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# Three new species of *Marasmius* from remnants of the Atlantic Rainforest, São Paulo, Brazil

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**Résumé –** Trois nouvelles espèces de *Marasmius* sont décrites ici avec leur caractère unique soutenue par des examens morphologique et taxinomique complètes. *Marasmius cantareirensis* et *M. fuligineo-ochraceus* appartiennent à la sect. *Marasmius* subsect. *Sicciformes* tandis que *M. pulberistipitatus* est un représentant de la sect. *Globulares*. Tous les échantillons ont été prélevés en forêt tropicale atlantique dans le sud-est du Brésil. Descriptions micro- et macromorphologiques détaillées sont fournies pour chaque taxon, suivies par des illustrations et commentaires taxinomiques.

**Abstract –** Three new species of *Marasmius* are described herein with their uniqueness supported by full morphological and taxonomic examination. *Marasmius cantareirensis* and *M. fuligineo-ochraceus* belong to sect. *Marasmius* subsect. *Sicciformes* while *M. pulberistipitatus* is a representative of sect. *Globulares*. All specimens were collected in the Atlantic Rainforest in Southeastern Brazil. Detailed micro and macromorphological descriptions are provided for each taxon, followed by illustrations and taxonomic comments.

**Agaricales / sect. *Globulares* / Marasmiaceae / morphology / Neotropics / subsect. *Sicciformes* /taxonomy**

## INTRODUCTION

Members of *Marasmius* sect. *Marasmius* are characterized by the typical marasmioid habit based on *Marasmius rotula* (Scop.) Fr., which means thin and frequently small basidiomata, umbilicate and membranous pileus, presence of a hymenophoral collar, chitinous, hair-like and insititious stipe, and the not exclusively dextrinoid trama (Singer, 1976, 1986; Antonín & Noorderloos, 2010). The section, according to the morphological classifications (Singer, 1976; 1986; Antonín, 1991), is divided into two mostly known subsections: *Marasmius* (*Rotalis*-type broom cells in the pileipellis) and *Sicciformes* (*Siccus*-type broom cells in the pileipellis); plus the unknown and monotypic *Horriduli* (anomalous dermatocystidia along with elongate setae in the pileipellis). On the other hand, *Marasmius* sect. *Globulares*

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*sensu* Singer (1986) is known to contain species that often produce larger and more robust fleshy basidiomata, many of them presenting a gymnopoid habit, non-insititious stipe, exclusively dextrinoid hyphal trama and pileipellis composed of *Globulares*-type smooth cells only.

In molecular phylogenetics, the clade including species of sect. *Marasmius* is the reference for *Marasmius sensu stricto*, which forms a monophyletic clade with sect. *Globulares sensu* Antonín & Noordeloos 2010 (Moncalvo *et al*., 2000; 2002; Wilson & Desjardin, 2005; Matheny *et al*., 2006). Using ITS as molecular marker and with a more comprehensive sampling, sect. *Marasmius* does not form a single monophyletic clade, but several paraphyletic to each other (Wannathes *et al*., 2009; Tan *et al*., 2009). In the case of sect. *Globulares*, it was verified that their members clustered mixed among taxa of sect. *Sicci* based also on ITS data (Wannathes *et al*., 2009; Tan *et al*., 2009), and both sections were combined into sect. *Globulares* Kühner emend. Antonín & Noordeloos (Antonín & Noordeloos, 2010).

Until now, many species of *Marasmius* have been discovered or recorded from Brazil (Berkeley, 1843; 1856; Berkeley & Cooke, 1876; Hennings, 1904; Theissen, 1909; Dennis, 1951a; 1951b; 1957; 1961; 1970; Rick, 1961; Singer, 1959; 1960; 1965; 1976; 1989; Pegler, 1988; 1990; 1997; Maia *et al.*, 2015), some of them from the Atlantic Rainforest (Puccinelli & Capelari, 2006; 2007; Oliveira *et al*., 2008; Puccinelli & Capelari, 2009a; 2009b; Oliveira & Capelari, 2012; Oliveira *et al*., 2014). In the present paper, three new species are proposed: *Marasmius cantareirensis* and *M. fuligineo-ochraceus* belonging to sect. *Marasmius* subsect. *Sicciformes* and *M. puberistipitatus* to sect. *Globulares sensu* Singer (Singer, 1986), all from areas of the Atlantic Rainforest, São Paulo, Brazil. The species have their uniqueness supported by macro- and micromorphological characteristics and the descriptions are followed by taxonomic comments based on literature examination and illustrated with detailed line-drawings.

## MATERIAL AND METHODS

The specimens were collected from: 1) Reserva Biológica de Paranapiacaba (RBP) – 23°46’00” to 23°47’10” S and 46°18’20” to 46°18’40” W – close to Vila de Paranapiacaba, Santo André City, SP, Brazil. The reserve has 336 ha of preserved Ombrophilous Dense Forest area, with predominantly mountainous landscape near the coast, ranging from 750-891 m of altitude (Xavier *et al*., 2008; Domingos *et al*., 2000), characterized by super-humid climate, with an annual average rainfall of 3,381 mm and an average temperature of 17.9°C (Domingos *et al*., 2000); 2) Parque Estadual da Cantareira (PEC), Núcleo Engordador – 23°24’11.89” S and 46°35’12.29” W – situated at the Sierra of Cantareira, north of São Paulo City, has an area covered by Seasonal Semideciduous Forest of humid mesothermal climate (Secretaria do Meio Ambiente do Estado de São Paulo, 2000), at an altitude of 750-1,215 m (Xavier *et al*., 2008), with an annual average rainfall of 1,545 mm (Ventura *et al*., 1966) and an annual average temperature around 14.3-18.2°C (Secretaria do Meio Ambiente do Estado de São Paulo, 2000).

