NOTE: 103 genera listed here are conceived in a broad, classical sense (generally the fleshy stipitate mushrooms with pores) including sequestrate morphologies. Phylogenetic inferences from DNA sequences suggest alignment in suborders: Boletineae, Suillineae, Sclerodermatineae, or in the Paxillaceae. Not all genera are well known, equally circumscribed or robustly inferred phylogenetically. Mycorrhizal associations may be confirmed, but many are presumed or suspected. Recent phylogenetic analyses based on DNA sequences infer some true gasteroid (truffle-like, sequestrate) taxa (aside from those in Sclerodermatineae, Suillineae) belong here. Some of the diagnoses are from protologues. Year of publication follows authority (-ies).

**Afroboletus** Pegler & Young (1981)

*Pileus* dry, coarsely fibrillose to squamose, black, often with appendiculate veil remnants, microscopically a trichodermium. *Context* white, staining red then black. *Hymenophore* adnexed, white then black, staining red then black. Peronate veil present. *Stipe* dry, squamose, sometimes annulate, white to gray to black. *Spores* black, short ellipsoid, longitudinally ridged or winged, sometimes with intercostal veins; a basal thickened rim around sterigmal appendage, lacking a plage. *Hymenial cystidia* present. *Clamp connections* absent. Apparently restricted to the African tropics. One sequestrate species known. Ectomycorrhizal presumed with caesalpinoid legumes.

**Afrocastellanoa** M.E. Smith & Orihara (2017)

From the protologue: *Basidiomata* sequestrate, gasteroid, firm, rubbery, with one or a few rhizomorphs at the base. Similar to *Octaviania* in the morphology of the basidiome and basidiospores, but different from *Octaviania* in the multilayered peridium and in basidia that are irregularly distributed within the solid gleba, resulting in the absence of a distinct hymenium and subhymenium. Phylogenetically related to the epigeous bolete genus *Porphyrellus*, but distantly related to the genus *Octaviania* s.s. One sequestrate species known, *A. ivoryana*. Ectomycorrhizal with *Anthonotha* (Fabaceae), *Uapaca* (Uapacaceae), and probably with other legumes in sub-Saharan Africa.

**Alessiaporus** Gelardi, Vizzini, & Simonini (2014)

Originally described as a monotypic genus for *Xeroconus ichnusanus*, a thermo-xerophilic taxon in Mediterranean Europe. The taxon, based on a summary of features in the protologue indicate it is a medium-small species, exhibiting an ochraceous-brown to dark olivaceous brown fibrillose pileus, sometimes with copper red hues and a wavy margin at least in young specimens, a yellow to olive colored hymenophore and a stout, deeply rooting stipe covered with a rough and darker net that is rarely absent, bright yellow at the apex, dark red-brown to blackish brown elsewhere and with a whitish gray basal mycelium. The context is whitish in the pileus, yellowish in the stipe with reddish shades, purplish red to brownish black at the base, turns uniformly blue on exposure, as do the external surfaces after injury or bruising. The most important morphological character is the narrow, granular ring-like zone in the middle or lower half of the stipe, formed by the remnants of the connection between the pileus margin and the stipe cortex during the primordial stage. A 3-gene analysis infers a relationship with *Pulchroboletus* near *Hemileccinum* in the *Xerocomoideae*. A second species, *A. rubriflavus*, was inferred by Frank et al from E USA. Ectomycorrhizal presumed with Fagaceae, possibly Pinaceae (USA).

**Alpova** Dodge (1931)

*Sequestrate*, globose to irregular in shape. *Peridium* well developed, variable in thickness, usually dry, whitish but usually discoloring with age and handling. *Gleba* sticky and gelatinous, with
gel-filled chambers, not forming a true hymenium, separated by pale colored veins, pale colored at first, but darkening with age. Spores hyaline, ellipsoid to oblong, smooth, inamylloid, strongly cyanophilic when young. Clamp connections usually present. At present confined to Northern Hemisphere. Ectomycorrhizae with Betulaceae, possibly Pinaceae or Fagaceae.

**Aureoboletus** Pouzar (1957)

Pileus viscid to dry, rugulose to even. Context white, unchanging. Hymenophore tubulose, bright yellow at first, greenish yellow with age in some, not oxidizing. Stipe central, glabrous, sometimes superficially pruinose or lacerate ridged, viscid or dry, rarely with a veil. Spores olive brown in deposit, smooth or rarely with conspicuous longitudinal ridges, fusoid to ovoid, inamylloid. Clamp connections absent. Mostly north temperate to pantropical. Ectomycorrhizae with Pinaceae, Fagaceae.

**Australopilus** Halling & Fechner (2012)

Basidiomata epigeous. Pileus gray to dark gray, sometimes pink to deep pink pigments present. Context white, unchanging. Hymenophore tubulose, white then vinaceous pink. Stipe white above, chrome yellow at base, beset with either fine isolated pink scabers or these often arranged in a well-defined or ill-defined raised reticulum, sometimes scattered on low longitudinal ridges. Spores pinkish to reddish brown in deposit, smooth, fusoid. Pileipellis a trichodermium. Hymenial cystidia present. Pseudocystidia absent. Clamp connections absent. Australia. Ectomycorrhizae with Myrtaceae, Casuarinaceae.

**Austroboletus** (Corner) C.B. Wolfe (1980)

Pileus viscid or dry, tomentose to subtomentose, microscopically a trichodermium or ixotrichodermium, sometimes with appendiculate remnants at margin. Context white or yellow, unchanging. Hymenophore tubulose, adnexed, white at first, pinkish flesh colored to brownish pink with maturity (rarely yellow), sometimes staining light brownish to pinkish brown. Stipe central, pruinose to alveolate-reticulate, dry or sometimes glutinous-viscid, not staining or developing stains in situ from aging; basal mycelium white. Spores vinaceous pink in deposit, obscurely pitted to pitted to sinuous pitted, sometimes equatorially verrucose, amygdaliform to elongate-fusoid, inamylloid or dextrinoid. Hymenial cystidia usually present. Clamp connections absent. KOH & NH4OH reactions negative. Mostly E Asia, Australasia, some temperate, montane tropic New World. Ectomycorrhizae with Pinaceae, Fagaceae, Myrtaceae, Dipterocarpaceae, Casuarinaceae.


Basidiomata stipitate-pileate. Pileus hemispherical, convex or planate, subtomentose, dry, usually incurved at the margin when young. Context pale yellow to yellow, slowly staining pale blue when cut. Hymenophore relatively thin (1/3–1/5 of pileal context midway from disc to margin), usually decurrent, yellow, immediately staining light blue to greenish blue when injured; pores angular, or sometimes nearly round; tubes short. Stipe smooth or occasionally with reticulations at the upper part; context pale yellow to yellow, basal mycelia white to pale yellow. Pileipellis a trichodermium to an interwoven trichodermium. Hymenial cystidia present. Basidiospores smooth, subfusciform to elongated subfusciform, light yellow to brownish-yellowish. Clamp connections absent. Eastern Asia, eastern North America. Ectomycorrhizae presumed with Pinaceae, Fagaceae.

**Binderoboletus** T.W. Henkel & M.E. Smith (2016)

Basidiomata epigeous. Pileus olive-yellow to olive-brown, matted fibrillose, trama light yellow, unchanging. Hymenophore tubulose, adnate, light yellow, browning with pressure, pores subisodiametric. Stipe subequal, concolorous and striate, yellow and reticulate at apex, base yellow

**Boletellus** Murrill (1909)

*Pileus* typically dry, rarely subviscid, scaly or tomentose, microscopically a trichodermium, sometimes with appendiculate remnants at margin. *Context* white or yellow, often changing to blue. *Hymenophore* tubulose, adnexed, white at first, soon yellow, often staining blue. *Stipe* central, usually pruinose, rarely with an apical reticulum, dry, rarely subviscid and annulate, sometimes staining blue; basal mycelium white, very rarely yellow or olive colored. *Spores* olive brown in deposit, longitudinally ridged/winged or slightly veined, cleft, dimpled or entire at apex, inamyloid or rarely dextrinoid. *Hymenial cystidia* usually present. *Clamp connections* usually absent, rarely present (one sp., *B. fibuliger*). KOH & NH₄OH reactions negative (more species need testing). N Hemisphere, temperate South America, Mesoamerica, Andean and Amazonian Colombia, one sp. in Venezuela (*B. fibuliger*), four spp. in Guyana, Amazonian and NE Brazil, central Africa, Australia, E Asia, SE Asia. Ectomycorrhizae with Pinaceae, Fagaceae, Myrtaceae, Dipterocarpaceae, Casuarinaceae, with caesalpinoid legumes (e.g., *Dicymbe*).

**Boletinellus** Murrill (1909)

*Pileus* dry, usually glabrous but sometimes finely tomentose to matted tomentose, soft textured, microscopically a repent entangled interwoven layer. *Context* pale yellowish, rarely cyanescent. *Hymenophore* tubulose, quite decurrent and with a radial boletinoid orientation, occasionally sublamellate, dull yellow, slowly cyanescent then brownish. *Stipe* lateral or eccentric, very rarely nearly central, dry, mostly glabrous. *Sclerotia* present. *Spores* olive brown in deposit, ovoid to nearly globose, smooth. *Hymenial cystidia* inconspicuous, often absent on the pores. *Clamp connections* present.

Not ectomycorrhizal. The type of the genus, *B. merulioides* is widespread in eastern North America where it is associated with *Fraxinus*, but is not mycorrhizal. Rather it is associated with a parasitic aphid restricted to *Fraxinus* roots. There is a well-documented report of its occurrence in Kyushu, Japan. Also, quite possibly in Queensland, Australia.

