

**PANAEOLUS (AGARICALES) FROM WESTERN  
PARANÁ STATE, SOUTH BRAZIL, WITH A  
DESCRIPTION OF A NEW SPECIES,  
PANAEOLUS SYLVATICUS**

A. G. S. SILVA-FILHO<sup>1</sup>, C. SEGER<sup>1</sup> & V. G. CORTEZ<sup>2</sup>

Three species of *Panaeolus* were collected in the western region of Paraná State, South Brazil. *Panaeolus sylvaticus* is proposed as a new species, based on macro- and micromorphological features and substrate (rotten wood and litter). *Panaeolus antillarum* and *P. papilionaceus* var. *parvisporus*, two coprophilous and widely distributed species, are also reported. All species are illustrated and discussed in detail, regarding their taxonomy, ecology and distribution. A key to the known species of *Panaeolus* from Paraná State is presented.

**Keywords.** Bolbitiaceae, coprophilous fungi, mushrooms, Psathyrellaceae, seasonal semideciduous forest, taxonomy.

INTRODUCTION

*Panaeolus* (Fr.) Quél. is a small agaric genus comprising approximately 77 species (Kirk, 2018). The family includes species with very wide distributions, because most members are associated with dung of several herbivores, especially cattle and horses (Gerhardt, 1996). The genera *Anellaria* P. Karst., *Copelandia* Bres. and *Panaeolina* Maire are considered distinct by some mycologists (Singer, 1986; Young, 1989), whereas others consider the species placed in these genera to be members of *Panaeolus s.l.* under a broader concept (Ola'h, 1969; Watling & Gregory, 1987). Classified by Singer (1986) in the family Coprinaceae Overeem & Weese, more recently the genus was suggested to belong in the Bolbitiaceae Singer (Matheny *et al.*, 2006), but in the MycoBank database it is placed in the Psathyrellaceae Vilgalys, Moncalvo & Redhead. Although the systematic position of the genus remains unclear, the available data indicate that *Panaeolus* and its allies may be best placed in a new family, with an intermediate position between the Bolbitiaceae and Psathyrellaceae (Tóth *et al.*, 2013).

In Brazil, twelve *Panaeolus* names are reported, mainly from the south of the country, although only a few studies have focused on the genus and its allies (Stijve & De Meijer, 1993; Alves & Cavalcanti, 1996). Rick (1961) reported nine *Panaeolus* taxa from Rio Grande do Sul State, but in most cases these names are misidentifications or synonyms or lack specimens (e.g. *P. atro-sanguineus* Henn. and *P. phalarnarum* Fr.). De Meijer (2006)

<sup>1</sup> Programa de Pós-Graduação em Botânica, Universidade Federal do Paraná, Caixa Postal 19031, 81531-980 Curitiba – PR, Paraná, Brazil. E-mail for correspondence: [silvafilhoags@gmail.com](mailto:silvafilhoags@gmail.com)

<sup>2</sup> Departamento de Biodiversidade, Universidade Federal do Paraná, Rua Pioneiro 2153, Jardim Dallas, CEP 85950-000, Palotina, Paraná, Brazil.

listed the following taxa from Paraná State: *Panaeolus antillarum* (Fr.) Dennis, *P. cinctulus* (Bolton) Sacc., *P. papilionaceus* var. *parvisporus* Ew. Gerhardt and *P. cf. reticulatus* Overh. De Meijer (2006) also reported *Panaeolus foenicicii* (Fr.) J. Schröt, currently a member of the genus *Panaeolina*, and *Panaeolus cambodginiensis* Oláh & R. Heim, *P. cyanescens* (Berk. & Broome) Sacc., and *P. aff. tropicalis* Oláh, which are currently members of the neurotropic genus *Copelandia* Bres (Singer, 1986; Young, 1989). More recently, *Copelandia mexicana* Guzmán, a non-coprophilous species, was reported from the western region of Paraná State (Silva-Filho *et al.*, 2018a).

Considering the limited knowledge of the mycobiota, and the agaricoid fungi in particular, for this study we collected specimens from selected areas in western Paraná State (Silva-Filho *et al.*, 2016; Silva-Filho & Cortez, 2017; Silva-Filho *et al.*, 2018a, 2018b). Our aim is to provide information on the richness, taxonomy and distribution of mushrooms found in that region, and the results dealing with *Panaeolus* are presented here, including full descriptions of collected materials and a key for species reported from the state.

