

Wood-decaying Agaricomycetes (Basidiomycota, Fungi): new records for the state of Santa Catarina, Brazil

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ABSTRACT

In this study, we identified six polyporoid species of Agaricomycetes: *Abundisporus roseoalbus*, *Fuscocerrena portoricensis*, *Oligoporus caesius*, *Antrodiella duracina*, *Inocutis jamaicensis* and *Inonotus venezuelicus*. All of these represent new records for the state of Santa Catarina, located in southern Brazil. For Brazil as a whole, this is the second record of *O. caesius*.

Key words: Fungal diversity, polypores, taxonomy

Agaricomycetes, formerly basidiomycetes (Hibbett *et al.* 2007), comprises nearly 21,000 species, including wood-decaying, parasitic and ectomycorrhizal fungi (Hibbett 2006; Kirk *et al.* 2008). Wood-decaying (white-rot and brown-rot) fungi are the primary agents of lignocellulose degradation (Morgenstern *et al.* 2008). White-rot fungi degrade all components of the plant cell wall, including hemicellulose, cellulose and lignin (Kersten & Dan Cullen 2007), whereas brown-rot fungi remove polysaccharides but do not solubilize lignin, which remains as a brown amorphous residue (Aguar & Ferraz 2007). In tropical areas, most basidiomycetes (96%) are white-rot fungi (Okino *et al.* 2000).

Over the past three decades, extensive efforts have been made to gather data related to the polypores associated with wood substrates in the state of Santa Catarina, located in southern Brazil. The most recent fungal checklist for the state (Loguercio-Leite *et al.* 2009) registered 212 species of basidiomycetes, of which seven were new to science (Loguercio-Leite & Wright 1991a, 1991b, 1998; Loguercio-Leite *et al.* 1998, 2001, 2002; Baltazar *et al.* 2009). The aim of this study was to increase the knowledge of Agaricomycetes diversity in Santa Catarina.

The forest vegetation of the state of Santa Catarina is mainly Atlantic Forest with different formations (Fernandes & Bezerra 1990): mangroves, coastal rain forests, semideciduous forests and Araucaria forests. This study was performed in the municipalities of Aurora

(27°18'33"S; 49°38'00"W) and Alfredo Wagner (27°40'45"S; 49°10'38.4"W). Both sites are located in the Upper Itajaí Valley, in the east-central part of the state. Aurora is covered by dense rain forest and Alfredo Wagner is covered by Araucaria forest.

Periodical fungal samplings were conducted between September 2007 and July 2009. Basidiomata were studied by observing their morphology, including macroscopic characters (*e.g.*, size, color, number of pores/mm, length of tubes) and microscopic characters (presence/absence of structures, size). Measurements were made from slide preparations stained with 1% aqueous phloxine (plus 1% and/or 5% potassium hydroxide) and Melzer's reagent (Ryvarden 1991). We identified specimens down to the species level using specialized bibliographies and comparing with collections of the following herbaria (Thiers 2012): the Herbarium of the Botany Department of the Federal University of Santa Catarina (code, FLOR); the Herbarium of the Biological Sciences Department of the University of Buenos Aires (code, BAFC); and the Herbarium of the Biosciences Institute at the Federal University of Rio Grande do Sul (code, ICN). After having been examined, vouchers were deposited in the FLOR herbarium. Taxonomic arrangement follows Kirk *et al.* (2008).

We identified six new occurrences of Agaricomycetes in the state of Santa Catarina: *Abundisporus roseoalbus* (Jungh.) Ryvarden; *Oligoporus caesius* (Schrad.) Gilb. & Ryvarden; *Fuscocerrena portoricensis* (Spreng. ex Fr.) Ryvarden;

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Antrodiella duracina (Pat.) I. Lindblad & Ryvardeen; *Inocutis jamaicensis* (Murrill) A.M. Gottlieb, J.E. Wright & Moncalvo; and *Inonotus venezuelicus* Ryvardeen. This survey yielded tropical (neotropical and pantropical) or cosmopolitan taxa, mostly white-rot fungi, except for *O. caesius* which is a brown-rot fungus. For Brazil as a whole, this represents the second record of *O. caesius*.

Polyporaceae Corda

Abundisporus roseoalbus (Jungh.) Ryvardeen, Belg. J Bot. 131: 154, 1998.

≡ *Polyporus roseoalbus* Jungh., Praem. Fl. Crypt. Javae Insulae:43, 1838.

Description - Parmasto & Hallenberg (2000).

Distribution - Cosmopolitan. In Brazil, recorded for the states of Bahia, Pará, Paraná and Rio Grande do Sul (Gugliotta *et al.* 2012).

