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First records of *Xerocomus silwoodensis* (*Boletaceae*) in the Czech Republic

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The paper contains a report on the first collections of *Xerocomus silwoodensis* in the Czech Republic. The authors present a macro- and microscopic description of this species based on a study of material collected from one Bohemian and one Moravian locality. Characters distinguishing *X. silwoodensis* from related species of the genus *Xerocomus* Quél. s. str. (*X. ferrugineus*, *X. subtomentosus*, and *X. chrysonemus*) are discussed.

Key words: *Xerocomus silwoodensis*, *Boletaceae*, description, ecology, Czech Republic.

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Článek informuje o prvních nálezech hřibu topolového - *Xerocomus silwoodensis* v České republice. Autoři článku předkládají makroskopický a mikroskopický popis tohoto druhu založený na studiu materiálu sbíraného z jedné lokality v Čechách a jedné na Moravě. Jsou diskutovány znaky odlišující *X. silwoodensis* od příbuzných druhů rodu *Xerocomus* Quél. s. str. (*X. ferrugineus*, *X. subtomentosus* a *X. chrysonemus*).

INTRODUCTION

In August 2008, during a mycological survey in the vicinity of the town of Tovačov (Moravia, Czech Republic), Jiří Polčák found several fruitbodies of an interesting bolete. This collection was however not subsequently studied in detail. Another collection of twelve fruitbodies in various developmental stages was collected on 23 August 2013 by J. Polčák together with the third author of this paper. After detailed macro- and microscopic examination we identified this bolete as *Xerocomus silwoodensis* A.E. Hills, U. Eberh. & A.F.S. Taylor. Later, the species was also found at one locality in the Nymburk District, Bohemia.

The aim of this paper is to report on the first collections of the recently described species *X. silwoodensis* in the Czech Republic.

MATERIAL AND METHODS

Macroscopic characters of the bolete described below were studied on fresh fruitbodies growing at lake Donbas in the vicinity of the town of Tovačov and in Velký les forest near the villages of Nouzov and Dymokury. Some terms in our macroscopic description were used in accordance with the original description by Hills, Eberhardt & Taylor (see Taylor et al. 2007). Microscopic mounts were made from dried material in ammoniacal Congo Red and Melzer's solution and studied under an Olympus CX21 light microscope. Spore sizes of 30 spores measured (extremely large spores were omitted) are presented in the form of the main data range, complemented with extreme values in parentheses. Q_{av} is the average value of spore length and width ratio.

Herbarium specimens have been deposited in the Mycological Department, National Museum, Prague (PRM). Abbreviations of public herbaria follow Thiers (on-line).

Data on geological conditions were taken from maps and descriptions at www.geologicke-mapy.cz (Bokr on-line).

RESULTS

Xerocomus silwoodensis A.E. Hills, U. Eberh. & A.F.S. Taylor in Taylor, Hills, Simonini, Muñoz & Eberhardt, Mycol. Res. 111: 406, 2007. Figs. 1–11

Illustrations: Taylor et al. (2007): p. 407, fig. 3; Muñoz et al. (2008): p. 252, figs. A–F; Gelardi (2011): p. 29, figs. 1–3; Kibby (2012, 2013): p. 55, fig. 78, back cover; Hagara (2014): p. 529, upper and bottom right photo.

Etymology: The epithet *silwoodensis* is derived from the name of the type locality Silwood Park in the county of Berkshire in England.

Description

Macroscopic characters. Pileus at first widely hemispherical, then convex, plano-convex to pulvinate, even or somewhat rugose, 25–60(80) mm wide, margin incurved and sometimes slightly wavy when young, later regular or subregular. Coloration of pileus pale brown-ochre, brownish, ochre-brown, rusty brown, brown, dark brown, but most typically with rich bronze to red-brown or reddish brown shade, often unevenly coloured, lighter at the margin or sometimes at the centre (Figs. 2, 3, 7–9). Pileus surface dry, matt, initially velutinous to tomentose, sometimes finely cracking, but only in the cuticular layer (fissures do not reach the pileus context, Fig. 6), at times with dark reddish brown or dark brown spots caused by guttation drops in young fruitbodies (Figs. 5, 10); in places bitten by slugs or other animals initially whitish to yellowish, becoming slowly yel-

lowish ochre, rusty ochre to rusty orange, finally (after full pileipellis recovery) remaining dark reddish brown or dark brown (Figs. 7–9).

