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## *Cantharellus amazonensis*, a new species from Amazon

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*Cantharellus amazonensis* is described as a new species from the Amazon. It is characterized by the contrasting red pileus with yellow folds and stipe, the basidiospores size and thin-walled pileipellis hyphae. A description, discussion, photograph and line drawings are provided.

**Key words** – Cantharellaceae – Cantharellales – Neotropic – taxonomy

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### Introduction

*Cantharellus* Adans.: Fr is a conspicuous mycota element that forms ectomycorrhizal associations with canopy trees in Northern South America (Henkel et al. 2012, Wilson et al 2012). The first reports of the genus from Brazilian Amazon were of *C. pusio* Berk. (Berkeley 1856) and of *C. cibarius* Fr. (Berkeley & Cooke 1876). In the beginning of the 20<sup>th</sup> century, European mycologists continued to describe the genus from the region. For example, Hennings (1904) cited *C. cibarius* and also described the species *C. helvelloides* Henn. More recently, Singer et al. (1983) reported three taxa, *C. atratus* Corner, *C. hystrix* Corner and *C. guyanensis* Mont. and reported a yellow unknown chanterelle that resembles *C. cibarius* in neighboring Manaus, in the State of Amazonas.

Despite the reasonable frequency in which species of *Cantharellus* have been cited in Northern South America, it is now believed that the number of *Cantharellus* taxa in the Brazilian Amazon is smaller than otherwise cited, since many of these taxa have been transferred to other genera (see comments by

Wartchow et al. 2012).

At present, the only recognized species of *Cantharellus* from the Brazilian Amazon is *C. guyanensis*. The most recent citation of *C. guyanensis* was by Souza et al. (2008), who reported the production of protease by this species. In this article, we propose a new species of *Cantharellus* collected in 'terra-firme' forest in Amazon.

### Methods

*Cantharellus* basidiomata were collected in an area of "terra-firme" forest 30 km from Manaus, near to a small farming town (Nogueira & Mainbourg 2001). Microscopic observations were made from material mounted in 3% KOH and Congo red solutions. Presentation of basidiospore data follows the methodology proposed by Tulloss et al. (1992), slightly modified by Wartchow (2012) and Wartchow et al. (2012). Measurements and statistics are based on 40 spores. Abbreviations include **L(W)** = average basidiospore length (width), **Q** = the length : width ratio range as determined from all measured basidiospores, and **Q** = the Q value averaged from all



**Fig. 1** – Basidiomata of *Cantharellus amazonensis*. Holotype. Scale bar = 10 mm. Photo by Jucileuza C. Santos.

basidiospores measured. Colour codes are based on the Online Auction Color Chart (2004). The holotype is deposited at JPB (Thiers 2012).

## Results

### *Cantharellus amazonensis* Wartchow, **sp. nov.**

Figs 1–4

Mycobank MB800535.

Etymology – pertaining to the Amazonia biome where the type was collected.

