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MYCENA CALIFORNIENSIS RESURRECTED

BRIAN A. PERRY AND DENNIS E. DESJARDIN

Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco , CA 94132, E-mail: baperry@sfsu.edu

Abstract: *Agaricus* (*Mycena*) *californiensis*, first described by M.J. Berkeley and M.A. Curtis in 1860, represents a common species found in the oak woodlands of California. The species is redescribed, illustrated, and compared with morphologically similar taxa. *Mycena elegantula* Peck is proposed as a synonym.
Key words: Agaricales, California agarics, *Mycena*, taxonomy.

Our current investigation of California species of *Mycena* indicates that *Mycena californiensis* (Berk. & M.A. Curtis) Sacc. is a species common to the coastal oak woodlands of the state. For years, California investigators have collected what was generally identified as *M. elegantula* Peck (1895) or *M. sanguinolenta* (Alb. & Schwein.: Fr.) P. Kumm., on the leaf litter of *Quercus agrifolia* Nee and a few other *Quercus* spp. Upon microscopic examination of these collections, most appeared to share characteristics with *M. elegantula*. One odd character however, was the presence of pigmented laticiferous hyphae throughout the stipe and tramal tissues of all collections. While this character would be expected in those species reported to contain colored latex such as *M. sanguinolenta*, this character has never been reported for *M. elegantula*. Recent collections made by us all contained copious amounts of reddish to orangish red latex.

Investigation of the literature for species superficially resembling *M. elegantula*, revealed the relatively unknown taxon *M. californiensis*, which was described from a single collection made during the U. S. North Pacific Exploring Expedition, 1853-1856. The material was collected by the expedition botanist, Charles Wright, on oak leaves at Mare Island Naval Yard, Solano

Co., California, in January of 1856 (notes with specimen; Pfister, 1978). The collection was presumably sent by M.A. Curtis to M.J. Berkeley in England, and was published as *Agaricus californiensis* Berk. & M.A. Curtis (Berkeley & Curtis, 1860). Unfortunately the published description of the species is very brief, and the existing type specimens are of very poor quality. Smith (1947) included *Mycena californiensis* in the "excluded and doubtful species" portion of his monograph on the genus, stating that the species "cannot be recognized until the microscopic characters of the type are known." Maas Geesteranus (1982, 1992a) investigated the holotype material (K), but was unable to distinguish any defining characters due to the poor state of the collection. Based on his examination of the holotype material, Mass Geesteranus agreed with Smith's view of the species.

We were able to resolve sufficient information from the isotype material of *M. californiensis* [housed at FH(!) and accompanied by Wright's original notes on the material] to conclude that it is conspecific with the commonly encountered oak loving species from California. Investigation of the holotype material of *M. elegantula* revealed that this species is conspecific with the isotype material of *M. californiensis*. Due to the later publication date of *M. elegantula* (Peck, 1895), the binomial *M. californiensis* has priority. The placement of *M. elegantula* as a synonym of *M. californiensis* is therefore proposed.

We present here a more comprehensive description of *Mycena californiensis* based on it's isotype (FH!), on the holotype of *M. elegantula* (NYS!), and on numerous other specimens from California. In the description that follows, color terms and notations are from Kornerup and Wanscher (1978); spore statistics include: $\bar{x}_r$ the range of spore means where $\bar{x}$ is the arithmetic mean of the spore length by spore width for n spores measured in a single sample (specimen), $\bar{x}_m$ the mean of all spores measured (±SD); Q, the quotient of spore length and spore width in any one spore, indicated as a range of variation in n spores measured; $\bar{Q}_r$, the range of $\bar{Q}$-values where $\bar{Q}$ is the mean of Q-values in a single sample; $\bar{Q}_m$, the mean Q-value for all spores measured (±SD). All specimens are deposited at SFSU unless specified otherwise. Frequently cited collectors are abbreviated as follows: D. E. Desjardin (DED), Harry D. Thiers (HDT).

