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New records on *Fomitiporia* and *Fuscoporia* (Hymenochaetaceae) in areas of the Atlantic Forest in Northeastern Brazil

Novos registros de *Fomitiporia* e *Fuscoporia* (Hymenochaetaceae) em áreas de Mata Atlântica no Nordeste do Brasil

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ABSTRACT

During collections carried out in the Atlantic Forest in Northeastern Brazil, specimens belonging to *Fomitiporia* and *Fuscoporia* were collected. The morphological and molecular analyses of ITS and nLSU regions confirmed that they represent *Fomitiporia conyana*, *Fo. maxonii*, *Fo. neotropica*, *Fuscoporia atlantica*, *Fu. formosana*, *Fu. licnoides* and *Fu. scruposa*, some of them new records for areas of Atlantic Forest in Brazil as well as for the states of Alagoas, Bahia and Pernambuco.

Keywords — Basidiomycota; Hymenochaetales; *Phellinus sensu lato*; Poroid fungi.

RESUMO

Durante as coletas realizadas em áreas de Mata Atlântica no Nordeste do Brasil, foram coletados exemplares de *Fomitiporia* e *Fuscoporia*. As análises morfológicas e moleculares das regiões ITS e nLSU confirmaram que representam *Fomitiporia conyana*, *Fo. maxonii*, *Fo. neotropica*, *Fuscoporia atlantica*, *Fu. formosana*, *Fu. licnoides* e *Fu. scruposa*, alguns dos quais novos registros para áreas de Mata Atlântica no Brasil, bem como para os estados de Alagoas, Bahia e Pernambuco.

Palavras-chave — Basidiomycota; Fungos poroides; Hymenochaetaceae; *Phellinus sensu lato*.

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INTRODUCTION

Hymenochaetaceae can be distinguished among the poroid Basidiomycota by the rusty brown coloration of the basidiomata and positive xanthochroic reaction when in contact with potassium hydroxide (KOH) (Ryvarden & Johansen, 1980; Ryvarden, 2004). The basidioma can be stipitate, pileated or resupinate, the hymenophore hydnoid, smooth or more usually poroid, the hyphal system monomitic or dimitic, frequently presenting setae, and the spores usually smooth, rarely ornamented (Ryvarden, 2004). The family has around 55 genera (Wu *et al*., 2016, 2022; Salvador-Montoya *et al*., 2020; Catalogue of Life, 2022; Xavier de Lima *et al*., 2022), *Fomitiporia* and *Fuscoporia* among them. These genera have similar characteristics, but can be differentiated by morphological analysis. *Fomitiporia* presents basidiomata with pileal surface velutinate to smooth, generative hyphae hyaline to pale yellowish, thin- to fairly thick walled, spores subglobose, hyaline, thick-walled, strongly dextrinoid and very strongly cyanophilous. *Fuscoporia*, in turn, presents basidiomata mostly with pileal surface tomentose to velutinate, non-crusted, generative hyphae at dissepiment edge or hymenium usually covered by crystals, which dissolve in KOH, spores cylindric, oblong-ellipsoid, broadly ellipsoid or subglobose, hyaline, thin-walled, smooth (Dai, 2010). In Brazil, both genera have an increasing number of occurrences, with records for all regions. *Fomitiporia* has so far 26 registered species, while *Fuscoporia* has 13, being, however, the real number probably much higher due to the frequent updates on the diversity of these genera (Flora and Funga do Brasil, 2022; Species Link, 2022).

The Atlantic Forest in Brazil originally covered 15% (MMA, 2010), mostly along the entire coastal zone of the country, suffering the impacts of the various economic cycles in Brazil and being today considered the most devastated and threatened biome on the entire planet (Cardoso, 2016). Nowadays, the remaining vegetation of the Atlantic Forest is around 28% (Rezende *et al*., 2018), holding from 1 to 8% of the world's biodiversity, often distributed in areas still little known (Silva & Casteleti, 2005; MMA, 2010).

In the Atlantic Forest of Northeastern Brazil, two species of *Fomitiporia* and four of *Fuscoporia* are reported: *Fo. conyana*, *Fo. maxonii* (Flora e Funga do Brasil, 2022), *Fu. formosana*, *Fu. licnoides*, *Fu. marquesiana*, and *Fu. scruposa* (Yuan *et al*., 2020). In the current study, materials collected in Atlantic Forests areas in Northeastern Brazil were incorporated into the previous phylogeny of *Fomitiporia* and *Fuscoporia*, and improved the knowledge about the distribution of some other species of these genera, with new records for areas of Atlantic Forest in Brazil as well as for the states of Alagoas, Bahia and Pernambuco.

MATERIALS AND METHODS

Collection areas

The collections were carried out in the Parque National e Histórico (PARNAH) de Monte Pascoal, located in the extreme southern Bahia, in the municipality of Porto

Seguro; in the Reserva Biológica (REBIO) de Pedra Talhada, located on the border between the states of Pernambuco and Alagoas and in the 7th Grupo de Artilharia de Campanha (GAC), municipality of Olinda, also in the state of Pernambuco. All areas belong to the Atlantic Rain Forest domain.

Morphological analyses

The specimens collected were dried in an oven and initially analyzed macroscopically. A drop of 3% KOH was poured over the basidioma to observe the presence or absence of color change (xanthochroic reaction). The basidiomata were analyzed according to the length, width, thickness, insertion in the substrate, consistency, color and characteristics of the abhymenial and hymenial surfaces, the context, and the margin of the basidioma (Kornerup & Wanscher, 1978; Fidalgo & Bononi, 1989). For microscopic analyses of hyphae, spores, basidia and setae, slides were prepared in 3% KOH in order to observe the microstructures, such as hyphae, basidia, basidiospore and hymenal setae. Melzer's reagent was used to observe dextrinoid reactions of these structures.

Molecular and phylogenetic analyses

DNA extraction was performed according to the protocol of Góes-Neto *et al*. (2005) and the DNA regions of interest were amplified by polymerase chain reactions (PCR). The internal transcribed spacer regions (ITS) and the partial nuclear large subunit rDNA (nLSU) were amplified with primer pairs ITS4 and ITS5 for the ITS region, and LR0R and LR5 for the nLSU region (White *et al*., 1990). For *Fuscoporia*, the sequences from the ITS region presented problems and could not be included in the phylogenetic analysis. The electropherograms were analyzed and edited in the Staden Package 2.0 software (Staden *et al*., 1998) and the sequences obtained were compared with those deposited in GenBank using the BLASTn tool. *Phellinus uncisetus* Robledo, Urcelay & Rajchenberg was designated as an outgroup in the analyses of the genus *Fomitiporia* Murrill following Decock *et al*. (2007), while *Coniferiporia sulphurascens* (Pilát) L.W. Zhou & Y.C. Dai and *Phellinidium fragrans* (M.J. Larsen & Lombard) Nuss were used for *Fuscoporia* Murrill following Chen *et al*. (2019).

The phylogenetic trees were constructed using the Maximum Likelihood (ML) and Maximum Parsimony (MP) method with 1,000 bootstrap resamplings (Fig. 1 and 2). The phylogenetic reconstruction by ML and MP was performed using the MEGA X program (Kumar *et al*., 2018).

RESULTS AND DISCUSSION

The LSU and ITS region datasets included 27 new sequences generated in this study (Table 1). The best evolutionary models estimated for the alignments were T92+G+1 for the *Fomitiporia* dataset and K2+G+I for *Fuscoporia* dataset.

