm in diam; skeletal hyphae brownish, thick-walled with a medium lumen, unbranched, aseptate, flexuous, interwoven, 2.5–3.5 μm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, thin- to thick-walled, occasionally branched, frequently septate, 2–3 μm in diam; skeletal hyphae brownish, thick-walled with a narrow to medium lumen, unbranched, aseptate, loosely interwoven to subparallel along tubes, 2.5–3.5 μm in diam; hymenial setae mostly ventricose, thick-walled, dark brown, 13–21 × 4.5–6 μm; cystidioles present, fusoid, hyaline, thin-walled, 7–11 × 3–4 μm; basidia barrel-shaped, with four sterigmata and a simple

septum at the base, 6.5–9.5 × 4–5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores subglobose, yellowish, slightly thick-walled, usually collapsed, IKI–, CB–, 2.7–3 × (1.8–)2–2.6 µm, L = 2.92 µm, W = 2.3 µm, Q = 1.27 (n = 30/1).

Remarks. — *Tropicoporus hainanicus* is characterized by annual to biennial, resupinate basidiocarps with 8–10 pores per mm, lacerate dissepiments, very thin to almost lacking subiculum, a dimitic hyphal structure, and subglobose basdiospores measuring 2.7–3 × 2–2.6 µm. Phylogenetically the new species formed a lineage nested in *Tropicoporus* (Fig. 71).

Tropicoporus lineatus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 76, 77)

MycoBank: MB 840026.

Type. — **MALAYSIA**. Selangor, Kota Damansara, Community Forest Reserve, on dead angiosperm tree, 7.XII.2019, Dai 21196 (holotype, BJFC032850).

Etymology. — *Lineatus* (Lat.): referring to the species having several black lines.

Fruiting body. — Basidiocarps perennial, pileate, a few imbricate, hard corky and without distinctive odor or taste when fresh, woody hard and heavy in weight when dry; pilei dimidiate to triquetrous, projecting up to 4 cm, 8 cm wide, and 2 cm thick at base; pileal surface black when fresh, becoming fuscous black when dry, concentrically sulcate and zonate, velutinate to glabrous, encrusted with age, uncracked; margin obtuse. Pore surface grayish brown when fresh, becoming cigar brown when dry, not glancing; sterile margin purplish chestnut, up to 2 mm wide; pores circular, 8–10 per mm; dissepiments thick, entire. Context date brown, zonate, woody hard, up to 1 cm thick, a black crust present at pileal surface, several black lines present along context. Tubes rust tawny, paler than pore surface, hard corky to brittle, up to 1 cm long, annual layers distinct.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae dominant, pale yellow, slightly thick-walled with a wide lumen, occasionally branched, frequently septate, 1.8–2.5 µm in diam; skeletal hyphae infrequent, brownish, thick-walled with a narrow to medium lumen, unbranched, straight, regularly arranged, 2–3.2 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched, frequently septate, 1.8–2.2 µm in diam; skeletal hyphae brownish, thick-walled with a narrow to medium lumen, unbranched, aseptate, straight, parallel along the tubes, 2–3 µm in diam; hymenial setae mostly ventricose, thick-walled, dark brown, 15–19 × 6.5–8 µm; cystidioles present, fusoid, hyaline, thin-walled, 6.5–11 × 2.5–4.5 µm; basidia barrel-shaped, with four sterigmata and a

simple septum at the base, 7.5–10.5 × 4.5–5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller; rhomboid crystals occasionally present.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, usually collapsed, IKI–, CB–, 3.2–3.8(–3.9) × (2.2–)2.3–3 µm, L = 3.51 µm, W = 2.55 µm, Q = 1.38 (n = 30/1).

Remarks. — Tropicoporus lineatus is characterized by imbricate basidiocarps, black to fuscous black pileal surface, several black lines present in context, small pores 8–10 per mm, absence of cystidioles, and broadly ellipsoid basidiospores measuring 3.2–3.8 × 2.3–3 µm. For its relationship with *T. angustisulcatus* see the remarks for the latter species.

Tropicoporus minus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 78, 79)

MycoBank: MB 840027.

Type. — **MALAYSIA**. Broga, on fallen angiopserm trunk, 2. XII.2019, Dai 21139 (holotype, BJFC032793).

Etymology. — *Minus* (Lat.): referring to the species having small pores.

Fruiting body. — Basidiocarps perennial, resupinate, firmly attached to the substrate, hard corky and without distinctive odor or taste when fresh, woody hard when dry, up to 22 cm long, 6 cm wide, and 7 mm thick at center. Pore surface fulvous to umber when fresh, becoming cigar brown to black when dry, glancing; sterile margin cream yellowish when fresh, yellowish brown when dry, up to 1 mm wide; pores circular, 10–12 per mm; dissepiments thin, entire. Subiculum umber, hard corky, up to 0.2 mm thick. Tubes concolorous with pore surface, woody hard, up to 6.8 mm thick, annual layers indistinct; white mycelial strands usually present in old tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae pale yellowsih, slightly thick-walled with a wide lumen, rarely branched, frequently septate, flexuous, 2.5–3 µm in diam; skeletal hyphae golden yellow to brownish, thick-walled with a narrow lumen, unbranched, aseptate, flexuous, interwoven, 2.5–3.5 µm in diam

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish thin- to thick-walled with a wide lumen, occasionally branched, frequently septate, 2–3 µm in diam; skeletal hyphae infrequent, golden yellow to brown, distinctly thick-walled with a narrow lumen, unbranched, aseptate, straight, subparallel along the tubes, 2–3.5 µm in diam; hymenial setae ventricose, thick-walled, dark brown, 12–18.5 × 5.5–8 µm; cystidioles present, fusoid, hyaline, thin-walled, 9–11 × 4.5–5.5 µm; basidia pyriform, with four sterigmata and a simple septum at the base, 8–10 × 4.5–5.5 µm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller; rhomboid crystals frequently present in trama and hymenium.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB–, (3–)3.2–4 × (2.5–)2.8–3(–3.1) µm, L = 3.58 µm W = 2.94 µm, Q = 1.2–1.25 (n = 120/4).

Additional specimens (paratypes) examined. — **CHINA**. Hainan Province, Ledong County, Jianfengling Forest Park, on angiosperm root, 26.IV.2018, Dai 18487A (BJFC026956). **MALAYSIA**. Selangor, Kota Damansara, Community Forest Reserve, on rotten angiosperm wood, 16.IV.2018, Dai 18601 (BJFC026889), on fallen angiopserm trunk, 7. XII.2019, Dai 21183 (BJFC032837).

Remarks. — *Tropicoporus minus* is characterized by it resupinate basidiocarps with small pores 10–12 per mm, presence of cystidioles, and broadly ellipsoid basidiospores measuring 3.2–4 × 2.8–3 µm. Phylogenetically *T. minus* formed an independent lineage in *Tropicoporus* (Fig. 71).

Tropicoporus ravidus Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 80, 81)

MycoBank: MB 840028.

Type. — **CHINA**. Guangdong Province, Shixing County, Chebaling Nature Reserve, on angiosperm stump, 18. IX.2017, Dai 18165 (holotype, BJFC025694).

Etymology. — *Ravidus* (Lat.): referring to the species having gray pores when fresh.

Fruiting body. — Basidiocarps perennial, resupinate, cushion-shaped, firmly attached to the substrate, hard corky and without distinctive odor or taste when fresh, woody hard to bone hard when dry, up to 10 cm long, 7 cm wide, and 10 mm thick at center. Pore surface ash gray when fresh, becoming umber when dry, distinctly glancing; sterile margin cream yellowish when fresh, yellowish brown when dry, up to 2 mm wide; pores angular, 8–10 per mm; dissepiments thin, entire. Subiculum very thin to almost lacking, umber, hard corky, less than 0.1 mm thick. Tubes concolorous with pore surface, bone hard, up to 10 mm thick, annual layers distinct, a thin context present between tubes; white mycelial strands usually present in old tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae infrequent, pale yellow, slightly thick-walled, occasionally branched, frequently septate, 2–3.5 µm in diam; skeletal hyphae yellow to brownish, thick-walled with a narrow lumen, rarely branched, aseptate, flexuous, interwoven, 2.8–5 µm in diam.

Trama of the tubes. — Generative hyphae hyaline to pale yellowish, unbranched, frequently septate, 2–3 µm in diam; skeletal hyphae dominant, brownish, distinctly thick-walled with a narrow lumen, unbranched, aseptate, flexuous, interwoven, 2.5–4.5 µm in diam; hymenial setae ventricose, thick-walled, dark brown, 12–21 × 5.5–8 µm; cystidioles occasionally present, fusoid, hyaline, thin-walled, 10–16 × 3.5–5.5 µm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 8–10 × 4–5 µm; basidioles

dominant in hymenium, in shape similar to basidia, but slightly smaller; rhomboid crystals frequently present in trama and hymenium.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB–, (3–)3.1–3.8(–4) × 2.2–3 µm, L = 3.55 µm, W = 2.88 µm, Q = 1.23 (n = 30/1).

Remarks. — Phylogenetically *Tropicoporus ravidus* is closely related to *T. tenuis* (Fig. 71); morphologically both species have similar-sized pores and basidiospores, and they occur in southern China. However, *T. tenuis* has very thin and even (not cushion-shaped) basidiocarps and lacks cystidioles. In addition, nucleotide differences in the ITS regions between the two species are up to 2.9%.

Tropicoporus substratificans Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 82, 83)

MycoBank: MB 840029.

Type. — **FRENCH GUIANA**. Cayenne, Roura Camp Cayman, 31.VIII.2019, Vlasák 1908/80 (holotype in PRM; isotypes in JV and BJFC033005).

Etymology. — *Substratificans* (Lat.): referring to the species having similarity with *Tropicoporus stratificans.*

Fruiting body. — Basidiocarps perennial, pileate, pendent, solitary, woody hard to bone hard and heavy in weight when dry; pilei triquetrous, projecting up to 3 cm, 6 cm wide, and 3 cm thick at base; pileal surface black when dry, concentrically sulcate, velutinate to glabrous, encrusted with age, cracked; margin obtuse. Pore surface snuff brown when dry, glancing; sterile margin black when dry, distinctly darker than pores, up to 2 mm wide; pores circular, 8–10 per mm; dissepiments thick, entire. Context very thin to almost lacking, fulvous, azonate, woody hard, up to 0.2 mm thick, a black crust present at pileal surface. Tubes concolorous with pore surface, bone hard, up to 3 cm long, annual layers distinct, a black line present between tubes.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Context. — Generative hyphae pale yellow, slightly thick-walled with a wide lumen, rarely branched, frequently septate, 2.4–3 µm in diam; skeletal hyphae brownish, thick-walled with a medium lumen, unbranched, straight, regularly arranged, 2.5–4 µm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched, frequently septate, 2–2.6 µm in diam; skeletal hyphae brownish, thick-walled with a narrow to medium lumen, unbranched, aseptate, straight, subparallel along the tubes, 2.5–3.5 µm in diam; hymenial setae mostly subulate, originating from tramal skeletal hyphae, embedded in trama and hymenuim, thick-walled, dark brown, 17–35 × 4.5–5.5 µm; cystidioles present, fusoid, hyaline, thin-walled,

10–12 × 3–4 μm; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 8–11.5 × 4.5–6 μm; basidioles dominant in hymenium, in shape similar to basidia, but slightly smaller.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, mostly collapsed, IKI–, CB–, 4–4.6 × (3.1–)3.4–4 μm, L = 4.22 μm, W = 3.72 μm, Q = 1.13 (n = 30/1).

Remarks. — *Tropicoporus substratificans* is characterized by its pendent basidiocarp, setae originating from tramal skeletal hyphae, not from subhymenium, embedded in trama and hymenium, mostly subulate with a long root in trama. It has similar microscopic characterics with *Tropicoporus stratificans*, and both species are phylogenetically related (Fig. 71), but *T. stratificans* has resupinate basidiocarps with bigger pores (5–7 per mm vs. 8–10 per mm, Coelho et al. 2016). In addition, nucleotide differences in the ITS regions between the two species are up to 4.9%.

Tropicoporus tenuis Y.C. Dai & F. Wu, **sp. nov.** (Figs. 71, 84, 85)

MycoBank: MB 840030.

Type. — **CHINA**. Guangdong Province, Renhua County, Danxiashan Forest Park, on living angiosperm tree, 4.VI.2019, Dai 19699 (holotype, BJFC031375).

Etymology. — *Tenuis* (Lat.): referring to the species having thin basidiocarps.

Fruiting body. — Basidiocarps annual, resupinate, firmly attached to the substrate, corky and without distinctive odor or taste when fresh, hard corky when dry, up to 8 cm long and 2 cm wide, and 1 mm thick at center. Pore surface snuff brown when fresh, becoming umber to black when dry, glancing; sterile margin yellowish brown when fresh, brown when dry, up to 1 mm wide; pores angular, 8–10 per mm; dissepiments thin, entire. Subiculum very thin to almost lacking, umber, corky, less than 0.1 mm thick, a black line present between substrate and subiculum. Tubes concolorous with pore surface, hard corky; up to 1 mm thick.

Hyphal structure. — Hyphal system dimitic; generative hyphae simple septate; all hyphae IKI–, CB–; tissue becoming blackish brown in KOH.

Subiculum. — Generative hyphae pale yellowish, slightly thick-walled, occasionally branched, frequently septate, 2–3.2 μm in diam; skeletal hypahe golden yellow, thick-walled with a narrow to medium lumen, unbranched, aseptate, interwoven, 2.5–4.5 μm in diam.

Trama of the tubes. — Generative hyphae frequent, hyaline to pale yellowish, thin- to slightly thick-walled, occasionally branched, frequently septate, 1.5–3 μm in diam; skeletal hyphae dominant, brownish, thick-walled with a narrow to wide lumen, rarely branched, aseptate, interwoven, 2–4 μm in diam; hymenial setae subulate to ventricose, thick-walled, dark brown, 12–20 × 5–7.5 μm; cystidioles absent; basidia barrel-shaped, with four sterigmata and a simple septum at the base, 7.5–10 × 4–5.5 μm; basidioles

dominant in hymenium, in shape similar to basidia, but slightly smaller; rhomboid crystals frequently present in trama and hymenium.

Spores. — Basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB(+), (3.5–)3.6–4(–4.2) × (2.6–)2.7–3.2 µm, L = 3.91 µm, W = 2.96 µm, Q = 1.31–1.33 (n = 60/2).

Additional specimen (paratype) examined. — **CHINA**. Guangdong Province, Shixing County, Chebaling Nature Reserve, on fallen angiosperm trunk, 14.VI.2019, Dai 19724 (BJFC031399).

Remarks. — *Tropicoporus tenuis* is characterized by resupinate and thinbasidiocarps with small pores 8–10 per mm, a dimitic hyphal structure, ventricose to subulate hymenial setae, absence of cystidioles, presence of rhomboid crystals in trama and hymenium, and broadly ellipsoid basidiospores measuring 3.6–4 × 2.7–3.2 µm. For differences with *T. ravidus* see the remarks for the latter.

In addition to the above new species, the following 22 taxa were previously accepted in *Inonotus sensu lato* or *Phellinus sensu lato*, but their characteristics fit *Tropicoporus* well, and some of them are nested in *Tropicoporus* in our phylogeny (Fig. 71). So, the following combinations are proposed:

Tropicoporus anchietanus **(**Decock & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840031.

Basionym: *Phellinus anchietanus* Decock & Ryvarden, *Cryptog. Mycol.* 18(3): 222 (1997).

This specis resembles *Tropicoporus detonsus* (*= Inonotus marginatus* Ryvarden) by having mycelial setae, hymenial setae and colored basidiospores, but the latter has a monomitic hyphal structure.

Tropicoporus appositus (Lév.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840032.

Basionym: *Polyporus appositus* Lév., *Annls Sci. Nat., Bot., sér.* 3 5: 141 (1846).

≡ *Phellinus appositus* (Lév.) Pat., *Essai Tax. Hyménomyc.* (Lons-le-Saunier): 97 (1900).

Specimen examined. — **INDONESIA**. Sumatera, Sungai Maiunto, 27.05.1995 Nunez 808 (O).

Tropicoporus cambodiensis (L.W. Zhou & W.M. Zhang) Y.C. Dai & F. Wu, **comb. nov.** MycoBank: MB 840033.

Basionym*: Fulvifomes cambodiensis* L.W. Zhou & W.M. Zhang, *Mycotaxon* 119: 176 (2012).

Tropicoporus carteri (Berk. ex Cooke) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840034.

Basionym: *Poria carteri* Berk. ex Cooke, *Grevillea* 15(73): 25 (1886).

≡ *Phellinus carteri* (Berk. ex Cooke) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

Tropicoporus caryophylleus (Cooke) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840035.

Basionym: *Fomes caryophylleus* Cooke, *Grevillea* 15(73): 21 (1886).

≡ *Phellinus caryophylleus* (Cooke) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

Specimen examined. — **COSTA RICA**. Guanscaste, Santa Rosa National Park, 20.10.1996, Lindblad 2221-B (O).

Tropicoporus cesatii (Bres.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840036.

Basionym: *Poria cesatii* Bres., *Stud. Trent.*, ser. 2 7: 7 (1926).

≡ *Phellinus cesatii* (Bres.) Ryvarden, *Norw. J. Bot.* 19: 234 (1972).

Tropicoporus chaquensis (Iaconis & J.E. Wright) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840037.

Basionym: *Fomes chaquensis* Iaconis & J.E. Wright, *Anal. Soc. cient. argent.* 156(1): 14 (1953).

≡ *Phellinus chaquensis* (Iaconis & J.E. Wright) J.E. Wright & Blumenf., *Mycotaxon* 21: 416 (1984).

Tropicoporus detonsus (Fr.) Y.C. Dai & F. Wu, **comb. nov.** (Fig. 71)

MycoBank: MB 840038.

Basionym: *Polyporus detonsus* Fr. *Linnea* 5, 519 (1830).

≡ *Phellinus detonsus* (Fr.) Ryvarden, *Syn. Fung.* 19: 174 (2004).

= *Phellinus tropicalis* Larsen & Lombard, *Mycologia* 80: 73 (1988).

= *Tropicoporus tropicalis* (M.J. Larsen & Lombard) L.W. Zhou & Y.C. Dai, in Zhou et al., *Fungal Diversity* 77: 345 (2015).

= *Inonotus marginatus* Ryvarden, *Syn. Fung.* 15: 75 (2002).

According to Ryvarden (2004) *Polyporus detonsus* Fr. is a prior name for *T. tropicalis* (M.J. Larsen & Lombard) L.W. Zhou & Y.C. Dai.

Inonotus marginatus was described by Ryvarden (2002), and hyaline and thin-walled spores were mentioned in the original description, but we studied one sample (O 43725) collected by Ryvarden from Costa Rica, and it has yellowish and slightly thick-walled basidiospores. In addition, ITS and nLSU sequences from a strain isolated in French Guiana by Cony Decock were analyzed, and it nested in the *Tropicoporus* clade.

Tropicoporus extensus (Lloyd) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840039.

Basionym: *Polyporus extensus* Lév., Annls Sci. Nat., Bot., sér. 3 5: 129 (1846).

≡ *Phellinus extensus* (Lév.) Pat., Essai Tax. Hyménomyc. (Lons-le-Saunier): 97 (1900).

Tropicoporus glaucescens (Petch) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840040.

Basionym: *Poria glaucescens* Petch, *Ann. R. bot. Gdns Peradeniya* 6(1): 139 (1916).

≡ *Fulvifomes glaucescens* (Petch) Y.C. Dai, *Fungal Diversity* 45: 192 (2010).

≡ *Phellinus glaucescens* (Petch) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

Tropicoporus inamoenus (Mont.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840041.

Basionym: *Polyporus inamoenus* Mont., *Annls Sci. Nat., Bot., sér.* 2 18: 22 (1842).

= *Phellinus inamoenus* (Mont.) Ryvarden, *Norw. Jl Bot.* 19(3-4): 234 (1972).

Tropicoporus lapideus (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840042.

Basionym: *Phellinus lapideus* Corner, *Beih. Nova Hedwigia* 101: 107 (1991).

Tropicoporus lopezii (M. Mata & Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840043.

Basionym: *Phellinus lopezii* M. Mata & Ryvarden, *Syn. Fung.* 27: 60 (2010).

Tropicoporus minisporus (B.K. Cui & Y.C. Dai) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840044.

Basionym: *Phellinus minisporus* B.K. Cui & Y.C. Dai, *Mycotaxon* 110: 126 (2009).

Tropicoporus nothofagi (G. Cunn.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840045.

Basionym: *Fuscoporia nothofagi* G. Cunn., *Bull. N.Z. Dept. Sci. Industr. Res.* 164: 263 (1965).

≡ *Phellinus nothofagi* (G. Cunn.) Ryvarden, *Norw. Jl Bot.* 19(3-4): 235 (1972).

Tropicoporus poeltii (Ryvarden) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840046.

Basionym: *Phellinus poeltii* Ryvarden, *Khumbu Himal* 6: 381 (1977).

As mentioned by Ryvarden (1977) the species is characterized by a dimitic hyphal structure, presence of hyphoid setae and hymenial setae, thick-walled and colored basidiopores, and growing on *Abies*. These characteristics do not fit the definition of any existing genera, and it is possible that a new genus should set up for the species. However, its phylogenetic relationships with other members of Hymenochaetaceae are unknown because its DNA data is not availble so far. Morphologically *Tropicoporus poeltii* resembles *T. detonsus* by sharing hyphoid setae, hymenial setae, thick-walled and yellowish basidiospores, and the latter species is nested in the *Tropicoporus* clade (Fig. 71).

