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Studies in the Rhodophylloid Fungi V: Leptonia Subgenus Paludocybe Section Albidicaules and Section Roseicaules and Related Taxa

Abstract

Leptonia roseicinnamomea, a species belonging to *Leptonia* subgenus *Paludocybe* section *Albidicaules*, and *Leptonia rosea* var. *marginata*, a variety belonging to *Leptonia* subgenus *Paludocybe* section *Roseicaules* are described as new. Type specimens of *Leptonia albida* (Murr.) Murr., *Leptonia albinella* Pk., *Nolanea clintoniana* (Pk.) Sacc. (= *Leptonia clintoniana* (Pk.) Largent comb. nov.), *Eccilia subacus* Pk. (= *Leptonia subacus* (Pk.) Largent comb. nov.), and *Leptonia transformata* Pk., were restudied and ultimately classified into *Leptonia* subgenus *Paludocybe* *Leptonia* section *Albidicaules*. Type specimens of *Agaricus delicatulus* Pk., *Nolanea earlei* Murr., *Nolanea parvipapillata* Murr., *Eccilia flavida* Pk. (= *Nolanea flavida* (Pk.) Largent comb. nov.), *Eccilia unicolor* Pk. (= *Nolanea unicolor* (Pk.) Largent comb. nov.), *Entoloma flavifolium* Pk., *Entoloma parvulum* Murr. and *Entoloma pubescens* Murr. were re-examined since they superficially resemble species of either *Alboleptonia* or of *Leptonia* section *Paludocybe* subsection *Albidicaules*.

In the following account, one species of *Leptonia* belonging to subgenus *Paludocybe* section *Albidicaules* (Largent, 1974) and one variety belonging to subsection *Roseicaules* (Largent, 1973) are described as new and are part of the rhodophylloid flora of the Pacific Coast. Five type specimens of species which belong to *Leptonia* subgenus *Paludocybe* section *Albidicaules* and which were described as new by Peck or by Murrill were restudied. Nine type specimens of species, described as new by either Peck or Murrill, which are similar in color to species of *Leptonia* subgenus *Paludocybe* section *Albidicaules* or species of *Alboleptonia* Largent and Benedict, were restudied. With the exception of *Eccilia subacus* Pk., which was originally examined by the author and possibly by Murrill, the remaining thirteen type specimens were examined previously by Hesler (1963). These collections "were re-examined in order to obtain data on the cuticles of the pileus and stipe, the location of the pigments, the measurements of the spores and ancillary structures and to verify his observations on the presence or absence of clamp connections." (Largent, 1971, p. 238)

Abbreviations used in the specific descriptions are discussed in two previous papers (Largent and Benedict, 1970, p. 439; Largent, 1971, p. 239). The carpophore colors in quotation marks were taken from Ridgway (1912); all others were taken from Kornerup and Wanscher (1961). Formulas and techniques used for the macrochemical reactions are to be found in the Largent and Benedict (1970) publication. Those collections cited with *L.* are my own; all others have the collector's name preceding the collection number. All collections are deposited in the cryptogamic herbarium of Humboldt State University.

Leptonia subgenus *Paludocybe* section *Albidicaules* Largent (1974).

Pileus with a furfuraceous or minutely squamulose to appressed fibrillose surface; white to pale pinkish cinnamon; pileal cuticle hymeniform, or in some cases, nearly a palisade trichodermium; pileocystidia colorless, versiform in shape. Stipe whitish to yellowish to pale pinkish cinnamon.

Type species: *Leptonia albinella* Pk.

Key to the species of subsection *Albidicaules*.

1. Pileus and stipe white when moist, becoming blackish to blackish brown on drying; spores 10-16 x (5.5)6-9 μ 6. *Leptonia transformata*.
1. Pileus, stipe, and spores not with the above combination of features 2.
 2. Spores 8-10 μ long, average length less than 9.0 μ 1. *Leptonia albida*.
 2. Spores 9-13 μ long, average length 9.6 μ or more 3.
3. Caulocystidia present; clamp connections present; pileal margin not translucent-striate 5. *Leptonia subacus*.
3. Caulocystidia absent; clamp connections absent; pileal margin translucent-striate 4.
 4. Pileus uniformly pale pinkish cinnamon, remaining so on the disc with age; stipe pale pinkish cinnamon, becoming pallid to white with age 4. *Leptonia roseicinnamonea*.
 4. Carpophore white, at times tinged yellowish 5.
5. Pileus whitish to light grey; stipe white, at times becoming tinged yellow 3. *Leptonia clintoniana*.
5. Pileus and stipe white at all times 2. *Leptonia albinella*.

1. *Leptonia albida* (Murr.) Murr. Mycologia 9: 180. 1917. (*non Leptonia albida* J. B. Cleland. Trans. Proc. Royal Soc. South Australia 57: 189. 1935).

Basionym: *Leptoniella albida* Murr. North Amer. Flora 10(2): 87. 1917.

Synonym: *Entoloma albidum* (Murr.) Hesler. Beih. zur Nova Hedwigia 23: 27. 1967. (*non Entoloma albidum* Murr. North Amer. Flora 10(2): 119. 1917.)

