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Article

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Phylogeny of *Megasporoporia s.lat.* and related genera of Poyporaceae: New genera, new species and new combinations

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Abstract

Several resupinate poroid Polyporaceae with dextrinoid skeletal hyphae and cylindrical, thin-walled basidiospores have been placed in *Dichomitus* and *Megasporoporia*. With the inclusion of DNA sequences, mostly from Chinese material, in the phylogeny of the genera, new genera were recognized, i.e., *Megasporoporiella* and *Megasporia*. In the current study, *Jorgewrightia* and *Mariorajchenbergia* are described as new genera in the Polyporaceae based on phylogenetic analyses of four gene regions: nuc rDNA ITS1-5.8S-ITS (ITS) and partial Large Subunit (28S), Translation Elongation Factor 1-alpha (TEF1), and RNA polymerase II second largest subunit (RPB2), mostly from Brazilian material. These new genera currently accommodate species formerly placed in *Cerioporus*, *Dichomitus*, *Megasporia*, *Megasporoporiella* and *Pachykytospora*. *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia* have mostly resupinate pale-colored basidiomata, poroid hymenophore, usually dextrinoid branched skeletal hyphae, and cylindrical basidiospores. These genera are difficult to differentiate on morphology alone and analyses based on sequences from at least two regions (ITS and 28S), as well as information about geographical distribution, are needed to separate them. *Megasporia variabilicolor* and *Megasporoporia neosetulosa* are described as new species, and one neotype and 20 new combinations are proposed. Synoptic tables including characteristics for 27 species from the five genera is presented.

Keywords – Agaricomycetes – diversity – neotropics – Polyporales

Introduction

In recent years, circumscription of genera in Polyporaceae has been much improved due to broader sampling, morphological reassessments and phylogenies based in DNA analyses (Binder et al. 2013, Justo et al. 2017, Cui et al. 2019). Multiloci phylogenetic treatments have been provided for large, widespread genera, such as *Dichomitus* D.A. Reid, typified by *Trametes squalens* P. Karst., and *Megasporoporia* Ryvarden & J.E. Wright, typified by *Poria setulosa* Henn., which include several species of resupinate, more rarely pileate, poroid fungi with dextrinoid skeletal hyphae and cylindrical, thin-walled basidiospores (Ryvarden et al. 1982, Masuka & Ryvarden 1999, Dai & Wu 2004, Zhou & Dai 2008, Du & Cui 2009, Gomes-Silva et al. 2012, Li & Cui

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2013a, b, Yuan 2013, Wang et al. 2021).

Initially, *Dichomitus* was considered to be allied to *Antrodia* P. Karst. based on similar morphological characteristics except for the presence of arboriform skeletal hyphae (Ryvarden & Johansen 1980) in the former. Later, *Dichomitus* was reevaluated as closer to *Polyporus* P. Micheli ex Adans. because of the arboriform skeletal hyphae and similar basidiospore morphology (Ryvarden 1991).

Megasporoporia was first assumed to be related to *Grammothele* Berk. & M.A. Curtis (Ryvarden et al. 1982) due to the presence of dextrinoid skeletal hyphae, similar basidiospore morphology and presence of dendrohyphidia. However, Ryvarden (1991) suggested a closer alliance to *Dichomitus* because of the similar basidiomata and basidiospore features. *Megasporoporia* was eventually reduced to a synonym of *Dichomitus*, after the dextrinoid reaction was considered a "chemical character of doubtful taxonomic importance at the generic level" (Masuka & Ryvarden 1999). This synonymization was either accepted (Gomes-Silva et al. 2012) or rejected by other authors (Dai & Wu 2004, Zhou & Dai 2008, Du & Cui 2009, Li & Cui 2013b, Yuan 2013, Wang et al. 2021).

With the use of analyses of DNA sequences, the separation of *Dichomitus* and *Megasporoporia* became evident (Ghobad-Nejhad & Dai 2010, Binder et al. 2013, Li & Cui 2013a). Moreover, new clades were delimited and included species with similar characteristics as existing genera, *i.e.*, mostly resupinate, poroid Polyporaceae, with branched and variably dextrinoid skeletal hyphae, variable presence of dendroyphydia, crystals and hyphal pegs, and cylindrical, thin-walled, non-dextrinoid, non-amyloid basidiospores (Ghobad-Nejhad & Dai 2010, Li & Cui 2013a). Thus, two new genera were described. *Megasporoporiella* B.K. Cui, Y.C. Dai & Hai J. Li, with *Polyporus cavernulosus* Berk. as type, included five species characterized by large pores, skeletal hyphae dominating the trama, and presence of crystals in the hymenium. *Megasporia* B.K. Cui, Y.C. Dai & Hai J. Li, was described with *Poria hexagonoides* Speg. as type and included seven species similar to those of *Megasporoporia*, but without hyphal pegs (Li & Cui 2013a). Recently, five new species were added to *Megasporia*, one to *Megasporoporia* and one to *Megasporoporiella*, mostly from China (Yuan et al. 2017, Wang et al. 2021), while Zmitrovich (2018) synonymized *Megasporoporiella*, among other genera, to *Cerioporus* Quél.

Li & Cui (2013a) admitted that the characteristics were insufficient to morphologically distinguish the new genera, *i.e.*, *Megasporoporiella* and *Megasporia*, from each other, and from *Megasporoporia*. Li & Cui (2013a) concluded that variation in pore size, basidiospore morphology, hyphal system type, and skeletal hyphae reaction in Melzer's reagent could be used to distinguish *Megasporia*, *Megasporoporia* and *Megasporoporiella* from other genera in what is recognized today as Polyporaceae. Species, however, could be distinguished by the presence of dendrohyphidia, hyphal pegs, cystidioles and crystals, even though Li & Cui (2013a) suggested these features are homoplastic. Later, Yuan et al. (2017) observed that *Megasporoporia* had di-trimitic hyphal structure and strongly dextrinoid skeletal hyphae, while *Megasporoporiella* and *Megasporia* had dimitic hyphal structure and weakly to moderately dextrinoid skeletal hyphae. In addition, *Megasporoporiella* was distributed in temperate areas, while *Megasporia* was present in the subtropics and tropics. Nevertheless, Cui et al. (2019) and Wang et al. (2021) could not separate these three genera in their keys.

Brazilian material with the characteristics of *Dichomitus s.lat.* and *Megasporoporia s.lat*. has been collected in several biomes in the past years. After morphological and DNA analyses, some of them could not be assigned to known taxa and description of new species and reclassification at the genus level became necessary. Here, we discuss the taxonomic and phylogenetic positions of several resupinate fungi previously placed in *Cerioporus*, *Dichomitus*, *Megasporia*, *Megasporoporia*, *Megasporoporiella*, *Pachykytospora* and in two new genera delimited after the inclusion of Brazilian collections, as well as one from Tanzania.

Materials & Methods

Area of study and morphological studies

The specimens were collected in Brazilian Amazonia, Caatinga and Atlantic Rain Forest. Other samples previously deposited in the Herbaria of the Departamento de Micologia of UFPE (URM), Departamento de Botânica of UFSC (FLOR), Instituto de Pesquisas Ambientais de São Paulo (SP) and University of Oslo (O) were revised and partly used in molecular analyses.

Specimen were identified or confirmed based on macro- (measures, shape and color of the basidiomata) and micro-morphology (slide preparations with 5% KOH, stained with 1% aqueous phloxine, Melzer's reagent and Cotton Blue to analyze the hyphal system, dextrinoid or cyanophylic reaction, presence/absence and measurements of sterile structures and basidiospores) (Ryvarden 1991). The designation of color followed Watling (1969). The following abbreviations are used: IKI = Melzer's reagent, IKI– = no reaction, IKI+ = dextrinoid, KOH = potassium hydroxide, CB = Cotton Blue, CB+ = cyanophilous, CB– = acyanophilous, L = mean spore length (arithmetic average of all measured spores), W = mean spore width (arithmetic average of all measured spores), Q = variation in the L/W ratios between the specimens studied, and n (a/b) = number of spores (a) measured from a given number (b) of specimens.

DNA extraction, PCR amplification and sequencing

Fragments (1–2 mg) from the basidiomata were removed and placed in tubes of 1.5 ml and stored at -20°C until extraction. The DNA was extracted according to the method described in Goés -Neto et al. (2005). The nuc rDNA Internal Transcribed Spacer (ITS) and partial Large Subunit (nLSU), the Translation Elongation Factor 1-alpha (TEF1) and the RNA Polymerase II Second Largest Subunit (RPB2) were amplified for the sequences generated here using the primer pairs ITS4-ITS5, LR0R-LR5, RPB2 5F-RPB2 7.1R and Ef DF-EF1 2218 R, respectively (White et al. 1990, Moncalvo et al. 2000, Rehner & Buckley 2005, Frøslev et al. 2005, Smith & Sivasithamparam 2000). Negative controls containing all components of the reaction mix, but exchanging DNA by water, were used in each procedure to detect possible contamination. The amplification products were purified with GenJET PCR Purification Kit (Thermo Scientific) and sequenced at the Plataforma Tecnológica de Genômica e Expressão Gênica do Centro de Biociências, UFPE, Brazil, and at the Stab Vida, Portugal, both using the Sanger method. Cycle sequencing was carried out with the same primers as the amplification reactions (Moncalvo et al. 2000). All obtained sequences were deposited in GenBank (National Center for Biotechnology Information, Maryland, USA) (Table 1).

Phylogenetic analyses

The chromatograms were analyzed to check their quality and edited using the STADEN Package 2.0 software (Bonfield et al. 1995). Then, the newly generated sequences were compared with sequences deposited in GenBank (https://www.ncbi.nlm.nih.gov/genbank/). For alignment, we followed the results of Li & Cui (2013a), Justo et al. (2017), Yuan et al. (2017), and Wang et al. (2021), as well as the most similar sequence from GenBank (Table 1). One data set was prepared with ITS+28S+RPB2+TEF1. Sequence alignment was deposited at TreeBase (submission ID 29066, link to reviewers: http://purl.org/phylo/treebase/phylows/study/TB2:S29066?x-access-code=23438728876fa258df1cba366f69c4b6&format=html). Each locus was aligned using the MAFFT v.7 online interface, under the auto mode strategy [http://mafft.cbrc.jp/alignment/server/, Katoh & Toh (2008)], then manually improved using MEGA7 (Kumar et al. 2016).

Phylogenetic reconstructions were performed using Maximum Likelihood (ML) and Bayesian Inference (BI) analyses. Nucleotide substitution models for each gene fragment were estimated based on Bayesian Information Criterion (BIC) on W-IQ-TREE (Kalyaanamoorthy et al. 2017) and used for ML and BI analyses.

ML analysis was run in W-IQ-TREE (Trifinopoulos et al. 2016), with 1000 bootstrap replicates (Nguyen et al. 2015) and Ultrafast bootstrap (UFBoot2, Hoang et al. 2017).

BI analysis was performed using MrBayes v.3.1.2 (Ronquist & Huelsenbeck 2003), for two independent runs, each with four Markov chains Monte Carlo (MCMC) independent runs for $5x10^6$ generations (split frequencies = 0.011). Statistical support for branches was considered informative with Bayesian posterior probabilities (pp) ≥0.90 and bootstrap (bs) and UFBoot2 (ub)values ≥80%. The tree was visualized using FigTree (Rambaut 2014) and the final layout made in Inkscape 2020.

