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# NOTES ON MICHIGAN BOLETACEAE

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(With seven Text-figures and Plate 27)

Studies have continued on the diversity of the Michigan bolete flora. During the season of 1972 a variety of *Boletus affinis* Peck having a reticulate stipe was discovered and abundant material of *Boletus bicolor* var. *subreticulatus* Smith & Thiers was obtained. *Boletus hortonii* Smith & Thiers was collected on two occasions and a detailed description was prepared. *Boletus rubissimus* sp. nov. is described. Specimens of *Leccinum aurantiacum* from France are reported upon, and color variants in *Suillus* are discussed. In *Tylopilus* amyloid reactions in *T. sordidus* are discussed and *T. subfusipes* is described as new.

Since publishing 'The Boletes of Michigan' (Smith & Thiers, 1971), Smith has continued his study of this group in the state with the result that a number of new problems have been discovered as well as data have been obtained on a number of problems of long standing. In the following account some of the more interesting items resulting from continued field work in the state are presented.

One was the discovery, by Mrs. Florence Hoseney, of a *Tylopilus* growing in connate clusters and having narrow spores and a bitter taste. Another was the discovery of a variant of *Suillus brevipes* in which the pileus stains or flushes green over extensive areas. Also, the taxonomic value of the amyloid reactions in the *Tylopilus sordidus* complex still remain questionable because of the erratic pattern of appearance which they present. The problem, apparently, concerns metabolic products precipitated in a fortuitous manner so that similar results are never obtained in a consistent pattern from one fruit body to another, or even from different mounts from the same basidiocarp. This phenomenon is not restricted to the genus *Tylopilus* in the Boletaceae. Singer (1962) and Snell & Dick (1970) both described the genus *Xanthoconium* as having the stipe entirely smooth. Here in Michigan we have picked up a variant of *Boletus affinis* with the stipe distinctly reticulate.

The specimens cited have all been deposited in the University Herbarium of the University of Michigan (MICH). Color terms within quotation marks are taken from R. Ridgway, 'Color Standards and Color Nomenclature', Washington D.C. 1912.

## BOLETUS AFFINIS var. **reticulatus**, *var. nov.*

Pileus 3–5 cm latus, late convexus, siccus, velutinus, ochraceo-brunneus ("Sudan brown"), non-maculatus, cum 'KOH' ferrugineus. Contextus albidus, immutabilis, mitis. Pori fulvo-

ochracei. Stipes 4–7 cm longus, 12–13 mm crassus; subalbidus, reticulatus; reticulum cinnamomeum. Sporae 10.5–14 × 3.5–4.5 μ. Highland Rec. reaction. Area, Oakland County, Michigan, July 24, 1972, A. H. Smith 81176 (typus, MICH).

Pileus 3–5 cm broad, hemispheric to broadly convex, dry, velvety to merely unpolished, evenly colored "Sudan brown" to "buckthorn brown" overall (a rich yellow-brown), margin flush with the tubes; KOH on cuticle ferruginous; $FeSO_4$ no reaction. Context whitish, taste slight, odor not distinctive, with KOH: no color change.

Tubes mature, all dull amber-brown, adnate, plane, spotting rusty ochraceous to dull "Sudan brown," no blue stains evident; pores minute, nearly concolorous with the pileus when mature.

Stipe 4–7 cm long, 12–13 mm thick, equal, solid, distinctly reticulate overall with a brown ("Sayal brown") reticulum on a pallid to brownish ground color, base white and naked at first, the brown color gradually extending baseward until entire stipe is colored.

Spore deposit rusty ochraceous. Spores 10.5–14(–15) × 3.5–4.5 μ, smooth; in profile narrowly inequilateral, in face view suboblong to bluntly navicular, bright ochraceous in KOH, pale rusty brown in Melzer's.

Basidia 4-spored, clavate, 6–7 μ broad, hyaline in KOH. Pleurocystidia scattered, subaciculate, 30–45 × 6–9 μ, hyaline in KOH, in Melzer's many seen to have a ± granular dark yellow-brown content. Cheilocystidia similar to pleurocystidia and hyaline, some clavate cells with golden-ochraceous incrustations also present. Caulocystidia abundant, clavate, 25–38 × 10–18 μ, hyaline and thin-walled in KOH, yellow in Melzer's; small dextrinoid particles and incrustations present and these very abundant on cortical hyphae as revived in Melzer's.

