

## Key to Species of *Inocybe* from eastern North America – v02 (20-Dec-2016)

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This unpublished key includes treatment to 198 species, varieties, and forms of *Inocybe* documented from eastern North America, including Central America and the Caribbean Basin. The number of species included is based on a survey of the literature but also including notes based on unpublished type studies by D.E. Stuntz. Ca. 60 taxonomic synonyms are currently accepted, eleven species are considered doubtful, and six species are excluded in other genera. 67 North American species recorded only from western North America are listed at the end of this document. Thus, 265 species of *Inocybe* are presently accepted from North America. However, this is likely an underestimate as regions such as California, the Gulf Coast, and particularly Mexico are largely understudied. Moreover, detailed molecular studies have not been performed for most species.

Note this early draft version of the key is *not* strictly dichotomous. Undoubtedly, future versions and revisions to this key will be necessary as omissions and errors are corrected and as species concepts become better established. For a glossary of terminology (e.g., fulvous, fuscous, necrobasidia, rimose, pleurocystidia), see an online glossary at <http://inocybaceae.org/glossary.html>.

### Key to species of *Inocybe* from eastern North America

#### Spores smooth, yellowish-brown, and pleurocystidia absent

Pileus fibrillose-squamulose to squarrose

Basidia necropigmented; odor not remarkable; flesh not reddening

Stipe fibrillose-squamulose; cheilocystidia > 50 µm long

**I. unicolor** Peck (Syn. *I. lorillardiana* Murrill, *I. marmoripes* G.F. Atk., *I. caesariata sensu* Lincoff 1981, *non* Kauffman)

Stipe fibrillose to subglabrous (rarely squamulose); cheilocystidia < 50 µm long

Spores elliptic to phaseoliform or subamygdaliform, Q<2.0

Cortina forming a distinct annular zone, pileus long incurved, stipe solid, under (planted?), *Picea abies*, New Jersey

**I. tomentosa** Ellis & Everh., *non* Qué. (cf. *I. agardhii* (N. Lund) P.D. Orton under *Salix* in Europe; syn. *I. subdecurrens* Ellis & Everh. per Kauffman 1924)

Cortina *not* forming a distinct annular zone, pileus margin decurved, stipe solid or hollow, vegetation various

Lamellae usually sinuate, stipe solid or hollow; alpine, boreal, and arctic in distribution

**I. dulcamara** (Pers.) P. Kumm. *sensu* Malloch (Syn. *I. subtomentosa* Peck, *I. squamosodisca* Peck, *I. fibrillosa* Peck, *non* (Cleland) Grgurinovic)

Lamellae adnate or subdecurrent, stipe hollow (or unknown)

Under (planted) *Picea abies*

**I. subdecurrens** Ellis & Everh.

Under *Quercus*, Florida

**I. fulvumbonata** Murrill

Spores oblong-elliptic to oblong-phaseoliform, Q>2.0, Florida

Pileus pale isabelline to fulvous, stipe pallid with bulbous base; cheilocystidia slenderly clavate

**I. multispora** Murrill

Pileus isabelline, stipe white, equal; cheilocystidia broadly clavate or short utriform

**I. praevillosa** Murrill

Pileus fulvous, stipe pallid, equal; cheilocystidia utriform to saccate

**I. fulviceps** Murrill (Syn. *I. pertomentosa* Murrill, *I. vialis* Murrill)

Basidia hyaline; odor *often* noticeable – fruity, *Pelargonium*, green corn, spermatic; flesh *often* reddening

Flesh *not* reddening, odor none

Fruit bodies medium; pileus 25-40 mm wide, with reddish brown scales appressed against yellow ground color; spores ovate-elliptic, 9.5-10 x 5.5-6.3 µm

**I. squamata J.E. Lange** (*I. spuria* Jacobsson & E. Larss. from Europe and western North America is very similar but differs by more narrow spores 8.5-11 x 4.5-6  $\mu\text{m}$  and more robust fruit bodies)  
Fruit bodies small; pileus 3-4 mm wide, reddish-brown, nowhere yellow; spores subreniform, 9-15 x 6-8  $\mu\text{m}$

**I. tenerrima G.F. Atk.**

Flesh reddening, odor conspicuous

Stipe surface fibrillose

Odor spermatic

**I. hirsuta Quél. sensu Grund & D.E. Stuntz**

Odor floral, aromatic

**I. subrubescens G.F. Atk.**

Odor 'old wine' or 'dank casks'

**I. cervicolor (Pers.) Quél. sensu Eur. auct.**

Odor strong of green corn

**I. cervicolor sensu D.E. Stuntz**

Stipe surface with recurved scales or fibrillose-scaly

Blue-green colors inconspicuous or lacking above the stipe base

**I. mutata (Peck) Massee** (Syn. *I. leptocystella* G.F. Atk.? See 'doubtful species')

Blue-green colors conspicuous at the stipe base, sometimes throughout the stipe

Fruitbodies large, stipe 55-120 x 6-14 mm

**I. hirsuta var. maxima A.H. Sm.**

Fruitbodies medium, stipe 25-90 x 2.5-6 mm

Odor of green corn

**I. mucidiolens (Grund & D.E. Stuntz) Matheny**

Odor fishy or fruity

Odor fishy or like bruised Geranium leaves

**I. calamistrata (Fr.: Fr.) Gillet**

Odor like ripe pears

**I. apiosmota Grund & D.E. Stuntz**

Pileus finely-fibrillose to rimose, *not* squamulose

Stipe smooth

Stipe white, slowly red where bruised (pileus turning red), spores 10-13.5 x 5.5-7  $\mu\text{m}$

**I. erubescens A. Blytt.** (Syn. *I. patouillardi* Bres.)

Stipe pinkish or vinaceous, spores smaller than above

Pileus dull red-brown, stipe pinkish, odor oily-spermatic, spores 8-9 x 4.5-5  $\mu\text{m}$

**I. rosellicularis Grund & D.E. Stuntz**

Pileus vinaceous-brown, stipe vinaceous, odor sickly sweet to aromatic with a green corn component, spores 9.5-11.5 x 6  $\mu\text{m}$

**I. jurana (Pat.) Sacc. sensu Hesler**

Stipe white and/or brunnescent and *not* turning red, spores smaller than in *I. erubescens*

Pileus pale rosy-isabelline, odor spermatic

**I. pallidifolia (Murrill) Matheny, comb. prov.** (Syn. *Hebeloma pallidifolium* Murrill)

Pileus yellowish to brownish yellow or orange-brown to tawny, odor of green corn or aromatic with a green corn component

Pileus yellowish to brownish yellow, odor of green corn, velipellis inconspicuous or absent

**I. rimosoides Peck**

Pileus tawny to fulvous or orange-brown, odor *aromatic* with a green corn component, velipellis inconspicuous, absent, or present as patches

Pileus tawny to fulvous, velipellis patches often *conspicuous*

**I. lanatodisca Kauffman** (*I. maculata* f. *fulva* Bon is a fulvous European form of *I. lanatodisca*; an umbrinous form, *I. lanatodisca* var. *phaeoderma* (D.E. Stuntz) Grund & D.E. Stuntz, differs from *I. maculata* Boud. and *I. fastigella* mainly by its complex aromatic odor)

Pileus orange-brown or tawny, velipellis inconspicuous or absent

***I. curreyi* (Berk.) Sacc. *sensu* Hesler** (*I. glabra* Kauffman, originally *I. 'glaber'*, differs by its nauseous or radishy odor)

Pileus dark brown, chestnut-brown, or brown (umbrinous), odor *without* a green corn component

Pileus pale tan to light tan with a whitish low broad umbo, stipe even (not bulbous), white, *odor none*, spores elliptic to reniform, 8.5-9.5 x 5-6.5  $\mu\text{m}$ , under *Quercus*, lowland Costa Rica

***I. notodryina* Singer**

Pileus brown or umbrinous, *with a prominent umbo*, stipe slender, odor *none* (spores per protologue subreniform, 7-9 x 4-5  $\mu\text{m}$ ; spores per Stuntz *not* subreniform but rather elliptic, 7.5-9 x 5-5.5  $\mu\text{m}$ )

***I. fastigiella* G.F. Atk.** (*I. glabra* Kauffman has an ochraceous-brown to livid-brown (vinaceous-brown) umbonate pileus, nauseous or radishy odor, and subreniform spores 7-9 x 4-5  $\mu\text{m}$ ; described under hardwoods, Michigan)

Pileus dark brown, chestnut-brown or umbrinous, without a prominent umbo, odor definitely present; spores 8-10 x 4.5-5.5  $\mu\text{m}$ , subreniform

Odor penetrating, definitely not spermatic, but complex with strongly fungoid (like young *Lycoperdon*), pungent aromatic, and raphanoid components

***I. maculata*** (differs from *I. lantodisca* in odor and pileus color; cf. *I. lantodisca* var. *phaeoderma*, which differs by odor; cf. *I. grabra* with an ochraceous-brown to livid-brown pileus)

Odor spermatic

Pileus with distinct white patches of velipellis

***I. neobrunnescens* var. *leucothelota* Grund & D.E. Stuntz**

Pileus lacking distinct white patches of velipellis

***I. neobrunnescens* var. *neobrunnescens* Grund & D.E. Stuntz** (Syn. *I. brunnescens* G.F. Atk., non Earle; *I. fastigiata* var. *microsperma* Bres. *sensu* A.H. Sm.)

