



# Taxonomy and multi-gene phylogeny of *Datronia* (*Polyporales*, *Basidiomycota*)

H.J. Li<sup>1</sup>, B.K. Cui<sup>1</sup>, Y.C. Dai<sup>1</sup>

## Key words

ITS  
nLSU  
*Polyporaceae*  
RPB2  
wood-inhabiting fungi

**Abstract** Taxonomic and phylogenetic studies on *Datronia* were carried out. Phylogeny based on ITS, nLSU and RPB2 regions revealed that *Datronia* in current sense includes species belonging to three distantly related clades in polypores. The *Datronia* in a restricted sense is proposed for the clade including the type species *D. mollis* and *D. stereoides*. *Neodatronia* gen. nov. was proposed for two new resupinate species, *N. gaoligongensis* and *N. sinensis*. Species of *Neodatronia* differ from *Datronia* s.s. by their resupinate basidiomes, moderately to frequently branched skeletal hyphae in subiculum. *Datroniella* gen. nov., typified by *D. scutellata* was proposed for species in the other clade. Four new species of *Datroniella*, *D. melanocarpa*, *D. subtropica*, *D. tibetica* and *D. tropica*, were identified. Species of *Datroniella* differ from *Datronia* s.s. by their moderately to frequently branched skeletal hyphae in context and absence of dendrohyphidia. While, differentiate from *Neodatronia* by their small pileate, effused-reflexed or rarely resupinate basidiomes and absence of dendrohyphidia. Illustrated descriptions of the new species and two new genera are provided. The main morphological differences between *Datronia*, *Datroniella*, *Neodatronia* and related genera are discussed, identification keys to related genera and species in each genus are provided.

**Article info** Received: 24 January 2013; Accepted: 18 June 2013; Published: 6 May 2014.

## INTRODUCTION

*Datronia* Donk was established by Donk (1966) on *D. mollis* (Sommerf.) Donk. The genus is characterized by effused-reflexed basidiocarps, brown to black pileal surface which is tomentose or glabrous, more or less brownish context usually with a black line upwards, a dimittic hyphal system with clamped generative hyphae, hyaline, thin-walled and smooth basidiospores which are negative in Melzer's reagent, and an ecology causing a white rot mainly on angiosperm wood (Gilbertson & Ryvarden 1986, Ryvarden 1991, Ryvarden & Gilbertson 1993, Núñez & Ryvarden 2001). At present, eight species are accepted in the genus, *D. decipiens* (Bres.) Ryvarden, *D. glabra* Ryvarden, *D. mollis*, *D. orcomanta* Robledo & Rajchenb., *D. perstrata* (Comer) T. Hatt. & Sotome, *D. scutellata* (Schwein.) Gilb. & Ryvarden, *D. sepiicolor* (Comer) T. Hatt. & Sotome and *D. stereoides* (Fr.) Ryvarden (Ryvarden 1987, 1988, Núñez & Ryvarden 2001, Robledo et al. 2006, Hattori & Sotome 2013).

Phylogenetic studies showed that *Datronia* nested within the core polyporoid clade and was closely related to some species of *Polyporus* P. Micheli ex Adans. (Binder et al. 2005, Sotome et al. 2008, Ghobad-Nejhad & Dai 2010, Justo & Hibbett 2011, Sotome et al. 2013). However, only *D. mollis* and *D. scutellata* were sampled in the previous studies, and they were never clustered together as a monophyletic lineage (Sotome et al. 2008, Justo & Hibbett 2011). So, further phylogenetic analyses sampling more species are needed to clarify the relationships of *Datronia* and its related genera.

In the last two decades, extensive taxonomic studies of wood-inhabiting fungi in China have been carried out, and many new species were described based on morphological characters (Dai 1995, Dai & Niemelä 1997, Langer & Dai 1998, Dai et al. 2002, 2003, 2004, 2009, 2010, 2011, Cui & Dai 2006, Cui et

al. 2011a, Dai 2010, Li & Cui 2010, He & Li 2011). Recently, molecular data along with morphology were used to certify the taxonomy and phylogeny of wood-inhabiting fungi in China (Cui et al. 2008, 2011b, Cui 2013, Cui & Decock 2013, Li & Cui 2013, Tian et al. 2013, Yuan 2013, Zhao & Cui 2013, Zhao et al. 2013). During investigations of wood-inhabiting fungi in China, nearly 200 specimens were preliminarily identified as *Datronia* spp., but their taxonomic affinities and phylogenetic relationships remain uncertain. The aim of this work is to clarify the taxonomy and phylogeny of *Datronia* species in China based on both morphological study and phylogenetic analysis using three genes (ITS, nLSU and RPB2).

## MATERIAL AND METHODS

### Morphological studies

For the studied specimens, most are deposited at the herbarium of the Institute of Microbiology, Beijing Forestry University (BJFC), while a few samples from Canada and Finland were provided by the Botanical Museum of the University of Helsinki (H). The microscopic procedure followed Cui & Zhao (2012). In presenting the variation in the size of the spores, 5 % of measurements were excluded from each end of the range and were given in parentheses. In the text the following abbreviations are used: IKI = Melzer's reagent, IKI– = both inamyloid and indextrinoid, KOH = 5 % potassium hydroxide, CB = Cotton Blue, CB– = acyanophilous, CB+ = cyanophilous, L = mean spore length (arithmetic average of all spores), W = mean spore width (arithmetic average of all spores), Q = variation in the L/W ratios between the specimens studied, n = number of spores measured/number of specimens. Special colour codes followed Petersen (1996).

### DNA extraction, PCR amplification and sequencing

CTAB rapid plant genome extraction kit-DN14 (Aidlab Biotechnologies Co., Ltd, Beijing) was used to obtain PCR products

<sup>1</sup> Institute of Microbiology, Beijing Forestry University, Beijing 100083, China; corresponding authors e-mail: baokaicui2013@gmail.com; yuchengd@yahoo.com.

from dried specimens according to the manufacturer's instructions with some modifications. ITS region was amplified with primer pairs ITS5 (GGA AGT AAA AGT CGT AAC AAG G) and ITS4 (TCC TCC GCT TAT TGA TAT GC) (White et al. 1990). Nuclear LSU region was amplified with primer pairs LR0R (ACC CGC TGA ACT TAA GC) and LR7 (TAC TAC CAC CAA GAT CT) (<http://www.biology.duke.edu/fungi/mycolab/primers.htm>). RPB2 was amplified with primer pairs fRPB2-f5F (GAY GAY MGW GAT CAY TTY GG) and bRPB2-7.1R (CCC ATR GCY TGY TTM CCC ATD GC) (Liu et al. 1999, Matheny 2005). The PCR procedure for ITS 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 procedure for RPB2 follows Justo & Hibbett (2011) with slightly modifications. Initial denaturation at 94 °C for 2 min, followed by 10 cycles at 94 °C for 40 s, 60 °C for 40 s and 72 °C for 2 min, then followed by 37 cycles at 94 °C for 45 s, 55 °C for 1.5 min and 72 °C for 2 min, and a final extension of 72 °C for 10 min. The PCR products were directly sequenced at Beijing Genomics Institute, China, with the same primers. All newly generated sequences were deposited at GenBank (Table 1).

### Phylogenetic analysis

Beside the sequences generated from this study, reference taxa for our phylogenetic analysis were selected based on Binder et al. (2005), Sotome et al. (2008, 2013), Justo & Hibbett (2011) and through searches in GenBank (Table 1). The phylogeny was inferred from combined ITS, nLSU and RPB2 sequences. Sequences of each gene was initially aligned using Clustalx1.83 (Chenna et al. 2003) and manually edited in BioEdit 7.0.5.3 (Hall 1999). Their combinability was evaluated with the incongruence length difference (ILD) test (Farris et al. 1994) implemented in PAUP\* 4.0b10 (Swofford 2002). Heuristic search and 1 000 homogeneity replicates were performed. A P-value of < 0.05 was considered as statistically significant for combinability. Our ILD test found a P-value of 0.32, indicating no significant discrepancy between ITS, nLSU and RPB2 sequences in reconstructing phylogenetic trees. The alignment of combined ITS, nLSU and RPB2 sequences was deposited at TreeBase (submission ID 13816). Maximum parsimony (MP) analysis and Bayesian inference (BI) of ITS, nLSU and RPB2 were performed with PAUP\* 4.0b10 and MrBayes 3.1.2 (Ronquist & Huelsenbeck 2003), respectively. Phylogenetic trees were visualized using Treeview (Page 1996).

For MP analysis, gaps were treated as missing data. Trees were generated using 100 replicates of random stepwise addition of sequence and tree-bisection reconnection (TBR) branch-

**Table 1** Species and their GenBank accession numbers of ITS, nLSU and RPB2 sequences used in this study.

Species	Sample number / Location	ITS	nLSU	RPB2	References
<i>Datronia mollis</i>	Dai 11253 / China	JX559258	JX559289	JX559306	this study
	Dai 11456 / China	JX559253	JX559292	JX559307	this study
	RLG6304sp / USA	JN165002*	JN164791*	JN164872*	Justo & Hibbett 2011
	WD794 / Japan	AB587623*	AB368063*	AB368121*	Sotome et al. 2008
<i>Datronia stereoides</i>	Holonen / Finland	KC415179	KC415196	KC415202	this study
	Niemelä 3020 / Canada	KC415178	KC415195	–	this study
<i>Datroniella melanocarpa</i>	Cui 10646 (holotype) / China	KC415186	KC415194	KC415201	this study
<i>Datroniella scutellata</i>	Cui 7265 / China	JX559263	JX559300	–	this study
<i>Datroniella subtropica</i>	RLG9584T / USA	JN165004*	JN164792*	JN164873*	Justo & Hibbett 2011
	Dai 7186 (paratype) / China	JX559262	JX559301	JX559310	this study
	Dai 12881 (holotype) / China	KC415183	KC415193	KC415200	this study
	Dai 12883 (paratype) / China	KC415184	KC415191	KC415198	this study
<i>Datroniella tibetica</i>	Dai 12885 (paratype) / China	KC415185	KC415192	KC415199	this study
	Cui 9486 (holotype) / China	JX559265	JX559299	JX559309	this study
<i>Datroniella tropica</i>	Cui 9510 (paratype) / China	JX559264	JX559298	JX559308	this study
	Dai 13147 (holotype) / China	KC415181	KC415189	KC477838	this study
<i>Echinochaete ruficeps</i>	Dai 13152 (paratype) / China	KC415182	KC415190	KC477839	this study
	WD674 / Japan	AB462310*	AB368065*	AB368123*	Sotome et al. 2008
<i>Favolus emerici</i>	WD2343 / Japan	AB587626*	AB368089*	AB368146*	Sotome et al. 2008
<i>Favolus roseus</i>	PEN33 / Japan	AB735975*	AB368099*	AB368156*	Sotome et al. 2008, 2013
<i>Lentinus tigrinus</i>	DSH93-181 / –	AY218419*	AF518627*	AY218493*	Wang et al. 2004
<i>Neodatronia gaoligongensis</i>	Cui 8055 (holotype) / China	JX559269	JX559286	JX559317	this study
	Cui 8132 (paratype) / China	JX559270	JX559287	JX559316	this study
	Cui 8186 (paratype) / China	JX559268	JX559285	JX559318	this study
	Cui 9434 (paratype) / China	JX559271	JX559282	JX559319	this study
<i>Neodatronia sinensis</i>	Cui 9976 (paratype) / China	JX559276	JX559279	JX559321	this study
	Cui 10769 (paratype) / China	KC415187	KC415197	KC415203	this study
	Dai 11921 (holotype) / China	JX559272	JX559283	JX559320	this study
<i>Neofavolus alveolaris</i>	WD2358 / Japan	AB587624*	AB368079*	AB368136*	Sotome et al. 2008
<i>Polyporus arcularius</i>	WD2359 / Japan	AB478875*	AB368082*	AB368139*	Sotome et al. 2008
<i>Polyporus badius</i>	WD2341 / Japan	AB587625*	AB368083*	AB368140*	Sotome et al. 2008
<i>Polyporus cf. pseudobetulinus</i>	WD1872 / Japan	AB587641*	AB368092*	AB368151*	Sotome et al. 2008
<i>Polyporus grammacephalus</i>	WD2351 / Japan	AB587627*	AB368090*	AB368148*	Sotome et al. 2008
<i>Polyporus guianensis</i>	CuITENN10921 SBI 8 / Venezuela	AF516566*	AJ487948*	–	–
<i>Polyporus leprieurii</i>	CuITENN10489 SBI 10 / Costa Rica	AF516567*	AJ487949*	–	–
<i>Polyporus squamosus</i>	AFTOL-ID 704 / –	DQ267123*	AY629320*	DQ408120*	–
<i>Polyporus tricholoma</i>	CuITENN9579 SBI 1 / USA	AF516553*	AJ488115*	–	Krüger et al. 2004
<i>Polyporus tubaeformis</i>	WD1839 / Japan	AB587634*	AB368101*	AB368158*	Sotome et al. 2008
<i>Polyporus tuberaster</i>	WD2382 / Japan	AB474086*	AB368104*	AB368161*	Sotome et al. 2008
<i>Polyporus umbellatus</i>	WD719 / Japan	–	AB368109*	AB368166*	Sotome et al. 2008
<i>Polyporus varius</i>	WD619 / Japan	AB587635*	AB368110*	AB368167*	Sotome et al. 2008
	WD2347 / Japan	AB587636*	AB368111*	AB368168*	Sotome et al. 2008
<i>Pseudofavolus cucullatus</i>	WD2157 / Japan	AB587637*	AB368114*	AB368170*	Sotome et al. 2008
<i>Trametes sanguinea</i>	PRSC95 / Puerto Rico	JN164982*	JN164795*	JN164858*	Justo & Hibbett 2011
<i>Trametes suaveolens</i>	FP102529sp / USA	JN164966*	JN164807*	JN164853*	Justo & Hibbett 2011