Tube trama with boletoid hyphal arrangement (hyphae diverging from a central strand.). Pilear cuticle a closely packed trichodermium of inflated cells 9–18 μ wide giving an impression of a cellular layer (epithelium) but the terminal cells ± cystidioid and acute to obtuse at apex, these cells up to 15 μ or more wide and the layer yellow in KOH except for the hyaline ultimate and penulatimate cells; dextrinoid debris conspicuous in the cellular layer. Tramal body of wide (12–15 μ) hyphae with fine particles scattered in the intercellular spaces or on the hyphal walls (not as dextrinoid as the particles in the cuticle). Clamp connections none.

Gregarious under oak-beech (old growth stand). Highland Recreation Area, Oakland County, Michigan, July 24, 1972, A. H. Smith 81176 (type, MICH).

OBSERVATIONS.—This variant is clearly a "*Xanthoconium*" in the sense of Singer. It is closest to *Boletus affinis* var. *affinis* but differs sharply in the stipe being reticulate (quite obviously so) to near the base, and in having spores measuring slightly smaller. The degree to which dextrinoid debris occurs in the tissues of var. *reticulatus* is rather striking, but its taxonomic significance remains to be established.

### BOLETUS BICOLOR var. SUBRETICULATUS Smith & Thiers

During the season of 1972 near Oak Grove in Livingston County, Michigan, fruitings of hundreds of basidiocarps were observed, and variation within *B. bicolor*, especially var. *subreticulatus*, was studied in detail. The following characters were observed:—

(1) The reticulum at the apex of the stipe: It is obscure in most young basidiocarps, but evident at maturity and in age, and is to be regarded as a rather con-

stant feature of freshly matured fruit bodies. It is present to the same degree that one finds it in *Boletus sensibilis* Peck. (2) The color of the pileus: It is very close to "brick red" and soon fades so that mature caps have usually lost the deep red tone. In fact about half of all the basidiocarps seen had lost nearly all the red tints (but were, admittedly, past maturity). The red pigment is located in the epicuticular hyphae and as these are pulled apart by the expansion of the pileus, yellow becomes the dominant color. (3) The tubes: They were typically adnate-decurrent and short. They often split instead of separating when broken downward. In var. *bicolor*, they tend to become depressed around the stipe and to separate when broken downward. (4) Staining reactions: The context, tubes and stipe readily changed to blue when injured. (5) Size: The dimensions as recorded on paper may create a false impression as to the proportions of the fruit body. Var. *subreticulatus* typically has a slender stipe in relation to the width of the pileus. Young stages resemble closely Peck's (1872) illustration of the type variety. In none of the basidiocarps did one get the impression of a thick-stiped species as shown in the upper figure of Snell & Dick (1970). However, these authors have dealt with the variants of this species remarkably well in their plate 40 (1970). Their upper figure is of the robust variant of the type variety as I have always known it since my student days. Their central lower figure appears to me to be typical of var. *subreticulatus*. The figures to the left and to the right represent the type variety as illustrated by Peck. The point of all this is that to me the robust variant is a true *Boletus* in the sense of Singer (1962), whereas *B. bicolor* var. *subreticulatus* is a "*Xerocomus*" a genus I do not recognize as distinct from *Boletus*.

### BOLETUS HORTONII Smith & Thiers—Pl. 27

This bolete was first described as *Boletus subglabripes* var. *corrugis* by Peck. The very irregular pilear surface obviously influenced the choice of the varietal epithet. Since no critical account based on fresh specimens is available. the following one is offered:—

Pileus 5–9 cm broad, convex, becoming broadly convex, surface coarsely rugulose-pitted and uneven, often more so toward the margin, color variable–reddish cinnamon with olive-brown areas or rather evenly colored by either of these colors, redder in drying but some pilei retaining olive-buff areas, margin even. Context whitish becoming yellow over the tubes, pinkish under the cuticle, taste mild (or the cuticle slightly acid-bitterish), when cut showing occasional very weakly bluish areas and the line above the tubes becoming bluish green; KOH on cuticle merely brownish.

