A world-wide key to the genus *Suillus*
Weltschlüssel der Gattung *Suillus*

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Abstract: In the modern concept of the order *Boletales* the genus *Suillus* is included, together with some other genera, in the family *Suillaceae*, one of the families in suborder *Suillineae*, based on anatomical characters and results of molecular studies. A world-wide key of the genus is given and the new combinations *Suillus americanus* f. *helveticus*, *S. americanus* f. *sibiricus*, *S. bresadolae* f. *flavogriseus*, *S. grevillei* var. *proximus*, *S. pseudobrevipes* f. *volcanalis*, *S. umbrinus*, and *S. viscidus* f. *albus* are proposed.

Zusammenfassung: Im modernen Konzept der Ordnung *Boletales* ist die Gattung *Suillus,* zusammen mit einigen anderen Gattungen, in die Familie *Suillaceae* integriert, eine der Familien der Unterordnung *Suillineae*, basierend auf anatomischen Merkmalen und Erkenntnissen molekularbiologischer Studien. Ein weltweiter Schlüssel wird gegeben und einige neue Kombinationen (s. Abstract) werden vorgeschlagen.

1. Synopsis of families in *Suillineae* BESL & BRESINSKY 1997

Molecular studies (JAROSCH 2001) show that the suborder *Suillineae*, mainly established on the basis of chemical data (FISCHER & al. 1997, BESL & BRESINSKY 1997) represent a monophyletic group.

Suillaceae BESL & BRESINSKY 1997 with following genera:
Psiloboletinus SINGER 1945
Suillus ADANS. 1763 (incl. *Fuscoboletinus* POMERL. & A. H. SM. 1962, *Mariaella* ŠUTARA 1987, *Gastrosuillus* THIERS 1989)
Boletinus KALCHBR. 1867

Gomphidiaceae MAIRE ex JÜLICH 1982 with following genera:
Chroogomphus (SINGER) O. K. MILLER 1964
Gomphidius FR. 1835
Cystogomphus SINGER 1942
***Gomphogaste**r* O. K. MILLER 1973
Brauniellula A. H. SM. & SINGER 1959

Rhizopogonaceae GÄUM. & C. W. DODGE 1928 with following genera:
Rhizopogon FR. 1817

Rhopalogaster J. R. JOHNST. 1902
Fevansia TRAPPE & CASTELLANO 2000

Truncocolumellaceae AGERER 1999 with following genus:
Truncocolumella ZELLER 1939

2. Key to the genera of *Suillaceae*

mostly ectomycorrhizal with *Pinaceae*, spores smooth

1	clamp connections present; – glandular dots on the stipe absent, stipe often hollow	2
1*	clamp connections absent; – glandular dots on the stipe present or absent, stipe not hollow, veil and/or annulus often present	***Suillus***
2	veil present	***Boletinus***
2*	veil absent	***Psiloboletinus***

3. Synonyms of *Suillus*

(adapted after Index and Species Fungorum.)

Suillus P. MICHELI, Nova plantarum genera (Florentiae): 126, 1729, nom. inval.
Suillus P. MICHELI ex ADANS., Familles des plantes **2**:10, 1763
Suillus S. F. GRAY, Nat. Arr. Brit. Pl. (London) **1**: 646, 1821
Boletopsis HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. **I** (Leipzig) **1**: 194, 1900 [1898] nom. illeg. non FAYOD 1889
Boletus* sect. *Viscipellis FR., Epicr. syst. mycol. (Upsaliae): 419, 1838 [1836-1838]
Cricunopus P. KARST., Revue mycol., Toulouse **3**(no. 9): 16, 1881
Euryporus QUÉL., Enchir. fung. (Paris): 163, 1886
Fuscoboletinus POMERL. & A. H. SM., Brittonia **14**: 157, 1962
Gastrosuillus THIERS, Mem. New York Bot. Gard. **49**: 357, 1989
Gymnopus (QUÉL.) QUÉL. ex MOUG. & FERRY, in LOUIS, Départ. Vosges, Fl. Vosges, Champ.: 476 (p. 108 of reprint), 1887
Ixocomus QUÉL., Fl. mycol. France (Paris): 411, 1888
Mariaella ŠUTARA, Česká Mykol. **41**(2): 73, 1987
Peplopus (QUÉL.) QUÉL. ex MOUG. & FERRY, in LOUIS, Départ. Vosges, Fl. Vosges, Champ.: 476 (p. 108 of reprint), 1887
Pinuzza GRAY, Nat. Arr. Brit. Pl. (London) **1**: 646, 1821
Rostkovites P. KARST., Revue mycol., Toulouse **3**(no. 9): 16, 1881
Solenia HILL ex KUNTZE, Revis. gen. pl. (Leipzig) **3**(2): 521, 1898
Viscipellis (FR.) QUÉL., Enchir. fung. (Paris): 155, 1886
Viscipellis* subgen. *Gymnopus QUÉL., Enchir. fung. (Paris): 155, 1886
Viscipellis* subgen. *Peplopus QUÉL., Enchir. fung. (Paris): 155, 1886

Synonyms which are treated as separate genera:
Boletinus KALCHBR., Bot. Ztg. **25**: 182, 1867
Suillus P. KARST., Bidr. Känn. Finl. Nat. Folk **37**: v, 1, 1882; this is ***Gyroporus*** QUÉL.

4. The genus *Suillus* ADANS. (MICHELI ex ADANSON), history and delimitation

a) Original diagnosis:

Diagn. orig. MICHELI (1729): Suillus est plantae genus capitatum, duabus partibus constans, capitulo A, & pediculo B, capitulo in sua perfectione, ut plurimum hemisphaerico, id est superne convexo, inferne vero plano, vel paululum fornicato: Cujus centrum C pediculo insidet D, idcirco totum corpus umbraculi imaginem adamussim repraesentat; Pars inferior hujusce capituli E, a superiore F separabilis, & innumeris, & cylindricis tubulis G inter se segregabilibus H composita. In quorumcumque tubulorum ore I, & in suprema pediculi parte D, dum capitulum expanditur, reperiuntur flores K, qui sunt apelali, monostipeones seu unico filamento L constantes, steriles, & nudi, scilicet calyce, pistillo, atque staminibus destituti. Eorumdem tuborum cavitati M adhaerent femina N, quemadmodum Microscopium ad literam 0 melius demonstrat.

ADANSON (1763): Chapeau hemispherique ou orbiculaire, double en dessous de tuyaux verticaux. Porte par une tige centrale. Substance charnue molle.

Some authors prefer the combination *Suillus* MICHELI ex S. F. GRAY or *Suillus* S. F. GRAY (1821): Stipe central; collar distinct; cap circular; tubes adhering together. GRAY (1821) lists *Pinuzza* as a further genus, now regarded as a synonym of *Suillus*.

Typus: *Boletus luteus* LINNEE.

≡*Suillus luteus* (L.: FR.) ROUSSEL, Fl. Calvados: 34, 1796

According to molecular biological results by KRETZER & al. (1996) the independent status of the genera *Fuscoboletinus* and *Mariaella*, created by POMERLEAU & SMITH (1962) and ŠUTARA (1987 b) cannot be sustained. Further, many species do not belong to established sections (SINGER 1938 a, 1945 a, 1965, SINGER & al. 1963, 1973 a emended by ESTADES & LANNOY 2001) and some of the sections are not monophyletic (BINDER & HIBBETT 2006, KRETZER & al. 1996).

b) Genus characters

Structures of the fungi in this genus in common with members of the family *Boletaceae* including the presence of a cylindrical stipe, fleshy pileus, soft context and tubular hymenium. Pileus surface viscid to glutinose and glabrous, slimy and sticky when moist or dry and fibrillose-squamulose, the fibrils or scales superimposed above a gelatinized layer, more rarely innate, detersile or not, sometimes with appendiculate remnants. Microscopically an ixotrichodermium or a trichodermium, or also a two-layered cuticle consisting of an upper trichodermal and a lower gelatinous layer.

Context white or pale yellow, unchanging or staining pale reddish or turning greenish-blue by autooxidation. Hymenophore adnate to adnexed, sometimes decurrent, whitish, grey, yellow, orange or pale cinnamon brown, seldom bruising bluish or greenish. Pores small to wide, occasionally boletinoid. Stipe solid, dry or glutinous, veil present or absent, often forming an annulus or merely a velar appendiculation on the margin of the pileus, typically with but also without glandular dots or smears. Bilateral hymenophoral trama boletoid. Spores smooth, elongate, short fusoid, usually cinnamon brown or chocolate brown in mass, sometimes with olivaceous tinge. Hymenial cystidia rather large and mostly covered by a colored incrustation, usually clustered, with amorphous brown pigmentation at the base. Clamp connections absent. Distributed mostly in the northern temperate hemisphere and southward into the tropics to the southern limit of *Pinaceae*. Some species introduced adventitiously with pine trees in pine plantations outside of the indigenous area of *Pinaceae*; thus frequently

occurring with transplanted *Pinaceae*. Species in the genus associated especially with members of the genera *Pinus*, *Larix* and *Pseudotsuga*, but also known with *Betula* spp. and *Salicaceae;* most species obligately mycorrhizal (SINGER 1986, ŠUTARA 1987 a, 2005, KLOFAC 2007, HALLING 2013); the strict affiliation to accompanying trees often overestimated (KRETZER & al. 1996, WU & al. 2000).

c) Literature on the genus including detailed descriptions and keys

Detailed descriptions, including keys for **European** species are found in: ALESSIO (1985), BREITENBACH & KRÄNZLIN (1991), ENGEL & al. (1996), GALLI (1998, 2007), KERN (1945), KIBBY (2011), KREISEL (1986), LANNOY & ESTADES (2001), MUNOZ (2005), NÜESCH (1920), SINGER (1965), WATLING (1970), WATLING & HILLS (2005). Detailed descriptions, without keys for European species are found in: DÄHNCKE (1993), ESTADES & LANNOY (2004), GILBERT (1931), KALLENBACH (1926-1943), KONRAD & MAUBLANC (1924-1935), KROMBHOLZ (1831), MARCHAND (1971, 1975), ROSTKOVIUS (1844).

Further taxa are mentioned in: BAS (1972/73), BIZZI & FILIPPI (1995), BLUM (1965, 1969 a, b), BOLLMANN (1996), BON (1990), BRESINSKY & STANGL (1964), CAZZOLI (2002), DICKER (2007), ESTADES (1989), ESTADES & HURTADO (2006), FAVRE (1937), GERHOLD (1985 a, b), HALLER (1948), HUIJSMAN (1969), KILLERMANN (1925), KLEINE & ROHLAND (2009), KNAPP (1923), KONRAD (1927), KORHONEN & al. (1993), LAVORATO (1996, 1997), MARGAINE (1967), MORENO & HEYKOOP (1994), MORENO & al. (1995), NOORDELOOS (2000), PANTIDOU & WATLING (1970), PEARSON (1950 a), PARROT (1966), PILAT & DERMEK (1974), PILAT & SVRCEK (1949), RIVA & WEBER (1989), RIVA (2006), SIMONINI (1998), SINGER (1938 b), TORTIČ (1967, 1987), WATLING (1965, 1968, 1969).

A key only was published by MOSER (1983).

Keys for **American** species are found in: ARORA (1986), BESSETTE & al. (2000), KUO (2004), SMITH & THIERS (1964, 1971), SNELL (1936), THIERS (1975 a).

Regional literature including American taxa of the genus is: BANDALA & MONTOYA (1993), BARONI & al. (1976), BESSETTE & al. (1995), BESSETTE & al. (2007), BOTH (1992), CAPPELLO & CIFUENTES (1982), COKER & BEERS (1971), DICK & SNELL (1960), FROST (1874), GARCIA & CASTILLO (1981), GRUND & HARRISON (1976), HALLING (1977), HEMMES & DESJARDIN (2008), IMLER (1985), LAMOUREUX & DESPRES (1997), MONTOYA & al. (2003), MORENO & al. (1996), NEVES & CAPELARI (2007), NGUYEN & al. (2012), ORTIZ-SANTANA & al. (2007), PANTIDOU (1964), PHILLIPS (1991), POMERLEAU (1964), ROODY (2003), SINGER & DIGILIO (1957, 1960), SINGER & al. (1963), SLIPP & SNELL (1944), SMITH (1973), SMITH & THIERS (1967), SMITH & al. (1965), SNELL & DICK (1941, 1956, 1958, 1970), STUNTZ & ISAACS (1962), SMITH & TRAPPE (1972), SNELL & al. (1959), THIERS (1979), only local key, THIERS & SMITH (1973), VALENZUELA (2003), WATLING & MEIJER (1997).

Basic research can be attributed to MURRILL (1909, 1910, 1912, 1913 a, b, 1915, 1940, 1943, 1948), PECK (1888, 1889, 1894, 1895, 1900, 1906, 1911, 1912), SINGER (1945 a, 1959, 1966, 1970, 1973 a), SNELL (1932, 1933, 1934, 1942, 1945), THIERS (1967, 1975 b, 1976).

Gastroid taxa and their phylogenetics: BAURA (1992), KRETZER & BRUNS (1997), SINGER & BOTH (1977), THIERS (1989), THIERS & TRAPPE (1969), TRAPPE & al. (2009), TRAPPE & CASTELLANO (2000).

For native taxa of **Africa** see: BEELI (1926), KLOFAC & HAUSKNECHT (2008), most taxa are introduced: BERTAULT (1979), HEINEMANN (1951), HEINEMANN & RAMMELOO (1989), PEARSON (1950 b), PEGLER (1977), REID & EICKER (2000).

A similar situation is found in **Australia** and **New Zealand**: CLELAND (1924, 1934-1935), GRGURINOVIC (1997), LEONARD & BATCHELOR (2010), MCNABB (1968), STEVENSON (1961-1962), WATLING & LI (1999).

The numerous taxa in **Asia** (whereby the occurrence of some of the adventitious species is doubtful) are documented by: BI & al. (1982), BI & LI (1990), BI & al. (1993), CHEN & al. (2003), CHIU (1948), DAI & al. (2010), DING & WEN (2003 a, b), GARDEZI & SABIR (2006), HONGO (1974), HUANG (1998), WANG & al. (2004), WANG & YAO (2004), WATLING-(1995), YEH & CHEN (1980, 1981), ZANG (1980, 1985, 1986, 2006), ZANG & CHEN (1990), ZANG & al. (2013).

Chemosystematic, molecular phylogenetic, morphological and nomenclatural publications: BINDER (1999), BRESINSKY & BESL (1979), BRUNS & PALMER (1989), DONK (1955), ELROD & SNELL (1940), KRETZER & BRUNS (1999), PEGLER & YOUNG (1981), REDEUILH (1988, 1990, 1991).

A world-key was published in SINGER (1945 b) with 25 taxa and in SINGER (1965) with 40 taxa.

Suillaceae in general are treated by SINGER (1938 a, 1949, 1961, 1973 b, 1981, 1986), and MOSER (1997) BOTH (1993) lists all described taxa from North America.

There are some databases for fungi in diverse countries, helpful for an overview of the distribution of species, e.g., AUSTRIAN MYCOLOGICAL SOCIETY (2013).

d) Main characters used for identification, determinability, edibility, economic value

The main macroscopic field characters are: pileus colour, viscidity and pileus ornamentation, veil presence (either fibrillose-flocculose to membranous or gelatinous, forming an annulus or not) , presence of glands on the stipe, flesh colour and its discoloring, smell and taste, mycelium colour, configuration and colour of pores and the identity of the associated host (habitat), further colour of spore deposit and macrochemical reactions. Microscopically spore size (the size range for the genus being rather narrow) and differences in cystidia are useful.

Unfortunately, for instance in Asia (e.g., ZANG M. & al. 2013) but also in other regions, still European or American literature of the past decades with nowadays obsolete systematics and nomenclature is used to identify indigenous, often endemic species. Many of the species named in this way are neither in accordance with the original description nor with the current concept of the taxa. Obviously, distribution data based on these identifications are erroneous.

Most species are edible, some are not recommended or not considered to be choice; quite obviously this is also a matter of taste. Some species are widely collected and sold in the markets in Europe, Asia (e.g., DAI & al. 2010 note all *Suilli* as edible for China), and South America (e.g., export of dried mushrooms in Chile, SINGER 1986). The slime coating, however, may cause indigestion if not removed (BRESINSKY & BESL 1985). In USA and Europe some cases of mushroom poisoning are known (*Suillus luteus, S. collinitus*), leading to gastrointestinal symptoms or to allergic reactions with an immunohemolytic syndrome (FLAMMER & HORAK 2003). For some persons just handling some *Suillus* species causes a rash, a contact dermatitis (*Suillus americanus, S. pungens* and similar species).

This ectomycorrhizal genus is important in forestry. Several species are commercially used as inocula for trees planted outside of the usual ectotroph regions (SINGER 1986).

5. Genera easily to be confused

a. Species with viscid pileus may be confused with ***Aureoboletus*** spp. according to KLOFAC (2010), who lists the main characters of the genus *Aureoboletus*: "pileus often viscid, but also subtomentose.Tubes and pores with all shades of yellow. Smell and taste heterogeneous. Carpophores small to medium-sized. Hymenophoral surface more or less depressed around the stipe, broadly adnate or with decurrent tube walls. Stipe subequal or fusoid, nearly always slightly to distinctly swollen in the middle and more or less rooting or attenuated to the base not distinctly reticulate and neither scabrous nor glandulose (*Suillus*-like), but many species of the genus having a yellow floccosity on surface of stipe, basal mycelium often withish. Most species ectomycorrhizal with frondose trees."

The subequal to fusoid stipe with a swollen middle part and an attenuated to rooting base remains the only macroscopic character that is characteristic for *Aureoboletus* species.

b. Species with a tomentose pileus surface can be confused with ***Bothia*** spp. (HALLING & al. 2007): "brown, dry pileus, decurrent, pale brown hymenophore with radially elongated tubes, a short, sometimes eccentric, exannulate stipe, yellow brown spore deposit and constant association with *Quercus"*.

c. Some species may be confused with ***Xerocomus*** species: pileus dry, subtomentose, never viscid, hymenophoral trama of the "*Phylloporus*-type" (subregular), sectioned hymenophore showing broken tubes (a single tube not removeable from it).

d. Species with strongly granulose, pseudoscabrous stipe may be confused with ***Leccinellum*** and ***Pseudoleccinum*** species: stipe more or less furfuraceous or squamulose-scabrous.

e. Species with viscid pileus and only weakly granulose stipe may be confused with ***Fistulinella*** species (HALLING 2013): "pileus viscid, glabrous, or dry, fibrillose or tomentose. Context white, unchanging, stipe dry or viscid, glabrous or pruinose, without annulus, veil or granules. Spore deposit brownish pink."

f. Some species may be taken for ***Boletus*** spp. with a shiny pileus**,** particularly some of the robust ones may resemble *Suillus* species, but they are clearly separated by typical character combinations, such as reticulated stipe, never granulated stipe, no veil or annulus, and colour of pores.

6. New combinations in the genus *Suillus*

***Suillus americanus* f. *helveticus* (SINGER) KLOFAC, comb. & stat. nov.**
MycoBank MB 807170
Basionym: *Suillus sibiricus* subsp. *helveticus* SINGER, Lilloa 22: 657, 1949 [1951] emend. SINGER, Die Röhrlinge I, Die *Boletaceae* (ohne *Boletoideae*): 70, 1965

***Suillus americanus* f. *sibiricus* (SINGER) KLOFAC, comb. & stat. nov.**
MycoBank MB 807171
Basionym: *Ixocomus sibiricus* SINGER, Rev. de Mycol. 3: 46, 1938

***Suillus bresadolae* f. *flavogriseus* (CAZZOLI & CONSIGLIO) KLOFAC, comb. & stat. nov.**
MycoBank MB 807172
Basionym: *Suillus bresadolae* var. *flavogriseus* CAZZOLI & CONSIGLIO, Il Fungo 15(Suppl. 1-3): 25, 1997 [1996]

***Suillus grevillei* var. *proximus* (A. H. SM. & THIERS) KLOFAC, comb. & stat. nov.**
MycoBank MB 807173
Basionym: *Suillus proximus* A. H. SM. & THIERS, Monogr. North Amer. Species *Suillus*: 42, 1964

***Suillus pseudobrevipes* f. *volcanalis* (THIERS) KLOFAC, comb. & stat. nov.**
MycoBank MB 807174
Basionym: *Suillus volcanalis* THIERS, Madrono 19: 158, 1967

***Suillus umbrinus* (TRAPPE & CASTELLANO) KLOFAC, comb. nov.**
MycoBank MB 807175
Basionym: *Gastrosuillus umbrinus* TRAPPE & CASTELLANO, Mycotaxon 75: 160, 2000
Molecular studies of KRETZER & BRUNS (1997) already showed that the species belongs to *Suillus*, but at the time of their publication the taxon was not yet described validly.

***Suillus viscidus* f. *albus* (KÜHNER) KLOFAC, comb. nov.**
MycoBank MB 807176
Basionym: *Ixocomus viscidus* f. *albus* KÜHNER, Botaniste 17(1-4): 201, 1926

7. Worldwide key to the species of *Suillus*

a) How to use the key:

1. Due to the instability of some otherwise typical features (e.g., presence of a veil, bluing) and particularly when only older or damaged basidiomata are available, choose also the alternative pathway in the key; use of the key is only adviseable when young basidiomata are present.
2. Several points include trichotomies; it is not always possible to present strict alternatives, sometimes original data are simply missing for completing character pairs; additional character combinations are mentioned when considered to be useful (separated by dashes). With the present knowledge it is hard to distinguish species groups in the genus and thus to subdivide the key. The hitherto used sections cannot be maintained and there are no 100% constant characters for species groups.
3. Existing keys are developed according to various criteria, such as geographical regions or climate zones (ARORA 1986, BESSETTE & al. 2000, DING & WEN 2003 a, KUO 2004, SNELL 1936, THIERS 1975 b, THIERS 1979), accompanying trees, partners of symbiosis, mycorrhizae (ARORA 1986, KUO 2004, SINGER 1965), spore deposits (BESSETTE & al. 2000, SMITH & THIERS 1964, SMITH & THIERS 1971, SMITH & al. 1981), and morphology (SMITH & THIERS 1964, SMITH & THIERS 1971, THIERS 1975 b) but:

4. Due to continent-crossing activities, such as planting non-native trees, and climate change the occurrence of any species can nowhere be excluded. Species introduced in other continents do not only switch over to tree species of the same family, but adopt to other conifers or in rare cases from conifers to deciduous trees. Spore deposits are available only from few species and thus cannot be used as criterion for identification.
5. There are some taxa (printed in small) included in the key, which are as yet poorly understood, or where some features are missing in the original description, for the purpose to direct attention to them; an approach, which has indeed led to many rediscoveries of ancient species in recent times, e. g. in North America *Ceriomyces* (= *Boletus*) *atkinsonianus* MURRILL 1912 (BOTH & al. 2003, KLOFAC 2010) and in Europe *Boletus* (= *Xerocomellus*) *pruinatus* FR. & HÖK 1835 (KLOFAC & KRISAI-GREILHUBER 1992).

b) key (mainly made for the determination of fresh basidiomata)

For signs used, abbreviations and list of cited illustrations see point 11

1	Spores nearly round, with clamp-connections, associated with hardwoods; – spore deposit olive-mustard see ***Paragyrodon***	
1*	spores not so, without clamp–connections, on wood; – pileus brown, stipe glabrous, pale yellow or orange above, towards base light yellow-brown, indistinctly annulated, mycelium yellow, tubes decurrent, radially arranged, yellow to olivaceous, context white to yellowish, in pileus weakly bluing, spores -15 × 6 µm, on wood of *Pinus densata*, China (poorly known species) Selected illustrations: AMS20:1/1 ***Boletinus lignicola*** M. ZANG	
1**	spores not so, without clamp-connections, but not on wood	2
2	context or tubes or pores bluish or greenish when bruised (often seldom – see also 2*)	3
2*	context nowhere bluish or greenish when bruised (but seldom possible – see also 2)	25
3	glandular dots absent	4
3*	glandular dots present, annulus absent	20
3**	glandular dots present, annulus present, (otherwise see 52, but bluing) ***S. luteus* var. *cyanescens* VELEN.**	
4	(3 glandular dots absent) annulus present	5
4*	(3 glandular dots absent) annulus absent (but see also 4)	17
5	pileus surface dry (to moist), typically covered by brick red to reddish fibrils or fibrillose squamules, not viscid or viscid only when wet or old	15
5*	pileus surface not so	6
6	with orange rusty hymenium and pileus; – pileus in dry stage fibrillose, context only exceptionally discolouring greenish, associated	

with *Larix*, hitherto in Europe and Asia
Selected illustrations: see 35

***S. tridentinus* (BRES.) SINGER°**

6* hymenium not so 7

7 hymenium variable yellow(ish), in age discoloured 8
7* hymenium in older stage grey or with greyish tones 11

8 pores small (1-3 per mm) 9
8* pores large, (sub)angular, sometimes radially elongated 10

9 pileus viscid, with streaks beneath the gluten, pileus colour yellow to orange; – pileus context with an acid-metallic smell, stipe context developing bright green areas when exposed, spores -10 × -4.5 µm, associated with *Larix* (*Thuja*), hitherto North America, ?China
Selected illustrations: BBF370, BM11(B/W), BRB335b.!, MiM362r.!?, ST13(B/W)

***S. grevillei* var. *proximus* (A. H. SM. & THIERS) KLOFAC**

9* pileus viscid, without streaks beneath the gluten, pileus colour yellow to orange; – bluish discolouration of context only exceptionally, smell weak, basidiomata with gastroid appearance are known, spores -11 × 4 µm, average 9 × 3.5 µm, associated with *Larix* worldwide, often introduced in plantations
Selected illustrations: see 40

***S. grevillei* (KLOTZSCH) SINGER var. *grevillei*°**

9** pileus purple-violet, to raspberry; –associated with *Larix (dahurica)*, hitherto northeastern Asia (poorly known species)

