

AGARICALES OF THE HAWAIIAN ISLANDS—  
7. NOTES ON *VOLVARIELLA*, *MYCENA* SECT. *RADIATAE*,  
*PHYSALACRIA*, *PORPOLOMA* AND *STROPHARIA*

DENNIS E. DESJARDIN<sup>1,2</sup> AND DON E. HEMMES<sup>3</sup>

**Abstract.** Three species of *Volvariella* are described from material collected in the Hawaiian Islands, and a key to aid in diagnosis is provided. *Volvariella bombycina* var. *ciliatomarginata* is described as a new variety, and *V. earlei*, a rarely collected species known previously only from Cuba and North Carolina, is redescribed. *Mycena papyracea* is described as new and a key to the worldwide members of *Mycena* sect. *Radiatae* is provided. *Physalacria angustispora*, *Porpoloma bambusarum* and *Stropharia variicolor* are described as new. All species are illustrated and compared with phenetically similar taxa.

**Keywords:** fungi, Hawai'i, mushrooms, *Mycena*, *Physalacria*, *Porpoloma*, *Stropharia*, systematics, *Volvariella*.

Extensive fieldwork has been conducted over the past eight years on six of the eight main Hawaiian Islands as part of a biotic survey of the Agaricales from the archipelago. Described herein are a number of new or poorly known agaric taxa belonging to the genera *Volvariella*, *Mycena*, *Physalacria*, *Porpoloma* and *Stropharia*.

In the descriptions that follow, color terms and notations in parentheses are from Kornerup and Wanscher (1978), while those in quotation marks are from Ridgway (1912). Spore statistics include:  $\bar{x}_r$ , the range of spore means where  $\bar{x}$  is the arithmetic mean of the spore length by spore width for *n* spores measured in a single specimen;  $\bar{x}_m$ , the mean of spore means ( $\pm$  SD); *Q*, the quotient of spore length and spore width in any one spore, indicated as a range of variation in *n* spores measured;  $\bar{Q}_r$ , the range of  $\bar{Q}$ -values

where  $\bar{Q}$  is the mean of *Q*-values in a single specimen;  $\bar{Q}_m$ , the mean of  $\bar{Q}$ -values. All specimens are deposited in SFSU or BISH. Frequently cited collectors are abbreviated as follows: D. E. Desjardin (DED), D. E. Hemmes (DEH).

TAXONOMY

Out of over 2000 specimens of agarics collected to date, only three species of *Volvariella* have been encountered, and are reported as follows: the cosmopolitan paddy straw mushroom, *V. volvacea* (Bull.: Fr.) Singer; the rarely collected Cuban species, *V. earlei* (Murr.) Shaffer; and a new variety of *V. bombycina* (Schaeff.: Fr.) Singer from the bark of living Norfolk pine. All three species are known only from lowland alien habitats and are considered by us to represent introduced species.

ARTIFICIAL KEY TO THE HAWAIIAN SPECIES OF *VOLVARIELLA*

- 1a. Pileus pure white, 30–45 mm diam.; basidiospores 11.5–15.5 × 8–10 μm . . . . . *V. earlei*  
1b. Pileus lemon yellow with brown fibrils or dark greyish brown to black, 40–135 mm diam.;  
basidiospores 6–9 × 4.5–6.5 μm . . . . . 2  
2a. Pileus lemon yellow with brown fibrils; cheilocystidia filamentous, up to 240 μm long;  
basidiomes formed on bark of living trees . . . . . *V. bombycina* var. *ciliatomarginata*  
2b. Pileus dark greyish brown to black; cheilocystidia clavate to ventricose-mucronate, up to 105 μm long;  
basidiomes formed on organic matter such as compost, fertilized woodchips or bagasse. . . . . *V. volvacea*

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<sup>1</sup>Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco, California 94132, U.S.A. E-mail: ded@sfsu.edu

<sup>2</sup>Corresponding author.

<sup>3</sup>Department of Biology, University of Hawai'i at Hilo, 200 West Kawili St., Hilo, Hawai'i 96720, U.S.A. E-mail: hemmes@uhunix.uhcc.hawaii.edu

*Volvariella earlei* (Murr.) R. Shaffer, *Mycologia* 49: 550. 1957. Figs. 1, 4–7.

Basionym: *Volvariopsis earlei* Murr., *Mycologia* 3: 282. 1911. TYPE: CUBA. Santiago de las Vegas, collected on the ground in a banana field, 4 June 1904, *F. S. Earle 45* (Holotype: NY) [non *Volvariopsis earleae* Murr., *N. Amer. Fl.* 10(2): 142. 1917, based on Earle #60 from Biloxi, Mississippi, USA].

Synonym: *Volvaria earlei* (Murr.) Murr., *Mycologia* 4: 332. 1912.

**Selected descriptions:** Murrill (1911: 282); Coker (1947: 233). The following are type studies: Shaffer (1957: 550); Pegler (1987: 886).

Pileus (Fig. 1) 30–45 mm diam., convex to campanulate, becoming broadly campanulate to plano-umbonate, disc smooth, margin striatulate; surface dull, dry but with a few debris particles adhered (subviscid?), glabrous; pure white or with an off-white disc, striations and extreme margin often colored like the young lamellae. Context 5–8 mm thick, white. Odor and taste not distinctive. Lamellae free, close with 3–4 series of lamellulae, broad (6–7 mm), white when young, becoming brown (7E5) in age; edges concolorous or slightly paler, even. Stipe 40–70 × 5–7 mm, central, cylindrical, ±equal or with a slightly enlarged, subclavate base, sometimes flattened, hollow, dull, dry, longitudinally striate, glabrous, white; partial veil absent; universal veil membranous, remaining as a persistent, saccate volva, 10–15 × 8–12 mm, glabrous to pubescent, white.

Basidiospores (Fig. 4) 11.5–15.5 × 8–10(–11.2) μm [ $\bar{x}$  = 13.1 ± 1.2 × 9.2 ± 0.7 μm, Q = 1.2–1.6,  $\bar{Q}$  = 1.42 ± 0.2, n = 25 spores], broadly ellipsoid to subamygdaliform, smooth, golden in KOH, inamyloid, guttulate, with walls 0.5–1.0 μm thick, reddish brown in deposit. Basidia (Fig. 5) 36–48 × 12.5–15.0 μm, clavate, 4-spored, unclamped. Basidioles clavate. Cheilocystidia (Fig. 6) scattered, lamellar edge fertile, 32–72 × 8–16 μm, ventricose or fusoid to clavate-mucronate, hyaline, thin-walled and often collapsed. Pleurocystidia (Fig. 7) scattered, uncommon to rare, 48–52 × 20–32 μm, broadly clavate, hyaline, thin-walled and often collapsed. Pileipellis a cutis; hyphae 4–14 μm diam., repent, cylindrical, non-inflated, non-incrusted, non-gelatinous to subgelatinous, hyaline to pale yellow, inamyloid. Pileus trama of loosely interwoven hyphae, 5–24 mm diam., cylindrical to slightly

inflated, otherwise like the pileipellis hyphae. Hymenophoral trama convergent; hyphae 3.5–20 μm diam., like the pileus tramal hyphae, with oleiferous hyphae interspersed. Stipitipellis a cutis similar to the pileipellis. Clamp connections absent in all tissues.

**Habit, habitat and distribution:** Scattered in black sand along the coast under false kamani (*Terminalis catappa* L., Combretaceae). January. Hawai'i.

**Additional specimen examined:** UNITED STATES. : Hawai'i, Waipio Valley, 5 January 1997, *DEH 1401* (SFSU).

**Commentary:** *Volvariella earlei* is a poorly known species, reported previously only from Cuba (Murrill, 1911) and North Carolina (Coker, 1947). The Hawaiian specimen represents the first report of the species outside of North America. The species is characterized by a relatively small, white, striatulate, dry to subviscid pileus, a narrowly cylindrical stipe sheathed basally by a small white volva, by rare, broadly clavate pleurocystidia and by large basidiospores (11.5–15.5 × 8–10 μm). It is phenetically similar to another subtropical species, *V. canalipes* (Murr.) R. Shaffer, but the latter differs in forming larger basidiomes with numerous, fusoid-ventricose pleurocystidia, much longer basidiospores (15.5–23 μm long), and has deep, longitudinal furrows on the stipe (*vide* Shaffer, 1957). *Volvariella pusilla* (Pers.: Fr.) Singer, a common temperate taxon with similar macromorphology, differs from *V. earlei* in forming much smaller basidiospores (in the range 5.5–8.0 × 4–6 μm) and fusoid-ventricose pleurocystidia.

*Volvariella bombycina* var. *ciliatomarginata* Desjardin & Hemmes var. *nov.* TYPE: UNITED STATES. : Lana'i, Koele Lodge, 25 January 1997, *D. E. Hemmes 1455* (Holotype: SFSU; Isotype: BISH). Figs. 2, 8–11.