Tropicoporus purpureogilvus (Petch) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840047.

Basionym: *Poria purpureogilva* Petch, *Ann. R. bot. Gdns Peradeniya* 6(1): 138 (1916).

≡ *Phellinus purpureogilvus* (Petch) Ryvarden, *Norw. Jl Bot.* 19: 235 (1972).

Tropicoporus ralunensis (Adask., Gilb. & Blanchette) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840048.

Basionym: *Phellinus ralunensis* Adask., Gilb. & Blanchette, *Mycol. Res.* 95: 769 (1991).

Tropicoporus reichingeri (Bres.) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840049.

Basionym: *Fomes rechingeri* Bres., *Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl.* 85: 179 (1910).

≡ *Phellinus reichingeri* (Bres.) Ryvarden [as '*reichingeri*'], *Mycotaxon* 33: 319 (1988).

Tropicoporus rickii (Teixeira) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840050.

Basionym: *Phellinus rickii* Teixeira, *Bragantia* 10: 120 (1950).

Tropicoporus sanfordii (Lloyd) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840051.

Basionym: *Fomes sanfordii* Lloyd, *Mycol. Writ.* 4 (Syn. gen. *Fomes*): 258 (1915).

≡ *Phellinus sanfordii* (Lloyd) Ryvarden, *Norw. Jl Bot.* 19: 235 (1972).

Tropicoporus scorodocarpi (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840052.

Basionym: *Phellinus scorodocarpi* Corner, *Beih. Nova Hedwigia* 101: 139 (1991).

Tropicoporus shaferi (Murrill) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840053.

Basionym: *Fuscoporella shaferi* Murrill, *N. Amer. Fl.* (New York) 9(1): 7 (1907).

≡ *Phellinus shaferi* (Murrill) Ryvarden, *Norw. Jl Bot.* 19: 235 (1972).

Specimen examined. — **BRAZIL.** Rondonia, Velho, 20.08.2010, AC Gomes-Silva 3041, URM 83110.

Tropicoporus tubifragilis (Corner) Y.C. Dai & F. Wu, **comb. nov.**

MycoBank: MB 840054.

Basionym: *Phellinus tubifragilis* Corner, *Beih. Nova Hedwigia* 101: 160 (1991).

Key to species of *Tropicoporus*

1. Basidiocarps resupinate to effused-reflexed..... 2

1. Basidiocarps distinctly pileate 21

2. Basidiocarps annual to biennial..... 3

2. Basidiocarps perennial..... 9

3. Basidiocarps resupinate to effused-reflexed, pileal surface tomentose to hispid.....

..... *T. excentrodendri* L.W. Zhou & Y.C. Dai

... Basidiocarps annual, resupinate, effused-reflexed to pileate, imbricate; pileal surface vinaceous brown to fuscous, tomentose to hispid, concentrically sulcate; pore surface buff to honey yellow, glancing; pores 7–8 per mm; context duplex with a black line; hyphal system dimitic in both context and trama; hymenial setae ventricose, 20–25 × 5–8 µm; basidiospores broadly ellipsoid to subglobose, pale yellowish, slightly thick-walled, smooth, IKI–, CB–, (3.2–)3.4–4(–4.2) × (2.7–)2.9–3.6(–3.8) µm, L = 3.74 µm, W = 3.21 µm, Q = 1.16–1.17 (Zhou et al. 2016b); type locality in China; distribution: China.

3. Basidiocarps completely resupinate..... 4

4. Hyphal system monomitic.....

... *T. detonsus* (Fr.) Y.C. Dai & F. Wu (=*Phellinus tropicalis* M. Lars. & Lomb. = *Inonotus marginatus* Ryvarden)

Basidiocarps annual, resupinate; pore surface deep yellowish brown; pores 7–9 per mm; hyphal system monomitic; hyphoid setae present in trama and dissepiments, 30–180 × 5–12 µm; hymenial setae present, 18–30 × 6–10 µm; basidiospores subglobose, pale yellowish, slightly thick-walled, 3 × 2.5 µm (Larsen and Cobb-Poulle 1990); type locality in Costa Rica; distribution: Neotropics.

4. Hyphal system dimitic..... 5

5. Hymenial setae hooked..... *T. lopezii* (M. Mata & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps annual to biennial, resupinate; pore surface deep tobacco brown; pores 7–9 per mm; subiculum very thin to almost lacking; hyphal system dimitic; hymenial setae frequent, sub-ventricose to acuminate, hooked, 12–30 × 6–10 µm; basidiospores ovoid to subglobose, yellowish, thin-walled, IKI–, 3.5–4.5 × 2.5–3.5 µm (Mata and Ryvarden 2010); type locality in Costa Rica; distribution: Costa Rica.

5. Hymenial setae straight..... 6

6. Basidiospores 2.2–3 µm long..... 7

6. Basidiospores 3.6–4 µm long..... 8

7. Dissepiments lacerate, context layer present between tube layers.....

..... *T. hainanicus* Y.C. Dai & F. Wu

Basidiocarps annual to biennial, resupinate; pore surface umber to bay, glancing; pores 8–10 per mm; dissepiments lacerate; subiculum very thin to almost lacking; a thin context present between tube layers; hyphal system dimitic; hymenial setae frequent, ventricose, 13–21 × 4.5–6 µm; basidiospores

subglobose, yellowish, slightly thick-walled, usually collapsed, IKI–, CB–, 2.7–3 × (1.8–)2–2.6 µm, L = 2.92 µm, W = 2.3 µm, Q = 1.27; type locality in China; distribution: South China.

7. Dissepiments entire, context layer absent between tube layers.....

..... *T. boehmeriae* (L.W. Zhou & F. Wu) Y. C. Dai & F. Wu

Basidiocarps annual, resupinate, inseparable from substrate; pore surface pinkish buff to honey yellow, glancing; pores 7–9 per mm; dissepiments entire; subiculum up to 0.5 mm thick; context absent between tube layers; hyphal system dimitic; hymenial setae strongly ventricose, 13–25 × 5–9 µm; basidiospores subglobose, slightly thick-walled, pale yellowish, IKI–, CB–, (2–)2.2–2.9(–3) × 2–2.5(–2.7) µm, L = 2.58 µm, W = 2.23 µm, Q = 1.13–1.18 (Wu et al. 2015a); type locality in Thailand; distribution: Thailand.

8. A black line present between substrate and subiculum..... *T. tenuis* Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface snuff brown to umber, glancing; pores 8–10 per mm; dissepiments thin, entire; a black line present between substrate and subiculum; hyphal system dimitic; hymenial setae frequent, ventricose, 12–20 × 5–7.5 µm; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB(+), (3.5–)3.6–4(–4.2) × (2.6–)2.7–3.2 µm, L = 3.91 µm, W = 2.96 µm, Q = 1.31–1.33; type locality in China; distribution: South China.

8. Black line absent..... *T. glaucescens* (Petch) Y.C. Dai & F. Wu

Basidiocarps annual, resupinate; pore surface grayish brown to dark brown, glancing; pores 8–9 per mm; dissepiments thin, entire; black line absent between substrate and subiculum; hyphal system dimitic; hymenial setae frequent, ventricose to subulate, 12–23 × 5–6.5 µm; basidiospores broadly ellipsoid to subglobose, yellowish, thick-walled, IKI–, CB–, (3.2–)3.6–4(–4.5) × (2.7–)2.8–3.4(–3.5) µm, L = 3.76 µm, W = 3.11 µm, Q = 1.21 (Dai 2010); type locality in Sri Lanka; distribution: tropical Asia and Africa.

9. Basidiocarps resupinate to effused-reflexed..... 10

9. Basidiocarps completely resupinate..... 11

10. Hyphoid setae present; boreal species..... *T. poeltii* (Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate to effused-reflexed, very light when dry; pileal surface cinnamon to golden brown, weakly concentrically zonate; pore surface dark brown; pores 4–5 per mm; hyphal system dimitic; hyphoid setae present in trama and dissepiments, 58–117 × 6–9 µm; hymenial setae subulate, septate, 32–65 × 6–12 µm; basidiospores broadly ellipsoid, thick-walled, rust brown, IKI–, CB–, (5.2–)5.5–7(–7.5) × (4.8–)4.9–5.8(–6) µm, L = 6.44 µm, W = 5.29 µm, Q = 1.22 (based on the type P 188); on *Abies*; type locality in Nepal; distribution: Nepal.

10. Hyphoid setae absent; tropical species..... *T. appositus* (Lév.) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate to effused-reflexed; pileal surface dark brown, pubescent, azonate; pore surface dark rust to sienna brown; pores 7–8 per mm; hyphal system dimitic; hymenial setae ventricose, hooked (based on the specimen Nunez 808), 30–45 × 11–15 µm; basidiospores subglobose, pale yellow, thick-walled, 4–5 µm in diam (Larsen and Cobb-Poulle 1990); on angiosperm wood; type locality in Indonesia; distribution: Indonesia.

11. Basidiocarps distinctly cushion-shaped..... *T. ravidus* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate, cushion-shaped; a thin context present between tubes, white mycelial strands usually present in old tubes; pore surface ash gray to umber, glancing; pores 8–10 per mm; dissepiments thin, entire; hyphal system dimitic; hymenial setae frequent, ventricose, 12–21 × 5.5–8 µm; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB–, (3–)3.1–3.8(–4) × 2.2–3 µm, L = 3.55 µm, W = 2.88 µm, Q = 1.23; type locality in China; distribution: South China.

11. Basidiocarps even..... 12

12. Hyemenial setae hooked..... 13

12. Hyemenial setae straight..... 14

13. Pores 4–6 per mm; basidiospores 4–8 × 3–7 µm.....

... *T. melleoporus* (Murrill) Salvador-Montoya & Drechsler-Santos (*= T. texanus* A.A. Brown et al.)

Basidiocarps perennial, resupinate; pore surface orange citrine to dark medal bronze when fresh, golden brown to dark purplish brown when dry; subiculum with black zone next to the substrate; pores 4–6 per mm; dissepiments sometimes lacerate with age; hyphal system dimitic; hymenial setae hooked, 30– 65 × 4–14 µm; cystidioles fusoid, 13–19 × 3.5–5 µm; basidiospores ellipsoid to subglobose, hyaline, thin-walled, 4–8 × 3–7 µm, L = 5.81 µm, W = 4.56 µm, Q = 1.29 (Larsen and Cobb-Poulle 1990; Brown et al. 2020); type locality in USA; distribution: Southern USA and South America.

13. Pores 6–8 per mm; basidiospores 3.8–4.3 × 3–3.8 µm.....

..... *T. anchietanus* (Decock & Ryvarden) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface light brown to brown; pores 6–8 per mm; dissepiments entire; a black line present between subiculum and substrate; context layer absent among tube layers; hyphal system dimitic; mycelial setae present at sterile margin and dissepiments, 70 × 4–7 µm; hymenial setae ventricose, hooked, 15–21 × 6–8 µm; basidiospores pale yellowish, slightly thick-walled, broadly ellipsoid to subglobose, IKI–, CB–, 3.8–4.3 × 3–3.8 µm (Decock and Ryvarden 1997); type locality in Brazil; distribution: Brazil.

14. Basidiospores < 2.5 µm long..... *T. minisporus* (B.K. Cui & Y.C. Dai) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface yellowish brown to fawn, glancing; pores 8–11 per mm; hyphal system dimitic; hymenial setae ventricose to subulate, 16–30 × 5.4–9.5 µm; cystidioles fusoid, 9.2–16.7 × 3.5–5.6 µm; basidiospores broadly ellipsoid to subglobose, pale yellowish, fairly thick-walled, IKI–, CB(+) to moderately CB+, (1.8–)2–2.5(–2.8) × (1.5–)1.6–2(–2.3) µm, L = 2.21 µm, W = 1.92 µm, Q = 1.12–1.2 (Cui et al. 2009); type locality in China; distribution: South China.

14. Basidiospores > 3 µm long..... 15

15. Pores 10–12 per mm..... *T. minus* Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface cigar brown to black, glancing; pores 10–12 per mm; dissepiments entire; hyphal system dimitic; hymenial setae ventricose, 12–18.5 × 5.5–8 µm; cystidioles fusoid, 9–11 × 4.5–5.5 µm; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, some collapsed, IKI–, CB–, (3–)3.2–4 × (2.5–)2.8–3(–3.1) µm, L = 3.58 µm, W = 2.94 µm, Q = 1.2–1.25; type locality in Malaysia; distribution: South China and Malaysia.

15. Pores 4–10 per mm..... 16

16. Hyphal system monomitic; on *Nothofagus* ..... *T. nothofagi* (G. Cunn.) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface dark umber, glancing; margin thinning out; pores 4–6 per mm; dissepiments thick, entire; hyphal system monomitic; hymenial setae ventricose, 12–20 × 4–8 µm; cystidioles present, 5–6.5 × 3–3.5 µm; basidiospores ovoid to subglobose, thick-walled, yellowish brown, 5–6 × 4–5 µm (Cunningham 1965; Larsen and Cobb-Poulle 1990); on *Nothofagus*; type locality in New Zealand; distribution: New Zealand.

16. Hyphal system dimitic; on tree other than *Nothofagus*..... 17

17. A thin context layer present among tube layers..... 18

17. Context layer absent among tube layers..... 19

18. Pores 8–10 per mm..... *T. cesatii* (Bres.) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface rust brown, dull brown or dark brown, glancing; pores 8–10 per mm; dissepiments thin, entire; a distinct black zone present between substrate and subiculum; tube layers separated by a thin context layer; hyphal system dimitic; hymenial setae ventricose to subulate, 17–31 × 4.5–8 µm; basidiospores broadly ellipsoid to subglobose, fairly thick-walled, yellowish, IKI–, slightly CB+, (3.1–)3.3–4.1(–4.2) × (2.3–)2.5–3.1(–3.3) µm, L = 3.78 µm, W = 2.86 µm (Dai 2010); type locality in Sarawak; distribution: Sri Lanka, Sarawak and China.

18. Pores 5–7 per mm..... *T. stratificans* G. Coelho & Yurchenko

Basidiocarps perennial, resupinate; pore surface yellowish brown to dark yellowish brown, glancing; pores 5–7 per mm; subiculum very thin to almost lacking; tube layers separated by a thin context layer; hyphal system dimitic; hymenial setae ventricose to lanceolate, 17–30 × 4.5–7 µm; cystidioles ventricose; basidiospores subglobose to ellipsoid, thick-walled, pale yellow to brown, (3.5–)4–5(–6) × (3–)3.5–4(–4.5) µm (Coelho et al. 2016); type locality in Brazil; distribution: Brazil.

19. Pores 6–7 per mm; dissepiments lacerate..... *T. shaferi* (Murrill) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface reddish brown to ash blue; pores 6–7 per mm; dissepiments lacerate; subiculum very thin to almost lacking; context layer absent among tube layers; hyphal system dimitic in both subiculum and trama; hymenial setae ventricose, 12–20 × 4–8 µm; basidiospores broadly ellipsoid, pale yellow, 4–4.5 ×3.5–4 µm (based on URM 83110); type locality in Montserrat; distribution: West Indies.

19. Pores 7–9 per mm; dissepiments entire..... 20

20. Basidiospores 4.5–6.5 µm long..... *T. carteri* (Berk. ex Cooke) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface dark fulvous to umber brown; pores 7–9 per mm; context layer absent among tube layers; hyphal system dimitic; hymenial setae ventricose to acuminate, 20–30 × 8–10 µm; basidiospores globose, golden yellow, 4.5–6.5 µm in diam (Larsen and Cobb-Poulle 1990); type locality in India; distribution: India and Africa.

20. Basidiospores 3.5–4.5 µm long..... *T. purpureogilvus* (Petch) Y.C. Dai & F. Wu

Basidiocarps perennial, resupinate; pore surface purplish brown to umber; pores 7–8 per mm; context layer absent among tube layers; hyphal system dimitic; hymenial setae frequent, subulate, 25–40 × 5.5–8 µm; basidiospores broadly ellipsoid, pale yellowish, 3.5–4.5 × 3–4 µm (Larsen and Cobb-Poulle 1990); type locality in Sri Lanka; distribution: Sri Lanka and Tanzania.

21. Pileal surface hispid; trichocysts present..... *T. ralunensis* (Adask. et al.) Y.C. Dai & F. Wu

Basidiocarps annual, pileate, effused-reflexed, solitary or imbricate; pilei dimidiate; pileal surface brown to umber, concentrically sulcate, hispid; pore surface brown to bay; pores 4–7 per mm; hyphal system monomitic; hymenial setae ventricose, 20–40 × 4.5–7 µm; trichocysts present; basidiospores ellipsoid, thick-walled, golden yellow, 5.5–6.5 × 3.5–4 µm (Adaskaveg et al. 1991); on *Eucryphia*; type locality in Chile; distribution: Chile.

21. Pileal surface matted to glabrous; trichocysts absent..... 22

22. Pores 8–12 per mm..... 23

22. Pores 2–8 per mm..... 26

23. Basidiospores 4–4.6 µm long..... *T. substratificans* Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, pendent, solitary; pilei triquetrous; pileal surface black, glabrous, concentrically sulcate and zonate, encrusted; a black line present between tubes; pore surface snuff brown, glancing; pores 8–10 per mm; dissepiments entire; hyphal system dimitic; hymenial setae present at hymenium and trama, subulate, 17–35 × 4.5–5.5 µm; cystidioles present; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, mostly collapsed, IKI–, CB–, 4–4.6 × (3.1–)3.4–4 µm, L = 4.22 µm, W = 3.72 µm, Q = 1.13; type locality in French Guiana; distribution: French Guiana.

23. Basidiospores 3–4 µm long..... 24

24. Several black lines present in context..... *T. lineatus* Y.C. Dai & F. Wu

... Basidiocarps perennial, pileate, imbricate; pilei dimidiate to triquetrous; pileal surface black to fuscous black, concentrically sulcate, zonate, glabrous, encrusted, uncracked; pore surface grayish brown to cigar brown; pores 8–10 per mm; dissepiments entire; several black lines present in context; hyphal system dimitic; hymenial setae mostly ventricose, 15–19 × 6.5–8 µm; cystidioles present; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, usually collapsed, IKI–, CB–, 3.2–3.8(–3.9) × (2.2–)2.3–3 µm, L = 3.51 µm, W = 2.55 µm, Q = 1.38; type locality in Malaysia; distribution: Malaysia.

24. Black lines absent in context..... 25

25. Tubes fragile, pores 8–10 per mm..... *T. tubifragilis* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate; pileal surface fuscous to dull black, velutinate to glabrous, concentrically sulcate and zonate, encrusted; pore surface chocolate brown to fuscous umber; pores 8–10 per mm; tubes carbonaceous to brittle; hyphal system dimitic; hymenial setae ventricose, 10–19 × 5–6 µm; basidiospores broadly ellipsoid, yellowish brown, 3–4 × 2.5–3 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia.

25. Tubes hard corky, pores 10–12 per mm..... *T. angustisulcatus* Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei dimidiate to triquetrous; pileal surface mouse gray to snuff brown, glabrous, concentrically sulcate and zonate, encrusted; pore surface cigar brown to umber, not glancing; pores 11–12 per mm; tubes hard corky; hyphal system dimitic; hymenial setae ventricose, 12.5–37 × 5–7 µm; cystidioles present; basidiospores broadly ellipsoid, yellowish, slightly thick-walled, mostly collapsed, IKI–, CB–, 3–3.8(–4) × 2–3 µm, L = 3.36 µm W = 2.54 µm, Q = 1.32–1.33; type locality in Brazil; distribution: South America.

26. Pores 2–3 per mm..... *T. sideroxylicola* Vlasák & Y.C. Dai

... Basidiocarps perennial, pileate; pilei semicircular to dimidiate, ungulate; pileal surface fuscous to black, concentrically zonate and sulcate, matted, cracked; pore surface cinnamon to grayish brown, slightly glancing; pores 2–3 per mm; context cinnamon; hyphal system dimitic both in context and trama;

hymenial setae subulate to ventricose, 27–35 × 6–8 µm; cystidioles present; basidiospores broadly ellipsoid to ellipsoid, usually collapsed when mature, yellowish and thick-walled, IKI–, CB–, 6–7(–7.2) × (4.2–)4.4–5.1(–5.5) µm, L = 6.61 µm, W = 4.76 µm, Q = 1.38–1.40 (Vlasák et al. 2013); type locality in USA; distribution: USA.

26. Pores 4–8 per mm..... 27

27. Context duplex..... 28

27. Context homogeneous..... 32

28. Hymenial setae hooked..... *T. caryophylleus* (Cooke) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate to conchate; pileal surface rust to reddish brown, velutinate to tomentose, concentrically sulcate and zonate; pore surface dark reddish brown; pores 6–8 per mm; context duplex with a distinct black line between tomentum and context; hyphal system dimitic; hymenial setae ventricose or subulate, hooked, 20–35 × 7–13 µm; basidiospores subglobose, yellowish, 4–5.5 × 3–4.5 µm (Ryvarden 2004); type locality in Brazil; distribution: Brazil.

28. Hymenial setae straight..... 29

29. Hyphal system monomitic..... *T. chaquensis* (Iaconis & J.E. Wright) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate to ungulate; pileal surface black, rimose; pore surface cinnamon; pores 5–8 per mm; context duplex with a distinct black line between tomentum and context; hyphal system monomitic; hymenial setae ventricose, 13–20 × 5.2–6.5 µm; basidiospores globose to subglobose, dark brown, 4.5–6.5 × 3.9–5.2 µm (Larsen and Cobb-Poulle 1990); type locality in Argentina; distribution: Argentina.