Tubes about 1 cm deep at maturity, yellow at first, greenish in age, very faintly blue where bruised or cut, adnate or depressed around the stipe; pores minute, yellow at first, olive-green in age, staining slowly to dull cinnamon if bruised.

Stipe 4–8 cm long, 12–18 mm thick, equal, pith white, cortex yellow (and color more pronounced in age); surface bright yellow, naked to pruinose, in age discolored below to $\pm$ cinnamon buff.

Spore deposit olive-brown. Spores 13–15 $\times$ 4–4.5 $\mu$, smooth, inequilateral in profile, in face view navicular to subelliptic, weakly ochraceous to pale tawny in KOH, yellowish to tan in Melzer's; wall about 0.3 $\mu$ thick.

Basidia 9–10.5 μ broad near apex, clavate, 4-spored, hyaline in KOH and practically so in Melzer's. Pleurocystidia none found. Cheilocystidia narrowly elongate, 40–65 × 2–3 μ (at base) × 4–5 μ at apex, this type typically originating from a ventricose cystidium-like cell as an apical proliferation differentiated by a septum; some aciculate to fusoid-ventricose cells also present on tube edges, these 18–27 × 3–5(–10) μ, hyaline and smooth. Caulocystidia in patches of caulohymenium, dextrinoid when first revived in Melzer's but soon fading, tubular with a blunt apex and measuring 25–50 × 5–8 μ, arising as the terminal cell of a filament or as an apical prolongation of a ventricose cell 10–15 μ wide.

Tube trama of hyphae divergent from a central strand (the boletoid type), hyaline to yellowish in KOH and in Melzer's respectively. Pilear trama of interwoven hyphae 8–20 μ wide, yellowish to hyaline in KOH or Melzer's but with a strong "fleeting amyloid" reaction. Hyphae of stipe cortex perpendicular, 7–25 μ wide, walls of some hyphal cells thickened to 2 μ or more and the wall distinctly amyloid under the microscope (but often only in the region near the septa or in the thickened part of the wall, many cells entirely inamyloid and thin-walled), some cells with both deep red and blue present in different areas. Clamp connections not found.

Gregarious on humus in low oak woods, Highland Recreation Area, Oakland County, Michigan, July 24, 1972, A. H. Smith 81172, 81188. The collections were made in the same woods but about a mile apart.

OBSERVATIONS.—The above description is drawn entirely from the collections cited to avoid any possible confusion. The positive features which cause me to identify these collections as *B. hortonii* are the rugose-pitted roughened pileus, the aspect of *Boletus subglabripes*, the very slight bluing reaction, the spore size, and the details of the pileus cuticle. On the other hand, the characters noted in these collections which appear to distinguish them from the type of *B. hortonii* are the elongated narrowly clavate proliferations from ventricose cells—here termed cheilocystidia, and which appear to be a secondary development—and the amyloid reactions of the cortical cells of the stipe in freshly dried mature basidiocarps.

At the present time, however, I do not feel justified in using these features in establishing a 'new species'. Since the proliferations of the cuticular cells of the pileus are a feature of Peck's type, and since the elongated cheilocystidia of the 1972 collections are most numerous on the older basidiocarps for the present I interpret them as an expression of one and the same genetic set of factors. At least this seems to be the sensible course to follow until a much larger sample of the species is availabke for study.

The amyloid reaction on the hyphae of the stipe was demonstrated on old but not on young material. Also, it tends to fade in an hour or so. I was unable to demonstrate it on other collections (from Massachusetts and Ohio as well as from Michigan) which have been in the herbarium for a number of years. This is unusual for the iodine reactions generally are more reliable on dried material that has been in the herbarium for many years than on fresh or recently dried specimens. No amyloid reaction was found on the cortical hyphae of the stipe of *Boletus subglabripes*. Because of these considerations, I prefer to study the problem further. One point, however, was clearly emphasized by the 1972 collections: *Boletus subglabripes* and *B. hortonii*

are very closely related, and have no close relationship to the genus *Leccinum* other than the fact they are boletes. The stipe in *B. hortonii* is less distinctly ornamented than that of *B. subglabripes*.