Tubes 5–12(15) mm long, at first adnexed to depressed around the stipe apex, later slightly decurrent, yellow-ochre or ochre at the beginning, then pale yellow to dirty straw-yellow, unchanging when bruised or cut (Fig. 11). Pores 0.5–2 mm large, small and roundish to somewhat labyrinthine when young, angular with age, initially sordid yellow with a brown to rusty brown tint particularly near the pileus margin, later paler and more vivid yellow, finally dull straw yellow, often with reddish to rusty brownish spots, unchanging, not bluing when bruised (Figs. 2, 3).

Stipe 25–70(120) × 10–20(25) mm, elongate-subclavate or almost cylindrical, usually more or less tapering at the base, sometimes rooting, almost concolorous with the pileus, but paler, at times with reddish brown striation on pale yellowish, yellowish pink, straw-yellow to buff background, smooth or with more or less distinct decurrent ribs at the apex or reddish brown reticulum formed by stretched meshes in the upper half, less frequently almost over the entire length (Figs. 2, 3, 8, 9, 11), sometimes the stipitipellis splitting and peeling both upwards and downwards when the fruitbody dries and matures (Fig. 7). Stipe base covered with whitish to yellowish tomentum (Figs. 2, 3, 10, 11), basal mycelium pale to vivid yellow (Figs. 4, 10).

Context firm, whitish to pale yellowish in the pileus, becoming yellow after some time when drying, sometimes with a light reddish or red-brownish line above the tubes, whitish to pale yellowish, partially mottled watery greyish pink in the stipe, occasionally somewhat reddish brown in the base or some parts of the peripheral layer of the stipe, not turning blue when cut (Figs. 3, 11). Colour of fresh tunnels of insect larvae at first yellow, becoming reddish brown or brownish. Taste mild to slightly acidulous, smell inconspicuous. Young fruitbodies sometimes produce guttation drops on the margin of the pileus surface and on the pores (Figs. 3, 5).

Microscopic characters. Basidiospores (9.0)9.8–13.0(15.0) × (4.0)4.5–5.5(6.0) µm, Q_{av} = 2.2–2.3, ellipsoid to cylindrical-fusiform, mostly with suprahilar depression in profile, with distinct hilar appendix, smooth under light microscope, with a 'bacilate' ornamentation under SEM (see Šutara 2008, fig. 4). Content of basidiospores often with oil guttulae, slightly dextrinoid (at least part of the spores becoming pale brownish) in Melzer's solution (Fig. 1A). Basidia 33–46 × 10–13 µm, clavate, mostly 4-spored (Fig. 1B). Pleurocystidia 42–62 × 8–13 µm, scattered, smooth and thin-walled, fusiform (Fig. 1C). Cheilocystidia similar to pleurocystidia, 33–60 × 8–14 µm (Fig. 1D). Clamps absent. Hymenophoral trama in well-developed state composed of a bilateral structure with distinctly gelatinised hyphae, distance between lateral stratum hyphae up to 3(4) µm. Caulohymenium present. Pileipellis composed of a trichoderm of more or less erect, not very intertwined hyphae, terminal cells mostly rounded, 8–17 µm in diam.

