Abstract
*Gymnopilus* is characterized by its ferruginous-yellow basidiomata and lamellae, ferruginous spore print, ellipsoidal basidiospores with warty and rough ornamentation, and lacking a germinative pore. Here, novel data on the *Gymnopilus* species of Paraguay is presented, macro and microscopic morphological characteristics, distribution, and ecology are described, and a taxonomic discussion is provided. *Gymnopilus imperialis* is recorded in the Alto Paraná Department, *G. lepidotus* in the Central Department, *G. luteofolius* in the Cordillera Department, *G. peliolepis* in the Paraguari Department, and *G. purpureosquamulosus* in the Central Department and Boquerón, all as new records for Paraguay. Photographs of the fresh basidiomata and some microscopic structures such as basidia and basidiospores are attached.

**Key words**: Agaricomycetes, fungal diversity, taxonomy.

Introduction
The genus *Gymnopilus* P. Karst. includes more than 200 saprobic species, mainly lignicolous, which is why they represent an important component of the wood mycobiota around the world (Guzmán-Dávalos 2003; Holec 2005; Kirk *et al.* 2008). Based on the pigments it contains and the non-mycorrhizal habit, Kühner (1984) classified *Gymnopilus* together with *Galerina* Earle in the Strophariaceae family. Later, Singer (1986) placed it within Cortinariaceae due to the ornamentation and lack of germinal pore of the basidiospores. Currently, according to the results of phylogenetic analysis based on DNA sequences, *Gymnopilus* is not related to any of the two families mentioned above, since it forms an independent clade called
“Gymnopilae” by Matheny et al. (2006) and is currently included in the family Hymenogastraceae (Kirk et al. 2008).

Gymnopilus is characterized by its yellow, ferruginous or purple basidiomata, yellow to ferruginous lamellae, central to eccentric stipe, with a partial cortinoid or fibrillose veil, generally fugacious, or as a membranous ring, bitter to farinaceous flesh, ferruginous spore print, basidiospores ellipsoidal with warty to rugose ornamentation, without germinative pore and in most species with dextrinoid walls, presence of subcapitulated cheilocystidia to capitated and hyphae with clamp connections (Horak 1989; Guzmán-Dávalos 2003; Holec 2005). An important ecological character is the lignicolous habit, being able to grow in woods in different degrees of decomposition (Guzmán-Dávalos 2003; Holec 2005) and apparently without having a preference for the substrate (Singer 1951). However, it has been observed that some tropical species are associated with Angiosperms and others with palms, while in temperate zones they are associated with conifers.

In South America Gymnopilus has been recorded by Berkeley & Cooke (1876), Saccardo (1887), Patouillard & Gaillard (1888), Singer (1951, 1953b, 1961, 1969, 1975), Singer & Digilio (1951), Dennis (1953, 1961, 1970), Raithelhuber (1974, 1980, 1991, 2004), Talice & Talice (1980), Bononi et al. (1984), Lazo (1984), Garrido (1985, 1988), Horak (1989), Pegler (1988, 1990, 1997), Putzke (1994), Valenzuela et al. (1994), Sede & Lópe (1999), Cardona et al. (2005), Cortez & Coelho (2005), Franco-Molano et al. (2005), Wright & Wright (2005), Lechner et al. (2006), Drechsler-Santos et al. (2007), Karstedt & Stümer (2008), Wright et al. (2008), Lobato et al. (2010), Vasco-Palacios & Franco-Molano (2013), Magnago et al. (2013), Sequeira (2013), Silva-Junior & Wartchow (2015) and Grassi et al. (2016). These authors have cited species for Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador and Uruguay. Nonetheless, records of this genus in Paraguay are scarce: Saccardo (1887), who cited Flammula sapinea var. australis Kalchbr. and Piris da Motta et al. (2015), who cited G. subtropicus Hesler for the Paraguari Department. However, Gymnopilus presents an important diversity in Paraguay, which is not yet documented. The aim of this work was to describe species of Gymnopilus and thus contribute to the registration and knowledge of agaricoid mycobionta of Paraguay.