*Differt a varietate typi pileo luteo vel limoneo, lamellis ad aciem ciliatis, cheilocystidiis longioribus (usque ad 240 μm), interdum catenatis. Solitarius ad lignum Araucariarum.*

Pileus (Fig. 2) 90 mm broad × 80 mm tall, obtusely conic to campanulate with decurved margin; surface dull, dry, radially appressed-fibrillose, non-striate; pale lemon yellow with yellowish brown radial fibrils. Context up to 5 mm thick, buff. Lamellae ascending, free, close to crowded with 3 series of lamellulae, moderately broad (8–10 mm), white becoming pale

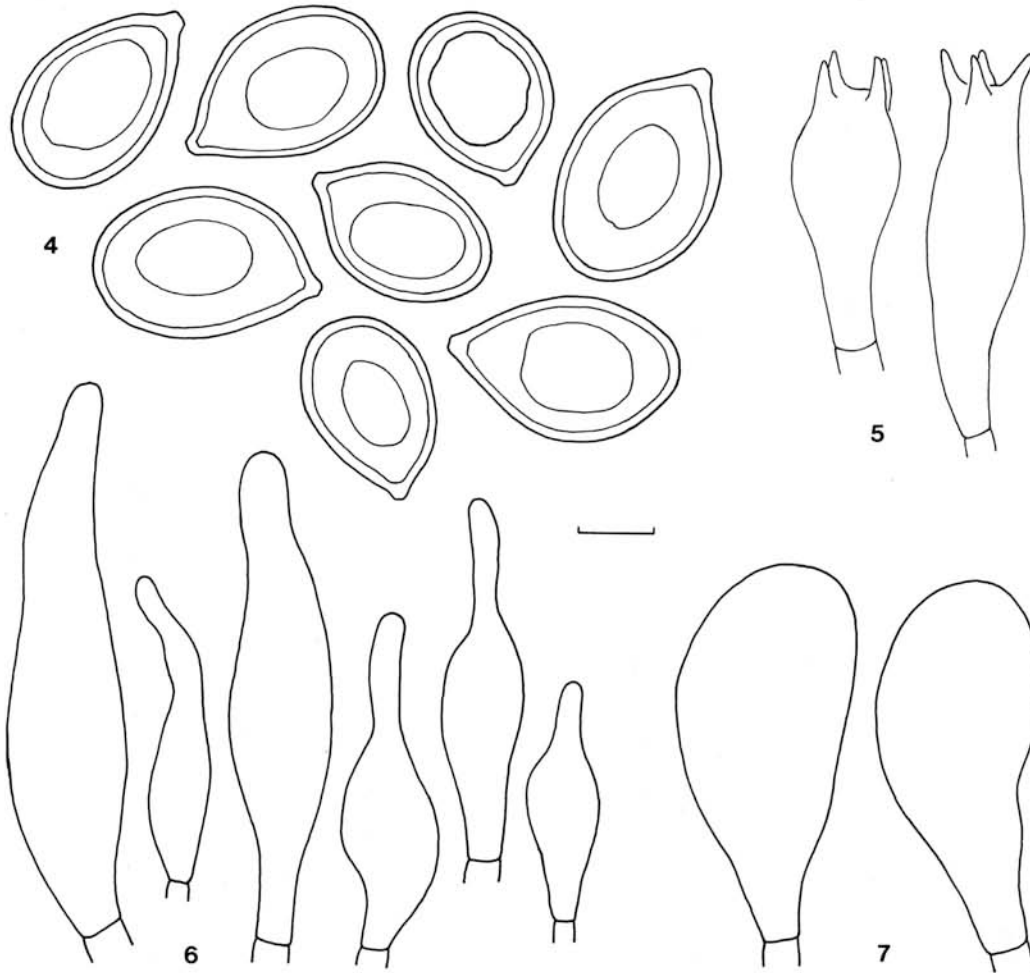


FIGURES 1–3. Basidiomes of *Volvariella* species. 1. *Volvariella earlei* (DEH 1401). 2. *Volvariella bombycina* var. *ciliatomarginata* (Holotype, DEH 1455). 3. *Volvariella volvacea* (DEH 1170). Scale bar = 10 mm.

pinkish brown to reddish brown; edges ciliate, white. Stipe 150 mm tall  $\times$  13 mm broad at apex to 38 mm broad at base (including volva), central, narrowed upward, hollow, dull, dry, with fine longitudinal grooves, glabrous, pale

lemon yellow to yellowish white; partial veil absent; universal veil membranous, remaining as a persistent, saccate volva,  $80 \times 25\text{--}38$  mm, dingy white but discoloring dark brown.

Basidiospores (Fig. 8)  $6.0\text{--}8.0$  ( $-8.5$ )  $\times$



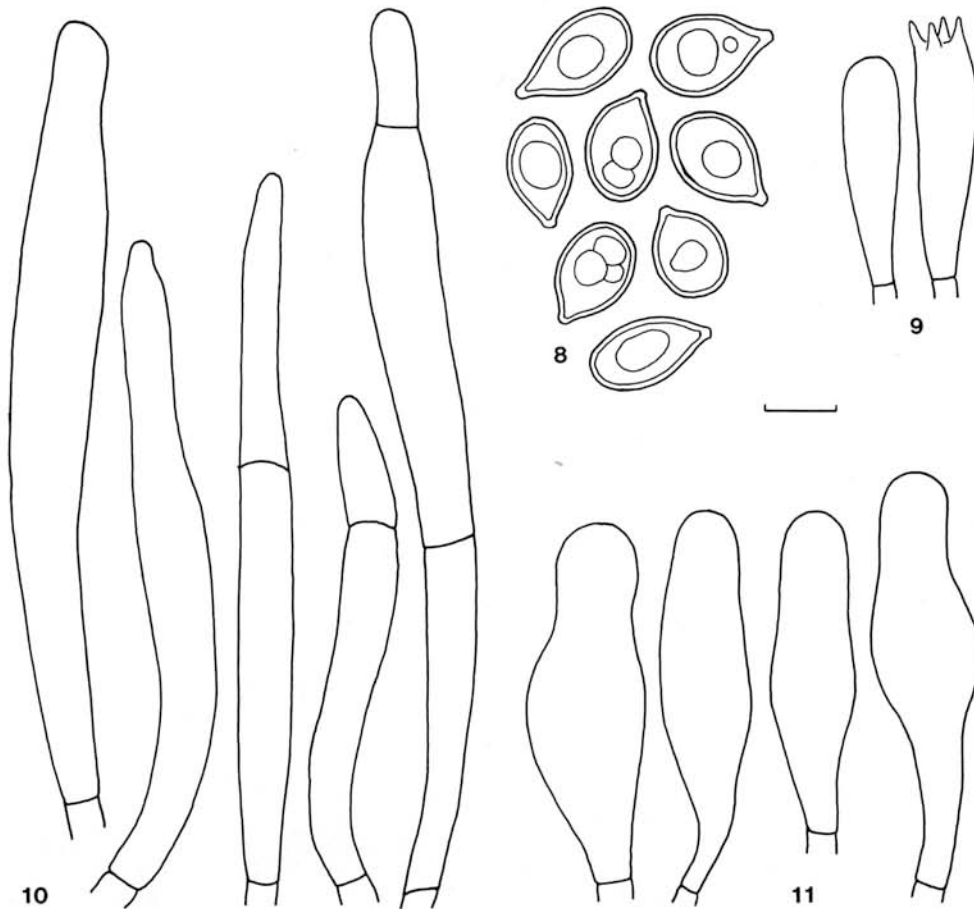
FIGURES 4-7. *Volvariella earlei* (DEH 1401). 4. Basidiospores. 5. Basidia. 6. Cheilocystidia. 7. Pleurocystidia. Scale bars: 4 = 5  $\mu$ m; 5-7 = 10  $\mu$ m.

4.5-5.5  $\mu$ m [ $\bar{x}$  = 7.4  $\times$  5.0  $\mu$ m,  $Q$  = 1.3-1.7,  $\bar{Q}$  = 1.48  $\pm$  0.12,  $n$  = 20], ovoid to broadly ellipsoid, with a prominent hilar appendix, smooth, thick-walled, pale yellowish brown in KOH, guttulate, inamyloid. Basidia (Fig. 9) 20-40  $\times$  7-10  $\mu$ m, clavate, 4-spored. Cheilocystidia (Fig. 10) abundant, lamellar edge sterile, 36-240  $\times$  14-26  $\mu$ m, cylindrical to narrowly subclavate, sometimes catenulate, thin-walled, hyaline, unclamped. Pleurocystidia (Fig. 11) common, 46-60  $\times$  12-17  $\mu$ m, broadly lageniform to broadly clavate, broadly obtuse, thin-walled, hyaline. Pileipellis a cutis; hyphae 8-30 (-48)  $\mu$ m diam., cylindrical to slightly inflated, thin-walled, non-gelatinous, non-incrusted, hyaline to pale yellow with a few cells with yellowish brown contents, inamyloid; terminal cells repent, up to 560  $\mu$ m long, cylindrical to fusoid, similar to the cheilocystidia. Pileus

trama undifferentiated from the pileipellis. Hymenophoral trama convergent; hyphae 3.5-12  $\mu$ m diam., cylindrical, hyaline, inamyloid; with numerous oleiferous hyphae interspersed, 3.2-5  $\mu$ m diam., hyaline, refractive. Stipitipellis a cutis similar to the pileipellis. Clamp connections absent in all tissues.

**Habit, habitat and distribution:** solitary, on the rotting base of a living Norfolk Pine (*Araucaria* sp., Araucariaceae) in horticultural area. January. Lana'i.

**Commentary:** *Volvariella bombycina* var. *ciliatomarginata* differs from the typical variety of the species in having a lemon yellow pileus (similar to *V. bombycina* var. *flaviceps* (Murrill) Shaffer, 1957), and most significantly in having a ciliate lamellar edge formed from extremely long and narrow cheilocystidia. This latter feature is apparently unique in the genus.



FIGURES 8–11. *Volvariella bombycina* var. *ciliatomarginata* (Holotype, DEH 1455). 8. Basidiospores. 9. Basidium and basidiole. 10. Cheilocystidia. 11. Pleurocystidia. Scale bars: 8 = 5  $\mu$ m; 9, 11 = 10  $\mu$ m; 10 = 20  $\mu$ m.

Growth on *Araucaria* sp. is also unusual; however, at present there are not enough data on the new variety to determine whether it is restricted to this substrate or may utilize a wide variety of substrates as in *V. bombycina* var. *bombycina*. *Volvariella bombycina* var. *ciliatomarginata* is known at present from a single specimen from the island of Lana'i.

*Volvariella volvacea* (Bull.: Fr.) Singer, Lilloa 22: 401. 1949 (1951). TYPE: FRANCE, not extant. Figs. 3, 12–15.

Basionym: *Agaricus volvaceus* Bull., Herb. Fr., pl. 262. 1780; *Agaricus volvaceus* Bull.: Fr., Syst. Mycol. 1: 278. 1821.