**Boletochaete** Singer (1944)


Ectomycorrhizae not determined with certainty – probably Fagaceae and/or Dipterocarpaceae.

**Boletus** L. (1753)

*Pileus* dry to subviscid, glabrous to tomentose to fibrillose, microscopically a trichodermium or ixotrichodermium. *Context* white, not changing. *Hymenophore* adnexed to adnate, white to yellow to greenish yellow, not changing with *pores* occluded ("stuffed") when young, concolorous or sometimes red to brownish red in aged specimens. *Stipe* dry, glabrous to subpruinose to reticulate or sometimes nearly alveolate, with *basal mycelium* white. *Spore deposit* olive brown. *Spores* smooth, fusoid. *Hymenial cystidia* present. *Clamp connections* absent. Mostly temperate northern hemisphere, a few in paleo-neotropics. In southern hemisphere, one sequestrate in New Zealand (*B. semigastroideus*), one in northern Queensland (*B. australis*). *Boletus edulis* sometimes appearing
with exotic Pinaceae planted outside native range.
Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, Dipterocarpaceae (?), Myrtaceae, Casuarinaceae, caesalpinoid legumes(?). Possibly other families less commonly.

**Note:** This genus remains after all others have been separated based on molecular phylogenetic analyses or other idiosyncratic features. Monophyly inferred from molecular phylogenetics suggests restriction to the ‘porcini’ clade (i.e., *Boletus edulis* etc.). Also included here are some sequestrate species (*B. subalpinus, B. semigastroideus*).

**Borofutus** Hosen & Zhu L. Yang (2012)

*Pileus* squamulose, microscopically a trichodermium. **Context** usually unchanging, but slowly pale reddish to pale reddish purple. *Hymenophore* subdecurrent, with broad pores, pallid to cream colored at first, then yellowish to golden brown, staining brownish red. *Stipe* central, glabrous and ribbed above, squamulose below, with whitish basal mycelium. *Spores* purple to purplish red to purplish violet in KOH with light microscope optics, boletoid to subamygdaliform, with shallow pits (regular to irregular). *Hymenial cystidia* present, lageniform, thick-walled. *Clamp connections* absent. Tropical Asia (Bangladesh, Thailand). Apparently phylogenetically allied to the sequestrate *Rhodactina, Spongiforma*, and epigeous *Ionosporus*.

Ectomycorrhizae with Dipterocarpaceae (*Shorea*).

**Bothia** Halling, Baroni & Binder (2007)

*Pileus* dry, coarsely tomentose to subtomentose to aggregated fibrillose or appressed fibrillose, microscopically a trichodermium. **Context** soft textured, whitish, not cyanescent. *Hymenophore* decurrent, shallow, conspicuously boletoid, often with compound pores, pale brown, staining darker brown. *Stipe* dry, central or eccentric, pale brown, staining darker brown, frequently reticulate at least at the apex, with white basal mycelium. *Spores* yellow brown in deposit, ellipsoid to long ovoid, smooth, inamyloid. *Hymenial cystidia* present and conspicuous. *Clamp connections* absent. Eastern North America, China.

Ectomycorrhizae with Fagaceae (*Quercus*).

**Buchwaldoboletus** Pilát (1969)

*Pileus* dry, unpolished, sometimes subtomentose, microscopically a collapsed trichoderm or cutis. **Context** pale colored, usually unchanging but sometimes with a cyanescence just above hymenophore. *Hymenophore* adnexed, adnate to decurrent, yellow to olivaceous, rarely bruising brownish or cyanescent. *Stipe* central to sometimes eccentric, dry, smooth and lacking ornamentation. *Spores* ellipsoid to short-subfuscoid, smooth, inamyloid. *Hymenial cystidia* present, variously shaped. *Clamp connections* absent. North temperate zone, some tropical, and vouched reports from southern hemisphere.

Mycoparasitic with one species closely associated with *Phaeolus schweinitzii* and rotting Pinaceae wood.

**Butryiboletus** D. Arora & J.L. Frank (2014)

*Basidiomata* epigeous and stipitate. *Pileus* mostly brown to reddish. *Hymenophore* with tube layer yellow, often turning blue when bruised. *Stipe* yellow or reddish tinged and reticulate over the upper portion. **Context** of pileus pale yellow, turning blue erratically if at all when cut; **context** of stipe often vinaceous-tinged at the base. *Spores* fusoid, smooth, brown (olive brown in mass); pileipellis a trichodermium. *Clamp connections* absent. North temperate zone and possibly montane neotropics. Ectomycorrhizae with Pinaceae and Fagaceae.

**Cacaopus** Raspé & Vadthanarat (2019)

From the protologue: *Basidiomata* similar to *Sutorius* but differs in that this genus is a chocolate brown to blackish-brown overall, without any violet tinges; the *hymenophore* is not separable from the
pileus context; basal mycelium of the stipe is white and rubescence; context is rubescent. Spores in deposit dark brown, smooth, amygdaliform to ovoid, sometimes with acute apex. Phylogenetic inference based on four genes (atp6, rpb2, tef1, cox3) places the genus near Cupreoboletus and Cyanoboletus in the Pulveroboletus group. Two species known from Thailand and so far known from mid- to high elevation forests. Ectomycorrhizae presumed with Dipterocarpaceae, Fagaceae.

**Caloboletus** Vizzini (2014)

*Basidiomata* stipitate-pileate with tubular hymenophore. *Pileus* usually pale, whitish to smoke-grey, clay-buff, often with ochraceous/olivaceous tinges, rarely with red tinges, gradually darkening, not turning blue when bruised. *Context* whitish to pale lemon-yellow, sometimes with red tinges at stipe base, gradually changing to blue when cut. *Tubes* and *pores* at first lemon-yellow to sulphur-yellow (but pores are orange to red in *Caloboletus firmus*), then olivaceous, blue when injured. *Hymenophoral trama* bilateral-divergent of the Boletus-subtype. *Stipe* central, pale yellow to yellow, with or without red tinges, usually reticulated, reticulum sometimes reduced or even absent. *Taste* bitter (presence of cycloalcalopins), fading with age. *Spores* boletoid, smooth. *Clamp connections* absent. Northern Hemisphere. Ectomycorrhizae with Pinaceae, Fagaceae.

**Carolinigaster** M.E. Smith & S. Cruz (2018)

From the protologue: *Basidiomata* hypogeous to partially emergent, sequestrate, globose to subglobose. *Peridium* not changing color when handled. *Gleba* loculate. *Stipe* or *columella* lacking. *Basidiospores* statismosporic, globose to subglobose, ornamented with short irregular warts at maturity, pink in water and inamyloid but strongly dextrinoid, bleaching to almost hyaline in KOH. *Clamp connections* and *hymenial cystidia* absent. The type species, *C. bonitii*, described from North Carolina, USA, is inferred to belong in the subfamily Austroboletoideae, sister to *Mucilopilus* (sine type) without support, based on ITS, LSU and *tef1* sequences. Ectomycorrhizae presumed with Fagaceae and Pinaceae.

**Castellanea** T.W. Henkel & M.E. Smith (2015)

*Basidiomata* sequestrate, with a short stipe, orange brown peridium, brown, loculate gleba, with a short columella arising from a sterile pad, with smooth subfusoid basidiospores that are frequently dextrinoid, lacking clamp connections and hymenial cystidia. Molecular inference places the taxon within a clade containing several species of *Tylopius* without bootstrap support. Monotypic species in Guyana. Ectomycorrhizae with Dipterocarpaceae (*Pakaraimae*), Caesalpinoid legumes (*Dicymbe*).

**Chalciporus** Bataille (1908) (=Rubinoboletus)

*Pileus* dry or subviscid, glabrous, microscopically a trichodermium. *Context* pale yellow or white or rarely pale pinkish, staining blue in some. *Hymenophore* adnate to subdecurrent, dull red, cinnamon brown, carmine to salmon pink, not staining or rarely staining blue. *Stipe* dry, pruinose to glabrous, with bright yellow basal mycelium. *Spores* brown in deposit, fusoid or short ellipsoid, smooth. *Hymenial cystidia* present. *Clamp connections* absent. North Temperate and Pantropical. Some dubious reports from southern Hemisphere; possibly native in New Zealand, but also exotic. *Chalciporus piperatus* and *C. piperatoides* are exotic invasive in Australia brought in on roots of *Pinus*. True Australian natives found in NSW in 2017 (Prichard, unpublished). Putatively mycoparasitic on *Amanita muscaria* (at least *C. piperatus*), but possibly ectomycorrhizal with Pinaceae, Fagaceae and Myrtaceae for some taxa.

**Chamonixia** Rolland (1899)

*Basidiomata* sequestrate, globose to subglobose, dry, white at first, soon staining blue, with

**Chiua** Y.C. Li & Zhu L. Yang (2016) 

From the protologue: *Basidiomata* stipitate-pileate with tubular hymenophore. *Pileus* hemispherical to subhemispherical or convex; surface submentose, dry, slightly extended at the margin when young; context yellow to bright yellow, unchanging in color when injured. *Hymenophore* depressed around apex of stipe; hymenophoral surface white when young, and becomes pinkish or pink to purplish when mature; *pores* angular or roundish; *tubes* concolorous with hymenophoral surface, unchanging in color when injured. *Stipe* central, yellow to lemon yellow at upper part, bright yellow to chrome yellow at the base; *basal mycelium* chrome yellow. *Basidiospores* smooth, subfusiform. *Pleuro- and cheilocystidia* subfusiform to ventricose or clavate. *Pileipellis* subcutis or trichodermium composed of filamentous interwoven hyphae, or hypoeithelium composed of filamentous hyphae and concatenated subglobose cells. *Clamp connections* absent. Gene inference indicates the genus is distinct in the Zangioideae. Four species known from southern China, Thailand. Ectomycorrhizae presumed with Fagaceae, Pinaceae.

