

MYCOTAXON

Vol. XXXIV, No. 1, pp. 181-196

January 20, 1989

KEY TO THE SPECIES OF INOCYBE IN CALIFORNIA

FLORENCE H. NISHIDA

Botany Section, Natural History Museum
900 Exposition Blvd., Los Angeles, CA 90007

SUMMARY

A key to the species of *Inocybe* found in California is presented, based on a recent systematic study of the genus in southern California. The occurrence of nearly 60 species is indicated for the state, augmenting the 16 nominal species previously reported in the literature. Several species with type localities in California or the west coast of the U.S. were re-collected and determined for the first time since their original description. Distinct *Inocybe* floras appear in northern and southern California, associated with different forests, mixed conifer vs. live oak, respectively. Less than a quarter of the total species occur in both regions. A checklist is provided of nominal *Inocybe* species of California, based on published reports and herbaria records at SFSU and LAM.

The genus *Inocybe* has been poorly studied in most of North America, some conspicuous exceptions being areas near New York (Peck, 1872-1910), Michigan (Kauffman, 1920, 1924, 1925; A.H. Smith, 1939; Stuntz, 1954), Washington (Stuntz, 1940, 1965; A.H. Smith & Stuntz, 1950), Florida (Murrill, 1941, 1944, 1945), and Nova Scotia, Canada (Grund & Stuntz, 1968-1984). A recent systematic study of *Inocybe* in southern California (Nishida, 1987, and ms. in prep. for Contributions in Science, Natural History Museum of Los Angeles County) revealed that the genus is surprisingly well-represented in semi-arid southern California, in relatively moist, coastal woods of live oak (*Quercus agrifolia*). At least 26 smooth-spored species and 5 nodulose-spored species are reported from southern California. Voucher specimens are deposited in herbarium LAM (Natural History Museum of Los Angeles County, California). It is worth noting that most of these nodulose species occur in inland, montane conifer woods of

Pinus ponderosa, P. jeffreyi, and Abies concolor.

My study of the herbarium specimens at San Francisco State University (SFSU) indicates a northern California Inocybe flora of at least 26 smooth-spored species and 13 nodulose-spored species. Many of the Inocybe collections had been annotated by Daniel Stuntz in 1971, but many other collections had not been determined, nor examined microscopically and none had been reviewed in light of recent taxonomic revisions of the genus. Nearly 60 species of Inocybe are presently reported from California, in contrast to 16 nominal species previously reported in the literature (Earle, 1904; Peck, 1909; Kauffman, 1924; Murrill, 1916; A.H. Smith, 1939, 1941; Smith & Stuntz, 1950; Grund & Stuntz, 1970).

Based on collections in the herbarium at SFSU there is evidence of a contrasting Inocybe flora in northern California. This abundant collection represents the mycological activities of Harry D. Thiers and his students over many years in the mixed conifer and conifer-hardwood (Pseudotsuga menziesii, Abies grandis, Picea sitchensis, Quercus chrysolepis, Q. kelloggii) forests of northern California. Although the two regions (northern and southern California) appear to have the same number of species of Inocybe, a closer examination shows that there are two distinct floras, with some overlapping of species. In general, nodulose species are more to be found associated with conifers. The northern California collection, mostly of the mixed conifer region, has 13 nodulose spored species, compared to 5 in southern California, where most of my collecting has been in the live oak woods. Nearly half (48%) of the total species occur only in northern California; less than a third (30%) occur only in southern California. Less than a quarter (23%) of the species are found in both regions. Among these latter are species of wide distribution in the world (I. fraudans, I. geophylla, I. leptocystis, I. rimosa, I. mixtilis, and I. variabilissima).

California is an area of great floristic, topographic, and climatic diversity. Sampling of the live oak woods of the southern coast and the pine and fir woods of the northern coast has yielded nearly 60 species of Inocybe. Large areas, potentially rich in Inocybe species, remain unstudied, especially the stands of Quercus kelloggii, and Q. chrysolepis on the lower slopes of the Sierra Nevada range, and of Q. douglasii surrounding the central valley, as well as much of the conifer forest extending along the Sierra Nevadas.

Recent taxonomic studies by Thomas W. Kuyper, including a revision of European smooth-spored species (1986), have provided useful information on some particularly difficult "species complexes," as well as updating nomenclature. My own recent systematic study of the southern California species of Inocybe has resulted in some taxonomic revision. Both these works should be consulted for complete descriptions and synonymy of species, as well as Nishida (1988) for new species, reported in this key to species of Inocybe in California.

