

**AMANITA PROTECTA—A NEW SPECIES
FROM COASTAL SOUTHERN CALIFORNIA**

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Summary

Amanita protecta is described as new from the coastal region of southern California.

Amanita protecta Tulloss & Wright sp. nov. Holotypus: California, Los Angeles County, Santa Monica Mountains, Stunt Canyon, 3.i.1987 Barry Silver [Wright 1383A = Tulloss 1-3-87-BS1] (NY¹).

Etymology: *protectus*, protected—referring to the thick universal veil in this species.

Pileus griseolus vel griseus vel brunneo-griseus, 40 - 115 mm in mensura diametrica, margine striata, nonappendiculata; materies volvica fibrillo-coacta, alba vel subcinerea, et, juxta marginem, pallida, rara, pulverulenta. Lamellae confertae, liberae vel anguste adnatae, margine grisea vel griseo-brunnea. Stipes 80 - 130 × 10 - 22.5 mm, pallidus, fibrillis griseis vel griseo-brunneis. Volva circumsciscens vel lobata, alba vel albida, a stipe remotissima, 20 - 40+ mm alta. Caro albida vel subgriseola, decolorationibus denique ochraceis. Basidiae tetrasterigmaticae, (53.5-) 60.5 - 92 × 13.5 - 16.5 (-17.5) μm; fibulae absentes. Sporae (8.7-) 9.4 - 12.6 (-14.7) × (7.3-) 8.4 - 11.2 (-13.3) μm, globulosae vel subglobulosae vel late ellipsoideae vel ellipsoideae, nonamyloideae.

1.

F - Herbarium of the Field Museum of Natural History, Chicago, Illinois, U.S.A.
NY - Herbarium of The New York Botanical Garden, Bronx, U.S.A.

All collections with no herbarium location cited are in Tulloss' private herbarium.

Amanita protecta (Fig. 1) is a member of section *Vaginatae*. It is a medium-sized mushroom with gray to gray-brown pileus, an exannulate stipe covered for much of its length with dark gray to black fibrils, and a robust universal veil leaving thick felted/fibrillose patches over a layer of fine pulverulence on the pileus and a thick, lobed, volva at the stipe base. The volval limb is rather widely separated from the stipe by a gap partially due to the fact that the inner 1-2 mm of the volva is carried up on the expanding pileus. All parts of the basidiocarp have a tendency to develop ochraceous stains when damaged and due to aging. The context of the pileus and stipe, as well as the universal veil tissue, display many terminal hyphal segments and terminal inflated cells (sometimes in chains) with thick walls. In the portion of the universal veil below its desiccated surface, the hyphae are coiled and twisted. The basidia of this species can be quite long for the genus. Clamps were observed only in the stipe context where they were very rare.

PILEUS: 40 - 115 mm diam, from pale to dark gray or "brownish grey" or deep brownish gray (11D-E2²), viscid when moist, becoming shiny when dry, convex expanding to plano-convex with deflexed margin to finally concave, occasionally deeply rimose; margin weakly striate to striate (0.1R - 0.25R); universal veil up to 3 mm thick, occasionally appearing to have two layers (then the "outer layer" thin, whitish with ochraceous staining, rather fragile, submembranous), otherwise whitish or pale grayish at first, eventually cream or grayish with ochraceous stains, subatomate to atomate, in large floccose-felted patches becoming smaller toward margin where the remnants are reduced to a fine pulverulence, detersile; context 4± - 10 mm thick at disk thinning evenly to margin or to about 90% of radius and then a membrane to margin, firm, whitish to pale grayish, becoming faintly pink or ochraceous on exposure, occasionally dark grayish below the pileipellis in disk. LAMELLAE: close, 4.5 - 12.5 mm broad, free to very narrowly adnate with a white decurrent line on stipe, white with a dark gray or gray-brown margin, unchanging, after drying 4A-B3 or 5A4 or 2.5Y 8/2-4 or 7.5YR 8/6; margin minutely fimbriate (lens); lamellulae truncate, frequently with line of truncation concave, occasionally anastomosing with neighboring lamellae. STIPE: 80 - 130 × 10 - 22.5 mm, white to pale grayish at apex, creamy white to grayish with ochraceous stains for 10 - 20 mm above attachment of volval sac (sometimes with pallid silky fibrils in this area), otherwise medium gray to very dark gray to gray-brown fibrils (sometimes in chevron pattern) on a sordid ground, subcylindrical, flaring at apex, without bulb, rounded to somewhat pointed at base, staining ochraceous with exposure; context white above and white, fulvous, tannish, or salmon-cinnamon in base, faintly becoming pink or staining ochraceous, the discoloration becoming more intense toward the base, stuffed, central cavity diam about one third to one half that of stipe, or rarely solid, at times becoming hollow near base; exannulate; universal veil saccate, subcircumscissile to limbate, highest point of limb reaching to 20 - 40+ mm from stipe base, up to 5 mm thick at point of connection to stipe, surface white to whitish with ochraceous stains, occasionally the surface

