

CENTRAL AMERICAN PEZIZALES. III. THE GENUS PHILLIPSIA¹

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SUMMARY

Five species of *Phillipsia* Berk. are reported from Central America: *P. domingensis*, *P. crispata*, *P. lutea*, *P. hartmannii*, and *P. costaricensis*. Two of these, *P. lutea* and *P. costaricensis*, are new species. Five extra-limital (Caribbean) species are included in a key to species expected to be found on the mainland. The limits of the genus *Phillipsia* and its relationship to other genera in the family Sarcoscyphaceae are discussed with special emphasis upon material from the American tropics.

MATERIALS AND METHODS

This study is based upon 28 collections of *Phillipsia* made by the author and his students in Central America in 1962 and 1964, supplemented by herbarium specimens. Descriptions of whole apothecia incorporate field observations of fresh specimens and are supported by color photographs. For microscopic examination of asci, spores, and paraphyses, a fragment of dried apothecium was rehydrated in water, crushed, and mounted in a saturated solution of aniline blue in lactic acid. Paraffin sections were used for study of excipular tissues. Dried apothecia were wetted with 95% ethanol, vacuum infiltrated with 10-15% ammonium hydroxide, washed in water, hardened in formol-acetal-alcohol fixative, dehydrated and embedded through a tertiary butanol series, sectioned at 15 μ , and stained with safranin and fast green (Johansen, 1940). Spore sculpturing was drawn and photographed with the aid of a Leitz 100 $\times$ planapochromatic objective.

LIMITS OF THE GENUS

Le Gal (1953, 1959) discussed most of the known species of *Phillipsia* and transferred to the genus several species previously assigned

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elsewhere. Her work marked a major advance in clarifying the limits of the genus. Subsequently Rifai (1968) emended the genus by erecting a new genus, *Aurophora*, based on *Phyllipsia dochmia*, and probably to include *P. carminea*, *P. hirsutoloides*, and *P. inaequalis*. He further remarked, "There are two or three recognizable series within the genus *Phyllipsia*. . . . Future monographic studies should decide whether or not the series . . . deserve formal taxonomic recognition." I am accepting Le Gal's circumscription of the genus as emended by Rifai. The series mentioned by Rifai are discernible within the Central American material, but not with sufficient clarity to justify their recognition as subgenera.

Phyllipsia belongs to the family Sarcoscyphaceae: in common with other members of the family, its species have thick-walled, subpericulate asci and prosenchymatous excipula. The family is usually divided into 2 tribes: Sarcoscyphae, containing those genera, including *Phyllipsia*, with light-colored or bright-colored apothecia; and Urnulae, containing genera with dark-colored apothecia. Species of *Phyllipsia* are most likely to be confused with those of other genera of the Sarcoscyphae, but there are also similarities between *Phyllipsia* and the genus *Wynnea*, which is in the Urnulae. Those genera most readily confused with *Phyllipsia* include: *Aurophora* Rifai, *Cookeina* Kuntze, *Geodina* Denison, *Phaedropesia* Le Gal, *Sarcoscypha* (Fr.) Boud. and *Wynnea* Berk. & Curt. apud Berk. A summary of the differences between *Phyllipsia* and each of these genera is given below.

Cookeina Kuntze differs from *Phyllipsia* in having deeply cup-shaped to goblet-shaped apothecia which are centrally attached and usually have long, slender stipes. The apothecia in *C. venezuelae*, however, are sessile. In *Cookeina* the excipulum is thin and flexible, with a distinct pseudoparenchymatous ectal excipulum in which the long axes of the cells are perpendicular to the exterior of the apothecium. The asci mature simultaneously rather than seriatim and the paraphyses anastomose freely to form a network enclosing the asci.

Geodina Denison (1965) differs from *Phyllipsia* in its more deeply cupulate, stipitate, centrally attached apothecia. The excipulum is thick and fleshy as in *Phyllipsia*, but the ectal excipulum is pseudoparenchymatous with the long axes of the cells perpendicular to the exterior of the apothecium as in *Cookeina*. *Geodina* has bristle-like, fasciculate hairs, similar to those in some species of *Cookeina*, whereas the apothecia of *Phyllipsia* are glabrous to glabrescent and hairs, where they occur, are simple rather than fasciculate. *Geodina* occurs on soil whereas *Phyllipsia* is found on wood.

Phaedropezia Le Gal (1953) contains species with discoid apothecia and red, orange, or yellow pigmentation. They occur on wood in moist habitats, often on wood that is immersed in water or continually wet by spray. Le Gal originally placed the genus in the family Humariaceae despite that fact that it has suboperculate asci, but Eckblad (1968) has subsequently transferred it to the Sarcoscyphaceae. Discoid apothecia of the smaller species of *Phyllipsia* may be confused with those of *Phaedropezia*. However, the ascospores in *Phaedropezia* are smooth and blunt-ended, and the ectal excipulum is pseudoparenchymatous, nearly *textura globulosa*.²

Many species of *Sarcoscypha* (Fr.) Boud. have thick-fleshed, cup-shaped, sessile apothecia resembling those of *Phyllipsia*. However, in *Sarcoscypha* the ectal excipulum is a distinct layer of *textura prismatica* to *textura porrecta* with the long axes of the cells parallel to the exterior, whereas the ectal excipulum is often indistinct in *Phyllipsia* and of *textura intricata* to *textura epidermoidea*. In *Sarcoscypha* the ascospores are symmetrical, ellipsoidal to subcylindrical, and smooth, whereas most species of *Phyllipsia* have asymmetrical ascospores and most have spores with longitudinal corrugations or striations.

