

Two sequestrate cortinarioid fungi from Rio Grande do Sul, Brazil

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ABSTRACT - (Two sequestrate cortinarioid fungi from Rio Grande do Sul, Brazil). *Descomyces albellus* (Masse & Rodway) Bougher & Castellano and *Setchelliogaster tenuipes* (Setch.) Pouzar, two sequestrate fungi of the Cortinariaceae are reported from Rio Grande do Sul State, in southern Brazil. The distribution and taxonomy of both taxa are briefly discussed, and descriptions, line drawings, and photos are presented. *Setchelliogaster tenuipes* is reported for the first time in Rio Grande do Sul State, and the occurrence of *D. albellus* is confirmed.

Key words: Agaricales, Cortinariales, ectomycorrhizal fungi, *Eucalyptus*, gasteromycetes

RESUMO - (Dois fungos gasteróides no Rio Grande do Sul, Brasil). *Descomyces albellus* (Masse & Rodway) Bougher & Castellano e *Setchelliogaster tenuipes* (Setch.) Pouzar, ambos representantes gasteróides da família Cortinariaceae, são registrados para a micobiota sul-rio-grandense. São apresentadas descrições, ilustrações e fotos, bem como uma breve discussão sobre a taxonomia e distribuição geográfica das espécies mencionadas. *Setchelliogaster tenuipes* é registrada pela primeira vez na micobiota sul-rio-grandense, enquanto a ocorrência de *D. albellus* é confirmada.

Palavras-chave: Agaricales, Cortinariales, *Eucalyptus*, fungos ectomicorrízicos, gasteromicetos

Introduction

For many years, the family Cortinariaceae Heim ex Pouzar comprised several agaric genera such as *Cortinarius* Fr., *Galerina* Earle, *Gymnopilus* (Fr.) Murrill, and *Inocybe* Fr., among others, following traditional classifications (Pegler 1983, Singer 1986). Morphological and molecular evidence led to the inclusion of several sequestrate (gasteroid and secotioid) genera into the family, for example, *Descomyces* Bougher & Castellano, *Hymenogaster* Vittad., *Setchelliogaster* Pouzar, and *Thaxterogaster* Singer. These relationships have been discussed in previous studies (Smith 1973, Thiers 1984, Peintner *et al.* 2001, Francis & Bougher 2002, Castellano *et al.* 2004), and the proposal of a segregated order, Cortinariales Jülich (Jülich 1981), from the Agaricales Underw. has been accepted by several authors (Beaton *et al.* 1985a, Pegler *et al.* 1993, Martín & Moreno 2001). Currently, studies of molecular systematics have provided some insights towards the phylogenetic relationships of this large group (Moncalvo *et al.* 2002, Matheny *et al.* 2006), however, the available results have not been conclusive because of its enormous variability.

In southern Brazil, in spite of numerous mycological surveys, there is little information about the occurrence of sequestrate members of Cortinariaceae. Rick (1934, 1961) reported only *Hymenogaster vulgaris* Tul. & C. Tul. from Rio Grande do Sul, whose specimens were not available for revision. More recently, Giachini *et al.* (2000) reported four species of cortinarioid sequestrate fungi associated with *Eucalyptus* in the state of Santa Catarina: *Descomyces albellus* (Masse & Rodway) Bougher & Castellano, *D. albus* (Klotzsch) Bougher & Castellano, *D. giachinii* Trappe, V.L. Oliveira, Castellano & Claridge, and *Setchelliogaster tenuipes* (Setch.) Pouzar.

With the aim to revise the gasteroid mycobiota of Rio Grande do Sul, the authors have collected and studied specimens in the region. As partial results of this survey, we report the occurrence of two interesting sequestrate species of Cortinariaceae associated to *Eucalyptus*.

Material and methods

The specimens were collected in *Eucalyptus* plantations during mycological surveys in Rio Grande

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do Sul, in southern Brazil. The studied material is preserved in the ICN herbarium (Universidade Federal do Rio Grande do Sul, Instituto de Biociências). Macroscopic and microscopic analyses followed standard methods for the study of gasteroid mushrooms (Miller Junior & Miller 1988, Castellano *et al.* 2004). Basidiospore measurements include the complex perisporium. Color codes are those of Kornerup & Wanscher (1978). Scanning Electron Microscopy (SEM) studies were performed at the Universidade Federal do Rio Grande do Norte with a Phillips scanning electron microscope. For preparation of the samples, the following procedure was adopted: small portions of the gleba were removed, then transferred to aluminum stubs previously covered with a double-face carbon tape. Later, the stubs were sputter coated with gold for up to five minutes before examination under the SEM, under 20 Kv and magnification of 5,000-6,000 ×.

