

## An annotated checklist of *Leccinum* in China

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**Abstract**—Species of the genus *Leccinum* reported from China are reviewed and annotated with a summary of their current research status. A total of 32 names have been included from an extensive literature research. Among these names, two are regarded as synonyms of other species of the genus and another one transferred to *Tylopilus*. The taxonomic status of three names, the generic placement of two names and the application of one name to Chinese material are controversial. Among the remaining 23 names, seven were reported without specimen support and 16 with specimen citation. It is also found that the descriptions of six of these taxa from China differ from those from Europe and elsewhere. Specimen citation, morphology description and species identification of the Chinese records are also discussed.

**Key words**—boletes, distribution, nomenclature

摘要：通过全面的文献调查研究，本文总结了自中国报道的疣柄牛肝菌属 (*Leccinum*) 的名称记录，概述了各个分类单元的研究现状。文献研究结果表明，已报道的中国疣柄牛肝菌属名称共有32个，其中2个已被列为异名，1个已被转移到粉孢牛肝菌属 (*Tylopilus*)，还有3个在分类学地位、2个在归属问题和1个在对中国标本的名称使用上存在争议；在其他23个分类单元中，16个具有标本引证，但有6个在形态描述上存在疑问，缺乏标本引证的有7个。所有这些分类单元需要全面的分类学修订，以确证它们在中国的存在。

### Introduction

The genus *Leccinum* Gray belongs to *Basidiomycota*, *Boletales*, *Boletaceae* Chevall., with about 75 accepted species (25) and some 282 proposed names (<http://www.indexfungorum.org/Names/Names.asp>, March 2006). The genus is worldwide, but distributed mainly in the northern temperate zone (25). Species of *Leccinum* are ectomycorrhizal (42) and play important roles in both ecology and economy. Ectomycorrhizal basidiomycetes, including boletes, constitute an important component of forest fungal communities (4, 13, 63) and forest ecosystems. It has been shown that ectomycorrhizal fungal diversity can determine plant productivity (23) and enrich the diversity of plants (26) and that ectomycorrhizal fungi benefit their hosts by enhancing mineral uptake, thus contributing to the recycling of nutrients in the ecosystem (15, 17). Furthermore, all known species of *Leccinum* seem to be edible; some are used for

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food and sold in markets as fresh, dried, salted or pickled products (42). *Leccinum extremiorientale*, for example, is often found in the wild mushroom market in Kunming, Yunnan, China.

Species of *Leccinum* in China have been the subject of modern scientific studies since the early 20<sup>th</sup> century but such studies were infrequent until the 1980s. Baccarini (3) reported *L. scabrum* from Qinling Mountains, Shanxi, and the same species was subsequently reported some 30 years later as *Boletus scaber* from Jiangsu (50). Subsequently, two more *Leccinum* species were reported from Yunnan (24). Chiu (10) recorded three *Leccinum* species in *Boletus* L. in his comprehensive study of boletes in the south-west of China, mainly Yunnan province. A further species was added by Teng (52). In a sylloge of all known Chinese fungi, Tai (49) included six species of *Leccinum*. Zang carried out further research on boletes in the south-west of China from the 1980s and reported six *Leccinum* species, including one new to science (72). Subsequently, 15 species were reported from the south-west of China by Ying & Zang (68). Some additional species of *Leccinum* were also included in local lists of fungi (14, 22, 28–30, 32–35, 39, 55, 56, 59, 62, 69–71, 73, 75). Five species of *Leccinum* were reported from Taiwan in a serial report on boletes in the province (64–67). In total, 32 names of *Leccinum* have been reported from China. A full list of these names, arranged alphabetically, is provided in this paper with information on their current status in the hope of furthering research into species resources of *Leccinum* in China.

***Leccinum albellum*** (Peck) Singer, *Mycologia* 37: 799 (1945).

*Boletus albellus* Peck, Rep. N. Y. St. Mus. nat. Hist. 41: 77 (1888).

*Ceratomyces albellus* (Peck) Murrill, *Mycologia* 1: 145 (1909).

This species was first reported with description and specimen support from Taiwan (66) and then from the mainland (7). The species was also described from the mainland with specimen citation (8, 68) and further recorded from different provinces (22, 39, 73, 75).