Wynnea Berk. & Curt. apud Berk. is placed in the *Urnulae* because of its blackish apothecia, but its spores resemble those of *Phyllipsia* in that they are asymmetrical and ornamented with longitudinal striations. In *Wynnea*, however, the apothecia are shaped like rabbit ears and arise in clusters from buried sclerotia. Thus the two genera are easily separated by gross morphology.

GENERIC DIAGNOSIS

PHILLIPSIA Berkeley, J. Linn. Soc. London Bot. 18: 388. 1881.

Apothecia solitary, scattered, or in clusters, small to large, (0.1–)0.2–8.0(–10) cm broad, sessile, substipitate, or stipitate, centrally attached or eccentric, rarely lateral, discoid to slightly concave or convex, occasionally bowl-shaped or funnel-shaped, thick-fleshed, rarely thin-fleshed; texture firm-fleshy to rubbery, becoming corky when dry; stipe, where present, usually stout, not sharply differentiated from the apothecium; hymenium purple-red to pink, orange, brown, tan, or bright yellow; exterior whitish, glabrous to glabrescent, occasionally finely tomentose; hairs, where present, hypha-like, flexuous; ectal excipulum thin, often

² Italicized descriptive terms for excipular tissues (e. g., *textura globulosa*, *textura angularis*) are based on the tissue types of Starbäck (1895) as emended by Korf (1951) and illustrated by Van Brummelen (1967).

poorly differentiated from the medullary excipulum, *textura intricata* to *textura epidermoidea* with the long axes of the cells parallel to the exterior of the apothecium; medullary excipulum thick, *textura intricata*; asci suboperculate, ripening seriatim, not bluing in iodine, thick-walled, cylindrical, with gradually tapered bases; ascospores mostly to subulate, medium-sized to large, (14-)16-40(-42) μ long, ornamented with longitudinal striations or corrugations which do not stain in cotton blue, containing one or two large oil drops and several smaller ones; paraphyses slender, barely enlarged above, straight, septate, infrequently branched or anastomosing; occurring on wood in the tropics.

TYPE SPECIES: *Peziza downiensis* Berk.

KEY TO SPECIES FROM CENTRAL AMERICA, MEXICO, AND THE CARIBBEAN

1. Apothecia fan-shaped, ear-shaped, or spoon-shaped, laterally attached or very eccentric, thin-fleshed, cartilaginous to leathery.....2
1. Apothecia cup-shaped, discoid, convex, or funnel-shaped, centrally attached or eccentric, thick-fleshed, less often thin-fleshed, rubbery, firm-fleshed, or leathery.....4
2. Hymenium yellow to yellow-brown; apothecia medium-sized, 1-3.5 cm broad; ascospores 24-35 $\times$ 11-16 μ , with 4-6 striations on a side.....4

Aurophora dochmia
(=*Phyllipsia dochmia*)

2. Hymenium red, purple, or orange.....3
3. Apothecia all laterally attached; hymenium red; apothecia medium-sized, 1-3.5 cm broad; ascospores 23-32 $\times$ 12-16 μ , with 4-6 striations on a side.....3

Phyllipsia hirsutoides

3. Apothecia varying from centrally attached or eccentric to lateral, usually funnel-shaped to spoon-shaped.....5
4. Apothecia funnel-shaped to deeply cup-shaped, stipitate, medium-sized to large, 2-8 cm broad.....5
4. Apothecia discoid, convex or concave, rarely cup-shaped, sessile to sub-stipitate, small to medium-sized, 0.5-4.5 cm broad.....7
5. Hymenium orange; apothecia cup-shaped to ear-shaped, large, 4-7 cm broad; ascospores 23-32 $\times$ 10-15 μ , with 3-6 striations on a side.....5

Phyllipsia inaequalis

5. Hymenium red to red-purple.....6
6. Apothecia stout, thick-fleshed, funnel-shaped, often clustered with stout, confluent stipes, large, 4-6 cm broad; ascospores 22-30 $\times$ 11-15 μ , with 3-6 striations on a side.....6

Phyllipsia gigantea

6. Apothecia thin-fleshed, goblet-shaped to funnel-shaped or fan-shaped, with a long, slender stipe; medium-sized to large, 2-6 cm broad; ascospores 20-36 $\times$ 11-17 μ , with 3-5 striations on a side.....6

Phyllipsia carminea

7. Hymenium bright yellow; apothecia discoid to concave or convex, medium-sized, 1-3 cm broad; asci 4-spored; ascospores 30-42 $\times$ 12-15 μ , with 3-6 striations on a side.....7

