

Supplementary notes on *Xerocomus chrysonemus* (*Boletaceae*): bluing context and distribution in the Czech Republic

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The paper summarises the current state of knowledge of the distribution and ecology of *Xerocomus chrysonemus* in the Czech Republic. The authors present information on newly discovered localities in the Czech Republic and a yet unobserved feature of the species – bluing of the context. A distribution map based on the collections from the Czech Republic is presented and features suitable for field identification are summarised, especially with regard to *X. subtomentosus*, which frequently occurs together with the species in question.

Key words: *Xerocomus chrysonemus*, *Boletaceae*, distribution, ecology, bluing context, Czech Republic.

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Článek shrnuje dosavadní vědomosti o rozšíření a ekologii hříbu zlatokořenného – *Xerocomus chrysonemus* v České republice. Autoři článku informují o nových lokalitách druhu a diskutují nově zjištěný znak nepravidelného modrání dužniny. Je také uveřejněna mapa rozšíření druhu v ČR, sestavená podle všech dosud zjištěných nálezů, a shrnuty znaky vhodné pro určení druhu v terénu, zejména pro odlišení od hříbu plstnatého – *X. subtomentosus*, který se často vyskytuje společně s diskutovaným druhem.

INTRODUCTION

This work follows on from our previous paper about the first collections of *Xerocomus chrysonemus* A.E. Hills & A.F.S. Taylor in the Czech Republic (Janda et al. 2013). We have also focused on occurrence of *X. chrysonemus* in this area in the past two years. The search for further localities is continuing in order to better describe the overall distribution and ecology of this species within the Czech Republic.

Moreover, there was a yet unresolved unusual observation from July 2012, when V. Janda and J. Rejsek collected one fruitbody of *X. chrysonemus* whose context in the stipe base turned blue when cut. We recorded this fact as a possibly new, probably either unobserved or only undescribed feature of the species yet. However, with regard to all available descriptions in mycological literature, we had explained the bluing of the context as our failure for the use of a poorly cleaned knife, which had been used for cutting fruitbodies of some species belonging to sect. *Luridi* of the genus *Boletus* a short time before. However, further observations showed the bluing is not an exceptional case or a failure.

The aim of this paper is to present new data on *X. chrysonemus* obtained in the seasons of 2013 and 2014 and improve the initial information comprised in our first paper dealing with this species (Janda et al. 2013).

MATERIAL AND METHODS

Macroscopic characters were studied on fresh fruitbodies. For the purpose of examining context colour changes, all partially dried, too much dampish or water-soaked fruitbodies were excluded.

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

The distribution map is based on the herbarium specimens cited in the “Material examined” chapter in this paper and in Janda et al. (2013). Lakes mentioned in this chapter are man-made, created by intentional damming of streams for fishing purposes.

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

RESULTS AND DISCUSSION

Current knowledge of distribution and ecology of *Xerocomus chrysonemus*

In our first work on *Xerocomus chrysonemus* (Janda et al. 2013) we mentioned about five localities of this species in the Czech Republic: Kněžičky Game Preserve, Komárovský lake near the village of Nouzov, Dománovice, Dětenice and Žernov forest near Horní Ředice. In 2013 and 2014 we repeatedly collected the species at all mentioned localities.

Also several new localities were discovered. We consider the locality in relatively dense vegetation of oak and hazel on the north bank of Jakubský lake in the



Fig. 1. Distribution of *Xerocomus chrysonemus* in the Czech Republic.

surroundings of the villages of Dymokury and Poušť, Nymburk district a remarkable one. It consists of an approximately 10–15 m broad belt composed of deciduous forest and a tourist trail running parallel with the bank of the lake, where the terrain is plain to gently sloping at an altitude of 200–205 m a.s.l. The favourable weather conditions in the first half of September 2013 allowed us to observe here a rich occurrence of *X. chrysonemus* accompanied by some other boletoid species such as *Xerocomus subtmentosus* (L.: Fr.) Quéf., *Aureoboletus gentilis* (Quéf.) Pouzar, *Butyriboletus appendiculatus* (Schaeff.) D. Arora & J.L. Frank, *Caloboletus radicans* (Pers.) Vizzini, *Suillellus queletii* (Schulzer) Vizzini, Simonini & Gelardi, *Boletus legaliae* Pilát & Dermek, *Hemileccinum impolitum* (Fr.) Šutara, and remarkably rich fructification of *Lactarius chrysorrheus* Fr. We collected fresh fruitbodies of *X. chrysonemus* at five isolated microlocalities here.