Materials and Methods

Samples were collected in the Departments Alto Parán, Boquerón, Central, Cordillera and Paraguarí-Paraguay, and analyzed in the Análisis de Recursos Vegetales Laboratory, Mycology lab, Facultad de Ciencias Exactas y Naturales (FACEN), of the Universidad Nacional de Asunción, Paraguay. The macroscopic descriptions were based on fresh material, according to the guidelines proposed by Wright & Albertó (2002) and Lodge et al. (2004). The microscopic characteristics were described from the material mounted in 5% KOH and observed in an optical microscope; in addition, 1% floxin, Congo ammoniac red, Melzer reagent and cresyl blue were used, the last one for the metachromatic reaction. The following notations were followed when performing the measurements of the basidiospores: Q = ratio between the length and width of the spores, indicated as a range of variation; \( n \) = number of measured spores and \( N \) = number of basidiomata (Niveiro et al. 2012). The specimens studied were deposited in the herbarium of the Facultad de Ciencias Exactas y Naturales of the Universidad Nacional de Asunción, Paraguay (FACEN).

Results and Discussion

Five species of Gymnopilus were recorded: G. imperialis in the Alto Parán Department, G. lepidotus in the Central Department, G. luteofolius in the Cordillera Department, G. peliopelis in the Paraguari Department and G. purpureosquamulosus in the Central and Boquerón Departments, all as new records for Paraguay.

Gymnopilus imperialis (Speg.) Singer, Lilloa 22: 561 (1951) [1949].
≡ Pholiota imperialis Speg., Boletín de la Academia Nacional de Ciencias en Córdoba 11(4): 416 (1889).
Fig. 1

Cespitose to scattered basidiomata. Pileus 8–12 cm in diameter, ovoid when immature, convex, plane-convex to flat; margin entire, wavy, revolute in maturity; surface wet to dry, ochraceous orange, finely velvety when young, turning ferruginous orange, radially fibrillose in mature specimens, not hygrophane. Lamellae adnate to sinuated, ventricose, up to 0.8 cm wide, subdecurrent to decurrent, yellow when young, tobacco color to ferruginous when old, margin entire, concolorous, lamellulae of two lengths. Ferruginous spore print. Context ferruginous orange, does not
change to the touch. Characteristic smell of tobacco, taste not tested. Stipe 6–12 × 0.8–2 cm, cylindrical, widened towards the base, central, hollow, flaring, sulphurous yellow when young, reddish brown when mature, fibrous to fibrillose. Membranous partial veil, sulphurous yellow, later as an apical, evanescent membranous ring that leaves membranous remains to rust-brown fibrils in the stipe. Abundant basal mycelium, yellowish. Spore print dark brown ferruginous.

Basidiospores (6.4–)8.5–9 × 4.4–6.8 µm, Q = 1.26–1.44, Qx = 1.35, n = 30, N = 2, widely ellipsoid to ellipsoid, apex rounded to acute, strongly verrucose, warts large, without plage, with or without suprahilar depression, golden to ferruginous, dextrinoid, not metachromatic. Basidia (25–)28–35 × 7–8 µm, clavate, tetrasporic, sterigmata 4.5–6 µm long, amber to ferruginous. Pleurocystidia absent. Cheilocystidia 27.5–38.5 (–40) × 5.5–10 µm, clavate to narrowly utriform, subcapitated to capitated. Subhymenium cellular. Hymenophoral trama subregular, hyphae 4.5–9 (–11.5) µm in diam., thin-walled, yellowish. Pileus trama interwoven, hyphae of 5.5–8.5(–13.5) µm diam., thin-walled, yellowish. Pileipellis a cutis, prostrate hyphae, some erect to suberect, amber to brownish, septate, thin-walled. Caulocystidia not observed. Clamp connections present in the hyphae of the hymenophoral trama, pileus trama and stipe.

It was found in grassland near plantations of Pinus elliotti, during autumn.