Stipe furfuraceous-pruinose or fibrillose and not staining

Pileus white to pale ivory, yellow, grayish brown to pinkish gray or pinkish brown

Stipe vinaceous-purple at the apex, pileus pale dingy cream with greenish tinges

***I. vinosistipitata* Grund & D.E. Stuntz**

Stipe without vinaceous colors absent, pileus without greenish tinges

Stipe, pileus, *and* lamellae yellow; odor none

***I. holoxantha* Grund & D.E. Stuntz**

Lacking the combination of yellow traits above

Stipe pale ochraceous (pileus yellow but lamellae pale brown), odor none, under *Coccoloba*, Caribbean Basin

***I. littoralis* Pegler**

Stipe white to pallid throughout; odor none or of green corn, under other plant associates, location various

Spores narrow, 8-11.5 x 4-5.5  $\mu\text{m}$ , pileus cream-buff, odor none, under *Inga*, Caribbean Basin

***I. ingae* Pegler**

Spores larger than above, pileus color various, odor none or distinctive, under plants in temperate areas

Pileus white or pallid ivory, odor none, spores 11-14 x 5.5-7  $\mu\text{m}$ , in mixed woods

***I. fastigiata* f. *subcandida* Malençon**

Pileus yellowish, odor of green corn, spores 11-15.5 x 6-8  $\mu\text{m}$ , under hardwoods or conifers

***I. sororia* Kauffman**

Pileus grayish brown to pinkish gray or pale pinkish beige, odor aromatic, spores 10-12.5 x 5.5-6  $\mu\text{m}$ , under conifers (*Picea*, *Tsuga*)

***I. obsoleta* Romagn.** (Syn. *I. aurora* var. *aurora* Grund & D.E. Stuntz)

Same as *I. obsoleta* above but odor none, spores 11-12 x 6-6.5  $\mu\text{m}$ , under mixed conifers and hardwoods

***I. aurora* var. *inodorata* Grund & D.E. Stuntz**

Pileus darker than above – brownish-orange, yellowish-brown or dark brown, often with lighter colored margin

Fruit bodies small or slender and fragile, pileus 10-30 mm, conical but lacking any prominent umbo, stipe 15-55 x 1-3 (-5) mm

Lamellae tinged olivaceous, odor of green corn, pileus yellowish-brown shading isabelline towards the margin, long-rimose, under *Quercus* or in *Quercus-Carya* forests, southeast U.S.

**I. perparva Stuntz ex Matheny, nom. prov.**

Lamellae without olivaceous tones; odor of green corn or none, pileus color, surface, and habitat various  
Odor of green corn, pileus dark brown to dark grayish brown at the center, shading brown towards the margin, long-rimose, under *Quercus*, *Carya*, *Fagus*, Louisiana

**I. actinocephala Stuntz ex Matheny, nom. prov.**

Odor none, pileus not as dark towards the margin as above, plant associates and distribution various  
Odor none, pileus dark brown shading to *fulvous and brownish yellow* towards the margin, *weakly rimose*, spores 10-11 x 6-5.5  $\mu\text{m}$ , in low elevation woods under *Fagus*, *Quercus*, and *Pinus*, east Texas

**I. brunneicothurnata Stuntz ex Matheny, nom. prov.**

Odor none, pileus center brown (umbrinous) shading to isabelline towards the margin, rimose, spores 11-13 x 5.5-7  $\mu\text{m}$ , at high elevations under *Betula* and *Abies-Picea*, Tennessee-North Carolina

**I. sp. PBM2601** (close to *I. perparva* but differing by the lack of an odor and habitat)

Odor none, pileus brownish-orange to pale brown, rimose, spores 12-13 x 5.5-6.5  $\mu\text{m}$  (“with a narrow germ pore”), in tropical rainforest, Yucantan Peninsula, Mexico

**I. tropicalis Guzmán**

Fruit bodies larger than above, pileus 20-70 mm, stipe 50-80 x 4-10 mm

Pileus very dark brown to dark brown at the center, with acute to obtuse umbo, shading to brown or yellowish-brown towards the margin, long-rimose; lamellae light gray to brown, medium; odor none; cheilocystidia fusiform or clavate, under *Quercus*, Tennessee-Virginia and Costa Rica (low-elevation)

**I. umbrinella Bres. sensu Kauffman** (the American version of *I. perlata* (Cooke) Sacc.)

Pileus mostly yellowish to yellowish brown

Pileus dull yellow-ocher to rich yellowish-fusoid, at times bister at the center or pale, odor ‘strong and disagreeable’ (spermatocytic most likely), lamellae narrow, whitish but then tinged olivaceous; spores 9-12 x 5-6  $\mu\text{m}$ , cheilocystidia saccate, “in woods”, widespread

**I. fastigiata (Schaeff.) Quél. sensu Kauffman** (Kauffman’s concept likely was broad)

Similar to *I. fastigiata sensu Kauffman*, odor strongly spermatocytic, lamellae olivaceous and narrow; but spores somewhat larger – 11-13 x 6-6.5  $\mu\text{m}$ ; cheilocystidia cylindrical, fusiform, or clavate, under hardwoods *Quercus*, *Fagus*, *Betula* mixed with *Pinus strobus*, New England

**I. parafastigiata D.E. Stuntz ex Matheny, nom. prov.**

Similar to *I. parafastigiata* (spore size) but without any odor, under *Populus deltoides*, Oklahoma

**I. sp. CO4124**

**Spores smooth, yellowish-brown, and pleurocystidia present**

Stipe pruinose at the apex only or not at all

Pileus and stipe white

Fruit bodies turning red after bruising or drying, robust

**I. pudica** (Syn. *I. geophylla* var. *lateritia* (Berk. & Br.) W.G. Sm., *I. geophylla* f. *perplexa* Kauffman)

Fruit bodies not turning red after bruising or drying, slender

**I. geophylla (Bull.: Fr.) P. Kumm sensu lato**

Pileus convex... **convex form**

Pileus papillate... **umbonate form**

Pileus and stipe not white

Pileus tinged violaceous in youth, otherwise mouse-gray to dark brown, scaly; lamellae violaceous in youth, stipe apex with violaceous tinges

**I. cincinnata (Fr.: Fr.) Quél. sensu Kauffman** (cf. *I. violaceifolia* Peck described with grayish pileus only and white to whitish stipe but with violet lamellae in youth)

Pileus and/or stipe lilac to violaceous or with lilac or pinkish-lavender tinges, *not* scaly; lamellae *not* violaceous in youth

Pileus and stipe lilac or violaceous, odor spermatocytic

**I. lilacina (Peck) Kauffman**

Pileus *not* lilac or violaceous, stipe with lilac or pinkish-lavender tinges at the apex

Odor of *Pelargonium*, not spermatic

Pileus yellowish brown

**I. griseolilacina J.E. Lange**

Pileus reddish brown with pale brown margin

**I. personata Kühner**

Odor spermatic or *not* like *Pelargonium*

Pileus pale ochraceous, stipe apex violet but finely white velutinous elsewhere, base with a membranous volva

**I. violacealbipes G.F. Atk.**

Pileus dark brown to brown or fuscous

Pileus and stipe brown, *not* virgate, at times subscaly; stipe fibrillose; spores >11 µm long and minimally angular

**I. lacera (Fr.: Fr.) P. Kumm.** (Syn. *I. euthellella* Peck, form with a slight violet stipe apex)

Pileus dark brown to brown, *not* virgate (without radiating stripes); stipe with scattered brown fibrils against a lighter ground color; spores <11 µm long

**I. cinnatula Kühner** (cf. *I. retipes* G.F. Atk., *non* Singer)

Pileus fuscous, virgate; stipe with fuscous peronate sheath of fibrils; spores <11 µm long

**I. fusciothurnata Grund & D.E. Stuntz** (*I. virgata* the same but without the lilac stipe apex)

Pileus and stipe without lilac tinges

Pileus *and* stipe squarrose, squamulose, or floccose-squamulose

Scales brown

Pileus and stipe squarrose, spores <11 µm long and amygdaliform, in forests

**I. hystrix (Fr.) P. Karst.** (a Costa Rican report is a darker independent species, under high-elevation *Quercus*)

Pileus squamulose or squarrose, stipe floccose-scaly (other forms merely densely fibrillose), spores >11 µm long and fusiform or 'boletoid', along roadsides or in disturbed areas

**I. lacera (Fr.: Fr.) P. Kumm.** (Syn. *I. infelix* (Peck) Peck, *I. infelix* var. *brevipes* Peck?)

Scales whitish or bright ochraceous, *not* brown

Scales whitish against dull yellowish or dull ochre background, hymenial cystidia hyaline in KOH

**I. griseoscabrosa (Peck) Earle**

Scales and ground color bright ochraceous, hymenial cystidia bright yellow in KOH

**I. subochracea (Peck) Peck** (Syn. *I. subochracea* var. *burtii* Peck, which was described to accommodate a variety with a more conspicuous cortina, longer stipe, and more heavily fibrillose pileus margin and stipe surface)

Pileus squamulose, squarrose, floccose, or fibrillose *but* stipe *not* scaly

Pileus squarrose, squamulose, or floccose

Pileus *and* stipe bright yellow-ochre (or ochre and tawny), pleurocystidia *bright yellow* in KOH

**I. subochracea (Peck) Peck** (Syn. *I. subochracea* var. *burtii* Peck, see above for details)

Pileus and stipe *not* bright yellow-ochre, pleurocystidia hyaline or with yellowish contents in KOH