Snell & Dick (46) considered *L. albellum* to be synonymous with *Boletus niveus* Fr., followed by Coker & Beers (12). Singer (41) maintained them as separate, because of the chains of sphaerocysts in the pileus cuticle of *L. albellum*, and this taxonomic treatment was followed by American mycologists (5, 43, 45) and Chinese mycologists (7, 22, 66, 68, 72, 73), as well as being accepted in the present paper.

Reported distribution: Guangdong (7, 8, 39, 75), Guizhou (39, 68, 73, 75), Sichuan (73) and Yunnan (22, 39, 68).

***Leccinum ambiguum*** A.H. Sm. & Thiers, *Boletes of Michigan*: 138 (1971).

This was recorded from Sichuan with description and specimen support (14, 71). The description of Chinese material is compatible with that of Smith & Thiers (45).

Reported distribution: Sichuan (14, 71).

***Leccinum atrostipitatum*** A.H. Sm., Thiers & Watling, *Michigan Bot.* 5: 155 (1967).

This was reported with description and specimen support from Sichuan by Dai & Li (14) and later by others (68, 71, 73).

Reported distribution: Sichuan and Yunnan (14, 68, 71, 73).

***Leccinum aurantiacum*** (Bull.) Gray, Nat. Arr. Brit. Pl. (London) 1: 646 (1821).

*Boletus aurantiacus* Bull., Herb. France 5: t. 236 (1785).

*Krombholzia aurantiaca* (Bull.) E.-J. Gilbert, Bolets.: 182 (1931).

*Krombholziella aurantiaca* (Bull.) Maire, Publ. Inst. Bot. Barcelona 3: 46 (1937).

*Trachypus aurantiacus* (Bull.) Romagn., Rev. Mycol. Paris, N.S. 4: 141 (1939).

This species was initially reported as *B. aurantiacus* from Yunnan by Keissler & Lohwag (24), subsequently as *L. aurantiacum* with description (1, 34, 35, 39, 61, 70, 73) or specimen support (36, 56) or both (68, 69). Griffiths (18) recorded this species in Hong Kong. This fungus is widely distributed in China, but sometimes recorded with orthographical errors as *L. aurantiaca* (e.g. 56, 61). *Krombholzia* P. Karst., *Krombholziella* Maire and *Trachypus* J. Bataille are synonyms of *Leccinum* (see 25, although *Trachypus* was listed as a synonym of *Krombholzia* there).

Reported distribution: Guangxi (1), Guizhou (39, 61, 68, 73), Hebei (1, 34–36, 39, 68, 70), Heilongjiang (34–36, 39, 68), Hong Kong (18), Hunan (1), Jilin (1, 34–36, 39, 68), Liaoning (1, 34–36, 39, 68), Qinghai (1, 34, 35, 39, 68, 73), Shanxi (34–36, 39, 68, 70), Sichuan (1, 34–36, 39, 68), Tibet (1, 34–36, 39, 68–70, 73), Xinjiang (1, 34–36, 68, 73), Yunnan (24, 34–36, 39, 68) and Zhejiang (1).

***Leccinum chromapes*** (Frost) Singer, Amer. Midl. Nat. 37: 124 (1947).

*Boletus chromapes* Frost, Bull. Buffalo. Soc. Nat. Sci. 2: 105 (1874).

*Tylopilus chromapes* (Frost) A.H. Sm. & Thiers, Mycologia 60: 948 (1968).

This species was reported from Yunnan with description and specimen support in 1937 (24) and then from various provinces (1, 14, 28, 30, 34, 35, 39, 51–53, 62, 67–70, 73, 74).

The systematic position of this species is still controversial. Singer (41) transferred it to *Leccinum*, which was followed by most Chinese mycologists (e.g. 14, 68, 71). However, Smith & Thiers (44) placed it in *Tylopilus*, based on the stipe scales not turning black when the basidiomata are mature, and this was accepted by Zhang (75) and Bessette et al. (5). Further investigation is required to determine the genetic position for this species.

