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PILEATE HYDNACEAE OF THE PUGET SOUND AREA. II. BROWN-SPORED GENERA: HYDNUM

D. HALL¹ AND D. E. STUNTZ

Department of Botany, University of Washington, Seattle, Washington 98105

SUMMARY

Descriptions of twelve taxa in the genus *Hydnum* are provided, with keys for their determination. One new species is proposed. Macroscopic illustrations, as well as photomicrographs of spores are provided for all taxa.

This is the second in a series of three papers intended to survey the pileate Hydnaceae of the Puget Sound area. The color designations preceded by a single asterisk are colors taken from Ridgway (1912). Those preceded by a double asterisk are colors taken from Kornerup and Wanscher (1962). If a series of colors is given, the author citation will precede only the first color of the series. All macrochemical tests and photomicrographic techniques were carried out as outlined in our previous paper (Hall and Stuntz, 1971). All collections cited in this paper were made by the senior author, and are deposited in the private herbarium of D. Hall, at Northeastern Illinois State College, Chicago, Illinois.

HYDNUM L. emend S. F. Gray, Nat. Arr. Brit. Pl. 1: 650. 1821.

Hydnum Fr., Syst. Mycol. 1: 397. 1821 (in part).

Plants terrestrial, medium to large size, centrally stipitate; context fleshy-fibrous, homogenous. Spores brown in print, tuberculate or angular-nodulose, inamyloid. Hymenium simple.

TYPE SPECIES: *Hydnum imbricatum* L. ex Fr.

The nomenclatural problems involved in using the generic name *Hydnum* L. emend S. F. Gray and in typification of the genus with *H. imbricatum* Fr. are discussed by Donk (1956).

¹ This manuscript is abstracted in part from a dissertation submitted to the Graduate School of the University of Washington by Dennis Hall in partial fulfillment of the requirements for the degree of Doctor of Philosophy. Present address: Biology Department, Northeastern Illinois State College, Byrn Mawr at St. Louis Avenue, Chicago, Illinois 60625.

KEY TO STIRPES

- 1A. Clamp connections present in the pileus trama.....2
 2A. Pileus and stipe trama pallid or faintly **sepia.....Stirps *Imbricatum*
 2B. Pileus and stipe trama **green.....Stirps *Fumosum*
 1B. Clamp connections not present in the pileus trama.....3
 3A. Pileus and stipe context pallid or faintly **sepia, sometimes becoming suffused with pinkish or vinaceous tints when cut.....
Stirps *Scabrosum*
 3B. Pileus context and stipe context violaceous.....Stirps *Commutatum*

Stirps IMBRICATUM

Trama of the pileus and stipe concolorous, pallid or faintly **sepia, in some specimens becoming suffused with pinkish, vinaceous or greenish tints when cut (while fresh). Clamp connections present. Spores coronate, or angular-nodulose, inamyloid, acyanophilous.

KEY TO SPECIES

- 1A. Pileus smooth, at times with minute, adnate scales, but not rimose-cracked or imbricate-scaly; context becoming tinted with violaceous tones when cut; odor farinaceous.....*H. laevigatum*
 1B. Pileus imbricate-scaly or rimose-cracked, not smooth.....2
 2A. Pileus imbricate-scaly; odorless or with a faint earthy odor.....3
 3A. Pileus predominantly *Warm Buff to Light Ochraceous-Buff with **chocolate or negro-colored scales.....
*H. imbricatum* var. *imbricatum*
 3B. Pileus predominantly *Vinaceous-Russet or Vinaceous-Tawny, with *Aniline Black or Dull Purplish Black scales.....
*H. imbricatum* var. *monticola*
 2B Pileus rimose-cracked; odor spicy, of fenugreek, or of coumarin.....4
 4A. Pileus rimose-cracked but not deeply so, *Cream-Buff to Cream Color; odor of coumarin; spores $4.4 \times 3.2 \mu^2$
*H. calvatum* var. *odoratum*
 4B. Pileus deeply rimose-cracked, plants darker than above; odor pleasant but not of coumarin; spores larger than above.....5
 5A. Pileus **grayish brown or dark brown or brownish red; pileal context when cut becoming suffused with yellowish green tints; odor of fenugreek when fresh; stipe context not changing color when cut; spores $6.0-7.0 \times 5.0-6.5 \mu$
*H. crassum*
 5B. Pileus *Wood Brown or Cinnamon-Drab and Mars Orange; pileal context not changing color when cut; odor spicy when cut; stipe context becoming suffused with pinkish tints when cut; spores $5.5-7.0 \times 4.0-5.0 \mu$
*H. indurescens*

² Dimensions given in tenths of microns here and elsewhere in this work are the result of the averaging of a number of measurements.

HYDNUM IMBRICATUM L. ex Fr., Syst. Mycol. 1: 398. 1821. var.
IMBRICATUM. FIGS. 1, 13

Plants to 12 cm tall, occurring singly on ground in duff and moss, under *Pinus*. Pileus to 12 cm broad, convex when young, becoming depressed and finally the depression extending into the stipe, **brownish gray to chocolate brown or negro, no bruising reaction recorded; surface imbricate-scaly, scales to 15×12 mm, irregularly truncate and up-turned, **chocolate brown or negro, the flesh between the scales in all cases *Light Ochraceous-Buff to Warm Buff; margin undulate, uneven, inrolled, **yellowish brown; context to 3 cm thick, homogeneous, pallid, drying with a yellowish cast, fleshy-fibrous, odor faint, taste mild. Spines irregularly decurrent, to 0.7 cm long, 1–2 per mm², fleshy, terete, subulate, coarse but velvety to the touch, curving when dried, *Ochraceous-Buff to Ochraceous-Tawny, no bruising reaction noted, extending all the way to the margin. Stipe central to slightly eccentric, not tapered, to 6 cm \times 3.0 cm, *Cinnamon-Buff to Pinkish Buff, becoming *Warm Sepia or Snuff Brown when bruised, context homogeneous, fleshy-fibrous, concolorous with the pileal context when fresh and when dried, odorless, tasteless; stipe base bulbous, concolorous with the rest of the stipe.

Spores $6.3\text{--}7.5 \times 5.3\text{--}6.3$ μ , angular-nodulose, appearing as a Maltese cross in outline, coronate, subspherical to ellipsoidal, brown in print, inamyloid, acyanophilous. Basidia $40\text{--}45 \times 4\text{--}7$ μ , clavate, 4-spored. Cystidia absent. Hyphae 4–14 μ in diam, thin-walled, with clamps, reinflating well in 3% KOH.

DISTRIBUTION: Kittitas and Snohomish counties.

COLLECTIONS EXAMINED: Hall 107, 216 and 217.

The colored photograph in Harrison's book (1961) is an excellent representation of *Hydnum imbricatum* var. *imbricatum* as it occurs in the Pacific Northwest. The species occurs under *Pinus ponderosa* Laws., and is not common in the Puget Sound area. It can readily be distinguished from var. *monticola* by the pileal color, which is *Light Ochraceous-Buff to *Warm Buff in var. *imbricatum*, and *Vinaceous-Russet to Vinaceous-Tawny in var. *monticola*.