The color description of the basidiomata was coded according to Küppers (2002). The macromorphological description was made on fresh specimens, and the specimens were then dried at 30-40°C. For microscopy, sections of dried material were rehydrated in 70% ethanol and mounted in 5% KOH or Melzer’s reagent. The

spores were evaluated by the range of length×width, and basic statistical measurements: $x_m$, the arithmetic mean of length (± standard deviation, SD)×width (± SD); $Q_m$, the mean of the range of length/width of the basidiospores (± SD); and *n*, the number of spores measured. The lamellae spacing is based on: *L*, the number of lamellae that reach from the stipe apex to the pileus margin, and *l*, the number of series of lamellulae among the lamellae.

Voucher collections were deposited in the Herbarium Maria Eneyda Pacheco Kauffmann Fidalgo (Herbarium SP) of the Instituto de Botânica, São Paulo, Brazil. Unfortunately, only a single collection for each taxon was made during our forays (15 in RBP and seven in PEC) across rainy seasons from 2010 to 2012, indicating that our taxa are likely quite rare. Furthermore, the small size of *M. cantareirensis* and *M. fuligineo-ochraceous* hampered the easy visualization of the basidiomata in the field, reducing the probability of being found. So far, regular protocols for DNA extraction, PCR and/or DNA sequencing have failed to produce the DNA barcode sequences from the holotypes. Hopefully, future efforts will obtain molecular data as well as new collections.

## RESULTS AND DISCUSSION

***Marasmius cantareirensis*** J.S. Oliveira, **sp. nov.** **Figs 1-7**

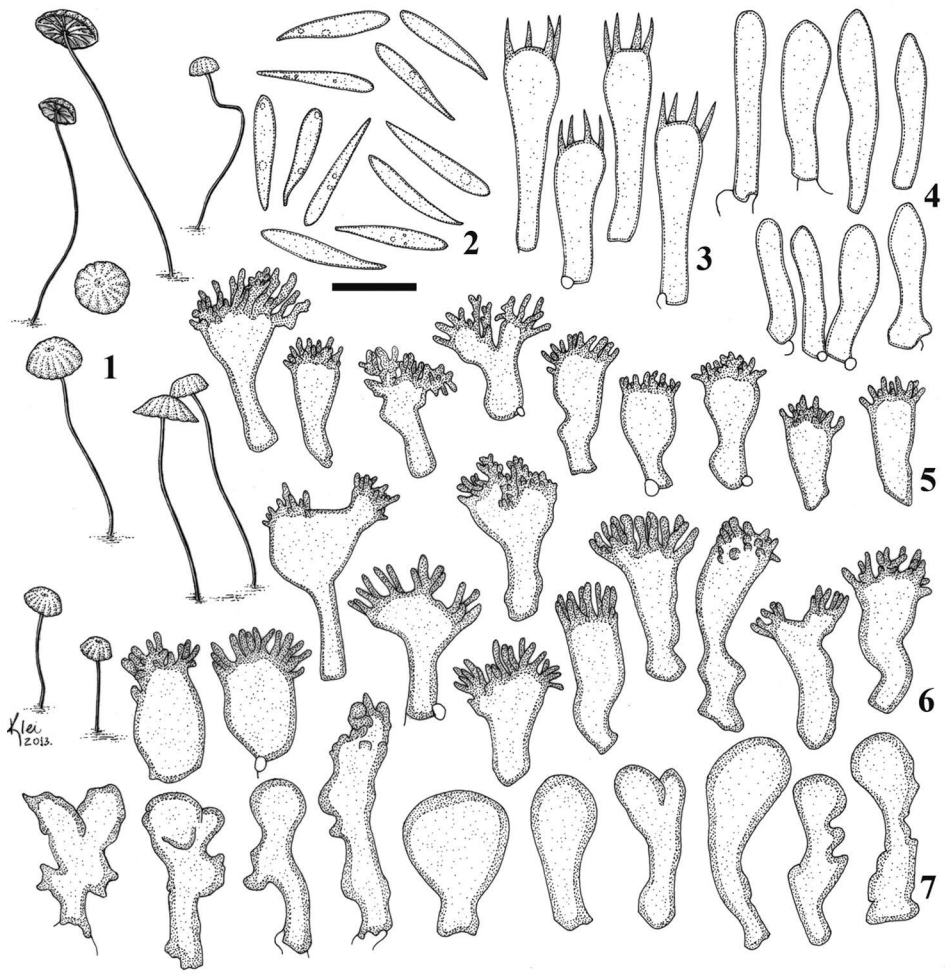
*Mycobank nr*: MB 814214

*Pileus* 1.4-5.3 mm diam., convex, sulcate, whitish to sordid cream, center pale brownish orange mottled with brownish microdots. *Lamellae* collariate, 11-13. *Stipe* 14-29×0.2-0.6 mm, bronze to dark brown, insititious, with rare, black rhizomorphs. *Basidiospores* 12.3-15.6×2-3 µm, clavate to subfusoid. *Lamellae and pileus trama* inamyloid. *Pileipellis* hymeniform, composed of *Siccus*-type broom cells and smooth cells. On fallen leaves.

