

# Distribution of the Hallucinogenic Mushroom *Psilocybe antioquensis* Guzmán et al. (Agaricomycetidae) in Colombia, Mexico, and Cambodia

Gastón Guzmán,<sup>1</sup> John W. Allen,<sup>2</sup> & Prakitsin Sihamonth<sup>3</sup>

<sup>1</sup>Instituto de Ecología, Veracruz, México; <sup>2</sup>P.O. Box 45164 Seattle, Washington 98105, USA.; <sup>3</sup>Department of Microbiology, Faculty of Sciences, Chulalongkorn University, Phayathai Road, Bangkok 10303, Thailand

Address all correspondence to Gastón Guzmán, Instituto de Ecología, Apartado Postal 63, Xalapa 91000, Veracruz, México; guzmang@ecologia.edu.mx

**ABSTRACT:** Two new records from Mexico and one from Cambodia of the hallucinogenic mushroom *Psilocybe antioquensis*, originally known only from Colombia, are discussed. This fungus grows on soil in subtropical meadows, and it is defined by its subumbonate pileus, long pseudorhiza, ovate-subrhomboid thick-walled spores, and for their pleuro- and cheilocystidia. It belongs to the section *Mexicanae* in genus *Psilocybe*.

**KEY WORDS:** *Psilocybe antioquensis*, hallucinogenic species, distribution, ecology, Colombia, Mexico, Cambodia

## INTRODUCTION

In the confirming studies of hallucinogenic mushrooms in Thailand and other regions of southeast Asia made by Allen and Merlin (1992 a,b) and in the works of Guzmán on the second edition of *The Genus Psilocybe* (in preparation), the wide distribution throughout Mexico and Cambodia of the Colombian hallucinogenic mushroom *P. antioquensis* Guzmán et al. (1994) is presented below. It is well known that many of the hallucinogenic species of *Psilocybe* have worldwide distribution as *P. semilanceata* (Fr.:Secr.) P. Kumm., *P. cubensis* (Earle) Singer and *P. subcubensis* Guzmán; the first being more common in Europe, the U.S., Chile, and New Zealand, and the latter species being pantropical. However, there are certain species only known from the country where they were described. Species, such as *P. aztecorum* P. Heim emend. Guzmán, *P. galindii* Guzmán, and *P. fagicola* P. Heim are known only from Mexico; *P. venenata* (Imai) Imaz et Hongo from Japan; and *P.*

*samuiensis* Guzmán, Band.-Muñoz et Allen from Thailand. Others species, such as *P. mexicana* P. Heim is known only from Mexico and Guatemala, and *P. yungensis* Singer et Smith is known only in Bolivia (type locality) and Mexico (Guzmán, 1983).

## MATERIALS AND METHODS

All microscopic observations were made on sections mounted in 5% KOH solution, after a rehydration with alcohol of 90°. Colors in the description are based on Kornerup and Wanscher (1978).

## DESCRIPTION, HABITAT, DISTRIBUTION, AND DISCUSSION

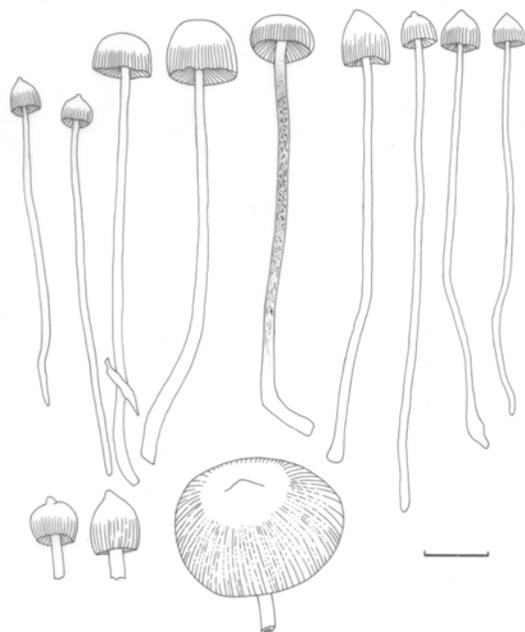
***Psilocybe antioquensis* Guzmán, Saldarriaga, Pineda, García, et Velásquez, *Mycotaxon* 51: 225, 1994. Figs. 1–32**