**Chlorogaster** Lassè & Jalink (2004) 

From the protologue: *Gasterocarp* epigeous, slenderly pyriform to broadly clavate, pseudostipitate, entirely covered with dark green to blackish conspicuous conical warts. *Peristome* present. *Exoperidium* consisting of irregular (rounded) angular, almost isodiametric to rectangular elements, clearly delimited from the hyphal endoperidium. True capillitium lacking, paracapillitium present. *Gleba* dark grey, non-gelatinous when submature, with white veins and very firm, then more fluffy and dull olive with age. *Spores* globose, dark brown, with very high, crested ornament, up to 30 µm in diameter including ornamentation. *Clamp connections* absent. Hypothesized to belong to the Sclerodermataceae. One species, *C. dipterocarpi*, from Sabah, Malaysia. Ectomycorrhizae presumed with Dipterocarpaceae.

**Corneroboletus** N.K. Zeng & Zhu L. Yang (2012) 

*Pileus* convex becoming plane; surface mucilaginous, covered with conical to subconical to irregularly shaped squamules, microscopically an ixoohypsophelitium. *Hymenophore* yellow to olivaceous yellow, turning reddish brown slowly when injured. *Stipe* central, cylindrical; surface covered with conical to subconical to irregularly shaped squamules, but apical part nearly smooth. *Spores* subfusiform to ellipsoid, smooth under light microscopy but irregularly warted to irregularly bacillate with SEM. *Hymenial cystidia* present. *Clamp connections* absent. One species, *C. indecorus*, known from Singapore, Malaysia, tropical China. Ectomycorrhizae likely with Fagaceae.

**Costatisporus** T.W. Henkel & M.E. Smith (2015) 

From the protologue: *Basidiomata* hypogeous to partially emergent, sequestrate. *Peridium* greyish yellow, staining dark blue, glabrous to submentose, thin. *Gleba* brown, unchanging, loculate, sterile veins absent. *Basidiospores* statismosporic, subglobose to oblong, light brown, inamylloid, with costate ornamentation of longitudinal ridges pole to pole; these entire or discontinuous; pedicel infrequent. *Basidia* clavate. *Cystidia* and *clamp connections* absent. A relationship within Boletaceae is inferred from molecular analysis which infers *Costatisporus* is a sister taxon to *Sutorius*. Monotypic with one species, *C. cyanescens*, from Guyana. Ectomycorrhizae with Caesalpinoid legumes (*Dicymbe, Aldina*).
**Crocinoboletus** N.K. Zeng, Zhu L. Yang & G. Wu (2014)

*Basidiomata* epigeous. *Pileus* convex to planate, surface yellowish orange, bright orange to reddish orange, covered with minute, reddish brown squamules, turning bluish olivaceous quickly, then blackening when bruised. *Context* vivid golden yellow, turning bluish olivaceous quickly when bruised. *Hymenophore* poroid, adnate or slightly depressed around apex of stipe; tubes orange, turning bluish olivaceous quickly, then blackening when bruised. *Stipe* centrally attached, subcylindric, concolorous with the pileus, sometimes with reddish orange squamules, turning bluish olivaceous quickly, then blackening when bruised. *Spores* subfusciform to ellipsoid, smooth. *Pleuro- and cheilocystidia* present. *Pileipellis* an interwoven trichoderm at the middle part of the pileus but a cutis at the margin of the pileus. *Clamp connections* absent. *Polyene pigments* boletocrocin present. Two species known: *C. rufouaureus*, *C. laetissimus*. Eastern Asia, Australia. Ectomycorrhizae presumed with Pinaceae, Fagaceae, Myrtaceae, Casuarinaceae(?).

**Cupreoboletus** Simonini, Gelardi & Vizzini (2015)

A former member of *Boletus* sect. *Luridi*, with reticulate stipe, the taxon produces peculiar protruding crystals on the hymenophore along with pseudocystidia. *Odor* is described as intense and sweet, recalling propolis, cinnamon or poplar flower buds. Four-gene molecular phylogenetics infer placement as a sister genus to *Cyanoboletus* on a well-supported polytomous clade. Monospecific, *C. poikilochromus*, in thermophilic southern Europe. Ectomycorrhizae assumed with *Quercus*.

**Cyanoboletus** Gelardi, Vizzini & Simonini (2014)


**Durianella** Desjardin, A.W. Wilson, Manfr. Binder (2008)

*Basidiomata* sequestrate, globose to somewhat flattened, dry, covered with yellow brown, short, conical warts. *Gleba* with dark, gelatinized locules, deep indigo blue to black with exposure, with white sterile trama, also deep blue-black on exposure. *Spores* globose to subglobose, with straight to curved conical spines. *Clamp connections* absent. One species, *D. echinulata*, known from Malaysia and Borneo. Molecular phylogenetic inference, while suggesting placement in the Boletineae (Zangioidae?), is equivocal in relationships to known taxa. Ectomycorrhizae likely with *Shorea*.

**Erythrophylloporus** Ming Zhang & T.H. Li (2018)

From the protologue: *Basidiomata* epigeous, small to medium-sized, stipitate-pileate with lamellate hymenophore. *Pileus* convex to applanate, dry, pruinose or velutinous, subtomentose to faintly squamulose or subfloccose towards the center, orange, deep orange, yellowish red to reddish orange. *Context* vivid yellow to orange yellow, gradually changing dark violet, blackish blue to dark blue when exposed. *Hymenophore* decurrent, lamellate, yellowish orange, orange, deep orange, reddish orange to orange red changing grayish blue, grayish turquoise to grayish green when bruised. *Stipe* central, solid, subcylindric or clavate, orange, yellow, reddish orange to yellowish red, with orange, reddish orange to orange red pruinose scales on surface, *basal mycelium* vivid yellow. *Basidiospores* broadly ellipsoid, ellipsoid to nearly ovoid, smooth, thin-walled. *Pleuro- and cheilocystidia* present, usually containing
yellowish brown pigment, slowly dissolving in KOH. Pileipellis a subcutis to trichoderm, becoming a subcutis when mature. Clamp connections absent. One species, *E. cinnabarinus*, known from southern China. A four gene (nrLSU, *tef1*, *rpb1*, *rpb2*) phylogenetic inference places the genus ambiguously in the *Pulveroboletus* group near *Lammaoa* and *Rugiboletus*. Ectomycorrhizae presumed with Fagaceae.

**Exsudoporus** Vizzini, Simonini & Gelardi (2014)

*Basidiomata* stipitate-pileate, epigeal. *Pileus* convex to planate, bright blood red, crimson-red, purplish-red, reddish-pink or reddish-brown, opaque to shiny, dry to subviscid with moist weather, glabrous to subpruinose or subtomentose. *Context* pale yellow to bright yellow, quickly turning dark blue when injured or exposed, then fading blackish *Hymenophore* tubulose, adnate or slightly depressed around stipe apex; *tubes* yellow to olivaceous-brown; *pores* pinkish-red, reddish-orange, blood red to dark red, rarely yellowish-orange or yellow, often beaded with golden yellow or amber yellow droplets when young and fresh. *Stipe* central, solid, yellowish to concolorous with the pileus, conspicuously reticulate with elongated, red meshes or deeply reticulate-alveolate. *Spores* olive-brown in deposit, smooth, sub fusiform to ellipsoidal to ellipsoidal-fusoid. *Cystidia* present. *Pileipellis* an interwoven trichoderm tending to a cutis. Clamp connections absent. Known from the Northern Hemisphere. Genus phylogenetically inferred for three iconic species (*B. frostii, B. floridanus, B. permagnificus*). Ectomycorrhizae presumed with Fagaceae

**Fistulinella** Henn. (=*Mucilopilus*?) (1901)

*Pileus* dry or viscid, glabrous, fibrillose or tomentose, often scrobiculate, microscopically a trichodermium, cutis, isotrichodermium, or ixocutis. *Context* white, unchanging, soft-textured. *Stipe* dry or viscid, glabrous or pruinose. *Spores* brownish pink in deposit, smooth, fusoid. Clamp connections absent. Mexico, Caribbean, Brazil, Africa, Asia, Australia, New Zealand, Japan, Indonesia. The type species, *F. staudtii*, needs recollection for phylogenetic inference so that the genus can be interpreted in a modern sense. Compare *Mucilopilus* (below).

Ectomycorrhizae probable for some species with Fagaceae, Nothofagaceae, Leguminosae, Sapotaceae, Myrtaceae; doubtfully present in others.

**Gastroboletus** Lohwag (1926)

The genus appears polyphyletic and circumscribes taxa that have lost the ability to forcibly discharge spores (they are truffle-like, sequestrate). Further, the macromorphology is “reduced” in that the hymenophore is rarely exposed because the pileus does not expand and the stipe does not elongate. These taxa are typically hypogeous to suberumpent. Based on phylogenetic inferences from DNA sequences, this is a polyphyletic genus with alignments in clades of epigeous genera such as *Boletus, Xerocomus, Leccium*, and *Suillus*. The majority have been described from North America, one from Africa, one from Chile, and two from China. There appear to be entities allied to *Heimioporus* in Australia.

Ectomycorrhizae with Fagaceae, Nothofagaceae(?), Pinaceae, legumes(?), Myrtaceae.

**Guyanaporus** T.W. Henkel & M.E. Smith (2016)

One species, *G. albipodus*, from Guyana. True relationships for this genus in the Boletaceae are not apparent. A phylogenetic analysis of the nrLSU and *rpb1* places the genus on a long unsupported branch near *Tylopilus*, *Xanthoconium* and *Imleria. Ectomycorrhizae with *Dicymbe* (caesalpinoid legume), *Pakaraimaeae* (Cistaceae, formerly in Dipterocarpaceae).

