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A NEW SPECIES OF *OMPHALOTUS*

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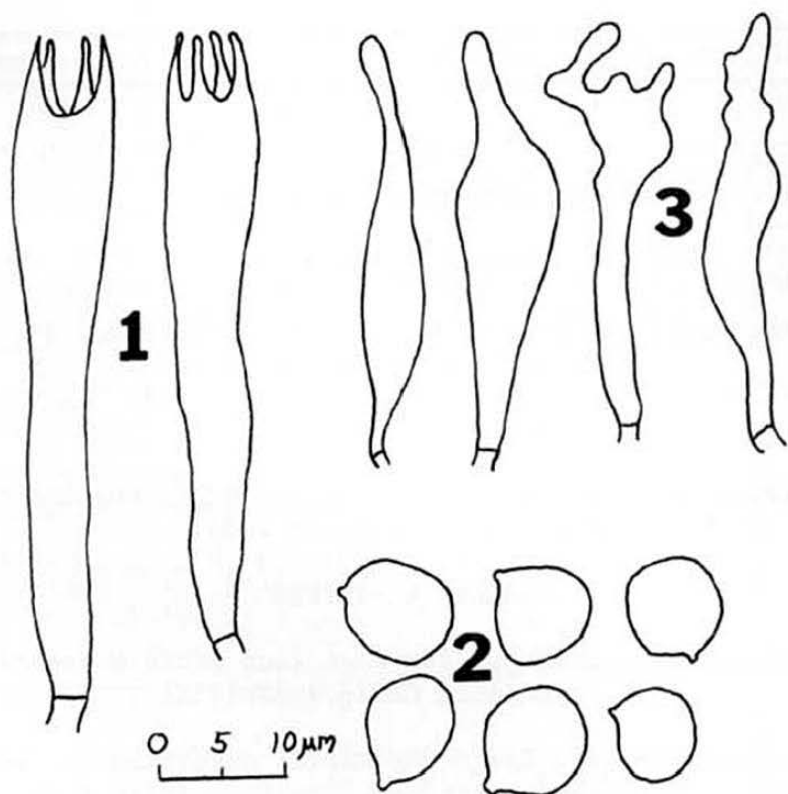
For many years a large *Omphalotus* occurring on the west coast of North America has been identified variously as *Omphalotus olearius* (Fries) Singer, *Clitocybe illudens* (Schw.) Sacc. or *Monadelphus subilludens* Murr. However, a study of California collections reveals that this western agaric is quite distinct by a number of features from any of the aforementioned taxa and actually represents an undescribed species. The distribution of *Omphalotus olivascens* is not known with certainty, but it is fairly abundant in north-central California.

The colors cited in the following description are from Ridgway (1912).

Omphalotus olivascens Bigelow, Miller & Thiers, sp. nov.

Figs. 1-8.

Pileus 4.5-24 cm latus, convexus tum planus, tandem depressus, margine saepe irregularis, aliquando substriatus, udus, glaber vel radiato-fibrillosus, levis vel rugosus, disco interdum squamosus vel maculatus, obscuro-aurantiacus, vel luteus vel brunneo-croceus tum olivascens; contextus tenuis vel subcrassus, aquosus, lentus, subtenax, olivaceus deinde olivaceo-aurantiacus. Odor et sapor mitis. Lamellae



FIGS. 1-3. *Omphalotus olivascens*. 1. Basidia. 2. Basidiospores. 3. Cheilocystidia.

decurrentes, angustae vel latae, confertae vel distantae, olivaceae demum gilvae, luminescentiae. Stipes 4-22 cm longus, apice 0.7-8 cm crassus, attenuatus deorsum, aliquando compressus, solidus, glaber vel subfibrillosus, olivaceus vel obscuro-sulphureus, tandem ferruginascens. Sporae (6.5-) 7-8 (-8.5) x (5-) 6-6.5 (-7.5) μ m, globosae ad subglobosae vel subellipticae, inamyloideae, in cumulo cremeae. Basidiocarpi caespitosi, ad lignum arborum frondosarum.