Pileus pale ochraceous, ochraceous-tawny, yellow, or warm buff; stipe similarly colored or pale yellow

Lamellae eventually olivaceous-brown, spores 9-10 x 4-5 µm

Cystidia 40-63 x 10-15 µm, hyaline

**I. submuricellata var. stenospermina Grund & D.E. Stuntz**

Cystidia 30-40 x 8-11 µm (color not indicated)

**I. cylindrocystis Murrill** (cf. *I. cryptocystis* D.E. Stuntz, which differs by the presence of a bulbous stipe base and fibrillose pileus)

Lamellae *not* olivaceous or pale yellow, spores larger or more broad

Lamellae white to brown, spores 8-9.5 x 5-5.5 µm, cystidia 60-90 x 12-15 µm, often with yellowish content

**I. ochraceomarginata Kuuffman** (similar to *I. microteroxantha* Grund & D.E. Stuntz but lacking caulocystidia below stipe center)

Lamellae pale yellow, spores mostly 10-11 x 5-6 µm, cystidia 50-70 x 10-15 µm, hyaline

**I. submuricellata var. submuricellata G.F. Atk.**

Pileus darker than above (or lamellae and flesh *reddening*), stipe *not* ochraceous or yellow

Odor sweet-aromatic (like Matsutake) or like green corn (“meal” or “cornsilks”)

Pileus yellow-ochre or raw sienna, stipe lighter in color, flesh and lamellae reddening, ecology not clear (“in mixed woods”), odor of green corn

**I. rubellipes G.F. Atk.**

Pileus dark brown at the center, yellowish-brown towards the margin, overlain with pallid superficial fibrils, stipe white, flesh and lamellae reddening, odor aromatic (like Matsutake), in hardwoods mixed with *Tsuga*

**I. fraudans (Britzelm.) Sacc. (Syn. *I. pyriodora* (Pers.: Fr.) P. Kumm. *sensu* Am. auct.)**

Pileus uniformly dark brown or bister, stipe paler brown – pale umbrinous to cinnamon-buff, flesh *not* reddening, odor aromatic, under *Picea*

**I. scabra (O.F. Müll.) Quél. *sensu* Grund & D.E. Stuntz (*sensu* J.E. Lange, M.M. Moser)**

Odor spermatic or not remarkable

Stipe base or lower part of stipe dark brown or becoming so

Pileus fibrillose-scaly with small pointed tips, up to 20 mm wide; spores with mean Q-value >2.0, cylindrical, fusiform or ‘boletoid’, pleurocystidia predominantly thick-walled or slightly thick-walled, some apices acute... **I. lacera (Fr.: Fr.) P. Kumm. and varieties (Syn. *I. infelix* (Peck) Peck)**

Spores 11-12.5 x 4.5-5 µm, near *Fagus*, *Betula*, Nova Scotia

**I. lacera f. subsquarrosa F.H. Møller**

Spores 12-13.5 x 5.5-6 µm, edge of flatwoods pond (under *Pinus?*), Florida

**I. sublongipes Muriill (cf. *I. gigantispora* Murrill, spores 11-16 x 5-6 µm, under *Quercus*, Florida)**

Spores extremely variable in size and shape, in roadside gravel, Nova Scotia

**I. lacera var. heterosperma Grund D.E. Stuntz**

Pileus appressed fibrillose-scaly, 20-65 mm wide; spores with mean Q-value <2.0, amygdaliform, pleurocystidia thin-walled, apices not acute

**I. melanopus D.E. Stuntz (orth. variant *I. melanopoda*)**

Stipe base *not* darker than rest of the stipe

Fruit bodies very small (pileus <15 mm, stipe 13-25 x 1-2 mm) and pileus dark reddish brown to red-brown or dull umber

**I. minima Peck, *non* Killerm.**

Fruit bodies larger than above (pileus >15 mm, stipe >25 x 1-2 mm) and pileus not colored as above

Pileus with coarse recurved scales and low umbo, spores >11 µm long, in sand, Greenland

**I. ursinella M. Lange**

Pileus lacking coarse recurved scales, or, if squarrose, then with small acute umbo, spores <11 µm long, in temperate forests

Pileus without an umbo, pallid at first becoming a dingy straw color or pale brown, in temperate forests, Michigan to Tennessee

**I. melanopus D.E. Stuntz (orth. variant *I. melanopoda*)**

Pileus obtusely umbonate, disc brown and shading to yellowish or warm buff towards the margin; stipe apex white, elsewhere yellow (walls of cystidia yellow in KOH), temperate

**I. flocculosa Sacc. (Syn. *I. stuntzii* Grund; cf. *I. excoriata* Peck with lacerate-excoriate pileus surface and white stipe, New England and New York; cf. *I. abjecta* (P. Karst. Sacc. *sensu* Grund & Stuntz, which differs by its grayish-umber pileus that is mostly fibrillose and hyaline cystidia)**

Pileus with a mammilate or papillate umbo, brown or dull dark brown; stipe pallid or white, walls of cystidia *not* distinctly yellow in KOH (but may be brown)

Pileus squarrose, lamellae edges *brown*, under *Quercus*, lowland Costa Rica, tropical

**I. plocamophora Singer**

Pileus appressed-squamulose or with slightly upraised tips towards the margin, lamellae edges *white*, under conifers or *Corylus*, north temperate

**I. gausapata Kühner** (spores mostly 8-9 x 5-6  $\mu\text{m}$ , walls of pleurocystidia 3-4  $\mu\text{m}$  thick, under *Tsuga*, Nova Scotia)

**I. pallidipes Ellis & Everh.** (spores somewhat longer and narrower than in *I. gausapata*, walls of pleurocystidia 4-7  $\mu\text{m}$  thick; note that the protologue does *not* mention a mammilate umbo; under *Corylus*, New Jersey)

Fruit bodies not very small (pileus 15-20 mm, stipe 15 x 3-5 mm) and pileus bister or dark brown to dark yellowish brown, margin splitting (stipe pale rosy-isabelline)

**I. striatiformis Murrill**

Pileus fibrillose

Pileus with green or glaucous tones, stipe base becoming green where cut, odor aromatic

**I. corydalina Qué.**

Pileus lacking green tones, stipe base *not* becoming green, odor different

Pileus whitish, yellowish, or yellow-ochre, pleurocystidia *often* short (<50  $\mu\text{m}$  long)

Pileus whitish

Pileus whitish, dry, margin without veil remnants, lamellae *not* purplish, stipe even, on soil, New York

**I. sambucella G.F. Atk.**

Pileus pearly-white with a yellowish umbo, margin appendiculate with veil remnants, lamellae with a purplish tint, on dead wood, Xalapa (Mexico)

**I. jalapensis Murrill**

Pileus yellow, viscid (with adhering dirt particles), margin without veil remnants, stipe even (pleurocystidia up to 65  $\mu\text{m}$ )

**I. hebelomoides Murrill, non Kühner**

Pileus pale yellow, cream-buff, or yellow-ochre, dry, stipe clavate with a bulbous base or with a napiform bulb

Stipe with a napiform bulb, pale yellow shading downward to dull brown, pleurocystidia very short (mostly 30-40 x 12-13  $\mu\text{m}$ ), in mixed woods of *Fagus* and *Tsuga*

**I. cryptocystis D.E. Stuntz** (cf. *I. cylindrocystis* Murrill but with numerous small fibrillose-scales towards the margin)

Stipe clavately-bulbous, pallid, pleurocystidia larger than above (mostly 45-50 x 13-17  $\mu\text{m}$ ), under conifers

Pileus pale yellow, cystidia thick-walled, odor spermatic

**I. pallidicremea Grund & D.E. Stuntz**

Pileus yellow-ochre, cystidia predominately thin-walled (some also thick), odor "farinaceous"

**I. connexa Kauffman**

Pileus tawny, brown, red-brown, dark brown, or fuscous, pleurocystidia *not* short (>50  $\mu\text{m}$  long)

Fibrils on pileus and lower part of stipe agglutinated *and* spores ovate-elliptic

Pileus and lower part of stipe pale-tawny or fulvous

**I. agglutinata Peck** (Syn. *I. geophylla* var. *fulva* (Pat.) Sacc. *sensu* Perez Silva?)

Pileus and lower part of stipe fuscous

**I. fuscodisca (Peck) Masee** (spore apices bluntly pointed, occ. obtuse; cf. *I. virgata* G.F. Atk.)

Fibrils on pileus and lower part of stipe *not* agglutinated, spores elliptic, cylindrical, or amygdaliform

Pleurocystidia thin-walled and pileus some shade of red-brown

Fruit bodies more robust than below; stipe 30-60 x 2-6 mm, pallid or tinged dingy pinkish; spores 7-10 x 5-6  $\mu\text{m}$ , in hardwood stands or mixed stands

**I. leptocystis G.F. Atk.**

Fruit bodies more slender than above; stipe 15-60 x 0.5-3 mm, pinkish; spores 9.5-12 x 5-6  $\mu\text{m}$ , in swampy areas under hardwoods

**I. rufidula Kauffman**

Pleurocystidia slightly thick-walled (0-1.5  $\mu\text{m}$ ) or thick-walled (>1.5  $\mu\text{m}$ )