***S. jacuticus* (SINGER) SINGER**

10(8*) annulus gelatinous, thick, yellow, orange, underside often reddish brown, pileus yellow (especially on margin) to reddish brown; – pileus glutinous to viscid, -15(-25) cm broad, context staining greenish in stipe base (also stipe and pileus staining greenish), or more bluish, usually not changing in pileus, associated with conifers, especially *Pseudotsuga menziesii*, hitherto western North America
Selected illustrations: AR117, BRB336m., BRB338b.,339a., MY122:391r., S52, ST11(B/W), TH45, *

***S. ponderosus* A. H. SM. & THIERS**
= *S. imitatus* var. *viridescens* A. H. SM. & TRAPPE

10* annulus not gelatinous, dry, fibrillose, pallid, pileus ochraceous-tawny, dull orange, often yellowish toward margin; – pileus viscid, -15 cm, soon glabrous to appressed-fibrillose streaked, tubes and pores yellow, context in stipe base (seldom stipe) staining bluish green, in pileus sometimes turning pinkish, associated with conifers, especially *Pseudotsuga menziesii*, hitherto western North America, ?China
Selected illustrations: Ar180, BeS47m., BRB333b., Li394, MS16, MY122:391l., PH246a.l., ST10,12(B/W), TA222m., TH40, *

***S. caerulescens* A. H. SM. & THIERS**
= *S. imitatus* A. H. SM. & THIERS

11(7*) pileus yellow; – viscid (but compare also 13*) 12
11* pileus not yellow 13

12 young basidiomata alike *S. grevillei*, then the yellow pores widening and becoming uniformly ochraceous, then dirty olivaceous, later more greyish olivaceous, tubes more greyish discolouring, context in stipe more yellow and weakly bluing, annulus pallid, hitherto Europe and Asia (?China), higher montane or alpine altitudes associated with *Larix*
Selected illustrations: AM56(„flavus"), BSMF122(4): 311(„flavus"), CD1636, CP879, DPi18e-k, En: T18/22, FLST72, MJ10, RIV45(1): 10b., Si5/ pl.III: 11-13 (= Br904)

***S. nueschii* SINGER°**

12* exactly as *S. bresadolae* (see 14) but with yellow pileus and more pallid annulus, bluish discolouration of context only exceptionally, hitherto Europe, associated with *Larix*
Selected illustrations: GS: 63a. (= GR: 45), 65b., La10b., Sup.IF15/26,27

***S. bresadolae* f. *flavogriseus* (CAZZOLI & CONSIGLIO) KLOFAC°**

13 pileus reddish brown, (chestnut)brown, ochraceous brown 14
13* pileus smoky grey to olivaceous or olive brownish, seldom yellow or whitish (***S. viscidus* f. *albus* (KÜHNER) KLOFAC°**); – at times scale-like tearing up, context white, in stipe in places yellowish and there staining bluish-green (without developement of greyish-purple tints), annulus pallid, hymenium young whitish, later uniformly grey, nearly worldwide, also introduced, associated with *Larix*
Selected illustrations: AM53, BEL17/18: f.8, BKIII53, BL47, BM42(B/W)?, Br932, BRB319a.?, BSMF: LXV,Atl.pl.91, BTR32(5-6): 13, CD1638, CPS357, Ct294, Dh27, DPi17 p. p., En: 16,17,T26/30b., ER57b.(= Rou31), FBT 195, FLST69, FMDS174: 11a., Fr II: t.178/3, GII39, Ga21: 2, Gh489m., GS: 61a., GS3:61a., HG9, IH:I-37/216, IOH303, Hg61, Ki34m., Kib60, KM416p. p., Kr2: 307, L1?, La9, LEC3, Ll28:137, M919-2?, Md226, MHI143 = HKI143, MJ1a., M/M80-81: 22, MT2: 41, Mu14, PA815, Ph217, PU24, RE131, RH213b., RIV45(1): 9a., Ro122, RT191(1), Si5/pl.III: 1-2,4-10 [= Kb18 (10-14,16-20,22-26) p. p.], SMJ69, Sup.IF15/14, TA225b.?, Ve133a., *

***S. viscidus* (L.) ROUSSEL f. *viscidus*°**

14 yellow pores, soon discolouring greyish with violaceous tint from the stipe outwards, leaving a yellow zone at the margin for a long time; – bluish discolouration of context only exceptionally, annulus yellow, higher montane or alpine altitudes associated with *Larix*, Europe
Selected illustrations: Br933, BTR32(5-6): 15, CD1639, DPi18a-d, En: 13,T7/8, FBT195a, FMDS147: 30, FT1 t.14 (= MuT.59), Gh489b., GS: 64, 65a., GS3:65b., La10a., MJ1b., Mu12, PFNO286, PH253a.l!?, RIV45(1): 10a., Si5/Pl.III: 14-16, SPTIII/42, Sup.IF15: 22, *

***S. bresadolae* (QUÉL.) GERHOLD f. *bresadolae*°**

14* whitish pores, often with ochraceous tint, injured or bruised grey, later brownish and dark brown(greyish) drying; – young small, later larger, pileus seldom covered by a dark (reddish)brown slime layer, mostly fading paler, at times streaked or scale-like tearing up, context

white, in stipe in places yellowish and there discolouring bluish-(green), bluish-grey, developing later purple grey tints, annulus pallid, also with small yellowish zones, associated with *Larix*, Europe, North America, ?China, distribution data insufficient due to confusion with *S. viscidus*

Selected illustrations: AM54!, Ba173b.!?, BC1397!, BRB319m., CeI: 458, CeI: 460!, CP3:1393, CQ, Ct295?, DPi17 p. p., En: T26/30a., GH36(S/W), GS: 61b., Kb18(1-9, 15, 21), KM416p. p., M919-1, 919-3?, Md227!, MuPl. 5!,6!, No110, RIV45(1): 9b., Ro122a.r., SD13p. p.!?, Sup.IF15/15, Wi7.4, *

***S. serotinus* (FROST) KRETZER & T. D. BRUNS**
= *S. viscidus* var. *brunneus* CAZZOLI & CONSIGLIO°

15(5) associated with *Pinus strobus*; – pileus dry, ruby coloured squamules on yellow ground, stipe having a sheath or zones of dull red fibrils, annulus white, but often tinged red, stipe -8(-12) cm long, bluish discolouration of context only exceptionally (but cited in IMLER 1985 and observed personally), spores -11(-12) × 5 µm, Q =2.6, North America, introduced in Europe and (?)Eastern Asia

Selected illustrations: see 29

***S. pictus* (PECK) KUNTZE°**

15* associated with *Pseudotsuga* (*Abies*, *Picea*) 16

15** associated with *Larix*; – pileus -20 cm, dry, with first whitish then pink to bright (rosy)red fibrils and scales on reddish ground, veil fragments often on pileus margin, annulus inconspicuous or sometimes absent, pores boletinoid, bluish discolouration of context often missing, taste acrid, bitterish, spores -9.5 × 3.2 µm, clamp connections seldom, associated with *Larix occidentalis*, western North America, introduced in Europe, ?China

Selected illustrations: AR123, Ba224a., BM36,37(B/W), BRB319a., Bri14:1 (B/W), Li404, Mi280, MiM360l., MS13, PH252, SB33-3, Sm41, *

Boletinus ochraceoroseus SNELL
(in molecular analyses this species is again included in *Boletinus*)

16 pileus brick red to reddish brown squamulose; – viscid when wet or old, spores only -9 × 4 µm, North America, introduced in Europe

Selected illustrations: BRB337m., En: 10, GS: 53b., ST7(B/W), *

***S. lakei* var. *pseudopictus* A. H. SM. & THIERS**

16* pileus less red, more reddish brown, pinkish or sometimes orange buff or tawny, smaller scales; – bluish discolouration of yellow context mostly only in the base of young basidiomata, spores -10(-11) × 4 µm, western North America, introduced in Europe and Australia/ New Zealand

Selected illustrations: AM66b, AR124, Ar183, BRB337m., BTR32(5-6): 29!, BTR40(2-3): 287, CP877, Ct1570! (= CeI452!), DPi15d-f, E159a., En: 8,9,T14/17, FLST83, Fu297, Gri 30b, GS: 53a., Li392, McK11, MiM363r., MJ9a., MS19, Mu10a, PH246b.l., RIV32 (1-2): 87, RIV 45(1): 25, S48, SB29-2, Sm46, SMJ71b., SSW65, ST8,9(B/W), TA223b., TH43, TINT4/2007:49! *

S. lakei* (MURRILL) A. H. SM. & THIERS var. *lakei

17 (4*lacking glandular dots, annulus absent) stipe reticulate, particulary in upper half; – context and pore surface blue when bruised, pileus (sub)viscid, brown, spores 9-11 × 3-4 µm, associated with *Pinus contorta*, western North America, ?China

***S. reticulatus* THIERS** nom. ill.

17* stipe pseudoreticulate beneath scaber-like dots, developing from cracking tomentum, pileus -11 cm broad, (sub)viscid, conspicuously corrugated-pitted, (rusty)orange-brown with darker disc, context white, changing to pink then carrot- or brick-red, staining bright blue at least in base of stipe, KOH on pileipellis light blood red, spores -19 × 6.5 µm, among leaves or on decaying pieces especially of *Quercus*, western North America
Selected illustrations: BRB317a.l., *

Boletus viscidocorrugis BOTH

17** stipe not reticulate 18

18 pores at first pale yellow, later more orange finally yellow-brown, large, -4 mm, spores -14 × 5 µm; – pileus covered with hairy evanescent squamules, slimy when wet, stipe pallid to yellow, fibrillose to fibrillose squamulose, associated with *Pinus sorbus* and *Quercus*, North America
Selected illustrations: SB31-1, SD23a.

***S. subvariegatus* SNELL & E. A. DICK**

18* pores beige to olivaceous mustard (exeptionally bright yellow), smaller, and spores not larger than (10-)11 × 4 µm 19

18** pores whitish, soon greyish (brown), associated with *Larix*, bluish discolouring only exceptionally 74

19 pileus only young weakly subfibrillose, soon glabrous, wet viscid, nearly plane in age, ochraceous to rusty orange, tubes adnate decurrent, as pores beige to olivaceous mustard (bright yellow in ***S. bovinus*** var. ***luteoporus*** **R. BENES** nom. inval., Europe Ill.:La21b.l.); – context golden yellow, associated with various *Pinus*, particulary *P. sylvestris, P. radiata*, Europe, Africa, North America
Selected illustrations: Si5/pl.IX: 6, *!

***S. bovinus* (L.: FR.) ROUSSEL var. *viridocaerulescens* (A. PEARSON) SINGER**

19* pileus more fibrillose-finely scaly, soon dry, tubes and pores similar, somewhat darker, pileus colour yellowish ochre, yellow brown, pores smaller, stipe sometimes with a few pustular felty patches (but not glandular dots); – KOH on context greyish to dirty purple pink (with reddening parts of the basidiomata: ***S. variegatus* f. *rubescens* (OPAT.) ESTADÈS & LANNOY**, Ill.: La 22b.), associated with various *Pinus*, particulary *P. sylvestris*, Europe, Asia (Russia), (reports and illustrations from East Asia and Africa contested)
Selected illustrations: AM66, BKIII52, BL49, CCH87:52, CD1649, Clu46(2): p.295, CP883, Ct285 [= BTR33(1-2): p.17, = CeI:484], Dh35, DPi31,32, En: 43,T25/29, ER61m., FBT187, Ga19: 4, GG225 b., Gh493b., Gli: 57, GS: 79, HAB69, HG11, Kib58, Kr2: 312, La22a., LEC15, Md232, MHI147 = HKI147, MJ8b., MT37, Mu30, PA805, PC75, PU27, RF196,197, RIV45(1): 20b., Ro121B/7-11,13-14, Rou38, SCI74, Si5/pl.IX: 7-14 (= Kb20 p. p.), SM1: 111, SMJ89, SPTIII/46, Ve131b., *

***S. variegatus* (SW.) RICHON & ROZE f. *variegatus*°**

20 (3*with glandular dots, annulus absent) pileus subfibrillose-tomentose 21

20* pileus glabrous 23

21 pileus bright red sprinkled with darker spots, associated with *Picea engelmannii, Pinus contorta murrayana*, western North America
***S. ruber* SINGER**

21* pileus not bright red 22

22 pileus rather dry, yellowish to yellow-brown, greyish to reddish brown fibrillose, pore surface brownish, old more olive-yellow, blue when bruised, stipe not discolouring when bruised, usually staining fingers brown on handling, spores 7-12 × 3-5 µm, associated with conifers, particularly 2-needle *Pinus* (*P. contorta*), North America, Central America, South America, Asia
Selected illustrations: Ar178, Ba177m., BM13(B/W), BRB340b., CQ, E159b., FD27-119, GH60(B/W), IOH306b., Li415, McK11, Mi292, MiM359l., SB31-2, SD22b., Sm52(B/W), SSW68, ST17,18(B/W), TA224b., TH49, *
***S. tomentosus* (KAUFFMAN) SINGER, SNELL & DICK var. *tomentosus*°**

22* pileus more viscid, creamy buff to darker brown or olive-brown, finally dull cinnamom-brown, greyish fibrillose, pore surface dingy ochraceous, staining greenish blue, then brownish, stipe with brown glandular dots staining the fingers brown, reddish tones in base of stipe, spores 9-13 × 4-4.5 µm, associated with pine (*Pinus strobus*) North America
Selected illustrations: Ll28:135(B/W)
***S. tomentosus* var. *discolor* A. H. SM., THIERS & O. K. MILL.**

22** pileus dry, velutinous-granular to velvety, brown, -7 cm broad, margin rimulose or subtomentose, tubes and pore surface ochraceous-citrinous with pores blueing when bruised, context of pileus slowly turning blue, stipe with brown granulae on paler ground, rugose-subreticulate or ribbed, only -1 cm thick, basal mycelium sordid-pallid to white, associated with *Krugiodendron, Nectandra coriacea, Bursera simaruba*, known from Florida
Boletus granulosiceps SINGER

23 (20*) stipe distinctly reticulate at the medial-inferior portion with black to red brown glandulae; – pileus -6 cm, viscid, (yellow)brown, pore surface yellow, brown when bruised, context (yellow)white, blue when bruised, spores 11-16 × 4.5-6 µm, Asia (China) in broad-leaf forest
***S. subreticulatus* Z. S. BI**

23* stipe not reticulate 24

24 associated with *Pinus* in mountains (*P. sibirica*), Asia, ?Europe; – collections from China, incorrectly identified as bluing *S. punctipes* should obviously be placed here. However, SINGER (1938 a, 1965) could have also erronously integrated here some collections of *S. punctipes* (he mentions temporary almond smell), otherwise see 109.
Selected illustrations: Si5:pl.7:8
***S. plorans* subsp. *cyanescens* SINGER**

24* associated with *Pinus* (*P. ayacahuite, P. patula*), described from Mexico; – pileus whitish-yellowish, later straw yellow to yellow orange, pores and tubes yellow to ochraceous-olivaceous, blue when bruised, context in stipe from the centre to the base with reddish tone, spores 9.5-13 × 3-4 µm
Selected illustrations: RIV39:261
***S. guzmanii* G. MORENO, BANDALA & MONTOYA**

25 (2* context nowhere bluish or greenish when bruised) glandular dots absent 26
25* glandular dots present, annulus present (may be missing) 43
25** glandular dots present, annulus or veil present or absent 46

26 (25 glandular dots absent) annulus present (see also 49) 27
26* (25 glandular dots absent) annulus absent, but (possibly) with veil 74
26** (25 glandular dots absent) annulus and veil absent 111

27 not associated with *Larix* 28
27* associated with *Larix* 34

28 pileus surface typically covered by brick red to reddish fibrils or fibrillose squamules, dry (to moist), not viscid or viscid only when wet or old 29
28* pileus surface covered by a dry tomentose to fibrillose epicutis, coloured differently 31
28** pileus surface viscid 49

29 associated with *Pinus strobus*; – pileus dry, ruby coloured squamules on yellow ground, stipe having a sheath or zones of dull red fibrils, the annulus white, but often tinged red, stipe -8(-12) cm long, bluish discolouration of context only exceptionally, spores -11(12) × 5 µm, Q =2.6, North America, introduced in Europe and (?)Eastern Asia
Selected illustrations: At175(B/W), Ba173a., BBF370, BBN112m., BeS46a., BM10 (B/W), BRB338a.,m., BSMF113, Atl.pl.325, CB59(B/W), CQ, DPi15h-k, En: T19/23, GH55(B/W), IM98, IH:I-39/227, IOH301, La7a., L/E1F, Li391, McK11, Mi289, MiM359r., PH245l., Roo288, SD11, Sm47, SSW66, ST5,6(B/W), SWS61, WPB IX(3-5):48,49(B/W), *
***S. pictus* (PECK)KUNTZE°**
29* associated with *Pseudotsuga*, seldom with *Abies*, *Picea* 30

30 spores -4 µm broad, pileus less red, more reddish brown, pinkish or sometimes orange buff or tawny, scales smaller, tubes not decurrent; –bluish discolouration of context only exceptionally in the base of young basidiomata, spores -10(-11) × 4 µm, western North America, introduced in Europe and New Zealand
Selected illustrations: see 16*
S. lakei* (MURRILL) A. H. SM. & THIERS var. *lakei

30* spores -4.8(-5) µm broad, pileus with more maroon scales, tubes decurrent; – pores with olivaceous tinge, Europe, ?North America
Selected illustrations: AMNP: VB/7-T.IV, BL33, CCH80(1): t2, CD1627, DPi16, En: T15/18,19!, FRIC65a, RE135?, RIV38(2): 173, SMJ71a., TINT1/2003, *!
***S. lakei* var. *landkammeri* (PILÁT & SVRČEK)ENGEL & KLOFAC°**

31 (28* pileus surface coloured differently)
pileus reddish with more brownish tinge; – spores -10.8 × 4.1 µm, Q = 2.8, associated with *Pinus* (*P. koraiensis, P. sibiricus, P. parviflora, ?P. pentaphylla, P. griffithii, P. armandi*) Asia (?China)
Selected illustrations: Hu571, LII:14!?, M921?, 926?, WLY105a.?, YS430b. ?433?, *!
***S. pictus* (PECK) KUNTZE ss. auct. asiat.**

31* pileus coloured differently 32

32 associated with *Pinus*; – pileus orangish to dull yellow, tan or pale reddish brown, pores small, yellow to brownish yellow in age, veil and annular zone fragile, basidiomata also with gastroid appearance, hitherto North America, Central America,?China
Selected illustrations: BRB334m., BRBD55, FD27-116, Me226, MiM362, PH245r., SD12a.r., SWS62, *
***S. decipiens* (PECK) KUNTZE**

32* associated with *Pseudotsuga* or association unknown 33

33 associated with *Pseudotsuga*, pileus in young stage yellow with yellow squamules that in age develop burgundy at the tips, Europe
Selected illustrations: MIC: 286, Mu10c
***S. lakei* var. *calabrus* LAVORATO**

33* association unknown, pileus with closely apressed radially arranged brown to purplish fibrils; – stipe greyish above, often stained with darker spots, pores boletinoid, greyish brown to brown, spores -10 × 4.5 µm, eastern North America (poorly known species)
Selected illustrations: SD13 p. p.!?
***S. solidipes* (PECK) A. H. SM. & THIERS** comb. inv.

34 (27* associated with *Larix*) pileus bright red to orange-red with greyish or (reddish)brownish scales or patches; – partial veil and annulus with gelatinous outer layer, tubes yellowish, pore surface usually pinkish when bruised, context whitish or pale yellow, spores -13(-14) × 6 µm, associated with *Larix laricina* in North America, introduced in Asia, Europe
Selected illustrations: AR126, BeS45b., BM40,41(B/W), BRB319b., Bri14:2(B/W), CQ, En: 11,T23/27, IOH302, La7b., L/E1G, M925, MJ9b., NYSM4:pl.62, SB33-1, SD10, SIE43(1): cov., Sm42(B/W), SSW61, *
***S. spectabilis* (PECK)KUNTZE**

34* pileus surface more viscid to glutinous 35

35 with rusty orange hymenium and pileus; – pileus in dry stage fibrillose, greenish discolouration of context only exceptionally, hitherto in Europe and Asia

Selected illustrations: AM55, BKIII51, BL47, Br912, BTR32(5-6): 17,18, BSMF: LXII,Atl.pl.89, CD1637, CP3:1394, Ct293 (= CeI: 454b.), DPi19, En: 14,15,T24/28, ER59m.(= Rou30), FBT194, FLST71, FMDS78: 71, FT 1: t.13 (= Mu60), Ga21: 3, Gli: 45, GS: 69, HAB62, Hg63, KM417, Kr2: 309, La8, LEC4, L/E1H?, MHII22 = HKII22, MJ2b., Mu13+T.7, PC74a., PA813, Ph217, PU26b, RIV45(1): 11, Ro270, RT191(2), SCI52, Si5/pl.IV: 11-18 (= Kb29 p. p.), SMJ67, SPTIII/32, SW136, Wi7.3, *

***S. tridentinus* (BRES.) SINGER°**

35* without rusty orange hymenium and pileus 36

36 hymenium variable, from white to yellow(ish) or pinkish, pores rather small 37

36* hymenium in older stage grey or with greyish tones, pores large 41

37 pores small 38

37* pores larger, (sub)angular; – pileus small, -3 cm, subcinnamom with paler margin, a mucilaginous veil covering pileus and stipe, stipe and annulus glutinous, context pale yellow, spores -15.5(-17) × 5(-5.3) µm, associated with *Pinus (Quercus),* hitherto Japan
Selected illustrations: Hu617?, *

***S. viscidipes* HONGO**

38 pileus white 39

38* pileus not white 40

39 nearly entirely white pileus, at times spotted with green or yellow-brown, context unchanging; – spores -10.5(-11) × 4.5 µm, pallid, hyphae with some clamp connections, mixed coniferous forest, eastern North America, ?Europe
Selected illustrations: CJB42:Pl.1(B/W)

***S. hololeucus* PANTIDOU**

(genus affiliation uncertain)

39* white pileus, in older age yellowish spotted, bruised brownish yellow, context in base of stipe occasionally brownish yellow; – pores pallid, later pinkish, associated with *Larix* and *Pinus*, Europe
Selected illustrations: DPi25a-e, En: T14/Nr.16?!

***S. roseoporus* (SMOTL.) PILAT & DERMEK°**

40 (38*) pileus yellow to orange, context in pileus pallid to bright yellow, pileipellis hyphae not incrusted; – bluish discolouration of context only exceptionally, smell weak, spores – 10 × – 4 µm, average 9 × 3.5 µm, associated with *Larix* worldwide, often introduced in plantations
Selected illustrations: AM52,Ar181, BC144, BKIII46, BL47, BM12(B/W), Br902, BRB335b., CC124, CD1635, CeI: 456, CO872, Coo43(2): 81!, CP878!, CPS356, CQ, Ct1560!, Ct292 [= CeI: 454a. = BTR32(5-6): 6], Dh26, DPi20,21, DT91, En: 19,20,21,T13/15, ER59a., FBT193, FLST68, FN41:6, Ga21: 1, GG221b., Gh489a., GH52(B/W), Gli: 37, GS: 67, GS3:56, HAB60, HG10, Hg60, IH:II-28/177, IOH304,305, KAR33(1): p.4, Ki33b., Kib56, Kr2: 305, Kz: t.34/1-10!, La11, LEC6, Lx57/3, Md67, MGZ231, MHI144 = HKI144, Mi285, MJ2a., MT38,39, Mu15, NZJ6(2):3b(B/W), PA810, PC73, Ph216, PH246a.r., PL251, PU21, RF168,169,

RH213a., RIV45(1): 7, Ro119A, Roo285, Rou29, RT191l., SB29-5, SD14, Si5/pl.IV: 1-10 (= Kb17 p. p.), Sm45, SM1: 107, SMJ65, SPTI/34, SW133, ST14,15(B/W), TA223a., Ve130a., VS71b., Wi7.1, YS429m.!, *

***S. grevillei* (KLOTZSCH) SINGER°**

40* pileus (dark)reddish brown, maroon, context pale orange, in stipe light brown, russet, pileipellis hyphae incrusted; – hymenium yellow orange, pores later rust-coloured, stipe below annulus russet fibrillose, spores - 11(-12) × 4.5 µm, associated with *Larix*, especially *L. sibirica* and *L. gmelinii*, North America, Asia, Europe
Selected illustrations: En: 18,T7/9, KAR33(1): p.5, Kib:p.35, L4?!, Li406, Mu16, PH227l., SIE44: 144 , BRB336a.?, M917!?, YS429a.l.!?, *!

***S. clintonianus* (PECK) KUNTZE**

41 (36*) pileus brown with brownish-yellow to yellow spots; – the yellow pores soon discolouring greyish with violaceous tint from the stipe outwards, leaving a yellow zone at the margin for a long time, bluish discolouration of context only exceptionally, veil and annulus yellow, higher montane or alpine altitudes associated with *Larix*, Europe
Selected illustrations: see 14

***S. bresadolae* (QUÉL.) GERHOLD f. *bresadolae*°**

41* pileus not brown 42

42 pileus yellow and annulus more pallid; – otherwise exactly as *S. bresadolae* (see 41), bluish discolouration of context only exceptionally, hitherto Europe, associated with *Larix*
Selected illustrations: GS: 63a. (= GR: 45),65b., La10b., Sup.IF15/26,27

***S. bresadolae* f. *flavogriseus* (CAZZOLI & CONSIGLIO) KLOFAC°**

42* pileus smoky grey to olivaceous or olive brownish; – (seldom yellow or whitish: ***Suillus viscidus* f. *albus* (KÜHNER) KLOFAC°**), at times scale-like tearing up, context white, in stipe in places yellowish and there staining bluish-green, discolouration of context often absent, annulus pallid , hymenium young whitish, later uniformly grey, nearly worldwide, associated with *Larix*, also introduced
Selected illustrations: see 13*

***S. viscidus* (L.) ROUSSEL°**

43 (25* with glandular dots, annulus present – but may be absent when damaged)
pores very large (-5 × 3 mm), boletinoid; – basidiomata with gastroid appearance, pileus yellowish(tan), pale pinkish brown, with cinnamon-buff to ochraceous tawny streaks and fibrils, annulus often inconspicuous or only as veil adhering to pileus margin or as fibrillose annular zone on the stipe, stipe very short, often eccentric, associated with conifers (especially *Pinus contorta*), western North America
Selected illustrations: TH44, *

***S. megaporinus* SNELL & DICK**

43* pores smaller 44

44 pileus ground colour yellow, chamois or ochre, (dingy)olive-yellow, usually without reddish tinge but with (reddish)brownish scales, veil typically leaving remnants on the pileus margin, only sometimes forming a slight annulus on the stipe, context pale olive-yellow, slowly dull cinnamon, in stipe base staining vinaceous, taste ± acid, stipe -10 × 1.5 cm, not typically crooked, spores -12 × 4.8 µm, Q = 2.4, with *Larix* or *Pinus strobus, P. monticola, P. flexilis*, North America
Selected illustrations: AR116, BM24(B/W), BRB340a., PH251a.l., S50, ST34,35(B/W), TA225m., *
S. sibiricus ss. auct. americ. p. p.

