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The discovery of *Amanita lilloi* in Brazil

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Abstract— *Amanita lilloi*, an interesting and rare species is reported for the first time from Brazil.

Key words—*Lepidella*, *Vittadiniae*, taxonomy

Introduction

Amanita Pers. is a well-established genus that is well supported by morphological, biochemical, and molecular data (Weiß et al. 1998, Drehmel et al. 1999, Moncalvo et al. 2000). The main anatomical characterization of this pallid-spored genus is the presence of both bilateral lamella trama and longitudinally acrophysalidic stipe tissue (Bas 1969). Alternatively, schizohymenial development (Reijnders 1963, Bas 1969, Yang & Oberwinkler, 1999) of the basidioma characterizes the genus, in which all structural elements develop within a solid primordium and are separated by development of gelatinizing or friable intermediary tissues allowing edges of lamellae to separate from a partial veil or stipe surface, and hymenial surfaces of lamellae to be segregated from each other (Bas 1969).

The earliest record of this genus in Brazil was given by Rick (1906, 1937), who reported *A. pantherina* (DC. : Fr.) Krombh., *A. spissa* (Fr.) P. Kumm., *A. strobiliformis* (Paulet ex Vittad.) Bertill., *Armillaria bresadolae* Rick (=*Amanita bresadolae* (Rick) Rick nom. inval.) and *Amanitopsis plumbea* Rick, non

(Schaeff.) J. Schröt. from Rio Grande do Sul State. However Rick's publications and remaining material do not support interpretation at present, and these names are currently considered nomina dubia (Singer 1953, Bas 1978). Other authors recorded more species of *Amanita* from some Brazilian States: Homrich (1965) and Sobestiansky (2005) from Rio Grande do Sul; Grandi et al. (1984) and Pegler (1997) from São Paulo; Capelari & Maziero (1988) from Rondônia; Bas & de Meijer (1993), Stijve & de Meijer (1993) and de Meijer (2001) from Paraná and Giachini et al. (2000, 2004) from Santa Catarina.

This paper presents an unreported species of *Amanita* found in the Northeastern Brazilian State of Pernambuco.

Materials and Methods

We follow the methodology of Tulloss (1993). At the beginning of a set of spore data, the notation "[*a*/*b*/*c*]," where *a, b,* and *c,* are integers, is to be read "*a* spores were measured from *b* basidiomata taken from *c* collections." When ranges are provided in spore data in the form "(*m*-) *n*–*o* (-*p*)," where *m*, *n*, *o*, and *p* are integers, the values given are to be understood as follows: *m* is the smallest value observed or calculated and *p* is the largest value observed or calculated. In the range of values observed or calculated, the 5th percentile is *n*; and the 95th percentile is *o*.

A summary of definitions of biometric variables follows:

w_{cs} = breadth of central stratum of lamella

w_{st}- near = distance from one side of central stratum to nearest base of basidium

w_{st}- far = distance from one side of central stratum to most distant base of basidium on the same side of the central stratum

L, (**W**) = the range of average lengths (widths) of spores of each basidioma examined

L′, (**W′**) = the average of all lengths (widths) of spores measured

Q = the ratio of length to width of a spore or the range of such ratios for all spores measured

Q = the average of Q computed for all basidiomata examined

Q′ = the average of all Q values computed for all spores measured.

Authorial citations follow Kirk & Ansell (1992). Herbarium codes used follow Holmgren et al. (1990) with the exception of "RET", the private herbarium of Tulloss. Color naming and color codes follow Maerz & Paul (1930).