\* Sequences derived from GenBank.

swapping algorithm, with all characters given equal weight. The consistency indices (CI, Kluge & Farris 1969), retention indices (RI, Farris 1989) and rescaled consistency indices (RC, Farris 1989) were calculated for each tree generated. Branch support for all parsimony analysis was estimated by performing 1 000 bootstrap replicates (Felsenstein 1985) with a heuristic search of 10 random-addition replicates for each bootstrap replicate.

The best-fit models of nucleotide substitution, selected by the hierarchical likelihood ratio tests (hLRT; Huelsenbeck & Crandall 1997, Posada & Crandall 2001) implemented in MrModelTest 2.2 (Posada & Crandall 1998, Nylander 2004), were used for estimating BI. Eight Markov chains were run with a random starting tree for 1 000 000 generations of combined dataset of ITS, nLSU and RPB2, and trees were sampled every 100 generations. The first one-fourth of the sampled trees, which represented the burn-in phase of the analysis, were discarded, while the last three-fourth trees were used for calculating posterior probabilities in the consensus tree. Confident branch support is defined as Bayesian posterior probabilities (BPPs) equal or more than 0.95.

**RESULTS**

A total of 44 ITS, 45 nLSU and 40 RPB2 sequences were included in the combined dataset (Table 1), of which 21 ITS and nLSU, and 19 RPB2 were newly generated in this study. The resulted alignment had 3 097 base pairs with 908 parsimony-informative characters. Twelve equally parsimonious trees were yielded (tree length = 4.061, CI = 0.450, RI = 0.695, RC = 0.313) and one of them was shown in Fig. 1. In the par-

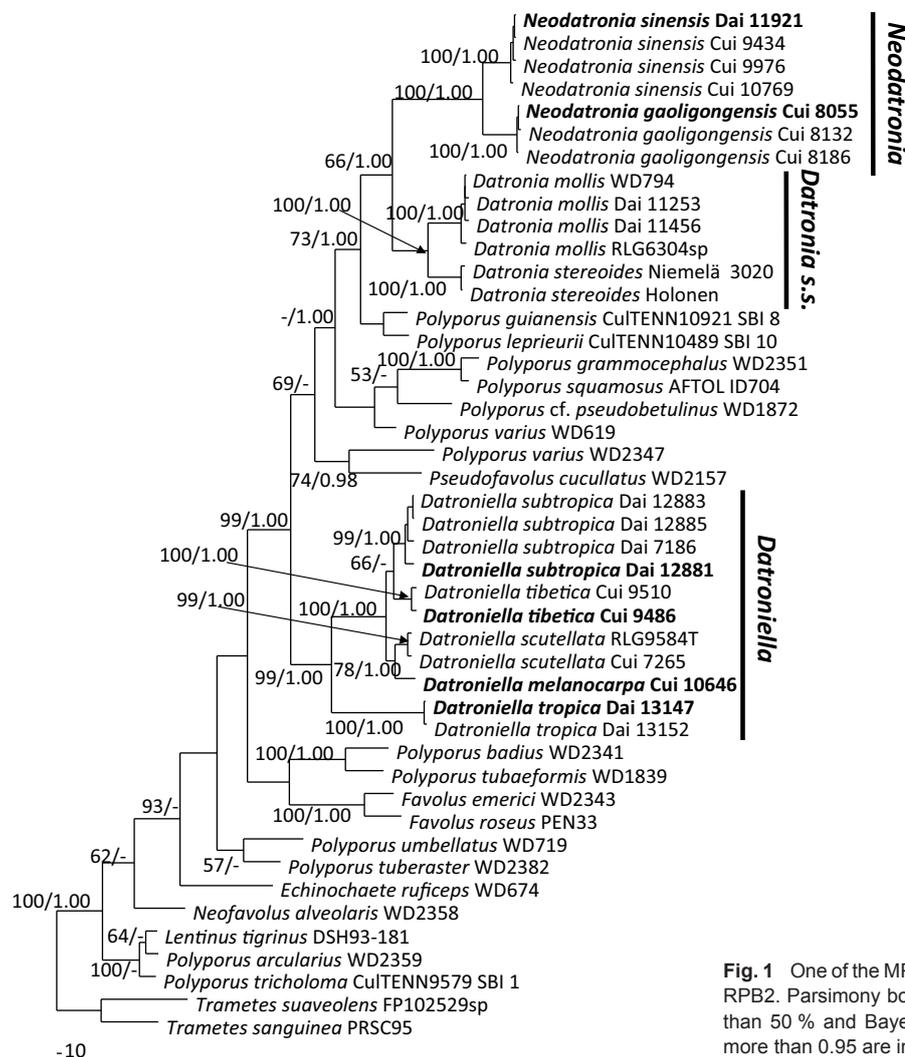
simony analysis, the current *Datronia* includes species belonging to three distinct clades, namely one clade of *D. mollis* and *D. stereoides*, the clade clustered by two Chinese resupinate species and the clade of *D. scutellata* and related species (Fig. 1). We propose to restrict *Datronia* to *D. mollis* and *D. stereoides*. The clade including two Chinese resupinate species was proposed as a new genus, *Neodatronia* gen. nov., and two new species, *N. gaoligongensis* and *N. sinensis* were identified (Fig. 1). *Datronia scutellata* and related species was proposed as member of another new genus, *Datroniella* gen. nov., typified by *D. scutellata*. Four new species, *D. melanocarpa*, *D. subtropica*, *D. tibetica* and *D. tropica*, were identified from China (Fig. 1). In the Bayesian analysis, no conflicts between topologies from the MP tree were discovered, the separation of *Datroniella* and *Neodatronia* from *Datronia* was also supported. Three clades identified as *Datronia* s.s., *Datroniella* and *Neodatronia* were strongly supported (BPP = 1.00, Fig. 1), and sequences of the six new species appear as distinct lineages with high support. Best model estimated and applied in the BI was ‘GTR+I+G’ with equal frequency of nucleotides.

**TAXONOMY**

***Datroniella*** B.K. Cui, Hai J. Li & Y.C. Dai, *gen. nov.* — Myco-bank MB803225

*Type species. Datroniella scutellata* (Schwein.) B.K. Cui, Hai J. Li & Y.C. Dai.

*Etymology. Datroniella*: referring to the genus morphologically similar to *Datronia*.



**Fig. 1** One of the MP tree inferred from combined dataset of ITS, nLSU and RPB2. Parsimony bootstrap proportions (before the slash markers) higher than 50 % and Bayesian posterior probabilities (after the slash markers) more than 0.95 are indicated along branches.

Basidiocarps annual, pileate, effused-reflexed or rarely resupinate, when pileate, pileus usually projecting less than 3 cm. Pileal surface brown to black, glabrous. Pore surface white, cream to pale brown; pores large to small, round to angular. Context pale brown to brown, corky. Hyphal system dimitic, generative hyphae with clamp connections, skeletal hyphae usually dominating, pale brown to brown, moderately to frequently branched in context and frequently branched in trama, IKI–, CB+, tissues darkening in KOH. Dendrohyphidia and cystidia absent in the hymenium, thin-walled cystidioles usually present. Basidiospores cylindrical, hyaline, thin-walled, smooth, IKI–, CB–. Usually growth on angiosperm wood and causing a white rot.

***Datroniella melanocarpa*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.* — MycoBank MB803226; Fig. 2, 3a

*Holotype.* CHINA, Sichuan Province, Jiuzhaigou County, Jiuzhaigou Nature Reserve, on living angiosperm tree, 12 Oct. 2012, B.K. Cui, Cui 10646 (BJFC).

*Etymology.* *melanocarpa* (Lat.): referring to the black pileal surface.

Basidiocarps annual, pileate. Pore surface white or cream to pale brown when dry; pores round, 2–3 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, slightly CB+; tissues turn to black in KOH and fading when dry. Basidiospores cylindrical, hyaline, thin-walled, smooth, IKI–, CB–,  $8.8\text{--}11 \times 3\text{--}4 \mu\text{m}$ .

*Basidiome* annual, pileate, without odour or taste when fresh, becoming corky upon drying; pilei projecting up to 8 mm, 2 cm wide and 3 mm thick at base. Sterile margin indistinct. Pileal surface fuscous to black, glabrous, often wrinkled and distinctly sulcate with zones. Pore surface white or cream to slightly pink when fresh, become brown when bruised, cream to pale brown when dry; pores round, 2–3 per mm; dissepiments thin, entire. Context pale yellowish brown, corky, up to 0.5 mm thick. Tubes concolorous with pore surface, corky, up to 2.5 mm long. *Hyphal system* dimitic; generative hyphae bearing clamp

connections; skeletal hyphae IKI–, slightly CB+; tissues turn to black in KOH and fading when dry. Generative hyphae in context infrequent, hyaline, thin-walled, moderately branched,  $1.8\text{--}5 \mu\text{m}$  diam; skeletal hyphae dominant, pale brown to pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, thick-walled basal stalk,  $3.5\text{--}6 \mu\text{m}$  wide, up to  $70\text{--}150 \mu\text{m}$  long, the branches  $2.4\text{--}4.5 \mu\text{m}$  wide,  $170\text{--}300 \mu\text{m}$  long. Generative hyphae in trama infrequent, hyaline, thin-walled, moderately branched,  $1.8\text{--}2.5 \mu\text{m}$  diam; skeletal hyphae dominant, pale brown to pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes,  $3.3\text{--}4 \mu\text{m}$  wide in the main part, up to  $20\text{--}80 \mu\text{m}$  long, the branches  $2\text{--}3.5 \mu\text{m}$  wide,  $50\text{--}250 \mu\text{m}$  long. *Dendrohyphidia* absent. *Cystidia* absent; *cystidioles* present, more or less ventricose, thin-walled, smooth,  $23\text{--}30 \times 6\text{--}9 \mu\text{m}$ . *Basidia* clavate to uniform, with four sterigmata and a basal clamp connection,  $25\text{--}30 \times 8\text{--}9 \mu\text{m}$ ; basidioles clavate or pyriform, smaller than basidia. *Basidiospores* cylindrical, hyaline, thin-walled, smooth, IKI–, CB–,  $(8.7\text{--})8.8\text{--}11 \times (2.9\text{--})3\text{--}4 \mu\text{m}$ ,  $L = 9.69 \mu\text{m}$ ,  $W = 3.46 \mu\text{m}$ ,  $Q = 2.8$  ( $n = 40/1$ ).