**Gymnogaster** J.W. Cribb (1956)

*Basidiomata* sequestrate, but stipitate with fertile portion exposed and surrounding percurrent stipe-columella, with pileal disc depressed, dry, dark brown to reddish brown to orangish brown, finely submentose. *Context* yellow, immediately cyanescent. *Hymenophore* loculose to irregularly poroid, slightly subdecurrent, whitish with some brownish red stains at first, then grayish yellow to olive, immediately cyanescent. *Stipe* central, tapering downward to a point, dry, deep yellow to orange yellow at apex, red to deep red downward, short sulcate at apex, subpruinose, immediately cyanescent, with interior yellow, immediately cyanescent, becoming hollow. *Spores* smooth, citriform to amygdaliform, with a germ pore, rarely dextrinoid, rarely cyanophilic. One species known: *G. boletoides* from SE Queensland, N New South Wales, Australia. Phylogenetic relationships to ballistosporic taxa not completely clear (poorly supported *Pulveroboletus* group). Probably ectomycorrhizal with Myrtaceae.

**Gyrodon** Opatowski (1836)

*Pileus* glabrous or rarely subsquamos, dry, microscopically a trichodermium. *Context* pale yellow to whitish. *Hymenophore* decurrent, with **tubes** and pores radially elongated, staining blue. *Stipe* central to eccentric, often curved and short. *Spores* olive to olive brown in deposit, smooth, short-ellipsoid to phaceoliform. *Hymenal cystidia* present to rarely present. *Clamp connections* present. Widespread, but so far not in Australia. Phylogenetic inference places the genus in the Paxillaceae.

Ectomycorrhizae with *Alnus*; sometimes apparently not (at least in *G. exigus*, perhaps others).

**Gyroporus** Quélét (1886)

*Pileus* dry, glabrous to fibrous-subsquamos, microscopically a trichodermium. *Context* white to pale yellow, staining blue or brown in some. *Hymenophore* adnexed, white then pale yellow, with pores staining brown or blue in some. *Stipe* dry, glabrous or fibrous-subfurfuraceous, hollow or solid, composed of circumferentially arranged hyphae (not longitudinal). *Spores* yellow in deposit, smooth, ellipsoid. *Hymenal cystidia* present. *Clamp connections* present. North Temperate and Pantropical; less common in the southern hemisphere, but widely distributed and diverse in Australia. Phylogenetic placement inferred in Sclerodermatinae, family *Gyroporaceae*. Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, Myrtaceae, Casuarinaceae(?), possibly Lauraceae.

**Harrya** Halling, Nuhn & Osmundson (2012)


**Heimioporus** E. Horak (2004)

*Pileus* dry, rarely subviscid, submentose to subvelutinous, even or rarely shallowly alveolate or rarely cerebriform, microscopically a palisadic trichodermium or approaching a hymeniform
epithelium. Context white to yellow, not staining or erratically cyanescent near Tube. Hymenophore adnexed, yellow, sometimes staining blue. Stipe dry, pruinose to reticulate or rarely with sublacerate ridges, with white basal mycelium. Spores olive brown in deposit, alveolate-reticulate to reticulate or with irregular, pit-like perforations, extremely rarely rugulose and with crater-like pits, elongate-ellipsoid to short ellipsoid, lacking a suprahilar plage. Hymenial cystidia present. Clamp connections absent. A sequestrate entity allied to H. cooloolae known from SE Australia. Asia, SE Asia, Australia, Mexico, Belize, and Costa Rica.

Ectomycorrhizae with Fagaceae, Dipterocarpaceae, Myrtaceae, Casuarinaceae.

Heliogaster Orihara & K. Iwase (2010)

Basidiomata sequestrate (secotoid to gastroid), hypogeous to nearly epigeous, soft-textured, primarily pale yellow then ochre to light brown. Stipe-columella usually present, forming dendritic sterile tissue. Gleba dry, loculose with empty locules, whitish to grayish white, soon bluish to purplish when cut and exposed. Basidiospores hyaline to pale ochraceous, with pyramidal conical spines, dextrinoid. Hymenial cystidia absent. Peridial surface formed from filamentous interwoven hyphae. Clamp connections absent. Allied to Xerocomellus chrysenteron complex of epigeous boletes according to describing authors (Orihara et al 2010). Morphologically reminiscent of Octaviania. Apparently only in Japan.

Ectomycorrhizae expected with Pinaceae and Fagaceae.

Hemileccinum Šutara (2008)

Basidiomata pileate-stipitate, recalling Leccinum sect. Luteoscabrum (see Leccinellum below); Pileus dry, submentose to glabrous, violet with NH₃, with pileipellis a trichodermium or hymeniform. Context yellow or white, unchanging. Hymenophore adnexed, light yellow to deep yellow, unchanging when bruised, with fine pores. Stipe dry, scabrous, with scabers light colored, and barely darkening with age. Spores olive brown in deposit, smooth, fusoid. Hymenial cystidia present. Clamp connections absent. Molecular inferences indicate distinction from Leccinum, Boletus, Xerocomus. Includes 5 species: H. impolitum, H. depilatum in Europe & China, H. subglabripes from E North America & China, and H. indecorum, H. rugosum in China. At least one undescribed from Australia.

Ectomycorrhizae with Fagaceae, Betulaceae, Ulmaceae and possibly Myrtaceae in Australia.

Hortiboletus Simonini, Vizzini & Gelardi (2015)

Basidiomata pileate-stipitate, recalling Xerocomellus. Spores smooth, not ornamented, with Qm < 2.5, stipe context with small vermiform red dots in the base. Clamp connections absent. Molecular inferences indicate distinction. Northern Hemisphere. Apparently two species from Europe: H. bubalinus, H. rubellus (this latter also N. America).

Ectomycorrhizae with Fagaceae(?).


Basidiomata stipitate-pileate with tubular hymenophore. Pileus hemispherical, convex to applanate, sometimes umbonate; surface densely covered with granular squamules when young, becoming rimose-diffract to small tufted squamulose with age, dry. Context whitish, cream-colored to yellowish, first bluish or indistinctly bluish, then reddish to brownish red, finally brownish to blackish when injured. Hymenophore adnate, sinuate or slightly decurrent; thickness of hymenophore 3–5 (7) times that of pileal context at the position halfway to the pileus center, flesh yellow to dull yellow, staining blue when injured; pores compound, angular; tubes concolorous with hymenophoral surface, staining blue when injured. Stipe central, pale yellow-brown, pale red-brown to dirty pale brown, nearly smooth, sometimes finely fibrillose; context dirty white to yellowish, first typically becoming bluish, then reddish to brownish red, and finally brownish to blackish when exposed; basal mycelia whitish. Pileipellis a trichoderm composed of cylindrical or tumid cells. Hymenial cystidia present.
**Spores** sub fusiform, brownish yellow, with bacillate ornamentation (under SEM), rarely only partially ornamented. *Clamp connections* absent. Known from China, Japan, Indonesia, Malaysia. Phylogenetic inference indicates the genus is sister to *Phylloporus* with 4-5 species. Ectomycorrhizae presumed with Pinaceae, Fagaceae, Dipterocarpaceae.

**Hymenoboletus** Y.C. Li & Zhu L. Yang (2016)

From the protologue: *Basidiomata* stipitate-pileate with tubular hymenophore. *Pileus* hemispherical or convex, submentose, dry; context white to cream, without discoloration when injured. *Hymenophore* depressed around apex of stipe; hymenophoral surface white when young, and becoming pinkish or pink when mature; *pores* angular or roundish; *tubes* concolorous with hymenophoral surface, unchanging in color when injured. *Stipe* central, pink to purplish pink, but yellow to yellowish at apex and bright yellow to chrome yellow at base; basal mycelium chrome yellow. *Basidiospores* smooth, sub fusiform. *Pleuro- and cheilocystidia* sub fusiform to sub fusiform-ventricose or clavate. *Pileipellis* hymeniform. *Clamp connections* absent. One species (*H. luteopuspureus*) phylogenetically inferred in the Zangioideae, between *Royaungia-Australopolius* and *Harra*, but lacks any further phylogenetic support. The single species appears clearly distinct based on microscopic features.

Ectomycorrhizae presumed with Fagaceae.

**Imleria** Vizzini (2014)

*Basidiomata* epigeous. *Pileus* reddish brown, chestnut brown to dark brick brown, sometimes pallid, minutely to distinctly tomentose when young and dry, soon becoming smooth and polished, viscid in wet weather. Contexts of pileus and stipe whitish to lemon-yellow, becoming blue particularly around the tubes and at the stipe apex when handled. *Tubes* cream to lemon-yellow, becoming dull yellow with age, bluing on cutting. *Pores* compound, angular, quite large at maturity, concolorous with tube, bluing when handled. *Stipe* central, concolorous with pileus or slightly paler, minutely flocculose or fibrillo- striate. *Spores* boletoid, smooth. *Pileipellis* an ixotrichoderm, consisting of long, slender and cylindrical interwoven hyphae, smooth to slightly incrustted by a minutely granular, yellowish pigment and embedded in a gelatinous matrix. *Clamp connections* absent. Northern Hemisphere. One well-known species in N. Hemisphere, *I. badia*, is inferred from molecular phylogenetics. Three others described from E. Asia; another European one placed here without justification.

Ectomycorrhizae presumed with Pinaceae, Fagaceae.