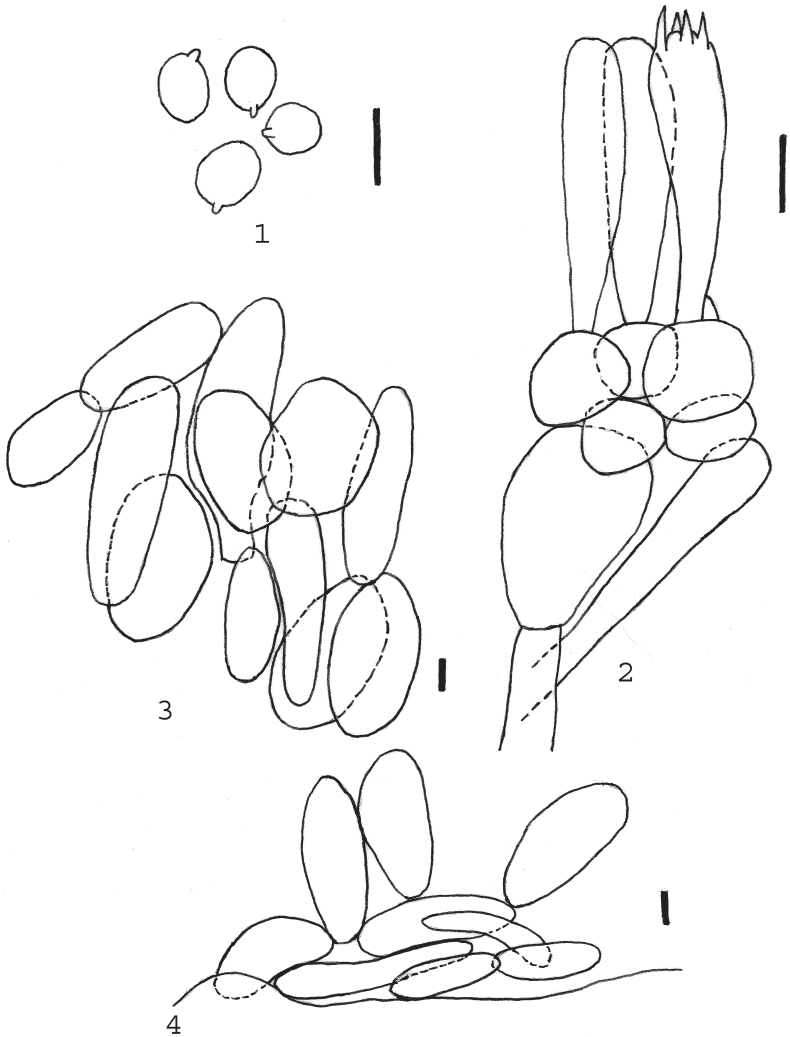
Exsiccata were deposited in the Herbarium of the Mycology Department of the Universidade Federal de Pernambuco (URM), with duplicate material deposited in "RET", the private herbarium of R. E. Tulloss. Generic and infrageneric names and concepts follow Corner & Bas (1962) and Bas (1969).

Taxonomy

Amanita lilloi Singer, in Singer & Digilio, Lilloa 25: 245. 1952 ('1951'). Figs. 1-5

Pileus: (14–) 20–40 mm wide, subglobose or hemispheric, then expanding to plano-convex and finally plano-concave in some old specimens, white or somewhat light beige ("Putty, Seed Pearl, Cambridge Buff" 11B2); *margin* entire, not striate, appendiculate; *universal veil* as numerous white then cream or yellow ochre (11L7) but rarely beige ("Putty, Seed Pearl, Cambridge Buff" 11B2) pyramidal warts up to 2 mm high in young specimens and having cottony aspect (under 10× lens), becoming scarce in mature specimens and concentrated mainly over disc; *context* fleshy, up to 5 mm thick at center, thinning toward margin, white, unchanging. **Lamellae:** narrowly adnexed in young basidiomata then free, moderately crowded, white then cream-colored and rarely pale yellowish cream (9B1) or more paler than "Polar Bear" (9B2) when fresh, ochraceous in exsiccata, up to 6 mm broad with concolorous edge; *lamellulae* attenuate to subtruncate, evenly distributed. **Stipe:** (16–) 23–50 × (2–) 4–6 mm, cylindrical, white with rather small and sometimes indistinct concolorous squamules; *bulb* radicating 10-20 × 2-9 mm, elongate-fusiform (mainly in young basidiomata) then elongate-radicating, sinuous in some specimens; *context* fleshy, white, unchanging, solid; *partial veil* superior to subsuperior, white, membranous, moderately thick, with verrucose white squamules on margin of lower surface, occasionally deciduous; *universal veil* very scarce or as remnants scattered over surface. **Odor** and **taste,** unpleasant. **Macrochemical spot tests,** none performed.

