




A synopsis of stipitate corticioid fungi (Basidiomycota) from Southern Brazil

Sinopsis de los hongos corticioides estipitados (Basidiomycota) del Sur de Brasil

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ABSTRACT

A synopsis of the stipitate corticioid fungi from Southern Brazil (states of Paraná, Rio Grande do Sul and Santa Catarina) is presented, including new information based on collected specimens and herbaria revision. A total of 22 species belonging to ten genera is known from the area. *Mycorrhaphium adustum* is reported for the first time from Brazil. Keys for the identification of genera and species and information about literature records and distribution of the treated taxa are provided.

Keywords — Corticiaceae s.l.; Neotropical funga; taxonomy.

RESUMEN

Se presenta una sinopsis de los hongos corticioides estipitados del Sur de Brasil (estados de Paraná, Rio Grande do Sul y Santa Catarina), incluyendo nueva información basada en especímenes recolectados y revisiones de material de herbario. Se citan un total de 22 especies pertenecientes a diez géneros. *Mycorrhaphium adustum* es reportada por primera vez para Brasil. Se presentan claves de identificación para

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los géneros y especies, además de información adicional sobre citas en la literatura y su área de distribución.

Keywords — *Corticiaceae* s.l.; funga neotropical; taxonomía.

INTRODUCTION

Corticioid fungi are *Basidiomycetes* Dowell *sensu* Hibbett *et al.* (2007) characterized by resupinate to stipitate basidiomes and a smooth, verrucose, merulioïd, hydnoïd, odontioïd or rarely poroïd hymenophore (Hjortstam *et al.*, 1988; Larsson, 2007). They were traditionally treated as aphyllophoroïd fungi together with polypores and clavarioïd fungi (Donk, 1964).

Most of corticioid fungi produces resupinate to effuse-reflexed basidiomes. However, there are several taxa characterized by a pileate basidiome, and they were treated in other morphological groups according to their hymenophore's type: hydnoïd fungi for those with hydnoïd hymenophore, and stereoid fungi for those with smooth hymenophore. Important monographs and identification manuals about stereoid fungi in Neotropics were published (Reid, 1965; Ryvarden, 2010; Welden, 2010). However, studies about stipitate corticioid fungi for specific areas within the Neotropics are still scarce. It is worth to highlight the long terms works on macrofungi of Johannes Rick (early XX century) in the State of Rio Grande do Sul and André de Meijer (from 1980's to nowadays) in the State of Paraná (e.g., Rick, 1958, 1959a, 1959b, 1960, 1961a, 1961b; Meijer, 2001, 2006, 2010). However, no specific studies about stipitate corticioid fungi were made in Southern Brazil.

The aim of the present work is to present a synopsis of the stipitate corticioid fungi from Southern Brazil, providing an identification tool for with taxonomic information.

MATERIAL AND METHODS

The Southern Region of Brazil comprises 576,409.6 km², almost the same area of the Iberian Peninsula, and comprises the states of Paraná, Santa Catarina and Rio Grande do Sul. The climate is tropical to subtropical, with climates types Cfa and Cfb according to Köppen-Geiger climate classification (Peel *et al.*, 2007).

Examined specimens were collected by us or loaned from herbaria/fungaria FLOR, ICN and PACA (Thiers, 2022). Field trips were carried in 2005-2006 in three mangroves from Santa Catarina Island, Florianópolis, SC, Brazil, named Itacorubi, Ratonés and Saco Grande. Mangroves are typical tropical ecosystems at sea level, and those from Southern Brazil belong to Atlantic Forest Biome. Some specimens were collected in 2010 in Parque Nacional do Iguaçu during the rainy season. Two kinds of forests are found in this conservation unit, the Semideciduous Seasonal Forest and the Dense Ombrophilous Forest, both belonging to Atlantic Forest Biome. The maximum altitude in the visited trails is ca. 300 a.s.l.