#### MATERIALS AND METHODS

Specimens were collected in two localities, comprising fragments of seasonal semideciduous forest (Atlantic Forest biome) in the western region of Paraná State: Reserva Nacional do Patrimônio Nacional (RPPN) Fazenda Açú, in the Terra Roxa municipality, and São Camilo State Park, in the Palotina municipality.

Morphological analysis (macro- and microscopic) followed standard procedures for agaricoid fungi (Largent *et al.*, 1977; Largent, 1986). Colour names and codes used in the macroscopic descriptions are based on Kornerup & Wanscher (1978). The morphological terminology follows that used by Gerhardt (1996). In the description of basidiospores, size is given as length  $\times$  width in face view  $\times$  width in side view,  $Q$  is the quotient between the length and width,  $Q_m$  is the medium value of  $Q$ , and  $n$  is the number of measured basidiospores/number of analyzed basidiomata/number of collections. All microscopic structures were observed from sections obtained from dried material, mounted in 5% KOH solution, while Melzer's reagent was used to check amyloid reaction. Microscopic structures were measured at  $\times 1000$  magnification. Photographs were taken under an Olympus CX31 optical microscope with a Toup Cam FMA050 digital camera, and measurements taken using the software Toup Tek Toup View. All specimens were dried in the open air ( $\pm 38^\circ\text{C}$ ) and preserved at the mycological collection of the Herbarium of Campus Palotina (HCP), with the holotype housed at Universidade Federal do Paraná (UPCB).

#### TAXONOMY

***Panaeolus antillarum*** (Fr.) Dennis, Kew Bull. 15(1): 124 (1961). **Fig. 1.**

$\equiv$  *Agaricus antillarum* Fr., Elench. Fung. (Greifswald) 1: 42 (1828).

*Pileus* 29–39 mm in diameter, conic-campanulate, becoming conic-convex to broadly parabolic, surface slightly moist when young, at maturity dry, cracking, forming areolae



FIG. 1. *Panaeolus antillarum*. A, Basidiomata; B, basidiospores; C, pleurocystidia; D, cheilocystidia; E, caulocystidia; F, pileipellis; G, pileocystidia. Scale bars: A, 10 mm; B–G, 10  $\mu$ m. All photographs from A. G. S. Silva-Filho 801 (HCP 1152).

at centre, smooth, margin regular and non-striate, pale grey (1B1), brownish orange (5C3) to orange grey (5B2) at the centre. *Lamellae* adnate, somewhat fleshy, crowded, with three sizes of lamellulae, edge paler and serrulate, brownish grey (5D2, 5E2), mottled. *Stipe* 85–100  $\times$  6–7 mm, central, terete, equal to slightly bulbous at base, non-fistulose, surface

slightly striated and subtly pruinose near the apex, consistency fleshy, yellowish white (1A2) to pale grey (1B1) (Fig. 1A). *Context* fleshy, 4–6 mm thick, pale grey (1B1). *Veil* absent. *Spore print* dark grey (1F1).

*Basidiospores* (15–)15.5–18 × (9–)9.5–10.5(–11) × 8.5–10.5 μm ( $Q = 1.47$ – $1.72$ ,  $Qm = 1.64$ ,  $n = 50/1/1$ ), broadly ellipsoid to subhexagonal in face view, ellipsoid in side view, smooth, thick-walled (up to 1.5 μm thick), apically truncate by a broad germ pore, 1.3–2.5 μm, dark brown (Fig. 1B), not bleaching in sulphuric acid. *Basidia* 24–34.5 × 12.5–15 μm, broadly clavate to cylindroclavate, tetrasporic, hyaline. *Pleurocystidia* 26.5–41 × 12.5–19.5 μm, as chrysocystidia-like sulphidia, non-abundant, clavate, fusoid, rarely pedicellate, some with a small mucronate apex, thin-walled, hyaline but with an irregular greyish green refractive body (Fig. 1C). *Cheilocystidia* 19.5–37 × 7–13(–17) μm, as leptocystidia, abundant, clavate, lageniform to fusoid, thin-walled, hyaline (Fig. 1D). *Lamella edge* sterile. *Hymenophoral trama* regular, made up of filamentous and inflated hyphae, 3.5–12 μm in diameter, smooth, thin-walled, hyaline. *Pileipellis* an epithelium of isodiametric to (sub)pyriform elements, 12.5–35.5 μm in diameter, smooth, thin-walled, hyaline (Fig. 1F). *Pileocystidia* 36.5–71 × 7–12.5 μm, scarce, forming fascicles at the pileus margin, cylindrical to lageniform, subcapitate, thin-walled, hyaline (Fig. 1F,G). *Pileus trama* made up of interwoven hyphae 4–14 μm in diameter, horizontally arranged, thin-walled, hyaline. *Stipitipellis* a cutis, composed of filamentous hyphae 1.5–6 μm in diameter, smooth, thin-walled, hyaline. *Stipe trama* regular, made up of hyphae 4.5–12.5 μm in diameter, smooth, thin-walled, hyaline. *Caulocystidia* 18.5–39 × 3.5–12 μm, leptocystidia, abundant, cylindrical, thin-walled, hyaline (Fig. 1E). *Clamp connections* infrequently in all tissues.

