

ГОДИШНИК НА СОФИЙСКИЯ УНИВЕРСИТЕТ „СВ. КЛИМЕНТ ОХРИДСКИ“

БИОЛОГИЧЕСКИ ФАКУЛТЕТ

Книга 2 – Ботаника

Том 101, 2017

ANNUAL OF SOFIA UNIVERSITY “ST. KLIMENT OHRIDSKI”

FACULTY OF BIOLOGY

Book 2 – Botany

Volume 101, 2017

THE CORAL TOOTH FUNGUS *HERICIUM CORALLOIDES*
(SCOP.) PERS. - A NEW MEMBER OF THE URBAN
MYCOTA OF SOFIA CITY PARK *BORISOVA GRADINA*

STOYAN G. VOYKOV, MAYA P. STOYNEVA-GÄRTNER*, BLAGOY A.
UZUNOV & PETYA H. DIMITROVA

*Department of Botany, Faculty of Biology, Sofia University “St. Kliment Ohridski”, 8 Dragan
Tsankov Blvd., 1164 Sofia, Bulgaria*

Abstract. Nowadays the studies of the urban fungal diversity with highlighting mostly macrofungal species of conservation concern is a rapidly growing field of interest. The present paper reports the first finding of the wood-inhabiting fungus *Hericium coralloides* (Scop.) Pers., which has been considered rare and threatened in Europe and is included in the Red List of Bulgarian fungi with *Near Threatened* category, in the Sofia city park *Borisova gradina*. The previous findings of the same species in Plovdiv and in the Sofia park *Vrana* together with the records of another close and threatened species of the same genus, considered as *Endangered* in Bulgaria, namely *H. erinaceus* (Bull.) Pers., in another city park of Sofia – *Zapaden park*, strongly suggests that both tooth fungi tend to be members of the urban mycota in Bulgaria despite their apparent rarity. This serves to prove the need to investigate currently under-utilized opportunity that cities with their distinct species assemblages present for biodiversity conservation, when they are recognized as hotspots for threatened species.

Key words: basidiomycetes, rare species, saprotroph, threatened species, wood-inhabiting fungi

**corresponding author:* M. P. Stoyneva-Gärtner – Department of Botany, Faculty of Biology, Sofia University “St. Kliment Ohridski”, 8 Dragan Tsankov Blvd., 1164 Sofia, Bulgaria; mstoyneva@uni-sofia.bg

INTRODUCTION

Nowadays the understanding that cities represent appreciable opportunities for forwarding global biodiversity and sustainability goals increases significantly (NILON ET AL. 2017). Therefore, research on urban biodiversity combined with a focus on threatened species conservation is a rapidly growing field of interest (e.g. IVES ET AL. 2016; NORTON ET AL. 2016). This is also valid for the urban fungal diversity with highlighting mostly macrofungal species of greatest conservation concern. In Bulgaria, the macrofungal biodiversity was studied in the parks and streets of the cities Sofia and Plovdiv (for details see STOYNEVA & UZUNOV 2016). The present paper reports a new species of the urban mycota of Sofia city park *Borisova gradina* – the wood-inhabiting fungus *Hericium coralloides* (Scop.) Pers., which has been considered rare and threatened in Europe (BODDY ET AL. 2011).