2.

Color codes of the form "11D2" and associated color names in double quotation marks are from (Komerup & Wanscher, 1978). Color codes of the form "7.5YR 8/6" are from (Munsell Color, 1975).

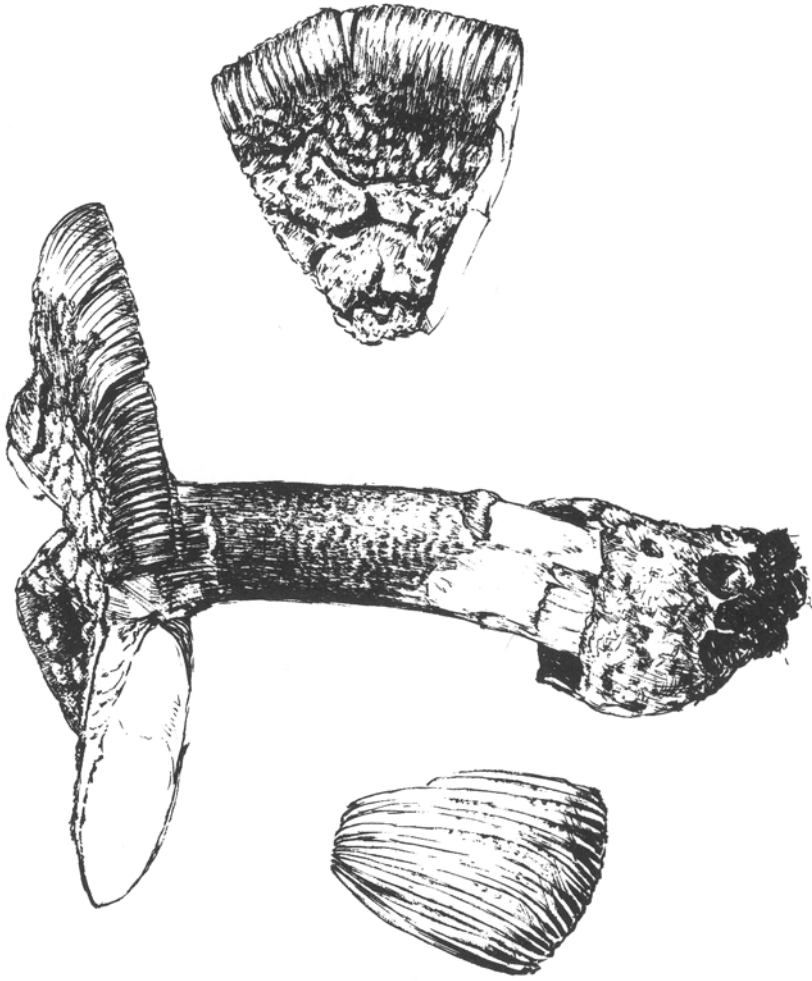
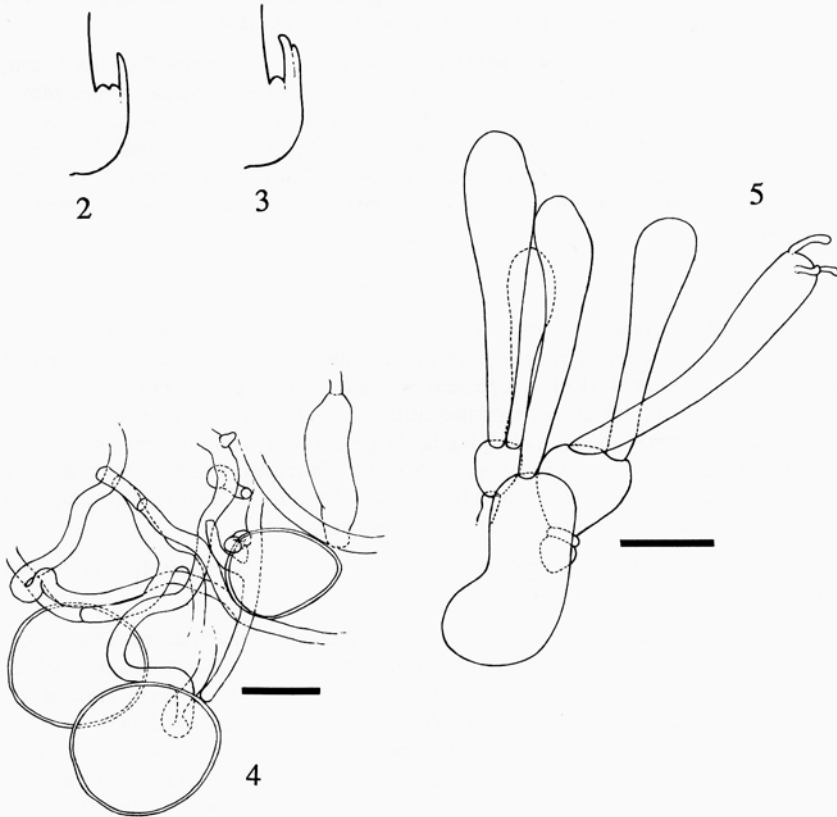