Taxonomy

Fomitiporia conyana Alves-Silva & Drechsler-Santos, Mycological Progress 19 (8): 781 (2020).

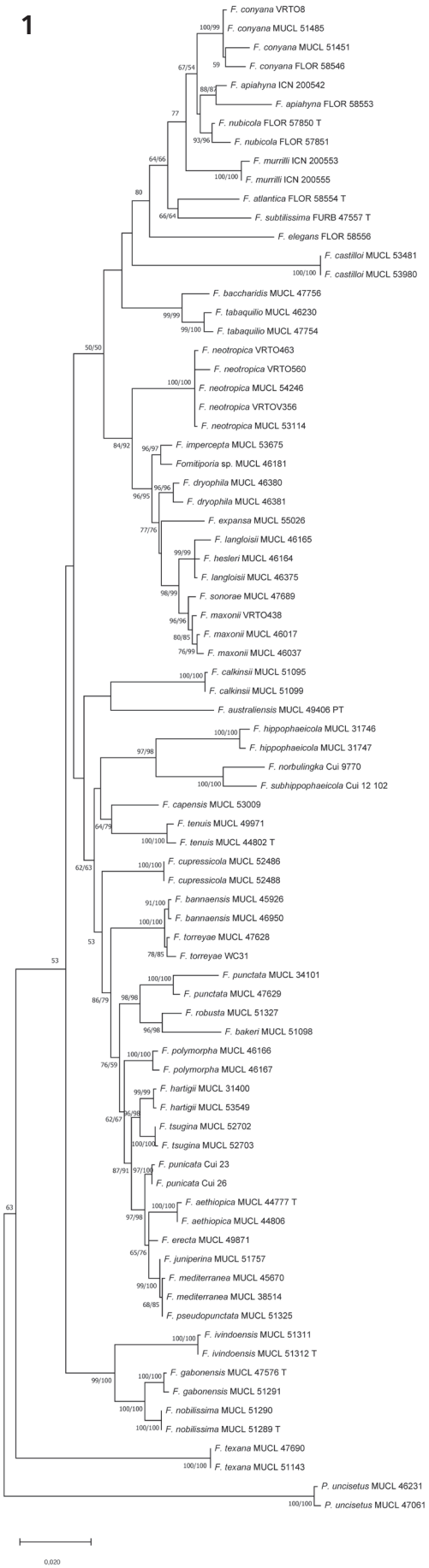
Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°15'02.3" S, 36°25'37.8" W, 753 m asl, *V.R.T. Oliveira*, (VRTO8, URM 94049).

Notes.— *Fomitiporia conyana* has a perennial, pileate, sessile, solitary or gregarious basidiomata, then emerging in groups, semicircular in outline, rarely pendant, triquetrous, obtriquetrous to ungulate in section, occasionally with a basal umbo, pileus glabrous, slightly convex, concentrically zonate with multiple narrow bands, sometimes interleaved with broad bands and moderated sulcus, radially cracked when dried and old, pores round to angular, 6–8(9)/mm, hyphal system dimitic in all parts, hymenial setae absent, cystidioles fusoid, lanceolate, hyaline, basidiospores subglobose to globose (4.5)5–5.5(6) × 4–5(6) μm (Alves-Silva *et al*. 2020). *Fomitiporia conyana* is reported from Brazil, Ecuador and French Guiana, being in Brazil previously collected in the Bahia, Rio Grande do Sul and Santa Catarina states (Alves-Silva *et al*. 2020; Flora e Funga do Brasil, 2022; Species Link, 2022). Here, it is reported as the second record for the Northeastern Brazil, being a new record for the Alagoas state.

Fomitiporia maxonii Murrill [as *'maxoni'*], North American Flora 9 (1): 11 (1907).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°15'23.0" S, 36°24'47.0" W, 542 m asl, 14-V-2019, *V.R.T. Oliveira*, (VRTO463, URM 93748); Pernambuco, Recife, Universidade Federal de Pernambuco, 8°3'6.239" S, 34°57'2.578" W, 15-V-2018, *I. Oliveira-Júnior*, (VRTO438, URM 94982).

Notes.— *Fomitiporia maxonii* has a perennial and resupinate basidiomata with a sterile margin, corky to woody, hymenophore with circular to ellipsoid or oblique pores, 7–9 per mm, hyphal system dimitic with hymenial setae absent, basidiospores subglobose to globose, (4.5–)5.3–6.5(–7) × (4–)4.8–6(–6.7) μm, and hyaline rhomboid crystals abundant in the hymenium as an important feature (Raymundo *et al*., 2012). *Fomitiporia maxonii* is reported from Argentina (Raymundo *et al*., 2012), Belize (Ryvarden, 2004; Raymundo *et al*., 2012), Brazil(Raymundo *et al*., 2012), Costa Rica (Ryvarden, 2004; Decock *et al*., 2007), Cuba (Decock *et al*., 2007; Raymundo *et al*., 2012), Ecuador (Ryvarden, 2004; Raymundo *et al*., 2012), Jamaica (Decock *et al*., 2007; Raymundo *et al*., 2012), Mexico (Raymundo *et al*., 2012), USA (Vlasák *et al*., 2011), and Venezuela (Decock *et al*., 2007; Raymundo *et al*., 2012), being in Brazil reported in the North, Northeast, Southeast and South regions, as well as for the states studied here (Flora e Funga do Brasil, 2022; Species Link, 2022).



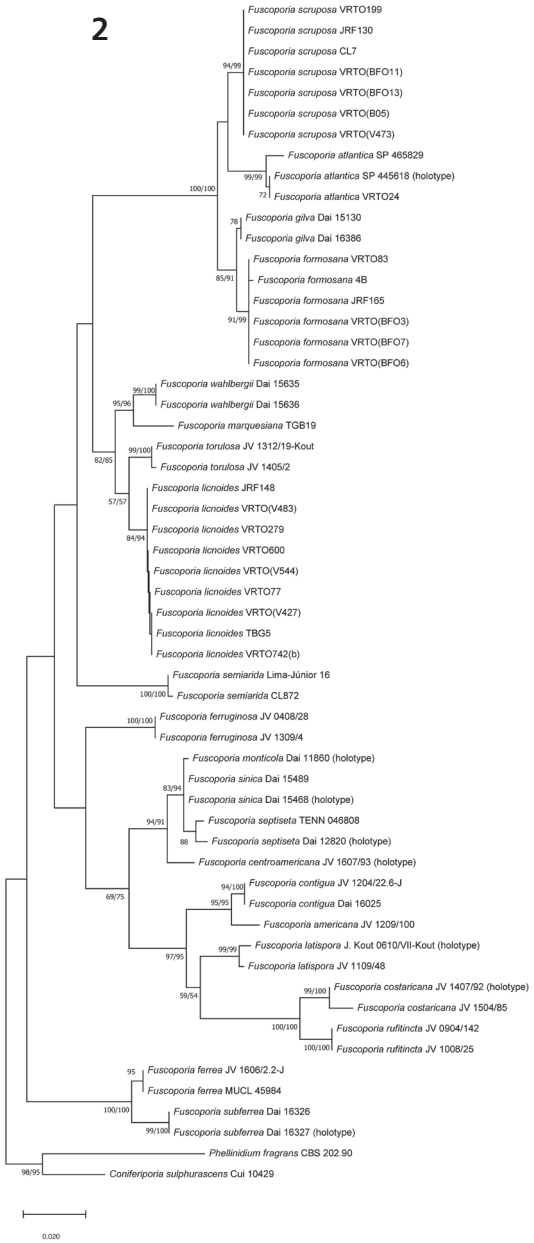


Fig 1 (left). Maximum likelihood (ML) tree of *Fomitiporia* from dataset of combined sequences LSU and ITS. Bootstrap values above 50 % are shown.