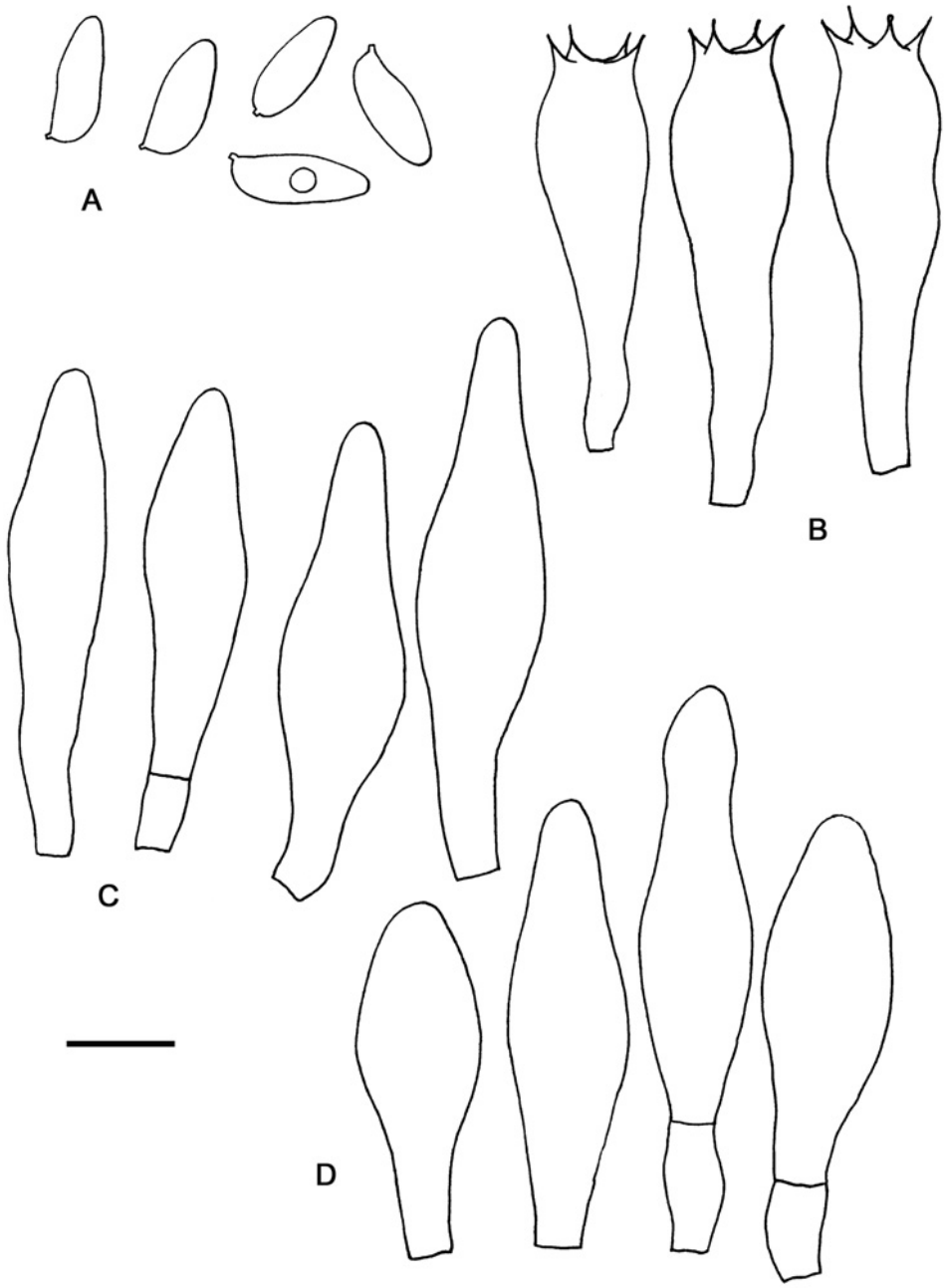

Fig. 1. *Xerocomus silwoodensis* (PRM 924312). **A** – basidiospores, **B** – basidia, **C** – pleurocystidia, **D** – cheilocystidia (scale bar = 10 µm). Del. M. Kříž.