Phyllipsia lutea

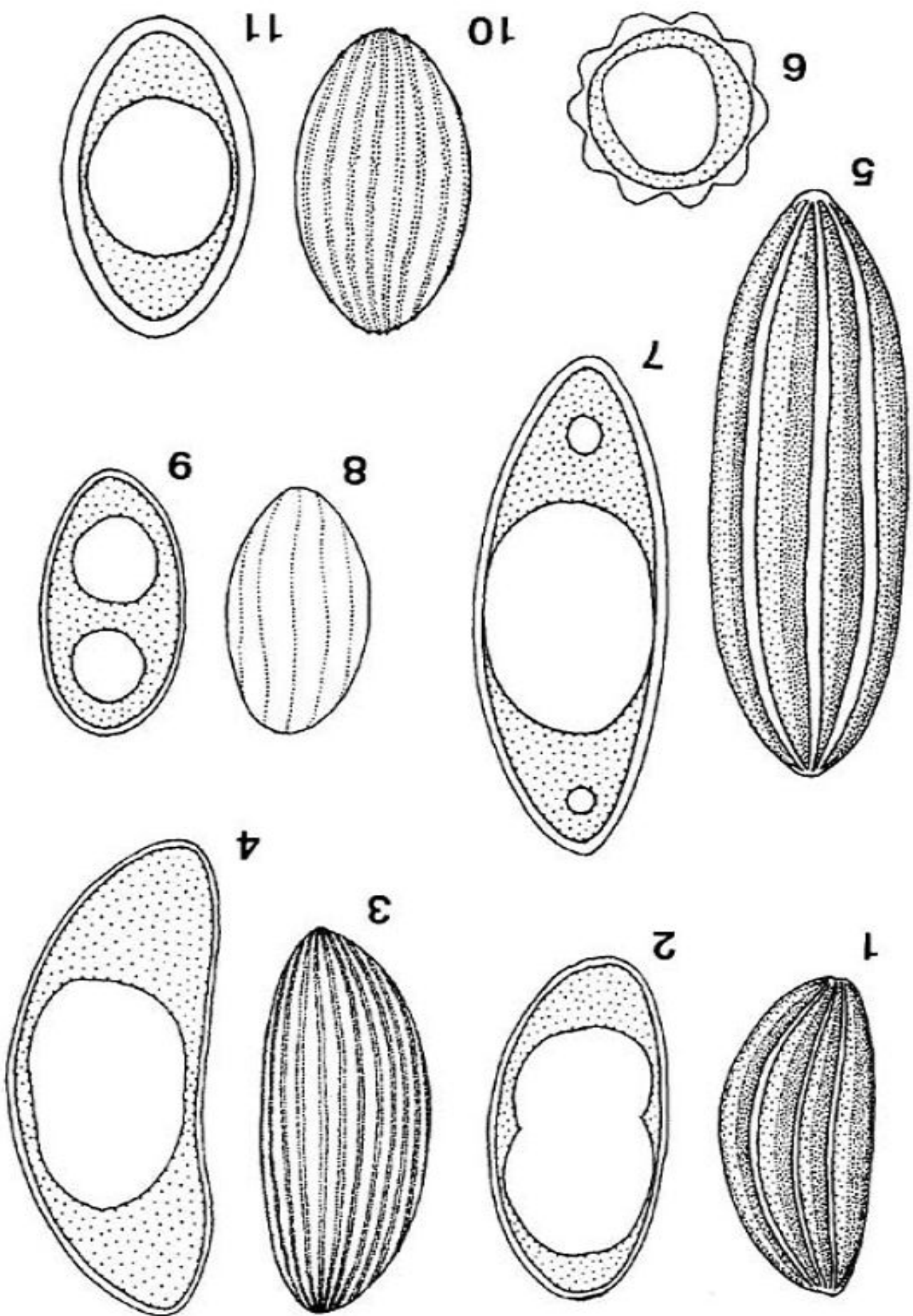
7. Hymenium pink, dark red, purple, brown, or tan, not bright yellow; asci 8-spored, often with one or more spores aborting; ascospores less than 35 μ long
8. Ascpores symmetrical, pointed ellipsoidal, 18-24 $\times$ 11-15 μ , with 7-9 fine striations on a side; hymenium yellow-brown to tan; apothecia shallow cup-shaped, small to medium-sized, 0.5-2.0 cm broad
- Phillipsia costaricensis*
8. Ascpores asymmetrical, unequal-sided ellipsoidal to crescent-shaped or bean-shaped; hymenium pink to purple-red or purple-brown.....9
9. Hymenium pink; apothecia small, less than 1 cm broad, discoid to saucer-shaped; ascospores 15-19 $\times$ 8-11 μ , smooth or with faint striations
- Phillipsia hartmannii*
9. Hymenium dark red, purple, or brown; ascospores more than 20 μ long, with distinct longitudinal striations.....10
10. Ascpores with 10-14 very fine striations on a side, 20-38 $\times$ 10-14 μ ; hymenium purple-brown to chocolate; apothecia small to medium-sized, 0.5-3.5 cm broad, discoid, convex, or concave.....*Phillipsia crispata*
10. Ascpores with 3-6 coarse ribs or corrugations on a side, 20-32 $\times$ 10-15 μ ; hymenium dark red to purple-red; apothecia medium-sized, 1-5 cm broad, discoid, concave, or convex.....*Phillipsia domingensis*

CENTRAL AMERICAN SPECIES

PHILLIPSIA DOMINGENSIS (Berk.) Berk. Figs. 1, 2, 12, 18
Peziza domingensis Berkeley, Ann. Mag. Nat. Hist. 9: 201. 1852.
 $\equiv$ *Phillipsia domingensis* (Berk.) Berkeley, J. Linn. Soc. London Bot. 18: 388. 1881.
 $\equiv$ *Otidea domingensis* (Berk.) Saccardo, Syll. Fung. 8: 97. 1889.
 $\equiv$ *Phillipsia chardoniana* Seaver, Mycologia 17: 48. 1925.

Apothecia solitary to clustered, discoid to slightly convex or saucer-shaped, sessile to substipitate, centrally attached or eccentric, medium-sized, 1-5 cm broad, 2-10 mm thick, tough-fleshy to rubbery when fresh, becoming corky when dry; hymenium purple-red, "Aster Purple"³ to "Amaranth Purple," often fading to whitish, pinkish, or buff when dry; exterior whitish, subglabrous to finely tomentose, becoming wrinkled and slightly yellowish when dry; ectal excipulum thin, 30-80 μ thick, *textura epidermoidea*; medullary excipulum thick, 0.5-2.0 mm thick at the margin, 2-8 mm thick at the center, *textura intricata*; asci cylindrical with gradually tapering bases, (300-)(360-420(-480) μ long, 14-18 μ wide, normally 8-spored, often with one or more spores aborting, occasionally 4-spored; ascospores unequal-sided ellipsoidal with acute poles, (20-)(24-28(-32) $\times$ (10-)(11-13(-15) μ , with conspicuous longitudinal ridges or corrugations, (3-)(4-5(-6) visible on a side,

³ Names of colors enclosed in quotation marks refer to the corresponding color chip in Ridgway (1912).



