DESCRIPTION AND CHEMICAL ANALYSIS OF A NEW SPECIES OF HALLUCINOGENIC *PSILOCYBE* FROM THE PACIFIC NORTHWEST

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In the course of our research on hallucinogenic fungi (**1**, **7**), and our work on a world monograph of the genus *Psilocybe,* we have discovered an interesting new hallucinogenic species. The mushroom was first collected on the campus of the University of Washington in Seattle, and has since been found in several other sites in western Washington and Vancouver, British Columbia. Since this species is very common in western Washington, and is widely used as a recreational drug, it is surprising that it has not been previously reported.

Psilocybe stuntzii Guzmán & Ott, sp. nov. FIGS. 1–8

Pileo 5-35 mm lato, convexo vel campanulato vel subpapillato, demun frequenter applanato, laevis, rubrobrunneo vel sordidoalutaceo vel alutaceo, hygrophano. Lamellis sinuato-adnatis, brunneo violaceus vel melano violaceus. Stipite 35–75 × 1.5–5 mm, centralis, uniformis, flexuosus, non bulbosus, cavus, albidus vel alutaceo, fortiter caerulescente. Annulus conspicuus, membranaceus, albus, caerulescente, vel caducus. Carne odore et sapore farinaceo, caerulescente. Sporis (8.2–)9.3–10.4(–12.6) × 6-7.1(–7.7) × 5.5–6.6 μm, frontaliter sublentiformibus, lateraliter subellipsoideae. Pleurocystidiis nullis. Cheilocystidiis 22–27.5 × 4.4–6.6 μm, subcolumnaris, longicollus, collum 1.6–2.22 μm lato. Subhymenium subbrunneum. Trama hyalinae vel subhyalinae. Hyphis epicutis pilei subgelatinescentibus. Hyphae cum fibulis. Ad terram, inter gramen vel stramen area, graminicola. Universita Washington, Seattle, U. S. A., Leg. D. Stuntz, auctumnus 1973, Typus (WTU).

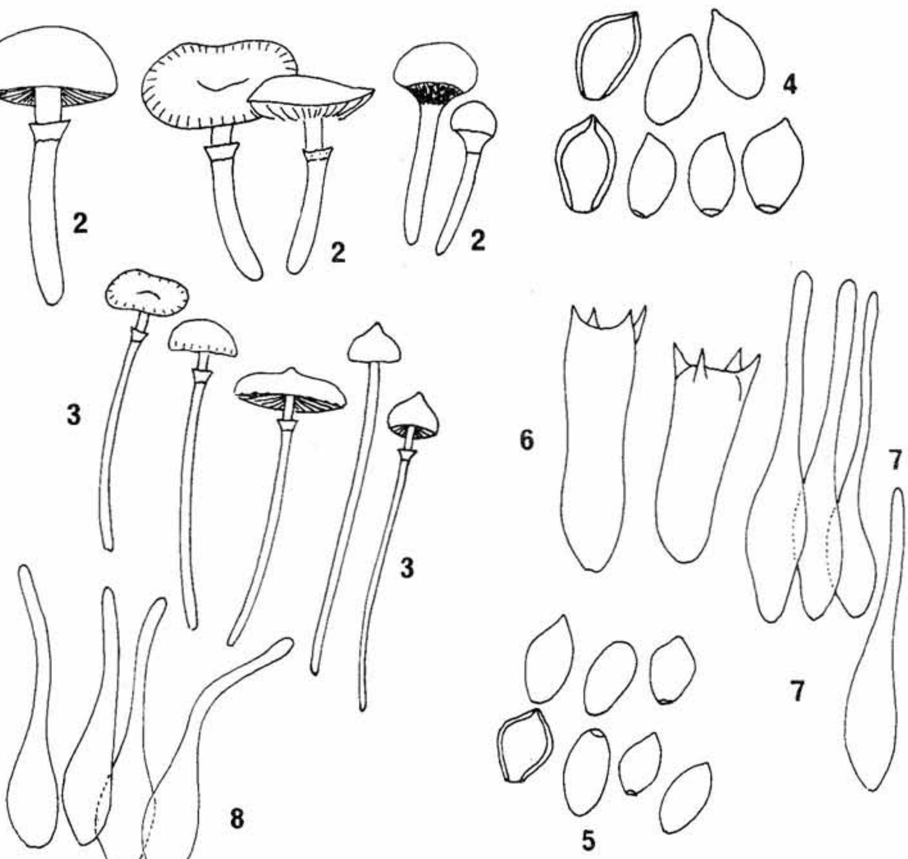
Pileus 5–35 mm broad, convex to campanulate or subpapillate, becoming sometimes shallowly depressed at the disc, glabrous, slightly viscid or lubricous, fulvous brown, fading to ochraceous or pale ochre, hygrophanous, smooth or sometimes striate at the margin, with traces of silky white veil adhering to the margin in young stages after annulus formation. Lamellae sinuate-adnate to short decurrent, narrow, brownish violet, chocolate brown to blackish violet, with whitish edges. Stipe 35–75 × 1.5–5 mm, central, equal, flexuous, glabrous to slightly fibrillose,

