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Contribution to the lignocellulolytic fungi (Basidiomycetes) of the Atlantic Rain Forest in Southern Brazil

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Abstract – Forty-seven species of wood inhabiting Basidiomycetes are reported from the Atlantic Rain Forest of the Parque Estadual da Serra do Tabuleiro, Santa Catarina, Brazil. Fourteen are new records for the state. All the species are new records for the studied area.
Key words: wood rot Basidiomycetes, checklist, xilophilous.

Introduction

The macrofungi have perhaps the longest history of diversity studies of any mycota. Nevertheless, they are understudied over most of the world. Taxonomic obstacles and the absence of long-term studies prevent conclusive answers even to basic questions about the number of species at a specific location or whether diversity is greater in one type of forest than in another (Lodge et al. 2004). It is known that the species of lignocellulolytic basidiomycetes are extremely abundant in all forest types and that they are the major wood decomposers in most ecosystems (Fryar et al. 1999). These fungi have received special attention of researchers in the last decades due to their potential applications in pollutant purification, soil bioremediation, and antibiotic production (Blanchette 1995; Kotterman et al. 1994; Smânia et al. 2003). However, in many geographical areas, especially in the tropical forest systems, it is clear that the known number of described fungal species represents only a small fraction of the number believed to exist there (Gilbert & Sousa 2002). The plant flora is better known than the fungi both in the Neotropical area (Thomas 1999) and the Brazilian Atlantic Forest. The latter is particularly relevant for studies because of its high biological diversity and severely threatened status (Tabanez & Viana 2000). An increased understanding of fungal diversity and natural history of fungi will contribute to the knowledge of the local biota and will greatly strengthen initiatives to protect and use sustainably our natural resources (Rossman et al. 1998).

According to available records, fungi were first collected in Santa Catarina State in 1815 by Adalberto de Chamisso, and only sporadically thereafter until Möller's activity in 1890 (Loguercio-Leite 1991). Starting in 1986, surveys were periodically conducted by researchers of the Mycology Laboratory (BOT/CCB/UFSC), who specifically targeted polyporoid lignocellulolytic fungi. Since then several studies have been published with data on collections from the Atlantic Forest, Santa Catarina Island, and other areas in the state. This has produced approximately 60 new species

records for the state, six of which are new to science (Loguercio-Leite & Wright 1991, 1998; Loguercio-Leite et al. 1998, 2001, 2002).

Material and Methods

The Atlantic Forest is composed of two major vegetation types: the Atlantic Rain Forest and the Atlantic Semi-deciduous Forest (Morellato & Haddad 2000). The state of Santa Catarina (26^{o}-30^{o} S lat, 48^{o}30'-54^{o} W long) in Southern Brazil currently has only 17.4% of its original area covered by the Atlantic Forest (Ministério do Meio Ambiente 2002).

The present study was conducted in Parque Estadual da Serra do Tabuleiro, which belongs to the Atlantic Rain Forest region. The Parque (27^{o} 42' 09"-28^{o} 34' 09" S lat, 48^{o} 57' 23"-48^{o} 43' 09" W long), which covers 900 km^{2} and is located at the center-east portion of the state of Santa Catarina, includes nine municipalities (Fig. 1): Palhoça, Santo Amaro da Imperatriz, Águas Mornas, São Bonifácio, Imaruí, Garopaba, Paulo Lopes, São Martinho and Florianópolis (Batista 2003).

Highly diverse, the Parque Estadual da Serra do Tabuleiro contains representatives of the different landscapes types of Santa Catarina. The diverse ecosystems and habitats support known rare, endangered and endemic species, with many new species yet to be recorded. Therefore, this area both serves as a highly important genetic reservoir and offers opportunities for biodiversity and conservation research as well (Rosário 2003).

Periodical fungal inventories were conducted between July 2000 and July 2001. Basidiomes were studied using macroscopic (e.g., size, colour, number pores/mm, length of tubes) and microscopic (presence/absence of structures, dimensions) vegetative and reproductive characters (Ryvarden 1991, Singer 1975). Measurements and drawings were made from slide preparations stained with 1% aqueous phloxine and 5% KOH. Specimens were identified to species using specialized references and comparing collections with FLOR, BAFC, ICN and PACA Herbaria collections. Vouchers were deposited in FLOR Herbarium (Universidade Federal de Santa Catarina) after examination. (Holmgren et al. 1990). Nomenclature and authorities are from Kirk et al. (2001).