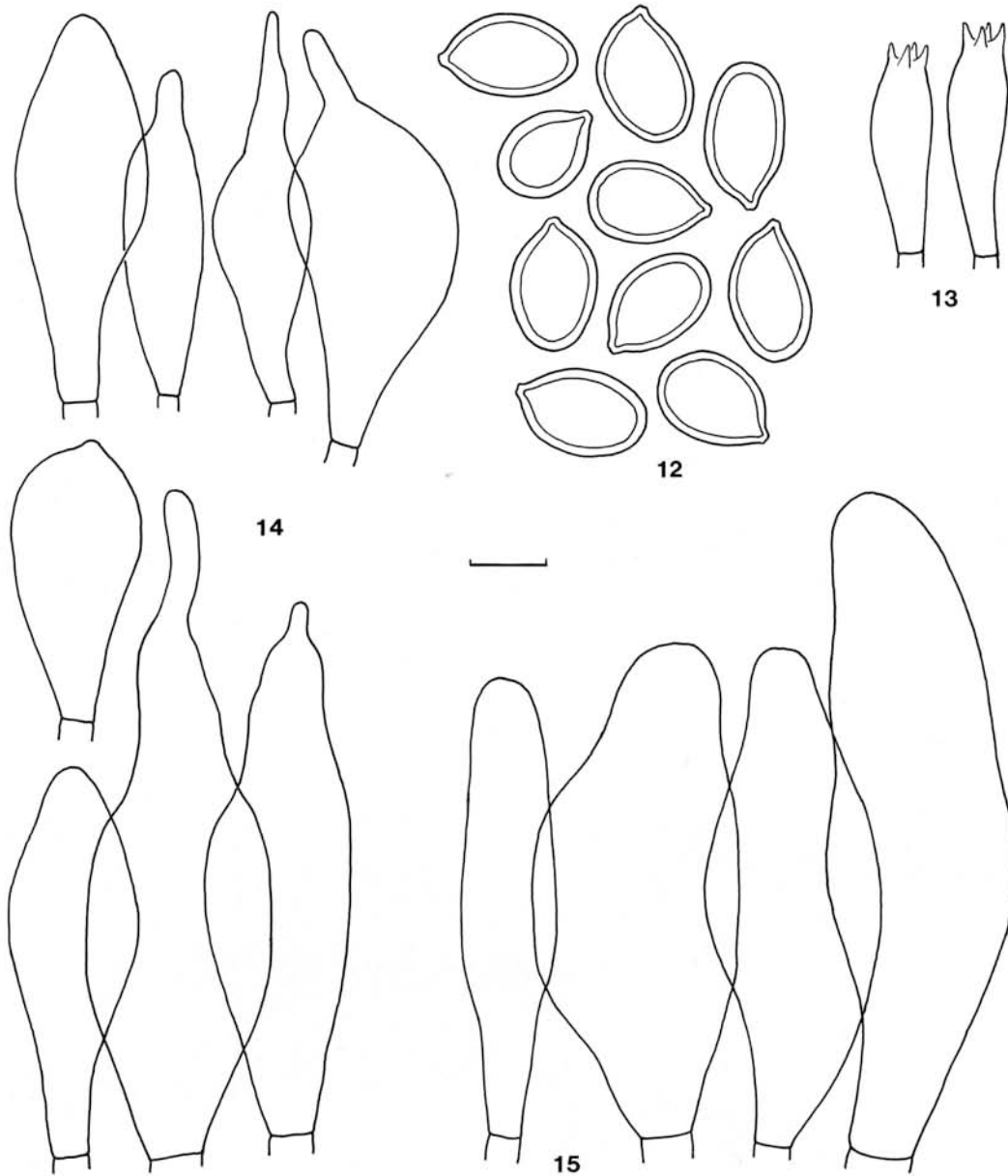
Synonyms: *Volvaria volvacea* (Bull.: Fr.) Kummer, Führ. Pilzk. 23: 99. 1871.

*Volvariopsis volvacea* (Bull.: Fr.) Murr., Mycologia 3: 280. 1911.

**Selected descriptions:** Shaffer (1957: 563); Hongo (1963: 233); Horak (1968: 709); Pegler (1983: 303); Orton (1986: 64); Boekhout (1990: 63).

Pileus (Fig. 3) 40–150 mm diam., ovoid to obtusely conical when young, expanding in age to campanulate, broadly campanulate, broadly convex or plano-umbonate, non-striate; surface dull, dry, virgate with black to dark grey, appressed fibrils, in age radially rimose; greyish brown (7E3) to dark greyish brown (7–8F3) or nearly black on the disc, margin slightly paler when young, often nearly white after pileus expansion. Context 3–7 mm thick, white. Odor slightly musty; taste mild. Lamellae ascending, free, close to crowded with 3–4 series of lamellulae, broad (8–17 mm), white when young, becoming pale pinkish white to pinkish brown (8C–D2–3) or reddish brown





FIGURES 12–15. *Volvariella volvacea* (DEH 740). 12. Basidiospores. 13. Basidia. 14. Cheilocystidia. 15. Pleurocystidia. Scale bars: 12 = 5  $\mu\text{m}$ ; 13–15 = 10  $\mu\text{m}$ .

(8C4) in age; edges concolorous or slightly paler, even. Stipe 85–145 mm tall  $\times$  10–15 mm broad at apex to 25–45 mm broad at base (including volva), central, narrowed upward, hollow, dull, dry, longitudinally striate, glabrous to finely fibrillose, white; partial veil absent; universal veil membranous, remaining as a persistent, saccate volva, 30–70  $\times$  25–45 mm, margin irregularly lobed after rupture,

glabrous to furfuraceous, apex dark grey or greyish brown, base dingy white.

Basidiospores (Fig. 12) 6.5–9.0 (–9.5)  $\times$  5.0–6.5  $\mu\text{m}$  [ $\bar{x}_r = 7.4\text{--}8.3 \times 5.6\text{--}5.7 \mu\text{m}$ ,  $\bar{x}_m = 8.0 \pm 0.4 \times 5.6 \pm 0.05 \mu\text{m}$ ,  $Q = 1.2\text{--}1.7$ ,  $Q_r = 1.28\text{--}1.48$ ,  $\bar{Q}_m = 1.41 \pm 0.2$ ,  $n = 25$  spores per 3 collections], ovoid to broadly ellipsoid or drop-shaped, smooth, pale yellow in KOH, inamyloid, guttulate, with walls 0.5–1.0  $\mu\text{m}$  thick, dark

pinkish brown in deposit. Basidia (Fig. 13) 30–40 × 8–11 μm, clavate, 4-spored, unclamped. Basidioles clavate. Cheilocystidia (Fig. 14) abundant, 45–105 × 11–28 μm, versiform, ranging from clavate or ventricose to fusoid, ventricose-mucronate, lageniform or irregular in outline, typically mucronate, hyaline, thin-walled. Pleurocystidia (Fig. 15) abundant, 48–100 × 13–42 μm, broadly clavate to ventricose or broadly lageniform, broadly obtuse, hyaline, thin-walled. Pileipellis a cutis; hyphae 8–18 μm diam., repent, cylindrical to slightly inflated, thin-walled, non-gelatinous, non-incrusted, hyaline, inamyloid, with brown to brownish orange, globular vacuolar or plasmatic pigments; terminal cells 24–160 × 12–25(–30) μm, repent, cylindrical to subclavate. Pileus trama of loosely interwoven hyphae 4–24 μm diam., cylindrical to inflated, hyaline, inamyloid, non-gelatinous; with oleiferous, refractive hyphae interspersed. Hymenophoral trama convergent; hyphae 2–15 μm diam., similar to pileus tramal hyphae, with oleiferous hyphae interspersed. Stipitipellis a cutis similar to the pileipellis except all hyphae lacking pigmented contents. Clamp connections absent in all tissues.

**Habit, habitat and distribution:** solitary to clustered, in bagasse (sugar cane refuse and cane mud press) in sugar cane fields, or in compost piles or composted woodchips in horticultural areas. Year-round. Hawai'i, Kaua'i.

**Additional specimens examined:** UNITED STATES. : Hawai'i, Hilo, Bayfront area, 3 August 1996, *DEH 1183* (SFSU); same location, 23 July 1998, *DEH 1701* (SFSU); Hilo, Univ. of Hawai'i at Hilo campus, organic garden area, 26 January 1996, *DEH 1022*(SFSU); same location, 11 July 1996, *DEH 1170*. Kaua'i, Lihue, 16 February 1995, coll. by Ryan Resquer, *DEH 740* (SFSU).

**Commentary:** *Volvariella volvacea*, the commonly cultivated paddy straw mushroom, is a cosmopolitan species that grows in organic matter heated by fermentation, especially in compost, straw, or rich organic soil with woodchips. In the Hawaiian Islands, the species frequents bagasse piles in sugar cane fields or fertilized woodchip mulch in horticultural areas, and has a long history of being collected for the table. The Hawaiian populations that we have encountered are phenetically indistinguishable from European, American or Asian material that we have studied.

A word of caution is provided concerning human consumption of wild-collected Hawaiian

*V. volvacea*. The primordium stage of the species, which is the favored stage to collect for the table, is nearly indistinguishable from the primordium stage of *Amanita marmorata* var. *myrtacearum* Miller, Hemmes and G. Wong (1996). The latter species belongs to the *A. phalloides* species group and is putatively deadly if ingested. In Hawai'i, both species may co-exist in horticultural areas where the myrtaeous associates of *A. marmorata* grow.

#### MYCENA SECT. RADIATAE

*Mycena* sect. *Radiatae* was established by Singer (1962a) and later amended (Singer, 1975) to accommodate species with the following combination of characters: a plicate and often rimose pileus suggestive of *Coprinus*; free or subfree lamellae; a pruinose to fibrillose-pubescent, insititious or subsinititious stipe lacking a basal disc; an absence of blue pigments in basidiomes; basidiospores that are ellipsoid to cylindrical, hyaline, amyloid, and lacking a germ pore; short and broad basidia; cheilocystidia are absent or if present then hair-like and not acanthophysoid; a pileipellis composed of non-diverticulate, hair-like hyphae or chains of short cells; dextrinoid (*ut* "pseudoamyloid") or inamyloid hyphae with irregular and inconstant clamp connections; and a habit generally on wood or woody humus. He designated *M. radiata* (Dennis) Singer as type species (Singer, 1962a) and included 7–9 species in the section: viz., *M. radiata*, *M. dennisii* (Dennis) Singer, *M. squamulosa* Singer, *M. chlorinosma* Singer, *M. multicaudata* Singer, *M. aosma* Singer, *Corrugaria viridiflava* Métrod, and probably also *M. lenta* Maire and *Hiatula boninensis* Berk. & M.A. Curtis (Singer, 1975, 1986). Maas Geesteranus (1985) redefined the section based only on analysis of the type species and concluded that the section should be considered monotypic until further analyses of additional taxa were conducted. His recircumscription does not differ substantially from that provided by Singer (1962a, 1975, 1986), but he limits the variation allowed in some structures (basidiospores pip-shaped; cheilocystidia absent) and adds a few additional observations (lamellar trama non-dextrinoid; caulocystidia inflated). Moreover, Maas Geesteranus (1985) intentionally makes no mention of clamp connections "as this piece of information may depend on possible other members of the section." Since 1986, more data have become





*Mycena papyracea* Desjardin & Hemmes, *sp. nov.* TYPE: UNITED STATES.