Basidiospores: [100/5/2] (7–) 7.5–9.5 (–10.5) × (6–) 6.5–7.5 (–8) μm, (**L** = 8–8.6 μm, **L'** = 8·3 μm; **W** = 6.8–7 μm, **W'** = 7 μm; Q = (1.11–) 1.14–1.36 (–1.43); **Q** = 1.16–1.22, **Q'** = 1.2), amyloid, colorless, hyaline, smooth, thin walled, subglobose to broadly ellipsoid occasionally ellipsoid, usually or at least somewhat adaxially flattened; apiculus lateral; contents guttulate; white in deposit. **Basidia:** 32–41 × 9–12 μm, 4-sterigmate, with sterigmata up to 5–7 μm long, clamps present at base, but scarce. **Subhymenium:** up to 23 μm thick, as 2–4 layers of more or less isodiametric cells (e.g., 13.5 × 12.3 μm); w_{st}-near = (29–) 44–69 μm (with some basidia appearing to arise directly from uninflated hyphae of the subhymenial base); w_{st}-far = 66–86 μm. **Lamella trama:** bilateral, with divergence of elements from the central stratum rather abrupt; w_{cs} = 38–57 μm; filamentous undifferentiated hyphae up to 2.5–4 μm wide, usually branched; slightly inflated terminal cells up to 12 μm wide; vascular hyphae 5–6 μm wide, very scarce. **Pileus context:** filamentous undifferentiated hyphae 2.5–5 μm wide, commonly branched, interwoven, forming a loose matrix where other elements occur; acrophysalides 47–54 x 30–37 μm; vascular hyphae 3–14 μm wide, unbranched, with irregular outline in some regions. **Stipe context:**



Figures 1–4. *Amanita lilloi* (from F. Wartchow 2/2005). 1. Basidiospores. 2. Basidium and subhymenium. 3. Elements of the wart (tip). 4. Elements of the wart (base). Scale bar is 10 μm.

longitudinally acrophysalidic; acrophysalides (e.g.) 141 × 20 μm; filamentous undifferentiated hyphae 2.7–6.7 μm wide, branched; vascular hyphae 2–13 μm wide, unbranched. **Pileipellis:** difficult to distinguish. **Universal veil:** *On pileus*: filamentous undifferentiated hyphae 3.5–7.5 μm wide, unbranched, scarce; with elongate-fusiform slender elements at base of warts (42–108 × 12.5–28

Figure 5. *Amanita lilloi*. Basidiomata of the collection F. Wartchow 01/2006.

μm) arising from the pileus context and periclinal orientation near context, becoming anticlinal upward; inflated cells becoming more common toward tips of warts, with cells 61–110 × 23–42 μm, subparallel ascendant, broadly fusoid and clavate, with infrequent ovoid and subglobose cells, hyaline, thin-walled; vascular hyphae not observed; clamps occasional. *On stipe:* scarce, with elements arising from context, similar to cells of universal veil on pileus surface, with inflated cells 40–148 × 15–35 μm. **Partial veil:** undifferentiated hyphae 2-6 μm wide, interwoven, plentiful; inflated cells 10–15 μm wide, infrequent; vascular hyphae 2.5–7.5 μm wide, unbranched, occasional; with elements of universal veil present on lower side, fusiform-elongate 42–111 × 12–45 μm or ovoid (e.g., 23–42 × 16–25 μm), hyaline; clamps rare.

Habitat: On soil in lawn, with some basidiomata at least 1 m from the nearest tree base (*Ficus* sp. - *Moraceae*).