Key to Subgenera, Sections, and Subsections of Inocybe *

1. Pleurocystidia absent; cheilocystidia thin-walled, no crystals at apex; spores always smooth.....2
 2. Cheilocystidia originating from the hymenophoral trama; basidia with necropigment; stipe usually shorter than diameter of pileus..... Subgen. Mallocybe
 2. Cheilocystidia originating as modified (sub)hymenial elements; basidia without necropigment; stipe usually longer than diameter of pileus..... Subgen. Inosperma
 3. Pileus squamulose to squarrulose; context often reddening; basidia slender; odor often distinct..... Sect. Cervicolores
 3. Pileus radially rimose or rimulose, not squamulose or squarrulose; context reddening or not; basidia broader; odor mild or spermatoc..... Sect. Rimosae
1. Pleurocystidia present, almost always thick-walled and with crystals at apex; cheilocystidia of two kinds, pleurocystidioid and clavate to (sub)globose paracystidia; spores smooth, angular, or nodulose in outline..... Subgen. Inocybe
 4. Spores smooth in outline (subangular at times in I. lacera): ovate, ellipsoid, (sub)amygdaliform, less often (sub)reniform)..... Sect. Inocybium
 5. Caulocystidia present over entire length of stipe (occasionally scarce in lower 1/3, or difficult to find or interpret) as thin- or thick-walled metuloids or thin-walled clavate, cylindrical cells of various sizes, or combination of these; cortina absent in young stage..... Subsect. Holoconiatae
 5. Caulocystidia present at apex of stipe only, occasionally rare or absent (sometimes with cystidioid terminal cells at the base, but not considered true cystidia); cortina often present in young specimens..... Subsect. Acroconiatae
 4. Spores generally angular, or coarsely to definitely nodulose to stellate in outline..... Sect. Inocybe

* The infrageneric classification follows Kuyper (1986). I concur that this is a phylogenetically valid grouping of smooth-spored and nodulose-spored species.

6. Caulocystidia at apex of stipe only, or absent; cortina present in young stage.....
Subsect. Cortinatae
6. Caulocystidia over entire length (including lower 1/3); cortina absent in young stage.....
Subsect. Marginatae

Key to Species of Subgenus Mallocybe

Pleurocystidia absent; cheilocystidia thin-walled, no crystals at apex; spores always smooth; cheilocystidia originating from hymenophoral trama; basidia often with necropigment.

1. Small basidioma, pileus 10-25 mm, wooly-tomentose to coarsely scaly-squarrose, color fulvous to cinnamon-brown, context pallid to amber, purplish then brown in KOH; lamellae (sub)distant, margin pallid or concolored; cortina sparse; stipe sparsely to obviously fibrillose; cheilocystidia articulated, thin-walled, clavate; spores ovate to subreniform with distinct suprahilar depression, 10-11 x 5-6.5 μ m; under Salix in wet places.....I. dulcamara
1. Larger basidioma, pileus 20-60 mm, appressed-fibrillose but not scaly or wooly-tomentose, ochre to brownish ochre; lamellae pallid at first, often becoming concolorous; stipe fibrillose peronate with distinct, thick cortina; cheilocystidia thin-walled, clavate; spores elliptical to subreniform, 8-10 x 4.5-5.5 μ m; under conifers.....I. agardhii

Key to Species of Subgenus Inosperma

Pleurocystidia absent; cheilocystidia originating as modified hymenial elements; basidia without necropigment.

1. Pileus diffracted scaly on disc, brown, isabella to umber, squarrulose to squamulose in margin; stipe long (25-80 mm), pale brown at apex, darker at base, often with grey-green, blue-green to olivaceous blackish stains, surface coarsely squamulose; context reddening; odor sweetish, like Pelargonium, or fishy.....
 (Sect. Cervicolores, one species).....I. calamistrata
1. Pileus and stipe not scaly, squarrulose or squamulose... (Sect. Rimosae)2
2. All parts of basidioma, including context, changing to vinaceous, pinkish red, or vinaceous brown; distinctive odor lacking; spores 10-12.5(-15) x 6-7(-7.5) μ m.....
I. adaequata
2. Basidioma not changing as above.....3
3. Pileus buff, ochraceous, yellow-brown to fulvous.....4
4. Stipe with blue-violet, gray-blue tints.....5
5. Spores (sub)reniform, > 6 μ m broad.....

-I. vinosistipitata
 5. Spores elliptical, < 6 μm broad; stipe gen. pale yellow, occ. violet.....I. quietiodor
 4. Stipe white, pale yellow, becoming more yellow.....
 6. Pileus often pallid overall at first, due to heavy covering of white velipellis (particularly in southern California husky, inodorous forms), in time becoming rimose and also yellow, yellow-brown to fulvous; odor absent, spermatic, or of fresh corn; spores 10-13 x 6-7 μm , (sub)reniform.....
I. rimosa
 6. Pileus with conspicuous central white patch of velipellis, drying entire, rarely, in squamules; umbo very obtuse or absent; stipe wax colored, smooth, equal or swollen, never emarginate-bulbous; spores 9-10 x 5-5.5 μm , ellipsoid, fewer subreniform; odor lacking or faintly rancid-mealy.....I. brunnescens
 3. Pileus brown, reddish brown, chestnut, russet, to umbrinous, lacking conspicuous velipellis; silky smooth; odor mild or faintly spermatic; spores 9-10 x 5-6 μm , mostly ellipsoid with obtuse apex.....
I. fastigiella

Key to Species of Subgenus Inocybe, Section Inocybium

Spores smooth (ovate, ellipsoid, subamygdaliform, subreniform; pleurocystidia present.

Key to Species of Subsection Holoconiatae

Caulocystidia found along entire length of stipe.

