

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

VÁCLAV JANDA^{1*}, MARTIN KRÍŽ², JIŘÍ REJSEK³

¹Ondříčkova 29, CZ-130 00 Praha 3, Czech Republic; janda.vaclav@gmail.com

²National Museum, Mycological Department, Cirkusová 1740, CZ-193 00 Praha 9,
Czech Republic; martin_kriz@nm.cz

³Poštovská 88, CZ-289 30 Rožďalovice, Czech Republic; jiri.rejsek@seznam.cz

*corresponding author

Janda V., Kríž M., Rejsek J. (2013): First records of *Xerocomus chrysonemus* (*Boletaceae*) in the Czech Republic. – *Czech Mycol.* 65(2): 157–169.

The paper details the first collections of *Xerocomus chrysonemus* in the Czech Republic. The authors present a macro- and microscopic description of this species based on the study of material collected at five different localities. Characters distinguishing *X. chrysonemus* from related species of the genus *Xerocomus* s. str. (*X. ferrugineus*, *X. subtomentosus*, and *X. silwoodensis*) are discussed. The Latin name *X. chrysonemus* is a combination of the words ‘*chryso*’ = golden and ‘*nema*’ = mycelium, which very accurately describes the characteristic feature of this species, the golden yellow mycelium at the base of stipe.

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

Janda V., Kríž M., Rejsek J. (2013): První nálezy druhu *Xerocomus chrysonemus* (*Boletaceae*) v České republice. – *Czech Mycol.* 65(2): 157–169.

Článek informuje o prvních nálezech druhu *Xerocomus chrysonemus* v České republice. Autoři článku předkládají makroskopický a mikroskopický popis tohoto druhu založený na studiu sbíraného materiálu z pěti různých lokalit. Jsou diskutovány znaky odlišující *X. chrysonemus* od příbuzných druhů rodu *Xerocomus* s. str. (*X. ferrugineus*, *X. subtomentosus* a *X. silwoodensis*). Latinské jméno druhu *X. chrysonemus* spočívá v kombinaci slov „*chryso*“ = zlatý a „*nema*“ = mycelium, což velmi přesně vystihuje jeden z charakteristických znaků tohoto druhu: zlatožluté mycelium na bázi třeně. Navrhujeme pro tento druh české jméno hřib zlatokořený.

INTRODUCTION

In August 2011, during a mycological survey of the locality Kněžičky Game Preserve (also known as Žehuňská Game Preserve) in Central Bohemia (Czech Republic), Jiří Rejsek, Josef Šutara and Václav Janda found a fruit body of a small inconspicuous bolete. This bolete resembled *Xerocomus subtomentosus* (L.: Fr.) Quél., but its basal tomentum was golden yellow and its context was not bluing when cut. After a detailed examination in the following days, Josef Šutara identified this bolete as *Xerocomus chrysonemus* A.E. Hills & A.F.S. Taylor, a species

described from England in 2006 (Taylor & al. 2006). Since then we have focused on obtaining further finds of *Xerocomus* sp. with the characteristic features of *X. chrysonemus*. Subsequent study revealed that other collections of this species had also been acquired by other collectors and from other localities, however, this material had often not been satisfactorily identified.

The aim of this paper is to inform about our knowledge of the newly observed species *X. chrysonemus* in the Czech Republic.

MATERIAL AND METHODS

Macroscopic characters of the bolete described below were studied on fresh fruit bodies growing at several localities, especially within the above-mentioned Kněžičky Game Preserve territory. Some terms in our macroscopical description were used in accordance with the very accurate original description by Hills & Taylor (see Taylor & al. 2006). 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 20 spores were measured (extremely large spores were omitted) and are presented in the form of the main data range, complemented with extreme values in parentheses. The measurements summarise values obtained from fruit bodies from three different localities. The Qav value means the average value of spore length and width ratio.