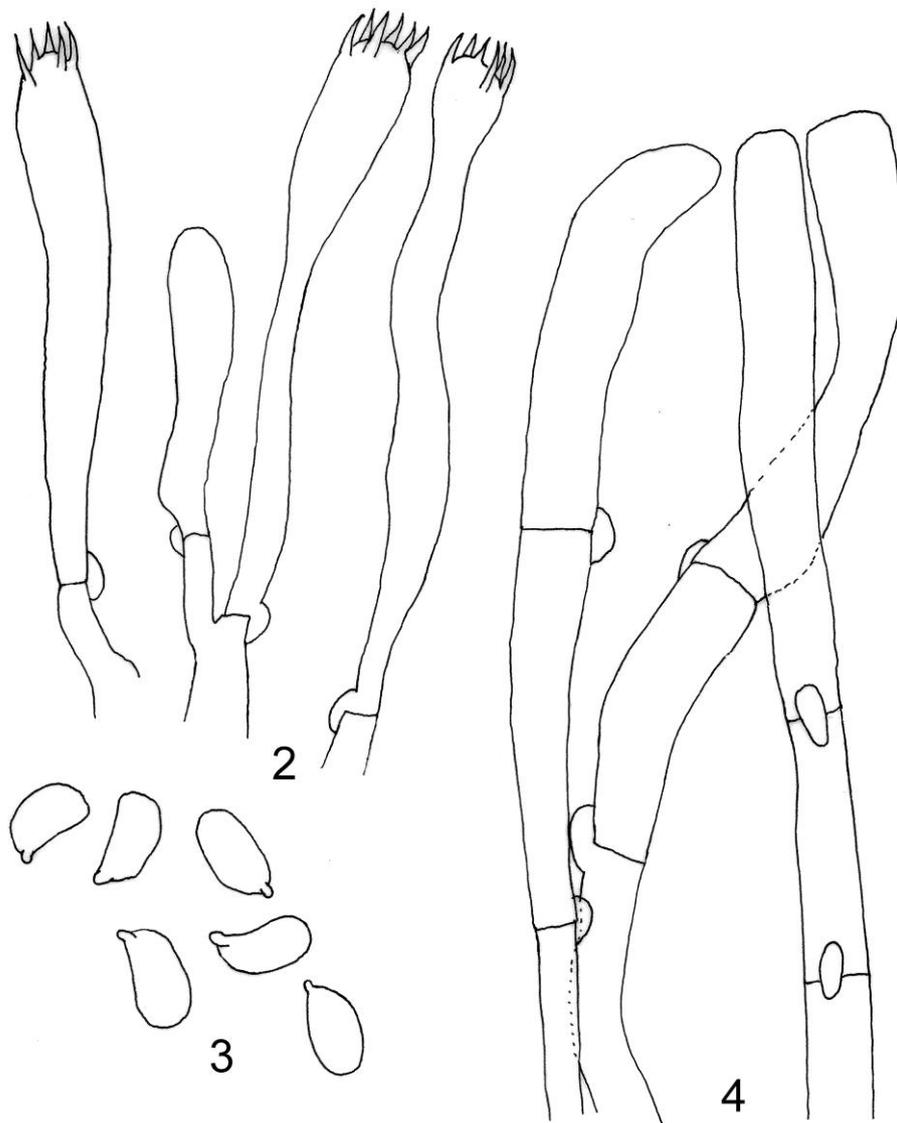
This species is characterized by the red pileus, yellow folds and stipe, non-anastomosed folds, basidiospore size (8.5–10.8 × 4.8–6.5 μm) and thin-walled ending elements of the pileipellis.

Holotype – BRAZIL. Amazonas, Manaus, Ramal Pau Rosa, BR-174, March 2007, J.C. Santos (JPB 46804).

Pileus ranging from 30–35 mm in diam., cyathiform to subfundibuliform, bright red (OAC 495–496, 572) to somewhat slightly paling, mostly toward center; surface slightly fibrillose at margin, glabrescent, smooth in the rest; margin entire, sometimes lobed, slightly enrolled; context fleshy. Hymenophore decurrent, with folds appearing truly lamellate

(about 2 mm broad), subcrowded, infrequently dichotomous, non-anastomosing, non-venose, yellowish (OAC 813–814) to pale orange (between OAC 763–764); edge entire, sharp. Stipe up to 60 × 4 mm, equal slightly expanding upward and subcylindric, more or less concolorous to folds (OAC 763–764) in few young specimens yellowish orange (OAC 763), slightly longitudinally fibrillose over entire length; context solid, remaining so in dried state. Odor very pleasant, like flowers. Taste not distinct.

Basidiospores 8.5–10.8(–13.7) × (4.3–)4.8–6.5(–7) μm, **L** = 9.7 μm; **W** = 5.5 μm, **Q** = (1.41–)1.48–2.10(–2.20), **Q** = 1.76, inamyloid, hyaline, ellipsoid to elongate sometimes cylindric, adaxial surface frequently concave, subreniform, thin-walled; hilar appendix prominent, obtuse, sublateral to subapical; contents as small gutules. Basidia 60–70 × 6.5–8.5 μm, slender clavate, mostly with 6 sterigmata, each up to 5 μm high. Basidioles plentiful, slender clavate. Subhymenium with slender branched hyphae about 5 μm wide from which the basidia and basidioles arise. Cystidia absent. Pileipellis composed by plentiful cylindric hyphae 3.5–7.5 radially oriented then more or less



**Figs 2–4** – *Cantharellus amazonensis* (holotype). 2. Basidia and basidiole. 3. Basidiospores. 4. Terminal elements of the pileipellis. Scale bar = 10  $\mu\text{m}$ .

interwoven to suberect, frequently compressed, colorless or pale yellowish orange, thin-walled; the terminal cells measuring to 40–60  $\mu\text{m}$  long, cylindric, with mostly rounded obtuse apices. Hymenophoral trama irregular, with abundant conspicuously interwoven hyphae up to 2–6  $\mu\text{m}$  wide. Clamp connections proliferate, present on most septae.