: Moloka'i, Pala'au State Park, Phallic Rock area, elev. 400–490 m, N21°10.500', W157°00.312', 10 January 1995, D. E. Desjardin 6228 (Holotype: SFSU; Isotype: BISH). Figs. 16, 19–24.

*Pileus* 12–30 mm *latus*, *primo obtuse conicus dein campanulatus ad plano-umbonatus, striatus vel sulcatus, interdum fissus, primo furfuraceus dein glabrus vel sericeus, ad centrum pallide brunneus vel aurantio-brunneus, albus marginem versus. Lamellae liber, confertae vel subdistantes, latae, albae. Stipes* 15–35 × 1.5–4 mm, *teres, aequalis, fistulosus, siccus, pruinose vel fibrillosus, subinsititius, primo albus, dein ad basim pallide aurantio-albus vel pallide rufobrunneus. Basidiosporae* (9.0–) 9.5–14.5 (–16) × 3.8–5.0 (–5.5)  $\mu\text{m}$ , *subcylindraceae, leves, hyalinae, amyloideae, tenuitunicatae. Basidia* 12.5–22.5 × 6–9  $\mu\text{m}$ , *1-spora vel 2-spora. Basidiola clavata. Cheilocystidia* 29–52 × 4.8–8.0  $\mu\text{m}$ , *fusoidea vel fusoideo-mucronata. Pleurocystidia nulla. Pileipellis ex hyphis* 3.5–14  $\mu\text{m}$  *latis, haud diverticulatis, subgelatinosis; cellulis terminalibus (pileocystidiis)* 60–120 × 7–12  $\mu\text{m}$  *instructis, fusoideis vel fusoideo-mucronatis, ad apicem attenuatis vel filiformibus* 2–5  $\mu\text{m}$  *latis. Trama lamellarum regulare, ex hyphis inamyloideis compositum. Caulocystidia pileocystidiis similia. Fibulae nullae. Sparsus, ad lignum dicotyledoneum.*

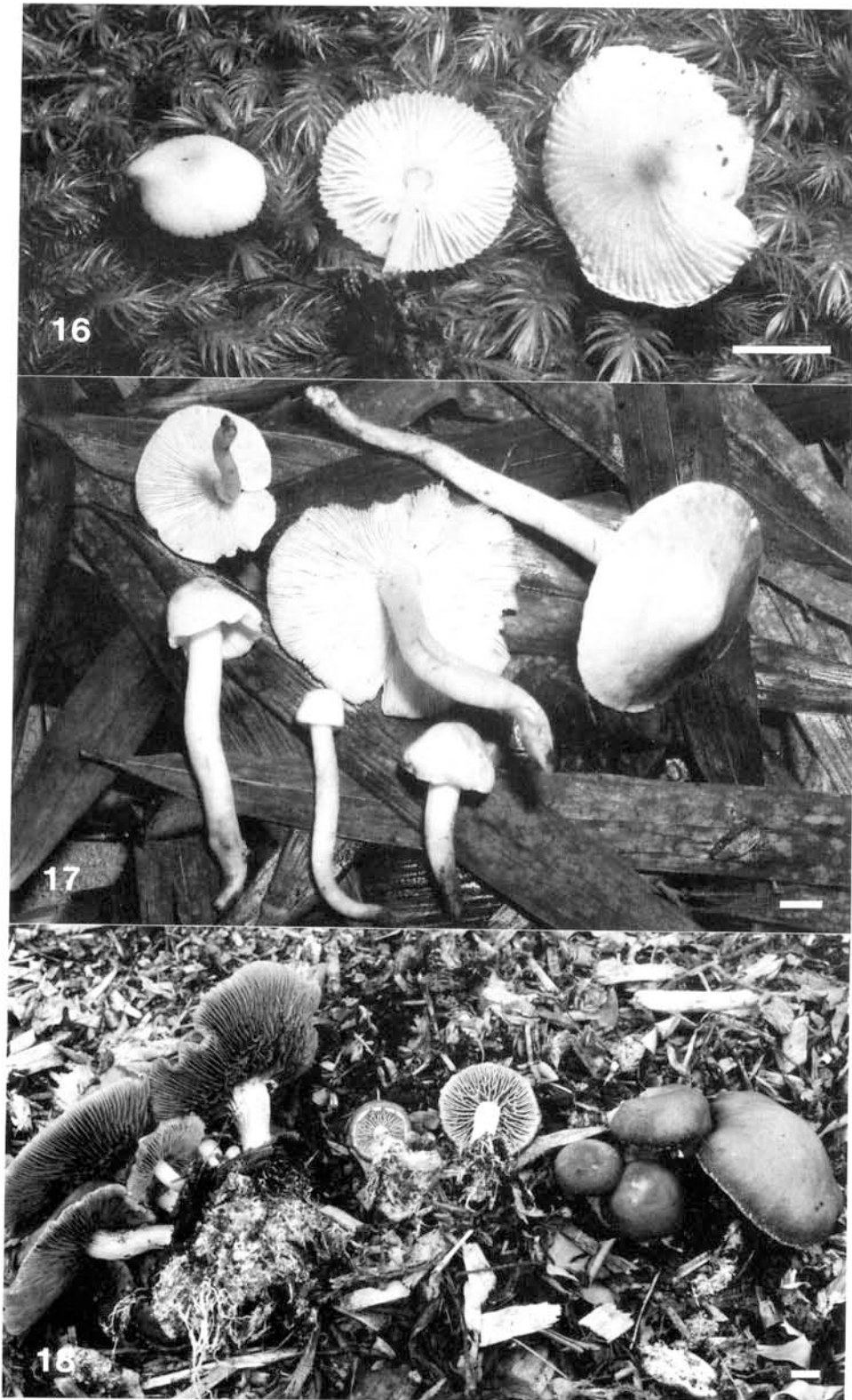
Basidiomes (Figs. 16, 19) putrescent, at maturity with the texture of tissue paper, very soft and silky. Pileus 12–30 mm diam., when young bullet-shaped to parabolic or obtusely conical, expanding in age to broadly obtusely conical or campanulate, sometimes plano-umbonate; margin even and entire when young, becoming striate or sulcate to the disc in age, sometimes splitting; surface at first minutely furfuraceous to submicaceous, glabrescent, becoming radially streaked, silky to satiny, often wrinkled, shiny, dry; disc pale brown (6–7D5–6; “hazel”) to pale brownish orange (6C4; “ochraceous tawny”), pure white elsewhere. Context extremely thin (0.5–1.5 mm), soft, silky. Lamellae free, ascending, close to subdistant with 1–3 series of lamellulae, broad (3–7 mm), convex to concave, thin, white. Stipe 15–35 × 1.5–4 mm, central, terete, often curved,  $\pm$ equal or slightly enlarged downward, fistulose, fibrous, dull to subshiny, dry, pruinose to appressed-fibrillose overall, glabrescent, exanulate, subinsititious, pure white overall or with a pale orangish white to pale reddish brown base

at maturity; tissues not staining where bruised.