*Specimen examined.* BRAZIL. **Paraná State:** Palotina, São Camilo State Park, 332 m, 24°18′15.83″S, 53°54′8.88″W, 18 vi 2016, A. G. S. Silva-Filho 797 (HCP 1168).

*Habitat and ecology.* On pastures, solitary, growing on cow dung.

*Distribution.* Widely distributed on all continents (Halama *et al.*, 2014). In Brazil, it has been reported from the Atlantic Forest in the south (Rio Grande do Sul, Santa Catarina and Paraná States), in the southeast (São Paulo), in the northeast (Pernambuco) and from the Cerrado in the Central-West region (Goiás State) (Maia *et al.*, 2015). In Paraná State, it was recorded in dense ombrophilous forest (De Meijer, 2006).

The robust, fleshy and greyish basidiomata, initially viscid and non-hygrophanous pileus, stipe with or without traces of a veil, smooth and opaque basidiospores with central and broad germ pore and presence of sulphidia are features that group *Panaeolus antillarum* in subg. *Anellaria* Gerhardt (1996). This subgenus also includes *Panaeolus semiovatus* (Sowerby) S.Lundell & Nannfeldt and its varieties, which differ by the presence of a membranous veil and larger (up to 24 μm long) basidiospores (Gerhardt, 1996). Furthermore, *Panaeolus antillarum* is well distributed in tropical and subtropical areas, whereas *P. semiovatus* prefers temperate regions (Halama *et al.*, 2014). This mushroom is

frequently found in pastures on cow dung, as one of the commonest coprophilous agarics in South Brazil.

*Panaeolus antillarum* is a species frequently misidentified by people looking for psychedelic fungi for recreational use, because it is very similar to *Psilocybe* species and *Copelandia cyanescens*, which are potentially psychoactive (Stamets, 1996), and grows on the same substrate types. The latter species is also a common coprophilous mushroom found in the same habitats in western areas of Paraná State (Silva-Filho *et al.*, 2018a), and despite being macroscopically similar, the basidiomata of *Copelandia cyanescens* are smaller and turn bluish when touched. The absence of psilocybin, psilocin and baeocystin, or serotonin and 5-hydroxytryptophan, in *Panaeolus antillarum* was confirmed by Stijve & De Meijer (1993) and Halama *et al.* (2014), based on Brazilian and Polish collections, respectively.

***Panaeolus papilionaceus* var. *parvisporus*** Ew. Gerhardt, *Bibl. Bot.* 147: 58 (1996). **Fig. 2.**

*Pileus* 12–31 mm in diameter, conic-campanulate to convex, sometimes umbonate, surface smooth, cracking at centre, margin non-striate, brownish grey (5C2) to light brown (5D4) at the disc, hygrophanous. *Lamellae* adnate, somewhat fleshy, crowded, with two sizes of lamellulae, edge even and concolorous with the sides, greenish grey (1D2) to medium grey (5E1), mottled. *Stipe* 33–110 × 2–5 mm, central, terete, equal to slightly bulbous at base, fistulose, surface smooth, yellowish white (1A2), pale grey (1B1) at apex, light brown (6D4) at centre, and light brown (6D5, 7D5) towards the base. *Context* fleshy, 1.5–3 mm thick, pale grey (1B1) (Fig. 2A,B). *Veil* present at pileus margin, forming appendiculate to dentate submembranous remnants, observed only in young specimens (Fig. 2A). *Spore print* dark grey (1F1).