Maas Geesteranus (1956) gave an excellent discussion of the synonymy of *H. imbricatum* (there listed as *Sarcodon imbricatus*) and continued the discussion under the names of the synonyms as they appear in his work "Notes on Hydnums I–VII" (Maas Geesteranus, 1960, 1964, 1966a, b, 1967a, b, c). He also (Maas Geesteranus, 1962) discussed and illustrated the hyphal structures to be found in certain mem-

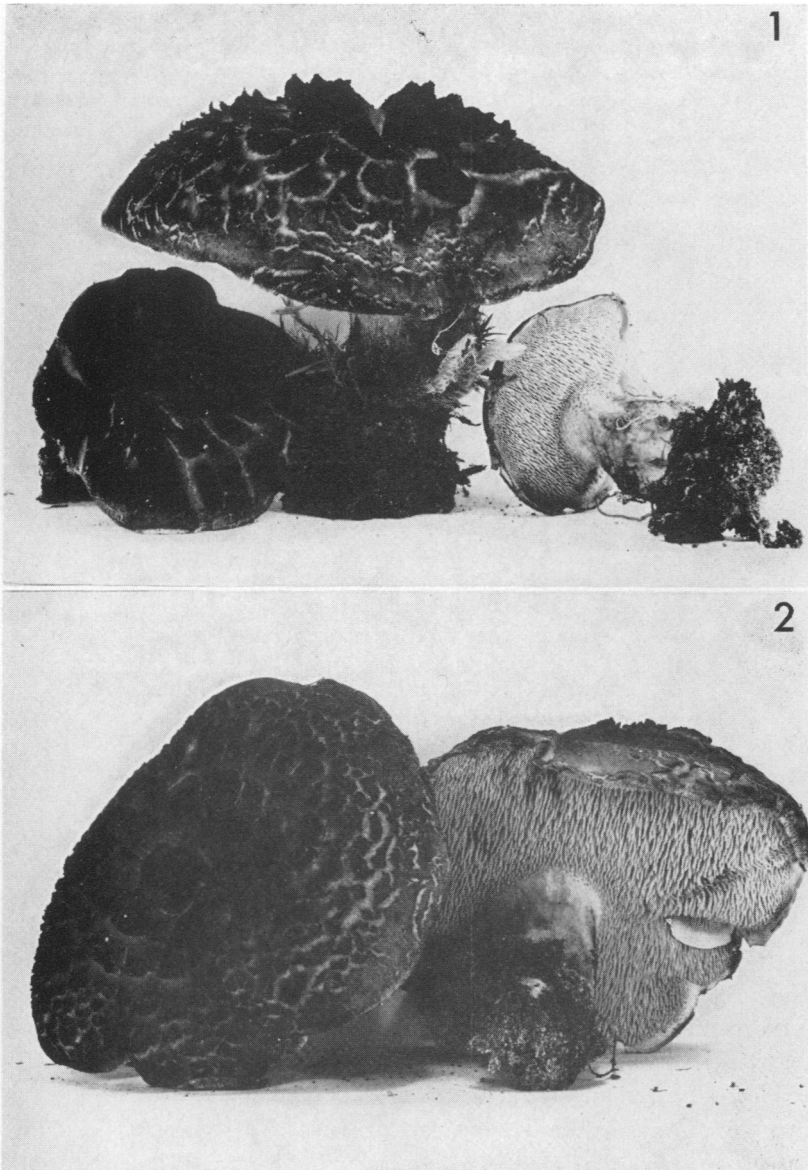


FIG. 1. *Hydnum imbricatum* var. *imbricatum*, $\times 1/4$.

FIG. 2. *H. imbricatum* var. *monticola*, $\times 1/6$.

bers of this stirps, notably *Sarcodon imbricatum* and *Sarcodon laevigatum*.

Hydnum imbricatus L. ex Fr. var. **monticola** 19 K. A. Harrison, var. prov. FIGS. 2, 14

Plants 6–12 cm tall, occurring singly on ground in moss, in open, park-like stands of *Abies* and *Tsuga* or *Pinus contorta* Loud. Pileus 5–11 (–16) cm broad, convex when young, becoming depressed in age, the depression in some specimens extending into the stipe, *Vinaceous-Russet to Vinaceous-Tawny (*Terra Cotta, Walnut Brown, Burnt Umber, Vandyke Brown), not changing color when bruised, the surface recurved-scaly to imbricate-scaly, scales 7–15 × 6–10 mm, irregularly truncate or pointed, *Aniline Black to Dull Purplish Black (*Burnt Umber, Chocolate, Black, Warm Blackish Brown or Seal Brown), in young specimens the scales sometimes concolorous with the pileus, in age becoming darker and weathering off except in the central depressed region; margin undulate, uneven, slightly inrolled, or upturned in very old weathered specimens, *Pecan Brown to Vinaceous-Tawny (Vandyke Brown, Burnt Umber, Vinaceous-Russet); flesh to 2 cm thick, homogeneous, fleshy-fibrous, **tan or cream color, becoming somewhat violaceous when cut, odorless or with faint earthy odor, taste mild to farinaceous. Spines sometimes slightly decurrent, 0.2–1.2 cm long, 2–4 per mm², fleshy, terete, subulate, velvety to the touch, in some specimens *Pale Vinaceous-Fawn to Vinaceous-Beige (*Tilleul Beige, Vinaceous-Brown, Sorghum Brown), becoming *Light Grayish Vinaceous to *Vinaceous-Russet when bruised. Stipe central to eccentric, tapered, 4–8.5 × 1.5–3.5 cm, **pale pink to reddish gray (*Sorghum Brown, Light Seal Brown, Salmon-Beige, Avellaneous, Pinkish Cinnamon), becoming *Tilleul Beige to pale Vinaceous-Beige (Warm Sepia, Verona Brown, Snuff Brown) when bruised, fleshy-fibrous, the flesh in stipes of older sporocarps rotted away or worm-eaten, taste mild, odorless or with a smoky odor; stipe base swollen, blunted, concolorous with the rest of the stipe or *Sorghum Brown to Seal Brown (*Slate-Violet, Ochraceous-Tawny).

Spores 6.2–7.3 × 5.5–6.5 μ , angular-nodulose, resembling a Maltese cross in outline, subspherical to ellipsoidal, *Fawn Color in print, inamyloid, acyanophilous. Basidia 40–45 × 6.7–8 μ , clavate, 4-spored. Cystidia absent. Hyphae 2.7–14 μ in diam, hyaline or with a faint brownish tint, thin-walled, with clamps, reinflating well in 3% KOH.

DISTRIBUTION: Lewis, Mason, Pierce and Snohomish counties.

COLLECTIONS EXAMINED: Hall 6, 7, 14, 19, 87, 88, 129, 150, 174, 226, 227, 1576, 1595, 1596, 1615, 1620, 1621 and 1634.

This variety is most abundant at higher elevations, though it does occur in the Puget Sound Basin. The Mason Lake collections were made in an open, mossy area under lodgepole pine, the Silver Spring Campground and Buck Creek specimens were collected in open, mossy (Buck Cr.) patches or in patches of kinnikinnick and moss under *Abies* and *Tsuga*. Young specimens bear a superficial resemblance to *Hydnum scabrosum* Fr., but examination of the pileal trama for clamp connections resolved the difficulty.

The hyphal system of var. *monticola* is the same as that of var. *imbricatum*. For a detailed account of hyphal structure see Maas Geesteranus (1962).