Holotypus: prope Boulder Creek, San Mateo County, California, 9 Dec. 1971, H.E. Bigelow 17015 (MASS).

Pileus 4.5-24 cm broad, convex with an inrolled and incurved margin at first, becoming broadly convex to plane, broadly depressed in larger pilei, margin irregular in age to broadly undulate, lobed or incised, arched or recurved

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FIGS. 4-5. *Omphalotus olivascens*. (1/3 nat. size). Photographs by H. D. Thiers.

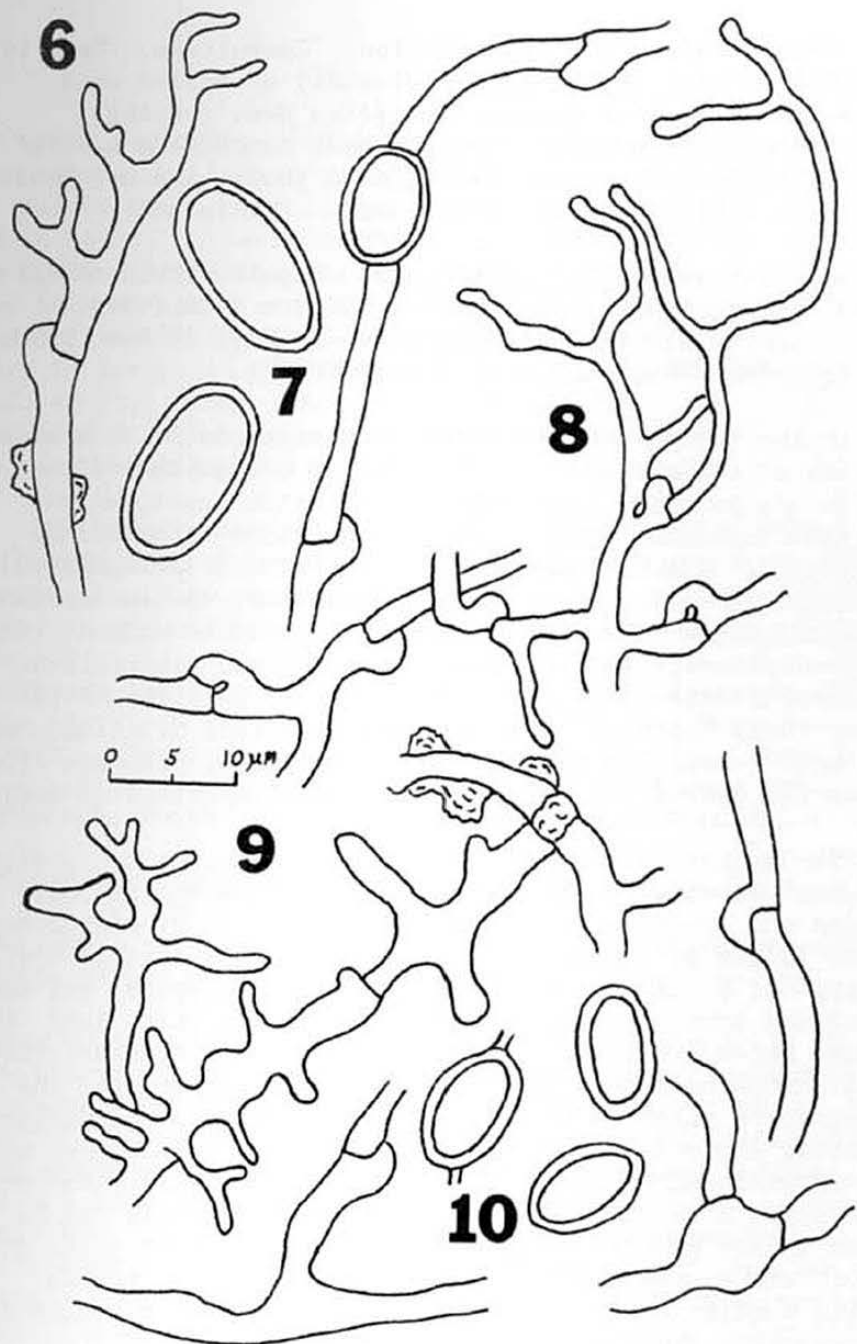
at times, sometimes short striate, surface moist, glabrous or sometimes radiate with innate fibrils, smooth or rugose, occasionally diffracted scaly on disc or with watery spots, dull orange (nearest "orange") or brownish-orange, disc tinged olive at times ("olive lake," "dull citrine") and generally olivaceous in age; context thin to rather thick (up to 2 cm thick on disc in largest caps), watery, pliant, rather tough, olivaceous when young, dull orange then olivaceous when expanded. Cap surface is dark vinaceous on contact with 3% KOH and gray with FeSO_4 . Odor not distinctive. Taste mild.