FIGS. 1-11. Ascospores, $\times 1600$. Each species is represented in both surface view and optical section. 1-2. *Phillipsia domingensis* (Denison 2365). 3-4 *Phillipsia crispa* (Denison 2461). 5-7. *Phillipsia lutea* (from HOLOTYPE, Denison 2269). 8-9. *Phillipsia hartmannii* (Denison 2307). 10-11. *Phillipsia costaricensis* (from HOLOTYPE, Denison 2358).

containing 2 large oil drops; paraphyses slender, cylindrical to sub-clavate, 1-3 μ thick below, 3-5 μ thick at their apices.

Habitat: On sticks and old wood.

Distribution: Known from Central America, Mexico, the Caribbean, South America, and Madagascar. Probably pantropical.

Specimens Examined: Costa Rica: *Denison 2176*, hills above Golfito, Puntarenas, alt. 66 m, 30 Aug. 1964 (OSC, CUP, CR)*; *Denison 2272, 2275, 2287*, Km 135 Pan American Highway north of Puntarenas, Guanacaste, alt. 30 m, 13 Sept. 1964 (OSC, CUP, CR); *Denison 2320, 2326*, El Silencio above Tilaran, Guanacaste, alt. 830 m, 17 Sept. 1964 (OSC, CUP, CR); *Denison 2365, 2366, 2368, 2369*, forest adjacent to the Instituto Interamericano de Ciencias Agrícolas, Turrialba, Cartago, alt. 560 m, 17 Sept. 1964 (OSC, CUP, CR). Jamaica: *F. S. Earle 532*, Mooretown, Oct.-Nov. 1902 (NY). Mexico: *Guzmán 2797*, cerca de Chiltepec, Cerro Sebastopol, Oaxaca, alt. 50 m, 30 Oct. 1960 (ENCB, MEXU); *E. Hidalgo*, Veracruz, 20 July 1968 (ENCB). Puerto Rico: *J. R. Johnston 708*, Mameyes, 4 Dec. 1912 (NY); *C. E. Chardon 304*, Adjuntas, 24 Dec. 1923, (NY) (HOLOTYPE of *Phillipsia chardoniana*). United States: *A. S. Rhoads*, Gainesville, Fla. 10 Sept. 1952 (BPI). Notes: Two collections (2176, 2368) have predominantly 4-spored asci and slightly larger ascospores (25-28 $\times$ 12-13 μ). In other respects, however, they seem to be typical *P. dominicensis*.

PHILLIPSIA CRISPATA (Berk. & Curt. apud Berk.) Le Gal

FIGS. 3, 4, 15, 19

Peziza (Sarcoscypha) crispata Berk. & Curt. apud Berkeley, J. Linn. Soc. London Bot. 10: 367. 1868.
=*Lachnea crispata* (Berk. & Curt. apud Berk.) Saccardo, Syll. Fung. 8: 169. 1889.
=*Phillipsia crispata* (Berk. & Curt. apud Berk.) Le Gal, Discom. de Madagascar 262. 1953.

Apothecia scattered to gregarious, discoid and slightly convex to saucer-shaped, sessile to subsessile, centrally attached or slightly eccentric, small to medium-sized, 0.5-3.5 cm broad, 2-5 mm thick, tough-fleshy when fresh, becoming corky when dry; hymenium dark purple-red to red-brown or purple-brown, "Vandyke Red" to "Madder Brown," fading to whitish or buff when dry; exterior whitish, glabrous to sub-tomentose, becoming wrinkled when dry; ectal excipulum thin, 20-40 μ .

* The abbreviations of herbaria are those proposed by Lanjouw and Stafleu (1964).

textura epidermoidea: medullary excipulum thick, 1-4 mm thick, *textura intricata*; asci cylindrical with gradually tapering bases, thick-walled, (340-) 360-400(-420) μ long, 14-18 μ wide, 8-spored, but often with one or more spores aborted; ascospores unequal-sided ellipsoidal to subglobose, with acute poles, (20-) 22-30(-38) $\times$ (10-) 12-13(-14) μ , with 10-14 very fine striations visible on a side; paraphyses slender, cylindrical to subclavate, 2-3 μ thick below, 3-5 μ thick at their apices.

Habitat: On sticks and old wood.

Distribution: Known from Costa Rica, Cuba, and Mexico. Probably occurs throughout Central America and the Caribbean.

Specimens Examined: Costa Rica: *Denison* 2323, El Silencio above Tilaran, Guanacaste, alt. 830 m, 15 Sept. 1964 (OSC, CUP, CR); *Denison* 2350, 2367, forest adjacent to Instituto Interamericano de Ciencias Agrícolas, Turrialba, Cartago, alt. 520 m, 17 Sept. 1964 (OSC, CUP, CR); *Denison* 2461, Finca 59, United Fruit Co., Coto, Puntarenas, alt. 25 m, 3 Oct. 1964 (OSC, CUP, CR). Mexico: *M. E. Sanchez* 155, 15 km east of Rayón, San Luis Potosí, alt. 1,200 m, 12 Sept. 1967 (ENCB).

Notes: In the field *Phillipsia crispata* is easily confused with *P. domingensis*. However, the apothecia of *P. crispata* are usually smaller and the hymenial color distinctly brownish. Under the microscope the ascospores of the 2 species are easily distinguished. The coarse ridges on the spores of *P. domingensis* are easily seen without an oil immersion objective, even when the finer striations of *P. crispata* cannot be resolved. The spores of *P. crispata* are slightly larger and some appear curved as in Fig. 4.

I base my concept of this species on Le Gal's (1953) description and illustrations of what is probably the type material.