1. Entire basidioma reddening with age and/or on bruising, pure white at first; stipe base bulbous, sub-emarginate; odor spermatic; spores (10-)11-12.5(-15) x 6-7.5 μm , subamygdaliform to sublimoniform, apex subconical.....
I. godeyi
1. Basidioma not reddening with age.....2
2. Stipe incarnate (some shade of reddish to orange, salmon, pinkish tan, reddish brown, reddish orange, or orange ochraceous), at least at the apex.....3
3. Odor of bitter almond.....4
4. Odor of bitter almond in lamellae, spermatic in stipe; pileus ochraceous to ochraceous brown, radially fibrillose, sometimes becoming scaly; stipe orange ochraceous, not distinctly reddish; pleurocystidia cylindrical-clavate, to fusiform, moderately yellow in KOH.....I. hirtella var. hirtella
4. Odor weakly of almond, or else spicy as Pelargonium, frequently spermatic; pileus ochraceous brown to fulvous, tending to become squarrose-scaly around the disc; stipe often short, distinctly reddish brown at apex, or becoming purplish; pleurocystidia with bright yellow walls in KOH, fusiform to sublageniform.....I. muricellata
3. Without distinct odor of bitter almond.....5

5. Pileus bright colored (orange-brown, "rusty," tawny, fulvous).....6
6. Pileus often bicolorous, bright, tawny brown to red-brown on disc and ochraceous to honey in margin; stipe salmon-incarnate, context incarnate or pinkish orange; pileus and stipe often with tawny to orange fibrils; pleurocystidia extremely abundant, with very thick walls (4.5-5 μ m); spores 9-11 x 5.5-6 μ mI. laetior
6. Pileus unicolorous, bright orange-brown to fulvous orange; stipe pale orange-incarnate, context white; spores 8.5-9.5 x 5.0-5.5 μ m.....I. vaccina
5. Pileus not brightly colored, definitely brown.....7
7. Pileus tending to become squarrose-scaly around disc, without obvious velipellis, ochraceous brown to fulvous; stipe distinctly reddish brown, sometimes becoming purplish; pleurocystidia bright yellow in KOH, thick-walled; odor spermatic, rarely, faintly spicy or of almond.....I. muricellata
7. Pileus smooth, uniformly brown.....8
8. Pileus ochraceous brown, chestnut-brown, sometimes greyish on disc from velipellis; stipe reddish brown to orange ochraceous, with marginate bulb; pleurocystidia thin-walled, hyaline; spores rather small (7.5-9.5 x 4.5-5.5 μ m), mostly ellipsoid.....I. amblyspora
8. Pileus dark reddish brown to mahogany brown, silky smooth, greasy appearing, velipellis absent or scanty; stipe incarnate, pinkish buff to fleshy ochraceous, without bulbous base; pleurocystidia thick-walled; spores larger (8.5-10 [-12] x 5.5-6.5 μ m).....I. leiocephala
2. Stipe white, pallid, or variously colored, sometimes distinctly darkening, but nowhere incarnate.....9
9. Spores generally >11 μ m long (10-12 [-16] μ m), ellipsoid to subamygdaliform; robust habit; pileus buff, tan, dull ochraceous to ochraceous brown, paler in center from thick velipellis; husky stipe (30-80 mm long), with subbulbous to emarginate bulbous base, often with grey-green stains; pleurocystidia variable, often subcapitate; thin-walled clavate caulocystidia sometimes present at base.....I. bakeri
9. Spores generally <11 μ m long.....10
10. Pileus light (cream, isabella brown, buff, tan, dull ochraceous, ochraceous brown); stipe not distinctly darkening.....11
11. Pileus bright, yellow to golden with fulvous disc when fresh, becoming entirely orange brown when dry; velipellis absent; stipe pale yellow; pleurocystidia fusiform with very thick (4 μ m), pale to moderately yellow wall; spores amygdaliform to sublimoniform 10-11 x 5.5-6 μ m.....I. chrysocephala
11. Pileus pallid, not bright; stipe long, pallid...12
12. Habit robust (pil. 10-60 mm); pileus cream to isabelline, ochraceous, fibrillose-scaly at

- disc; stipe long (40-80 x 4-10 mm), even to clavate at base; spores 8-10 x 5-6 μ m, sub-amygdaliform; pleurocystidia lageniform to fusoid-ventricose, abundant.....I. kauffmanii
12. Habit regular (pil. 38 mm); pileus white to buff silky-smooth; context light brown under pellis; acrid taste; spores 9-10 x 5-5.5 μ m, elliptical to subreniform; pleurocystidia short, very rare, clavate to subfusiform, with extremely thick walls (4-5.5 μ m), hyaline.....I. menthi-gustans
10. Pileus definitely brown, sometimes appearing bicolorous; stipe darkening in lower half; odor of Pelargonium or of Amanita phalloides, or else spermatic.....13
13. Habit robust (pil. to 70 mm); stipe distinctly darkening to dark orange-brown, dark reddish brown or blackish brown; pileal disc light (yellowish brown), margin dark (cinnamon-brown to dark reddish brown), uniformly brown when dry; spores ellipsoid, subamygdaliform, 8.5-9 x 5.0-6.0 μ m....I. splendens
13. Habit slight (pil. to 55 mm); stipe not distinctly darkening, but discoloring with handling (tan to orange brown); disc vinaceous to chestnut-brown, margin reddish brown, uniformly russet when dry; spores 9-10 x 5.5-6.0 μ m, amygdaliform, conical apex.....I. phaeoleuca

Key to Species of Subsection Acroconiatae

Caulocystidia found only in upper 1/3 to 1/2 of stipe.