*Basidiospores* (11–)11.5–14.5 × 7.5–9(–9.5) × 6–7.5 μm ( $Q = 1.36–1.68$ ,  $Q_m = 1.49$ ,  $n = 40/4/4$ ), limoniform in face view, elliptic in side view, smooth, thick-walled (up to 1.8 μm thick), apically truncate by a broad germ pore, 1.5–1.9 μm, dark brown (Fig. 2C), not bleaching in sulphuric acid. *Basidia* 20.5–25 × 9.5–13.5 μm, broadly clavate to cylindroclavate, tetrasporic, hyaline. *Pleurocystidia* absent. *Cheilocystidia* 20.5–33.5 × 4–7.5 μm, as leptocystidia, abundant, versiform, mostly cylindrical and ventricose, thin-walled, hyaline (Fig. 2D). *Lamella edge* sterile. *Hymenophoral trama* regular, made up of filamentous and inflated hyphae 3.5–8 μm in diameter, smooth, thin-walled, hyaline. *Pileipellis* an epithelium of (sub)isodiametric to pyriform elements, 10.5–19 μm in diameter, smooth, thin-walled, hyaline, rarely with light brownish content (Fig. 2F). *Pileocystidia* 19.5–44 × 7–12.5 μm, scattered, and in fascicles at the pileus margin, cylindrical to lageniform, with subcapitate apex, thin-walled, hyaline (Fig. 2F,G). *Pileus trama* consisting of interwoven and inflated hyphae, 10.5–20.5 μm in diameter, thin-walled, hyaline. *Stipitipellis* a cutis composed of filamentous hyphae 1.5–4.5 μm in diameter, smooth, thin-walled, hyaline. *Stipe trama* regular, composed of hyphae 3.5–16.5 μm in diameter, smooth, thin-walled, hyaline. *Caulocystidia* 18.5–56 × 5.5–10.5 μm, clavate, some with swollen apex, flexuous, thin-walled, hyaline (Fig. 2E). *Clamp connections* inconspicuous, present in all tissues.



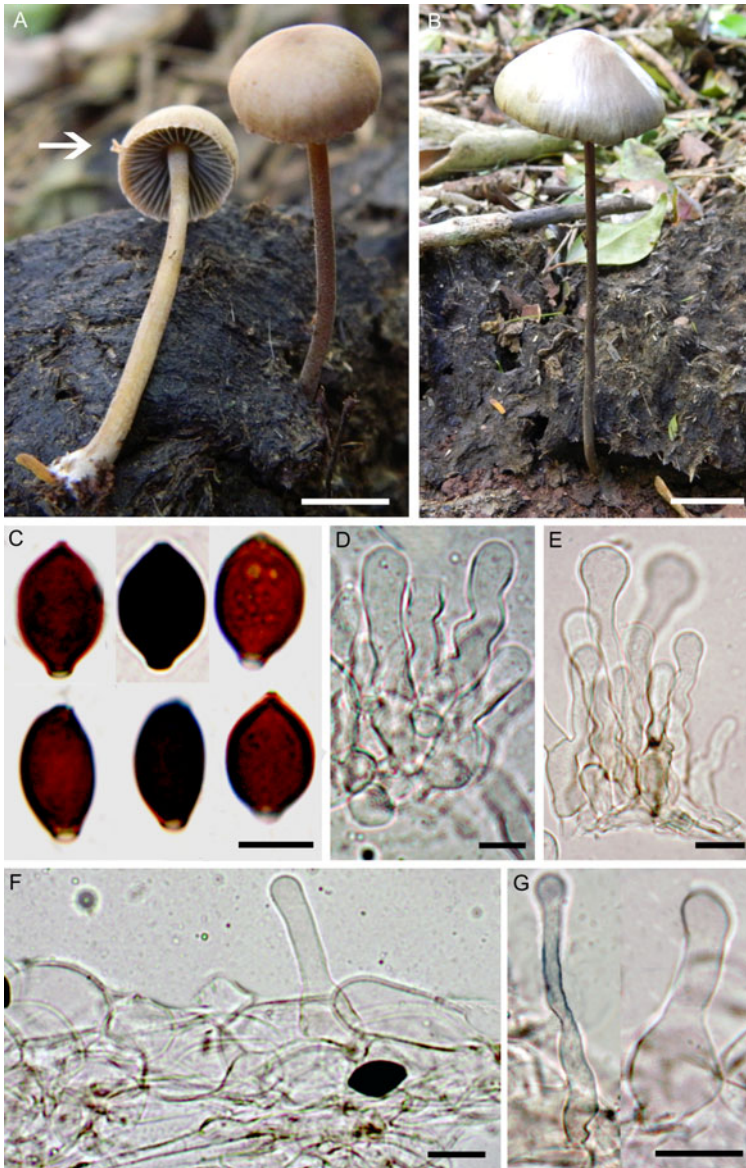


FIG. 2. *Panaeolus papilionaceus* var. *parvisporus*. A, Young basidiomata with remains of veil (arrow); B, mature basidioma; C, basidiospores; D, cheilocystidia; E, caulocystidia; F, pileipellis; H, pileocystidia. Scale bars: A and B, 10 mm; C–H, 10  $\mu$ m. Photographs: A, A. G. S. Silva-Filho 801 (HCP 1152); B–H, A. G. S. Silva-Filho 798 (HCP 1167).