Results and Discussion

Descomyces albellus (Masse & Rodway) Bougher & Castellano, Mycologia 85: 282. 1993 = *Hymenogaster albellus* Masse & Rodway in Masse, Bull. Misc. Inf. 138: 126. 1898.

Figures 1, 3, 5-7

Basidiomes gasteroid, partially hypogeous, subglobose to globose in shape, 8-11 mm diam., 6-7 mm high. Peridium white (KW 1A1) or light yellow (KW 1A4) to dark yellow (KW 4C8), up to 1 mm thick, smooth and dry or slightly moist when fresh, opening by irregular dehiscence at the top of the basidiomes, rhizomorphs absent or poorly developed. Stipe absent. Columella usually absent or reduced to a basal disc. Gleba loculate, composed by anastomosed lamellae, initially brownish grey (KW 5C2) and then yellowish brown (KW 5E7-5F8) at maturity. Basidiospores (14.2-)17-18.5(-19.5) × (10-)11.5-13.5(-14.5) μm, ovoid to limoniform in frontal view, ovoid to fusiform in profile, color rusty under KOH, walls very thick and ornamented by sub-reticulate to verrucose perisporium; under SEM the basidiospore surface has a sub-smooth wall with slight reticulation. Basidia (17-)25-34(-38) × (6-)8.5-11(-12.5) μm, clavate, mainly bisporic, some tetrasporic. Basidioles 24.5-34.5(-47) × 8.5-12 μm, variable in shape, lageniform, subfusoid, ampullaceous, some with a capitate apex, walls hyaline and thin, basal clamp

present. Peridium two layered: the external layer formed by non-gelatinized, ascendant to prostrate hyphae, 5-12 μm diam., with thickened, golden yellow walls; the internal layer is composed by filamentous, thin-walled, hyaline hyphae, 6-8.5 μm diam. Clamp connections present in most septa.

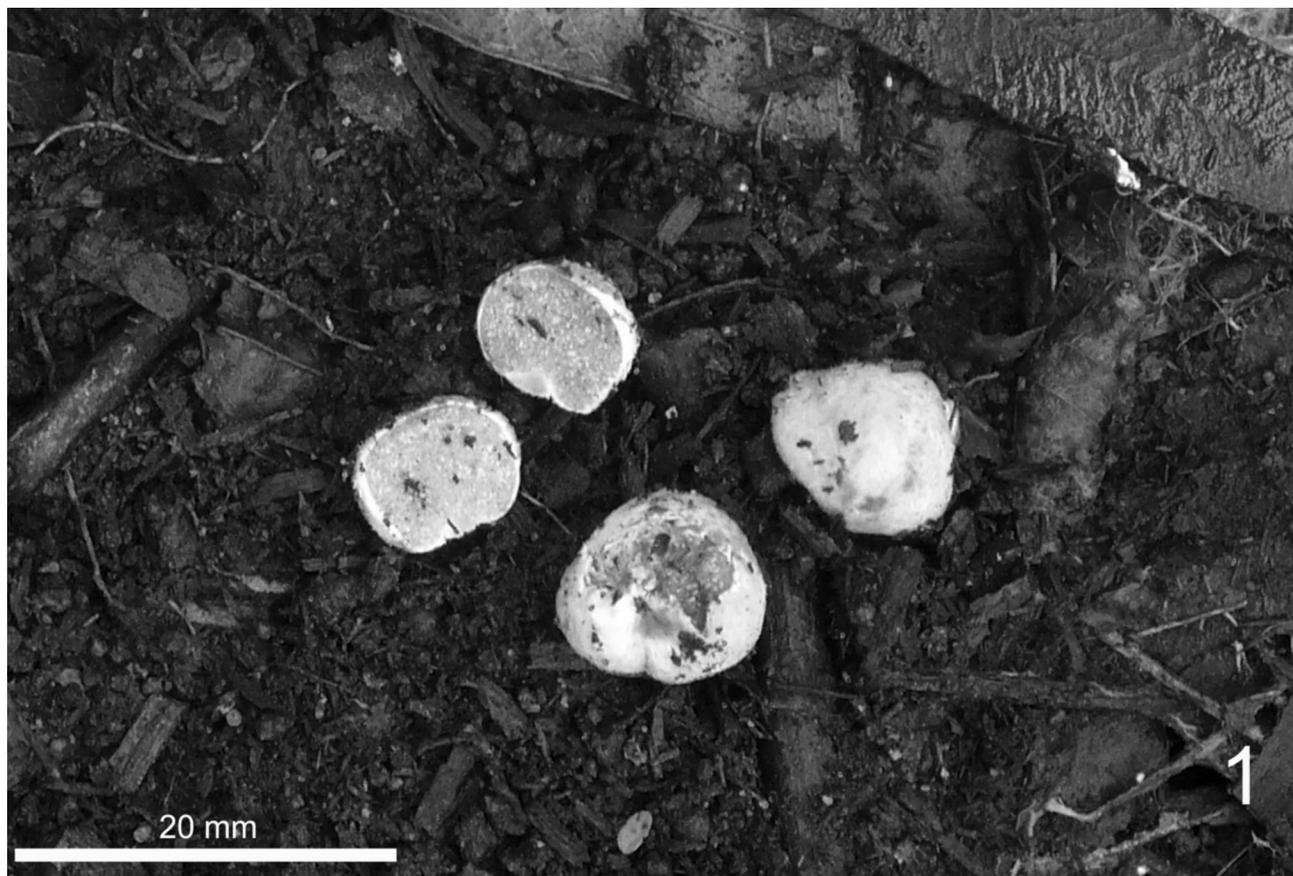
Material examined: BRAZIL. RIO GRANDE DO SUL: Santa Maria, Boca do Monte, Estação Experimental de Silvicultura (FEPAGRO), 3-VI-2006, V.G. Cortez 51/06 (ICN); idem, in *Eucalyptus* plantation, 12-V-2007, V.G. Cortez 90/07 (ICN).