Herbarium specimens have been deposited in the private herbaria of some collectors (abbreviations used: JŠ = herb. J. Šutara, VJ = herb. V. Janda), the Mycological Department, National Museum, Prague (PRM), Museum of Southern Bohemia, České Budějovice (CB) and the Museum of Eastern Bohemia, Hradec Králové (HR). 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 chrysonemus A.E. Hills & A.F.S. Taylor in Taylor, Hills, Simonini, Both & Eberhardt, Mycol. Res. 110(3): 283, 2006. Figs. 1–9

Illustrations: Taylor & al. (2006): p. 284 fig. 3A, 3B; Hills (2007): p. 40-42, fig. 22-28; Hills (2008): p. 84, fig. 4; Muñoz et al. (2008): p. 258, fig. A-E; Chalange (2011): p. 286, fig. 15; Kibby (2012): p. 55, fig. 76.

Description

Macroscopic characters. Pileus at first almost hemispherical, with inrolled margin when young, then convex to pulvinate, 25–50(75) mm wide, yellow-ochre to yellow-olive, greyish tawny, fulvous, often very variable in colour depending on weather conditions, brownish when injured. Pileus surface dry, matt, initially tomentose, becoming glabrous with age. Subcuticular layer of context brownish to red-brown. Tubes 5–10(12) mm long, adnexed to slightly depressed around the stipe and often decurrent with a tooth, initially bright yellow, soon with a greenish tinge, not bluing when cut. Pores bright yellow, golden yellow to amber yellow, usually with a narrow brownish zone at the pileus margin, large (1–2 mm wide) and angular in age, unchanging, not bluing, but after some time slightly browning when bruised. Stipe 30–50(70) × 5–15(20) mm, slender to more or less fairly robust, tapered below, bright yellow when young, resembling the colour of the pores, soon toning down, finally dull straw with red-brown spots, sometimes with an incomplete reticulum forming a stretched net. Stipe base covered with pale yellowish to golden yellow tomentum, basal mycelium golden yellow. Context very pale yellowish white to pale lemon yellow in the pileus, bright yellow in the lower third of the stipe, not turning blue when cut. Taste mild, smell inconspicuous.

Microscopic characters. Basidiospores (8)9–12.5(13.5) × (4)4.5–6 µm, $Q_{av} = 1.95–2.25$, ellipsoid to ellipsoid-fusiform, mostly with suprahilar depression in profile, with distinct hilar appendix, smooth under light microscope, often with one or more oil guttules inside, moderately dextrinoid (becoming pale reddish brown) in Melzer's solution. Basidia 32–54 × 10–12.5(14) µm, clavate, mostly 4-spored, sterigmata 4–7 µm long. Pleurocystidia 42–62 × 8–11 µm, scattered, smooth and thin-walled, fusiform. Cheilocystidia similar to the pleurocystidia, possibly somewhat shorter and thicker. Clamps absent. Hymenophoral trama in fully developed state possessing a bilateral structure with distinctly gelatinised lateral stratum hyphae, but only slightly divergent as in the phylloporoid type. Distance between lateral stratum hyphae variable, frequently up to 5 µm, possibly up to 7(9) µm, but the values are conditioned by precision of the transverse section and are vulnerable to the excessive pressure on the cover slip. Distance between mediostratum hyphae is also observable but considerably smaller, up to 1–3 µm. Caulohymenium present, caulocystidia occasionally septate. Pileipellis a trichoderm.

Habitat. In damp places covered with rotten leaf litter, moss or grass in oak-hornbeam and oak forests in ectomycorrhizal association with *Quercus* sp., most commonly with *Quercus robur*, solitary or in small groups, sometimes even in small clumps comprising two or three fruit bodies. The geological bedrock consists of calcareous claystone, marlite and calcareous siltstone, the altitudinal range is from 200 to 260 m a.s.l.