29. Hyphal system dimitic..... 30

30. Basidiocarps pendent; basidiospores 4–5 µm long..... *T. dependens* (Murrill) L.W. Zhou et al.

Basidiocarps perennial, pileate, pendent; pilei dimidiate to triquetrous; pileal surface black, concentrically zonate and narrowly sulcate, with conspicuous sharp furrows, matted, radially cracked; pore surface buff yellow to cinnamon buff, glancing; pores 5–7 per mm; context duplex with a distinct black crust on the pileal surface; hyphal system dimitic both in context and trama; hymenial setae ventricose or subulate, 10–20 × 5–6 µm; basidiospores broadly ellipsoid, usually collapsed when mature, yellowish, thick-walled, CB–, IKI–, 4–4.8(–5) × (3–)3.4–4 µm, L = 4.37 µm, W = 3.74 µm, Q = 1.17–1.18 (Vlasák et al. 2013); type locality in USA; distribution: USA.

30. Basidiocarps not pendent; basidiospores 3–4 µm long..... 31

31. Basidiospores broadly ellipsoid; Asian species..... *T. sanfordii* (Lloyd) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary to imbricate; pilei dimidiate to applanate; pileal surface rust brown, tomentose, glabrous with age; pore surface rust to snuff brown; pores 7–8 per mm; context duplex with a black line present under upper tomentum; hyphal system dimitic; hymenial setae frequent, strongly ventricose, 20–30 × 8–11 µm; basidiospores broadly ellipsoid, pale yellowish, 3–4(–4.5) × 3 µm (Ryvarden and Johansen 1980); type locality in Sri Lanka; distribution: Sri Lanka, Pakistan, India and Japan.

31. Basidiospores subglobose to globose; American species..... *T. extensus* (Lév.) Xavier de Lima

Basidiocarps perennial, pileate, solitary; pilei applanate to dimidiate; pileal surface reddish brown to black, tomentose, a black crust present under tomentum, concentrically sulcate, cracked with age; pore surface yellowish to dark brown, glancing; pores 7–10 per mm; context duplex with a black line; hyphal system dimitic; hymenial setae strongly ventricose, 25–40 × 8–11 µm; basidiospores subglobose to globose, pale yellow, thick-walled, 3–4 µm in diam (Larsen and Cobb-Poulle 1990); type locality in Guadeloupe; distribution: Neotropics.

32. Pore surface pruinose..... *T. lapideus* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei applanate to ungulate; pileal surface dull brown to blackish, velutinate then glabrous, encrusted, concentrically sulcate, rimose; pore surface dark brown, pruinose; pores 5–8 per mm; dissepiments thick, entire; context homogeneous; hyphal system dimitic; hymenial setae ventricose, 10–25 × 4–10 µm; basidiospores broadly ellipsoid to subglobose, pale yellowish, 3.5–4.3 × 2.8–3.3 µm (Corner 1991); type locality in Malaysia; distribution: Malaysia

32. Pore surface not pruinose..... 33

33. Hyphal system dimitic both in context and tube trama..... 34

33. Hyphal system monomitic at least in context..... 37

34. Basidiospores 4–4.5 µm long..... *T. rickii* (Teixeira) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei applanate; pileal surface yellowish brown to blackish brown, concentrically zonate, matted; pore surface dull yellowish brown; pores 4–5 per mm; context homogeneous; hyphal system dimitic; hymenial setae ventricose, 12–20 × 4.5–6.5 µm; basidiospores broadly ellipsoid to subglobose, brown, 4–4.5 × 3.5–4 µm (Larsen and Cobb-Poulle 1990); type locality in Brazil; distribution: Brazil.

34. Basidiospores 5–6.2 µm long..... 35

35. Pileal surface azonate..... *T. reichingeri* (Bres.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei applanate to ungulate; pileal surface dark brown, glabrous, azonate; pore surface dark brown; pores 4–6 per mm; context homogeneous; hyphal system dimitic; hymenial

setae frequent, subulate, 25–32 × 5–7 µm; basidiospores globose, golden yellow, 5–6 µm diam (Ryvarden 1988); type locality in Buka Island; distribution: Buka Island and Australia.

35. Pileal surface concentrically sulcate and zonate..... 36

36. Basidiocarps solitary, pilei ungulate to triquetrous.....

..... *T. cambodiensis* (L.W. Zhou & W.M. Zhang) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, solitary; pilei ungulate to triquetrous; pileal surface deep reddish brown to dark clay buff, glabrous, concentrically sulcate and zonate, cracked; pore surface yellowish brown; pores 5–6 per mm; dissepiments thin, entire; context homogeneous; hyphal system dimitic; hymenial setae frequent, subulate, 13–30 × 6.5–17 µm; basidiospores broadly ellipsoid, yellowish, thick-walled, IKI–, CB–, (5.5–)5.8–6.2(–6.3) × (4.5–)4.6–5.2 µm, L = 5.98 µm, W = 4.95 µm, Q = 1.21 (Zhou and Zhang 2012); type locality in Cambodia; distribution: Cambodia.

36. Basidiocarps imbricate, pilei semicircular..... *T. inamoenus* (Mont.) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate, imbricate; pilei semicircular; pileal surface dark reddish brown to grayish black, matted, concentrically sulcate and zonate, encrusted; pore surface dark cinnamon to umber; pores 6–7 per mm; context homogeneous; hyphal system dimitic; hymenial setae acuminate, 28–45 × 10–15 µm; basidiospores subglobose, hyaline to pale yellow, 5–6 × 4–5 µm (Larsen and Cobb-Poulle 1990); type locality in India; distribution: India.

37. Tramal hyphae monomitic..... *T. scorodocarpi* (Corner) Y.C. Dai & F. Wu

Basidiocarps perennial, pileate; pilei dimidiate to ungulate; pileal surface dark fulvous to dull black, velutinate to glabrous, encrusted, concentrically sulcate, rimose; pore surface dark brown; pores 5–8 per mm; dissepiments thick, entire; context homogeneous; hyphal system monomitic; hymenial setae ventricose, 18–40 × 6–12 µm; basidiospores broadly ellipsoid, yellowish brown, 4.5–5.5 × 3.5–4.5 µm (Corner 1991); on *Scorodocarpus borneensis*; type locality in Malaysia; distribution: Malaysia.

37. Tramal hyphae dimitic..... 38

38. Skeletal hyphae becoming swollen in KOH; tropical African species.....

..... *T. rudis* (Pat.) L.W. Zhou & Y.C. Dai

... Basidiocarps perennial, pileate; pilei applanate; pileal surface yellowish brown to fulvous, velvety, concentrically zonate, matted, rimose; pore surface grayish brown to umber brown; pores 6–7 per mm; context homogeneous; hyphal system dimitic in trama, monomitic in context; skeletal hyphae swollen in KOH; hymenial setae infrequent, ventricose, 17–19 × 5–7 µm; basidiospores subglobose to broadly ellipsoid, pale yellowish brown, IKI–, CB(+), (4.9–)5–5.8(–6) × (4–)4.1–4.7(–4.8) µm, L = 5.24 µm, W =

4.35 µm, Q = 1.21 (based on the type “Maijirgui, 17 mai 1906. M. Chudeau”); type locality Sudan; distribution: Africa.

38. Skeletal hyphae unchanged in KOH; tropical American species..... 39

39. Pore surface not glancing, pores 4–5 per mm..... 40

39. Pore surface glancing, pores 5–8 per mm..... 41

40. Cystidioles absent..... *T. pseudolinteus* Vlasák & Y.C. Dai

... Basidiocarps perennial, pileate; pilei semicircular to dimidiate, ungulate; pileal surface fuscous to black, concentrically sulcate, matted, cracked; pore surface cinnamon to grayish brown, not glancing; pores 4–5 per mm; context homogeneous; hyphal system monomitic in context, dimitic in trama; hymenial setae subulate to ventricose, 20–34 × 5–7 µm; basidiospores broadly ellipsoid, usually collapsed when mature, yellowish, thick-walled, IKI–, CB–, (4.7–)4.8–5.8(–6) × (3.3–)3.7–4.6(–4.9) µm, L = 5.23 µm, W = 4.09 µm, Q = 1.25–1.27 (Vlasák et al. 2013); type locality in Venezuela; distribution: USA and Venezuela.

40. Cystidioles present..... *T. drechsleri* Salvador-Montoya & Popoff

... Basidiocarps perennial, pileate, broadly attached, solitary to imbricate; pilei applanate, triquetrous to ungulate; pileal surface brown to dark brown, concentrically zonate and sulcate, glabrous, encrusted, rimose; pore surface dark brown, not glancing; pores 4–5 per mm; context homogeneous, fibrous, azonate; hyphal system monomitic in the context and dimitic in trama; hymenial setae subulate or ventricose, 16–42 × 4.5–9 µm; cystidioles narrowly lageniform to lageniform; basidiospores broadly ellipsoid to ellipsoid, thick-walled, yellowish, IKI–, (4–)4.5–5(–5.5) × (3–)3.5–4(–4.5) µm, L = 4.76 µm, W = 3.56 µm, Q = 1.13–1.5 (Salvador-Montoya et al. 2018a); type locality in Argentina; distribution: Argentina.

41. Cystidioles present, basidiospores mostly > 4 µm wide.....

... *T. linteus* (Berk. & M.A. Curtis) L.W. Zhou & Y.C. Dai (= *Phellinus calcitratus* (Berk. & M.A. Curtis) Ryvarden)

... Basidiocarps perennial, pileate; pilei dimidiate; pileal surface yellowish brown to black, concentrically sulcate, glabrous, cracked; pore surface honey yellow to dark reddish brown, glancing; pores 5–7 per mm; context homogeneous, yellowish brown to fulvous, woody hard, faintly concentrically zonate; hyphal system monomitic in context, dimitic in trama; hymenial setae ventricose or subulate, 22–30 × 4–7 µm; cystidioles present; basidiospores broadly ellipsoid to subglobose, yellowish, thick-walled, IKI–, CB–, 4.8–5.5(–5.7) × (3.8–)3.9–4.6(–4.8) µm, L = 5.09 µm, W = 4.2 µm, Q = 1.21 (Tian et al. 2013); type locality in Cuba; distribution: Central America and USA.

41. Cystidioles absent, basidiospores mostly < 4 µm wide..... 42

42. Pores 7–8 per mm..... *T. guanacastensis* L.W. Zhou et al.

... Basidiocarps perennial, pileate, solitary; pileal surface black, radially cracked, concentrically zonate and sulcate, matted; pore surface cinnamon buff to honey yellow, slightly glancing; pores 7–8 per mm; context homogeneous; hyphal system monomitic in context and dimitic in trama; hymenial setae subulate to ventricose, 12–25 × 4–8 µm; basidiospores ellipsoid, pale yellowish, slightly thick-walled, IKI–, CB–, 4.1–4.9(–5) × (3.1–)3.3–3.9(–4) µm, L = 4.47 µm, W = 3.64 µm, Q = 1.22–1.23 (Zhou et al. 2016b); type locality in Costa Rica; distribution: Costa Rica.

42. Pores 5–6 per mm..... *T. cubensis* (Y.C. Dai et al.) L.W. Zhou & Y.C. Dai

... Basidiocarps perennial, pileate; pilei semicircular to dimidiate, ungulate; pileal surface blackish to black, concentrically zonate and sulcate, matted, cracked; pore surface honey yellow to fulvous, slightly glancing; pores 5–6 per mm; context homogeneous, fulvous, concentrically zonate; hyphal system monomitic in context, dimitic in trama; hymenial setae subulate to ventricose, 27–43 × 5–10 µm; basidiospores broadly ellipsoid to ellipsoid, slightly yellowish, thick-walled, IKI–, CB–, (4–)4.2–5(–5.1) × 3.2–4(–4.3) µm, L = 4.72 µm, W = 3.75 µm, Q = 1.24–1.32 (Tian et al. 2013); type locality in Cuba; distribution: Cuba.

Addendum

NOMINA EXCLUDENDAE

Coltricia gracilipes Corner (nom. inval.), *Beih. Nova Hedwigia* 101: 93 (1991).

This name was published invalidly because no type was designated, and according to Dai and Li (2012) the material for this taxon in fact represents *Coltricia pyrophila* (Wakef.) Ryvarden.

Coltricia grandis Corner (nom. inval.), *Beih. Nova Hedwigia* 101: 94 (1991).

This name was published invalidly because no type was designated, and according to Dai and Li (2012) the material for this taxon in fact represents *Coltricia crassa* Y.C. Dai.

Coltricia magna Corner (nom. inval.), *Beih. Nova Hedwigia* 101: 109 (1991).

This name was published invalidly because no type was designated, and Dai and Li (2012) re-described it as *Inonotus magnus* Y.C. Dai & Hai J. Li.

Coltricia subfastosa Corner, *Beih. Nova Hedwigia* 101:152 (1991).

According to Dai and Li (2012) its type represents *Pyrrhoderma adamantinum* (Berk.) Imazeki.

Fomitiporella americana Y.C. Dai, X.H. Ji & Vlasák, in Ji, Vlasák, Zhou, Wu & Dai, *Mycologia* 109: 316 (2017)

It is a synonym of *Fomitiporella umbrinella* (Bres.) Murrill (Salvador-Montoya et al. 2020).

Fomitiporella micropora Y.C. Dai, X.H. Ji & Vlasák, in Ji, Vlasák, Zhou, Wu & Dai*, Mycologia* 109: 313 (2017).

It is a synonym of *Fomitiporella coruscans* (Murrill) Salvador-Montoya & Popoff (Salvador-Montoya et al. 2020).

Fomitiporia hesleri M. Fisch., in Fischer & Binder, *Mycologia* 96: 805 (2004).

It is a synonym of *Fomitiporia langloisii* Murrill (Decock et al. 2007).

Fomitiporia mediterranea M. Fisch., *Mycol. Progr.* 1: 321 (2002).

According to our study it is a synonym of *Fomitiporia pseudopunctata* (A. David, Dequatre & Fiasson) Fiasson.

Fuscoporia tenerrima (Berk. & Ravenel) Murrill, *Mycologia* 13: 119 (1921). ≡ *Polyporus tenerrimus* Berk. & Ravenel

According to Ryvarden (1984) the type material is without a fruitbody and only the bark of the substrate remains, so its taxonomic status is uncertian.

Inonotus castanopsidis G.J. Ren & Y.C. Dai, *Phytotaxa* 338: 120 (2018).

The type of the species in fact repesents *Ochrosporellus tricolor* (Bres.) Y.C. Dai (≡ *Phellinus tricolor* (Bres.) Kotl.).

Inonotus canariicola Y.C. Dai, *Mycoscience* 53: 40 (2012).

According to our study the type of the species in fact repesents *Inonotus latemarginatus* Y.C. Dai.

Inonotus leprosus (Fr.) Murrill, *Tropical Polypores:* 69 (1915).

≡ *Polyporus leprosus* Fr., *Elench. fung.* (Greifswald) 1: 107 (1828).

According to Ryvarden (2005) it is a synonym of *Hexagonia leprosa* (Fr.) Ryvarden.

Inonotus exilisporus Y.C. Dai & Niemelä, in Dai, Niemelä & Zang, *Mycotaxon* 65: 275 (1997).

Based on phylogenetic analysis it was combined as *Geliporus exilisporus* (Y.C. Dai & Niemelä) Yuan Yuan et al. in Phanerochaetaceae (Yuan et al. 2017).

Inonotus permixtus Corner, *Beih. Nova Hedwigia* 101: 126 (1991).

This name was published invalidly because no type was designated, and its taxonomic status is uncertain without studying the original material.

Inonotus porrectus Murrill, *Tropical Polypores*: 68 (1915).

According to our study it is identical with *Fulvifomes luteoumbrinus* (Romell) Y.C. Dai & Vlasák.

Inonotus pseudohispidus Kravtzev, *Bull. Acad. Sci. Kazakh SSR* 98: 128 (1950).

According to Ryvarden (2005) it is a synonym of *Inocutis levis* (P. Karst.) Y.C. Dai ≡ *Inonotus levis* P. Karst.

Inonotus pseudoobliquus (Pilát) Pilát, *Atlas Champ. l'Europe, Polyporaceae I* (Praha) 3: 570 (1942).

≡ *Xanthochrous pseudoobliquus* Pilát.

According to Kotlaba and Pouzar (1988) its type represents *Elmerina caryae* (Schwein.) D.A. Reid (≡ *Protomerulius caryae* (Schwein.) Ryvarden).

Inonotus separabilis Corner, *Beih. Nova Hedwigia* 101: 144 (1991).

This name was published invalidly because no type was designated, and its taxonomic status is uncertain without studying the original material.

Inonotus sinensis Teng, *Chung-kuo Ti Chen-chun* [Fungi of China]: 761 (1963).

= *Polyporus sinensis* Lloyd. The type (BPI306644) was studied, and it represents *Neomensularia kanehirae* (Yasuda) F. Wu et al.

Inonotus vulpinus (Link) P. Karst., *Bidr. Känn. Finl. Nat. Folk* 37: 72 (1882).

According to Ryvarden (2005) it is a synonym of *Inocutis rheades* (Pers.) Fiasson & Niemelä.

Onnia incisa (Lloyd) Imazeki, *Bull. Gov. Forest Exp. Stn Tokyo* 57: 114 (1952).

≡ *Polystictus incisus* Lloyd, *Mycol. Writ.* 7 (Letter 67): 1155 (1922).

According to Ryvarden (1992) the type represents *Microporellus obovatus* (Jungh.) Ryvarden.

Phellinidium cryptocystidiatum Spirin & Zmitr., *Nov. sist. Niz. Rast.* 40: 167 (2006).

According to our study it is a synonym of *Coniferiporia sulphurascens* (Pilát) L.W. Zhou & Y.C. Dai

Phellinus bresadolanus Teixeira [as 'bresadolianus'], *Revista Brasileira de Botânica* 15(2): 126 (1992). This species was based on *Hydnochaete badia* Bres. (Teixeira 1992); it is a hydnoid species and is currently called *Hymenochaete peroxydata* (Berk. ex Cooke) Baltazar et al. (Baltazar 2014).

Phellinus calcitratus (Berk. & M.A. Curtis) Ryvarden, *Norw. Jl Bot.* 19: 234 (1972).

According to our study it is identical with *Tropicoporus linteus* (Berk. & M.A. Curtis) L.W. Zhou & Y.C. Dai.

Phellinus eugeniae T.T. Chang, *Mycol. Res.* 99: 1527 (1995).

The holotype (TFRI660) was studied and it is a synonym of *Fuscoporia torulosa* (Pers.) T. Wagner & M. Fisch.

Phellinus formosanus T.T. Chang & W.N. Chou, *Mycol. Res.* 103: 50 (1999).

The type (TFRI 534) was studied, and it is a synonym of *Neomensularia kanehirae* (Yasuda) F. Wu, L.W. Zhou & Y.C. Dai.

Phellinus lividus (Kalchbr.) S. Ahmad, *Basidiomyc. W. Pakist.*: 63 (1972).

≡ *Polyporus lividus* Kalchbr., in Cooke 1882. According to Zmitrovich (2018) its current name is *Truncospora livida* (Kalchbr. ex Cooke) Zmitr.

Phellinus neolundellii Zmitr., Malysheva, Psurtseva & Spirin, *Nov. sist. Niz. Rast*. 39: 128 (2005).

This species was described based on morphology from Russia (Zmitrovich et al. 2005), but according to Tomšovský et al. (2010b), it nested within *Phellinus alni* (Bondartsev) Parmasto by phylogenetic analysis.

Phellinus neoquercinus M.J. Larsen, in Larsen & Cobb-Poulle, *Synop Fungorum* 3: 93 (1990).

≡ *Fuscoporia quercina* J.D. Zhao, in Zhao & Zhang, *Acta Mycol. Sin.* 5: 156 (1986).

According to Dai and Yuan (2010) the type of *Fuscoporia quercina* represents *Inonotus obliquus* (Fr.) Pilát.

Phellinus pseudoigniarius Y.C. Dai & F. Yang, *Mycotaxon* 104: 104 (2008).

It is a synonym of *Phellinus igniarius* according to Zhou et al. (2016).

Phellinus quercinus Bondartsev & Ljub., *Nov. sist. Niz. Rast.* 1965: 141 (1965).

According Dai and Niemelä (1995) the type represents *Melanoporia castanea* (Imazeki) T. Hattori & Ryvarden.

Phellinus scleropileatus X.L. Zeng, *Acta Mycol. Sin.* 6: 144 (1987).

..... According to Dai (1996) the type specimen represents *Phellinus igniarius* (L.) Quél.

Phellinus stratosus Pat., *Annales de Cryptogamie Exotique* 1: 13 (1928).

This taxon is uncertain becausethe type was not found (Ryvarden 1983).

Phellinus syringeus X.L. Zeng, *Acta Mycol. Sin.* 6: 142 (1987).

..... According to Dai (1996) the type specimen represents *Phellinus tuberculosus* (Baumg.) Niemelä sensu lato.

Phellinus ussuriensis Bondartsev & Ljub., *Nov. sist. Niz. Rast.* 1965: 143 (1965).

According to Dai and Niemelä (1995) the type material represents *Nigroporus ussuriensis* (Bondartsev & Ljub.) Y.C. Dai & Niemelä.

Tropicoporus texanus A.A. Brown et al., Pl. Path. 69(2): 216 (2020).

According to our study it is identical with Tropicoporus melleoporus (Murrill) Salvador-Montoya & Drechsler-Santos.

Declarations

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Conflicts of interest

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

Availability of data and material

The names of the repositories and accession numbers can be found in the Supplementary table 1. Requests for materials could be made to the corresponding author.

Code availability

Not applicable.