Figure 1 – a-f. Gymnopilus imperialis – a, b, c. basidiomata when fresh (b. immature basidioma); d. cheilocystidia; e. basidiospores in cotton blue; f. basidiospores in KOH. (leg. M. Campi 027).
The type specimen is from Brazil, also recorded from Argentina, Costa Rica and Jamaica (Spegazzini 1889; Hesler 1969; Guzmán-Dávalos et al. 2003). In Brazil it has been cited for the states of São Paulo and Paraná (Spegazzini 1889; Pegler 1997; Capelari et al. 2015; BFG 2018).

**Examined material.** PARAGUAY. ALTO PARANÁ: Refugio Biológico Tatí Yupí, 25°22’22.6”S, 54°35’50.5”W, 10.IV.2015, M. Campi 003346 (FACEN).

This species is grouped within the spectabilis-imperialis clade as the basal species, which also includes *G. junonius* (Fr.) P.D. Orton, *G. pampeanus* (Speg.) Singer and *G. spectabilis* (Fr.) Singer, this clade includes robust basidiomata, with thick membranous ring and fibrilllose to slightly squamulosus, dark ferruginous colour pileus (Guzmán-Dávalos et al. 2003). The species of this clade are very similar to each other, and in many cases have been considered as synonyms or varieties of the same taxon (Guzmán-Dávalos et al. 2003).

*Gymnopilus pampeanus* is a related species, and is differentiated from *G. imperialis* by its cylindrical stipe and adnexed to inunate-dnate lamellae in the first one, besides *G. pampeanus* appears to be closely associated with Eucalyptus forests (Pegler 1983, 1997).

Another closely related species is *G. rugulosus* R.Valenz., Guzmán & J. Castillo. This species is known for the tropical and subtropical regions of the northern hemisphere, shares characters such as robust basidiomata with tuberculated basidiospores; however, it differs from *G. imperialis* by the presence of lageniform, ventricular, non-capitated or subcapitated pleurocystidia of 21–38 × 5–10 µm (Guzmán-Dávalos & Ovrebo 2001; Cardona et al. 2005).

*Gymnopilus imperialis* was originally described for the south of Brazil (Spegazzini, 1889), and considering the main morphological characters like robust basidiomata, pileus greater than 10 cm in diameter, claviform stipe widened towards the base, membranous ring, basidiospores subglobose to ellipsoidal, tuberculated, and absence of pleurocystidia to be consistent with those observed in the Paraguayan specimen, the material analyzed from Paraguay is identified as *G. imperialis*.

*Gymnopilus lepidotus* Hesler, Mycologia Memoirs 3: 40 (1969).

Basidiomata cespitose. Pileus 3.5–10 cm diam., hemispheric to convex, margin entire when young, plane-concave with revolute margin at maturity; wet to dry surface, ferruginous chestnut with vinous tones, becoming clear towards the margin, covered with chestnut scales, erect, abundant in the center, scattered towards the margin. Lamellae subdecurrent, crowded, up to 0.4 cm wide, reddish brown in fresh, ferruginous in dry, margin entire, concolorous, lamellulae of two lengths. Context thin, up to 0.1 cm thick, ferruginous yellow in dry samples, darkens to reddish brown with contact in fresh samples. Smell and taste not tested. Stipe 2–7 cm × 0.4–1 cm, central, cylindrical, widens slightly towards the base, up to 1 cm in diameter, hollow, beige to light brown, fibrilllose, striated, reddish to the touch. Partial veil not observed. Basal mycelium whitish to cream, abundant. A reddish pigment dissolves from the pileus when mounted in KOH. Spore print yellow ferruginous to orange ferruginous.