Pileus very dark brown, bister, or sepia

Pileus streaked very dark brown, similar to lower part of stipe

**I. virgata G.F. Atk.** (similar to *I. fuscicothurnata* Grund & D.E. Stuntz but without the lilac apex; *I. striatiformis* Murrill has stiff upturned fibrils on pileus and pale rosy-isabelline stipe)

Pileus and stipe not as above

Spores 10.5-14.5 x 4.5-5.5 µm, narrowly cylindrical or with slight irregular outline (similar to *I. lacera*), pileus context whitish but turning slightly reddish brown, velipellis present, stout overall, under *Salix* or *Populus*, Greenland and Montana

**I. longispora M. Lange**

Spores <11 µm, amygdaliform, fruit bodies *not* stout, velipellis present or absent, stipe surface and context rubescent or not, under conifers or *Fagus*

Stipe with faint pinkish floccules that *become red* where handled, context slightly *rubescent*; pileus with a dingy brown velipellis; spores 7-9 x 5-6 µm; under *Picea*, Nova Scotia

**I. erythrospilota Grund & D.E. Stuntz** (original spelling 'erythospilota')

Stipe *and* context *not* rubescent, velipellis absent; spores mostly 9-11 x 6 µm, under conifers or *Fagus*

**I. nemorosa (R. Heim) Grund & D.E. Stuntz** (cf. *I. pseudodestructa* Stangl & J. Veselský)

Pileus red-brown, dark reddish brown or lighter than above – brown (umbrinous), grayish brown, isabelline, or bicolorous

Pileus bicolorous – tawny at the center, dull yellow towards the margin

**I. semifulva Grund & D.E. Stuntz**

Pileus red-brown or dark reddish-brown

Pileus 10-20 mm, dark reddish brown, silky fibrillose; lamellae brown tinged olive; stipe base *bulbous* (12 mm), brownish incarnate; spores 7-9.5 x 4.5-5.5 µm; pleurocystidia thin-walled (0.5-1.5 µm), in mixed hardwoods and conifers, Nova Scotia

**I. obscurobadia (J. Favre) Grund & D.E. Stuntz sensu Grund & D.E. Stuntz** (*I. furfurea sensu* Favre from Europe is similar but has an entirely pruinose stipe)

Pileus 30-50 mm, red-brown, surface at length somewhat lacerate or excoriate; lamellae white to brownish-gray or avellaneous; stipe even, *not* bulbous, white or whitish; spores 7-9 x 4.5-5.5 µm; pleurocystidia thick-walled, hyaline, "in ground in woods", Mass. and New York

**I. excoriata Peck** (cf. *I. rimosa* (Bull.: Fr.) P. Kumm. *sensu* Kauffman but with spores 9-11 x 4.5-6 µm, New York)

Pileus 25-40 mm, brown (dark brown) to reddish brown, with patches of grayish velipellis, *not rimose*, at times slightly scaly around the center; lamellae without olivaceous tones; stipe even, whitish to pale yellowish buff, at times with pinkish tints at the apex, spores 9-11 x 5.5-6.5 µm, cystidia thick-walled; under hardwoods and conifers, New York (based on PBM2442)

**I. griseovelata Kühner** (cf. *I. rimosa sensu* Kauffman with similar spores, also New York but with rimose pileus and subbulbous stipe base)

Pileus umbrinous, grayish brown, yellowish brown, or isabelline

Odor none, spores small – 6-7 x 4 µm, under *Quercus*, Florida

**I. glabripes Ricken** (Syn. *I. parvispora* Murrill)

Odor often spermatic, spores larger than above, plant associates various

Spores 9.5-11.5 x 4-4.5 µm, narrowly oblong-elliptical or fusiform (like *I. lacera*), mean Q: 2.5

**I. cylindrospora Murrill** (on a lawn under *Pinus palustris*, Florida)

Spores not as long and narrow as above, often amygdaliform, mean Q < 2.0

Spores 7-9.5 x 4.5-5 µm; pileus grayish-umber with a pallid persistent velipellis, the margin with few broad flat scales; in woods including *Tsuga*, Nova Scotia

**I. abjecta P. Karst. sensu J. Lange, Kühner, non P. Karst** (= *I. flocculosa sensu* Kuyper 1986)

Spores 8.5-10 x 4.5-5 µm, pileus uniformly isabelline, velipellis absent, under *Pinus*, Florida

**I. praenucleata Murrill**

Spores 9-10 x 5-5.5 µm, pileus uniformly umbrinous (tawny-olive) to cinnamon, velipellis absent, under hardwoods, northeast North America



**I. pallidobrunnea Kauffman**

Spores >10 µm, pileus umbrinous, without a velipellis, stipe with pinkish tinges

Pileus shiny, stipe 4-5 mm diam, spores 9-11 x 4.5-5.5 µm

**I. substricta Kauffman** (cf. *I. griseovelata* Kühner with distinct grayish velipellis and wider spores)

Pileus dull, stipe <4 mm diam, spores 9-12.5 x 5.5-6 µm

**I. descissa var. macrospora R. Heim sensu D.E. Stuntz**

Stipe pruinose below the stipe center

Fruit bodies reddening

Stipe even, not bulbous; under *Quercus*, Florida

**I. roseifolia Murrill**

Stipe bulbous, base a distinct marginate bulb; under conifers, Michigan

**I. godeyi Gillet sensu D.E. Stuntz** (in Europe *I. godeyi* occurs under hardwoods)

Fruit bodies *not* reddening

Fruit bodies very small (pileus <10 mm), pileus with whitish or grayish strigose hairs

**I. comatella (Peck) Sacc.** (Syn. *I. agordina* Bizio)

Fruit bodies larger than above, pileus without strigose hairs

Lower part of stipe fuscescent (becoming sepia or very dark brown)

Young lamellae yellow, pileus warm reddish brown on the disc

**I. luteifolia A.H. Sm.**

Young lamellae white, pileus sepia on the disc

**I. tenebrosa Qué.** (Syn. *I. atripes* G.F. Atk.)

Lower part of stipe *not* fuscescent (occasionally brunnescent)

Odor of bitter almonds

**I. hirtella Bres.**

Odor not as above

Fruit bodies robust, pileus up to 60-70 mm wide, stipe (3-) 5-10-15 mm wide

Pileus *viscid* when moist, pale clay brown but darker at the center; stipe 10-12.5 mm wide, white; spores 9-12 x 5-6 µm, New York

**I. olpidiocyctis G.F. Atk.**

Pileus *dry* or with persistent sand grains attached

Pileus whitish tinged brownish at center, yellowish towards margin; stipe 6-15 mm wide, white; spores *large* (10-16 x 6-8 µm), on sandy shores, sand dunes (cf. *I. vulpinella* below)

**I. serotina Peck** (Syn. *I. bulbosa* Peck, *I. ammophila* G.F. Atk., *non* Hongo & Matsuda; cf. *I. praefarinacea* Murrill under *Quercus*, Florida)

Pileus colored different than above *or* spores smaller (7-11 x 5-6 µm), in forests or under trees

Pileus uniformly brown or orange brown towards the margin

Pileus dry, uniformly brown (umbrinous) or somewhat darker at the center, stipe 5-8 mm wide, white or pallid, at times flushed with yellow tones; spores 8-11 x 5-6 µm; in mixed woods often under *Picea*, Nova Scotia

**I. phaeoleuca Kühner**

Pileus with adhering sand grains, brown to dark brown around the center, orange brown to ochraceous-brown towards margin, coarsely tomentose-fibrillose with initial grayish cobwebby velipellis; stipe 20-75 x 2-9 mm, clavate to submarginately bulbous, yellowish brown to orange brown above, dark brown above the base, bulb white; spores 12-18 x 7-9 µm; in sand dunes or woods under *Salix*, *Populus* (Europe), or on mine wastes, Ontario

**I. vulpinella Bruyl.** (Syn. *I. immigrans* Malloch but less brightly colored than samples from Europe; cf. *I. similis* Bres., which differs by presence of a cortina and with caulocystidia restricted to the stipe apex).

Pileus lighter in color than above, at least when young

Pileus whitish at first, becoming straw yellow to dingy ochre with age, at first floccose-fibrillose; stipe 4-9 mm wide, white or whitish with a submarginate bulb; spores 8-10 x 5-6 µm,

pleurocystidia 60-80 x 15-20  $\mu\text{m}$ , in forests under conifers or hardwoods, throughout eastern states

***I. sindonia* (Fr.) P. Karst. *sensu* Kauffman**

Pleurocystidia shorter than above

Pileus cream to chamois or isabelline, fibrillose-scaly becoming long-rimose; stipe more or less equal or enlarged toward the base, 4-10 mm wide, same color as the pileus or paler; spores 8-10 (-12) x 5-6  $\mu\text{m}$ ; pleurocystidia 45-50 x 12-16  $\mu\text{m}$ , in coniferous woods, Michigan (also western states)

***I. kauffmani* A.H. Sm. (Syn. *I. longipes* Kauffman)**

Pileus dull whitish to pinkish-buff at first or tinged cinereous, becoming cinnamon-buff to clay color, occasionally darker and more tawny, stipe 3-8 mm wide, white turning sordid brownish below with a subbulbous base; spores 7-9 x 5-6  $\mu\text{m}$ , pleurocystidia short (<50  $\mu\text{m}$  long), under *Picea*

***I. langei* R. Heim *sensu* A.H. Sm.**

Fruit bodies *not* robust, pileus up to 35-45 (-50) mm wide, stipe up to 6 mm wide

