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BOLETUS BUBALINUS (*BOLETACEAE*). A NEW ADDITION FOR THE BOLETE MYCOTA OF BULGARIA AND THE BALKANS

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Abstract

Boletus bubalinus (= *Xerocomus bubalinus*), a rare and insufficiently known xerocomoid bolete, is recorded for the first time for the mycota of the Balkan Peninsula and Bulgaria. Description is provided based upon the Bulgarian specimens and the delimitation of *B. bubalinus* from the rest of the European chrysenteroid boletes is briefly discussed. In addition, the new collections confirm that the species is probably associated with wider range of host-trees than previously known.

Key words: *Boletales*, fungal diversity, *Xerocomellus*, xerocomoid boletes, *Xerocomus*

Introduction. *Boletus bubalinus* was first described twenty years ago [1] and for a long time thought to be more or less restricted to Northern Europe. Its

presence in the southern parts of the continent was just recently confirmed [2–5] but its true distribution and variability still remain insufficiently known. The authors' studies on the bolete mycota of Bulgaria confirmed its presence in the country [6] and the Balkan Peninsula, based on ample collections.

Materials and methods. Air dried specimens of the fungus are preserved in the Mycological Collection at the Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences (SOMF). The samples are documented with colour photographs and appropriate field notes. Colour notations in the description below follow the British Fungus Flora Colour Chart [7], referred as 'BFF' in the text. Microscopic features were observed in water and 3% KOH and measured in water. The amyloidity reaction was ascertained by use of Melzer's solution (recipe after KIRK et al. [8]) and tested on dried samples as described by LADURNER and SIMONINI [9]. The measurement values for basidiospores are presented in the following form: (min–) mean $\pm 1\sigma$ (–max); for the rest of the microscopic structures minimum and maximum values are noted. Spore volume (Vm) is calculated according to the formula $\mathrm{Vm} = 4/3\pi.(1/2\mathrm{Sw})^2.1/2\mathrm{Sl}$, where Sl is a spore length, Sw is a spore width, and the result is estimated to an integer number.

Description of the species. ***Boletus bubalinus*** Oolbekk. & Duin, in Oolbekkink, Persoonia 14(3): 367, 1991; *Xerocomus bubalinus* (Oolbekk. & Duin) Redeuilh, Doc. Mycol. 23: 62, 1993.

Pileus up to 6 cm in diameter, at first hemispherical, then convex, finally flat-convex, flat or slightly depressed, usually initially finely felty, later glabrous, sometimes slightly rugulose, often finely cracked, buff (BFF 52), clay pink (BFF 30), vinaceous buff (BFF 31), clay buff (BFF 32), sometimes in places brown vinaceous (BFF 25), date brown (BFF 24) or with prominent vinaceous tint (BFF 76), occasionally buff with prominent peach tint (BFF 46); surface unchanging on bruising or handling. *Stipe* up to 6×1.5 cm, cylindrical and tapering towards the base, spindle-shaped or clavate, often distinctly swollen at the base; dull scarlet (BFF 43), coral (BFF 44), sometimes almost reddish brown at the same base, often lemon yellow (BFF 54) to straw (BFF 50) in the upper part, colours normally fading with age; stipe surface fibrillose or finely granulate, unchanging or occasionally slightly blueing after rough handling. *Context* whitish in the upper and yellowish in the lower portion of the stipe, dirty pale orange (BFF 48), dirty saffron (BFF 49) or orange brown in the stipe base, whitish in the cap, but pinkish under the cap cuticle, usually faintly blueing above the tubes when exposed to the air. *Tubes* up to 1.5 cm long, pale lemon yellow (BFF 54) when young, then with somewhat olivaceous tint, mostly unchanging or rarely blueing when injured. *Pores* at first small, angular or sometimes more or less rounded,

at maturity angular, pale lemon yellow when young, later with olivaceous tint, slightly blueing or darkening when bruised. *Smell* not distinctive. *Taste* somewhat acidulous. *Basidiospores* (10.5–) 11.8 ± 0.4 (–13.5) × (4.0–) 4.8 ± 0.1 (–5.5) µm ($n = 100$), ratio (2.2–) 2.4 ± 0.1 (–3.0), spore volume (97–) 143 ± 11 (–209) µm^3, with 1–3 large guttules. *Basidia* inconspicuous, clavate, hyaline in KOH and Melzer's reagent, generally 4-spored (2- and 3-spored basidia also occur, albeit rarely), 32.5–50.0 × 10.0–12.5 µm ($n = 30$). *Cystidia* ventricose-fusiform, hyaline in KOH and Melzer's reagent, 37.5–67.5 × 10.0–15.0 µm ($n = 15$). *Pileipellis* a physalo-palisadoderm of subparallel septate moderately encrusted hyphae, terminal cells cylindrical, acorn-shaped or cystidioid, mostly with rounded apex, 25.0–65.0 × 10.0–17.5 µm, ratio 2–4.6 ($n = 30$). *Macrochemical and microchemical reactions*: no 'fleeting-amyloid' reaction observed with Melzer's solution with the hymenophore; hyphae of the stipe base inamyloid, no other macro- or microchemical reactions are noted.

Habitat. On rich and often humid soils in urban or disturbed environment – parkland, gardens, wooded strips along roads, lawns, artificial plantations; in Bulgaria under silver birch (*Betula pendula* Roth.), lime (*Tilia* spp.), poplars (*Populus alba* L.) and spruce (*Picea abies* (L.) Karst., *P. pungens* Engelm.). In Bulgaria basidiomata of the fungus have been observed so far from June through August.