Spores 8.0-10.0 x 6.0-7.5 μ , average length 8.9 μ , average width 6.6 μ , L-D 1.50-3.0 μ (average 2.3 μ), 5-6 sided, elongate angular. Basidia not observed. Cheilocystidia and pleurocystidia absent. Lamellar trama subparallel. Pileal cuticle on the disc a palisade layer of cells; pileocystidia (terminal cells) cylindro-clavate to clavate, 25-80 x 12.5-25.0 μ , average length 56.7 μ , average width 17.3 μ , Lt/Dt 1.7-4.9 (average 3.3), D1/Dt 0.50-0.80 (average 0.60); hypoderm area strongly interwoven. Cuticle at the stipe apex mostly repent but with a few clusters of clavate to fusoid, colorless caulocystidia. Lactifers absent. Clamp connections absent on the hyphae of the pileal and stipe cuticles, absent at the base of the basidia or basidioles, and absent on the hyphae of the basal tomentum. Pigmentation vacuolar in all hyphae.

Material Studied: TYPE: NORTH CAROLINA. In sandy soil in deep shade by last path from Battle's Branch to Piney Prospect, Chapel Hill. 12 Sept. 1915. Coker 1759 (collected by H. R. Totten). (HOLOTYPE NY).

2. *Leptonia albinella* Pk. N. Y. S. Mus. Bull. 1(2): 6. 1887.

Synonyms: *Leptoniella albinella* (Pk.) Murr. North Amer. Flora 10(2): 87. 1917.

Entoloma albinellum (Pk.) Hesler. Beih. zur Nova Hedwigia 23: 26-27. 1967.

Spores 9.5-11.5 x 6.5-8.0 μ , average length 10.4 μ , average width 7.2 μ , L-D 2-4 μ (average 3.2 μ), 5-6 sided elongate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileocystidia clustered, colorless broadly elliptical to clavate, 26-60 x 12-22 μ average length 42.4 μ , average width 17.0 μ , Lt/Dt 1.6-3.3 (average 2.5); clusters more or less erect near the disc but semi-erect to repent toward the margin. Cuticle at the apex of the stipe undifferentiated; caulocystidia absent. Oleiferous hyphae scattered in both the pileal and stipe tramas. Clamp connections absent at the cross walls of the cuticular hyphae of the pileus and stipe and absent at the base of the basidia. Pigmentation vacuolar in all hyphae.

Material Studied: TYPE: NEW YORK. In bushy places, Sand Lake. July 6 (no year given). (HOLOTYPE NYS).

There was insufficient type material to study radial sections of the pileal disc. However the arrangement of the pileocystidia clusters near the disc, the shape of the pileocystidia and the furfuraceous or minutely squamulose pileal surface, at least near the disc, were nearly hymeniform. None of these features would be found in species of *Alboleptonia*.

3. *Leptonia clintoniana* (Pk.) Largent comb. nov.

Basionym: *Agaricus clintonianus* Pk. N. Y. St. Mus. Ann. Rept. 24: 67. 1872.

Synonym: *Nolanea clintoniana* (Pk.) Sacc. Syll. Fung. 5: 723. 1887.

Spores 8.5-11 x 6-7 μ , average length 9.6 μ , average width 6.4 μ , L-D 2.0-4.0 μ (average 3.2 μ), 5-6 sided, elongate angular. Basidia not observed. Cheilocystidia and pleurocystidia absent. Subhymenium not distinctive. Lamellar trama subparallel. Cuticle on the pileal disc not observed (see below); pileocystidia broadly cylindric to broadly clavate, colorless, more or less erect, 37.5-87.5 x 15-32.5 μ , average length 58.8 μ , average width 23.1 μ , Lt/Dt 1.9-3.9 (average 2.5). Cuticle at the apex of the stipe repent; caulocystidia absent. Oleiferous hyphae scattered

to abundant in the pileal trama. Clamp connections absent on the hyphae of the pileal cuticle; absent at the base of the basidia.

Material Studied: NEW YORK. TYPE. On soil in swamps; Peck's collection from Sand Lake, New York. August. (HOLOTYPE NY).

This species can be recognized by its scabrous squamulose, white to light grey, striate pileus, white stipe that is slightly tinged with yellow, elongate angular spores, and broad, colorless pileocystidia. I have studied specimens from the West Coast that have a similar pileal surface and similar pileocystidia. These specimens have a hymeniform to nearly a palisade trichodermium and are good species of *Leptonia*.

4. *Leptonia roseicinnamomea* Largent sp. nov.

Pileus 12-20 mm latus, 10-20 mm altus, campanulatus vel conicus, aetate convexus, adpresse fibrillosus vel adpresse squamulosus, plus minusve hygrophanus, pallide roseicinnamomeus, margine aetate pallens, albidus, centro roseicinnamomeus remans; caro tenui, pallida, fragili, sapore miti, odore haud speciali. Lamellae adnatae, subdistantes, modice latae, roseicinnamomeus, marginibus concoloribus. Stipes 35-50 mm longus, ad apicem 2 mm latus, aequalis, teres, fragilis, glaber pallidus.

Spores 10-12 x 7-9 μ , pentagonae vel hexagonae, elongato-angulatae; basidia 34-44 x 8-12.5 μ , sporis 2 vel 4, granulis refractivis repleta. Cuticula pilei centro fere hymeniformis, pileocystidiis aut ellipsoideis aut napiformibus vel clavatis, centro erectis, 35-92 x 20-32.5 μ . Caulocystidia carentia; fibulae desunt.