Table 1 Specimens used in this study with vouchers and GenBank accession numbers for the ITS, nLSU, RPB2 and TEF1 sequences. The sequences in bold were generated in this study

Species	**Sample no.**	**Geographic origin**	**GenBank**				**References**
			ITS	**nLSU**	**RPB2**	**TEF1**	
Cerioporus squamosus	Cui 10394	China	KX851635	KX851688	KX851766	KX851789	Cui et al. (2019)
Cerioporus squamosus	AFTOL-ID 704	USA	DQ267123	AY629320	DQ408120	DQ028601	Genbank
Cerioporus squamosus	Cui 10595	China	KU189778	KU189809	KU189988	KU189925	Zhou et al. (2016)
Crassisporu imbricatus	Dai 10788	China	KC867350	KC867425	–	–	Cui et al. (2019)
Crassisporu imbricatus	Cui 6556	China	KC867351	KC867426	–	–	Cui et al. (2019)
Crassisporus macroporus	Cui 14465	China	MK116485	MK116494	MK122990	MK122983	Cui et al. (2019)
Crassisporus macroporus	Cui 14468	China	MK116486	MK116495	MK122991	MK122984	Cui et al. (2019)
Daedaleopsis confragosa	Cui 6556	China	KU892428	KU892448	KU892507	KX838418	Cui et al. (2019)
Daedaleopsis confragosa	Cui 9756	China	KU892438	KU892451	KU892508	–	Cui et al. (2019)
Daedaleopsis hainanensis	Dai 9268	China	KU892434	KU892458	KU892496	–	Li et al. (2016)
Daedaleopsis hainanensis	Cui 5178	China	KU892435	KU892462	KU892495	KX838441	Li et al. (2016)
Daedaleopsis purpurea	Dai 13583a	China	KX832054	KX832063	KX838480	KX838440	Cui et al. (2019)
Daedaleopsis purpurea	Dai 8060	Japan	KU892442	KU892475	KU892498	KX838438	Li et al. (2016)
Datronia mollis	Dai 11456	China	JX559253	JX559292	JX559307	KX838424	Li et al. (2014)
Datronia mollis	Dai 11253	China	JX559258	JX559289	JX559306	–	Li et al. (2014)
Datronia subtropica	Dai 12885	China	KC415185	KC415192	KC415199	KX838428	Li et al. (2014)
Datronia subtropicus	Dai 12883	China	KC415184	KC415191	KC415198	KX838427	Li et al. (2014)
Dichomitus ecuadoriensis	Ryvarden 44728 (Holotype)	Ecuador	–	JQ780440	–	–	Li & Cui (2013a)
Dichomitus squalens	–	Sweden	JQ518275	–	–	–	Carlsson et al. (2012)
Dichomitus squalens	LY-AD-421-SS1	França	KP135330	–	–	–	Floudas & Hibbett (2015)
Dichomitus squalens	A-670	Finland	AM988624	–	–	–	Genbank
Dichomitus squalens	Cui 9639	China	JQ780407	JQ780426	KX838478	KX838436	Li & Cui (2013a)
Dichomitus squalens	Cui 9725	China	JQ780408	JQ780427	–	KX838435	Li & Cui (2013a)
Dichomitus squalens	LE 258894	Russia	KM411455	KM411471	–	KM411486	Zmitrovich & Kovalenko (2016)
Echinochaete russiceps	Dai 13868	China	KX832051	KX832060	KX838479	KX838437	Cui et al. (2019)

Table 1 Continued.

Species	Sample no.	Geographic origin	GenBank				References
			ITS	nLSU	RPB2	TEF1	
Echinochaete russiceps	Dai 13866	China	KX832050	KX832059	–	–	Cui et al. (2019)
Favolus acervatus	Cui 11053	China	KU189774	KU189805	KU189994	KU189920	Zhou & Cui 2017
Favolus acervatus	Dai 10749b	China	KX548953	KX548979	KX549073	KX549043	Zhou & Cui (2017)
Favolus niveus	Cui 11129	China	KX548955	KX548981	KX549074	KX549045	Zhou & Cui (2017)
Favolus niveus	Dai 13276	China	KX548956	KX548982	–	KX549046	Zhou & Cui (2017)
Favolus pseudoemerici	Cui 11079	China	KX548958	KX548984	KX549075	KX549048	Zhou & Cui (2017)
Favolus pseudoemerici	Cui 13757	China	KX548959	KX548985	–	KX549049	Zhou & Cui (2017)
Hexagonia glabra	Dai 12993	China	KX900637	KX900683	KF274649	KX900823	Cui et al. (2019)
Hexagonia glabra	Cui 11367	China	KX900638	KX900684	KX900798	KX900824	Cui et al. (2019)
Hexagonia tenuis	Niemela-9032	Zambia	KY948738	KY948842	–	–	Justo et al. (2017)
Hornodermoporus latissimus	Dai 12054	China	KX900639	KX900686	–	KF286303	Cui et al. (2019)
Hornodermoporus latissimus	Cui 6625	China	HQ876604	JF706340	–	KF181134	Zhao & Cui (2012)
Hornodermoporus martius	Cui 4055	China	KX900641	KX900688	–	–	Cui et al. (2019)
Hornodermoporus martius	Cui 7992	China	HQ876603	HQ654114	–	KF181135	Zhao & Cui (2012)
Jorgewrightia bambusae	Dai 20064	China	MW694885	MW694928	–	MZ618632	Wang et al. (2021)
Jorgewrightia bambusae	Dai 22106 (Holotype)	China	MW694884	–	–	MZ618631	Wang et al. (2021)
Jorgewrightia cystidiolophora	Cui 2642	China	JQ780390	JQ780432	–	–	Li & Cui (2013a)
Jorgewrightia cystidiolophora	Cui 2688 (Paratype)	China	JQ780389	JQ780431	–	–	Li & Cui (2013a)
Jorgewrightia ellipsoidea	Cui 5222 (Holotype)	China	JQ314367	JQ314390	–	–	Li & Cui (2013a)
Jorgewrightia ellipsoidea	Dai 19743	China	MW694879	MW694923	–	–	Wang et al. (2021)
Jorgewrightia fusiformis	Dai 18596 (Holotype)	Malaysia	MW694892	MW694935	–	MZ618637	Wang et al. (2021)
Jorgewrightia fusiformis	Dai 18578	Malaysia	MW694893	MW694936	–	MZ618638	Wang et al. (2021)
Jorgewrightia guangdongensis	Cui 13986	China	MG847208	MG847217	MG867680	MG867699	Cui et al. (2019)
Jorgewrightia guangdongensis	Cui 9130 (Holotype)	China	JQ314373	JQ780428	–	-	Li & Cui (2013a)
Jorgewrightia hengduanensis	Cui 8076 (Holotype)	China	JQ780392	JQ780433	KX900805	KF286337	Li & Cui (2013a)
Jorgewrightia hengduanensis	Cui 8176	China	JQ314370	KX900697	KX900806	MG867700	Li & Cui (2013a)
Jorgewrightia major	Cui 10253	China	JQ314366	JQ780437	JX559314	–	Li & Cui (2013a)
Jorgewrightia major	Yuan 1183	China	JQ314365	–	–	–	Li & Cui (2013a)
Jorgewrightia rimosa	Dai 21997	China	MW422262	–	–	–	Wang et al. (2021)
Jorgewrightia rimosa	Dai 15357 (Holotype)	China	KY449436	KY449447	–	–	Yuan et al. (2017)
Jorgewrightia sp.	Cui 6592	China	JQ780402	JQ780438	–	–	Li & Cui (2013a)
Jorgewrightia sp.	Cui 13855	China	MG847209	MG847218	MG867681	MG867701	Li & Cui (2013a)
Jorgewrightia sp.	He 2608	-	JQ314368	JQ314388	–	–	Li & Cui (2013a)
Jorgewrightia sp.	Cui 13853	China	MW694880	MW694924	–	MZ618625	Wang et al. (2021)
Jorgewrightia tropica	Cui 13740	China	KY449438	KY449449	–	MZ618629	Yuan et al. (2017)

Table 1 Continued.

Species	Sample no.	Geographic origin	GenBank				References
			ITS	nLSU	RPB2	TEF1	
Jorgewrightia tropica	Cui 13660 (Holotype)	China	KY449437	KY449448	–	MZ618630	Yuan et al. (2017)
Jorgewrightia violacea	Cui 13845	China	MG847211	MG847220	MG867683	MG867703	Cui et al. (2019)
Jorgewrightia violacea	Cui 13838	China	MG847210	MG847219	MG867682	MG867702	Cui et al. (2019)
Jorgewrightia violacea	Cui 6570 (Holotype)	China	JQ780393	–	–	–	Li & Cui (2013a)
Jorgewrightia yunnanensis	Dai 13870 (Holotype)	China	KY449443	KY449454	–	–	Yuan et al. (2017)
Jorgewrightia yunnanensis	Cui 12614A	China	KY449442	KY449453	–	MZ618628	Yuan et al. (2017)
Mariorajchenbergia australiae	Dai 18657(Holotype)	Australia	MW694888	MW694931	–	MZ618634	Wang et al. (2021)
Mariorajchenbergia australiae	Dai 18658	Australia	MW694889	MW694932	–	MZ618635	Wang et al. (2021)
Mariorajchenbergia hubeiensis	Wei 2045 (Holotype)	China	JQ780387	JQ780421	–	–	Cui et al. (2019)
Mariorajchenbergia hubeiensis	Dai 18102	China	MW694890	MW694933	–	MZ618636	Wang et al. (2021)
Mariorajchenbergia hubeiensis	Dai 18103	China	MW694891	MW694934	–	–	Wang et al. (2021)
Mariorajchenbergia pseudocavernulosa	Yuan 1270 (Holotype)	China	JQ314360	JQ314394	–	–	Li & Cui (2013a)
Mariorajchenbergia pseudocavernulosa	Dai 19379	China	MW694882	–	–	MZ618626	Wang et al. (2021)
Mariorajchenbergia rhododendri	Dai 4226 (Holotype)	China	JQ314356	JQ314392	–	-	Li & Cui (2013a)
Mariorajchenbergia rhododendri	Cui 12432	China	MW694883	MW694927	–	MZ618627	Wang et al. (2021)
Mariorajchenbergia subcavernulosa	Cui 14247	China	MG847213	MG847222	MG867685	MG867705	Cui et al. (2019)
Mariorajchenbergia subcavernulosa	Cui 9252	China	JQ780378	JQ780416	JX559315	MG867706	Li & Cui (2013a)
Megasporia amazonica	JV 1407/47	Costa Rica	KT156707	–	–	–	Genbank
Megasporia amazonica	**URM 85601**	**Brazil**	**KX584455**	**KX619579**	**MT984345**	**MW161494**	**Present study**
Megasporia amazonica	URM 87859	Brazil	MW989394	MW965595	–	–	Wang et al. (2021)
Megasporia anoectopora	**URM 86947**	**Brazil**	**KX584456**	**KX619577**	**MT984346**	**MW045831**	**Present study**
Megasporia anoectopora	**URM 83928**	**Brazil**	**KX584457**	**KX619580**	**MT984347**	**MW161495**	**Present study**
Megasporia anoectopora	**URM 83838**	**Brazil**	–	**KX619572***	–	–	**Present study**
Megasporia anoectopora	**URM 83837**	**Brazil**	–	**KX619583***	–	–	**Present study**
Megasporia cavernulosa	JV 0904/52J	USA	JF894107	–	–	–	Genbank
Megasporia cavernulosa	JV 0904/50J	USA	JF894105	–	–	–	Genbank
Megasporia cavernulosa	JV 0904/81	USA	MW989395	–	–	–	Wang et al. (2021)
Megasporia cavernulosa	**URM 83867**	**Brazil**	**KX584458**	**KX619582**	**MT984341**	–	**Present study**
Megasporia cylindrospora	Ryvarden 45186	Belize	–	JQ780439	–	–	Li & Cui (2013a)
Megasporia hexagonoides	CBS 464.63	Argentina	–	AY333802	–	–	Genbank
Megasporia mexicana	JV 1806/4J	Honduras	MW989396	–	–	–	Wang et al. (2021)
Megasporia variabilicolor	**URM 88369**	**Brazil**	**KX584449**	**KX619578**	**MT984342**	**MW045833**	**Present study**
Megasporia variabilicolor	**URM 84769**	**Brazil**	**KX584450**	**KX619570**	**MT984343**	**MW045834**	**Present study**
Megasporia variabilicolor	**URM 88368 (Holotype)**	**Brazil**	**KX584448**	**KX619574**	**MT984344**	**MW161496**	**Present study**

Table 1 Continued.