*Habitat* mycenoide, like *P. mexicana* without pseudorhiza. *Pileus* (5-) 10–15 (-30) mm diam, 5–15 (-20) mm high, globose or conic at first to

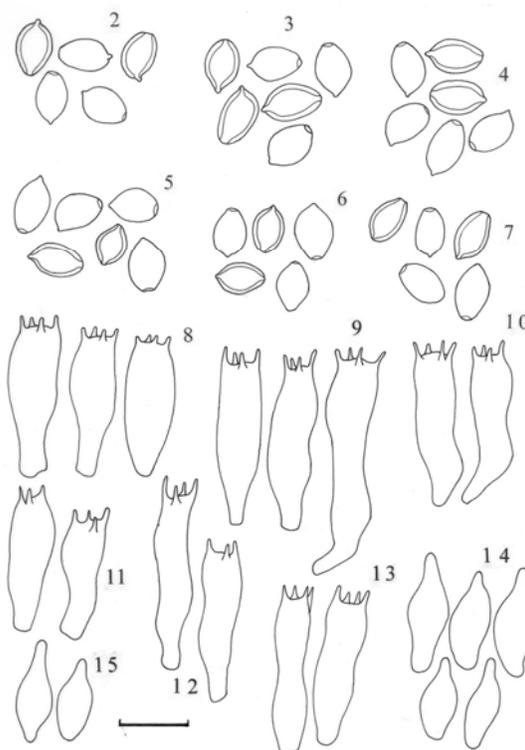
campanulate, with a narrow or wide papilla, or convex with or without papilla, not fully expanded at maturity, glabrous, subviscid to dry, smooth but the margin sulcate-striate, with entire or lacerate margin, hygrophanous, orange brown (6A5-8), sometimes ochraceous brown (5E5) or ochraceous olivaceous (4E6), fading to ochraceous (4A4-7), mainly in apex, with concolorous or whitish margin. *Lamellae* adnate to sinuate, pale ochraceous (4A2-4) to dark violaceous (14F3-4), with whitish edges. *Stipe* (40-) 60–124 (-180) × (1-) 1.5-2 (-3) mm (including the pseudorhiza), hollow, slightly and irregularly undulate, equal, subbulbous or attenuated at the base, cartilaginous, whitish to pale or dark ochraceous (4A3, 4A7), covered by white, appressed to grayish fibrills to more or less smooth above. *Veil* poorly developed, white, fibrillose or silky, soon evanescent, leaving fine appressed fibrills on the upper part of the stipe. *Context* in pileus whitish to pale ochraceous (4A2), in stipe ochraceous (4A3-4) to reddish ochraceous (6A6). *Odor and taste* farinaceous. *KOH* readily stains reddish brown pileus, stipe and context. All parts, except lamellae stain green-blue when bruised and

irregularly green-blue to black when dry. *Spore print* dark violaceous brown (11F4 or 13F4).

*Spores* (6-) 8–10 (-11) × (5-) 6–6.5 (-7) × 5–6 μm, ovate-subrhomboid in face view, subellipsoid in side view, thick-walled, wall around 1 μm thick, pallid brownish, with a distinct and broad germ pore in one end, and an apical short appendage in the other. *Basidia* (20-) 23–28 (-45) × (6-) 7–9 (-10) μm, four spored, rare two spored, hyaline, ventricose, frequently flexuous, with a median constriction and a narrow base. *Pleurocystidia* (13-) 15–20 (-23) × (3.5-) 5–7 (-9) μm, hyaline, rare to more or less common, regular or irregularly sublageniform, or fusoid ampullaceous, with a narrow or ample base and a short or long neck in the apex, sometimes irregularly branched [those ventricose or subcylindric elements described by Guzmán et al. (1994) are basidioles]. *Cheilocystidia* (13-) 15–