Authors' contributions

YC Dai and F Wu designed the experiment; YC Dai, F Wu, LW Zhou and J Vlasák prepared the samples; F Wu, LW Zhou, J Vlasák and YC Dai conducted the molecular experiments and analyzed the data; F Wu, LW Zhou, J Vlasák and YC Dai drafted the manuscript. All the authors approved the manuscript.

Additional declarations for articles in life science journals that report the results of studies involving humans and/or animals

Not applicable.

Ethics approval

Not applicable.

Consent to participate

Not applicable.

Consent for publication

All authors give their consent to publish this study in Fungal Diversity.

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Figures

Figure 1

Maximum likelihood tree of selected taxa in genera of Hymenochaetaceae based on the combined dataset of ITS+nLSU sequences. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

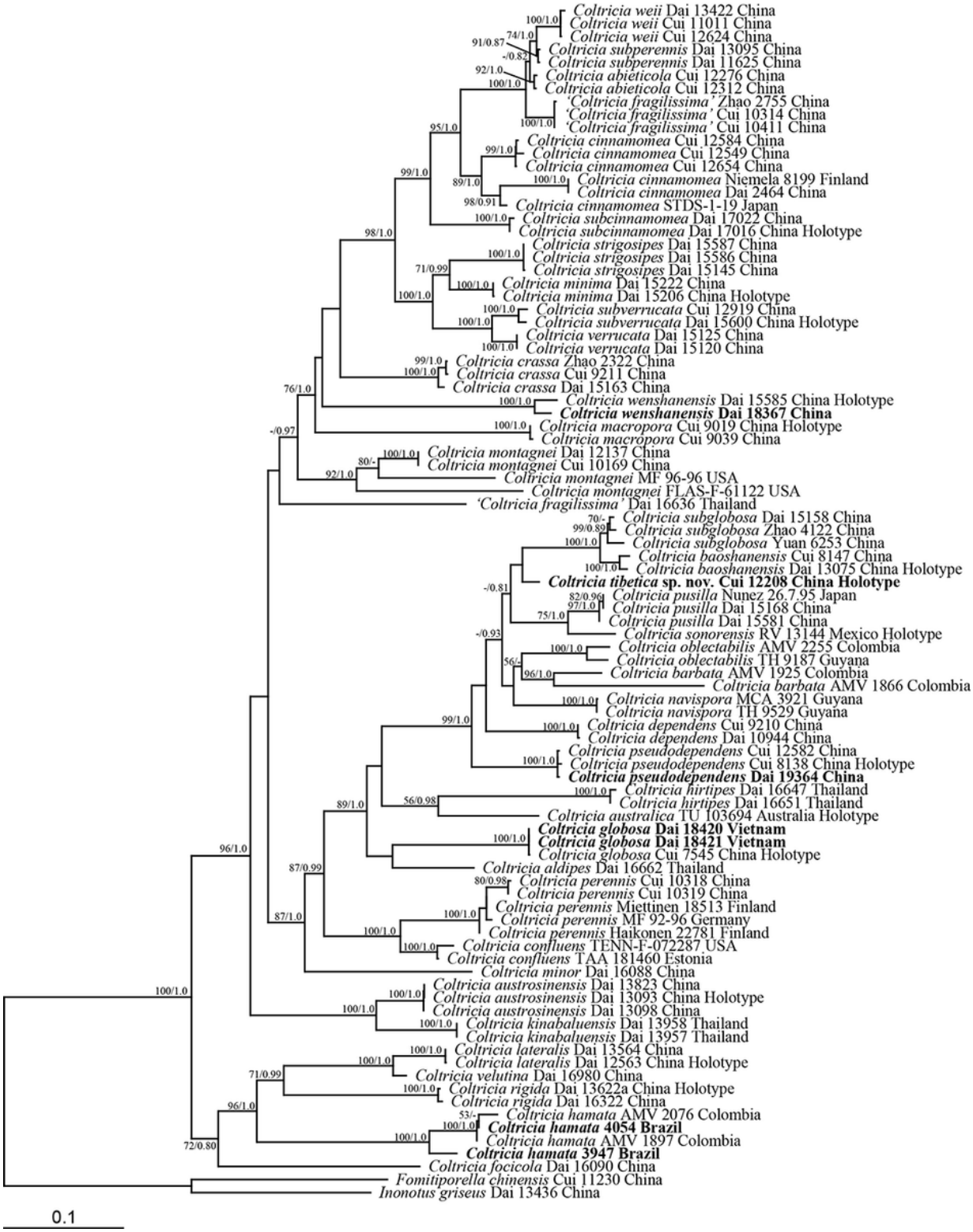

Figure 2

Maximum likelihood tree illustrating the phylogeny of Coltricia based on the combined dataset of ITS+nLSU sequences. Fomitiporella chinensis (KX181309, KY693759) and Inonotus griseus (KX364802, KX364823) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 3

Basidiocarps of Coltricia tibetica (Cui 12208).

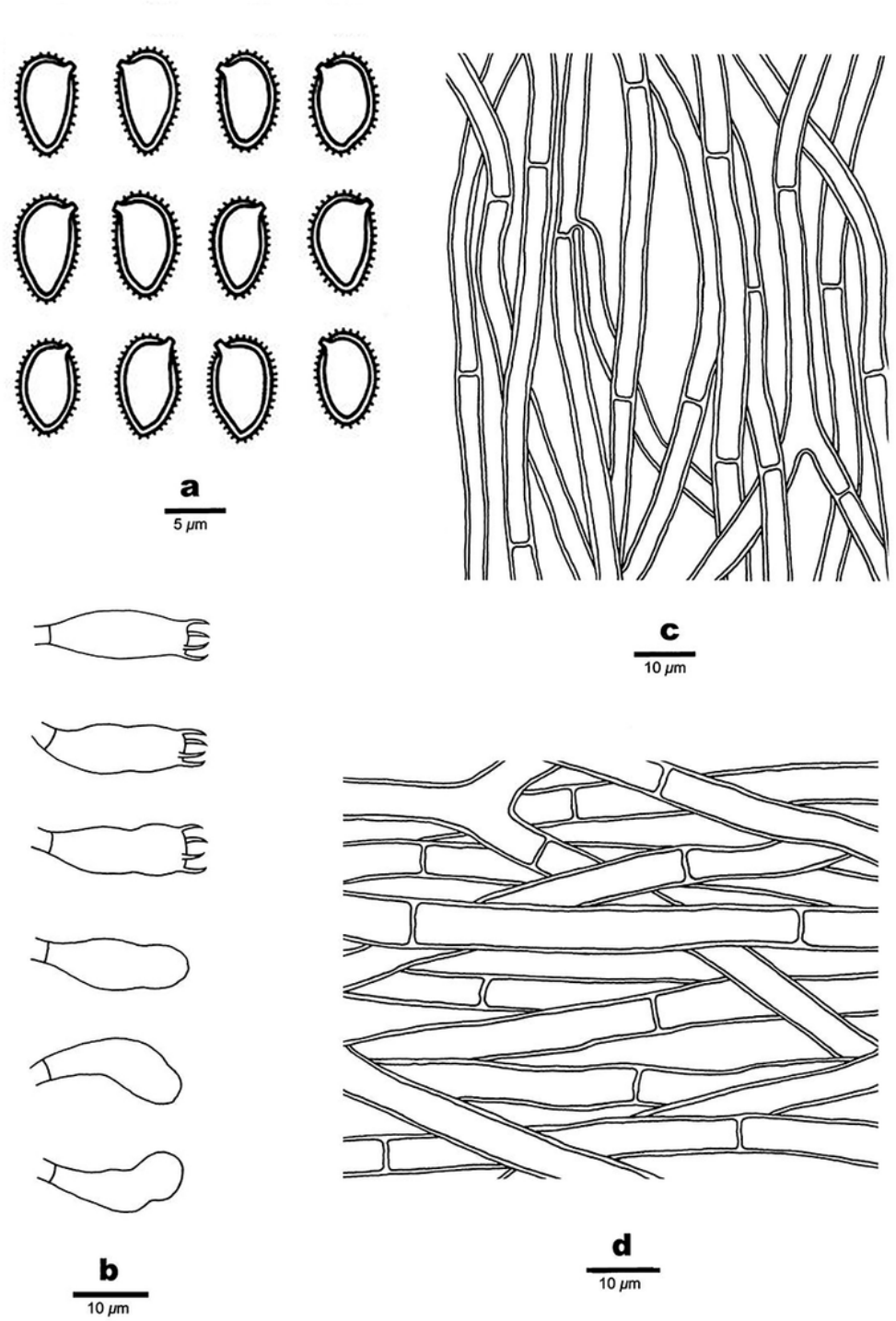

Figure 4

Microscopic structures of Coltricia tibetica (Cui 12208). a. Basidiospores; b. Basidia and basidioles; c. Hyphae from trama; d. Hyphae from context.

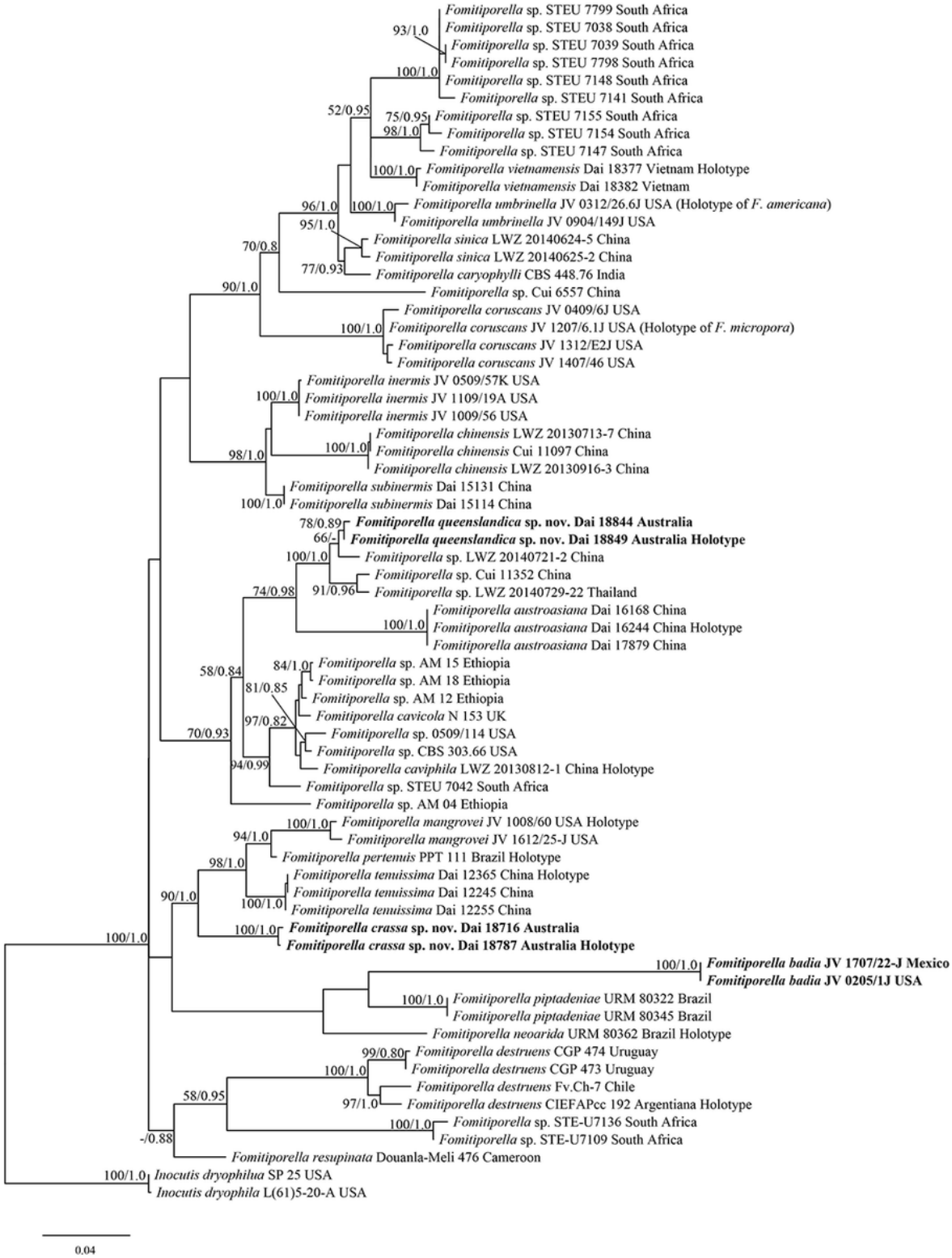

Figure 5

Maximum likelihood tree illustrating the phylogeny of Fomitiporella based on the combined dataset of ITS+nLSU sequences. Inocutis dryophila (AM269783, AM269846; AM269782, AM269845) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 6

A basidiocarp of Fomitiporella crassa (Dai 18787).

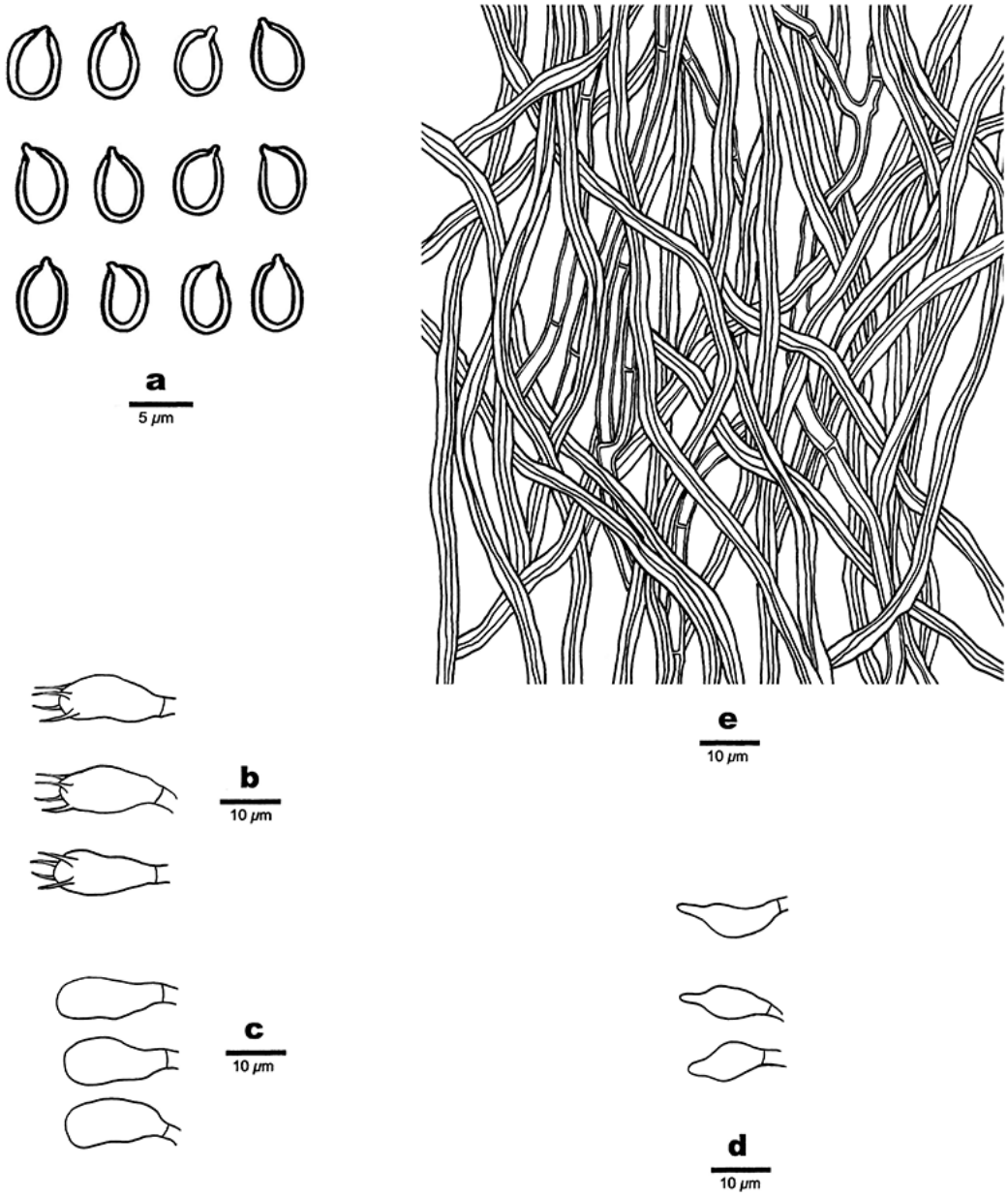

Figure 7

Microscopic structures of Fomitiporella crassa (Dai 18787). a. Basidiospores; b. Basidia; c. Basidioles; d. Cystidioles; e. Hyphae from trama.

Figure 8

Basidiocarps of Fomitiporella queenslandica (Dai 18849).

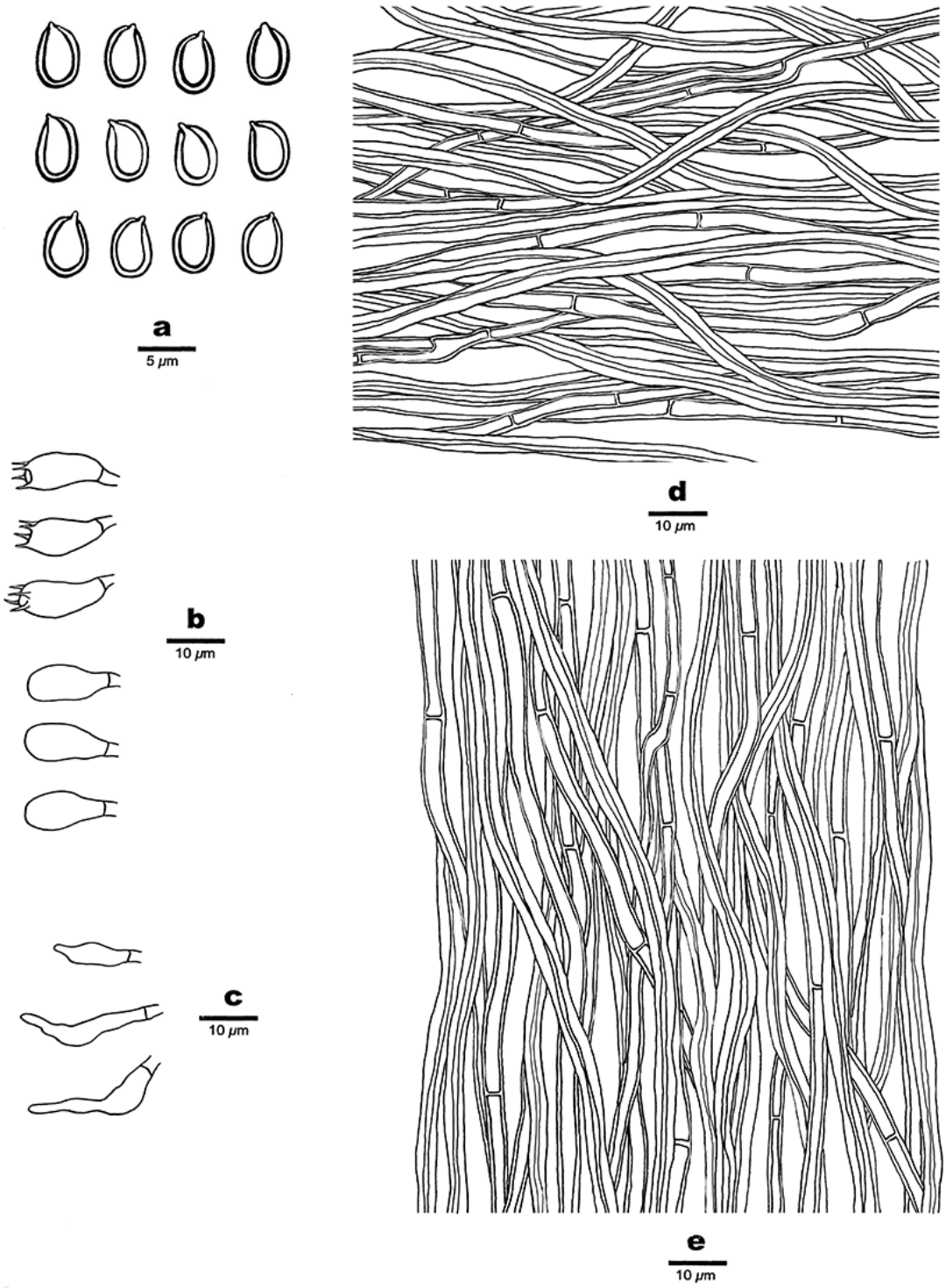

Figure 9

Microscopic structures of Fomitiporella queenslandica (Dai 18849). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hyphae from context; e. Hyphae from trama.