Distribution: widespread in *Eucalyptus* plantations throughout the world (Lago & Castro 2004). In South America, it is known from Argentina (Wright & Albertó 2006), Brazil, Chile, and Uruguay (Dodge & Zeller 1934).

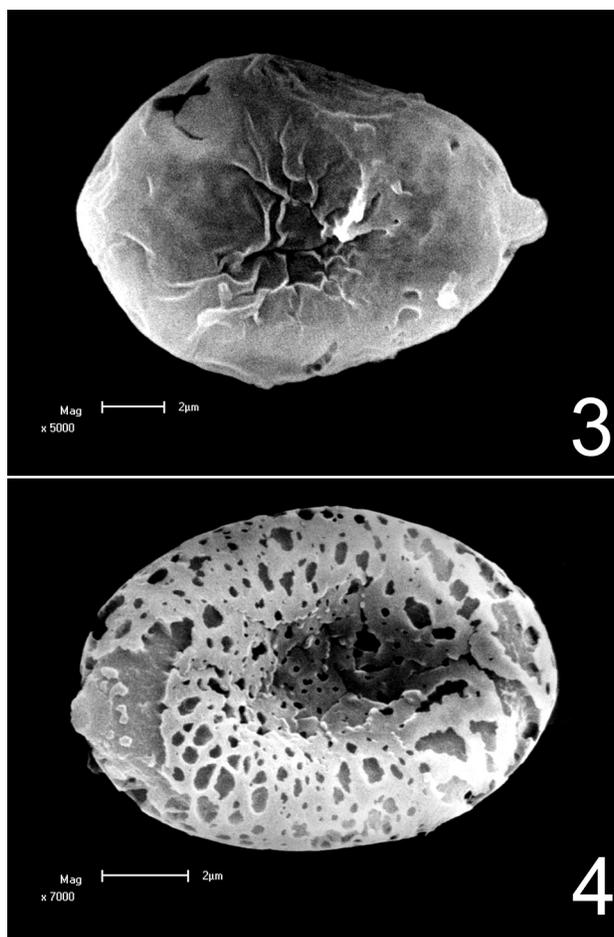
The genus *Descomyces* was segregated from *Hymenogaster* because its members present rusty colored basidiospores with a distinct verrucose to subreticulate perisporium and a non-gelatinized peridium that is trichodermial to epithelial (Bougher & Castellano 1993). Five species are currently recognized in the genus, four of which are associated with *Eucalyptus* (Francis & Bougher 2004, Lago & Castro 2004). The first report of *Descomyces* in Brazil was from Santa Catarina by Giachini *et al.* (2000), who reported *D. albellus*, *D. albus* (Klotzsch) Bougher & Castellano, and *D. giachinii* Trappe, Castellano, Oliveira & Claridge. All of these species are associated with exotic species of *Eucalyptus*. *Descomyces albellus* is closely related to *D. albus*. The most significant difference between these species is the peridium structure, which is trichodermial in *D. albellus* and epithelial in *D. albus* (Francis & Bougher 2004, Lago & Castro 2004). Dodge & Zeller (1934) reported a collection of *Hymenogaster albellus* by Rick from Brazil, without any indication of locality. Since Rick collected over many years in Rio Grande do Sul, it is probable that the material was gathered in this state. In contrast, the specimens studied here confirm the presence of this species in Rio Grande do Sul.