Specimens examined. Bulgaria, Sofia region: Sofia city, Iztok Estate, 1 Lyuben Rusev Str., the yard of 'Sveti Naum' Hospital, UTM: FN-92, alt. *ca* 560 m, 01 July 2010, leg. B. Assyov & D. Stoykov: under *Picea abies* with *Juniperus* sp. present, 42°40′4.8″N, 23°21′47.8″E (SOMF 29159); *idem*, a lawn with solitary tree of *Tilia platyphyllos* Scop., 42°40′3.4″N, 23°21′45.1″E (SOMF 29160); *idem*, in the base of *Picea abies* with *Tilia* sp. and *Betula pendula* present in immediate vicinity, 42°40′3.1″N, 23°21′45.6″E (SOMF 29161); *idem*, an isolated lawn with group of *Picea pungens*, 42°40′2.1″N, 23°21′40.9″E (SOMF 29162); a lawn with scattered trees of *Populus alba*, 42°40′2.2″N, 23°21′38.5″E (SOMF 29163); *idem*, in the base of *Picea abies*, with mixed broadleaf trees present in perimeter of 10 m, 42°40′3.8″N, 23°21′48.8″E (SOMF 29204); Sofia city, Iztok Estate, small roadside wooded strip between Tsarigradsko chausée Blvd and blockhouse No 22, dense plantation of mixed broadleaf trees (*Tilia* sp., *Fraxinus* sp., *Acer platanoides* L., *Syringa vulgaris* L.), at the base of *Betula pendula*, alt. *ca* 565 m, 42°40′20.0″N, 23°21′46.5″E, 17 June 2008, leg. B. Assyov (SOMF 29205); Vitosha Region: Vitosha Mt, along the track between Bistritsa village and Aleko chalet, under *Betula pendula*, FN-91, alt. *ca* 1200 m, 10 September 2003, leg. B. Assyov and I. Assyova (SOMF 29206).

Extralimital specimen examined. UK, Cheshire: Chester, under hedge of beech (*Fagus sylvatica* L.), 04 July 2007, leg. B. Assyov (SOMF 29207).

Comments. The studied Bulgarian collections match very well both the original and the later descriptions of the species [1,3,4,9–12].

Boletus bubalinus belongs to the group of *B. chrysenteron,* whose members are characterized by high variability and practically all of them may resemble the bolete in question. Macroscopically *B. bubalinus* is recognized by the pinkish context in the cap although this character may appear at least in *B. rubellus* Krombh. but probably also in other species. Given the great variability of most xerocomoid boletes, examination of the microscopic features is always required to tell *B. bubalinus* apart. From the similarly coloured forms of *B. armeniacus* Quél. it differs by the structure of the pileipellis that is composed of encrusted hyphae, which lack congophilous plaques. From *B. porosporus* Imler ex Bon & G. Moreno and the recently described *B. marekii* Šutara & Skála it is easily distinguished by the non-truncate basidiospores. *Boletus bubalinus* has non-striate spores, a character that could certainly delimit it from its striate-spored allies, namely *B. pruinatus* Fr. & Hök, *B. cisalpinus* (Simonini, H. Ladurner & Peintner) Watling & A. E. Hills, *B. ripariellus* (Redeuilh) Watling & A. E. Hills, and *B. fennicus* (Harmaja) Šutara. *Boletus bubalinus* would be probably most easily mistaken for *B. rubellus* and *B. engelii* Hlaváček, but it is distinguished by the pale saffron flesh in the stipe base and slightly lower spore length/width ratio. It was until recently considered that *B. bubalinus* is lacking flame-red dots, while both *B. rubellus* and *B. engelii* feature numerous such dots. However, recent Italian collection of *B. bubalinus* was found to have small solitary orange dots in the flesh in the stipe base [4]. Gelardi also noted that such gatherings are known from Sweden and the UK. This feature was not observed in any of the known Bulgarian collections, although the authors had the opportunity to study numerous fresh fruitbodies. *Boletus bubalinus* also shows a lot of similarity to the yet little known *Xerocomus erubescens* Cadiñanos & Bandala, a species so far documented only from Spain, where it grows under oak (*Quercus* sp.). As previously emphasized by some authors [2,9] the distinction between those two boletes is critical and study (incl. by molecular techniques) of further collections of *X. erubescens* is desperately needed.

Boletus bubalinus is a rarely recorded species, for a long time exclusively known from the Netherlands, Norway and Sweden, and more recently found in Austria, France, Germany, Hungary, Italy, Spain and the UK [1–4,9–12]. Gelardi [4] and Kibby [12] suggested that it is probably not rare but overlooked and confused with other similar species of this group. The Bulgarian localities are

the easternmost so far known on the continent and further research will most probably reveal that this bolete is more widespread on the Balkan Peninsula and is present in the adjacent countries.

Throughout its known geographic range, *B. bubalinus* is documented to develop basidiomata mostly under *Populus* and *Tilia*. The Bulgarian specimens are the first collections found under *Picea*, including one non-native species of this genus. Association with spruce was inferred possible by a recent collection of Gelardi [4], who has found the species under mixed trees with *Picea* being present in the stand. Two of the Bulgarian gatherings were undoubtedly associated with Norway spruce (*P. abies*) and the American Blue spruce (*P. pungens*) respectively. The first author also had the chance to collect this species in Britain, where it was apparently associated with beech (*Fagus sylvatica*). Thus, the observations in this paper confirm the suggestion of Gelardi [4] and Kibby [12] that the species might occur under wider range of hosts than previously known.

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