

## The Entolomataceae of the Pakaraima Mountains of Guyana III: new species of *Rhodocybe*

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**Abstract** *Rhodocybe pruinosostipitata*, found on woody debris, and *R. spongiosa*, found on soil litter, are described as new species from tropical rainforests of the Pakaraima Mountains of Guyana. Both species possess pustulate basidiospores and pseudocystidia. *Rhodocybe pruinosostipitata* is classified in section *Rhodocybe* based on its centrally attached stipe, pleurocystidia as pseudocystidia with brightly colored contents, and lack of clamp connections. *Rhodocybe spongiosa* is classified in section *Crepidotoides* based on its pleurotoid stature and hymenial pseudocystidia. Macromorphological, micromorphological, and habitat data are provided for the new species.

**Keywords** Agaricales · Basidiomycota · Guiana Shield · Neotropical fungi · Taxonomy

### Introduction

In his world monograph, Baroni (1981) reported 18 species of *Rhodocybe* (Entolomataceae, Agaricales, Agaricomycetes) from Argentina, Bolivia, Brazil, Chile, Paraguay,

Trinidad, and Venezuela. Two additional South American species were described from Brazil by Singer (1989) and Raithelhuber (1990). Baroni and Halling (1992) added four new species, three from Venezuela and one from Ecuador, and provided a key to the 24 *Rhodocybe* taxa then known from South America, as well as ten extralimital species. More recently, Putzke and Putzke (2000) provided a key to three species of *Rhodocybe* found in northern Brazil, and Pegler (1997) reported species from Sao Paulo, Brazil, and Venezuela; all were previously described and had been included in the key by Baroni and Halling (1992). De Meijer (2001) reported potentially 16 undescribed species from Paraná State, Brazil, indicating that additional *Rhodocybe* species will be found in South America.

Here we describe two new species from northeastern South America classified in *Rhodocybe* based on their flesh-colored, minutely pustulate–undulate basidiospores. This is the first report of *Rhodocybe* from Guyana.

### Materials and methods

Collections were made during the rainy seasons of June–July 2001–2003 from the Upper Potaro River Basin in the Pakaraima Mountains of west-central Guyana within a 5-km radius of a permanent base camp at 5°18′04.8″N, 59°54′40.4″W, elevations 710–750 m. Collections were made in forests dominated by *Dicymbe corymbosa* Spruce ex Benth. (Fabaceae subfam. Caesalpinioideae) or mixed rainforests. Collection methods, field descriptions, and microscopic analyses were those of Largent et al. (2008) with color coding according to Kornerup and Wanscher (1978).

Quantitative factors for microscopic features included:  $\bar{x}$ , the arithmetic means of spore length and width,  $\pm$  standard deviation;  $E$  the quotient of spore length by spore width

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indicated as a range variation in  $n$  objects measured,  $Q$  the mean of  $E$  values,  $L - D$  the length minus the diameter of spores, and  $AL - D$  the average  $L - D$ ,  $n/4$  indicates the number of objects measured ( $n$ )/the number of collections studied (4) (Largent 1994).

## Taxonomy

**1. *Rhodocybe pruinostipitata*** T.J. Baroni, Largent & Aime, sp. nov. Figs. 1–4

Mycobank no.: MB512595

Pileus initio glaber; croceo-bubalinus vel atro-croceus vel brunneo-croceus, tum canescens, tandem helvolus, in centro magis croceus. Lamellae late adnatae vel adnatae, stramineae vel hevolae vel griseo-croceae. Stipes pileo concolor, ubique minute albo-pruinosis. Basidiosporae forma seminis pomi, pustulato-undulatae, heterodiametricae,  $6.5\text{--}8.7 \times 4.7\text{--}6.8 \mu\text{m}$ . Pseudocystidia late ventricosa vel lageniformia, contento aureo in 3% KOH,  $23.5\text{--}84.3 \times 2.1\text{--}8.0 \mu\text{m}$ . Cheilocystidia numerosa, similia forma pseudocystidiis sed magis cylindracea. Pileipellis

tenuia strata hypharum cylindracearum intricatarum. Stipitipellis cutis sed cum numeroso fasciculo hypharum minutarum, irregulariter ramosarum, nodosarum vel contortarum, cylindraceos erectos apices habentium. Pigmentum extus incrustatum in hyphae stipitipelle. Fibulae carentes. Habitatio: in lignoso substrato vel infosso ligno, *Dicymbe corymbosa* sylvas habitat.