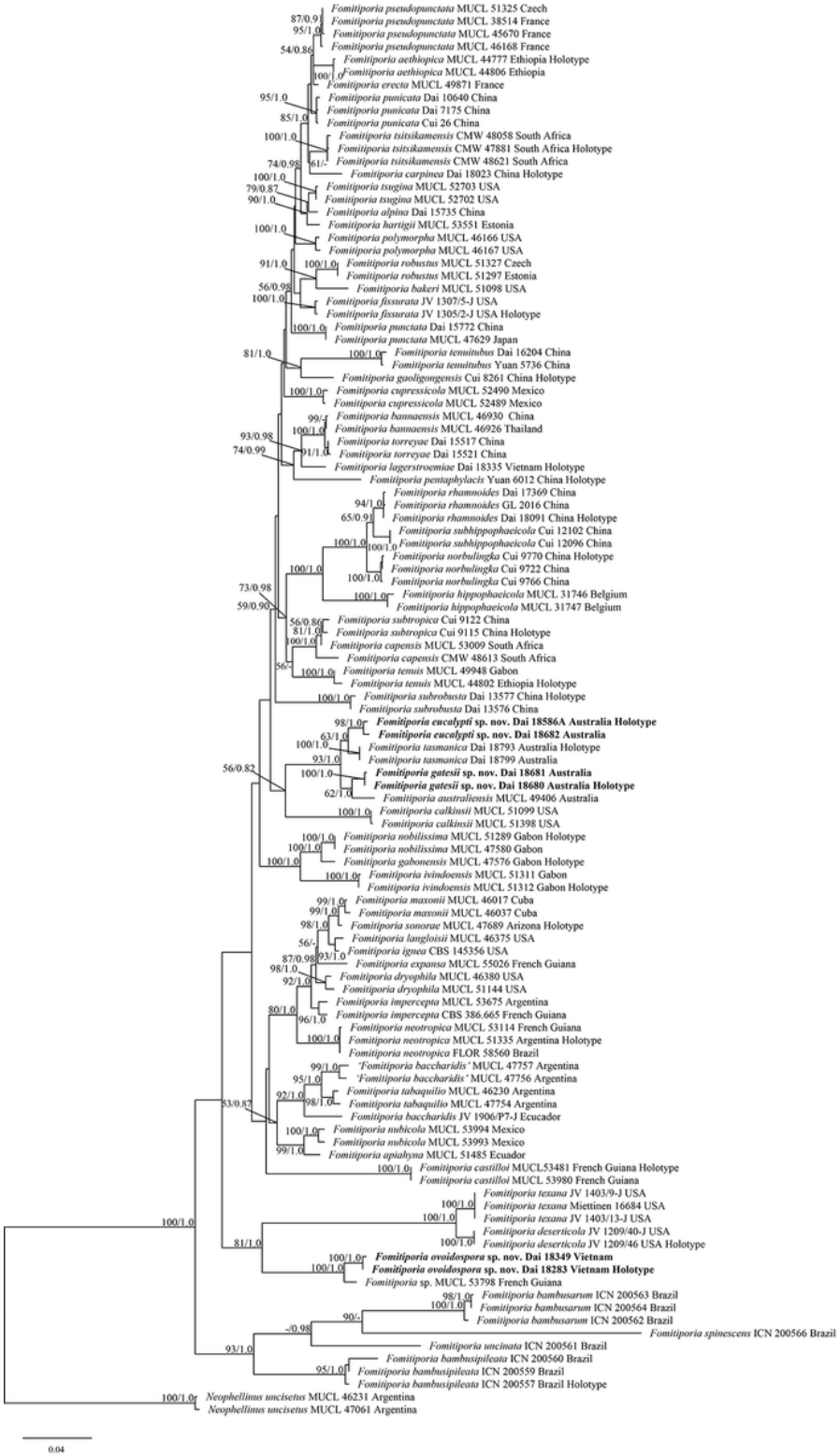

Figure 10

Maximum likelihood tree illustrating the phylogeny of Fomitiporia based on the combined dataset of ITS+nLSU sequences. Neophellinus uncisetus (GU461960, EF429235; GU461972, GU462000) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species are in bold.

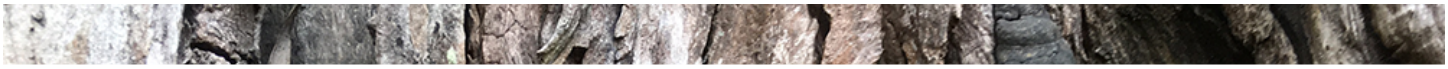

Figure 11

Basidiocarps of Fomitiporia eucalypti (Dai 18682).

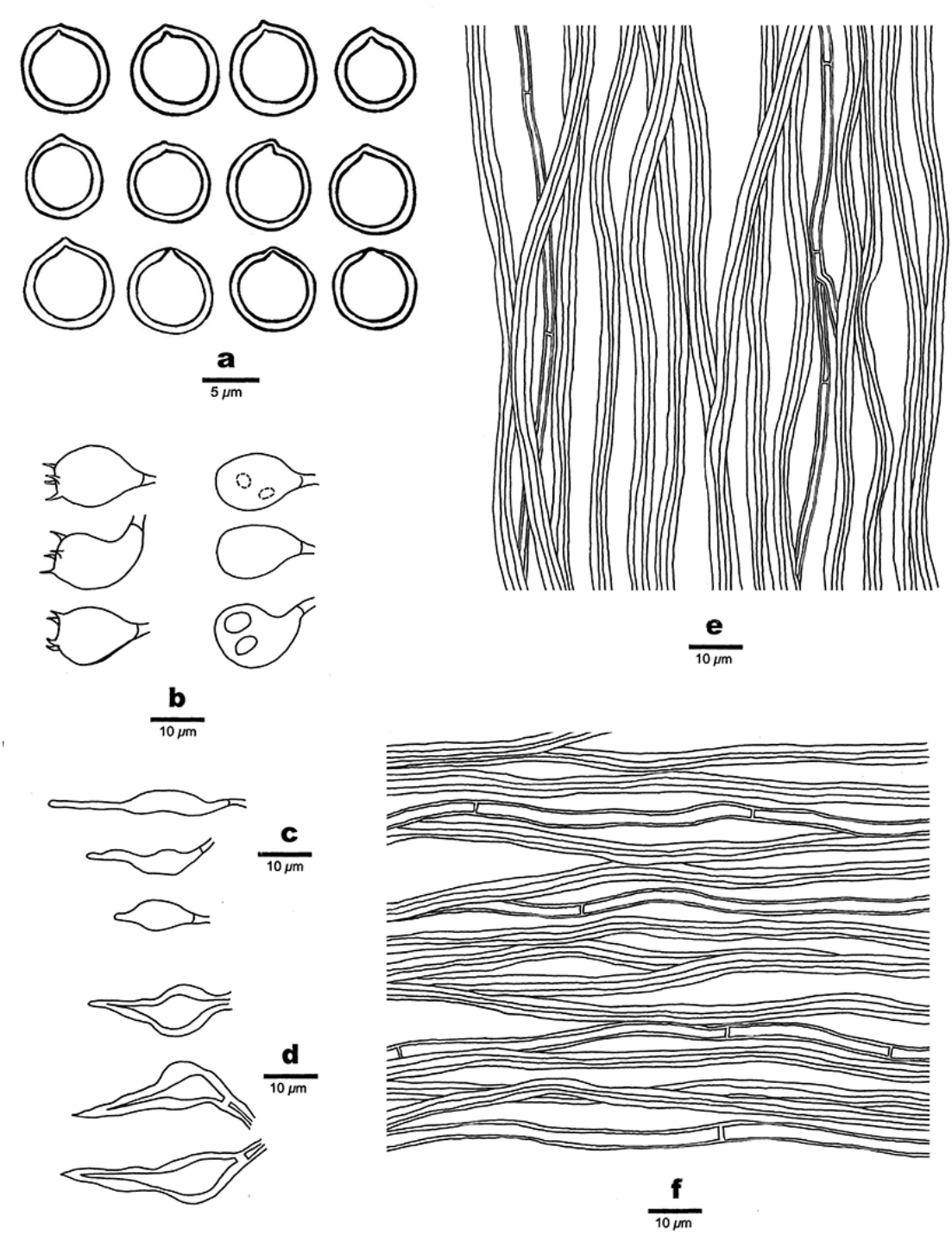

Figure 12

Microscopic structures of Fomitiporia eucalypti (Dai 18682). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from trama. f. Hyphae from context.

Figure 13

A basidiocarp of Fomitiporia gatesii (Dai 18680).

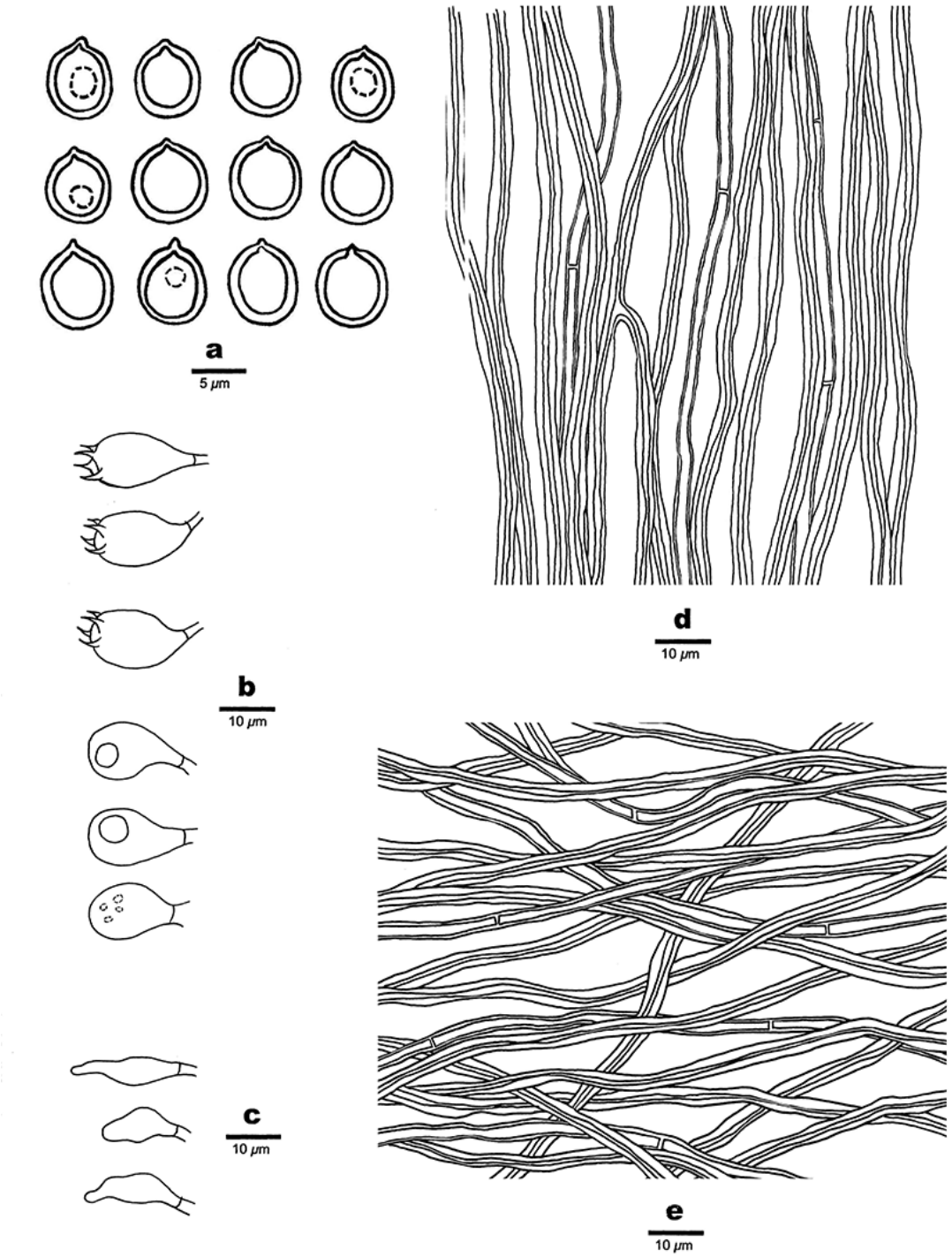

Figure 14

Microscopic structures of Fomitiporia gatesii (Dai18680). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hyphae from trama; e. Hyphae from subiculum.

Figure 15

Basidiocarps of Fomitiporia ovoidospora (Dai 18283).

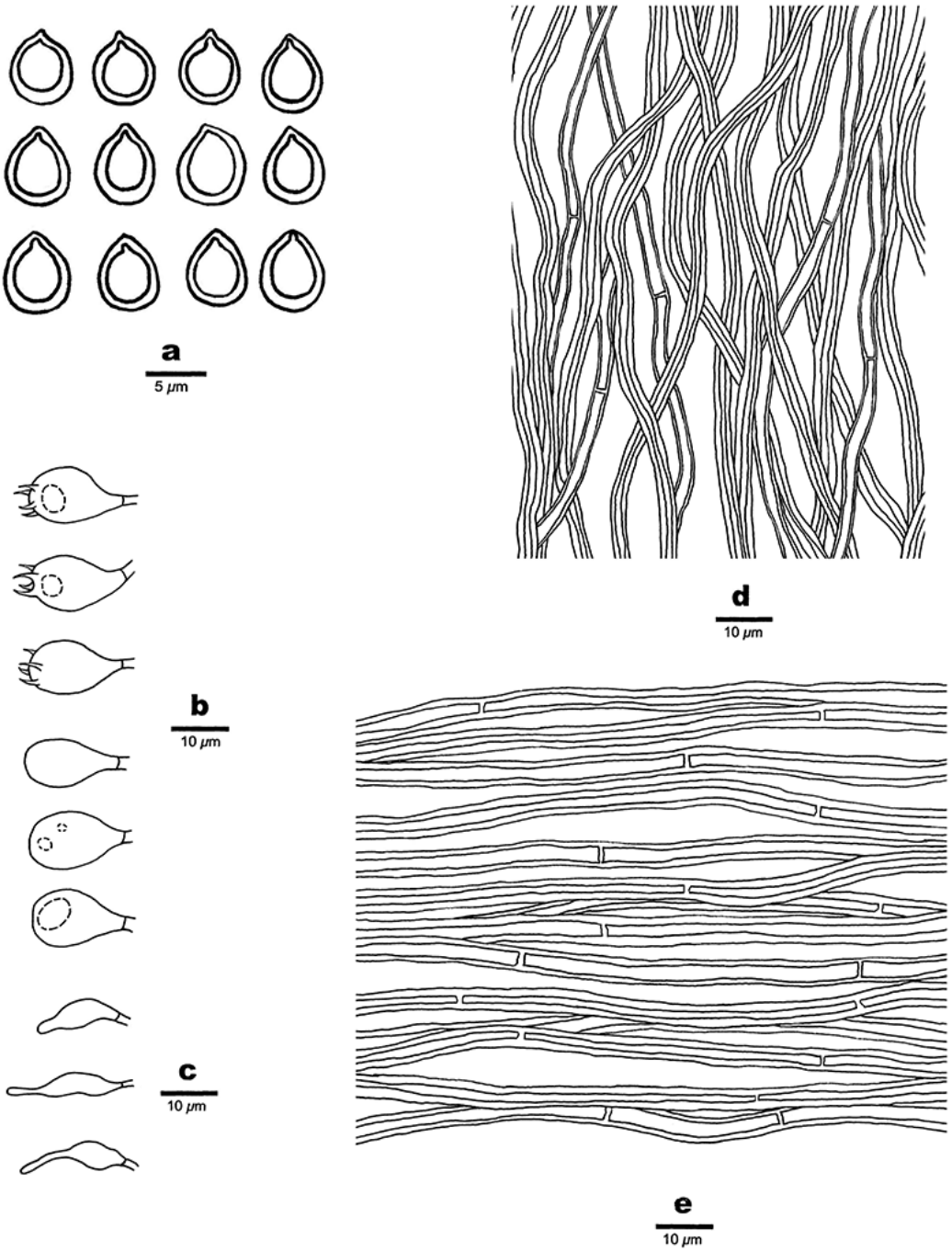

Figure 16

Microscopic structures of Fomitiporia ovoidospora (Dai 18283). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hyphae from trama; e. Hyphae from context.

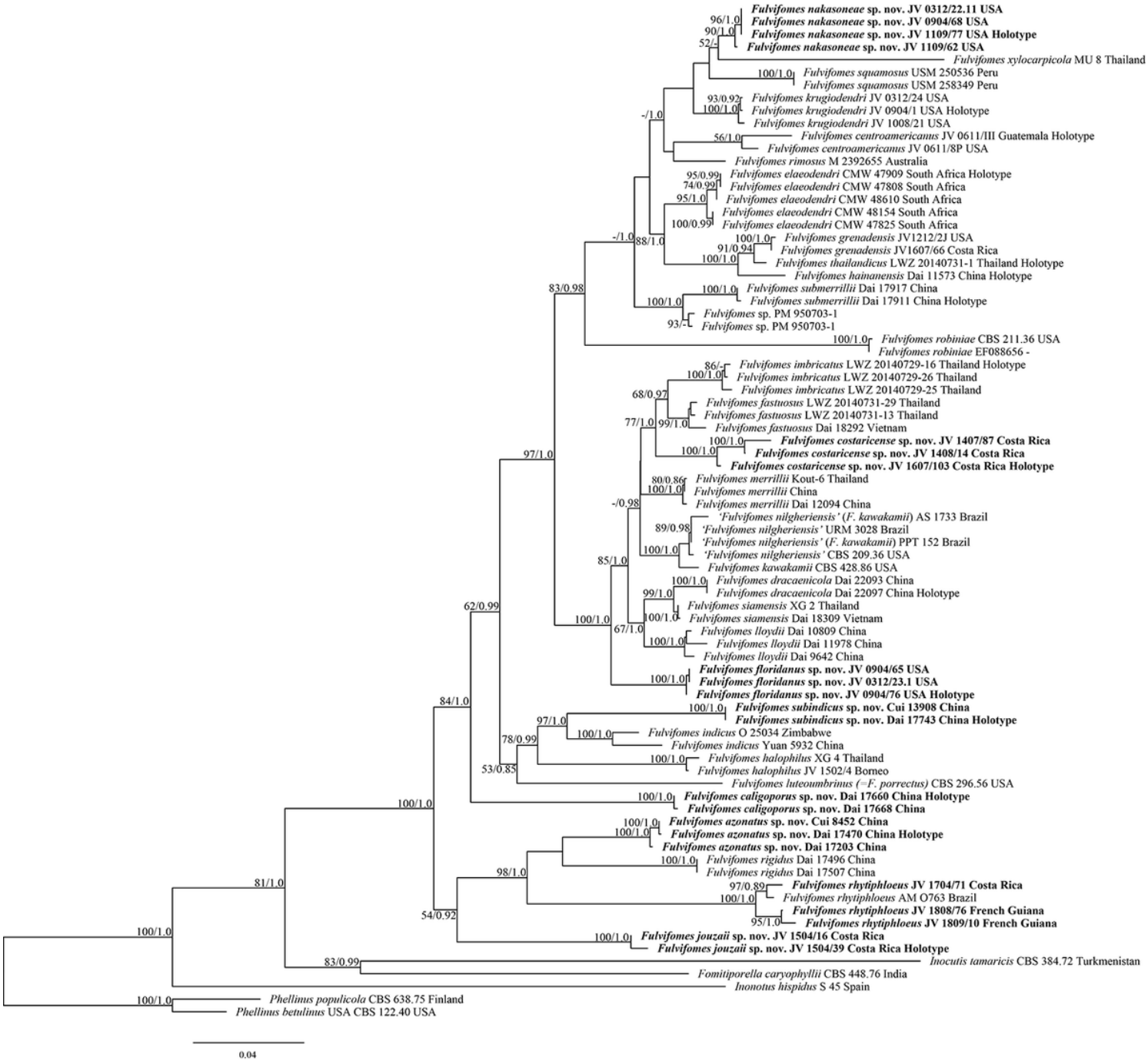

Figure 17

Maximum likelihood tree illustrating the phylogeny of Fulvifomes based on the combined dataset of ITS+nLSU sequences. Phellinus betulinus (MH856059, MH867554) and P. populicola (MH860960, MH872729) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species are in bold.

Figure 18

Basidiocarps of Fulvifomes azonatus (Dai 17470).

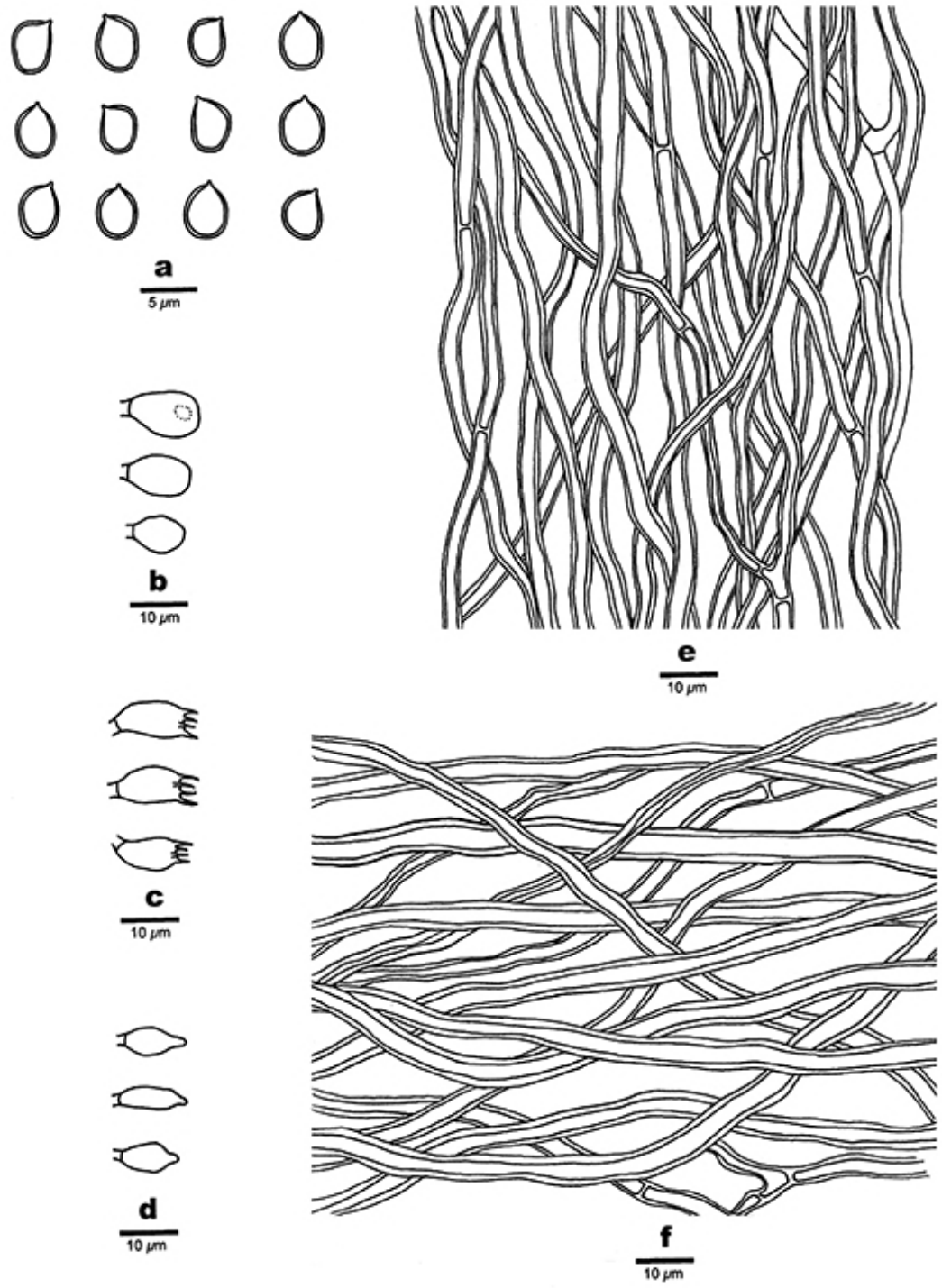

Figure 19

Microscopic structures of Fulvifomes azonatus (Dai 17470). a. Basidiospores; b. Basidioles; c. Basidia; d. Cystidioles; e. Hyphae from trama; f. Hyphae from context.

