

First records of mushroom species for Bulgaria

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Abstract. During field studies two interesting species were recorded for the first time from Bulgaria, namely *Pluteus aurantiorugosus* (on chestnut wood in Belasitsa Mt near the border with Greece) and *Suillus lakei*, an alien species, associated with *Pseudotsuga menziesii* in the western part of Stara Planina Mts. Another unrecorded in this country bolete, *Boletus cisalpinus*, was recognized on previously misidentified specimen from the Bulgarian Black Sea coast. Descriptions of both species are provided upon the Bulgarian samples.

Key words: Boletales, *Boletus*, *Pluteus*, *Suillus*, *Xerocomus*

Introduction

During the studies in connection with the investigation of the Bulgarian Boletales, one interesting North American species of *Suillus* was found in the country, namely *S. lakei*. This is the second alien species of that genus in Bulgaria (Assyov & Denchev 2004). This find is described herein, as well as the first Bulgarian records of *Pluteus aurantiorugosus* and *Boletus cisalpinus*.

Materials and Methods

Air dried specimens are preserved in the Mycological Collection at the Institute of Botany, Bulgarian Academy of Sciences (SOMF). Each sample is documented with a color photograph and a concise description. In the descriptions of the findings, the color nomenclature of Kornerup & Wanscher (1978) is used as much as possible. Microscopic features are observed and measured in water. Measurement values are presented below in the following manner: (min–) mean (–max). Spore volume (Vm) is calculated according to the formula $Vm = 4/3\pi \cdot (1/2Sw)^2 \cdot 1/2Sl$; Sl – spore length, Sw – spore width, and the result is estimated to an integer number (Breitenbach & Kränzlin 1991). Iodine reaction was performed by Melzer's solution (Kirk *et al.* 2001) on dried samples.

New records

Boletus cisalpinus (Simonini, Ladurner & Peitner) Watling & Hills, Kew Bull. 59(1): 169, 2004. – *Xerocomus cisalpinus* Simonini, Ladurner & Peitner, Mycol. Res. 107(6): 664, 2003. (Fig. 1)

Basidiomata small-sized, colours of exiccates inconspicuous. Pileal surface strongly cracked. **Basidiospores** (10–) 11.8 (–13.5) × (4–) 4.5 (–5) μm, ratio (2.3–) 2.6 (–3), spore volume (86–) 123 (–180) μm³, with 1-2 large oil drops, under light microscopy appearing glab, in SEM finely longitudinally striate. **Basidia** 4-spored, (23.5–) 26.3 (–29) μm. **Pileipellis** a palisadoderm, terminal cells mostly cylindrical, tapering towards the apex or cystidioid, exceptionally clavate, finely incrustated, (27–) 41.2 (–51) × (11–) 14.3 (–21) μm. **Context** with scattered thick-walled 'pruinatus-type' hyphae.

Habitat – thermophilous broadleaved forests.

Specimen examined: Southern Black Sea coast: Arkoutino locality nearly the town of Primorsko (Bourgas distr.), in a broadleaved forest, 17 Sep 1978, leg. G. Stoichev (sub *Xerocomus chrysenteron* (Bull. ex St.-Aman) Quél.), det. B. Assyov (14 273).

Distribution in Europe: Bulgaria, Great Britain, and Italy (Ladurner & Simonini 2003; Watling & Hills 2004).

Annotation. Easily distinguished from the rest of the species of *Boletus chrysenteron*-complex by its relatively small