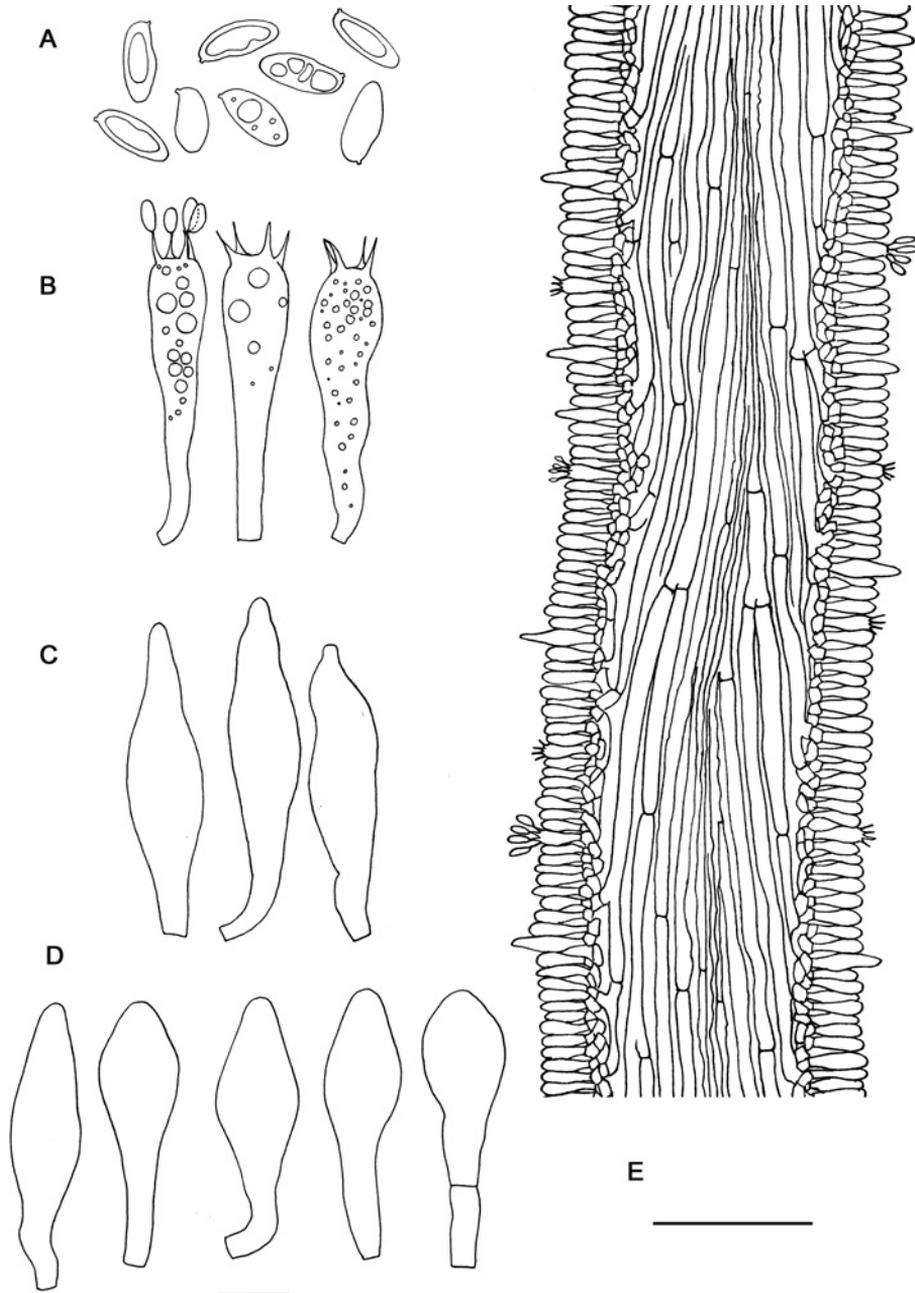


Fig. 1. *Xerocomus chrysonemus* (PRM 861380). A – basidiospores, B – basidia, C – pleurocystidia, D – cheilocystidia (scale bar = 10 μ m), E – longitudinal section of hymenophoral trama (scale bar = 100 μ m). Del. M. Kříž.



Fig. 2. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 20 Aug. 2012, under *Quercus*, leg. M. Kríž (PRM 861379). Photo M. Kríž.