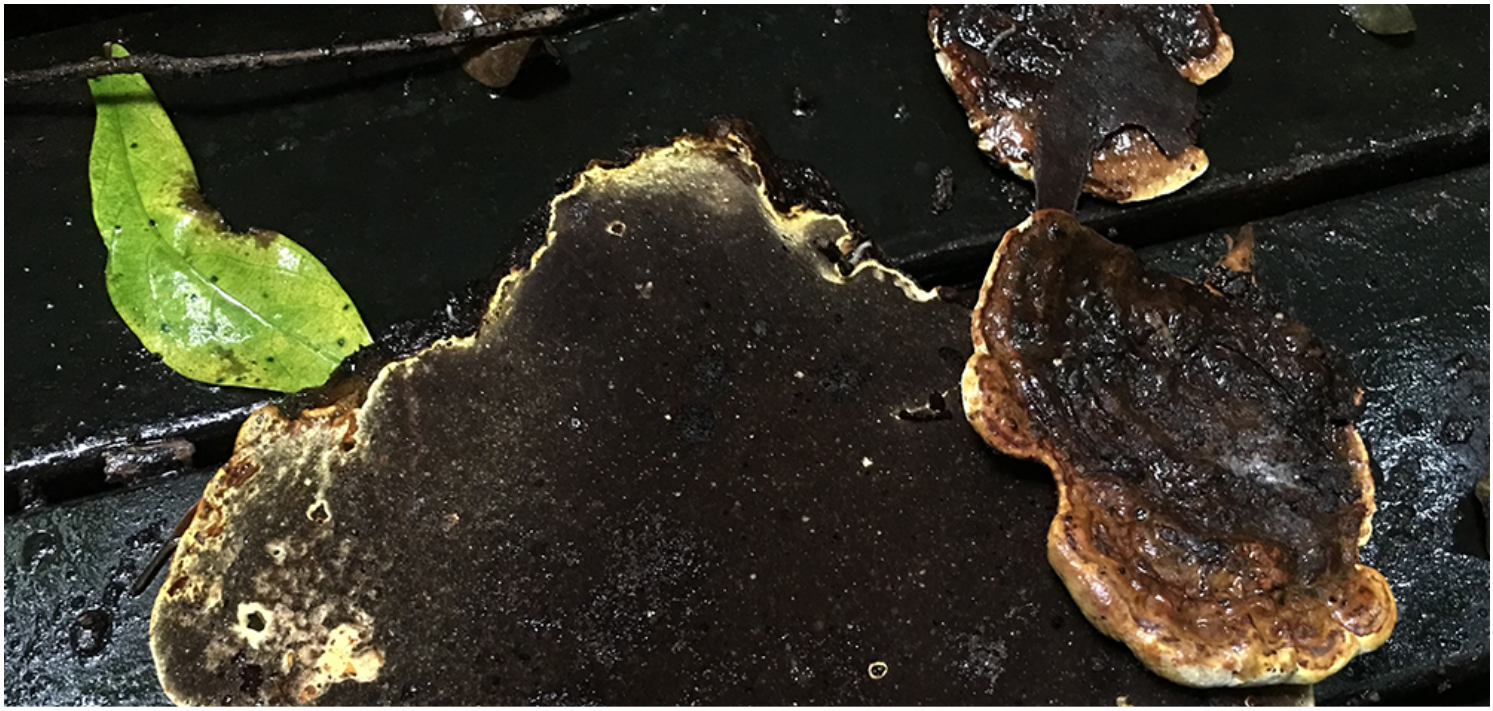

Figure 20

Basidiocarps of Fulvifomes caligoporus (Dai 17660).

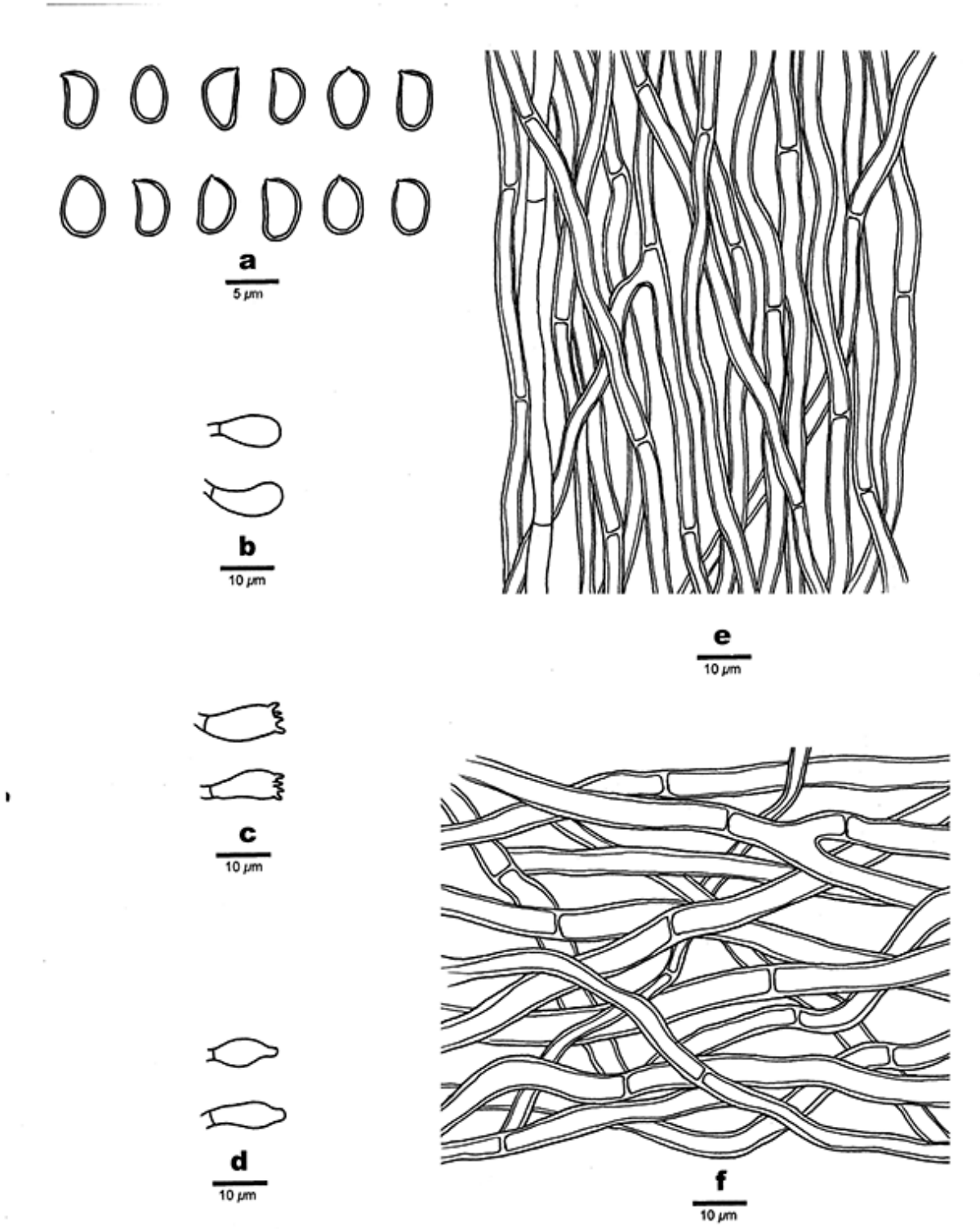

Figure 21

Microscopic structures of Fulvifomes caligoporus (Dai 17660). a. Basidiospores; b. Basidioles; c. Basidia; d. Cystidioles; e. Hyphae from trama; f. Hyphae from context.

Figure 22

Basidiocarps of Fulvifomes costaricense (JV 1407/87).

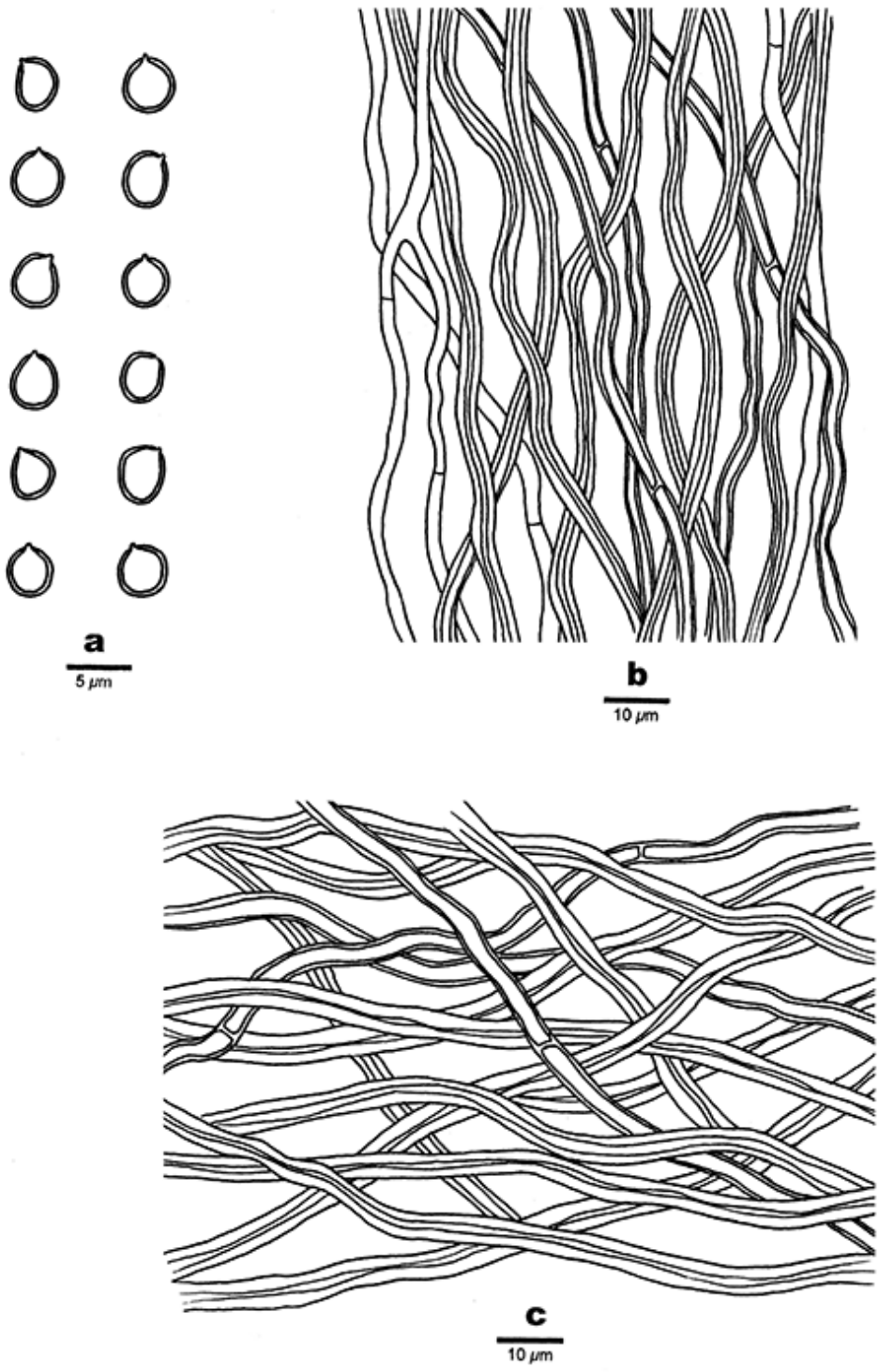

Figure 23

Microscopic structures of Fulvifomes costaricense (JV 1407/87). a. Basidiospores; b. Hyphae from trama; c. Hyphae from context.

Figure 24

A basidiocarp of Fulvifomes floridanus (JV 0905/65).

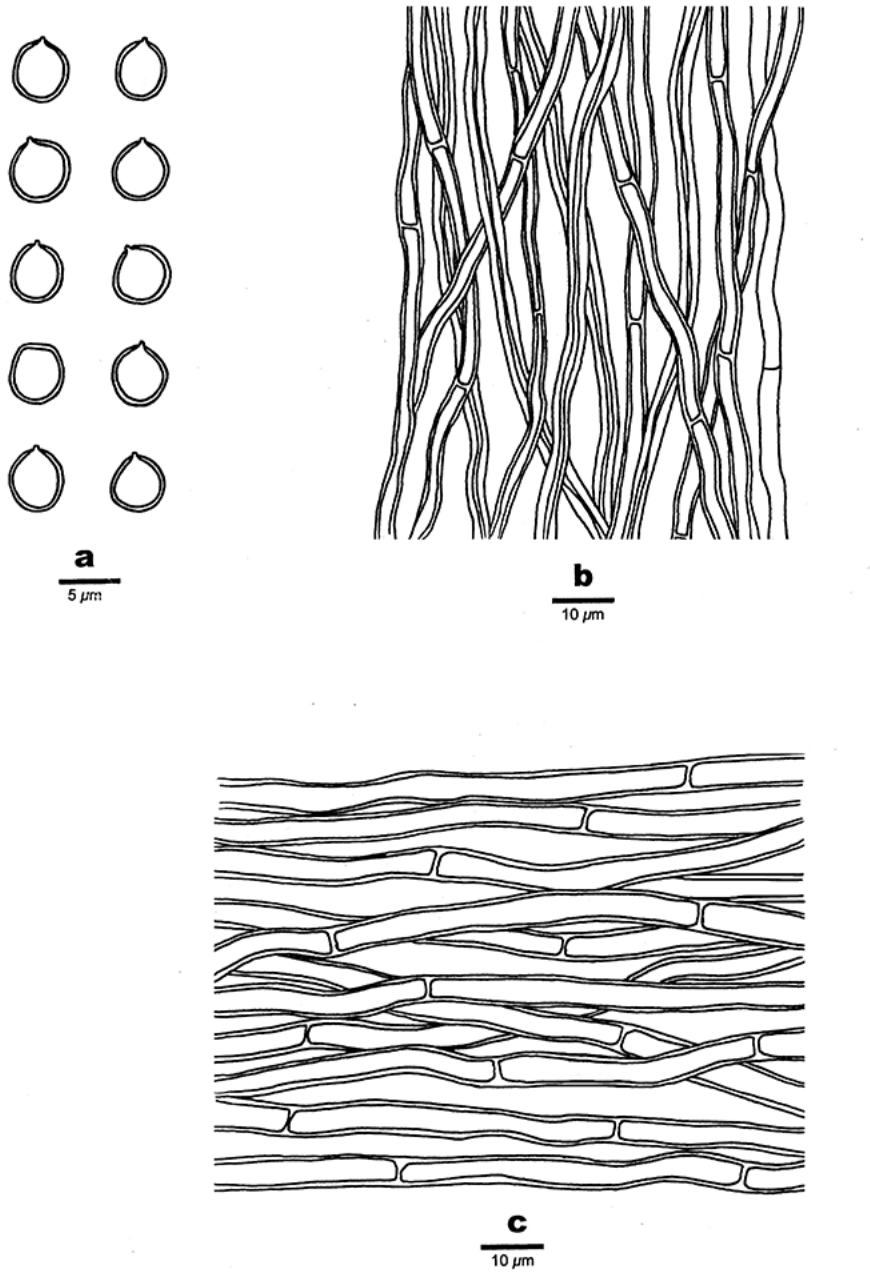

Figure 25

Microscopic structures of Fulvifomes floridanus (JV 0905/65). a. Basidiospores; b. Hyphae from trama; c. Hyphae from context.

Figure 26

A basidiocarp of Fulvifomes jouzaii (JV 1504/39).

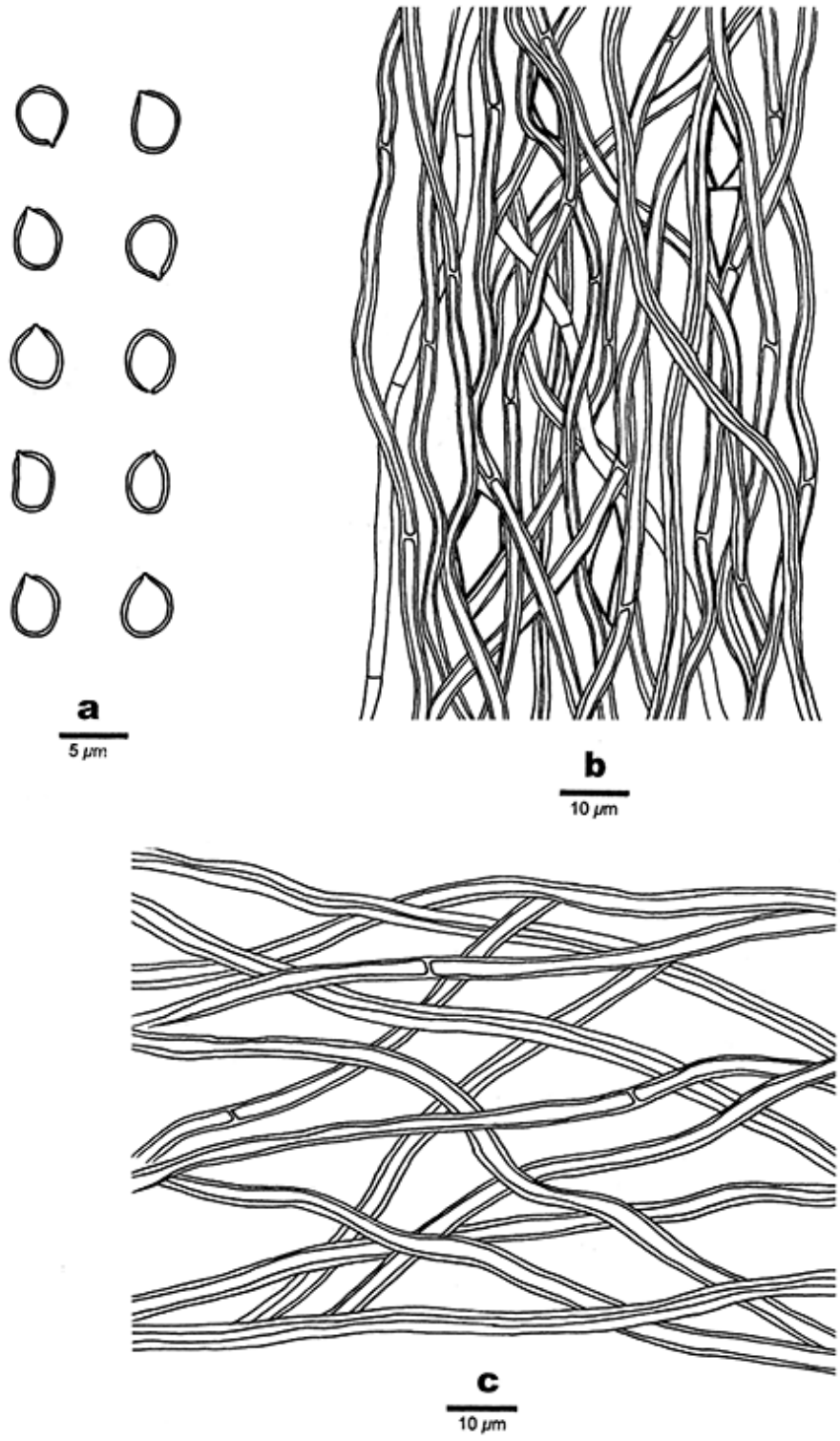

Figure 27

Microscopic structures of Fulvifomes jouzaii (JV 1504/39). a. Basidiospores; b. Hyphae from trama; c. Hyphae from context.

Figure 28

A basidiocarp of Fulvifomes nakasoneae (JV 1109/62).