Species	Sample no.	Geographic origin	GenBank				References
			ITS	nLSU	RPB2	TEF1	
Megasporia variabilicolor	**URM 86249**	**Brazil**	**KX584454**	**KX619581**	–	–	**Present study**
Megasporia variabilicolor	**URM 83930**	**Brazil**	**KX584453***	**KX619569***	–	–	**Present study**
Megasporia variabilicolor	**URM 83982**	**Brazil**	**KX584451***	–	–	–	**Present study**
Megasporia variabilicolor	**URM 88366**	**Brazil**	**KX584452**	**KX619574**	–	–	**Present study**
Megasporoporia bannaensis	Dai 13596	China	KX900653	KX900702	KX900808	KX900838	Cui et al. (2019)
Megasporoporia bannaensis	Dai 12306 (Holotype)	China	JQ314362	JQ314379	–	KF494979	Li & Cui (2013a)
Megasporoporia inflata	Dai 17882	Malaysia	MW694886	MW694929	–	–	Wang et al. (2021)
Megasporoporia inflata	Dai 17478 (Holotype)	Malaysia	MW694887	MW694930	–	MZ618633	Wang et al. (2021)
Megasporoporia minor	Dai 12170 (Holotype)	China	JQ314363	JQ314380	–	KF494980	Li & Cui (2013a)
Megasporoporia minor	Dai 18322	Vietnam	MW694881	MW694925	–	MZ618624	Wang et al. (2021)
Megasporoporia minuta	Zhou 120	China	JX163055	JX163056	–	–	Genbank
Megasporoporia minuta	Cui 13945	China	MW989397	MW965596	–	–	Wang et al. (2021)
Megasporoporia neosetulosa	JV1008/51J	USA	JF894109	–	–	–	Li & Cui (2013a)
Megasporoporia neosetulosa	JV1008/102J	USA	JF894110	–	–	–	Li & Cui (2013a)
Megasporoporia neosetulosa	**URM 85113**	**Brazil**	**KX584460**	–	–	**MW045832**	**Present study**
Megasporoporia neosetulosa	**URM 85679 (Holotype)**	**Brazil**	**KX584459**	**OL684780**	–	–	**Present study**
Megasporoporia setulosa	**LR 9907 (Neotype)**	**Tanzania**	**OL678508**	**OL684781**	–	–	**Present study**
Microporus affinis	Wu 9806-33	Taiwan	–	AY351931	–	–	Genbank
Neodatronia gaoligongensis	Cui 8186	China	JX559268	JX559285	–	–	Li et al. (2014)
Neodatronia gaoligongensis	Cui 8055	China	JX559269	JX559286	JX559317	KX900846	Li et al. (2014)
Polyporus arcularius	Cui 10998	China	KX548973	KX548995	KX549077	KX549059	Zhou & Cui (2017)
Polyporus arcularius	Cui 11398	China	KU189766	KU189797	KU189980	KU189911	Zhou et al. (2016)
Polyporus megasporoporus	Yuan 3880 (Holotype)	China	JQ314377	JQ314395	–	KF286334	Li & Cui (2013a)
Polyporus megasporoporus	Yuan 3874	China	–	MW694926	–	–	Wang et al. (2021)
Polyporus tuberaster	Dai 12462	China	KU507580	KU507582	–	KU507590	Zhou et al. (2016)
Polyporus tuberaster	Dai 11271	China	KU189769	KU189800	KU189983	KU189914	Zhou et al. (2016)
Polyporus varius	Cui 12249	China	KU507581	KU507583	KU507592	KU507591	Zhou et al. (2016)
Polyporus varius	Dai 13874	China	KU189777	KU189808	KU189987	KU189923	Zhou et al. (2016)
Trametes hirsuta	RLG 5133T	USA	JN164941	JN164801	JN164854	JN164891	Li & Cui (2013a)
Truncospora macrospora	Cui 8106	China	JX941573	JX941596	KX880871	KX880920	Zhao & Cui (2013)
Ttrametes ochracea	HHB 13445sp	USA	JN164954	JN164812	JN164852	JN164904	Li & Cui (2013a)

*****Sequences not used in phylogenetic analysis

Results

Phylogeny

Sixteen specimens were sequenced, generating 14 ITS, 14 nLSU, seven RPB2 and seven TEF1 sequences. The concatenated alignment resulted in 3012 positions including gaps, of which 1652 are constant sites and 1191 parsimony-informative. The best-fit models selected were TPM2u+F+I+G4 for ITS, SYM+I+G4 for nLSU, TN+F+I+G4 for RPB2, and TIMe+I+G4 for TEF1.

Five different datasets, one for each locus and the concatenated one, were analyzed using ML and BI analyses. No strong conflicts were detected among the datasets, consequently only the analyses from the concatenated data set are presented here. The results of the phylogenetic analyses generated from ML and BI showed similar tree topologies. Thus, the BI trees with bootstrap support values (BS), UFBoot2 (UB) and posterior probabilities (PP) were used to show the results (Fig. 1).

The newly generated sequences are placed in two clades of Polyporaceae: three in *Megasporoporia s.str.* and nine in a redefined *Megasporia*, both with strong support (BS = 99.9%; UB = 83%; PP = -- and BS = 99.5%; UB = 100; PP = 0.91, respectively). The results also support the description of two new species (Fig. 1). In addition, several sequences of species previously placed in *Cerioporus*, *Dichomitus*, *Megasporia*, *Megasporoporiella* and *Pachykytospora* are recovered in two strongly supported clades that could not be assigned to known taxa of Polyporaceae (Fig. 1) and are described below as new genera.

Li & Cui (2013a) typified *Megasporoporiella* with *M. cavernulosa* based on the placement of a 28S sequence from Chinese material identified as *M. cavernulosa* (Wu 9508-328). However, the type of *M. cavernulosa* originated from Brazilian Amazonia. In our analyses, the ITS, 28S and TEF1 sequences of what we consider the true *M. cavernulosa* recently collected in Brazilian Amazonia were placed in the *Megasporia* clade (Fig. 1). This makes *Megasporoporiella* a synonym of *Megasporia* and renders nameless the clade that corresponds to *Megasporoporiella sensu* Li & Cui (2013a). Recently, Wang et al. (2021), without further notice, selected *M. pseudocavernulosa* as the type species of *Megasporoporiella*, because they had discovered that the type specimen (Wu 9508-328) selected by Li & Cui (2013a) actually represents *M. subcavernulosa*. This typification does not follow the procedures for changing a genus type outlined in the International Code of Nomenclature for algae, fungi, and plants (Turland 2018), neither has the typification been registered, as required by the same Code. Consequently, the solution suggested by Wang et al. (2021) for *Megasporoporiella* is not valid. Instead, the new genus *Mariorajchenbergia* is described below to include *M. australiae*, *M. hubeiensis*, *M. pseudocavernulosa*, *M. rhododendri* and *M. subcavernulosa*.

Megasporia was typified by *M. hexagonoides* Li & Cui (2013a), and the species was represented in the phylogeny by sequences from Chinese collections (He 2608 and Cui 6592). The type specimen of *M. hexagonoides*, however, is from Argentina and the inclusion of an Argentinean sequence of *M. hexagonoides* (CBS 464.63, deposited by J.E. Wright) revealed that the clade that corresponds to *Megasporia* is a different one (Fig. 1). The species placed in *Megasporia sensu* Li & Cui (2013a) are now referred to the new genus *Jorgewrightia* including *J. bambusae*, *J. cystidiolophora*, *J. ellipsoidea*, *J. fusiformis*, *J. guangdongensis*, *J. major*, *J. rimosa*, *J. hengduanensis*, *J. tropica*, *J. violacea* and *J. yunnanensis* as well the Chinese specimens misidentified as *M. hexagonoides* (He 2608, Cui 6592, Cui 13853 and Cui 13855), whose identity should be re-examined (Fig. 1).

The addition of the Argentinean sequence of *M. hexagonoides* also indicated that a revised *Megasporia* includes the neotropical *M. amazonica*, *M. anoectopora*, *M. cavernulosa*, *M. cylindrospora*, *M. hexagonoides* and the new species *M. variabilicolor* (described below) (Fig. 1).

At last, *Megasporoporia sensu* Li & Cui (2013a) included a specimen identified as *M. setulosa* (MG38, only nLSU), as well as *M. bannaensis* and *M. minor*, all from China. With the inclusion of the neotype of *M. setulosa* (designated below), collected in north Tanzania close to the type locality, *Megasporoporia* currently includes, besides the neotype and the Chinese species, the neotropical, new species *M. neosetulosa* (described below) (Fig. 1). Also, the identity of *M. setulosa* (MG38) should be re-examined.

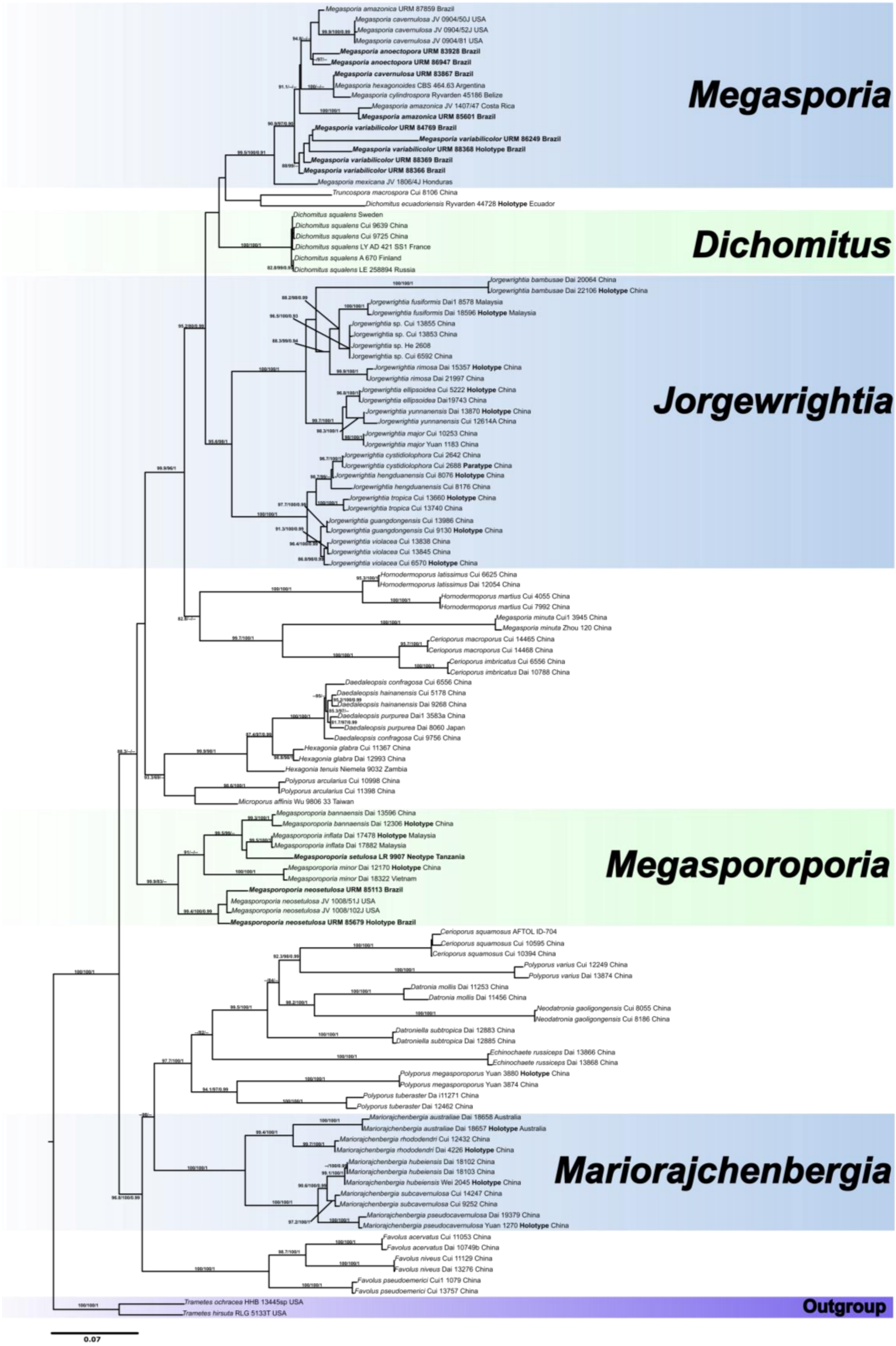

Figure 1 – Phylogenetic reconstruction of *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia* from a combined dataset (ITS + nLSU + RPB2 + tef1)

sequences. Branches are labeled with ML bootstrap and UFBoot2 (≥ 80%) and BA posterior probabilities (≥ 0.90) are shown along the branches, respectively. The sequences in bold were generated for this study.