*Etymology.* Refers to the Sierra of Cantareira, locality where the holotype was collected.

*Holotypus*. Brazil. São Paulo State, São Paulo City, Parque Estadual da Cantareira, Núcleo Engordador, 16 Feb 2012, *J.J.S. Oliveira & M. Capelari JO515* (SP, nr SP445569).

*Pileus* 1.4-5.3 mm diam., convex, orbicular, sulcate, center umbilicate with a central, large, circular point or spot, or forming a slight central protrusion, margin incurved, edge regular to crenate; almost white or whitish ($N_{00}Y_{10}M_{00}$) or sordid cream ($N_{10}Y_{30}M_{00}$) or grayish white ($N_{10}Y_{10}M_{00}$) toward the margin, becoming pale yellowish beige (paler than $N_{10}Y_{50}M_{20}$), sometimes darkening to pale brown ($N_{20}Y_{50}M_{30}$), with central disk slightly orange brown ($N_{10}Y_{60}M_{20}$) mottled with brownish microdots (seen under lens) around a dark brown point or spot in the center; membranous, context white, thin (< 1 mm); glabrous, dry, dull, subvelutinous, non-hygrophanous. *Lamellae* collariate (collar tight to the stipe apex), subdistant, *L* = 11-13, equal, simple, *l* = 0, opaque, smooth, white to pale cream ($N_{00}Y_{10}M_{00}$), edges regular, concolorous with the lamellae faces and with the hymenium between lamellae. *Stipe* 14-29×0.2-0.6 mm, central, filiform, thin, circular, insititious, accompanied by rare, black rhizomorphs; chitinous, hollow; apex concolorous with the lamellae, becoming bronze brown ($N_{60}Y_{70}M_{40}$) to dark brown at the base; surface glabrous, smooth, glossy.




Figs 1-7. *Marasmius cantareirensis* (*JO515* – Holotype): **1.** basidiomata; **2.** basidiospores; **3.** basidia; **4.** basidioles; **5.** cheilocystidia; **6.** *Siccus*-type broom cells of the pileipellis, **7.** smooth or scarcely diverticulate cells of the pileipellis. Scale: **1** = 7 mm, **2-7** = 10 µm.

*Basidiospores* 12.3-15.6×2-3 µm [$x_m$ = 13.5 (± 0.8)×2.6 (± 0.2) µm, $Q_m$ = 5.3 (± 0.5), *n* = 30], oblong, narrow, clavate to subfusoid, smooth, hyaline, thin-walled, inamyloid. *Basidia* 21.3-28.8×5-7.3 µm, clavate, smooth, thin-walled, hyaline, inamyloid, with 4 long sterigmata. *Basidiola* 16.3-25×3.8-6.3 µm, cylindrical, clavate to subfusoid, smooth, hyaline, thin-walled, inamyloid. *Pleurocystidia* absent. *Cheilocystidia* in form of *Siccus*-type broom cells, not numerous, main body 12.5-21.5×5-12.5 µm, clavate, inflated at the apex, sometimes pedicellate, rarely branched into lobes, some irregular in outline, hyaline, thin-walled, inamyloid; setulae apical, erect, usually short, 1.5-5.3×0.5-1 µm, finger-like, cylindrical to verruciform, simple to branched, solid, hyaline, with obtuse and rounded apex, sometimes subacute. *Lamellae trama* inamyloid, irregular, strongly interwoven, hyphae cylindrical, 1.3-

8.8 µm diam., regular in outline, branched, hyaline, smooth, thin-walled. *Pileus trama* similar to the lamellae trama, hyphae 1.3-7.5 µm diam., but with some inflated and rounded segments. *Pileipellis* hymeniform, but often subhymeniform in the center of the pileus, hyaline, with two cellular types: 1) *Siccus*-type broom cells, apparently prevalent in the marginal region, slightly pale yellow or even often hyaline when in group, main body 13.8-18.8(-26.3)×5-12.5 µm, clavate to turbinate, sometimes a little inflated to subglobose, rarely branched, sometimes hand-shaped, hyaline, slightly thick-walled, inamyloid; setulae apical, erect, few short to moderately elongate, 1.3-5×0.8-1.3 µm, finger-like, cylindrical, rarely wart-shaped, regular in outline, simple, solid, pale yellow or hyaline, apex obtuse and rounded, 2) numerous smooth cells also present, some slightly diverticulate, apparently more numerous in the center of the pileus, 12-32.5×7-13.8(-18) µm, hyaline or some slightly golden yellow or even ferruginous brown, these later form clusters, generating spots that are the dark brown microdots in macroscopy under hand lens, irregular in outline, sometimes with excrescences, clavate to pyriform, rarely bulboid, thick-walled. *Stipe trama* weakly dextrinoid, especially at the internal hyphae and in the stipe apex, cortical hyphae in parallel, strongly cohesive, cylindrical, 2.5-8 µm diam., regular in outline, light brown, walls moderately thickened, smooth, with seemingly overflowing content from inside the hyphae; internal hyphae smooth, 2-6.3 µm diam., hyaline, thin-walled. *Clamp connections* present in all tissues.