*Specimens examined.* BRAZIL. **Paraná State:** Palotina, São Camilo State Park, 18 vi 2016, A. G. S. Silva-Filho 798 (HCP 1167), 799 (HCP 1166); *ibid.*, 23 vi 2016, A. G. S. Silva-Filho 801 (HCP 1152), 803 (HCP 1170).

*Habitat and ecology.* Occurs on pastures growing on cow dung, gregarious to subcaespitose.

*Distribution.* Widely distributed (Gerhardt, 1996). In Brazil, it has been reported from Atlantic Forest in the south (Rio Grande do Sul and Paraná States) and the southeast (São Paulo) (Maia *et al.*, 2015). In Paraná State, De Meijer (2006) recorded it from dense ombrophilous forest.

The absence of metuloidal cystidia, the limoniform basidiospores in face view, the pileus with veil remnants in the margin and the non-bluing basidiomata place *Panaeolus papilionaceus* in subg. *Panaeolus* sect. *Panaeolus* in the sense of Gerhardt (1996), along with *Panaeolus venezolanus* Guzmán and *Panaeolus rubricaulis* Petch. Gerhardt (1996) states that *Panaeolus papilionaceus* var. *papilionaceus* is distinguished by the larger basidiospores (15–18 µm long) and distinctly appendiculate pileus margin. In contrast, *Panaeolus papilionaceus* var. *parvisporus* has basidiospores up to 15 µm long and possess a very fugacious veil at the pileus margin, sometimes absent. Our collections are characterised by basidiospores up to 14.5 µm long and fugacious traces of veil, observed only in young basidiomata, therefore we consider the South Brazilian specimens within the concept of *Panaeolus papilionaceus* var. *parvisporus*.

*Panaeolus venezolanus*, known from Venezuela and Mexico, has a membranous annulus on the stipe, which is absent in *P. papilionaceus* var. *parvisporus* (Guzmán, 1978; Gerhardt, 1996). *Panaeolus rubricaulis*, described from Sri Lanka, differs in the presence of pleurosulphidia, which are also not found in *P. papilionaceus* var. *parvisporus* (Gerhardt, 1996).

*Panaeolus papilionaceus* falsely gained notoriety for its supposed hallucinogenic status after Schultes (1939) doubtfully indicated *Panaeolus campanulatus* var. *sphinctrinus* (Fr.) Quél. to be the sacred *teonanacatl* used in Aztec ceremonies. Stamets (1996) reported no effects after ingesting nearly thirty specimens of the species, although Guzmán *et al.* (2000) considered *Panaeolus papilionaceus* var. *papilionaceus* *sensu auct. non s. Ew.* Gerhardt as a neurotropic species. However, the hallucinogenic or neurotropic status of that mushroom has not been supported by chemical analysis.

***Panaeolus sylvaticus*** Silva-Filho & Cortez, **sp. nov.** – Type: Brazil, Paraná, Palotina, São Camilo State Park, 09 vi 2015, A. G. S. *Silva-Filho* 478 (holo UPCB). MycoBank no. 827918.

Basidiomata delicate with pileus less than 15 mm broad and stipe less than 3 mm broad, solitary on rotten wood, fallen leaves and small branches. Lamellae with inconspicuous pale droplet secretion on the edges. Basidiospores (8.5–)9–11.5(–12.5) × (5.5–)6–7.5 × 4–6.5 µm, limoniform in face view, ellipsoid in side view, smooth, truncate, brown to dark brown. Pleurocystidia absent. Cheilo-, pileo- and caulocystidia with yellowish droplets or content. Clamp connections present, inconspicuous. **Fig. 3.**

*Pileus* 5–14 mm in diameter, broadly plane, umbonate, convex, conic-campanulate to broadly parabolic, surface smooth to slightly fibrillose, margin striate, rarely non-striate,