Material examined: BRAZIL. Pernambuco: Recife, Campus UFPE (Reitores Avenue), 05.iv.2005 F. Wartchow 2/2005 (URM 78685, RET); same locality, 28.iii.2006, F. Wartchow 1/2006 (URM 78713, RET).

Additional material examined: ARGENTINA. Buenos Aires: Av. Alvear al 2900, 1949 J. E. Wright B-762 (BAFC); Locality not given, 10.i.1951, R. Singer s.n. (BAFC 30606).

Remarks: *Amanita lilloi* is a typical species of *Amanita* [subgenus *Lepidella* (Roze) Veselý emend. Corner & Bas (1962), section *Lepidella*, subsection *Vittadiniae* Bas (1969), stirps *Vittadinii* (Bas 1969: 347–349)] due to its subglobose to broadly ellipsoid amyloid spores; a non-striate and appendiculate pileus margin; lack of membranous volval limb at the stipe base; the dominance of concatenated, hyaline, elongate-fusiform cells in the universal veil; the frequent presence of clamps at the bases of basidia; and the distribution of volval remnants over the elongated basal part of stipe. Within this stirps, only two unpigmented species belong to the group with spore length under 9.5 μm: *A. lilloi*, originally described from Argentina (Singer & Digilio 1952), and *A. boliviana* Bas nom. prov., known from Bolivia (Bas 1969).

The present collection agrees in several points with *A. lilloi* as characterized by Singer & Digilio (1952) and Bas (1969): (1) the large, white and densely placed floccose pyramidal volval remnants on the pileus; (2) the adnexed lamellae in young basidiomata; (3) and the occurrence in gardens or lawns [although sometimes near woody plants in lawns (according to the annotation of J. E. Wright B-762 in BAFC, and in the case of our collections)]. On the other hand, our material differs from the original description of *A. lilloi* in the present species' (1) the smaller basidiomata, (2) slightly larger basidiospores [an isotype of *A. lilloi* had basidiospores [25/1/1] (6.5–) 7–8.5 × (5.5–) 6–7 μm according to Bas (1969)] and (3) its less squamulose stipe. The amount of volva on the stipe can be easily altered by environmental factors and handling prior to storage in a herbarium. Therefore we further examined the question of spore size.

The examination of some authentic material of *A. lilloi* from Argentina produced spore measurements (from the few undamaged mature spores) having ranges of length, width, and Q that contain the ranges of those variables as reported by Bas (above) and are more similar to the spore data reported for the Brazilian material: [39/3/2] (6.5–) 6.7–9 (–10.5) × 5–7 (–8) μm, (**L** = 7.2–8 μm; **L′** = 7.8 μm; **W** = 5.9–6.2 μm; **W′** = 6 μm; Q = (1.08–) 1.14–1.49 (–1.5); **Q** = 1.22–1.35 μm; **Q′** = 1.29 μm). We believe that the remaining differences between Argentine and Brazilian material can be attributed to the poor quality of preservation in the BAFC material.

Recently *A. lilloi* was reported again from Argentina, but there appears to have been a misdetermination: the accompanying illustration shows exclusively sub globose elements in the volval remnants (Wright & Albertó 2002: 120-121), which cannot occur in subsection *Vittadiniae* by its definition.

The Brazilian collection of *A. lilloi* resembles *A. boliviana* in the size of its basidiospores [(7.5–) 8–9.5 × 6.5–7.5 (–8.5) μm in *A. boliviana*], but the latter species has smaller squamules on the pileus and an exannulate stipe (Bas 1969).

Moreover, the sole collection of *A. boliviana* comes from a forest habitat.

Species of *Amanita* usually have an ectomycorrhizal relationship with one or more of a large variety of tree species (Trappe 1962, Smith & Read 1997), but there is no record suggesting any mycorrhizal symbiont for *A. lilloi* (see Singer & Digilio 1952, Bas 1969), which appears to occur commonly without or with few woody plants in the vicinity.

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