*Habit and substrate*. Marasmioid, close to gregarious, on dried leaves of dicotyledonous tree in the litter.

*Material examined*. BRAZIL. São Paulo: São Paulo City, Parque Estadual da Cantareira, Núcleo Engordador, 16 Feb 2012, *J.J.S. Oliveira & M. Capelari JO515* (holotype, SP445569).

*Comments. Marasmius cantareirensis* is mainly recognized by the sulcate, off-white to pale yellowish-beige or dirty cream pileus (1.4-5.3 mm diam.), with a conspicuous central dot or a shallow, dark brown protrusion in the center; by the indistinctly collariate, subdistant (11-13), cream-colored lamellae; by the insititious stipe, growing directly from the substrate, rarely accompanied by black rhizomorphs; by the oblong, narrow, clavate to subfusoid basidiospores (12.3-15.6×2-3 µm); by the inamyloid lamellae and pileus trama, weakly dextrinoid in the stipe trama; and by having a mottled pileipellis, formed by two cellular types: 1) *Siccus*-type broom cells and 2) smooth and pigmented cells often forming groups or clusters, more present in the region of the central disc.

The new species belongs to sect. *Marasmius* subsect. *Sicciformes* according to the morphological concept. No other species in literature combines such a whitish or pale pileus with similar basidiospore dimensions. Slender, oblong [$Q_m = 5.3 (\pm 0.5)$ µm], clavate to fusoid basidiospores are more frequently present in species with well-pigmented pileus. The conspicuous dot or central shallow, dark brown protrusion is similar to what is found in *M. bulliardii* Quél. (Antonín & Noordeloos, 2010).

Within the subsection, species combining a distinctly colored pileus with oblong basidiospores are *M. beelianus* Singer, *M. brevicollus* Corner, *M. chrysocephalus* Singer, *M. guyanensis* Mont., *M. purpureobrunneolus* Henn. (= *M. acierufus* Corner), *M. marthae* Singer, *M. megalospermus* Singer, *M. rubromarginatus* Dennis, *M. sanguirotalis* Singer and *M. xerophyticus* Singer (Singer, 1964; 1965; 1976; Corner, 1996; Desjardin *et al*., 2000; Wannathes *et al*., 2009; Tan *et al*., 2009). Another species with oblong basidiospores (14.5-18.5×3-4.3 µm) but paler pileus is *M. inundabilis* Singer. It has a grayish pileus which sometimes has a white zone around the central, uniformly brown papilla (Singer, 1989). However, along with its longer basidiospores and different pileus pigmentation pattern, *M. inundabilis* has a stipe rising from long

rhizomorphs through nodes, dextrinoid tissues all over, and thick-walled, dextrinoid, broom cells with coarse apical appendages in the pileipellis and on the lamella edge, which are similar to those in *M. iodactylus* Singer.

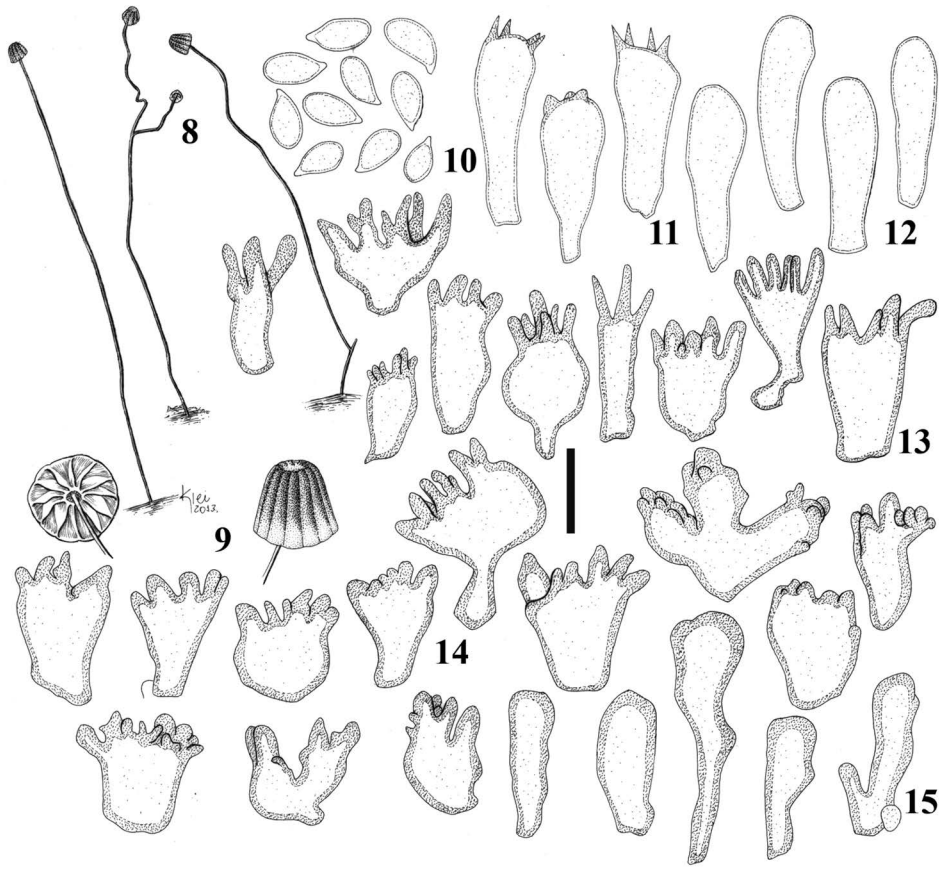
***Marasmius fuligineo-ochraceus*** J.S. Oliveira, **sp. nov.** **Figs 8-15**