Reported distribution: Anhui (34, 35, 39, 51–53, 70, 71), Guangxi (34, 35), Guizhou (34, 35, 39), Heilongjiang (34, 35, 39, 70, 71), Hong Kong (35), Jilin (28, 30, 34, 35, 39, 71), Liaoning (39), Sichuan (1, 14, 34, 35, 39, 56, 71, 73, 75), Taiwan (67), Qinghai (34, 35, 39), Tibet (34, 35, 75), Yunnan (1, 34, 35, 39, 70, 71, 73, 75) and Zhejiang (34, 35, 39, 51–53, 70).

***Leccinum crocipodium*** (Letell.) Watling, Trans. & Proc. Bot. Soc. Edinburgh 39: 200 (1961).

*Boletus crocipodius* Letell., Fig. Champ.: t. 666 (1838).

*Boletus nigrescens* Richon & Roze, Atlas Champignons: 191 (1888). [See Watling (58)].

This species was reported as *B. crocipodius* with specimen support from Yunnan (10) and then from other provinces (1, 11, 34, 35, 39, 60, 61, 68, 71, 72, 75). However, Ying et al. (70) regarded *L. crocipodium* sensu W. F. Chiu as identical to *L. rugosiceps*, whilst Wang & Liu (55) considered that the species was misinterpreted by these authors and that *L. crocipodium* sensu W. F. Chiu was identical to *L. extremiorientale*. The distribution of *L.*

*crocipodium* in China therefore requires further confirmation.

Rauchert (38) was able to establish *L. tessellatum* (Kuntze) Rauschert as the correct name for *L. crocipodium* and listed *B. nigrescens* as its synonym. However the combination of *L. tessellatum* seems to have been overlooked or ignored by the editors of *Index of Fungi* and *Indexfungorum*, although another combination on the same page, *L. niveum* (Fr.) Rauschert, has been picked up in these indexes. Apparently, the taxonomic status of these names requires thorough investigation.

Reported distribution: Anhui (1, 60, 71), Fujian (1, 39, 60, 68, 71, 73), Guangdong (1, 39, 60, 68, 71, 73), Guangxi (1, 39, 60, 68, 73), Guizhou (1, 60, 61, 71, 73), Hubei (1, 71), Hunan (1, 39, 60, 68, 71, 73), Jiangsu (1, 60, 71), Sichuan (39, 60, 71), Taiwan (1, 39, 60, 68, 71, 73), Tibet (39, 68, 73), Yunnan (1, 10, 11, 60, 68, 71, 73) and Zhejiang (1, 39, 60, 71).

***Leccinum duriusculum*** (Schulzer ex Fr.) Singer, Amer. Midl. Nat. 37: 122 (1947).

*Boletus duriusculus* Schulzer ex Fr., Hymenomyc. Eur. (Uppsala): 515 (1874).

The fungus was reported from China twice with description, but without specimen support (33, 34). The description of the Chinese material is congruent with that of Watling (58).

Reported distribution: Tibet (33, 34).

***Leccinum eximium*** (Peck) Singer, Persoonia 7: 319 (1973).

*Boletus eximius* Peck, J. Mycol. 3: 54 (1887).

*Tylopilus eximius* (Peck) Singer, Amer. Midl. Nat. 37: 109 (1947).

The first record of this species in China was from Yunnan with description and specimen citation (10, as *B. eximius*). Since then, it has been well documented and extensively discussed (1, 2, 6, 14, 22, 33–35, 39, 49, 56, 60, 61, 68–73, 75).

Reported distribution: Guizhou (39, 61, 71–73, 75), Hainan (6), Hubei (2, 39), Jilin (56), Sichuan (1, 14, 34, 35, 39, 56, 60, 69–72, 75), Tibet (1, 33, 39, 60, 71, 75) and Yunnan (1, 10, 14, 22, 34, 35, 39, 60, 68–70, 73, 75).

***Leccinum extremiorientale*** (Lar. N. Vassiljeva) Singer, Agar. Mod. Tax. 2<sup>nd</sup> Ed.: 744 (1962).

*Krombholzia extremiorientalis* Lar. N. Vassiljeva, Not. Syst. Crypt. Inst. Bot. Acad. Sci. URSS 6: 191 (1950).

This species was recorded with specimen support, but without description from Hubei and Sichuan (2). Subsequently, it was reported from different provinces (22, 30, 35, 39, 55, 68). Wang & Liu (54) described this species in detail and pointed out the misidentification of this species with *L. crocipodium* in the Chinese literature.