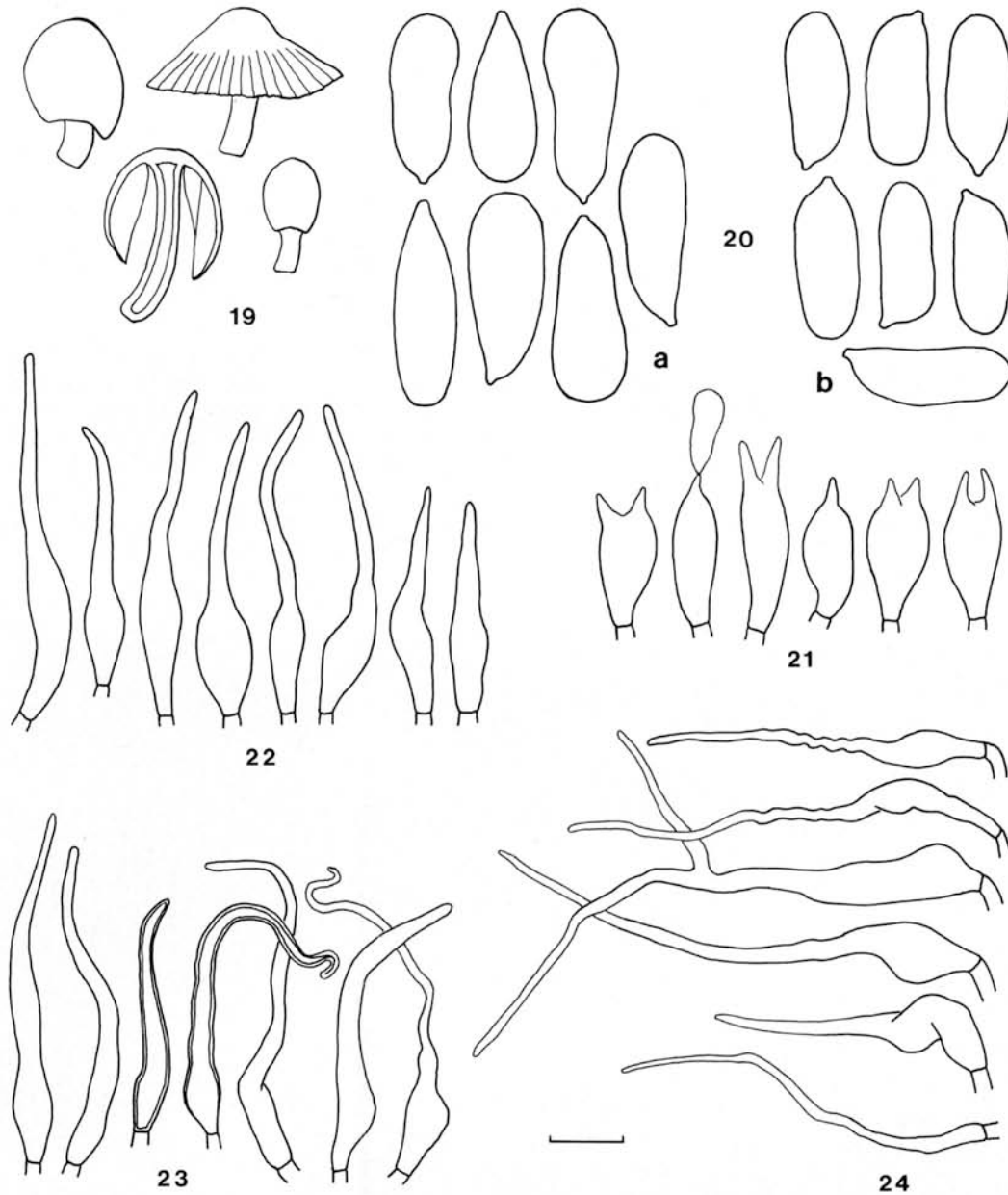
Basidiospores (Fig. 20) (9.0–) 9.5–14.5 (–16) × 3.8–5.0 (–5.5)  $\mu\text{m}$  [ $\bar{x}_r = 10.2$ –13.5 × 4.2–4.6  $\mu\text{m}$ ;  $\bar{x}_m = 11.3 \pm 1.9 \times 4.35 \pm 0.2 \mu\text{m}$ ;  $Q = 2.0$ –3.8;  $\bar{Q}_r = 2.4$ –2.9;  $\bar{Q}_m = 2.6 \pm 0.3$ ;  $n = 20$  spores per 3 collections], elongate-subcylindrical, sometimes slightly constricted, smooth, amyloid to strongly amyloid with an inamyloid hilar appendix, thin-walled, white in deposit. Basidia (Fig. 21) 12.5–22.5 × 6–9  $\mu\text{m}$ , broadly clavate, primarily 1-spored in DED 6228, 2-spored in DED 6050 and DED 6426, unclamped. Basidioles clavate. Cheilocystidia (Fig. 22) abundant, 29–52 × 4.8–8.0  $\mu\text{m}$ , fusoid to fusoid-ventricose with an elongated neck, hyaline, thin-walled; neck 1.5–2.5  $\mu\text{m}$  diam. Pleurocystidia absent. Pileipellis a cutis with numerous erect to repent pileocystidia; hyphae 3.5–14  $\mu\text{m}$  diam., non-diverticulate, hyaline or pale yellow over disc, weakly gelatinous, non-incrusted; pileocystidia (Fig. 23) narrowly fusoid to filamentous, or ventricose with a filamentous appendage, 60–120 × 7–12  $\mu\text{m}$  (at broadest diam. near base of cell), neck or filamentous appendage 2–5  $\mu\text{m}$  diam., ranging from hyaline and thin-walled (a majority) to yellow and thick-walled (a minority), acute, inamyloid. Pileus trama of radially arranged hyphae, 5.5–12 (–16)  $\mu\text{m}$  diam., non-gelatinous, hyaline, inamyloid or weakly dextrinoid. Lamellar trama regular; hyphae inamyloid, non-dextrinoid. Stipitipellis composed of abundant, erect to suberect, tangled caulocystidia (Fig. 24) similar to the pileocystidia, 80–160 × 5–18  $\mu\text{m}$  (at broadest), irregularly swollen at the base with a filiform appendage that is often twisted, contorted or helical, rarely branched, hyaline, inamyloid, thin-walled; appendage 2–5  $\mu\text{m}$  diam. Stipe tramal hyphae 2–12  $\mu\text{m}$  diam, irregularly cylindrical, hyaline, inamyloid to dextrinoid, thin- to thick-walled (–0.5  $\mu\text{m}$ ). Clamp connections absent in all tissues.

**Habit, habitat and distribution:** solitary on bark of living or dead casuarina (*Casuarina equisetifolia*; Casuarinaceae), *Formosa* koa (*Acacia confusa* Merr.; Fabaceae), and *Eucalyptus* species (*E. robusta* and others; Myrtaceae) in Lowland Alien Forest. January. Moloka'i.

**Additional specimens examined:** UNITED STATES. : Moloka'i, Pala'au State Park, Phallic Rock area, elev. 400–490 m, N21°10.500', W157°00.312', 12 January 1994, DED 6050 (SFSU); same location, 13 January 1996, DED 6426 (SFSU).



FIGURES 16–18. Basidiomes. 16. *Mycena papyracea* (DED 6050). 17. *Porpoloma bambusarum* (DED 6241). 18. *Stropharia variicolor* (DEH 1703). Scale bar = 10 mm.



FIGURES 19–24. *Mycena papyracea* (Holotype, DED 6228, and DED 6050). 19. Basidiomes (6228) x1. 20. a–b. Basidiospores (a. 6228; b. 6050). 21. Basidia (1-spored from 6228; 2-spored from 6050). 22. Cheilocystidia (6050). 23. Pileocystidia (6050). 24. Caulocystidia (6228). Scale bars: 19 = 10 mm; 20 = 5  $\mu$ m; 21–22 = 10  $\mu$ m; 23–24 = 20  $\mu$ m.

**Etymology:** *papyraceus* (Lat.) = papery, referring to the texture of the pileus.

**Commentary:** in the field, *Mycena papyracea* looks like a species of *Leucocoprinus*. When picked, it falls apart easily and has the texture of wet, silky paper. The Hawaiian species shares the most features with *M. squamulosa*,

described from Tucuman, Argentina, but differs in the details presented in the key above.

***Physalacria angustispora*** Desjardin & Hemmes, *sp. nov.* TYPE: UNITED STATES. : Maui, Iao Valley State Park, Po'ohohoaho Trail, N20°52.975', W156°32.700', 25 July

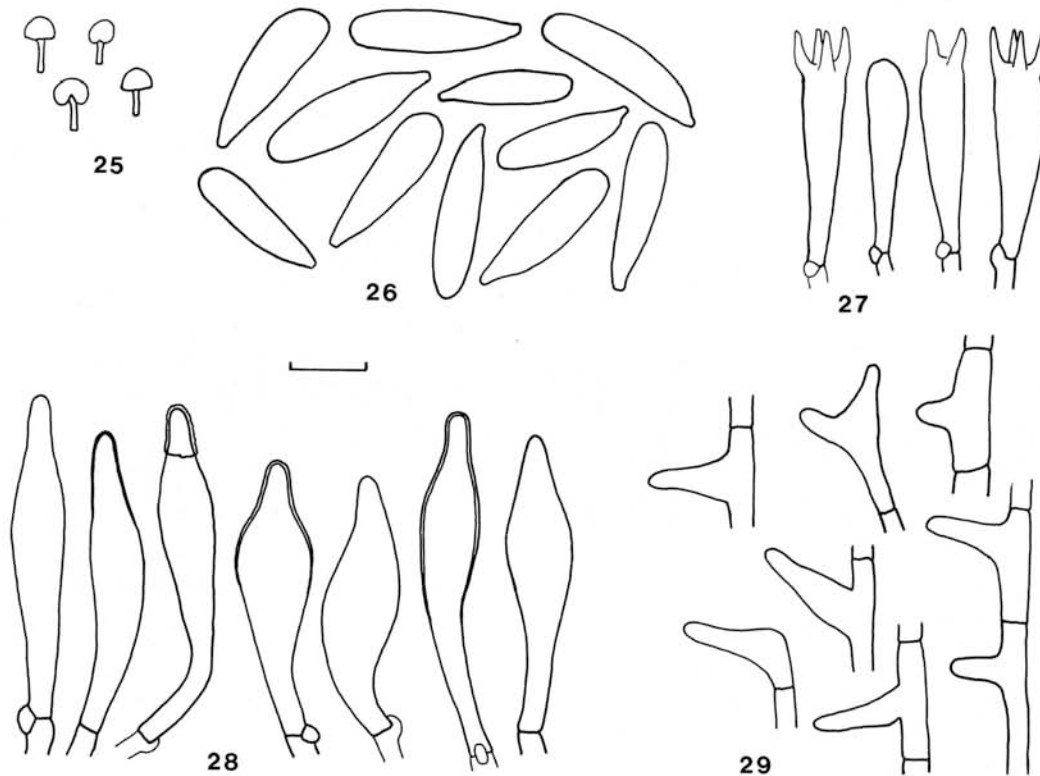
1993, D. E. Desjardin 5808 (Holotype: SFSU; Isotype: BISH). Figs. 25–29.

*Basidioma* 1.0–1.8 mm alta, solitaria. *Capitulum* primo subglobosum, dein hemisphericum, 0.4–0.8 mm latum, pruinose, album, aurantiobrunneum in herbario. *Stipes* 0.5–1.0 × 0.01 mm, insititius, glabrus, albus. *Basidiosporae* (8.5–) 9–11.5 × 2–3.5  $\mu$ m, subcylindricae vel subclavatae, leves, inamyloideae, hyalinae. *Basidia* 24–28 × 5.8–7  $\mu$ m, clavata, 4-sporea, fibulata. *Gloeocystidia* 35–46.5 × 6.5–.5 (–10)  $\mu$ m, fusioidea vel lageniformia, apicaliter obtusa, hyalina, fibulata. *Hyphae stipitis* 2–3.2  $\mu$ m latae, inamyloideae, defibulatae. *Sparsus*, ad folia putrida plantarum dicotyledonearum.

Basidiomes (Fig. 25) stipitate, 1.0–1.8 mm tall, with a subglobose hymenophore when young, becoming hemispheric or broadly bilobed at maturity, 0.4–0.8 mm diam.; surface minutely pruinose overall, dull, moist to dry, opaque to subtranslucent; white or buff when moist, drying in situ to pale brownish orange.