1. Basidioma generally white to cream and remaining so or becoming tinted with other colors.....2
2. Slender habit (cap:stipe = <0.60); pileus 10-35 mm, silky-smooth to fibrillose, conical or convex, umbonate sometimes subviscid; odor spermatic.....3
3. Staining orange-red with time and/or damage, lubricous when wet, shiny.....I. whitei f. whitei
3. Not staining orange-red.....4
4. Pileus with violet or lilac colors, especially in young specimens.....I. geophylla var. lilacina
4. Pileus without violet or lilac colors.....5
5. Remaining more or less silky white, or becoming buff in age.....I. geophylla var. geophylla
5. Not remaining white; disc of pileus fuscous, margin paler, and base of stipe also fuscous.....I. fuscodisca
2. Stocky habit (cap:stipe = or >0.60), resembles Hebeloma pileus 20-50 mm, convex, exumbonate; dry or subviscid in wet weather; white to dingy buff, becoming matte buff to tan, never silky-fibrillose; odor lacking.....I. insinuata

1. Basidioma colored from the first (ochre, yellow-brown, fulvous, reddish brown, umbrinous, etc.).....6
6. Basidioma having a distinct sweet, aromatic, or fruity odor.....7
7. Pileal disc, and/or some part of the stipe with green (greyish green to dull olive-green), pileus often scaly; context whitish, not reddening; strong odor of "Peruvian balsam" or cinnamaldehyde.....I. corydalina var. corydalina
7. Pileus smooth, color pale ochraceous, pale fulvous, or mixture of yellow, red, dark russet, umbrinous, vinaceous brown; context pallid, reddening upon exposure; stipe becoming brick red then vinaceous; strong odor, variously described as methyl cinnamate, "Peruvian balsam," or "matsutake".....I. fraudans
6. Basidioma lacking a distinct aromatic, sweet odor, or else with a spermatoc odor.....8
8. Violet or lilac shades in some or all parts: pileus, lamellae, stipe.....9
9. Pileus small, 10-35 mm, ochraceous brown, smooth, in age becoming diffracted-scaly in margin; lamellae briefly violaceous; stipe equal to subbulbous, often violaceous in lower portion; pleurocystidia fusoid-ventricose, hyaline; spores subamygdaliform, 7.5-10.5 x 4.5-5.5 μmI. pusio
9. Pileus large, 15-50 mm, dark brown, umbrinous to reddish brown, with violaceous tinges from underlying context, distinctly scaly to tomentose-squamulose; stipe equal with brown fibrillose punctae, streaks, or squamules, especially toward base; pleurocystidia slenderly fusiform, with thick, bright yellow walls; spores amygdaliform with subconical to papillate apex 8.5-10 x 5-5.5 μmI. phaeocomis var. major
8. Violet or lilac shades absent and pileus pallid, brightly colored or brown.....10
10. Pileal colors pallid, ochraceous, to ochraceous brown or brightly colored, not definitely brown..11
11. Spores = or > 11 μm (10.5-13 x 5.5-6.0 μm) subamygdaliform; pleurocystidia broad, utriform to fusoid, thick walled, hyaline; pileus 25-55 mm, pale ochraceous to ochraceous brown, smooth, often with dirt or litter adhering; stipe white, husky (50-80 x 5-15 mm) with bulbous to emarginate base; differentiated caulocystidioid hairs sometimes found on base of stipe; odor lacking.....I. bakeri
11. Spores <11 μm 12
12. Pleurocystidia long and narrow (60-90 μm), thick walled, pale to bright yellow; spores 7.5-9 x 4.5-5.0 μm , subamygdaliform; pileus isabella, greyish ochraceous to ochraceous brown; odor spermatoc and farinaceous.....I. subochracea
12. Pleurocystidia short (40-60 μm), fusiform to utriform, with pale to bright yellow wall; spores 8.3-9 x 4.5-5.5 μm , subamygdaliform; pileus yellow, pale cream to ochraceous yellowI. auricoma
10. Pileus definitely brown; basidiocarp rarely with