Results and Discussion

In the state of Santa Catarina, 163 species of lignocellulolytic fungi (Basidiomycetes) have been recorded since 1986. In the investigated area 47 species were found, representing about 28 percent of the total number of polypores reported for the State, until now. Those species are distributed in 29 genera and 11 families. Fourteen of the identified species are new records for the State and are marked with * in the checklist. All species are new citations for the area.

As this study was based on collecting during a period of 13 months and, as some fungi form its basidiomes irregularly, many species were probably unrecorded. Mycelia belonging to a species with low productivity may exist in the substrate over many years but only rarely produce basidiomes except under optimal conditions (Straatsma & Krisai-Greilhuber 2003

Thirty-two (68%) of the species collected in the Parque Estadual da Serra do Tabuleiro, show a tropical (neotropical and pantropical) distribution, while four

[*Amauroderma corneri* Gulaid & Ryvarden, *Antrodiella multipileata* L. Leite & Wright, *Henningsia brasiliensis* (Speg.) Speg., *Skeletocutis roseolus* (Rick ex Theiszen) Rajch.] are known only from Brazil. Fifteen (32%) species are cosmopolitan.

The genera with the largest number of species (4) were *Ganoderma* and *Phellinus*. *P. grenadensis* was most frequent (8), mostly on trunks of *Piptadenia gonoacantha*. However, host data are poor in the tropics, particularly as the great diversity of species makes host identification difficult, particularly when basidiomes fruit on dead trees or fallen trunks (Gilbert et al. 2002).

This study substantially increases the geographic ranges of the lignocellulolytic fungi. Obviously more work is required to increase our knowledge on these fungi at the Park, an area of extreme biological importance.

- Checklist for the species at Parque Estadual da Serra do Tabuleiro:

AGARICALES

Tricholomataceae

**Lentinus crinitus* (L.) Fr.
Syst. Orb. Veg. p. 77. 1825.
BASIONYM: *Agaricus crinitus* L., 1763.
DISTRIBUTION: neotropical.
Ref.: Dennis, 1970; Guzmán & Johnson, 1974; Pavlich, 1976; Jejelowo & Abraham, 1998.

**Lentinus strigosus* (Schw.) Fr.
Syst. Orb. Veg. p. 77. 1825.
BASIONYM: *Agaricus strigosus* Schw., 1822.
DISTRIBUTION: pantropical.
Ref.: Rick, 1938; Dennis, 1970; Hongo, 1974; Guzmán & Johnson, 1974; Pavlich, 1976; Pegler, 1987; Saber, 1997.

**Panellus pusillus* (Pers. ex Lév.) Burdsall & Miller.
Nova Hedwigia Beih. 51: 85, 1975.
BASIONYM: *Gloeoporus pusillus* Pers. ex Lév., 1844.
DISTRIBUTION: cosmopolitan.
Ref.: Burdsall & Miller, 1975.

Schizophyllaceae

**Schizophyllum commune* Fr.
Syst. Mycol. 1: 330, 1821.
DISTRIBUTION: cosmopolitan.
Ref.: Cooke, 1961.

HYMENOCHAETALES

Hymenochaetaceae

Cyclomyces iodinus (Mont.) Pat.
Essai Tax. p. 98, 1900.
BASIONYM: *Polyporus iodinus* Mont., 1841.
DISTRIBUTION: neotropical.
Ref.: Gerber, 1996.

**Cyclomyces tabacinus* (Mont.) Pat.
Essai Tax. p. 98, 1900.
BASIONYM: *Polyporus tabacinus* Mont., 1835.
DISTRIBUTION: pantropical.

Ref.: Ryvarden & Johansen, 1980; Nuñez & Ryvarden, 2000a.

**Hymenochaete corrugata* (Fr.) Lév.
Ann. Sci. Nat. Bot. III 5: 152, 1846.
BASIONYM: *Thelephora corrugata* Fr., 1815.
DISTRIBUTION: cosmopolitan.
Ref.: Job, 1985a,b; Dueñas & Tellería, 1988; Soares & Gugliotta, 1998; Dai, 2000.

**Hymenochaete minuscula* Cunn.
Trans. Royal Soc. New Zeal. 85: 48, 1957.
DISTRIBUTION: pantropical.
Ref.: Job, 1985a; Azevedo & Guerrero, 1993.

**Hymenochaete sallei* Berk. & Curt.
Linn. Soc. Bot. J. 10: 333, 1868.
DISTRIBUTION: cosmopolitan.
Ref.: Dennis, 1970; Job, 1985a; Azevedo & Guerrero, 1993; Zhang, 1999.