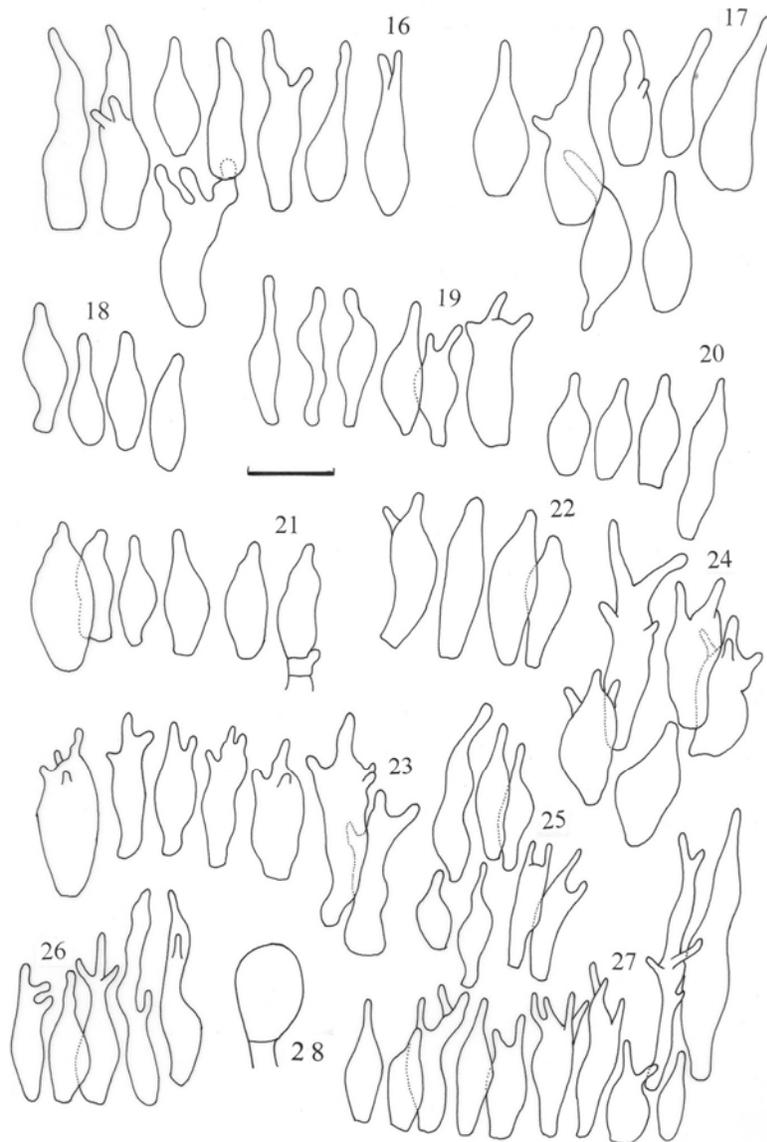
**FIGURE 1.** *Psilocybe antioquensis*. Basidiomata from Cambodia (Allen "D"). Scale bar 12 mm.



**FIGURES 2–15.** *Psilocybe antioquensis*. 2–7: spores, 8–13: basidia. 14–15: pleurocystidia (2, 8, 14: isotype; 3, 9: *García* 426; 4, 10: *Galván* 88; 5, 11: *Allen* "B"; 6, 12: *Allen* "C"; 7: *Allen* "D"; 15: *Gómez* 4). Scale bar 10 μm, except in 8–13, which is 15 μm.

20 (-25) (-29) × (3-) 4–6 (-7) (-9) μm, hyaline, forming a sterile band, similar to pleurocystidia, but more irregular branched, frequently subcylindrical or submoniliform. *Subhymenium* with hyphae, 2–5 wide, hyaline or incrustated with yellowish brown pigment. *Hymenophoral trama* regular, with hyaline or incrustated like subhymenium hyphae, 6–18 μm wide, some of them subglobose.

*Pileipellis* an ixocutis, (10-) 20–40 μm thick, with hyaline, 1–3 (-9) μm wide hyphae. *Subpellis* (hypodermium) nondifferentiated. *Context* with hyaline to incrustated hyphae, 3–25 μm wide, some are subglobose. *Stipepellis* with postrated hyaline to yellowish brown hyphae, 2–12 μm wide, some of them subraised with a globose head, up to 13 μm diam. *Clamp connections* present.