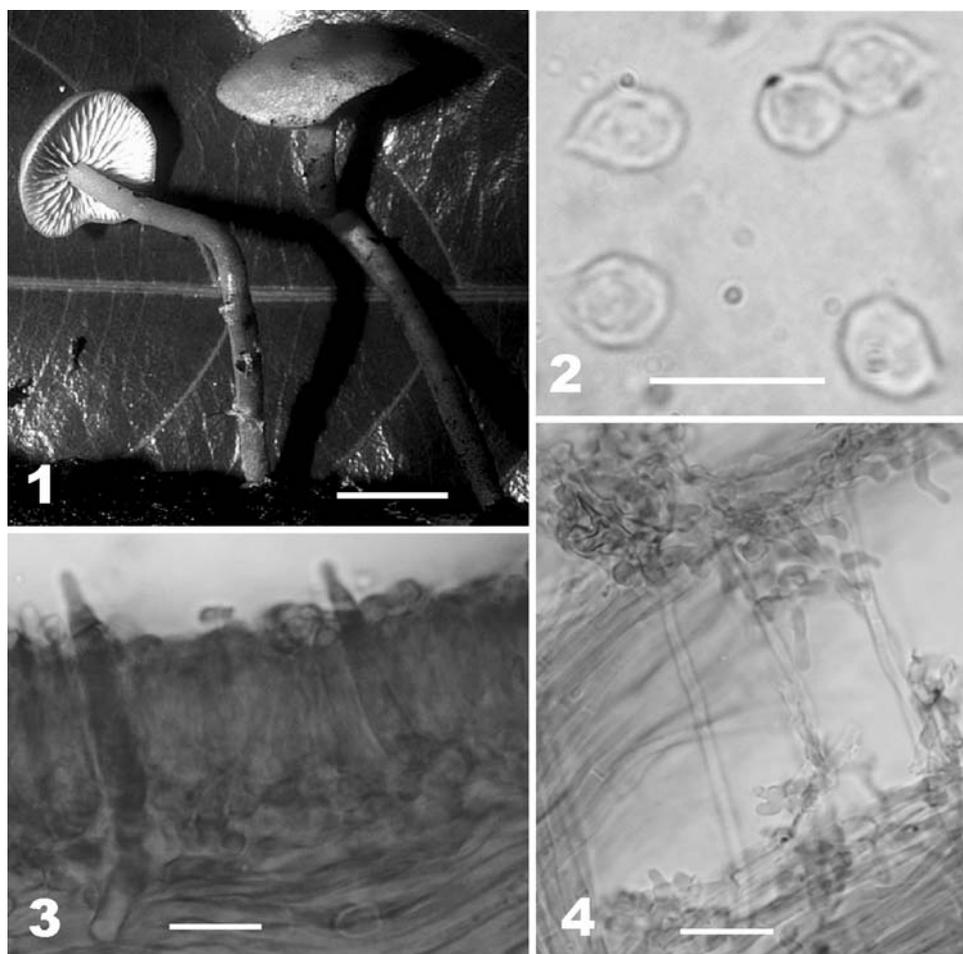
Holotypus hic designatus: Aime 1161, Guyanae, superioris fluminis Potaro regio, in montibus Pakaraima (BRG 021226).

Etymology: *pruinosis* (Latin) and *stipitatus* (Latin), referring to the pruinose stipe surface.

Basidiomata scattered on forest litter, centrally stipitate. Pileus 15- to 30-mm broad, 7-mm high, plano-convex to plane with subeccentric, acute umbo; dry, glabrous, hygrophanous, glabrous; when moist, orange buff to dark orange to brownish orange (5-6-BD7-8); upon drying, canescent and becoming grayish yellow (4B-56), more orange over disc (5B7); margin entire, smooth, at times translucent-striate. Lamellae broadly adnate to adnate, 2- to 5-mm broad, close, yellowish white or greyish yellow (3A2 or 4B3) to dirty pale orange or greyish orange (5B4); edges

**Figs. 1–4** *Rhodocybe pruinostipitata*:

**1** Basidiomata, Aime 1492.  
**2** Basidiospores, Aime 1161 (holotype). **3** Pseudocystidial pleurocystidia, Aime 2351.  
**4** Terminal elements of stipitipellis, Aime 2351.  
 Bars: **1** 10 mm, **2–4** 10  $\mu\text{m}$



concolorous. Stipe 35–57 × 3–3.5 mm, equal but bent, dry, stuffed with tightly packed, cream, fibrous hyphae, tough but flexible, exterior orange (5B7 at apex, lower 3/4ths 5C7) and concolorous with pileus, with white pruinose covering overall; this more dense and forming a tomentum at the base. Pileus trama yellowish white (3A2), fibrous, ≤1-mm thick over lamellae, 2 mm over stipe, eventually discoloring orange. Odor mildly fungal with a sweetish component. Taste bitter.