Basidiocarpia in humo sylvae mixtae arborum coniferarum et decuduorum solitaria.

Typus *Largent 77a* in Sylva Jacksonii comitato Mendocino pagi californiaci lectus, in herbario Universitatis Humboldtii conservatus.

Illustrations: Figure 6.

Pileus 12-20 mm broad, 10-20 mm high, campanulate to conic, becoming convex with age; appressed fibrillose to appressed squamulose, more or less hygrophanous; "pale pinkish cinnamon" fading to near white, the darker color remaining on the disc and margin; margin inrolled to incurved becoming decurved, even to irregular, entire to faintly striate. Context thin on the margin and disc, pallid, fragile. Lamellae ascending adnate, subdistant, moderately broad, "light pinkish cinnamon" to "pale pinkish cinnamon," margin even to irregular, concolorous with the lamellar surface. Stipe 2 mm broad at the apex, 35-50 mm long, equal, terete, fragile, glabrous, concolorous with the pileus; context hollow with age, more or less concolorous with the pileal context. Taste and odor indistinct.

Spores 10-12 x 7-9 μ , average length 10.9 μ , average width 7.9 μ , L-D 1.5-4.0 μ (average 3.0 μ), 5-6 sided, elongate angular. Basidia 34.5-44 x 8.0-12.5 μ , 2-4 spored, filled with numerous refractive granules. Subhymenium a narrow zone of cells, more or less filled with refractive granules. Lamellar trama subparallel, hyphae up to 10 μ wide. Cuticle on the pileal disc more or less hymeniform; pileocystidia elliptical to napiform to short clavate, colorless, erect on the disc, 35-92.5 x 20-32.5 μ , average length 59.5 μ , average width 28.3 μ , Lt/Dt 1.1-3.2 (average 2.1); hypoderm not distinctive; hyphae of the pileal trama up to 25 μ wide. Cuticle at the apex of the stipe repent; caulocystidia absent; hyphae of the trama up to 25 μ wide. Oleiferous hyphae scattered to abundant in the trama of the pileus and of the stipe apex. Clamp connections absent on the cuticular hyphae of the pileus and of the stipe apex, absent at the base of the basidia, and absent on the hyphae of the basal tomentum.

Macrochemical Reactions: No data.

Habitat and Distribution: Solitary in humus in mixed woods, California, early December. Known only from the type locality.

Material Studied: CALIFORNIA. Mendocino Co.: *L77a* Jackson State Forest. Early December, 1960. (TYPE).

The campanulate to convex, appressed squamulose, pale pinkish cinnamon pileus, concolorous stipe, elongate angular spores, hymeniform cuticle, and elliptical to broadly clavate, colorless pileocystidia are the distinguishing characters of this species.

Nolanea delicatula (Pk.) Sacc. is the species most closely related to *Leptonia roseicinnamomea*, but it is different because of its repent pileal cuticle and its cheilocystidia. *Rhodophyllus icterinus* (Fr.) Quél., *Entoloma pallidiceps* Murr., and *E. melleipes* (Murr.) Hesler resemble *L. roseicinnamomea* in shape, but have a differently colored pileus and stipe.

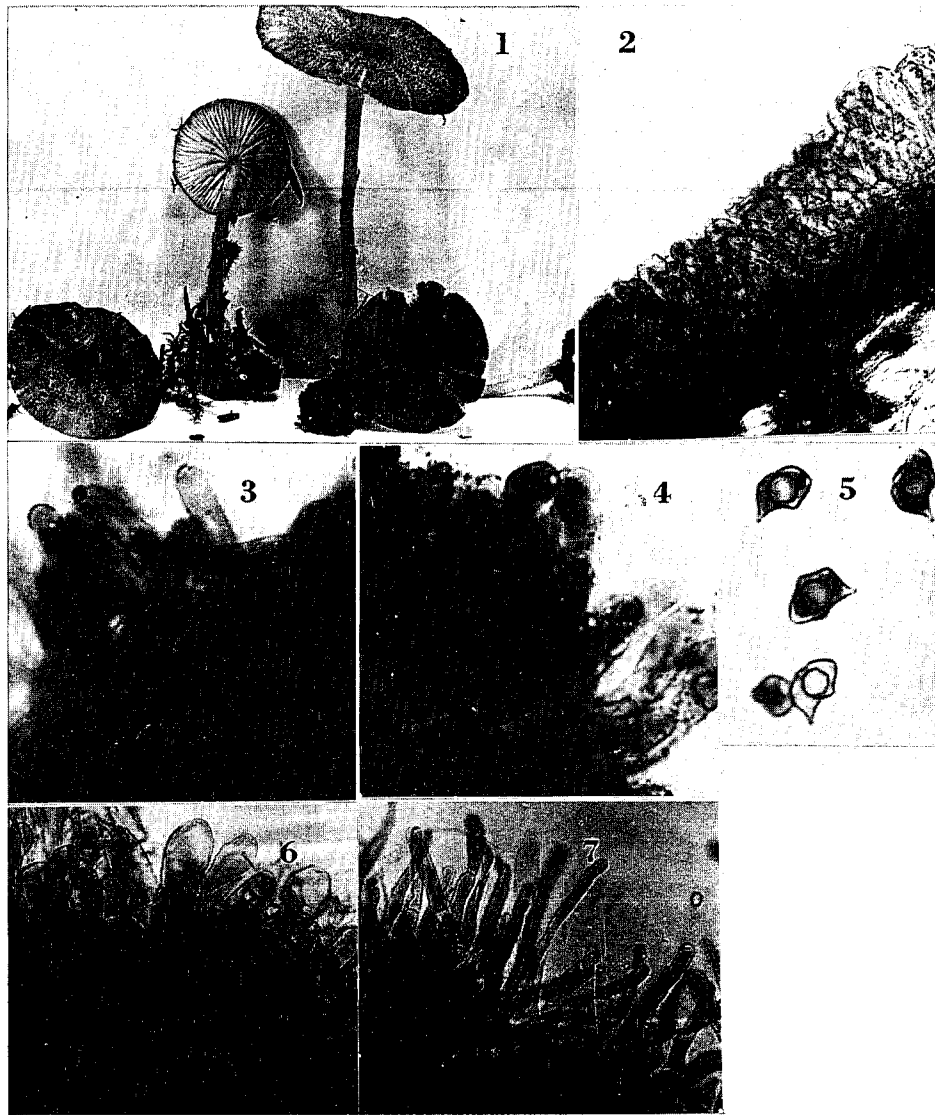
5. *Leptonia subacus* (Pk.) Largent comb. nov.