44* not so (see also 72, 73, 74, 87,106) 45

45 pileus ground colour bright yellow, with orange (to reddish) scales and spots, bruised brown, veil typically leaving remnants on the pileus margin, only exceptionally forming a slight annulus on the stipe, pores without watery drops; – [with short net on stipe: ***S. americanus* var. *reticulipes* (COKER & BEERS) GRAND,** comb. inv., Ill.:CB54b.(B/W)], context yellow, staining purplish brown when cut, smell farinaceous, stipe often crooked or twisted, typically not more than 1 cm wide, becoming hollow, spores -11 × 4.2 µm, Q = 2.5, associated with *Pinus strobus*, North America, ?South America, ?Africa, ?Asia (?China, ?Korea)
Selected illustrations: At171(B/W), Ba177a., BM25(B/W), BRB332m.,b., CB54a.(B/W), CQ, GH48(B/W), Li416, Mi284, MiM361l., McK11, PH249a., Roo335, SD15b., Sm53, SSW70, ST36,37(B/W), *
***S. americanus* (PECK) SNELL f. *americanus*°**

45* pileus ground colour olive-yellow to sulphur olive, mustard yellow with yellowish or orange-brownish scales and spots, bruised reddish, veil typically leaving remnants on the pileus margin and often forming a slight annulus on the stipe, pores with watery drops; – spores -11.5(-13) × 5 µm, associated with various *Pinus* (*P. sibirica*, *P. koraiensis*, *P. armandii*, *P. patula*) Asia, Africa
Selected illustrations: Lak6b?, M910!,924, Si5/ pl.V: 2-4
***S. americanus* (PECK) SNELL** f. ***sibiricus* (SINGER) KLOFAC**

45** pileus paler; – spores -12 × 4.5 µm, montane or alpine altitudes associated with *Pinus cembra* (*P. peuce*), Europe
Selected illustrations: AM64, BKIII50, BSMF 122(4): 315a., BTR32(5-6): 22,23, CC344, CD1642, Coo51(4):191(f.5), CP3:1392, Ct301 (= CeI: 462), DPi23, En: 24,25,T22/26, FBT192, FMDS147: 32a., Gli: 41, GS: 71, La12b., L/E1I, Lx59/3, Md230, MJ3a., MT43, Mu18+T.9,10, PA808, PFNO288, RIV45(1): 21, Si5/ pl.V: 1, SMJ83, SPTIV/50, TINT4/2002: 30, *
***S. americanus* (PECK) SNELL f. *helveticus* (SINGER) KLOFAC°**

46(25**) annulus present (see also 33*, 67, 68, 69) 47

46* only veil present 62

46** annulus or veil absent (but compare old basidiomata with 62) 75

47 pores more than 1 mm wide in mature fruit bodies 48
47* pores less than 1 mm wide in mature fruit bodies 50

48 pileus yellowish tan, olivaceous-buff to greyish olive or avellaneous to dingy cinnamon, basidiomata small; – pileus viscid, pores radially arranged, yellowish, pinkish cinnamon when bruised, stipe with similar discolouring, gelatinous veil forming a band-like annulus, associated with various *Pinus* spp. (*P. mugo* incl. subsp. *rotundata, P. contorta, P. banksiana*), Europe, North America, Asia
Selected illustrations: AM57, Ar179, Ba171b., BC1396, BKIII44, BL47, Br905, BRB334b., BSMF122(4): 314a., CD1641, CP3:1391, Dh28, DPi22, En: 22,23,T10/12, ER57m.(= Rou28), FBT189, GR: 47, GS:73, GS3:73a., HAB63, Kib55, Kr2: 295, Kz: t.4/35-37, La12a., LEC7, Lx61/1, McK11, MGZ229, MHII19= HKII19, MiM363r., MJ3b., Mu17+T.8, Ph215, PH249b.m., RF14b.,192, RH212a., RIV45(1): 14, SB28-3, SD20a.l., Si5/pl.V:5-12 (= Kb50 p. p.), Sm51, SM1: 103,SMJ85, ST29,30(B/W), TA225a., TH50, Ve132b., *
***S. flavidus* (FR.) J. PRESL°**

48* pileus with other colour, basidiomata stouter 49

49 (28** pileus surface viscid)
pileus -13 cm broad, with a thick slimy layer when wet, red when young, chestnut-brown to mahogany, reddish brown, pores pale bright yellow when young, annulus and stipe below annulus slimy, only above annulus punctate with reddish points; – spores -11.5 × 5 µm, associated with *Abies balsamea, Tsuga canadensis, Thuja occidentalis*, North America, ?China
Selected illustrations: BM38,39(B/W), BRB318m., Bri14:3,4a.(B/W), CQ, GH34(B/W), SDpl.12b., *
***S. glandulosus* (PECK) SINGER**

49* pileus -16 cm broad, viscid, ferruginous to chestnut-brown, brownish-red, pores boletinoid, dull yellow brown, stipe red, dry and fibrillose-squamulose below a zone left by the not gelatinous veil; – context sometimes reddish when cut, associated with conifers (*Pinus, Abies, Picea*), North America.
Selected illustrations: Ba172m.?, Bri14:5 (B/W), SB33-2
***S. sinuspaulianus* (POMERL. & A. H. SM.) E. A. DICK & SNELL**
(Supposed membership to *Boletinus* not clearly shown by molecular analysis)

50 stipe base conspicuously staining yellow when injured, pileus without white squamules; – pileus pale olivaceous to olive brown, in age with greyish and pinkish tinges, context, tubes and pores yellowish, spores 7-10 × 3-4 µm, associated with conifers (*Picea, Abies, Pinus strobus*), North America, ?China
Selected illustrations: *
***S. lutescens* A. H. SM. & THIERS**

50* not staining as above, pileus without white squamules 51
50** not staining as above, pileus with white squamules on orange-brown ground when young; – stipe only sometimes with a ragged superior annular zone that soon disappears, smooth or with few glandular dots near apex 68

51 annulus on its outer side with a thin gelatinous vinaceous-grey to purplish-drab layer or zone (see also 60*) 52
51* annulus different 55

52 pileus chocolate brown, in age ochre-brown discolouring, spores 7-9 × 2.5-3 µm, context pallid yellowish to yellow in age, worldwide (often introduced) associated with *Pinus*, seldom with other conifers
Selected illustrations: AM58, AR118, Ba170b., BaCN31/1-3, BC47, BeS47b., BKIII47, BL47, BM17(B/W), Br901, BRB337b., BS311, BTR36(1-2): p.8, CB5-3?,53(B/W), CC89, CD1640, CeI: 466 [= BTR32(5-6): 20], CO873, Coo55/1:11, CPS358, CQ, Ct296, Dh29, DPi24, DT92, En: 26,27,T16/20, ER57a.(= Rou27), FBT186, FLST74, FN41:6, Fu299, Ga23: 2, GG221a., Gh491m., GH54(B/W), Gli: 43, GS: 75, HAB64, HG8, Hg59, IH:I-37/213, IOH307, Ki33m., Kib57, Kr2: 297, Kz: t.33, La13a., LEC8, Li401, Lx61/2, M920, McK11, Md167, MGZ232, MHI145= HKI145, Mi287, MiM363l., MJ4a., M/M93:24, 96:16, MS21a., MT42, Mu19, NZJ6(2):3a(B/W), PA807, PC74b., PDM12-1999: p.38, f.1, PDM27: 78b., Ph214, PH248l., PL253, PU25, RE132, RF14a.,174,175, RH212b., RIV45(1): 13, Ro120B, Roo287, RT192, SB29-6, SCI25, SD17, Si5/pl.V: 13-21 (= Kb19 p. p.), Sm49, SM1: 109, SMJ73, SPTII/69, Sr: t.114, SSW67, ST23(B/W), SW132, Ve130b., VS71a., WE131a., Wi7.6, *
***S. luteus* (L.) ROUSSEL f. *luteus*°**

52* pileus chocolate brown, as *S. luteus* f. *luteus*, but stipe with a volva-like zone (poorly known species)
Selected illustrations:La14a.r.
***S. luteus* f. *pseudovolvatus* (LEUBA) LANNOY** comb. inv.

52** pileus with other colours 53

53 pileus white, associated with *Pinus* in Europe
Selected illustrations: AL262a.r., En: 28, FMDS113: p.16b., La13b., Mu20a,c?, *
***S. luteus* f. *albus* WASSER & SOLDATOVA**

53* pileus not white 54

54 pileus pale brown, fawn, brownish, pale cream to whitish discolouring, Europe (poorly known species)
Selected illustrations: La14a.l., Re133, RF176,177b.?, *!
***S. luteus* f. *decolorans* ESTADES & LANNOY**

54* pileus yellow ochre, brownish yellow, ochre-brown, dun-yellow, associated with *Pinus*, Europe (poorly known species)
Selected illustrations: FMDS174: 11b., La14b., L/E2A, RF177a.?.*!
***S. luteus* f. *ochraceobrunneolus* ESTADÈS & LANNOY**

55 annulus in young basidiomata baggy and thick, flaring away from stipe at lower as well as upper margin before maturity 56
(51*)
55* annulus present, but not thick and baggy 57
55** annulus often as veil forming a fibrillose zone 59*

56 pileus pale yellow, ochraceous to clay colour, sometimes mottled with these colours, (more brown and with salmon-orange stipe base: **var. *hiemalis* (SINGER) A. H. SM. & THIERS)** pores yellow, pileus not more than 4-6 cm broad, context marbled orange buff and light

buff, staining dark purple drab; – smell fragrant, spores 8-10 × 2.5-3.5 µm, on stipe hyaline scales composed of large inflated basidium-like cells (dermatocystidia) present, associated with *Pinus*, also on mossy trunks, North America, reported from Europe, Asia (Phillipines), South America (Brazil)
Selected illustrations**:** En: T9/11, SIE46(1994): 101, BRB334m., SD19b., *

***S. cothurnatus* SINGER**

56* pileus ochraceous-salmon, cinnamon-brown, darker dingy yellow-brown in age, pores salmon-coloured, pileus -9.5 cm broad, context pale orange-yellow to orange(-buff), salmon ochraceous, not staining; – stipe with thicker, more rubbery veil, with a conspicuously thickened cottony roll at the base of stipe, smell not distinctive, taste of gluten acid at first, spores 6-11 × 2.5-4 µm, on stipe no hyaline scales composed of large inflated basidium-like dermatocystidia present, associated with *Pinus,* North, Central and South America, introduced in Australia, ?Africa, ?Asia(?China)
Selected illustrations: BM21(B/W), BRB340a., BRBD56, CQ, FD27-118, FN41:7, GH61(B/W), HD106, IOH306a.?, Li371, M928?, MiM365, Mycol54:284(B/W), Sm50(B/W), ST28(B/W), SWS64, *

***S. salmonicolor* (FROST) HALLING°**

57 (55*annulus not or only slightly bagging), taste of gluten of pileus clearly to strongly acid (see also 56*) 61

57* taste of gluten of pileus not clearly to strongly acid 58

58 context orange-buff, all parts drying blackish; – pileus often with olive tint, with darker (in age nearly black) streaks, tubes and pores bright yellow when young, then orange-yellow, annulus less than 8 mm broad, associated with *Pinus rigida*, North America
Selected illustrations: SD19a., *!

***S. pinorigidus* SNELL & E.A. DICK°**

(synonymy with *S. salmonicolor* not clearly proven)

58* context not orange-buff, more pallid, yellowish or olive-grey 59

58** context white to yellow 60

59 context in pileus pallid near pileipellis, yellowish above the tubes, or olive-grey, at times staining pinkish when exposed, annulus olivaceous when young; – pileus bister to olive-brown, tan or olive(-tan), -10 cm broad, pores olive-grey when young, then dingy olive, stipe with pinkish brown, darkening to blackish glandular dots, associated with mixed conifers (*Pinus monticola*), western North America
Selected illustrations: AR121, BRB340b., MS21b., S49, SB29-1, ST24,25(B/W), *

***S. subolivaceus* A. H. SM. & THIERS**

59* (55** annulus often as partial veil forming a fibrillose zone)
context pallid nearly lemon yellow above the tubes, bruised slowly becoming vinaceous brownish; – pileus pallid to dingy pinkish cinnamon, pinkish buff to vinaceous buff, tan, pore surface pale yellow,

later brownish, vinaceous cinnamon when bruised, stipe pallid to yellowish with vinaceous-cinnamon glandular dots, annulus gelatinous, band-like, typically collapsed on mature basidiomata, associated with *Pinus strobus, Pinus resinosa*, North America, ?China
Selected illustrations**:** Ba 171a.!, BM20(B/W), BRB340m., CQ, GH58(B/W), *

***S. subalutaceus* (A. H. SM. & THIERS) A. H. SM. & THIERS**

60 context white, yellowish near tubes, yellow in stipe, pileus -11 cm wide, rosy-isabelline, viscid when wet, patches of dirty grey veil along the margin, tubes bright yellow to ochraceous, stipe white, yellow in age, reticulated above, with indistinct pallid to blackish dots, with a narrow indistinct soon evanescent dirty grey annular belt, associated with *Pinus palustris, P. taeda, P. australis*, hitherto only known from Florida

***S. pseudogranulatus* (MURRILL) MURRILL**

60* context yellowish white to pale ochraceous, veil without greyish tinge 61

61 (57 taste of gluten of pileus clearly to strongly acid)
pores pale yellow when young; pileus pale yellow at first, becoming ochraceous, tan or yellow-brown; – often appendiculate with yellow patches of veil, streaked, -16 cm wide, pores dingy yellow in age, pale reddish brown when bruised, stipe darkening where handled, cortex salmon-ochraceous in lower part, annulus pale buff, spores -11 × 5 µm, associated with *Pinus resinosa, Tsuga canadensis*, North America
Selected illustrations: BM19(B/W), BRB336b.,GH53(B/W), PH248r., Roo286, SD18b.!?, *!

***S. intermedius* (A. H. SM. & THIERS) A. H. SM. & THIERS**

61* pores dingy yellow when young, pileus whitish or buff, becoming pale yellow; – pileus not streaked beneath the gluten, -10 cm wide, context white, tubes pallid then dull yellow, pores slowly brownish where bruised, stipe young whitish, spores -9 × 3.3 µm, associated with *Pinus resinosa*, North America, ?China
Selected illustrations: Ba176b., BM18(B/W), CQ, NYSM59:pl.T, PH249b.r.!, YS425?, *!

S. acidus* (PECK) SINGER var. *acidus

61** pores dull brown when young, pileus pale yellow, in age cinnamom-buff; – beneath the gluten streaked in age with brownish fibrils, context dull yellow, stipe pallid, around the base stained greyish, associated with *Pinus*, North America
Selected illustrations: ST26,27(B/W)

***S. acidus* var. *luteolus* A. H. SM. & THIERS**

62 (46* with glandular dots, only veil present) pileus white, often only occasionally in young stage 63

62* pileus not white, especially in young stage 66

63 stipe with glandular dots that are inconspicuous on young basidiomata 64

63* stipe with conspicuous reddish or brownish glandular dots; – pileus only occasionally white in young stage, pileus colour variable, but typically becoming grey at first, then olive(grey), olive-brown, possibly reddish brown in age, mostly young margin with a white cottony roll, smell pungent, associated with *Pinus* (*P. radiata, P. attenuata, P. ponderosa*), hitherto California
Selected illustrations: Ar177a., AR114, BRB339b., Li386, S51, TH47, *
***S. pungens* THIERS & A. H. SM.**

64 pileus with slime changing to chocolate-brown to lilac-brown, causing streaked appearance; – context white then yellowish, stipe white, base staining vinaceous, then brownish, veil white staining vinaceous grey, spores -9 × 3.2 µm, associated with *Pinus lambertiana, P. contorta*, western North America, introduced to Europe (*Pinus strobus, P. nigra*)
Selected illustrations: BRB333m.,b., ST38,39(B/W), *
***S. brunnescens* A. H. SM. & THIERS**

64* pileus not so 65

65 pileus whitish buff or tan, becoming pale ochraceous, tawny, vinaceous cinnamon or brown, with a sterile band of felty fibrillose veil elements surrounding the pileal margin, context white, then yellow, stipe white, in age with only darker dots in lower portion, there discolouring brown; – spores -9 × 3 µm, KOH on pileus cuticle: olivaceous grey, (sandy soil) associated with *Pinus*, (e.g., *Pinus resinosa*) North America with rather northern distribution, ?Asia (China)
Selected illustrations: BM22,23(B/W), BRB337b., CQ, GH47(B/W), McK11, PH250a.l.?!, SD20b.r., Sm56a, ST32,33(B/W), TH38, *
***S. neoalbidipes* M. E. PALM & E. L. STEWART**

65* pileus whitish pink, tawny olive or pale cinnamon drab, fading to buff or sulphur yellow, white, cottony patches from veil remnants, context soft, white, yellow above tubes, stipe white, then orange brown glandular dotted on upper half; – pores nearly circular to angular, pale cream colour becoming buff, associated with *Pinus occidentalis*, hitherto Dominican Republic.
Selected illustrations: FD27-117, *
***S. pseudoalbivelatus* B. ORTIZ & LODGE**

66 (62* pileus not white, especially in young stage)
stipe with glandular dots that are sparse, obscure or absent on young basidiomata (see also 65, 65*) 67

66* stipe with conspicuous glandular dots in all stages 70

67 basidiomata not gastroid, pileus sometimes fibrillose-streaked beneath the gluten, slimy when fresh; – pileus -14 cm wide, clay colour, honey-yellow to yellow brown or reddish brown, context white then pale yellow, patches of dirty grey veil along the margin, stipe often short, -3 cm thick at apex, glandular dots whitish, obscure when

young, veil typically sheathing the lower half of the stipe, usually forming an fibrillose annular zone, spores -9 × 3 µm, associated with *Pinus contorta,* hitherto western and ?southern North America
Selected illustrations: BRB339a., McK11, ST16(B/W), TH46, *

***S. pseudobrevipes* A. H. SM. & THIERS**

67* basidiomata with gastroid appearance, pileus at first covered with a white fibrillose veil 68

68 (50**) veil leaving (floccose)white squamules on buff to orange-brown ground when young; – pileus becoming vinaceous brown, brownish red to yellow-brown in age, stipe only sometimes with a ragged superior annular zone, that soon disappears, smooth or with few glandular dots near apex, context white, then yellowish, staining pinkish-vinaceous, spores -8.5 × 3 µm, associated with *Pinus ponderosa*, western North America
Selected illustrations: Ll28:122l(B/W), PH251a.r., SB31-4, *

***S. albivelatus* A. H. SM., THIERS & O. K. MILL.**

68* pileus without white squamules 69

69 pileus -12 cm broad, bright yellow with ochraceous areas, duller in age to russet mixed pale yellow, margin with veil remnants, context pallid yellow, stipe short, yellow at apex, otherwise white becoming brownish, annular zone only occasionally present, glandulae near apex in age apparent, associated with *Pinus jeffreyi*, hitherto California
Selected illustrations: TH51, *(!)

***S. pseudobrevipes* A. H. SM. & THIERS f. *volcanalis* (THIERS) KLOFAC**

69* pileus -12 cm broad, reddish brown, dark brown, orange-cinnamon, surface often streaked, membranous veil with purplish tint, tubes yellow, context whitish, yellow at maturity, pores yellowish, stipe 2-4 cm long, spores -9 × 5 µm, particularly associated with *Pinus monticola, P. kesiya,* western North America, Asia (Phillipines)
Selected illustrations: BRB333a., Ll28:122r., 124(B/W), PH250b.r., S53, *

***S. borealis* A. H. SM., THIERS & O. K. MILL.**

69** pileus only -7 cm broad, yellow-brown to orange brown; – pores yellowish, stipe yellow above, downwards orange brown, with small glandular dots, veil pallid pinkish, spores -9 × 3.8 µm associated with *Pinus nigra*, hitherto Greece (poorly known species)

***S. roseovelatus* PANTIDOU & WATLING**

70 (66* stipe with conspicuous glandular dots at all stages) pores small (1-3 per mm) 71

70* pores large 72

71 pileus yellow to pinkish tan or (reddish)cinnamon, margin with white cottony roll, pores white at first, buff to tan, yellowish in age, often beaded with reddish brown droplets when young, stipe pallid, staining brown when handled, glandular dots dark brown to black, context

white, yellowish in age, associated with pine (*Pinus contorta, P. muricata*), North America with rather southern distribution, e.g. California, ?China
Selected illustrations: BRB335a., TH42, *

***S. glandulosipes* THIERS & A. H. SM.**

71* pileus yellow brown to brown ochre, fibrillose streaked, pores yellow, stipe yellowish above, veil typically sheathing the lower half of the stipe brownish, glandular dots reddish brown, context pallid in pileus, in stipe yellow, base brownish pink, base-mycelium pallid, associated with *Pinus halepensis, P. pinea*, Europe
Selected illustrations: FNDVI: 11,12 (= Mu22a),13, Mu22b, Rou33

***S. collinitus* var. *velatipes* CONTU, LAVORATO & SIMONINI**

71** pileus pale brown to orange-buff, margin with evanescent white veil, pores whitish, later yellow brown, stipe whitish, later yellow, light yellow orange, base and mycelium pale pink, glandular dots red-brown, spores -12.5 × 5.5 µm, associated with *Pinus halepensis*, hitherto Greece (poorly known species)

***Suillus alboflocculosus* PANTIDOU & WATLING**

72 (70* pores large)
pileus viscid; – and -7 cm broad, greyish pink, pinkish cinnamon, pinkish avellaneous, vinaceous brown, marginal areas orange-cinnamon, later brownish, context pallid to yellow, pores large, yellowish, developing vinaceous brown glandular dots, stipe vinaceous brown from a coating of glandular dots, at times staining yellow particularly at the base where bruised, white to yellow fibrillose veil sheathing the lower part of the stipe, sandy soil in mixed forest, hitherto Minnesota

***S. weaverae* (A. H. SM. & SHAFFER) H. ENGEL & KLOFAC**

72* pileus (becoming) areolate to fibrillose-scaly, hirsute or subsquamulose 73

73 basidiomata with gastroid appearance, pileus viscid becoming areolate, cinnamon-brown to ochraceous fibrillose-scaly, (dark) brown to yellow-ochre, with yellow veil, stipe yellow, glandular dots brown, pores -4 × 3 mm, in vicinity of dead logs and stumps, *Pinus lambertiana, P. ponderosa*, hitherto California
Selected illustrations: TH48, *

***S. riparius* THIERS**

73* Basidiomata without gastroid appearance, pileus subviscid, innately fibrillose and minutely hirsute, margin covered with cobweb-like to wooly remnants of a veil, pileus cinnamon, soon yellow, stipe yellow, becoming sometimes carmine red, brownish red, low hammock and in flatwoods associated with *Pinus palustris*, hitherto southern North America
Selected illustrations: Fa2:276(B/W), Me225?, *!

***S. hirtellus* subsp. *thermophilus* SINGER°**

74 (26* lacking glandular dots, annulus absent, but with veil, 18** pores whitish, soon greyish(-brown), associated with *Larix*, bluish discolouration only exceptionally)

pileus apressed fibrillose to subsquamulose, only slightly viscid, pale dull olive to greyish, also tinted yellowish; – veil whitish to greyish, typically not forming an annulus, context white to faintly olivaceous, tubes or context only exceptionally bluish when bruised, pores pallid to greyish, becoming boletinoid, spores -11.5(-14) × 5(-6) µm, on needle litter or among *Sphagnum* in bogs associated with *Larix*, North America, ?China

Selected illustrations: BM43(B/W), Bri14:4b.(B/W), BRB318b., SD12a.l., *

***S. grisellus* (PECK) KRETZER & T. D. BRUNS**

74* pileus glabrous, ochre-yellow; – -20 cm broad, margin incurved and appendiculate from remains of a membranous veil, tubes yellow, pores angular, staining brown when bruised, stipe yellow, spores -9.5 × 3.5 µm, associated with *Abies*, western North America (poorly known species)

***S. appendiculatus* (PECK) A. H. SM. & THIERS** comb. ill.

75 (46** with glandular dots, annulus or veil absent) pileus (at least young) entirely whitish 76

75* pileus only on pileus margin or in spots whitish 79

75** pileus without whitish colours 80

76 with conspicuous glandular dots (see also 93) 77

76* without conspicuous glandular dots 78

76** with glandular dots often conspicuous only in older stage 93

77 especially associated with *Pinus strobus*; – pileus yellowish in age, pores whitish, yellowish in age, as well as stipe with pinkish tan glandular dots, spores -9 µm long, North America, Europe, Asia, Africa

Selected illustrations: AM62, Ba176a., BC1443, BKIII48, BM26,27(B/W), Boud.147bis, Br944, BRB338m., BSMF122(4): 314b., BTR33(1-2) p.21,22, CB51(B/W), CC345, CD1647, CeI: 470 [= BTR33(1-2): p.20], CP882, CQ, Ct290, Dh30, DPi25f-h,26, En: 32,33,T20/24, ER63b.(= Rou35), Ga23: 1, GG227a., GH56(B/W), KM415, La15mr.,b.l., LEC12, Li372, M922-2?, MHII20 = HKII20, MJ4b., MT30, NYSM64:pl.121, PA814, PH250a.r., Pil6, PL254, PUII: 7, RIV45(1): 23a., RT182(2), SCI44, SD21a., Si5/pl.VI: 1-9 (= Kb37 p. p.), SMJ79, SPTIII/47, ST40(B/W), SVA56:2,3, SWS65, TINT3/2004: 52, Wi7.14, *

***S. placidus* f. *placidus* (BONORD.) SINGER°**

77* especially associated with *Pinus cembra*; – more robust, spores -10.5 µm, Europe, Asia, ?western North America.