*Mycobank nr*: MB 814215

*Pileus* 1.5-2.5 mm diam., hemispheric to campanulate, somewhat rigid, fuliginous ocher to cream in the margin, central disc fuliginous brown. *Lamellae* collariate, 9-12. *Stipe* 7-52×0.2-0.4 mm, wire, insititious. *Basidiospores* 5.6-7.5×3-4.4 µm, ellipsoid to subellipsoid. *Trama* dextrinoid. *Pileipellis* hymeniform, composed of: 1) *Siccus*-type broom cells, dextrinoid, with coarse apical diverticula; 2) cylindrical-clavate elements. On dicotyledonous leaves.

*Etymology.* Referring to the fuliginous ocher pileus.

*Holotypus*. Brazil. São Paulo State, Santo André City, Reserva Biológica de Paranapiacaba, 23 May 2010, *J.J.S. Oliveira & J.F. Santos JO151* (SP, nr SP445437).




Figs 8-15. *Marasmius fuligineo-ochreaceus* (*JO151* – Holotype): **8-9.** basidiomata; **10.** basidiospores; **11.** basidia; **12.** basidioles; **13.** cheilocystidia; **14.** *Siccus*-type broom cells of the pileipellis, **15.** smooth cells of the pileipellis. Scale: **8** = 8 mm, **9** = 2 mm, **10-15** = 10 µm.

*Pileus* 1.5-2.5 mm diam., hemispheric to more often campanulate, orbicular, very slightly sulcate, center umbilicate, margin incurved, edge wavy; fuliginous ocher ($N_{40}Y_{70}M_{30}$ with a slight hue of dark soot) to pale dirty ocher ($N_{20}Y_{50}M_{30}$), reaching to pale yellowish brown ($N_{20}Y_{50}M_{30}$) or cream ($N_{00}Y_{20}M_{10}$) at the margin, with fuliginous brown central disc having an unobtrusive olivaceous hue ($N_{30}Y_{60}M_{30}$) or only dark brown ($N_{80}Y_{99}M_{30}$), also containing a brownish cream umbilicus around a central dot; membranous, somewhat rigid, context thin (< 1 mm); surface glabrous, dry, dull, subvelutinous, non-hygrophanous. *Lamellae* collariate, subdistant, *L* = 9-12, equal, *l* = 0, opaque, smooth, light cream ($N_{00}Y_{10}M_{10}$), edge regular, concolorous with the sides as well as with the hymenium between the lamellae. *Stipe* 7-52×0.2-0.4 mm, central, filiform, thin, equal, insititious, simple, growing directly from the substrate, or branched, rising from thin, glabrous, black rhizomorphs; chitinous, hollow; apex concolorous with the lamellae, but dark brown to black elsewhere; surface glabrous, smooth, shiny.

*Basidiospores* 5.6-7.5×3-4.4 µm [$x_m$ = 6.4 (± 0.5)×3.6 (± 0.3) µm, $Q_m$ = 1.8 (± 0.2), *n* = 30], obovoid, ellipsoid to subellipsoid, hyaline, smooth, thin-walled, inamyloid. *Basidia* 20-23.8×7.5 µm, clavate, smooth, hyaline, thin-walled, 4 sterigmata, inamyloid. *Basidiola* (14.5-)18.8-27.5×5.4-8.8 µm, clavate, smooth, hyaline, thin-walled, inamyloid. *Pleurocystidia* absent. *Cheilocystidia* similar to the *Siccus*-type in transition to *Chrysochaetes*-type broom cells of the pileipellis, abundant, hyaline, main body (8-)11-17.3(-24)×6-14.4 µm, clavate, cylindrical clavate, turbinate, globose to ventricose, sometimes compressed, hyaline, moderately thick-walled; setulae or diverticula apical, erect, 1-7.5×1.3-3 µm, verruciform to digitiform, cylindrical, some short, all coarse or broad, solid or with lumen, hyaline, simple, with obtuse and rounded apex. *Lamellae trama* dextrinoid, irregular, interwoven, hyphae cylindrical, 1.5-6.3 µm diam., regular in outline, branched, hyaline, smooth, thin-walled. *Pileus trama* similar to the lamellae trama, hyphae 2-6.3 µm diam. *Pileipellis* hymeniform, composed of *Siccus*-type broom cells, in transition to *Chrysochaetes*-type broom cells, dextrinoid, brownish in KOH when in group, paler to hyaline when isolated, abundant, main body 9.4-17.5×7-16(-22.5) µm, clavate, turbinate, globose, truncate, branched, sometimes pedicellate, or irregular in outline, thick-walled; diverticula or excrescences apical, many times short to a little elongate, 1.6-6×1.5-3.8 µm, verruciform to granular, coarse, broad, simple, solid, sometimes with lumen, hyaline, with obtuse apex; some smooth cells present, rare, cylindrical to clavate, hyaline to pale brown, thick-walled, 16.8-31.3×5.6-9 µm. *Stipe trama* dextrinoid, especially the internal hyphae and those of the stipe apex; cortical hyphae in parallel, cylindrical, 2.5-7.5 µm diam., regular in outline, smooth, orange brown or brown, thick-walled; internal hyphae disorganized, 1.3-5 µm diam., branched, hyaline. *Clamp connections* present in all tissues, but not observed at the base of the broom cells.