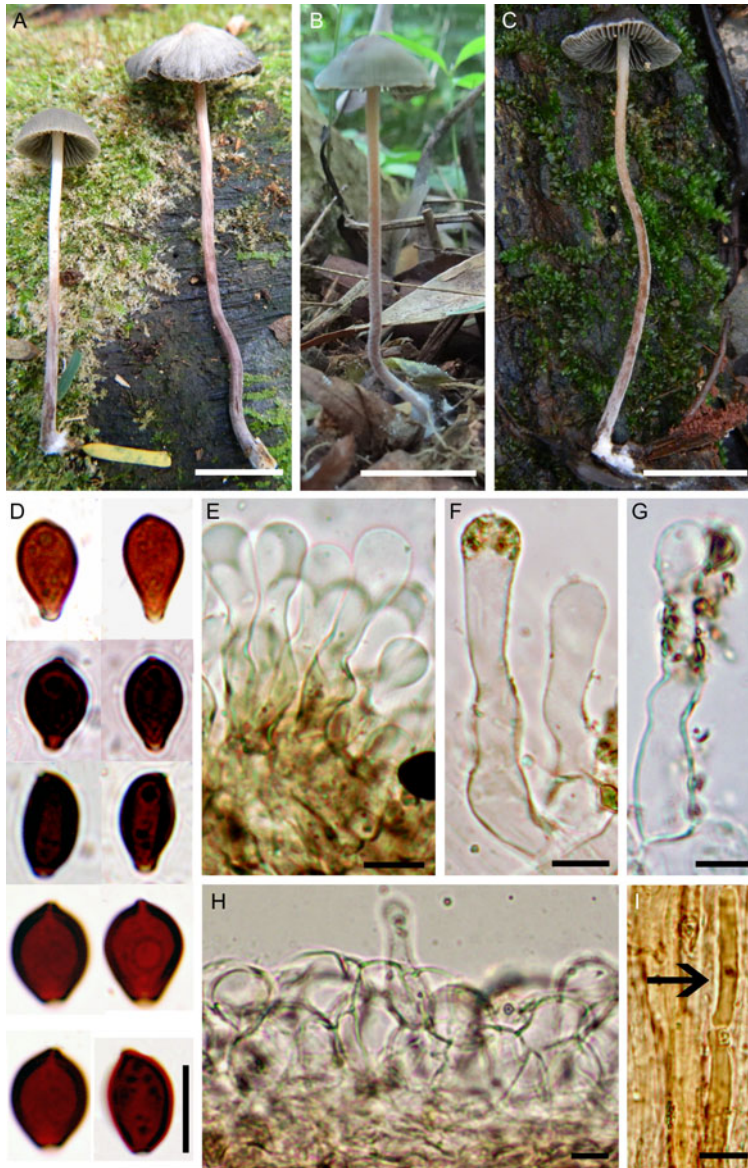


FIG. 3. *Panaeolus sylvaticus* Silva-Filho & Cortez. A–C, Basidiomata; D, basidiospores; E, cheilocystidia; F, pileocystidia; G, caulocystidium; H, cross-section of pileus, showing the pileipellis with pileocystidia, I, stipite trama with oleiferous hyphae (arrow). Scale bars: A–C, 10 mm; D–I, 10  $\mu$ m. Photographs: A and D–I, A. G. S. Silva-Filho 478 (UPCB – holotype); B, A. G. S. Silva-Filho 549 (HCP 1217); C, A. G. S. Silva-Filho 444 (HCP 1216).

occasionally undulate, colour varying from pale grey (1B1), light grey (1C1), grey (1D1), greyish yellow (1B4), yellowish grey (2B2) or greenish grey (1B2) to olive (2E3, 1F8) and olive brown (4F8). *Lamellae* adnate, thick membranous, crowded, with two sizes of



lamellulae, first olive grey (1F8, 2F2), then dark grey (1F7) mottled, with even to slightly crenate and conspicuously paler edges, some with inconspicuous off-white secretory droplets. *Stipe* 33–52 × 1.5–3 mm, central, terete, equal, fistulose, with an insititious base, but occasionally with a white (1A1) to whitish basal mycelium, striated to slightly pubescent, consistency fleshy, yellowish white (1B1), greyish orange (5B4) or light orange (6A4) at apex, yellowish brown (5F8), brown (6E5, 6E4, 7E3) to dark brown (6F8) towards the base (Fig. 3A–C). *Context* fleshy, 1–2 mm thick, pale grey (1B1) to yellowish grey (1A2). *Veil* absent. *Spore print* dark grey (1F1).