Pileus brown (umbrinous) or reddish brown, often darker at the center

Spores 11-13 x 7.5-9  $\mu\text{m}$ , noticeably thick-walled, stipe whitish at apex and at the base but yellowish-brown elsewhere, odor indistinct, in alpine zone under *Dryas*, *Salix* (known only from arctic areas of North America)

***I. ohenojae* Vauras & E. Larss.**

Spores <10  $\mu\text{m}$  long or <7  $\mu\text{m}$  wide, *not* noticeably thick-walled, stipe cinnamon brown or incarnate, more widespread than above and also in southerly regions

Pileus dark brown at the center, brown elsewhere *not* hygrophanous; stipe pale cinnamon-brown, even, odor spermatic, spores mostly 8-9 x 5-5.5  $\mu\text{m}$ ; in sandy soil under conifers, Nova Scotia (also Washington)

***I. brunneolipes* Grund & D.E. Stuntz**

Pileus chestnut-brown (reddish brown), diffracted-scaly at the margin, *not* hygrophanous, stipe white at apex, tinged rufous elsewhere, base subbulbous or marginate; odor none or faintly spermatic; spores 6-7 x 5-6  $\mu\text{m}$ , ovate to subglobose; in hardwoods, Michigan and New York (spores reported by Kauffman 1924 are slightly wider than by Kuyper 1986)

***I. albomarginata* Veln. (Syn. *I. ovalispora* Kauffman)**

Pileus dark brown at the center, elsewhere reddish brown to dingy yellowish-brown, at times uniformly reddish brown, *hygrophanous* in appearance; stipe incarnate, equal or (sub)bulbous; odor none or faintly spermatic; spores 9-11.5 x 5.5-7  $\mu\text{m}$ ; in mixed hardwood forests or under *Salix* in arctic-alpine, Michigan, Canada, Greenland (also in western montane conifer forests and alpine areas under conifers or *Salix*)

***I. leiocephala* D.E. Stuntz (cf. *I. subbrunea* Kühner under western conifers, Wyoming to Mexico, spores with obtuse apices; cf. *I. brunnea* Quél. *sensu* Perez Silva, Mexico)**

Pileus tawny, yellowish brown, isabelline, or dull honey color

Fruit bodies short and stout (pileus 30-35 mm, stipe 25 x 7 mm), pileus isabelline and stipe white, spores >10  $\mu\text{m}$  long, Florida

***I. subconnexa* Murrill**

Fruit bodies *not* short and stout

Velipellis absent, center fulvous (tawny), margin yellow, odor faintly spermatic or none, under hardwoods or mixture of hardwoods and conifers

***I. microteroxantha* Grund & D.E. Stuntz (close to *I. ochraceomarginata* Kauffman but the latter is pruinose only at apex of stipe)**

Velipellis present, odor strongly of green corn or spermatic, under conifers

Odor strongly spermatic, lamellae dull yellowish brown with olivaceous tinge, stipe pale dull yellow

***I. chalcodoxantha* Grund & D.E. Stuntz**

Odor strong of green corn but becoming spermatic, lamellae grayish pallid with faint yellowish cast, becoming darker brown, stipe pallid or with slight tinge of brown

**I. melleiconica Grund & D.E. Stuntz**

**Spores angular, nodulose, stellate, or spinose and yellowish brown; pleurocystidia present** (but see *I. leptophylla*)

Stipe pruinose at the apex only *or* not at all (caulocystidia, if present, restricted to stipe apex)

Pileus *and* stipe squarrose to squamulose or fibrillose-scaly to floccose-scaly

Pileus dark grayish-olive or fuscous-olivaceous, in degraded xerophytic forest, Guadeloupe

**I. viridumbonata Pegler**

Pileus reddish brown, dark purplish-fuscous, brown, or dark brown, in temperate or boreal forests, widespread

Fruit bodies red to reddish brown *or* dark purplish-fuscous, at least some spores cruciate

Fruit bodies red to reddish brown, under *Abies* in spruce-fir zone, North Carolina

**I. carolinensis Mathenuy, nom. prov.**

Fruit bodies dark purplish-fuscous, in mixed hardwood forests throughout eastern North America

**I. tahquamenonensis D. E. Stuntz** (Syn. *I. stellatospora* (Peck) Masee *sensu* Kauffman, *non* Peck)

Fruit bodies dark brown to brown

In *Sphagnum* under conifers, spores 10-12.5 x 7.5-10 µm, coarsely nodulose about an elliptic outline with 11-20 nodules; Great Lakes region

**I. teraturgus M.M. Moser**

On soil or rotten wood in coniferous forests; if spores as large as above, then pleurocystidia absent, more widespread than above

Pleurocystidia absent, on rotten wood, spores >10 µm long

**I. leptophylla G.F. Atk.** (Syn. *I. leptophylla* var. *cystomarginata* G.F. Atk., *I. casimiri* Velen.)

Pleurocystidia present, on soil or rotten wood, on soil, spores <10 µm long

Fruit bodies small, pileus 7-13 mm wide, stipe 10-30 x 1-2 mm, spores weakly nodulose

**I. diminuta Peck**

Fruit bodies medium, larger than above; spores with 8-14 distinct nodules

Pleurocystidia thin-walled and elongate (>50 µm long)

**I. stellatospora (Peck) Masee** (Syn. *I. longicystis* G.F. Atk., *I. lanuginosa* (Bull.: Fr.) P. Kumm. *sensu* Euro. auct., *non* Kauffman)

Pleurocystidia thick-walled and short-obovate to pyriform (<50 µm long)

**I. lanuginosa (Bull.: Fr.) P. Kumm. sensu Amer. auct.** (Syn. *I. nodulospora* (Peck) Sacc., *I. ovatocystis* Boursier & Kühner, *non* Perez Silva)

Pileus fibrillose or scaly, stipe not scaly

Young lamellae and/or stipe grayish-lavender, fruit bodies small

Pileus 8-10 mm, obtusely umbonate, squarrose at the center, uniformly reddish umber, lamellae at first grayish lavender becoming pale grayish olivaceous beige; stipe 20 x 1-1.5 mm, grayish lavender, spores 8-10 x 6-7 µm with about 7-8 prominent obtuse nodules; on soil under *Betula*, *Fagus*, Nova Scotia, temperate

**I. fulvella Bres. sensu Grund & D.E. Stuntz** (*non* D.E. Stuntz 1947)

Pileus 15-17 mm, with small papillate umbo, reddish brown (Mars Brown), appressed fibrillose-squamulose, lamellae light violet gray becoming grayish-ocher; stipe 27-30 x 2.5-4 mm, robust, pale buff becoming brown below; spores 8.5-11.5 x 6-7.5 µm, ovate with 11-14 small nodules; in xerophytic forest, Guadeloupe, Caribbean Basin

**I. ianthinofolia Pegler**

Young lamellae or stipe *not* grayish-lavender, fruit body size various

On logs or rotten wood, pileus hygrophaneous

**I. tubarioides G.F. Atk.**

On soil, pileus *not* hygrophaneous

Spores mostly oblong and smooth to irregular in outline, 12-15.5 x 4.5-6.5 µm, some with a few basal nodules, under *Pinus*

**I. texensis Thiers**

Spores distinctly nodulose, shorter than above, habitat various

Stipe base distinctly bulbous

Pileus with a prominent acute umbo, spores 6-8 x 4-6 µm, nodules not very distinct, “on ground in woods”

**I. prominens Kauffman** (Syn. *I. umboninota* Peck 1910, *non* 1885 (type); *I. prominens* f. *longistriata* Kauffman)

Pileus with an obtuse umbo, if present, on ground under conifers

Stipe base napiform, spores 8-10.5 x 6-7.5 µm, angular-nodulose with 6-10 coarse nodules, under *Tsuga*

**I. napipes J.E. Lange**

Stipe base marginate, spores 7-9.5 µm in diam, subquadrate, subtrianangular or subrectangular to subglobose, with coarse obtuse nodules, in coniferous woods (e.g., *Abies*)

**I. nodulosa Kauffman**

Stipe base with an ovate bulb, spores 6-9 x 5-6 µm, coarsely nodulose about a globose to elliptic outline, under *Pinus* or in mixed woods, Florida

**I. subnodulosa Murrill**

Stipe even or swollen below, base not distinctly bulbous

Pileus and stipe yellow; spores somewhat angular-nodulose, 6-9 x 5-6 µm; cystidia mostly thin-walled, less often -1.5 or 2 µm thick, in hardwood or mixed forests, Nova Scotia and New York

**I. ventricosa G.F. Atk.**

Pileus pinkish buff (light ochraceous-salmon) with a brownish center, stipe pale brown to almost white at the base (subbulbous but not marginate), spores 8-10 x 6.5-8 µm with 10-14 nodules, in degraded xerophytic forest, Guadeloupe, Caribbean Basin

**I. paralanuginosa Pegler**

Pileus vivid reddish brown (Sanford’s Brown), lamellae ochraceous-orange, apricot-buff or ochraceous-tawny, stipe pinkish to light orange, base enlarged but not bulbous or marginate; spores 6.5-8 x 4-5.5 µm with 10-12 nodules, in woods under *Quercus* and *Coccoloba*, Florida to lowland Costa Rica

**I. neotropicalis Singer**

Pileus dark brown, reddish brown, brown, or grayish brown, stipe *not* yellow or light orange; spores various; arctic, boreal, or temperate in distribution, widespread