Basionym: *Eccilia subacus* Pk. Bull. Torr. Bot. Cl. 34: 100. 1907.

Illustrations: Figure 7.

Spores 9-11 x 6-8 μ , average length 9.9 μ , average width 7.1 μ , L-D 2.0-4.0 μ (average 2.8 μ), 5-6 sided, elongate angular. Basidia not observed. Cheilocystidia and pleurocystidia absent. Subhymenium not distinctive. Lamellar trama subparallel. Cuticle on the pileal disc nearly a palisade trichodermium; pileocystidia colorless, cylindro-clavate, clavate, obclavate, or obclavate-ventricose,

more or less erect on the disc, often not reaching the same height, loosely entangled forming scattered clusters, $52.5-82.5 \times 10.0-15.0 \mu$, average length 67.9μ , average width 11.3μ , Lt/Dt 5.0-8.0 (average 6.0), D1/Dt 0.69-1.25 (average 0.93), D2/Dt 0.67-0.85 (average 0.76). Cuticle at the apex of the stipe mostly repent except for scattered clusters of caulocystidia similar to the pileocystidia, often agglutinated, abundant, colorless, cylindro-clavate and often capitate, $42.5-60 \times 7.5-10.0 \mu$, average length 51μ , average width 8.2μ , L/D 4.7-9.6 (average 6.2). Oleiferous



Figures 1-5. *Leptonia rosea* var. *marginata*. Figure 1. Entire carpophore. Figure 2. A nearly hymeniform pileal cuticle. Figure 3. Cluster of cylindric to clavate caulocystidia. Figure 4. Cylindric to clavate cheilocystidia. Figure 5. Spores.

Figure 6. A more or less hymeniform pileal cuticle of *Leptonia roseicinnamomea*. (Largent 77A).

Figure 7. A more or less palisade trichodermium for the pileal cuticle of *Leptonia subacus* (HOLOTYPE).

hyphae absent in the trama of the pileus and of the stipe apex. Clamp connections small and inconspicuous, abundant on the hyphae of the pileal cuticle, at the base of the basidia, and on the hyphae of the basal tomentum. Pigmentation vacuolar in all instances.

Material Studied: MASSACHUSETTS. TYPE. In grass in swampy areas, under deciduous trees. Peck, from Stow, Massachusetts, 26 Sept. 1906. Collected by Simon Davis. (HOLOTYPE NYS).

The white, convex-umbilicate, pruinose pileus that is not translucent-striate, white lamellae, white stipe, peculiar pileal cuticle, clamp connections, and caulocystidia are features that distinguish this species of *Leptonia*. *Eccilia subacus* is listed as a synonym of *Eccilia nivea* Pk. by Murrill (1917: 81). *Eccilia nivea* Pk. was treated as *Alboleptonia sericella* var. *nivea* by Largent and Benedict (1970) and is considered different than *Leptonia subacus* because of its cheilocystidia and its pileal cuticle consisting of an entangled trichoderm.

Even though clamp connections are present on the hyphae of the pileal cuticle, they are small and inconspicuous, differing from the large, fat clamp connections most typical of section *Leptonia*. The colors, stature, and the type of pileal cuticle are similar to those found in species of subgenus *Paludocybe*, section *Albidicaules*; in my opinion these features should be emphasized over clamp connections when classifying *L. subacus*.

6. *Leptonia transformata* Pk. N. Y. State Mus. Bull. 116: 32. 1907.

Synonym: *Leptoniella transformata* (Pk.) Murr. North Amer. Flora 10(2): 87. 1917.