Stipe 0.5–1 × 0.01 mm, central, filiform, dry, shiny, glabrous, insititious, hyaline-translucent.

Basidiospores (Fig. 26) (8.5–) 9–11.5 × 2–3.5  $\mu$ m [ $\bar{x}$  = 10.3 ± 1.0 × 2.8 ± 0.4  $\mu$ m, Q = 2.8–5.1,  $\bar{Q}$  = 3.7 ± 0.6, n = 20], subcylindric to elongate-subclavate, smooth, inamyloid, hyaline. Basidia (Fig. 27) 24–28 × 5.8–7  $\mu$ m, clavate, 4-spored, clamped. Basidioles clavate. Hymenial gloeocystidia (Fig. 28) numerous, 35–46.5 × 6.5–.5 (–10)  $\mu$ m [ $\bar{x}$  = 40.4 × 7.7  $\mu$ m, n = 25], fusoid to elongate-lageniform, obtuse, non-capitate, mostly thin-walled, a few thick-walled (–0.5  $\mu$ m) near the apex, hyaline, sometimes with a resinous apical incrustation; with resinous, yellowish orange, orange or pale brownish orange droplets scattered in the hymenium. Hymenophoral trama of interwoven hyphae 2–3.2  $\mu$ m diam., cylindric, smooth, non-gelatinous, hyaline, inamyloid, thin-walled. Stipe tissue monomitic; hyphae 2–5.5  $\mu$ m diam., parallel, cylindric, smooth, non-gelatinous, hyaline, inamyloid. Caulocystidia (Fig. 29) scattered, as terminal cells or inter-



FIGURES 25–29. *Physalacria angustispora* (Holotype, DED 5808). 25. Basidiomes x5. 26. Basidiospores. 27. Basidia and basidiole. 28. Hymenial gloeocystidia. 29. Caulocystidia. Scale bars: 25 = 2 mm; 26 = 5  $\mu$ m; 27–29 = 10  $\mu$ m.

calary outgrowths, (4–) 6.5–18 × 2.5–5 (–7.5)  $\mu\text{m}$ , subcylindric, narrowly conic or fusoid, obtuse, non-capitate, thin-walled, hyaline. Clamp connections present only on hymenial and subhymenial elements, absent in all other tissues.

**Habit, habitat and distribution:** scattered on senescent, rotting leaves of umbrella tree (*Schefflera actinophylla* (Endl.) Harms, Araliaceae) and other broad-leaved hardwoods in Lowland Mesic Forest (Guava Forest and Kukui Forest). July. Maui.

**Additional specimen examined:** UNITED STATES. : Maui, Iao Valley State Park, Po`ohohoahoa Trail, N20°52.975', W156°32.700', 13 January 1995, DED 6235 (SFSU).

**Commentary:** taxonomically informative features of *Physalacria angustispora* include: 1) very small basidiomata with subglobose to hemispheric head up to 0.8 mm diam. that is white when fresh but dries pale brownish orange; 2) a glabrous, hyaline, insititious stipe up to 1 mm long; 3) basidiospores averaging 10.3 × 2.8  $\mu\text{m}$ , with mean Q-value of 3.7; 4) fusoid hymenial cystidia with mean width 7.7  $\mu\text{m}$ ; 5) non-diverticulate stipe cortical hyphae that give rise to short, cylindrical to fusoid caulocystidia; 6) clamp connections present only on hymenial and subhymenial elements; and 7) habit on dicotyledonous tree leaves.

The new species is most closely allied with *Physalacria clusiae* Sydow, *P. cryptomeriae* Berthier & Rogerson, and *P. komabensis* Imazeki. *Physalacria clusiae* differs in having longer basidiospores (14–18  $\mu\text{m}$ ), larger hymenial cystidia (20–60 × 8–12  $\mu\text{m}$ ), diverticulate caulocystidia, fructification on leaves of *Clusia rosea* Jacq. (Clusiaceae), and lacks clamp connections (Corner, 1950; Berthier, 1985). *Physalacria cryptomeriae* differs in forming larger basidiospores (16–18 × 3.5–5  $\mu\text{m}$ ), longer basidia (30–50  $\mu\text{m}$ ), some capitate hymenial cystidia, basidiomata that dry white overall, and fructification on leaves of *Cryptomeria japonica* (L.) D. Don (Taxodiaceae) (Berthier and Rogerson, 1981; Berthier, 1985). Unlike other *Physalacria* species, *P. angustispora* and *P. cryptomeriae* both have relatively narrow hymenial cystidia (6.5–8  $\mu\text{m}$ ) and form clamp connections only on the hymenial and subhymenial elements. *Physalacria komabensis* differs in forming broader basidiospores (4–5.5  $\mu\text{m}$ ) on bisporic basidia, broader hymenial cystidia (9.5–13

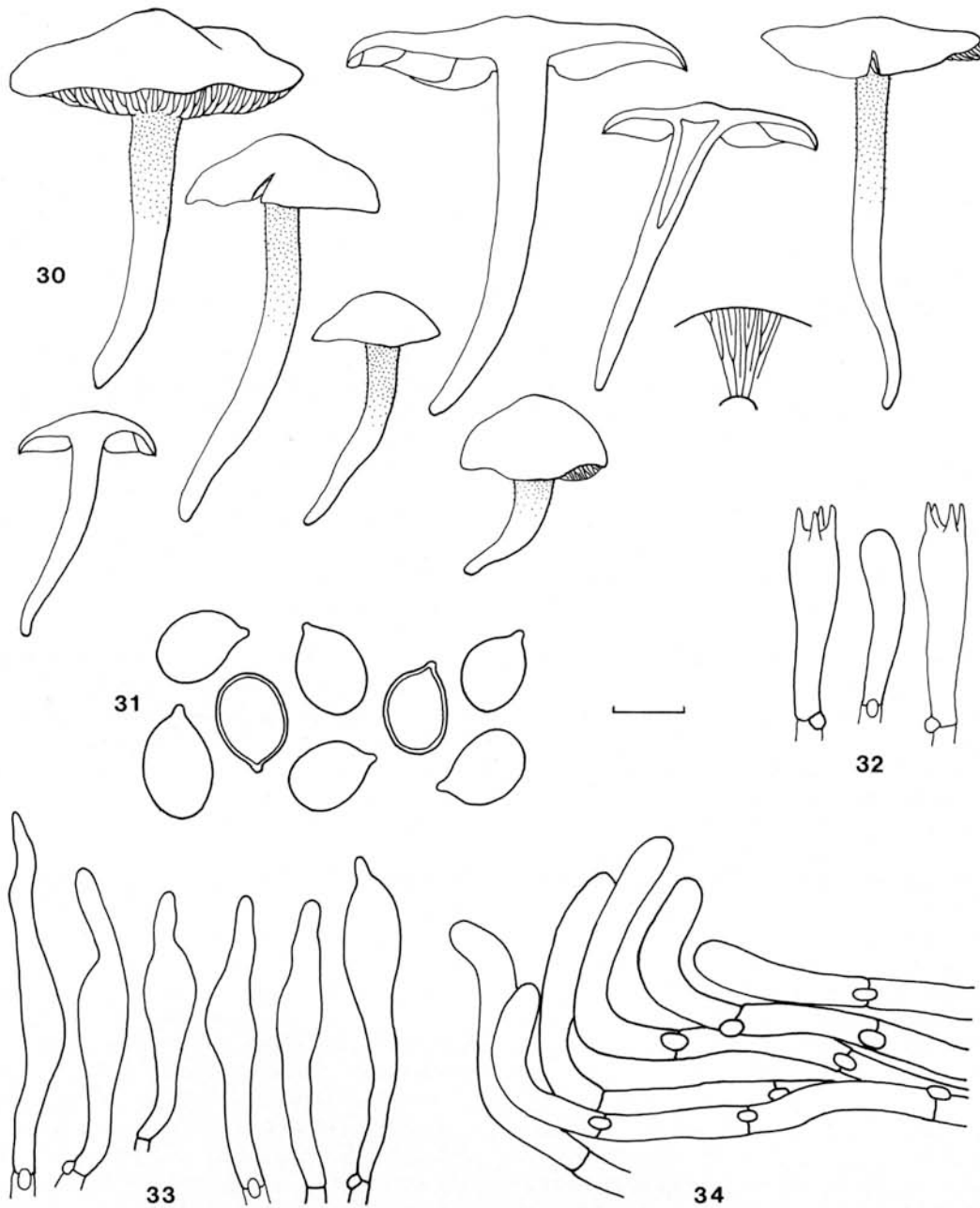
$\mu\text{m}$ ), fructification on rotten hardwood, and presumably lacks caulocystidia (Imazeki, 1935; Corner, 1970; Berthier, 1985).

***Porpoloma bambusarum*** Desjardin & Hemmes, *sp. nov.* TYPE: UNITED STATES. : O`ahu, Manoa Valley, Manoa Falls Trail, 8 January 1992, D. E. Desjardin 5462 (Holotype: SFSU; Isotype: BISH). Figs. 17, 30–34.