HYDNUM LAEVIGATUM Fr., Syst. Mycol. 1: 399. 1821. Figs. 3, 15

Plants 5–14 cm tall, occurring singly, on ground in duff under *Abies* and *Tsuga*. Pileus 5–13 cm broad, convex to plane, with a slight depression in older specimens, **grayish brown or reddish brown (*Sayal Brown), not changing color when bruised; surface smooth or furfuraceous with a slight tomentum, becoming areolate-cracked in age, or with small, adnate, concolorous scales; margin uneven, undulate, concolorous with the pileus; context to 2.5 cm thick, homogeneous, fleshy-fibrous, *Cream Color, or pallid, becoming tinted with *Lavender when cut, with slight smoky or medicinal odor, tasteless or farinaceous. Spines decurrent, 1–1.2 cm long, 2–3 per mm², fleshy, terete, subulate, slightly curved toward the stipe, becoming mere tubercles toward the margin in young material, **dull red with pallid tips, becoming **reddish brown when bruised having a violet tint when cut. Stipe central, 4.5–5 × 3 cm, not tapered, **reddish brown, becoming dull violet when bruised, the inner tissues with a vinaceous tint when cut, context fleshy-fibrous, tasteless to slightly farinaceous, odorless or with a slightly smoky odor; stipe base not swollen, blunted, concolorous with the rest of the stipe, sometimes with yellowish white proliferating mycelium that retains soil when collected.

Spores 6.4–7.1 × 5.3–6.3 μ, angular-nodulose, irregularly ellipsoidal to subglobose, *Fawn Color in print, inamyloid, acyanophilous. Basidia 45–50 × 6.6–8 μ, clavate, 4-spored. Cystidia absent. Hyphae 4–8 μ in diam, hyaline, thin-walled, with clamps, septate, nonvesiculose, re-inflating in 3% KOH.

DISTRIBUTION: Clallam, Grays Harbor and Island counties.

COLLECTIONS EXAMINED: Hall 67, 176, 811, 873, 993, 1096 and 1148.

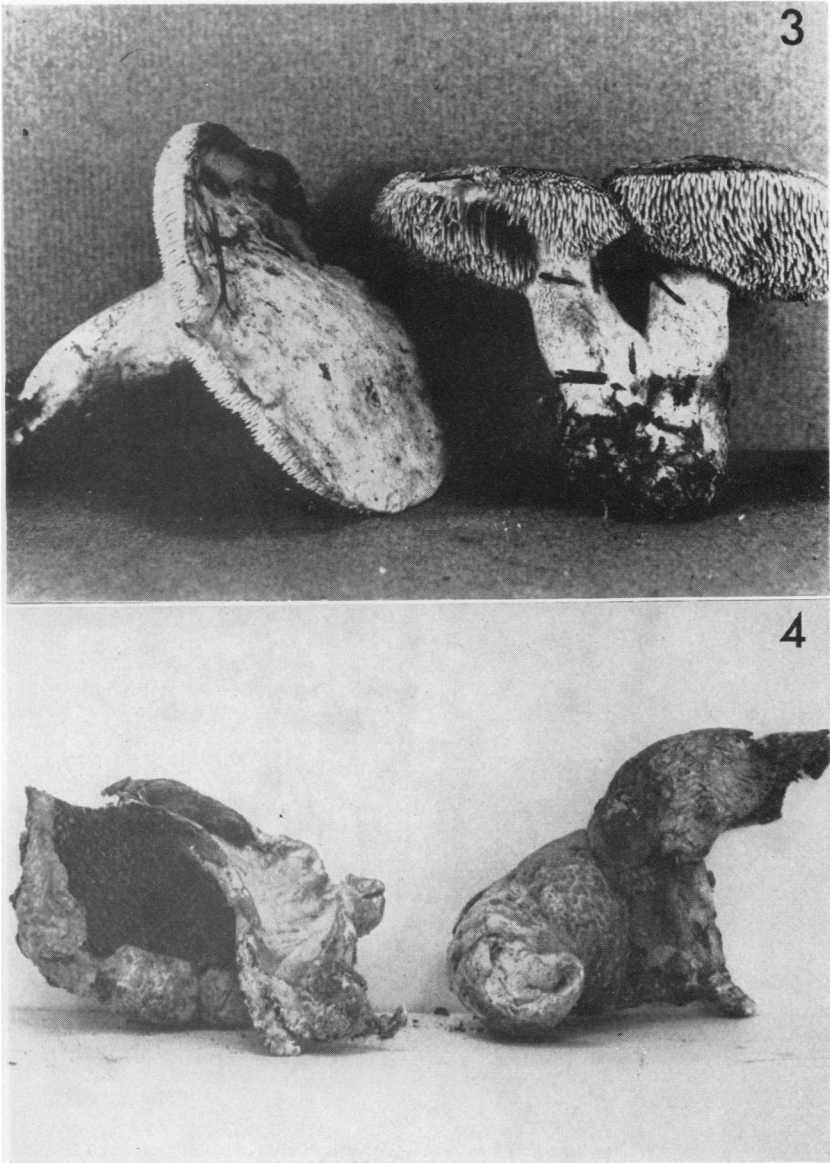


FIG. 3. *Hydnum laevigatum*, $\times 1/4$.

FIG. 4. *H. calvatum* var. *odoratum*, $\times 1/6$.

The collections of *Hydnum laevigatum* from the Pacific Northwest correspond very well to the description of the species given by Bourdot and Galzin (1927). They differ macroscopically from the two varieties of *H. imbricatum* in having a smooth, glabrous, grayish brown or reddish brown pileus, and a distinctly farinaceous odor when fresh specimens are cut open. The pileus, normally smooth, may become minutely areolate-cracked, but whether due to age or weathering is not clear.

Maas Geesteranus (1956) discussed some of the problems of varying interpretations of this species by European mycologists. He also considered its synonyms in his series "Notes on Hydnums," and illustrated and discussed its hyphal structures (Maas Geesteranus, 1962).

HYDNUM CALVATUM K. A. Harrison var. ODORATUM K. A. Harrison,
Canad. J. Bot. 42: 1217. 1964. FIGS. 4, 16

Plants to 8 cm tall, occurring singly or in groups, in some cases with the stipes fused, on ground in duff under *Abies* and *Pseudotsuga*. Pileus to 10 cm broad, convex, lacking any noticeable central depression, **cream color or *Cream-Buffer, becoming brownish when bruised, becoming rimose-scaly in age, the scales **grayish orange and becoming brownish when bruised; margin thin, tapered, *Chamois or concolorous with the *Cream-Buffer portions of the pileus; context homogeneous, fleshy-fibrous, pallid, taste not distinguishable, odor fragrant, of coumarin or vanilla extract. Spines not decurrent, to 5 mm long, 2-3 per mm², coarse, fleshy, terete, subulate, **earth color, nutria or sepia, with pallid tips. Stipe eccentric, to 5 × 3 cm, tapered sharply, colored same as the cap but whitish at the tip with a faint *Buffy Brown cast, context fleshy-fibrous, pallid, odor of coumarin or vanilla extract, tasteless; stipe base pointed, not enlarged, white-myceloid.

Spores 4.4 × 3.2 μ, subspherical to ellipsoidal in outline, angular-nodulose, apiculate, **brown in print, inamyloid, acyanophilous. Basidia 35-40 × 4-8 μ, clavate, 4-spored. Cystidia absent. Hyphae to 8 μ in diam, light colored, not vesiculose, very large clamps abundant in the pileal trama.

COLLECTION EXAMINED: Pierce county: Hall 535.

This species can be distinguished readily from other members of the stirps by the coumarin odor and the small, angular-nodulose spores.