Fig. 1 *Amanita protecta*. Tulloss 1-3-87-BS1 [$\times 0.9$].

desiccates producing a thin, submembranous to hardened or shell-like "outer layer" sometimes having the texture of a chicken eggshell; interior pale grayish white to grayish, floccose-felted, at times largely carried up onto pileus so that the "outer layer" forms a limb separated considerably from the stipe, occasionally leaving only one or more concentric ridges between the volval sac and the stipe (Fig. 2), occasionally remaining as a separate second limb (not a limbus internus) which may even project above the limb formed by the "outer layer" (Fig. 3); no noticeable limbus internus. Odor slightly sweet (Wright) to faintly unpleasant in age (Tulloss). Taste slightly sweet (Wright). Wright experienced no symptoms of poisoning after eating about 30 g of the cooked mushroom. Meixner test (Vergeer, 1986) negative for amatoxins—unreactive or dull orangish or orange-reddish with a yellow ring around the acid drop. Paracresol spot test for tyrosinase (Marr, 1979) positive except in universal veil, lamellae, marginal pileus context, and very base of stipe. Syringaldazine spot test for laccase (Marr, 1979) negative. Phenol on stipe: wine-red. KOH on pileus: no reaction.

PILEIPELLIS: up to 560 μm thick, composed of interwoven, undifferentiated, filamentous, frequently branching hyphae 2.1 - 3.5 μm diam, gelatinizing near surface, not having a clear boundary with pileus context. **PILEUS CONTEXT:** a tangle of interwoven, filamentous, undifferentiated, branching hyphae 3.5 - 10.5 μm diam, with lengthy, thick-walled (wall thickness here and below to 1.2 μm except as noted), terminal or subterminal segments inflated up to 28 μm diam; inflated cells thick-walled, plentiful, terminal singly or in chains, subglobose to pyriform to clavate to elongate to irregular, up to 106 \times 63 μm (the larger cells more often elongated than the smaller); branching oleiferous hyphae 2.5 - 5.0 μm diam, common. **LAMELLA TRAMA:** bilateral; branching, undifferentiated, filamentous hyphae 3.5 - 5.6 μm diam; inflated cells to 70 \times 24.5 μm , thin-walled, intercalary; oleiferous hyphae present, but not common, 3.5 - 4.9 μm diam. **SUBHYMENIUM:** slightly inflated ramose to subcellular to cellular. **BASIDIA:** (53.5-) 60.5 - 92 \times 13.5 - 16.5 (-17.5) μm , narrowly to very narrowly clavate, 4-spored, rarely 3- or 2-spored, thin-walled; clamps not seen. **UNIVERSAL VEIL:** On the stipe base at the surface: composed largely of gelatinizing, undifferentiated, filamentous, branching hyphae 4.2 - 5.9 μm diam, disorderly, intertwining or in intertwining fascicles, some with intercalary and/or terminal segments slightly inflated to 19.6 μm diam; clavate terminal cells up to 77 \times 25 μm ; pyriform to lachrimiform cells up to 65.1 \times 