**Boletus rubissimus**, *sp. nov.*

Pileus 4–9 cm latus, convexus demum late convexus, impolitus, siccus, canescens, rubissimus ("Pompeian red"), demum ad marginem sulphureus vel ochraceo-roseus. Contextus pallide luteus, immutabilis, mitis. Pori laete lutei, 2–3 per mm. Stipes 7–9 cm longus, 16–23 mm crassus, sursum laete luteus, deorsum flavus, tactu caeruleus, pruinosus; pruina laete rosea. Sporae 9–11 × 3–4 $\mu$. Highland Recreation Area, Oakland County, Michigan, July 25, 1972, A. H. Smith 81187. (typus, MICH).

Pileus 4–9 cm broad, convex becoming broadly convex, surface unpolished and dry when very fresh with a hoary sheen, "Pompeian red" over all at except the bright yellow ("sulphur yellow" or more ochraceous) margin, disc retaining the pinkish red tones. Context thick, pale yellow, taste mild, not staining blue when cut or only weakly so and then in very limited areas. KOH on pilear cuticle: slowly yellow on the pink surface; $NH_4OH$: no color change on pilear cuticle; $FeSO_4$: on context gray.

Tubes (all young) 2–4 mm deep, bright yellow, staining a grayish blue when injured, depressed around the stipe; pores minute (2–3 per mm in young material), lemon-yellow becoming dingy near maturity.

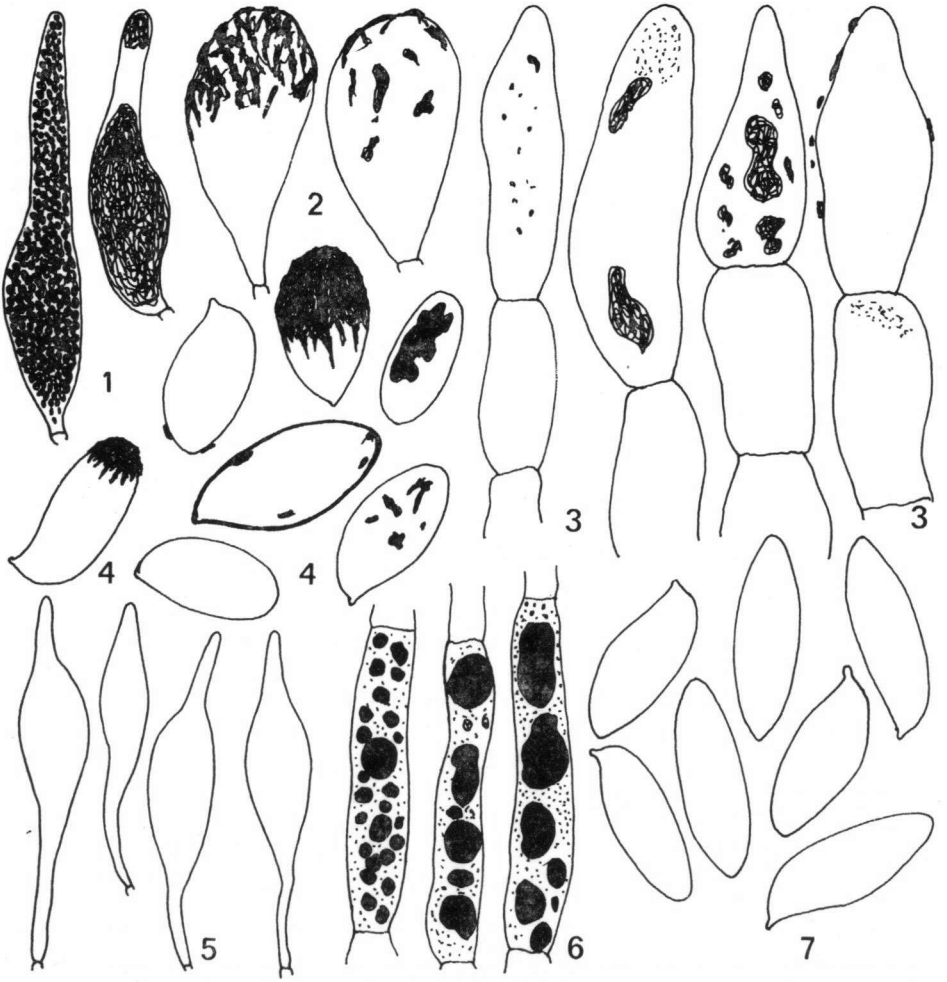
Stipe 7–9 cm long, 16–23 mm thick, equal, solid, pale yellow above, flavous below, when cut turning blue in local areas near base and these eventually reddish stained, paler yellow above; surface flushed pompeian red over lower portion and pruinose, yellow above and there finely reticulate, yellow mycelium around base.