Phillipsia lutea Denison, sp. nov. FIGS. 5, 7, 13, 19

Apothecia solitaria vel sparsa, orbicularia vel patellaria, modica, 1-3 cm lata, 1-5 mm crassa, late sessilia; hymenio luteo; facie externa albidula, glabra vel subglabra; asci cylindracei, ad basim sensim angustati, 380-420 $\times$ 13-16 μ , quadrisporae; sporae acutae ellipsoideae vel leviter curvatae, subcymbiformae, 30-42 $\times$ 12-15 μ , 4-5-striatae, 1-2 guttis adiectae; paraphyses tenues cylindraceae, ad apicem subclavatae, infrequenter ramosae et anastomosantes. Plantae lignicolae in Costaricae vigentes.

Apothecia solitaria or scattered, discoid to slightly concave or convex, medium-sized, 1-3 cm broad, 1-5 mm thick, sessile, sometimes broadly attached over most of the lower surface, tough-fleshy to rubbery, becoming corky when dry; hymenium bright yellow, "Light

Cadium" to "Lemon Yellow," fading on drying; exterior whitish, glabrous to subglabrous, irregularly wrinkled; ectal excipulum thin, 20-80 μ thick, *textura epidermoidea*; medullary excipulum thick, 0.5-4.0 mm thick, *textura intricata*; asci 4-spored, less often 2- to 6-spored, cylindrical, with gradually tapering bases, 380-420 $\times$ 13-16 μ ; ascospores unequal-sided ellipsoidal with acute poles (30-)(34-40(-42) $\times$ (12-)(13-14(-15) μ with 1 or 2 oil drops, with (3-)(4-5(-6) conspicuous longitudinal pleats or corrugations visible on a side; paraphyses filiform, barely enlarged at their apices, sparingly septate and branched, occasionally anastomosing.

Habitat: On wood in wet places. The two known collections were found on wood in the spray from waterfalls.
Distribution: Known only from Costa Rica, but probably occurs elsewhere in Central America.

Type Specimen: *Denison 2269*. (HOLOTYPE at OSC; ISOTYPES at CUP, CR).

Name: From the Latin, *luteus* = yellow, the distinctive color of the hymenium.

Specimens Examined: Costa Rica: *Denison 2269*, waterfall along Pan American Highway near San Ramon, Alajuela, alt. 710 m, 13 Sept. 1964 (OSC, CUP, CR); *Denison 2190*, gorge north of Palmar Norte, Puntarenas, alt. 53 m, 31 Aug. 1964 (OSC, CUP, CR).

Notes: Three other species of *Phillipsia* have yellow or yellowish hymenia: *P. brasiliensis* (Rick) Le Gal; *P. dochmia* (Berk. & Curt.) Seaver; and *P. straminea* Ito & Imai. None of these have spores as large as those of *P. lutea*, and all have 8-spored asci. *P. brasiliensis* and *P. dochmia* have thin-fleshed, laterally-attached, spoon-shaped ascocarps.

Le Gal (1953) transferred *Cookeina tetraspora* Seaver to the genus *Phillipsia*. As its name implies, *C. tetraspora* has 4-spored asci, but it is easily distinguished from *P. lutea*. Its spores are much smaller (16-25 μ) than those of *P. lutea*; its hymenium is red-orange rather than yellow; and its apothecia are minute and distinctly stipitate. For reasons discussed elsewhere (Denison, 1963) I have transferred *C. tetraspora* to the genus *Sarcoscypha*.

One of the original collections (2190) was mistakenly identified in the field as a species of *Phaeodropezia* because of its yellow color, its appressed, discoid apothecium, and its habitat. However, the large, sculptured, asymmetrical ascospores of *Phillipsia lutea* are easily recognized, and are totally different from the small, smooth, blunt, ellipsoidal ascospores of any species of *Phaeodropezia*.

Peziza hartmannii Phill. apud Cooke, *Grevillea* 16: 5, 1887.

=*Humaria hartmannii* (Phill. apud Cooke) Saccardo, *Syll. Fung.* 8: 125, 1889.

=*Phillipsia hartmannii* (Phill. apud Cooke) Rifai, *Verh. Ned. Akad. Wetensch.* 57: 50, 1968.

? = *Phillipsia carnicolor* Le Gal, *Discom. de Madagascar* 281, 1953.

Apothecia scattered to gregarious, discoid to saucer-shaped, sessile to subspitulate, centrally attached or slightly eccentric, small, (1–) 2–8(–11) mm broad, tough-fleshy to subcartilaginous, becoming corky to leathery when dry; hymenium pink, "Spinel Pink" to "Daphne Red," fading to whitish or yellowish when dry; exterior whitish, becoming wrinkled when dry, glabrous to minutely pustulate, the pustules composed of compact masses of tissue similar to the ectal excipulum; ectal excipulum 40–100 μ thick, *textura epidermoidea* to *textura prismatica* with the long axes of the cells parallel to the exterior of the apothecium; medullary excipulum 0.1–1.5 mm thick, *textura intricata*; asci cylindrical with tapered bases, often with a bulbous swelling just at the base, 180–210 μ long, 10–15 μ wide, 8-spored; ascospores ellipsoidal to bean-shaped or slightly unequal-sided, with one or two large oil drops, (15–)16–18(–19) $\times$ (8–)9–10(–11) μ , smooth or with (4–)5–9(–10) very faint longitudinal striations on a side; paraphyses slender, 1.5–2.5 μ thick, barely enlarged to 2–3 μ at their apices.