Fig. 3. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 10 Sept. 2011, under *Quercus*, leg. J. Šutara, V. Janda & J. Rejsek (JŠ 5897). Photo V. Janda.



Fig. 4. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 15 Sept. 2012, under *Quercus*, leg. V. Janda & J. Rejsek (VJ150912-01). Photo V. Janda.



Fig. 5. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 15 Sept. 2012, under *Quercus*, leg. V. Janda & J. Rejsek (VJ150912-01). Photo V. Janda.



Fig. 6. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 10 Sept. 2011, under *Quercus*, leg. J. Šutara, V. Janda & J. Rejsek (JŠ 5897). Photo V. Janda.



Fig. 7. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 1 Oct. 2011, under *Quercus*, leg. V. Janda & J. Rejsek (VJ011011-02). Photo V. Janda.



Fig. 8. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 24 Sept. 2011, under *Quercus*, leg. V. Janda & J. Rejsek (VJ240911-01). Photo V. Janda.



Fig. 9. *Xerocomus chrysonemus*, Czech Republic, Kněžičky, Kněžičky Game Preserve, 28 Sept. 2011, under *Quercus*, leg. J. Šutara, V. Janda & J. Rejsek (JŠ 5919). Photo V. Janda.

Material examined

Czech Republic, Bohemia. Kněžičky (Central Bohemia, Středolabská tabule plateau), Kněžičky Game Preserve, 22 July 2009, under *Quercus*, leg. & det. M. Kříž, rev. J. Šutara (JŠ 6165); *ibid.*, 20 Aug. 2011, under *Quercus*, leg. J. Rejsek, J. Šutara & V. Janda, det. J. Šutara (JŠ 5868); *ibid.*, 2 Sept. 2011, under *Quercus*, leg. & det. J. Šutara (JŠ 6166); *ibid.*, 10 Sept. 2011, under *Quercus*, leg. J. Šutara, V. Janda & J. Rejsek, det. J. Šutara (JŠ 5897); *ibid.*, 24 Sept. 2011, under *Quercus*, leg. & det. V. Janda & J. Rejsek (VJ 240911-01, VJ 240911-02); *ibid.*, 28 Sept. 2011, under *Quercus*, leg. J. Rejsek, J. Šutara & V. Janda, det. J. Šutara (JŠ 5919); *ibid.*, 1 Oct. 2011, under *Quercus*, leg. & det. V. Janda & J. Rejsek (VJ 011011-01, VJ 011011-02); *ibid.*, 25 July 2012, under *Quercus*, leg. & det. V. Janda & J. Rejsek (VJ 250712-01); *ibid.*, 20 Aug. 2012, under *Quercus*, leg. & det. M. Kříž (PRM 861379); *ibid.*, 9 Sept. 2012, under *Quercus*, leg. V. Janda & L. Opat, det. V. Janda (VJ 090912-01, VJ 090912-02); *ibid.*, 13 Sept. 2012, under *Quercus*, leg. & det. J. Rejsek (PRM 861380, PRM 861381); *ibid.*, 15 Sept. 2012, under *Quercus*, leg. & det. V. Janda & J. Rejsek (VJ 150912-01); *ibid.*, 31 Aug. 2013, under *Quercus*, leg. L. Opat & V. Janda, det. V. Janda (CB18400). – Nouzov (Central Bohemia, Středolabská tabule plateau), south bank of Komárovský pond, 17 Aug. 2012, under *Quercus*, *Carpinus* and *Tilia*, leg. & det. J. Rejsek. – Dománovice (Central Bohemia, Středolabská tabule plateau), forest plantations north-east of the village (called „Na rovných“ or „Slánské“), 21 July 2009, under *Quercus*, leg. J. Zámečník, det. M. Kříž (HR 85460); *ibid.*, 22 Aug. 2013, under *Quercus*, *Carpinus* and *Betula*, leg. M. Kříž & P. Mikuš, det. M. Kříž (PRM 922671). – Dětenice (East Bohemia, Jizerská tabule plateau), "U rybníčka" forest, 17 Sept. 2011, under *Quercus*, *Carpinus*, leg. & det. L. Opat (VJ 170911-01). – Horní Ředice (East Bohemia, Východolabská tabule plateau), Žernov forest (outside Žernov Nature Reserve), 30 July 2012, under *Quercus* and *Carpinus*, leg. J. Kramoliš, det. T. Tejklová, rev. M. Kříž (HR 91362).