Fig. 1 (esquerda). Árvore de máxima verossimilhança (ML) de *Fomitiporia* a partir do conjunto de dados de sequências LSU. Valores de bootstrap acima de 50% são mostrados.

Fig. 2 (above). Maximum likelihood (ML) tree of *Fuscoporia* from dataset of LSU sequences. Bootstrap values above 50 % are shown.

Fig. 2 (acima). Árvore de máxima verossimilhança (ML) de *Fuscoporia* a partir do conjunto de dados de sequências LSU. Valores de bootstrap acima de 50% são mostrados.

Table 1 (1/3). Data of sequences included in the phylogenetic molecular analyses. New sequences generated in this study are in boldface.

Tabela 1 (1/3). Dados de sequências incluídas nas análises moleculares filogenéticas. Novas sequências geradas neste estudo estão em negrito.

Species	Voucher	Country	LSU	ITS
Coniferiporia sulphurascens (Pilát) L.W. Zhou & Y.C. Dai	Cui 10429	China	KR350555	-
Fomitiporia aethiopica	MUCL 44777 (T)	Ethiopia	AY618204	GU478341
F. aethiopica	MUCL 44806	Ethiopia	AY618202	GU461944
F. apiahyna (Speg.) Robledo, Decock & Rajchenb.	FLOR 58553	Brazil	KU663291	KU663317
F. apiahyna	ICN 200542	Brazil	MN918564	MN918571
F. australiensis M. Fisch., Jacq. Edwards, Cunningt. & Pascoe	MUCL 49406 (PT)	Australia	GU462001	AY624997
F. baccharidis (Pat.) Decock, Robledo & Amalfi	MUCL 47756	Argentina	JQ087913	JQ087886
F. bakeri (Murrill) Vlasák & Kout	MUCL 51098	USA	JQ087901	JQ087874
F. bannaensis Y.C. Dai	MUCL 45926	Thailand	EF429217	GU461942
F. bannaensis	MUCL 46950	China	EF429218	GU461943
F. calkinsii (Murrill) Vlasák & Kout	MUCL 51095	USA	KF444708	KF444685
F. calkinsii	MUCL 51099	USA	KF444709	KF444686
F. capensis M. Fisch., Cloete, L. Mostert & Halleen	MUCL 53009	South Africa	JQ087917	JQ087890
F. castilloi Decock & Amalfi	MUCL 53481	French Guiana	JQ087916	JQ087889
F. castilloi	MUCL 53980	French Guiana	JX093830	JX093786
F. conyana Alves-Silva & Drechsler-Santos	VRTO8	Brazil	**ON795819**	**ON795811**
F. conyana	MUCL 51451	Ecuador	GU461997	GU461963
F. conyana	MUCL 51485	Ecuador	GU461996	GU461962
F. conyana	FLOR 58546	Brazil	KU663269	KU663297
F. cupressicola Amalfi, Raymundo, Valenz. & Decock	MUCL 52486	Mexico	JQ087904	JQ087877
F. cupressicola	MUCL 52488	Mexico	JQ087905	JQ087878
F. dryophila Murrill	MUCL 46380	USA	EF429219	EF429238
F. dryophila	MUCL 46381	USA	EF429220	EF429239
F. elegans (J.E. Wright & Blumenf.) Alves-Silva, Robledo & Drechsler-Santos	FLOR 58556	Brazil	KU663293	KU663319
F. erecta (A. David, Dequatre & Fiasson) Fiasson	MUCL 49871	France	GU461976	GU461939
F. expansa Decock & Amalfi	MUCL 55026	French Guiana	KJ401032	KJ401031
F. gabonensis Amalfi & Decock	MUCL 47576 (T)	Gabon	GU461990	GU461971
F. gabonensis	MUCL 51291	Gabon	GU461986	GU461967
F. hartigii (Allesch. & Schnabl) Fiasson & Niemelä	MUCL 31400	Japan	JQ087909	JQ087882
F. hartigii	MUCL 53549	Estonia	JX093831	JX093787
F. hesleri M. Fisch.	MUCL 46164	USA	EF429222	AY340031
F. hippophaeicola (H. Jahn) Fiasson & Niemelä	MUCL 31746	Belgium	AY618207	GU461945
F. hippophaeicola	MUCL 31747	Belgium	GU461977	GU461946
F. ivindoensis Decock, Amalfi & Yombiy.	MUCL 51311	Gabon	GU461979	GU461952
F. ivindoensis	MUCL 51312 (T)	Gabon	GU461978	GU461951
F. juniperina (Murrill) T. Hatt. & Y. Ota	MUCL 51757	Tunisia	JQ087927	JQ087900
F. langloisii Murrill	MUCL 46375	USA	EF429225	EF429242
F. langloisii	MUCL 46165	USA	EF429223	AY340026
F. maxonii Murrill	VRTO438	Brazil	**ON795815**	**ON795807**
F. maxonii	MUCL 46017	Cuba	EF429230	EF433559
F. maxonii	MUCL 46037	Cuba	EF429231	EF433560
F. mediterranea M. Fisch.	MUCL 38514	Italy	AY618201	GU461953
F. mediterranea	MUCL 45670	France	GU461980	GU461954
F. murrilli Alves-Silva, R.M. Silveira & Drechsler-Santos	ICN 200553	Brazil	MN918569	MN918577

Table 1 (2/3).
Tabela 1 (2/3).