Another newly discovered locality is a planar and somewhat shady oak-hornbeam forest with admixture of linden close to the Bahenský stream in the buffer zone of the recently proposed Dymokursko-Bahenské Meadows Nature Reserve at an altitude of 230 m a.s.l. Further, there are two areas E and NE of the village of Rožďalovice (Nad Bučickým rybníkem, Babínek forest and Na židech) in the wider surroundings of Bučický lake where *X. chrysonemus* grows. We encountered this species here in a relatively planar area with deciduous oak-hornbeam forests with admixture of linden at an altitudinal range of 205 to 215 m a.s.l.

The last new locality lies on the territory of Kunčice near Nechanice in East Bohemia. It is a deciduous forest on the northern edge of Štika lake with presence of oak and birch at an altitude of 250 m a.s.l.

The overall distribution of *X. chrysonemus* in the Czech Republic is currently limited to only one area in the thermophytic region in Central and East Bohemia, roughly between the towns of Kolín, Nymburk, Jičín, Hradec Králové and Holice (Fig. 1).

For a better understanding of the ecology of *X. chrysonemus* we will describe the places where the species occurs in detail. Generally, the habitat can be described as damp sites in oak-hornbeam and oak forests. The species has an ectomycorrhizal association with *Quercus* (Janda et al. 2013). Based on an analysis of the collected data, we can summarise the ecology of *X. chrysonemus* as follows:

- (1) Occurrence of a water source in the vicinity of the localities. Most frequently it is a lake (e.g. Komárovský lake, Jakubský lake, Pilský lake, Kopičácký lake, Smilek and Mordýř lakes, and Štika lake), but it can be also a stream (e.g. Bahenský stream). The species occurs in their vicinity.
- (2) The terrain of the localities is fully planar or very slightly sloping. Most of the approximately 30 microlocalities known to us have an altitude ranging from 200 to 240 m a.s.l.
- (3) Presence of more or less shallow, natural or artificially created depressions, such as naturally regenerated ruts on forest roads.
- (4) Presence of clayey soils. This type of soil is well able to retain water.
- (5) Presence of *Quercus*.

The soil moisture of the localities of *X. chrysonemus* is variable. Previous waterlogging and subsequent desiccation of the soil is probably an important factor for fructification. All the above-mentioned habitat factors are able to slow down soil desiccation.

The fructification falls in a period when the drying process is over and standing water is absent. However, also in this period both specific atmospheric moisture and a minimum of rainfall are important. As with other boletoid fungi, proper development of fruitbodies depends on favourable weather conditions.

Context oxidation and summary of identification features

The original Latin description of *Xerocomus chrysonemus* (Taylor et al. 2006) states the context of this fungus to be “immutabilis ubi scissus vel contuses”, in the English part of the protologue “normally unchanging with cutting or bruising”. Also later descriptions state the context to be either unchanging (Taylor et al. 2008, Hills 2008, Kibby 2012, 2013, Janda et al. 2013) or do not mention it (Chalange 2011). However, some of our collections are not fully in accordance with this description. Also two of the photos presented in the papers by Hills (2007, p. 40, fig. 23) and Muñoz et al. (2008, p. 258, fig. A) show a weak bluing of the context in the stipe base similar to that in our observation from Kněžičky



Fig. 2. *Xerocomus chrysonemus*, Jakubský lake, Záhornice near Městec Králové, Czech Republic, 15 Sept. 2013, under *Quercus*, leg. L. Opat, J. Rejsek, T. Pavelka & V. Janda (PRM 924609). Photo V. Janda.