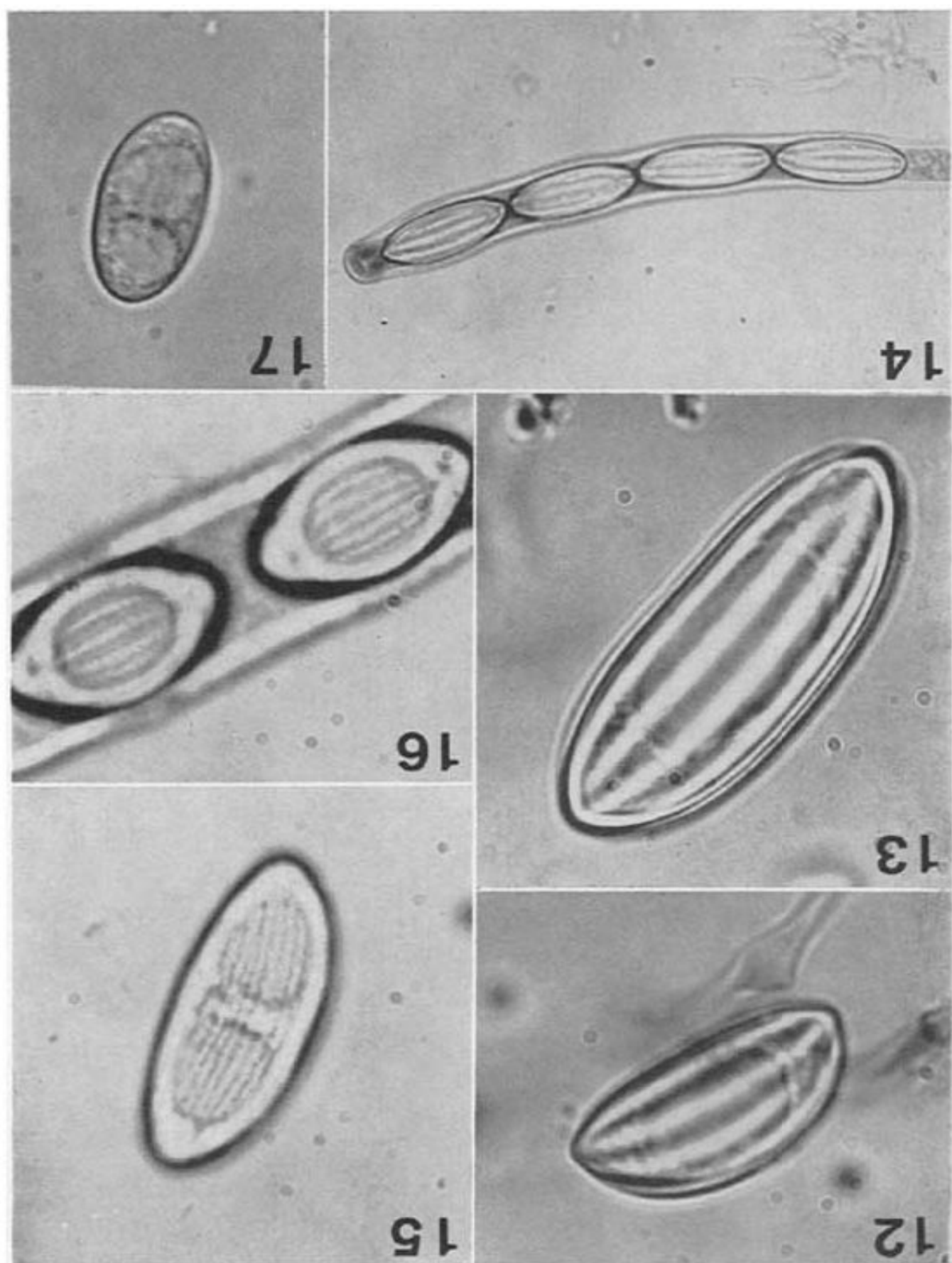
Habitat: On sticks and old wood.

Distribution: Known from Costa Rica and Trinidad in the New World, and from Australia, Congo, and Malacca. Probably pan-tropical.

Specimens Examined: Costa Rica: *Denison* 2282, Km. 135, Pan American Highway north of Puntarenas, Guanacaste, alt. 30 m, 13 Sept. 1964 (OSC, CUP, CR); *Denison* 2297, Pan American Highway north of Caña, Guanacaste, alt. 50 m, 13 Sept. 1964 (OSC, CUP, CR); *Denison* 2307, Pan American Highway at Rio Potreras, Guanacaste, alt. 100 m, 13 Sept. 1964 (OSC, CUP, CR).

Notes. The description above is based upon the Costa Rican collections cited. They agree in most respects with the published descriptions of *P. hartmannii*. However, in the Costa Rican collections the exterior of the apothecium is slightly pustulate, whereas the apothecium of the type collection is described simply as "glabrous

FIGS. 12-17. Ascospores, 12-13, 15-17, $\times 1350$; 14, $\times 360$. 12. *Phillipsia* *domingensis* (Denison 2365). 13-14. *Phillipsia lutea* (Denison 2190). 15. *Phillipsia cripta* (Denison 2461). 16. *Phillipsia costaricensis* (from HOLOTYPE, Denison 2358). 17. *Phillipsia hartmannii* (Denison 2307).



to minutely downy" (Rifai, 1968). Moreover, the asci of the Costa Rican collections are somewhat shorter, 175–210 μ vs. 175–280 μ , than has been reported (Le Gal, 1953).

Rifai (1968) suggests that *P. hartmannii* and *P. carnicolor* are probably synonymous and lists *P. carnicolor* as a synonym, but with a question mark. I am following him in this tentative disposition.

***Phillipsia costaricensis* Denison, sp. nov. Figs. 10, 11, 16, 20**

Apothecia solitaria vel sparsa, cupularia vel patellar, minuta vel modica, 5–20 mm lata, 1–2 mm crassa, coriacea, sessilia; hymenio ochraceo vel luteo-umbrinum; facie externa pallide ochracea, minute tomentosa; pili flexuosi, crasse tunicati, cylindracei, apice late rotundato, 0–3-septati, 50–300 $\times$ 4–6 μ ; asci cylindracei, ad basin sensim angustati, 300–320 $\times$ 13–15 μ , octospori; sporae acutae ellipsoideae, nunquam curvatae, 18–24 $\times$ 11–15 μ , 7–9-striatae, guttulis magnis adfectae; paraphyses tenues cylindraceae, ad apicem subclavatae. Plantae lignicolae in Costaricae videntes.