Species	Voucher	Country	LSU	ITS
F. murrilli	ICN 200555	Brazil	MN918570	MN918578
F. neotropica Camp.-Sant., Amalfi, R.M. Silveira, Robledo & Decock	VRTO463	Brazil	**ON795817**	**ON795809**
F. neotropica	VRTO560	Brazil	**ON795818**	**ON795810**
F. neotropica	VRTO(V356)	Brazil	**ON795816**	**ON795808**
F. neotropica	MUCL 53114	French Guiana	JX093836	JX093792
F. neotropica	MUCL 54246	Brazil	KF444720	KF444697
F. nobilissima Decock & Yombiy.	MUCL 51290	Gabon	GU461983	GU461964
F. nobilissima	MUCL 51289 (T)	Gabon	GU461984	GU461965
F. norbulingka B.K. Cui & Hong Chen	Cui 9770	China Tibet	KU364430	KU364420
F. nubicola Alves-Silva, Bittencourt & Drechsler-Santos	FLOR 57850 (T)	Brazil	KU663275	KU663303
F. nubicola	FLOR 57851	Brazil	KU663276	KU663304
F. polymorpha M. Fisch.	MUCL 46166	USA	DQ122393	GU461955
F. polymorpha	MUCL 46167	USA	EF429233	GU461956
F. pseudopunctata (A. David, Dequatre & Fiasson) Fiasson	MUCL 51325	Czech Republic	GU461981	GU461948
F. punctata (P. Karst.) Murrill	MUCL 34101	Germany	AY618200	GU461947
F. punctata	MUCL 47629	Japan	GU461982	GU461950
F. punicata Y.C. Dai, B.K. Cui & Decock	Cui 23	China	GU461991	GU461974
F. punicata	Cui 26	China	GU461992	GU461975
F. robusta (P. Karst.) Fiasson & Niemelä	MUCL 51327	Czech Republic	GU461993	GU461949
Fomitiporia sp.	MUCL 46181	Argentina	EF429234	EF433563
F. sonorae (Gilb.) Y.C. Dai	MUCL 47689	USA	JQ087920	JQ087893
F. subhippophaeicola B.K. Cui & Hong Chen	Cui 12 102	China Tibet	KU364424	KU364423
F. subtilissima Alves-Silva, Reck & Drechsler-Santos	FURB 47557 (T)	Brazil	KU557527	KU557531
F. tabaquilio (Urcelay, Robledo & Rajchenb.) Decock & Robledo	MUCL 46230	Argentina	DQ122394	GU461940
F. tabaquilio	MUCL 47754	Argentina	GU461994	GU461941
F. texana (Murrill) Nuss	MUCL 47690	USA	JQ087921	JQ087894
F. texana	MUCL 51143	USA	JQ087922	JQ087895
F. torreyae Y.C. Dai & B.K. Cui	MUCL 47628	Japan	JQ087923	JQ087896
F. torreyae	WC31	China	JQ087924	JQ087897
F. tenuis Decock, Bitew & G. Castillo	MUCL 44802 (T)	Ethiopia	AY618206	GU461957
F. tenuis	MUCL 49971	Uganda	GU461999	GU461959
F. tsugina Murrill	MUCL 52702	USA	JQ087925	JQ087898
F. tsugina	MUCL 52703	USA	JQ087926	JQ087899
Fuscoporia americana Y.C. Dai, Q. Chen & J. Vlasák	JV 1209/100	USA	MG008467	-
F. atlantica Motato-Vásq., R.M. Pires & Gugliotta	VRTO24	Brazil	**ON795835**	-
F. atlantica	SP 445618 (holotype)	Brazil	KP058517	-
F. atlantica	SP 465829	Brazil	KP058516	-
F. centroamericana Y.C. Dai, Q. Chen & J. Vlasák	JV 1607/93 (holotype)	Costa Rica	MG008460	-
F. contigua (Pers.) G. Cunn.	JV 1204/22.6-J	USA	MG008456	-
F. contigua	Dai 16025	USA	MG008454	-
F. costaricana Y.C. Dai, Q. Chen & J. Vlasák	JV 1407/92 (holotype)	Costa Rica	MG008461	-
F. costaricana	JV 1504/85	Costa Rica	MG478454	-
F. ferrea (Pers.) G. Cunn.	JV 1606/2.2-J	USA	KY189100	-
F. ferrea	MUCL 45984	France	KY189112	-
F. ferruginosa (Schrad.) Murrill	JV 0408/28	Czech Republic	KY189103	-
F. ferruginosa	JV 1309/4	Slovakia	KY189102	-
F. formosana (T.T. Chang & W.N. Chou) T. Wagner & M. Fisch.	VRTO(BFO3)	Brazil	**ON795827**	-

Table 1 (3/3).
Tabela 1 (3/3).

Species	Voucher	Country	LSU	ITS
F. formosana	VRTO(BFO6)	Brazil	**ON795829**	-
F. formosana	VRTO(BFO7)	Brazil	**ON795828**	-
F. formosana	VRTO83	Brazil	**ON795830**	-
F. formosana	JRF165	Brazil	MH407351	-
F. formosana	4B	Brazil	MH407350	-
F. gilva (Schwein.) T. Wagner & M. Fisch.	Dai 15130	China	KY189109	-
F. gilva	Dai 16386	China	MG008452	-
F. latispora Y.C. Dai, Q. Chen & J. Vlasák	J. Kout 0610/VII-Kout (holotype)	Mexico	MG008469	-
F. latispora	JV 1109/48	USA	MG008468	-
F. licnoides (Mont.) Oliveira-Filho & Gibertoni	VRTO77	Brazil	**ON795824**	-
F. licnoides	VRTO279	Brazil	**ON795823**	-
F. licnoides	VRTO600	Brazil	**ON795822**	-
F. licnoides	VRTO742(b)	Brazil	**ON795826**	-
F. licnoides	VRTO(427)	Brazil	**ON795821**	-
F. licnoides	VRTO(V483)	Brazil	**ON795820**	-
F. licnoides	VRTO(V544)	Brazil	**ON795825**	-
F. licnoides	TBG5	Brazil	MH407354	-
F. licnoides	JRF148	Brazil	MH407353	-
F. marquesiana Gibertoni & C.R.S. de Lira	TBG19	Brazil	MH407343	-
F. monticola Y.C. Dai, Q. Chen & J. Vlasák	Dai 11860 (holotype)	China	MG008457	-
F. rufitincta (Berk. & M.A. Curtis ex A.L. Sm.) Murrill	JV 0904/142	USA	KX058574	-
F. rufitincta	JV 1008/25	USA	KX058575	-
F. scruposa (Fr.) Gibertoni & Oliveira-Filho	VRTO(BFO11)	Brazil	**ON795834**	-
F. scruposa	VRTO(BFO13)	Brazil	**ON795833**	-
F. scruposa	VRTO(B05)	Brazil	**ON795832**	-
F. scruposa	VRTO(V473)	Brazil	**ON795836**	-
F. scruposa	VRTO199	Brazil	**ON795831**	-
F. scruposa	CL7	Brazil	MH407344	-
F. scruposa	JRF130	Brazil	MH407345	-
F. semiarida Lima-Júnior, C.R.S. de Lira & Gibertoni	Lima-Júnior 16	Brazil	MH407362	-
F. semiarida	CL872	Brazil	MH407361	-
F. septiseta Y.C. Dai, Q. Chen & J. Vlasák	TENN 046808	USA	MG570133	-
F. septiseta	Dai 12820 (holotype)	China	MG478455	-
F. sinica Y.C. Dai, Q. Chen & J. Vlasák	Dai 15468 (holotype)	China	MG008459	-
F. sinica	Dai 15489	China	MG008458	-
F. subferrea Q. Chen bis & Yuan Yuan	Dai 16326	China	KY053472	-
F. subferrea	Dai 16327 (holotype)	China	KY053473	-
F. torulosa (Pers.) T. Wagner & M. Fisch.	JV 1312/19-Kout	Spain	KY189107	-
F. torulosa	JV 1405/2	Czech Republic	KY189106	-
F. wahlbergii (Fr.) T. Wagner & M. Fisch.	Dai 15635	China	MG008449	-
F. wahlbergii	Dai 15636	China	MG008450	-
Phellinidium fragrans (M.J. Larsen & Lombard) Nuss	CBS:202.90	USA	MH873887	-
Phellinus uncisetus Robledo, Urcelay & Rajchenb.	MUCL 46231	Argentina	EF429235	GU461960
P. uncisetus	MUCL 47061	Argentina	GU462000	GU461972

Fomitiporia neotropica Camp.-Sant., Amalfi, R.M. Silveira, Robledo & Decock, Mycological Progress 13: 610 (2014).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°15'23.0" S, 36°24'47.0" W, 542 m asl, 15-V-2019, *V.R.T. Oliveira*, (VRTO560, URM 94056); Bahia, Itamaraju, Parque Nacional e Histórico do Monte Pascoal, 09°15'02.3" S, 36°25'37.8" W, 753 m asl, 8-VIII-2018, *V. Xavier de Lima*, [VRTO(V356), URM 93714].