HYDNUM CRASSUM K. A. Harrison, Stip. Hydnums of Nova Scotia,
p. 29. 1961. FIGS. 5, 17

Plants to 13 cm tall, occurring singly but grouped in a small area, on ground in duff under *Pinus ponderosa* Laws. Pileus 11-12 cm

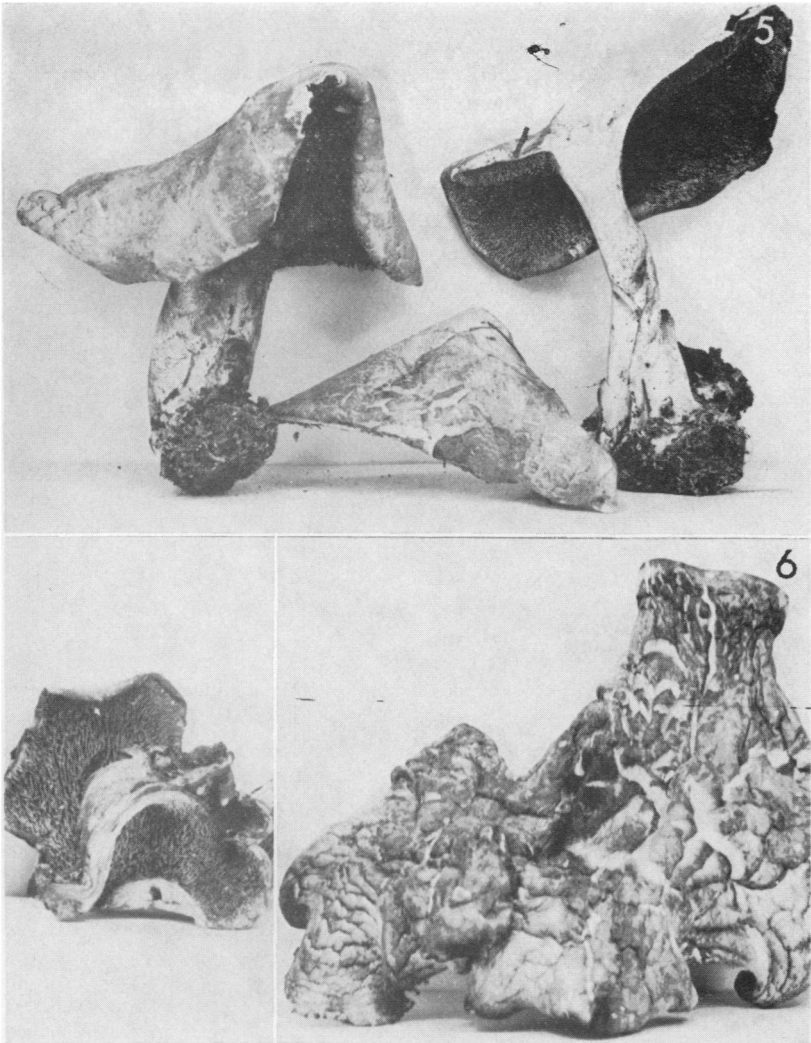


FIG. 5. *Hydnum crassum*, $\times 1/6$.

FIG. 6. *H. indurescens*, $\times 1/4$.

broad, convex with no central depression evident, the larger specimens elliptical in outline, **grayish brown to dark brown on the disc, becoming tinted with red towards the margin, surface diffracted to rimose-scaly; margin thin, inrolled in younger specimens, straightened in age, **grayish brown to brownish red; context homogeneous, pallid, turning **yellowish green when cut, odor when collected of fenugreek, be-

coming smoky on storage in the cold room, tasteless. Spines not decurrent, or if so then as tubercles, 5–15 mm long, 2–4 per mm², terete, fleshy, subulate, **brownish orange with pallid tips, in older specimens **grayish orange to red haired, no bruising reaction noted, extending to the margin. Stipe central or slightly eccentric, to 7 × 2 cm, **gray to reddish gray to dull red, no bruising reaction observed, context fleshy-fibrous, homogeneous, pallid throughout, not staining where cut, odor smoky, taste fungoid; stipe base tapered slightly in some, not so in others, pointed or blunted, concolorous with the rest of the stipe.

Spores 6.0–7.0 × 5.0–6.5 μ, coarsely tuberculate or angular-nodulose, resembling a Maltese cross in outline, ellipsoidal, **brown in print, inamyloid, acyanophilous. Basidia 35–45 × 6–8 μ, clavate, sterigmata 3–5 μ, 4-spored. Hyphae to 10 μ in diam, thin-walled, hyaline, with abundant clamps, reinflating well in 3% KOH.

COLLECTION EXAMINED: Chelan county: Hall 237.

The specimens of Hall 237 were collected in a park-like stand of *Pinus ponderosa* Laws., growing in a cluster that barely pushed up the pine straw.

Hydnum indurescens Hall & Stuntz, sp. nov.

FIGS. 6, 18

Pileus 8–19 cm latus, e convexo depressus denique infundibuliformis. superficie indurata profunde rimosa, primo in centro avellaneus vel aurantius, aetate brunneus vel fuliginus, ad marginem avellaneus vel colore centri colubrinus, contusus immutabilis, caro crassa, homogenea, pallide alutacea vel luteola, immutabilis, insipida, odore grato. Spinae irregulariter decurrentes, 6–8 mm longae, 1–2 per mm², griseo-luteolae vel avellanae, apicibus pallidis. Stipes 5.5–7 cm longus, 2.5 cm crassus, basin versus attenuatus, pileo concolorus, carnosio-fibrillosus, fractus roseolus. Sporae 5.5–7 × 4–5 μ, grosse anguloso-verrucosae, ellipsoidales vel subsphaericae, basidia 35–40 × 5–8 μ, clavata, cystidia desunt. Hyphae carnis usque ad 10 μ crassae, tenuitunicatae, fibrillatae.

Ad terram in pinetis in comitato Chelan, Washington, Hall 207 (typus, in herbario D. M. Hall ad Universitate Boreo-orientali Illinois conservatus).

Plants to 10 cm tall, occurring singly on ground in duff under pine. Pileus 8–19 cm broad, convex becoming depressed and finally infundibuliform in age, **reddish gray or gray to *Wood Brown, Cinnamon-Drab or Mars Orange, becoming *Bister to Cinnamon-Brown in age, no color change noted when bruised, surface leathery, deeply rimose-cracked; margin incurved, undulate, *Cinnamon-Drab or **grayish or mottled with areas that are concolorous with the disc; flesh to 4 cm thick, homogeneous, fleshy-fibrous, **light tan or yellowish white, drying hard, no change in coloration when cut, tasteless, odor recorded as mouldy with a spicy component.

HYDNUM SCABROSUM Fr., Anteckn. öfv. i Sverige väx. ätl. Svamp.,
p. 62. 1836. FIGS. 7, 19

Plants 8–10.5 cm tall, occurring singly or gregariously on ground in duff under *Abies*, *Tsuga*, and *Pseudotsuga*. Pileus 4–12 cm broad, convex-pulvinate, becoming slightly depressed in age, **Mars Brown, Tawny, **grayish orange to caramel brown or cocoa brown to cinnamon-brown, becoming *Chestnut-Brown to Carob Brown when bruised; cap surface smooth to diffracted-scaly, areolate in the depressed center, scales up to 1 cm long, truncate, concolorous with the rest of the cap or **nutria to violet-gray; margin undulate, incurved, whitish when young becoming *Vinaceous-Fawn in age, turning *Carob Brown to Chestnut-Brown when bruised; context to 1.5 cm thick, homogeneous, fleshy-fibrous, *White to Cream-Buff when fresh, becoming tinted lavender when cut and left standing, drying with a brownish coloration, odor farinaceous to smoky, taste bitter to slightly acrid-farinaceous. Spines slightly decurrent, to 1 cm long, 3–6 per mm², fleshy, terete, subulate, delicate, interspersed with shorter spines about half their length (0.5 cm), all spines *Tilleul Buff or Avellaneous to Vinaceous-Buff with pallid tips, becoming *Benzo Brown or **dark blond or clay to grayish orange when bruised, becoming mere tubercles on the margin. Stipe central, 3.5–8 × 2–3.5 cm, only slightly tapered, *Auburn to Bay, Vinaceous-Brown or Army Brown, becoming *Carob Brown to Chestnut-Brown when bruised; the context fleshy-fibrous to tough-fibrous but not corky, taste mild to farinaceous-bitter, odor farinaceous; stipe base not swollen, truncate, its surface **blackish green to dark bluish green, its context concolorous with that of the stipe and pileus, often with white proliferating mycelial strands that tend to retain soil particles when collected.