Taxonomy

Jorgewrightia Gibertoni & C.R.S. Lira, gen. nov.

MycoBank number: MB832804

Etym. – *Jorgewrightia*, in honor of the late Jorge Eduardo Wright renowned Argentinean mycologist.

Basidiomata annual, resupinate. Pore surface white, cream, pale yellowish, honey yellow, salmon, pinkish, ash gray, greyish violet or violet or brown. Pores round to angular, 2–7 per mm. Hyphal system dimitic with clamped generative hyphae, skeletal hyphae non-dextrinoid to strongly dextrinoid, CB+, unbranched to frequently branched. Basidiospores cylindrical, ellipsoid in one species, hyaline, thin-walled, smooth, IKI-, CB-. Polyhedric crystals in the subhymenium and hymenium present in all species except for *J. yunnanensis*. Hyphal pegs present in two species. Dendrohyphidia present in all but four species. Causing white rot on angiosperms. So far, known only from tropical and subtropical China.

Type species – *Megasporia guangdongensis* B.K. Cui & Hai J. Li, Mycologia 105: 371. 2013.

Observations – The description above is updated from *Megasporia sensu* Li & Cui (2013a) and Yuan et al. (2017), which included *M. cystidiolophora*, *M. elipsoidea*, *M. guangdongensis*, *M. hengduanensis*, *M. hexagonoides*, *M. major, M. rimosa*, *M. tropica* and *M. violacea*.

Jorgewrightia bambusae (Y.C. Dai, Yuan Yuan & Ya.R. Wang) Gibertoni, comb. nov.

MycoBank number: MB842097

Basionym – *Megasporia bambusae* Y.C. Dai, Yuan Yuan & Ya.R. Wang, Mycosphere 12:1020, 2021.

Observations – According to Wang et al. (2021), *J. bambusae* is distinguished from other species in *Megasporoporia s.lat.* by its fairly thick-walled basidiospores and by growing on bamboo.

Jorgewrightia cystidiolophora (B. K. Cui & Y. C. Dai) Gibertoni & C.R.S. Lira, comb. nov.

MycoBank number: MB832806

Basionym – *Megasporoporia cystidiolophora* B.K. Cui & Y.C. Dai, Mikologiya i Fitopatologiya 41: 512, 2007.

Observations – According to Cui & Dai (2007), this species is distinct by its sterile margin, salmon coloured pore surface when dry, and microscopically by the subulate or ventricose cystidioles, and by lacking hyphal pegs and dendrohyphidia.

Jorgewrightia elipsoidea (B.K. Cui & P. Du) C.R.S. Lira & Gibertoni, comb. nov.

MycoBank number: MB832790

Basionym – *Megasporoporia ellipsoidea* B.K. Cui & P. Du, Mycotaxon 110: 132. 2009.

Megasporia ellipsoidea (B.K. Cui & P. Du) B.K. Cui & Hai J. Li, Mycologia 105: 375. 2013.

Observations – According to Du & Cui (2009), this species is characterized by its cream to orange yellow pore surface and large pores, calabash-shaped gloeocystidia and ellipsoid basidiospores.

Jorgewrightia fusiformis (Y.C. Dai, Yuan Yuan & Ya.R. Wang) Gibertoni, comb. nov.

MycoBank number: MB842098

Basionym – *Megasporia fusiformis* Y.C. Dai, Yuan Yuan & Ya.R. Wang, Mycosphere 12: 1022, 2021.

Observations – According to Wang et al. (2021), *J. fusiformis* is distinguished by the fusiform basidiospores. They report both IKI- and IKI+ for the skeletal hypha of this new species.

Jorgewrightia guangdongensis (B.K. Cui & Hai J. Li) Gibertoni & C.R.S. Lira, comb. nov.
MycoBank number: MB832807
Basionym – *Megasporia guangdongensis* B.K. Cui & Hai J. Li, Mycologia 105: 371, 2013.
Observations – According to Li & Cui (2013a), this species is characterized by the cream, ash gray, honey yellow or grayish violet pore surface and special cystidioles with collapsed tips and secondary septa.

Jorgewrightia hengduanensis (B.K. Cui & Hai J. Li) Gibertoni & C.R.S. Lira, comb. nov.
MycoBank number: MB832808
Basionym – Megasporia hengduanensis B.K. Cui & Hai J. Li, Mycologia 105: 374, 2013.
Observations – According to Li & Cui (2013a), this species is characterized by the cream to cream buff pore surface, large pores, almost unbranched skeletal hyphae, and presence of calabash-shaped basidia in the hymenium.

Jorgewrightia major (G.Y. Zheng & Z.S. Bi) C.R.S. Lira & Gibertoni, comb. nov.
MycoBank number: MB832792
Basionym – *Pachykytospora major* G.Y. Zheng & Z.S. Bi, Acta Mycologica Sinica 8:198, 1989.
Megasporia major (G.Y. Zheng & Z.S. Bi) B.K. Cui & Hai J. Li, Mycologia 105: 375, 2013.
Observations – According to Dai & Li (2002), this species is characterized by the cream pore surface, large pores, oblong ellipsoid to subcylindrical basidiospores and presence of hyphal pegs, dendrohyphdia and crystals.

Jorgewrightia rimosa (Y. Yuan, X.H. Ji & Y.C. Dai) C.R.S. Lira & Gibertoni, comb. nov.
MycoBank number: MB832793
Basionym: Megasporia rimosa Y. Yuan, X.H. Ji & Y.C. Dai, MycoKeys 20: 42, 2017.
Observations: According to Yuan et al. (2017), this species is characterized by the extremely thin and cracked basidioma (less than 0.5 mm thick) when dry.

Jorgewrightia tropica (Y. Yuan, X.H. Ji & Y.C. Dai) Gibertoni & C.R.S. Lira, comb. nov.
MycoBank number: MB832809
Basionym – *Megasporia tropica* Y. Yuan, X.H. Ji & Y.C. Dai, MycoKeys 20: 44, 2017.
Observations – According to Yuan et al. (2017), this species is characterized by the strongly dextrinoid skeletal hyphae, and by lacking dendrohyphidia, cystidioles and hyphal pegs.

Jorgewrightia violacea (B.K. Cui & P. Du) Gibertoni & C.R.S. Lira, comb. nov.
MycoBank number: MB832810
Basionym – *Megasporoporia violacea* B.K. Cui & P. Du, Mycotaxon 110: 134, 2009.
Megasporia violacea (B.K. Cui & P. Du) B.K. Cui, Y.C. Dai & Hai J. Li, Mycologia 105:374, 2013
Observations – According to Du & Cui (2009), this species is unique by its distinct sterile margin, violet to greyish violet pore surface, small pores, presence of both cystidioles and dendrohyphidia, but absence of hyphal pegs.

Jorgewrightia yunnanensis (Y. Yuan, X.H. Ji & Y.C. Dai) C.R.S. Lira & Gibertoni, comb. nov.
MycoBank number: MB832794
Basionym – *Megasporia yunnanensis* Y. Yuan, X.H. Ji & Y.C. Dai, MycoKeys 20: 44, 2017.
Observations – According to Yuan et al. (2017), this species is characterized by the brownish tints on the pore surface and by the absence of tetrahedric or polyhedric crystals.

Mariorajchenbergia Gibertoni & C.R.S. Lira, gen. nov.

MycoBank number: MB832795

Etym. – *Mariorajchenbergia* (Latin), in honor of Mario Rajchenberg, renowned Argentinean mycologist.

Basidiomata annual, resupinate. Pore surface cream, pale yellowish to honey yellow or gray. Pores angular, 1–5 per mm. Hyphal system dimitic with clamped generative hyphae, skeletal hyphae non-dextrinoid to strongly dextrinoid, CB+ (except in *M. hubeiensis*), moderately to frequently branched. *Basidiospores* cylindrical to oblong-ellipsoid, ellipsoid in one species, hyaline, thin-walled, smooth, IKI-, CB-. Polyhedric crystals in the subhymenium and hymenium of three species. Hyphal pegs present in three species. Dendrohyphidia present in two species. Causing white rot on angiosperms. So far, known from temperate and subtropical China.

Type species – *Megasporoporia subcavernulosa* Y.C. Dai & Sheng H. Wu, Mycotaxon 89: 384. 2004.

Observations – The description above is updated from *Megasporoporiella sensu* Li & Cui (2013a), which included *M. cavernulosa*, *M. hubeiensis*, *M. lacerata*, *M. pseudocavernulosa*, *M. rhododendri* and *M. subcavernulosa*.

The dextrinoid reaction may be present or absent in the species of *Mariorajchenbergia* and the reaction is observable right after the preparation of the slides, as usual for species of *Megasporoporia s.lat.* Cyanophily should be carefully analyzed, not only in *Mariorajchenbergia*, to certify that the blue coloration takes place in walls and ornamentations of the microstructures and not in the cytoplasm (Lira et al. 2016).

Mariorajchenbergia australiae (Y.C. Dai, Yuan Yuan & Ya.R. Wang) Gibertoni, comb. nov.

MycoBank number: MB 842172

Basionym – *Megasporoporiella australiae* Y.C. Dai, Yuan Yuan & Ya.R. Wang, Mycosphere 12: 1027, 2021.

Observations – According to Wang et al. (2021), this species and *M. hubeiensis* lack dextrinoid skeletal hyphae. From *M. hubeiensis*, *M. australiae* can be distinguished by smaller pores.

Mariorajchenbergia hubeiensis (Hai J. Li & B.K. Cui) Gibertoni & C.R.S. Lira, comb. nov.

MycoBank number: MB832796

Basionym – *Dichomitus hubeiensis* Hai J. Li & B.K. Cui, Nordic Journal of Botany 31: 118, 2013.

Megasporoporiella hubeiensis (Hai J. Li & B.K. Cui) Y.C. Dai, Yuan Yuan & Ya.R. Wang, Mycosphere 12: 1029, 2021.

Observations – According to Li & Cui (2013b), this species is distinct by its cream to straw-yellow pore surface and large pores, indextrinoid skeletal hyphae, presence of cystidioles and dendrohyphidia in the hymenium, and more or less ellipsoid basidiospores.

Mariorajchenbergia pseudocavernulosa (B.K. Cui & Hai J. Li) Gibertoni & C.R.S. Lira, comb. nov.

MycoBank number: MB832799

Basionym – *Megasporoporiella pseudocavernulosa* B.K. Cui & Hai J. Li, Mycologia 105: 378, 2013.

Cerioporus pseudocavernulosus (B.K. Cui & Hai J. Li) Zmitr., Folia Cryptogamica Petropolitana (Sankt-Peterburg) 6: 47, 2018.

Observations – According to Li & Cui (2013a), this species is easily recognized by its white to cream basidiomata and large and shallow pores.

Mariorajchenbergia rhododendri (Y.C. Dai & Y.L. Wei) Gibertoni & C.R.S. Lira, comb. nov.

MycoBank number: MB832801

Basionym – *Megasporoporia rhododendri* Y.C. Dai & Y.L. Wei, Annales Botanici Fennici 41: 323, 2004.

Megasporoporiella rhododendri (Y.C. Dai & Y.L. Wei) B.K. Cui & Hai J. Li, Mycologia 105:378, 2013.