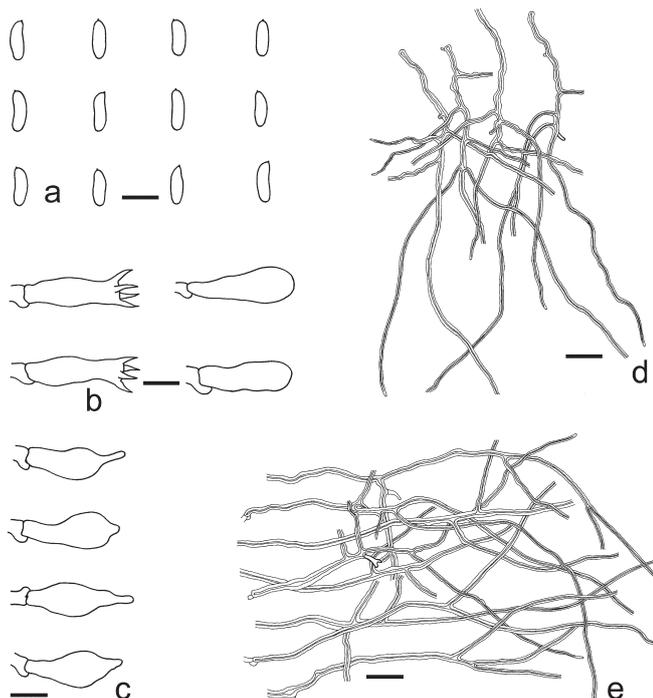
*Notes* — *Datroniella melanocarpa* is characterized by its small black basidiocarps, large and round pores (2–3 per mm). *Datronia mollis* (Fig. 3b) is similar to the new species in producing large basidiospores ( $10\text{--}12 \times 3\text{--}4 \mu\text{m}$ , Núñez & Ryvarden 2001), however, the former usually has larger effused-reflexed basidiomes with tomentose surface and larger pores (1–2 per mm, Núñez & Ryvarden 2001).

***Datroniella scutellata*** (Schwein.) B.K. Cui, Hai J. Li & Y.C. Dai, *comb. nov.* — Mycobank MB803227; Fig. 3b, 4

*Basionym.* *Polyporus scutellatus* Schwein., Trans. Amer. Philos. Soc., 4, 2: 157. 1832.

= *Datronia scutellata* (Schwein.) Gilb. & Ryvarden, Mycotaxon 22: 364. 1985.

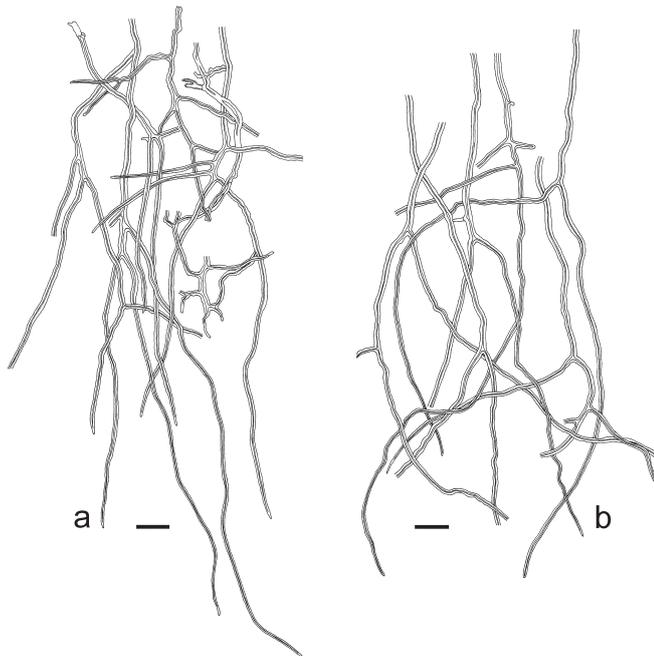
*Basidiome* annual, effused-reflexed or pileate, without odour or taste when fresh, becoming corky upon drying; pilei projecting up to 8 mm, 12 mm wide and 3 mm thick at base. Sterile margin indistinct. Pileal surface yellowish brown to black from margin towards the base, glabrous and sulcate. Pore surface white or cream to pale brown when dry; pores round, 3.5–5 per mm; dissepiments thin, entire. Context yellowish brown to brown, corky, up to 2 mm thick. Tubes concolorous with context, corky, up to 1 mm long. *Hyphal system* dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and fading when dry. Generative hyphae in context infrequent, hyaline, thin-walled, moderately branched,  $2\text{--}2.5 \mu\text{m}$  diam; skeletal hyphae dominant, pale brown, thick-walled with a narrow lumen to subsolid, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, thick-walled basal stem,  $3.8\text{--}4.5 \mu\text{m}$  wide, up to  $120\text{--}200 \mu\text{m}$  long, the branches  $1.7\text{--}3.8 \mu\text{m}$  wide,  $200\text{--}360 \mu\text{m}$  long. Generative hyphae in trama infrequent, hyaline, thin-walled, rarely branched,  $1.5\text{--}2.3 \mu\text{m}$  diam; skeletal hyphae dominant, pale brown, thick-walled with a narrow lumen to subsolid, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes,  $3\text{--}5 \mu\text{m}$  wide in the main part, up to  $30\text{--}150 \mu\text{m}$  long, the branches  $2\text{--}3.5 \mu\text{m}$  wide,  $120\text{--}370 \mu\text{m}$  long. *Dendrohyphidia*, *cystidia* and *cystidioles* absent. *Basidia* clavate, with four sterigmata and a basal clamp connection,  $20\text{--}27 \times 6\text{--}8 \mu\text{m}$ ; basidioles in shape similar to basidia, but smaller. *Basidiospores* cylindrical, hyaline, thin-walled, smooth, usually with 1–3 moderate guttules, IKI–, CB–,  $(7.6\text{--})7.8\text{--}9.2(9.8) \times 3\text{--}3.6(3.8) \mu\text{m}$ ,  $L = 8.53 \mu\text{m}$ ,  $W = 3.13 \mu\text{m}$ ,  $Q = 2.69\text{--}2.76$  ( $n = 60/2$ ).



**Fig. 2** Microscopic structures of *Datroniella melanocarpa*. a. Basidiospores; b. basidia and basidioles; c. cystidioles; d. skeletal hyphae from trama; e. skeletal hyphae from context (all: holotype). — Scale bars: a–c = 10  $\mu\text{m}$ ; d, e = 20  $\mu\text{m}$ .



**Fig. 3** Basidiocarps of *Datronia*, *Datroniella* and *Neodatronia* species. a. *Datroniella melanocarpa*; b. *D. scutellata*; c, d. *D. subtropica*; e. *D. tibetica*; f. *D. tropica*. g. *Datronia mollis*; h. *Neodatronia gaoligongensis*; i. *N. sinensis*. — Scale bars = 1 cm.



**Fig. 4** Microscopic structures of *Datroniella scutellata*. a. Skeletal hyphae from trama; b. skeletal hyphae from context (all: Cui 7265). — Scale bars = 20  $\mu$ m.

*Specimens examined.* CHINA, Henan Province, Xiuwu County, Yuntaishan Park, on fallen angiosperm trunk, 4 Sept. 2009, B.K. Cui, Cui 7263 (BJFC); on living tree of *Ulmus*, 4 Sept. 2009, B.K. Cui, Cui 7265 (BJFC).

*Notes* — *Datroniella scutellata* is characterized by its effused-reflexed or pileate basidiocarps, small and round pores (3.5–5 per mm) and white or cream to pale brown pore surface.

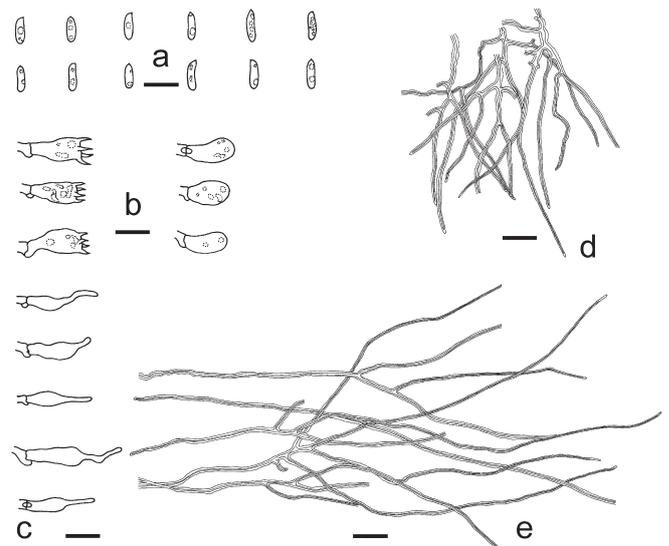
***Datroniella subtropica*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.* — MycoBank MB803228; Fig. 3c, d, 5

*Holotype.* CHINA, Sichuan Province, Xichang, on fallen angiosperm branch, 16 Sept. 2012, Y.C. Dai, Dai 12881 (BJFC).

*Etymology.* *subtropica* (Lat.): referring to the species being distributed in the subtropics.

Basidiocarps annual, effused-reflexed or pileate. Pileal surface buff or yellowish brown to black from margin towards the base, glabrous, narrowly sulcate. Pore white to pale brown when dry; pores round, 6–8 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and fading when dry. Basidiospores cylindrical, hyaline, thin-walled, smooth, usually with one to several small guttules, IKI–, CB–,  $6.8\text{--}8 \times 2\text{--}2.7 \mu\text{m}$ .

*Basidiome* annual, effused-reflexed or pileate, without odour or taste when fresh, becoming corky upon drying; pilei projecting up to 8 mm, 1.5 cm wide and 2 mm thick at base. Sterile margin indistinct. Pileal surface buff or yellowish brown to black from margin towards the base, glabrous, narrowly sulcate. Pore surface white to pale brown when dry; pores round, 6–8 per mm; dissepiments thick, entire. Context yellowish brown, corky, up to 0.2 mm thick. Tubes concolorous with pore surface, corky, up to 1.8 mm long. *Hyphal system* dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and fading when dry. Generative hyphae in context infrequent, hyaline, thin-walled, moderately branched, 1.7–3.5  $\mu$ m diam; skeletal hyphae dominant, pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, little differentiated, thick-walled basal stalk, 2.8–4  $\mu$ m wide, up to 100–400  $\mu$ m long, the branches 1.8–3  $\mu$ m wide, over 200  $\mu$ m long. Generative hyphae in trama



**Fig. 5** Microscopic structures of *Datroniella subtropica*. a. Basidiospores; b. basidia and basidioles; c. cystidioles; d. skeletal hyphae from trama; e. skeletal hyphae from context (all: holotype). — Scale bars: a–c = 10  $\mu$ m; d, e = 20  $\mu$ m.

infrequent, hyaline, thin-walled, usually incrustated with fine crystals at dissepimental ends, moderately branched, 1.5–3  $\mu$ m diam; skeletal hyphae dominant, pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, frequently branched, straight to sinuous, 3–6  $\mu$ m wide in the main part, up to 30–80  $\mu$ m long, the branches 2–3.5  $\mu$ m wide, 50–170  $\mu$ m long. *Dendrohyphidia* absent. *Cystidia* absent; *cystidioles* present, more or less fusoid, thin-walled, smooth,  $13\text{--}23 \times 4\text{--}5 \mu\text{m}$ . *Basidia* more or less barrel-shaped, with four sterigmata and a basal clamp connection,  $15\text{--}18 \times 6\text{--}8 \mu\text{m}$ ; basidioles in shape similar to basidia, but smaller. *Basidiospores* cylindrical, slightly tapering at apiculus, hyaline, thin-walled, smooth, usually with one to several small guttules, IKI–, CB–,  $(6.5\text{--})6.8\text{--}8 \times 2\text{--}2.7\text{--}(3) \mu\text{m}$ ,  $L = 7.27 \mu\text{m}$ ,  $W = 2.31 \mu\text{m}$ ,  $Q = 3.13\text{--}3.16$  ( $n = 80/2$ ).