Reported distribution: Guangxi (35, 68), Guizhou (35, 68), Hubei (2, 35, 39, 68), Jilin (30), Sichuan (2, 22, 39, 68) and Yunnan (54, 55).

***Leccinum griseum*** (Quél.) Singer, Die Röhrlinge II: 89 (1967).

*Gyroporus griseus* Quél., C. R. Assoc. Fr. Avanc. Sci. 30: 495 (1902).

*Boletus griseus* (Quél.) Sacc. & D. Sacc., Syll. Fung. 17: 100 (1905).

This species was first reported with specimen support from Taiwan (65), and then from

various provinces on the mainland (35, 60, 68, 73).

Reported distribution: Heilongjiang (35, 60, 68), Jilin (35, 68), Qinghai (35, 68), Sichuan (35, 60, 68), Taiwan (65), Tibet (35, 68), Xinjiang (35, 60, 68) and Yunnan (35, 60, 73).

***Leccinum holopus*** (Rostk.) Watling, Trans. Br. mycol. Soc. 43: 692 (1960).

*Boletus holopus* Rostk., Sturm's Deutschl. Flora, III (Pilze) 5: 131 (1844).

The first record of this species was from Taiwan with description and specimen support (64) and then from the mainland without specimen citation (35). Both of these two descriptions are similar to that of Watling (58). However, Rauschert (38) considered *L. holopus* as a synonym of *Boletus niveus* and made the combination of *L. niveum*. The controversy over the taxonomic status of these names requires further investigation.

Reported distribution: Qinghai (35) and Taiwan (64).

***Leccinum hortonii*** (A.H. Sm. & Thiers) Hongo & Nagas., Rep. Tottori mycol. Inst. 16: 50 (1978).

*Boletus hortonii* A.H. Sm. & Thiers, Boletes of Michigan: 319 (1971).

This species was reported with description and specimen support by Ying & Zang (68), and then by others (22, 39, 73, 75). The description by Ying & Zang (68) is compatible with that of Smith & Thiers (45).

Reported distribution: Sichuan, Tibet and Yunnan (22, 68, 73, 75).

***Leccinum insigne*** A.H. Sm., Thiers & Watling, Michigan Bot. 5: 160 (1967).

This species was recorded in Taiwan with description and specimen support (65), but has not been reported from the mainland.

Reported distribution: Taiwan (65).

***Leccinum intusrubens*** (Corner) Høil. in Høiland & Schumacher, Nordic J. Bot. 2: 270 (1982).

*Boletus intusrubens* Corner, Boletus in Malaysia: 104 (1972).

*Leccinum intusrubens* (Corner) Hongo, Mem. Fac. Edu. Shiga Univ. Nat. Sci. 33: 40 (1983). [superfluous].

This fungus was reported as *L. intusrubens* (Corner) Hongo with description, but without specimen citation (60).

Reported distribution: Guizhou, Hainan and Yunnan (60).

***Leccinum nigrescens*** (Richon & Roze) Singer, Amer. Midl. Nat. 37: 116 (1947).

*Boletus nigrescens* Richon & Roze, Atl. Champ.: 191 (1888).

The name, *B. nigrescens*, was once listed as a synonym of *B. crocipodius* in the Chinese literature (11) and accepted by Tai (49). However, it was reported from China again as *L. nigrescens* later (1, 39, 60, 68), but most lacking specimen support except for Ying & Zang (68). The description by AAS (1) is similar to that of *L. extremiorientalis*. However,

*L. nigrescens* is a synonym of *L. crocipodius* (58, and see above under the species entry) and the following reported distribution may be referable to the latter.

Reported distribution: Hubei (39, 60, 68), Jiangsu (1, 39, 60, 68), Sichuan (1, 39, 60, 68) and Yunnan (1, 60, 68).

***Leccinum olivaceopallidum*** A.H. Sm., Thiers & Watling, Michigan Bot. 6: 125 (1967).

The fungus was reported with description and specimen citation from Hainan (6), but the recorded spore size of 10–15 × 4.0–5.8 µm differs from that of Smith & Thiers (48, as 16–19 × 5–6.5 µm). The species was recorded again but without description and specimen support (59). The distribution of this species in China, therefore, requires further study.