**FIGURES 16–28.** *Psilocybe antioquensis*. 16–20: pleurocystidia. 21–27: cheilocystidia. 28: A terminal cell of the stipepellis (16, 23: *García* 426; 17, 24: *Galván* 88; 18, 25: *Allen* “B”; 19, 26: *Allen* “C”; 20, 23, 27: *Allen* “D”; 21 28: isotype; 22: *Gómez* 4). Scale bar 10 μm.

### Habitat

Solitary or in small to numerous groups, in clay soil or sand soil, in meadows with horses, cattle, or Indian Brahman cattle (*Bos*), and/or water buffalo (*Bubablus*), with leveling grasses, sometimes the mycelia is attached to the roots of the grasses, in subtropical humid regions, at 1000–1600 m altitude.

### Distribution

Known from Antioquia in Colombia; Jalisco and Veracruz in Mexico, and Angkor in Kampuchea (formerly Cambodia). Probably a pantropical species.

### Studied Specimens

- Colombia, Antioquia Department, Porce Municipio, near the road Medellín to Amalfi, zone of Puente Gabino, Aug. 31, 1990, *Guz-*



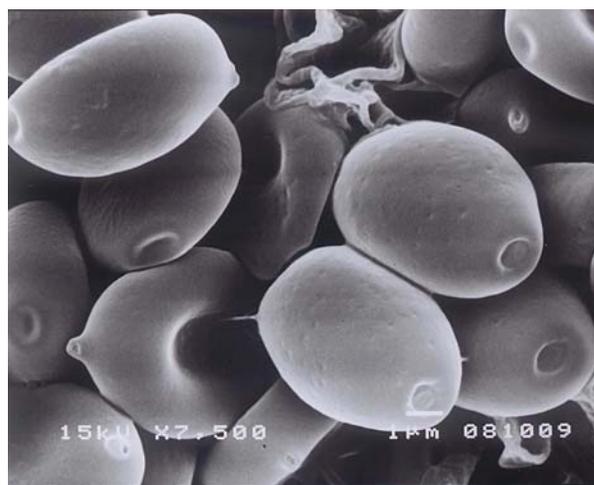
**FIGURES 29–31.** *Psilocybe antioquensis*. Basidiomata from Cambodia (Allen “B”).

*mán* 29562-B (holotype HUA, isotype XAL); 29560-B; 29567-B; 29569-B (all in HUA and XAL).

- Mexico, Jalisco, Tala, June 11, 1994, *Gómez 4* (IBUG); Veracruz, Xalapa, El Seminario, near the Campus of Universidad Veracruzana, July 18, 1981, *García 426*; *Galván 83* (both in XAL).
- Cambodia, Kampuchea Angkor, Banteay Srei, Temple of the Women, Aug. 2002, *Allen B*; Banteay Kdei, old Cambodian Prison (Citadel of the Cell), Aug. 2002, *Allen C*; Ruins of Angkor Wat, Aug. 2003, *Allen D* (all in BCU and XAL).

### DISCUSSION

Its large pseudorhiza and oblong-subrhomoid thick-walled spores, and its basidioma, such as *Psilocybe mexicana* or *P. galindii*, and the form and size of the pleuro- and cheilocystidia, are the mean taxonomic features of *P. antioquensis*. It belongs to the section *Mexicanae* Guzman (1983) for form and thick-walled spores as well as for the bluing feature of the basidioma. The Mexican and Cambodian material studied confirm the Colombian material, although there is a small variation in the size of the cheilocystidia. While the type of the cheilocystidia are (13-) 15–20 (-25) × (3-) 5–7 μm, the Mexican material are (13-) 17–25 (-29) × (4.5-) 6–8 (-9) μm, and the Cambodian material