Selected illustrations: Ga23: 1, Gli: 51, GS: 83a. (= GR: 63), HAB67, La15a.,ml.,b.r., Lx61/3, Md68, Mu27a-b, VS82b., *

***S. placidus* f. *fusipes* (HEUFL.) KLOFAC°**

77** associated with 2-needle *Pinus* (*P. halepensis*); – pileus white at first but relatively quickly with other, darker colours, pileus becoming whitish-grey, more yellowish, then with yellow brown, coffee brown, chocolate brown, lilac brown spots in age, margin remaining pale, stipe lemon yellow above, white downwards, granular dots salmon to red-brown, context white, in cortex somewhat yellowish, in the Mediterranean area of Europe, Africa, Asia, ?North America

Selected illustrations: BC96, BL47, Br908, BSMF82(2): pl.V, BTR33(1-2):

p.11,12, CD1646, CP880, CS221, Ct1562 (= CeI: 474), Dh31, En: 34, FSII t.4 (= MuT.61), ER63a.(= Rou34), Gli: 49, GS: 89, GS3:59,89,286, La18, LEC10,11, Md65, MJ7, MT28, Mu25+T.11, PDM31, RE136,137, RF184-189, RIV45(1): 18a., SCI73, SMJ81b., WE127b., Zu68, *

***S. bellinii* f. *bellinii* (INZENGA) KUNTZE°**

78 pileus slowly becoming pale yellow to dull cinnamon-buff, with sterile margin, becoming areolate beneath the gluten in age; – pores soon yellow, stipe white, yellow above, glandular dots inconspicuous or absent, associated with *Pinus contorta*, western North America, ?China
Selected illustrations: ST41(B/W), *

***S. pallidiceps* A. H. SM. & THIERS**

78* pileus white when young but soon olive to greyish-olive and then becoming yellow, tawny cinnamon, rusty-brown, orange, reddish brown or often mottled and streaked with various combinations of the above colour; – context white when young, soon becoming lemon-yellow, tubes white when young becoming yellow and finally dark yellow brown or dingy ochre in age, hitherto Pakistan (poorly known species)
Selected illustrations: APP 40(5):372

***S. shardasus* GARDEZI** nom. inval.

78** pileus covered with darkening slime, but with veil (see 64)

79(75) only margin of pileus whitish, otherwise brown yellow, brown with reddish tint; – pores dirty yellow to brownish yellow, stipe with cinnamon red granular dots, associated with *Pinus halepensis*, Europe only in Greece (poorly known species)
Selected illustrations: Pant.193, PDM31

***S. obscurus* PANTIDOU & WATLING**

79* pileus grey-brown to purplish brown or vinaceous brown over a whitish ground colour on the disc, margin white, sometimes with grey-brown spots and areas; – context white, pores white or ivory, later cream-buff to yellowish, small, stipe white, apex yellowish, with white glandular dots that become brownish to purplish brown at maturity, 5-needle *Pinus* (*P. albicaulis, P. flexilis*), in subalpine forests, hitherto western North America

***S. subalpinus* M. M. MOSER**

79** pileus dark vinaceous brown, young with faintly white-tomentose margin (see also 100, 101) 80

80 (75** pileus without whitish colours) see also 93
pileus mainly light-coloured in all stages (yellow, ochre to brownish), viscid, not fibrillose 81

80* pileus with various orange, reddish or brown tones, young sometimes ochre or yellow-orange, pileus fibrillose 87

80** pileus with the same colours as 80*, viscid or not, not fibrillose 88

81 pileus pallid yellow to ochre 82

81* pileus mainly with bright yellow colours 83

82 pileus completely pallid lemon yellow; – pores light yellow, basal mycelium whitish-pinkish, Europe, otherwise see 77**
Selected illustrations: En: 35,T5/6, GS3:88, MM22(1):72b., Mu26, RCM18: 17, RCM26: 136, SC118, *

S. bellinii f. ***luteus*** **PEREZ-DE-GREGORIO**

82* pileus pale yellow, than pale or dingy ochraceous; – glutinous to viscid, pores -2.5 mm wide, yellow, context white, at apex of stipe sulphur yellow, stipe whitish then yellow with pinkish brown glandular dots, sometimes (pinkish) brown (in) at base in age, associated with *Pinus* (*P. contorta, P. monticola*), North America
Selected illustrations: Ll127, BRB334b.

S. flavogranulatus **A. H. SM., THIERS & O. K. MILL.°**

82** pileus pale yellow to ochre-yellow or pale yellow with ochre-yellow spots, bright dark ochre on the disc; – pores yellow-brown to brown-olive, stipe almost chrome yellow, granular dots cinnamon, context pallid chrome yellow, KOH on context pallid orange, then brown black, associated with *Pinus halepensis*, hitherto Greece (poorly known species)
Selected illustrations: Pant.187

S. alkaliaurantians **PANTIDOU & WATLING**

83 pileus soon bright yellow, pores ochraceous in age; – basal mycelium whitish, Europe, otherwise see 100
Selected illustrations: BSMF122(4): 319,322, ER52b., La19b., PDF16:17

S. mediterraneensis **f. *xanthus*** **ESTADÈS & HURTADO**

83* pileus constant yellow to lemon yellow, tubes and pores bright yellow; – basal mycelium yellow, context pale to bright lemon-yellow, stipe lemon-yellow, staining dull olivaceous, spores -9.8 × 4.2 µm, scattered in *Populus tremula-Betula-Picea-* forest, North America, ?China (poorly known species)
Selected illustrations: BM31(B/W), MB7:17(B/W), SD20a.r.,

S. unicolor **(FROST) KUNTZE**

83** pileus yellow, pores young appearing pinkish red, brick-red from beaded exudations 84

84 pores and stipe with reddish, darkening glandular dots and smears; – pileus viscid, yellow, occasionally with reddish flushes, context very pale yellow, smell pungent, stipe yellow near the apex, becoming whitish toward te base, spores -10.5 × 4.5 µm, associated with *Pinus ponderosa*, southwestern USA
Selected illustrations: BRB341a.

S. wasatchicus **THIERS**

84* Only yellow pores dotted with reddish glandular exudations; – pileus viscid, only -3 cm, yellow with red on disk, tubes long, yellowish, old dingy yellow, context pallid, whitish, stipe viscid, yellow, dotted with livid-yellow glandules, basal mycelium colour and habitat unknown, hitherto Pennsylvania

Boletus inflexus PECK

(description reads undoubtely like a *Suillus*, but must be considered as a poorly known species, see comment)

84** pores not red from beaded exudations 85

85 pileus viscid, fibrous streaked; – pileus with yellow but sometimes variable colour, deep yellow, golden yellow, brownish yellow, pores

bright yellow, Europe, otherwise see 103
Selected illustrations: FNDVI: 14

***S. collinitus* var. *aureus* (HUIJSMAN) LANNOY & ESTADÈS** comb. inv.

85* pileus viscid, but not fibrous streaked 86

86 pileus with yellow-brown gluten; – pileus small, only -3 cm, pale whitish-yellow, pores yellow, yellow-brown to black glutinous, such as pallid reddish stipe, spores -8 × 5 µm, China

***S. gloeous* Z. S. BI & T. H. LI**

86* pileus without gluten 87

87 (80*) pileus ground colour bright yellow or apricot-orange, with appressed tomentum in minute brownish fibrillose spots or patches and these at times red; – context yellow, slightly reddish where cut, tubes ochraceous, pores yellowish orange to dingy yellow, becoming radially elongated, stipe yellow, brownish where bruised, basal mycelium white, spores -10 × 3.5 µm, $FeSO_4$ olive on context, associated with *Populus tremula* and various *Quercus* (scrub oak), but also *Pinus strobus*, North America, South America, ?Asia (?China)
Selected illustrations: BM15(B/W), BRB340m., CQ, GH59(B/W)?, M927?, PH247r., SD16b., Sm54, SSW72, ST19(B/W), *

***S. subaureus* (PECK) SNELL**

87* pileus yellowish with yellow tufts of fibrills, barium to pinard yellow, with fibrils forming squamules, occasionally with greyish fibrillose remnants on margin; – stipe yellow, pallid toward base, granules from pale brown to blackish, basal mycelium pink, spores -13.5 × 3.3 µm, associated with *Pinus palustris, P. australis, P. taeda*, North America

***S. hirtellus* var. *cheimonophilus* (SINGER) A. H. SM. & THIERS**

88 (80***) stipe with reddish brown glandular dots; – pileus variable, pallid buff, tan, yellow to (pinkish)cinnamon, light brown, context white, above tubes and in stipe yellowish, stipe below vinaceous or with dark red stains, pores buff to yellow, frequently dark salmon in age, small, spores -9.5 × 4.5 µm, associated with *Pinus ponderosa*, western USA
Selected illustrations: Ar177b., BRB337a., *

***S. kaibabensis* THIERS**

88* glandular dots absent or inconspicuous; – pileus buff, tan, pale brown to pinkish cinnamon, streaked, often appearing rimose-scaly in age, pores 1-2 mm wide, tan to yellow, stipe white to yellow, context white, yellow in age, associated with *Pinus ponderosa*, western USA
Selected illustrations: BRB338a., *

***S. occidentalis* THIERS**

88** not with the above combination of characters 89

89 pores sublamellate, boletinoid, dark yellow, pileus subconical to campanulate or umbonate, only -4 cm broad, viscid, ochraceous, pale

brown with darker brown streaks, dingy ochraceous on margin when young, stipe yellowish, base with white rhizomorphs, KOH purple-brown on cuticle, associated with *Pinus contorta*, North America
Selected illustrations: Mycologia 65:1376(B/W), BRB336a.
***S. helenae* THIERS & A. H. SM.**

89* not with the above combination of characters 90

90 pores brownish-orange, sordid greyish when bruised, small, pileus only -5 cm broad, viscid, colour variable, ochraceous-yellowish with greyish tints later between brown-grey and brown, in places pale scrobiculate, stipe yellow with brownish or darker glandular dots, context yellow, in base of stipe orange, associated with *Pinus patula*, Mexico
***S. chiapasensis* SINGER**

90* not with the above combination of characters 91

91 basidiomata robust, pileus -10 cm broad, yellowish brown to brownish orange, also becoming dark brown or dark brown streaked, tubes strongly decurrent, pores (pale) yellow, later greyish yellow to pale orange, stipe -5 cm broad, pale yellow, staining reddish to brownish when handled, infrequently glandulose at apex, KOH on pileal surface dark bluish green, associated with *Quercus, Arctostaphylos, Pinus ponderosa*, hitherto California
Selected illustrations: Mycol68:657(B/W), BRB332b.
***S. anomalus* T. J. BARONI, LARGENT & THIERS**

91* not with the above combination of characters 92

92 species without dense fibrillose or squamulose pileus 93
92* species with dense fibrillose or squamulose pileus 105

93 at least when young with pallid pileus; – pileus from whitish pallid to chocolate-brown (colour of *S. luteus*), glandular dots inconspicuous or conspicuous: the "*granulatus*" named species, (see also 113) 94
93* even young with darker pileus 95

94 pileus whitish to hazel or pinkish fawn, gibbose, often subconical or campanulate, stipe long and thin, light citrine, only later with fine purplish black glandulae, context yellow in stipe, whitish in pileus, associated with *Pinus*, Europe
Selected illustrations: La20b.r.
***S. granulatus* var. *campanulatus* (BLUM) LANNOY** comb. inv.

94* Pileus yellowish white when young becoming pale ochraceous with age and then obscurely spotted by the drying gluten, -8 cm, viscid or glutinous, stipe short, white, with few or no glandular dots at the top, context white, tubes whitish in young basidioma, becoming yellow and finally brownish ochraceous, spores 8-10 × 3-4 µm, associated with *Pinus strobus*. North America
Selected illustrations: NYSM.57: pl. 130, BRB335m.?!, Sm56?!,56b.(B/W)?, *!
***S. albidipes* (PECK) SINGER ss. PECK non ss. auct.**

94** pileus generally reddish brown to brown (young and immature seldom but then for a long time white to pallid), mostly mottled or as spots from aggregations of the gluten of the epicutis, stipe strongly glandulose with pinkish tan to vinaceous

brown dots, whitish, soon bright yellow above, tinged cinnamon toward base, context white to pale yellow, spore print (dingy)cinnamon to brown, spores -9(-10) × 3.5(-4) µm, KOH olive on pileipellis, associated with *Pinus*, North America
Selected illustrations: CQ, Roo336, McK11, *

Suillus granulatus ss. auct. americ. p. p.

95 (93* even if young with darker pileus)
glandular dots inconspicuous (see also 100**); – pileus -10 cm broad, slimy, pinkish buff to (darker) pinkish cinnamon, streaked in age, context pallid with lemon-yellow areas, pores pale yellow, with beaded exudations, staining brownish where bruised, stipe short, pale lemon-yellow, streaked, staining brown when handled, (vinaceous)cinnamon in base, spores 7-9 × 3 µm, associated with *Pinus strobus,* NorthAmerica, ?China
Selected illustrations: BM30 (B/W), BRB337a., M918?, *

Suillus lactifluus ss. auct. americ.

95* glandular dots conspicuous (see also 103*) 96

95** glandular dots conspicuous, but hitherto only in European and African Mediterranean areas 100

96 basal mycelium yellow; – pileus yellow-orange to orange, pores yellow, later fox-red, bruised brown-red, olive drab in age, stipe light sulfur yellow, glandular dots from the same colour then reddish brown, context pale sulfur yellow, spores -8 × 3.5 µm, associated with *Pinus*, Europe (a poorly known species)
Selected illustrations: La20b.l., Sr t.123, *!

***S. granulatus* var. *flavorufus* (SCHAEFF.) LANNOY** comb. inval.

96* basal mycelium not yellow 97

97 stipe with (pseudo)reticulated zone 98

97* stipe without (pseudo)reticulated zone 99

98 pileus grey-brown to dark grey; – stipe short, yellow, downwards grey-brown, with fine yellow to reddish purple glandular dots, forming a pseudo-network, context in pileus pale yellow, brown to purplish in stipe, in base grey-brown to blackish, associated with *Pinus*, (southern) Europe (a poorly known taxon)
Selected illustrations*:* AL260b.?, En: T12/14, RIV37(3): p.227

***S. granulatus* f. *marchandii* G. MORENO &** HEYKOOP

98* pileus colours very variable and often mixed ranging from pale creamy yellow to olivaceous grey and a range of yellowish brown, pileus -14 cm broad, viscid becoming glabrous and shiny when dry, stipe faintly reticulate at apex, covered with pinkish brown glandular dots that exude creamy droplets, pores dull yellow, becoming darker in age, 1 per mm, context white, becoming yellow when exposed, KOH on cuticle vinaceous brown, spores -9(-10) × 3.5(-4) µm, associated with *Pinus radiata* and other North American *Pinus,* New Zealand
Selected illustrations: FN41:7, NZJ6(2):7a, *

***S. subacerbus* MCNABB**

99 pileus colour variable, pale yellow ochre, light brown, yellow-brown to reddish brown: – pileus -10 cm broad, margin seldom with a narrow band of minute apressed fibrills, pores young whitish, cream,

light yellow, young with milky droplets, stipe white-yellow to yellow, glandular dots concolorous, later brownish, context white to white-yellow, above tubes and apex of stipe lemon yellow, spores 8-10 × 3-4.5 µm, Q = 2.5-2.9, KOH on surface of pileus olivaceous, associated with *Pinus*, but also *Picea*, worldwide, often introduced
Selected illustrations: AM59, BaCN31/4-7,9-12, BC46, BKIII45, BL47, Br907, CC88, CD1643, CPS359, Ct297 [= CeI: 478, = BTR36(1-2): p.9 = BTR33(1-2): p.5], Dh33, DPi27,28a-g, En: 37,38,T11/13, ER63m., FLST75, p.200, Gh491b., Gli: 47, GR: 57, GS: 85, HAB65, HG10, Hg58, Ki33a., Kib54, Kr2: 299, La20a., LEC9, Let: t.604, Lx63/2, Md66, MHI146 = HKI146, MJ6a., MT26, NZJ6(2):4b(B/W), PA808, Ph217, PL252, PU23, RF180,181, RIV45(1): 16a., Ro120A, Rou32, RT193, Set200, Si5/pl.VII: 9-13,VIII: 3,5-10 (= Kb48 p. p.), SMJ77, Sow.420, SPTII/70, SW137, VS75b., WE129b., Wi7.11, Zu70, *

***S. granulatus* (L.: FR.) ROUSSEL f. *granulatus*°**

99* pileus orange cinnamon to cinnamon rufous to dark reddish brown, sometimes bleaching from the centre outward; – context, tubes and stipe at first and for a long time remaining white or pallid, glandular dots soon with darker tones, purple or blackish, spore print Isabella colour (olive yellow), spores -8.2 × 3(-3.5) µm, KOH on surface of pileus: lilac, then immediately greyish brown, associated with *Pinus strobus, P. monticola*, North America, South America, ?Asia
Selected illustrations: Ar176?, Ba174a.?, BRB335m.?, GH51(B/W)?, HD105b.?, IH:I-37/214?, IOH308?, Li376?, M916?, Mi294?, MS18?, SB31-3?, SD20m., Si5/pl.XVII:3(B/W), Sm56a.(B/W)?, *!

***S. granulatus* subsp. *snellii* SINGER**

100 (95** glandulae conspicuous, but hitherto only in European and African Mediterranean areas)
pileus light yellow, ochraceous yellow, ochraceous maroon, olivaceous ochre, at first with whitish zones, not always coloured throughout, yellow streaks often remaining, also margin remaining lighter, pores yellow ochre; – basal mycelium itself white but the stipe base underneath shining through pinkish, stipe granules soon becoming brownish, later brownish-reddish, then more brown to nearly blackish, context yellowish, chrome yellow close to the tubes, coconut smell, associated with *Pinus halepensis, P. pinea, P. pinaster*, European and African Mediterranean areas.
Selected illustrations: CD1645, CP3:1395, CS218!, ER54a., FAMMn.s., 3: 46, FMDS174: 16b., FNDVI: 15, Gh493a., GS: 91, GS3:91b., La19a., M/M100:22, Mu24a (= BC1298)?, 24b,c, PDF16:15, RF190, SCI72, SMJ81a.,*

***S. mediterraneensis* f. *mediterraneensis* (JACQUET. & J. BLUM) REDEUILH°**

100* pileus chestnut brown, hazel, reddish ochre, reddish brown, brown-red, coloured throughout, pores for this group relatively large and angular, yellowish; – tubes often decurrent, granules light brown then purple black, context first almost sulfur-yellow then turning pale, occasionally with reddish discolouration, basal mycelium pink, associated with *Pinus halepensis*, *P. pinea*, *P. pinaster*, European Mediterranean areas
Selected illustrations: DM100: pl.5d, FNDVI: 16, La17b., PDM31

***S. bovinoides* (J. BLUM) BON**

100** similar species hitherto not reported from Europe, but with glutinous pileus and short stipe 101

101 stipe young not obviously glandular dotted, pure white, pileus margin in young basidiomata faintly white-tomentose, almost chocolate brown to dark vinaceous brown, greyish brown slowly becoming pale tan to ochraceous, context white, yellow in age at least in apex of stipe, seldom reddish-rusty patches in and on base of stipe, pores whitish to pale yellow at first, dingy yellow in age, associated with *Pinus*, (eastern)North America, Central America, ?China, ?Australia
Selected illustrations: AR115, Ar175, BBN112a., BM28(B/W), BRB333m., BRBD55, CB52(B/W), CQ, E158b., FD27-115, GH49(B/W), HD105a., L2?, Li387, McK11, Mi291, MiM357, MS15, NYSM4:66, NZJ6(2):4a(B/W)?, PH251a.m., SB31-5, SD21b., Sm55(B/W), SSW69, ST42(B/W), TA222a., TH39, SWS66?, *

***S. brevipes* var. *brevipes* (PECK) KUNTZE**

101* stipe not dotted, thinner, pileus paler, also with yellow streaks or yellowish bleaching, tubes bright yellow, North America, ?China
Selected illustrations: BM29(B/W), SB31-6, Sm55!?, *!

***S. brevipes* var. *subgracilis* A. H. SM. & THIERS**

101** stipe obviously glandular dotted 102

102 Glandular dots initially only slightly darker than stipe surface but sometimes light brown, becoming nearly black when dry, stipe pale yellow on apical fifth, lower part same colour or white or overlaid with a light brown layer, pileus some shade of light brown or nearly light orange or greyish yellow, later brown or deep brown, sometimes with olivaceous patches or tones, context white, sometimes with brownish stains just under cuticle, and pale yellow tones just above tubes, tubes slightly lighter than brilliant orange yellow, spores average 7.7-8.7 × 2.8-3 µm, associated with *Pinus muricata*, hitherto California
Selected illustrations: Mycol102(2):443, *

***S. quiescens* T. D. BRUNS & VELLINGA**

102* not with the above combination of characters 103

103 pores small, yellow, pileus -12 cm broad, yellowish ochre to brown, with maroon brown radial fibrils; – basal mycelium pink, spores -10 × 4.5 µm, stipe yellowish above, downwards reddish brown with rather fine reddish brown granules, context yellow, more pallid in pileus, especially associated with 2-needle *Pinus*, but seldom also in pure deciduous forests, Europe, Africa, ?Asia
Selected illustrations: AM60, BC443, BKIII43, BL47, BSMF83: Atl.pl.174, BTR33(1-2): p.7, CD1644, CeI: 476 (= BTR33(1-2): p.8), DÄ23, DPi28h-k, En: 29,T8/10, ER61b., GR: 59?, GS: 87a., Kb48(8,27)!, Kib53, Kr2: 301, La17a., Lx63/1, M913?, MDS174:16a., MJ5b.?, M/M90:21a., 96:24, 100:31, Mu21a,c,d +T.13?, PA81, Pant.185!?, PFNO135, Ph215, RF183, RicIII, RIV45(1): 16b., Si5/pl.VI: 10, Si5/VIII: 4!, SM1: 101, SMJ75, Zu69, *

***S. collinitus* (FR.) KUNTZE°**

103* pores large, boletinoid, white at first, in age yellow to ochraceous, pileus -20 cm broad, orange-brown or finally violaceous-brown, purplish brown, often streaked; – context white to yellowish, usually greenish yellow near the tubes and tinged greyish vinaceous under the cuticle, stipe white, becoming yellow near apex or base, with brownish (vinaceous) glandular dots, associated with *Pinus strobus, P. contorta, P. monticola,* North America, ?Australia, ?China
Selected illustrations: BM33,34(B/W), BRB339m., Ll28:130(B/W), ST45(B/W), TA224m., *

***S. punctatipes* (SNELL & E. A. DICK) SINGER**

103** pileus less than 12 cm broad, pores large 104

104 pileus ochre, cinnamon-brown or orange-cinnamon, -5 cm, context pale yellow, deeper at the centre, paler in stipe, pores radially arranged, pale yellow to brown, tubes short decurrent, stipe pale yellow, with dark granular dots, spores -12 × 5 µm, mixed forests, hitherto China
Selected illustrations: M839

***S. kunmingensis* (W. F. CHIU) Q. B. WANG & Y. J. YAO**

104* pileus orange cinnamon to ochre brown, often with a red tone, context pale red orange, tubes decurrent, pores radially arranged, large, dark yellow-brown, stipe coloured as pileus or paler with brown dots on the upper part, spores -9 × 4 µm, in forest of *Keteeeria* and *Pinus*, hitherto China
Selected illustrations: Hu572, M841, WLY105b.,YS369

***S. pinetorum* (W. F. CHIU) H. ENGEL & KLOFAC**

105 (92* species with dense fibrillose or squamulose pileus)
pileus with dull yellow to golden ground colour, -7 cm, squamules brownish to reddish brown, vermillion in places, context yellow, tinged reddish or greenish in places, pores golden yellow to ochraceous, rather large, boletinoid, tubes very short, stipe deep yellow, tinged greenish at apex, purplish red at base, glandular dots ochraceous to brown, spores -9 × 3 µm, associated with mixed hardwood and *Tsuga*, hitherto eastern North America, ?Asia
Selected illustrations: SD16a.

***S. flavoluteus* (SNELL) SINGER**

105* pileus with other combination of characters 106

106 spores -9 × 3.5 µm; – pileus -15 cm broad, squamules greyish, brownish or often reddish on bright yellow ground, context pale yellow, pores pale yellow, orange buff when mature, staining slightly vinaceous brown when bruised, stipe and glandular dots at first pale yellow, dots blackening in age, basal mycelium white, NH_4OH on pileus lilac to red, associated with *Pinus, Picea, Abies balsamea*, North America
Selected illustrations: BM14a.(B/W), BRB336m., BRBD55, ST20,21(B/W), SD22m., SWS63, *

***S. hirtellus* (PECK) KUNTZE°**

106* spores larger 107

107 context yellow; – pileus ground colour cinnamon to ochraceous or buff, young densely coated with olive-brown to dark brown or vinaceous brown fibrils or sqamules, pores yellow, small, taste weakly unpleasant, glandular dots brown to vinaceous brown, NH_4OH on pileus purplish brown, spores -12 × 4 µm, associated with *Pinus radiata, P. ponderosa*, western USA
Selected illustrations: AR119,120, BRB335a., TH37,41, *

***S. fuscotomentosus* THIERS & A. H. SM.**

107* context yellow to pale orange or orange buff; – pileus ground colour dull ochre to buff, more cinnamon in age, covered with olive brown or fuscous (deep greyish brown) fibrillose scales, smell and taste unpleasant, stipe pallid to yellow or brownish buff or often pinkish orange to pale orange, especially toward base, glandular dots brown to cinnamon, associated with *Pinus*, hitherto Pakistan (poorly known species).
Selected illustrations: APP 40(5):372?