*Pileus* 25–60 mm *latus*, *primo obtuse conicus vel campanulatus dein planoconvexus vel late umbonatus, interdum depressus, siccus, haud hygrophanus, coactus vel subgranulosus vel fibrillis obscuris obtectus, marmoratus, brunneus vel cinereobrunneus ad discum, marginem versus albus, haud striatus, saepe fissilis vel lobatus. Caro* 3–5 mm *crassa in centro pilei, fragilis, alba. Odor raphanaceus. Lamellae adnexae vel sinuatae (haud decurrentes), confertae, angustae vel latae (2–4 mm), furcatae, albae deorsum rubescentes tactu, rufobrunneae in herbario. Stipes (25–) 40–70 (–90) × 3–8 mm, ad basim 2–4 mm latus, plerumque deorsum attenuatus, radicans, fragilis, solidus dein fistulosus, furfuraceus, albus deorsum pallide rufobrunneus. Basidiosporae 5.4–6.5 (–7) × 4.2– 5.2  $\mu\text{m}$ , ovatae vel late ellipsoideae, leves, hyalinae, amyloideae. Basidia 25.5–29 × 6–7  $\mu\text{m}$ , clavata, 4-spora. Cheilocystidia (25–) 32–52 (–60) × 4.5–8 (–10)  $\mu\text{m}$ , versiformia, subcylindrica, clavata, lageniformia vel fusiformia, interdum apice mucronato vel filiforme, hyalina, tenuitunicata. Pleurocystidia nulla. Pileipellis 2.5–6.5  $\mu\text{m}$  ex hyphis latis, cylindricis, cellulis terminalibus cylindratis vel subclavatis instructis, succo hyalino vel griseobrunneo impletis. Stipitipellis pileipellidem similis. Fibulae presentes. Gregarius, ad terram et in humo Bambusarum.*

Basidiomes (Fig. 17, 30) tricholomatoid. Pileus 25–60 mm diam., obtusely conical or campanulate with incurved margin when young, expanding to plano-convex, plane-undulate, broadly campanulate, plano-umbonate, or plane with uplifted, straight or wavy margin, seldom centrally depressed; margin often split at maturity or sometimes cleft or lobed, not striate; surface dull, dry, not hygrophorous, opaque, granulate or appressed-fibrillose, not squamulose; splotchy when young, brown (7E4) or greyish brown (7E3) on the disc with a white margin showing pale brown splotches, in age central region evenly colored brown (6E4–5; 7E4) to dark greyish brown





FIGURES 30–34. *Porpoloma bambusarum* (Holotype, DED 5462, and DED 6572). 30. Basidiomes (6572) x1. 31. Basidiospores (5462). 32. Basidia and basidiole (5462). 33. Cheilocystidia (5462). 34. Pileipellis terminal cells (5462). Scale bars: 30 = 10 mm; 31 = 5  $\mu$ m; 32–34 = 10  $\mu$ m.

(6F3–4), margin brown (7E4) with scattered buff, pale brownish buff to nearly white areas; yellow or red pigments absent but often staining or discoloring greyish red (8–9C4–5) or pale reddish brown (8D4–5, 9D5–6) in age. Context thick (3–5 mm), soft and brittle, white. Odor strong, raphanoid, disagreeable or mildly fungal

(but not like *Tricholoma saponaceum* nor fruity as in other *Porpoloma* species). Taste fungal and often bitter. Lamellae shallowly adnexed or sinuate, seceding at maturity, never decurrent, crowded with 1–2 series of lamellulae, many forked but not regularly so near the margin, convex, narrow to moderately broad (2–4 mm), eas-

ily separable from pileus context; pure white when young, becoming buff in age and typically discolored pink to pale pinkish purple where bruised, dried reddish brown. Stipe (25–) 40–70 (–90) × 3–8 mm (apex) × 2–4 mm (base), central or eccentric, round or slightly compressed in cross-section, seldom cleft, gradually narrowed downward to a pointed radicating base, radicating 20–40 mm, dull, dry, solid becoming stuffed to hollow, brittle to twisted-fibrous, furfureous overall when young, base glabrescent; white overall when young, apex remaining so in age, base often discoloring to pale reddish brown or pale brown.

Basidiospores (Fig. 31) 5.4–6.5 (–7) × 4.2–5.2 μm [ $\bar{x}$  = 6.0 ± 0.5 × 4.7 ± 0.3 μm,  $Q$  = 1.2–1.4,  $\bar{Q}$  = 1.28 ± 0.04,  $n$  = 25], ovate to broadly ellipsoid, smooth, firm-walled (–0.5 μm), strongly amyloid, hyaline. Basidia (Fig. 32) 25.5–29 × 6–7 μm, clavate, 4-spored, clamped. Basidioles subclavate. Cheilocystidia (Fig. 33) numerous, lamellar edge sterile, (25–) 32–52 (–60) × 4.5–8 (–10) μm, versiform, ranging from filamentous-flexuous or irregularly subcylindric to clavate, lageniform or fusoid, sometimes mucronate or with an elongate apical appendage, hyaline, thin-walled. Pleurocystidia absent. Pileipellis (Fig. 34) a cutis with suberect to erect and clustered terminal cells; terminal cells cylindrical to subclavate, poorly differentiated from subtending hyphae; hyphae 2.5–6.5 μm diam., cylindrical, smooth, non-gelatinous; walls hyaline, thin to firm (–0.5 μm); contents ranging from hyaline to pale greyish brown (i.e., pigment cytoplasmic or vacuolar). Pileus trama interwoven; lamellar trama subparallel; hyphae 3–8 (–9.5) μm diam., cylindrical, thin- to firm-walled, smooth, non-gelatinous, inamyloid, walls and contents hyaline. Stipe tissue monomitic; cortical hyphae 2.5–6 μm diam.; medullary hyphae 5–12 μm diam.; parallel, cylindrical to slightly inflated, not moniliform, not sinuous, sometimes secondarily septate, smooth, non-gelatinous, thinwalled, hyaline. Stipitipellis similar to the pileipellis, a cutis with regions of suberect to erect and clustered, undifferentiated terminal cells; hyphal walls and contents hyaline to pale yellow. Clamp connections common in all tissues.

**Habit, habitat and distribution:** scattered, rooting in soil under black bamboo (*Phyllostachys nigra* (Wodd.) Munro, Gramineae) in Lowland Mesic Forest dominated by alien plants. January to July. Maui, O`ahu.

**Additional specimens examined:** UNITED

STATES. : Maui, Ko`olau State Forest Reserve, Na`ili`iliha`ele Trail, N20°53.230', W156°12.625', 19 July 1994, *DEH 499* (SFSU); same location, 14 January 1995, *DED 6241* (SFSU); same location, 16 January 1996, *DED 6445* (SFSU); same location, 28 August 1996, *DED 6572* (SFSU). O`ahu, Manawili Trail, windward side of Pali, 14 September 1996, *DEH 1235* (SFSU).

**Commentary:** *Porpoloma bambusarum* is characterized by the following features: 1) a greyish brown, granulose pileus lacking squamules and lacking yellow pigmentation; 2) white, crowded, forked, adnexed to sinuate lamellae that discolor pink where bruised and dry reddish brown; 3) a narrow, white, radicating stipe that discolors brown at the base; 4) relatively small, ovate, amyloid basidiospores with  $Q$  = 1.3; 5) a sterile lamellar edge composed of versiform cheilocystidia; and 6) cytoplasmic or vacuolar greyish brown pigments. In addition, *P. bambusarum* is the only known member of the genus that forms bifurcate lamellae, a strong raphanoid odor, bitter taste, and is saprotrophic in tropical bamboo habitat. All other described species are either obligately ectomycorrhizal with *Nothofagus* or various Fagales [viz., *P. adriani* Raithele, *P. amyloideum* (Stevenson) Horak, *P. boninense* (S. Ito & Imai) Hongo, *P. coyan* N. Garrido, *P. portentosum* Sing., *P. sejunctum* Sing., *P. terreum* Sing., and possibly *P. umbrosum* (A. H. Smith & Walters) Sing. (Dr. Roy Halling, pers. obs.)], or they are saprotrophically associated with various dicotyledonous trees [viz., *P. macrocephalum* (Schulz. apud Kalchbr.) Bon, *P. macrorhizum* (Sacc.) Bon, *P. spinulosum* (Kühn. & Romag.) Sing., and several others described in *Tricholoma* by Corner (1994)], saprotrophic with conifers [viz., *P. elytroides* (Scop.: Fr.) Sing., *P. umbrosum*], or they occur in montane grasslands [viz., *P. metapodium* (Fr.) Sing., *P. pescaprae* (Fr.) Sing.].

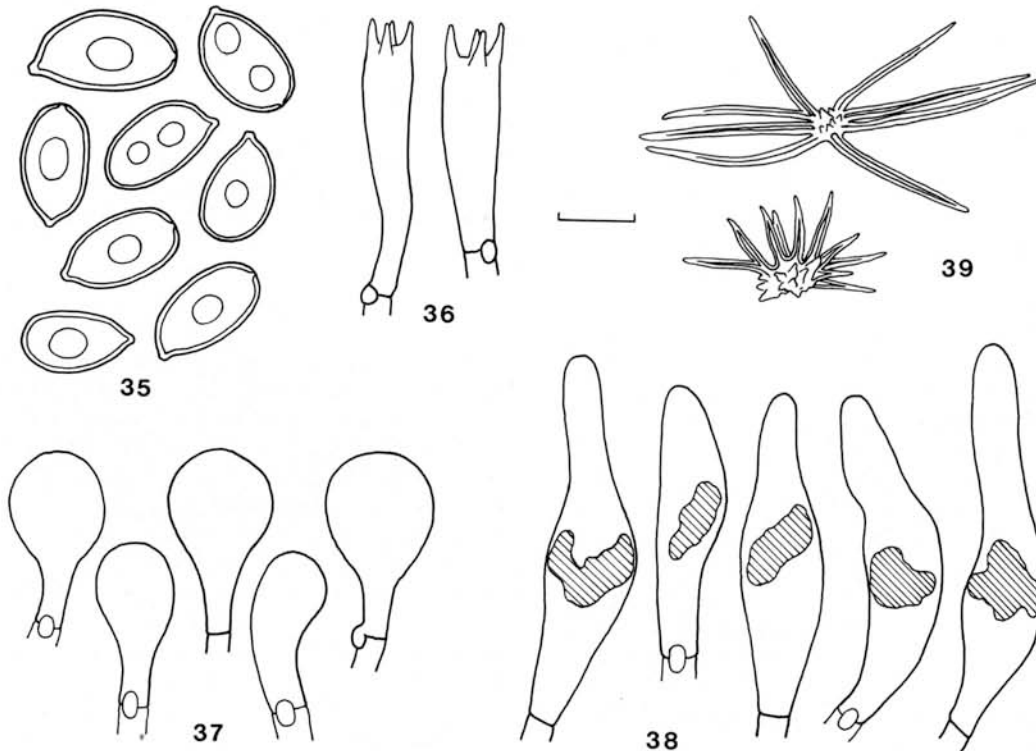
*Porpoloma bambusarum* is most phenetically similar to *P. macrocephalum* sensu Bon (1978), sharing pileus pigmentation, lamellae that are forked near the margin and discolor pink, and a radicating stipe. The latter species differs from *P. bambusarum* in developing much larger basidiomes with squamulose pilei (pilei 80–200 mm diam.; stipes 50–150 × 10–70 mm) and in its association with beech and oak in Europe. In addition, *P. macrocephalum* has slightly narrower basidiospores (3–4.5 μm), and lacks cheilocystidia.