Pileus reddish brown at the center, paler towards the margin

Pileus with a low or mammilate umbo, lamellae tinged olivaceous, stipe often pale brown; spores 8-9.5 x 5.5-6.5 µm, polyhedral with 7-10 coarse nodules; mostly with *Picea*, *Betula*, boreal to arctic

**I. borealis J.E. Lange** (Syn. *I. heterochrominea* Grund & D.E. Stuntz)

Pileus with prominent conical umbo, lamellae pallid to brownish, stipe white; spores angular, 7-9 x 4-5 µm; under *Quercus*, Florida

**I. subprominens Murrill**

Pileus dark brown, brown, or grayish brown

Pileus dark brown with an acute umbo (pale brown at margin)

Spores 8-11 x 5.5-7.5 µm, mostly 9-10 x 6.5 µm, angular or irregular in outline, at times pointed apically, typically with 6-10 small nodules, under *Tsuga* (under *Salix* in northern Europe)

**I. acuta Boud.** (cf. *I. bufonia* Kokkonen & Vauras with equal to subbulbous stipe base and spores, 7.5-10 x 5.5-7 µm, polyhedral with mostly 7-10 moderate-sized nodules, under *Betula* (*Picea*), Quebec, British Columbia)

Spores 9-12 x 6.5-9 µm, mostly 11-12 x 7-8 µm, polygonal-nodulose with 10-15 very prominent nodules (“star-shaped” per Esteve-Raventós 1987), “mossy ground in woods”

**I. umboninota (Peck) Sacc. sensu Peck 1885, non Peck 1910**

Pileus with a low obtuse umbo or *not* umbonate

Pileus scaly (squamose or squarrose)

Pileus squarrose to squamose at the center, dark umbrinous or sepia; stipe slightly bulbous, with pallid fibrils over dark brown ground color; spores 6.5-10 x 4.5-5 µm, irregularly polygonal with few nodules; pleurocystidia without a long slender pedicel, apices rounded to obtuse; under *Picea*, *Tsuga*

**I. maritimoides (Peck) Sacc.**

Pileus often scaly at the center or appressed-scaly throughout, umbrinous or tawny; stipe even, pallid above, brown below, spores 9-12 x 5-6.5  $\mu\text{m}$ , trapeziform with 6-10 moderate to small nodules, pleurocystidia with long slender basal pedicel and subacute apices, often under hardwoods or *Pinus*

**I. curvipes P. Karst.** (Syn. *I. decipientoides* Peck, *I. radiata* Peck, *I. astoriana* Murrill, *I. jamaicaensis* Murrill, *I. ochraceoscabra* G.F. Atk.; *I. rennyi* (Berk. & Broome) Sacc. is an unusually elongated spored form)

Pileus fibrillose, not scaly

Spores >10  $\mu\text{m}$  long

Pileus bicolorous with a very dark brown (bister to sepia) center, brown towards the margin; spores 9-13 x 7-11  $\mu\text{m}$ , substellate; in forests under *Picea*, *Abies*, *Tsuga*, *Betula*

**I. pseudoasterospora Kühner & Boursier**

Pileus uniformly grayish brown; spores 8.5-11.5 x 5.5-8  $\mu\text{m}$ , type on gravelly ground in open fields, New Jersey, reported from Spain under *Quercus*

**I. cicatricata Ellis & Everh.**

Spores <10  $\mu\text{m}$  long

Pileus with a thin felty brown superficial layer, not rimose, odor aromatic, stipe even (not bulbous), spores 6.5-9 x 4.5-6  $\mu\text{m}$ , angular-nodulose with 4-7 large nodules, under *Picea*

**I. parcecoacta Grund & D.E. Stuntz** (*I. subcarpta* Kühner & Boursier is somewhat similar but has a squamulose pileus, no distinctive odor, and somewhat larger and much more nodulose spores)

Pileus without a thin felty brown superficial layer, rimose, odor *not* aromatic, stipe swollen or subbulbous, spores 7-10 x 5.5-8  $\mu\text{m}$  with 8-12 small but distinct nodules, under conifers

**I. assimilata Britzelm.** (Syn. *I. umbrina* Bres, *non* Masee, *I. castaneoides* Peck)

Stipe pruinose below the stipe center or with caulocystidia and cauloparacystidia present below the stipe center

Stipe even or tapered downward

Spores globose or elliptic with bifid or multicoronate saddle-shaped nodules *or* spinose

Spores globose to elliptic with numerous blunt, wedge-shaped, or truncate nodules, these often bifid or saddle-shaped *or* multicoronate

Spores 12-14.5 x 10-12  $\mu\text{m}$ , nodules multicoronate, cheilocystidia metuloid (thin-walled per the protologue), under *Picea*, Nova Scotia, boreal

**I. multicoronta A.H. Sm.**

Spores 8-10.5 x 7-9  $\mu\text{m}$ , nodules bifid, wedge-shaped or crested, cheilocystidia thin-walled, under hardwoods, Guadeloupe (type Venezuela, also reported from Guyana but with larger spores), Caribbean Basin

**I. lasserii Dennis sensu Pegler**

Spores spinose, nodules *not* bifid; under hardwoods

Pileus squarrose-scaly, dark reddish brown, spores globose (9-12  $\mu\text{m}$  diam), hymenial cystidia not rare

**I. calospora Qué.** (Syn. *I. rigidipes* Peck)

Pileus appressed-scaly, cinnamon (umbrinous) to ochraceous-tawny (fulvous), spores subelliptic to subglobose (10-13.5 x 9-11  $\mu\text{m}$ ), hymenial cystidia rare

**I. subfulva Peck** (Syn. *I. calospora sensu* Grund & D.E. Stuntz, *I. echinocarpa* Ellis & Everh., *I. praeechinulata* Murrill, *I. subfulviformis* Murrill; cf. *I. pseudocoronata* Matheny, nom. prov. with a bulbous stipe base and spines that are occasionally bifid or multicoronate)

Spores angular-nodulose or nodulose, *not* spinose

Pileus white or light silvery-gray, stipe white or yellowish

Fruit bodies white; spores mostly 7.5-8 x 5  $\mu\text{m}$

**I. paludinella (Peck) Sacc.** (cf. *I. infida* (Peck) Masee, which has a bulbous stipe base)

Pileus light silvery-gray, stipe yellowish; spores 8-10 x 4-5  $\mu\text{m}$

**I. alabamensis Kauffman 1924**

Pileus and stipe darker than above

Tropical in distribution, Martinique (Caribbean Basin), likely associated with Nyctaginaceae or *Coccoloba*

Pileus chestnut brown (reddish-brown) or darker, fibrillose-rimose

***I. antillana* Pegler**

Pileus ochraceous-tawny, ochraceous or pale yellowish brown, surface fibrillose-squamulose  
Spores 7.5 x 5.5-7.5 µm, cystidia 40-55 µm long, odor strongly spermatic

***I. crassicystidiata* Pegler**

Spores 8-11 x 5-7.5 µm, cystidia 45-70 µm long, odor not described

***I. martinica* Pegler**

Boreal or temperate in distribution (eastern Canada and U.S.A.), associated with conifers or temperate hardwoods

Pileus uniformly cinnamon brown to umbrinous (tawny-olive) *or* with a brownish-black disc *and* spores 6.5-8 x 4.5-5.5 µm, under hardwoods or conifers, also in *Sphagnum*

Pileus uniformly cinnamon brown to umbrinous (tawny-olive)

***I. petiginosa* (Fr.: Fr.) Gillet**

Pileus colored as above but with a brownish black disc

***I. nigrodisca* Peck**

Pileus reddish brown or chestnut-brown *and* spores <8 µm long, under conifers or in mixed conifer-hardwood stands

Pleurocystidia lanceolate, spores 5-7 x 4-6 µm with variable number of nodules (0, 3-4, or 8-10), under conifers

***I. castanea* Peck, *non* Velen.**

Pleurocystidia ventricose or jug-shaped, spores 6-8 x 5-6 µm with 10 or more small rounded nodules, in swampy places or among mosses under conifers or in mixed conifer-hardwood stands

***I. subexilis* (Peck) Sacc.**

Pileus pale brown to brown (umbrinous) *and* spores >8 µm long, under conifers (but see *I. praenodulosa*)

Stipe brown with pinkish tinges, with a distinct odor, in *Picea* forests

Pileus umbonate; odor penetrating and unpleasant, not spermatic; spores with 5-8 low obtuse nodules

***I. acriolens* Grund & D.E. Stuntz**

Pileus not distinctly umbonate, odor spermatic, spores with 6-10 distinct nodules

***I. jacobi* Kühner**

Stipe brown or white, *lacking* pinkish tinges, odor unknown, in *Pinus* forests or habitat unknown

Pileus not umbonate, stipe brown, spores with 5-8 low obtuse nodules, in sandy *Pinus* forests, Carolinas

***I. sabuletorum* (Berk. & M.A. Curtis) Sacc.**

Pileus umbonate, stipe white, spores coarsely nodulose, Florida (plant associates unknown)

***I. praenodulosa* Murrill**

Stipe base bulbous with a marginate, rounded, turbinate, or napiform bulb

Spores spinose (spines occasionally bifid or multicornate), stipe base napiform (or turbinate); pleurocystidia 40-50 x 11-15 µm, broadly clavate, utriform, or obovate; under *Pinus* and *Quercus*, Texas (Gulf Coast)