Fig. 2. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

Fig. 3. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

Fig. 4. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

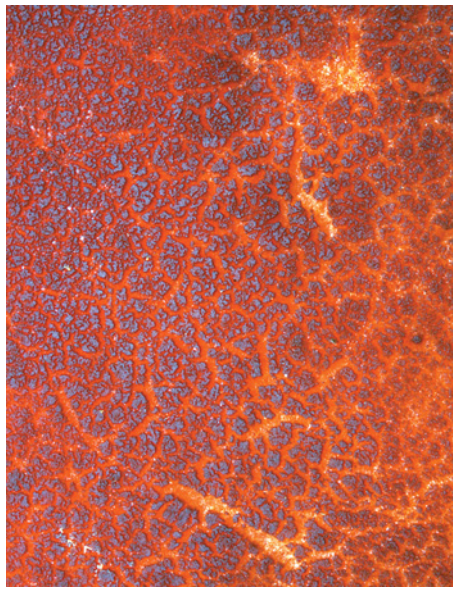

Fig. 5 (left). *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca. **Fig. 6 (right).** *Xerocomus silwoodensis*, Velký les forest, Nouzov near Dymokury, Bohemia, Czech Republic, 15 Sept. 2013, under *Populus tremula* and *Tilia*, leg. V. Janda, J. Rejsek, T. Pavelka & L. Opat (PRM 924745). Photo V. Janda.

Fig. 7 (left), 8 (right). *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

Fig. 9. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

Fig. 10. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 31 Aug. 2013, under *Populus*, leg. M. Graca, V. Balner & M. Kříž (PRM 924314). Photo M. Kříž.

Fig. 11. *Xerocomus silwoodensis*, lake Donbas, Tovačov, Moravia, Czech Republic, 23 Aug. 2013, under *Populus*, leg. J. Polčák & M. Graca (PRM 924312). Photo M. Graca.

Habitat. In damp, partially shaded places, where the ground vegetation is sparse or absent, in ectomycorrhizal association with *Populus* spp., solitary or in small groups, sometimes in small clumps consisting of two or three fruitbodies.

Material examined

Czech Republic. Bohemia. Nouzov near Dymokury (Středolabská tabule plateau, Central Bohemia), Velký les forest, near streambed of a brooklet, under *Populus tremula* and *Tilia*, 15 Sept. 2013, leg. V. Janda, J. Rejsek, T. Pavelka & L. Opat, det. V. Janda & M. Kříž (PRM 924745). – Moravia. Tovačov (Hornomoravský úval basin, Central Moravia), lake Donbas, under *Populus tremula*, 23 Aug. 2013, leg. J. Polčák & M. Graca, det. M. Graca, M. Kříž & V. Janda (PRM 924312); ibid., under *Populus tremula*, *Betula*, *Fraxinus*, *Quercus* and *Tilia*, 31 Aug. 2013, leg. & det. M. Graca, V. Balner & M. Kříž (PRM 924314).

Phenology and ecology

The fructification of *Xerocomus silwoodensis* takes place from July to October (Taylor et al. 2007); our material was collected in August and September. The locality near the town of Tovačov lies in a flat landscape and is situated at the NE edge of lake Donbas (former sandpit, at present water reservoir), near the confluence of the Morava and Bečva rivers. It is a grove of *Populus tremula* mixed with other deciduous trees, e.g. *Populus alba* (possibly *Populus* × *canescens*), *Fraxinus excelsior*, *Tilia cordata*, *Salix alba*. The undergrowth also consists of *Quercus*, *Betula*, *Alnus* and shrubs. Bushes did not occur directly on the sites with *Xerocomus silwoodensis*, but locally form a dense shrub layer (*Cornus sanguinea* and *Prunus padus*). The herb layer is generally sparse, with occurrence of e.g. *Rubus* sp., *Torilis japonica*, *Hypericum* sp., etc. The locality lies on alluvial sediment with sand and gravel, where the soil appears to be moist and clayey. The altitude is 200 m a.s.l. Fruit bodies grew on bare soil or among fallen leaves.

Some other macromycetes found together with *Xerocomus silwoodensis* were *Leccinum duriusculum* Schulzer, *L. rufum* (Schaeff.) Kreisel [= *L. aurantiacum* (Bull.) Gray sensu auct. plur., non Bull.], *Xerocomellus cisalpinus* (Simonini, H. Ladurner & Peintner) Klofac, *X. ripariellus* (Redeuilh) Šutara, *Lactarius lacunarum* Romagn. ex Hora, *Russula medullata* Romagn., and *R. parazurea* Jul. Schäff.

The Bohemian locality in the district of Nymburk lies near the village of Dymokury, which is flatland as well. The place is somewhat damp and overshadowed by deciduous trees in a slightly sloping shallow valley of a brooklet. The forest is predominated by *Tilia* with admixture of *Quercus* and individuals of *Populus tremula*, and bushes are absent. The locality is covered by moss and grass in places. The collected fruitbody grew on the ground in sparse leaf litter. The geological bedrock in the area is formed by calcareous claystones and marlites. The locality lies on alluvial sediment at an altitude of 210 m a.s.l.