Fig. 3. *Xerocomus chrysonemus*, Žernov forest, Horní Ředice, Czech Republic, 28 Sept. 2014, under *Quercus*, *Carpinus*, *Tilia*, *Crataegus*, *Picea* and *Pinus*, leg. V. Janda, T. Pavelka & L. Opat (PRM 924593, PRM 924594 – bluing fruitbody). Photo V. Janda.



Fig. 4. *Xerocomus chrysonemus*, Jakubský lake, Záhornice near Městec Králové, Czech Republic, 7 Sept. 2013, under *Quercus*, leg. V. Janda & L. Opat (PRM 924606). Photo V. Janda.



Fig. 5. Comparison of *Xerocomus subtomentosus* (left) and *X. chrysonemus* (PRM 924588; right), Kněžičky Game Preserve, Kněžičky, Czech Republic, 25 July 2012, under *Quercus*, leg. V. Janda & J. Rejsek. Photo V. Janda.

Game Preserve on July 25, 2012 (Fig. 5). Therefore we studied almost all suitable collected material especially with regard to oxidation of the context. In some cases we observed a clear blue oxidation when cut (Figs. 2–5). However, this undescribed phenomenon seems to be irregular. A great proportion of the studied fruitbodies shows no colour change (see e.g. figs. 3 and 8 in Janda et al. 2013) and is therefore in accordance with the original description, but a small proportion shows a significant blue oxidation when cut.

A bluing context is probably related to the degree of water saturation of the fruitbody. Fruitbodies developed in wet or rainy weather have the tendency to show a bluing of the context, while we did not register this phenomenon in dry periods (see also parts of introductory chapters dedicated to the context of boletoid fungi in e.g. Ladurner & Simonini 2003 and Šutara et al. 2009). The bluing of context of *X. chrysonemus* can most frequently be seen in the stipe base (Figs. 3–5), less frequently in the central part of stipe, exceptionally in the pileus or in the tubes. The more intensive bluing in the stipe base is somewhat reminiscent of the bluing of species belonging to sect. *Luridi* of the genus *Boletus*, i.e. the blue tint is visibly deeper than in e.g. *X. subtomentosus* (Fig. 5).

It may be useful to incorporate the character of a bluing context into identification keys for the genus *Xerocomus*: *X. silwoodensis* A.E. Hills, U. Eberh. & A.F.S. Taylor and *X. ferrugineus* (Schaeff.) Bon show no colour changes in the context. *X. subtomentosus*, which according to our observation occurs together with *X. chrysonemus* at the same sites, differs in a regular and somewhat less intensive and lighter blue oxidation of the pileus context, apex of the stipe and tubes (Fig. 5).

Additionally, we summarise a few typical macroscopic features which may be utilised for successful identification of *X. chrysonemus* already in the field:

- (1) The colour of the pileus is a relatively stable feature – almost always a basic olive colour predominates in combination with an ochre or yellow tint in more or less dry periods or a browner tint in humid weather. In this feature, *X. subtomentosus* is significantly more variable.
- (2) The tubes at the pileus margin show a conspicuous narrow brownish zone which somewhat expands with the lengthening of the tubes during maturation (see Figs. 2–4, detailed photo in fig. 5 in Janda et al. 2013). This feature is very specific and completely absent from *X. subtomentosus* according to our observation.
- (3) The basal mycelium is deeply yellow to golden yellow. The stipe should be removed from the substrate with special care to avoid the loss of this important part of the fruitbody. Especially in the summer, when the soil is dry, this part of the fruitbody can be lost and overlooked. However, although the basal mycelium of *X. subtomentosus* is dirty whitish, some single fibres can be clearly yellow, so in this case it is necessary to use the other characters to distinguish the two species.