MATERIAL AND METHODS

The finding presented in this study was made by the first author on 31.10.2017 in the north part of Sofia city park *Borisova gradina* (**Fig. 1**). Ten separate basidiomata were found on two dead oak trunks, one fallen and one standing (**Fig. 2a**), nearby to CSKA Sofia Stadium with coordinates 42 40 57 N 23 20 23 E. Small parts of two fruiting bodies from both trunks were collected and were almost immediately transferred to the Department of Botany of the Faculty of Biology of Sofia University “St. Kliment Ohridski”, which is situated at the edge of the same city park. Identification was done on the next day after HANSEN & KNUDSEN (1997). The collected specimens are kept in the Mycological Collection of Sofia University “St. Kliment Ohridski”. Both species and author names were updated according to the INDEX FUNGORUM. The spore observations and measurements were carried out on non-permanent slides using light microscope Motic BA 400. Data on the general species distribution in Bulgaria were consulted mainly with the recent checklist of Bulgarian macromycetes (DENCHEV & ASSYOV 2013). According to the map provided by the last authors, it can be stated that they summarized and presented the fungal species distribution in the twenty floristic regions of Bulgaria, proposed by JORDANOV (1966). In addition, the distribution provided in the papers by PENCHEVA ET AL. (2009), ASSYOV ET AL. (2010), LACHEVA (2010) and GYOSHEVA ET AL. (2016) was taken into account. The nature conservation status was checked in the Red Lists of Bulgarian fungi (GYOSHEVA ET AL. 2000, 2006).

RESULTS

The fungus species found on the dead oak trunks (**Fig. 2. a-d**) was identified as *Hericium coralloides* (Scop.) Pers. (Dikaryomycota, Basidiomycetes, Russulales) according to the morphological features of both fruiting bodies (basidiomata,

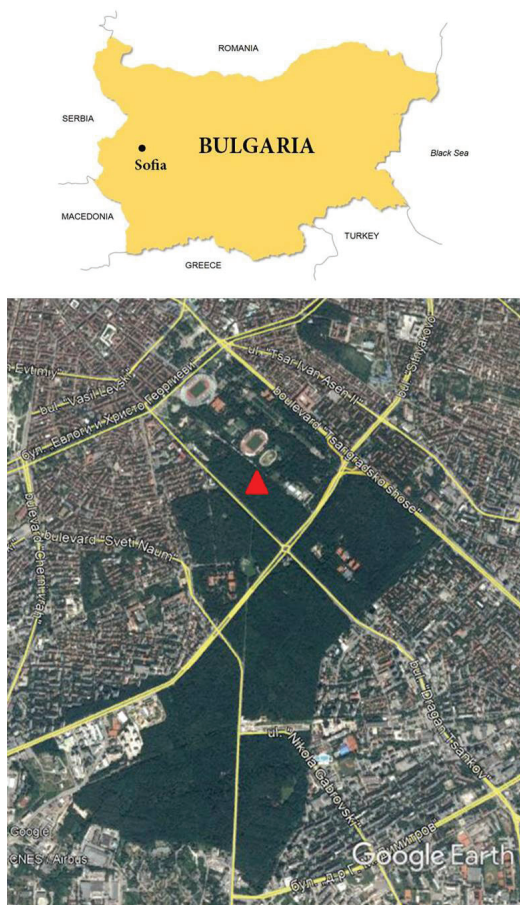


Fig. 1. Map of Bulgaria with indication of the capital city Sofia and Google Earth map of the city park Borisova gradina (dark green colour) with the site of finding of *Hericium coralloides* (top of the red triangular).

yet remains a moot point (e.g. HALLENBERG 1983; SPOONER & ROBERTS 2005; BODDY ET AL. 2011). In Bulgaria, in particular, it was documented from the wilderness in eleven regions of Bulgaria - the Black Sea coast, North-East Bulgaria, Forebalkan, Stara planina Mts, Sofia, Znepole region, Rila Mts, Mt Sredna Gora, the Rodopi, Trakiyska nizina, Mt Strandzha (ASSYOV ET AL. 2010; DENCHEV & ASSYOV 2013; GYOSHEVA ET AL. 2016). The species was recorded also in two Bulgarian cities: as a rare lignicolous fungus on the white mulberry *Morus alba* L. in a city park of Plovdiv (LACHEVA 2010) and on *Populus* sp. in the park *Vrana* on the eastern edge of Bulgarian capital Sofia (PENCHEVA ET AL. 2009). *H. coralloides* was included

basidiocarps) and basidiospores. The basidiomata were up to 25-30 cm in diameter, mostly whitish with visible changes to pinkish or brownish at the surface during aging. They were branchy, coral-like with short (up to 5 mm long) equally distributed protrusions (hymenium spines). The basidiospores were smooth, oval, 2.5-3x3-5 μm . The finding of all well-developed fruiting bodies of the fungus on decaying wood, strongly suggests its saprotrophic character.