Spores 5.8–6.5 × 5.0–5.6 μ, coarsely tuberculate, spherical to ellipsoid in outline, *Fawn Color in print, inamyloid, acyanophilous. Basidia 40–50 × 6.7 μ, clavate, 2–4-spored. Hyphae 4–20 μ in diam, hyaline, thin-walled, without clamps, septate, irregular-vesiculose, reinflating in 3% KOH.

DISTRIBUTION: Grays Harbor, Island, King, Mason, Pierce and Snohomish counties.

COLLECTIONS EXAMINED: Hall 1, 69, 70, 126, 671, 688, 689, 699, 707, 841, 956, 965, 984, 989, 1001, 1003, 1007, 1018, 1029, 1049, 1090, 1101, 1113, 1216, 1590, 1610, 1627 and 1632.

Harrison's illustration (1961, Pl. 1, Fig. 8) is a good representation of *Hydnum scabrosum* as it occurs in the Pacific Northwest. In this region, the species is associated with *Tsuga heterophylla* Sarg. and *Gaultheria shallon* Pursh., the carpophores growing in abundance under

the dense patches of *Gaultheria* that occupy openings in second-growth stands of *Tsuga* and *Pseudotsuga*. It can be distinguished from other members of stirps *Scabrosum* by its strong farinaceous odor, coarsely

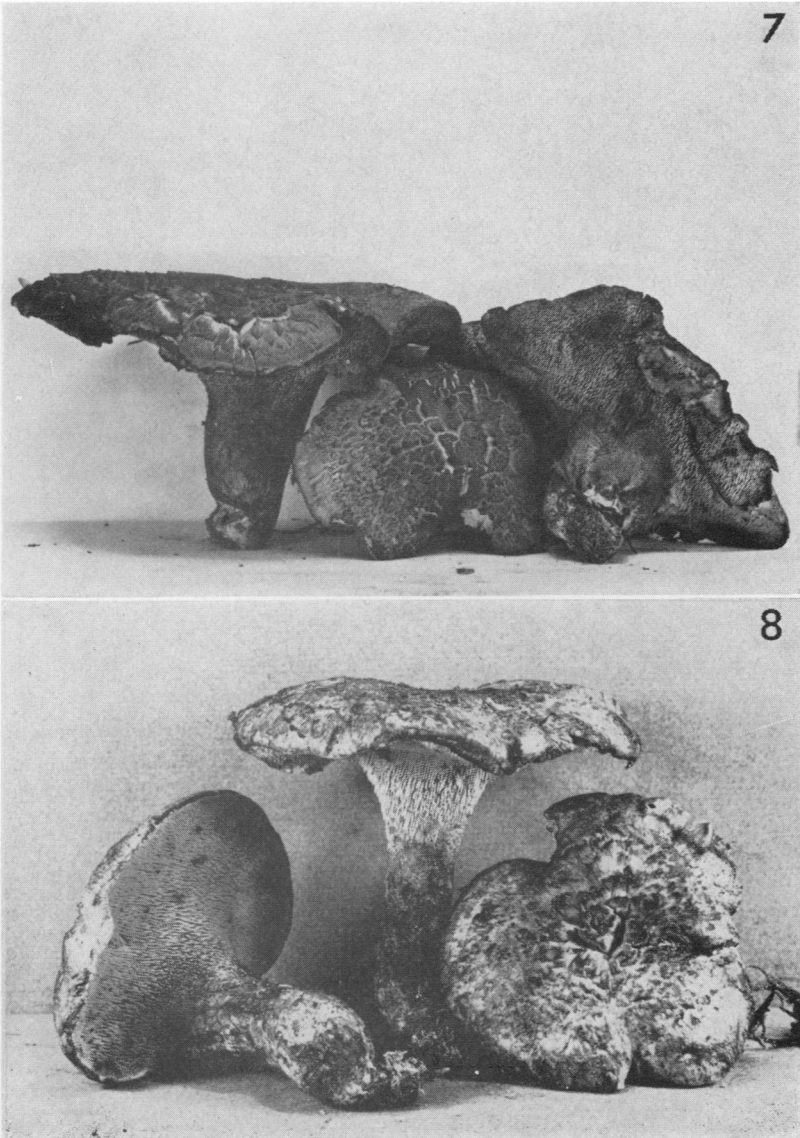


FIG. 7. *Hydnum scabrosum*, $\times 1/6$.
FIG. 8. *H. subincarnatum*, $\times 1/4$.

scaly pileus, its lack of pinkish tint when the flesh is cut, and its coarse spines.

Maas Geesteranus (1956) describes and comments upon this species, and in another paper discusses its hyphal structures (Maas Geesteranus, 1962).

HYDNUM SUBINCARNATUM K. A. Harrison, *Canad. J. Bot.* **42**: 1216. 1964. FIGS. 8, 20

Plants to 8 cm tall, occurring singly or in small groups, on ground in duff and leaves under *Pseudotsuga*, *Pinus* or *Tsuga*. Pileus to 8 cm in diam, convex, becoming slightly depressed in age, **brownish orange to dark brown or grayish brown on the appressed scales, against a *Seashell Pink to **light orange background between the scales, becoming **brownish black or sepia when bruised; surface smooth when young, then diffracted scaly, and finally rimose-scaly in age; margin inrolled, colored same as the disc or **pinkish white to reddish gray, becoming **dark brown or sepia when bruised; context commonly worm-eaten, to 2 cm thick, homogeneous, pallid or faintly tinged with **sepia, becoming suffused with reddish or lilaceous tints when cut, especially just beneath the pileal surface, odor farinaceous, taste slightly bitter. Spines irregularly decurrent, to 3 mm long, 2-6 per mm², fleshy, terete, subulate, bicolorous (in some specimens) **yellowish white to orange-white below, **pallid white at their tips, becoming **dark brown when bruised, the marginal areas sterile, or with scattered tubercles. Stipe central, 7 cm × 2 cm, tapered, the upper portions appearing rough due to the hymenium being decurrent as tubercles, whitish above by decurrent hymenium in some specimens, generally **red haired to sahara or grayish orange and bruising to **brownish black; context fleshy-fibrous, homogeneous, that of the upper stipe concolorous with the pileal context, taste slightly bitterish, odor farinaceous; stipe base slightly swollen, pointed, with context and exterior grayish green.

Spores 5.1-5.8 × 4.8-5.2 μ, elliptical or subglobose in outline, tuberculate, apiculate, inamyloid, acyanophilous. Basidia 40-50 × 5-8 μ, clavate, 4-spored. Hyphae to 16 μ wide, hyaline, thin-walled, without clamps, septate, reinflating well in 3% KOH.