Basidiospores pip-shaped, pustulate–undulate, 6.8–8.1 × 4.7–6.8 μm ( $\bar{x}$  = 6.8 ± 0.6 × 5.3 ± 0.4 μm,  $E$  = 1.1–1.5,  $Q$  = 1.3 ± 0.1,  $L - D$  0.5–2.7 μm,  $AL - D$  1.5 ± 0.6 μm;  $n/2$  = 55). Basidia cylindro-clavate, 22.2–27.7 × 4.6–7.0 μm ( $\bar{x}$  = 24.3 ± 1.8 × 5.6 ± 0.6 μm,  $E$  = 3.9–4.8,  $Q$  = 4.4 ± 0.39;  $n$  = 13). Pleurocystidia as pseudocystidia abundant, most clearly originating from the lamellar trama, broadly ventricose to lageniform, 23.5–84.3 × 2.1–8.0 μm; contents golden and coagulated in 3% potassium hydroxide (KOH). Cheilocystidia as pseudocystidia, abundant, originating from the lamellar trama, similar in shape but more cylindrical than the pleurocystidia, projecting 5 μm beyond the hymenium. Lamellar trama parallel, hyphae narrow to inflated, 52.3–141.8 × 2.9–7.0 μm. Pileipellis a narrow layer of 1–4 entangled cylindrical hyphae, individual hyphae rarely with erect terminal ends, staining with phloxine more readily than the pileus trama, with minute debris adhering to outermost hyphae; pigmentation cytoplasmic. Stipitipellis of largely repent hyphae with abundant clusters of irregularly branched, contorted hyphae with cylindrical upturned terminal cells (2.5–4.0 × 1.5 μm); pigmentation externally incrustated on hyphae of the outer stipe trama. Refractive hyphae absent in all trama. Clamp connections absent.

Habit, habitat, and distribution: Scattered on sticks in litter or buried wood in *Dicymbe*-dominated and mixed tropical rainforest; known only from the type locality.

Specimens examined: GUYANA, REGION 8 POTARO-SIPARUNI: Pakaraima Mountains, Upper Potaro River, 5°18'04.8"N, 59°54'40.4"W; elevation 710 m; Palloway Ridge; 7 June 2000; Aime 1161 (HOLOTYPE, BRG 021226; ISOTYPE, LSUM 184496); Mixed plot 2 on stick in litter, 27 May 2001, Aime 1492 (BRG; LSUM); vicinity of base camp fruiting from buried wood, 9 July 2003, Aime 2351 (BRG; LSUM).

Commentary: *Rhodocybe pruinosostipitata* can be recognized by its plano-convex to plane, acutely umbonate pileus ≥15-mm broad, pruinose stipe that is concolorous with the pileus, adnate, close lamellae, pip-shaped spores averaging 6.8 × 5.3 μm, elongated pseudocystidia, incrustated hyphae only in the outer stipe trama, presence of contorted hyphae in the stipitipellis, and lignicolous habit.

Because of its pseudocystidia and centrally stipitate basidiomata, *Rhodocybe pruinosostipitata* is classified in section *Rhodocybe* (Baroni 1981). In that section, on the

basis of its basidioma colors, pip-shaped basidiospores, and pseudocystidia, *Rhodocybe pruinosostipitata* is phenotypically similar to three species: *Rhodocybe galerinoides* Singer from Bolivia; *Rhodocybe retroflexa* (Berk. & Broome) Pegler from Sri Lanka; and *Rhodocybe collybioides* Singer from Argentina.

*Rhodocybe galerinoides* can be differentiated from *Rhodocybe pruinosostipitata* by its smaller pileus (16 × 7 mm); glabrous stipe; subdistant to distant deeply sinuate gills; absence of incrustated hyphae in the stipe trama; smaller, subglobose spores [5–5.5(–6.5) × 4–5 μm]; and its somewhat longer hymenial cystidia (70–111 μm).

*Rhodocybe retroflexa* can be distinguished by its depressed, smaller pileus (9- to 13-mm broad); adnexed, subdistant gills; and its larger, subglobose spores (6–8 × 4.5–6 μm with an average length of 7.5 μm). Pigmentation and stipe surface features are not mentioned for *Rhodocybe retroflexa* in Pegler's original description from Sri Lanka (Pegler 1977) or in Baroni's world monograph of *Rhodocybe* (Baroni 1981).