**Imperator** Koller, Assyov, Bellanger et al. (2015)

From the protologue in Index Fungorum 243: Habitus robustissimarum Boletacearum typicus. A gen. *Rubroboletus* differt pileo tacto caeruleo- dein nigro maculoso, contextum in stipites basi rubropurpureo. Stipes robustus, totaliter reticulato atque flavo-purpurascens. Porii minuti, primitus lutei vel rubri, tacto caeruleoscentibus. Caro compacta, odore fortis, flavo-sulphurea, virescens deunque fracta caeruleascens; stipite basi. Holotype: *Boletus torosus* Fr. 1835. Phylogenetic results based on ITS and 28S rDNA sequences reveal that the three species cited above (*I. luteocupreus*, *I. rhodopurpureus*, *I. torosus*) belong to a monophyletic lineage, not characterized in earlier works (Nuhn et al. 2013, Fungal Biology 117: 479-511; Arora & Frank 2014, Mycologia 106(3): 464-480; Gelardi et al. 2014, Mycologia 106 (6): 1168-1187; Simonini & Vizzini 2014, Mycol. Progress 13(1): 95-109; Wu et al. 2014, Fungal Diversity on line, DOI: http://dx.doi.org/10.1007/s13225-014-0283-8; Wu et al 2015, Fungal Diversity on line, DOI: 10.1007/s13225-015-0322-0). The three species identified in this clade are all European, known from broadleaved forests on calcareous soils. This group is characterized by a unique combination of features: yellow to reddish-orange reticulate stipe, staining dark purplish red from base with age, a typical blue to blackish staining on pileus surface when touched, and an intense bluing reaction of the context when cut. Pores are either yellow, red or purplish with a high chromatic variability of all parts of basidiome in *I. rhodopurpureus*. Phylogenetic results supporting this publication (ITS and 28S ML phylogenetic trees) are accessible online at
Indopus Karthikeyan, Das, Hembrong & Vizzini (2018)

Based on the protologue: Basidiomata epigeous; pileus gray with black squamules, dry, with yellowish white context, quickly dull red to grayish red then eventually black when exposed. Hymenophore tubulose, depressed around stipe, reddish gray or brownish orange when bruised, eventually black, with simple angular pores. Stipe smooth, grayish violet above, gray to blackish brown below, with context grayish violet to dark violet above, dark blackish brown below becoming black when exposed. Spores grayish brown in deposit, smooth, inamyloid. Pleurocystidia hyaline and rare; cheilocystidia hyaline and common. Pileipellis a trichoderm, with hyphae containing blackish brown pigment, sometimes with zebroid incrustations.

Clamp connections? The type species I. shoreae was described from Jharkhand, India based on several specimens. Molecular phylogenetic analyses based on nrLSU, ITS, and rpb2 infer an independent clade sister to Afroboletus and Boletus pallidus (LSU, rpb2 with no support) and Chalciporus and Buchwaldoboletus (ITS with less than 70% support). Ectomycorrhizae with Dipterocarpaceae (Shorea robusta) probable.

Ionosporus Khmelitsky (2019)

Basidiomata epigeous, dry, dark gray to sooty gray brown on pileus and stipe; hymenophore tubulose with angular pores, whitish to grayish yellow to pale greenish yellow, staining red when bruised; stipe usually central, finely but conspicuously reticulate and densely finely subpruinose, concolorous with pileus, conspicuously white at the base; context white or very pale yellow, unchanging when exposed. Spores pale violet to reddish brown in deposit, deeply purple-violet in dilute KOH solutions, dextrinoid in Melzer’s Reagent, fusoid to elongate, appearing smooth with bright field light microscopy, barely granulose with Nomarski DIC optics, irregularly and finely granulose to pitted granulose with SEM, sometimes with a faint germ pore. Pileipellis a trichoderm. Clamp connections absent. Peninsular Malaysia, E Australia; two species: I. longipes, I. australis. Molecular phylogenetics infers placement in Leccinoideae near Borofutus, Rhodactina, and Spongiforma.

Ectomycorrhizae presumed with Dipterocarpaceae, Myrtaceae, Casuarinaceae.


Distinguished by morphological features (and sequestrate habit), including molecular inference as allied to Tylopilus. See latter for morphological features. One species from Guyana. Ectomycorrhizae with caesalpinoid legumes (Dicymbe, Aldina).

Kombocles Castellano, T.W. Henkel, & Dentinger (2016)

Basidiomata sequestrate, emergent and (sub-)globose, firm, becoming brownish. Gleba loculate, with white tramal veins, with brown locules. Columnella absent. Spores asymmetrical, fusoid to allantoid to unevenly ellipsoid, yellow brown, rugulose, dextrinoid. Hymenial cystidia and clamp connections absent. One ribosomal gene (28S) inferred placement near Heimioporus with very low bootstrap support. One species, K. bakaiana, from Cameroon.

Ectomycorrhizae presumed with Uapaca.


Basidiomata stipitate-pileate. Pileus hemispherical, convex or applanate, subtomentose, dry, slightly incurved at the margin when young. Context off-white to cream yellow, slowly staining pale blue to light blue when injured. Hymenophore adnexed or sinuate, thin (1/3–1/5 thickness of context midway from disc to margin), cream yellow to lemon yellow, staining dull blue when injured with tubes concolorous with hymenophoral surface or light red, staining dark blue when injured with pores angular or nearly round. Stipe central, cream yellow, light yellow to lemon yellow at the apex and light to dark purple red towards the base with basal mycelia yellowish white to white. Pileipellis often an interwoven trichodermium to subcutis, rarely ixosubcutis. Hymenial cystidia present. Spores


Accommodates most of the taxa with yellow *hymenophore* formerly placed in *Leccinum* sect. *Luteoscabrum* (but see *Hemileccinum* above). This includes several European taxa (e.g., *L. nigrescens*, *carpini*, *corsicum*, *crociptodium*, *griseum*, *lepidium*, & *luteoscabrum*, and *L. quercophilum* from E N America). Apparently restricted to the Northern Hemisphere (Europe, E North America, E Asia). Ectomycorrhizae with Fagaceae, Betulaceae.

**Leccinum** S. F. Gray (1821)

*Pileus* viscid or dry, glabrous to submentose, microscopically a trichodermium or hymeniform. *Context* white or pale yellow, unchanging or staining red, pink, gray, or blue to blue-green. *Hymenophore* adnexed, white to tan to yellow, often staining pale brown. *Stipe* dry, scabrous, with scales whitish at first becoming brown to black. *Spores* brown (olive brown?) in deposit, smooth, fusoid. *Hymenial cystidia* present. *Clamp connections* absent. North Temperate, montane Neotropics, Asian and African tropics. In Australia as exotic import associated with horticultural plantings (*Betula, Quercus*) fide Watling & Gregory (1988); likewise in New Zealand (McNabb 1968). Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, caesalpinoid legumes.

**Mackintoshia** Pacioni & Sharp (2000)

*Basidiomata* sequestrate, hypogeous, subglobose to pyriform. *Peridium* well developed, pale yellow to orange yellow wit rusty colored cracks. *Gleba* white to ochraceous to olivaceous, soft and rubbery with gelatinous tranal plates, gel-filled at maturity. *Spores* smooth, elliptical, slightly thick-walled, sometimes reported with a germ pore. *Hymenial cystidia* with dense, yellow, cyanophilous content, thin-walled. *Clamp connections* absent. Odor fruity. So far, only one species, *M. persica*, reported from Zimbabwe. 28s and ITS infer placement near Parvixerocomus in the Boletoidae. Ectomycorrhizae presumed with caesalpinoids, *Brachystegia* and *Burkea*.

**Melanogaster** Corda (1831)

*Basidiomata* sequestrate, usually hypogeous. *Peridium* well developed, dry, slightly pruinose, ochre to ochraceous yellow to reddish brown, sometimes with adherent rhizomorphs. *Gleba* gel-filled at maturity, whitish at first then brown to black at maturity, lacking well-developed hymenium, with whitish to yellowish tranal plates, lacking a sterile base and columella. *Spores* smooth, dark brown, orthotrophic, with well-developed sterigmal appendage, ovoid to ellipsoid, fusoid to limoniform. *Clamp connections* present. Northern Hemisphere, Central America. Phylogenetic inference places the genus in the Paxillaceae. Ectomycorrhizae presumed with Pinaceae, Fagaceae, Betulaceae.

**Mucilopus** Wolfe (1979)

The genus is based on *Porphyrellus viscidus*, described by McNabb from New Zealand. Five other species were placed here by Wolfe. Some, including the type species, were incorporated earlier in *Fistulinella* (q.v.) by Singer, and another was moved to *Veloporphryellus* (*V. conicus*) based on molecular phylogenetic analyses. Only *M. castaneiceps* and *M. mexicanus* have not been transferred. If the type species is truly a *Fistulinella*, then the genus becomes a synonym of that genus and some other generic name is needed for *castaneiceps* and *mexicanus*. Refer to *Fistulinella* for features.

**Mycoamaranthus** Castellano, Trappe, & Malajczuk (1992)

*Basidiomata* sequestrate, bright chrome yellow to orange yellow, dry, glabrous to squamulose,
globose to subglobose, with numerous rhizomorphs. Gleba viscid to spongy-gelatinous to rubbery, variously colored at first, but darker (grayish-brownish) at maturity. Spores ovoid to obpyriform, with apparent germ pore at apex, pedicillate, spinose to minutely verrucose. Clamp connections absent. Zimbabwe, Malawi, Congo-Kinshasa, Cambodia, Thailand, Malaysia, Singapore, Australia.

Ectomycorrhizae with Dipterocarpaceae, Myrtaceae (Eucalyptus, Syncarpia), Allocasuarina, Brachystegia, Julbernarda, Upacca.