Setchelliogaster tenuipes (Setch.) Pouzar, Česká Mykol. 12: 34, 1958 = *Secotium tenuipes* Setch., J. Mycol. 13: 239. 1907 = *Descolea tenuipes* (Setch.) Neville & Poumarat, Bull. Soc. Mycol. Fr. 120: 68. 2004.

Figures 2, 4, 8-10



Figures 1-2. Basidiomes of *Descomyces* and *Setchelliogaster*. 1. Fresh basidiomes of *D. albellus*. 2. Dried basidiomes of *S. tenuipes*.



Figures 3-4. Basidiospores under SEM. 3. *Descomyces albellus*. 4. *Setchelliogaster tenuipes*.

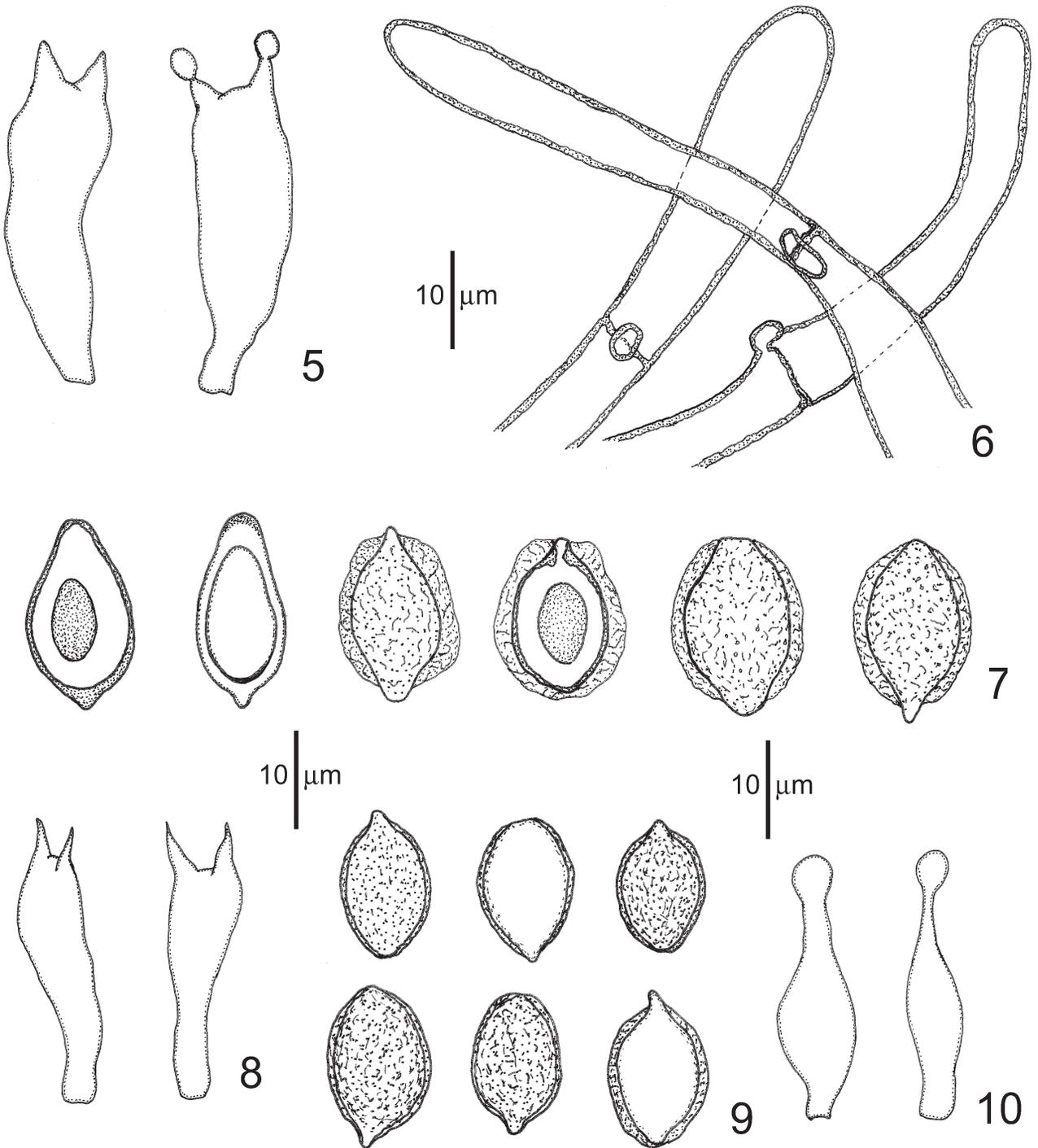
Basidiomes secotioid, stipitate and with a globose and enclosed pileus, 22-33 mm high. Pileus 13-17 mm diam., 9-14 mm high, subglobose to globose-depressed. Peridium reddish brown (KW 9E8) to dark brown (KW 9F6), up to 1 mm thick, surface dry and rugulose to rugose, dehiscence not observed. Stipe 11-19 × 1.5-3 mm, sinuous or in some cases subcylindrical and erect, with a conspicuous bulbous base, attached to soil and roots by whitish and thin rhizomorphs, color reddish brown (KW 9E8). Columella continuous with the stipe, crossing the entire extension of the gleba. Gleba light brown (KW 6D7), loculate, formed by anastomosed lamellae. Basidiospores (12-)13.5-16(-17.2) × (8-)9.2-11(-12.2) μm , ovoid to ellipsoid in both face and side view, rusty under KOH, with a punctate and thickened wall, apiculus prominent; under SEM, the perisporium has a perforate to subreticulate pattern.