DISCUSSION

Hericium coralloides has been seen on living trees, but is widely accepted as a saprotroph that grow on the wood of broadleaved trees and its occurrence usually signify a relatively advanced state of underlying decay (e.g. WALD ET AL. 2004; BODDY ET AL. 2011). Its attractive fruiting body is commonly known as the *coral tooth fungus*. This macromycetous species has been scarcely distributed and rarely recorded in Europe and Red Listed in several European countries (e.g. Bulgaria, Denmark, Germany, Sweden, U.K.), although the rarity

in the fungal Red Lists (GYOSHEVA ET AL. 2000, 2006) with a *Near Threatened* category. The present record is the first finding of the *coral tooth fungus* in the Sofia central city park *Borisova gradina*, from which recently 115 macrofungal taxa have been reported (STOYNEVA & UZUNOV 2016).

In spite of the fact that *H. coralloides* and all other *Hericium* species produce basidiomata infrequently (the *coral tooth fungus* tending to fruit from August to December), their easily visible large and attractive, epaulet-like or fractal-like fruit bodies are hard to miss and are probably not under recorded (BODDY ET AL. 2011). The previous findings of *H. coralloides* in Sofia and Plovdiv (PENCHEVA et al. 2009; LACHEVA 2010) together with the records of another close species of the same genus, namely *H. erinaceus* (Bull.) Pers. (commonly known as *monkey head*, or *lion's mane fungus*), in another city park of Sofia – *Zapaden park* (ALEXOV ET AL. 2012), strongly suggests that both tooth fungi tend to be members of the urban mycota in Bulgaria despite their apparent rarity. According to BODDY ET AL. (2011) the rarity of the field observations could be explained with the low germination of the basidiospores and the possible latent endophytic development of the mycelia, which grow overtly only when the wood begins to dry (PARFITT ET AL. 2010). At the same time, it is worth mentioning the threatened character, the nature conservation status and the indicator use of these fungi. For example, *H. coralloides* as a wood-rotting