- violaceous colors13
13. Basidioma with striking lamellar colors (bright orange to ochraceous tawny); also pileus orange to cinnamon at first, becoming cinnamon to "Soyal brown," context orange-cinnamon; stipe with heavy covering of cinnamon colored fibrils, context and surface cinnamon, becoming brownish, spores subamygdaliform; pleurocystidia fusoid-ventricose....
.....I. cinnamomea
13. Basidioma without striking lamellar color, but stipe may be incarnate (with pinkish, pinkish brown, reddish orange, reddish brown) or not....14
14. Stipe incarnate.....15
15. Pleurocystidia uniquely thin-walled, without a double membrane, clavate to utriform with wavy margin, apex obtuse or subcapitate; spores subamygdaliform, 8-9 x 5-6 μm ; pileus red-brown, "bay," sometimes fading to "tawny," at center or margin; odor faint, raphanoid to farinaceous...
.....I. leptocystis
15. Pleurocystidia definitely thick-walled.....16
16. Spores generally $>11 \mu\text{m}$17
17. Spores elongate to slightly angular, 11-14 x 4.5-5.5 μm ; pileus coarsely fibrillose, tomentose, squamulose to squarrose; stipe buff at apex, sometimes with pinkish tinge; brownish toward base, fibrillose..I. lacera
17. Spores never angular, but broad, 11.5-13.5 x 6-7 μm ; pileus orange-brown to cinnamon - brown with conspicuous and persistent white patch of velipellis in center; smooth to slightly diffracted scaly on disc; stipe light brown with reddish to orange tinges, with submarginate bulbous base.....
.....I. hemileuca
16. Spores $<11 \mu\text{m}$ 18
18. Pileus with disc distinctly darker than margin (disc umber to fuscous, sometimes ochraceous brown, outer whitish to cream); surface smooth to appressed-scaly to diffracted scaly; stipe densely fibrillose, reddish brown context and surface, caulocystidia at apex very rare; spores 9-10 x 5-5.5 μm ; pleurocystidia subcylindrical to subfusiform, walls moderately thick (1.5-2 μm).....I. phaeodisca
18. Pileus unicolorous, dark brown, rufous to umbrinous, margin sometimes tawny olive; pleurocystidia ventricose, very thick-walled (3.5 μm); spores 10 x 5-5.5 μm , subamygdaliform; odor spermatic.....
.....I. subdestricta
14. Stipe not incarnate; pileus pale brown, ochraceous brown, fibrillose-squamulose especially over disc, often recurvately squamulose-squarrose; stipe white, becoming pale ochraceous or pale brownish; spores 8.5-9.5 x 5-6 μm , subamygdaliform; pleuro-

cystidia fusoid-ventricose, with thick (3.5 μm),
pale to bright yellow wall; caulocystidia at stipe
apex sometimes rare; odor spermatic-acidulous....
.....I. flocculosa

Key to Subgenus Inocybe, Section Inocybe

Spores angular, angular-nodulose, or obtusely to definitely
nodulose to stellate in outline; pleurocystidia usually
present.

Key to Species of Subsection Marginatae

Caulocystidia along entire stipe; stipe pruinose overall;
cortina lacking or attached to base of stipe which is
frequently bulbous.

1. Basidioma reddening and with pleasant, aromatic, fruity
or sweet odor; pileus fulvous to yellowish brown; spores
7-9 x 5-6.5 μm , bluntly nodulose; pleurocystidia fusoid
ventricose, thick walled.....I. bresadolae
1. Basidioma not reddening2
2. Stipe incarnate or becoming tinged with pink, orange,
salmon.....3
3. Pileus bicolored, white to pale cream on disc, grey-
vinaceous brown, or pale pinkish brown in margin;
pellis smooth to minutely squamulose; spores 6.5-8 x
4.5-6 μm , with 7-9 nodules; pleurocystidia ventricose
with thick wall (5-6.5 μm); odor spermatic.....
.....I. albobdisca
3. Pileus red-brown, cinnamon-brown, glabrous; stipe
with marginate bulb, color gradually darkening; spores
9-11 x 5.5-8 μm , with 8-10 large, prominent nodules;
pleurocystidia broadly ventricose to subglobose.....
.....I. oblectabilis
2. Stipe not becoming incarnate.....4
4. Basidioma entirely white, remaining pallid.....5
5. Pileus 25-50 mm smooth, greasy to subviscid at first,
in time pale ochre-yellow; stipe base not distinctly
bulbous; spores 8-10 x 5-6 μm , ellipsoid-oblong with
7-9 coarse nodules; pleurocystidia fusoid ventricose,
thick walled (2.5-3 μm); strong odor of Cortinarius
purpurascensI. olida
5. Pileus 15-30 mm, dry, fibrillose, becoming
obscurely scaly, white becoming dingy to ochraceous;
stipe base bulbous to submarginate; spores 7-10 x 5-
6 μm , polygonal, 4-9 nodules, or merely angular;
pleurocystidia distinctly thick walled (4-5.5 μm),
short (30-55 μm), fusoid to clavate.....
.....I. umbratica
4. Basidioma not white, but variously colored.....6
6. Stipe noticeably darkening or blackening.....7
7. Pileus 20-35 mm, straw-yellow to brownish yellow,
often paler in margin or disc from velipellis, moist