Spores 9–11 × 3–4(–4.5) $\mu$, smooth, yellowish in KOH and yellowish hyaline in Melzer's, in profile somewhat inequilateral, in face view almost oblong varying to narrowly ellipsoid, wall thin (–0.2 $\mu$ thick).

Basidia 28–34 × 7–9 $\mu$, 4-spored, clavate, hyaline in KOH and yellowish in Melzer's. Pleurocystidia numerous, 37–55 × 9–14 $\mu$, fusoid-ventricose and tapered to an acute apex, hyaline in KOH or in Melzer's, thin-walled, smooth, content not distinctive ('empty'). Cheilocystidia either similar to pleurocystidia or smaller (20–35 × 4–10 $\mu$) and aciculate to clavate, remaining yellow in KOH (on fresh material) for sometime before fading, some yellow incrusting material seen on some cells (but this not characteristic). Caulohymenium of cystidia and basidia, the cystidia 28–56 × 7–17 $\mu$, mostly fusoid to fusoid-ventricose and many with yellow content (in KOH), varying toward clavate (apex obtuse and neck lacking), thin-walled, smooth; flexuous filamentose elements also present in the layer.

Tube trama of hyaline thin-walled hyphae 6–9 $\mu$ wide, tubular or an occasional hypha with inflated cells up to 15–20 $\mu$ wide, wall in both types thin and hyaline, arrangement boletoid (hyphae divergent to subhymenium). Pileus trama of compactly interwoven hyphae 8–15 $\mu$ wide, walls thin and hyaline. Cuticle of pileus a basal layer of interwoven hyaline (in KOH) hyphae 3–7 $\mu$ wide from the upper surface of which arrises a trichodermium in patches of narrow hyphae (2–3.5 $\mu$), sparingly septate and with end-cells having parallel walls (in optical section) and the apex blunt, walls smooth and thin. Clamp connections none.

Scattered among bushes of *Vaccinium* under oak, Highland Recreation Area, Oakland County Michigan, Juli 25, 1972, A. H. Smith 81187 (type, MICH).




Figs. 1–4. *Tylopilus sordidus* (a variant). — 1. A pleurocystidum with granular amyloid content and one with coagulated amyloid content (revived in Melzer's). — 2. Cheilocystidia with amyloid material adhering to surface. — 3. Cells from pilear trichodermium with amyloid content and amyloid incrusting material. — 4. Spores with amyloid incrusting material and amyloid content.

Figs. 5–7. *Leccinum aurantiacum*. — 5. Pleurocystidia. — 6. Hyphae from pilear cuticle showing pigment globules and granules. — 7. Spores.

Spores as reproduced approximately × 600; hyphae and hyphal end-cells approximately × 425.

OBSERVATIONS.—The salient features of this bolete are the fine reticulation over the uppermost portion of the stipe, the most beautiful deep pink color of the pileus imaginable (and which is persistent over the disc), the short spores, and the weak and sporadic color change to blue in the context of the pileus and upper part of the stipe. It is a fifth species in the stirps *Regius* of *Boletus*. *Boletus speciosus*, *B. peckii*, and *B. pseudopeckii* are the others. *B. rubissimus* differs from *B. speciosus*, the most similar one of the group, in shorter spores (9–11 × 3–4.5 $\mu$ compared to 11–15 × 3–4 $\mu$), in having a weak and spotty change to blue except for the young tubes, and in the hoary sheen of young pilei along with the rather inconspicuous reticulation on the stipe. *Boletus pseudopeckii* is readily distinguished by its dull red pileus at first soon becoming brown, by its spores (10–14 × 3.5–4 $\mu$), by the lack of any trichodermial development of the pilear epicutis, and more extensive development of the reticulum over the stipe. *Boletus regius* has spores 11–16 × 4–5 $\mu$, and quite a different pattern of pigmentation, but the color change to blue in both appears to be rather similar (see Singer, 1967: 40). *Boletus peckii* differs in the strongly reticulated stipe (as described by Peck), a bitter taste (as reported by Coker & Beers), in having very few pleurocystidia and in having the hyphae of the pilear trichodermium 4–8 (–10) $\mu$ wide in sharp contrast to the 2–4 $\mu$ width of the hyphae as found in *B. rubissimus*.