Spores 10-14 x 6-8 μ , average length 11.0 μ , average width 6.7 μ , L-D 3.0-7.0 (average 4.3), 7-9 sided, elongate angular and nodulose. "Basidia 28-36 x 8-9 μ , 2-4 spored" (from Hesler, 1963: 350). Subhymenium not distinctive. Lamellar trama subparallel. Cuticle on the pileal disc nearly hymeniform; pileocystidia elliptical, napiform, broadly clavate to clavate, with a vacuolar pigment, erect and parallel on the disc, 27.5-112.0 x 15-32.5 μ , average length 87.0 μ , average width 22.8 μ , Lt/Dt 1.3-6.0 (average 3.8), Dl/Dt 0.30-0.83 (average 0.48). Cuticle at the apex of the stipe repent; caulocystidia absent. Oleiferous hyphae absent. Clamp connections absent on the cuticular hyphae of the pileus and of the stipe, absent at the base of the basidia. Pigmentation vacuolar in all hyphae.

Material Studied: MASSACHUSETTS. TYPE. On soil in bushy places; Peck's collection from Stow, Massachusetts, 10 July 1906. Collected by Simon Davis. (HOLOTYPE NYS).

This species is characterized by its white stipe and pileus that become blackish brown on drying, striatulate pileal margin, white lamellae, and elongate angular spores with an average L-D of greater than 4.0 μ . Since the pileocystidia have a brownish vacuolar pigment, I think Davis' determination of color in the type description is questionable. However, until further collections can be made, I have decided to classify it in section *Albidicaules* based on the color of the stipe and in subgenus *Paludocybe* based on the type of pileal cuticle.

Leptonia subgenus *Paludocybe* section *Roseicaules* Largent (1974).

Pileus with a furfuraceous or minutely squamulose to appressed fibrillose surface; medium to light pinkish red to roseus; pileal cuticle hymeniform to nearly a palisade trichodermium; pileocystidia with a vacuolar pigmentation. Stipe pale roseus.

Type species: *Leptonia rosea* Longyear, *sensu* P. D. Orton (1960).

7. *Leptonia rosea* Longyear. Reports Mich. Acad. Sci. 3: 59. 1902, *sensu* P. D. Orton in Trans. Brit. Mycol. Soc. 43(2): 300. 1960.

Synonym: *Rhodophyllum roseus* (Longyear) Moser, in Gams, Kryptogamenflora II b/2, Basidiomycetes, Ed. 3, p. 158. 1967.

Illustrations: Figures 1-5.

Longyear. Reports Mich. Acad. Sci. Plate I, Fig. 5.

Kauffman. Agaricaceae of Michigan. Vol. II: plate CXIV. 1917.

Variety *marginata* Largent var. nov.

Pileus 40 mm latus, 8-10 mm altus, late convexus vel planus, initio omnino tomentulosus deinde centro furfuraceus albi adpresse squamulosus, hygrophanus, ruber vel roseus, carne alba, odore non speciali, sapore miti. Lamellae adnatae vel uncinatae, subdistantes, angustae vel modice latae, ex albis roseolae, marginibus plus minusve serrulatis, rubris, pallescentibus. Stipes 40-65 mm longus, ad apicem 2-3 mm latus, teres, strictus, apice purinoso, alibi glaber, pallide roseus.

Sporae 9.5-12 x 7-9 μ , elongato-angulosae; basidia 30-40 x 9-11 μ , clavata, granulis refractivis repleta; cheilocystidia 30-55 x 7-14 μ , abundantia, fasciculata vel agglutinata, cylindracea vel clavata et strangulata; pleurocystidia desunt. Cuticula pilei centro fere hymeniformis, ubi e pileocystidiis erectis pigmentumvacuolare praebentibus, 22-75 x 9-27.5 μ . Caulocystidia ad apicem stipitis 35-50 x 7-10 μ , cylindracea vel clavata, fasciculos dispersos facientia. Fibulae carentes.

Basidiocarpia in humo sylvae mixtae arborum coniferarum et deciduorum dispersa. Typus Largent 2390 in San Juan Island comitato San Juan pagi washingtonci lectus, in herbario Universitatis Humboldtii conservatus.

Pileus 40 mm broad, 8-10 mm high, broadly convex to plane, at times with an uplifted

margin, shallowly depressed; entirely tomentulose at first, becoming furfuraceous near the disc and appressed squamulose elsewhere with pileal expansion, hygrophanous; medium to light pinkish red or roseus (10, A-B, 5-7; "dark vinaceous" to "hydrangea pink" to "light Corinthian pink"); margin incurved then decurved, even to irregular, entire, translucent-striate when moist; context up to 1 mm broad near the disc, white, unchanging; taste and odor not distinctive.

Lamellae adnate to uncinatate or decurrent with a short tooth, subdistant, narrow to moderately broad (2-6 mm wide, 9-19 mm long), white then near "shell pink" with spore maturation; margin more or less serrulate, pinkish red marginate (10, A, 4-5) when moist, then nearly concolorous with the lamellar surface with age. Stipe 2-3 mm broad at the apex, 40-65 mm long, equal terete, straight; pruinose at the apex, glabrous elsewhere; pale roseus (10, A, 2-3; "Chatenay pink" to "flesh pink"); context stuffed then hollow, concolorous with the flesh of the pileus.