Reported distribution: Hainan (6, 59).

***Leccinum oxydabile*** (Singer) Singer, Amer. Midl. Nat. 37: 123 (1947).

*Krombholzia oxydabilis* Singer, Revue Mycol., Paris 3: 189 (1938).

This was recorded from China with description but without specimen citation by Mao (35). However, the description (pileus 5–14 cm diam., stipe 7–11 cm long) by Mao (35) is quite different from the North American description by Smith & Thiers (45) (pileus 2.5–3 cm diam., stipe 6–7 cm long). The distribution of this species in China is therefore doubtful.

Reported distribution: Qinghai (35).

***Leccinum potteri*** A.H. Sm., Thiers & Watling, Michigan Bot. 5: 138 (1967).

*Krombholziella potteri* (A.H. Sm., Thiers & Watling) Šutara, Česká Mykol. 36(2): 82 (1982).

The species was reported from Sichuan with both description and specimen support (14) or with only description (71). The descriptions of this species from Chinese material (14, 71) are congruent with that of Smith & Thiers (45).

Reported distribution: Sichuan (14, 71).

***Leccinum quercinum*** (Pilát) E.E. Green & Watling, Notes R. bot. Gdn Edinb. 29: 151 (1969).

*Leccinum aurantiacum* var. *quercinum* Pilát, *Mushrooms and other Fungi*: 6 (1961).

This was reported from China by Mao (35) with description and colour photos, but lacking specimen citation. The spore size (13–18.5 × 4–5 µm) given by Mao (35) is much larger than that given by Watling (58) for European material ((10–)12–15 × 3.5–5.5 µm). The occurrence of this species in China requires further investigation.

Reported distribution: Qinghai (35).

***Leccinum roseofractum*** Watling, Notes R. bot. Gdn Edinb. 28: 313 (1968).

*Krombholzia scabra* var. *roseofracta* Singer, Ann. Mycol. 40: 36 (1942). [See Watling (57)].

The fungus was reported with description and specimen citation from Hainan only (6, 59), but the recorded spore size of 10–13 × 5–6 µm (6) is clearly smaller than that of European material (57, as 15.5–17.5(–18) × 5–5.5(–6) µm). The identity of the Chinese records is therefore doubtful.

Reported distribution: Hainan (6, 59).

***Leccinum rubropunctum*** (Peck) Singer, Amer. Midl. Nat. 37: 117 (1947).

*Boletus rubropunctus* Peck, Ann. Rep. N. Y. State Mus. 50: 109 (1898).

There are several reports of this species from China with both description and specimen citation (10, as *B. rubropunctus*; 68, as *L. rubropunctum*) or with description only (1, 34, 39, 71), but the spore size varies in the Chinese literature, e.g. 11–14 × 4–4.5 µm (10), 11–17 × 4–4.5 µm (34) and 16–18 × 6–7 µm (68), which are all clearly smaller than that of North American material (45, as 17–21 × 5.5–7.5 µm). The distribution of this species in China requires confirmation.

Reported distribution: Sichuan (34, 39, 68, 71), Tibet (71) and Yunnan (1, 10, 34, 39, 68).

***Leccinum rubrum*** M. Zang, Acta bot. Yunnanica 8: 11 (1986).

According to Zang (72), the type location of this species is in Tibet and the holotypus is deposited in HKAS (HKAS 1986). Zang (73) recorded this species from Tibet again.

Reported distribution: Tibet (72, 73).

***Leccinum rufum*** (Schaeff.) Kreisel, Boletus SchrReihe 1: 30 (1984).

*Boletus rufus* Schaeff., Fung. Bavar. Palat. nasc. 2: 103 (1763), non *B. rufus* Schrad., J. F. Gmelin, Syst. Nat. 2(2): 1435 (1792).

This was recorded from China with description and a colour photo, but without specimen citation (35).

Snell (47) considered *L. rufum* a synonym of *B. aurantiacus* (= *L. aurantiacum*), accepted by Singer (41) and Tai (49), but Breitenbach & Kraenzlin (9) came to the opposite conclusion, regarding *L. aurantiacum* as the synonym of *L. rufum*. In fact, the basionym of *L. rufum*, *B. rufus* Schaeff., is a name not available for use because *B. rufus* Schrad. was combined as *Polyporus rufus* (Schrad.) Fr. and therefore sanctioned (16).