DISCUSSION

Xerocomus silwoodensis is a recently described species based on both molecular and morphological studies (Taylor et al. 2006, 2007). The species belongs together with *X. subtomentosus* (L.: Fr.) Quél., *X. ferrugineus* (Schaeff.) Bon and *X. chrysonemus* A.E. Hills & A.F.S. Taylor to the genus *Xerocomus* Quél. s. str., to a group sometimes also called the *X. subtomentosus* complex (for more details, see e.g. Šutara 2008 and Janda et al. 2013).

Our studied material is in good accordance with the original description in both macroscopic and microscopic characters. Also several characters important according to some authors (e.g. Taylor et al. 2006) for infrageneric delimitation within the genus *Xerocomus* s. str., such as spore Q_{av}, flesh colour and colour of the basal mycelium were observed.

Characters important to distinguish *X. silwoodensis* from other European species of genus *Xerocomus* can be summarised as follows.

(1) Context in pileus whitish to pale yellowish becoming yellow when drying, ± whitish and partially mottled greyish pink in the stipe, not bluing when cut (see also Muñoz et al. 2008, p. 252, fig. C).
(2) Colour of basal mycelium pale to vivid yellow.
(3) Spore Q_{av} value ± 2.3 (Taylor et al. 2007; in our measurements 2.2–2.3).
(4) Pileus colour most typically with rich bronze to red-brown or reddish brown shade.
(5) Stipe tapering at the base, often deeply rooting.
(6) Habitat in damp, partially shaded places, in association with *Populus* species.

The species can be mistaken for any of the above-mentioned related taxa of genus *Xerocomus* s. str., especially *X. ferrugineus*, which is both molecularly and morphologically the closest species.

Xerocomus ferrugineus differs from *X. silwoodensis* in the following characters: whitish to pale cream context without a tendency to yellow in the pileus when drying, growth under other ectomycorrhizal partners, both conifers and deciduous trees like *Picea*, *Betula*, *Fagus* and *Salix*, spores on average narrower (Taylor et al. 2007, tab. 2) with a Q_{av} value ≥ 2.5 (Taylor et al. 2006, tab. 4).

Xerocomus subtomentosus is well distinguished from *X. silwoodensis* by pinkish brown shades in the context of the lower part of stipe, blue oxidation in both hymenophore and pileus context above tubes and at stipe apex when cut, whitish basal mycelium and basal tomentum, on average longer spores (Taylor et al. 2007) with a Q_{av} value of usually ± 2.4 (Taylor et al. 2007, tab. 2) and growth under *Quercus* (Šutara et al. 2009), according to Ladurner & Simonini (2003) also under e.g. *Castanea* and *Corylus*.

Xerocomus chrysonemus differs from *X. silwoodensis* especially in the yellow-olive, ochre-olive or brown-olive pileus colour, bright yellow context in the lower third of the stipe immediately after cut, golden yellow basal mycelium, symbiosis with *Quercus* and type of hymenophoral trama, which rather represents a transition between the boletoid and phylloporoid types (Janda et al. 2013; for classification of tramal structures in the *Boletaceae* and *Suillaceae* families, see Šutara 2005).

X. silwoodensis is probably a rare but widespread taxon, which is overlooked in the field due to resemblance with other taxa of genus *Xerocomus* s. str. Currently we have only very limited data related to the distribution of *X. silwoodensis* in the Czech Republic, thus the overall distribution of this species is not yet sufficiently known. We therefore propose including this bolete into the next edition of the Red list of macromycetes of the Czech Republic and classifying it in the data deficient (DD) category. We expect the species to be found at other sites in the Czech Republic.

Other available data on the distribution of *X. silwoodensis* in Europe are from the United Kingdom (Taylor et al. 2007, Hills 2008), Spain (Muñoz et al. 2008), Italy (Taylor et al. 2007) and Slovakia (J. Kuriplach, pers. comm. 2014).

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