Basidiomes were removed from the substrata using a knife and were placed in paper bags, where data about collection were annotated. Specimens were dried in a laboratory oven or an electric fruit dryer under 40°C during 2–4 days (Wu *et al.*, 2004). Macroscopic features were analyzed under a stereoscopic. Free hand sections were made from different parts from the basidiomes using a steel razor blade. They were mounted in microscope slides with one drop of 3-5% potassium hydroxide (KOH) plus one drop of 1% phloxine or one drop of Melzer's reagent for observation and measurement of structures and reactions (Bills & Foster, 2004).

Each species in the list is provided with literature references for descriptions, drawings and distribution. Additionally, we strongly recommend a visit to the MycoBank website (Crous *et al.*, 2004; Robert *et al.*, 2005) because descriptions and illustrations for most species treated here are open accessed there. Measurements provided in this work were based on the specimens studied by us and on literature cited for each taxon. Synonyms are given only when this information is necessary to help the readers to handle literature. In the Distribution heading of each species, the global distribution is given first, followed by the distribution in the studied area.

RESULTS AND DISCUSSION

Based on literature revision and study of specimens, a compilation of 22 species belonging to ten genera is provided below. *Mycorrhaphium adustulum* (Banker) Ryvarden is reported for the first time from Brazil.

Key to stipitate corticioid genera from Southern Brazil

- | | | |
|----|--|----------------------|
| 1 | Hymenophore odontoid to hydroid | 2 |
| 1' | Hymenophore smooth to rugose, merulioid or folded | 5 |
| 2 | Basidiospores smooth | <i>Mycorrhaphium</i> |
| 2' | Basidiospores ornamented | 3 |
| 3 | Basidiospores amyloid | <i>Auriscalpium</i> |
| 3' | Basidiospores non-amyloid | 4 |
| 4 | Hymenophore odontoid to hydroid, aculei up to 1 mm long, basidiospores ellipsoid to subglobose, not curved | <i>Trechispora</i> |
| 4' | Hymenophore hydroid, aculei longer than (1–) 3 mm, basidiospores ellipsoid to pip-shaped or almost navicular, at least slightly curved (suballantoid) or adaxially flattened | <i>Beenakia</i> |
| 5 | Basidiomes blackening in KOH (xanthocroic reaction), brown setae present | <i>Hymenochaete</i> |
| 5' | Basidiomes not blackening in KOH, brown setae absent | 6 |
| 6 | Hyphal system monomitic (important to check the hyphal system in the stipe) | 7 |
| 6' | Hyphal system di-trimitic | 9 |

- 7 Cystidia present (distinctly seen and projecting above the basidial layer)
 *Cotylidia*
- 7' Cystidia absent (cystidioles or gloecystidia may be present but they are little
 differentiate or embedded) 8
- 8 Basidiomes small, whitish, spathulate, growing on the ground on open soil
 *Cyphellostereum*
- 8' Not as above *Stereopsis*
- 9 Hymenophore folded *Cymatoderma*
- 9' Hymenophore smooth to rugose *Podoscypha*

Auriscalpium Gray, Nat. Arrange. Br. Plants 1: 650, 1821.

Auriscalpium villipes (Lloyd) Snell & E.A. Dick, Lloydia 21: 35, 1958.

Description.— Stalpers (1996).

Distribution.— Neotropical (Hjortstam & Ryvardeen, 2007); Paraná and Rio Grande do Sul (Baltazar & Gibertoni, 2009).

Remarks.— Stalpers (1996) is referred for a key and descriptions of *Auriscalpium* species.

Beenakia D.A. Reid, Kew Bull. 10(4): 635, 1956 [“1955”].

Beenakia informis (Rick) Maas Geest., Persoonia 7(4): 555, 1974.

≡ *Hydnum informe* Rick, Egatea 17: 2, 1932.

Descriptions.— Maas Gesteranus (1974) and Núñez & Ryvardeen (1994).

Distribution.— Known from Bolivia, Brazil (type locality) and Costa Rica (Núñez & Ryvardeen, 1994); Rio Grande do Sul.