Reported distribution: Qinghai (35).

***Leccinum rugosiceps*** (Peck) Singer, Mycologia 37: 799 (1945).

*Boletus rugosiceps* Peck, Bull. N. Y. State Mus. 94: 20 (1904).

*Krombholzia rugosiceps* (Peck) Singer, Ann. Mycol. 40: 34 (1942).

This has been widely recorded with description and specimen support from both Taiwan (64) and the mainland (1, 22, 34, 35, 37, 39, 56, 61, 68, 70, 73, 75).

Ying et al. (70) considered that the Chinese material of *L. rugosiceps* had been misidentified as *L. crocipodius* sensu W.F. Chiu in the past, but Wang & Liu (54) regarded both *L. rugosiceps* sensu Y.Z. Ying et al. and *L. crocipodius* sensu W. F. Chiu as *L. extremiorientale*. In addition, the description of Taiwan material named as *L. rugosiceps* showed much smaller spores (64, 10–16 × 4–5 µm) than those from the mainland (e.g. 70) and from America (45, (14–)16–21 × 5–5.5 µm).

Reported distribution: Fujian (22), Gansu (75), Guangxi (34, 39, 70), Guizhou (61, 73), Sichuan (22, 34, 35, 39, 68, 70, 75), Taiwan (64), Tibet (1, 34, 35, 39, 56, 75) and Yunnan (1, 22, 34, 35, 39, 54, 56, 68, 73, 75).

***Leccinum scabrum*** (Bull.) Gray, Nat. Arr. Brit. Pl. (London) 1: 646 (1821).

*Boletus scaber* Bull., Herb. France 3: t. 132 (1783): Fr., Syst. mycol. 1: 393 (1821).

*Krombholzia scabra* (Bull.) P. Karst., Rev. Mycol. 3: 17 (1881).

*Gyroporus scaber* (Bull.) Quél., Enchir. fung. (Paris): 162 (1886).

*Ceromyces scaber* (Bull.) Murrill, Mycologia 1: 146 (1909).

*Krombholziella scabra* (Bull.) Maire, Publ. Inst. Bot. Barcelona 3: 46 (1937).

*Trachypus scaber* (Bull.) Romagn., Revde Mycol. 4: 141 (1939).

This is a widespread species and well recorded in China with description (1, 3, 22, 27, 30, 34, 35, 52, 61, 62, 70, 71, 75), or with specimen citation (32, 56, 72) or both (6, 14, 68).

Reported distribution: Anhui (22, 34, 39, 56, 70, 71, 75), Guangdong (34), Guizhou (1, 61, 71, 73, 75), Hainan (6, 59), Hebei (1, 22, 32, 39, 56, 71, 75), Heilongjiang (1, 22, 32, 34, 39, 56, 70, 71, 73, 75), Jilin (1, 22, 27, 30, 32, 34, 39, 56, 62, 70, 71, 73, 75), Jiangsu (1, 22, 32, 34, 39, 50, 56, 70, 71, 75), Liaoning (32, 34, 39, 71, 75), Qinghai (1, 22, 32, 34, 39, 56, 69, 71, 73, 75), Shanxi (1, 22, 32, 34, 39, 56, 69, 71, 75), Sichuan (1, 14, 22, 32, 34, 56, 69–71), Tibet (1, 32, 34, 56, 71, 73), Xinjiang (22, 34, 39, 73, 75), Yunnan (1, 3, 22, 32, 33, 56, 71, 75) and Zhejiang (1, 22, 32, 34, 39, 69, 71, 75).

***Leccinum subglabripes*** (Peck) Singer, Mycologia 37: 799 (1945).

*Boletus subglabripes* Peck, Bull. N. Y. State Mus. 2(8): 112 (1889).

*Suillus subglabripes* (Peck) Kuntze, Rev. Gen. Pl. 3(2): 536 (1898).

*Ceromyces subglabripes* (Peck) Murrill, Mycologia 1: 153 (1909).

*Krombholzia subglabripes* (Peck) Singer, Rev. Mycol. 3: 188 (1938).