*Habit and substrate*. Marasmioid, gregarious, on dried leaves of dicotyledonous tree in the litter.

*Material examined*. BRAZIL. São Paulo: Santo André City, Reserva Biológica de Paranapiacaba, 23 May 2010, *J.J.S. Oliveira & J.F. Santos JO151* (holotype, SP445437).

*Comments*. *Marasmius fuligineo-ochraceus* is recognized by the hemispheric to campanulate, slightly sulcate, fuliginous ocher pileus; by the collariate, subdistant (9-12), white lamellae with a concolorous edge; by the thin, filiform stipe, growing directly from the substrate or rising from rhizomorphs; by the ellipsoid to subellipsoid basidiospores (5.6-7.5×3-4.4 µm); by the dextrinoid pileus and lamellae trama; and by the hymeniform pileipellis composed of: 1) unusual, thick-walled, pale to brownish

*Siccus*-type to *Chrysochaetes*-type broom cells with coarse and broad apical diverticula, and 2) some smooth, thick-walled, cylindrical-clavate, rare elements.

The "*Chrysochaetes*-type" was a terminology used by Singer to determine the unusual "*Siccus*-type" broom cells found in *Marasmius chrysochaetes* Berk. & M.A. Curtis. This term should be used for broom cells "with apical appendages which are often finger-like and 2-3 µm broad, entire wall to thick-(to 3.5 µm)-walled, pseudoamyloid" (Singer, 1976). Therefore, the dextrinoid, distinctly thick-walled broom cells combined with the apical, digitiform, coarse, broad diverticula would indicate the *Chrysochaetes*-type broom cells. Singer used it when describing *M. misionensis* Singer (Singer, 1965; 1976). However, he was not consistent in using the term, possibly to avoid weakening his subsectional classification (exclusively based on these two types of broom cells) or because the *Chrysochaetes*-type might be merely considered as a sub-expression of the *Siccus*-type. Molecular phylogenetic studies may reveal whether or not this pattern represents an important characteristic, which would then have its implications on the classification.

No single species containing "*Chrysochaetes*-type" broom cells corresponds to *J.J.S. Oliveira & J.F. Santos JO151* (Singer, 1965; 1976), confirming its morphological uniqueness. *Marasmius misionensis* differs from the new species mainly by having distant lamellae (*L* = 7) and distinctly larger basidiospores (7.5-9 µm in length) (Singer, 1976). *Marasmius fuligineorotula* Singer also has some similarities with the new species in the pigmentation and shape of the pileus, number of lamellae, presence of rhizomorphs and of thick-walled *Siccus*-type broom cells (Singer, 1976). However, *M. fuligineorotula* differs by having broader pileus (4-11 mm diam.), larger basidiospores (10.2-12.3×4.5-6 µm), and by having broom cells intermediate between the *Rotalis*-type and the *Siccus*-type accompanying those that are distinctly of the *Siccus*-type.