Cerioporus rhododendri (Y.C. Dai & Y.L. Wei) Zmitr., Folia Cryptogamica Petropolitana (Sankt-Peterburg) 6:47, 2018.

Observations – According to Dai et al. (2004), this species is characterized by the lack of hyphal pegs, dendrohyphidia and polyhedric crystals. In addition, generative hyphae dominate the tramal structure, the basidiospores are ellipsoid and it grows in boreal forests on fallen trunks and dead trees of *Rhododendron*.

Mariorajchenbergia subcavernulosa (Y.C. Dai & Sheng H. Wu) Gibertoni & C.R.S. Lira, comb. nov.

MycoBank number: MB832803

Basionym – *Megasporoporia subcavernulosa* Y.C. Dai & Sheng H. Wu, Mycotaxon 89: 384, 2004.

Megasporoporiella subcavernulosa (Y.C. Dai & Sheng H. Wu) B.K. Cui & Hai J. Li, Mycologia 105: 379, 2013.

Cerioporus subcavernulosus (Y.C. Dai & Sheng H. Wu) Zmitr., Folia Cryptogamica Petropolitana (Sankt-Peterburg) 6: 47, 2018.

Observations – According to Dai & Wu (2004), this species has both hyphal pegs and dcndrohyphidia, and basidiospores distinctly smaller than in *Megasporia cavernulosa*.

Megasporia B.K. Cui, Y.C. Dai & Hai J. Li

Basidiomata annual, resupinate. Pore surface white, cream, ochraceous, pale brown, pale purplish brown or with lavender tints; pores mostly angular, rarely round, 0.5–5 per mm. Hyphal system dimitic with clamped generative hyphae, skeletal hyphae non-dextrinoid to strongly dextrinoid and CB-, unbranched to sparingly branched. Basidiospores cylindrical to ellipsoid, hyaline, thin-walled, smooth, IKI-, CB-. Polyhedric crystals in subhymenium and hymenium in two species, observed in KOH, Melzer's reagent and CB. Hyphal pegs absent, except for few observed in *M. mexicana*. Dendrohyphidia in *M. cavernulosa*, difficult to observe. Causing white rot on angiosperms. So far, known from the neotropics.

Type species – *Poria hexagonoide*s Speg., Anales del Museo Nacional de Historia Natural de Buenos Aires 6: 170, 1898 (1899).

Observations – The description above is updated from *Megasporia sensu* Li & Cui (2013a) and Yuan et al. (2017). *Megasporia* can be characterized by the acyanophilous, non-dextrinoid hyphae, which are also unbranched to sparingly branched, usually lack of hyphal pegs and of dendrohyphidia, and the neotropical distribution.

Megasporia variabilicolor C.R.S. Lira & Gibertoni, sp. nov. Fig. 2

MycoBank number: MB816410

Etym. – *variabilis* (Latin), *color* (Latin), referring to the variable color of basidiomata.

Basidiomata annual, resupinate, easily detachable from the substrate, 1.1–6.2 × 0.4–2.8 × 0.2–0.3 mm. Pore surface greyish brown, beige to cream (30 Clay Pink, 32 Clay Buff, 52 Buff), angular pores, (2)3–4(5) per mm, dissepiments thin and entire. Margin sterile, up to 3 mm width, lighter than the pore surface (5 E to 6 F). Context very thin, invisible to naked eye, 0.1 mm. Tubes concolorous to the pore surface, up to 3 mm deep.

Hyphal system dimitic, generative hyphae hyaline, clamped, thin, 2–3 µm diam., thin-walled; skeletal hyphae dominant, dichotomously and moderately branched, weakly to strongly dextrinoid, 2.5–3.5 µm diam., CB-. Large, pyramidal crystals present in the trama and hymenium, 3–5 µm. Dendrohyphidia, cystidia, cystidiols and hyphal pegs absent. Basidia clavate to cylindrical, four-sterigmate and clamped at the base, 22–30 × 5–8 µm.

Basidiospores cylindrical, hyaline, thin-walled, smooth, (11–)12–13 × (2–)3–4(–5) µm (L = 10.62, W = 3.42, Q = 3.10, n = 29), IKI-, CB-.

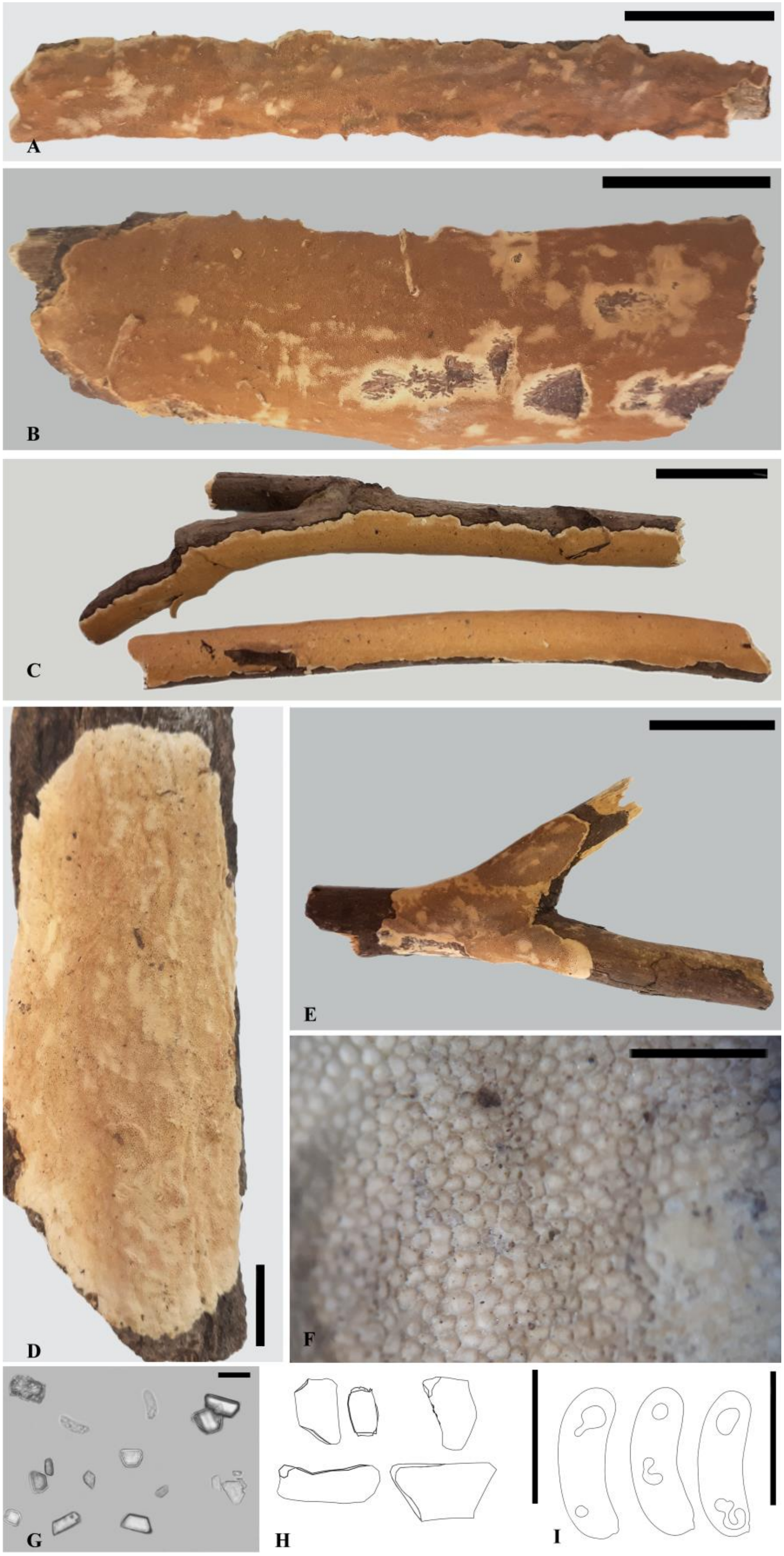

Figure 2 – *Megasporia variabilicolor*. A–E Basidiomata. A URM 88368 (holotype). B URM 83982. C URM 84769. D URM 88369. E URM 88366. F Pores (URM 88369). G Basidiospores

and crystals (URM 88369). H Crystals. I Basidiospores. Scale bars: A–E = 2 cm, F = 2 mm, G–I = 10 µm.

Type specimen – BRAZIL. *Paraíba:* Areia, Reserva Ecológica Estadual Mata do Pau-Ferro, in dead branch, 17 Jul. 2013, *C. R. S. Lira* 1095 (URM 88368! – holotype of *Megasporia variabilicolor*, isotype SP).

Specimens examined – BRAZIL. *Ceará:* Fortaleza, Parque Botânico do Ceará, 01 Nov. 2010, *R.S. Chikowski* 09 (URM 88164). *Paraíba:* Areia, Reserva Ecológica Estadual Mata do Pau-Ferro, 16 Ap. 2012, *C. R. S. Lira* 624, 630 (URM 83982, URM 83930); 21 Jul. 2012, *CRS Lira* 206 (URM 84769); 17 Jul. 2013, *C. R. S. Lira* 1073, 1078 (URM 88369, URM 88366). *Pernambuco*: Jaqueira, Reserva do Patrimônio Natural Frei Caneca, 08 Mar. 2013, GSN Melo 472 (URM 86249). *Rio Grande do Norte*, Nísia Floresta, Floresta Nacional de Nísia Floresta, Nov. 2002, *T. B. Gibertoni* s/n (URM 78071). *Sergipe:* Itabaiana, Serra de Itabaiana, Jan. 2002, *T. B. Gibertoni* s/n (URM 78048, 78049).

Additional specimens examined – BRAZIL. *Alagoas:* Barra de São Miguel, RPPN Rosa do Sol, Oct. 2000, *T. B. Gibertoni* s/n (URM 78059). *Rio Grande do Norte:* Baía Formosa, RPPN Senador Antonio Farias – Mata Estrela, Jan. 2002, *TB Gibertoni* s/n (URM 78079), Mar. 2002, *TB Gibertoni* s/n (URM 78080), as *Dichomitus cavernulosus*.

Ecology and distribution – Found on fallen branches of angiosperms in Atlantic Rain Forest and "brejos nordestinos" in Northeast Brazil.

Observations – The phylogeny places this species as a member of the polyporoid clade (Justo et al. 2017) and close to *M. hexagonoides*, the type of the genus (Li & Cui 2013a) (Fig. 1). Morphologically, *M. variabilicolor* is very similar to *M. cavernulosa*, from which it differs by the slightly larger pores (2–4 per mm) and basidiospores [(10)12–16 × 5–7 µm], presence of dendrohyphidia and unbranched hyphae (Table 2, 3). Additionally, *M. cavernulosa* seems to have a Northern distribution (Brazilian Amazonia), while *M. variabilicolor* is so far distributed in the Atlantic Rain Forest and "Brejos Nordestinos" in Northeast Brazil. However, specimens with intermediate characters were found (URM 78059, URM 78079, URM 78080) and should be sequenced for an accurate identification.

Megasporia amazonica (Gomes-Silva, Ryvarden & Gibertoni) C.R.S. Lira & Gibertoni, comb. nov.

MycoBank number: MB832797

Basionym – *Dichomitus amazonicus* Gomes-Silva, Ryvarden & Gibertoni, Mycological Progress 11: 882, 2012.

Specimens examined – BRAZIL. *Amazonas*: Manaus, Reserva Ducke, 28 Oct. 2009, *L. Ryvarden* 48295 (URM 83054 – holotype of *Megasporia amazonica*). *Bahia*: Abaíra, Parque Nacional Chapada da Diamantina, 10 Nov. 2015, *CRS Lira* 03 (URM 87859). *Ceará*: Tianguá, Serra de Ibiapaba, 18 Apr. 2012, *C. R. S. Lira* PPBio 704 (URM 83965). *Paraíba*: Areia, Reserva Ecológica Estadual Mata do Pau-Ferro, 09 Nov. 2010, *CRS Lira* 12 (URM 84733). *Pernambuco*: Buíque, Parque Nacional do Catimbau, 31 Jul. 2013, *CRS Lira* 677 (URM 85601).