44.1 μm ; occasional oleiferous hyphae 3.5 - 4.2 μm diam; tissues difficult to reinflate. On the stipe base below the surface: Below a depth of about 1 mm, before inflation, the tissue seems mainly composed of intertwining fascicles of hyphae which surround minute lacunae; when reinflated, the tissue is seen to be composed of undifferentiated, filamentous, branching, tightly coiled or twisted hyphae 3.1 - 8.0 μm diam with terminal and subterminal sequences of hyphal segments often inflated up to 14.0 μm diam; scattered oleiferous hyphae 4.9 \pm μm diam; frequent inflated cells thin- or thick-walled, terminal, subglobose to ellipsoid up to 64 \times 50.5 μm and clavate up to 126 \times 33 μm . On the pileus: nearest pileipellis, dominated by globose to subglobose to ovoid inflated cells, terminal, singly or in chains of up to 4, thin- and thick-walled (these with wall thickness to 1.5 μm), up to 61.6 \times 52.5 μm ; undifferentiated, filamentous, extensively branching hyphae 2.1 - 8.4 μm diam which, in a very thin layer just above the pileipellis, sometimes gelatinize leaving only inflated cells in that region. Further from pileus, hyphae becoming more curved and showing

some coiling as in veil at stipe base, with terminal and subterminal segments inflated to 14 μm diam; terminal subglobose to clavate cells thick-walled, up to $56 \times 29.4 \mu\text{m}$. STIPE CONTEXT: acrophysalidic; branching, filamentous, undifferentiated hyphae, 2.8 - 4.9 μm diam; oleiferous hyphae 10.5 - 12.6 μm diam, not common; dominated by thick-walled acrophysalides up to $215 \times 52 \mu\text{m}$ (most narrower); clamps very rare. All tissues pale yellow in 2% KOH or 10% NH_4OH .



Figs. 2-5 *Amanita protecta*. 2. Diagram of stipe base and universal veil with inner layers of volva largely carried away on the pileus. 3. Diagram of stipe base and universal veil with most of the interior of the universal veil remaining attached to its desiccated external surface. 4. Universal veil elements from patch on pileus (Tulloss 1-3-87-BS1). 5. Elements of hymenium and subhymenium (Tulloss 1-3-87-BS1). The bars in Figs. 4 and 5 represent 20 μm .

BASIDIOSPORES: [140 spores from 7 specimens measured in Melzer's reagent] (8.7-) 9.4 - 12.6 (-14.7) \times (7.3-) 8.4 - 11.2 (-13.3) μm , (average length (per specimen) = 10.3 - 11.4 μm ; average length (overall) = 11.0 μm ; average width (per specimen) = 9.3 - 10.2 μm ; average width (overall) = 9.7 μm ; Q = 1.0 - 1.23 (-1.43); average Q (per specimen) = 1.09 - 1.19; average Q (overall) = 1.13), inamyloid, thin-walled, hyaline, smooth, globose to subglobose to broadly ellipsoid, occasionally ellipsoid, sometimes slightly expanded at one end, frequently adaxially flattened or slightly so; contents guttulate; apiculus sublateral, truncate conic; white in deposit.