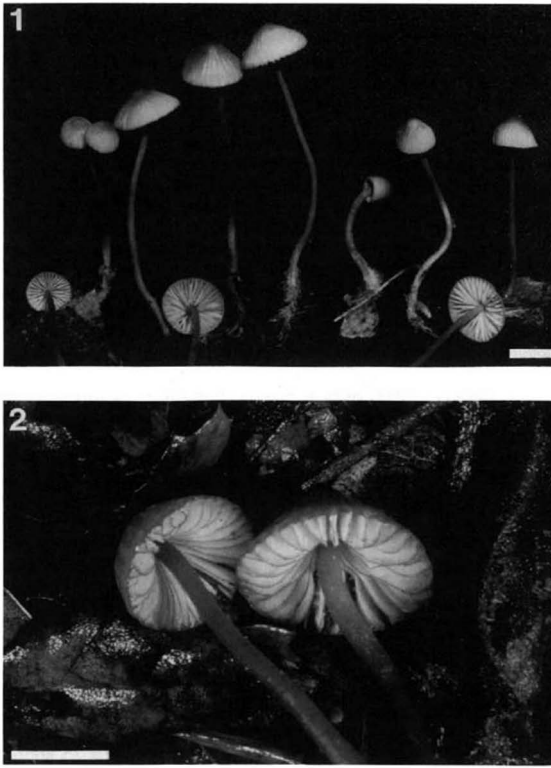
Mycena californiensis (Berk. & M.A. Curtis) Sacc., Syll. Fung. 5: 255. 1887.

≡*Agaricus californiensis* Berk. & M.A. Curtis, Proc. Amer. Acad. Arts 4: 112. 1860.

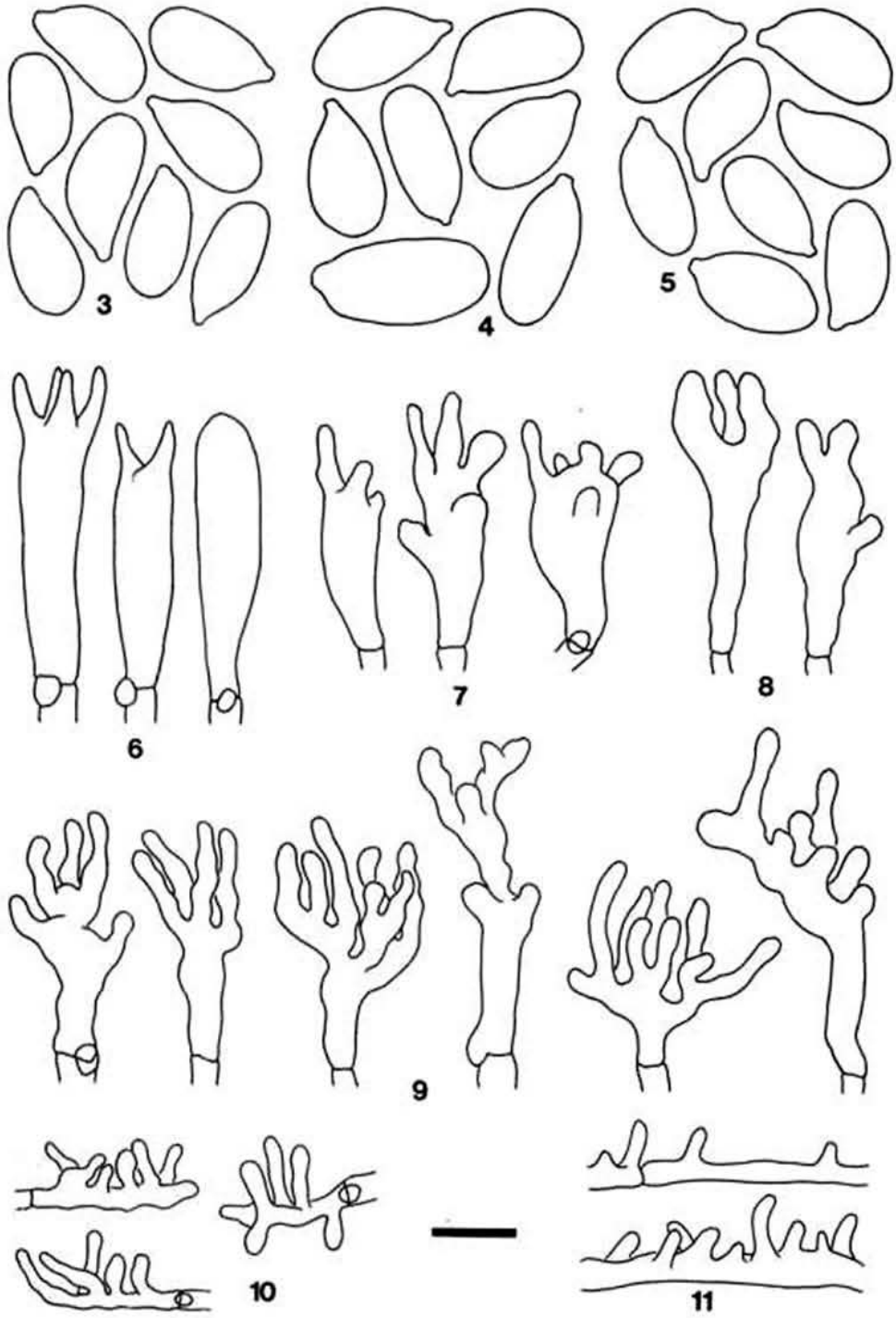
= *Mycena elegantula* Peck, Bull. Torrey Bot. Club 22: 199. 1895.