Spores 9.5-12.0 x 7-9 μ , average length 10.6 μ , average width 7.6 μ , L/D 2.0-4.0 μ (average 3.0 μ) 5-6 sided, elongate angular. Basidia 30-40 x 9-11 μ , average length 37.1 μ , average width 10.1 μ , L/D 3.3-4.0 (average 3.7), clavate, 4-spored, filled with refractive granules. Cheilocystidia abundant, clustered to agglutinated, forming a sterile layer, cylindrical to clavate and strangled, with a vacuolar pigment soluble in 3 percent KOH, 30-55 x 7-14 μ , average length 40.8 μ , average width 8.6 μ , L/D 3.8-9.1 (average 5.7); pleurocystidia absent. Subhymenium with numerous refractive granules, otherwise not distinctive. Lamellar trama subparallel with hypae up to 12 μ wide. Cuticle on the pileal disc nearly hymeniform; pileocystidia on the disc erect, with a pale vacuolar pigment soluble in 3 percent KOH, 22-75 x 9.0-37.5 μ , average length 42.8 μ , average width 17.2 μ , Lt/Dt 1.4-3.9 (average 2.4), Dl/Dt 0.30-0.59 (average 0.48), D2/Dt 0.25-0.55 (average 0.35). Cuticle at the apex of the stipe mostly repent, but with scattered clusters of colorless, cylindrical to clavate caulocystidia 33-50 x 7-10 μ , average length 40.6 μ , average width 9.2 μ , L/D 4.0-5.7 (average 4.9). Lactifers abundant in the trama of the lamellae, of the pileus and of the stipe apex. Clamp connections absent on the cuticular hyphae of the pileus and of the stipe apex, absent at the base of the basidia, and absent on the hyphae of the basal tomentum.

Macrochemical Reactions: Guaiac, guaiacol, alpha-naphthol, phenol, aniline, sulfovanillin, Melzer's, PDAB, all negative.

Habitat and Distribution: Scattered in needle humus of mixed coniferous-deciduous woods, near Douglas fir or western red cedar; California, late October; Washington, early November.

Material Studied: CALIFORNIA: Mendocino Co.: L790, 794, 5281. MICHIGAN: *Stuntz* 11409 (Merritt Bog). WASHINGTON: San Juan Co.: L2390 (TYPE), 3365.

This beautiful species of *Leptonia* can be recognized by its rosy colors, white lamellae that are pinkish red marginate at first, elongate angular spores, cylindrical to clavate cheilocystidia, and abundant, clustered caulocystidia.

There are three somewhat different interpretations of *Leptonia rosea* in the literature. Hesler's (1967) of *Entoloma roseum* differs from mine in that his specimens have a basically white or whitish pileus with rosy-brown squamules, greyish brown fibrils at the pileal margin, a fragrant odor, a pale brownish rose stipe, concolorous lamellar margin, and inconspicuous, somewhat collapsed caulocystidia. From his description I would not consider his *E. roseum* to be the same as *L. rosea sensu* Longyear. Kauffman's (1918) concept of *L. rosea*, which closely resembles that of Longyear, is similar to mine but his specimens have concolorous lamellar margins and a pileus that becomes isabelline with age; no mention was made of cheilocystidia or caulocystidia. My specimens agree in most respects with those described by Orton (1960), differing only in the marginate lamellae and pigmented cheilocystidia. These features are taxonomically too insignificant to warrant describing a new species, but are sufficiently constant in the West Coast material to justify varietal status.

Rhodophyllus calalaunicus (Sing.) Romagn. and *Rhodophyllus queletii* (Boud.) Quél. are similar species. The former differs from *Leptonia rosea* by having an ashy or pale grey blue stipe that is more or less punctate at the apex and villose elsewhere, and a brown or rusty brown pileus; the latter differs by having a white stipe that becomes either cream or yellowish with age, and larger spores, 12-15 x 8-10 μ . *Rhodophyllus ianthinus* Romagn. and Favre is another closely related species that differs in having a lilac stipe and no cheilocystidia. *Agaricus* (*Nolanea*) *rufocarneus* Berk. (= *Nolanea rufocarnea* (Berk.) Sacc.) is considered by Kauffman and by P. D. Orton to be somewhat related to *Leptonia rosea*, but the two species differ in taste and in color of the pileus.

Orton considers *Entoloma griseocyaneum* var. *roseum* Maire to be synonymous with *L. rosea* Longyear. From Maire's description and illustration, I think Orton's opinion is possible; however, I refrain from making the taxa conspecific until I can study Maire's material.

Related Forms

On the basis of color, several species are related either to *Alboleptonia* or to *Leptonia* subgenus *Paludocybe* section *Albidicaules* or *Roseicaules*. The following descriptions are based on the study of type material; all were previously studied by Hesler (1963).

8. *Nolanea delicatula* (Pk.) Sacc. Syll. Fung. 5: 723. 1887.

Basionym: *Agaricus delicatulus* Pk. N. Y. State Mus. Ann. Reports 24: 66. 1872.

Spores 9-12 x 6.5-8.0 μ , average length 10.5 μ , average width 7.5 μ , L-D 2.5-5.0 μ (average 3.0 μ), 6-8 sided, elongate-angular. Basidia not studied. Cheilocystidia abundant particularly near the pileal margin, colorless, scattered, not in a sterile layer, broadly ventricose, often broadly ventricose-rostrate, 37.5-62.5 x 20-30 x 5-8.5 (apex) μ , average length 54.2 μ , average width 23.8 μ , Lt/Dt 1.3-3.2 (average 2.3). Pleurocystidia not studied. Pileal cuticle repent; pileocystidia apparently absent. Cuticle at the apex of the stipe repent, caulocystidia absent. Lactifers absent. Clamp connections absent on the hyphae of the pileal cuticle, of the stipe cuticle at the apex and at the base of the basidia. Pigmentation vacuolar.