***I. pseudocoronata* Matheny, *nom. prov.***

Spores stellate, stipe base marginate, pleurocystidia >50 µm long; ecology various, more widely or northerly distributed

Fruit bodies staining *greenish blue* where bruised, odor aromatic but with spermatic component

***I. insignis* A.H. Sm.**

Fruit bodies *not* staining greenish blue where bruised, odor other than above

Pileus chestnut-brown to cinnamon-rufous, stipe tinged rufous or with red, odor spermatic

***I. asterospora* Quél. *sensu* Kauffman**

Pileus light brown or mixed more with yellowish shades or reddish amber to orange-yellow, stipe yellow becoming dull brown or white or faintly tinged with yellow, odor none

Pileus light brown or mixed more with yellowish shades, stipe yellow becoming dull brown

***I. intricata* Peck**

Pileus reddish amber to orange-yellow (raw sienna), duller in age, stipe white or faintly tinged with yellow

***I. intricata* var. *pallidistipitata* Grund & D.E. Stuntz**

Spores angular-nodulose or nodulose

Pileus white, pallid, ivory, or tinted straw-colored

Pileus up to 30 mm wide, stipe 30-45 x 3.5-6 mm (base -12 mm), spores <10 µm long

Stipe solid, spores mostly 8-9 x 5.5 µm, odor spermatic in eastern populations

***I. umbratica* Quél.** (Syn. *I.alachuana* Murrill, *I.floridana* Murrill, *I.suaveolens* D.E. Stuntz)

Stipe hollow, spores mostly 9-10 x 6.5 µm

***I. fallax* Peck**

Pileus 40-100 mm wide, stipe 40-100 x 6-20 mm, spores 9-12 x 5-7 µm

***I. fibrosa* (Sowerby) Gillet** (cf. *I.fibrosa* var. *trivialis* J.E. Lange *sensu* Perez Silva, Mexico)

Pileus bicolorous due to whitish disc or honey yellow, yellowish brown, brown or reddish brown

Pileus bicolorous due to whitish disc, margin avellaneous or brownish

Under mixture of conifers and/or *Betula*

***I. grammata* Quél. *sensu stricto*** (Syn. *I.albodisca* Peck, *I.permucida* Grund & D.E. Stuntz *pro parte*; extending south to Tennessee; west coast '*albodisca*' differs by shorter spores)

Under *Quercus*, *Fagus* (New York, Tennessee, extending south into Central America)

***I. "grammata" sensu lato*** (cf. *I. aff. angustifolia* (Corner & E. Horak) Garrido *sensu* Singer, spores 6-8.5 x 5-5.5 µm with 8-10 moderate-sized nodules, under *Quercus*, lowland Costa Rica)

Pileus honey yellow, yellowish brown, brown or reddish brown

Spores <10 (-10.5) µm long

Pileus lubricous or viscid when moist

Pileus honey yellow, stipe white, odor spermatic, spores mostly 9-10 x 6-6.5 µm, angular in outline with 9-10 rather prominent nodules; cystidia thick-walled, under *Tsuga* and hardwoods, widespread

***I. mixtilis* (Britzelm.) Sacc.** (Syn. *I.trechispora* (Berk) P. Karst.; *I.abundans* Murrill may be the same but with a dry pileus)

Pileus umbrinous with the umbo pale-ochraceous or yellow, stipe flavescent, white-mycelioid at the base, odor not recorded; spores 7-9 x 4-7 µm, irregularly angular with rather distinct obtuse nodules; cystidia relatively thin-walled, under *Pinus*, Massachusetts

***I. davisiana* Kauffman**

Pileus avellaneous-isabelline; stipe white, odor not recorded, spores est. 6-8 x 5-6 µm with mostly 4-7 small nodules or corners (orig. reported as "5-6 x 3-4" µm), cystidia thick-walled, in sandy soil, Florida

***I. minutispora* Murrill**

Pileus dry

Pileus becoming brownish-red with age or upon drying, the umbo often darker, forming scales; stipe reddish or brownish below apex, Missouri

***I. desquamans* Peck** (Syn. *I.repanda* (Bull.: Fr.) Quél. *sensu* Kauffman)

Pileus *not* discoloring brownish-red, scales absent; stipe without red, distribution various

Pileus margin cream-buff to chamois, stipe white, resembling *I.geophylla* in habit (small, slender, white, and typically with an umbonate pileus)

***I. infida* (Peck) Masee** (cf. *I.paludinella* (Peck) Sacc., which has an even stipe)

Pileus darker than above, *not* resembling *I.geophylla*

Odor disagreeable or spermatic

Pileus brownish yellow; stipe pallid above, dull brownish-yellow below, odor disagreeable but not spermatic, in woods or mixed woods, New York, Nova Scotia

***I. abundans*** (dry forms of *I. mixtilis* would key here; per Smith (1939) same as *I. mixtilis*; note Murrill described the presence of an evanescent veil in the protologue but caulocystidia are present below the stipe center in the type)

Pileus light buff with brownish margin, stipe white to pale buff, odor strong spermatic, in xerophytic tropical forest under *Coccoloba*, Guadeloupe (Caribbean basin)

***I. xerophytica* Pegler**

Odor none

Pileus pale ochraceous-tawny to light pinkish-tan, dry; stipe white or pallid, odor none, in mixed woods, Alabama to Tennessee

***I. earleana* Kauffman**

Pileus yellowish-brown or clay color, with a prominent umbo, stipe white and hollow, odor not described, in mixed woods under *Picea*, *Fagus*, New York

***I. paludosella* G.F. Atk.**

Pileus reddish brown (castaneous) to dark brown

Pileus 20-40 mm; stipe 25-70 x 3-7 mm, with conspicuous marginate bulb 7-13 mm wide, white with pinkish tinges; odor none; spores 9-11 x 6.5-8  $\mu\text{m}$ , mostly angular in outline with 8-10 coarse prominent nodules; under hardwoods, Nova Scotia (pileus umbrinous and under conifers in Washington)

***I. decemgibbosa* (Kühner) Vauras** (Syn. *I. oblectabilis* f. *decemgibbosa* Kühner)

Pileus 15 mm; stipe 50 x 1.5 mm with a small bulb, rosy-isabelline; odor not described; spores ca. 8 x 5-6  $\mu\text{m}$ , nodule number and size unknown; under "Magnolia", Florida

***I. subradiata* Murrill**

Spores >10  $\mu\text{m}$  long

Stipe drying ashy-gray or black

***I. nigrescens* G.F. Atk.** (cf. *I. umbrinescens* Murrill with stellate spores)

Stipe not drying ashy-gray or black, but may dry brown

Pileus yellowish brown (stipe may dry brown)

***I. praetervisa* Quél.** (cf. *I. paludosella* G.F. Atk. with a prominent umbo, smaller size, pileus 15-20 mm diam.; stipe 2.5 mm diam with a rounded basal bulb, white; spores typically <10  $\mu\text{m}$  long, in mixed woods under *Picea*, *Fagus*, New York)

Pileus reddish brown

Stipe with pinkish tinges

***I. decemgibbosa* (Kühner) Vauras**

Stipe pallid to very pale yellow

***I. obtusiuscula* (Syn. *I. rufofusca* (J. Favre) Bon)**

### Spores nodulose and hyaline; pleurocystidia present

One species - Fruit bodies entirely white, similar to *I. paludinella* but spores nodulose about a subangular to subelliptic outline (*Lanuginosa*-like) with 9-12 distinct conical nodules, 8.5-10.5 x 6.5-8  $\mu\text{m}$ ; pleurocystidia thick-walled, hyaline; caulocystidia present below stipe center?

***I. pernivosa* (Murrill) Matheny, comb. prov.** (Syn. *Entoloma pernivosum* Murrill)

### Species of uncertain status

*Inocybe eutheloides* (Peck) Peck, *N.Y. St. Mus. Bull.* 1: 13. 1888 (*Agaricus eutheloides* Peck, *Ann. Rep. N.Y. St. Mus.* 32: 29. 1879). No published data on the type exist to my knowledge. In Peck's protologue, the spores are described as "even, uninucleate, gibbous or unequally elliptical". Until the type is examined, I would consider application of this name (e.g., Hesler 1936) as doubtful. Kauffman (1924), however, treated *I. eutheloides* as a smooth-spored species near *I. pallidipes*. It's not clear if his treatment is based on the type.

*Inocybe fulvelliceps* Murrill, *Quart. J. Florida Acad. Sci.* 8: 186. 1945. Data on the stipe covering are lacking. Murrill described the stipe as bulbous, white, and smooth. The spores are nodulose with 7-12 moderate-sized conical nodules about a subelliptic to subangular outline and less than 10  $\mu\text{m}$  long. The thick-walled pleurocystidia appear rather short and fusiform to broadly so or utriform. Basidia are 4-sterigmate. The species was described by Murrill under *Quercus* in Florida. If the stipe is pruinose and bears caulocystidia the entire length, the species would be close to *I. abundans*, the latter close to, if not conspecific with, *I. mixtilis*.

*Inocybe leptocystella* G.F. Atk., *Am. J. Bot.* 5: 212. 1918. The type was designated by Atkinson as CUP19844.

Kauffman and Stuntz concluded the data presented in the protologue were derived from other specimens not CUP19844 given the large spores of the latter. Kauffman considered CUP19844 as the same as *I. mutata*, but again the spores are much too large. In my opinion, Atkinson's protologue is consistent with that of *I. mutata*, but CUP material that match this species have not been located.