Apothecia solitary to scattered, bowl-shaped to saucer-shaped or subdiscoid, sessile to subsessile, centrally attached, small to medium-sized, 5–20 mm broad, 1–2 mm thick, leathery when fresh, becoming brittle-corky when dry; hymenium tan, "Ochraceous-Tawny" to "Buckhorn Brown," paler when dry; exterior paler, "Warm Buff," becoming wrinkled when dry, minutely tomentose; hairs hyaline, thick-walled, flexuous, cylindrical with blunt tips, 0 to 3-septate, (20–) 50–300 (–400) μ long, 4–6 μ thick; ectal excipulum (20–) 40–80 (–150) μ thick, *textura epidermoidea*; medullary excipulum (0.3–) 0.5–1.5 (–2.0) mm thick, *textura intricata*; asci cylindrical with irregularly tapered, crooked bases, thick-walled, (270–) 300–320 (–350) μ long, (12–) 13–15 (–17) μ wide, 8-spored; ascospores pointed ellipsoidal, symmetrical, (18–) 20–22 (–24) $\times$ (11–) 12–14 (–15) μ , with 7–9 distinct striations visible on a side; paraphyses slender, cylindrical to subclavate, 2–4 μ broad below, barely enlarged to 3–5 μ at their apices, sparingly septate, straight, infrequently branched or anastomosing.

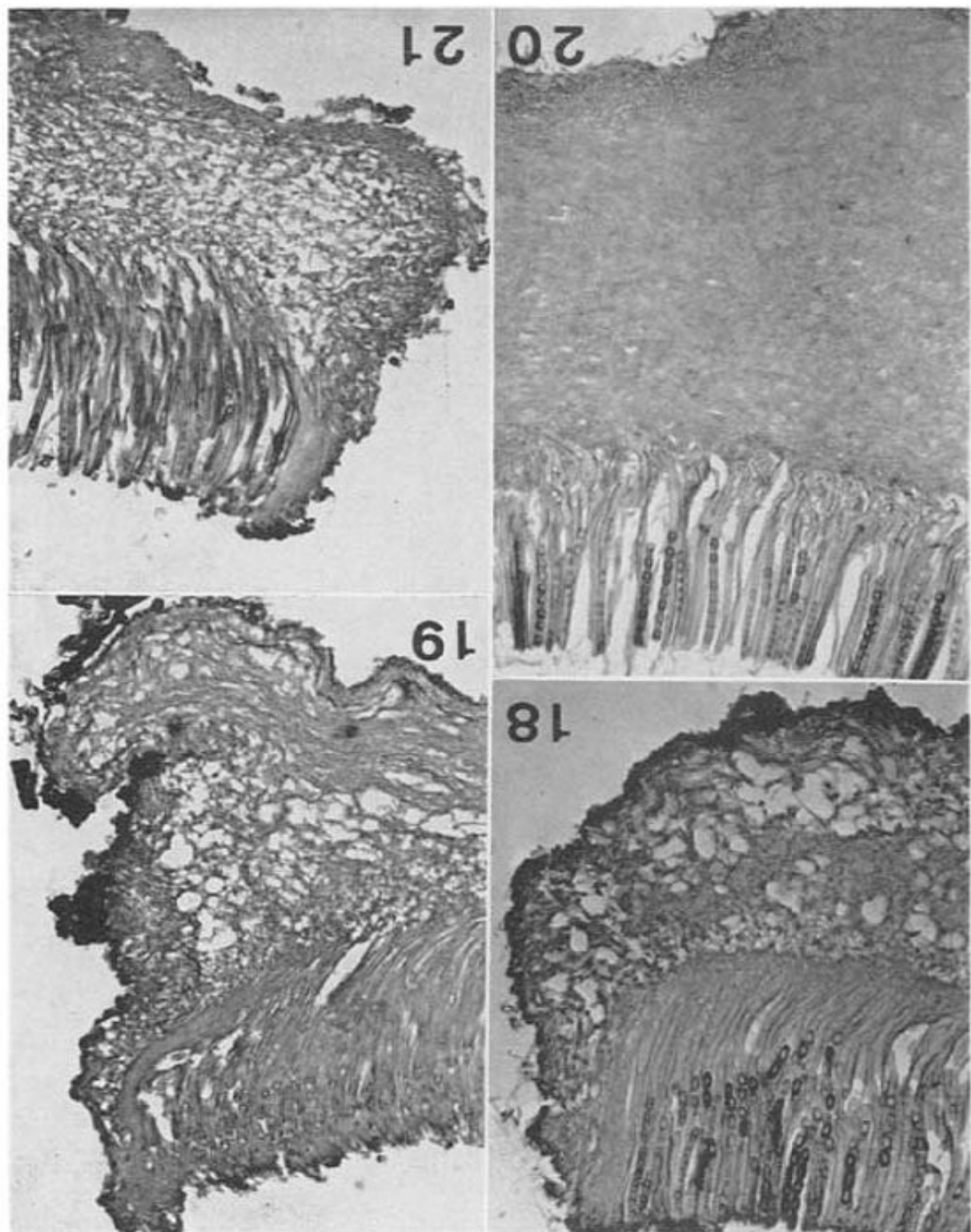
Habitat: On sticks and old wood.

Distribution: Known only from Costa Rica.

Type Specimen: *Denison 2358* (HOLOTYPE at OSC; ISOTYPES at CUP, CR).