Basidiospores 6–7.5(–8.5) × (4–)4.5–5 µm, Q = 1.5–1.53, Qₜ = 1.51, n = 30, N = 2, ellipsoid, amygdaliform, with rounded to subacute apex, without plage, with or without suprahilar depression, thin-walled, warty, warts medium, golden to ochre, dextrinoid, not metachromatic. Basidia 19–24 × 6–7.5 µm, claviform, bi to tetrasporic, sterigmata 4.3–4.5 µm in length, hyaline or with amber-colored content. Pleurocystidia of pseudocystidia type, 21.5–27.5(–43.5) × 6–7.5(–10) µm, utriform to subusciform, with amber content. Cheilocystidia (15–)18–23 × (6–)8–8.5 µm, lageniform, with obtuse to subcapitate apex, hyaline or with amber content. Subhymenium cellular. Hymenophoral trama subregular, hyphae of 2–4 µm diam., up to 18.5–25.5 µm diam., thin-walled, hyaline or a few with amber content. Pileus trama radial, hyphae of 2.5–4 µm in diam., thin-walled, hyaline or a few with amber color. Pilepellis cutis to trichoderms in the scales, hyphae of 4.5–13 µm in diam., orange to yellowish, prostrate, suberect to erect. Caulocystidia 29.5–32 × 5–5.5 µm, cylindrical, thin-walled, scarce in the apical portion, absent in the rest of the stipe. Clamp connections present in the hyphae of the pileus trama, hymenophoral trama and stipe.

It was found on decomposing trunk, in urban area.

The type is from Florida, United States America (Hesler 1969; Guzmán-Dávalos 2003). In addition it was recorded from Argentina for Misiones Province (Wright & Wright 2005; Lechner et al. 2006; Wright et al. 2008; Grassi et al. 2016), from Colombia (Franco-Molano et al. 2005; Vasco-Palacios & Franco-Molano 2013) and
from Mexico for the states of Jalisco and Veracruz (Guzmán-Dávalos 1996).

**Examined material:** PARAGUAY. CENTRAL: San Lorenzo city, Universidad Nacional de Asunción Campus, 25°20'5,51"S, 57°30'56,95"W, 10.II.2017, Y. Maubet 003783 (FACEN).

*Gymnopilus lepidotus* is characterized by the brownish-colored pileus with small erect or adherent scales, pleurocystidia and basidioles with granular, golden content, usually very abundant, cheilocystidia and pleurocystidia not capitated to subcapitated and radial pileus trama (Guzmán-Dávalos 1996, 2003).

The size of the pileus is a character that has been discussed: Hesler (1969) and Wright et al. (2008) described the pileus as small, 4–8 mm in diam.; later Guzmán-Dávalos (1996, 2003), after reviewing the samples from Florida, stated that the measurements obtained by Hesler (1969) maybe mistaken because, even when dry, the samples reviewed by Hesler presented a bigger pileus, from 6–18(–26) mm in diam. In addition, some samples from Mexico reached up to 70 mm in diam. As for the pleurocystidia, Hesler (1969) mentioned that they are hyaline, rare and inconspicuous; abundant clavate basidioles with brown content. Guzmán-Dávalos (1996) interprets these basidioles as pleurocystidia of the pseudocystidia type, which coincides with the samples described by Wright et al. (2008), who mentioned subpyriform, clavate to subutriform pleurocystidia, 20–22 × 5–6 μm, with ferruginous chestnut content.

*Gymnopilus dilepis* (Berk. & Broome) Singer is a very similar species to *G. lepidotus*, and probably are synonymous (Guzmán-Dávalos 2003). However, *G. dilepis* has a paleotropical distribution, whereas *G. lepidotus* is an exclusively neotropical species (Guzmán-Dávalos 2003).

The presence of the cheilocystidia, caulocystidia, pleurocystidia of the pseudocystidia type with amber content in the samples from Paraguay are consistent with the microscopic

![Figure 2](https://example.com/image2.png)

**Figure 2** – a-f. *Gymnopilus lepidotus* – a, b. basidiomata (a. basidiomata when fresh; b. detail of the pileus showing scales); c. basidiospores; d. pleurocystidia of pseudocystidia type; e. cheilocystidia; f. caulocystidia. (leg. Y. Maubet 040).
descriptions of Guzmán-Dávalos (1996, 2003). However, the size of the basidioma in the Paraguayan samples are significantly greater than those cited in the literature. The basidiomata collected here were found saturated with rain water, which may have influenced the color of the pileus and the scales. Given that these characters are controversial, we do not believe it to be enough to discard the species, thus we conclude the specimen studied corresponds to *G. lepidotus*, and this therefore the first record in Paraguay.