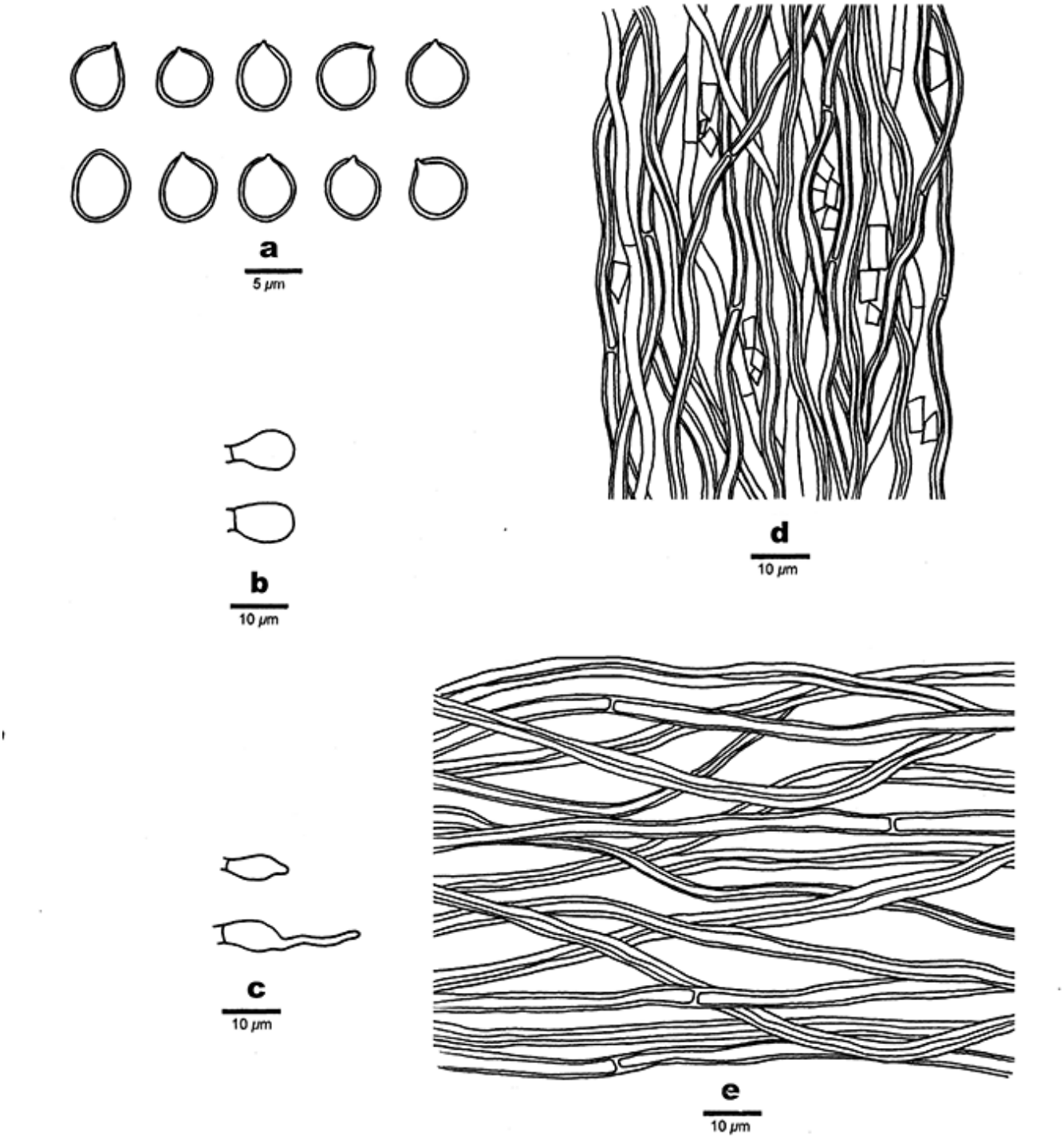

Figure 29

Microscopic structures of Fulvifomes nakasoneae (JV 1109/62). a. Basidiospores; b. Basidioles; c. Cystidioles; d. Hyphae from trama; e. Hyphae from context.

Figure 30

A basidiocarp of Fulvifomes subindicus (Dai 17743).

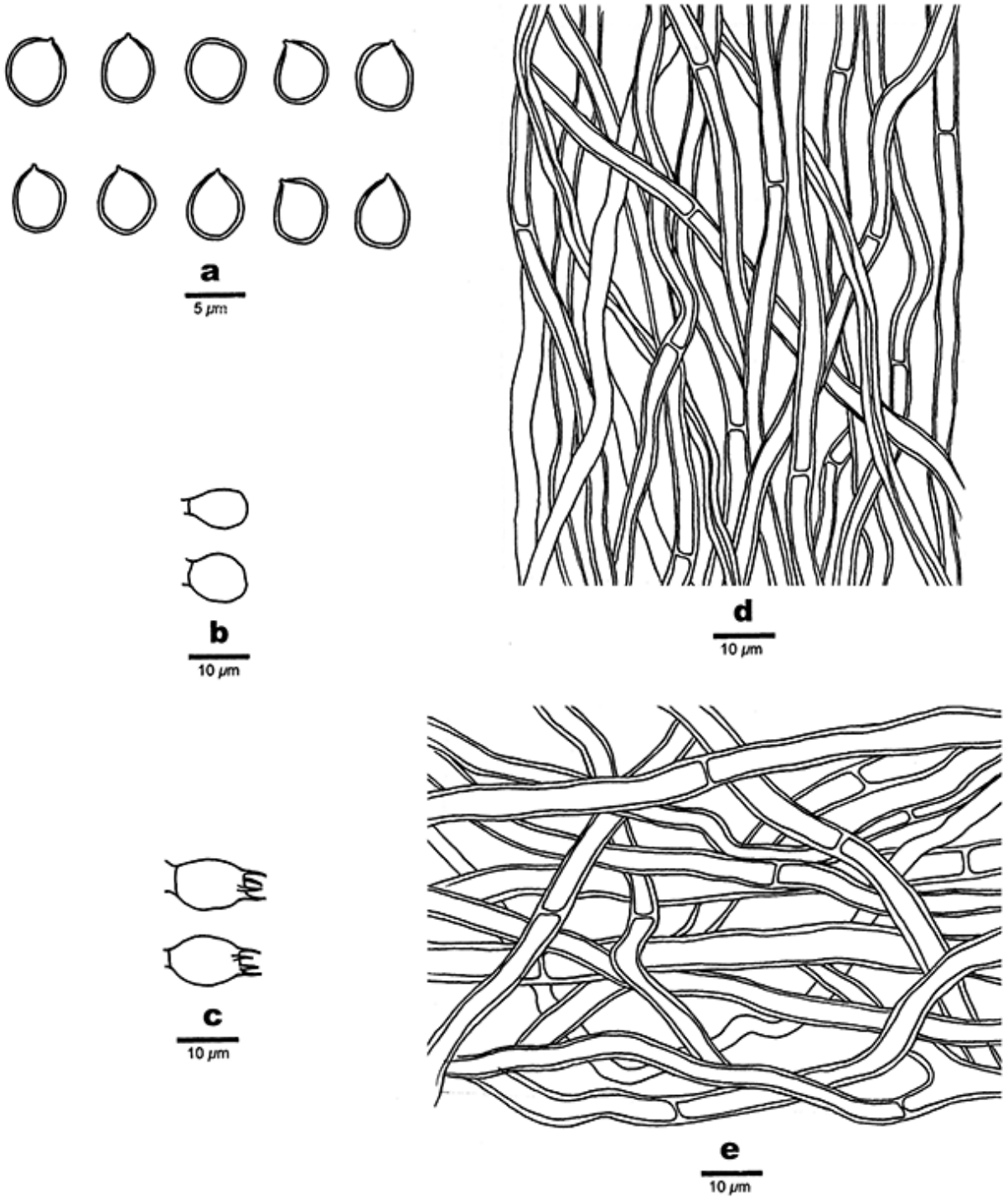

Figure 31

Microscopic structures of Fulvifomes subindicus (Dai 17743). a. Basidiospores; b. Basidioles; c. Basidia; d. Hyphae from trama; e. Hyphae from context.

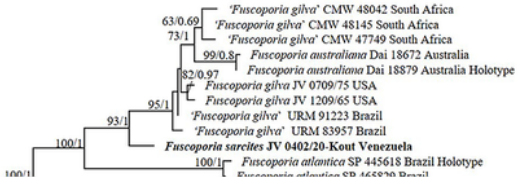

Figure 32

Maximum likelihood tree illustrating the phylogeny of Fuscoporia based on the combined dataset of ITS+nLSU+tef1 sequences. Coniferiporia weirii (AY829341, AY829345) and Phellinidium fragrans (AY558619, AY059027) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 33

A basidiocarp of Fuscoporia sinuosa (Dai 20498).

Figure 34

Microscopic structures of Fuscoporia sinuosa (Dai 20498). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Mycelial setae; f. Hyphae from trama; g. Hyphae at dissepiment edge.

Figure 35

A basidiocarp of Fuscoporia submurina (Dai 19655).

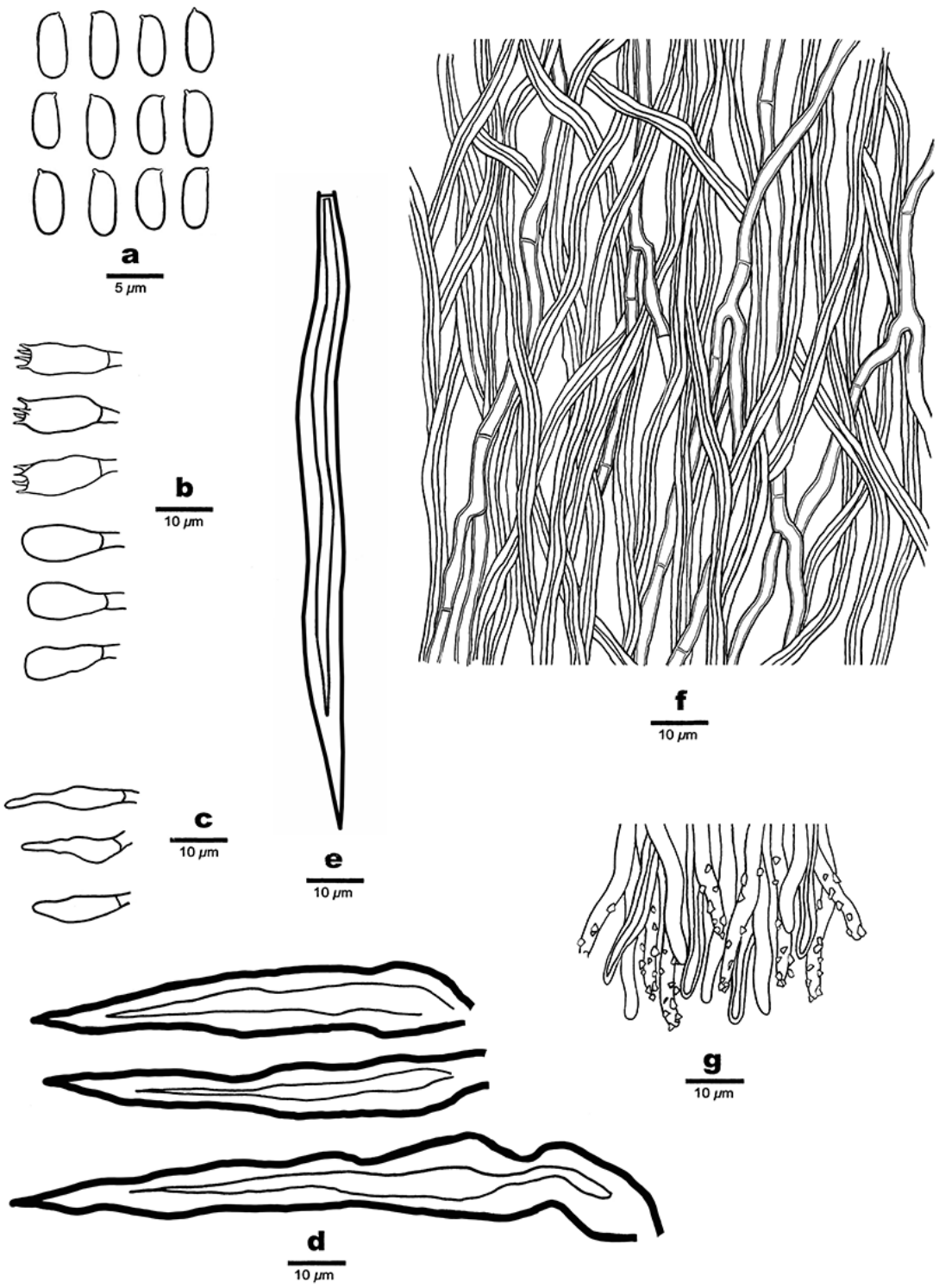

Figure 36

Microscopic structures of Fuscoporia submurina (Dai 19655). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Mycelial setae; f. Hyphae from trama; g. Hyphae at dissepiment edge.

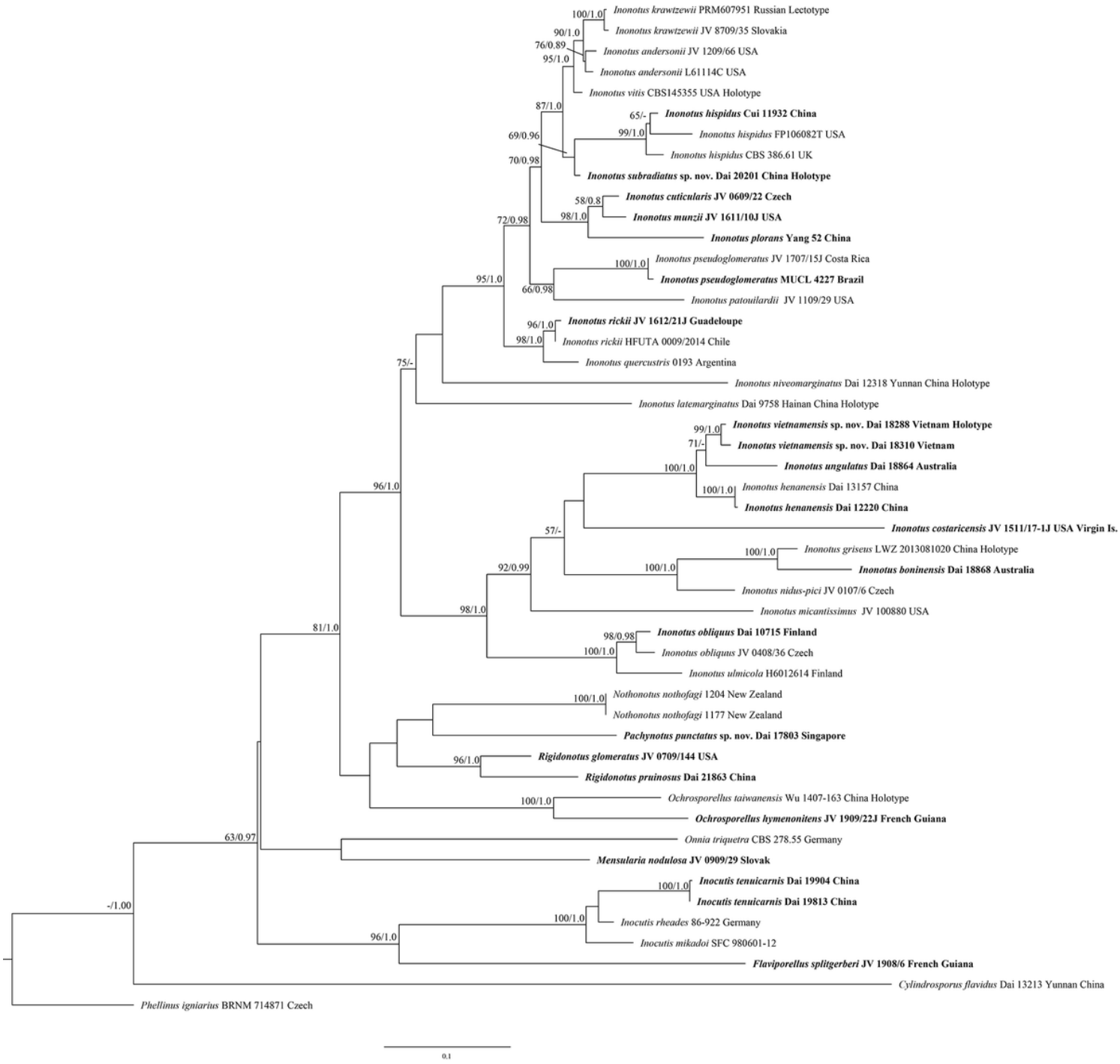

Figure 37

Maximum likelihood tree illustrating the phylogeny of Inonotus based on ITS sequences. Phellinus igniarius (GQ383713) was used as outgroup. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 38

Basidiocarps of Inonotus subradiatus (Dai 20201).

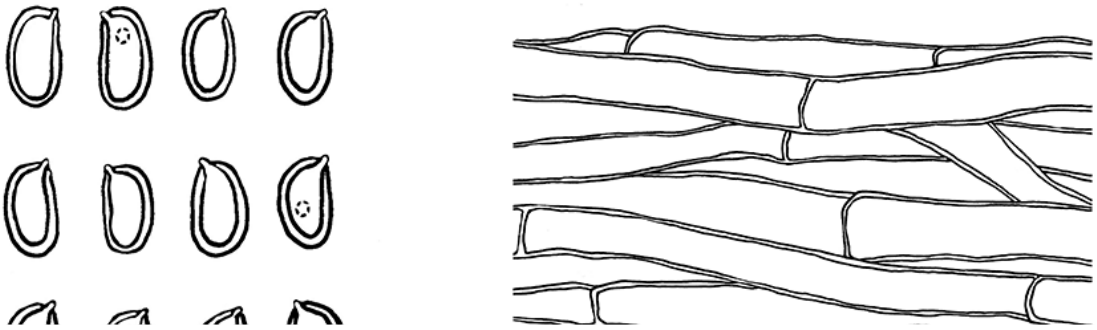

Figure 39

Microscopic structures of Inonotus subradiatus (Dai 20201). a. Basidiospores; b. Basidia and basidioles; c Cystidioles; d. Hymenial setae; e. Hyphoid setae; f. Hphae from context; g. Hyphae from trama; h. Hyphae at dissepiment edge.

Figure 40

Basidiocarps of Inonotus vietnamensis (Dai 18287).

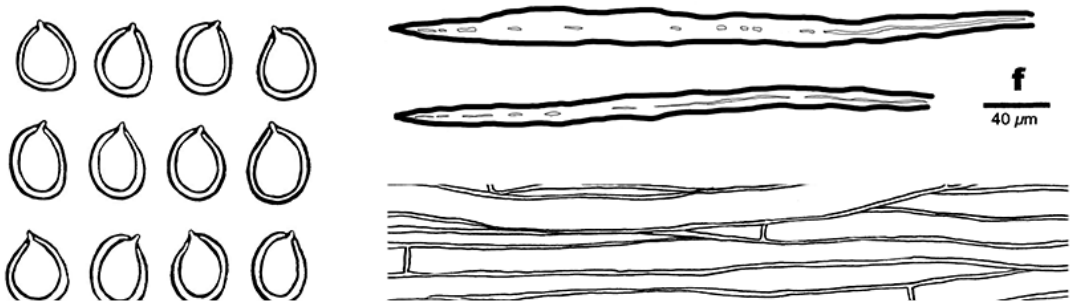

Figure 41

Microscopic structures of Inonotus vietnamensis (Dai 18287). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphoid setae from trama; f. Hyphoid setae from context; g. Hphae from context; h. Hyphae from trama.

Figure 42

A basidiocarp of Neomensularia castanopsidis (Dai 19907).

Figure 43

Microscopic structures of Neomensularia castanopsidis (Dai 19907). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from context; f. Hyphae from trama.

Figure 44

A basidiocarp of Pachynotus punctatus (Dai 17803).

Figure 45

Microscopic structures of Pachynotus punctatus (Dai 17803). a. Basidiospores; b. Basidia and basidioles; c. Hymenial setae; d. Hyphae from subiculum; e. Hyphae from trama.

Figure 46

Basidiocarps of Phellinus cuspidatus (Dai 19837).

Figure 47

Microscopic structures of Phellinus cuspidatus (Dai 19837). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from subiculum; f. Hyphae from trama.

Figure 48

A basidiocarp of Phellinus subellipsoides (Dai 19623).

Figure 49

Microscopic structures of Phellinus subellipsoides (Dai 19623). a. Basidiospores; b. Basidia and basidioles; c. Hymenial setae; d. Hyphae from subiculum; e. Hyphae from trama.

Figure 50

Maximum likelihood tree illustrating the phylogeny of Phylloporia based on nLSU sequences. Inonotus hispidus (AF311014) was used as outgroup. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species are in bold.

Figure 51

Basidiocarps of Phylloporia minutissima (Dai 21223).

Figure 52

Microscopic structures of Phylloporia minutissima (Dai 21223). a. Basidiospores; b. Basidia; c. Basidioles; d. Hyphae from the lower context; e. Hyphae from trama.

Figure 53

Basidiocarps of Phylloporia tabernaemontanae (Dai 18852).

Figure 54

Microscopic structures of Phylloporia tabernaemontanae (Dai 18852). a. Basidiospores; b. Basidia; c. Basidioles; d. Hyphae from the lower context; e. Hyphae from trama.

Figure 55

Maximum likelihood tree illustrating the phylogeny of Porodaedalea based on the combined dataset of ITS+tef1 sequences. Onnia leporina (FJ775542, FJ775573) was used as outgroup. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 56

A basidiocarp of Porodaedalea occidentiamericana (JV 0206/8-J).

Figure 57

Microscopic structures of Porodaedalea occidentiamericana (JV 0206/8-J). a. Basidiospores; b. Cystidioles; c. Hymenial setae; d. Hyphae from context.

Figure 58

A basidiocarp of Porodaedalea orientoamericana (Dai 12818).