Basidiomes (Figs. 1-2) gregarious to subcaespitose, putrescent. **Pileus** 6-20 mm, obtusely conic to campanulate when young, generally with incurved margins, remaining so with age or expanding to broadly campanulate at maturity, occasionally becoming convex-umbonate; margin entire when young, often becoming wavy or crenate with age, sometimes splitting, striate or striatulate, extreme edges often staining or bruising darkly, pellucid striate; surface dull, moist to dry, glabrous; at first disc dark brown (8F5-6) to reddish brown (9D-F7-8), in age ranging from brownish red (8C6-8) to reddish brown (8D-F5-8), margin generally lighter, grayish red (8C4-6) to reddish brown (8D-E5-7), or brownish orange (7C5-6) when young, in age fading to grayish orange (6B3) or brownish orange (6C3). **Context** thin, concolorous with pileus or paler, often staining dark reddish. **Lamellae** (Fig. 2) ascending adnate to adnate, often with a short decurrent tooth, close to subdistant (15-20) with 1-2 series of lamellulae, moderately broad (1-3 mm), convex; white to pinkish buff, edges reddish brown (9C-D8), reddish orange, or brownish orange. **Stipe** 29-130 X 1-2 mm, central, terete, ±equal, rarely compressed or cleft, dull to shiny, moist to dry, hollow, apex glabrous to pruinose, glabrous below, base covered with strigose to downy tomentum ranging from buff to some shade of orange or pink; apex brownish orange to light brown (7C-D5-8), reddish brown (8D5-6), or grayish red (8C4-6), some fading in age to lighter brownish orange (5-6C4-6), base concolorous or slightly darker; tissue exuding a brownish orange (7C6-8) to reddish brown (9-10D8) or violet brown (11F7-8) latex when cut.

Basidiospores (Fig. 3-5) 8.0-12.0 (-13.0) X 4.0- 6.0 (-6.7) µm [$\bar{x}_r$ = 9.1-11.0 X 4.9-5.6 µm, $\bar{x}_m$ = 9.7 ± 0.8 X 5.2 ± 0.5, Q = 1.4-2.4, Q_r = 1.8-2.0, Q_m = 1.9 ± 0.2, n = 25 spores per specimen], ellipsoid to amygdaliform, smooth, thin walled, hyaline, weakly to moderately amyloid. **Basidia** (Fig. 6) 26.0-37.5 (- 48.0) X 7.0-10.5 µm, clavate, 4-spored, rarely mixed with 2- spored forms, clamped. **Basidioles** (Fig. 6) clavate,



Figs 1-2. *Mycena californiensis*. 1. Basidiomes (DED 5963). 2. Closeup of lamellar edges (M.Wood s.n.). Scale bar = approximately 10 mm for both figures.