*Gymnopilus luteofolius* (Peck) Singer, Lilloa 22: 260 (1951) [1949].
≡ *Agaricus luteofolius* Peck, Annual Report on the New York State Museum of Natural History 27: 94 (1875).

*Figure 3* – a-h. *Gymnopilus luteofolius* – a. basidiomata; b. basidiospores; c. hymenophoral trama; d1. basidium; d2. pleurocystidium; d3. basidiole; e. pileocystidium; f. pleurocystidium with rostrate apex; g. cheilocystidia; h. basidia. (leg. *M. Campi 128*).
== Pholiota luteofolius (Peck) Sacc., Sylloge Fungorum 5: 756 (1887) == Pholiota peliopilepis (Speg.) Singer, Lilloa 22: 561 (1951) [1949].

Examine material: PARAGUAY. CORDILLERA: Atyra City, Los Agüero country house, 25°20'45.2"S, 57°11'19.0"W, 12.XI.2016, M. Campi 128 (FACEN).

This species is characterized by a dark reddish to reddish brown colour on the surface of the pileus when young, turning pinkish red or yellowish red to yellowish; red to vinous context that shifts to yellowish, and the clavate to ventricose caulocystidia disposed in clusters, in addition the species has fusoid to ventricose pleurocystidia and ventricose cheilocystidia with capitale to non-capitate apex (Hesler 1969). The studied samples do not present dextrinoid basidiospores, which differs from the observations of Hesler (1969). Singer (1969) noted that the dextrinoid reaction could be lost in herbarium samples and it is very difficult to observe. Because the fresh material was not studied for the Paraguayan material, it is inconclusive whether or not the basidiospores are dextrinoid.

Gymnopilus in Paraguay

Basidiomata cespitose. Pileus 1.1–2.3 cm in diam., hemispheric to plane-convex; margin entire to rimose when fresh, involute when young, appendiculate when mature, dry, surface, whitish to cream color, covered by fibrilllose scales, erect, suberect to prostrate, reddish to purple, permanent, distributed more or less evenly over the surface of the pileus, which in dry turns dark brown on a yellowish to ochre surface. Lamellae close, ventricose, up to 0.3 cm wide, with a decurrent tooth, cream to yellowish in fresh, chestnut golden when dry. Margin entire, concolorous, lamellulae of two lengths. Context whitish in fresh, yellowish in dry. Smell and taste not tested. Stipe 2.3–3.5 × 0.5–0.8 cm, central, cylindrical, uniform to slightly widened towards the base, hollow, flexuous, fibrilllose to squamous, scales brown, insert to the substrate. Partial veil remains as yellowish membranous remains at the top of the stipe, evanescent. Spore print ferruginous chestnut.

Basidiomata cespitose. Pileus 1.1–2.3 cm in diam., hemispheric to plane-convex; margin entire to rimose when fresh, involute when young, appendiculate when mature, dry, surface, whitish to cream color, covered by fibrilllose scales, erect, suberect to prostrate, reddish to purple, permanent, distributed more or less evenly over the surface of the pileus, which in dry turns dark brown on a yellowish to ochre surface. Lamellae close, ventricose, up to 0.3 cm wide, with a decurrent tooth, cream to yellowish in fresh, chestnut golden when dry. Margin entire, concolorous, lamellulae of two lengths. Context whitish in fresh, yellowish in dry. Smell and taste not tested. Stipe 2.3–3.5 × 0.5–0.8 cm, central, cylindrical, uniform to slightly widened towards the base, hollow, flexuous, fibrilllose to squamous, scales brown, insert to the substrate. Partial veil remains as yellowish membranous remains at the top of the stipe, evanescent. Spore print ferruginous chestnut.