Basidia 23.5-26 × 6-7.5 μm , clavate, hyaline and thin-walled, mainly producing two (less commonly four) basidiospores. Cystidia rare; when present, 17.5-28.5 × (10-)11.5-13.5(-14.5) μm , hyaline and thin-walled, lecythiform to lageniform, with a distinct capitate, globose apex. Peridium pseudoparenchymatic, composed by subglobose hyphae, 12-24 μm diam., with thin to slightly thickened, yellowish brown walls, over a filamentous layer of yellowish hyphae. Clamp connections present.

Material examined: BRAZIL. RIO GRANDE DO SUL: Guaíba, Estação da CEEE, in *Eucalyptus* plantation, III-1987, *R.T Guerrero s.n.* (ICN56595); Viamão, Estação Agronômica UFRGS, in *Eucalyptus* plantation, 27-VI-1987, *E. Esposito* (ICN56556).

Distribution: widespread in *Eucalyptus* plantations throughout the world (Lago & Castro 2004). It has been reported in South America from Argentina and Uruguay by Wright (1980) and from Chile by Lazo (1972).

The genus *Setchelliogaster* is currently accepted as comprising five species, two of which are known to be associated with *Eucalyptus* (Lago & Castro 2004). The only known report of the genus in Brazil was of *S. tenuipes* from the neighboring state of Santa Catarina (Giachini *et al.* 2000). The main features of *S. tenuipes* are the reddish brown basidiomes, the presence of a well-developed stipe, and the lecythiform cystidia (Lago & Castro 2004). The latter structures are scarce and some authors consider them to be absent (Martín & Moreno 2001), but as shown and discussed in detail by Lago *et al.* (2001) they are present only in the partially exposed margin of anastomosed gills. The systematic position of *Setchelliogaster* is controversial; some authors (Kirk *et al.* 2001, Moreno *et al.* 1997) place it within the *Bolbitiaceae* Singer (due to the epithelial peridium and the *Conocybe*-like cystidia) whereas others include it in the *Cortinariaceae* (Beaton *et al.* 1985b, Castellano *et al.* 2004). The relationships of *Setchelliogaster* with *Descomyces* and *Descolea* have been discussed by several authors due to the nature of the peridium/pileipellis, shape of cystidia, basidiospore type, and the mycorrhizal status of their species (Bougher & Castellano 1993, Lago *et al.* 2001, Lago & Castro 2004). The material studied here was collected more than twenty years ago, but the report was never published. At that time, part of this material was sent to Dr. Rolf Singer, who identified (*in litt.*) the specimens as *S. tenuipes*.



Figures 5-10. Details of *Descomyces albellus* and *Setchelliogaster tenuipes*. 5-7. *D. albellus*. 5. Basidia. 6. External hyphae of the peridium. 7. Basidiospores. 8-10. *S. tenuipes*. 8. Basidia. 9. Basidiospores. 10. Cystidia.

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