DISTRIBUTION: Island, King, Mason and Pierce counties.

COLLECTIONS EXAMINED: Hall 47, 66, 167, 178, 179, 233, 236, 834, 850, 989, 992, 1009 and 1031.

This species occurs in the same collecting sites and under the same conditions as *Hydnum scabrosum*. It can be distinguished rather easily from the latter when fresh carpophores of the two are seen side by side;

H. scabrosum has a reddish brown pileus and brown spines, whereas *H. subincarnatum* has the pileus brown without reddish tones, and its spines are pallid. Also, the flesh of *H. subincarnatum* becomes tinted pinkish when cut, and that of *H. scabrosum* does not. Dried carpophores of the two species are more difficult to distinguish, since the pileal surface of *H. subincarnatum* dries with a reddish sheen.

Hydnum underwoodii (Banker) Hall, comb. nov. Figs. 9, 21

Sarcodon underwoodii Banker, Mem. Torrey Bot. Club. 12: 147. 1906.

Plants to 6 cm tall, occurring singly, on ground in duff under *Abies* and *Tsuga*. Pileus 7–10 cm broad, convex, with a slight central depression in some specimens, **camel to grayish brown or brown on the disc, becoming **cinnamon-brown to cocoa brown toward the margin, not changing color where bruised, surface distinctly scaly, scales concolorous, large, to 1 cm long, the areas between the scales **grayish orange; margin uneven, undulate, incurved, concolorous with the pileus or **grayish orange, no color change on bruising noted; context to 2 cm thick, homogeneous, fleshy-fibrous, pallid, odor slightly smoky or farinaceous, taste bitter. Spines irregularly decurrent, 3–10 mm long, 3–4 per mm², fine, fleshy, terete, subulate, becoming tubercles at the margin in some plants, **grayish orange to grayish brown or brown, tips pallid, no bruising reaction apparent. Stipe central to slightly eccentric, to 4 × 3.5 cm, **grayish orange to light brown or yellowish brown, no color change recorded when bruised, tapered to a point; context fleshy-fibrous, pallid, odor farinaceous, taste farinaceous or bitter; stipe base pointed, concolorous.

Spores 5.0–6.1 × 4.5–5.1 μ, ellipsoidal to subspherical, tuberculate, apiculate, **brown in print, inamyloid, acyanophilous. Basidia 30–40 × 5–8 μ, clavate, 4-spored. Cystidia absent. Hyphae up to 10 μ in diam, thin-walled, lacking clamps, septate, reinflating well in 3% KOH.

DISTRIBUTION: Clallam, Island and Pierce counties.

COLLECTIONS EXAMINED: Hall 70, 158, 223 and 884.

This species is distinguished from *Hydnum scabrosum* only with difficulty. The spines of *H. underwoodii* are capillary, and when dry they break off easily. Its odor is not as farinaceous as that of *H. scabrosum*, and it lacks the latter's green stipe base.

HYDNUM RIMOSUM K. A. Harrison, Canad. J. Bot. 42: 1212. 1964.

Figs. 10, 22

Plants to 12 cm tall, occurring singly or in small groups, on ground in duff and moss, under *Pseudotsuga*, *Abies*, or *Tsuga*. Pileus to 12 cm

broad, convex, becoming slightly depressed in age or umbilicate, *Gull Gray to Deep Gull Gray, dark Ramier Blue, or Dark Slate-Violet to Light Vinaceous-Fawn, becoming *Blackish Brown when bruised, sur-

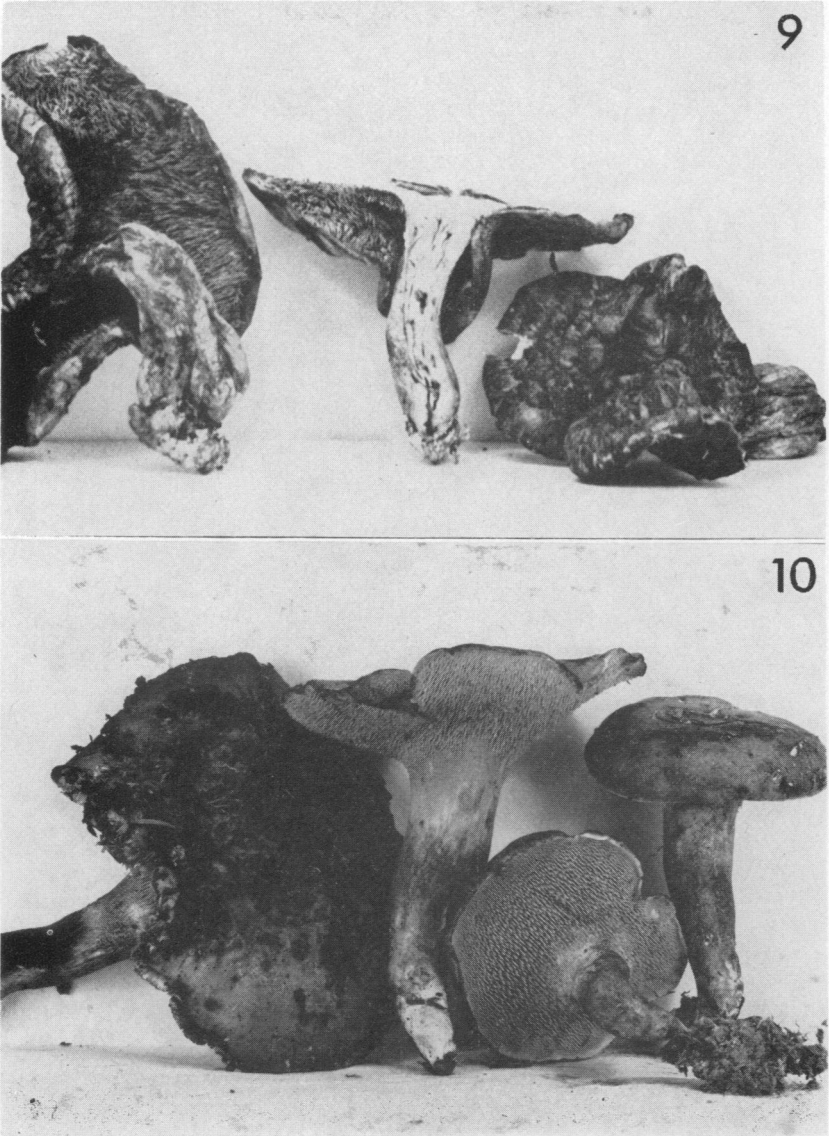


FIG. 9. *Hydnum underwoodii*, $\times 1/4$.

FIG. 10. *H. rimosum*, $\times 1/4$.

face smooth to furfuraceous in some young specimens, becoming rimose-cracked in age, the cracks **grayish red. Margin thin, uneven, undulate, concolorous with the pileus or **grayish red, bruising **Dark Gull Gray; flesh to 1.5 cm thick, homogeneous, worm-eaten, pallid or faintly tinged with sepia when cut, becoming suffused with lilaceous tints on standing, taste variable, farinaceous to acrid-farinaceous, odor smoky or farinaceous. Spines irregularly decurrent, to 0.9 cm long, 1-4 per mm², fleshy, terete, subulate, becoming mere tubercles towards the margin in younger material, *Tilleul Buff to Vinaceous-Buff, Sayal Brown or Cinnamon, becoming **dark brown when bruised. Stipe central to slightly eccentric, to 9 × 2.5 cm, distinctly tapering, *Olive-Buff to Pale Olive-Buff, Pale Cinnamon-Pink to Light Vinaceous-Cinnamon, becoming **violaceous or *Pale Quaker Drab to Light Quaker Drab; context concolorous with that of the pileus, pallid, generally worm-eaten, taste farinaceous, odor smoky to farinaceous; stipe base pointed, **grayish violet to deep grayish violet.