Material examined

Czech Republic. Bohemia. Kněžičky (Středolabská tabule plateau, Central Bohemia), Kněžičky Game Preserve, 25 July 2012, under *Quercus*, leg. & det. V. Janda & J. Rejsek (PRM 924588); *ibid.*, 21 Aug. 2013, under *Quercus*, leg. & det. J. Rejsek (PRM 924587); *ibid.*, 7 Sept. 2013, under *Quercus*, leg. L. Opat & V. Janda, det. V. Janda (PRM 924603, PRM 924604). – Nouzov (Středolabská tabule plateau, Central Bohemia), southern bank of Komárovský lake, 16 Aug. 2013, under *Quercus*, *Carpinus* and *Tilia*, leg. & det. J. Rejsek (PRM 924591). – Záhornice, Nymburk District (Středolabská tabule plateau, Central Bohemia), northern bank of Jakubský lake, 22 Aug. 2013, under *Quercus* and *Corylus*, leg. M. Kříž & P. Mikuš, det. M. Kříž (PRM 922672); *ibid.*, 24 Aug. 2013, under *Quercus* and *Corylus*, leg. L. Opat, det. V. Janda & J. Rejsek (PRM 924600); *ibid.*, 7 Sept. 2013, under *Quercus* and *Corylus*, leg. V. Janda, T. Pavelka & L. Opat, det. V. Janda (PRM 924605, PRM 924606, PRM 924607, PRM 924608); *ibid.*, 15 Sept. 2013, under *Quercus* and *Corylus*, leg. L. Opat, J. Rejsek, T. Pavelka & V. Janda, det. V. Janda (PRM 924609); *ibid.*, 28 Sept. 2014, under *Quercus* and *Corylus*, leg. L. Opat, T. Pavelka & V. Janda, det. V. Janda (PRM 924599); *ibid.*, 5 Oct. 2014, under *Quercus* and *Corylus*, leg. & det. T. Pavelka (PRM 924592). – Hasina (Středolabská tabule plateau, Central Bohemia), near dam of Pílský lake, site named “Na Pile”, 17 Sept. 2013, under *Quercus*, leg. Horelová, det. J. Rejsek (PRM 924601). – Podolí near Rožďalovice (Středolabská tabule plateau, Central Bohemia), Babínek forest, area named “Nad Bučickým rybníkem”, 29 Sept. 2013, on forest road under *Quercus*, *Tilia* and *Carpinus*, leg. & det. J. Rejsek (PRM 924610, PRM 924612); *ibid.*, 24 Sept. 2014, under *Quercus*, *Tilia*, *Carpinus* and *Picea*, leg. & det. J. Rejsek (PRM 924611). – Rožďalovice (Středolabská tabule plateau, Central Bohemia), southern part of area named “Na židovském”, on forest road, 30 Sept. 2014, under *Quercus*, *Carpinus* and *Tilia*, leg. & det. J. Rejsek (PRM 924590); *ibid.*, 3 Oct. 2014, under *Quercus*, *Carpinus* and *Tilia*, leg. & det. J. Rejsek (PRM 924589). – Dětenice (Středolabská tabule plateau, East Bohemia), “U rybníčka” forest, near bend in former railway siding and on eastern bank of small forest pond, 28 Sept. 2014, under *Quercus* and *Carpinus*, leg. V. Janda, T. Pavelka & L. Opat, det. V. Janda (PRM 924597, PRM 924596). – Tuchom (Středolabská tabule plateau, Central Bohemia), deciduous forest close to Bahenský stream, 28 Sept. 2014, under *Quercus*, *Tilia* and *Carpinus*, leg. V. Janda, T. Pavelka & L. Opat, det. V. Janda (PRM 924598). – Horní Ředice (Východolabská tabule plateau, East Bohemia), Žernov forest (outside Žernov Nature Reserve), in forest bordering waterlogged area between Smilek and Mordýř lakes, 27 Sept. 2014, under *Quercus*, *Carpinus*, *Tilia*, *Crataegus*, *Picea* and *Pinus*, leg. V. Janda, T. Pavelka & L. Opat, det. V. Janda (PRM 924593, PRM 924594, PRM 924595). – Kunčice near Nechanice (Východolabská tabule plateau, East Bohemia), deciduous forest bordering Štika lake in the north, 1 Oct. 2014, under *Quercus* and *Betula*, leg. H. Hrabáková & T. Tejtklová, det. T. Tejtklová (HR 93700).

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