***Marasmius puberistipitatus*** J.S. Oliveira, **sp. nov.** **Figs 16-21**

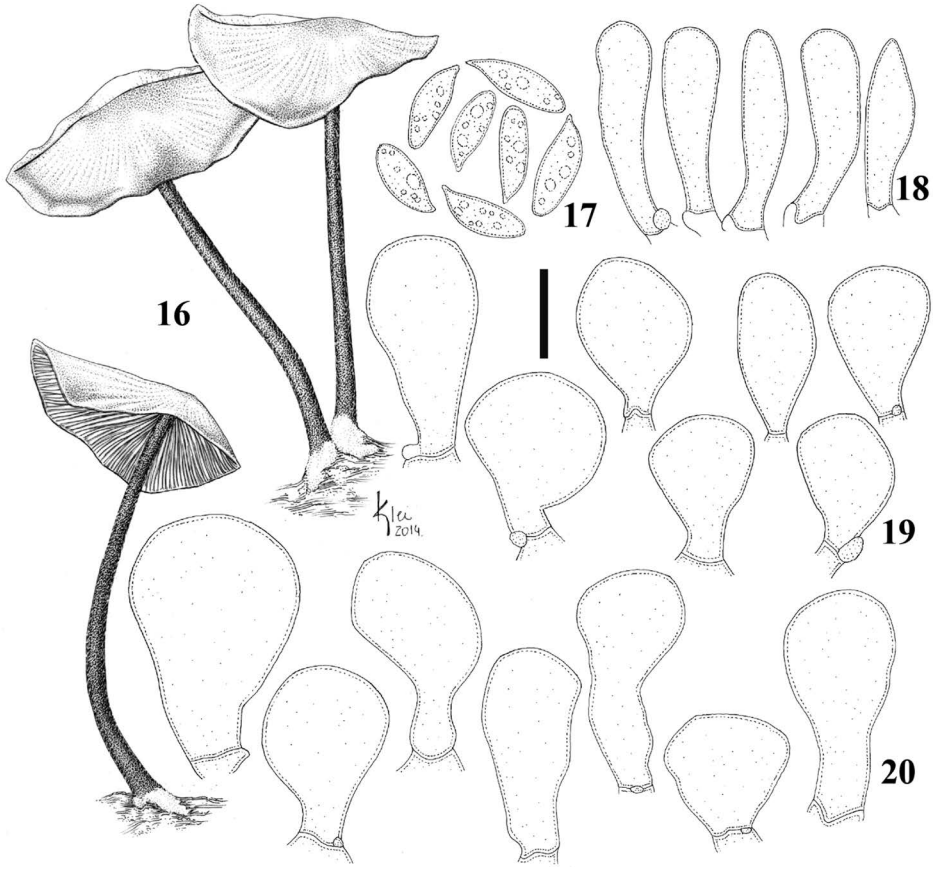
*Mycobank nr*: MB 814216

*Pileus* 38-52 mm diam., convex to plane, smooth to corrugate, yellowish cream to pale ochraceous, with yellowish brown center, glabrous, humid. *Lamellae* close, abundant. *Stipe* 70-83×2.3-4 mm, non-insititious, pubescent. *Basidiospores* 9-13×3.8-4.8 µm, lacrimoid to short clavate. *Pleurocystidia* absent. *Trama* dextrinoid. *Pileipellis* hymeniform, made up by smooth cells, 18.8-30.6×11.5-22.5 µm. *Stipitipellis* made up by filamentous extensions of hyphae. On several dicotyledonous debris.

*Etymology.* Referring to the strongly pubescent stipe.

*Holotypus.* Brazil. São Paulo State, Santo André City, Reserva Biológica de Paranapiacaba, 9 Dec 2010, *J.J.S. Oliveira & P.O. Ventura JO308* (SP, nr SP445483).

*Pileus* 38-52 mm diam., convex to plane, orbicular, smooth to corrugate at the margin, center flat, margin incurved to straight, edge regular to crenate; yellowish cream or pale ochraceous ($N_{00}Y_{40}M_{10}$ or $N_{00}M_{50}M_{10}$) near the margin, with center yellowish brown to ochraceous ($N_{40}Y_{99}M_{50}$), or orangish yellow, or also brownish yellow ($N_{10}Y_{80}M_{30}$); membranous, context moderately fleshy (< 2 mm); surface glabrous, smooth, humid or seemingly viscid, dull to semi translucent at the margin, hygrophanous. *Lamellae* free to adnexed, close to very close, abundant, *L* ca. 35, narrow, unequal, *l* = 4-5, simple or rarely interveined, opaque, smooth, pale cream ($N_{00}Y_{10}M_{00}$), edge entire, concolorous. *Stipe* 70-83×2.3-4 mm, central, cylindrical, some contorted, equal or with broadened base, with an abundant, yellowish cream, strigose basal mycelium; semi cartilaginous to cartilaginous, fibrilous, hollow; dark reddish brown ($N_{60}Y_{90}M_{60}$) all over the external surface of the stipe cortex, but with




Figs 16-20. *Marasmius puberistipitatus* (*JO308* – Holotype): **16.** basidiomata; **17**. basidiospores; **18.** basidioles; **19.** cheilocystidia; **20.** smooth cells of the pileipellis. Scale: **16** = 16 mm, **17-20** = 10 µm.

cream pubescence; surface strongly pubescent or sometimes with sparse strigosity covering all the stipe surface.

*Basidiospores* 9-13 × 3.8-4.8 µm [$x_m$= 11 (± 0.8)×4.2 (± 0.3) µm; $Q_m$ = 2.6 (± 0.2); *n* = 30], shortly oblong, lacrimoid to short clavate, hyaline, smooth, thin-walled, inamyloid. *Basidia* not observed. *Basidiolas* 20.3-28×5.5-8 µm, clavate to cylindrical clavate, some fusoid, hyaline, thin-walled, inamyloid. *Pleurocystidia* absent. *Cheilocystidia* 16.5-23(-28.8)×9-14.3(-18.8) µm, similar to the smooth cells of the pileipellis in outline, hyaline, thin-walled. *Lamellar trama* strongly dextrinoid, irregular, composed of interwoven and interconnected hyphae, cylindrical, 2.5-12 µm diam., branched, smooth, thin-walled, hyaline. *Pileus trama* strongly dextrinoid, irregular, composed of hyphae similar to those of lamellae trama, some inflated, 3.8-16.3 µm diam., regular in outline. *Pileipellis* hymeniform, dextrinoid, composed of *Globulares*-type smooth cells, (15.3-)18.8-30.6×11.5-22.5 µm, vesiculose, clavate to pyriform, or ballon-shaped, some flattened at the top, frequently pedicellate, hyaline, thin-walled, dextrinoid. *Stipe trama* strongly dextrinoid, cortical hyphae in parallel, cylindrical, 3.8-12.5 µm diam., regular in outline, branched,