*Basidiospores* (8.5–)9–11.5(–12.5) × (5.5–)6–7.5 × 4–6.5 μm ( $Q = 1.31–1.83$ ,  $Q_m = 1.47$ ,  $n = 105/7/7$ ), limoniform in face view, ellipsoid in side view, smooth, thick-walled (wall up to 1.2 μm thick), apically truncate by germ pore, 1.3–1.9 μm, orange brown to dark brown (Fig. 3D), not bleaching in sulphuric acid. *Basidia* 17–21(–28) × 7–10 μm, broadly clavate to cylindroclavate, predominantly tetrasporic, sometimes bisporic, hyaline. *Pleurocystidia* absent. *Cheilocystidia* 26–40 × 4.5–10 μm, as leptocystidia, clavate, clavate-pedicellate, cylindrical, cylindroclavate, flexuous, rarely ventricose, sometimes septate, abundant, thin-walled, hyaline, smooth or covered with numerous yellow-green droplets along the wall (Fig. 3E). *Lamella edge* sterile. *Hymenophoral trama* regular, made up of filamentous and inflated hyphae 2.5–15 μm in diameter, smooth, thin-walled, hyaline to yellowish brown. *Subhymenium* composed by filamentous hyphae, 2–4.5 μm in diameter, smooth, thin-walled, light brown. *Pileipellis* an epithelium composed of cylindrical, isodiametrical to pyriform cells, 11–33 μm in diameter, thin-walled, hyaline smooth or faintly covered by small yellow-green droplets (Fig. 3H). *Subpellis* a layer of filamentous hyphae, 2.5–4 μm in diameter, parallel, horizontally arranged, thin-walled, smooth, light brown. *Pileocystidia* 19.5–44 × 7–12.5 μm, cylindrical, clavate, lageniform, thin-walled, hyaline with yellow-green droplets, scattered at pileus centre and more evident (in fascicles) at pileus margin (Fig. 3F,H). *Pileus trama* composed of horizontally arranged, interwoven, filamentous and inflated hyphae 4.5–16.5 μm in diameter, hyphae thin-walled, hyaline to yellowish brown. *Stipitipellis* a cutis composed of smooth, thin-walled, light brown, filamentous hyphae 1.5–3.5 μm in diameter. *Stipe trama* regular, with hyphae 5–12 μm in diameter, smooth, thin-walled, hyaline and light brown. *Caulocystidia* 27–54(–57) × 3–11.5 μm, clavate, some with swollen apices, flexuous, thin-walled hyaline, with yellow-green droplets at apex (Fig. 3G). *Clamp connections* present, inconspicuous, observed only at the base of basidia and cystidia. *Oleiferous hyphae* observed in subpellis layer of pileipellis, lamella and stipite trama (Fig. 3I).

*Additional specimens examined.* BRAZIL. **Paraná State:** Palotina, São Camilo State Park, A. G. S. Silva-Filho 322 (HCP 1214); *ibid.*, 30 ix 2015, A. G. S. Silva-Filho 636 (HCP 1215). Terra Roxa, RPPN Fazenda Açú, A. G. S. Silva-Filho 444 (HCP 1216); *ibid.*, 20 vii 2015, A. G. S. Silva-Filho 549 (HCP 1217); *ibid.*, 12 x 2016, A. G. S. Silva-Filho 650 (HCP 1218); *ibid.*, 13 xii 2016, A. G. S. Silva-Filho 780 (HCP 1219).

*Habitat and ecology.* Occurs in seasonal semideciduous forest, solitary, growing on very rotten wood, fallen leaves and small branches.

*Distribution.* Known only from the type locality in Brazil.

*Etymology.* From Latin *sylva* (= forest), referring to the habitat of species.

*Panaeolus sylvaticus* is diagnosed by its small (less than 14 mm), grey to olive, smooth to slightly fibrillose pileus, weeping lamellae with off-white droplets, limoniform basidiospores in face view, and the absence of pleurocystidia, the presence of cheilo-, pileo- and caulocystidia with yellowish droplets or content, and the presence of clamp connections. Considering these distinctive morphological features and the specific ecology (substrate and habitat preferences), we propose *Panaeolus sylvaticus* as a new species.