LECCINUM AURANTIACUM (St-Amans) S. F. Gray—Figs. 5–7

Smith, Thiers & Watling (1966) published an account of this species based largely on American collections, but no neotype was designated. In fact it would have been inappropriate to do so, since the name originated with Bulliard and we did not study material from his area. But over the years there has been much confusion regarding the application of Bulliard's name — and I am afraid this confusion has been carried into the modern literature, see Singer, 1967, and Smith, Thiers & Watling, 1966.

Bulliard's (1809, 1812) plates 236 and 489 fig. 2, show an orange-red *Leccinum* with no overlapping sterile pilear margin, a feature which Smith & al (1966) used to distinguish the section *Leccinum* with *L. aurantiacum* as the type. Singer (1967) made the same mistake since he listed *B. versipellis* Fr. as a synonym of "*Leccinum aurantiacum* (Bull. ex St-Amans) S. F. Gray." (Fries described *Boletus versipellis* in 1838, p. 424 as follows: " . . . velo membran. annulari inflexo appendiculato . . ." a statement which clearly indicates an appendiculate pilear margin).

This situation was again brought to mind by a collection made south of Dôle, France, in the company of Dr. Vincent Demoulin of Liège, Belgium. We found a collection of three basidiocarps in perfect condition which answered perfectly to Bulliard's illustrations. To make a long story short, a description of this material follows:—

Pileus 8–12 cm broad, hemispheric to convex, becoming broadly convex, surface dry and dull, ferruginous (orange red) to deep ferruginous red (dark red), cuticle

continuous at first but toward the margin with minute appressed squamules, margin not distinctly appendiculate (a very narrow inconspicuous sterile zone present). Context white quickly changing to watery-vinaceous to vinaceousgray to bluish fuscous, odor and taste pleasant.

Tubes 1.3–1.5 cm deep in mature pilei, depressed around the stipe, whitish to "ivory yellow" (very weakly yellowish) to grayish, staining as in the context if injured; pores small, whitish to (temporarily) ivory yellowish, dark gray or brownish in age, if rubbed lightly staining yellowish, if severely injured changing as in the context.

Stipe up to 12 cm long and 3.5 cm thick, enlarged evenly downward, ground color white; ornamentation black in age, white at first and becoming reddish to reddish brown before blackening, darkened areas may be in a subreticulate pattern, no blue staining evident.

Spores 12–15 × 3.5–5 $\mu$, smooth, narrowly inequilateral in profile, in face view narrowly subfusoid, apex lacking a pore, color in KOH dull cinnamon, in Melzer's pale dull cinnamon. Basidia 4-spored, 9–12 $\mu$ wide at apex, hyaline in KOH. Pleurocystidia 34–56(–63) × 9–14 $\mu$, fusoid with acute apex, thin-walled, smooth, hyaline and 'empty' as revived in KOH. Pileus cuticle of appressed hyphae containing a dissolved red to orange pigment and 5–10 (12–20) $\mu$ wide, wall in wide hyphae with an irregular hyaline outer thin sheath (revived in KOH).

OBSERVATIONS.—The pileus dries rusty reddish as in American collections placed under this name. Smith & al. (1966) used, as one of the distinguishing features of the 'type' variety of *L. aurantiacum*, the fact that the intracellular pigment in many cuticular hyphae, when revived in Melzer's, rounded up into 'pigment globules' which were 0.5–10 $\mu$ in diam. The collection from France also shows this character clearly. But the American '*L. aurantiacum*' and Bulliard's species differ sharply in the degree to which the sterile pilear marginal membrane develops, and in its behavior as the pileus expands. If we formulate a concept from Bulliard's plates with microscopic characters added from the collection south of Dôle, France, we have the following: (1) pileus margin not distinctly appendiculate; (2) pileus ferruginous red (orange-red); (3) ornamentation of stipe passing from white through reddish to reddish brown before becoming blackish; (4) tubes pallid (whitish) or so lightly tinted yellow as to be scarcely yellow at all; (5) pigment globules in some of the cuticular hyphae of the pileus as revived in Melzer's; and (6), the cut flesh changing through reddish to fuscous. I believe that a neotype should be selected to 'anchor' Bulliard's name to a fungus with the above six essential features, or perhaps in the interim, regard Bulliard's two published plates as a substitute for the type. Our collection is not sufficient to establish a neotype and make the proper distribution of specimens. But it does serve, along with the account by Kühner & Romagnesi (1953: 40) which emphasizes the color of the intracellular pigment, to clearly show that a *Leccinum* with a red pileus and a non-crenate pilear margin does exist, and in my estimation must be regarded as the type-variant of the species. The American variant previously designated as the type differs in the distinctly appendiculate pilear margin as previously stated.