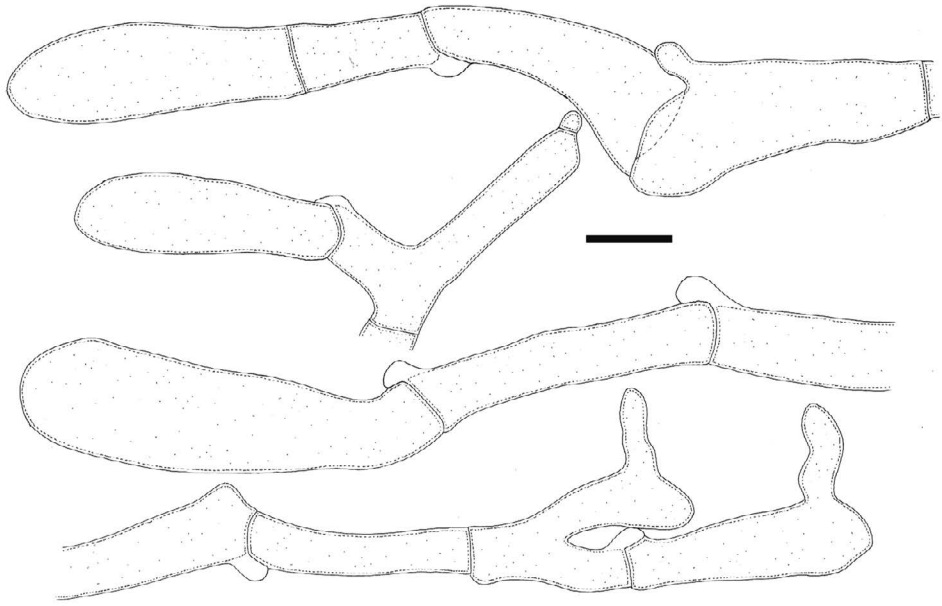


Fig. 21. *Marasmius puberistipitatus* (*JO308* – Holotype): Stipitipellis. Scale: 10 µm.

smooth, pale brownish yellow, walls moderately thick; internal hyphae hyaline, thin-walled. *Stipitipellis* with filamentous extensions of hyphal endings rising from a strigose-pubescent layer, cylindrical, forming clavate endings, overall undifferentiated, septate, hyaline, thin-walled, inamyloid. *Clamp connections* present in all tissues, but not seen at the base of the smooth cells of the pileipellis, nor in the lamellae and pileus trama.

*Habit and substrate*. Gymnopoid, gregarious, on leaves, humus and rotten twigs of dicotyledonous tree.

*Material examined.* BRAZIL. São Paulo: Santo André City, Reserva Biológica de Paranapiacaba, 9 Dec 2010, *J.J.S. Oliveira & P.O. Ventura JO308* (Holotype, SP445483).

*Comments*. Only one collection was obtained from the field, but composed of many basidiomata. *Marasmius puberistipitatus* is mainly characterized by having humid or apparently viscid, yellowish cream to pale ochraceous, slightly corrugate pileus; by numerous, free, cream-colored lamellae; and by strongly pubescent or sparsely strigose stipe all over, with abundant basal mycelium. The basidiospores are short-elongate, lacrimoid or clavate (9-13 µm); and the cheilocystidia and cells of the pileipellis consist of clavate to pyriform smooth cells. The entire hyphal trama is strongly dextrinoid, with slightly inflated hyphae and the stipitipellis has clavate hyphal endings emerging from the loose layer of hyphae which covers the stipe surface. *Marasmius puberistipitatus* is a member of sect. *Globulares sensu* Singer (Singer, 1986).

*Marasmius flavus* Singer and *M. mesosporus* Singer (Singer, 1964) are two similar species, also in spore size [cc. 13.5×3.2 µm in the former and 10.5-13.5 (-15.5)×4.5-5.3(-6.7) µm in the latter]. *Marasmius flavus* also shares a similar pileus pigmentation, but differs by having distant lamellae, glabrous stipe, presence of

pleurocystidia and smaller smooth cells in the pileipellis (16×11.5-12.5 µm), whereas *M. mesosporus* differs from *M. puberistipitatus* in having a much smaller pileus (15-25 mm diam.) which is pale violet with ochraceous central disc, more distant lamellae, glabrous stipe and smooth cells in the pileipellis smaller than 22.5×15 µm. *Marasmius viegasii* Singer also has oblong spores and comparable in size (about 16×4 µm) to those of *M. puberistipitatus*, but with many other strikingly different morphological characteristics (Singer, 1976).

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