- Inocybe murinopilacina* Ellis & Everh., *J. Mycol.* 5: 25. 1889. Stuntz, in his unpublished notes, considered this a species of *Cortinarius*.
- Inocybe nucleata* Murrill, *Quart. J. Florida Acad. Sci.* 8: 188. 1945. Stuntz' unpublished notes on the type indicate the absence of caulocystidia on the lower part of the stipe. Murrill, however, described the stipe as equal and whitish-pulverulent, especially above. More data from the type, including the spore morphology, are necessary to include it in the key.
- Inocybe scabella* P. Kumm. sensu Kauffman (1918, 1924). The overall gross morphology and ecology would suggest *I. lacera*, but Kauffman (1918, 1924) described the spores as "almond-shaped" or "ellipsoid-almond-shaped". Material was not studied by Smith (1939). *Inocybe scabella* var. *rufa* is described in Kauffman (1918) and distinguished by its pale rufous to sordid brick color, more slender stipe (50-60 x 1-2 mm), and common occurrence in swampy or mossy wet places on rich soil in cedar and hemlock forests (Kauffman 1918). No one to my knowledge has re-assessed the taxonomy of these taxa.
- Inocybe strigosa* (Peck) Peck, *Bull. N.Y. St. Mus.* 131: 116. 1909 (*Paxillus strigosus* Peck, *Bull. Buffalo Soc. Nat. Sci.* 1: 56. 1873). In the protologue the pileus is described as brittle, strigose with scattered stiff hairs, whitish, the lamellae as subdecurrent and at times forked, the stipe pruinose, the spores subglobose. Peck also mentions the lamellae are not easily removed from the pileus, and suggests a morphological similarity with *Clitocybe* and *Lepista*. The species was originally described in *Paxillus*. Without a modern assessment based on a study of the type, the species is doubtfully *Inocybe*.
- Inocybe subeuthelloides* Murrill, *Mycologia* 33: 282. 1941. The pileus is small (up to 25 mm wide) and described as finely hispid-squamulose and slightly rimose-lacerate with age. The color of the pileus is not clear (isabelline but with a subfuliginous umbo). The stipe is 25-30 x 3-4 mm, equal, subsmooth, and white. Pleurocystidia are ostensibly present, and the spores are described as smooth about 9 x 4.5 µm. The type is recorded under in woods of *Quercus* and *Pinus*, Florida. I have not studied the type, and Stuntz' unpublished notes only indicate the presence of lageniform caulocystidia at the stipe apex mixed with shorter clavate cells. The species appears to key most closely to the *I. flocculosa* group. Aside from the white stipe, it shares many affinities with *I. stuntzii* (= *I. flocculosa*) per Grund & Stuntz (1975).
- Inocybe subroindica* Banning & Peck, *Ann. Rep. N.Y. St. Mus.* 44: 182. 1892 [1890]. "Pileus at first campanulate, obtuse, dry, cracked longitudinally, glossy, fleshy at the disk, then at the margin, flesh white or slightly pinkish; lamellae adnate, close, forked, lanceolate, cream color, turning brownish ochre; stem nearly regular, twisted, marked with reddish fibrils, stuffed, hard, brittle. In open places in woods. August and September." A plate (Pl. 61) is indicated but is not included in the 1985 reprint of Peck's reports. The species was described from Maryland, however, it may conform better with *Entoloma* than with *Inocybe*. No unpublished data on the type are present among Stuntz' works.
- Inocybe rubroindica* Banning & Peck, *Ann. Rep. N.Y. St. Mus.* 44: 70. 1891. Saccardo (1895) makes reference to the epithet "*rubroindica*" in the 44<sup>th</sup> report, but such a reference cannot be found. The epithet is also not present in Stuntz' note card library. I can only speculate that "*subroindica*" was in error and meant to be "*rubroindica*".
- Inocybe tuberosa* Clements, *Bot. Surv. Neb.* 2: 40. 1893. In Saccardo (1895) the pileus is described as 30 mm wide, squamose, fleshy, and brown; the stipe 40 mm long, 7-10 mm wide, bulbous or "tuberoso", gilvous; and the lamellae as brown; spores obtuse ovoid-ellipsoid, 6 x 4 µm. The species was described from Sioux County, in northwest Nebraska with an affinity to *I. insequenti* (Britzelm) Sacc. Likely plant associates could have included *Pinus*, Salicaceae, or possibly *Pseudotsuga*. The type was not studied by Kauffman (1924), and I could find no mention of it in Stuntz' unpublished notes.

### Excluded taxa

- Inocybe angustispora* Bessette & Fatto (*Cortinarius aureifolius*)
- Inocybe ferruginosa* A.H. Sm. (*Cortinarius uliginosus* var. *nauseosus*, *C. ferruginosus*)
- Inocybe taedophila* Murrill (*Cortinarius aureifolius*)
- Inocybe weberi* Murrill (*Cortinarius weberi* (Murrill) Matheny, comb. prov.)
- Inocybe sterlingii* Peck (*Hebeloma sterlingii* (Peck) Murrill)
- Inocybe taedophila* Murrill (*Cortinarius aureifolius* Peck)

**Western North American taxa of *Inocybe* not treated here (67 total)**

- I. acystidiosa* (Kauffman 1924)
- I. adaequata* sensu Nishida (Nishida 1989)
- I. aestiva* (Kropp et al. 2013)
- I. agardhii* (Nishida 1989, Matheny 2003)
- I. amblyspora* (Nishida 1989)
- I. anomala* (Murrill 1916, Kauffman 1924)
- I. appendiculata* (Matheny, unpubl.)
- I. arthrocytis* (Cripps et al. 2010)
- I. auricoma* (Nishida 1989)
- I. bakeri* (Kropp et al. 2010)
- I. boltonii* ssp. *giacomii* (Miller 1987)
- I. bresadolae* (Nishida 1989)
- I. breviterincarnata* (Kropp et al. 2013)
- I. brunnescens* (Earle 1904, Kauffman 1924, *non brunnescens* G.F. Atk. 1918)
- I. californica* (Kauffman 1924)
- I. candidipes* (Kropp & Matheny 2004)
- I. cercocarpi* (Kropp et al. 2013)
- I. chelanensis* (Stuntz 1947, Nishida 1989, Kropp & Matheny 2004)
- I. chondroderma* (Matheny et al. 2013)
- I. chrysocephala* (Nishida 1988, 1989)
- I. cinnamomea* (Nishida 1989)
- I. coloradoensis* (Kauffman 1924, =*I. caesariata* sensu Kauffman)
- I. dulcamara* f. *pygmaea* (Miller 1987)
- I. eutheles* sensu A.H. Sm. (Smith 1939)
- I. flavella* sensu Cripps (Cripps 1997)
- I. fulvella* sensu D.E. Stuntz, *non* Grund & Stuntz (Stuntz 1947)
- I. fuscescentipes* (Larsson et al. 2014)
- I. geophylla* var. *lilacina* sensu Nishida (Nishida 1989, *I. ionocephala* nom. prov.)
- I. hemileuca* (Nishida 1988)
- I. hotsoniana* (Stuntz 1947)
- I. insinuata* (Kauffman 1924, Nishida 1989)
- I. laetior* (Smith & Stuntz 1950)
- I. leucoblema* (Cripps et al. 2010)
- I. leucoloma* (Cripps et al. 2010)
- I. lucifuga* sensu D.E. Stuntz (Stuntz 1947, Perez Silva 1967)
- I. menthigustans* Nishida (Nishida 1988, 1989)
- I. monticola* Kropp & Matheny (Kropp et al. 2010)
- I. mutifolia* (Braaten et al. 2014)
- I. multifolia* f. *cryptophylla* (Braaten et al. 2014)
- I. muricellata* (Nishida 1989)
- I. mytiliodora* (Matheny unpubl.)
- I. niveivelata* (Kropp et al. 2013)
- I. oblectabilis* (Nishida 1989)
- I. obscura* var. *rubens* (Stuntz 1947)
- I. obscura* var. *obscura* (Stuntz 1947, Perez Silva 1967)
- I. occidentalis* (Kropp et al. 2013)
- I. olida* (Nishida 1989)
- I. phaeocomis* var. *major* (Nishida 1989, Cripps 1997)
- I. phaeodisca* (Nishida 1989)
- I. picrosma* (Smith & Stuntz 1950)
- I. praecox* (Kropp et al. 2010)

- I. prominens* f. *longistriata* (Kauffman 1925)
- I. pusio* (Perez Silva 1967, Nishida 1989)
- I. pyrotricha* (Smith & Stuntz 1950)
- I. rainierensis* (Smith & Stuntz 1950, Kropp & Matheny 2004)
- I. rufoalba* sensu Lange (Miller 1987)
- I. quietiodor* (Nishida 1989)
- I. sierraensis* (Kropp & Matheny 2004)
- I. siskiyouensis* (Kauffman 1929, Smith 1939)
- I. splendens* sensu Nishida (Nishida 1989)
- I. spuria* (Cripps 1997 as *I. squamata*; Kropp et al. 2013)
- I. subporospora* (Seres et al. 2015, Alaska, north-western Canada)
- I. substraminipes* (Cripps et al. 2010)
- I. terrigena* (Matheny 2003)
- I. vaccina* (Nishida 1989)
- I. viscidula* sensu Stuntz (Stuntz 1947)
- I. volvata* (Stuntz 1947)

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