**Neoboletus** Gelardi, Simonini & Vizzini (2014)

*Basiidiomata* stipitate-pileate with tubular hymenophore, epigeal, evelate. *Pileus* convex to applanate, bay-brown, date-brown, olive-brown, reddish-brown to blood red, ochraceous or yellow, opaque, dry, velvety to submentose. *Context* firm, pale yellow to bright yellow, quickly turning dark blue when injured or exposed. *Hymenophore* tubulose, adnate or slightly depressed, with *tubes* yellow to olivaceous-brown, with *pores* reddish-orange, blood red to reddish-brown, yellowish-orange or yellow. *Stipe* central, solid, yellowish, ornamented by conspicuous reddish to reddish-brown or yellow punctuations throughout or at least in the upper part, sometimes reticulate, with or without strigose base. *Spores* olive-brown in deposit, smooth, subfusiform to ellipsoidal to ellipsoidal-fusoid. *Cystidia* present. *Pileipellis* a subparallel or interwoven trichoderm tending to a cutis. Clamp connections absent. North Temperate.

Ectomycorrhizae presumed with Pinaceae, Fagaceae.

**Nigroboletus** Gelardi et al. (2015)

Original diagnosis: *Basiidiome* stipitate–pileate with tubular hymenophore, epigeal, evelate, medium–small sized; *pileus* convex to applanate, submentose to glabrous; hymenophore very thin, poroid, adnate to subdecurrent, yellow to olive–yellow; *stipe* solid, dry, smooth to minutely pruinose-punctate, reticulation absent; *context* firm, yellowish; tissues turning dull grayish to blackish throughout when injured or exposed; *taste* mild: *spore* print olive–brown; *spores* smooth, broadly ellipsoid to subvoid; pleuro–, chelo–, and caulocystidia present; pileipellis consisting of subparallel to loosely interwoven erect hyphae; hymenophoral trama bilateral–divergent of the *Boletus*–type or intermediate between the *Boletus*–type and the *Phylloporus*–type; lateral *stipe* stratum of the boletoid type; clamp connections absent; ontogenetic development gymnocarpic. Molecular phylogenetic inference places the single known species, *N. roseonigrescens*, in the Boletoideae near Xerocomellus. Currently only known from tropical SE China.

Ectomycorrhizae presumed with Pinaceae, Fagaceae (Castanopsis, Castanea, Lithocarpus).

**Octaviania** Vittadini (1831)

*Basiidiomata* sequestrate, frequently hypogeous, or more rarely emergent. *Peridium* persistent, glabrous to floccose or warty to scaly, often discoloring when bruised. *Gleba* whitish at first, marbled, becoming brown to black at maturity, dry to gelatinized. *Spores* globose to ellipsoid, beset with thick, conspicuous, pyramidal to conical projections (warts?) sometimes fused to form irregular ridges, dextrinoid. *Sterile base* absent or present. Clamp connections absent. North America, Europe, Asia, Australasia.

Ectomycorrhizae presumed with Pinaceae, Fagaceae, Betulaceae, Nothofagaceae, Myrtaceae, Casuarinaceae.

**Paragyrodon** (Singer) Singer (1942)


Ectomycorrhizae with *Quercus* suspected but not confirmed. Phylogenetic inference places the genus
in the Paxillaceae.


Based on the protologue: *Basidioma* stipitate-pilate with tubular hymenophore, small. *Pileus* convex to applanate, submentose, dry; *context* yellowish to yellow, staining blue immediately when injured. *Hymenophore* subdecurrent, often with teeth on the apex of stipe; hymenophoral surface yellowish to yellow, staining blue immediately when injured; *pores* irregular, angular to nearly round, often compound; tubes concolorous with hymenophoral surface, staining blue immediately when injured. *Stipe* central, light brown, brownish red to reddish brown, surface often pruinose; basal mycelia cream to grayish yellowish. *Pileipellis* an epithelium composed of submoniliform to moniliform hyphae with cystidioid terminal cells. *Pleuro- and cheilocystidia* sub fusiform-ventricose or clavate, with subacute apex or with long beak. *Basidiospores* smooth, ovoid to ellipsoid, yellowish to brownish yellow. *Clamp connections* absent. Phylogenetic inference places the genus in the Boletoidae near *Xerocomellus*. Two species known from China and Japan. Ectomycorrhizae presumed with Fagaceae and possibly Pinaceae.

**Paxillogaster** Horak (1966)

*Basidiome* epigeous, pyriform to lycopodon-like, dry, not expanded, with interwoven hyphae in the epicutis. *Gleba* loculate to sublamelliform, typically enclosed, rarely exposed. *Stipe* well developed, with fragmented veil absent. *Spores* bilaterally symmetric, fusoid to inequilaterally ellipsoid, smooth but with exosporium indistinctly perforate, yellow. *Cystidia* claviform, *Clamp connections* absent. One species known, *P. luteum*, from Antarctic beech forests in Argentina. Ectomycorrhizae presumed with *Nothofagus dombeyi*, *pumilio*, *antarctica*.

**Phlebopus** (Heim) Singer (1936)


**Phylloboletellus** Singer (1952)


**Phyllobolites** Singer (1942)


**Phylloporopsis** Angelini et al. (in Farid et al. 2018)

From the original diagnosis: *Basidiomata* pulate-stipitate with lamellate to subporoid hymenophore, epigean, evelate, medium-small sized; pileus convex to planate, velvety-tomentose to
fibrilllose; hymenophore lamellate to subporoid with anastomosing and intervenose gills, strongly
decurrent, beige to olive-cream or olive buff; stipe solid to sometimes hollow at maturity, dry, pruinose to
longitudinally fibrilllose, reticulation absent; basal mycelium whitish to yellowish, context firm, whitish
but cream-yellowish in the stipe; tissues unchangeable or turning light blue especially on hymenophore
and pileus context when injured or exposed; taste mild to slightly bitter; olive-brown spore print;
purplish-pink or reddish reaction with ammonia on pileus cuticle; basidiospores smooth, ellipsoid-
fusiform, spore wall cyanophilic; pleuro-, cheilo and caulocystidia present; pileipellis a trichodermium;
hymenophoral trama bilateral-divergent of the “Phylloporus-type”; lateral stipe stratum absent; clamp
connections absent; ontogenetic development gymnocarpic. According to the phylogenetic analysis of
the combined ITS, 28S, TEF1-a, and RPBI sequences the genus is unrelated to Phylloporus and sister to
Bothia and Soliocasus (Bothia clade); part of a polytomy in the Boletoidae. One species, P.
boletinousoides, found in Central America, Caribbean, and eastern-southeastern USA.
Ectomycorrhizae presumed with Pinaceae and Fagaceae.

Phylloporus Quélet (1888)
Pileus dry, tomentose to subtomentose, microscopically a trichodermium or a modified
hymeniform layer. Context usually white, sometimes yellow, sometimes changing to blue when
exposed. Hymenophore lamellate to subtubulose to radically boletinoid, sometimes changing to blue
when bruised. Stipe central, rarely slightly eccentric, usually pruinose; basal mycelium white or
yellow (IMPORTANT!). Spores olive brown in deposit, smooth, fusoid or ovoid, dextrinoid.
Hymenial cystidia present. Clamp connections absent (present in 1 or 2 species). NH3 reactions
negative or positive (blue or blue green, sometimes pinkish lilac or rarely other colors –
IMPORTANT!). Mostly tropical, but some temperate (north and south) taxa.
Ectomycorrhizae with Pinaceae, Fagaceae, Myrtaceae, Dipterocarpaceae, Casuarinaceae.

Porphyrellus E.-J. Gilbert (1931)
This genus used for the typically, somber colored taxa originally placed in Tyloporus with
very dark brown to dark pinkish brown colored spore print. They are often cyanescent and/or
rufescent and then nigrescent. The hymenophore is usually not pinkish vinaceous with maturity, but
might be a pale greenish yellow becoming black. Based on the European P. pseudosacer nom. inval.
(= P. porphyrosporus). A distinct genus inferred from DNA sequences. Further taxon discovery and
phylogenetic inference should help clarify generic boundary. Many north temperate (one in Europe,
several in North America, E Asia), and possibly a few in Australia, New Zealand; these latter may be
generically distinct based on molecular inference.
Ectomycorrhizae presumed with Pinaceae, Fagaceae, Myrtaceae, Casuarinaceae, perhaps
Dipterocarpaceae, Nothofagaceae, caesalpinoid legumes.

Basidiomata stipitate-pileate with tubular hymenophore. Pileus hemispherical to applanate,
not viscid when wet, with radially arranged filamentous squamules. Context white to pallid,
unchanged in color when injured, but occasionally with yellowish discoloration on the base of the
stipe. Hymenophore adnate to depressed around apex of stipe, white to pallid when young, and
becoming pale pinkish or pinkish to pink when mature, unchanged in color when injured. Stipe pallid
to white, reticulate with elongate meshes. Basal mycelia white. Pileipellis an interwoven trichoderm.
Hymenial cystidia with brown to dark brown vacuolar pigment. Spores pinkish to pink in deposit,
smooth, pinkish to light olivaceous to nearly colorless. Clamp connections absent. Currently known
from Japan, China, Malaysia, Singapore. One species, with two varieties.
NOTE: Despite the generic name, the genus is not close to Austroboletus; rather based on the
molecular inference, it is most nearly allied to Tyloporus (nrLSU) or a Leccinoideae clade (combined
nrLSU, tef1, mtSSU).
Ectomycorrhizae apparently with Fagaceae.
**Pseudoboletus** Šutara (1991)

An epigeous bolete with xerocomoid habit that is associated with *Scleroderma* and *Astraeus*. Northern hemisphere. Considered parasitic, but one of the pair is ectomycorrhizal.