*Rhodocybe collybioides* can be separated by its terrestrial habitat; its convex-umbilicate, smaller pileus (15-mm broad); glabrous stipe; and incrustated hyphae throughout the pileus and stipe tramas.

## 2. *Rhodocybe spongiosa* T.J. Baroni, Largent & Aime, sp. nov. Figs. 5–7

Mycobank no.: MB512590

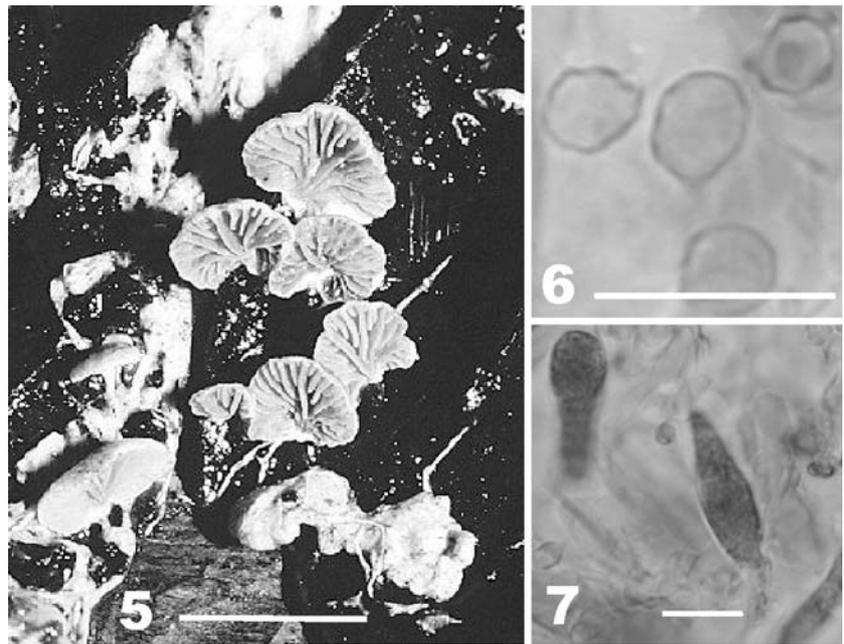
Basidiomata pleurotoidea, densas, spongiosas myceliales tegetes formantia in sylvestri solo. Pileus 3–8 mm diametro, dimidiatus, glaber, albus, cum albo, membranaceo pulvino super inferiore dimidium. Lamellae cinereo-aurantiacae vel brunneo-aurantiacae. Stipes carens. Basidiosporae late ellipsoideae, valde undulato-pustulatae, heterodiametricae, 4.5–6.5 × 3.3–5.0 μm. Pseudocystidia cylindrica, ventricosa, ventricoso-mucronata vel lageniformia, atro-cinnamomea in 3% KOH, 28.5–46.1 × 5.2–8.1 μm. Pileipellis tenuia strata hypharum intricatarum; hyphae non incrustatae. Fibulae carentes. Habitatio: gregarius in soli substrata, *Dicymbe* corymbosa sylvas habitat.

Holotypus hic designatus: Aime 2129, Guyanae, superioris fluminis Potaro regio, in montibus Pakaraima (BRG 021225).

Etymology: *spongiosus* (Latin); referring to the spongy mycelial mat in the litter.

Basidiomata pleurotooid, subtended by dense, spongy mycelial mats in litter, with white elastic hyphal cords connecting the basidiomata between sticks, leaves, humus, and descending into mineral soil. Pileus 3- to 8-mm in diameter, dimidiate, glabrous, dirty white, attached by white, membranous pads over basal ½ of upper surface, as a result partially resupinate. Lamellae laterally radiating, subclose, grayish orange to medium brownish orange

**Figs. 5–7** *Rhodocybe spongiosa*. Aime 2129 (holotype): **5** Basidiomata with mycelial mats and hyphal cords. **6** Basidiospores. **7** Hymenial pseudocystidia. Bars: **5** 10 mm, **6, 7** 10  $\mu$ m



(5B5–5C5). Stipe absent. Point of basidioma attachment on lamellar side a small white plug from which hyphal cords radiate. Odor none. Taste not obtained.