Examined specimen.— BRAZIL. Rio Grande do Sul, São Leopoldo, without date, *f. Rick Fungi Rickiani 16539* (PACA, holotype of *H. informe*).

Cotylidia P. Karst., Rev. Mycol. 3(9): 22, 1881.

Cotylidia aurantiaca (Pat.) A.L. Welden, Lloydia 21: 40, 1958.

Descriptions.— Reid (1965) and Ryvardeen (2010).

Distribution.— Widespread and quite common in the Neotropics (Reid, 1965); Paraná, Rio Grande do Sul and Santa Catarina (Reid, 1965; Meijer, 2006).

Examined specimens.— BRAZIL. Paraná, Foz do Iguçu, Parque Nacional do Iguçu, Trilha do Poço Preto, 12-XII-2010, *f.M. Baltazar 2426* (ICN). *Ibid.*, Trilha das Bananeiras, 13-XII-2010, *f.M. Baltazar 2465* (ICN).

Remarks.— Reid (1965) described *C. aurantiaca* var. *alba* Reid based on specimens from Argentina (Iguazu), Bolivia, Brazil (Mato Grosso) and Samoa. This variety differs from *C. aurantiaca* var. *aurantiaca* solely by the basidiome color, which is whitish in *C. aurantiaca* var. *alba*. and bright to pale yellow when fresh, becoming ochraceous to straw colored after drying in *C. aurantiaca* var. *aurantiaca*. The specimens examined by us are addressed as *C. aurantiaca* var. *aurantiaca*. In his monograph Ryvardeen (2010) had not made distinction between varieties within *C. aurantiaca*.

Cymatoderma Jungh., Tijdschr. Natuurl. Gesch. Physiol. 7: 290, 1840.

- 1 Basidiome centrally stipitate, pileus infundibuliform, basidiospores subcylindric, 7.5–12 μm long *C. caperatum*
 1' Basidiome sessile to pseudostipitate, pileus dimidiate to flabellate, basidiospores broadly ellipsoid to subglobose, (2.5–)3–4 \times (2–)2.5–3(3.5) μm
 *C. dendriticum*

Cymatoderma caperatum (Berk. & Mont.) D.A. Reid, Kew Bull. 10: 635, 1956 ["1955"].

Descriptions.— Reid (1965) and Ryvarden (2010).

Distribution.— Neotropical (Reid, 1965; Ryvarden, 2010); Rio Grande do Sul and Santa Catarina (Reid, 1965).

Cymatoderma dendriticum (Pers.) D.A. Reid, Kew Bull. 13(3): 523, 1959 ["1958"].

Descriptions.— Reid (1965) and Ryvarden (2010).

Distribution.— Pantropical (Reid, 1965; Ryvarden, 2010); Paraná, Rio Grande do Sul and Santa Catarina (Reid, 1965; Meijer 2006).

Examined specimens.— BRAZIL. Santa Catarina, Florianópolis, Manguezal de Ratoes, on unidentified hardwood, 31-V-2005, *J.M. Baltazar 20* & *L. Trierveiler-Pereira* (FLOR). *Ibid.*, Manguezal do Itacorubi, on *Avicennia schaueriana*, 24-II-2006, *L. Trierveiler-Pereira 182* & *J.M. Baltazar* (FLOR). *Ibid.*, on dead trunk of *Avicennia schaueriana*, 24-II-2006, *L. Trierveiler-Pereira 189* & *J.M. Baltazar* (FLOR). *Ibid.*, Manguezal do Saco Grande, on unidentified hardwood, 27-IV-2006, *J.M. Baltazar 199* & *A. Regolin* (FLOR).

Cyphellostereum D.A. Reid, Beih. Nova Hedwig. 18: 336, 1965.

Cyphellostereum pusiolum (Berk. & M.A. Curtis) D.A. Reid, Beih. Nova Hedwig. 18: 342, 1965.

Descriptions.— Reid (1965) and Ryvarden (2010).

Distribution.— Pantropical (Reid, 1965; Ryvarden, 2010); Paraná and Santa Catarina (Reid, 1965; Meijer, 2006).