Phellinus gilvus (Schw.: Fr.) Pat.
Ess. Tax. Hym. p. 97, 1900.
BASIONYM: *Boletus gilvus* Schw., 1822.
DISTRIBUTION: cosmopolitan.
Ref.: Loguercio-Leite & Wright, 1995.

Phellinus grenadensis (Murr.) Ryv.
Norw. J. Bot. 18: 234, 1972.
BASIONYM: *Pyropolyporus grenadensis* Murr., 1908.
DISTRIBUTION: pantropical.
Ref.: Larsen & Cobb-Poulle, 1990; Gerber & Loguercio-Leite, 2000.

Phellinus umbrinellus (Bres.) Herrera & Bond.
Mikol. Fitopatol. 14(1): 8, 1980.
BASIONYM: *Poria umbrinella* Bres., 1896.
DISTRIBUTION: pantropical.
Ref.: Gilbertson & Ryvarden, 1987; Loguercio-Leite & Wright, 1995.

Phellinus wahlbergii (Fr.) Reid.
Contr. Bolus. Herb. 7: 97, 1975.
BASIONYM: *Trametes wahlbergii* Fr., 1848.
DISTRIBUTION: pantropical.
Ref.: Ryvarden & Johansen, 1980; Gilbertson & Ryvarden, 1987; Loguercio-Leite & Wright, 1995.

Phylloporia spathulata (Hook.) Ryv.
Synop. Fung. 5: 196, 1991.
BASIONYM: *Polyporus spathulatus* Hook., 1822.
DISTRIBUTION: pantropical.
Ref.: Ryvarden & Johansen, 1980.; Gerber, 1996; Wagner & Ryvarden, 2002.

POLYPORALES

Corticiaceae

Gloeoporus dichrous (Fr.) Bres.
Annls. Mycol. 14: 230, 1916.
BASIONYM: *Polyporus dichrous* Fr., 1815.
DISTRIBUTION: cosmopolitan.
Ref.: Gilbertson & Ryvarden, 1986; Nuñez & Ryvarden, 2000b.

Ganodermataceae

Amauroderma camerarium (Berk.) Furtado
Revisão do gênero *Amauroderma* (tese): 140, 1968.
BASIONYM: *Polyporus camerarius* Berk., 1856.

DISTRIBUTION: neotropical.
Ref.: Furtado, 1981.

Amauroderma corneri Gulaid & Ryvarden
Mycologia Helvetica 10(1): 28, 1998.
DISTRIBUTION: neotropical (known only Brazil).-
Ref.: Gulaid & Ryvarden, 1998.

Ganoderma applanatum (Pers.) Pat.
Bull. Soc. Mycol. France 5: 67, 1889.
BASIONYM: *Boletus applanatus* Pers., 1799.
DISTRIBUTION: cosmopolitan.
Ref.: Steyaert, 1975; Silveira & Guerrero, 1991; Leonard, 1998; Nuñez & Ryvarden, 2000a.

Ganoderma resinaceum Boudier.
Bull. Soc. Mycol. France 5: 72, 1889.
BASIONYM: *Ganoderma chaffangeonii* Pat., 1889.
DISTRIBUTION: cosmopolitan.
Ref.: Steyaert, 1972; Nuñez & Ryvarden, 2000a.

Ganoderma tornatum (Pers.) Bres.
Hedwigia 53: 55,1912.
BASIONYM: *Polyporus tornatus* Pers., 1827.
DISTRIBUTION: pantropical.
Ref.: Leonard, 1998; Nuñez & Ryvarden, 2000a.

Hapalopilaceae

Bjerkandera adusta (Willd.: Fr.) Karst.
Medd. Soc. Fauna Flora Fenn. 5: 38, 1879.
BASIONYM: *Boletus adustus* Willd., 1787.
DISTRIBUTION: cosmopolitan.
Ref.: Gilbertson & Ryvarden, 1986; Nuñez & Ryvarden, 2000b.

Ceriporia mellea (Berk. & Br.) Ryv.
Bull. Jard. Bot. Nat. Belg. 48: 98, 1978.
BASIONYM: *Poria mellea* (Berk. & Br.) Sacc., 1888.
DISTRIBUTION: pantropical.
Ref.: Nuñez & Ryvarden, 2000b.

Meripilaceae

Henningsia brasiliensis (Speg.) Speg.
Bol. Acad. Nac. Ci. Córdoba 23: 411, 1919.
BASIONYM: *Polyporus brasiliensis* Speg., 1889.
DISTRIBUTION: neotropical (known only Brazil).
Ref.: Ginns, 1979; Gerber & Loguercio-Leite, 2000.