Spores 5.0-5.3 × 4.4-4.7 μ, ellipsoidal to subspherical, tuberculate, apiculate, **brown in print, inamyloid, acyanophilous. Basidia 25-35 × 5-10 μ, clavate, 4-spored. Hyphae up to 10 μ in diam, thin-walled, lacking clamps, septate, reinflating well in 3% KOH.

DISTRIBUTION: Island, King, Kittitas and Pierce counties.

COLLECTIONS EXAMINED: Hall 9, 36, 42, 50, 59, 69, 89, 115, 157, 159, 228, 299, 692, 695, 698, 709, 745, 755, 757, 758, 759, 786, 826, 839, 845, 888, 890, 891, 893, 894, 895, 951, 964, 982, 988, 1241, 1242 and 1609.

This species is very well illustrated by Harrison (1964), the worm-eaten stipe shown in his FIG. 2 being characteristic. In the Pacific Northwest the carpophores occur in dense second growth stands of *Tsuga* and *Abies*, or *Pseudotsuga* and *Tsuga*, under bushes of evergreen huckleberry.

Hydnum rimosum can be distinguished from the other members of stirps *Scabrosum* by its *Dark Slate-Violet to light Vinaceous-Fawn, rimosely cracked pileal surface, as well as by its *Vinaceous-Cinnamon to Quaker Drab stipe surface.

Stirps COMMUTATUM

Pileal trama *Vinaceous-Lilac, stipe trama Vinaceous-Purple. Clamp connections absent. Spores tuberculate, inamyloid, acyanophilous.

This stirps is represented by one species in the Pacific Northwest.

HYDNUM FUSCOINDICUM K. A. Harrison, *Canad. J. Bot.* **42**: 1213.
1964. FIGS. 11, 23

Plants occurring singly on ground in duff, under *Tsuga heterophylla* Sarg. Pileus to 9 cm broad, convex or with a shallow central depression, dark *Blackish Purple, Dusky Brown to Blackish Brown to Light Seal Brown; surface matted-tomentose, becoming squamulose-cracked in age, not truly scaly; margin slightly inrolled, *Deep Brownish Drab to Cinnamon-Drab; context to 1.5 cm thick, homogeneous, firm, brittle, compact, *Dark Slate-Purple, (*Dark Slate-Violet to Dull Violet-Black), odor farinaceous, taste not bitter but farinaceous. Spines decurrent for a long distance down the stipe, to 4 mm long, fleshy, terete, subulate, *Violet-Plumbeous or Dark Lavender. Stipe central, to 10 × 2 cm, *Fawn Color due to decurrent spines and light tomentose coat, dark **purplish black where the coat is rubbed off, the context fleshy-fibrous, *Dark Purplish Gray to Dark Slate-Violet; stipe base blunted, its context *Fawn Color.

Spores 6.0–7.2 × 4.7–6.7 μ , ellipsoidal to subglobose, tuberculate, apiculate, *Fawn Color in print, inamyloid, acyanophilous. Basidia 50–55 × 6.7–8 μ , clavate, 4-spored. Cystidia absent. Hyphae 2–10 μ in diam, hyaline, thin-walled, septate, semivesiculose, without clamps, reinflating in 3% KOH.

DISTRIBUTION: Grays Harbor, Island, Mason, Pierce and Snohomish counties.

COLLECTIONS EXAMINED: Hall 8, 10, 71, 128, 133, 156, 220, 221, 222, 225, 751, 753, 754, 756, 1088, 1142, 1484, 1486, 1591, 1597, 1612 and 1631.

This is a very well-marked species, with its aniline black, rimose-cracked or areolate-scaly pileus, and its violet context, reminiscent of that of *Cortinarius violaceus* Fr. The carpophores tend to grow in moss [*Rhytidiadelphus* or *Hylocomium splendens* (Hedw.) B.S.G.], in open areas under saplings of *Tsuga heterophylla* Sarg.

In Bresadola's *Iconographia mycologica* there is a plate (1932, Pl. 1048) labeled *Hydnum fuligineo-violaceum* Kalchbr. that is an excellent representation of *H. fuscoindicum*. It is possible, then, that *H. fuscoindicum* has been found in Europe and identified as *H. fuligineo-violaceum*.

