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Annulatascus apiculatus sp. nov., a new freshwater ascomycete from the semi-arid Caatinga biome of Brazil

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Abstract – During an inventory of lignicolous fungi in freshwater habitats in northeastern Brazil, an interesting ascomycete belonging to the genus *Annulatascus* was found. This fungus differs morphologically from other species of *Annulatascus* and is herein described as a new species, *A. apiculatus*. The new species is characterized by globose, black, semi-immersed perithecial ascomata with stout black necks; cylindrical, unitunicate asci that have a relatively large bipartite, refractive apical apparatus; hyaline, 0–3 septate ascospores with short, cellular, hyaline, tapering, bipolar apiculi, and surrounded by a narrow mucilaginous sheath. The new species differs from other described *Annulatascus* species in ascospore dimensions and the presence of bipolar apiculi.

Key words – *Annulatascaceae*, diversity, systematic, submerged wood, taxonomy

Introduction

Aquatic ascomycetes are ecologically important, ubiquitous microbial saprobes in freshwater environments (Wong et al. 1998, Tsui & Hyde 2004, Shearer et al. 2007). About 557 species have been reported from freshwater habitats worldwide (Shearer et al. 2008, http://www.fungi.life.uiuc.edu). It is surprising,

therefore, that no species have been reported from Brazil. Absence of such reports most likely reflects lack of collecting efforts rather than absence of these fungi from Brazilian freshwater habitats. To learn more about the freshwater mitosporic and meiosporic ascomycetes in Brazil, we initiated a study of the fungi colonizing dead plant substrates in freshwater habitats in the Caatinga biome in northeastern Brazil.

During this study we collected an undescribed ascomycete from submerged wood in a small stream. This ascomycete strongly resembled species in the *Annulatascaceae (Sordariomycetes)*, particularly those in the genus *Annulatascus*. The most distinctive characteristic of this family and genus is the presence of a very large ascus apical ring. Currently, *Annulatascus* includes 14 species (Tsui et al. 2002). Two of these species, *A. citriosporus* J. Fröhl. & K.D. Hyde and *A. licualae* J. Fröhl. & K.D. Hyde, were described from terrestrial habitats (Fröhlich & Hyde 2000), while most other species have been reported only from freshwater habitats in temperate and tropical latitudes (Hyde & Wong 2000, Cai et al. 2002, Tsui et al. 2002, http://www.fungi.life.uiuc.edu.).

The Brazilian specimen is described and illustrated herein as a new species of *Annulatascus* and is compared to other species in the genus.

Materials and methods

Study site. Collecting trips were made to the Caatinga biome in the Serra da Jibóia, one of nine hygrophilous forests that occur in the semi-arid region in northeast Brazil (Velloso et al. 2002). The vegetation of this area is similar to that of the Atlantic rain forest and has been described previously (Barbosa et al. 2007, Marques et al. 2007). Streams are bordered by bryophytes, pteridophytes and several vascular plants.

Collection techniques. Submerged woody debris was collected from lentic habitats and an unnamed stream in the Serra da Jibóia. Samples of submerged dead plant material were placed in plastic bags and returned to the laboratory. The plant material was then incubated at 25º C in Petri dish moist chambers stored within 50 L plastic boxes with 200 ml sterile water plus 2 ml glycerol. Samples were examined over four weeks for the presence of microfungal fruiting bodies.

Specimen examination. Fruiting structures were located on the substrates with a dissecting microscope and removed to a glass slide where they were crushed and mounted in polyvinyl alcohol-glycerol (8.0 g in 100 ml of water, plus 5 ml of glycerol). Measurements were made of fixed material. Dry material and permanent slides were deposited in Herbarium HUEFS.

Taxonomy

Annulatascus apiculatus F.R. Barbosa & Gusmão, **sp. nov.** Figs. 1–9

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Ascomata 400–550 × 240–410 µm, semi-immersa, globosa, nigra, coriacea, aggregata, ostiolata. Colla 100–250 × 100–180 µm, cylindrica, atro-brunnea, periphysata. Peridium 15–60 µm latis. Paraphyses 2.5–6 µm crassae, hyalinae, filiformes, septatae, glabro-tunicatae, simplices. Asci 175–250 × 10–13 µm, 8-spori, cylindrici, unitunicati, persistenti, pedicellati apparato apicale 6–7.2 × 1.8–2.4 µm. Ascosporae 23–36.5 × 8.8–10 µm, uniseriatae, fusiformes, hyalinae, 0-3 septatae, laevae, cum spinulis in ambibus extremitatibus 0.7–1.2 µm et vagina mucilaginosa circundantes.

Holotype: HUEFS 134723. **BRAZIL. Bahia: Santa Terezinha,** Serra da Jibóia, on submerged wood from a stream, 19.II.2008, coll. FR Barbosa.

Etymology: Latin, *apiculatus* referring to the apiculus present at both ends of the ascospores.

Ascomata on wood, 400–550 × 240–410 µm, clustered, semi-immersed, globose, black, coriaceous, ostiolate. Neck 100–250 × 100–180 µm, cylindrical, dark brown, periphysate. Peridium 15–60 µm wide, dark brown. Paraphyses 2.5–6 × 75–100 µm, broad at the base and tapering towards the apex, hyaline, septate, smooth-walled, simple. Asci 175–250 × 10–13 µm, 8-spored, cylindrical, unitunicate, persistent, pedicellate, with a large bipartite, refractive apical ring, 6–7.2 × 1.8–2.4 µm. Ascospores 23–36.5 × 8.8–10 µm, uniseriate, fusiform, straight, hyaline, 0–3 septate, not constricted at septa, with smooth, short, cellular, hyaline tapering, bipolar apiculi; apiculi 0.7–1.2 µm high; ascospore surrounded by a narrow mucilaginous sheath.