Observations – This species is characterized by cream to light brown basidiomata, large pores, and large, ellipsoid to subcylindrical basidiospores (Table 2, 3). It is macroscopically similar to *M. cavernulosa*, which has larger, cylindrical basidiospores. *Megasporia amazonica* was also collected in Costa Rica (http://mykoweb.prf.jcu.cz/polypores/list_dtof.html). The sequenced collections do not group together (Fig. 1) and, despite being compared and shown to be similar to the type, the Brazilian material should be revaluated, as well as JV1407/47 from Costa Rica, when sequences from the type or material from the type locality are obtained.

Megasporia anoectopora (Berk. & M.A. Curtis) C.R.S. Lira & Gibertoni, comb. nov.

MycoBank number: MB832800

Basionym – *Polyporus anoectoporus* Berk. & M.A. Curtis, Botanical Journal of the Linnean Society 10: 318, 1869.

Poria anaectopora (Berk. & M.A. Curtis) Sacc., Sylloge Fungorum 6: 326, 1888.

Dichomitus anoectoporus (Berk. & M.A. Curtis) Ryvarden, Mycotaxon 20: 331, 1984.

Specimens examined – BRAZIL. *Pará*: Portel, Floresta Nacional de Caxiuanã, 15 Apr. 2014, *A. M. S. Soares-Brandão* 562 (URM 86947). *Paraíba*: Areia, Reserva Ecológica Estadual Mata do Pau-Ferro, 24 Apr. 2013, *CRS Lira* 570 (URM 85602). *Piauí*: Caracol, Parque Nacional Serra das Confusões, 15 Mar. 2012, *CRS Lira* 592, 600 (URM 83838, URM 83928).

Observations – *Megasporia anoectopora* is characterized by beige to purplish brown basidiomata, large pores and ellipsoid, oblong-ellipsoid basidiospores (Table 2, 3). It is reported from the Caribbean area (Ryvarden 2015) and Brazil (Gomes-Silva et al. 2012).

Megasporia cavernulosa (Berk.) C.R.S. Lira & Gibertoni, comb. nov.

MycoBank number: MB832802

Basionym – *Polyporus cavernulosus* Berk., Hooker's Journal of Botany and Kew Garden miscellany 8: 235, 1856.

Poria cavernulosa (Berk.) Sacc., Sylloge Fungorum 6: 324, 1888.

Coriolus cavernulosus (Berk.) Pat., Essai taxonomique sur les familles et les genres des Hyménomycètes (Lons-le-Saunier): 94, 1900.

Megasporoporia cavernulosa (Berk.) Ryvarden, Mycotaxon 16: 174, 1982.

Dichomitus cavernulosus (Berk.) Masuka & Ryvarden, Mycological Research 103: 1127, 1999.

Megasporoporiella cavernulosa (Berk.) B.K. Cui, Y.C. Dai & Hai J. Li, Mycologia 105: 378, 2013.

Specimens examined – BRAZIL. *Rondônia*: Porto Velho, Estação Ecológica de Cuniã, 12 Mar. 2012, *A. C. Gomes-Silva* and *T. B. Gibertoni* 17 (URM 83867).

Observations – *Megasporia cavernulosa* is characterized by pale cream basidiomata, strongly dextrinoid hyphae, and presence of dendrohyphidia (Tables 2, 3). The type specimen of this species is from the Brazilian Amazonia, thus reports elsewhere should be revaluated (Ryvarden et al. 1982, Li & Cui 2013a, Yuan et al. 2017, Cui et al. 2019, Wang et al. 2021). In the phylogeny (Fig. 1), this species clusters with *M. cylindrospora* and *M. hexagonoides*. For the latter, two only LSU sequences are available, which possibly makes the genetic delimitation less reliable. *Megasporia cavernulosa*, *M. cylindrospora* and *M. hexagonoides* are all morphologically distinct (Tables 2, 3) and were originally collected in different ecosystems. In addition, specimens identified as *M. cavernulosa* and collected in Florida (USA) (JV 0904/52J, JV 0904/50J, JV 0904/81, ITS only) do not cluster with the Brazilian *M. cavernulosa* and may represent another species.

Megasporia cylindrospora (Ryvarden) C.R.S. de Lira & Gibertoni, comb. nov.

MycoBank number: MB832805

Basionym – *Dichomitus cylindrosporus* Ryvarden, Synopsis Fungorum 23: 40, 2007.

Specimens examined – BRAZIL. *Santa Catarina:* Blumenau, Parque Nacional da Serra do Itajaí, 06 Nov. 2011, *M. A. B. Silva*, *E. R. Drechsler-Santos, F. M. Freire* and *V. F. Lopes* 191 (FLOR 49196); *ibid*, 13 Sep. 2012, *M. A. B. Silva, D. H. Costa-Rezende, C. Salvador-Montoya, V.F. Lopes, F.M. Freire.* and *Demetrio* 291 (FLOR 49277). *São Paulo*: Cananéia, Ilha do Cardoso, 05 Feb. 1987, *L. Ryvarden, K. Hjortstam* and *D. Pegler* 24802 (SP-Fungi 466096), São Luiz do Piraitinga, Parque Estadual da Serra do Mar, 29 Jul. 2013, *R. M. Pires* RP31, RP93 (SP446261, SP213600).

Observations – According to Ryvarden (2007), this species is characterized by narrow, cylindrical basidiospores (8–10 × 2.5–3 µm). Of the examined specimens, only FLOR 49277 had basidiospores, which were slightly longer than originally described (10–12 × 2.5–3.5 µm). Except for SP-Fungi 466096, mostly conical (25–35 × 25–35 µm), occasionally cylindrical (37 × 12 µm) or globose (35 × 35 µm) hyphal pegs were observed, which were not reported in the original description. So far, it is known from the type locality in Belize and possibly South and Southeast Brazil.

Megasporia hexagonoides (Speg.) B.K. Cui, Y.C. Dai & Hai J. Li.

MycoBank number: MB801185

Basionym – *Poria hexagonoides* Speg., Anales del Museo Nacional de Historia Natural de Buenos Aires 6: 170, 1898, 1899.

Megasporoporia hexagonoides (Speg.) J.E. Wright & Rajchenb., Mycotaxon 16: 176, 1982.

Dichomitus hexagonoides (Speg.) Robledo & Rajchenb., Mycotaxon 100: 7, 2007.

Specimens examined – ARGENTINA. *Salta*: La Viña, 1897, *Carlo Spegazzini* (O-F-450306, SP); camiño de Rosario de la Frontera a Gobernador Garmendia, Aug. 1963, *A. Okada* (O-F-910700). *Tucuman*: Dique de Cadillal, 10 Jun. 1951, *R. Singer* 1568 (O-F-910699, BAFC 27919).

Observations – This species is characterized by ash grey basidiomata with lavender tints, large and hexagonal pores, and cylindrical to slightly allantoid basidiospores (Ryvarden et al. 1982).

Megasporia mexicana (Ryvarden) Gibertoni, comb. nov.

MycoBank number: MB842099

Basionym – *Megasporoporia mexicana* Ryvarden, Mycotaxon 16: 178, 1982.

Dichomitus mexicanus (Ryvarden) Ryvarden, Synopsis Fungorum 23: 42, 2007.

Observations – This species has the largest basidiospores in the genus and basidiomata with hyphal pegs, although usually few (Ryvarden et al. 1982).

***Megasporoporia* Ryvarden & J.E. Wright**

MycoBank number: MB18028

Basidiomata annual, resupinate. Pore surface white, cream, ochraceous or pale brown, pores angular, 0.5–7 per mm. Hyphal system dimitic with clamped generative hyphae, skeletal hyphae strongly dextrinoid, CB+, unbranched to sparingly branched. Basidiospores cylindrical to ellipsoid, hyaline, thin-walled, smooth, IKI-, CB-. Polyhedric crystals in subhymenium and hymenium absent in one species, observed in KOH, Melzer's reagent and CB. Hyphal pegs absent in one species. Dendrohyphidia absent. Causing white rot on angiosperms. So far, known from tropical and subtropical areas.

Type species – *Poria setulosa* Henn., Botanische Jahrbücher fur Systematik, Pflanzengeschichte und Pflanzengeographie 28:321. 1900.

Neotype – TANZANIA. *Arusha province*: Arusha National Park, Lake Kusare, Ngurdoto Crater, alt. 1500–1700 m, 3°13'S and 36°53'E, *L. Ryvarden* 9907, 7–9 Feb. 1973 (*neotypus hic designatus*: O-F-503664!, designated here, MBT391367).

Observations – The description above is updated from *Megasporoporia sensu* Ryvarden et al. (1982), typified by *Poria setulosa* Henn., collected in Usambara, Tanga Region in Tanzania, and deposited at herbarium B. Ryvarden et al. (1982) stated that the type is lost, probably during World War II. Upon our request, R. Lücking [current curator for cryptogams (lichens, fungi, bryophytes) in herbarium B, pers. comm.] confirmed that the material or similar is absent from herbarium B. Material identified as *Megasporoporia setulosa* (Henn.) Rajchenb. and also collected in north Tanzania had its DNA sequenced and selected here to be the neotype of *P. setulosa*.

Megasporoporia is characterized by strongly dextrinoid, cyanophilous hyphae, which are also unbranched to sparingly branched, lack of dendrohyphidia, presence of hyphal pegs in most of species, and tropical and subtropical distribution.

Megasporoporia neosetulosa C.R.S. de Lira & Gibertoni sp. nov. Fig. 3

MycoBank number: MB835041

Etym. – *neosetulosa* (Latin), referring to a new species being similar to *M. setulosa*.

Basidiomata annual, resupinate, easily detachable from the substrate, 1.8–5.1 × 0.4–1.6 × 0.1–0.2 mm. Pore surface beige to cream (52 Buff), angular pores, 1.5–2 per mm, dissepiments thin and entire. Margin sterile, up to 1 mm width, lighter than the pore surface (6 F). Context very thin, invisible to naked eye, 0.1–0.2 mm. Tubes concolorous to the pore surface, up to 2 mm deep.

Hyphal system dimitic, generative hyphae hyaline, clamped, thin, 2–3 µm diam., thin-walled; skeletal hyphae dominant, rarely branched, strongly dextrinoid, 2.5–3.5 µm diam., CB+. Pyramidal crystals present in the trama and hymenium, 3–5 µm. Dendrohyphidia, cystidia and cystidiols absent. Hyphal pegs present in the hymenium, conical, 62.5–87.5 × 20–30 µm. Basidia not seen. Basidiospores rare, cylindrical, hyaline, thin-walled, smooth, 10–12 × 3–4 µm, IKI-, CB-.