**FIGURE 32.** *Psilocybe antioquensis*, spores by scanning electron microscopy (Allen “C”).

are (15-) 17–25 (-28) × (4-) 5–6 (-8) μm. Also, the pleurocystidia in the type and Cambodian material are (13-) 16–20 (-23) × (4-) 5–7 (-8) μm, in the Mexican material from Xalapa are (13-) 16–27 (-29) × (3.5-) 5–7 (-9) μm. These variations have no taxonomic value. The records of *P. antioquiensis* in Mexico and Cambodia are new. It is interesting to observe that *P. antioquiensis* runs from Colombia to Mexico, through the humid subtropical mountains. This distribution is similar to that of *P. yungensis* described from the forests region of Yungas, in Bolivia (Singer and Smith, 1958), and found in Mexico, in the forests of the Huautla de Jiménez region. Both localities of *P. yungensis* have the same type of vegetation, a cloud subtropical forest (Singer, personal communication in 1957 to the senior author in the Huautla de Jiménez region). The Bolivian locality presents an altitude of 2000 m, and Huautla de Jiménez 1800 m. The record of *P. antioquiensis* from Cambodia shows the probability of pantropical distribution of this species, through the subtropical regions of the world. The Cambodian record is the second report of a hallucinogenic species of *Psilocybe* in Cambodia. Heim and Wasson in 1958 and Allen and Merlin in 1992 (Guzmán et al., 1998) reported *P. cubensis* from Cambodia. *Psilocybe antioquiensis* is closely related to *P. samuiensis* Guzmán, Band.-Muñoz and Allen, species only known from Thai-

land (Guzmán et al., 1993). The Thailand species differs in having large spores, (9-) 10–12 (-13) × 6–8 (-9) × 6–7 μm, and in having a poorly developed pseudorhiza. *Psilocybe antioquiensis* is also close to *P. galindii*, but that species has spores (8-) 9.5–12 (-14) × (6.5-) 7–8 × 6–7 μm.

## ACKNOWLEDGMENTS

The senior author acknowledges the support of his research through CONACYT, SNI, and Instituto de Ecología at Xalapa, all of which are in Mexico. He also expresses his thanks to Etelvina Gándara and Virginia Ramírez-Cruz for their help in microscopic observations, to Manuel Hernández and Bertha Ulloa for their assistance in computation, and to Juan Lara Carmona for his help in the herbarium. Thanks are also given to Laura Guzmán-Dávalos for loan materials of IBUG. The senior author also is grateful to Yamille Saldarriaga and colleagues from the University of Antioquia for their help in the preliminary studies of the species discussed here. Allen and Sihamonth express their thanks to Rujiporn Prateepasen at The Scientific Technological Research Equipment Center in Chulalongkorn University, for her assistance in scanning electronic microscopy. We also thank Dr. Tjakko Stijve of Vevey, Switzerland, for kindly reviewing this paper.

## REFERENCES

- Allen J. W. and Merlin M. D. 1992a. Psychoactive mushroom use in Koh Samui and Koh Pha-Ngen, Thailand. *J Ethnopharmacology*, **35**, 205–228.
- Allen J. W. and Merlin M. D. 1992b. Psychoactive fungi in Thailand. Some aspects of their relationship to human use, law and art. *J Mind Moving Plants Culture*, **2-3**, 99–108.
- Guzmán G. 1983. The genus *Psilocybe*. Beih. Nova Hedwigia. **74**, Cramer, Vaduz.
- Guzmán G., Bandala V. M., and Allen J. W. 1993. A new bluing *Psilocybe* from Thailand. *Mycotaxon*, **46**, 155–160.
- Guzmán G., Saldarriaga Y., Pineda F., García G., and Velásquez L. F. 1994. New species of *Psilocybe* from Colombia and discussion on the known species. *Mycotaxon*, **51**, 225–235.
- Guzmán G., Allen J. W., and Gartz J. 1998. A worldwide geographical distribution of the neurotropic fungi, an analysis and discussion. *Annali Museo Civico Rovereto*, **14**, 189–280.
- Heim R. and Wasson R. G. 1958. Les Champignons Hallucinogènes du Mexique. Mus. Nat.d'Hist. Nat., Paris. 324 pp. + 36 pls.
- Kornerup A. and Wanscher J. H. 1978. Methuen handbook of colour. 3th ed., Methuen, London (reprint in 1989). 252 pp.
- Singer R. and Smith A. H. 1958. Mycological investigations on Teonanácatl, the Mexican hallucinogenic mushroom. Part. II. A Taxonomic monograph of *Psilocybe* section *Caerulescentes*. *Mycologia*, **50**, 262–330.