*Additional specimens (paratypes) examined.* CHINA, Fujian Province, Wuyishan Nature Reserve, on fallen angiosperm branch, 18 Oct. 2005, Y.C. Dai, Dai 7186 (BJFC); Sichuan Province, Xichang, on fallen angiosperm branch, 16 Sept. 2012, Y.C. Dai, Dai 12883, 12885 (BJFC).

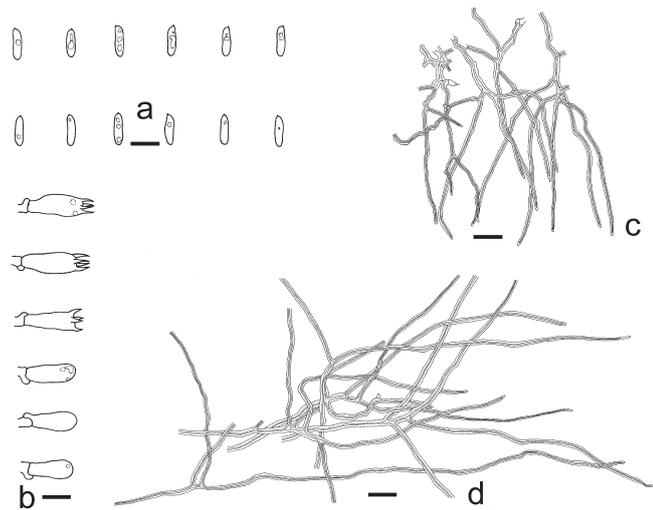
*Notes* — *Datroniella subtropica* is characterized by its effused-reflexed or pileate basidiocarps, pileal surface glabrous, narrowly sulcate, buff or yellowish brown to black from margin towards the base, small and round pores (6–8 per mm) and distribution within subtropical areas. *Datronia glabra* also has small pores (7–8 per mm) and similar basidiospores ( $7\text{--}9 \times 2\text{--}3 \mu\text{m}$ , Ryvarden 1987), but its dextrinoid skeletal hyphae are different from those of *D. subtropica*.

***Datroniella tibetica*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.* — MycoBank MB803229; Fig. 3e, 6

*Holotype.* CHINA, Xizang Autonomous Region (Tibet), Bomi County, on fallen angiosperm branch, 19 Sept. 2010, B.K. Cui, Cui 9486 (BJFC).

*Etymology.* *tibetica* (Lat.): referring to the locality (Tibet) of the species.

Basidiocarps annual, resupinate to effused-reflexed or pileate. Pileal surface buff, yellowish brown or cinnamon to black from margin towards the base, glabrous and distinctly sulcate with zones. Pore ash-grey when dry; pores round to angular, 4–6 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and fading when dry. Basidiospores cylindrical, hyaline, thin-walled, smooth, usually with one to three small guttules, IKI–, CB–,  $8\text{--}10.2 \times 2.5\text{--}3 \mu\text{m}$ .



**Fig. 6** Microscopic structures of *Datroniella tibetica*. a. Basidiospores; b. basidia and basidioles; c. skeletal hyphae from trama; d. skeletal hyphae from context (all: holotype). — Scale bars: a, b = 10  $\mu$ m; c, d = 20  $\mu$ m.

**Basidiome** annual, resupinate to effused-reflexed or pileate, without odour or taste when fresh, becoming corky upon drying; pilei projecting up to 7 mm, 1.5 cm wide and 3 mm thick at base. Sterile margin indistinct. Pileal surface buff, yellowish brown or cinnamon to black from margin towards the base, glabrous and distinctly sulcate with zones. Pore surface greyish white when fresh, ash-grey when dry; pores round to angular, 4–6 per mm; dissepiments thin to thick, entire. Context pale yellowish brown, corky, up to 0.3 mm thick. Tubes concolorous with pore surface, corky, up to 2.7 mm long. **Hyphal system** dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and fading when dry. Generative hyphae in context infrequent, hyaline, thin-walled, sometimes incrustated with fine crystals, moderately branched, 2–4  $\mu$ m diam; skeletal hyphae dominant, pale yellowish brown to golden yellow, thick-walled with a narrow lumen to subsolid, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, little differentiated, thick-walled basal stalk, 3–5  $\mu$ m wide, over 90  $\mu$ m long, the branches 2.8–4  $\mu$ m wide, 200–400  $\mu$ m long. Generative hyphae in trama infrequent, hyaline, thin-walled, usually incrustated with fine crystals at dissepimental ends, moderately branched, 1.8–2.8  $\mu$ m diam; skeletal hyphae dominant, pale yellowish brown to golden yellowish, thick-walled with a narrow lumen to subsolid, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes, 3.5–5.2  $\mu$ m wide in the main part, up to 30–60  $\mu$ m long, the branches 2.2–3.6  $\mu$ m wide, 110–160  $\mu$ m long. **Dendrohyphidia**, **cystidia** and **cystidioles** absent. **Basidia** more or less barrel-shaped, with four sterigmata and a basal clamp connection, 16–25  $\times$  6–8  $\mu$ m; basidioles in shape similar to basidia, but smaller. **Basidiospores** cylindrical, slightly tapering at apiculus, hyaline, thin-walled, smooth, usually with one to three small guttules, IKI–, CB–, (7.8–)8–10.2(–10.8)  $\times$  2.5–3(–3.1)  $\mu$ m, L = 9.13  $\mu$ m, W = 2.88  $\mu$ m, Q = 3.01–3.33 (n = 80/2).

**Additional specimen (paratype) examined.** CHINA, Xizang Autonomous Region (Tibet), Bomi County, on fallen angiosperm branch, 19 Sept. 2010, B.K. Cui, Cui 9510 (BJFC).

**Notes** — Tibet is located in the Qinghai-Tibet Plateau, which is known as ‘the roof of the world’. This area is characterized by extremely complex topography and is considered as one of the most important hotspots of biodiversity. *Datroniella tibetica* is characterized by its small basidiocarps with buff to yellowish brown or cinnamon pileal surface, small, round to angular pores (4–6 per mm), generative hyphae sometimes incrustated with

fine crystals. *Datroniella scutellata* also has effused-reflexed or pileate basidiocarps, similar pores (3.5–5 per mm), but its basidiospores (7.8–9.2  $\times$  3–3.6  $\mu$ m) are distinctly wider than those in *D. tibetica*.

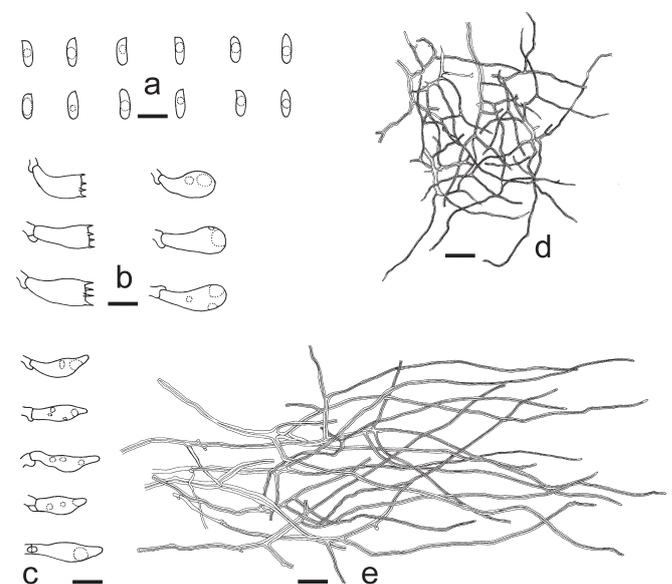
***Datroniella tropica*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.* — MycoBank MB803230; Fig. 3f, 7

**Holotype.** CHINA, Yunnan Province, Longchuan County, Tongbiguan Nature Reserve, on fallen angiosperm branch, 31 Oct. 2012, Y.C. Dai, Dai 13147 (BJFC).

**Etymology.** *tropica* (Lat.): referring to the species being distributed in the tropics.

**Basidiocarps** annual, effused-reflexed. Pileal surface yellowish brown to reddish brown or almost black from margin towards the base, glabrous, azonate to slightly sulcate. Pore white to cream pale grey when dry; pores round, 5–7 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and leave a black stain when dry. Basidiospores cylindrical, hyaline, thin-walled, smooth, usually with 1–3 small to moderate guttules, IKI–, CB–, 8–9.8  $\times$  2.5–3.5  $\mu$ m.

**Basidiome** annual, effused-reflexed, without odour or taste when fresh, becoming corky upon drying; pilei projecting up to 2 cm, 2 cm wide and 2.5 mm thick at base. Sterile margin buff to cinnamon-buff or brown, up to 1 mm wide. Pileal surface yellowish brown to reddish brown or almost black from margin towards the base, glabrous, azonate to slightly sulcate. Pore surface white to cream when fresh, become brown when bruised, pale grey when dry; pores round, 5–7 per mm; dissepiments thin to thick, entire. Context yellowish brown to brown, corky, up to 0.3 mm thick. Tubes concolorous with pore surface, corky, up to 2.2 mm long. **Hyphal system** dimitic; generative hyphae bearing clamp connections; skeletal hyphae IKI–, CB+; tissues turn to black in KOH and leave a black stain when dry. Generative hyphae in context infrequent, hyaline, thin- to slightly thick-walled, moderately branched, 1.8–3.5  $\mu$ m diam; skeletal hyphae dominant, pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, little differentiated, thick-walled basal stalk, 3–8  $\mu$ m wide, up to 70–120  $\mu$ m long, the branches 2–4  $\mu$ m wide, 200–380  $\mu$ m long.



**Fig. 7** Microscopic structures of *Datroniella tropica*. a. Basidiospores; b. basidia and basidioles; c. cystidioles; d. skeletal hyphae from trama; e. skeletal hyphae from context (all: holotype). — Scale bars: a–c = 10  $\mu$ m; d, e = 20  $\mu$ m.

Generative hyphae in trama infrequent, hyaline, thin-walled, moderately branched, 1.3–2.3 µm diam; skeletal hyphae dominant, pale yellowish brown, thick-walled with a narrow lumen to subsolid, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes, 3.7–4.8 µm wide in the main part, up to 20–70 µm long, branches well differentiated from the main part, 1.8–3 µm wide, 20–160 µm long. *Dendrohyphidia* absent. *Cystidia* absent; *cystidioles* present, fusoid, thin-walled, smooth, 13–22 × 4–6 µm. *Basidia* more or less barrel-shaped, with four sterigmata and a basal clamp connection, 16–25 × 6–8 µm; basidioles mostly pyriform, smaller than basidia. *Basidiospores* cylindrical, hyaline, thin-walled, smooth, usually with one to three guttules, IKI–, CB–, (7.4–)8–9.8(–10) × (2.1–)2.5–3.5(–3.9) µm, L = 8.54 µm, W = 2.93 µm, Q = 2.66–3.1 (n = 101/4).

*Additional specimens (paratypes) examined.* CHINA, Hainan Province, Ledong County, Jianfengling Nature Reserve, on fallen angiosperm branch, 18 Nov. 2007, B.K. Cui, Cui 5201 (BJFC); on fallen angiosperm trunk, 18 Nov. 2007, Y.C. Dai, Dai 9291 (BJFC); Yunnan Province, Mangao Nature Reserve, on fallen angiosperm trunk, 8 June 2011, Y.C. Dai, Dai 12336 (BJFC); Longchuan County, Tongbiguan Nature Reserve, on fallen angiosperm branch, 31 Oct. 2012, Y.C. Dai, Dai 13152 (BJFC).