Material Studied: NEW YORK. TYPE. Peck's collection from Sand Lake, New York, August. (HOLOTYPE NYS).

The type collection consists of only fragments of the carpophore, mostly unsuited for radial sections through the pileal disc. Due to this fact I was not able to verify completely Hesler's observations of a repent pileal cuticle with tufts of colorless pileocystidia (1963: 331). However, squash mounts of the pileal disc revealed repent, undifferentiated pileocystidia which would seem to correlate with Hesler's comments. Mounts of the complete gill edge revealed cheilocystidia particularly near the pileal margin, an observation contrary to that of Hesler.

9. *Nolanea earlei* Murr. North Amer. Flora 10(2): 97. 1917.

Spores 7.0-9.0 x 6.5-8.0 μ , average length 8.0 μ , average width 7.4 μ , L-D 0.0-1.5 μ (average 0.6 μ), 5-6 sided, ovate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileal cuticle repent near the disc; pileocystidia undifferentiated, cylindro-clavate; hypoderm more or less cellular. Cuticle at the apex of the stipe repent and undifferentiated; caulocystidia absent. Oleiferous hyphae scattered in the trama of the pileus and stipe. Clamp connections absent at the base of the basidia, on the hyphae of the pileal cuticle and on the hyphae of the cuticle at the stipe apex, rare to scattered on the hyphae of the basal tomentum. Pigmentation vacuolar in all hyphae.

Material Studied: NEW YORK. TYPE. Botanical Garden, New York, 30 July 1902. *Earle* 769. (HOLOTYPE NY).

10. *Nolanea parvipapillata* Murr. North Amer. Flora 10(2): 97. 1917.

Spores 8.0-10.0 x 6.0-7.0 μ , average length 9.0 μ , average width 6.5 μ , L-D 2.0-3.5 μ (average 2.5 μ), 5-6 sided, elongate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileal cuticle on the disc a tightly interwoven trichodermium, becoming more repent and epicutis-like toward the margin; terminal cells colorless, cylindro-clavate, often, at least on the disc, originating from obclavate to ventricose hypodermal hyphae, 47.5-100 x 7.5-10 μ . Cuticle at the apex of the stipe repent and undifferentiated; caulocystidia absent. Oleiferous hyphae not seen. Clamp connections absent on the hyphae of the pileal cuticle and the cuticle at the stipe apex, on the hyphae of the basal tomentum and at the base of the basidia. Pigmentation vacuolar in all hyphae.

Material Studied: NEW YORK. TYPE. On dead leaves, Botanical Garden, New York, 30 July 1902. *Earle* 768. (HOLOTYPE NY).

11. *Nolanea flavida* (Pk.) Largent comb. nov.

Basionym: *Eccilia flavida* Pk., Bull. Torrey Bot. Club 36:153. 1909.

Spores 8.0-10.0 x 5.5-6.5 μ , average length 9.0 μ , average width 5.9 μ , L-D 2.0-4.0 μ (average 3.1 μ), 5-6 sided, elongate angular. Basidia not studied. Cheilocystidia cylindric to cylindro-clavate, colorless, abundant particularly near the pileal margin; pleurocystidia absent. Pileal cuticle a very loosely entangled trichodermium, particularly evident near the disc; pileocystidia not differentiated. Cuticle at the stipe apex repent and not differentiated; caulocystidia absent. Oleiferous hyphae absent. Clamp connections absent on the hyphae of the pileal cuticle and cuticle at the stipe apex, absent at the base of the basidia. Pigmentation vacuolar.

Material Studied: MASSACHUSETTS. TYPE. Peck's collection from Stow, Massachusetts, 11 August 1908. (HOLOTYPE NY).

Because of the absence of clamp connections, slender stipe and type of pileal cuticle, this taxon is a good *Nolanea* species.

12. *Nolanea unicolor* (Pk.) Largent comb. nov.

Basionym: *Eccilia unicolor* Pk. Bull. Torrey Bot. Club 34: 99. 1907.

Spores 8.0-10.5 x 5.5-7.0 μ , average length 9.9 μ , average width 6.7 μ , L-D 2.0-4.5 (average 3.2 μ), 5-6 sided, elongate angular. "Basidia 30-36 x 7-9 μ " (Hesler, 1967: 148). Cheilocystidia and pleurocystidia absent. Pileal cuticle a very loosely entangled trichodermium, absent in many places on the pileus; pileocystidia cylindro-clavate to clavate, colorless, 25-62.5 x 3.7-7.5 μ , average length 38.2 μ , average width 4.5 μ , cuticle at the stipe apex and caulocystidia not studied. Oleiferous hyphae absent. Clamp connections absent on the hyphae of the pileal cuticle and at the base of the basidia. Pigmentation vacuolar.