Comments - In our material, the basidiospore size (4-4.5 (-5) × (2-) 2.5-3 μm) was very similar to the 3.0-4.5 × 2.0-3.0 μm described by Ryvardeen & Johansen (1980). However, Parmasto & Hallenberg (2000), who considered *A. roseoalbus* as a synonym of *A. fuscopurpureus* (Pers.) Ryvardeen, cited smaller basidiospores (3.2-3.9 (-4.2) × 2.0-2.8 (-3.0) μm). In addition, we observed a slightly dextrinoid reaction in the basidiospore walls, which is in agreement with the findings of Ryvardeen & Johansen (1980) and Parmasto & Hallenberg (2000). Another interesting aspect was an ambiguity related to the hyphal system. Ryvardeen & Johansen (*op. cit.*) stated that *A. roseoalbus* could be considered trimitic (skeletal and binding hyphae) or subtrimitic (skeletal-binding hyphae), as Parmasto & Hallenberg (*op. cit.*) assumed. The material examined showed a high number of skeletal-binding hyphae, with a low number of skeletal hyphae.

Voucher material - BRAZIL, Santa Catarina: Aurora, Braço Aurora, *Gutjahr & Strey* 238, 23/I/2009, (FLOR 32417).

Additional material - BRAZIL, Rio Grande do Sul: Porto Alegre, Morro Santana, *M. C. Westphalen* 45, 11/ V/2007, (ICN 154098); *ibid.*, *M. A. Reck*, 14/IV/2005, (ICN 154154 and 154155); *ibid.*: São Francisco de Paula, FLONA, *L. V. Graf* 91, 02/IX/2006, (ICN 139428).

Fuscocerrena portoricensis (Spreng. ex Fr.) Ryvardeen. Transactions of the British Mycological Society 79: 279 1982. ≡ *Polyporus portoricensis* Fr. Elench. Fung. 1: 115. 1828.

Description - Gilbertson & Ryvardeen (1986).

Distribution - Neotropical. In Brazil, recorded for the states of Paraná, Rio Grande do Sul and São Paulo (Gugliotta *et al.* 2012).

Comments - Easily recognized by the dark brown pileus and whitish-gray hymenophore, with ruptured pores. Diagnostic features include dendrohyphidia limited to hymenium, clamped generative hyphae and cylindrical basidiospores. Dendrohyphidia are always covered with delicate crystals, although it is sometimes difficult to observe this contour, very similar to those described by Gilbertson & Ryvardeen (1986).

Voucher material - BRAZIL, Santa Catarina: Alfredo Wagner, Reserva Rio das Furnas, *Gerlach, Reck & Loguercio-Leite* 218, 17/VII/2009, (FLOR 32402).

Additional material - BRAZIL, Rio Grande do Sul: Dom Pedro de Alcântara, *M. A. Reck*, 04/VII/2008, (ICN 154196).

Oligoporus caesius (Schrad.) Gilb. & Ryvardeen, Mycotaxon 22(2): 365, 1985.

≡ *Boletus caesius* Schrad., Spicil. Fl. Germ. 1: 167, 1794.

Description - Ryvardeen & Johansen (1980).

Distribution - Cosmopolitan. In Brazil, recorded for the state of São Paulo [Gugliotta *et al.* 2012, as *Postia caesia* (Schrad.) P. Karst.].

Comments - *Oligoporus caesius* has a very soft, white to bluish basidioma, a monomitic hyphal system, with clamped generative hyphae, amyloid basidiospores and gloeopleurous hyphae. As noted by Loguercio-Leite *et al.* (2008), gloeopleurous hyphae are always present in this species and absent in two related species, *O. subcaesius* (A. David) Ryvardeen & Gilb. and *O. caesioflavus* (Pat.) Baltazar, Michels & C. L. Leite. The shape and size of the basidiospores (allantoid, 4.0-5.0 × 1.0-1.5 μm) are similar to the additional material as well to that reported by Rajchenberg (2006). However, Ryvardeen & Johansen (1980) described narrower basidiospores (4.0-5.0 × 0.7-1.0 μm) and Gilbertson & Ryvardeen (1986) mentioned them with larger dimensions (5.5-7.5 × 1.0-2.0 μm). For Brazil as a whole, this is the second record of *O. caesius*.

Voucher material - BRAZIL, Santa Catarina: Aurora, Braço Aurora, *Gutjahr & Strey* 97, 23/V/2008 (FLOR 32418).

Additional material - ARGENTINA, Buenos Aires: Isla de Martin Garcia, *Rajchenberg & Wright*, 9-11/I/1986 (FLOR 11779).

Phanerochaetaceae Jülich

Antrodiella duracina (Pat.) I. Lindblad & Ryvardeen. Mycotaxon 71: 336, 1999.