The combination of grey intracellular pigments, amyloid basidiospores and forked lamellae that stain pink and are easily separated from the pileus context, are features strongly suggestive of the genus *Cantharellula*. Indeed, *P. bambusarum* is phenetically similar to *Cantharellula humicola* Corner, described recently from Malesia (Corner, 1994). The latter species differs, however, in forming smaller (7–30 mm diam.), subtomentose to scurfy-pruinose pilei, distinctly decurrent, concave, brown-marginate, narrower (1–2.5 mm) lamellae that neither discolor pink at maturity nor dry reddish brown, forms slightly smaller basidiospores ( $4.5\text{--}6 \times 3.5\text{--}5 \mu\text{m}$ ), and is not associated with bamboo (*vide* Corner, 1994). Features of *P. bambusarum* indicate the difficulty in distinguishing tropical amyloid-spored tricholomatoid taxa (i.e., *Porpoloma*) from *Cantharellula* and suggest a close relationship between these taxa. We are following Singer's (1986) generic concepts in accepting the new species in *Porpoloma* rather than in *Cantharellula*.

*Stropharia variicolor* Desjardin & Hemmes, *sp. nov.* TYPE: UNITED STATES.

Prince Kuhio Mall area, 2 August 1994, D. E. Hemmes 523 (Holotype: SFSU; Isotype: BISH). Figs. 18, 35–39.

*Pileus* 40–90 mm *latus*, *primo* *hemisphaericus vel convexus*, *dein planus*, *fibrillis albis veli ad marginem obtectus*, *viscidus*, *glabrus*, *primo ope castaneus vel obscure violaceobrunneus*, *palescens*, *senectudine pallide aurantiobrunneus vel flavobrunneus*. *Lamellae adnatae vel adnexae*, *latae*, *primo pallide brunneae dein fuscae*. *Stipes* 40–80  $\times$  8–14 (–20) mm, *cylindricus*, *apprise fibrillosus*, *saepe striatus*, *argillaceus vel pallide aurantioalbus*, *anulo albo membranaceoque instructus*, *ad basim rhizomorphis albis conspicuis obtectus*. *Basidiosporae* 7–8  $\times$  4.5–5.0  $\mu\text{m}$ , *ellipsoideae*, *poro inconspicuo instructae*, *leves*, *crasse tunicatae*, *castaneae in cumulo*. *Basidia* 25–35  $\times$  6.5–8.0  $\mu\text{m}$ , *clavata*, *4-sporea*. *Cheilocystidia* 17.5–26  $\times$  9–15  $\mu\text{m}$ , *late clavata vel sphaeropedunculata*, *hyalina*, *tenuitunicata*. *Pleurocystidia* 37–55  $\times$  9.5–13  $\mu\text{m}$ , *chrysocystidiis*



FIGURES 35–39. *Stropharia variicolor* (Holotype, DEH 523). 35. Basidiospores. 36. Basidia. 37. Cheilocystidia. 38. Pleurocystidia (chrysocystidia). 39. Rhizomorph acanthocytes. Scale bars: 35 = 5  $\mu\text{m}$ ; 36–38 = 10  $\mu\text{m}$ ; 39 = 20  $\mu\text{m}$ .

*similia, clavata vel ventricoslageniformia, pigmento flavo impleta. Ixocutis ex hyphis subgelatinosis, hyalinis vel pallide luteobrunneis, 4.0–6.5 (–12) μm diam, pigmento parietale instructis. Trama lamellarum regulare. Caulocystidia nulla. Fibulae presentes. Solitarius vel cespitosis ad quisquilia lignosa.*

Basidiomes (Fig. 18) tricholomatoid. Pileus (25–) 40–90 mm diam., hemispherical to convex when young, expanding in age to broadly convex or plano-convex; margin incurved when young and attached to a thick, membranous, cottony, white partial veil, becoming decurved to straight or sometimes uplifted in age, typically appendiculate with shaggy, white partial veil remnants, entire or splitting in age; surface dull to shiny, viscid when young, dry in age, glabrous; color variable, when young typically dark reddish brown (8–9F–6–8) to dark violet brown (10–11F6), seldom brown (6E6–8), becoming splotchy in age and losing reddish brown tones and becoming brown (6E6–8) to brownish orange (6B–C5–6) or yellowish brown (5C–D6–8), mature basidiomes often a combination of dark reddish brown and paler brownish orange colors or faded entirely to yellowish brown. Context thick (5–10 mm), white to buff. Lamellae adnate to shallowly adnexed, close with 3–4 series of lamellulae, convex, broad (8–12 mm), light brown (6D–E4–5; “hazel” to “snuff brown”) when young, becoming dark brown (6F4–5) in age. Stipe 40–80 × 8–14 (–20) mm, central, cylindrical or with a slightly enlarged apex, solid, dull, dry, appressed-fibrillose, often striate, buff to pale orange white (5A2) or pale greyish orange (5B4–5); partial veil membranous, cottony, white, persistent as an appendiculate margin, rarely leaving a few evanescent patches on stipe apex; base of stipe with numerous, coarse, white rhizomorphs that bind the woody substrate together.

Basidiospores (Fig. 35) (6.5–) 7–8 (–9) × 4.5–5.0 (–5.7) μm [ $\bar{x}$  = 7.6 ± 0.6 × 4.8 ± 0.3 μm; Q = 1.4–1.9;  $\bar{Q}$  = 1.6 ± 0.1; n = 25 spores], ellipsoid, with or without a very small, nearly indistinguishable germ pore, smooth, inamyloid, thick-walled (0.4–0.7 μm), brown to golden brown in 3% KOH; spore deposit dark brown with a hint of purple (6–7F4–5; “chestnut brown” to “mummy brown”). Basidia (Fig. 36) 25–35 × 6.5–8.0 μm, clavate, 4-spored, clamped. Basidioles clavate. Cheilocystidia (Fig. 37) 17.5–26 × 9–15 μm, abundant, lamel-

lar edge sterile, broadly clavate to sphaeropedunculate, hyaline, thin-walled, contents hyaline. Pleurocystidia abundant as chrysocystidia (Fig. 38) 37–55 × 9.5–13 μm, clavate to ventricose or lageniform with a neck up to 20 μm long, hyaline, thin-walled, with an amorphous to globular, refractive, yellow inclusion centrally located in cell. Pileipellis an ixocutis; hyphae 4.0–6.5 (–12) μm diam., repent, interwoven, subgelatinous to gelatinous, non-incrusted, hyaline to yellowish brown, pigments parietal, inamyloid, thin-walled. Hypodermium undifferentiated. Pileus trama composed of loosely interwoven hyphae, 4–14 μm diam., cylindrical to slightly swollen, non-gelatinous, non-incrusted, thin- to thick-walled. Hymenophoral trama regular, hyphae as in pileus trama but also with gloeplerous hyphae interspersed. Stipitipellis a cutis; hyphae similar to those of pileus trama. Rhizomorphs with numerous acanthocytes (Fig. 39), with unbranched stellate outgrowths from an amorphous central cell, thick-walled, hyaline to yellow. Clamp connections present in all tissues.

**Habit, habitat and distribution:** single or more commonly in dense cespitose clusters (2–30 basidiomes) on woodchip debris in horticultural areas. May to November. Hawai'i.

**Additional specimens examined:** UNITED STATES. : Hawai'i, Hilo, Panaewa, UH College of Agriculture farm, 24 July 1998, *DEH 1703* (SFSU); University of Hilo campus, 29 November 1997, *DEH 1616* (SFSU); same location, 3 May 1998, *DEH 1682* (SFSU).

**Commentary:** *Stropharia variicolor* is a problematical taxon in that it shows features of *Stropharia*, *Hypholoma*, and in the field looks like an *Agrocybe*. Features that suggest *Agrocybe* include a yellowish brown (when mature), glabrous pileus, brown lamellae with a chestnut brown spore deposit, a white partial veil, coarse white rhizomorphs, and growth in clusters on woodchips. The pileipellis anatomy (an ixocutis), chrysocystidia, and rhizomorph acanthocytes of *S. variicolor*, however, exclude *Agrocybe* from consideration. Features that suggest *Hypholoma* include a yellowish brown, glabrous pileus with appendiculate margin, chrysocystidia, pileipellis a cutis, and cespitose habit on woody debris. However, *Hypholoma* typically produces collybioid basidiomes (not tricholomatoid) with a distinctly subcellular hypodermium, with thinner, cortinate partial veil, and lacks rhizomorph acanthocytes.

Features that suggest the genus *Stropharia* is the proper taxonomic placement for this unusual new species include a tricholomatoid stature, membranous partial veil, coarse white rhizomorphs with acanthocytes (cf., Farr, 1980), and the absence of a subcellular hypodermium. A chestnut brown spore deposit with only a hint of purple produced by *S. variicolor* is unusual for *Stropharia* wherein species typically produce a distinctly purplish brown spore deposit.

*Stropharia variicolor* is reminiscent of *S. rugosoannulata* Farl. ex Murrill which also forms tricholomatoid basidiomes with reddish brown to vinaceous pilei and grows in woody debris in horticultural areas. *Stropharia rugosoannulata* differs in forming a persistent

annulus (instead of appendiculate remnants on pileus margin), much larger basidiospores (11–13 (–18) × 6–7 μm), and much larger, clavate-mucronate cheilocystidia (fide Watling and Gregory, 1987). Another red pileate species that grows in caespitose clusters on woodchips is *Hypholoma aurantiacum* (Cooke) Guzmán ex Singer, but the latter differs from *S. variicolor* in forming much smaller basidiomes with brilliant red to orangish red pilei, larger basidiospores (11–13 × 6–7.5 μm), and forms a distinct subcellular hypodermium. Numerous specimens of *S. rugosoannulata* and *H. aurantiacum* (at SFSU) from California were compared with the Hawaiian *S. variicolor*, and all three species were found to be distinct because of the features indicated above.

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