Phenology, ecology and distribution

According to our observations, the fructification of *Xerocomus chrysonemus* takes place from the second half of July to the first third of October (21 July – 1 October) with its maximum in September. The typical habitat of *X. chrysonemus* is thermophilic deciduous forests with a dominant presence of oaks in a more or less flat landscape on calcareous soils. Localities can be categorised as economic forests, but have a tree composition corresponding to the original vegetation and with long-term stable conditions. Unfortunately, the stands of old oaks, constituting a favourable environment for *X. chrysonemus* and other rare thermophilous fungi, are threatened by felling, since none of the above-mentioned localities are situated in a protected area.

The most frequent fungal species found together with *X. chrysonemus* are *Leccinum crocipodium* (Letell.) Watling and *Leccinum aurantiacum* (Bull.) Gray [= *Leccinum quercinum* (Pilát) ex Pilát & Dermek], especially because of their widespread distribution at the studied localities. In some cases we have observed other significant thermophilous bolete species together with *X. chrysonemus* which are very characteristic of thermophilous habitats near the towns of Nymburk, Poděbrady and Hradec Králové, e.g. *Rubinoboletus rubinus* (W.G. Sm.) Pilát & Dermek, *Aureoboletus gentilis* (Quél.) Pouzar, *Boletus appendiculatus* Schaeff., *B. fechtneri* Velen., *B. radicans* Pers.: Fr., *B. queletii* Schulzer, *B. luridus* Schaeff.: Fr., *B. satanas* Lenz, *B. legaliae* Pilát & Dermek, *B. rhodopurpureus* Smotl., and *Hemileccinum impolitum* (Fr.) Šutara.

The largest locality of *X. chrysonemus* is a forest complex known as Kněžičky Game Preserve located approximately between the villages Dlouhopolsko, Kněžičky and Lovčice to the north, and Žehuň, Choťovice and Zbraň to the south. It is a relatively planar area at altitudes of 215 to 261 m a.s.l. with many enclaves of sparse oak forests on calcareous bedrock which is formed by silicified calcareous claystones and marlites. Although local thermophilous forests often suffer from long dry weather periods, many suitable damp localities (maintaining the moisture over dry seasons) in various places across the complex (especially in terrain depressions including even the highest places in the southern part of the complex) are suitable for *X. chrysonemus*. To date we have registered 11 small microlocalities of the studied species at different, isolated and relatively distant sites, but we consider Kněžičky Game Preserve to be one homogeneous macrolocality. The minimum distance between separate microlocalities is ca. 100 m. All the sites are located in sparse oak forests, especially with *Quercus robur*, at altitudes from 240 to 260 m a.s.l. We have collected or observed fruit bodies at some microlocalities repeatedly in 2011 and 2012. Because of the availability of suitable habitats, we expect further microlocalities to be discovered within this area in the future.

The second locality is a deciduous forest at the bank of Komárovský pond near the villages of Dymokury and Nouzov (Central Bohemia, Středolabská tabule plateau). The third author of this paper has found two small sites where *X. chrysonemus* occurs within this area. Both sites are located on the south bank of a pond in sloping terrain with *Quercus*, *Carpinus* and *Tilia*. Its altitude is approximately 200 m a.s.l. and its geology is similar to the first locality.

The third locality is located in the surroundings of the villages of Prodašice and Dětenice. We have registered only one site next to a small forest pond, discovered and documented by Lubomír Opat. This deciduous forest with *Quercus* and *Carpinus* has an altitude of approximately 230 m a.s.l. and the local bedrock is formed by calcareous claystones, marlites and calcareous siltstones.