Notes.— The species has seasonal to at least bi-seasonal basidiomata, resupinate, effusive and adnate, cork consistency when fresh and hard cork when dry, with a densely fibrous texture, dense and velvety margin, small, round to ellipsoid pores in inclined parts, 6–9 per mm, dimitic hyphae system with hymenial setae ranging from absent to abundant and hyaline basidiospores subglobose to largely obovoid, 5–7 (−7.5) × 4.5–7 μm (Campos- Santana *et al*., 2014). *Fomitiporia neotropica* is reported from Argentina, Brazil and French Guiana, being in Brazil previously collected in the North, Midwest, Southeast and South regions (Campos- Santana *et al*., 2014; Flora e Funga do Brasil, 2022; GBIF, 2022; Species Link, 2022). Here, it is reported as the first record for the Northeastern Brazil, being a new record for the states Alagoas and Bahia.

Fuscoporia atlantica Motato-Vásq., R.M. Pires & Gugliotta, Mycotaxon 130 (3): 848 (2015).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°15'00.7" S, 36°25'38.3" W, 758 m asl, 16-VII-2018, *V.R.T. Oliveira*, (VRTO24, URM 94980).

Notes.— The species is characterized by having an annual, hairy, sessile to effuse-reflex basidioma, flexible when fresh to leathery when dry, solitary to imbricate, semicircular and flattened cap with a concentrically zoned upper surface, radially wrinkled, glabrous to tomentose, 7–9 pores per mm, hyphal system dimitic with abundant hymenial setae, spores from broadly ellipsoid to ellipsoid, hyaline to pale yellow, smooth, thin-walled and inamyloid, 4–4.5 × (2–)3–3.5 μm (Pires *et al*., 2015). Our specimen differs from the original description by a leatherier to papyraceous basidioma when dry. It was known only from the type locality in the Atlantic Forest in the state of São Paulo. Here, we report the second record of the species and the first for the Atlantic Forest of Northeastern Brazil, more specifically for the state of Alagoas (Pires *et al*., 2015; Species Link, 2022).

Fuscoporia formosana (T.T. Chang & W.N. Chou) T. Wagner & M. Fisch., Mycologia 94 (6): 1013 (2002).

Basionym: ***Inonotus formosanus*** T.T. Chang & W.N. Chou, Mycological Research 102 (7): 789 (1998).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°14'44.8" S, 36°25'14.7 W", 688 m asl, 16-VII-2018, *V.R.T. Oliveira*, (VRTO83, URM 93763); Pernambuco, Olinda, 7th Grupo de Artilharia de Campanha, 8°0'10.728" S, 34°51'25.427" W, 16-VI-2018, *V.R.T. Oliveira*, [VRTO(BFO7), URM 94503].

Notes.— *Fuscoporia formosana* has an annual, sessile, solitary or overlapping basidiomata, of woody consistency, flattened, convex, fan-shaped cap with sharp edges, gray to black on the surface, rounded or subangular pores, 6–8 per mm, hyphae system dimitic and with hymenial setae, ellipsoid to ovoid basidiospores, smooth, yellow or brown, 4–5 × 3–4 μm (Chang & Chou, 1999; Yuan *et al*., 2020). *Fuscoporia formosana* was previously reported for Maranhão and Pernambuco, being those the first for the Americas (Yuan *et al*., 2020). Here, the species is reported for the first time for the Alagoas state, but it may occur in other states identified as *Phellinus gilvus* (Schwein.) Pat. or *P. gilvus* var. *scruposus* (Fr.) S. Ahmad (Yuan *et al*., 2020).

Fuscoporia licnoides (Mont.) Oliveira-Filho & Gibertoni, Fungal Diversity 104: 129 (2020).

Basionym: ***Polyporus licnoides*** Mont., Annales des Sciences Naturelles Botanique 13: 204 (1840).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°14'47.0" S, 36°25'15.0" W, 695 m asl, 17-VII-2018, *V.R.T. Oliveira*, (VRTO77, URM 93747); 09°15'25.0" S, 36°24'47.0" W, 540 m asl, 4-II-2019, *V.R.T. Oliveira*, (VRTO279, URM 93769); 09°15'00.7" S, 36°25'38.3" W, 758 m asl, 14-V-2019, *V.R.T. Oliveira*, (VRTO600, URM 93816); [VRTO742(b), URM 94976]; Bahia, Itamaraju, Parque Nacional e Histórico do Monte Pascoal, 16°51'55.6" S, 39°24'54.7" W 131 m asl, 9-VIII-2018, *V. Xavier de Lima*, [VRTO(V427), URM 93739]; 16°53'33.8" S, 39°24'37.8" W, 408 m asl, 7-VIII-2018, *V. Xavier de Lima*, [VRTO(V483), URM 93742]; 16°51'01.7" S, 39°24'14.7" W, 36 m asl, 5-VIII-2018, *V. Xavier de Lima*, [VRTO(V544), URM 93740].

Notes.— The species is characterized by hard corky to slightly flexible pileus up to 1 cm thick and a hymenial surface concentrically and narrowly zonate and sulcate, grayish shade and often showing at the middle portion of the surface zones with a purplish-brown shade (Fidalgo & Fidalgo, 1968; Yuan *et al*., 2020). *Fuscoporia licnoides* may be confused to *F. semiarida* Lima-Júnior, C.R.S. de Lira & Gibertoni or *F. atlantica* or may have been previously identified as *P. gilvus*. Thus, specimens identified as such should be reexamined (Yuan *et al*., 2020). In Brazil, it is reported in Pará, Paraíba, Pernambuco, and Rondônia (Yuan *et al*., 2020) and it is here reported for the first time for the states of Alagoas and Bahia.

Fuscoporia scruposa (Fr.) Gibertoni & Oliveira-Filho,
Fungal Diversity 104: 130 (2020).

Basionym: ***Polyporus scruposus*** Fr.,
Epicrisis Systematis Mycologici: 473 (1838).

Material examined.— BRAZIL. Alagoas, Quebrangulo, Reserva Biológica de Pedra Talhada, 09°15'31.0" S, 36°25'10.3"W, 599 m asl, 8-II-2019, *V.R.T. Oliveira*, (VRTO199, URM 93756); Bahia, Itamaraju, Parque Nacional e Histórico do Monte Pascoal, 16°51'01.4" S, 39°24'12.9" W, 41 m asl, 12-II-2019, *D. P. B. Monte*, [VRTO(B05), URM 93727]; Pernambuco, Olinda, 7th Grupo de Artilharia de Campanha, 8°0'10.728" S , 34°51'25.427" W, 16-VI-2018, *V.R.T. Oliveira*, [VRTO(BFO13), URM 94662)]; [VRTO(BFO11), URM 94981].

Notes.— *Fuscoporia scruposa* has a hard to corky, but more often flexible pileus up 0.5 cm thick, hymenial surface concolorous, strigose and fibrillose with radial furrows, being ochraceous to rusty-brown and becoming glabrous with age (Fidalgo & Fidalgo, 1968; Yuan *et al*., 2020). *Fuscoporia scruposa* may be confused with *F. formosana* or have been previously identified as *P. gilvus* or *P. gilvus* var. s*cruposus*, thus specimens worldwide should be reexamined (Yuan *et al*., 2020). In Brazil, there are reports in Alagoas, Maranhão and Piauí (Yuan *et al*., 2020), being here reported for the first time to Bahia and Pernambuco.