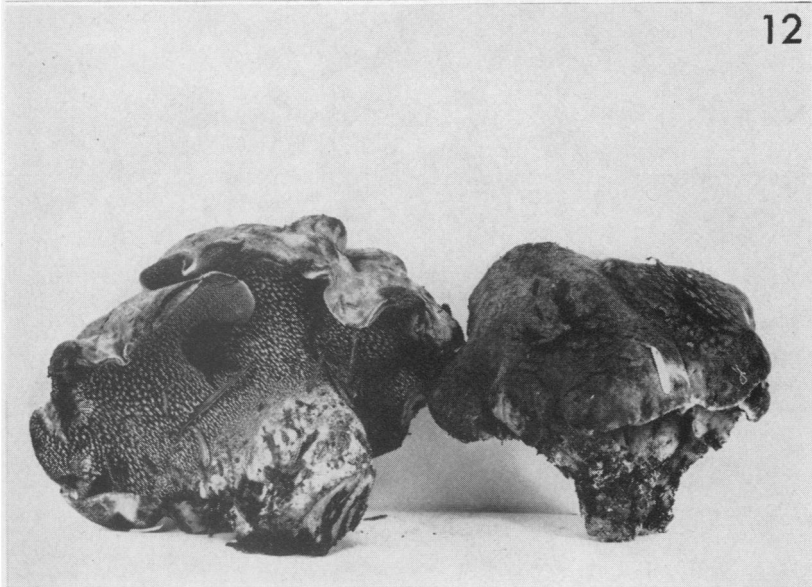
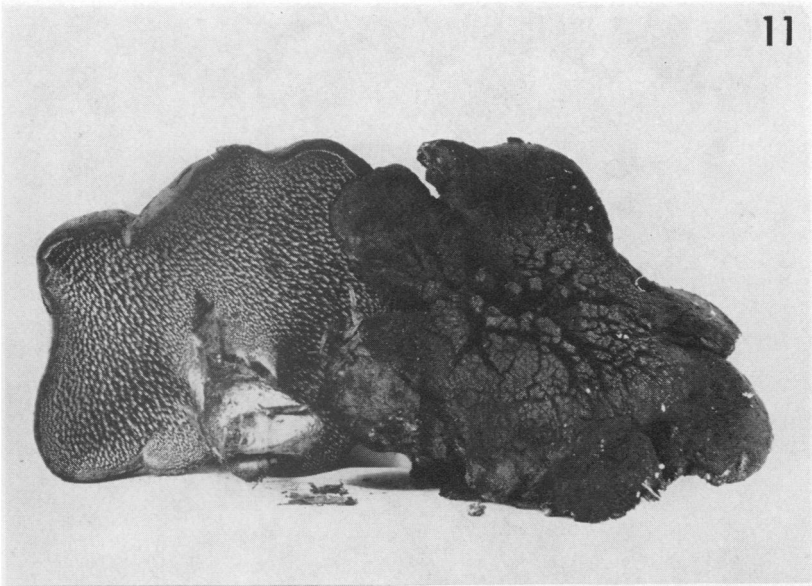
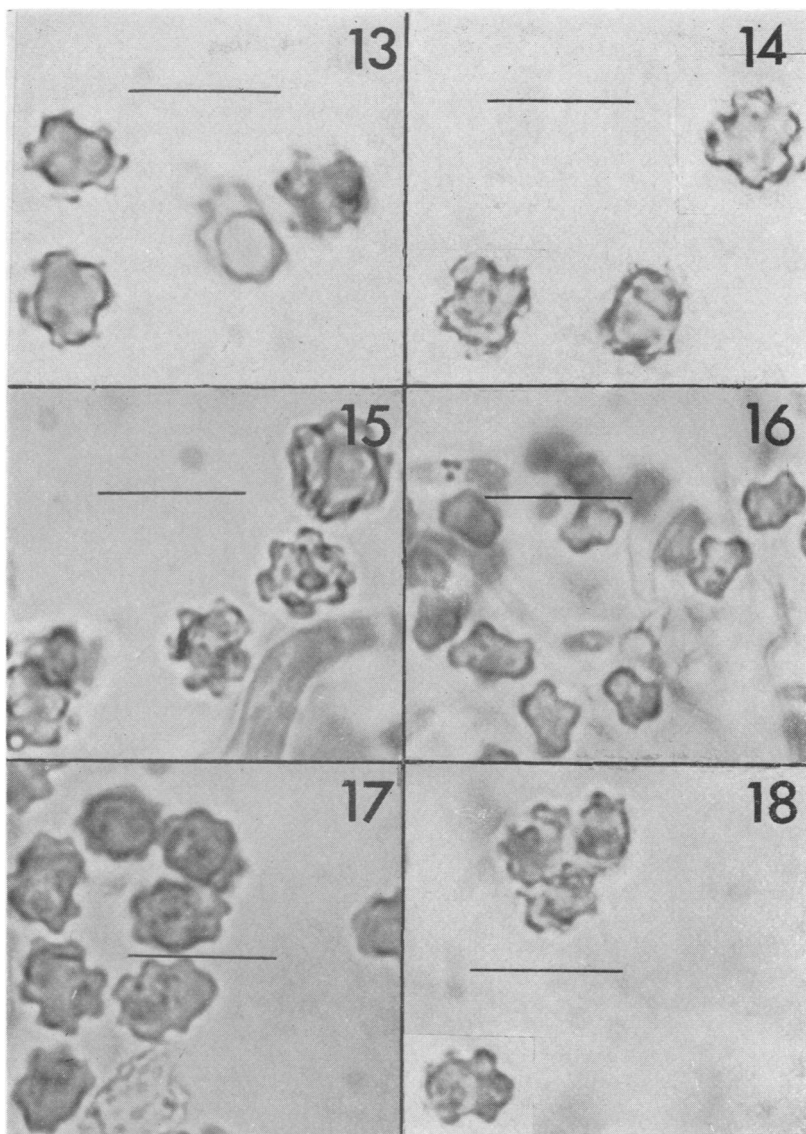


FIG. 11. *Hydnum fuscoindicum*, $\times 1/4$.

FIG. 12. *H. fumosum*, $\times 1/4$.



FIGS. 13-18. Basidiospores. 13. *Hydnum imbricatum* var. *imbricatum*. 14. *H. imbricatum* var. *monticola*. 15. *H. laevigatum*. 16. *H. calvatum* var. *odoratum*. 17. *H. crassum*. 18. *H. indurescens*. (Scales = 10 μ).

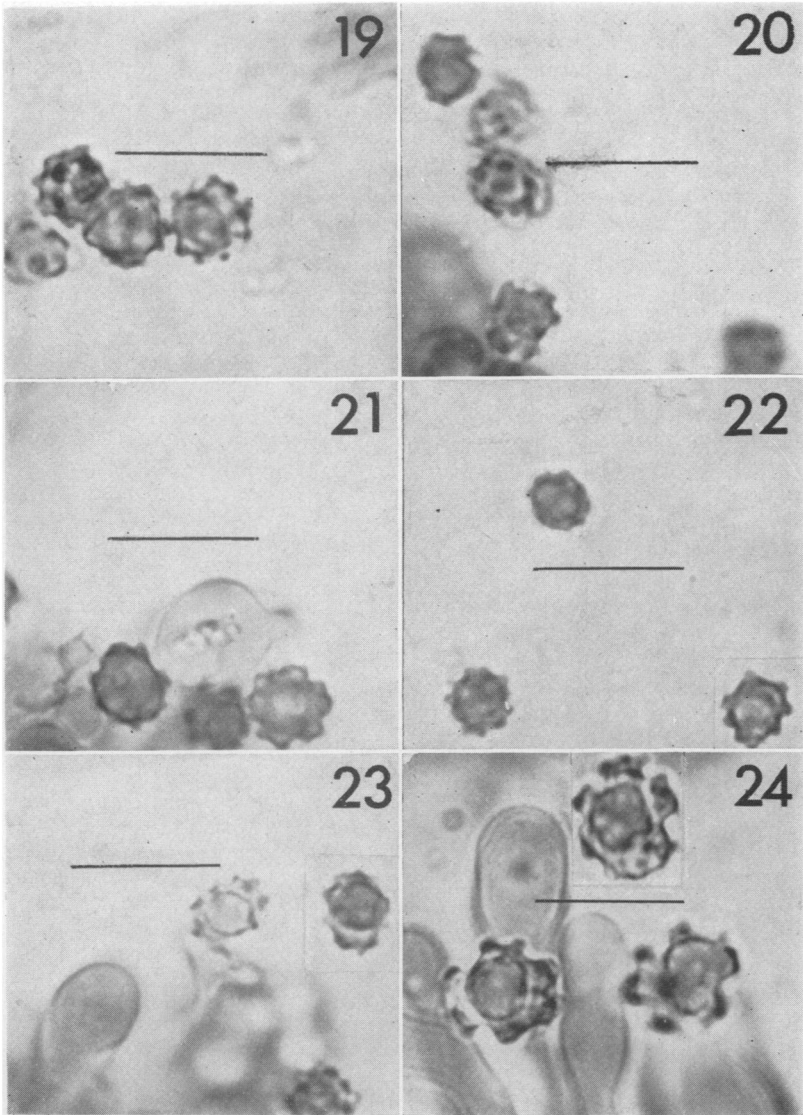


FIG. 19-24. Basidiospores. 19. *Hydnum scabrosum*. 20. *H. subincarnatum*. 21. *H. underwoodii*. 22. *H. rimosum*. 23. *H. fuscoindicum*. 24. *H. fumosum*. (Scales = 10 μ .)

Stirps FUMOSUM

Context of pileus greenish or olivaceous, becoming brittle and powdery on drying, clamps abundant, stipe trama concolorous. Spores coarsely tuberculate, inamyloid, acyanophilous.

This stirps contains a single species, *H. fumosum*.

Hydnum fumosum (Banker) Hall, comb. nov. FIGS. 12, 24

Sarcodon fumosus Banker, Mycologia 5: 16. 1913.

No notes on our specimens in the fresh condition are available. For a macroscopic description, the reader is directed to Banker (1913) and Coker and Beers (1951).

The spores of our collection are inamyloid and acyanophilous, and measure $6.5\text{--}8.0 \times 8.0\text{--}10 \mu$. These measurements agree well with those quoted by Coker in his re-evaluation of Banker's type.

COLLECTION EXAMINED: Snohomish county: Hall 255.

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