Rigidoporus microporus (Fr.) Overeem.
Icon. Fung. Malayensum 5: 1, 1924.
BASIONYM: *Polyporus microporus* Fr., 1821.
DISTRIBUTION: pantropical.
Ref.: Gilbertson & Ryvarden, 1986; Gugliotta, 1997.

Rigidoporus ulmarius (Sow.: Fr.) Imazeki.
Bull. Govt Forest. Exp. Stn. Meguro 57: 97, 1952.
BASIONYM: *Boletus ulmarius* Sow., 1797.
DISTRIBUTION: cosmopolitan.
Ref.: Silveira & Guerrero, 1991.

Rigidoporus vinctus (Berk.) Ryv.
Norw. J. Bot. 19: 139-144, 1972.

BASIONYM: *Polyporus vinctus*, Berk., 1852.
DISTRIBUTION: pantropical.
Ref.: Ryvarden, 1972; Setliff, 1972.

Polyporaceae

Earliella scabrosa (Pers.) Gilbn. & Ryv.
Mycotaxon 22: 364, 1985.
BASIONYM: *Polyporus scabrosus* Pers., 1827.
DISTRIBUTION: neotropical.
Ref.: Gilbertson & Ryvarden, 1986; Gerber & Loguercio-Leite, 2000; Nuñez & Ryvarden, 2000b.

Hexagonia papyracea Berk.
Ann. Mag. Nat. Hist. 10: 379, 1843.
DISTRIBUTION: pantropical.
Ref.: Loguercio-Leite, 1994.

Microporellus obovatus (Jungh.) Ryv.
Norw. J. Bot. 19: 232, 1972.
BASIONYM: *Polyporus obovatus* Jungh., 1838.
DISTRIBUTION: pantropical.
Ref.: Mitra, 1999.

Perenniporia subannosa (Bres.) C. Decock, Herrera & Ryv.
Mycologia 93(1): 196-204, 2001.
BASIONYM: *Fomes subannosus* Bres., 1926.
DISTRIBUTION: neotropical.
Ref.: Gerber et al., 1999; Decock et al., 2001.

**Polyporus arcularius* (Batsch) Fr.
Syst. Mycol. 1: 342, 1821.
BASIONYM: *Boletus arcularius* Batsch, 1783.
DISTRIBUTION: pantropical.
Ref.: Ryvarden & Johansen, 1980; Gilbertson & Ryvarden, 1986; Nuñez & Ryvarden, 2000b.

Polyporus dictyopus Mont.
Annls. Sci. Nat. Bot. II 3: 345, 1835.
DISTRIBUTION: pantropical.
Ref.: Ryvarden & Johansen, 1980; Loguercio-Leite, 1992.

Polyporus tenuiculus (Beauv.) Fr.
Syst. Mycol. 1: 344, 1821.
BASIONYM: *Favolus tenuiculus* Beauv., 1806.
DISTRIBUTION: pantropical.
Ref.: Loguercio-Leite, 1992.

Pycnoporus sanguineus (L.: Fr.) Murr.
Bull. Torrey Bot. Club 31: 421, 1904.
BASIONYM: *Boletus sanguineus* L., 1763.
DISTRIBUTION: pantropical.
Ref.: Nuñez & Ryvarden, 2000b.

**Skeletocutis roseolus* (Rick ex Theiszen) Rajch.
Nord. J. Bot. 7(5): 561, 1987.
BASIONYM: *Polystictus roseolus* Rick ex Theiszen, 1911.
DISTRIBUTION: neotropical (known only Brazil).
Ref.: David, 1982; Rajchenberg, 1987; Silveira & Guerrero, 1991.

**Trametes membranacea* (Swartz) Kreisel.
Monogr. Cienc. Univ. Habana 4 16: 83, 1971.
BASIONYM: *Boletus membranaceus* Swartz, 1806.

DISTRIBUTION: neotropical.
Ref.: Silveira & Guerrero, 1991.

Trametes versicolor (L.) Pilát.
Atlas Champ. Eur. Polypor. B 3: 261, 1939.
BASIONYM: *Boletus versicolor* L., 1753.
DISTRIBUTION: cosmopolitan.
Ref.: Silveira & Guerrero, 1991; Loguercio-Leite, 1993.

Trametes villosa (Swartz) Kreisel.
Monogr. Cienc. Univ. Habana 4 16: 83, 1971.
BASIONYM: *Boletus villosus* Swartz, 1806.
DISTRIBUTION: neotropical.
Ref.: Loguercio-Leite, 1993.