FIG. 1. *Psilocybe stuntzii.* Basidiocarps (photo R. Gerrish).

dry, whitish to ochraceous, staining blue where injured, becoming hollow. Annulus membranous to scaly membranous, thin, smooth below, slightly striate above. Context white throughout, tough in the stipe, staining blue. Odor and taste slightly farinaceous. Spore print deep violaceous to dark purple violaceous.

Spores (8.2–)9.3–10.4(–12.6) × 6–7.1(–7.7) × 5.5–6.6 μm, smooth, subrhombic in face view and subelliptic in side view, with a visible hilar appendix; apex truncate from an apical pore; dingy yellow brown in

KOH. Basidia 16.5–25 × 5.5–7.7 μm, sterigmata 3–4.4 μm long, 4-spored, subcylindric, with a slightly constricted median. Pleurocystidia none. Cheilocystidia 22–27.5 × 4.4–6.6 μm, fusiform-lanceolate or fusoid-ampullaceous, with an elongate and flexuous neck 1.6–2.2 μm diam, hyaline in KOH, forming a sterile band on the gill edge. Subhymenium thin, segments irregularly arranged, with a yellowish brown wall pigment in KOH, unevenly distributed. Lamellar trama regular with elongate-cylindric or subglobose hyphae, hyaline in KOH. Epicutis consisting of a thin pellicle of filamentous, more or less gelatinized hyphae, 1.6–5 μm broad, hyaline or yellowish in KOH. Hypodermium



FIGS. 2–8. *Psilocybe stuntzii.* 2–3. Basidiocarps (2: Ott 01; 3: Type). 4–5. Spores (4: Type; 5: Jones 10/8/73). 6. Basidia (Type). 7–8. Cheilocystidia (7: Type; 8: Jones 10/8/73). (Drawings by G. Guzmán).

of compactly arranged hyphae, 5 μm or more broad, brownish to brownish red in KOH.

Solitary or in dense clusters on lawns, in fields and on bark mulch in landscaped areas. Fruiting from August to December, common in western Washington (U. S. A.); also found in Vancouver, British Columbia (Canada).

Collections studied.—U. S. A. WASHINGTON. University of Washington, Seattle, *Stuntz, Aut. 1973* (WTU, TYPE); *Stuntz 11/5/72* (WTU); *Jones 10/8/73* (WTU); *Stamets, Aut. 1975* (ENCB). Near Seattle, *Benedict & Brady 1961* (ENCB) (part); *Benedict & Brady 1962* (ENCB) (part). Near Cispus Environmental Center, Randle, *Pollock 10, 26/75* (ENCB). Capitol Lake, Olympia, *Ott 75–14* (ENCB); *Ott 75–15* (ENCB). Near Millersylvania State Park, Maytown, *Ott 75–8* (ENCB). Tumwater, *Ott 01* (ENCB). CANADA. British Columbia. Vancouver, *Haard & Pollock 10/28/75* (ENCB).

Psilocybe stuntzii is very close to *P. venenata* (Imai) Imazeki & Hongo from Japan and *P. subaeruginascens* Höhnel from Java. We have established *P. stuntzii* as a new and distinct species because of significant and consistent differences in the sizes of spores and cheilocystidia. Singer and Smith (8) placed *P. venenata* and *P. subaeruginascens* in synonymy with admitted reservations, as they were unable to locate type material of the former. These species should be retained as separate entities.. *Psilocybe venenata* has spores (9.0–)10.4–12(–13.2) $\times$ 6–7.1(–8.8) $\times$ 5.5–6.6 μm, and cheilocystidia 17–23 $\times$ 4.4–5.5 μm with necks 1–1.5 μm broad. *Psilocybe subaeruginascens* has spores (8.2–)8.8–10(–11) $\times$ 6.6–7.7 $\times$ 6–6.6 μm, and cheilocystidia 18–28 $\times$ 5–5.7 μm with necks 3.3–4.4 μm broad. *Psilocybe subaeruginascens* is synonymous with *P. aerugineomaculans* (Höhnel) Sing. & Smith. This synonymy and the relationship of *P. stuntzii, P. venenata* and *P. subaeruginascens* are based on study of the types of all of these species (Höhnel's types from Farlow Herbarium, Imai's from National Science Museum of Tokyo). Singer and Smith (8) separated *P. subaeruginascens* from *P. aerugineomaculans* based on the epicutis of the pileus; gelatinous in the former, not gelatinous in the latter. Several species of *Psilocybe,* however, show variation in this feature, and we do not think it represents a valid taxonomic distinction. A further difference noted by Singer and Smith was habitat—*P. subaeruginascens* was collected on horse dung, *P. aerugineomaculans* on rotten wood. Several species of *Psilocybe* are found in varying habitats, suggesting that this character lacks taxonomic significance. Guzmán has found *P. yungensis* Sing. & Smith on rotten wood, humus and soil, and *P. caerulescens* Murr. on clay soil outside the forest with or without grass, on humus inside the forest and on sugar cane mulch in plantations.