This species has been reported or described with specimen support from China by various authors (1, 2, 33, 37, 39, 48, 56, 66, 68, 71, 73, 74), but its systematic position is controversial. Singer (40) transferred it to *Leccinum*, accepted by some Chinese mycologists (1, 33, 39, 71) and Hongo (20) in Japan. On the other hand, Smith & Thiers (44) maintained it in *Boletus* and that was accepted by Grund & Harrison (19) and Bessette et al. (5). In the Chinese literature, it was once reported in both *Boletus* and *Leccinum* (68).

Reported distribution: Sichuan (39, 56, 68, 71, 75), Taiwan (66), Tibet (37, 39, 56, 68, 71, 73, 74), Xinjiang (73), Yunnan (1, 2, 39, 56, 68, 71, 73, 75) and Zhejiang (2, 71).

***Leccinum subgranulosum*** A.H. Sm. & Thiers, Boletes of Michigan: 210 (1971).

This was first reported with description and specimen support from Sichuan by Ying & Zang (68), followed by Shao & Xiang (39). The description by Ying & Zang (68) is congruent with that of Smith & Thiers (45).

Reported distribution: Sichuan (39, 68).

***Leccinum subleucophaeum*** E.A. Dick & Snell, Mycologia 52: 453 (1960).

This was reported from China in a list of species without description and specimen citation (29).

Reported distribution: Tibet (29).



*Leccinum subleucophaeum* var. *minimum* C.S. Bi, in Bi, Li, Zheng & Li, Acta Mycol. Sin. 3: 201 (1984).

This variety was described from Guangdong and the holotypus is deposited in HMIGD (7). It was later reported from the same province again (39, 59).

Reported distribution: Guangdong (7, 39, 59).

*Leccinum subradicatum* Hongo, Mem. Shiga Univ. 23: 41 (1973).

This species was recorded from China with description and a colour photo, but lacking specimen support (35). However, the description of the Chinese material (35) is congruent with that of Hongo (21).

Reported distribution: Shanxi (35).

*Leccinum variicolor* Watling, Notes R. bot. Gdn Edinb. 24: 268 (1969).

This species has been reported several times from China with description, but without specimen support (33–35).

Reported distribution: Tibet (33–35).

*Leccinum versipelle* (Fr.) Snell, Lloydia 7: 58 (1944).

*Boletus versipellis* Fr., Boleti, Fungorum generis, illustratio: 13 (1835).

This fungus was reported with description but without specimen support from Shanxi (31, 34, 35) and then with specimen citation but no description from Gansu (32).

Singer (41) regarded it as a synonym of *L. aurantiacum*, accepted by Watling (58), but Breitenbach & Kraenzlin (9) considered it to be the correct name for *L. testaceoscabrum* Secr. ex Singer. The taxonomic status of this name is controversial.

Reported distribution: Gansu (32) and Shanxi (31, 34, 35).

## Conclusions

Among the 32 names, two are regarded as synonyms of other species of the genus (*L. nigrescens* and *L. rufum*) and one (*L. eximium*) is transferred to *Tylopilus*. The taxonomic status of three (*L. crocipodium*, *L. holopus* and *L. versipelle*) and the generic placement of two (*L. chromapes* and *L. subglabripes*) are controversial because of the simplicity and plasticity of morphological and anatomical characters.

Among the remaining 23 names, seven were reported without specimen support, i.e. *L. duriusculum*, *L. intusrubens*, *L. oxydabile*, *L. quercinum*, *L. subleucophaeum*, *L. subradicatum* and *L. variicolor*, and 17 with specimen citation, i.e. *L. albellum*, *L. ambiguum*, *L. atrostipitatum*, *L. aurantiacum*, *L. extremiorientale*, *L. griseum*, *L. hortonii*, *L. insigne*, *L. olivaceopallidum*, *L. potteri*, *L. rugosiceps*, *L. roseofractum*, *L. rubropunctum*, *L. rubrum*, *L. scabrum*, *L. subgranulosum* and *L. subleucophaeum* var. *minimum*. The descriptions of some of these taxa from China are different from those of the same taxa from Europe and elsewhere, i.e. *L. olivaceopallidum*, *L. oxydabile*, *L. quercinum*, *L. rugosiceps*, *L. roseofractum* and *L. rubropunctum*. A revision of these taxa is required to verify their occurrence in China.

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