Lamellae long decurrent and also often with decurrent ridges, narrow near pileus margin to broad near stipe (up to 15 mm), close at pileus margin to distant on stipe, intervenose and forked at times, olive mottled with honey yellow when young, becoming somewhat more yellow-orange than pileus (near a dull "capucine yellow") but olivaceous tint usually present. Luminescent.

Stipe 4-22 cm long, apex 0.7-8 cm thick, tapering downward to a point (up to 2 cm in largest specimens), sometimes fused at base, compressed at times, solid (concolorous with surface within), surface uneven, glabrous or somewhat longitudinally fibrillose, olive to olive-yellow or dull sulphur-yellow, rusty brownish stained in age.

Spores (6.5-) 7-8 (-8.5) x (5-) 6-6.5 (-7.5) μm , globose or subglobose or broadly elliptic, smooth, not amyloid, deposit cream colored ("cream color," "cream buff"). Basidia 36-50 x (5.5-) 7-8 (-10) μm , 4-spored, some basidia and basidioles with yellow refractive globules, hymenium yellowish in mass in KOH, pseudocystidia occasionally present and numerous on some lamellae, 25-46 x 5-8 μm , lageniform, ventricose-rostrate to irregular in shape (Fig. 3), thin-walled, hyaline and usually shorter than the basidia:

Pileus cutis of cylindric hyphae 1.5-8 μm in diam, thin or thickened walls, some with incrustations, in 3% KOH the incrustations, walls and oleiferous hyphae are yellow (sub-surface layer with greatest concentration of pigment); context yellowish or nearly hyaline, hyphae cylindric or slightly inflated, (3-) 5-12 (-17) μm diam, walls thin or thickened, rarely finely encrusted; yellow oleiferous hyphae present. Hymenophoral trama of undulate-subparallel hyphae, hyphae cylindric, 2.5-7.5 μm diam, hyaline except for yellow oleiferous hyphae (tissue paler than hymenium). Clamp connections present.



FIGS. 6-10. Cultural characters of *Omphalotus*. 6-8. *Omphalotus olivascens*. 6. Stag-horn branches of aerial hyphae. 7. Broadly elliptical chlamydospores. 8. Intricately branched submerged hyphae. 9-10. *Omphalotus olearius*. 9. Stag-horn branches of aerial hyphae. 10. Broadly elliptical chlamydospores.

Habit, habitat and distribution. Caespitose. Usually on stump or base of stump, occasionally on buried wood (recorded on wood of *Quercus agrifolia* Nee. (encina), *Arctostaphylos* sp. (manzanita), *Cercis canadensis* L. (red bud) and live *Lithocarpus densiflorus* (Hook. & Arn.) Rehd. (tan bark oak). October to February. California.

Material examined. California: Bigelow 17015 (TYPE) (MASS) (SFS), 17017 (VPI) (MASS); R.T.Orr 3038 (VPI); Smith 25 Nov 1970 (MICH); Thiers (no number) 25 Nov. 1970, San Francisco Watershed, California (MICH).