Hymenochaete Lév., Ann. Sci. Nat., Bot. Ser. III 5: 150, 1846, *nom. cons.*,
 non *Hymenochaeta* P. Beauv. ex T. Lestib. 1819 (Cyperaceae).

= *Cyclomyces* Kunze ex Fr., Linnaea 5:512, 1830, *nom. rej.*

= *Hydnochaete* Bres., Hedwigia 35(5): 287, 1896.

= *Stipitochaete* Ryvarden, Trans. Brit. Mycol. Soc. 85(3): 536, 1985.

Here we follow a modern circumscription of *Hymenochaete* based on phylogenetic studies (Wagner & Fischer, 2002; He & Dai, 2012; He & Li, 2013; Baltazar *et al.*, 2014; Parmasto *et al.*, 2014), which include species with poroid and hydroid hymenophore, traditionally placed in *Cyclomyces* and *Hydnochaete*, additionally to species with smooth hymenophore. However, all stipitate species known from the genus have smooth hymenophore.

- 1 Hymenial setae 40–70 × 10–15 μm *H. reniforme*
 1' Hymenial setae (75–)100–175(–200) × (7–)8–15(–20) μm *H. damicornis*

Hymenochaete damicornis (Link : Fr.) Lév., Ann. Sci. Nat., Bot.
 Ser. III 5: 151, 1846.

≡ *Stipitochaete damicornis* (Link : Fr.) Ryvarden, Trans. Brit. Mycol. Soc. 85(3): 537, 1985.

Descriptions.— Ryvarden (1985), Léger (1998) and Parmasto (2001).

Distribution.— Neotropical, type locality (neotype) in Brazil (Ryvarden, 1985; Léger, 1998); Paraná, Rio Grande do Sul and Santa Catarina (Bresadola, 1896; Hennings, 1897; Baltazar & Gibertoni, 2009).

Hymenochaete reniformis (Fr.) Lév., Ann. Sci. Nat., Bot.
 Ser. III 5: 151, 1846.

≡ *Stipitochaete reniformis* (Fr.) Ryvarden, Trans. Brit. Mycol. Soc. 85(3): 538, 1985.

Descriptions.— Ryvarden (1985) and Léger (1998).

Distribution.— Neotropical, type locality (neotype) in Brazil (Léger, 1998); Paraná and Rio Grande do Sul (Ryvarden, 1985; Meijer, 2006).

Mycorrhaphium Maas Geest., Persoonia 2(3): 394, 1962.

Mycorrhaphium adustulum (Banker) Ryvarden, Mem. N. Y. Bot. Gard. 49:
 346, 1989. Fig. 1.

≡ *Steccherinum adustulum* Banker, Mem. Torrey Bot. Club 12: 133, 1906.

Descriptions.— Banker (1906), but also check key presented by Ryvarden (1989). A short description of the examined specimen is provided below.

Basidiomes pileate sessile with a contracted base to effuse-reflexed, 1,7–7 × 1,8–4 cm. *Hymenophore* hydroid, aculei cylindrical, up to 1.5 mm long, 3–5 aculei per mm. *Hyphal system* dimitic in the trama of aculei, monomitc in the context, generative hyphae clamped, thin to thick-walled, in the context almost solid but clearly recognized due to the presence of clamp-connections. *Cystidioles* present in the hymenium, ventricose, hyaline, thin to slightly thick-walled, smooth. *Basidiospores* ellipsoid, hyaline to yellowish, thin-walled, smooth, 3.5(–4) × 1.5(–2) μm , IKI-.

Distribution.— Previously known only from USA; first record from Brazil, found in Paraná (this study).



Fig. 1. *Mycorrhaphium adustulum*. General macroscopic appearance of basidiomes. J.M. Baltazar 2416 (ICN). Scale = 2 cm.

Fig. 1. *Mycorrhaphium adustulum*. Aspecto macroscópico general de los basidiomas. J.M. Baltazar 2416 (ICN). Escala = 2 cm.