- to subviscid; stipe pale dingy straw color, darkening to gray or black on drying; spores 9-12 x 7-9 μm , with 9-12 large, prominent nodules; pleurocystidia lageniform, ventricose, with thick, bright yellow wallI. xanthomelas
7. Pileus 15-60 mm, pale brown to grayish brown, surface becoming appressed-fibrillose scaly; stipe pale yellowish, blackening on drying; spores 9-10 x 7-9 μm , oblong, with 8-12 large, prominent nodules; pleurocystidia slenderly ventricose with long neck, thick walled (3.5-5 μm), hyalineI. nigrescens
6. Stipe not noticeably darkening or blackening8
8. Pileus straw, ochraceous brown to fulvous in margin, with yellow disc, 15-40 mm, silky to lubricous; lamellae grayish pallid; stipe pallid, densely pruinose, with marginate bulbous base; spores 8-10 x 5.5-6 μm , with 9-10 prominent nodules; pleurocystidia 40-55 μm long, broadly ventricose, very thick walled (2-5 μm), yellow.....I. mixtilis
8. Pileus ochraceous brown to cinnamon-ochre, covered with greyish to grey-brown veil, smooth or greyish brown, scaly, 45-65 mm, umbonate, subviscid, dirt often adhering; stipe pallid, becoming yellowish brown; spores very large, 9-13 (-15) μm , scarcely nodulose, polygonal; pleurocystidia ventricose to clavate, thick walled (3 μm)I. decipiens

Key to Species of Subsection Cortinatae

Caulocystidia lacking on base of stipe; stipe not pruinose all over; cortina present in young specimens; stipe base bulbous or not.

1. Pleurocystidia lacking or extremely rare or difficult to find.....2
2. Pileus brown, tomentose-scaly, to squarrose-scaly...3
3. Pleurocystidia lacking; only thin-walled subglobose cheilocystidia; pileus dry, disc densely covered with minute squarrose scales, margin smooth, walnut-brown to amber; stipe floccose fibrillose to tomentose, concolorous; spores 10-12 x 8-9 μm ellipsoid, with 12-20 prominent subconical nodules; in damp woods, on rotten wood.....I. leptophylla
3. Pleurocystidia short (25-45 μm), difficult to locate, ovate; pileus and stipe dark brown, densely squarrose to scaly overall, with pale zone below lamellae; spores 8-10 x 5.5-7 μm , with 8-10 small nodules; in conifer woods and on rotten woodI. lanuginosa
2. Pileus not strongly squarrose-scaly; ochraceous, fulvous brown, reddish brown, fibrillose to finely appressed-fibrillose scaly; stipe pallid to tan, glabrous; spores 9-11.5 x 5.5-6.5 μm , oblong, notable by their extreme variability, from merely angular to angular-nodulose, to nodulose, but with low

- nodules; pleurocystidia rare, short, 40-55 x 18- 30 μ m, with distinctive, ovate or utriform shape, often with mucronate apex, wall not thick (1.5-2 μ m)
I. variabilima.....
1. Pleurocystidia present and obvious.....4
4. Pleurocystidia unique, truly thin-walled (reminiscent of I. leptocystis), 55-72 x 15-22 μ m, clavate, ventricose, subcapitate; spores 9-10 x 6.5 μ m, oblong, with 10-14 prominent nodules; pileus 10-50 mm, dark umber-brown to "snuff-brown" on margin, with large, erect scales on disc, squarrose on margin; stipe pallid, darkening to brownish in age, pinkish buff at apex, concolorous with pileus below
I. longicystis.....
4. Pleurocystidia normal.....5
5. Basidioma very small, pileus 5-15 mm, pale grey-brown, disc darker, greyish brown to chestnut-brown, with greyish white margin; spores 7-9 x 4.5-6 μ m, obscurely nodulose; pleurocystidia with bright yellow wall.....
I. petiginosa.....
5. Pileus 20-40 mm, vinaceous brown to tawny olive on margin with cinnamon-buff disc, silky smooth at first from velipellis, becoming fibrillose, subrimose; stipe white to incarnate; spores unique, 5.5-8 x 13-19 μ m, bullet shaped, with 1-5 large, obtuse nodules, or merely angular; pleurocystidia fusiform to clavate, thin-walled.....I. chelanensis.....

Checklist of Species of Inocybe in California

This is a checklist of nominal Inocybe species which either have appeared in the literature as occurring in California, or are associated with collections in the herbarium, SFSU. Some names, therefore, are synonyms or have been misapplied. Recent taxonomic studies of European inocybes by Kuyper (1986) and southern California inocybes by Nishida (1987, in prep.) should be consulted for discussions of species and complete synonymies. The columns to the right provide a quick reference to reports of Inocybe species in California. Headings are: (R), reports in literature; (N), collection from northern California in herbarium SFSU, only those studied and annotated by D.E. Stuntz and/or Nishida; (S), collection of southern California in LAM determined by Nishida; (P), associated plants: "Q" = Quercus, "C" = conifer. In columns, "T" indicates type collection made in California, "X" = present, "0" = absent.