**Notes** — *Datroniella tropica* is characterized by its effused-reflexed basidiocarps, yellowish brown to reddish brown or almost black pileal surface, small and round pores (5–7 per mm) and distribution in tropical China. *D. subtropica* also has small pores (6–8 per mm), but its basidiospores are distinctly smaller (6.8–8 × 2–2.7 µm) than those of *D. tropica*.

***Neodatronia*** B.K. Cui, Hai J. Li & Y.C. Dai, *gen. nov.* — MycoBank MB804548

*Type species.* *Neodatronia sinensis* B.K. Cui, Hai J. Li & Y.C. Dai.

*Etymology.* *Neodatronia*: referring to the resemblance of the genus to *Datronia*.

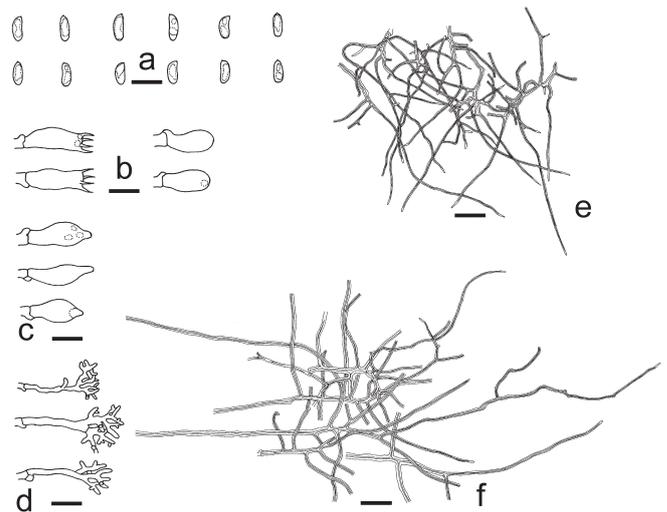
Basidiocarps annual, resupinate. Pore surface white, cream to pale brown; pores moderate to small, round to angular; pores surface fragile when dry. Subiculum yellowish brown to cinnamon, corky. Hyphal system dimitic, generative hyphae with clamp connections, skeletal hyphae usually dominating, pale brown to brown, moderately to frequently branched in subiculum and trama, branches of tramal skeletal hyphae usually well differentiated from the main part, IKI–, CB+, tissues darkening in KOH. *Dendrohyphidia* present in the hymenium and dissepiment edges, *cystidia* absent, but thin-walled *cystidioles* usually present. *Basidiospores* cylindrical, hyaline, thin-walled, smooth, IKI–, CB–. Usually growth on angiosperm wood and causing a white rot.

***Neodatronia gaoligongensis*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.* — MycoBank MB804549; Fig. 3h, 8

*Holotype.* CHINA, Yunnan Province, Baoshan County, Gaoligong Nature Reserve, on fallen angiosperm branch, 24 Oct. 2009, B.K. Cui, Cui 8055 (BJFC).

*Etymology.* *gaoligongensis* (Lat.): referring to its locality, Yunnan Province, Gaoligong Nature Reserve.

Basidiocarps annual, resupinate. Pore surface cream to pale grey; pores angular, 5–8 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal-binding hyphae IKI–, CB+; tissues in subiculum turn to black in KOH and leave a black stain when dry, tissues in subiculum unchanged and pore surface turned to olivaceous and paler when dry. *Dendrohyphidia* abundant in the hymenium and dissepiment edges. *Basidiospores* cylindrical, usually slightly curved, hyaline, thin-walled, smooth, with one to three small to large guttules, IKI–, CB–, 7–9.8 × 3–3.8 µm.



**Fig. 8** Microscopic structures of *Neodatronia gaoligongensis*. a. Basidiospores; b. basidia and basidioles; c. cystidioles; d. dendrohyphidia; e. skeletal hyphae from trama; f. skeletal hyphae from subiculum (all: holotype). — Scale bars: a–d = 10 µm; e, f = 20 µm.

*Basidiome* annual, resupinate, corky, without odour or taste when fresh, becoming hard corky upon drying, up to 17 cm long, 3 cm wide and 0.4 mm thick at centre. Sterile margin indistinct. Pore surface cream to pale grey; pores angular, shallow, 5–8 per mm; dissepiments thin, usually entire to lacerate. Subiculum yellowish brown, hard corky, up to 0.2 mm thick. Tubes concolorous with pore surface, fragile, up to 0.2 mm long. *Hyphal system* trimitic; generative hyphae bearing clamp connections; skeletal-binding hyphae IKI–, CB+; tissues in subiculum turn to black in KOH and leave a black stain when dry, tissues in subiculum unchanged and pore surface turned to olivaceous and paler when dry. Generative hyphae in subiculum infrequent, hyaline, thin-walled, moderately branched, 1.8–2.8 µm diam; skeletal hyphae dominant, yellowish brown, thick-walled with a wide to narrow lumen, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, little differentiated, thick-walled basal stalk, 3–5 µm wide, up to 10–180 µm long, the branches 1.8–3.4 µm wide, 80–320 µm long. Generative hyphae in trama infrequent, hyaline, thin-walled, moderately branched, 1.5–2.5 µm diam; skeletal hyphae dominant, pale yellowish brown, thick-walled with a narrow lumen, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes, 3–4 µm wide in the main part, up to 10–50 µm long, branches well differentiated from the main part, 1.4–2 µm wide, 50–200 µm long. *Dendrohyphidia* abundant in the hymenium and dissepiment edges. *Cystidia* absent; *cystidioles* present, fusoid, thin-walled, smooth, 16–25 × 5–7 µm. *Basidia* clavate, with four sterigmata and a basal clamp connection, 17–21 × 6.5–9 µm; basidioles in shape similar to basidia but smaller. *Basidiospores* cylindrical, hyaline, thin-walled, smooth, with one to two large guttules, IKI–, CB–, (6.8–)7–9.8(–10.2) × (2.7–)3–3.8(–4) µm, L = 8.1 µm, W = 3.2 µm, Q = 2.31–2.74 (n = 90/3).

*Additional specimens (paratypes) examined.* CHINA, Yunnan Province, Baoshan County, Gaoligong Nature Reserve, on fallen angiosperm branch, 25 Oct. 2009, B.K. Cui, Cui 8132 (BJFC), 26 Oct. 2009, B.K. Cui, Cui 8186 (BJFC).

**Notes** — *Neodatronia gaoligongensis* is characterized by its cream to pale grey pore surface, small pores (5–8 per mm) and presence of *dendrohyphidia* in the hymenium and dissepiment edges. *Neodatronia gaoligongensis* is similar to *N. sinensis* by having resupinate basidiocarps, but the latter species has larger pores (4–6 per mm) and smaller basidiospores (6.8–8 × 2–2.6 µm).

***Neodatronia sinensis*** B.K. Cui, Hai J. Li & Y.C. Dai, *sp. nov.*  
— MycoBank MB804550; Fig. 3i, 9

*Holotype.* CHINA, Anhui Province, Huangshan, on dead tree of *Cyclobalanopsis*, 22 Oct. 2010, Y.C. Dai, Dai 11921 (BJFC).

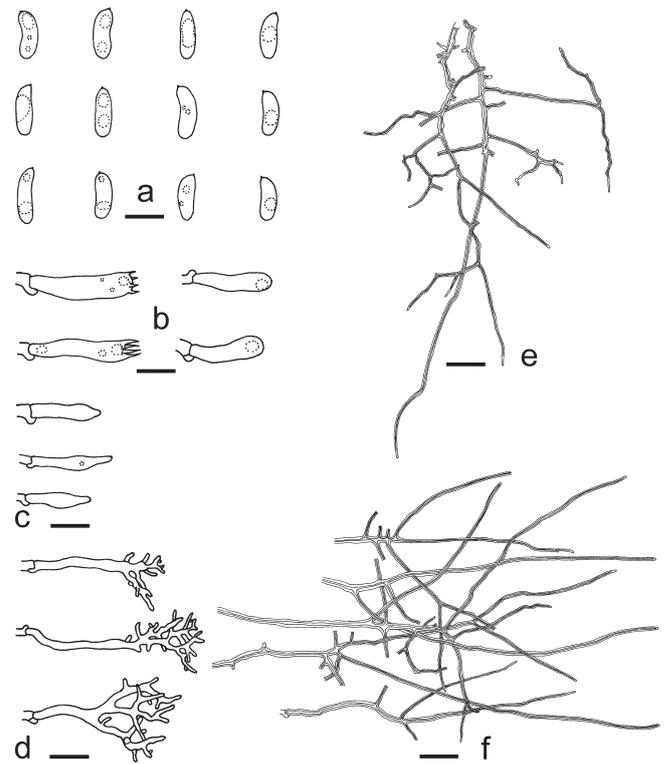
*Etymology.* *sinensis* (Lat.): referring to the country where this new species was found.

Basidiocarps annual, resupinate. Pore surface cream to buff to pale grey; pores angular, 4–6 per mm. Hyphal system dimitic; generative hyphae bearing clamp connections; skeletal-binding hyphae IKI–, CB+, tissues in subiculum turn to black in KOH and leave a black stain when dry, tissues in subiculum unchanged and pore surface turned to olivaceous and paler when dry. Dendrohyphidia abundant in the hymenium and dissepiment edges. Basidiospores cylindrical, usually slightly curved, hyaline, thin-walled, smooth, with 1–3 small to large guttules, IKI–, CB–,  $6.8\text{--}8 \times 2\text{--}2.6 \mu\text{m}$ .

*Basidiome* annual, resupinate, corky, without odour or taste when fresh, becoming hard corky upon drying, up to 20 cm long, 7 cm wide and 1 mm thick at centre. Sterile margin distinct, pale yellowish brown to cinnamon, up to 1 mm wide. Pore surface cream to buff to pale grey; pores angular, shallow, 4–6 per mm; dissepiments thin, usually entire and lacerate on sloping parts. Subiculum yellowish brown to cinnamon, hard corky, up to 0.8 mm thick. Tubes concolorous with pore surface, fragile, up to 0.2 mm long. *Hyphal system* trimitic; generative hyphae bearing clamp connections; skeletal-binding hyphae IKI–, CB+; tissues in subiculum turn to black in KOH and leave a black stain when dry, tissues in subiculum unchanged and pore surface turned to olivaceous and paler when dry. Generative hyphae in subiculum infrequent, hyaline, thin-walled, occasionally branched, 2–3.8  $\mu\text{m}$  diam; skeletal hyphae dominant, pale brown, thick-walled with a wide to narrow lumen, interwoven, moderately to frequently branched, straight to sinuous, with an unbranched, little differentiated, thick-walled basal stalk, 2.8–5  $\mu\text{m}$  wide, up to 50–150  $\mu\text{m}$  long, the branches 2–3  $\mu\text{m}$  wide, 60–240  $\mu\text{m}$  long. Generative hyphae in trama infrequent, hyaline, thin-walled, moderately branched, 1.2–2.2  $\mu\text{m}$  diam; skeletal hyphae dominant, pale brown, thick-walled with a wide to narrow lumen, interwoven, frequently branched, straight to sinuous, then occasionally with lateral aborted processes, 2.8–4  $\mu\text{m}$  wide in the main part, up to 10–30  $\mu\text{m}$  long, branches well differentiated from the main part, 1.3–2.6  $\mu\text{m}$  wide, 15–220  $\mu\text{m}$  long. *Dendrohyphidia* abundant in the hymenium and dissepiment edges. *Cystidia* absent; *cystidioles* present, fusoid, thin-walled, smooth, 12–18  $\times$  3.5–5  $\mu\text{m}$ . *Basidia* clavate, with four sterigmata and a basal clamp connection, 18–24  $\times$  4.5–6.5  $\mu\text{m}$ ; basidioles in shape similar to basidia, but smaller. *Basidiospores* cylindrical, usually slightly curved, hyaline, thin-walled, smooth, with one to three small to large guttules, IKI–, CB–,  $(6.2\text{--})6.8\text{--}8\text{--}(8.8) \times 2\text{--}2.6\text{--}(2.7) \mu\text{m}$ ,  $L = 7.29 \mu\text{m}$ ,  $W = 2.28 \mu\text{m}$ ,  $Q = 3.06\text{--}3.35$  ( $n = 60/2$ ).