≡ *Leptoporus duracinus* Pat. Bulletin de la Société Mycologique de France 18(2):174, 1902

Description - Lindblad & Ryvardeen (1999).

Distribution - Neotropical. In Brazil, cited for the states of Bahia, Pernambuco, Paraná, Rio Grande do Sul and São Paulo [(Gugliotta *et al.* 2012, as *Tyromyces duracinus* (Pat.) Murrill].

Comments - *Antrodiella duracina* has thin basidioma, concentrically zonate yellow-brownish, pileus, light brown, hymenophore with small pores (6.0-7.0 mm), with small allantoid basidiospores (3.0-)4.0-6.0 × 1.5-2.0 μm, larger than what reported by Lindblad & Ryvardeen data (1999) (4.0-4.5 × 1.0-1.5 μm), and skeletal hyphae with large lumen, abundant in the trama and rare in context as detected by Ryvardeen & Guzmán (2001). Despite this, Reck & Silveira (2008) consider only generative hyphae in context.

Voucher material - BRAZIL, Santa Catarina: Alfredo Wagner, Reserva Rio das Furnas, *Gerlach & Giovanka* 54,

19/IV/2008, (FLOR 32404); *ibid*, *ipse* 55, (FLOR 32403); *ibid*, *ipse* 131, 07/VII/2008, (FLOR 32405).

Additional material - BRAZIL, Rio Grande do Sul: Porto Alegre, Morro Santana, *M. A. Reck*, 06/VII/2005 (ICN 154158); *ibid*, *M. C. Westphalen* 037, 11/V/2007 (ICN 154091).

Hymenochaetaeae Imazeki & Toki

Inocutis jamaicensis (Murrill) A. M. Gottlieb, J.E. Wright & Moncalvo, *Mycological Progress* 1(3): 308, 2002.

≡ *Inonotus jamaicensis* Murrill, *Bulletin of the Torrey Botanical Club* 31(11): 597, 1904.

Description - Gottlieb *et al.* (2002).

Distribution - Neotropical. For Brazil cited to Paraná (Gibertoni *et al.* 2012).

Comments - According to Gottlieb *et al.* (2002) and Wagner & Fischer (2002a-b), *Inocutis* Fiasson & Niemelä is a monophyletic genus. *Inocutis jamaicensis* is characterized by a blackish and wrinkled pileus surface with a thin crust, absence of setae (Ryvarden 2005) and reddish brown ellipsoid basidiospores (Rajchenberg 2006). Ryvarden (2005) and Rajchenberg & Wright (1998) reported longer basidiospores (6.5-7.3 × 4.4-5.0 μm vs. 5.0-6.0(-7.0) × 3.5-4.5(-5.0) μm in our material). Granular core and sclerified hyphae have not been found, coinciding to Baltazar *et al.* (2010) who extended this data to all Brazilian specimens examined.

Voucher material - BRAZIL, Santa Catarina: Alfredo Wagner, Reserva Rio das Furnas, *Gerlach & Giovanka* 84, 07/VII/2008 (FLOR 32327); *Gonçalves P. 27*, 17/VII/2009 (FLOR 32328).

Additional material - ARGENTINA, Buenos Aires: Alsina, Campo los Pinos, 31/VIII-1978, on dead *Eucalyptus viminalis* (BAFC 24384).

Inonotus venezuelicus Ryvarden, *Mycotaxon* 28(2): 529, 1987. = *Inonotus serranus* Robledo, Urcelay & Rajchenb. *Mycologia* 95(2): 348, 2003.

Description - Robledo *et al.* (2006).

Distribution - Neotropical. In Brazil, recorder for the state of Rio Grande do Norte (Gibertoni *et al.* 2012).

Comments - *Inonotus venezuelicus* is very similar to *Inocutis jamaicensis*. It differs from *I. jamaicensis* mainly by the absence of a blackish thin crust and by having ellipsoid to ovoid larger basidiospores. In our material, the basidiocarp was effused-reflexed, as reported by Gottlieb *et al.* (2002) and Robledo *et al.* (2006), whereas Ryvarden (1987) and Baltazar *et al.* (2010) described it as typically resupinate. Molecular studies will be necessary to clarify the taxonomy of these species.

Voucher material - BRAZIL, Santa Catarina: Alfredo Wagner, Reserva Rio das Furnas, *Gerlach et al.* 14, 01/IX/2007 (FLOR 32325); *ibid*, *Gerlach & Giovanka* 76, 07/VII/2008, (FLOR 32324), *ibid*, *ipse* 109, 07/VII/2008 (FLOR 32326).

Additional material - BRAZIL, Rio Grande do Norte: RPPN Senador Antônio Farias - Mata Estrela, Baía Formosa, *Gibertoni*, on angiosperms: V/2002 (URM 77459).

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