In the field, *O. olivascens* is distinguished from other species of *Omphalotus*¹ by the duller orange to yellow-orange colors which have distinctive olive overtones or stains. Numerous observations on the eastern *Omphalotus* (*Clitocybe*) *illudens* and southern *Omphalotus* (*Monadelphus*) *subilludens*, and reports in the literature on the European *O. olearius* do not mention any olive colors or stains. The color difference is maintained in herbarium material, *O. olivascens* dries much darker than any collections of the other three "species". Usually specimens of *O. olivascens* are more robust and tougher than the others, although sometimes the eastern *C. illudens* may have dimensions as large.

The microscopic characters of *O. olivascens* are similar in many respects to the other species of *Omphalotus*, although the presence of encrusted pigments in *O. olivascens* seems unique at present. Spore measurements usually are larger for *O. olivascens* when taken from deposits, but some specimens have some smaller spores (5-7 μ m) which lead to ranges which overlap with those of the other species. This is a confusing aspect which requires further study. The cream spore print of *O. olivascens* is not a useful distinguishing character as cream spore prints are known for both *O. illudens* and *O. olearius*, although some collections have pure white deposits. Cystidia and pseudocystidia can be found in all species if the specimens are fairly young and a sufficient number of lamellae are studied. Likewise, yellow oleiferous hyphae and yellow refractive globules in some basidia seem to be present in all taxa.

¹ The relationship between *O. olearius* (DC. ex Fr.) Sing., *Clitocybe illudens* (Schw.) Sacc. and *M. subilludens* Murr. is currently under study by one of us (OKM) using cultures of monosporic isolates.

CULTURAL STUDIES

Cultures of *O. olivascens* were obtained from multispore and tissue isolates from fruiting bodies collected in California by Dr. Robert T. Orr and by one of the authors (HDT). In addition, cultures of the common *Omphalotus* encountered in eastern North America are described to afford a comparison between these two taxa. This taxon has traditionally been called *Clitocybe illudens* (Schw.) Sacc. and its counterpart in Europe is now referred to as *Omphalotus olearius* (DC. ex Fr.) Sing. (Miller and Farr, 1975). This complex is under study using monokaryotic isolates from Europe and eastern North America.

The cultures were grown on malt-extract agar medium at 20°C and 25°C, according to Nobles (1948). A tannic acid medium (Davidson, et. al., 1938) was used in tests for the presence of polyphenol oxidases, as was gum guaiac solution (Nobles, 1958) on cultures of varying ages. Colors in parentheses are from Ridgway (1912) and those designated by page and block (eg. 4A5) are from Konerup and Wanscher (1967). Cultures are maintained in the Virginia Tech Culture collection (VT) and at the Center for Forest Mycology Research, Forest Products Lab., Madison, Wisconsin.

Omphalotus olivascens

Figs. 6-8.

Cultures examined: VT452 (Robert T. Orr 3038, California); VT455 (Harry D. Thiers 35413, California).

Growth characters.--Growth medium, about 5.8-8.6 cm in diam in 14 days at 20°C. Advancing zone of mostly appressed hyphae, after 14 days with a silky appearance just at the margin, white to buff "light ochraceous buff," but the margin somewhat uneven with scalloped appearance. Older part of mat felty forming tufts and becoming somewhat raised near the inoculum plug, buff, "light ochraceous buff" to "ochraceous-buff," (4A5, 4A6) or "clay color" over the tufted area. In some plates a narrow, white zone, 1-2 mm, exists just around the inoculum plug. In age the older mat darkens to brown, "snuff brown" to "sayal brown". In one isolate (VT452) plate evenly brown pigmented, "snuff brown" to "sayal brown" after 20 days; other isolate, (VT455) brown color in a zone around the inoculum plug and in patches or sectors over plate with rest of mat remaining buff. Reverse side of plate bright yellow, "apricot yellow," directly beneath inoculum plug fading somewhat

toward margin to "buff-yellow". After plate is covered, the yellow pigment on the reverse side also fades. Odor distinctly stale after 14 days. On tannic acid agar a strong diffusion zone develops with hyphae growing from inoculum plug onto agar. Gum guaiac turns deep blue in 4 to 10 minutes, reaction more rapid on older cultures. No luminescence observed of cultures up to three months of age.