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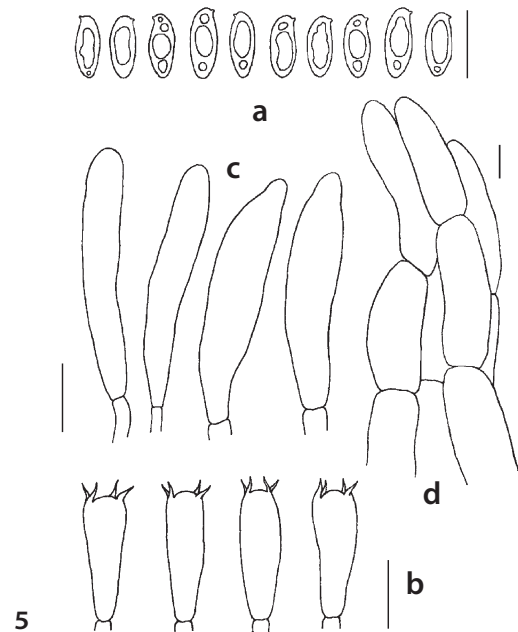
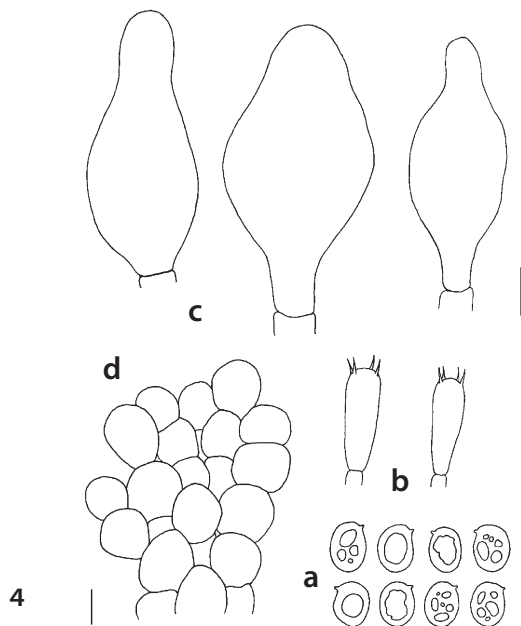
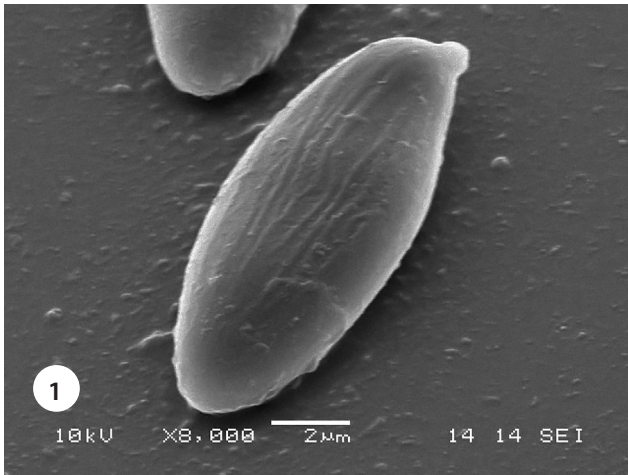


Fig. 1. Basidiospores of *Boletus cisalpinus*. Scale bar = 2 μ m. Fig. 2. Basidiomata of *Pluteus aurantiorugosus* in situ. Fig. 3. Basidiomata of *Suillus lakei* in situ. Fig. 4. Microscopic features of *Pluteus aurantiorugosus*: a – basidiospores, b – basidia, c – cystidia, d – pileipellis. Scale bars = 5 μ m (basidiospores), 10 μ m (basidia, cystidia), 20 μ m (pileipellis). Fig. 5. Microscopic features of *Suillus lakei*: a – basidiospores, b – basidia, c – cystidia, d – pileipellis. Scale bars = 10 μ m

basidiomata, the strongly cracking pileal surface and the finely striate spores. Special attention should be paid further, when recording the species of this group. Macroscopic characters seems to be quite variable within this complex, thus making the identification difficult and SEM is always required to distinguish the species.

Fresh basidiomata not studied. The following description is adapted from Ladurner & Simonini (2004). Detailed descriptions of this species are presented also by Peitner *et al.* (2003) and Watling & Hills (2005). Pileus 3.5-8 cm in diam, greyish, pale-ochre-brown with an olive shade when young, then greyish-brown-olive, with flesh-coloured to pinkish context visible in the cracks. Stipe 4.5-8 × 0.4-0.9 cm, mostly vivid yellow in the upper part, red downwards or sometimes entirely yellow; stipe surface floccose or fibrilous. Tubes and pores at first bright yellow, later dull greenish yellow, blueing when bruised. Flesh pale yellow in the pileus, vivid yellow or yellow with dull reddish tinges in the stipe, slowly but strongly blueing in the stipe, when exposed to air.