In the current study, the collected and analyzed materials were placed in *Fomitiporia* and *Fuscoporia* with good support (Fig. 1 and 2) and represent *Fomitiporia conyana*, *Fo. maxonii*, *Fo. neotropica*, *Fuscoporia atlantica*, *Fu. formosana*, *Fu. licnoides* and *Fu. scruposa*. So far, 12 species of *Fomitiporia* and six of *Fuscoporia* are phylogenetically confirmed to Brazil (Table 2 and 3).

Among the species in *Fomitiporia*, VRTO8 formed a clade with *F. conyana*, indicating that it is the same species (bootstrap = 100/99) (Fig. 1). The sequences grouped in the clade and are from Ecuador and Brazil (Tab. 1). *Fomitiporia conyana* was situated close to *F. apiahyna* and *F. nubicola* (Fig. 1). The similarity between the species has already been observed by Alves-Silva *et al*. (2020), which reports that *F. apiahyna* has basidiospores up to 7 μm wide and not more than 8 pores/mm and that *F. nubicola* has basidiospores up to 6.5 μm wide and up to 9 pores/mm, while in *F. conyana* the basidiospores are, in average, 4.9 × 4.4 μm.

The clade formed by VRTO463, VRTO560 and VRTO(V356) and *F. neotropica* (MUCL 53114 from French Guiana and MUCL 54246 from Brazil) (bootstrap = 100/100) confirms that they belong to the same species (Fig. 1). The type of *F. neotropica* is from French Guiana and the species is common in the Neotropics (Campos-Santana *et al*., 2014). *Fomitiporia neotropica* is in a clade with *F. dryophila*, *F. expansa*, *F. impercepta*, *F. langloisii/hesleri*, *F. maxonii*, and *F. sonorae* (bootstrap = 84/92) (Fig. 1). *Fomitiporia dryophila* differs from *F. neotropica* in the cushion-shaped to pseudopileate basidiomata and larger basidiospores (5.5–)6.2–8(−8.5) × (5–)5.7–7.3(−7.5) μm (Decock *et al*., 2007; Campos-Santana *et al*., 2014). *Fomitiporia neotropica* is rather similar morphologically, but differs by *F. expansa* in having much less extended basidiomata, with a distinctly brown pore surface and smaller pores, mostly 6-9/

Table 2. Morphological characters of *Fomitiporia* species confirmed for Northeast Brazil through molecular analysis.

Tabela 2. Características morfológicas das espécies de *Fomitiporia* confirmadas para o Nordeste do Brasil através de análises moleculares.

Species	Basidioma	Poros per mm	Basidiospore size (μm)	Basidiospore Q	Basidiospore shape	Substrate	References
Fomitiporia apiahyna	Pileate	(5)6–8	5– 6.5(7) × (4)5–6(7)	1– 1.2 (1.3)	Subglobose to globose	Dead standing trees	Alves-Silva *et al.* (2020)
Fomitiporia atlantica Alves-Silva, Reck & Drechsler-Santos	Pileate	6–8 (–9)	(4.5–) 5–5.5 (–6) × 4–5.5	1– 1.25	Subglobose, globose to obovoid	Dead standing trunk	Li *et al.* (2016)
Fomitiporia conyana	Pileate	6–8(9)	(4.5)5–5.5(6) × 4–5(6)	1.0–1.3(1.42)	Subglobose to globose	Mostly dead trunk	Alves-Silva *et al.* (2020)
Fomitiporia bambusarum (Rick) Campos-Santana & Decock	Resupinate	(8–) 9–11	4.0–5.0 × 4.0–4.5	1.0–1.2	Subglobose to globose	On bamboos	Pires *et al.* 2016; Alves-Silva *et al.* (2020)
Fomitiporia bambusipileata Alves-Silva, Drechsler-Santos & R.M.B. Silveira	Pileate	6–9(–10)	4–6(–6.5) × 4–5(–5.5)	1.2–1.4(–1.5)	Subglobose to globose	On dead culms of bamboos	Alves-Silva *et al.* (2020)
Fomitiporia elegans	Pileate	(6)7–9(10)	(5)6–7×5–6.5	1–1.2(1.4)	Subglobose to globose	Living and dead standing trunk	Alves-Silva *et al.* (2020)
Fomitiporia murrilli	Pileate	(4)5–7(8)	5–6(7) × 5–6(7)	1–1.2	Subglobose to globose	Living and dead standing trunk	Alves-Silva *et al.* (2020)
Fomitiporia neotropica	Resupinate, effused	6–9	5.0–7.0 (−7.5)×4.5–7.0	1–1.2	Subglobose to broadly obovoid	Dead trunk, or living branches	Campos-Santana *et al.* (2014)
Fomitiporia nubicola	Pileate	(5)6–8(9)	5–6(7) × (4)5– 6(6.5)	1–1.25(1.3)	Subglobose to globose	Living and dead standing trunk	Alves-Silva *et al.* (2020)
Fomitiporia spinescens (J.E. Wright & G. Coelho) G. Coelho, Guerrero & Rajchenb.	Resupinate, effused	4-5	4.5-6	-	Globose	On bamboos	Ryvarden 2004; Alves-Silva *et al.* (2020)
Fomitiporia subtilissima	Pileate	(4–) 5–9	4–5 × 4–4.5(–5)	1–1.25	Subglobose, globose to obovoid	Dead root of living *Sloanea guianensis*	Li *et al.* (2016)
Fomitiporia uncinata (Rajchenb.) G. Coelho, Guerrero & Rajchenb.	Resupinate, effused	5-6	5.5-7 × 5-6.5	-	Globose	On bamboos	Ryvarden 2004; Alves-Silva *et al.* (2020)

mm (Amalfi & Decock, 2014). *Fomitiporia impercepta* differs by smaller basidiospores (4.0)5.0–6.0(7.0) × 4.0–6.0(7.0) μm (Campos-Santana *et al*., 2014; Morera *et al*., 2017; Rajchenberg *et al*. 2019). *Fomitiporia langloisii* has a paler pore surface, grayish and honey-colored, sometimes with a slight pinkish tinge in young specimens, while *F. neotropica* commonly has a pore surface yellowish brown, greyish brown, dark yellow to dark brown or greyish chocolate brown (Decock *et al*., 2007; Raymundo *et al*., 2012; Campos-Santana *et al*., 2014). Decock *et al*. (2007) suggested that *F. langlosi* is an older available name for *F. hesleri*. *Fomitiporia neotropica* and *F. maxonii* share similar characteristics, except for the presence of setae, which are not reported in *F.*

Table 3. Morphological characters of species of the genus *Fuscoporia* confirmed for Northeast Brazil through molecular analyses.

Tabela 3. Características morfológicas de espécies do gênero *Fuscoporia* confirmadas para o Nordeste do Brasil por meio de análises moleculares.

Species	Basidioma	Poros per mm	Basidiospore size (μm)	Basidiospore Q	Basidiospore shape	Substrate	References
Fuscoporia atlantica	Pileate, sessile to effuse-reflexed	7–9	4–4.5 × (2–)3–3.5	(1.1–)1.3–2	Broadly ellipsoid to ellipsoid	On dead branches and trunks	Pires *et al.* (2015)
Fuscoporia formosana	Pileate to effuse-reflexed	7–9	4.5–5×2.5–3	1.55	Broadly ellipsoid	On dead wood	Current work
Fuscoporia licnoides	Pileate	7–9	4–5×2.5–3.5	1.52	Broadly ellipsoid	On dead wood	Current work
Fuscoporia marquesiana	Pileate	8–9	4–6×3–4	1.29	Broadly ellipsoid	-	Yuan *et al.* (2020)
Fuscoporia scruposa	Pileate to effuse-reflexed	8–10	3.5–5×2,5–3	1.49	Pileate to effuse-reflexed	On dead wood	Current work
Fuscoporia semiarida	Pileate	7–9	4–5×2–3.0	1.73	Ellipsoid	On dead wood	Yuan *et al.* (2020)

maxonii. *Fomitiporia sonorae*, in turn, is distinguished from of *F. neotropica* by larger pores (5–6/mm vs. 6–9/mm) and longer setae (20–44 μm in length vs. 10–30 μm) (Gilbertson & Ryvarden, 1987; Ryvarden, 2004; Raymundo *et al*., 2012; Campos-Santana *et al*., 2014).