Smooth-spored Species	R	N	S	P
<u>I. adaequata</u> (Britz.) Sacc.	0	X	X	Q
<u>I. agardhii</u> (Lund) Orton	0	X	0	C
<u>I. agglutinata</u> Peck = <u>I. whitei</u>	0	X	0	C
<u>I. amblyspora</u> Kuhn.	0	0	X	Q
<u>I. anomala</u> Murr.	T	0	0	C
<u>I. auricoma</u> (Batsch) J. Lange	0	X	0	C

<u>I. bakeri</u> Peck	T	0	X	Q
<u>I. brunnescens</u> Earle	T	X	X	Q
non <u>I. brunnescens</u> Atk.				
<u>I. bulbosa</u> Peck	T	0	X	Q
(probably = <u>I. bakeri</u>)				
<u>I. calamistrata</u> (Fr.) Quel.	0	X	0	C
<u>I. cincinnatula</u> Kühn.	0	X	0	Q,C
= <u>I. phaeocomis</u> var. <u>major</u>				
<u>I. cinnamomea</u> A.H. Smith	T	0	0	C
<u>I. corydalina</u> Quel.	0	X	0	Q
<u>I. dulcamara</u> (Alb. et Schw.: Fr.) Kumm.	0	X	X	S
<u>I. fastigiata</u> (Fr.) Quel. = <u>I. rimosa</u>	X	X	X	Q
<u>I. fastigiella</u> Atk.	0	X	X	Q,C
<u>I. flocculosa</u> (Berk.) Sacc.	0	X	0	C
<u>I. fraudans</u> (Britz.) Sacc.	0	X	X	Q,C
<u>I. fuscodisca</u> (Pk.) Massee	X	X	0	Q,C
<u>I. geophylla</u> (Fr.:Fr.) Kummer	X	X	X	Q,C
<u>I. geophylla</u> var. <u>lilacina</u> (Pk.) Gill.	0	X	0	C
<u>I. geophylla</u> f. <u>perplexa</u> Kauff.	0	X	0	C
= <u>I. whitei</u>				
<u>I. godeyi</u> Gill.	0	0	X	Q
<u>I. hirsuta</u> var. <u>maxima</u>	X	X	0	C
= <u>I. calamistrata</u>				
<u>I. hirtella</u> Bres.	0	0	X	Q
<u>I. insinuata</u> Kauff.	T	X	X	Q,C
<u>I. jurana</u> sensu auct. = <u>I. adaequata</u>	0	X	X	Q,C
<u>I. kauffmanii</u> Smith	X	X	0	C
<u>I. lacera</u> (Fr.:Fr.) Kumm.	0	X	0	C
<u>I. laetior</u> Stz.	0	0	X	?
<u>I. leiocephala</u> Stz.	0	X	0	Q,C
<u>I. leptocystis</u> Atk.	0	X	X	Q
<u>I. lilacina</u> (Pk.) Kauff.	X	X	0	C
= <u>I. geophylla</u> var. <u>lilacina</u>				
<u>I. muricellata</u> Bres.	0	0	X	Q
<u>I. olympiana</u> (A.H. Smith)	0	X	0	C
<u>I. phaeocomis</u> var. <u>major</u> (S. Petersen) Kuyp.	0	X	0	C
<u>I. phaeodisca</u> Kühn.	0	X	0	Q
<u>I. phaeoleuca</u> Kühn.	0	0	X	Q
<u>I. pudica</u> Kühn. = <u>I. whitei</u>	0	X	0	Q,C
<u>I. pusio</u> P. Karst.	0	0	X	C
<u>I. pyriodora</u> sensu auct. = <u>I. fraudans</u>	X	X	X	Q
<u>I. quietiodor</u> M. Bon	0	0	X	C
<u>I. retipes</u> Atk.	0	X	0	C
<u>I. rimosa</u> (Bull.:Fr.) Kumm.	0	X	X	Q,C
<u>I. serotina</u> Peck	X	0	0	
(report is based upon a misapplied name)				
<u>I. sororia</u> Kauff. = <u>I. rimosa</u>	0	X	0	Q,C
<u>I. splendens</u> Heim	0	0	X	Q
<u>I. subbrunnea</u> Kühn. = <u>I. leiocephala</u>	0	X	0	C
<u>I. subdstricta</u> Kauff.	0	X	X	Q,C
<u>I. subochracea</u> (Pk.) Pk.	0	X	0	C
<u>I. vaccina</u> Kühn.	0	X	0	C
<u>I. vinosistipitata</u> Grnd & Stz.	0	0	X	Q
<u>I. whitei</u> (B. & Br.) Sacc.	0	X	X	Q,C
FHN #2487	0	0	X	Q
FHN #3976	0	0	X	Q

FHN #498	0	X	X	C
Nodulose-spored Species	R	N	S	P
<u>I. acystidiosa</u> Kauff. = = <u>I. variabilissima</u>	T	0	0	C
<u>I. albodisca</u> Peck	0	X	0	Q,C
<u>I. bresadolae</u> Mass.	0	X	0	C
<u>I. californica</u> Kauff.	T	0	0	C
<u>I. chelanensis</u> Stz.	0	X	0	C
<u>I. decipiens</u> Bres.	0	X	X	Q,C
<u>I. decipientoides</u> Peck = <u>I. variabilissima</u>	0	X	0	C
<u>I. fallax</u> Peck	0	X	0	C
<u>I. lanuginosa</u> (Fr.) Kummer	0	X	0	C
<u>I. leptophylla</u> Atk.	0	X	0	A
<u>I. longicystis</u> Atk.	0	X	0	C
<u>I. mixtilis</u> (Britz.) Sacc.	0	X	X	Q,C
<u>I. nigrescens</u> Atk.	0	X	0	C
<u>I. oblectabilis</u> Britz.	0	0	X	C
<u>I. olida</u> Maire	0	0	X	Q,C
<u>I. petiginosa</u> (Fr.) Gill.	0	X	0	C
<u>I. umbratica</u> Quel.	0	X	0	C
<u>I. variabilissima</u> Speg.	0	X	X	Q,C
<u>I. xanthomelas</u> Bours. & Kühn.	0	X	0	C