Figure 59

Microscopic structures of Porodaedalea orientoamericana (Dai 12818). a. Basidiospores; b. Cystidioles; c. Hymenial setae; d. Hyphae from context.

Figure 60

A basidiocarp of Porodaedalea qilianensis (Dai 18971).

Figure 61

Microscopic structures of Porodaedalea qilianensis (Dai 18971). a. Basidiospores; b. Cystidioles; c. Hymenial setae; d. Hyphae from context; e. Hyphae at dissepiment edge.

Figure 62

A basidiocarp of Porodaedalea schrenkiana (Dai 19072).

Figure 63

Microscopic structures of Porodaedalea schrenkiana (Dai 19072). a. Basidiospores; b. Cystidioles; c. Hymenial setae; d. Hyphae from context; e. Hyphae at dissepiment edge.

Figure 64

Basidiocarps of Pseudophylloporia austaliana (Dai 18846).

Figure 65

Microscopic structures of Pseudophylloporia austaliana (Dai 18846). a. Basidiospores; b. Basidia; c. Basidioles; d. Hyphae from the lower context; e. Hyphae from trama.

Figure 66

Maximum likelihood tree illustrating the phylogeny of Sanghuangporus based on the combined dataset of ITS+nLSU sequences. Inonotus henanensis (KP030783, KX832918) and I. griseus (KX364802, KX364823) were used as outgroups. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 67

A basidiocarp of Sanghuangporus australianus (Dai 18847).

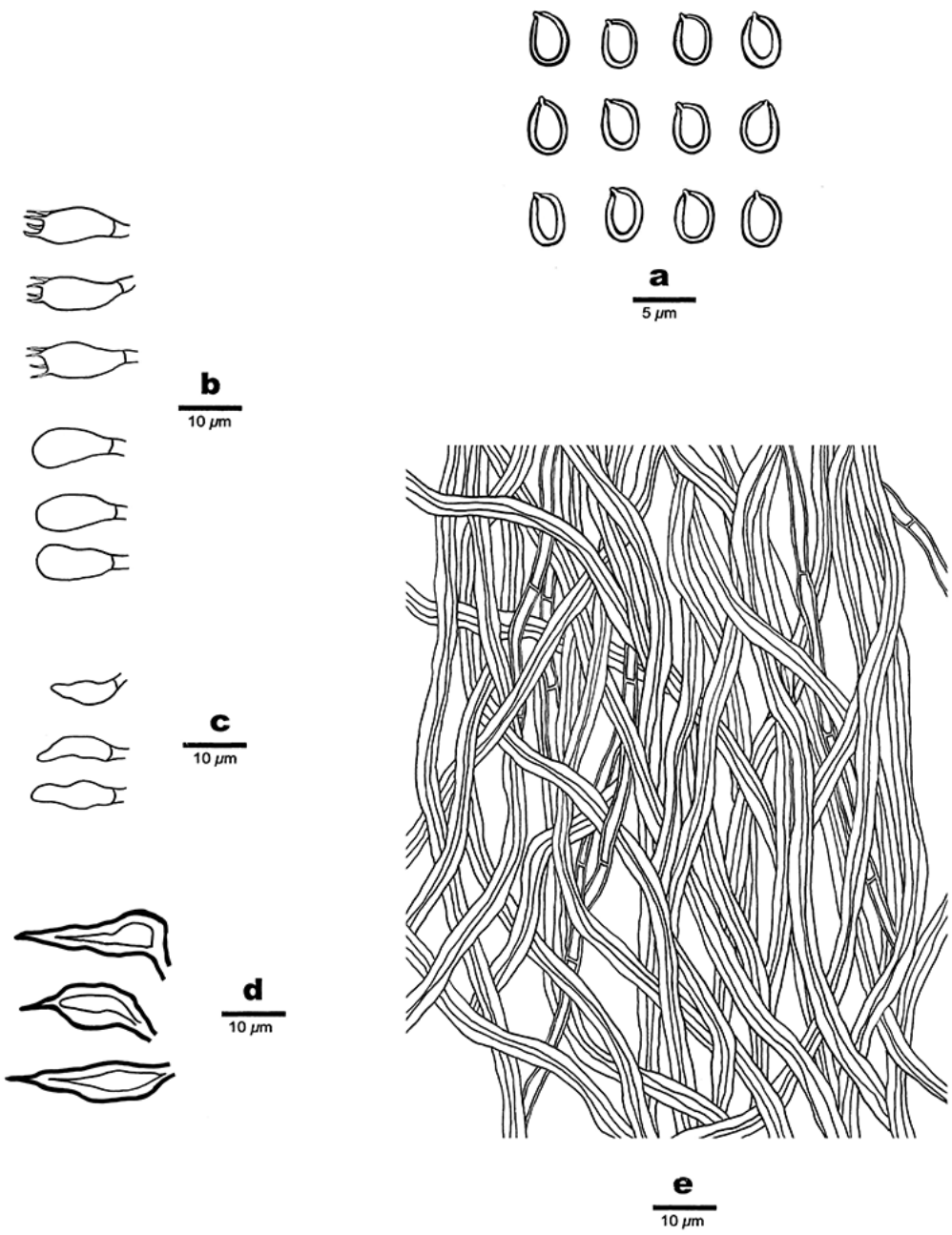

Figure 68

Microscopic structures of Sanghuangporus australianus (Dai 18847). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from trama.

Figure 69

A basidiocarp of Sanghuangporus lagerstroemiae (Dai 18337).

Figure 70

Microscopic structures of Sanghuangporus lagerstroemiae (Dai 18337). a. Basidiospores; b. Cystidioles; c. Hymenial setae; d. Hyphae from trama; e. Hyphae at dissepiment edge.

Figure 71

Maximum likelihood tree illustrating the phylogeny of Tropicoporus based on the combined dataset of ITS+nLSU sequences. Phellinus betulinus (MH856059, MH867554) was used as outgroup. The maximum likelihood bootstrap values (≥50) and bayesian posterior probability values (≥0.80) are indicated above the branches. The new species and newly generated sequences are in bold.

Figure 72

Basidiocarps of Tropicoporus angustisulcatus (Dai 17409).

Figure 73

Microscopic structures of Tropicoporus angustisulcatus (Dai 17409). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from context; f. Hyphae from trama.

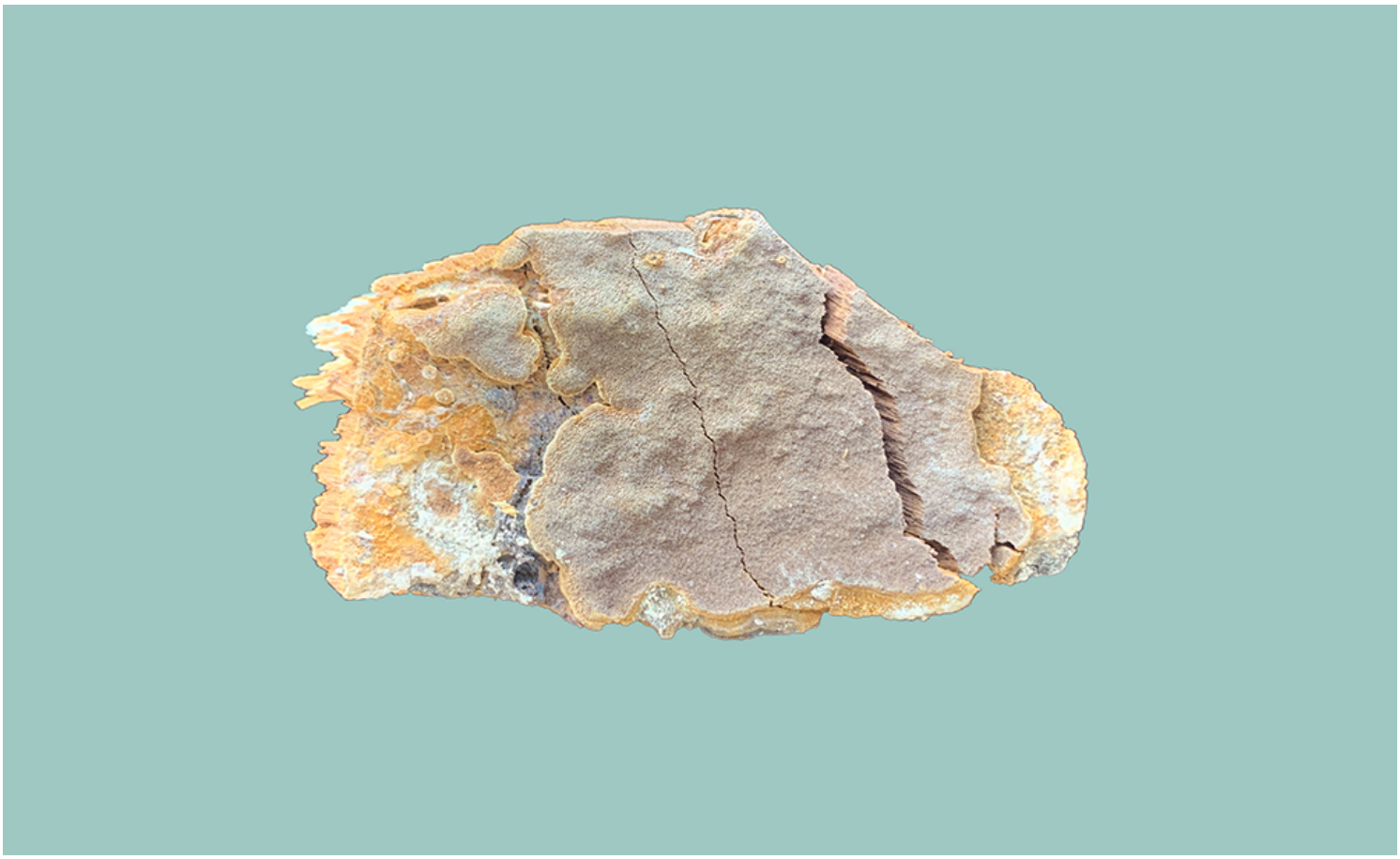

Figure 74

A basidiocarp of Tropicoporus hainanisis (Dai17705).

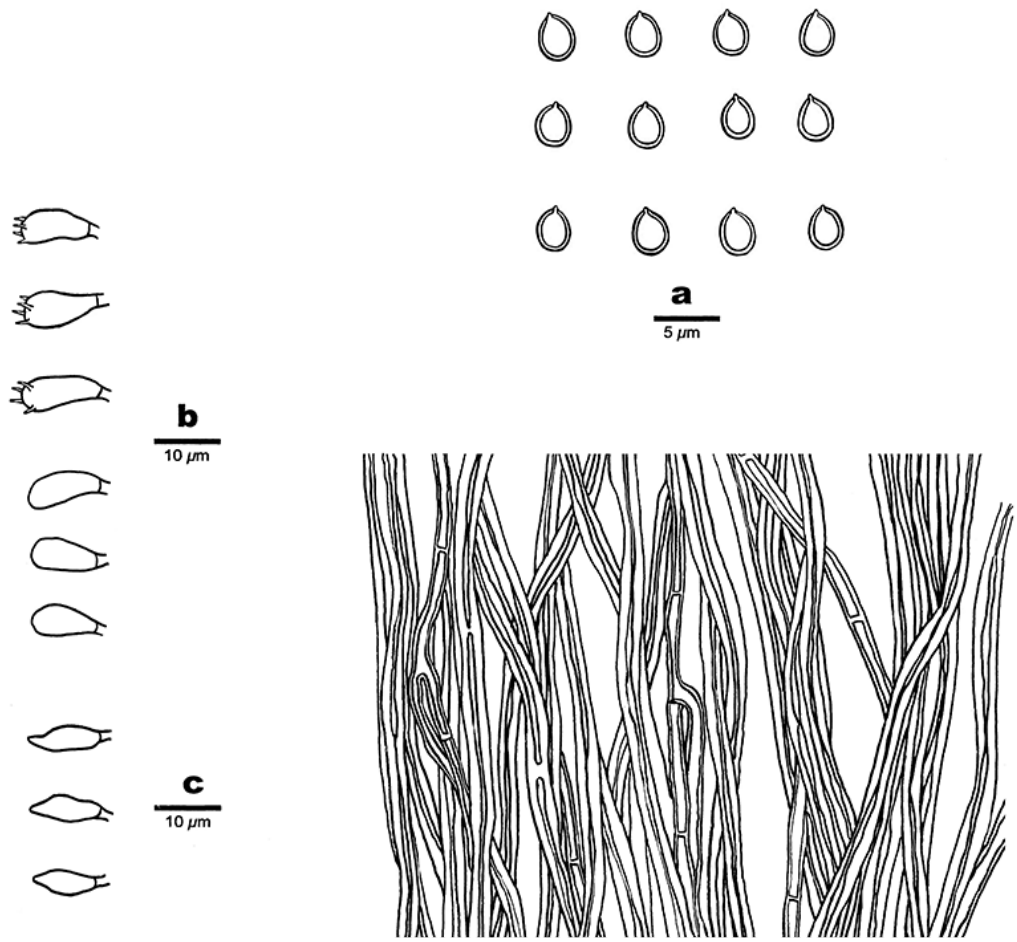

Figure 75

Microscopic structures of Tropicoporus hainanisis (Dai17705). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from trama.

Figure 76

Basidiocarps of Tropicoporus lineatus (Dai 21196).

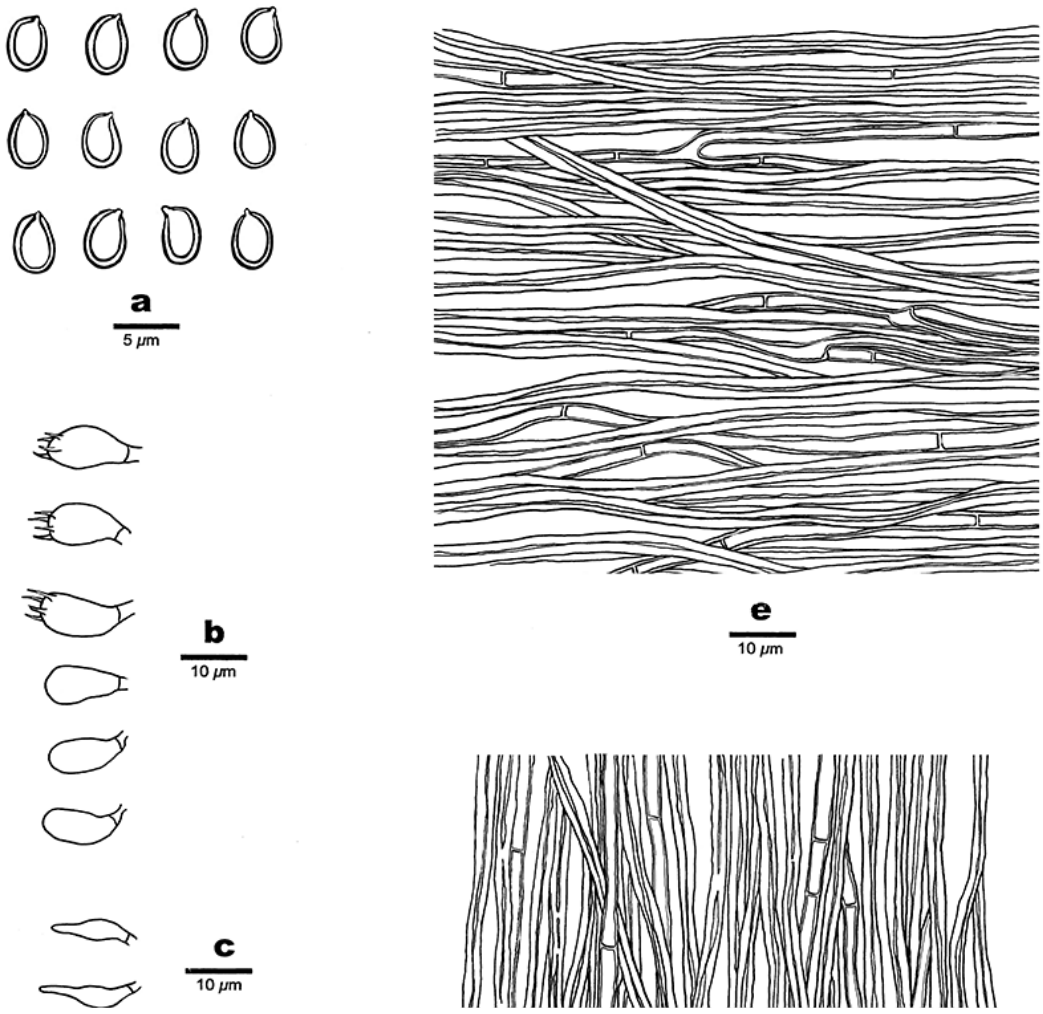

Figure 77

Microscopic structures of Tropicoporus lineatus (Dai 21196). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from context; f. Hyphae from trama.

Figure 78

A basidiocarp of Tropicoporus minus (Dai 21139).

Figure 79

Microscopic structures of Tropicoporus minus (Dai 21139). a. Basidiospores; b. Basidia and bidioles; c Cystidioles; d Hymenial setae; e Hyphae from trama.

Figure 80

A basidiocarp of Tropicoporus ravidus (Dai 18165).

Figure 81

Microscopic structures of Tropicoporus ravidus (Dai 18165). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from trama.

Figure 82

Basidiocarps of Tropicoporus substratificans (JV1908/80).

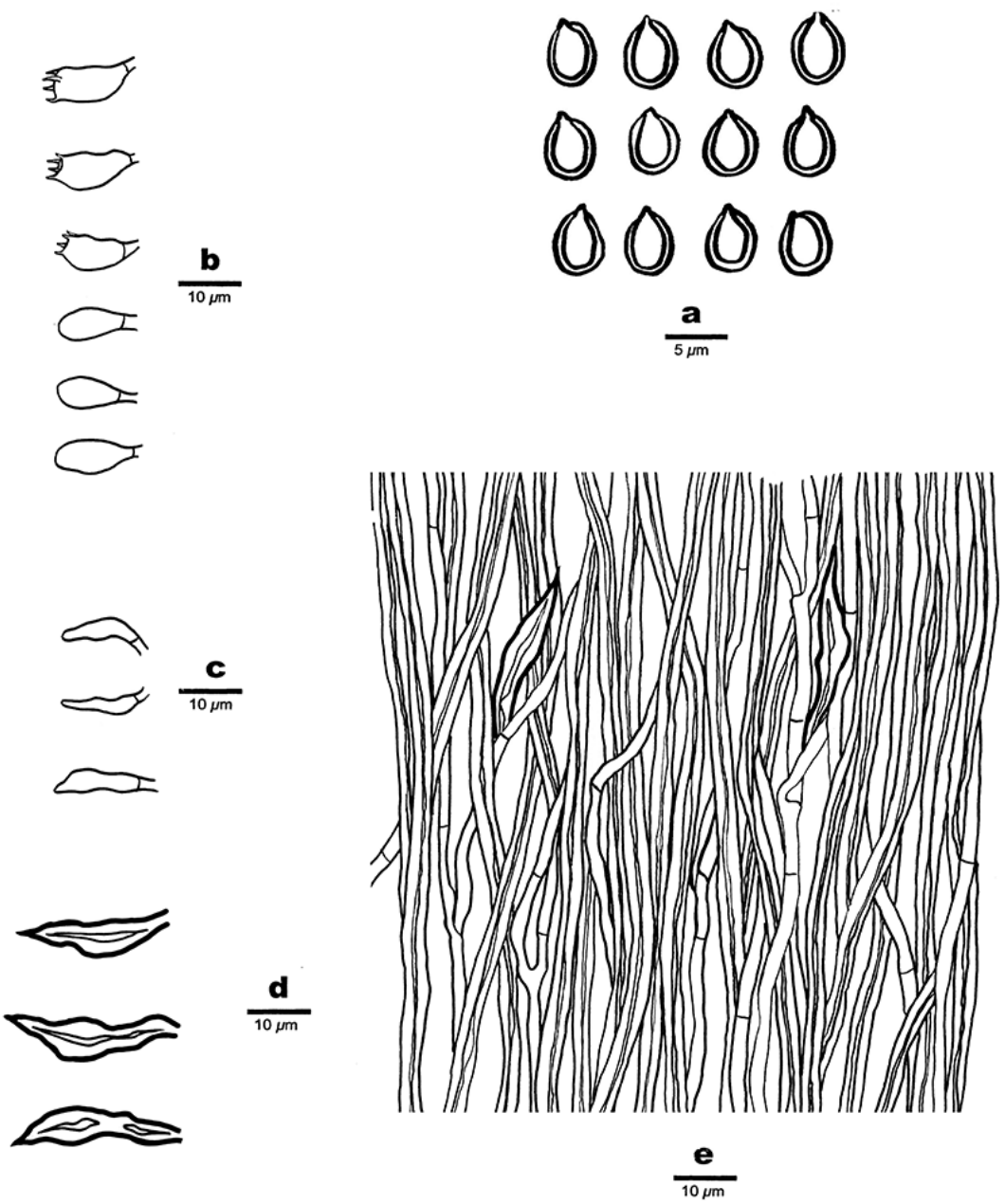

Figure 83

Microscopic structures of Tropicoporus substratificans (JV 1908/80). a. Basidiospores; b. Basidia and basidioles; c. Cystidioles; d. Hymenial setae; e. Hyphae from trama.

Figure 84

A basidiocarp of Tropicoporus tenuis (Dai 19699).

Figure 85

Microscopic structures of Tropicoporus tenuis (Dai 19699). a. Basidiospores; b. Basidia and basidioles; c. Hymenial setae; d. Hyphae from trama.

Supplementary Files

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- Table1Supplementarytable1.docx