Distribution and habitat: Solitary to gregarious under *Quercus agrifolia* Née, December to March, in coastal southern California to 800 m elev.

Collections examined: CALIFORNIA, Los Angeles Co., Santa Catalina Island, Grand Canyon, 27.xii.1920 L. W. Nuttall 988 (F, as *A. velosa*), Santa Monica Mtns., Stunt Canyon, 3.i.1987 Barry Silver [Tulloss 1-3-87-BS1, Wright 1383A] (holotype, NY), 10.i.1987 B. Silver [Wright 3701], Riverside Co., Santa Ana Mtns., El Cariso, 17.ii.1987 G. Wright 3701A, Slaughterhouse Canyon 3.iii.1987 G. Wright 3712, Santa Barbara Co., Santa Ynez Mtns., Los Prietos Campground, 30.iii.1979 Florence Nishida [Wright 1383].

DISCUSSION

The most remarkable macroscopic feature of *A. protecta* is its universal veil. In some specimens the veil appears to have a tough outer layer covering a second layer of floccose-felted material which is separated from the pileus by a third, pulverulent layer. Microscopically, the sometimes hardened surface is revealed to be a desiccated layer of tissue nearly identical to that underlying it; the portion of the veil nearest the pileus is composed mostly of small inflated cells, sometimes in chains, which make up the fine pulverulent layer visible where no volval patch is present. In Section *Vaginatae*, this form of universal veil is known only from the present species.

The upper limit for the length of basidia in *A. protecta* considerably exceeds that for any taxa described by Jenkins (1986).

To our knowledge, the presence of thick-walled inflated cells in the pileus and stipe contexts and in the universal veil has not been commonly recorded in *Amanita*. We at first considered that this might be a character which evolved to resist desiccation; however, the situation cannot be so simple; the character is found also in *A. mortenii* Knudsen & Borgen (known only from southwestern Greenland) (Knudsen & Borgen, 1987), in at least the hyphae of *A. peltigera* Reid (Reid, 1980), and in *A. phalloides* (Fr.) Link in Wildenow in which the character has been observed in English, North American, and Australian collections according to Reid (1980) and Tulloss (1988). In Tulloss' current studies of *Amanita* section *Amidella*, thickened cell walls have proven to be rather common.

In the field, if the limb of the volval sac were completely broken away, one might mistake this species for a member of Section *Amanita* close to *A. pantherina* (DC. : Fr.) Krombh. because the specimen would appear to have a cothurnate, even abrupt, bulb; however, the peculiar character of the volval material remaining on the pileus, the dark gill margins, and the dark fibrils on the exannulate, completely elongating (bulbless)

stipe should serve to prevent such an error.

Amanita constricta Thiers & Ammirati is a species of section *Vaginatae* with grayish to brownish pileus, grayish stipe, and grayish margins to its lamellae (Thiers & Ammirati, 1982). This entity can be distinguished from *A. protecta* by having a sulcate to tuberculate sulcate pileus margin and a thinner, constricted and flaring, membranous universal veil that reaches up one third to one half of its stipe and bruises reddish or salmon when moist. Arora (1986: 289) provides a good photograph of the universal veil of *A. constricta*. The lamellae of *A. constricta* turn gray or grayish with age.

Amanita pseudovaginata Hongo has some macroscopic similarities to *A. protecta* (gray material on stipe and gill margins and a relatively robust stipe base), but is smaller according to Hongo (1983). Also, the spores of *A. pseudovaginata* are much narrower (7 - 9 (-9.5) μm) and the basidia shorter (40 - 58 μm).

Nuttall 988 was determined originally to be *A. velosa* (Pk.) Lloyd; this latter species has a pallid, yellowish to orangish pileus; a relatively pointed stipe base; narrower spores; no marked tendency to ochraceous staining in the tissues; a more membranous volva which does not break up into pulverulence and floccose patches on the pileus and which tends to leave a single membranous calyptra over the disk; etc.

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