Comments: The presence of an apiculus at both ends of the ascospores of *A. apiculatus* differentiates this species from all other species of *Annulatascus.* The bipolar apiculi on ascospores in the new species is quite different from the bipolar pad-like appendages on ascospores of *A. fusiformis* K.D. Hyde & S.W. Wong (Hyde & Wong 2000). Among the non-appendaged species of *Annulatascus, A. apiculatus* is morphologically most similar to *A. velatisporus* K.D. Hyde and *A. aquaticus* W.H. Ho et al. (Hyde 1992, Ho et al. 1999). However, *A. velatisporus* has larger asci (220–290 × 12–18 µm) and longer non-septate ascospores surrounded by a gelatinous sheath (26–42 µm), while *A. aquaticus* has smaller asci (150–175 µm) and non-septate ascospores with smaller dimensions (19–24 × 6–7 µm). *Annulatascus apiculatus* is also similar to *Annulusmagnus triseptatus* (S.W. Wong et al.) J. Campb. & Shearer in having 3-septate ascospores (Campbell & Shearer 2004). The two species differ, however, in that the ascospores of *A. triseptatus* are almost always 3-septate, while those of *A. apiculatus* are non-septate when young and may become 3-septate when older, and ascospores of *A. triseptatus* are concave or flattened on

one side while those of *A. apiculatus* are not. To our knowledge, this represents the first report of a freshwater ascomycete from Brazil.

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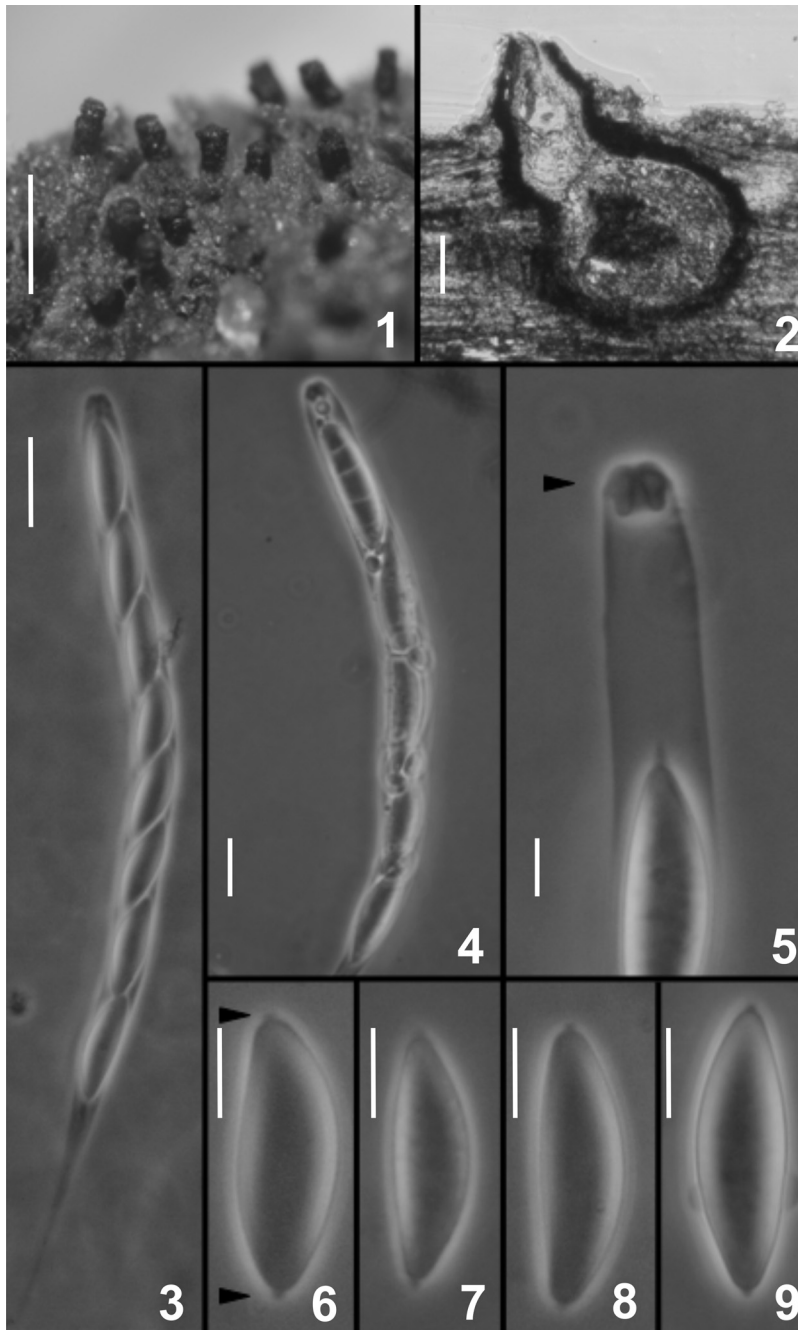
Figs. 1–9. *Annulatascus apiculatus* (from the holotype). 1. Immersed ascomata. 2. Longitudinal section of the ascoma. 3. Ascus with eight ascospores. 4. Older, hyaline septate ascospore in ascus. 5. Ascus apical ring (arrowed). 6–9. Ascospores with bipolar apiculi (arrowed).
Scale bars: 1= 0.5 mm, 2 = 100 µm, 3 = 25 µm, 4 = 15 µm, 5–9 = 10 µm.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