Material Studied: MASSACHUSETTS. TYPE. In gravelly soil by the side of an unusual street in close proximity to sweet fern, bay berry bushes, blackberry bushes, and thistles, col-

lected by Simon Davis in Falmouth, Massachusetts, 31 July 1908. (HOLOTYPE NY).

Hesler (1963) indicated the presence of cheilocystidia. On observing lamellar sections, I found structures similar to those he designated as cheilocystidia (1963: 342, Fig. 65), but I think these are developing basidia. Their shape is similar to basidioles and the size indicated by Hesler (1963: 350) "25-28 x 7-8 μ " is very similar to the size given for the basidia of *Entoloma unicolor* (Pk.) Hesler in 1967. The larger size of the cheilocystidia, 27-63 x 5-10 μ , reported in the 1967 study was probably found in specimens that were different from the type.

Because of the stature, type of pileal cuticle, undifferentiated pileocystidia and lack of clamp connections, this is a good *Nolanea* species.

13. *Entoloma flavifolium* Pk. N. Y. State Mus. Bull. 105: 21. 1906.

Spores 7.0-9.0 x 5.5-8.0 μ , average length 7.6 μ , average width 6.8 μ , L-D 0.0-2.5 μ (average 0.8 μ), 5-6 sided, ovate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileal cuticle repent, undifferentiated, with few, scattered, uplifted, claviform, slender, and undifferentiated terminal cells. Cuticle at the apex of the stipe and caulocystidia not observed. Oleiferous hyphae scattered in the pileal trama. Clamp connections scattered on the hyphae of the pileal cuticle. Pigmentation vacuolar.

Material Studied: NEW YORK. TYPE. Peck's collection from Port Henry, Essex Co., New York, 8 August 1905. (HOLOTYPE NY).

14. *Entoloma parvulum* Murr. North Amer. Flora 10(2): 114. 1917.

Spores 8.5-10.0 x 6.5-8.0 μ , average length 9.3 μ , average width 7.2 μ , L-D 2.0-3.0 μ (average 2.1 μ), 5-6 sided, elongate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileal cuticle on the disc an irregular and loosely entangled trichodermium, repent and undifferentiated elsewhere; terminal cells small, slender, cylindro-clavate and colorless. Cuticle at the apex of the stipe and caulocystidia not observed. Oleiferous hyphae not seen. Clamp connections scattered on the hyphae of the pileal cuticle and of the basal tomentum. Pigmentation membrane.

Material Studied: NEW YORK. TYPE. Collection from the New York Botanical Garden, Bronx, New York, 13 Sept. 1910. (HOLOTYPE NY).

15. *Entoloma pubescens* Murr. North Amer. Flora 10(2): 119. 1917.

Spores 7.0-9.0 x 5.0-6.0 μ , average length 7.9 μ , average width 5.4 μ , L-D 2.0-4.0 μ (average 2.5 μ), 5-6 sided, elongate angular. Basidia not studied. Cheilocystidia and pleurocystidia absent. Pileal cuticle on the disc an entangled to irregularly interwoven trichodermium; terminal cells slender, cylindro-clavate, with external roughenings. Cuticle at the apex of the stipe similar to the pileal cuticle; terminal cells similar. Oleiferous hyphae absent. Clamp connections absent on the hyphae of the pileal cuticle and of the cuticle at the apex of the stipe, absent at the base of the basidia and on the hyphae of the basal tomentum. Pigmentation vacuolar.

Material Studied: ALABAMA. TYPE. F. S. Earle's collection, on the ground in Palmetto Swamp, south of Auburn, Alabama, 21 Dec. 1899. (HOLOTYPE NY).

The unquestionably tricholomatoid habit (expanded pileus and thick stipe, 8-12 mm wide at the apex) make this a good *Entoloma* species even though clamp connections are absent. Incrusted pigmentation is rare in species of *Entoloma* and therefore this taxon would be in *Entoloma*, section *Typodochroa* Largent (1974).

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Literature Cited

- Hesler, L. R. 1963. A study of *Rhodophyllus* types. *Brittonia* 15(4): 324-366.
———. 1967. *Entoloma* in southeastern North America. *Beih. zur Nova Hedwigia* 23: 1-196.
Kauffman, C. H. 1918. The Agaricaceae of Michigan. *Mich. Geol. Biol. Survey* 26(5): Volume 1: 1-924.
Kornerup, A., and J. H. Wanscher. 1961. *Reinhold Color Atlas*. Reinhold Publishing Corp., New York.

- Largent, D. L. 1971. Rhodophylloid fungi of the Pacific Coast (United States) I: Type studies and new combinations of species described prior to 1968. *Brittonia* 32(3): 238-245.
- . 1974. Rhodophylloid fungi of the Pacific Coast (United States) IV: Infrageneric concepts of *Entoloma Nolanea* and *Leptonia*. *Mycologia* (in press).
- , and R. G. Benedict. 1970. Studies in the rhodophylloid fungi II: *Alboleptonia*, a new genus. *Mycologia* 62(3): 437-452.
- Murrill, W. A. 1917. *North American Flora* 10(2): 76-144.
- Orton, P. D. 1960. New checklist of British agarics and boleti. Part III. Notes on genera and species in the list. *Trans. Brit. Mycol. Soc.* 43(2): 159-439.
- Ridgway, R. 1912. *Color Standards and Color Nomenclature*. Published by the author, Washington, D.C.

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