Examined specimen.— BRAZIL. Paraná, Foz do Iguaçu, Parque Nacional do Iguaçu, Trilha do Poço Preto, 12-XII-2010, J.M. Baltazar 2416 (ICN).

Remarks.— The morphology of the examined material agrees with the description presented by Banker (1906) for North American specimens. The examined specimen is not typically stipitate but *M. adustulum* is included in this study because the basidiomes could be highly diverse, from central stipitate to completely resupinate.

Mycorrhaphium adustulum could macroscopically be confused with members of *Steccherinum* s.l.; however, they are easily separated in the microscopy due to the typical encrusted skeletocystidia in *Steccherinum* s.l. Species of *Mycoleptonoides* and *Stecchericum* are also morphologically similar, but members of the former have monomitic hyphal system, while members of the later have typical conducting hyphae arising in the context. Despite *M. adustulum* has a monomitic hyphal system in the context, skeletal hyphae are easily found in the trama of the aculei. The examined material has ventricose cystidioles similar to those of *Trichaptum* species, although they are encrusted in the later and smooth in *M. adustulum*.

***Podoscypha* Pat., Essai Tax. Hyménomycètes: 70, 1900.**

Podoscypha is a large genus with several species occurring in the Neotropics and subtropical areas of South America. We have studied no specimens of *Podoscypha* up to date. Nonetheless, several species were reported from Southern Brazil. Meijer (2006) reported from Paraná: *P. brasiliensis* D.A. Reid, *P. moelleri* (Bres. & Henn.) D.A. Reid [or *P. fulvonitens* (Berk.) D.A. Reid, as cited by Meijer (2006)], *P. multizonata* (Berk. & Broome) Pat., *P. nitidula* var. *nitidula* (Berk.) Pat., *P. petalodes* subsp. *petalodes* (Berk.) Boidin, *P. cf. ravenelii* (Berk. & M.A.Curtis) Pat., *P. venustula* (Speg.) D.A. Reid, and *P. viridans* (Lloyd) D.A. Reid.

From Rio Grande do Sul there are records of *P. corbiformis* (Fr.) D.A. Reid, *P. nitidula* var. *nitidula*, *P. ravenelii*, *P. replicata* (Lloyd) D.A. Reid, *P. venustula* and *P. viridians* (Teixeira, 1945; Reid, 1965).

Podoscypha moelleri was originally described from Santa Catarina by Bresadola (1896), while *P. ravenelii* was reported by Burt (1920).

Reid (1965) made a good treatment of *Podoscypha*, with a comprehensive key, descriptions and discussions, and included all species cited above. Additionally, Drechsler-Santos *et al.* (2007) presented a key for the species known in Brazil, and Ryvarden (2010) included a synopsis of the genus from America.

***Stereopsis* D.A. Reid, Beih. Nova Hedwig., 18: 290, 1965.**

- 1 Gloeocystidia present *S. radicans*
 1' Gloeocystidia absent *S. hiscens*

***Stereopsis hiscens* (Berk. & Ravenel) D.A. Reid, Beih. Nova Hedwig., 18: 298, 1965.**

Descriptions.— Reid (1965) and Ryvarden (2010).

Distribution.— Pantropical (Reid, 1965; Ryvarden, 2010); Paraná (Meijer, 2006).

***Stereopsis radicans* (Berk. & Ravenel) D.A. Reid, Beih. Nova Hedwig., 18: 314, 1965.**

Descriptions.— Reid (1965) and Ryvarden (2010).

Distribution.— Pantropical (Ryvarden, 2010); Paraná (Meijer, 2006).

***Trechispora* P. Karst., Hedwigia 29(3): 147, 1890.**

= *Hydnodon* Banker, Mycologia 5(6): 297, 1913.

Trechispora thelephora (Lév.) Ryvarden, Synop. Fungorum 15:
32, 2002.

Descriptions.— Ryvarden (2002).

Distribution.— Neotropical (Ryvarden, 2002); Paraná and Rio Grande do Sul (Baltazar & Gibertoni, 2009).

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