Name: From Costa Rica, the country in which the type was collected. Specimens Examined: Costa Rica: *Denison 2358*, forest adjacent to Instituto Interamericano de Ciencias Agrícolas, Turrialba, Cartago, alt. 520 m, 17 Sept. 1964 (OSC, CUP, CR).

Notes: *Phillipsia costaricensis* is unique among species of *Phillipsia* in having symmetrical spores. Its spores might be mistaken for those



FIGS. 18-21. Vertical sections of apothecia, $\times 75$. 18. *Philippia domingensis* (Denison 2365). 19. *Philippia lutea* (Denison 2190). 20. *Philippia costaricensis* (from HOLOTYPE, Denison 2358). 21. *Philippia crispata* (Denison 2461).

of a *Cookeina*, but their striations are widely spaced whereas those in *Cookeina* are closely adjacent or touching. The simple, flexuous hairs on the exterior of *P. costaricensis* resemble those of a *Sarcoscypha*, but the pointed, striated spores and an ectal excipulum of *textura epider-*

inidea remove it from that genus and indicate that this species belongs in *Phillipsia*.

CARIBBEAN AND MEXICAN SPECIES AND SYNONYMS

PHILLIPSIA CARMINEA (Pat.) Le Gal

Sarcoscypha carminea Patouillard, Bull. Soc. Myc. Fr. 15: 205. 1899.

= *Phillipsia carminea* (Pat.) Le Gal, Bull. Jard. Bot. Brux. 29: 103. 1959.

Notes: *Phillipsia carminea* was originally described from Guadeloupe and is thus a New World species. Judging by Le Gal's (1959) description, it is a *Phillipsia*, but I have not seen it from the mainland.

PHILLIPSIA CARNICOLOR Le Gal = (?) *Phillipsia hartmannii* (Phill. apud Cooke) Rifai

PHILLIPSIA CHARDONIANA Seaver = *Phillipsia downiensis* (Berk.) Berk.

AUROPHORA DOCHMIA (Berk. & Curt. apud Berk.) Rifai

Peziza dochmia Berkeley & Curtis apud Berkeley, J. Linn. Soc. London Bot. 10: 364. 1869.
= *Otidea dochmia* (Berk. & Curt. apud Berk.) Saccardo, Syll. Fung. 8: 95. 1889.
= *Phillipsia dochmia* (Berk. & Curt. apud Berk.) Seaver, N. Amer. Cup-Fungi. 184. 1928.

= *Aurophora dochmia* (Berk. & Curt. apud Berk.) Rifai, Verh. Kon. Ned. Akad. Wetensch. 57: 52. 1968.

Notes: This species was originally described from Cuba and has been reported from Puerto Rico (Seaver, 1928), Madagascar (Le Gal, 1953), and Australia (Rifai, 1968). Probably it also occurs in Central America.

PEZIZA CORDOVENSIS Cooke, Hedwigia 14: 81. 1875.

Notes: The type specimen, collected near Cordova, Mexico, seems to have disappeared. Seaver (1928) synonymized *Peziza cordovensis* with *Phillipsia downiensis*. Although Cooke initially allied the species with *Peziza alutacea*, he described the spores as, "arcte ellipticus," and the apothecia as, "peltata, vix marginata," which sounds more like a *Phillip-*

sia. In the absence of a type specimen it seems unwise to make a further judgment on the species.

PHILLIPSIA GIGANTEA Seaver, N. Amer. Cup-Fungi 183. 1928.

Specimens Examined: Jamaica: *Murrill 64*, Castleton Gardens, alt. 240 m, 14 Dec. 1908 (NY) (HOLOTYPE of *Phillipsia gigantea*).

Notes: This species differs from *P. domingensis* in its larger size and funnel-shaped apothecium. To judge from dried material, its texture is more gelatinous than is common in *P. domingensis*, and its excipulum lacks the large holes which give *P. gigantea* a corky texture when dry. The ascospores of *P. gigantea* are very like those of *P. domingensis*, but the asci in the type specimen are mostly 4-spored. So far as I am aware, *P. gigantea* has not been found in Central America.

PHILLIPSIA HIRNEOLOIDES (Berk. & Curt. apud Berk.) Berk.

Peziza hirneoloides Berkeley & Curtis apud Berkeley, J. Linn. London Bot. 10: 365. 1868.
=*Phillipsia hirneoloides* (Berk. & Curt. apud Berk.) Berk.
J. Linn. Soc. London Bot. 18: 388. 1881.
=*Oideia hirneoloides* (Berk. & Curt. apud Berk.) Saccardo, Syll. Fung. 8: 96. 1889.

Notes: *Phillipsia hirneoloides* was originally described from Cuba and eventually may be found on the mainland. Seaver (1928) synonymized *P. hirneoloides* with *P. dochmia*. Le Gal (1953) and Rifai (1968) consider it a related, but distinct, species.

PHILLIPSIA INAEQUALIS (Berk. & Curt. apud Berk.) Berk.

Peziza inaequalis Berkeley & Curtis apud Berkeley, J. Linn. Soc. London Bot. 10: 365. 1868.
=*Phillipsia inaequalis* (Berk. & Curt. apud Berk.) Berkeley, J. Linn. Soc. London Bot. 18: 388. 1881.

Notes: This species, originally from Cuba, was among those cited by Berkeley in his initial description of the genus *Phillipsia*. It apparently differs from *P. gigantea* Seaver chiefly in its orange, rather than red, hymenium. I know of no collections from the mainland.

PHILLIPSIA TETRASPORA (Seaver) Le Gal = *Sarcoscypha tetraspora* (Seaver) Denison.

PHILLIPSIA VENEZUELAE Berk. & Curt. apud Cooke = *Cookeina venezuelae* (Berk. & Curt. apud Cooke) Le Gal.

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