ACKNOWLEDGEMENTS

This manuscript is based in part on a thesis submitted in partial fulfillment of the requirements for the Master of Science degree at California State University at Los Angeles. I thank the chairman, Daniel P. Mahoney and members of my committee, Harry D. Thiers and Brian Capon for their guidance and assistance. I thank Don R. Reynolds, Curator of Botany at the Natural History Museum, and Dr. Thiers for providing facilities and collections used in this research. Further, I wish to thank Darryl W. Grund, Harry Thiers and Don Reynolds for helpful comments and suggestions which improved this contribution.

LITERATURE CITED

- Earle, F. S. 1904. Mycological studies II. Bull. New York Bot. Gard. 3: 289-312.
- Grund, D. W. & D. E. Stuntz. 1968. Nova Scotian Inocybes I. Mycologia 60: 406-425.
- & -----, 1970. Nova Scotian Inocybes II. Mycologia 62: 925-939.
- & -----, 1975. Nova Scotian Inocybes III. Mycologia 67: 19-31.
- & -----, 1977. Nova Scotian Inocybes IV. Mycologia 69: 392-408.
- & -----, 1980. Nova Scotian Inocybes V. Mycologia 72: 670-688.
- & -----, 1981. Nova Scotian Inocybes VI. Mycologia

- 73: 655-674.
 ----- & -----, 1983. Nova Scotian *Inocybes* VII. *Mycologia*
 75: 257-270.
 ----- & -----, 1984. Nova Scotian *Inocybes* VIII. *Mycologia*
 76: 733-740.
 Kauffman, C. H. 1920. Studies in the genus *Inocybe*. New
 York State Mus. Bul. (Rept. State Bot. 1919). 233/234:
 43-60.
 -----, 1924. *Inocybe*. North American Flora. 10(4): 227-260.
 -----, 1925. The fungus flora of Mt. Hood, with some new
 species. Pap. Mich. Acad. Sci., Arts, and Letters 5:
 115-148.
 Kuyper, T. W. 1986. Revision of the genus *Inocybe* in
 Europe. I. Subgenus *Inosperma* of the smooth-spored
 species of subgenus *Inocybe*. *Persoonia*, Suppl.
 3:1-247.
 Murrill, W. A. 1916. Notes and brief articles. *Mycologia* 8:
 312.
 -----, 1941. Some Florida novelties. *Mycologia* 33: 279-287.
 -----, 1944. New Florida fungi. Proc. Florida Acad. Sci.
 7:121-123.
 -----, 1945. New Florida fungi. Quart. Journ. Florida Acad.
 Sci. 8: 186-191.
 Nishida, F. H. 1987. The genus *Inocybe* in southern
 California (Agaricales, Basidiomycetes). M.S. Thesis.
 California State University, Los Angeles.
 -----, 1988. New species of *Inocybe* from southern
 California. *Mycotaxon* 33: 213-222.
 Peck, C. H. 1872. New York State Mus. Bul. (Rept. State
 Bot.). No. 23: 95-96.
 -----, 1874. New York State Mus. Bul. (Rept. State Bot.).
 No. 26: 57.
 -----, 1875. New York State Mus. Bul. (Rept. State Bot.).
 No. 27: 95.
 -----, 1879. New York State Mus. Bul. (Rept. State Bot.).
 No. 32: 28-29.
 -----, 1888. New York State Mus. Bul. (Rept. State Bot.).
 No. 41: 65-67.
 -----, 1898. New York State Mus. Bul. (Rept. State Bot.).
 No. 52: 289-290.
 -----, 1904. New York State Mus. Bul. (Rept. State Bot.).
 No. 75: 17.
 -----, 1909. New species of *Inocybe*. Bull. Torr. Bot. Club
 36: 332-333.
 -----, 1910. New York species of *Inocybe*. New York State
 Mus. Bul. (Rept. State Bot.). No. 139: 48-66.
 Smith, A. H. 1939. Certain species of *Inocybe* in the
 Herbarium of the Univ. of Michigan. Pap. Mich. Acad.
 Sci., Arts and Letters 24: 93-105.
 -----, 1941. New and unusual Agarics from North America.
 II. *Mycologia* 60: 406-425.
 ----- & D. E. Stuntz. 1968. New or noteworthy fungi from
 Mt. Rainier National Park. *Mycologia* 42: 80-134.
 Stuntz, D. E. 1940. *Inocybes* of Western Washington. Ph. D.
 Dissertation. Yale University.
 -----, 1954. Studies on the genus *Inocybe* II: new and
 noteworthy species from Michigan. Pap. Mich. Acad.

Sci., Arts and Letters 39: 53-84.

----- 1965. Inocybe (Fr.) Fr., subgenus Inocybium (Earle) Singer: section Inocybium Stuntz, section Rimosae (Fr.) Quel., section Dulcamarae Heim. University of Washington, Seattle (unpublished manuscript).