Habitat – gregarious on soil of Amazon forest.

#### Discussion

*Cantharellus amazonensis* can be accommodated in the subgenus

*Parvocantharellus* Eyssart. & Buyck, due the small size, thin-walled elements of the pileipellis and prolific clamp connections in all tissues (Eyssartier & Buyck 2001). This new striking and uncommon species is easily characterized by the red pileus contrasting with the yellowish hymenial folds looking-like true lamellae and stipe and size of the basidiospores 8.5–10.8(–13.7)  $\times$  (4.3–)4.8–6.5(–7)  $\mu\text{m}$ . According to the key by Corner (1966), our species is in the group of chanterelles with red pileus and relatively dry surface.

This species is distinct from the reddish *Cantharellus cinnabarinus* (Schwein.) Schwein., that is known from Canada, USA and Trinidad. *Cantharellus cinnabarinus* can

be easily distinguished in the field by its venose and concolorous folds to cinnabar-red or vermilion and discoloring orange pileus and concolorous stipe (Corner 1966). Petersen (1979), on the other hand, reported collections with less brightly coloured pileus. Microscopically this species differs from *C. amazonensis* in the smaller basidiospores (6.46–)6.71–7.57(–8.13) × (3.75–)3.82–4.68(–5.21), **L** = 7.14 µm; **W** = 4.25 µm, **Q** = (1.47–)1.57–1.80(–1.89), **Q** = 1.69 and variously thick-walled hyphal extremities of the pileipellis (Buyck et al. 2011). Corner (1966) reported it from Trinidad and Japan with somewhat wider basidiospores 6.5–7.5 × 5–5.7 µm. More recently Pegler (1983) cited it from the Lesser Antilles, in the island of Martinique under *Coccoloba uvifera*, with thin walled hyphal extremities of the pileipellis and larger basidiospores 8–10 × 4.7–6, **L** = 9 µm; **W** = 5.3 µm, **Q** = 1.68, which probably represents a different taxon. Pilz et al. (2003) also used the epithet '*cinnabarinus*' to describe collections made outside of North America (Japan, West Indies, and Central and South America for example). However, as discussed by Pegler (1983), all of these reports probably correspond to different taxa and need to be revised.

In tropical regions such as South Asia and Africa other reddish taxa occur. The Malaysian *C. pudorinus* Corner differs in the flesh-pink to apricot pileus and stipe, and shorter and proportionally wider basidiospores 7–9.5 × 6–7 µm (Corner 1966, Eyssartier et al. 2009). *Cantharellus incarnatus* Heinem. from Congo differs in the more robust basidiome, pink-orange folds and smaller basidiospores 7–7.8 × 4–5 µm (Heinemann 1958, 1966, Corner 1966). The other African red chanterelles *C. floridulus* Heinem., *C. heinemannianus* Eyssart. & Buyck, *C. symoensii* Heinem. and *C. platyphyllus* Heinem. differ from the two taxa mentioned above and our new species, primarily in the lack of clamp connections in their tissue (Heinemann 1958, 1966, Corner 1966, Eyssartier & Buyck 1998, Buyck et al. 2000). The two later taxa were recently separated as distinct genus *Afrocantharellus* (Eyssart. & Buyck) Tihuhwa (Tihuhwa et al. (2012).

*Cantharellus amazonensis* is now the second taxon of this genus found in the Brazilian Amazonia after *C. guyanensis*. A third species of *Cantharellus* might be a yellow chanterelle similar to northern temperate *C. cibarius* Fr. s.l. described in earlier collections by Singer et al. (1983). However, this material

needs to be recollected, examined and described using modern species concepts of the genus.

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