Basidiomata cespitose. Pileus 2.5–7.5 cm in diam., convex to plane-convex, margin entire, involute; surface yellowish chestnut, wet to dry, covered with erect to flattened scales, pyramidal, purple, evenly distributed when young, diminish towards the margins until disappearing in mature samples, not hygrophanous. Lamellae close, ventricose, up to 0.4 cm wide, decurrent to subdecurrent, yellow in fresh, with uneven color, ferruginous orange, with purple shades on the edge when dry, margin entire, lamellulae of three lengths. Context thin, up to 0.8 cm thick, whitish, adhering to the substrate. Spore print ferruginous chestnut.

Basidiomata cespitose. Pileus 2.5–7.5 cm in diam., convex to plane-convex, margin entire, involute; surface yellowish chestnut, wet to dry, covered with erect to flattened scales, pyramidal, purple, evenly distributed when young, diminish towards the margins until disappearing in mature samples, not hygrophanous. Lamellae close, ventricose, up to 0.4 cm wide, decurrent to subdecurrent, yellow in fresh, with uneven color, ferruginous orange, with purple shades on the edge when dry, margin entire, lamellulae of three lengths. Context thin, up to 0.8 cm thick, whitish, does not change color with touch. Smell and taste not tested. Stipe 2–3 × 0.2–0.6 cm, central, cylindrical, widens slightly towards the base, up to 0.66 cm diam., flexuous, fibrilllose, hollow, light yellow to light brown, stains with ferruginous color towards the base. Partial veil forms a fibrilllose ring in the upper part of the stipe, fleeting. Basal mycelium cottony, whitish, adhering to the substrate. Spore print ferruginous chestnut.

Basidiomata cespitose. Pileus 1.1–2.3 cm in diam., hemispheric to plane-convex; margin entire to rimose when fresh, involute when young, appendiculate when mature, dry, surface, whitish to cream color, covered by fibrilllose scales, erect, suberect to prostrate, reddish to purple, permanent, distributed more or less evenly over the surface of the pileus, which in dry turns dark brown on a yellowish to ochre surface. Lamellae close, ventricose, up to 0.3 cm wide, with a decurrent tooth, cream to yellowish in fresh, chestnut golden when dry. Margin entire, concolorous, lamellulae of two lengths. Context whitish in fresh, yellowish in dry. Smell and taste not tested. Stipe 2.3–3.5 × 0.5–0.8 cm, central, cylindrical, uniform to slightly widened towards the base, hollow, flexuous, fibrilllose to squamous, scales brown, insert to the substrate. Partial veil remains as yellowish membranous remains at the top of the stipe, evanescent. Spore print ferruginous chestnut.

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μm long, hyaline. Cheilocystidia 11–28 × 4.5–8.5 μm, lageniform, capitate, hyaline or with chestnut content. Subhymenium cellular. Hymenophoral trama subregular, hyphae of 3–12.5(–15) μm, hyaline, thin-walled. Pileus trama composed of intertwined hyphae of 3–14.5 μm in diameter, hyaline, thin-walled. Thrombopleurous hyphae of 4.5–9.5 μm in diam., with yellowish refringent content, abundant. Pileipellis a cutis to trichoderm in the scales, with hyphae of 6.5–11.5 (~13.5) μm diam., prostrate, suberect to erect, golden to brown. Pileocystidia not observed. Caulocystidia not observed. Clamp connections present in the hyphae of the pileus trama, hymenophore trama and stipe when mounted in KOH. A yellowish pigment dissolves.

It was found on decaying trunk of the palm native to south America, Acrocomia aculeata, during summer.

It's known for Argentina, Brazil and Florida, USA according to Hesler (1969), Farr (1973), Raithelhuber (1988, 1991, 2000, 2004), Singer (1951, 1953a) and Singer & Digilio (1951).

Figure 4 – a-f. Gymnopilus peliolepis – a, b, c. basidiomata (b. pileus in lateral view showing stipe insertion; c. pileus showing surface configuration); d. basidiospores in KOH; e. basidiospores in cotton blue showing ornamentation; f. cheilocystitum. (leg. C. Mancuello 013).
Examined material: PARAGUAY. PARAGUARÍ: Quindy city, 25°54’26.9”S, 57°15’56.1”W, 11.XII.2016, C. Mancuello 004314 (FACEN).