The fourth and fifth localities (see Material examined – Dománovice, Horní Ředice) were confirmed after a revision of two collections deposited in the Museum of Eastern Bohemia, Hradec Králové. Their altitudes are 220 m and 245 m a.s.l., respectively.

DISCUSSION

Xerocomus chrysonemus belongs to the genus *Xerocomus* Quél. s. str., which is characterised by its general xerocomoid appearance, fruit bodies relatively slender and less fleshy, pores at maturity angular, relatively large (ca. 1–3 mm), tubes at most 15 mm long, nearly adnate or somewhat depressed around the stipe

and decurrent with a tooth, pileus surface neither viscid nor sticky when wet and context in stipe base relatively firm (Šutara 2008). We consider the bacillate surface ornamentation of the spores detectable with a scanning electron microscope (for SEM photo of the spores of *X. chrysonemus* and more details, see Šutara 2008) and the pileipellis composed of a trichoderm from an early stage to be characteristic microscopic features grouping species of the genus *Xerocomus* s. str. However, as far as the hymenophoral trama is concerned, our microscopic observations showed that *X. chrysonemus* has a somewhat different hymenophoral trama than *X. subtomentosus* and *X. ferrugineus*, whose trama is considered phylloporoid. In our material of *X. chrysonemus* we observed distinctly gelatinised lateral stratum hyphae, which is in contradiction with the definition of the phylloporoid type. The tube trama may be interpreted as a transition between the boletoid and phylloporoid types, but certainly not truly phylloporoid, which is usually mentioned as typical of species of the genus *Xerocomus* s. str. such as *X. subtomentosus* and *X. ferrugineus* (for a classification of tramal structures in the *Boletaceae* and *Suillaceae* families, see Šutara 2005). During the preparation of this paper we consulted this fact with J. Šutara. Based on his own examination he confirmed that the hymenophoral trama of *X. chrysonemus* is very interesting and will require further detailed study.

The most typical characters of *X. chrysonemus* are the yellow-ochre to yellow-olive pileus colour, golden yellow basal tomentum and basal mycelium, context not bluing when cut, spores Qav value ≤ 2.3 (Taylor & al. 2006; in our measurements 1.95–2.25) and the above-mentioned distinctly gelatinised lateral strata of the tube trama with hyphae distinctly distant from each other.

The species could be mistaken for other related taxa of the genus *Xerocomus* s. str., especially *X. ferrugineus* (Schaeff.) Bon, *X. subtomentosus* (L.: Fr.) Quél. – including the infraspecific taxon *X. subtomentosus* var. *luteolus* (Velen.) Šutara – and *X. silwoodensis* A.E. Hills, U. Eberh. & A.F.S. Taylor. The group consisting of the above-mentioned related species is called the *Xerocomus subtomentosus* complex (e.g. Taylor et al. 2006, 2007).

Xerocomus ferrugineus differs from *X. chrysonemus* in the following characters: whitish to pale crème colour of context, presence of thin brown line of context above the tubes in young fruit bodies, growth under other ectomycorrhizal partners (both conifers and deciduous trees like *Picea*, *Betula*, *Fagus* and *Salix*), and spores with a Qav value ≥ 2.5 (Taylor & al. 2006, tab. 4).

Xerocomus subtomentosus is well distinguished from *X. chrysonemus* by pinkish brown (not yellow) shades of the context in 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, and spores with a Qav value of usually > 2.3 (Taylor & al. 2006, tab. 4).

Xerocomus silwoodensis differs from *X. chrysonemus* especially in the pileus colour tending to have richer red-brown tones, a stipe often radicating deeply into the substrate, and symbiosis with *Populus* species (Taylor & al. 2007). *Xerocomus silwoodensis* is a recently described species, probably overlooked in the field due to its resemblance with other taxa of *Xerocomus* s. str.