Pluteus aurantiorugosus (Trog) Sacc., Hedwigia 35(7): 5, 1896. – *Agaricus aurantiorugosus* Trog, Mitt. Naturf. Ges. Bern 32: 388, 1857. – *Pluteus leoninus* var. *coccineus* Masee, Brit. Fung. Fl. 2: 291, 1893. – *Pluteus coccineus* (Masee) J.E. Lange, Fl. Agaricina Danica 2: 88, 1937. (Figs 2, 4)

Pileus up to 4 cm in diam, at first campanulate, then convex, finely rugulose, cadmium orange, light orange, dark orange, persian orange, deep orange greyish orange, mandarin orange, carrot red, to reddish orange (5A7-8, 6A-B5-8, 7A7-8). **Stipe** up to 4 × 0.5 cm, fibrilous, pale yellow, pastel yellow or greyish yellow (1A-B3-4), sometimes somewhat brownish at the same base. **Flesh** whitish in the cap, yellowish in the stipe. **Gills** free, initially white, then pale pinkish at maturity. **Spore print** pink. **Spores** subglobose or ovoid, (5–) 5.4 (–5.5) × (4–) 4.2 (–4.5) μm, ratio (1.2–) 1.3 (–1.4), spore volume (42–) 51 (–61) μm³. **Basidia** 4-spored, (17–) 20.5 (–26.5) × (5.5–) 6.1 (–6.5) μm. **Cystidia** abundant, (27–) 39.4 (–55.5) × (16–) 23.6 (–31) μm. **Pileipellis** a hymeniderm of sphaerocytic, or rarely pyriform cells, (27–) 35.1 (–48) × (21.5–) 30.5 (–40.5) μm, ratio (1–) 1.2 (–1.5). **Microchemical reactions**: no reaction with Melzer's reagent observed in any part of the basidiomata.

Habitat – on dead stumps of deciduous trees.

Specimen examined: Belasitsa Mts: near the chalet of Belasitsa along the track to the waterfall, on dead stump of *Castanea sativa* Mill., 41°36' N, 23°18' E, alt. ca 720 m, 30 Sep 2003, leg. B. Assyov & H. Pedashenko, det. B. Assyov (25 443).

Distribution in Europe: Austria, Belgium, Belarus, Bulgaria, former Czechoslovakia, Denmark, France, Germany, Great Britain, Holland, Hungary, Poland, Russia, Slovenia, Spain, Sweden, and Turkey (Courtecuisse & Duhem 1995).

Annotation. Our specimen corresponds very well to the descriptions given by Printz (1992) and Citérin & Eysartier (1998).

Suillus lakei (Murrill) A.H. Smith & Thiers, Contrib. Monogr. North Am. *Suillus*, p. 34, 1964. – *Boletus lakei* Murrill, Mycologia 4: 97, 1912. – *Isocomus lakei* (Murrill) Singer, Rev. Mycol. 5: 6, 1940. – *Boletinus lakei* (Murrill) Singer, Farlowia 2: 257, 1945. – *Boletinus tridentinus* subsp. *landkammeri* Pilát & Svrček, Acta Mus. Nat. Pragae 5B: 1, 1949. – *Isocomus tridentinus* subsp. *landkammeri* (Pilát & Svrček) Pilát, Key, p. 56, 1951. – *Boletinus lakei* subsp. *landkammeri* (Pilát & Svrček) Pilát & Dermek, Hrib. Huby, p. 49, 1974. – *Boletinus landkammeri* (Pilát & Svrček) Bon, Docum. Mycol., 16: 66, 1986. – *Suillus lakei* var. *landkammeri* (Pilát & Svrček) Engel & Klofac, Schmier- und Filzröhrlinge, p. 52, 1996. (Figs 3, 5)