Gymnopilus peliolepis is characterized by its whitish-yellowish pileus, covered by fibrillose scales from bright red to dark purple, basidiospores with small to medium warts, absence of pleurocystidia and caulocystidia and being associated with decomposed hardwood (Singer 1951).

A morphologically related species is G. purpureosquamulosus, which Høiland (1998) proposes to differentiate specimens collected in Africa and Asia. Subsequently, Guzmán-Dávalos et al. (2008) recorded this species in Central America (Panama) and Europe. Previously it had been determined as G. palmicola Murrill or as G. peliolepis; thus G. peliolepis would currently be restricted to neotropical regions. Høiland (1998) differentiates G. purpureosquamulosus by its slightly thinner basidiospores (8.25 × 5.2 μm) and ventricose cheilocystidia with prostrate apex, rounded to globose, but not markedly capitated, as seen in G. peliolepis. Gymnopilus palmicola is differentiated by its larger basidiospores (8–12 × 5.6–7.2 μm) with larger warts (Guzmán-Dávalos et al. 2008).

From the type specimen of Brazil, Guzmán-Dávalos et al. (2008), described two types of basidiospore shape: from the spore print of 6–8 × 4.4–5.2 μm, ellipsoidal, with medium warts, and from the basidioma, 6.4–7.2 × 4–4.8 μm, ellipsoidal to oblong, with very small warts, almost asperulated. Singer (1951) and Hesler (1969) described verrucose basidiospores for this species. The basidiospores of G. peliolepis, from the type material are 7.2–9.2 × 4.9–6 μm, which is somewhat wider than those described by Guzmán-Dávalos et al. (2008). Singer (1951) described spores with verrucose ornamentation, which is consistent with the basidiospores presented.

An important character to consider of G. aculeatus (Bres. & Roum.) Singer is the habit. Gymnopilus aculeatus has been found on dead trunks of palms and orchids (Singer 1951). The same is described for G. palmicola, which is always related to palms. On the other hand, G. purpureosquamulosus grows both on decaying wood (Høiland 1998; Guzmán-Dávalos et al. 2008) and on living palms (Guzmán-Dávalos et al. 2008), and G. peliolepis is restricted to decaying wood (Singer 1951). However, more studies are necessary to determine the substrate specificity of these species.
of the stipe, scarce to absent in some samples. Clamp connections present in the hyphae of the pileipellis, pileus trama, hymenophoral trama and stipe. When mounting in KOH a yellowish pigment dissolves.

It was found in decaying wood or trunks, urban area, found during spring and summer.

The species have pantropical distribution. Zimbabwe (Høiland 1998), Nigeria, Italy, Switzerland, Panama (Guzmán-Dávalos et al. 2003), India (Acharya et al. 2017) and Brazil (Neves et al. 2013).

Examined material: PARAGUAY, CENTRAL: San Lorenzo City, Universidad Nacional de Asunción University Campus, 25°20’11.62”S, 57°30’51.98”W, 2.XI.2016, M. Campi 003774 (FACEN). BOQUERON DEPARTMENT, Montanía country house, 21°57’30.8”S, 60°11’15.6”W, 6.I.2016, Y. Maubet 026 (FACEN).

Gymnopilus purpureosquamulosus is characterized by having the pileus covered with pointed and erect scales in the center, adpressed towards the margin, reddish, lilac, reddish brown when fresh, and purple when dry, ellipsoidal to oblong basidiospores, with subacute apex, the cheilocystidia of varied forms, lageniform, utriform, cylindrical to fusiform, with claviform, rounded to globose apex. (Høiland 1998; Guzmán-Dávalos et al. 2008; Acharya et al. 2017).