**Pulchroboletus** Gelardi, Vizzini & Simonini (2014)

*Original diagnosis:* Differing from *Alessioporus* by the pastel pink, cream-pinkish to whitish pink or rarely blood red pileus surface, the smooth to densely punctuate stipe surface, rarely with a coarse reticulum, the pseudo-annulus usually located in the upper or middle part of the stipe, the pinkish lilac context of the pileus and unique ITS, LSU and tef-1α sequences. Apparently aligned in the *Xerocomoideae* and circumscribes just two species, one in Mediterranean Europe and the other in states along the Gulf Coast, USA.

Ectomycorrhizae presumed with Fagaceae (*Quercus, Castanea*), possibly *Cistus*.

**Pulveroboletus** Murrill (1909)


Ectomycorrhizae with Fagaceae, Myrtaceae, Casuarinaceae, Pinaceae(?), possibly Dipterocarpaceae, caesalpinoid legumes.

**Retiboletus** Binder & Bresinsky (2002)

Recognized as distinct from *Boletus*. In research published by V. Hellwig, the genus produces a unique group of butenolide compounds called retipolides (rarely without) that are responsible for the bitter taste and the intense yellow color of the context. *Spores* olive brown in deposit, fusoid, smooth. *Hymenial cystidia* present. *Clamp connections* absent. Circumscribes 12 northern hemisphere species with conspicuously reticulate stipes. Temperate New World (Japan?) to montane Neotropics.

Ectomycorrhizae with Fagaceae.

**Rheubarbarioboletus** Vizzini, Simonini & Gelardi (2015)

From the original diagnosis: Difers from *Xerocomellus* by the spores smooth in all species, never striate, never truncate, elements of the pileipellis smooth or only with finely incrusting pigment, the presence of conglphilous plaques on hyphal surface, the tapered and rooting stipe base, the bright yellow-ochreous to orange-rhubarb and unchangeable context in the stipe base, and the dark blue-green to blackish reaction with iron sulphate on pileus surface and in the stipe base context. Apparently restricted to Europe.

Ectomycorrhizae presumed with Fagaceae, Pinaceae.

**Rhizopogon** Fries (1817)

*Basidiomata* sequestrate, hypogeous to erumpent. *Peridium* dry, pruinose to submentose, sometimes with overlaying rhizomorphs, sometimes bruising, white to yellow to brown to reddish brown. *Gleba* dry, minutely loculose, whitish at first, eventually brownish, lacking a columella. *Spores* smooth, ellipsoid to fusoid, hyaline to pale yellowish, rarely globose and reticulate. *Clamp connections* absent. Northern Hemisphere. Often present where Pinaceae introduced (e.g., Australia, New Zealand, South America).

Ectomycorrhizae with Pinaceae.


*Basidiomata* sequestrate, globose to pyriform, white with a silky sheen and drab gray tinges,
bruising brownish gray to dark brown. *Gleba* enclosed, loculose, vinaceous at first, then soon pale cinnamon to avellaneous, with empty locules. *Stipe* absent but with a sterile basal pad. *Spores* reddish purple, broadly ellipsoid to subfusoid, longitudinally costate, with 6-10 ribs, dextrinoid. Peridal pellis repent, with fine to coarse encrustations. *Clamp connections* absent. Phylogenetic relationships inferred from *atp6, tef1, and rpb2* sequences indicate placement in subfam. Leccinoideae near *Ionosporus, Borofutus* and *Spongiforma*. Three species known from India and Thailand.

**NOTE**: there appear to be epigeous entities in SE Asia (Viet Nam, Thailand, Malaysia) with similar spore morphology. One species is well-described as *Afroboletus vietnamensis* by T.H.G. Pham *et al*. Ectomycorrhizae presumably with Dipterocarpaceae (at least *Shorea robusta*).

**Rossbeevera** T. Lebel, Orihara (2012) (originally *Rosbeeva*)

*Basidiomata* sequestrate, flattened to globose or subglobose, sometimes slightly cerebriform, white or rarely pink developing greenish blue colors in situ, sometimes slowly staining bluish or greenish blue when handled or on exposure. *Gleba* finely loculose, without gel-filled chambers, white at first, becoming cinnamon to dark brown with maturity. *Rhizomorphs* present at a sterile base. *Spores* pale brown to dark brown, ellipsoid to broadly fusoid, smooth but with 3–5 longitudinal ridges, angular to stellate in polar view. *Clamp connections* absent. A sequestrate genus described by Lebel et al (2011) allied to *Leccinum*, it is a western Pacific entity with species formerly placed in the north temperate *Chamomixia*. Distinction is primarily supported by molecular inferences and spore morphology. Australia, New Zealand, Singapore, Borneo, China, Japan. Ectomycorrhizae presumed with *Eucalyptus, Leptospermum, Syncarpia, Allocasuarina, Acacia, Castanopsis, Quercus, Fagus, Nothofagus*.

**Royoungia** Castellano, Trappe & Malajczuk (1992)

*Basidiomata* gasteroid (sequestrate), flattened to globose or subglobose, bright golden yellow to dull orange, dry. *Gleba* loculose, somewhat cartilaginous, chocolate brown or a sordid yellow in color when mature, with empty locules. *Rhizomorphs* numerous, concolorous with peridium. *Columella* absent or sometimes present as a basal pad, white, or nearly concolorous with peridium, erroneously described as staining bright red (in the type species). *Spores* subfusoid, smooth. *Peridal pellis* compactly interwoven. *Trama* divergent, gelatinous. *Clamp connections* absent. Eastern Australia (Queensland, New South Wales, Tasmania, Victoria). Ectomycorrhizae presumed with *Myrtaceae* (*Eucalyptus, Leptospermum, Melaleuca*), *Casuarinaceae* (*Allocasuarina*).

**Rubroboletus** Zhao & Zhu L. Yang (2014)

*Basidiomata* stipitate-pileate. *Pileus* hemispherical, convex or planate, grayish, pinkish to red. *Context* white, yellowish to lemon-yellow, cyanescent. *Hymenophore* surface orange red to blood red, sometimes orange-yellow when mature, rapidly bluing when bruised. *Tubes* yellow to olivaceous green, cyanescent when injured, then back to the original color slowly. *Stipe* central, covered with pinkish, red to brownish red reticula or spots. *Pileipellis* an interwoven trichoderm composed of more or less vertically arranged, sometimes gelatinized filamentous hyphae. Hymenophoral trama boletoid. *Basidiospores* smooth, subfusciform to ovoid-ellipsoid, slightly thick-walled. *Hymenal cystidia* present. *Clamp connections* absent. [Adapted from Zhao et al 2014]. China, Europe, North and Central America. Ectomycorrhizae presumed with *Pinaceae, Fagaceae*.


*Basidiomata* stipitate-pileate. *Pileus* hemispherical, convex or planate, subtomentose, dry, strongly wrinkled (especially when young), usually with incurved or extended margin. *Context* cream, light yellow to yellow, unchanging or staining light blue slowly when bruised. *Hymenophore* adnexed to adnate, light yellow, yellow, or brown, reddish brown to yellowish brown, unchanging or staining
blue to dark blue quickly when bruised, with tubes grayish-yellowish, brownish yellow, unchanging or staining blue, dark blue to greenish blue quickly when bruised, with pores nearly round to round. Stipe central, light yellow to yellow, covered by minute squamules, with basal mycelia off-white to light yellow. Pileipellis an ixotrichodermium to an interwoven ixotrichodermium. Hymenial cystidia present. Basidiospores smooth, subcfusiform, brownish yellow. Clamp connections absent. Eastern Asia (China, Japan, far east Russia, Korea, Nepal, Thailand) and possibly Central America, Colombia. Ectomycorrhizae presumed with Pinaceae, Fagaceae.

*Singerocomus* T.W. Henkel & M.E. Smith (2016)


*Singeromyces* Moser (1966)


*Soliocasus* Trappe, Osmundson, Manfr. Binder, Castellano & Halling (2013)

*Basidiomata* gastroid (seequstrate), hypogeous or emergent, subglobose to lobed and irregular in outline, arising from yellow to orange to red rhizomorphs, often wrapped with copious, flattened rhizomorphs, dry, with peridium soon evanescent, exposing loculose gleba, whitish when young, soon yellow to orange to red. *Gleba* loculose, developing yellow to orange to red colors, with a prominent to inconspicuous, dendroid, cartilaginous *columella*. *Spores* pale yellow, smooth (light microscope), faintly and irregularly roughened (Nomarski DIC, SEM), ellipsoid or rarely subangular to subfusoid, inamyloid. Clamp connections absent. Papua New Guinea, Australia (Queensland, Northern Territory). Ectomycorrhizae with Myrtaceae (*Corymbia, Eucalyptus, Leptospermum, Lophostemon, Melaleuca*), Casuarinaceae (*Allocasuarina*).


Description from protologue: Basidiomes stipitate-pileate with tubular hymenophore. *Pileus* convex or plano-convex, surface dry, subomentum to squamulose, in age often cracked into isolated
squamules; **context** whitish to cream, very slowly staining pale brown after exposure. **Tubes** adnexed, concolorous with pores when young, becoming yellowish brown to light brown with age, not narrow. **Pores** roundish to irregular-angular, cream colored when young, becoming apricot yellow to grayish orange with age, staining brownish to brown where bruised. **Stipe** central, coarsely reticulate to reticulate; context whitish to cream in the upper part, pale yellow in lower half, slowly staining pale brown to light brown on exposure. **Basidiospores** nearly elliptical to ovoid, with surface irregularly warty under light microscopy but with sponge-like perforated exospore under SEM. **Pleurocystidia** and **chelioecystidia** subfusiform-ventricose, sometimes with apical beak. **Pileipellis** an interwoven trichodermium. **Clamp connections** absent. One species known from the Singapore Botanic Garden (S. temasekensis). Robust molecular phylogenetic signal places this genus in the **Leccinoideae** on a long branch basal to **Leccinum**, **Leccinellum**, **Octaviania**, **Turmalinea**, and **Rossbeevera**.