Trichaptum sector (Ehrenb.) Kreisel.
Rev. Gen. Pl. 3: 497, 1971.
BASIONYM: *Boletus sector* Ehrenb., 1820.
DISTRIBUTION: neotropical.
Ref.: Silveira & Guerrero, 1991; Gerber, 1996.

Tyromyces leucomallus (Berk. & Curt.) Murr.
North American Flora 9: 36, 1907.
BASIONYM: *Polyporus leucomallus* Berk. & Curt., 1868.
DISTRIBUTION: cosmopolitan.
Ref.: Gilbertson & Ryvarden, 1986; Gonçalves & Loguercio-Leite, 2001.

Steccherinaceae

Antrodiella multipileata L. Leite & Wright.
Mycotaxon 41: 167, 1991.
DISTRIBUTION: neotropical.
Ref.: Loguercio-Leite & Wright, 1991.

Antrodiella semisupina (Berk. & Curt.) Ryv.
Prel. Polyp. Fl. East África p. 261, 1980.
BASIONYM: *Polyporus semisupinus* Berk. & Curt., 1872.
DISTRIBUTION: cosmopolitan.
Ref.: Gilbertson & Ryvarden, 1986; Nuñez & Ryvarden, 2000b.

Flaviporus brownei (Humb.) Donk.
Persoonia 1: 189, 1959.
BASIONYM: *Boletus brownii* Humb., 1793.
DISTRIBUTION: cosmopolitan.
Ref.: Ginns, 1980; Gerber & Loguercio-Leite, 1997; Gonçalves & Loguercio-Leite, 2001.

RUSSULALES

Hericiaceae

**Laxitextum bicolor* (Pers.) Lentz.
Agric. Monogr. 24: 19, 1955.
BASIONYM: *Thelephora bicolor* Pers., 1801.
DISTRIBUTION: cosmopolitan.
Ref.: Eriksson & Ryvarden, 1976.

Stereaceae

Cymatoderma dendriticum (Pers.) Reid.
Kew Bull. 1958: 523, 1959.
BASIONYM: *Thelephora dendritica* Pers., 1827.
DISTRIBUTION: pantropical.
Ref.: Reid, 1965.

**Stereum ochraceo-flavum* (Schw.) Sacc.
Syll. Fung. 6: 576, 1888.
BASIONYM: *Thelephora ochraceo-flava* Schw., 1832.
DISTRIBUTION: cosmopolitan.
Ref.: Lentz, 1955; Dueñas & Tellería, 1988; Hjortstam & Larsson, 1995; Eicker-Albert, 1998.

**Stereum ostrea* (Blume & Nees) Fr.
Epicr. Syst. Mycol. p. 547. 1838.
BASIONYM: *Thelephora ostrea* Blume & Nees, 1826.
DISTRIBUTION: cosmopolitan.
Ref.: Lentz, 1955.

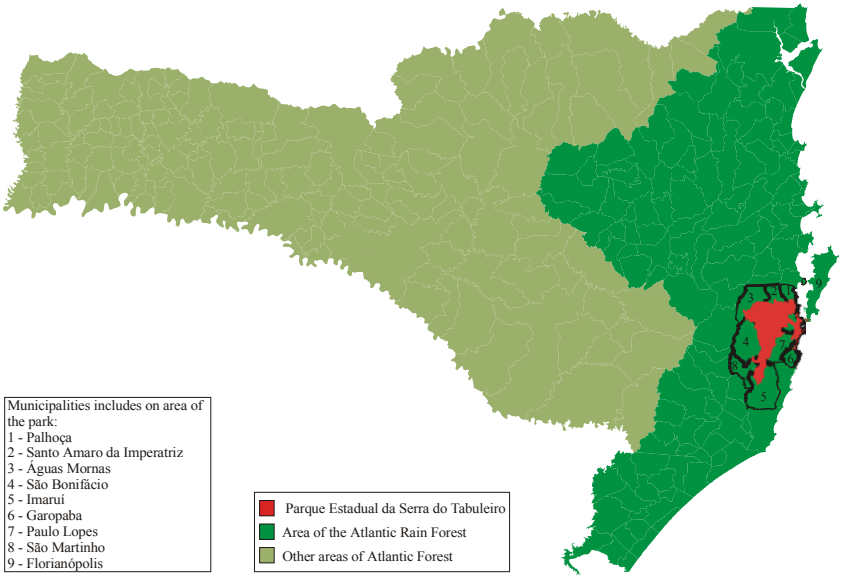

Figure 1 – Map of the State of Santa Catarina showing the areas of Atlantic Rain Forest and Parque Estadual da Serra do Tabuleiro.

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