The paper with the original description of *X. chrysonemus* mentions possible confusion with young fruit bodies of *Boletus moravicus* Vacek (cited as *Xerocomus moravicus*, Taylor & al. 2006). The distinguishing characters of *B. moravicus* can be summarised as follows: predominantly whitish context with brownish tinge at the very base, both tubes and pores pale cream to faintly yellowish, and typical intense and pleasant odour of almost all fruit bodies resembling a mixture of dill and coco, sometimes even with a slight admixture of vanilla or cinnamon (Šutara et al. 2009).

Although we have some partial data on the distribution of *X. chrysonemus* in Bohemia, the overall distribution of this species in the Czech Republic is not yet sufficiently known, hence we propose to add this bolete to the next edition of the Red list of macromycetes of the Czech Republic and classify it in the data deficient (DD) category. The main reason is that the species is well integrated into the thermophilous fungal communities with very rare and protected species, and also because all above-mentioned localities are situated outside protected areas.

Other available data from Europe on the distribution of *X. chrysonemus* are from Hampshire, Kent and Buckinghamshire counties, United Kingdom (Taylor & al. 2006, Hills 2008), Cantabria, Álava and Vizcaya provinces, Spain (Muñoz & al. 2008), and from Île-de-France – Seine-et-Marne and Essonne departments, France (Chalange 2011).

ACKNOWLEDGEMENTS

We wish to thank Josef Šutara for his invaluable advices and revising the manuscript. We also thank Tereza Tejklová from the Museum of Eastern Bohemia, Hradec Králové for kindly lending herbarium specimens. We are very grateful to Jan Kramoliš and Lubomír Opat for valuable information and excellent field cooperation. This work was financially supported by the Ministry of Culture of the Czech Republic (DKRVO 2013/06, National Museum, 00023272).

REFERENCES

- BOKR P. (on-line): Geologické a geovědní mapy. – <http://www.geologicke-mapy.cz>. [accessed June 2013]
[in Czech]
- CHALANGE R. (2011): Quelques espèces de basidiomycètes peu communes récoltées en Île-de-France. – *Bull. Soc. Mycol. Fr.* 127(3-4): 225–293.
- HILLS A.E. (2007): *Boletus* in the British Isles Updating British Species. – *Pagine di Micologia* 27: 21–25, 35–42.
- HILLS A.E. (2008): The genus *Xerocomus*. A personal view, with a key to the British species. – *Field Mycol.* 9(3): 77–96.
- KIBBY G. (2012): *British Boletes with keys to species.* – 79 p. London.
- MUÑOZ J.A., CADIÑANOS AGUIRRE J. A., FIDALGO E. (2008): Contribución al Catálogo del Género *Xerocomus* en la Península Iberica. – *Bol. Soc. Micol. Madrid* 32: 249–277.
- ŠUTARA J. (2005): Central European genera of the *Boletaceae* and *Suillaceae*, with notes on their anatomical characters. – *Czech Mycol.* 57(1-2): 1–50.
- ŠUTARA J. (2008): *Xerocomus* s.l. in the light of the present state of knowledge. – *Czech Mycol.* 60(1): 29–62.
- ŠUTARA J., MIKŠÍK M., JANDA V. (2009): Hřibovité houby. Čeled *Boletaceae* a rody *Gyrodon*, *Gyroporus*, *Boletinus* a *Suillus* [Boletoid fungi. Family *Boletaceae* and genera *Gyrodon*, *Gyroporus*, *Boletinus* and *Suillus*]. – 296 p. Praha. [in Czech]
- TAYLOR A.F.S., HILLS A.E., SIMONINI G., BOTH E.E., EBERHARDT U. (2006): Detection of species within the *Xerocomus subtomentosus* complex in Europe using rDNA-ITS sequences. – *Mycol. Res.* 110: 276–287.
- TAYLOR A.F.S., HILLS A.E., SIMONINI G., MUÑOZ J.A., EBERHARDT U. (2007): *Xerocomus silwoodensis* sp. nov., a new species within the European *X. subtomentosus* complex. – *Mycol. Res.* 111: 403–408.
- THIERS B. (on-line) [continuously updated]: Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. – <http://sweetgum.nybg.org/ih/>. [accessed June 2013]