***S. bekhsus* GARDEZI** nom. inval.

107** context white 108

108 basidiomata not gastroid, pores bright to dark yellow; – pores radially arranged, pileus -7 cm broad, light brown, brown to cinnamon-brown in age, darker fibrillose streaked, tubes when old decurrent, stipe ventricose to bulbous at base and abruptly pinched below, only in age in the apical region with glandular dots and also reticulate, yellow becoming brown toward base, associated with *Pinus contorta*, western USA

***S. monticola* THIERS**

108* basidiomata not gastroid, pores darker; – with pink or whitish basal mycelium 109

108** basidiomata with gastroid appearance 110

109 basal mycelium pink, pileus brown-yellow, yellow ochre or brown, ochre-brown streaked; – pores brownish yellow, olivaceous maroon, rusty olivaceous, when young with milky droplets drying up brown, stipe yellowish to brownish orange with pale then reddish to dark brown glandular dots, context whitish-yellowish, in base of stipe reddish brown, KOH on context stains light lilac or pink lilac, spores -12 × 5 µm, associated with *Pinus cembra*, Europe, ?North America (Mexico)
Selected illustrations*:* AM63, BKIII49, Br906!, BSMF: V,pl.15/1 (= MuT.62), CC345, CeI: 472 [= BTR33(1-2): p.18], CP881, Ct289, DPi29a-f, En: 39,T21/25, ER65a.(= Rou36), FBT191, FMDS147: 1(cov.), GG223b., Gh493m., GS: 77, La16, L/E2B, MJ5a., MHII21 = HKII21, MT2: 31, Mu28b, RIV45(1): 23b., Si5/pl.VII: 1-7, SMJ87, SPTIV/48r., *

***S. plorans* (ROLLAND) KUNTZE°**

109* pileus dark brown, sooty fibrillose, for other characters see 109
Selected illustrations: AM63, MHII21 = HKII21, MT31?, Mu28a, Si5/pl.VII: 1,3-4, SPTIV/48l.

***S. plorans* var. *cembrae* (STUDER) SINGER°**

109** similar but with whitish basal mycelium, context more intensely coloured, smell often like almond extract, staining fingers brownish when handled, young pores brown, KOH on context purplish to wine-red, associated with conifers (*Picea, Abies balsamea, Pinus strobus*) North America, introduced to Europe, Asia (?China)
Selected illustrations: At172(B/W), BM16(B/W), BRB339b., CB57(B/W), Coo55/1:34, GH57(B/W), PH249b.l., Roo295, SD22a., ST22(B/W), *

***S. punctipes* (PECK) SINGER°**

110 (108**) pileus with greyish yellow ground colour, dark olivaceous fibrillose; – -5 cm broad, pores greyish olive, context white with yellow areas, a rosy zone above the tubes, staining light sordid brownish when cut, smell pungent-farinaceous, taste slightly bitter, stipe pale salmonaceus with dark brown stains at base, with dark brown to blackish glandular dots in upper half, spores -10 × 2.5 µm, associated with *Tsuga mertensiana* and *Abies amabilis*, hitherto Oregon **(**poorly known species)

***S. imbellus* (TRAPPE) KRETZER & T. D. BRUNS**

110* pileus dark brown, paler toward the margin, when young paler; – only -3.5 cm broad, context white to pale yellow, in stipe with bright yellow areas, tubes disorganised, pores small, white to pale buff, stipe whitish with yellow tints, glandular dots pale yellowish to pale orange, spores -8.2 × 4 µm, associated with *Pinus lambertiana*, hitherto only California **(**poorly known species)

***S. amaranthi* (THIERS) KRETZER & T. D. BRUNS**

110** pileus only with a sparse tomentum over a dark sordid brown ground; – context brown-white to pale brown, pores large, dark brown, stipe short, pale brown to brown with brown to black glandular dots, spores -10 × 4 µm, associated with *Pinus monticola*, hitherto only California
Selected illustrations: TMLp.63, MY75:157-4(B/W)

***S. umbrinus* (TRAPPE & CASTELLANO) KLOFAC**

111 (26** lacking glandular dots, annulus and veil absent) see also 63
basidiomata with gastroid appearance, pileus -5 cm broad, buff to brown, fibrillose scaly in age, context buff to cream-yellow, pores greenish yellow to olive-yellow, stipe short, buff to brownish, coloured as pileus, spores -12 × 4.5 µm, associated with conifers (*Abies magnifica, Pinus murrayana*), hitherto California

***S. suilloides* (THIERS) KRETZER & T. D. BRUNS**

111* basidiomata without gastroid appearance 112
(see also species of the genus *Fistulinella*)

112 species with whitish pileus (at least young or on margin of pileus) 113
112* species never with whitish pileus 115

113 pileus slowly becoming pale yellow to dull cinnamon-buff, becoming areolate beneath the gluten in age; – pileus -8 cm broad, with sterile margin, pores small, soon yellow, stipe white, yellow above, glandular dots inconspicuous or absent, spores -11 × 4.4 µm, associated with *Pinus contorta*, western North America, ?China
Selected illustrations: see 78

***S. pallidiceps* A. H. SM. & THIERS**

113* only pileus margin in buttons faintly white-tomentose or pileus when young white 114

114 pores small; – pileus whitish to pale yellow at first, dingy yellow in age, stipe young not obviously glandular dotted, pure white, almost chocolate brown to dark vinaceous brown, greyish brown slowly becoming pale tan to ochraceous, context white, yellow in age at least in apex of stipe, associated with *Pinus*, North America
Selected illustrations: see 101

***S. brevipes* var. *brevipes* (PECK) KUNTZE**

114* pores large; – pileus glabrous, slimy, white to ivory when young, later with yellow tint and increasingly spotted brown, bruised staining rust-brown, pores pale yellow, rust-yellow to brownish yellow, boletinoid, stipe white to yellowish, fine flocculent, brownish to brown stained in age, context white, above tubes yellowish, later everywhere, spores -10 × 3.5 µm, associated with introduced *Pinus radiata*, hitherto Africa, Mauritius
Selected illustrations: ÖZP17:71

***S. holomaculatus* KLOFAC & HAUSKN.**

115 (112*) basidiomata robust, tubes strongly decurrent; – pileus -10 cm broad, yellowish brown to brownish orange, also becoming dark brown or dark brown streaked, pores pale yellow, large, later greyish yellow to pale orange, stipe -5 cm broad, pale yellow, staining reddish to brownish when handled, only infrequently glandulose, associated with *Quercus, Arctostaphylos, Pinus ponderosa*, hitherto California.
Selected illustrations: see 91

***S. anomalus* T. J. BARONI, LARGENT & THIERS**

115* basidiomata not so robust but tubes also strongly decurrent; – pileus not more than 5.5 cm broad, tomentose, viscid when moist, pale yellow to pale yellow brown, context pale yellow, pores radially arranged, 1-2/mm, yellow, stipe brown to coloured as pileus, hollow in age, in mixed forests, described from China

***S. cavipoides* (Z. S. BI & G. Y. ZHENG) Q. B. WANG & Y. J. YAO**

115** tubes not strongly decurrent 116

116 pileus -10 cm, glabrous, buff, tan, pale brown to pinkish cinnamon, streaked, pores 1-2 mm wide, tan to yellow, stipe white to yellow, glandular dots absent or inconspicuous, associated with *Pinus ponderosa*, western USA
Selected illustrations: see 88

***S. occidentalis* THIERS**

116* pileus viscid to glutinous, bright yellow to orange-yellow, older with brownish or whitish tints, pores whitish to buff or pale yellow, darkening at maturity, context whitish, stipe viscid to glutinous when fresh, yellow, the gluten having an acidic taste and staining fingers yellow, basal mycelium white, sheathing the base volvalike, in conifer (*Pinus*) or mixed wood, hitherto USA
Selected illustrations: BRB 289b., CB: frontispiece 1, MiM389l., SD31a., SWS67

Boletus curtisii BERK.

(Suspected affiliation to *Aureoboletus*, SHERNOFF 2009-2010, should be confirmed by molecular biology)

116** tubes somewhat decurrent, context white and pileus fibrillose or velvety 117

117 pileus -7 cm broad, light brown, brown to cinnamon-brown in age, darker fibrillose streaked, context white, tubes when old decurrent, pores radially arranged, bright to dark yellow, stipe ventricose to bulbous at base and abruptly pinched below, only in age in the apical region with glandular dots and also reticulate, yellow becoming brown toward base, associated with *Pinus contorta*, western USA

***S. monticola* THIERS**

117* pileus densely tomentose to velvety, chestnut brown, context white, tubes yellowish, pore pinkish brown to buff, radially arranged, stipe (paler) as pileus, $FeSO_4$ not olive on context, in deciduous woods, North America
Selected illustrations: BRB334a.l., Mycol99(2):fig.1-4(B/W), Roo309, SD25a., *!

Bothia castanella (PECK) HALLING, T. J. BARONI & MANFR. BINDER

117** context only in some parts of basidiomata or stages white, often in pileus in some stage pale pink, pale carmin or pale red orange 118

118 pores rather small 119

118* pores rather large 120

119 pileus pale red to carmine with paler margin, context pale carmine, in stipe white, taste acid, tubes yellow, pores bright yellow, stipe paler as pileus, spores -12 × 5.4 µm, associated with *Pinus,* China

***S. rubricontextus* M. R. DING & H. A. WEN**

119* pileus ochre-yellow to pale brown, fine-scaled, tubes decurrent, green yellow then brown such as the pores, context in age pale pink, KOH on pileus cuticle and context chestnut, spores -14(-15.5) × 5 (-6) µm, also some microscopic differences to the somehow similar *S. variegatus,* dry heathland associated with *Pinus* and *Betula*, hitherto northern Europe (poorly known species)

***S. lapponicus* HARMAJA**

120 pileus orange cinnamon to ochre brown, often with a red tone, context pale red orange, tubes decurrent, pores radially arranged, large, dark yellow-brown, stipe coloured as pileus or paler with brown dots, spores -9 × 4 µm, in forest of *Keteeeria* and *Pinus*, hitherto China
Selected illustrations: see 104*

***S. pinetorum* (W. F. CHIU) H. ENGEL & KLOFAC**

120* pileus with other colours 121

121 pileus pale yellow, brownish yellow, reddish orange, yellow grey, olive grey, olive brown, stipe coloured as pileus, basal mycelium grey white to pale pink incarnate, context dirty white, yellow olivaceous, in stipe also ochre-orange, golden brown or reddish brown, associated with different *Pinus*, especially *P. sylvestris*, Europe, Africa, Asia, Australia, in North America with *P. sylvestris* introduced and there rare.
Selected illustrations: AM65, BC143, BL49, Br909, BRB333a., CD1648, CeI: 482 [= BTR33(1-2): p.14], CPS355, Ct299, Dh34, DPi29g-l,30, En: 40,41,T6/7, ER61a.(= Rou37), GII38, Ga23: 4, GG225a., Gh495a., Gli: 55, GS: 81, GS3:81a.,

HAB68, IH:I-37/216, IOH309, Ki34b., Kib61, KM418, Kr2: 310, Kz: t.75/1-6, L3?,LII:19, La21a., LEC16, Lx65/1, Md228, MHI148 = HKI148, MJ8a., M/M96:11, MT32, Mu29, PA806, Ph215, PU22, RF198,199, RH214b., RIV45(1): 20a., Ro119B, RT194l., SCI13, Si5/pl.VIII: 11-16, IX: 1-5 (= Kb28 p. p.), SM1: 99, SMJ91, SPTIII/45, TINT4/2006: 83, Ve132a., WE129a., Wi7.9, Zu71, *

***S. bovinus* (L.:FR.) ROUSSEL°**

121* pileus violaceous purple, brown ochre-stained, tubes yellow, pores large, grey-brown to olive- rust, stipe pink violet or coloured as pileus, in submontane mountain forests, Europe
Selected illustrations: La21b.r., L/E2C, Kz: 36/8-11, RF200

***S. bovinus* var. *mitis* (MOUGEOT) BENES** comb. inv.

121** pileus -3 cm broad, ochraceous, context cream coloured, becoming brown, tubes (brown-) pinkish, decurrent, stipe coloured as pileus, without conifers?, Africa (poorly known species)

***Boletus congoensis* (BEELI) HEINEM.**

8. Comments to some taxa of the genus *Suillus*

Suillus granulatus (L.:FR.)ROUSSEL

The so-called "granulatus problem" arises from the fact that worldwide all collections named "granulatus" have little microscopic differences but macroscopically look different when compared with European illustrations. That there are indeed several species involved is sufficiently proven by molecular studies, even though a good part of the available sequences are based on identification errors (KRETZER & al. 1996, BINDER & HIBBETT 2006, BRUNS & al. 2010). Sequences of American material show no proximity to European material. The typical mycorrhizal associations of the European taxa are not confirmed in the field, especially in countries where species of this aggregate were introduced and later switched over to other mycorrhizal partners.

Also *Boletus albidipes* PECK (1912) is involved in this discussion. PALM & STEWART (1984 a, b) mention that they examined European material of *S. granulatus* and declared *Suillus albidipes* ss. PECK to be conspecific; however, without specification of microscopical details of PECKs typus and without mentioning to have compared their collections with material of so-called American "granulatus". Thus this might be a misinterpretation.

Most North American mycologists named some of their collections "*lactifluus* and thought later that they would be identical to the European "*granulatus*" (KUO 2004; BOTH, pers. comm.) but the microscopical data do not match or are not uniform; molecular investigation of these collections are missing. The so-called American "granulatus" materials are another species, clearly different from the European species as is also confirmed by the above mentioned molecular studies.

The species of PECK (1912), macroscopically undoubtedly different from *S. granulatus* ss. orig., could be used as one of the American "granulatus" named species.

For comparison the original description of *Boletus albidipes* PECK (1912) ss. orig.:

"Boletus albidipes Pk., Bull. New York State Mus. 157: 58 (1912) [1911]

Boletus granulatus albidipes Pk. N. Y. State Mus. Rep't 54, p. 168

WHITE STIPE BOLETUS Plate 130, figures 1-5

Pileus fleshy, convex becoming broadly convex or nearly plane, viscid or glutinous, yellowishwhite when young becoming pale ochraceous with age and then ob-

scurely spotted by the drying gluten, context white, tubes plane, adnate, whitish in the young plant, becoming yellow and finally brownish ochraceous, the edges of the dissepiments naked or rarely with few glandular dots; stipe short, equal, solid, white, with few or no glandular dots at the top; spores 8-10 x 3-4 µ. Pileus 5-8 cm broad; stipe 2.5-5 cm long, 8-12 mm thick. The white stipe boletus is related to the granular boletus, Boletus granulatus L. It may be separated from that species by its paler cap, white context and few or no glandular dots at the top of the stipe and on the edge of the dissepiments of the tubes. Gregarious. Under or near white pine trees. The cap is 2-4 inches broad; stipe 1-2 inches long, 4-6 lines thick. This is an excellent edible species and may be sought in September in pine groves or under or near white pine trees, specially in rocky places."

The American species with veil (*S. albidipes* in the sense of SINGER 1945 a, SMITH & THIERS 1964, 1968, 1971) has the new name *S. neoalbidipes*.

For comparison the original description of *Boletus granulatus* ss. PECK 1880, including all possible variations in:

The *Boleti* of the United States "*Boletus granulatus* L. GRANULATED BOLETUS

Hym. Eur. p. 498. Syl.Fung. Vol. VI, p. 5. *Boletus circinans* Syn. Fung. Car. 858. *B. collinitus* Rep. 23, p. 129

Pileus convex or nearly plane, very viscid or glutinous and ferruginous-brown when moist, yellowish when dry, flesh pale-yellowish; tubes short, adnate, yellowish, their mouths simple, granulated; stipe dotted with glandules above, pale-yellowish; spores "spindle-shaped, yellowish orange, .0003 to .0004 in.(=7,5-10µm) long, .0008 to .00012(should be 2-3µm) broad." Pileus 1.5 to 4 in. broad; stipe 1 to 2 in. long, 4 to 6 lines thick. Woods, especially of pine and in open places under or near pine trees. Very common. North Carolina, Schweinitz, Curtis. Pennsylvania, Schweinitz. New York, Peck. New England, Frost. New Jersey, Ellzs. Rhode Island, Bennett. The plant is generally gregarious and sometimes grows in circles whence the name B. circinans Pers. Occasionally it is caespitose. The pileus is very variable in color; pinkish-grey, reddish-brown, yellowish-grey, tawny-ferruginous or brownish; and is sometimes obscurely spotted by the drying gluten. The flesh is rather thick and often almost white except near the tubes where it is tinged with yellow. The tubes are small, at first almost white or very pale-yellow, but they become dingy-ochraceous with age. The stipe is generally short, stout and firm, whitish, pallid or yellowish, and often dotted to the base, though the glandules are more numerous and distinct on the upper part. I have quoted the spore characters as given in Sylloge and Stevenson's British Fungi, but in the American plant they appear ochraceo-ferruginous,* are .0003 to .00035 in.(=7,6-8,9µm) long, and about .00016 (=4µm)broad. This species and *B. Boudieri* appear to be the only European species with exannulate glandular- dotted stipes. If I have correctly estimated the characters of our plants we have **six** such species. It is true they are closely related to each other and may possibly be regarded by some as mere varieties of a single extremely variable species, but to me, the characters that separate them, appear to be constant and decisive. Most authors, including FRIES, PERSOON, CORDIER, STEVENSON and CURTIS pronounce this species edible. GILLET remarks that it should be regarded with suspicion. I have not tested it."

Another American"granulatus" could be *S. granulatus* subsp. *snellii* SINGER (1945 c) being dark reddish brown from young stages on, then bleaching.

Especially in North America confusion with rare species (*S. glandulosipes*, *S. neoalbidipes* or *S. albivelatus* - older without velum, *S. pallidiceps*, *S. subalpinus*, *S. brunnescens*, *S. flavogranulatus, S. chiapasensis, S. quiescens*) cannot be excluded.

Suillus subacerbus from New Zealand, associated with planted *Pinus radiata* and other native North American *Pinus* spp. has caused the presumption that this is a North American species and has been misidentified as *S. granulatus*.

Suillus granulatus ss. GRGURINOVIC (1997) from Australia with pinkish tomentum and vinaceous colour at base of the slightly hollow stipe is only one of numerous misidentifications for this species worldwide. In Asia, e.g., collections with blueing basidiomata are misidentified.

The impossibility to solve the problem morphologically can be seen when studying SMITH & THIERS (1966), SNELL & DICK (1961). In the present key all similar species descriptions are included, without prejudice to a final taxonomical result. Sorting out the taxonomy of this aggregate needs further morphological and molecular investigations from well documented material (e.g. with macroscopic descriptions, photographs, macrochemical reactions) from different geographic regions.

Boletus inflexus PECK**,** Bull. Torrey Bot. Cl. 22: 207, 1895
≡ *Suillus inflexus* (PECK) KUNTZE, Rev. Gen. Pl. 3: 535, 1898
SINGER (1947) regarded it as a synonym of *B. curtisii*, SMITH & THIERS (1971) stated in their type study : "it may belong in Section *Pseudoleccinum* of *Boletus*". The description reads like a *Suillus.*

Suillus serotinus versus ***Suillus viscidus* var. *brunneus***
There are no differences in macroscopical and microscopical regards. However, the fact that synonymy of the two taxa is as yet not confirmed by molecular biology is not surprising bearing in mind that before 1997, when the European variety was published (CAZZOLI & CONSIGLIO 1997), all collections were determined (and thus misidentified) as *Suillus bresadolae* or *Suillus viscidus* (*S. laricinus, S. aeruginascens*). Sequencing results (KRETZER & al. 1996) support this suspicion. Concluding from illustrations in modern publications, e.g. see selected illustrations under *S. serotinus* with !, this species is still misinterpreted as *S. viscidus*. HALLING (1983) selected a lectotype for *Suillus serotinus.*

Boletus larignus BRITZ. 1891, which could be a possible synonym of *Suillus viscidus* var. *brunneus* (see also SINGER 1965, who supposed a synonymy to *Suillus bresadolae*), is cited in INDEX FUNGORUM (2013): "SPECIES FUNGORUM (2013) current name: *Boletopsis larigna* (BRITZELM.) SINGER 1922". This is incorrect, because SINGER (1922) followed HENNINGS (1897-1898) and cites BECK´S system, who named nearly all *Suilli* as *Boletopsis*. All "*Boletopsis*"-called species in SPECIES FUNGORUM created by HENNINGS (1897-1898), SINGER (1922) and BECK (1923) are inexistent in *Boletopsis* and members of the genus *Suillus*.

ARMADA (2009) suggested *Ixocomus viscidus* f. *obscurus* KÜHNER as the earliest appropriate name for *Suillus viscidus* var. *brunneus* CAZZOLI & CONSIGLIO (1997).

Suillus brevipes versus ***Suillus weaverae***
The apparent proximity of the two species based on molecular biology (BRUNS & al. 2010, KRETZER & al. 1996) is not comprehensible, when comparing macroscopic features:

Suillus brevipes	*Suillus weaverae*
glandular dots weakly developed	glandular dots strongly developed
pores small	pores large
veil absent and no roll of cottony material present	veil fibrillose to cottony sheating lower part of stipe

(BRUNS & al. 2010) conclude that several collections of *S .brevipes* from eastern North America and collections from western NA belong to different taxa (compare also var. *subgracilis*).

Suillus americanus versus ***Suillus sibiricus***
There are only insignificant differences in macroscopical and microscopical regards. Worldwide both species are often synonymized, e. g. ARORA (1986), TRUDELL & AMMIRATI (2011). The apparent proximity of the two species is confirmed by molecular biology (KRETZER & al. 1996, WU & al. 2000, JAROSCH 2001).The synonymy of Central African material, with shorter and smaller spores is doubtful (HEINEMANN & RAMMELOO 1989), whereas an East African collection (PEGLER 1977) agrees well. In North America *S. americanus* was often misidentified as *S. flavidus* (e.g. PECK 1872), so PALM & STEWART (1986) designated a lectotype. The taxonomical status of the North American "*S. sibiricus*" has to be clarified by further studies.

***Suillus pictus* (*Suillus spraguei*)**
There are different opinions regarding the correct name of this taxon. Further, the name is used for one or even several disjunct species in Asia (WU & al. 2000, BURCHHARDT & al. 2011).