VRTO438 formed a well-supported clade with *F. maxonii* and *F. sonorae* (bootstrap = 96/96) (Fig. 1). This clade indicates that there is a strong proximity between both species, as already demonstrated in previous works (Amalfi *et al*., 2012; Amalfi & Decock, 2013; Ota *et al*., 2014). *Fuscoporia sonorae* has been collected so far only in southern USA and northern Mexico (Gilbertson & Ryvarden, 1987; Raymundo *et al*., 2012), while *F. maxonii* is a more distinctly tropical species, with records from southern Florida to Argentina, with records from Brazil (Decock *et al*., 2007; Vlasák *et al*., 2011; Raymundo *et al*., 2012; Species Link, 2022). We consider that our specimen represents *F. maxonii* and suggest that, for a good delimitation between these two species, it is necessary to include other regions of the DNA in the phylogenetic analyses. The *F. maxonii*/*F. sonorae* clade is very close to *F. langloisii* (bootstrap = 98/99) (Fig. 1). *Fomitiporia maxonii* and *F. langloisii* are morphologically similar, but they can be differentiated by the firm adherence to the substrate and the resupinate to effused basidioma in *F. langloisii*, while in *F. maxonni* the basidioma is only resupinate and can be easily detached from the substrate (Raymundo *et al*., 2012).

Among the species of *Fuscoporia*, VRTO24 formed a clade with *F. atlantica* (bootstrap = 99/99), indicating that it is a representative of this species (Fig. 2). *Fuscoporia atlantica* formed a clade without support with *F. scruposa* (Fig. 2), from which it can be distinguished by the concentrically zonate pileus and the setae subulate to ventricose, mostly uncinate or hooked (Pires *et al*., 2015; Yuan *et al*., 2020).

VRTO(BFO3), VRTO(BFO6), VRTO(BFO7) and VRTO83 formed a clade with *F. formosana* (bootstrap = 91/99), while VRTO(BFO11), VRTO(BFO13), VRTO(B05),

VRTO(V473) and VRTO199 with *F. scruposa* (bootstrap = 94/99) (Fig. 2). *Fuscoporia formosana* and *F. scruposa* are macro and microscopically very similar, both belonging to the "*Phellinus scruposus*" group within the "*P. gilvus*" complex (Yuan *et al*., 2020), requiring, therefore, molecular analyses for a better distinction. Phylogenetically, *F. formosana* formed a clade in common with two sequences identified as *F. gilva* from China (bootstrap = 85/91). The type of this species, however, was originally collected in the USA (Pennsylvania) and these samples should be reanalyzed (Yuan *et al*., 2020). *Fuscoporia scruposa*, in turn, is close to the clade formed between the species *F. atlantica*, as previously discussed.

VRTO77, VRTO279, VRTO600, VRTO742(b), VRTO(V427), VRTO(V483), and VRTO(V544) formed a clade with *F. licnoides* (bootstrap = 84/94), close, but with low support (bootstrap = 57/57) with *F. torulosa*. Both species share common features, such the pileate basidiomata, but can be easily distinguished by the shape of the margin, which is thin in *F. licnoides* and obtuse in *F. torulosa* (Dai, 2010; Yuan *et al*., 2020). In addition, the species can also be distinguished by their distribution: *F. licnoides* is probably a neotropical species, while *F. torulosa* is common in temperate climates (Dai, 2010; Yuan *et al*., 2020; GBIF, 2022).

CONCLUSION

The results indicate the importance of continuous investigation in the Atlantic Forest, which continues to reveal novelties about Hymenochaetaceae. Furthermore, the results obtained in this study improved the data on the geographic distribution of species and to elucidate the existing complexes, helping to identify species that are well distinguished only by molecular analysis.

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BIBLIOGRAPHY

Alves-Silva, G., Drechsler-Santos, E. R., & da Silveira, R. M. B. (2020). *Bambusicolous Fomitiporia* revisited: multilocus phylogeny reveals a clade of host-exclusive species. *Mycologia* 112 (3): 633-648.

Alves-Silva, G., Reck, M. A., da Silveira, R. M. B., Bittencourt, F., Robledo, G. L., Góes-Neto, A. & Drechsler-Santos, E. R. (2020). The Neotropical *Fomitiporia* (Hymenochaetales, Basidiomycota): the redefinition of *F. apiahyna* ss allows revealing a high hidden species diversity. *Mycological Progress* 19 (8): 769-790.

Amalfi, M., Raymundo, T., Valenzuela, R. & Decock, C. (2012). *Fomitiporia cupressicola* sp. nov., a parasite on *Cupressus arizonica*, and additional unnamed clades in the southern USA and northern Mexico, determined by multilocus phylogenetic analyses. *Mycologia* 104 (4): 880-893.

Amalfi, M. & Decock, C. (2013). *Fomitiporia castilloi* sp. nov. and multiple clades around *F. apiahyna* and *F. texana* in Meso-and South America evidenced by multiloci phylogenetic inferences. *Mycologia* 105 (4): 873-887.

Amalfi, M. & Decock, C. (2014). *Fomitiporia expansa*, an undescribed species from French Guiana. *Cryptogamie, Mycologie* 35(1): 73-85.

Campos-Santana, M., Amalfi, M., Robledo, G., Borges da Silveira, R. M. & Decock, C. (2014). *Fomitiporia neotropica*, a new species from South America evidenced by multilocus phylogenetic analyses. *Mycological progress* 13 (3): 601-615.

Cardoso, J. T. (2016). A mata atlântica e sua conservação. *Encontros Teológicos*, Florianópolis, v.31, n.3: 441-458.

Catalogue of Life. Hymenochaetaceae. (2022). Available at: http://www.catalogueoflife.org/. Accessed on: 27 Sep. 2022.

Chang, T. T. & Chou, W. N. (1999). Two new species of *Phellinus* from Taiwan. *Mycological Research* 103 (1): 50-52.

Chen, Q., Wu, F., Ji, X. H., Si, J., Zhou, L. W., Tian, X. M., Vlasák, J. & Dai, Y. C. (2019). Phylogeny of the genus *Fuscoporia* and taxonomic assessment of the *F. contigua* group. *Mycologia* 111 (3): 423-444.

Dai, Y. C. (2010). Hymenochaetaceae (Basidiomycota) in China. *Fungal diversity* 45 (1): 131-343.

Decock, C., Figueroa, S. H., Robledo, G. & Castillo, G. (2007). *Fomitiporia punctata* (Basidiomycota, Hymenochaetales) and its presumed taxonomic synonyms in America: taxonomy and phylogeny of some species from tropical/subtropical areas. *Mycologia* 99 (5): 733-752.

Fidalgo, O. & Fidalgo, M. E. P. K. (1968) Polyporaceae from Venezuela I. *Memoirs of the New York Botanical Garden* 17: 1-34.