Høiland (1998) indicates that G. peliolepis (Speg.) is similar to G. purpureosquamulosus; however, it differs in that the former has smaller basidiospores and less capitated cheilocystidia. Another morphologically similar species is G. dilepis, although it has smaller basidiospores than those found in G. purpureosquamulosus (Høiland 1998). In the description of the type specimen, the scales are adpressed in the center, while Guzmán-Dávalos et al. (2008) mention that the scales are erect in the center and appressed towards the margin.

There is some confusion between G. purpureosquamulosus and G. chrysopellus Singer & Digilio (1951). Gymnopilus chrysopellus was described by Berkeley & Curtis (1869) as Agaricus (Flammula) chrysopellus from Cuba. These authors

Figure 5 – a-f. Gymnopilus purpureosquamulosus – a, b, c. basidiomata (c. pileus showing lamellae); d. basidiospores in KOH; e. basidiospores in cotton blue; f. cheilocystidia. (leg. M. Campi 121).
describe “Pileo umbilicato adpressed tomentoso, quandoque depresso margine subsulcato…”

Subsequently, Murrill (1913) proposes the combination of this species to Gymnopilus, adding the characters of the spores. However, neither of the two mentioned authors described the coloration of the pileus and the scales. Singer & Digilio (1951) describe in detail G. chrysopellus based on material from Argentina, Brazil, Peru, Martinique, Guyana, Cuba and USA, noting that it is a common species throughout tropical and subtropical America. These authors provide a description with characters similar to those described by Høiland (1998) for G. purpureosquamulosus. Singer & Digilio (1951) describe the pileus surface as having a “yellow background, with erect scales, concolorous with the surface, gradually becoming deep orange to ferrugineus.” Moreover, Hesler (1969) described G. chrysopellus with a golden yellow surface, tomentose, sometime with appressed fibrils. Høiland (1998) when describing a G. purpureosquamulosus does not compare it with the Singer & Digilio descriptions of G. chrysopellus. Considering this, we could currently restrict G. chrysopellus to the specimens with the pileus surface fibrillose, golden yellow, without orange ferruginous scales, leaving the latter as a distinctive character for G. purpureosquamulosus. To know the identity of the specimens studied by Singer & Digilio (1951), is necessary to re-study them, in order to know with certainty the distribution of these two conflictive species. The morphological differences between the material studied in Paraguay and that recorded in the bibliography of the type specimen and additional materials of G. purpureosquamulosus are: (a) erect scales in the center agreeing with the description of Guzmán et al. (2008), but differing from the adpressed scales described by Høiland (1998) for the type specimen, and (b) hyphae of the pileipellis with pigment embedded in bands cited by Høiland (1998) and Guzmán et al. (2008); however, Acharya et al. (2017) did not describe this character for Indian materials. Based on the characters presented by the cited authors, we conclude that the material studied corresponds to G. purpureosquamulosus, cited for the first time in Paraguay.

Conclusion

Spegazzini (1919) recorded in Paraguay two species as Flammula picea (Pers.) P. Kumm. and Flammula sapinea (Fr.) P. Kumm. Later, Flecha & Niveiro (2019) suggested that this two records were synonyms of Gymnopilus based on the data available in Mycobank and Index Fungorum Databases; however, they did not analyse the samples from Spegazzini to confirm that they belong to the genus, hence we can not confirm the presence of Gymnopilus in the previous records made by Spegazzini in Paraguay. Flecha & Niveiro (2019) also mention the species Gymnopilus earlei Murrill recorded by Gullón (2011), which represents a photographic record since there is not a physical record of the sample, therefor this is also an unconfirmed record. After a long hiatus in the study of Funga in general, and of Gymnopilus in particular for Paraguay, this study represent the first contribution towards the description of Gymnopilus in the country, nevertheless a broader sampling and the inclusion of molecular data are necessary to complement the knowledge of Gymnopilus in Paraguay and in the region.

Acknowledgments

The authors thank Lic. Jissel Armoa and MSc. Claudia Mancuello, for the help with the collection of the materials under study; and Prof. Andrea Weiler, for the collection of the Chaco samples. And a special thanks to Patricia Kaishian, for the meticulous revision of the manuscript’s English and for the valuable contribution to the writing.

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