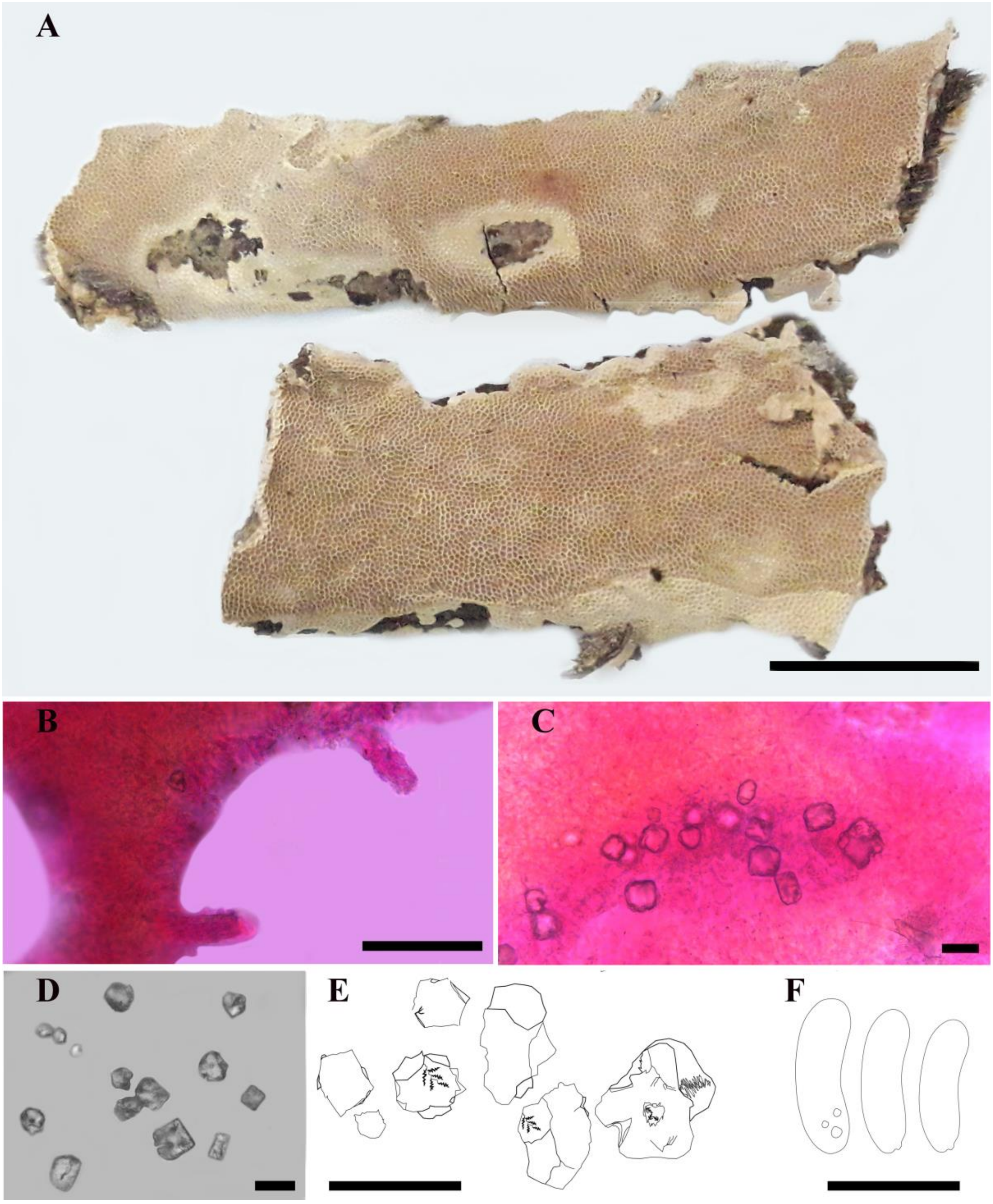

Figure 3 – *Megasporoporia neosetulosa* (URM 85679, holotype). A Basidiomata. B Hyphal pegs. C Crystals. D, E Crystals. F Basidiospores. Scales bars: A = 1 cm, B = 100 µm, C–F = 10 µm.

Type specimen – BRAZIL. *Ceará*: Crato, Floresta Nacional do Araripe, 17 May 2012, *C. R. S. Lira* 934 (URM 85679! – holotype of *Megasporoporia neosetulosa*, isotype SP).

Specimens examined – [most identified as *M. setulosa* or *Dichomitus setulosus* (Henn.) Masuka & Ryvarden]: BRAZIL. *Amazonas*: Humaitá, 23 Apr. 2013, *A. C. Gomes-Silva et al.* 109 (URM 87778). *Ceará*: Crato, Floresta Nacional do Araripe, 25 Jan. 2011, *C. R. S. Lira* 63 (URM 85111, 85678); *ibid*, 17 May 2012, *C. R. S. Lira PPBio* 929 (URM 87861); *ibid*, 17 May 2012, *C. R. S. Lira PPBio* 939 (URM 87862), Quixadá, RPPN Não Me Deixes, 01 Apr. 2014, *CRS Lira* 1170 (URM 88006). *Pará:* Melgaço, Estação Científica Ferreira Penna, Aug. 2007, *T. B. Gibertoni* w/n (URM 79700), *Portel*, Floresta Nacional de Caxiuanã, Jan. 2014, *AM Soares* 1242 (URM 89574); *ibid*, Sep. 2014, *AM Soares 1731* (URM 89575). *Paraíba*, Areia, Reserva EcológicaEstadual Mata do Pau-Ferro, 29 Apr. 2013, *C. R. S. Lira* 628 (URM 85113); *ibid*, 17 Jul. 2013, *CRS Lira* 1080 (URM 85680); *ibid*, 28 Mar. 2014, *C. R. S. Lira* 885 (URM 87779). *Pernambuco*: Araripina, Estação Experimental do IPA, 10 Mar. 2008, *ER Drechsler-Santos* 52PE (URM 80530); Igarassu, 26 Mar. 2015, *R. C. Chikowski 13* (URM 90141); *ibid*, date unknown, *R. C. Chikowski* 2 (URM 90142); Tamandaré, Reserva Biológica Saltinho, Feb. 2012, *L. S. Araujo-Neta* and *G. S. Nogueira-Melo* D18 (URM 87597); *ibid*, 30 Apr. 2014, *R. J. Rento-Freitas et al.* RF22 (URM 87598); Triunfo, Sítio Carro Quebrado, 20 May 2014, *C. R. S. Lira* 930 (URM 87904). *Piauí*: Caracol, Parque Nacional Serra das Confusões, 13 Mar. 2012, *CRS Lira* 512 (URM 85112). *Rondônia*: Porto Velho, Parque Circuito, 11 Mar. 2012, *A. C. Gomes-Silva* and *T. B. Gibertoni* TB03 (URM 83906, as *Grammothele setulosa* (Henn.) Ryvarden); *ibid*, Fazenda Macauã, 27 Jan. 2015, *A. M. Soares* and *S. G. Soares* ASR16 (URM 89573); *ibid*, Sítio Primavera, 10 Nov. 2014, *R. C. Chikowski 805* (URM 90174); *ibid*, Base de Selva Guararapes, 05 Nov. 2015, *R. C. Chikowski* 1013 (URM 90175).

Ecology and distribution – Found on fallen branches of angiosperms in Amazonia, Atlantic Rain Forest, “Brejos nordestinos” and “Caatinga” in northeast Brazil, but it may be present in other regions of the neotropics as well.

Observations – The phylogeny places this species as a member of *Megasporoporia* (Fig. 1). Morphologically, *M. neosetulosa* is very similar to *M. setulosa* due to the presence of hyphal pegs; however, they differ in the size of basidiospores, slightly larger in the latter (11–17 × 4–6 µm). In addition, *M. neosetulosa* seems to have a neotropical distribution, while *M. setulosa* seems to be restricted to Africa so far.

Table 2 Main morphological characteristics of the sequenced species of *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia*. The species in bold represent the type of each genera.

Genus	Species	Color	Pores (mm)/shape	Skeletal hyphae reactions
Dichomitus	***squalens***	surface white to cream, bay to almost blackish from the base; pore surface cream to greyish	4–5/round to angular	arboriform and usually dichotomously branched IKI-/CB-
Jorgewrightia	*bambusae*	white to cream when fresh, cream to buff when dry	4–5/angular	frequently branched weakly IKI+/CB+
	cystidiolophora	cream to pale pinkish brown to salmon coloured	3–5/round to angular	occasionally branched IKI+/CB+
	ellipsoidea	cream buff when fresh, becoming buff to orange yellow when dry	1–1.5/round to angular	rare- to frequently branched IKI- to weakly +/CB+

Table 2 Continued.

Genus	Species	Color	Pores (mm)/shape	Skeletal hyphae reactions
	Fusiformis	cream when fresh, cream to buff-yellow when dry	3.5–4/angular	frequently branched IKI- or +/CB+
	guangdongensis	cream, ash gray, honey yellow or grayish violet when dry	4–5/angular	occasionally branched IKI+/CB+
	hengduanensis	cream to cream buff when dry	2–3/round to angular	rarely branched IKI+/CB+
	major	cream to wood-colored	1–1.5/angular	ocasionally branched IKI+/CB+
	rimosa	white to cream when fresh, cream when dry	3–4/angular	moderately branched in subiculum, unbranched in tubes IKI weakly +/CB+
	tropica	clay-pink to fawn when dry	2–3/round	Unbranched IKI+/CB+
	violacea	violet	5–7/round to angular	frequently branched IKI+/CB+
	yunnanensis	white to cream but with brownish tints when dry	2–3/round	occasionally branched IKI weakly +/CB+
Mariorajchenbergia	*australiae*	white to cream	3–4/round to angular	frequently branched IKI-/CB+
	hubeiensis	cream to straw-yellow	1–2/angular	frequently branched IKI-/CB-
	pseudocavernulosa	white to cream	1.5–2.5/angular	moderately branched IKI+/CB+
	rhododendri	greyish	4–5/angular	moderately branched IKI+/CB+
	subcavernulosa	cream to pale grayish pore surface	2–4/angular	frequently branched IKI+/CB+
Megasporia	*amazonica*	pale cream	2/angular to hexagonal	sparingly branched IKI+/CB-
	anoectopora	white, tan to pale purplish brown	1–2/round to angular	rarely branched IKI-/CB-
	cavernulosa	white to cream	2–4/angular and shallow	unbranched and flexuous IKI+/CB-

Table 2 Continued.

Genus	Species	Color	Pores (mm)/shape	Skeletal hyphae reactions
	cylindrospora	pale brown to ochraceous	3–4/angular	arboriform, sparingly branched IKI- to +/CB-
	hexagonoides	ash grey with lavender tints	0.5–1/hexagonal	branched or not IKI+/CB-
	mexicana	white to pale cream	2–3/angular to round	unbranched, sinuous to dichotomously branched IKI+/CB?
	variabilicolor	beige to cream	3–4(5)/angular	dichotomously branched IKI- to +/CB-
Megasporoporia	*bannaensis*	cream to buff when dry	1–2/angular	almost unbranched skeletal hyphae IKI+/CB+
	inflata	cream to clay buff	2.5–3/round to angular	moderately branched IKI+/CB+
	minor	cream to buff when fresh, turn to pale brown when bruised	6–7/angular	rarely branched IKI+/CB+
	neosetulosa	beige to cream	1.5–2/angular	rarely branched IKI+/CB+
	setulosa	cream to ochraceous	0.5–2/angular	Unbranched IKI+/CB+

Table 3 Main morphological characteristics and distribution of the sequenced species of *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia*. The species in bold represent the type of each genera.

Genus	Species	Spore size (μm)/shape	Crystals, hyphal pegs and dendrohyphidia	Distribution	Selected references
Dichomitus	***squalens***	7–10 × 2.5–3.5/cylindrical to oblong–ellipsoid	None	Europe, possibly North America	Ryvarden & Gilbertson (1993)
Jorgewrightia	*bambusae*	(10.5–)11.8–14(–14.8) × (5.5–)5.8–6.8(–7.5)/ellipsoid	Crystals, dendrohyphidia	China	Wang t al. (2021)
	cystidiolophora	(10–)11.7–14.9(–15.5) × (4–)4.1–5.6(–6)/cylindrical	Crystals	China	Cui & Dai (2007)

Table 3 Continued.