9. Excluded and critical species

a) Species named *Suillus* but not belonging to this genus

Suillus albus HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 = *Boletus albus* GILLET, Revue mycol., Toulouse 3: 5, 1881, nom. illeg. = *Boletus gilletii* SACC. & CUB., Syll. fung. (Abellini) 6: 46, 1888 =***Leccinum holopus*** (ROSTK.) WATLING, Trans. Bot. Soc. Edinb. 43: 692, 1960, Eu, ?NA

Suillus ampliporus (PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletinus cavipes*** (KLOTZSCH: FR.) KALCHBR. sec. REDEUILH, Doc. Mycol. 18(72): 39, see also KLOFAC & KRISAI-GREILHUBER (1994), Eu, NA, As ,

Suillus armeniacus (QUÉL.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Xerocomus armeniacus*** (QUÉL.) QUÉL., Fl. mycol. France (Paris): 419, 1888, Eu

Suillus atroviolaceus HÖHN., Sitzungsber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. I, 123: 87, 1914 = *Boletus atroviolaceus* (HÖHN.) W. F. CHIU, Mycologia, 40: 203, 1948 = ***Gyroporus atroviolaceus*** (HÖHN.) E.-J. GILBERT, Les Livres du Mycologue Tome I-IV, Tom. III: Les Bolets: 102, 1931. As

Suillus auriporus (PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Aureoboletus auriporus*** (PECK) POUZAR, Česká Mykol. 11: 49, 1957, NA

Suillus badius (FR.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletus badius*** (FR.) FR., Syst. mycol., Index alphab. (Lundae): 56, 1832, Eu, NA, As

Suillus bicolor (PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletus bicolor*** PECK, Ann. Rep. New York State Mus. 24: 78, 1872 [1871], nom. illeg., NA

Suillus castanellus (PECK) A. H. SM. & THIERS, Monogr. North Amer. Species Suillus: 26, 1964 = ***Bothia castanella*** (PECK) HALLING, T. J. BARONI & MANFR. BINDER, Mycologia 99(2): 311, 2007, NA

Suillus castaneus (BULL.) P. KARST., Bidr. Känn. Finl. Nat. Folk 37: 1, 1882 = ***Gyroporus castaneus*** (BULL.) QUÉL., Enchir. fung. (Paris): 161, 1886, Eu, NA

Suillus changensis ROSTR., Bot. Tidsskr. 24: 207, 1902 = *Boletus changensis* (ROSTR.) SACC. & D. SACC., Syll. fung. (Abellini) 17: 97, 1905 = ***Xerocomus*** sec. CORNER, As

Suillus cyanescens (BULL.) P. KARST., Bidr. Känn. Finl. Nat. Folk 37: 1, 1882 = *Boletus cyanescens* BULL., Herb. Fr. 8: tab. 369, 1788 = ***Gyroporus cyanescens*** (BULL.) QUÉL., Enchir. fung. (Paris): 161, 1886, Eu, NA, As

Suillus fragrans (VITTAD.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletus fragrans*** VITTAD., Descr. fung. mang. Italia: 153, 1835, Eu

Suillus fruticicola (BERK.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Heimioporus fruticicola*** (BERK.) E. HORAK, Sydowia 56(2): 240, 2004, Aus

Suillus fulvidus (FR.) HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 [1900] = ***Gyroporus castaneus*** (BULL.) QUÉL., Enchir. fung. (Paris): 161, 1886, Eu, NA

Suillus griseus (FROST) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Retiboletus griseus*** (FROST) MANFR. BINDER & BRESINSKY, Feddes Repert. 113(1-2): 37, 2002, NA, As

Suillus jamaicensis (MURRILL) SACC. & TROTTER, Syll. fung. (Abellini) 21: 252, 1912 = ***Fistulinella jamaicensis*** (MURRILL) SINGER, in SINGER, ARAUJO & IVORY, Beih. Nova Hedwigia 77: 142, 1983, MA

Suillus lacunosus KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Austroboletus lacunosus*** (KUNTZE) T. W. MAY & A. E.WOOD, Mycotaxon 54: 149, 1995, Aus

Suillus maxonii (MURRILL) SACC. & TROTTER, [as *'maxoni'*] Revis. gen. pl. (Leipzig) 3: 535, 1898 = *Ceriomyces maxonii* MURRILL [as *'maxoni'*], Mycologia 1(5): 219, 1909 = ***Phellinus punctatus*** (P. KARST.) PILÁT, Atlas des Champignons de l'Europe III: *Polyporaceae*: 530, 1942, Eu, NA, SA, As, Aus, NS

Suillus napipes (F. MUELL.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletus napipes*** F. MUELL., J. Linn. Soc., Bot. 13: 161, 1872, Aus

Suillus ornatipes **(**PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Retiboletus ornatipes*** (PECK) MANFR. BINDER & BRESINSKY, Feddes Repert. 113(1-2): 37, 2002, NA, As

Suillus pallidus (FROST) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 =***Boletus pallidus*** FROST, Bull. Buffalo Soc. nat. Sci. 2: 105, 1874, NA, ?As

Suillus piperatus (BULL.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Chalciporus piperatus*** (BULL.) BATAILLE, Bull. Soc. Hist. nat. Doubs 15: 39, 1908, SA, As, Aus, NS

Suillus piperatus var**.** ***amarellus*** (QUÉL.) SINGER, Farlowia 2(1): 46, 1945 = ***Chalciporus amarellus*** (QUÉL.) BATAILLE, Bull. Soc. Hist. nat. Doubs 15: 39, 1908, Eu

Suillus prunicolor (COOKE & MASSEE) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 =***Fistulinella prunicolor*** (COOKE & MASSEE) WATLING, in WATLING & GREGORY, Proc. Roy. Soc. Queensland 100: 17, 1989, Aus

Suillus queletii (SCHULZER) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Boletus queletii*** SCHULZER, Hedwigia 24(4): 143, 1885, Eu, As, ?NA

Suillus regius **(**KROMBH.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Boletus regius*** KROMBH, Naturgetr. Abbild. Beschr. Schwämme (Prague) **2**: 3, 1832, Eu

Suillus reticulatus (SCHAEFF.) POIRET & KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = ***Boletus reticulatus*** SCHAEFF., Fung. Bavar. Palat. **2**: tab. 108, 1763, Eu, ?NA

Suillus retipes (BERK. & M. A. CURTIS) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, (1898) **=** ***Retiboletus retipes*** (BERK. & M. A. CURTIS) MANFR. BINDER & BRESINSKY, Feddes Repert. **113**(1-2): 37, 2002, NA, ?As

Suillus rubellus (KROMBH.) HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 [1900] = ***Xerocomus rubellus*** (KROMBH.) QUÉL**.**, Compt. Rend. Assoc. Franç. Avancem. Sci. 24(2): 620, 1896 [1895], Eu, ?NA, ?As

Suillus rubinellus (PECK) SINGER, Farlowia 2: 47, 1945 = ***Chalciporus rubinellus*** (PECK) SINGER, Persoonia 7(2): 319, 1973, NA

Suillus rubinus (W. G. SM.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Chalciporus rubinus*** (W. G. SM.) SINGER, Persoonia 7(2): 319, 1973, Eu

Suillus satanas (LENZ) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 =***Boletus satanas*** LENZ, Schwämme Mitteldeutschl.: 67, 1831, Eu

Suillus spadiceus (FR.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Xerocomus ferrugineus*** (SCHAEFFER) BON, Doc. Mycol. 14(56): 16, 1985, Eu

Suillus sphaerosporus (PECK) A. H. SM. & THIERS, Monogr. North Amer. Species *Suillus*: 22, 1964 = ***Paragyrodon sphaerosporus*** (PECK) SINGER, Ann. mycol. 40(1/2): 25, 1942, NA

Suillus subalbellus (MURRILL) SACC. & TROTTER, Syll. fung. (Abellini) 21: 252, 1912 = ***Gyroporus subalbellus*** MURRILL, N. Amer. Fl. (New York) 9(3): 134, 1910, NA

Suillus subglabripes (PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Boletus subglabripes*** PECK, Bull. New York State Mus. Nat. Hist. 2: 112, 1897, NA

Suillus subvelutipes (PECK) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = ***Boletus subvelutipes*** PECK, Bull. New York State Mus. 8: 142, 1889, NA, As

Suillus thibethanus (PAT.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = *Boletus thibetanus* PAT., Bull. Soc. Mycol. France 11: 196, 1895 = ***Aureoboletus thibetanus*** (PAT.) HONGO & NAGAS., Rep. Tottori Mycol. Inst. 18: 133, 1980, As

Suillus velatus ROSTR., Bot. Tidsskr. 24: 207, 1902 = *Boletus velatus* (ROSTR.) SACC. & D. SACC., Syll. fung. (Abellini) 17: 97, 1905, comb. ill. non *Boletus velatus* PERSOON 1825 = ***Tylopilus velatus*** (ROSTR.) F. L. TAI, Syll. fung. Sinicorum: 758, 1979, comb. inval., As

Note: Not all combinations of KUNTZE (1898) are included here (he transferred nearly all *Boletus* species known up to 1898 to *Suillus*).

b) Critical species

Suillus abietinus (LJ. N. VASSILJEVA) LJ. N. VASSILJEVA, Agarikowie sljapotsjnie gribi (por. *Agaricales*) primorskogo kraja [Die Blätterpilze und Röhrlinge (*Agaricales*) von Primorsky Region] (Leningrad): 272, 1973, comb. ill. non PANT. & WATL. 1970, = *Ixocomus abietinus* LJ. N. VASSILJEVA, Notul. syst. Sect. cryptog. Inst. bot. Acad. Sci. USSR 12: 263, 1959, Eu

Suillus alliciens (BERK.) KUNTZE, 3(2): 534, 1898 = *Boletus alliciens* BERK., London J. Bot. 4: 50, 1845, Aus, spec. dub.

Suillus arenarius (FR.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 534, 1898 = *Boletus arenarius* FR., Fungi in 'Plantae Preissianae ed. Chr. Lehmann' II: 134, 1846, Aus

Boletus aureus var. *mutabilis* ST.-AMANS, Fl. agen.: 553, 1821, Eu, spec. dub.

Suillus australis (COOKE & MASSEE) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = *Boletus australis* COOKE & MASSEE, Grevillea 16:32, 1887 = *Boletellus*?, Aus

Ixocomus australiuralensis VASSILKOV, Notul. syst. Sect. cryptog. Inst. bot. Acad. Sci. USSR10: 210, 1955, Eu, spec. dub.

Suillus brunneus (COOKE & MASSEE) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 =*Boletus brunneus* COOKE & MASSEE, Grevillea 19(no. 92): 90, 1891, Aus, NS, non ss. CLEL., auct. (= *Boletus carramarus* GRGURINOVIC 1997)

Suillus caesareus (FR.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = *Boletus caesareus* FR., Fungi in 'Plantae Preissianae ed. Chr. Lehmann' II : 134, 1846, Aus

Suillus californicus (MURRILL) THIERS, California Mushrooms: 186, 1975 = *Rostkovites californicus* MURRILL, Mycologia 7: 44, 1915 = *Boletus californicus* (MURRILL) MURRILL, Mycologia 7: 215, 1915 = *Gyrodon californicus* (MURRILL) SNELL, Mycologia 33: 422, 1941, comb. inv., NA, spec. dub.

Suillus cantharelloides (JACOBASCH) SACC. & P. SYD., Syll. fung. (Abellini) 16: 146, 1902 = spec. dub. ? deformation of *Cantharellus cibarius*

Suillus furfuraceus (BERK.) E. HORAK, Sydowia 33: 96, 1980 = *Boletus furfuraceus* BERK., HOOKER's Journal of Botany and Kew Garden Miscellany 4: 137, 1852, As (Bangladesch), spec. dub.

Suillus haedinus (BERK. & BROOME) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = *Boletus haedinus* BERK. & BROOME, Trans. Linn. Soc. London, Bot., Ser. 2 2(3): 57, 1883 = *Suillus*

haedinus (BERK. & BROOME) HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 [1900], comb. superfl., Aus

Suillus hygrophanus ROSTR., Bot. Tidsskr. 24: 207, 1902 = *Boletus hygrophanus* (ROSTR.) SACC. & D. SACC., Syll. fung. (Abellini) 17: 97, 1905, As, spec. dub.

Suillus infractus (FR.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = *Boletus infractus* FR., Fungi in 'Plantae Preissianae ed. Chr. Lehmann' II : 134, 1846, Aus

Suillus lithocarpi-sequoiae SINGER, Mycologia 51(4): 589, 1960 [1959] = *Pulveroboletus lithocarpi-sequoiae* (SINGER) SINGER, Agaric. in Mod. Taxon.: 734, 1962, comb. inval., = ? *S. ponderosus* A. H. SM. & THIERS, NA, typus lost

Suillus megalosporus (BERK.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 535, 1898 = *Boletus megalosporus* BERK. Bot. Antarct. Voy., III, Fl. Tasman. 2: 251, 1859 [1860] = ? *Tylopilus*, spec. dub., Aus

Suillus pinguis THORE, 1803 = *Boletus esculentus* var. *pinguis* (THORE) PERS., Mycol. eur. (Erlanga) 2: 131, 1825, Eu, spec. dub.

Suillus pusillus HENN., in Engler & Prantl, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 = *Boletus pusillus* BERK., Hooker's J. Bot. Kew Gard. Misc. 6: 135, 1854, nom. illeg., non SCHRADER 1794, India, spec. dub.

Suillus pusio (J. HOWSE) HENN., in ENGLER & PRANTL, Nat. Pflanzenfam., Teil. I (Leipzig) 1**: 190, 1898 [1900] =*Boletus pusio* J. HOWSE, Ann. Mag. nat. Hist., Ser. 5/3: 209, 1879, Eu, spec. dub.

Suillus thozetii (BERK.) KUNTZE, Revis. gen. pl. (Leipzig) 3(2): 536, 1898 = *Boletus thozetii* BERK., Austr. Fung. n. 254, 1881, Aus

10. Species and synonymy index (without excluded and critical species)

	Current name (in bold)
Boletellus viscidipes (HONGO) HAR. TAKAH. 1993	***S. viscidipes***
Boletinus appendiculatus PECK 1896	***S. appendiculatus***
Boletinus berkeleyi MURRILL 1909, nom. illeg.	***S. decipiens***
Boletinus cavipoides C. S. BI & G.Y. ZHENG 1982	***S. cavipoides***
Boletinus decipiens PECK 1889	***S. decipiens***
Boletinus flavoluteus SNELL 1941	***S. flavoluteus***
Boletinus floridanus MURRILL 1944 [1943]	***S. decipiens?***
Boletinus glandulosus PECK 1909[1907]	***S. glandulosus***
Boletinus grevillei (KLOTZSCH) POMERL. 1980	***S. grevillei* var. *grevillei***
Boletinus grevillei var. *clintonianus* (PECK) POMERLEAU 1980, comb. inv.	***S. clintonianus***
Boletinus grisellus PECK 1900	***S. grisellus***
Boletinus kunmingensis W. F. CHIU 1948	***S. kunmingensis***
Boletinus lakei (MURRILL) SINGER 1945	***S. lakei* var. *lakei***
Boletinus lakei subsp. *landkammeri* (PILÁT & SVRČEK) PILÁT & DERMEK 1974	***S. lakei* var. *landkammeri***
Boletinus landkammeri (PILÁT & SVRČEK) BON 1986	***S. lakei* var. *landkammeri***
***Boletinus lignicola* M. Zang 1980**	***Boletinus lignicola***
Boletinus mitis (MOUG.) v. HÖHNEL 1905	***S. bovinus* var. *mitis***
***Boletinus ochraceoroseus* Snell 1941**	***Boletinus ochraceoroseus***
Boletinus oxydabilis f. *aberrans* SINGER 1938	***S. pictus* ss. auct. asiat.?**
Boletinus pictus Peck 1889	***S. pictus***
Boletinus pinetorum (W. F. CHIU) TENG 1962	***S. pinetorum***
Boletinus punctatipes SNELL & E. A. DICK 1941	***S. punctatipes***
Boletinus punctatipes var. *pinetorum* W. F. CHIU 1948	***S. pinetorum***
Boletinus solidipes PECK 1913	***S. solidipes***

Boletinus spectabilis (PECK) MURRILL 1909	***S. spectabilis***
Boletinus subspectabilis VASSILKOV 1952	***S. viscidus* var. *viscidus***
Boletinus tridentinus (BRES.) BIG. & GUILLEM. 1913	***S. tridentinus***
Boletopsis bresadolae (QUÉL.) HENN. 1898 [1900]	***S. bresadolae* f. *bresadolae***
Boletopsis elegans (SCHUMACH.) HENN. 1898 [1900], comb. ill.	***S. grevillei* var. *grevillei***
Boletopsis flava (WITH.) HENN. 1898 [1900]	***S. grevillei* var. *grevillei***
Boletopsis flavidus (FR.) HENN. 1898	***S. flavidus***
Boletopsis fulvescens (SMOTL.) SMOTL. 1912	***S. tridentinus***
Boletopsis larigna (BRITZELM.) SINGER 1922	***S. serotinus?***
Boletopsis lutea (L.) HENN. 1898)	***S. luteus* f. *luteus***
Boletopsis pulchella (FR.) HENN. 1898	***S. flavidus***
Boletopsis serotina (FROST) HENN. 1898	***S. serotinus***
Boletopsis sordida (SCHWALB) G. BECK 1923, comb. ill.	***S. viscidus* var. *viscidus***
Boletopsis tridentina (BRES.) HENN. 1898 [1900]	***S. tridentinus***
Boletopsis viscida (L.) HENN. 1898	***S. viscidus* var. *viscidus***
Boletus acidus PECK 1905	***S. acidus* var. *acidus***
Boletus acidus PECK 1905	***S. acidus* var.*acidus***
Boletus aeruginascens SECR. 1833, nom. inval.	***S. viscidus* var. *viscidus***
Boletus albidipes PECK 1912 [1911]	***S. albidipes***
Boletus albus LAMBOTTE 1880, nom. illeg.	***S. placidus* f. *placidus***
Boletus albus PECK 1872 [1870], nom. illeg.	***S. placidus* f. *placidus***
Boletus amabilis PECK 1900 p. p.	***S. lakei* var. *landkammeri***
Boletus americanus PECK 1887	***S. americanus* f. *americanus***
Boletus americanus var. *reticulipes* COKER & BEERS 1943, nom. inval.	***S. americanus* var. *reticulipes***
Boletus amoenus THÜMEN 1878	***S. placidus* f. *placidus***
Boletus annularius BOLTON 1792 [1791]	***S. grevillei* var. *grevillei***
Boletus annularius BULL. 1786, nom. illeg.	***S. luteus* f. *luteus***
Boletus annulatus PERS. 1801, nom. illeg.	***S. luteus* f. *luteus***
Boletus annulatus PERS. ex KROMBH. 1821, nom. illeg.	***S. luteus* f. *luteus***
Boletus annulatus VAHL 1774, nom. illeg. non SCHAEFFER 1774	***S. luteus* f. *luteus***
Boletus aurantiacus JACOBASCH 1904, nom. illeg.	***S. tridentinus***
Boletus aurantiporus J. HOWSE 1883	***S. tridentinus***
Boletus aureus SCHAEFF. 1774	***S. variegatus* f. *variegatus?***
Boletus auricomus CHEVALLIER 1837	***S. variegatus* f. *variegatus***
Boletus bellinii INZENGA 1869	***S. bellinii* f. *bellinii***
Boletus boudieri QUÉL. 1879	***S. bellinii* f. *bellinii***
Boletus bovinoides J. BLUM 1969	***S. bovinoides***
Boletus bovinus L. 1753	***S. bovinus* var. *bovinus***
Boletus bovinus PERS. 1825	***S. bovinus* var. *bovinus***
Boletus bovinus var. *congoensis* BEELI 1926	***Boletus congoensis***
***Boletus bovinus* var. *luteoporus* Beneš 1942, nom. inval.**	***Boletus bovinus* var. *luteoporus***
Boletus bovinus var. *mitis* (MOUG.) QUEL. 1875	***S. bovinus* var. *mitis***
Boletus bovinus var. *moravicus* BENEŠ 1942, nom. inval.	***S. bovinus* var. *viridocaerulescens***
Boletus bovinus var. *viridocaerulescens* A. PEARSON 1951 [1950]	***S. bovinus* var. *viridocaerulescens***
Boletus bresadolae QUÉL. 1881	***S. bresadolae* f. *bresadolae***

Boletus brevipes PECK 1885	***S. brevipes* var. *brevipes***
Boletus britzelmayrii SACC. & TROTTER 1912	***S. viscidus* var. *viscidus***
Boletus campanulatus BLUM 1969, comb. inv.	***S. granulatus* var. *campanulatus***
Boletus cembrae STUDER 1896	***S. plorans* var. *cembrae***
Boletus circinans PERS. ex. CHEV. 1822	***S. granulatus* f. *granulatus***
Boletus clintonianus PECK 1872 [1870]	***S. clintonianus***
Boletus collarius PERS. 1825	***S. viscidus* var. *viscidus***
Boletus collinitus FR. ss. BRESADOLA 1931	***S. plorans* var.*plorans***
Boletus collinitus FR.1838 [1836-1838]	***S. collinitus* var. *collinitus***
***Boletus congoensis* (BEELI) HEINEM. 1951**	***Boletus congoensis***
Boletus coniferarum LEBEDEVA 1949	***S. plorans* subsp. *cyanescens***
Boletus conspersus VELEN. 1922	***S. variegatus* f. *variegatus***
Boletus cortinatus PERS. 1801	***S. grevillei* var. *grevillei***
Boletus decipiens BERK. & M. A. CURTIS 1853, nom. illeg.	***S. decipiens***
Boletus decurrens SCHUM. 1803	***S. grevillei* var. *grevillei?***
Boletus dubius ALLESCH. 1898, nom. illeg.	***S. serotinus?***
Boletus elbensis PECK 1872 [1870]	***S. viscidus* var. *viscidus***
Boletus elegans SCHUMACH. 1803, nom. illeg.	***S. grevillei* var. *grevillei***
Boletus elegans var. *flavus* (WITH.) REA 1922, comb. ill.	***S. grevillei* var. *grevillei***
Boletus elegans var. *pulchellus* (FR.) REA 1922	***S. flavidus***
Boletus eleutheros (ROLLAND) J. BLUM 1969, comb. inv.	***S. placidus* f. *placidus***
Boletus eleutheros (ROLLAND) J. BLUM 1969 ss. BLUM	***S. collinitus* var. *collinitus***
Boletus extractus BRITZ. 1893	***S. tridentinus***
Boletus flavidus FR. 1815	***S. flavidus***
Boletus flavorufus SCHAEFF. 1774	***S. granulatus* var. *flavorufus***
Boletus flavus WITH. 1801, nom. dub.	***S.* sp.**
Boletus flavus WITHERING ss. BRESADOLA, ss. auct. pp.	***S. nueschii***
Boletus fulvescens SMOTL. 1911	***S. tridentinus***
Boletus fuscopileus SECR. 1833, nom. inval.	***S. variegatus* f. *variegatus?***
Boletus fusipes HEUFL. 1865	***S. placidus* f. *fusipes***
Boletus granulatus L. 1753	***S. granulatus* f. *granulatus***
Boletus granulatus var. *albidipes* PECK 1902	***S. neoalbidipes***
Boletus granulatus var. *boudieri* (QUÉL.) J. BLUM 1965, comb. inv.	***S. bellinii* f. *bellinii***
Boletus granulatus var. *campanulatus* BLUM 1965	***S. granulatus* var. *campanulatus***
Boletus granulatus var. *capricollensis* BUCHS & HENN. 1903	***S. placidus* f. *placidus***
Boletus granulatus var. *flavorufus* (SCHAEFF.) J. BLUM 1965, comb. inv.	***S. granulatus* var. *flavorufus***
Boletus granulatus var. *lactifluus* (WITH.) J. BLUM 1965, comb. inv.	***S. granulatus* f. *granulatus***
Boletus granulatus var. *leptopus* (PERS.) J. BLUM 1965	***S. bellinii* f. *bellinii?***
Boletus granulatus var. *pictilis* (QUÉL.) J. BLUM 1965, comb. inv.	***S. placidus* f. *placidus***
Boletus granulatus var. *roseobasis* J. BLUM 1965, nom. inval.	***S. collinitus* var. *collinitus***
Boletus gregarius VAHL 1790	***S. bovinus* var. *bovinus***
Boletus grevillei KLOTZSCH 1832	***S. grevillei* var. *grevillei***
Boletus guttatus PERS. 1825	***S. variegatus* f. *variegatus***
Boletus hirtellus PECK 1889	***S. hirtellus* var.*hirtellus***

Boletus hirtellus var. *mutans* PECK 1941, nom. nud.?	***S. tomentosus* f. *tomentosus***
Boletus indecisus BRITZ. 1891, nom. ill.	***S. viscidus* var. *viscidus***
Boletus inquinans SCHRAD. 1794	***S. granulatus* f. *granulatus***
Boletus lactifluus SOWERBY 1809, nom. superfl.	***S. granulatus* f. *granulatus***
Boletus lactifluus WITH. 1796	***S. granulatus* f. *granulatus***
Boletus lambottei SACC. & CUB. 1888	***S. placidus* f. *placidus***
Boletus laricinus BERK. 1836	***S. viscidus* var. *viscidus***
Boletus larignus BRITZELM. 1891	***S. serotinus?***
Boletus lilaceus ROSTK. ss. LEBEDEVA	***S. jacuticus***
Boletus luteobadius BRITZ. 1893	***S. serotinus?***
Boletus luteus f. *pseudovolvatus* (LEUBA) J. BLUM 1969, comb. inv.	***S. luteus* f. *pseudovolvatus***
Boletus luteus f. *volvacea* BUCHS & ULBR. 1936	***S. luteus* f. *pseudovolvatus***
Boletus luteus L. 1753	***S. luteus f .luteus***
Boletus luteus var. *cothurnatus* (SINGER) MURRILL 1948	***S. cothurnatus***
Boletus luteus velifer SECR. 1833, nom. inval.	***S. variegatus* f. *variegatus?***
Boletus macrosporus ROSTK. 1844	***S. bovinus* var. *bovinus?***
Boletus mediterraneensis JACQUET. & J. BLUM 1969	***S. mediterraneensis* f. *mediterraneensis***
Boletus mitis MOUG. in PERS. 1825	***S. bovinus* var. *mitis***
Boletus murrayi BERK. & M. A. CURTIS 1872	***S. pictus***
Boletus oudemansii HARTSEN 1863	***S. placidus* f. *fusipes***
Boletus pictilis (QUÉL.) SACC. & TRAVERSO 1910	***S. placidus* f. *placidus***
Boletus pictus PECK 1872 [1870], nom. ill.	***S. pictus***
Boletus placidus BONORD. 1861	***S. placidus* f. *placidus***
Boletus placidus f. *pini-cembrae* KALLENBACH 1926-1942	***S. placidus* f. *fusipes***
Boletus placidus f. *pini-halepensis* KALLENBACH 1926-1942	***S. bellinii* f. *bellinii***
Boletus plorans ROLLAND 1889	***S. plorans* var.*plorans***
Boletus plorans var. *eleutheros* ROLLAND 1889	***S. placidus* f. *placidus***
Boletus pseudogranulatus MURRILL 1940	***S. pseudogranulatus***
Boletus pseudovolvatus LEUBA 1890	***S. luteus* f. *pseudovolvatus***
Boletus pulchellus FR. 1874	***S. flavidus***
Boletus punctipes PECK 1878 [1876]	***S. punctipes***
Boletus recedens BRITZELM. 1890	***S. bovinus* var. *bovinus***
Boletus roseoporus SMOTL. 1934	***S. roseoporus***
Boletus rubropunctatus RADDI 1806	***S. bellinii* f. *bellinii***
Boletus salmonicolor FROST 1874	***S. salmonicolor***
Boletus schoberi OUDEM. 1885	***S. granulatus* f. *granulatus***
Boletus serotinus FROST 1874	***S. serotinus***
Boletus serotinus FROST ss. MURRILL 1901	***S. clintonianus***
Boletus sibiricus (SINGER) A. H. SM. 1949	***S. americanus* f. *sibiricus***
Boletus sordidus SCHWALB 1891, nom. ill.	***S. viscidus* var. *viscidus***
Boletus spectabilis PECK 1872 [1870]	***S. spectabilis***
Boletus spraguei BERK. & M. A. CURTIS 1872	***S. pictus***
Boletus streptopus BLUM 1969	***S. bellinii* f. *bellinii?***
Boletus subaureus PECK 1887	***S. subaureus* var. *subaureus***
***Boletus subaureus* var. *rubroscriptus* PECK 1913**	***Boletus subaureus* var. *rubroscriptus***