Pileus up to 15 cm diam, at first hemispherical, later convex, flat-convex to almost flat, surface dry or slightly viscid in wet weather, scaly; background flesh colored, greyish red, reddish white, shell pink, reddish grey, dull red (6B3, 7B3, 8A-B2-3); scales brown, cocoa brown, hazel, rust brown, light brown, Titian red, brick red, Somalis, reddish brown, fox color, English red, Madeira, mahogany brown (6E4-6, 7D-E5-7, 8D-E5-8); cap margin appendiculate, inrolled, with remnants of the partial veil. **Stipe** up to 9 × 2 cm, solid, cylindric or club-shaped, in the upper part with whitish fibrilous ring; stipe surface above the ring yellowish white, pale yellow, pastel yellow, sulphur yellow, primrose yellow, greenish yellow, light yellow, yellow, straw yellow, wax yellow, mustard yellow (1A2-8, 2A2-5, 3A-B4-6), below the ring dirty white, sometimes with pinkish tint, in places flushed pale yellow, pastel yellow, orange white, pale orange, orange grey, flesh color, greyish red, brownish orange, red-haired, clay or honey yellow (2-3A3-4, 5C4-5, 5D5-6, 6A-B2-3, 6C3-4, 7B2); basal mycelium white. **Flesh** yellowish white in the cap, lemon yellow in the stipe, somewhat yellowish green in the stipe base, mostly unchanging when exposed to the air, or sometimes reddening (mainly in the pileus) or slightly blueing in stipe (especially in old basidiocarps). **Tubes** up to 1 cm long, subdecurrent, somewhat dirty yellow initially, later rusty yellowish, unchanging when injured. **Pores** angular, up to 5 mm wide, concolorous with the tubes, darkening when bruised. **Smell** not distinctive. **Taste** mild or somewhat slightly acid. **Basidiospores** (9–) 9.7-10.5 (–12) × (3.5–) 3.9-4 (–5) μm, ratio (2.2–) 2.5-2.7 (–3.3), spore volume (53–) 79-90 (–135) μm³, with 1-2 large oil drops. **Basidia** 4-spored, (25–) 29.0 (–33.5) × (8.5–) 10.5 (–13) μm. **Cystidia** mostly clustered, rarely solitary, incrustated, (35.5–) 43.8 (–56) × (7.5–) 8.9 (–11) μm. **Pileipellis** differentiated as a basal gelatinous layer of interwoven hyphae and clusters of non-gelatinized hyphae of the pileal scales, terminal cells (16.5–) 25.9-28.4 (–44) × (8.5–) 10.1-19.7 (–30) μm, ratio (1–) 1.4-2.5 (–4.5); reddish pigment extracellular. **Macrochemical reactions**: NH₄OH 10 % with the flesh of the pileus and of the stipe pink; KOH 4 % with the flesh at first (ca 1 sec) pinkish, then greyish violet; FeSO₄ 10 % – no reaction observed with any part of the basidiocarps; no reaction with Melzer's reagent observed in any part of the basidiomata.

Habitat – strictly mycorrhizal associated with *Pseudo-tuga* spp.

Specimens examined: Western Stara Planina Mts: Sofia distr., nearly the village of Tseretsel, in a culture of *Pseudotsuga menziesii* (Mirbel) Franco, 42°92' N, 23°25' E, ca 865 m, 2 Nov 2004, B. Assyov & R. Vassilev (25 438-25 442).

Distribution. In Europe introduced through its host, and it has been recorded in Bosnia and Herzegovina, Bulgaria, Czech Republic, Germany, Italy (incl. Sicily), and Slovakia (Chinková & Pouzár 1955; Pilát & Dermek 1974; Alessio 1985; Lavorato & Puntillo 1989; Engel *et al.* 1996; Lavorato 1997, 2000; Galli 1998; Venturella 2004; Muñoz 2005). Records of *S. amabilis* (Peck) Singer from UK, Denmark, and Hungary will also belong here if this name is considered a synonym (for discussion on this matter see Smith & Thiers 1964; Engel *et al.* 1996; Watling & Hills 2005). Naturally occurring in North America (for details and bibliography see Smith & Thiers 1964; Thiers 1975; Both 1993). As an alien species also known from New Zealand (McNabb 1968; Segedin & Pennycook 2001).

Edibility. As known from the literature and evidenced by the authors, a good edible species, but of insignificant value, because of its rarity.

Annotation. *Suillus lakei* is the third alien basidiomycete species recorded in Bulgaria. *Suillus grevillei* (Klotzsch) Singer, mycorrhizal with larch (*Larix* spp.) has been found in few localities in Bulgaria, where larch is planted (Assyov & Denchev 2004). One more species, *Leucocoprinus birnbaumii* (Corda) Singer has been recently found as a pot fungus (Assyov unpubl.). However, no special research has been held up to date on alien basidiomycetes in Bulgaria.

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