Basidiospores broadly ellipsoid, strongly undulate-pustulate,  $4.5\text{--}6.5 \times 3.3\text{--}5.0 \mu\text{m}$  ( $\bar{x} = 5.2 \pm 0.5 \times 4.0 \pm 0.4 \mu\text{m}$ ,  $E = 1.1\text{--}1.6$ ,  $Q = 1.3 \pm 0.1$ ,  $L - D = 0.5\text{--}2.0 \mu\text{m}$ ,  $AL - D = 1.2 \pm 0.4 \mu\text{m}$ ;  $n = 21$ ). Basidia clavate and tapered at the extreme base,  $18.3\text{--}24 \times 5.0\text{--}7.3 \mu\text{m}$  ( $\bar{x} = 20.6 \pm 1.9 \times 6.2 \pm 0.7 \mu\text{m}$ ,  $E = 2.6\text{--}4.7$ ,  $Q = 3.4 \pm 0.6$ ;  $n = 10$ ); 4-sterigmate, these short. Hymenial pseudocystidia cylindrical or ventricose to ventricose-mucronate to lageniform,  $28.5\text{--}46.1 \times 5.2\text{--}8.1 \mu\text{m}$ , abundant on side and on edges of lamellae, projecting beyond the hymenium up to  $20 \mu\text{m}$ , dark reddish golden brown in 3% KOH, originating in the lamellar trama. Lamellar trama without refractive hyphae, homogeneous, pale yellow in 3% KOH, consistently parallel; hyphae  $1.6\text{--}4.0 \mu\text{m}$  wide. Pileipellis a narrow entangled layer of hyphae with no projecting or suberect cells; hyphae very narrow,  $1.6\text{--}4.5\text{--}\mu\text{m}$  wide, not incrustated. Pileocystidia cylindrical to narrowly cylindro-clavate. Pigmentation probably cytoplasmic, not externally or internally incrustated. Clamp connections absent.

Habit, habitat, and distribution: Gregarious in litter, binding small substrata into a spongy, white, mycelial mass, in *Dicymbe*-dominated tropical rainforest; known only from type locality.

Specimens examined: GUYANA, REGION 8 POTARO-SIPARUNI: Pakaraima Mountains, Upper Potaro River,  $5^{\circ}18'04.8''\text{N}$ ,  $59^{\circ}54'40.4''\text{W}$ , elevation 710 m, *Dicymbe* plot 2 on fine woody debris in litter, 25 June 2002, Aime 2129 (HOLOTYPE, BRG 021225; ISOTYPE, LSUM 184495).

Commentary: *Rhodocybe spongiosa* is distinguished by its pleurotoid stature; glabrous, dirty white pileus; ellipsoid basidiospores; hymenial pseudocystidia; lack of clamp connections; nonincrusted pigmentation; and habit of forming dense, spongy mycelial mats. The mycelial mats with white elastic rhizomorphs connecting basidiomata and substrata are unique in *Rhodocybe*.

The presence of pseudocystidia and absence of a stipe allow *Rhodocybe spongiosa* to be placed in *Rhodocybe* section *Crepidotoides* Singer (Baroni 1981). An additional three species of *Rhodocybe* can be found in this section: *Rhodocybe crepidotoides* Singer from South America, Japan, and North America; *Rhodocybe fuliginea* E. Horak; and *Rhodocybe conchata* E. Horak from New Zealand.

*Rhodocybe crepidotoides* can be differentiated from *Rhodocybe spongiosa* by its slightly longer spores [(5–)  $5.5\text{--}7.0 \mu\text{m}$ ], incrusted hyphae in the pileal and lamellar trama, longer cystidia ( $20\text{--}65 \times 3\text{--}7 \mu\text{m}$ ), white or pale grayish pileus, and the absence of spongy mycelial mats (Baroni 1981; Baroni and Horak 1994). *Rhodocybe fuliginea* and *Rhodocybe conchata* can be differentiated by their grayish colors, farinaceous odor and taste, and larger spores with an average length of  $7.0 \mu\text{m}$ ; neither species possesses spongy mycelial mats (Horak 1979).

Although species classified in the *Rhodocybe* section *Claudopodes* Singer ex T.J. Baroni possess a pleurotoid stature as does *Rhodocybe spongiosa*, none of those species possess pseudocystidia (Baroni 1981). In section *Claudopodes*, however, *Rhodocybe rhizogena* T.J. Baroni & E. Horak described from North Carolina, USA, does possess well-developed white hyphal cords, as does *Rhodocybe spongiosa*. *Rhodocybe rhizogena* can be

distinguished from *Rhodocybe spongiosa* by its longer spores (5.5–8.5  $\mu\text{m}$ ), brownish orange pileus that matures to dark blonde, distinct stipe, and filamentous contorted cheilocystidia (Baroni and Horak 1994).

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