By virtue of the smooth basidiospores, the absence of a membranous annulus, metuloids and chrysocystidia-like sulphidia, as well as the presence of cheilocystidia secreting yellowish droplets, *Panaeolus sylvaticus* belongs to *Panaeolus* subg. *Panaeolus* sect. *Guttulati* in the sense of Gerhardt (1996). It was previously a monotypic section, comprising only *Panaeolus guttulatus* Bres., a species known from Europe and South Africa (Gerhardt, 1996; Pancorbo & Ribes, 2010; Panchetti, 2015).

*Panaeolus guttulatus* and *P. sylvaticus* share some morphological similarities: both present grey to olive colours in the pileus, pileocystidia and cheilocystidia with yellowish droplets, bi- and tetrasporic basidia, and the absence of pleurocystidia (Gerhardt, 1996). However, *Panaeolus guttulatus* has a darker and more robust pileus (10–30 mm in diameter) and smaller basidiospores ( $7\text{--}9 \times 4\text{--}5 \mu\text{m}$ ) with oil droplets. The production of the viscous substance by the cheilocystidia is a remarkable feature in *Panaeolus guttulatus* and can be observed even in dried specimens (Gerhardt, 1996), whereas in *P. sylvaticus* it is not so conspicuous. In addition, *Panaeolus sylvaticus* grows on rotting wood and leaf litter in seasonal semideciduous forest in the American subtropics, in contrast to *P. guttulatus*, which is found on sandy soil in temperate areas of Europe and South Africa (Gerhardt, 1996; Pancorbo & Ribes, 2010).

*Panaeolus fraxinophilus* A.H.Sm., from North America, is another non-coprophilous species without pleurocystidia and with similar pileus size (8–15 mm) and basidiospores measuring  $9\text{--}11 \times 6.5\text{--}7 \times 5\text{--}6 \mu\text{m}$  (Smith, 1948). Despite these similarities, *Panaeolus fraxinophilus* has a dark grey to sordid yellowish brown pileus, not producing yellowish content in the cystidia, and the cheilocystidia are narrower ( $4\text{--}5 \mu\text{m}$  in diameter; Smith, 1948). Moreover, *Panaeolus fraxinophilus* is a lignicolous species and grows only on wood of *Fraxinus* species (Smith, 1948).

Finally, *Panaeolus lignicola* Rick (1930), described from Rio Grande do Sul State (South Brazil), is another non-coprophilous species with similar size of pileus (8 mm in diameter), stipe ( $20 \times 2 \text{mm}$ ) and basidiospores ( $10\text{--}12 \times 8\text{--}9 \mu\text{m}$ ; Rick, 1961). Gerhardt (1996) revised the alleged type collection of the species preserved at PACA Herbarium and reported much larger spores ( $12\text{--}14 \times 8.5\text{--}9 \times 7\text{--}7.5 \mu\text{m}$ ). He noted that the obtained material is not a holotype but the ‘neotype’. Observing a relatively light yellow brownish colour of basidiospores and their olive brownish discoloration in KOH solution, Gerhardt (1996) considered Rick’s specimen as a member of *Psilocybe* (Fr.) P.Kumm., “i.e. *Deconica* (W.G. Sm.) P.Karst.” and suggested a close morphological resemblance of the studied material to *Deconica coprophila* (Bull.) P.Karst., which, however, does not grow

on wood. Neither the presence of droplets in the gill margin nor the presence of any kind of cystidia was reported by Rick (1930, 1961) or Gerhardt (1996). Given the differences in the basidiospore size and their colour, as mentioned by Rick (pale violaceous) and Gerhardt (light yellow brownish), it is very probable that the preserved 'neotype' does not correspond to original description of the species (Rick, 1930), and therefore *Panaeolus lignicola* should be considered a doubtful name.

#### KEY TO *PANAEOLOUS* TAXA REPORTED FROM PARANÁ STATE, BRAZIL

- 1a. Basidiomata small (less than 14 mm in diameter), growing in forests on very rotten wood, fallen leaves and small branches; cystidia with yellowish droplets or content  
**P. sylvaticus**
- 1b. Basidiomata over 14 mm in diameter, growing in pastures on cow dung or grass; cystidia without yellowish droplets or content \_\_\_\_\_ 2
- 2a. Pleurocystidia present \_\_\_\_\_ **P. antillarum**
- 2b. Pleurocystidia absent \_\_\_\_\_ 3
- 3a. Basidiomata without veil, cheilocystidia often capitate **P. cinctulus** (De Meijer, 2006)
- 3b. Basidiomata with remaining veil, cheilocystidia cylindrical **P. papilionaceus** var. **parvisporus**

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