Figs. 3-11. *Mycena californiensis*. 3-5. Basidiospores. 6. Basidia. 7-9. Cheilocystidia. 10. Hyphae of the pileipellis 11. Cortical hyphae of stipe. (Figs. 3,7 - Isotype of *Agaricus californiensis*; Figs. 4,8 - Holotype of *M. elegantula*; Figs. 5,6,9,10,11 - DED 5963) Scale bar = 7.5 µm for Figs. 3-5, 10 µm for Figs. 6-11.

similar to basidia. **Pleurocystidia** absent. **Cheilocystidia** (Fig. 7-9) 16-50 X 6.5-28.0 µm, projections 1.5-18.8 (-30.0) X 1.5-6.5 (-8.0), ranging from contorted-clavate with assorted knob-like projections to irregular in shape, generally with a clavate lower portion and an apical or sublateral portion branching into numerous cylindric projections, these often branching themselves, thin-walled, clamped, with brownish contents that stain darkly in Melzer's reagent. **Pileipellis** (Fig. 10) a cutis; hyphae 1.5-5.0 (-7.0) µm diam, interwoven, covered with abundant cylindric diverticula, 1.5-11.8 (-16.5) X 1.5-2.8 µm, thin-walled, non-gelatinous to subgelatinous, hyaline, inamyloid; terminal cells slightly inflated, otherwise similar to hyphae. **Hypodermium** of inflated cells, 7.0-38.5 µm diam, thin-walled, hyaline, dextrinoid, non-gelatinous; often intermixed with laticiferous hyphae up to 6.5 µm diam, containing brown granular contents. **Hymenophoral trama** dextrinoid, occasionally with laticiferous hyphae as in hypodermium. **Stipe tissues** monomitic; cortical hyphae (Fig. 11) 1.5-6.5 µm diam, parallel, cylindrical, thin walled, covered with scattered to numerous cylindric and occasionally branched diverticula, 2.0-7.0 (-14.0) X 1.0-2.5 µm; terminal cells slightly broader, 3.8-5.0 µm diam, diverticulate; medullary hyphae broader, 4.5-22.0 µm diam, smooth, thin-walled, hyaline; laticiferous hyphae common, 2.8-8.0 (-11.8) µm diam, usually containing brown granular contents. **Clamp connections** observed in all tissues except stipe medullary hyphae.

Habit, habitat and distribution. Gregarious to scattered, often subcaespitose, on leaves and fruits of *Quercus agrifolia*, *Q. lobata* Nee and *Q. kelloggii* Newb. Abundant and common in the coastal oak woodlands of California.

Material examined. California. Contra Costa Co.: Shell Ridge Open Space, 7 Dec. 1996, B.A. Perry 097. Los Angeles Co.: near Pasadena, 22 Dec. 1894, A.J. McClatchie 810 (Holotype of *M. elegantula*: NYS). Marin Co.: Audubon Canyon Ranch, Picher Canyon, 8 Nov. 1979, C. Calhoun 79-910; Audubon Canyon Ranch, Volunteer Canyon, 19 Nov. 1981, C. Calhoun 81-2597; Corte Madera, Deer Run Road, 11 Dec. 1992, DED 5571; Fairfax, Pine Mountain Fire Road, 1 Feb. 1992, DED 5523; Mt. Tamalpais State Park, Lake Lagunitas, 13 Dec. 1993, DED 5963; Olampali State Historic Park, 2 Dec. 1997, B.A.

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of reddish latex, this species is also characterized by fusiform cheilocystidia lacking apical outgrowths. The cheilocystidia of *M. californiensis* are irregular in shape, and have never been observed to be fusiform. Also, all examined California collections of *M. sanguinolenta* appear to be restricted to growth on decaying wood or debris of conifers. *Mycena californiensis* appears to be restricted to the leaves and debris of *Quercus* spp., and has never been observed to be lignicolous. *Mycena purpureofusca* differs from *M. californiensis* in the coloration of the fruiting bodies, which is generally much more violaceous in *M. purpureofusca*, in the absence of pigmented latex, in forming clavate to utriform cheilocystidia, and in growth on coniferous wood. *Mycena renati* has fusiform, subcylindrical and occasionally clavate cheilocystidia, yellow coloration to the stipe, no pigmented latex, and was also reported to grow on conifer wood in the United States (Maas Geesteranus, 1986, 1992b). We have observed that U.S. specimens which are micromorphologically indistinguishable from European *M. renati* lack yellow pigmentation to the stipe and may represent a distinct taxon. *Mycena rubromarginata* (Fr.: Fr.) P. Kumm. is another species that may superficially resemble *M. californiensis*. However, *M. rubromarginata* differs in both habit and cheilocystidia shape, and does not contain colored latex.