Psilocybe stuntzii is named in honor of Dr. Daniel E. Stuntz, Professor of Botany at the University of Washington in Seattle, in recognition of his valuable research in the field of mycology.

A 250-mg sample (Ott 01, ENCB) of finely pulverized *P. stuntzii* was placed in a small flask and extracted in 40 ml of cold 70% methanol by mixing overnight with a magnetic stirrer. The extract was filtered and concentrated to dryness. After being redissolved in 3 ml of 70% methanol, the extract was analyzed chromatographically.

Spots of 50–100 μl of the extract and standard solutions of psilocybin and psilocin were spotted singly and in admixture on sheets of Whatman 3MM filter paper. Chromatograms were developed for approximately 18 h by the ascending method. Three solvent systems were employed for each sample: A) water saturated *n*-butanol; B) *n*-butanol-acetic acid-water (12:3:5) and C) *n*-propanol-1 N ammonium hydroxide (5:1). Subsequent to development, the chromatograms were air dried and dipped in a modified Ehrlich's reagent (10% *p*-dimethylamino benzaldehyde in concentrated HCl, diluted 1:4 with acetone).

Psilocybin and psilocin were evident as violet and bluish-violet zones respectively. The following RF values were observed for psilocybin: 0.04 (System A), 0.44 (System B), 0.05 (System C); and psilocin: 0.50 (System A), 0.75 (System B), 0.86 (System C). All extracts analyzed showed a violet spot migrating with reference psilocybin in all three systems. These spots did not separate from reference psilocybin when this compound was mixed with the extracts. No spots corresponding to reference psilocin were evident in any system. The carpophores analyzed showed abundant bluing, probably caused by enzymatic oxidation of psilocin when fresh (4). Failure to detect psilocin is therefore likely due to the age of the carpophores and not to absolute lack of this compound in *P. stuntzii*.

In the fall of 1973, *P. stuntzii* began to fruit widely on the campus of the University of Washington, on bark mulch which gardeners spread around landscaped areas of the campus. Noticing that this species blued when injured (a common characteristic in hallucinogenic *Psilocybe* species), intrepid student experimenters began to consume it as a recreational drug (**5**, **6**). This practice soon became widespread, and users were admonished by an article in the student newspaper that the mushrooms were "dangerous." This warning was apparently ignored, and recreational use of *P. stuntzii* continued to grow in the fall of 1974, even spreading to the campus of The Evergreen State College in Olympia, Washington, where it was also fruiting. By the fall of 1975, users had discovered this species in a variety of locations in Seattle, Olympia, Tumwater and surrounding areas. Although recreational use of *Psilocybe stuntzii* and other psilocybian mushrooms became very common in western Washington by 1975 (**1**), there were no reports of adverse effects or hospitalizations resulting from this practice.

Psilocybe stuntzii has been misidentified as *P. cyanescens* in Weil's article on recreational use of hallucinogenic mushrooms (**9**), and in Haard and Haard's book on toxic fungi (**2**). A self-styled "professional mycologist" refers to this species as *Psilocybe pugetensis* (a nonexistent entity) in a fanciful book (**3**), thus introducing a spurious epithet to the literature.

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PSYCHOTROPIC MYCOFLORA OF WASHINGTON, IDAHO, OREGON, CALIFORNIA AND BRITISH COLUMBIA

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Classic ethnobotanical studies in Mexico (**5**, **6**, **13**) have stimulated modern interest in psychotropic fungi. In recent years, recreational use of psychoactive mushrooms has become popular in the United States and other countries (**10**, **11**, **18**). The Pacific Northwest abounds in psychotropic species of at least four genera, *Psilocybe, Panaeolus, Conocybe* and *Amanita* (**1**, **2**, **3**, **6**, **7**, **8**, **9**, **12**, **17**), and recreational use