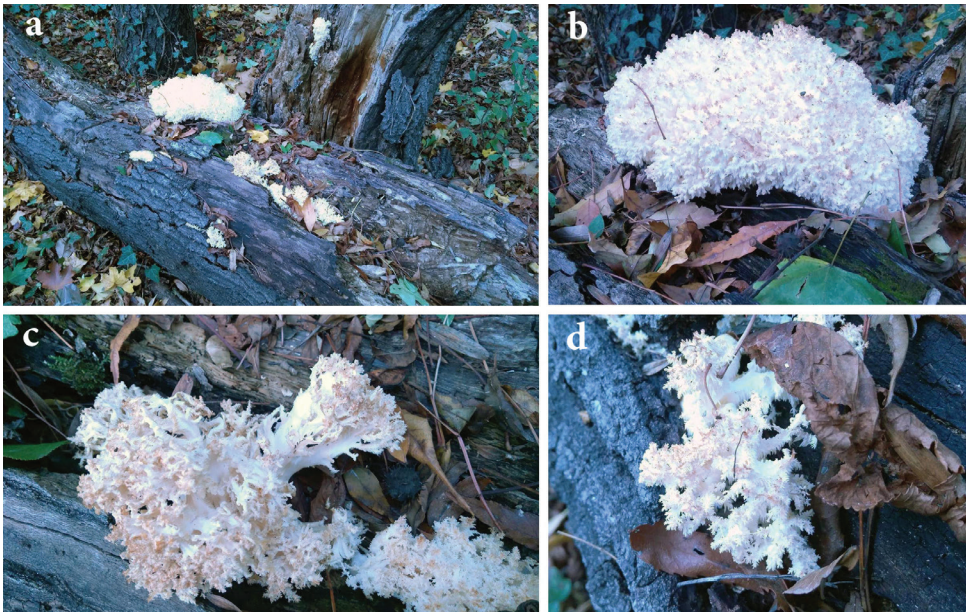


Fig. 2. Basidiomata of *Hericium coralloides* from the Sofia city park *Borisova gradina*: **a** – general view on some basidiomata on two dead *Quercus* trunks; **b** – the largest basidiome of the fungus; **c-d** – brownish and pinkish coloration of the basidiomata surface by aging; the short hymenium spines of the fractal-y branching coral-like bodies are well visible. Scale bar – 10 cm.

hydroid fungus, was included in the list of 44 species used in a standard method for assessing forest conservation sites in Estonia (PARMASTO 2001) and in Bulgaria *H. erinaceus* was Red Listed (GYOSHEVA 2000, 2006) and included as *Endangered* in the Bulgarian Red Data Book (GYOSHEVA 2015).

In addition to our previous evaluations of the utility features of the macromycetes from the same Sofia city park *Borisova gradina* (STOYNEVA & UZUNOV 2016), we have to mention that when young, *H. coralloides* is soft and edible with the slightly acrid taste, but as it ages the branches and hanging spines become brittle (HANSEN & KNUDSEN 1997; BOA 2004).

CONCLUSION

The present record is the first finding of the rare and threatened in Europe coral tooth fungus *H. coralloides* for the Sofia city park *Borisova gradina*. With this last finding, the number of the edible species in this city park becomes 69 (for details check STOYNEVA & UZUNOV 2016), the number of xylotrophs – 33 (op. cit.) and the number of threatened species - four (or 3%, op. cit.). The recent general distribution of the coral tooth fungus in Bulgaria, which inhabits eleven regions, proves the *Near Threatened* status of the species, which has been declared earlier by GYOSHEVA ET AL. (2000, 2006). It is possible to claim also that both tooth fungi *H. coralloides* and *H. erinaceus*, in spite of their rarity and threatened character, could be enlisted as members of the urban mycota in Bulgaria. This serves to prove the need to investigate the currently under-utilized opportunity that cities with their distinct species assemblages present for biodiversity conservation, when they are recognized as hotspots for threatened species (IVES ET AL. 2016; ARONSON ET AL. 2017).

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this article.

References

- ALEXOV R., VASSILEV D., NEDELEV P. & TRAIKOV I. 2012. New records of seven rare and noteworthy Basidiomycetes from Bulgaria. – *Trakia Journal of Sciences* 10 (2): 10–16.
- ARONSON M. F. J., C. A. LEPCZYK, K. L. EVANS, M. A. GODDARD, S. B. LERMAN, J. S. MACIVOR, C. H. NILON & T. VARGO 2017. Biodiversity in the city: key challenges for urban green space management. - *Frontiers in Ecology and the Environment*, DOI: 10.1002/fee.1480.
- ASSYOV B., D. STOYKOV & S. NIKOLOVA 2010. New records of some rare and