Boletus subaureus var. *siccipes* COKER & BEERS 1943	***S. hirtellus* var.*hirtellus***
Boletus subluteus PECK 1897	***S. salmonicolor***
Boletus theclae SCHULZ. 1870	***S. grevillei* var. *grevillei***
Boletus tomentosus KAUFFMAN 1923 [1921], nom. illeg.	***S. tomentosus* f. *tomentosus***
Boletus tridentinus BRES. 1881	***S. tridentinus***
Boletus tridentinus subsp. *landkammeri* PILÁT & SVRČEK 1949	***S. lakei* var. *landkammeri***
Boletus unicolor FROST in PECK 1889, nom. illeg.	***S. unicolor***
Boletus variegatus SW. 1810	***S. variegatus* f. *variegatus***
Boletus variegatus var. *aureus* (SCHAEFF.) FR. & HÖK 1835	***S. variegatus* f. *variegatus?***
Boletus variegatus var. *aureus* (SCHAEFF.) SACC. 1888 comb.superfl.	***S. variegatus* f. *variegatus?***
Boletus variegatus var. *guttatus* (PERS.) FR. 1838	***S. variegatus* f. *variegatus***
Boletus variegatus var. *olivaceus* OPAT. 1836	***S. variegatus* f. *variegatus***
Boletus variegatus var. *rubescens* OPAT. 1836	***S. variegatus* f. *rubescens***
Boletus variegatus var. *rufus* OPAT. 1836	***S. variegatus* f. *variegatus***
Boletus velatus PERS. 1825	***S. flavidus***
Boletus velifer SECR. ex BIG. & GUILL. 1909	***S. variegatus* f. *variegatus?***
Boletus viridarius FROST 1874	***S. grevillei* var. *grevillei?***
Boletus viscidus L. 1753	***S. viscidus* var. *viscidus***
Boletus viscidus var. *albidus* VELEN. 1939	***S. roseoporus?***
Boletus viscosus FROST 1874, nom. illeg.	***S. brevipes* var. *brevipes***
Boletus volvatus BATSCH 1783	***S. luteus* f. *pseudovolvatus***
Cricunopus elegans (SCHUMACH.) KARST. 1881, comb. ill.	***S. grevillei* var. *grevillei***
Cricunopus flavidus (FR.) KARST. 1881	***S. flavidus***
Cricunopus flavus (WITH.) KARST. 1881	***S. grevillei* var. *grevillei***
Cricunopus luteus (L.) P. KARST. 1881	***S. luteus f .luteus***
Cricunopus viscidus (L.) KARST. 1881	***S. viscidus* var. *viscidus***
Fuscoboletinus aeruginascens (SECR. ex SNELL) POMERL. & A. H. SM. 1962	***S. viscidus* var. *viscidus***
Fuscoboletinus glandulosus (PECK) POMERL. & A. H. SM. 1962	***S. glandulosus***
Fuscoboletinus grisellus (PECK) POMERL. & A. H. SM. 1962	***S. grisellus***
Fuscoboletinus laricinus (BERK.) BESSETTE, ROODY & A. R. BESSETTE 2000	***S. viscidus* var. *viscidus***
Fuscoboletinus serotinus (FROST) A. H. SM. & THIERS 1971	***S. serotinus***
Fuscoboletinus spectabilis (PECK) POMERL. & A. H. SM.1962	***S. spectabilis***
Fuscoboletinus viscidus (L.) GRUND & K. A. HARRISON 1976	***S. viscidus* var. *viscidus***
Fuscoboletinus weaverae A. H. SM. & SHAFFER 1965	***S. weaverae***
Gastroboletus imbellus TRAPPE 1969	***S. imbellus***
Gastroboletus laricinus SINGER & BOTH 1977	***S. grevillei* var. *grevillei***
Gastroboletus suilloides THIERS 1969	***S. suilloides***
Gastrosuillus amaranthi THIERS 1989	***S. amaranthi***
Gastrosuillus imbellus (TRAPPE) THIERS 1989	***S. imbellus***
Gastrosuillus laricinus (SINGER & BOTH) THIERS 1989	***S. grevillei* var. *grevillei***
Gastrosuillus suilloides (THIERS) THIERS 1989	***S. suilloides***
Gastrosuillus umbrinus TRAPPE & CASTELLANO 2000	***S. umbrinus***
Gyrodon fusipes (HEUFL.) SACC. 1888	***S. placidus* f. *fusipes***
Gyrodon oudemansii (HARTSEN) SACC. 1888	***S. placidus* f. *fusipes***
Gyrodon placidus (BONORD.) SACC. 1888	***S. placidus* f. *placidus***

Gyrodon smotlachae J. VESELSKY 1955	***S. viscidus* var. *viscidus***
Ixocomus americanus (PECK) E.-J. GILBERT 1931	***S. americanus* f. *americanus***
Ixocomus aurantiporus (J. HOWSE) BAT. 1908	***S. tridentinus***
Ixocomus bellinii (INZENGA) GILB. 1931	***S. bellinii* f. *bellinii***
Ixocomus bellinii (INZENGA) MAIRE 1933, comb. superfl.	***S. bellinii* f. *bellinii***
Ixocomus boudieri (QUÉL.) QUÉL. 1888	***S. bellinii* f. *bellinii***
Ixocomus bovinus (L.) QUÉL. 1888	***S. bovinus* var. *bovinus***
Ixocomus bovinus var. *mitis* (MOUG.) QUEL. 1888	***S. bovinus* var. *mitis***
Ixocomus cembrae SINGER 1938 p. p.	***S. plorans* subsp. *cyanescens***
Ixocomus cembrae SINGER 1938 p. p.	***S. punctipes***
Ixocomus elegans (SCHUMACH.) SINGER 1938, comb. ill.	***S. grevillei* var. *grevillei***
Ixocomus elegans f. *badius* SINGER 1938, nom. inval.	***S. clintonianus***
Ixocomus flavidus (FR.) QUÉL. 1888	***S. flavidus***
Ixocomus flavus (SCHUMACH.) QUÉL. 1888	***S. grevillei* var. *grevillei***
Ixocomus flavus f. *caerulescens* SINGER 1938, nom. subnud.	***S. nueschii***
Ixocomus flavus f. *viscidoaffinis* SINGER 1938, nom. subnud.	***S. nueschii***
Ixocomus flavus var. *tridentinus* (BRES.) QUÉL. 1890	***S. tridentinus***
Ixocomus fusipes (HEUFL.) QUEL. 1888	***S. placidus* f. *fusipes***
Ixocomus granulatus (L.) QUÉL. 1888	***S. granulatus* f. *granulatus***
Ixocomus grevillei (KLOTZSCH) VASSILKOV 1955	***S. grevillei* var. *grevillei***
Ixocomus hirtellus (PECK) SINGER 1942	***S. hirtellus* var.*hirtellus***
Ixocomus jacuticus SINGER 1938	***S. jacuticus***
Ixocomus lakei (MURRILL) SINGER 1942	***S. lakei* var. *lakei***
Ixocomus luteus (L.) QUÉL. 1888	***S. luteus f .luteus***
Ixocomus oudemansii (HARTSEN) GILB. 1931	***S. placidus* f. *fusipes***
Ixocomus pictilis QUÉL. 1893	***S. placidus* f. *placidus***
Ixocomus placidus (BONORD.) E.-J. GILBERT 1931	***S. placidus* f. *placidus***
Ixocomus placidus ssp. *bellinii* (INZENGA) KONRAD 1927	***S. bellinii* f. *bellinii***
Ixocomus plorans (ROLLAND) BATAILLE 1908	***S. plorans* var.*plorans***
Ixocomus plorans (ROLLAND) FAVRE 1945, comb. superfl.	***S. plorans* var.*plorans***
Ixocomus punctipes (PECK) SINGER 1942	***S. punctipes***
Ixocomus rubropunctatus (RADDI) GILB. 1931	***S. bellinii* f. *bellinii***
Ixocomus sibiricus SINGER 1938	***S. americanus* f. *sibiricus***
Ixocomus subaureus (PECK) SINGER 1938	***S. subaureus* var. *subaureus***
Ixocomus subluteus (PECK) E.-J. GILBERT 1931	***S. salmonicolor***
Ixocomus tridentinus (BRES.) BAT. 1923	***S. tridentinus***
Ixocomus variegatus (SW.) QUÉL. 1888	***S. variegatus* f. *variegatus***
Ixocomus viscidus f. *brunneolus* KüHner 1926, nom. inval.	***S. serotinus?***
Ixocomus viscidus f. *obscurus* KÜHNER 1926	***S. serotinus***
Ixocomus viscidus f. *viscidus* (FR. & HÖK) QUÉL. 1888	***S. viscidus* var. *viscidus***
Ixocomus viscidus var. *bresadolae* (QUÉL.) QUÉL. 1888	***S. bresadolae* f. *bresadolae***
Leccinum lactifluum (WITH.) GRAY 1821	***S. granulatus* f. *granulatus***
Mariaella bovina (L.) ŠUTARA 1987	***S. bovinus* var. *bovinus***
Pinuzza flava GRAY 1821	***S. grevillei* var. *grevillei***
Rostkovites bellinii (INZENGA) REICHERT 1940	***S. bellinii* f. *bellinii***
Rostkovites boudieri (QUÉL.) REICHERT 1940	***S. bellinii* f. *bellinii***
Rostkovites brevipes (PECK) MURRILL 1948	***S. brevipes* var. *brevipes***

Rostkovites granulata (L.) P. KARST. 1881	***S. granulatus* f. *granulatus***
Rostkovites hirtellus (PECK) MURRILL 1909	***S. hirtellus* var.*hirtellus***
Rostkovites subaureus (PECK) MURRILL 1909	***S. subaureus* var. *subaureus***
S. abietinus PANTIDOU & WATLING 1970	***S. collinitus* var. *collinitus?***
S. acerbus A. H. SM. & THIERS 1964	***S. fuscotomentosus***
***S. acidus* (PECK) SINGER 1945**	***S. acidus* var. *acidus***
***S. acidus* var. *acidus* (PECK) SINGER 1945**	***S. acidus* var. *acidus***
S. acidus var. *intermedius* A. H. SM. & THIERS 1964	***S. intermedius***
***S. acidus* var. *luteolus* A. H. SM. & THIERS 1971**	***S. acidus* var. *luteolus***
S. acidus var. *subalutaceus* A. H. SM. & THIERS 1964	***S. subalutaceus***
S. aeruginascens (SECR.) SNELL 1944, comb. inv.	***S. viscidus* var. *viscidus***
S. aeruginascens var. *bresadolae* (QUÉL.) M. M. MOSER 1967	***S. bresadolae* f. *bresadolae***
S. aeruginascens var. *brunneus* (CAZZOLI & CONSIGLIO) SUTARA 2009	***S. serotinus***
S. aeruginascens var. nueschii (SINGER) SCHMID-HECKEL 1985	***S. nueschii***
S. aeruginascens var. *subspectabilis* (VASSILK.) A. PETROV 1991	***S. viscidus* var. *viscidus***
***S. albidipes* (PECK) SINGER 1945**	***S. albidipes***
S. albidipes (PECK) SNELL 1945, comb. superfl.	***S. albidipes***
S. albidipes ss. auct. plur.	***S. neoalbidipes***
***S. albivelatus* A. H. SM., THIERS & O. K. MILL. 1965**	***S. albivelatus***
***S. alboflocculosus* PANTIDOU & WATLING 1970**	***S. alboflocculosus***
S. albus (PECK) KUNTZE 1898, comb. ill.	***S. placidus* f. *placidus***
***S. alkaliaurantians* PANTIDOU & WATLING 1970**	***S. alkaliaurantians***
S. amabilis (PECK) SINGER 1966 p. p.	***S. lakei* var. *landkammeri***
***S. amaranthi* (THIERS) KRETZER & T. D. BRUNS 1997**	***S. amaranthi***
***S. americanus* f. *helveticus* (SINGER) KLOFAC 2013**	***S. americanus* f. *helveticus***
***S. americanus* f. *americanus* (PECK) SNELL 1944**	***S. americanus* f.*americanus***
***S. americanus* f. *sibiricus* (SINGER) KLOFAC 2013**	***S. americanus* f. *sibiricus***
***S. americanus* var. *reticulipes* (COKER & BEERS) GRAND 1984, comb. inv.**	***S. americanus* var. *reticulipes***
S. amoenus (THÜMEN) KUNTZE 1898	***S. placidus* f. *placidus***
S. annulatus (PERS. ex KROMBH.) J. S. PRESL 1846, comb. ill.	***S. luteus f .luteus***
***S. anomalus* T. J. BARONI, LARGENT & THIERS 1976**	***S. anomalus***
***S. appendiculatus* (PECK) A. H. SM. & THIERS 1964, comb. ill.**	***S. appendiculatus***
***S. bekhsus* GARDEZI 2007, nom. inval.**	***S. bekhsus***
S. bellinii (INZENGA) WATLING 1967, comb. superfl.	***S. bellinii* f. *bellinii***
***S. bellinii* f. *bellinii* (INZENGA) KUNTZE 1898**	***S. bellinii* f. *bellinii***
***S. bellinii* f. *luteus* PÉREZ-DE-GREG. 1995**	***S. bellinii* f. *luteus***
S. *bellinii* var. *luteus* (PÉREZ-DE-GREG.) TORREJÓN 2003	***S. bellinii* f. *luteus***
S. bellinii var. *luteus* (PÉREZ-DE-GREG.) TORREJÓN, 2005	***S. bellinii* f. *luteus***
S. berkeleyi (MURRILL) H. ENGEL & KLOFAC 1996	***S. decipiens***
S. borealis A. H. SM., THIERS & O. K. MILL. 1965	***S. borealis***
S. boudieri (QUÉL.) A. MARCHAND 1968, comb. superfl.	***S. bellinii* f. *bellinii***
S. boudieri (QUÉL.) KUNTZE 1898	***S. bellinii* f. *bellinii***
S. boudieri (QUÉL.) WATL. 1968, comb. superfl.	***S. bellinii* f. *bellinii***
***S. bovinoides* (J. BLUM) BON 1990**	***S. bovinoides***
***S. bovinus* (L.:FR.) ROUSSEL 1796**	***S. bovinus* var. *bovinus***
S. bovinus (PERS.) ROUSSEL 1796	***S. bovinus* var. *bovinus***

***S. bovinus* var. *mitis* (MOUGEOT) BENES 1942, comb. inv.**	***S. bovinus* var. *mitis***
***S. bovinus* var. *viridocaerulescens* (A. PEARSON) SINGER 1962 [1961]**	***S. bovinus* var. *viridocaerulescens***
***S. bresadolae* (QUÉL.) GERHOLD 1985**	***S. bresadolae* f. *bresadolae***
***S. bresadolae* f. *flavogriseus* (CAZZOLI & CONSIGLIO) KLOFAC 2013**	***S. bresadolae* f. *flavogriseus***
S. bresadolae var. *flavogriseus* CAZZOLI & CONSIGLIO 1997 [1996]	***S. bresadolae* f. *flavogriseus***
S. brevipes var. *aestivalis* SINGER 1945	***S. brevipes* var. *brevipes***
***S. brevipes* var. *brevipes* (PECK) KUNTZE 1898**	***S. brevipes* var. *brevipes***
S. brevipes var. *pseudogranulatus* (MURRILL) SINGER 1945	***S. pseudogranulatus***
***S. brevipes* var. *subgracilis* A. H. SM. & THIERS 1964**	***S. brevipes* var. *subgracilis***
***S. brunnescens* A. H. SM. & THIERS 1964**	***S. brunnescens***
***S. caerulescens* A. H. SM. & THIERS 1964**	***S. caerulescens***
***S. cavipoides* (Z. S. BI & G. Y. ZHENG) Q. B. WANG & Y. J. YAO 2004**	***S. cavipoides***
S. cembrae (SINGER) SINGER 1945	***S. plorans* subsp. *cyanescens***
***S. chiapasensis* SINGER 1973**	***S. chiapasensis***
***S. clintonianus* (PECK) KUNTZE 1898**	***S. clintonianus***
S. collarius (PERS.) REDEUILH 1990	***S. viscidus* var. *viscidus***
***S. collinitus* var. *aureus* (HUIJSMAN) LANNOY & ESTADES 2001, comb. inval.**	***S. collinitus* var. *aureus***
***S. collinitus* var. *collinitus* (FR.) KUNTZE 1898**	***S. collinitus* var. *collinitus***
***S. collinitus* var. *velatipes* CONTU, LAVORATO & SIMONINI 1998**	***S. collinitus* var. *velatipes***
***S. cothurnatus* SINGER 1945**	***S. cothurnatus***
S. cothurnatus subsp. *aestivalis* SINGER 1945	***S. cothurnatus***
***S. cothurnatus* subsp. *hiemalis* SINGER 1945**	***S. cothurnatus* subsp. *hiemalis***
S. cothurnatus var. *hiemalis* (SINGER) A. H. SM. & THIERS 1964	***S. cothurnatus* subsp. *hiemalis***
***S. decipiens* (PECK) KUNTZE 1898**	***S. decipiens***
S. dubius (ALLESCH.) KUNTZE 1898, comb. ill.	***S. serotinus?***
S. elbensis (PECK) KUNTZE 1898	***S. viscidus* var. *viscidus***
S. elegans (SCHUMACH.) SNELL 1944, comb.ill.	***S. grevillei* var. *grevillei***
S. extractus (BRITZ.) O. KUNTZE 1898	***S. tridentinus***
***S. flavidus* (FR.) J. PRESL 1846**	***S. flavidus***
***S. flavogranulatus* A. H. SM., THIERS & O. K. MILL. 1965**	***S. flavogranulatus granl***
***S. flavoluteus* (SNELL) SINGER 1945**	***S. flavoluteus***
S. flavoluteus (SNELL) SNELL & DICK 1961, comb. superfl.	***S. flavoluteus***
S. flavus (WITH.) RICHON & ROZE 1888	***S. grevillei* var. *grevillei***
S. flavus (WITH.) SINGER 1946 [1945], comb. superfl.	***S. grevillei* var. *grevillei***
S. flavus ss. BRESADOLA ss.CAZZOLI & CONSIGLIO 1997 [1996] non al.	***S. bresadolae* f. *flavogriseus***
S. fluryi HUIJSMAN 1969	***S. collinitus* var. *collinitus***
S. fluryi var. *aureus* HUIJSMAN 1969	***S. collinitus* var. *aureus***
***S. fuscotomentosus* THIERS & A. H. SM. 1964**	***S. fuscotomentosus***
***S. glandulosipes* THIERS & A. H. SM. 1964**	***S. glandulosipes***
S. glandulosus (PECK) SINGER 1951 [1949]	***S. glandulosus***
S. glandulosus (PECK) SNELL & DICK 1962, comb. superfl.	***S. glandulosus***
***S. gloeous* Z. S. BI & T. H. LI 1990**	***S. gloeous***

S. granulatus f. *granulatus* (L.) ROUSSEL 1796	***S. granulatus* f. *granulatus***
S. granulatus f. *granulatus* (L.) SNELL 1944, comb.superfl.	***S. granulatus* f. *granulatus***
***S. granulatus* f. *marchandii* G. MORENO & HEYKOOP 1994**	***S. granulatus* f. *marchandii***
***S. granulatus* ss. auct. americ. p. p.**	***S. granulatus* ss. auct. americ.p.p**
S. granulatus subsp. *albidipes* (PECK) SNELL & E. A. DICK 1962 [1961]	***S. neoalbidipes***
S. granulatus subsp. *albidipes* (PECK) SNELL & E. A. DICK 1962 [1961]	***S. neoalbidipes***
S. granulatus subsp. *granulatus* (L.) SNELL 1944	***S. granulatus* f. *granulatus***
S. granulatus subsp. *leptopus* SINGER 1945	***S. bellinii* f. *bellinii?***
***S. granulatus* subsp. *snellii* SINGER 1945**	***S. granulatus* subsp. *snellii***
***S. granulatus* var. *flavorufus* (SCHAEFF.) LANNOY 2012, comb. inv.**	***S. granulatus* var. *flavorufus***
***S. granulatus* var. *campanulatus* (BLUM) LANNOY 2012, comb. inv.**	***S. granulatus* var. *campanulatus***
***S. grevillei* var. *proximus* (A. H. SM. & THIERS) KLOFAC 2013**	***S. grevillei* var. *proximus***
S. grevillei (KLOTZSCH) IMAZEKI 1952, comb. superfl.	***S. grevillei* var. *grevillei***
***S. grevillei* (KLOTZSCH) SINGER 1945**	***S. grevillei* var. *grevillei***
S. grevillei f. *badius* (SINGER) SINGER 1965, comb. inv.	***S. clintonianus***
S. grevillei var. *badius* (SINGER) WATLING 1970, comb. inv.	***S. clintonianus***
S. grevillei var. *clintonianus* (PECK) SINGER 1951 [1949]	***S. clintonianus***
S. grevillei var. *pulchellus* (FR.) REA 1922	***S. flavidus***
***S. grisellus* (PECK) KRETZER & T. D. BRUNS 1996**	***S. grisellus***
***S. guzmanii* G. MORENO, BANDALA & MONTOYA 1997 [1996]**	***S. guzmanii***
***S. helenae* Thiers & A. H. Sm. 1974 [1973].**	***S. helenae***
S. hirtellus (PECK) SNELL 1944, comb.superfl.	***S. hirtellus* var.*hirtellus***
***S. hirtellus* subsp. *cheimonophilus* SINGER 1945**	***S. hirtellus* subsp. *cheimonophilus***
***S. hirtellus* subsp. *thermophilis* SINGER 1945**	***S. hirtellus* subsp. *thermophilis***
S. hirtellus var. *cheimonophilus* (SINGER) A. H. SM. & THIERS 1964	***S. hirtellus* subsp. *cheimonophilus***
***S. hirtellus* var. *hirtellus* (PECK) KUNTZE 1898**	***S. hirtellus* var.*hirtellus***
S. hirtellus var. *mutans* PECK ex SNELL 1944, nom. nud.?	***S. tomentosus* f. *tomentosus***
S. hirtellus var. *thermophilus* (SINGER) A. H. SM. & THIERS 1964	***S. hirtellus* var. *thermophilus***
***S. hololeucus* PANTIDOU 1964**	***S. hololeucus***
S. hololeucus ss. auct. europ. p. p.	***S. roseoporus?***
***S. holomaculatus* KLOFAC & HAUSKN. 2008**	***S. holomaculatus***
***S. imbellus* (TRAPPE) KRETZER & T. D. BRUNS 1997**	***S. imbellus***
S. imitatus var. *imitatus* A. H. SM. & THIERS 1964	***S. caerulescens***
S. imitatus var. *viridescens* A. H. SM. & TRAPPE 1972	***S. ponderosus***
S. indecisus (BRITZ.) KUNTZE 1898, comb. ill.	***S. viscidus* var. *viscidus***
***S. intermedius* (A. H. SM. & THIERS) A. H. SM. & THIERS 1971, comb. ill.**	***S. intermedius***
S. jacuticus (SINGER) SINGER 1951 [1949]	***S. jacuticus***
***S. kaibabensis* THIERS 1976**	***S. kaibabensis***
***S. kunmingensis* (W. F. CHIU) Q. B. WANG & Y. J. YAO 2004**	***S. kunmingensis***
S. lactifluus (WITH.) A. H. SM. & THIERS 1968	***S. granulatus* f. *granulatus***
***S. lactifluus* ss. auct. americ.**	***S. lactifluus* ss. auct. americ.**
***S. lakei* (MURRILL) A. H. SM. & THIERs var. *lakei* 1964**	***S. lakei* var. *lakei***