*Additional specimens (paratypes) examined.* CHINA, Fujian Province, Wuyishan Nature Reserve, on fallen angiosperm branch, 22 Oct. 2005, Y.C. Dai, Dai 7374 (BJFC); Jilin Province, Antu County, Changbaishan Nature Reserve, on fallen trunk of *Acer*, 7 Aug. 2011, B.K. Cui, Cui 9949 (BJFC); on fallen angiosperm branch, 8 Aug. 2011, B.K. Cui, Cui 9976 (BJFC); Sichuan Province, Baoxing County, Fengtongzhai Nature Reserve, on fallen angiosperm branch, 18 Oct. 2012, B.K. Cui, Cui 10758, 10764, 10769 (BJFC); Xizang Autonomous Region, Linzhi County, on fallen angiosperm branch, 18 Sept. 2010, B.K. Cui, Cui 9434 (BJFC); Yunnan Province, Baoshan County, Gaoligong Nature Reserve, on fallen angiosperm branch, 25 Oct. 2009, B.K. Cui, Cui 8181 (BJFC), 28 Oct. 2012, Y.C. Dai, Dai 13096 (BJFC).

*Notes* — *Neodatronia sinensis* is characterized by its cream to buff to pale grey pore surface, small pores (4–6 per mm) and presence of dendrohyphidia in the hymenium and dissepiment edges. *Datronia stereoides* is similar to *N. sinensis*



**Fig. 9** Microscopic structures of *Neodatronia sinensis*. a. Basidiospores; b. basidia and basidioles; c. cystidioles; d. dendrohyphidia; e. skeletal hyphae from trama; f. skeletal hyphae from subiculum (all: holotype). — Scale bars: a = 5  $\mu\text{m}$ ; b–d = 10  $\mu\text{m}$ ; e, f = 20  $\mu\text{m}$ .

by having small angular pores (4–5 per mm), cystidioles and dendrohyphidia in the hymenium, but the former species has distinct larger basidiospores ( $8\text{--}12 \times 3.5\text{--}4.5 \mu\text{m}$ , Núñez & Ryvarden 2001).

#### **Notes on other species recorded of *Datronia* without molecular data**

***Datronia decipiens*** (Bres.) Ryvarden, Mycotaxon 33: 308. 1988

*Basionym.* *Trametes decipiens* Bres., Ann. Mycol. 18, 1–3: 40. 1920.

*Notes* — This species is characterized by effused-reflexed, dark brown, tomentose basidiomes, a dimitic hyphal system, large ellipsoid to subcylindrical basidiospores and lacking dendrohyphidia (Ryvarden 1988, Table 2). Its effused-reflexed basidiomes, lacking dendrohyphidia indicates it may be a *Datroniella* species.

***Datronia glabra*** Ryvarden, Mycotaxon 28, 2: 527. 1987

*Notes* — This species is characterized by pileate, glabrous basidiomes with pale brown to corky colour pileal surface which becoming bay from the base, a trimitic hyphal system and dextrinoid skeletal and binding hyphae (Ryvarden 1987, Table 2). All these characters indicate this species may belong to *Corioloropsis* Murrill.

***Datronia orcomanta*** Robledo & Rajchenb., Canad. J. Bot. 84, 10: 1566. 2006

*Notes* — This species is characterized by its effused-reflexed to pileate to triquetrous or unguulate and pendant basidiomes, with chocolate brown pileal surface, pale brown context, a dimitic hyphal system with frequently branched skeletal hyphae, lacking dendrohyphidia (Robledo et al. 2006, Table 2). Morphological characters of this species indicate it may belong to *Datroniella*.

**Table 2** Main morphological characters of *Datronia* s.s., *Datroniella*, *Neodatronia* and other *Datronia* species.

Species	Pores (/mm)	Basidiocarps	Basidiospores (µm)	Skeleto-binding hyphae		Dendrohyphidia	Cystidioles	Crystals on generative hyphae	
				Context / subiculum	Trama			Context / subiculum	Dissepimental ends
<b><i>Datronia</i> s.str.</b>									
<i>D. mollis</i>	1–3	R / E / P	10–12 × 3–4	r / m	f	+	+	–	–
<i>D. stereoides</i>	4–7	E	9–11.5 × 3.7–4.6	r	f	+	–	–	–
<b><i>Datroniella</i></b>									
<i>D. melanocarpa</i>	2–3	P	8.8–11 × 3–4	m / f	f	–	+	–	–
<i>D. subtropica</i>	6–8	E / P	6.8–8 × 2–2.7	m / f	f	–	+	–	+
<i>D. tibetica</i>	4–6	E / P	8–10.2 × 2.5–3	m / f	r	–	–	+	+
<i>D. tropica</i>	5–7	E	8–9.8 × 2.5–3.5	m / f	f	–	+	–	–
<i>D. scutellata</i>	3.5–5	E / P	7.8–9.2 × 3–3.6	m / f	f	–	–	–	–
<b><i>Neodatronia</i></b>									
<i>N. gaoligongensis</i>	5–8	R	7–9.8 × 3–3.8	m / f	f	+	+	–	–
<i>N. sinensis</i>	4–6	R	6.8–8 × 2–2.6	m / f	f	+	+	–	–
<b>Other <i>Datronia</i> species</b>									
<i>D. decipiens</i>	About 1	E	14–16 × 6–8	unknown	unknown	–	–	–	–
<i>D. glabra</i>	7–8	P	7–9 × 2–3	Trimitic / dextrinoid	Trimitic / dextrinoid	–	–	–	–
<i>D. orcomanta</i>	3–4	P	13–15 × 4–5.5	f	f	–	+	–	+
<i>D. perstrata</i>	7–8	P	5.5–6 × 2–2.5	f	f	–	–	–	–
<i>D. sepiicolor</i>	1–2 or 2–3	E / P	6.5–9 × 2.5–3.5	f	f	–	–	–	–

Abbreviations used: E = Effused-reflexed; P = Pileate; R = Resupinate; f = frequently branched; m = moderately branched; r = rarely branched; + = present; – = absent.

***Datronia perstrata*** (Corner) T. Hatt. & Sotome, *Mycoscience* 54, 4: 301. 2013

*Basionym.* *Trametes perstrata* Corner, *Beih. Nova Hedwigia* 97: 133. 1989.

Notes — This species is characterized by its pileate basidiomes, with narrowly sulcate, matt to glabrous pileal surface, light brown context, a dimitic hyphal system with frequently branched skeletal hyphae and small cylindrical basidiospores, lacking dendrohyphidia (Corner 1989, Hattori & Sotome 2013, Table 2). All these characters indicate it may be a *Datroniella* species.

***Datronia sepiicolor*** (Corner) T. Hatt. & Sotome, *Mycoscience* 54, 4: 304. 2013

*Basionym.* *Trametes perstrata* Corner, *Beih. Nova Hedwigia* 97: 160. 1989.

Notes — This species is characterized by its sessile to effused-reflexed basidiomes, dark brown, multi-sulcate pileal surface with distinctly tomentose zones, light brown to brown context, a dimitic hyphal system with frequently branched skeletal hyphae and lacking dendrohyphidia (Corner 1989, Hattori & Sotome 2013, Table 2). All these characters indicate it may be a *Datroniella* species.

## DISCUSSION

Our three-gene phylogeny on extensive samples showed that *Datronia* in current sense includes species for three distantly related clades, which confirms *Datronia* was not monophyletic (Sotome et al. 2008, Justo & Hibbett 2011).

One clade included the type species *D. mollis* and *D. stereoides*. This clade was strongly supported by both MP and BI analysis (MP = 100 %, BPP = 1.00, Fig. 1). Four samples of *D. mollis* from China, Japan and USA, two samples of *D. stereoides* from Canada and Finland formed two highly supported lineages (Fig. 1). Both species produce effused-reflexed basidiocarps, dendrohyphidia, rarely to moderately branched skeletal hyphae in context, and have been reported with wide distributions in the world (Gilbertson & Ryvarden 1986, Ryvarden & Gilbertson 1993, Núñez & Ryvarden 2001, Table 2).

*Neodatronia* was formed by two resupinate species: *N. gaoligongensis* and *N. sinensis* with strong support (MP = 100 %, BPP = 1.00, Fig. 1), then it clustered with *Datronia* s.s. Species in both genera share a dimitic hyphal system with clamped generative hyphae, thin-walled basidiospores and presence of dendrohyphidia (Núñez & Ryvarden 2001, Table 2). But *Neodatronia* differs from *Datronia* s.s. by producing distinct resupinate basidiomes, moderately to frequently branched skeletal hyphae in subiculum (Fig. 3, 8–11, Table 2, 3).

The three-loci phylogeny strongly supported the segregation of *D. scutellata* and related species from *D. mollis* clade (Fig. 1). Therefore, a new genus, *Datroniella*, is proposed to accommo-

**Table 3** Skeletal hyphae characterization of *Datronia* s.s., *Datroniella* and *Neodatronia*.

Species	Context / subiculum				Trama			
	Stem (µm)		Branches (µm)		Stem (µm)		Branches (µm)	
	diameter	length	diameter	length	diameter	length	diameter	length
<b><i>Datronia</i> s.s.</b>								
<i>D. mollis</i>	2.8–4	80–500	2–3.5	280–500	2.6–3.2	60–250	1.8–3	20–200
<i>D. stereoides</i>	4–5.8	300–600	3.8–5	> 250	2.5–4	30–80	1.2–3	30–100
<b><i>Datroniella</i></b>								
<i>D. scutellata</i>	3.8–4.5	120–200	1.7–3.8	200–360	3–5	30–150	2–3.5	120–370
<i>D. melanocarpa</i>	3.5–6	70–150	2.4–4.5	170–300	3.3–4	20–80	2–3.5	50–250
<i>D. subtropica</i>	2.8–4	100–400	1.8–3	> 200	3–6	30–80	2–3.5	50–170
<i>D. tibetica</i>	3–5	> 90	2.8–4	200–400	3.5–5.2	30–60	2.2–3.6	110–160
<i>D. tropica</i>	3–8	70–120	2–4	200–380	3.7–4.8	20–70	1.8–3	20–160
<b><i>Neodatronia</i></b>								
<i>N. sinensis</i>	2.8–5	50–150	2–3	60–240	2.8–4	10–30	1.3–2.6	15–220
<i>N. goliigongensis</i>	3–5	10–180	1.8–3.4	80–320	3–4	10–50	1.4–2	50–200

date species in this clade. *Datronia scutellata* was transferred to the new genus as *Datroniella scutellata* and serves as the generic type. Two samples of *D. scutellata* from China and USA formed a monophyletic lineage (bootstrap value = 99 %, BPP = 1.00, Fig. 1), which grouped with *Datroniella melanocarpa* (bootstrap value = 78 %, BPP = 1.00, Fig. 1). *Datroniella scutellata* produces small effused-reflexed or pileate basidiocarps and has a wide distribution in Asia (Núñez & Ryvarden 2001, Dai 2012), Europe (Ryvarden & Gilbertson 1993) and North America (Gilbertson & Ryvarden 1986). *Datroniella melanocarpa*, identified from Sichuan Province, southwestern China, produces small black basidiocarps and large pores (2–3 per mm). *Datroniella subtropica*, originating from southern China, has effused-reflexed or pileate basidiocarps (Fig. 3c, d). *Datroniella tibetica* was described from Xizang Autonomous Region (Tibet) and produces resupinate to effused-reflexed or pileate basidiocarps (Fig. 3e). *Datroniella tropica* was found in tropical China and has effused-reflexed or pileate basidiocarps (Fig. 3f).