It is evident from examination of the type material of *M. elegantula* and the work of Maas Geesteranus (1986, 1992b), that A. H. Smith's concept of *M. elegantula* does not agree with the type material of the species. Smith (1947) reported *M. elegantula* as having clavate to fusoid ventricose cheilocystidia, occasionally with several fingerlike projections, and he reports the species as occurring on decayed conifer wood. Although our investigation of the type material of *M. elegantula* revealed the presence of contorted-clavate cheilocystidia, it contains none that are fusoid-ventricose. The type material of *M. elegantula*, collected from southern California (Los Angeles Co.), is also clearly associated with leaves of *Q. agrifolia.* Investigation of numerous specimens determined by Smith as *M. elegantula*, revealed that his concept of the species (Smith, 1947) was much too broad, encompassing several taxa superficially resembling this species. Maas Geesteranus (1986, 1992b) reported similar findings from his investigation of Smith's material.

The observation of latex and laticiferous hyphae in *M. elegantula* indicates that the infrageneric placement of the taxon

must be reconsidered. Maas Geesteranus (1986, 1992b) placed the species in section Rubromarginatae Sing. ex Mass G., presumably due to the reddish lamellar edges and smooth to coarsely diverticulate cheilocystidia. However, none of the species within section Rubromarginatae are characterized by the presence of latex. Maas Geesteranus (1988, 1992b) segregates those taxa containing deeply colored latex into three sections: Sanguinolentae Maas G., Galactopoda (Earle) Maas G., and Crocatae Maas G. The placement of *M. californiensis* within section Galactopoda can be eliminated since all species of the section are characterized by smooth stipe cortical hyphae, and by stipes that turn black when specimens are dried, features not observed in *M. californiensis*. Of the remaining sections, the monospecific section Crocatae may also be eliminated due to the lack of marginate lamellae, pale stipe coloration, and clavate cheilocystidia with short, evenly spaced, cylindrical spinulae. Section Sanguinolentae is by far the most accommodating section for *M. californiensis*. The members of section Sanguinolentae are characterized macroscopically by reddish brown pileus and stipe coloration, red brown to purple brown lamellar edges, and dull orange to reddish brown latex. Microscopically the members of the section are characterized by cheilocystidia with reddish brown contents forming a sterile lamellar edge and occasionally covered with excrescences, smooth amyloid spores, and various other characters shared with *M. californiensis* (Maas Geesteranus, 1988, 1992b). The placement of *M. californiensis* in section Sanguinolentae is therefore proposed.

In addition to *M. californiensis*, the northern temperate members of section Sanguinolentae include *M. atkinsoniana* A.H. Sm. and *M. sanguinolenta*. To aid in distinguishing northern temperate *Mycena* species with deeply colored latex, the following artificial key is provided.

Key to Northern Temperate species of *Mycena* with deeply colored latex.

The following key is adapted from Mass Geesteranus (1988, 1992b), Smith (1947) and our own observations.

1. Stipe cortical hyphae smooth; stipe becoming black when dried ..sect. Galactopoda....*M. haematopus* (Pers.: Fr.) P. Kumm.
1. Stipe cortical hyphae diverticulate; stipe not becoming black when dried.....2

2. Lamellar edges white, non-marginate; stipe apex white to orange; cheilocystidia clavate, covered with evenly spaced, short, cylindrical spinulae.....sect. Crocatae..... .....*M. crocata* (Schrad.: Fr.) P. Kumm.
2. Lamellar edges reddish brown to purplish brown; stipe apex light brown, brownish orange, reddish brown or purplish brown; cheilocystidia fusiform or irregularly clavate, smooth or with knob-like to long, cylindrical apical projections.....sect. Sanguinolentae.....3

3. Cheilocystidia contorted-clavate to irregular in shape, with irregular knob-like diverticula and/or numerous long, cylindrical apical projections..... *M. californiensis*
3. Cheilocystidia fusiform to subcylindrical or rarely clavate, typically apically narrowed into one or more necks, acute, smooth or with occasional small diverticula.....4

4. Lamellae 23-26 reaching the stipe; basidiomes generally robust, stipe width 2-3 mm, pileus (5-) 10-30 mm broad ..... *M. atkinsoniana*
4. Lamellae 13-21 reaching stipe; basidiomes generally smaller, stipe width 0.5-1.5 mm, pileus 7-18 mm broad ..... *M. sanguinolenta*

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