- noteworthy larger fungi from Bulgaria. - *Trakia Journal of Sciences* 8 (4): 1-6.
- BOA E. 2004. Wild edible fungi: A global overview of their use and importance to people (non-wood forest products). Food & Agriculture Organization of the UN, 148 pp.
- BODDY L., M. E. CROCKATT & A. M. AINSWORTH 2011. Ecology of *Hericium cirrhatum*, *H. coralloides* and *H. erinaceus* in the UK. - *Fungal Ecology* 4: 163-173.
- DENCHEV C. M. & ASSYOV B. 2013. Checklist of the larger Basidiomycetes in Bulgaria. – *Mycotaxon* 111: 279–282.
- GYOSHEVA M. 2015. *Hericium erinaceus* (Bull.: Fr.) Pers. – In: PEEV D. (Ed.), Red Data Book of the Republic of Bulgaria. Vol. 1. Plants and Fungi. BAS & MoEW, Sofia, p. 809.
- GYOSHEVA M., FAKIROVA V. & DENCHEV C. 2000. Red list and threat status of Bulgarian macromycetes. – *Historia naturalis bulgarica* 11: 139–145.
- GYOSHEVA M. M., STOYKOV & MARINOV Y. A. 2016. Data on the fungal diversity of Balgarka Nature Park (Central Balkan, Bulgaria). – *Phytologia Balcanica* 22 (3): 309-322.
- GYOSHEVA M. M., DENCHEV C. M., DIMITROVA E. G., ASSYOV B., PETROVA R. D. & STOICHEV G. T. 2006. Red List of fungi in Bulgaria. – *Mycologia Balcanica* 3: 81–87.
- INDEX FUNGORUM. <http://www.indexfungorum.org>. (Last assessed on 7.11.2017).
- HALLENBERG N. 1983. *Hericium coralloides* and *H. alpestre* (basidiomycetes) in Europe. - *Mycotaxon* 18: 181-189.
- HANSEN L. & KNUDSEN H. (Eds) 1997. Nordic Macromycetes. Vol. 3. Nordsvamp – Copenhagen, 445 pp.
- JORDANOV D. (Ed.) 1966. Flora Republicae Popularis Bulgaricae. Vol. 3. Aedibus Acad. Sci. Bulgaricae, Serdica, 638 pp. (In Bulgarian)
- IVES C. D., LENTINI P. E., THRELFALL C. G. , IKIN K., SHANAHAN D. F., GARRARD G. E., BEKESSY S. A., FULLER R. A., MUMAW L., RAYNER L., ROWE R., VALENTINE L. E. & KENDAL D. 2016. Cities are hotspots for threatened species. - *Global Ecology and Biogeography* 25: 117–126.
- LACHEVA M. 2010. Lignicolous macromycetes in parks in the city of Plovdiv. - In: Proceedings of the eight Scientific-technical conference with international participation *Ecology and Health 2010*, 471-478.
- NORTON B. A., K. L. EVANS & P. H. WARREN 2016. Urban biodiversity and landscape ecology: patterns, processes and planning. - *Current Landscape Ecology Reports* 1: 178–192.
- NILON C. H., M. F. J. ARONSON, S. S. CILLIERS, C. DOBBS, L. J. FRAZEE, M. A. GODDARD, K. M. O'NEILL, D. ROBERTS, E. K. STANDER, P. WERNER, M. WINTER & K. P. YOCOM 2017. Planning for the future of urban biodiversity: A global review of city-scale initiatives. - *BioScience* 67 (4): 332–342.
- PARFITT D., DOCKRELL D., HUNT J., ROGERS H. J. & BODDY L. 2010. Do all trees

carry the seeds of their own destruction? PCR reveals numerous wood decay fungi latently present in sapwood of a wide range of angiosperm trees. - *Fungal Ecology* 3: 338-346.

- PARMASTO E. 2001. Fungi as indicators of primeval and old-growth forests deserving protection. - In: MOORE D., NAUTA M. M., EVANS S. E. & ROTHEROE E. (Eds), *Fungal conservation: issues and solutions*, Cambridge University Press, 81-88.
- SPOONER B. & ROBERTS P. 2005. *Fungi*. Harper Collins Publishers, London, 594 pp.
- STOYNEVA M. P. & B. A. UZUNOV 2016. Checklist of macromycetes, observed during the last 20 years (1994-2014) in the Sofia city park Borisova Gradina (Bulgaria). – *Annual of Sofia University “St. Kliment Ohridski”, Faculty of Biology, Book 2- Botany* 99: 88-99.
- WALD P. D., PITKANEN S. & BODDY L. 2004. Interspecific interactions between the rare tooth fungi *Creolophus cirrhatus*, *Hericium erinaceus* and *H. coralloides* and other wood-decay species in agar and wood. - *Mycological Research* 108: 1447-1457.

Received 5 November 2017
Accepted 19 December 2017