***S. lakei* var. *calabrus* LAVORATO 2000**	***S. lakei* var. *calabrus***
***S. lakei* var. *landkammeri* (PILÁT & SVRČEK) H. ENGEL & KLOFAC 1996**	***S. lakei* var. *landkammeri***
***S. lakei* var. *pseudopictus* A. H. SM. & THIERS 1964**	***S. lakei* var. *pseudopictus***
S. lambottei (SACC. & CUB.) KUNTZE 1898	***S. placidus* f. *placidus***
***S. lapponicus* HARMAJA 1978**	***S. lapponicus***
S. laricinus (BERK.) KUNTZE 1898	***S. viscidus* var. *viscidus***
S. laricinus var. *bresadolae* (QUÉL.) ALESSIO 1985	***S. bresadolae* f. *bresadolae***
S. leptopus (PERS.) MARCHAND 1971, comb. inval.	***S. bellinii* f. *bellinii?***
S. lutescens A. H. SM. & THIERS 1964	***S. lutescens***
S. luteus (L.) S. F.GRAY 1821, comb.superfl.	***S. luteus f .luteus***
***S. luteus* f .*luteus* (L.) ROUSSEL 1806**	***S. luteus f .luteus***
***S. luteus* f. *albus* WASSER & SOLDATOVA 1974**	***S. luteus* f. *albus***
***S. luteus* f. *decolorans* ESTADÈS & LANNOY 2001**	***S. luteus* f. *decolorans***
***S. luteus* f. *ochraceobrunneolus* ESTADÈS & LANNOY 2001**	***S. luteus* f. *ochraceobrunneolus***
***S. luteus* f. *pseudovolvatus* (LEUBA) LANNOY 2012, comb. inv.**	***S. luteus* f. *pseudovolvatus***
***S. luteus* var. *cyanescens* VEL. 1947**	***S. luteus* var. *cyanescens***
***S. mediterraneensis* f. *mediterraneensis* (JACQUET. & J. BLUM) REDEUILH 1992**	***S. mediterraneensis* f. *mediterraneensis***
***S. mediterraneensis* f. *xanthus* ESTADÈS & HURTADO 2007 [2006]**	***S. mediterraneensis* f. *xanthus***
S. mitis (KROMBH.) KUNTZE 1898	***S. bovinus* var. *mitis***
***S. monticola* THIERS 1967**	***S. monticola***
S. murrayi (BERK. & M. A. CURTIS) KUNTZE 1898	***S. pictus***
***S. neoalbidipes* M. E. PALM & E. L. STEWART 1984**	***S. neoalbidipes***
S. nueschii ss. CAZZOLI & CONSIGLIO 1997 [1996] non al.	***S. bresadolae* f. *flavogriseus***
S. nueschii var. *caerulescens* SINGER 1962 [1961]	***S. nueschii***
***S. nueschii* var. *nueschii* SINGER 1962 [1961]**	***S. nueschii***
***S. obscurus* PANTIDOU & WATLING 1970**	***S. obscurus***
***S. occidentalis* THIERS 1976**	***S. occidentalis***
S. ochraceoroseus (SNELL) SINGER 1973	***Boletinus ochraceoroseus***
***S. pallidiceps* A. H. SM. & THIERS 1964**	***S. pallidiceps***
***S. pictus* (PECK 1889) KUNTZE 1898**	***S. pictus***
S. pictus (Peck) A. H. Sm. & Thiers 1964, comb. superfl.	***S. pictus***
***S. pictus* (PECK) KUNTZE ss. auct. asiat.**	***S. pictus* ss. auct. asiat.**
***S. pinetorum* (W. F. CHIU) H. ENGEL & KLOFAC 1996**	***S. pinetorum***
S. pinetorum (W. F. CHIU) T. H. LI 1997, comb. superfl.	***S. pinetorum***
***S. pinorigidus* SNELL & E. A. DICK 1956**	***S. pinorigidus***
***S. placidus* f. *fusipes* (HEUFL.) KLOFAC 2007**	***S. placidus* f. *fusipes***
***S. placidus* f. *placidus* (BONORD.) SINGER 1945**	***S. placidus* f. *placidus***
***S. plorans* subsp. *cyanescens* SINGER 1965**	***S. plorans* subsp. *cyanescens***
S. plorans subsp. *placidus* (BONORD.) PILÁT 1961	***S. placidus* f. *placidus***
S. plorans subsp. *placidus* (BONORD.) PILÁT 1959, comb. inv.	***S. placidus* f. *placidus***
***S. plorans* var. *cembrae* (STUDER) SINGER 1965**	***S. plorans* var. *cembrae***
***S. plorans* var. *plorans* (ROLLAND) KUNTZE 1898**	***S. plorans* var.*plorans***
***S. ponderosus* A. H. SM. & THIERS 1964**	***S. ponderosus***
S. proximus A. H. SM. & THIERS 1964	***S. grevillei* var. *proximus***
***S. pseudoalbivelatus* B. ORTIZ & LODGE 2007**	***S. pseudoalbivelatus***
***S. pseudobrevipes* f. *volcanalis* (THIERS) KLOFAC 2013**	***S. pseudobrevipes* f. *volcanalis***

***S. pseudobrevipes* var. *pseudobrevipes* A. H. Sm. & Thiers 1964**	***S. pseudobrevipes* var. *pseudobrevipes***
S. pseudogranulatus (Murrill) A. H. Sm. & Thiers 1964, comb. superfl.	***S. pseudogranulatus***
***S. pseudogranulatus* (Murrill) Murrill 1948**	***S. pseudogranulatus***
S. punctatipes (Snell & E. A. Dick) A. H. Sm. & Thiers 1964, comb. superfl.	***S. punctatipes***
S. punctatipes (Snell & E. A. Dick) Snell & Dick 1962, comb. superfl.	***S. punctatipes***
***S. punctatipes* (Snell & E. A. Dick) Singer 1945**	***S. punctatipes***
***S. punctipes* (Peck) Singer 1945**	***S. punctipes***
***S. pungens* Thiers & A. H. Sm. 1964**	***S. pungens***
***S. quiescens* T. D. Bruns & Vellinga 2010**	***S. quiescens***
***S. reticulatus* Thiers 1975, nom. ill.**	***S. reticulatus***
***S. riparius* Thiers 1967**	***S. riparius***
S. roseobasis (J. Blum) Gröger 1967, comb. inval.	***S. collinitus* var. *collinitus***
***S. roseoporus* (Smotl.) Pilat & Dermek 1974**	***S. roseoporus***
***S. roseovelatus* Pantidou & Watling 1970**	***S. roseovelatus***
***S. ruber* Singer 1948 [1946]**	***S. ruber***
***S. rubricontextus* M. R. Ding & H. A. Wen 2003**	***S. rubricontextus***
S. rubropunctatus (Raddi) Redeuilh 1990	***S. bellinii* f. *bellinii***
***S. salmonicolor* (Frost) Halling 1983**	***S. salmonicolor***
S. schoberi (Oudem.) Kuntze 1898	***S. granulatus* f. *granulatus***
***S. serotinus* (Frost) Kretzer & T. D. Bruns 1996**	***S. serotinus***
***S. shardasus* Gardezi 2007, nom. inval.**	***S. shardasus***
***S. sibiricus* ss. auct. americ.**	***S. sibiricus* ss. auct. americ.**
S. sibiricus subsp. *helveticus* Singer 1949 [1951], nom. inval.?	***S. americanus* f. *helveticus***
S. sibiricus (Singer) Singer 1945	***S. americanus* f. *sibiricus***
***S. solidipes* (Peck) Smith & Thiers 1973, comb. inv.**	***S. solidipes***
***S. spectabilis* (Peck) Kuntze 1898**	***S. spectabilis***
S. spraguei (Berk. & M. A. Curtis) Kuntze 1898	***S. pictus***
***S. subacerbus* McNabb 1968**	***S. subacerbus***
***S. subalpinus* M. M. Moser 1997**	***S. subalpinus***
***S. subalutaceus* (A. H. Sm. & Thiers) A. H. Sm. & Thiers 1971**	***S. subalutaceus***
***S. subaureus* var. *subaureus* (Peck) Snell 1944**	***S. subaureus* var. *subaureus***
S. subluteus (Peck) Snell 1944 non ss. Snell	***S. salmonicolor***
S. subluteus ss. Slipp & Snell 1944?	***S. subolivaceus***
***S. subolivaceus* A. H. Sm. & Thiers 1964**	***S. subolivaceus***
***S. subreticulatus* Z. S. Bi 1990**	***S. subreticulatus***
***S. subvariegatus* Snell & E. A. Dick 1956**	***S. subvariegatus***
***S. suilloides* (Thiers) Kretzer & T. D. Bruns 1997**	***S. suilloides***
***S. tomentosus* (Kauffman) Singer, Snell & Dick 1960 [1959]**	***S. tomentosus* f. *tomentosus***
***S. tomentosus* var. *discolor* A. H. Sm., Thiers & O. K. Mill. 1965**	***S. tomentosus* var. *discolor***
***S. tridentinus* (Bres.) Singer 1945**	***S. tridentinus***
S. umbonatus E. A. Dick & Snell 1961 [1960]	***S. flavidus***
***S. umbrinus* (Trappe & Castellano) Klofac 2013**	***S. umbrinus***
***S. unicolor* (Frost in Peck) Kuntze 1898, comb. ill.**	***S. unicolor***
S. variegatus (Sw.) Kuntze 1898, comb. superfl.	***S. variegatus* f. *variegatus***

***S. variegatus* (SW.) RICHON & ROZE 1888**	***S. variegatus* f. *variegatus***
***S. variegatus* f. *rubescens* (OPAT.) ESTADÈS & LANNOY 2001**	***S. variegatus* f. *rubescens***
S. variegatus f. *rubescens* (OPAT.) ESTADES 1989, comb. inv.	***S. variegatus* f. *rubescens***
***S. viscidipes* HONGO 1974**	***S. viscidipes***
S. viscidus (FR. & HÖK) S. RAUSCHERT 1975, comb. superfl.	***S. viscidus* var. *viscidus***
S. viscidus (L.: FR.) IMAZEKI 1952, comb. superfl.	***S. viscidus* var. *viscidus***
S. viscidus f. *obscurus* (KÜHNER) ARMADA 2009	***S. serotinus***
S. viscidus var. *bresadolae* (QUÉL.) BON 1988	***S. bresadolae* f. *bresadolae***
S. viscidus var. *brunneus* CAZZOLI & CONSIGLIO 1997	***S. serotinus***
***S. viscidus* var. *viscidus* (L.) ROUSSEL 1806**	***S. viscidus* var. *viscidus***
S. volcanalis THIERS 1967	***S. pseudobrevipes* f. *volcanalis***
***S. wasatchicus* THIERS 1976**	***S. wasatchicus***
***S. weaverae* (A. H. SM. & SHAFFER) H. ENGEL & KLOFAC 1996**	***S. weaverae***
S. weaverae (A. H. SM. & SHAFFER) KRETZER & T. D. BRUNS 1996, comb. superfl.	***S. weaverae***
Uloporus placidus (BONORD.) QUÉL. 1886	***S. placidus* f. *placidus***
Versipellis variegata (SW.) QUÉL. 1886	***S. variegatus* f. *variegatus***
Versipellis variegata var. *guttata* (PERS.) QUEL. 1886	***S. variegatus* f. *variegatus***
Viscipellis / Gymnopus boudieri (QUÉL.) QUÉL. 1886	***S. bellinii* f. *bellinii***
Viscipellis bovina (L.) QUÉL. 1886	***S. bovinus* var. *bovinus***
Viscipellis bovinus var. *mitis* (MOUGEOT) QUÉL. 1886	***S. bovinus* var. *mitis***
Viscipellis bresadolae (QUÉL.) QUÉL. 1886	***S. bresadolae* f. *bresadolae***
Viscipellis collinita (FR.) QUÉL. 1886	***S. collinitus* var. *collinitus***
Viscipellis elegans (SCHUMACH.) QUÉL. 1886, comb. ill.	***S. grevillei* var. *grevillei***
Viscipellis flava (WITH.) QUÉL. 1886	***S. grevillei* var. *grevillei***
Viscipellis flavida (FR.) QUÉL. 1886	***S. flavidus***
Viscipellis fusipes (HEUFL.) QUEL. 1886	***S. placidus* f. *fusipes***
Viscipellis granulata (FR.) QUÉL. 1886	***S. granulatus* f. *granulatus***
Viscipellis lutea (L.) QUÉL. 1886	***S. luteus f .luteus***
Viscipellis pulchella (FR.) QUÉL. 1886	***S. flavidus***
Viscipellis tridentina (BRES.) QUÉL. 1886	***S. tridentinus***
Viscipellis viscida (L.) QUÉL. 1886	***S. viscidus* var. *viscidus***
Xerocomus lenticolor E. A. DICK & SNELL 1961 [1960]	***S. tomentosus* f. *tomentosus***
Xerocomus variegatus (SW.) BATAILLE 1908	***S. variegatus* f. *variegatus***

11. Signs used, abbreviations and list of cited illustrations

Signs used:

° material examined by the author. (mostly in the Herbarium WU)
( ),? at illustrations: not clearly significant picture,- at distribution report: doubtful
! at illustrations: species shown under a different (non-synonymous) name
* at illustrations: there are also authentic images available online in the world wide web

Abbreviations:

a.	above (icon.)	b.	below (icon.)
As	Asia	cov.	cover (icon.)
Aus	Australia	comb. ill.	illegitime combination
(B/W)	black and white (icon.)	comb. inv.	invalid combination

Eu	Europe	NS	New Zealand
f.	forma, form	p. p.	pro parte, partially
ill.	illustration	Q	quotient (length / width)
l.	left (icon.)	r.	right
m.	middle (icon.)	sp., spec.	species
NA	North America	spp.	species (plural)
nom. illeg.	nomen illegitimum, illegitimate name	ss.	sensu, in the sense of
		ssp., subsp.,	subspecies
nom. inval.	nomen invalidum, invalid name	var.	varietas, variety
		vs.	versus

List of cited illustrations:

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AM	ALESSIO, C. L.	Fungi Europaei 2 *Boletus* 1985 + 2a Suppl. *Boletus* 1991
AMNP		Acta Musei Nationalis Pragae
AMS		Acta Microbiologica Sinica
APP		Archives of Phytopathology and Plant Protection
AR	ARORA, D.	Mushrooms demystified 2nd edn 1986
Ar	ARORA, D.	All that the rain promises, and more...1990
At	ATKINSON, G. F.	Mushrooms 2nd edn 1961
Ba	BARRON, G.	Mushrooms Northeast North America 1999
BaCN	BARLA, J. B.	Champ. de la Prov. de Nice 1859
BBF	BESSETTE, A. E., BESSETTE, A. R., FISCHER, M.	Mushrooms of Northeastern North America 1997
BBN	BESSETTE, A. E., BESSETTE, A. R.,	Mushrooms of Cape Cod and the National Seashore 2001
BM	NEILL, W. J.	The *Boletes* of Michigan 1971
BMBM	SMITH, A. H., THIERS, H. D., BESSETTE, A. E., MILLER, O. K. BESSETTE, A., MILLER, H.	Mushrooms of North America in Color –A field guide to seldom-illustrated Fungi
BC		Bolets de Catalunya 1982-
BEL		Bellara
BeS	BESSETTE, A., SUNDBERG, W. S.	Mushrooms, Macmillan field Guides 1987
BKIII(PS)	BREITENBACH, J., KRÄNZLIN, F.	Pilze der Schweiz 3, 1991
BL	BON, M.	Pareys Buch der Pilze 1988/Mushrooms & Toadstools
BMBM	BESSETTE, A. E., MILLER, O. K., BESSETTE, A. R., H.H.MILLER	Mushrooms of North America in Color A Field Guide Companion to Seldom-Illustrated Fungi
Boud	BOUDIER, E.	Icones Mycologicae (1904-1910) repr.1981-1985 I-V
Br	BRESADOLA, G.	Iconographia Mycologica 1927-1933
BRB	BESSETTE, A. E., BESSETTE, A. R. ROODY, W.	North American *Boletes*, 2000
BRBD	BESSETTE, A. E., ROODY, W. C.,	Mushrooms of the Southeastern United States, 2007
Bri	BESSETTE, A. R., DUNAWAY, D.	Brittonia, plate No.
BS	BOUGHER, N., SYME, K.	Fungi of Southern Australien 1998
BSMF		Bulletin semestriel de la Soc. Mycol. de France
BTR		Bolletino del Gruppo Micologico Bresadola
CB	COKER, W. C., BEERS, A. H.	The Boleti of North Carolina, 1971
CC	CLEMENCON, H., & al.	Pilze im Wandel der Jahreszeiten, 1981
CCH		Casopis Ceskoslov. Houbaru = Mykol. Sbornik
CD	COURTECUISSE, R., DUHEM, B.	Guide des Champ. de France et d´Europe, 1994
CeI	CETTO, B.	Enzyklopädie der Pilze 1, 1987

CJB		Canadian Journal of Botany
Clu		Mikologiai Közlemenyek Clusiana
CO	COURTECUISSE, R.	Photo-guide des Champignons d'Europe, 2000
Coo		Coolia
CP	CONSIGLIO, G., PAPETTI, C.	Atlante fotografico de Funghi d'Italia 2, 2001
CPS	PAPETTI, C., CONSIGLIO, G., SIMONINI, G.	Atlante fotografico de Funghi d'Italia 1, 2000/ 2nd edn
CQ		Mille et un champignons du Quebec
CS	CONSTANTINO, C., SIQUIER, J. L.	Els bolets de les Balears 1, 1996
Ct	CETTO, B.	Der große Pilzführer 1-4, 1979-1984, I fungi dal vero 5-7, 1977-1993
DÄ	DÄHNCKE, R. M.	Las setas in Las Palmas
Dh	DÄHNCKE, R. M.	1200 Pilze in Farbfotos, 1993
DM		Documents Mycologiques
DPi	DERMEK, A., PILÁT, A.	Poznavajme huby 1974/ Illustr.No corresponds PD +10
DT	DAI, Y., TOLGOR, B.	Illustr. edible a.medicinal fungi Northeast.China
E	EVENSON,V. S.	Mushrooms of Colorado a. South. Rocky M. ,1997
En	ENGEL, H., & al.	Schmier- und Filzröhrlinge, 1996, Illustr. Nr.
ER	EYSSARTIER, G., ROUX, P.	Le Guide des champignons France et Europe, 2011
Fa		Farlowia
FAMM		Bulletin Fed. d. Assoc. Mycolog. Mediterraneennes
FBT	AUGUADRI, A., LUCCHINI, G., RIVA, A., TESTA, E.	Funghi e boschi del Cantone Ticino 1-4, 1984-1987
FD		Fungal Diversity
FLST	FOIERA, F. & al.	Funghi Boleti, 1993, Abb. Nr.
FMDS		Bull. de la Fed. Mycol. du Dauphiné-Savoie
FN		Fungimap Newsletter
FND		Fungi non delineati
Fr	FRIES, E.	Icones Selectae Hymenomycetum 1868
FT	BRESADOLA, G.	Fungi Tridentini 1881-1892
Fu	FUHRER B.	A field guide to Australian Fungi, 2005
GII	GERHARDT, E.	Pilze 1. und 2. BLV Intensivführer, 1984-1985
Ga	GARNWEIDNER, E.	GU Naturführer Pilze, 1985
GG	GRÜNERT, H., GRÜNERT, R.	Pilze, Steinbachs Naturführer, 1984
Gh	GERHARDT, E.	Der große BLV Pilzführer für unterwegs, 1997
GH	GRUND, D. W., HARRISON, A. K.	Nova Scotian Boletes, 1976
Gli	GALLI, R.	I Boleti delle nostre Regioni, 1980
GR	GALLI, R.	I Boleti delle nostre Regioni, 1987 (only new illustr.cited!)
Gri	GRGURINOVIC, C. A.	Larger Fungi of South Australia, 1997
GS GS3	GALLI, R.	I Boleti 1998 , + 3rd edn (only new illustr.cited!)
HAB	HAGARA, L., ANTONÍN, V.,	Houby/Les Champignons, 1999/2000 (Boletales.-Nr.)
HD	BAIER, J., HEMMES, D. E., DESJARDIN, D. E.	Mushrooms of Hawai'I, 2002
Hg	HAGARA, L.	Atlas hub, 1987, Abb. Nr.
HG	HAAS, H., GOSSNER, H.	Pilze Mitteleuropas, 1964
HKI,II	MICHAEL, HENNIG, KREISEL	Handbuch für Pilzfreunde, 1983-1988
Hu	HUANG, N.	Colored illustrations of macrofungi (mushrooms) of China, 1998
IH	IMAZEKI, R., HONGO, T.	Coloured Illustrations of Fungi of Japan I, II, 1980, 1981
IM		Icones Mycologicae
IOH	IMAZEKI, R., OTANI, Y., HONGO, T.,	Fungi of Japan, 1988

KAR		Karstenia
Kb	KALLENBACH, F. J.	Die Pilze Mitteleuropas 1 Die Röhrlinge, 1926-1943
Ki	KIBBY, G.	The Pocket Guide to Mushrooms a. other Fungi, 1991
Kib	KIBBY, G.	British Boletes, 2011, fig.no.
KM	KONRAD & MAUBLANC	Icones Selectae Fungorum, 1924-1937
Kr2	KRIEGLSTEINER, G.	Die Großpilze Baden-Württembergs 2, 2000
Kz	KROMBHOLZ, J. V.	Nat. Abb. u. Beschr. Schwämme, 1831
L- LII	LIU, X.	Coloratlas Wild Macrofungi China1+2, 2002, 2004
La	LANNOY, G.	Iconographie des Bolets d`Europe, 2013, fig.no.
Lak	LAKHANPAL, T. N.	Mushrooms of India Boletaceae
L/E	LANNOY, G., ESTADÈS, A.	Les Bolets Flore Myc. d´Europe 6, 2001
LEC	LECLAIR, A., ESSETTE, H.	Les Bolets, 1969
Let	LETELLIER, B.	Fig. des champ. suppl. aux pl. de Bulliard, 1839
Li	LINCOFF, G. H.	The Audubon Soc.Field Guide To North.Americ. Mushr., 1981
Ll		Lloydia
Lx	LAUX, H.	Der große Kosmos Pilzführer, 2001
M	MAO, XL., (Ed.)	The Macrofungi in China, 2000
M/M		Miscell. Mycol.
MB		The Michigan Botanist
McK	MCKNIGHT, K. H. & V. B.	Mushrooms
Md	MARCHAND, A.	Champ. du Nord et du Midi, 1971-1986, Icon. No.
Me	METZLER, S. & V., MILLER, O. K.	Texas Mushrooms, 1992
MGZ	MORENO,G., GARCÍA MANJÓN, J. L., ZUGAZA, A.	Guia de Incafo de los Hongos de Peninsula Iberica I-II, 1986
MH	MICHAEL, HENNIG	Handbuch für Pilzfreunde, 1958-1975
Mi	MILLER, O. K. jr.	Mushrooms of North America 5th edn, 1981
MiM	MILLER, O. K. jr. & MILLER, H. H.	North American Mushrooms, 2006
MIC		Ass. Micol. Bresad."Micologia 2000", 2000
MJ	MOSER, M. , JÜLICH, W.	Farbatlas der Basidiomyceten, 1985-2007, No.
MM		Micologia e Vegetazione Mediterranea
MS	MCKENNY, M., STUNTZ, D. E.	The New Savory Wild Mushroom, 1987
MT, MT2	MERLO, E. G., ROSSO, M., TRAVERSO, M.	I nostri funghi I Boleti 1980, 1983 (2nd edn, only new illustrations cited)
Mu	MUÑOZ, J. A.	Fungi Europaei2 *Boletus* s. l., 2005
MY		Mycotaxon
Mycol		Mycologia
NZJ		New Zealand Journal of Botany
NYSM		New York State Mus.
Pant	PANTIDOU, M. E.	Mushrooms of the Forests of Greece, 1991
PA	PAPOUSEK, T.	Velky Fotoatlas Hub z Jiznich Cech
PC	POELT, J., JAHN, H., CASPARI, C.	Champignons d´Europe S.F.L/Mitteleuropäische Pilze, 1963/1965
PD	PILÁT, A., DERMEK, A.	Hribovite houby, 1974
PDF		Parliamo di funghi
PDM		Pagine de Micologia
PFNO		Pilzflora Nordwestoberfrankens
Ph	PHILLIPS, R.	Les champignons 1981, Das Kosmosbuch der Pilze 1982, Mushrooms, 1981
PH	PHILLIPS, R.	Mushrooms of North America, 1991
PL	PACIONI, G.	Das neue BLV-Pilzbuch, 1982
PU	PILÁT, A., USAK, A.	Mushrooms Nase Houby I, 1952
PUII	PILÁT, A., USAK, A.	Nase Houby II, 1959
RCM		Revista Soc. Catalana Micol.
RE	RUIZ PASTOR, E.	Guia Micologica 4 Suppl. Orden *Boletales* en Espana,

		2006
RF	RUIZ FERNANDEZ, J. M.	Guia Micologica 1, Orden *Boletales* en Espana, 1997
RH	RYMAN, S., HOLMASEN, I.	Svampar 1984, Pilze, 1992
Ric	RICEK, E.	Pilzflora des Attergaues, Hausruck- und Kobernaußer waldes. Abh. Zool.-Bot. Ges. Österr. 23, 1989
RIV		Rivista di Micologia, Assoc. Micol. Bres.
Ro	ROMAGNESI, H.	Nouvel Atl. des Champ. de France 1956-1970, I-IV
Roo	ROODY, W. C.	Mushrooms of West Virginia and the Central Appalachians
Rou	ROUX, P.	Mille et un champignons, 2006
RT	RINALDO, A., TYNDALO, V.	Pilzatlas 1974, Atlante dei funghi, 1972
S	SMITH, A. H.	A field guide to western Mushrooms, 1975
SB	SCHALKWIJK-BARENDSEN, H.	Mushrooms of western Canada, 1991
SCI		Scientifica Nr.1. Brillouet: Princes des Champignons, Abb. No
SD	SNELL, W., DICK, E.	The boleti of northeastern North America, 1970 pl. No
Set		Setas del pais vasco
Si5	SINGER, R.	Die Röhrlinge I. Die Pilze Mitteleuropas V, 1965
SIE		Sienilehti
Sm	SMITH, A. H.	Mushroom Hunter's field guide, 1963
SM	SOCIEDAD MIC. MADRID	Setas de Madrid 1: *Boletales*, 1998
SMJ	ŠUTARA, J., MIKŠIK, M., JANDA,V.	Hřibovite houby, 2009
Sow	SOWERBY, J.	Col. Fig. of British Fungi or Mushrooms, 1795-1815
SPT	WALTY, H.	Schweizer Pilztafeln
Sr	SCHAEFFER, J. C.	Fungorum Bavar. et Palat. c. Ratis. nascunt, 1774
SSW	SMITH, A. H., SMITH-WEBER, N.	The Mushroom Hunter´s Field Guide, edn 1996
ST	SMITH, A. H., THIERS, H. D.	A Contrib. tow. a Monogr. of North Amer. spec. of *Suillus* 1964
Sup.IF15		Il fungo ATTI sup. 1-3 Il Fungo 15, 1997
SVA		Svampe
SW	SCHLITTLER, J., WALDVOGEL, F.	Das große Buch der Pilze, 1975, 1977
SWS	SMITH-WEBER, N., SMITH, A. H.	A field guide to southern Mushrooms, 1985
TA	TRUDELL S., AMMIRATI, J.	Mushrooms Pacific Northwest, 2009
TH	THIERS, H. D.	California Mushrooms, a field guide to the Boletes, 1975
TINT		Der Tintling
TML	TRAPPE & al.	Diversity, ecology, and conservation of truffle fungi, 2009
Ve	VESTERHOLT, J.	Danmarks Svampe
VS	VIOLA, S.	Die Pilze, 1972
WE	WESTHUIZEN, G. C. A., EIKER, A.	Field guide Mushrooms of southern Africa
Wi	WINKLER, R.	2000 Pilze einfach bestimmen ,1996
WLY	WANG, X., LIU, P., YU, F.,	Color Atlas of wild commercial mushrooms in Yunnan, 2004
WPB		Westfälische Pilzbriefe
YS	YUAN, M., SUN, P.	Pictorial book of mushrooms in China, 2007
Zu	ZUCCHERELLI, A.	I fungi delle Pinete 1, 1993, new edition 1994

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