*Leccinum insigne* has the color of *L. aurantiacum* in its type variant, but the pigment is not stable and breaks down in drying so that dried specimens can be distinguished

at a glance. Both have some very wide epicuticular hyphae which form the fibrils noted near the margin. Both the American and European *L. aurantiacum* have pigment globules in some of the cuticular hyphae, but these are absent in the type of *L. insigne*. Thus the two species are more readily distinguished in the herbarium than in the field.

### SUILLUS BREVIPES (Peck) Kuntze

Smith & Trappe (1972) published an account of collections of *Suillus imitatus* Smith & Thiers, in which the pilei became flushed with olive to dark bluish green, yet signs of deterioration of any kind in the basidiocarp were absent. In some instances pilei that were entirely dark green were observed. We thought that *S. imitatus* was the only species in which this change occurred, but on October 13, 1971, at Midland, Michigan, under *Pinus resinosus* it was observed in *S. brevipes* (Smith 80863). Four out of five basidiocarps in the group showed splashes of dull green on the pileus. These varied in extent with the individual fruit body but in no case did they cover more than half of the pileus.

*Suillus imitatus* is an annulate species not closely related to *S. brevipes* within the genus *Suillus*. Therefore the possibility that only one species is involved in this green-staining phenomenon is ruled out. The only common environmental factor was that in both instances the collections were found after periods of cold rain. No freezing was involved that I am aware of though night temperatures had been low in each area.

The variant of *S. imitatus* was formally described as a variety but the designation of *forma* as a category might be more logical in view of the Michigan find. Before making any formal changes, however, it would be advisable to know more about the nature of the change and its possible occurrence in still other species.

The microscopic data on Smith 80863 are as follows: Spores 7–8 × 2.8–3.2 $\mu$, smooth, in face view oblong to narrowly boat-shaped, in profile obscurely inequilateral, nearly hyaline in KOH. Basidia 15–21 × 5–6.5 $\mu$, clavate, 4-spored. Pleurocystidia in clusters surrounded by rusty brown incrusting material or some of this in the cells themselves, the cystidia 4–6 $\mu$ wide, cylindric, and variable as to length. Cheilocystidia not seen (edge may be identified of copious incrustations obscuring cellular detail). Pellicle of pileus an ixocutis as revived in KOH. Clamp connections not found.

### TYLOPILUS SORDIDUS (Frost) Smith & Thiers—Figs. 1–4

Smith & Thiers (1971) commented on the amyloid reactions of tissues in a collection (Hoseney 538) identified as this species (but with reservations). On July 25, 1972 at the Highland Recreation Area, Oakland County, Michigan, a collection (Smith 81193) was made in which the basidiocarps shed further light on the amyloid reactions of species in this genus. Four basidiocarps were found growing solitary, each 100 yards or more from the others, along a trail through hardwoods. All were

studied individually before being grouped under the above mentioned collection number. One basidiocarp was just past the button stage, two were mature, and one was old. In the youngest stage amyloid debris or adhering amyloid material or amyloid cell content was difficult to find, but after much searching, three examples of it were found in the fresh material in the pilear cuticle. It was also sparingly demonstrated again after the specimen had been dried. In the mature group material was found capping some cheilocystidia, it was rare (but present in places) in the pilear cuticle, it occurred in a few pleurocystidia as a granular content, and in or on some immature basidiospores. In the old specimen amyloid material distributed as described above occurred with greater frequency in both fresh and dried specimens. When found capping cheilocystidia or spores, rod-like extensions of amyloid capping material (resembling chromosomes stained with crystal violet) were evident. Within the spores there was no pattern for the amyloid bodies observed either as to shape or age of spore. Very rarely a spore with interior amyloid bodies was found in which the apex was capped by amyloid material.