The vegetative hyphae characterization (ramification pattern, stem and branches size), and the hyphal structure (variation of the vegetative morphology) were successfully used to corroborate phylogenetic hypothesis in *Perenniporias* s.l. (Robledo et al. 2009). Skeletal hyphae in *D. mollis* and *D. stereoides* are rarely to moderately branched, 80–500 µm and 300–600 µm long, respectively (Fig. 10, 11, Table 2, 3). Skeletal hyphae in *Neodatronia* moderately to frequently branched in subiculum and trama, branches of tramal skeletal hyphae usually well differentiated from the main part (Fig. 8, 9, Table 2, 3). Skeletal hyphae in *Datroniella* are moderately to frequently branched in context (Fig. 2, 4–7, Table 2, 3), which can easily differentiate from *Datronia*.

Dendrohyphidia were recorded in *D. mollis* (Núñez & Ryvarden 2001) and abundantly present at the dissepimental edges of *D. stereoides* (Núñez & Ryvarden 2001). Dendrohyphidia

were also abundant at the dissepimental edges of *Neodatronia gaoligongensis* and *N. sinensis* (Fig. 8, 9, Table 2). But, all five species of *Datroniella* lack dendrohyphidia. The presence or absence of dendrohyphidia showed certain consistency in *Datronia* s.s., *Datroniella* and *Neodatronia* clades.

Morphologically, *Neodatronia* is similar to *Megasporoporia* Ryvarden & J.E. Wright by sharing resupinate basidiomes, dimittic hyphal system with clamped generative hyphae, cylindrical, hyaline, thin-walled basidiospores (Ryvarden et al. 1982, Dai & Wu 2004, Li & Cui 2013). But *Megasporoporia* differs in having dextrinoid skeletal hyphae. Phylogenetically, *Megasporoporia* s.l. is polyphyletic nested within the core polyporoid clade, and two genera, *Megasporia* B.K. Cui, Y.C. Dai & Hai J. Li and *Megasporoporiella* B.K. Cui, Y.C. Dai & Hai J. Li were segregated from *Megasporoporia* (Li & Cui 2013). While *D. mollis* and *D. scutellata* (= *Datroniella scutellata*) were clustered with some *Polyporus* species and were distant from *Megasporoporia* s.l. (Justo & Hibbett 2011, Li & Cui 2013).

*Neodatronia* may resemble the resupinate species of *Dichomitus* D.A. Reid by sharing resupinate basidiomes, dimittic hyphal system and thin-walled basidiospores (Núñez & Ryvarden 2001, Li & Cui 2013). *Dichomitus ecuadoriensis* Ryvarden has similar pores (4–5 per mm) to *N. sinensis* (4–6 per mm), but differs in having white to pale ochraceous context, dextrinoid skeletal hyphae and large basidiospores (10–11 × 5–5.5 µm, Læssøe & Ryvarden 2010). *Dichomitus albidofuscus* (Domański) Domański shares similar small pores (5–7 per mm) to *N. gaoligongensis* (5–8 per mm), but *D. albidofuscus* has thicker basidiomes (up to 1.5 cm) and distinct smaller basidiospores (4–6 × 2.5–3 µm, Ryvarden & Gilbertson 1993). *Dichomitus pendulus* Læssøe & Ryvarden also has smaller pores (6–7 per mm), but its small pendant basidiomes can easily differentiate from *N. gaoligongensis* (Læssøe & Ryvarden 2010).

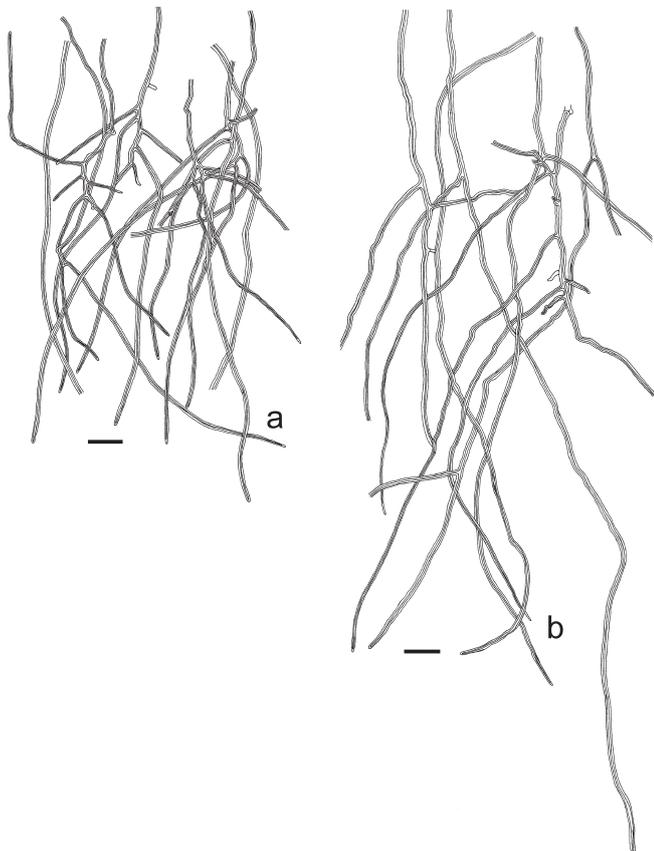


Fig. 10 Microscopic structures of *Datronia mollis*. a. Skeletal hyphae from trama; b. skeletal hyphae from context (all: Dai 11456). — Scale bars = 20 µm.

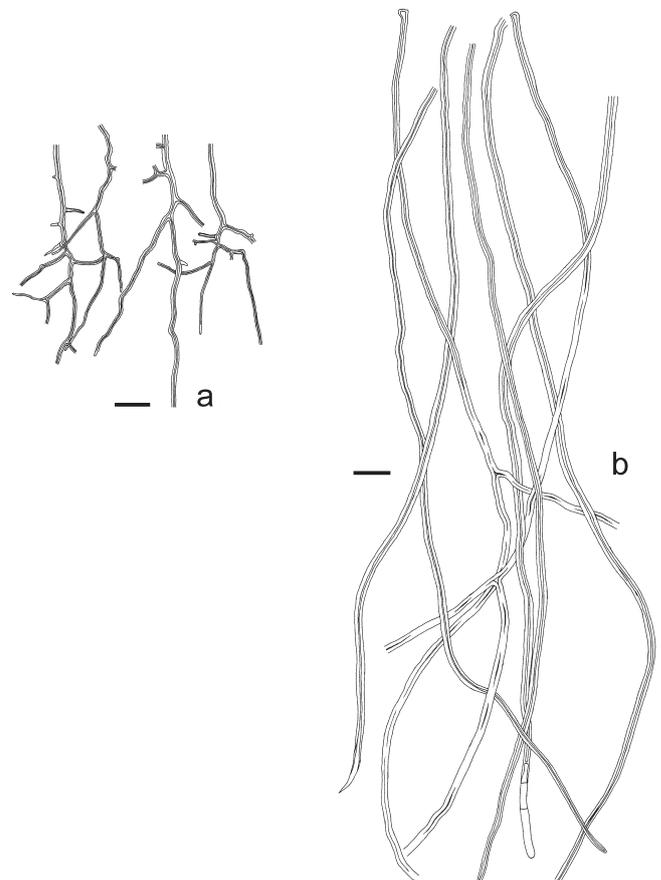


Fig. 11 Microscopic structures of *Datronia stereoides*. a. Skeletal hyphae from trama; b. skeletal hyphae from context (all: Niemelä 3020). — Scale bars = 20 µm.

*Melanoderma* B.K. Cui & Y.C. Dai is a recently proposed genus (Cui et al. 2011b). It is similar to *Datroniella* in black basidiocarps, a dimitic hyphal system with clamped generative hyphae, thin-walled basidiospores that are negative in Melzer's reagent. However, *Melanoderma* differs from *Datroniella* in having dextrinoid skeletal hyphae, encrusted cystidia and rhomboid crystals in trama and hymenium.

Previous studies showed that *Datronia* was closely related to some *Polyporus* species (Sotome et al. 2008, 2013, Justo & Hibbett 2011). Our phylogenetic analysis also confirmed the conclusion (Fig. 1). Both groups share a dimitic hyphal system with cyanophilous skeletal hyphae, cylindrical basidiospores and causes of a white rot of woods (Núñez & Ryvarden 1995, 2001, Sotome et al. 2008). However, *Polyporus* usually has a distinct stipe, cream-coloured context, tissues unchanged in KOH and hyaline skeletal hyphae, while *Datronia*, *Datroniella* and *Neodatronia* produce resupinate to sessile basidiocarps, brown context, tissues becoming black in KOH and brownish skeletal hyphae. *Polyporus* was demonstrated as polyphyletic and closely related with several other polypore genera, including *Datronia* (Krüger et al. 2006, Sotome et al. 2008, 2013).

No sequences of *Datronia decipiens*, *D. glabra*, *D. orcomanta*, *D. perstrata* and *D. sepiicolor* are available at present, but morphological characters indicate *D. glabra* may be a *Corioloopsis* species and the other four species may belong to *Datroniella* (Ryvarden 1987, 1988, Robledo et al. 2006, Hattori & Sotome 2013). Further molecular studies are needed to resolve their taxonomic and phylogenetic position.

#### Key to *Megasporoporia* s.l., *Dichomitus*, *Datronia* s.s. and *Datroniella*

1. Basidiome resupinate . . . . . 2
1. Basidiome effused-reflexed to pileate . . . . . 4
2. Skeletal hyphae dextrinoid . . . . .  
. . . . . *Megasporoporia* s.l. / *Dichomitus*
2. Skeletal hyphae IKI- . . . . . 3
3. Subiculum white to cream . . . . . *Dichomitus*
3. Subiculum yellowish brown to cinnamon . . . . . *Neodatronia*
4. Context white to cream, on conifers *Dichomitus squalens*
4. Context brown, on hardwoods . . . . . 5
5. Skeletal hyphae in context rarely branched, dendrohyphidia present . . . . . *Datronia* s.s.
5. Skeletal hyphae in context frequently branched, dendrohyphidia absent . . . . . *Datroniella*

#### Key to species of *Datronia* s.s.

1. Pores 1–3 per mm, basidiospores 10–12 × 3–4 µm . . . . .  
. . . . . *D. mollis*
1. Pores 4–7 per mm, basidiospores 9–11.5 × 3.7–4.6 µm . . . . .  
. . . . . *D. stereoides*

#### Key to species of *Datroniella*

1. Pores 2–3 per mm . . . . . *D. melanocarpa*
1. Pores 3–8 per mm . . . . . 2
2. Basidiospores 6.8–8 µm long . . . . . *D. subtropica*
2. Basidiospores > 8 µm long . . . . . 3
3. Cystidioles absent . . . . . *D. tibetica*
3. Cystidioles present . . . . . 4
4. Pores 3.5–5 per mm . . . . . *D. scutellata*
4. Pores 5–7 per mm . . . . . *D. tropica*

#### Key to species of *Neodatronia*

1. Basidiospores 2–2.6 µm wide . . . . . *N. sinensis*
1. Basidiospores 3–3.8 µm wide . . . . . *N. gaoligongensis*

**Acknowledgements** Special thanks are due to Drs. Shuang-Hui He and Chang-Lin Zhao (BJFC, China) and Hai-Sheng Yuan (IFP, China) for assistance in collecting the specimens. Yu-Cheng Dai is deeply indebted to Dr. Tuomo Niemelä (H, Finland) for his friendly support of Dai's work at the Botanical Museum of the University of Helsinki. The research was financed by the Fundamental Research Funds for the Central Universities (Project No. JC2013-1), the National Natural Science Foundation of China (Nos. 31093440, 30900006, 31070022) and the Program for New Century Excellent Talents in University (NCET-11-0585).