**Ectomycorrhizae** with **Hopea odorata** (Dipterocarpaceae).

**Stroblomyces** Berkeley (1851)

**Pileus** dry, coarsely fibrillose to squamulose, black, infrequently dark brown, very rarely pale yellow, often with appendiculate veil remnants, microscopically a trichodermium. **Context** white, staining reddish orange to dull reddish then black, or sometimes slowly blackening straightaway with only a hint of the reddish tints. **Hymenophore** adnexed to adnate, sometimes with subdecurrent lines, white then black, staining red then black or sometimes slowly black straightaway. Peronate veil present or sometimes absent and then remains hanging from **Pileus** margin. **Stipe** dry, squamose, sometimes annulate, white to gray to black. **Spores** black in deposit, globose, reticulate to irregularly echinate or sparrasoid to cristate. **Hymenial cystidia** present. **Clamp connections** absent. North Temperate Zone, montane Neotropics, Southeast Asia, Australia. Some African representatives have been transferred to **Afroboletus**.

**Ectomycorrhizae** with Pinaceae, Fagaceae, Myrtaceae, Casuarinaceae(?), Dipterocarpaceae, Caesalpinoid legumes.

**Suillellus** Murrill (1909)

**Pileus** surface glabrous or nearly so, dry or slightly viscid. **Context** white or yellow, fleshy, very firm, cyanescent. **Tubes** usually free, small, yellowish within, their mouths closed when young, and red or orange from the first, not covered with a veil, cyanescent. **Stipe** solid, usually reticulated or dotted. **Spores** oblong-ellipsoid, smooth, yellowish-brown, sometimes with greenish tints. **Clamp connections** absent. North Temperate.

**Ectomycorrhizae** assumed with Pinaceae, Fagaceae.

**NOTE**: This genus circumscribes a portion of the original **Boletus** subsect. **Luridi** (those with red pores). See also **Caloboletus**, **Crocinoboletus**, **Exsudoporus**, **Neoboletus**, and **Rubroboletus**.

**Suillus** S.F. Gray (1821)

**Pileus** viscid and glabrous or dry and squamulose, sometimes with appendiculate remnants, microscopically an ixotrichodermium or a trichodermium. **Context** white or pale yellow, unchanging or sometime staining a pale reddish. **Hymenophore** adnate to adnexed, yellow or pale cinnamon brown. **Stipe** dry, annulate or not, typically with glandular dots or smears. Spore deposit pale cinnamon brown. **Spores** smooth, short fusoid. **Hymenial cystidia** usually clustered, with amorphous brown pigmentation at the base. **Clamp connections** absent. North Temperate and southward into the tropics to the southern limit of Pinaceae (**S. subaureus** with **Betula**). Absent in Africa. Frequently occurring with exotic Pinaceae transplanted beyond natural range.

**Obligate ectomycorrhizae** with Pinaceae but one known with **Betula** in NE USA.

**Sutorius** Halling, Nuhn & Fechner (2012)

**Pileus** dry, rarely viscid (wet weather), very finely matted, brown to chocolate brown to violet brown. **Context** white and mottled brownish lilac, unchanging. **Hymenophore** adnexed, lilac to pale brown to violet brown. **Stipe** dry, with scissurate fine scales, lilac brown to violet brown. Spore

**Tengioboletus** G. Wu & Zhu L. Yang (2016)

From the protologue: *Basidiomata* stipitate-pileate with tubular hymenophore. *Pileus* convex or applanate, glabrous to submentose, dry, sometimes viscid when wet; *context* yellowish to yellow, color unchanging when cut. *Hymenophore* adnate to sinuate; hymenophoral surface white when young, yellowish to yellow when mature, color unchanging when injured; *pores* roundish; *tubes* concolorous with hymenophoral surface, color unchanging when injured. *Stipe* central, yellow, orange-yellow to brownish yellow, glabrous or reticulate; basal mycelium light yellow. *Pleuro- and cheilocystidia* subfusiform-ventricose or clavate, with subacute apex or long beak. *Pileipellis* an epithelium to an ixotrichodermium composed of distinctly inflated or cystidioid terminal cells. *Basidiospores* smooth, subfusiform, brownish yellow. *Clamp connections* absent. 2-3 species sister to *Porphyrellus* but lack deep node support with four genes (28S, *tef1*, *rpb1*, *rpb2*); Central China. Ectomycorrhizae presumed with Fagaceae.

**Tuboseta** Horak (=Setogyroporus fide Singer) (1967) (as *Tubosaeta*)


**Turmalinae** Orihara & N. Maek. (2015)


From the protologue: *Basidiomata* stipitate-pileate with tubular hymenophore. *Pileus* hemispherical or applanate; surface densely covered with granular or tomentose squamules, dry; *context* soft when mature, white to pallid, without discoloration when injured. *Hymenophore* depressed around apex of stipe; hymenophoral surface white to pallid or pinkish when young, and becoming pink to grayish pink when mature; *pores* relatively wide up to 1.5 mm, angular; *tubes* concolorous with hymenophoral surface, color unchanging when injured. *Stipe* central, concolorous with pileus or much deeper in color than the pileus; surface with concolorous verrucose or granular like squamules; *basal mycelium* pallid. *Basidiospores* subfusiform, smooth (under SEM). *Pileipellis* a trichodermium, composed of hyphae with 3-5 concatenated cells. *Pleuro- and cheilocystidia* fusiform to subfusiform, often with a sharp apex and a long pedicel. *Clamp connections* absent. Gene inference places genus in leccinoid clade sister to *Retiboletus* (Vadhanarat *et al* 2018). One species known from SW China. Ectomycorrhizae presumed with Fagaceae.

**Tyloecnus** P. Karsten (1881)
Pileus dry, glabrous to subtomentose, microscopically a trichodermium or subhymeniform. Context white, unchanging or staining pale brown, red then black, or rarely blue, with mild or bitter taste. Hymenophore adnexed, white then pinkish flesh colored to purplish brown to rusty brown, staining brown. Stipe dry, pruinose to glabrous to reticulate, to finely scabrous. Spores pinkish flesh colored to purplish brown, to rusty brown in deposit, smooth, fusoid to ovoid- phaseoliform. Hymenial cystidia present as pseudocystidia. Clamp connections absent. Some concepts include Porphyrellus; some (ballouoids) erroneously treated in Rubinoboletus (=Chalciopor)us, but molecular inference distinguishes Tylopilus from Porphyrellus, and embraces the ballouoids in Tylopilus. North Temperate, montane Neotropics, northern South America, southern and NE Brazil, E Asia, SE Asia, Australia, New Zealand, Africa.

Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, Nothofagaceae, Myrtaceae, Casuarinaceae, Caesalpinoid legumes.

Veloporpheryllus Gómez & Singer (1984)


Wakefieldia Corner & Hawker (1953)

Basidiomata globose-depressed, minutely subtomentose, white then yellow, subcartilaginous, lacking a columella, with a sterile, golden yellow, sterile base. Gleba white then vinaceous pink, with gyrose lacunae, not becoming rubbery or gelatinous. Spores globose, sculpted with irregular curved plaques, sectors or wedges, thick-walled, cyanophilic. Type species: W. striaespora from Singapore. Molecular inference places the genus in the Zangioideae.

Ectomycorrhizae not noted, but possibly presumed with Dipterocarpaceae and or Fagaceae in Thailand based on collections in NY gathered in 2006.

Xanthoconium Singer (1944)


Ectomycorrhizae with Fagaceae, possibly Pinaceae in America. Myrtaceae, Casuarinaceae in Queensland, New South Wales.

Xerocomellus Šutara (2008)

Pileus dry, matte, neither viscid nor sticky when moist, glabrous, velutinous or pruinose, usually without a distinct fibrilloose aspect when young, becoming subtomentose with age, often cracking with age and then areolate-rimose. Pileipellis a palisadoderm. Hymenophore adnate or shallowly depressed or sometimes subdecurrent, yellow to olive brown, cyaneous or not, with angular pores. Tube trama intermediate (boletoid-phylloporoid). Stipe minutely granulose, sometimes longitudinally striate but mostly non-reticulate. Lateral stipe stratum usually absent or quite reduced. Spores smooth or longitudinally striate/veined, sometimes truncate. Hymenial cystidia present. Clamp connections absent. North Temperate, montane Neotropics, northern South America, East Asia, SE Asia, Australia, New Zealand, Africa.

Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, Nothofagaceae, Myrtaceae, Casuarinaceae, caesalpinoid legumes.
**Xerocomus** Quèlet (1887)


Ectomycorrhizae with Pinaceae, Fagaceae, Betulaceae, Nothofagaceae, Myrtaceae, Casuarinaceae, caesalpinoid legumes.

**Zangia** Y.C. Li & Zhu L. Yang (2011)

*Pileus* dry, pubescent and rugose, microscopically an ixohypheoepithelium. *Context* white, unchanging. *Hymenophore* adnexed, white then pinkish to pink or purplish when mature, unchanging. *Stipe* central, dry, whitish to yellowish or reddish, with red to purplish red scabrous squamules, chrome yellow at base, with *context* slowly cyanescent in some. *Spores* pinkish to pink to pale purple in deposit, smooth, subfusoid or ellipsoid. *Hymenial cystidia* present. *Clamp connections* absent. So far, known from Southern China.

Ectomycorrhizae with Pinaceae, Fagaceae.