The characteristic inflated cheilocystidia of *T. sordidus* were present in all basidiocarps, but the large thick-walled spores mentioned by Smith & Thiers (1971) were absent to very rare and were demonstrated satisfactorily only in the oldest basidiocarp. In all the basidiocarps the context stained blue slowly and then reddish, the tubes were gray in all, and the stipe was pruinose but not reticulate.

The collection discussed here is still regarded as a variant of *T. sordidus*. The behavior of the amyloid material suggests that it is a transient stage in the development of the basidiocarp or possibly a product produced in small amounts which accumulates as the basidiocarps age. Since the location of the material cannot be predicted, i.e. on cystidia, on or in spores, or in cells of pileus cuticle or on them, it does not meet the criteria of a valid taxonomic character. It must also be remembered that the presence of this material has been noted for a number of species of the Boletaceae.

### **Tylopilus subfusipes**, *sp. nov.*

Pileus 4–8 cm latus, convexus, glaber, subviscidus, variegatus (pallidus et griseo-brunneus vel subspadiceus), pelliculosus; contextus amarus, inodorus, subgelatinosus; tubuli albidi demum incarnati; pori griseo-albidi demum incarnati, tactu tarde brunnei: stipes 4–6 (–8) cm longus, 10–15 mm crassus, deorsum attenuatus, non-reticulatus, pallidus vel sordide brunneus, udus, tactu incarnato-brunneus; sporae in cumulis incarnatae; 10–13.5 × 2.9–3.3 $\mu$. Prope Pinckney, Michigan, Livingston County, August 11, 1972, Florence Hoseney 2226 (typus, MICH).

Pileus 4–8 cm broad, convex to plane, the margin wavy and turned up in age, glabrous, tacky to subviscid fresh, surface mottled to variegate (color uneven, pallid in some areas, dingy yellow-brown elsewhere and with some areas grayish brown — reminding one of a medium-dark pileus of *B. griseus* Frost in Peck); pellicle often separable as a thin hyaline layer. Context watery-mottled, soft, taste bitter, odor not distinctive, with $FeSO_4$ olivaceous.

Tubes separable from pileus, 4–5 mm deep, whitish, becoming delicate pink,

adnate to subdecurrent; pores about 2 per mm, staining rusty vinaceous then a dingy brown when bruised.

Stipe 4–8 cm long, 10–15 mm at apex, tapered to a point below (connate), surface uneven but not reticulate, ground color whitish but obscurely streaked or flushed pinkish brown, not viscid but feeling wet to the touch, where cut staining dingy pinkish brown.

Spore deposit dingy pink, about as in *T. felleus* (Fr.) Karsten. Spores 10–13.5 × 2.9–3.3 $\mu$, smooth, apex lacking apical differentiation, color in KOH hyaline and nearly so in Melzer's; shape in face view suboblong to narrowly subfusoid, in profile narrowly inequilateral.

Basidia 4-spored, clavate. Pleurocystidia clavate to submucronate, 9–13 $\mu$ broad, content reddish in Melzer's in fresh material but amorphous and ochraceous in dried material (in both Melzer's and KOH), imbedded in the hymenium. Cheilocystidia basidiole-like but mostly yellow revived in KOH or Melzer's.

Pileus cuticle a thick tangled layer of hyphae 3–5 $\mu$ broad and appearing to be separated by slime, yellowish in Melzer's; no amyloid debris, incrustations, or distinctive cell-content seen. Clamp connections not present.

Cespitose-gregarious under oak, near Pinckney, Livingston County, Michigan, Aug. 11, 1972, Florence Hoseney 2226, (type MICH).

OBSERVATIONS.—The pellicle of the pileus, the connate stipes, the very narrow spores and yellow cystidial content as revived in Melzer's along with lack of reticulation on the stipe, distinguish this species among the bitter ones with vinaceous spore deposits. The wet consistency and 'feel' along with the very soft subgelatinous tissues (pileus and tubes) are also striking features.

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## EXPLANATION OF PLATE 27

*Boletus hortonii*. Smith 81188, × 1.