#### REFERENCES

- Binder M, Hibbett DS, Larsson K-H, Larsson E, Langer E, Langer G. 2005. The phylogenetic distribution of resupinate forms across the major clades of mushroomforming fungi (Homobasidiomycetes). *System and Biodiversity* 3: 113–157.
- Chenna R, Sugawara H, Koike T, Lopez R, Gibson TJ, Higgins DG, Thompson JD. 2003. Multiple sequence alignment with the Clustal series of programs. *Nucleic Acids Research* 31: 3497–3500.
- Corner EJH. 1989. Ad Polyporaceas VI. The genus *Trametes*. *Beihefte zur Nova Hedwigia* 97: 1–197.
- Cui BK. 2013. *Antrodia tropica* sp. nov. from southern China inferred from morphological characters and molecular data. *Mycological Progress* 12: 223–230.
- Cui BK, Dai YC. 2006. *Wrightoporia* (Basidiomycota, Aphyllophorales) in China. *Nova Hedwigia* 83: 159–166.
- Cui BK, Decock C. 2013. *Phellinus castanopsis* sp. nov. (Hymenochaetales) from southern China, with preliminary phylogeny based on rDNA sequences. *Mycological Progress* 12: 341–351.
- Cui BK, Du P, Dai YC. 2011a. Three new species of *Inonotus* (Basidiomycota, Hymenochaetales) from China. *Mycological Progress* 10: 107–114.
- Cui BK, Wang Z, Dai YC. 2008. *Albatrellus piceiphilus* sp. nov. on the basis of morphological and molecular characters. *Fungal Diversity* 28: 41–48.
- Cui BK, Zhao CL. 2012. Morphological and molecular evidence for a new species of *Perenniporia* (Basidiomycota) from Tibet, southwestern China. *Mycoscience* 53: 365–372.
- Cui BK, Zhao CL, Dai YC. 2011b. *Melanoderma microcarpum* gen. et sp. nov. (Basidiomycota) from China. *Mycotaxon* 116: 295–302.
- Dai YC. 1995. Changbai wood-rotting fungi 3. The genus *Phellinidium* (Basidiomycetes) and a new species, *P. aciferum*. *Annales Botanici Fennici* 32: 63–73.
- Dai YC. 2010. Hymenochaetales (Basidiomycota) in China. *Fungal Diversity* 45: 131–343.
- Dai YC. 2012. Polypore diversity in China with an annotated checklist of Chinese polypores. *Mycoscience* 53: 49–80.
- Dai YC, Cui BK, Liu XY. 2010. *Bondarzewia podocarpi*, a new and remarkable polypore from tropical China. *Mycologia* 102: 881–886.
- Dai YC, Cui BK, Yuan HS. 2009. *Trichaptum* (Basidiomycota, Hymenochaetales) from China with a description of three new species. *Mycological Progress* 8: 281–287.
- Dai YC, Cui BK, Yuan HS, He SH, Wei YL, Qin WM, Zhou LW, Li HJ. 2011. Wood-inhabiting fungi in southern China 4. Polypores from Hainan Province. *Annales Botanici Fennici* 48: 219–231.
- Dai YC, Härkönen M, Niemelä T. 2003. Wood-inhabiting fungi in southern China 1. Polypores from Hunan Province. *Annales Botanici Fennici* 40: 381–393.
- Dai YC, Niemelä T. 1997. Changbai wood-rotting fungi 6. Study on *Antrodia*, two new species and notes on some other species. *Mycotaxon* 64: 67–81.
- Dai YC, Niemelä T, Kinnunen J. 2002. The polypore genera *Abundisporus* and *Perenniporia* (Basidiomycota) in China, with notes on *Haploporus*. *Annales Botanici Fennici* 39: 169–182.
- Dai YC, Wei YL, Wang Z. 2004. Wood-inhabiting fungi in southern China 2. Polypores from Sichuan Province. *Annales Botanici Fennici* 41: 319–329.
- Dai YC, Wu SH. 2004. *Megasporoporia* (Aphyllophorales, Basidiomycota) in China. *Mycotaxon* 89: 379–388.
- Donk MA. 1966. Notes on European polypores 1. *Persoonia* 4: 337–343.
- Farris JS. 1989. The retention index and the rescaled consistency index. *Cladistics* 5: 417–419.
- Farris JS, Källersjö M, Kluge AG, Bult C. 1994. Testing significance of incongruence. *Cladistics* 10: 315–319.

- Felsenstein J. 1985. Confidence intervals on phylogenies: an approach using the bootstrap. *Evolution* 39: 783–791.
- Ghobad-Nejhad M, Dai YC. 2010. *Diplomitoporus rimosus* is found in Asia and belongs to the Hymenochaetales. *Mycologia* 102: 1510–1517.
- Gilbertson RL, Ryvarden L. 1986. North American polypores 1. *Abortiporus* - *Lindtneria*. *Fungiflora*, Oslo.
- Hall TA. 1999. Bioedit: a user-friendly biological sequence alignment editor and analysis program for Windows 95/98/NT. *Nucleic Acids Symposium Series* 41: 95–98.
- Hattori T, Sotome K. 2013. Type studies of the polypores described by E.J.H. Corner from Asia and West Pacific areas VIII. Species described in *Trametes* (2). *Mycoscience* 54, 4: 297–308.
- He SH, Li HJ. 2011. Hymenochaete in China. 2. A new species and three new records from Yunnan Province. *Mycotaxon* 118: 411–422.
- Huelsenbeck JP, Crandall KA. 1997. Phylogeny estimation and hypothesis testing using maximum likelihood. *Annual Review of Ecology, Evolution, and Systematics* 28: 437–466.
- Justo A, Hibbett DS. 2011. Phylogenetic classification of *Trametes* (Basidiomycota, Polyporales) based on a five-marker dataset. *Taxon* 60: 1567–1583.
- Kluge AG, Farris JS. 1969. Quantitative physics and the evolution of anurans. *Systematic Zoology* 18: 1–32.
- Krüger D, Hughes KW, Petersen RH. 2004. The tropical *Polyporus tricholoma* (Polyporaceae) – taxonomy, phylogeny, and the development of methods to detect cryptic species. *Mycological Progress* 3: 65–80.
- Krüger D, Petersen RH, Hughes KW. 2006. Molecular phylogenies and mating study data in *Polyporus* with special emphasis on group “*Melanopus*” (Basidiomycota). *Mycological Progress* 5: 185–206.
- Læssøe T, Ryvarden L. 2010. Studies in Neotropical polypores 26. Some new and rarely recorded polypores from Ecuador. *Synopsis Fungorum* 27: 34–58.
- Langer E, Dai YC. 1998. Changbai wood-rotting fungi 8. *Hyphodontia syringae* sp. nov. *Mycotaxon* 67: 181–190.
- Li HJ, Cui BK. 2010. A new *Trametes* species from Southwest China. *Mycotaxon* 113: 263–267.
- Li HJ, Cui BK. 2013. Taxonomy and phylogeny of the genus *Megasporoporia* with related genera. *Mycologia* 105: 368–383.
- Liu YL, Whelen S, Hall BD. 1999. Phylogenetic relationships among ascomycetes: Evidence from an RNA polymerase II subunit. *Molecular Biology and Evolution* 16: 1799–1808.
- Matheny PB. 2005. Improving phylogenetic inference of mushrooms with RPB1 and RPB2 nucleotide sequences (Inocybe; Agaricales). *Molecular Phylogenetics and Evolution* 35: 1–20.
- Núñez M, Ryvarden L. 1995. *Polyporus* (Basidiomycotina) and related genera. *Synopsis Fungorum* 10: 1–85.
- Núñez M, Ryvarden L. 2001. East Asian polypores 2. Polyporaceae s. lato. *Synopsis Fungorum* 14: 165–522.
- Nylander JAA. 2004. MrModeltest 2.2. Program distributed by the author. Evolutionary Biology Centre, Uppsala University, Uppsala.
- Page RMD. 1996. Treeview: An application to display phylogenetic trees on personal computers. *Computer Applications in Bioscience* 12: 357–358.
- Petersen JH. 1996. Farvekort. The Danish Mycological Society’s color-chart. Foreningen til Svampekundskabens Fremme, Greve.
- Posada D, Crandall KA. 1998. MODELTEST: testing the model of DNA substitution. *Bioinformatics* 14: 817–818.
- Posada D, Crandall KA. 2001. Selecting the best-fit model of nucleotide substitution. *Systems Biology* 50: 580–601.
- Robledo G, Urcelay C, Domínguez L, Rajchenberg M. 2006. Taxonomy, ecology, and biogeography of polypores (Basidiomycetes) from Argentinian *Polylepis* woodlands. *Canadian Journal of Botany* 84: 1561–1572.
- Robledo GL, Amalfi M, Castillo G, Rajchenberg M, Decock C. 2009. *Perenniporiella chaquenia* sp. nov. and further notes on *Perenniporiella* and its relationships with *Perenniporia* (Poriales, Basidiomycota). *Mycologia* 101, 2: 657–673.
- Ronquist F, Huelsenbeck JP. 2003. MrBayes 3: Bayesian phylogenetic inference under mixed models. *Bioinformatics* 19: 1572–1574.
- Ryvarden L. 1987. New and noteworthy polypores from tropical America. *Mycotaxon* 28: 525–541.
- Ryvarden L. 1988. Type studies in the Polyporaceae 20. Species described by G. Bresadola. *Mycotaxon* 33: 303–327.
- Ryvarden L. 1991. Genera of polypores: nomenclature and taxonomy. *Synopsis Fungorum* 5: 1–363.
- Ryvarden L, Gilbertson RL. 1993. European polypores. *Synopsis Fungorum* 6: 1–741.
- Ryvarden L, Wright JE, Rachenberg M. 1982. *Megasporoporia*, a new genus of resupinate polypores. *Mycotaxon* 16: 172–182.
- Sotome K, Akagi Y, Lee SS, Ishikawa NK, Hattori T. 2013. Taxonomic study of *Favolus* and *Neofavolus* gen. nov. segregated from *Polyporus* (Basidiomycota, Polyporales). *Fungal Diversity* 58: 245–266.
- Sotome K, Hattori T, Ota Y, To-anun C, Salleh B, Kakishima M. 2008. Phylogenetic relationships of *Polyporus* and morphologically allied genera. *Mycologia* 100: 603–615.
- Swofford DL. 2002. PAUP: Phylogenetic analysis using parsimony. Version 4.0b10. Sinauer Associates, Sunderland.
- Tian XM, Yu HY, Zhou LW, Decock C, Vlasák J, Dai YC. 2013. Phylogeny and taxonomy of the *Inonotus linteus* complex. *Fungal Diversity* 58: 159–169.
- Wang Z, Binder M, Dai YC, Hibbett DS. 2004. Phylogenetic relationships of *Sparassis* inferred from nuclear and mitochondrial ribosomal DNA and RNA polymerase sequences. *Mycologia* 96: 1015–1029.
- White TJ, Bruns T, Lee S, Taylor JW. 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: Innis MA, Gelfand DH, Sninsky JJ, White TJ (eds), *PCR Protocols: A guide to methods and applications*: 315–322. Academic Press, Inc., New York.
- Yuan HS. 2013. *Antrodiella chinensis* sp. nov., a Chinese representative of the *Antrodiella americana* complex. *Mycological Progress* 12: 437–443.
- Zhao CL, Cui BK. 2013. Three new *Perenniporia* (Polyporales, Basidiomycota) species from China based on morphological and molecular data. *Mycoscience* 54: 231–240.
- Zhao CL, Cui BK, Dai YC. 2013. New species and phylogeny of *Perenniporia* based on morphological and molecular characters. *Fungal Diversity* 58: 47–60.