Genus	Species	Spore size (µm)/shape	Crystals, hyphal pegs and dendrohyphidia	Distribution	Selected references
	ellipsoidea	(11–)12–15(–18) × 6–8.2(–9)/cylindrical	All	China	Du & Cui (2009)
	fusiformis	(14.1–)15–19.8(–20.2) × (4–)4.2–6.8(–7)/fusiform	Crystals, dendrohyphidia	Malaysia	Wang et al. (2021)
	guangdongensis	(10–)11–14.9(–15) × (3–)3.4–4.5(–4.9)/cylindrical	Crystals	China	Li et al. (2014)
	hengduanensis	(10.8–)11–15(–16.5) × (4–)4.2–5.2(–6.2)/cylindrical	Crystals	China	Li et al. (2014)
	major	15.2–20 × 5.5–7.1/cylindrical	all	China	Dai & Li (2002)
	rimosa	(16.5–)16.8–20.2(–21) × (4.1–)4.3–5.5 (–5.9)/cylindrical	Crystals, dendrohyphidia	China	Yuan et al. (2017)
	tropica	(14.2–)14.7–18.8(–19.7) × (4.9–)5–6.5 (–7.1)/cylindrical	Crystals	China	Yuan et al. (2017)
	violacea	(10–)11–14.9(–15.2) × (3–)3.2–5 (–5.2)/cylindrical	Crystals, dendrohyphidia	China	Li et al. (2014)
	yunnanensis	(15.1–)16.5–20.8(–21.5) × (5.1–)5.5–7.1 (–7.5)/cylindrical	Dendrohyphidia	China	Yuan et al. (2017)
Mariorajchenbergia	*australiae*	(11.5–)11.8–15(–16.5) × (3.5–)4–6(–6.5)/cylindrical	Crystals	Australia	Wang et al (2021)
	hubeiensis	(9–)10–14(–15) × (5–)5.6–7(–7.2)/cylindrical to oblong-ellipsoid	Hyphal pegs, dendrohyphidia	China	Li & Cui (2013b)
	pseudocavernulosa	(9.4–)10.8–14(–14.8) × (5–)5.3–6.5(–7)/cylindrical to ellipsoid	Crystals, hyphal pegs	China	Li & Cui (2013a)
	rhododendri	11–14 × 6.5–8/ellipsoid	None	China	Dai et al. (2004)
	subcavernulosa	9–12.1 × 4.2–5.2/cylindrical	All	China	Dai et al. (2004)
Megasporia	*amazonica*	(9–)10–12 × 3.5–4/ellipsoid to subcylindrical	None	Brazil, Costa Rica	Gomes-Silva et al. (2012)
	anoectopora	15–19 × 6–8/oblong–ellipsoid to ellipsoid	None	Brazil, Cuba, Porto Rico	Ryvarden (1984)
	cavernulosa	(10–)12–16 × 5–7/cylindrical	Dendrohyphidia, difficult to observe in old samples	Brazil, possibly neotropical	Masuka & Ryvarden (1999)
	cylindrospora	8–10 × 2.5–3/cylindrical	None	Belize, Brazil	Ryvarden (2007)

Table 3 Continued.

Genus	Species	Spore size (µm)/shape	Crystals, hyphal pegs and dendrohyphidia	Distribution	Selected references
	hexagonoides	16.6–21.8 × 5.5–6.8/cylindrical to slightly allantoid	Crystals	Argentina	Ryvarden et al. (1982)
	mexicana	20–26 × 6–9/cylindrical to allantoid	Hyphal pegs (few)	Belize, Honduras and Mexico	Ryvarden et al. (1982)
	variabilicolor	(11–)12–13 × (2–)3–4(–5)/cylindrical	Crystals	Brazil	**This work**
Megasporoporia	*bannaensis*	(9.7–)10–14 (–15) × (3.7–)3.9–4.6(–5)/cylindrical to allantoid	Crystals	China	Li & Cui (2013a)
	inflata	(9.8–)10–11.8(–12) × 3.5–4.2/cylindrical	Crystals	Malaysia and Singapore	Wang et al. (2021)
	minor	6–7.8(–8) × (2.5–)2.6–4/cylindrical to oblong-ellipsoid	Hyphal pegs	China	Li & Cui (2013a)
	neosetulosa	10–12 × 3–4/cylindrical	Crystals, hyphal pegs	Brazil, possibly neotropical	**This work**
	setulosa	11–17 × 4–6/cylindrical to oblong ellipsoid	Crystals, hyphal pegs	Tanzania, reported as common in Africa	Ryvarden et al. (1982)

Discussion

When studying the taxonomy and phylogeny of *Megasporoporia* and related genera, Li & Cui (2013a) delimited four clades: *Dichomitus s.str.*, *Megasporia, Megasporoporia s.str.* and *Megasporoporiella*. However, the taxonomical arrangement proposed by Li & Cui (2013a) failed due to the inadequate choice of generic types for the new genera *Megasporia* and *Megasporoporiella*. In both cases, the specimens representing the type species were misidentified, neither did they originate from the type localities. For the present study, we included material of the type species for *Megasporia* and *Megasporoporiella* from the vicinity of the type localities. With correctly identified sequences of the type species in the dataset, our analyses show that *Megasporoporiella* becomes a synonym of *Megasporia*. For the *Megasporoporiella* clade, excluding the type, we instead introduce the new genus *Mariorajchenbergia*. Our analyses also show that a redefined *Megasporia* presently contains only species from the Americas. The species, excluding the type, placed in *Megasporia* by Li & Cui (2013a) are here referred to the new genus *Jorgewrightia*. The species here selected as type of *Jorgewrightia* and *Mariorajchenbergia* were described as new species (Li & Cui 2013a) and only *M. subcavernulosa* had been placed in other genera, *i.e.*, *Megasporoporiella* and *Cerioporus*, but not fitted in these taxa according to our results (Fig. 1). *Poria hexagonoides*, the type species of *Megasporia*, had been placed in *Dichomitus*, *Hexagonia* and *Megasporoporia*, while *Poria setulosa*, type of *Megasporoporia*, had been placed in

Antrodia (a brown-rot genus), *Dichomitus*, *Elmerina* (Auriculariaceae), *Grammothele* and *Trametes*. These previous placements in the polyporoid clade, as well in others, were not supported by our results (Fig. 1).

Besides genetically separated, *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia* appear to have a delimited geographical distribution. *Dichomitus* seems restricted to temperate and boreal areas in Eurasia and *Megasporia* to the neotropics, while *Megasporoporia* is apparently a widespread genus in tropical and subtropical regions. *Jorgewrightia* and *Mariorajchenbergia* occur above all in subtropical and temperate China, but the former also in Australia and the latter also in Malaysia.

Morphologically, *Dichomitus* can be differentiated from the other genera by the absence of dextrinoid and cyanophilous hyphae, lack of crystals, hyphal pegs and dendrohyphidia. The neotropical *Megasporia* can be distinguished from the tropical and subtropical *Megasporoporia* by the acyanophilous hyphae and lack of hyphal pegs in all but one species. *Jorgewrightia* and *Mariorajchenbergia* are difficult to separate, but skeletal hyphae are usually branched in the latter, while more occasionally branched in the former (Table 2). Also, dendrohyphidia and crystals are most commonly found in *Jorgewrightia*, while hyphal pegs are more common in *Mariorajchenbergia* (Table 3).

The distinction between *Dichomitus* and *Megasporoporia s.lat.* is confirmed and, thus, the synonymization of *Megasporoporia* to *Dichomitus* not supported, which is in line with previous works (Li & Cui 2013a, b, Yuan 2013). The *Dichomitus* clade includes so far only the type species *D. squalens* (P. Karst.) D.A. Reid (Ryvarden 1991). The type is from Finland and the sequences used are from materials collected in China and Russia (Table 1), but ITS sequences from materials collected in France (KP135330) and probably Finland (AM988622, AM988623, AM988624), France (FJ349622) and Sweden (JQ518275) are also *D. squalens* when verified doing BLASTn searches, suggesting that the species and possibly the genus have a north temperate and boreal distribution and is absent in the tropics. However, sequences from North America that could confirm this hypothesis are lacking in GenBank.

So far, no other species belonging to *Dichomitus s.str.* has been sequenced, although several are still morphologically identified as such, as *D. citricremeus* Masuka & Ryvarden and *D. ecuadorensis* Ryvarden both recorded in Brazil (Maia et al. 2015). *Dichomitus citricremeus* was described from Cameroon, in tropical Africa, while the Brazilian specimen (FLOR 11808) was collected in a subtropical region in south Brazil. The Brazilian material was deteriorated and, thus, the presence of the species in the country is dubious. *Dichomitus ecuadoriensis* was described from Ecuador and recorded twice in Brazil (FURB 55087 and URM 83056). Both the type LR 44728 (O) and URM 83056 were examined and may belong to *Megasporia*. The specimen URM 83056 was not sequenced, however, the 28S sequence from LR 44728 is available in GenBank (JQ780440) and clustered without support with the type material of *Truncospora macrospora* (JX941596) (Fig. 1). It also had high LSU similarity (98.52%) with *T. macrospora* (JX941596). Sequencing the ITS region from the type is needed to evaluate the real identity of *D. ecuadoriensis*.

Besides the new genera and the rearrangements here proposed for *Megasporia* and *Megasporoporia*, two new species were introduced. A possible name for the new *Megasporoporia neosetulosa* would be *Trametes subserpens* Murrill, a species recorded in the Americas and listed as a synonym of *M. setulosa*, the African counterpart of *M. neosetulosa*, in Index Fungorum. *Trametes subserpens*, however, was not validly published according to the Article 38.1 (a) of Turland et al. (2018), since a description or diagnosis of the taxon was lacking. Among the synonyms listed to *Megasporia cavernulosa* that would fit *M. variabilicolor* neotropical distribution, *Hexagonia heteropora* Pat. was possibly collected in the Amazonian Venezuela (Puerto Zamuro, High Orinoco), while *Poria linearis* Murrill was collected in Panama, both distant from the type locality of *M. variabilicolor* and from different phytogeographical domains. In addition, *M. variabilicolor* is distantly related to *H. tenuis* (Fig. 1), the type species of *Hexagonia*.

Several species that belonged to *Megasporoporia sensu* Ryvarden et al. (1982) and *Megasporoporiella sensu* Li & Cui (2013a) and Wang et al. (2021) have been recently transferred to *Cerioporus* Quél. (Zmitrovich 2018): *Megasporoporiella cavernulosa*, *M. lacerata*, *M. pseudocavernulosa*, *M. rhododendri*, and *M. subcavernulosus*, but the author did not present a clear explanation for these decisions. Through his circumscription, *Cerioporus* became morphologically a rather heterogeneous genus. *Cerioporus* is typified by *Boletus squamosus* Huds. (better known as *Polyporus squamosus*) from Germany (based on *B. juglandis* Schaeff.) or Hungary (according to Ryvarden 1991). The sequences used in the present work are from the USA (AFTOL ID-704) and China (Cui 10394, Cui 10595) (Table 1), but ITS sequences from materials collected in Bulgaria (HQ439363), Denmark (AF516587.1), Germany (AF516588, AF516589), Sweden (AF516590) and Russia (KM411467.1) also represent *Cerioporus squamosus* (Huds.) Quél. when verified doing BLASTn searches. *Polyporus squamosus* (AFTOL ID-704) is distantly related to *Dichomitus*, *Jorgewrightia*, *Mariorajchenbergia*, *Megasporia* and *Megasporoporia* (Fig. 1). By contrast, Zmitrovich (2018) kept several species in *Dichomitus* that now clearly belong to other genera, including *D. amazonicus* (≡ *Megasporia amazonica*), *D. anoectoporus* (≡ *Megasporia anoectopora*), *D. cylindrosporus* (≡ *Megasporia cylindrospora*), *D. hubeiensis* (≡ *Mariorajchenbergia hubeiensis*) and *D. mexicanus* (≡ *Megasporia mexicana*) and, similarly to the reassignments suggested to *Cerioporus*, the author did not present reasons for these choices. Therefore, the taxonomical rearrangements proposed by Zmitrovich (2018) were not supported by our results.

This is the first molecular study of *Megasporoporia s.lat.* using sequences from materials collected in Brazil and Tanzania. The results provide a more natural placement for several specimens and species collected in the neotropics and support the guidelines proposed by Vellinga et al. (2015), that include (1) monophyletic genera with sufficient statistical support and based on more than one gene, (2) wide number of species, geographic coverage and type species of the studied genera, and (3) discussion of possible taxonomical rearrangements. Regarding the second guideline, we would like to emphasize that even more important is the inclusion of type specimens or at least reference specimens from or close to the type locality and similar habitat, since the use of type species based in unsuitable material has proven to cause misunderstandings in taxonomical delimitation.

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