Fidalgo, O. & Bononi, V.L.R. (1989) Fungos e líquens macroscópicos. In: Fidalgo O., Bononi V.L.R. (eds.). Técnicas de coleta, preservação e herborização de material botânico, pp. 24–26. São Paulo, Instituto de Botânica.

Flora e Funga do Brasil. (2022). Jardim Botânico do Rio de Janeiro. Available at: http://floradobrasil.jbrj.gov.br/. Accessed on: 29 Jun. 2022.

GBIF.org. (2022). GBIF Home Page. Available from: https://www.gbif.org. Accessed on: 29 Jun. 2022.

GenBank. (2022). NIH genetic sequence database. Available at: https://www.ncbi.nlm.nih.gov/genbank/. Accessed on: 29 Jun. 2022.

Gilbertson, R. L. & Ryvarden, L. (1987). North American Polypores. Part 2. *Megasporoporia – Wrightoporia*. *Fungiflora*, Oslo, pp 433-885.

Góes-Neto, A., Loguercio-Leite, C. & Guerrero, R. T. (2005). DNA Extraction from frozen field-collected and dehydrated herbarium fungal basidiomata: performance of SDS and CTAB-based methods. *Biotemas* 18 (2): 19-32.

Kornerup A. & Wanscher J. H. (1978) Methuen handbook of colour. Eyre Methuen. London.

Kumar, S., Stecher, G., Li, M., Knyaz, C. & Tamura, K. (2018). MEGA X: molecular evolutionary genetics analysis across computing platforms. *Molecular Biology and Evolution* 35 (6): 1547-1549.

Li, G. J., Hyde, K. D., Zhao, R. L., Hongsanan, S., Abdel-Aziz, F. A., Abdel-Wahab, M. A., ... & Maharachchikumbura, S. S. (2016). Fungal diversity notes 253-366: taxonomic and phylogenetic contributions to fungal taxa. *Fungal diversity* 78 (1): 1-237.

Ministério do Meio Ambiente (MMA). (2010). Mata Atlântica Manual de Adequação Ambiental. Available at: http://www.mma.gov.br/estruturas/202/_arquivos/adequao_ambiental_publicao_we b_202.pdf. Accessed on: 29 Jun. 2022.

Morera, G., Robledo, G., Ferreira-Lopes, V. & Urcelay, C. (2017) South american *Fomitiporia* (Hymenochaetaceae, Basidiomycota) 'jump on' exotic living trees revealed by multi-gene phylogenetic analysis. *Phytotaxa* 321: 277-286.

Ota, Y., Hattori, T., Nakamura, H., Terashima, Y., Lee, S. S., Miyuki, Y. & Sotome, K. (2014). Taxonomy and phylogenetic position of *Fomitiporia torreyae*, a causal agent of trunk rot on Sanbu-sugi, a cultivar of Japanese cedar (Cryptomeria japonica) in Japan. *Mycologia* 106 (1): 66-76.

Pires, R. M., Motato-Vásquez, V. & Gugliotta, A. D. M. (2015). *Fuscoporia atlantica* sp nov., a new polypore from the Brazilian Atlantic Rainforest. *Mycotaxon* 130 (3): 843.

Pires, R. M., Motato-Vásquez, V. & Gugliotta, A. D. M. (2016). New records of polypores (Basidiomycota) from the state of São Paulo, Brazil. *Iheringia, Série Botânica* 71 (2): 124-131.

Rajchenberg, M., Pildain, M. B., Madriaga, D. C., de Errasti, A., Riquelme, C. & Becerra, J. (2019). New Poroid Hymenochaetaceae (Basidiomycota, Hymenochaetales) from Chile. *Mycological Progress* 18 (6): 865-877.

Raymundo, T., Decock, C., Valenzuela, R., Amalfi, M., Cifuentes, J. & Pacheco Mota, L. (2012) New records of the genus *Fomitiporia* (Hymenochaetales, Basidiomycota) in Mexico. *Revista Mexicana de Biodiversidad* 83: 313-328.

Rezende, C. L., Scarano, F. R., Assad, E. D., Joly, C. A., Metzger, J. P., Strassburg, B. B. N., Tabarelli, M., Fonseca, G. A. & Mittermeier, R. A. (2018). From hotspot to hopespot: An opportunity for the Brazilian Atlantic Forest. *Perspectives in Ecology and Conservation* 16 (4): 208-214.

Ryvarden, L. (2004). Neotropical polypores: Part 1: Introduction, Ganodermataceae & Hymenochaetaceae. *Sinopse Fungorum* 19: 1-227.

Ryvarden, L. & Johansen, I. (1980). A preliminary polypore flora of East Africa. A preliminary Polypore flora of East Africa.

Salvador-Montoya, C. A., Popoff, O. F., Góes-Neto, A. & Drechsler-Santos, E. R. (2020). Global phylogenetic and morphological reassessment of *Fomitiporella* sl (Hymenochaetales, Basidiomycota): taxonomic delimitation of *Fomitiporella* ss and segregation of *Rajchenbergia*, gen. nov. *Plant systematics and evolution* 306 (2): 1-27.

Silva, J. D. & Casteleti, C. H. M. (2005). Estado da biodiversidade da Mata Atlântica brasileira. In Galindo-Leal, C. & Câmara, I. G. Mata Atlântica: biodiversidade,

ameaças e perspectivas. Fundação SOS Mata Atlântica/Conservação Internacional, São Paulo/Belo Horizonte, pp 43-59.

Species Link. (2022). Formulário de busca. Available at: http://www.splink.org.br/index?lang=pt. Accessed on: 29 Jun. 2022.

Staden, R., Beal, K. F. & Bonfield, J. K. (1998). The Staden Package. Computer Methods in Molecular Biology 132: 115-130, In: Bioinformatics Methods and Protocols, Eds Misener, S., Krawetz, S.A. Totowa. The Humana Press.

Vlasák, J., Kout, J., Vlasák, J. Jr. & Ryvarden, L. (2011). New records of polypores from southern Florida. *Mycotaxon* 118: 159-176.

White, T. J.; Bruns, T.; Lee, S. & Taylor, J. W. (1990). Amplification and direct sequencing of ribosomal RNA genes for phylogenetics. In: Innis, MA; Gelfand, DH; Sninsky, JJ; White, TJ. PCR Protocols, a Guide to Methods and Applications. *Academic Press*, New York, 315-322.

Wu, F., Zhou, L. W., & Dai, Y. C. 2016. *Neomensularia duplicata* gen. et sp. nov. (Hymenochaetales, Basidiomycota) and two new combinations. *Mycologia* 108(5): 891-898.

Wu, F., Zhou, L. W., Vlasák, J., & Dai, Y. C. (2022). Global diversity and systematics of Hymenochaetaceae with poroid hymenophore. *Fungal Diversity* 113 (1): 1-192.

Xavier de Lima, V., Oliveira, V. R. T., de Lima-Júnior, N. C., Oliveira-Filho, J. R. C., Santos, C., Lima, N. & Gibertoni, T. B. (2022). Taxonomy and phylogenetic analysis reveal one new genus and three new species in *Inonotus sl* (Hymenochaetaceae) from Brazil. *Cryptogamie Mycologie* 43 (1): 1-21.

Yuan, H. S. Dai, Y. C. Kevin D. H., ... Zhou, L. W. (2020). Taxonomic and phylogenetic contributions to fungal taxa. *Fungal Diversity Notes* 1276-1391.