Hyphal characters.--Advancing zone: hyphae hyaline in Melzer's solution and 3% KOH, 1-3 μm diam, frequently branched, with clamp connections. Older mat with intricately branched, submerged hyphae 0.5-2.5 μm in diam, hyaline to light yellow (Fig. 8). Aerial hyphae range up to 4 μm diam, dense yellow-brown, stag-horn branches develop after 14 days (Fig. 6) with dingy yellow-brown contents in Melzer's solution. Intercalary, broadly elliptical chlamydospores develop in 14 to 21 days (Fig. 7) attaining a size of 9-17.5 x 6-8 μm with slightly thickened walls (\pm 0.5 μm diam), usually becoming detached from connecting hyphal cells and floating free. Oidia not found. Stag-horn branches and other hyphae with deep yellow contents in Melzer's solution developing scattered, amyloid cell walls and amyloid incrustations on the cell walls after 30 days.

Omphalotus olearius

Figs. 9-10.

Cultures examined: VT331 (O.K.Miller 6086, Washington, D.C.); VT447 (H.E.Bigelow 17145, Massachusetts).

Growth characters.--Growth moderately rapid, 8-12 cm in diam in 14 days at 25^oC. Advancing zone uneven, appressed hyphae give rise to scattered raised hyphae. Older part soon appears corded and plumose, white over the entire mat except for a buff area around the inoculum plug. On close inspection the color results from yellow exudation droplets on the surface of the mat and is not a pigment in the cells. Reverse side of plate white or faintly cream color in areas around the inoculum plug beneath yellow droplets. Odor pleasant, fruity, almost like that of apple skins. On tannic acid agar a moderately strong to strong diffusion zone develops with the hyphae growing slowly from inoculum plug onto the agar. Gum guaiac tinted light grayish blue after 90 minutes or more.

Hyphal characters.--Advancing zone: hyphae hyaline in Melzer's solution and 3% KOH, 1.5-3 μm diam, frequently

branched, with clamp connections. Aerial hyphae up to 3.5 μm diam with multiple-branched, deep yellow, stag-horn branches (Fig. 9) with deep yellow contents in Melzer's solution. Intercalary broadly elliptical chlamydospores develop between 14 and 21 days attaining a size of 9-10.5 x 5-5.5 μm , with slightly thickened walls (\pm 0.5 μm diam), and deep ochraceous in Melzer's solution (Fig. 10), usually detached and floating free. Oidia oblong, 7.6-11.5 x 2-3 μm , appearing after 10 to 30 days, thin-walled, usually hyaline to pale yellow. Small, amorphous bodies develop in 21 days as intercalary swellings. After 50 days, stag-horn branches and other hyphae with deep yellow contents in Melzer's solution develop amyloid walls and amyloid incrustations on the cell walls.

SUMMARY

The ochraceous buff to brown pigments which develop in the cultures of *O. olivascens* are never found in cultures of *O. olearius* or *O. illudens* which have only white hyphae. Pale yellow areas in the latter cultures are found, on close examination, to be yellow exudation droplets. *O. olivascens* also develops a bright yellow pigmentation on the reverse side of the culture plates of malt agar while those of *O. olearius* are white or tinted cream color. In addition, *O. olivascens* has stronger tannic acid agar reactions and the gum guaiac reaction is swifter, and has a richer blue color. The microscopic, cultural characters are similar and the distinctive chlamydospores (Figs. 7, 10) are present in *O. olivascens* and *O. olearius* but oidia have not yet been detected in *O. olivascens* cultures. After 30 days, the typical amyloid cell walls and incrustations first reported by Miller (1971) in *Omphalotus* develop in both cultures of *O. olivascens*.

In addition to these very distinctive cultural differences, the olive colors of the sporocarps of *O. olivascens*, both fresh and dried, distinguish it at once from all other taxa in the genus. The spores are generally larger and the cuticular hyphae with yellow incrustations are found only in *O. olivascens*.

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