

# Conservation of larger basidiomycetes in Bulgaria: the case of *Boletus*

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**Abstract.** Examples from the spectacular and economically important fungus genus *Boletus* illustrate the current state of and recent events in fungal conservation in Bulgaria. National legislation is reviewed as a base for conservation and sustainable management of fungi. The evaluation approach and application of IUCN criteria for boletes on the new national Red List are illustrated by suitable examples.

**Key words:** *Boletus*, Bulgaria, conservation, larger basidiomycetes

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## Introduction

Current knowledge of the fungal diversity in Bulgaria is based on observations going back one hundred years. To date, the total number of fungi, fungus-like species and slime moulds recorded in Bulgaria is approximately 5220 (Denchev *et al.* 2005). The inventories of fungi and fungus-like organisms still lag seriously behind those of animals and plants in this country.

A checklist of larger basidiomycetes in Bulgaria was recently prepared (Denchev & Assyov 2010). The total number of larger basidiomycete species accepted for Bulgaria was 1537. A further 149 species were doubtful, or derived from confused or erroneously recorded names, or from illegitimate names. These were placed in a supplementary list of excluded records with reasons for their exclusion.

## The national legislation for conservation and use of fungi

Bulgaria has been a major producer of wild fungi in Europe for a long time (Sitta & Floriani 2008). Nonetheless, the country lacks a specific document (law or decree) regulating collection, purchase, sale, and export of wild fungi: those

activities are regulated only through the country's Forestry Act. Management of national fungal resources is thus trusted to forest landowners – forestry departments, municipalities, and private owners.

Any person is permitted to collect fresh wild mushrooms for their own consumption free of charge and no special permit is required for this activity. Larger quantities are assumed to be for trade and for this a special permit is required from the Forestry Commission, obtainable after payment of a fee. Additional restrictions and regulations may apply in National and Nature Parks as defined by their management plans. None of the above regulations apply for private lands, where there are no limitations for collecting.

The fee for collecting of wild fungi is negligible for all species of mushrooms. For ceps it is approximately 20 Eurocents per kg. There is, furthermore, no differentiation of the fee depending on the different quality grades of mushrooms. In addition, collection of the taxes is allegedly declining after the accession of Bulgaria in the EU (Anonymous 2008, 2009). This is probably explained because, after accession, trade with EU-countries was no longer considered export and no export-permit is now required.

Forestry Commission officials claim that even the above procedure is clumsy and sometimes impossible to apply, and that collected quantities by individuals are untraceable

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and probably often exceed the permitted amount per person daily. The Forestry Strategy explicitly notes that limits set for permissible quantities of wild mushrooms that may be collected are not based on scientifically reliable methods but simply on extrapolation of quantities collected in previous years, being therefore far from what one would call “sustainable harvesting”.

The absence of a special document focused on collecting of mushrooms remains a serious problem in this country. Up to now, collecting of fungi in Bulgaria has remained absolutely free and uncontrolled, and has greatly escalated since 1990. Regulations for picking are a sensitive issue as the mushroom trade contributes significantly to the income of many families in less developed rural areas.

Fungi were for a long time neglected by the nature conservation officials and were thus not even mentioned in the original *Biodiversity Act* despite numerous critical notes and proposals submitted when the law was passed in 2002. In 2007, after continuous lobbying, amendments to the Act were proposed by members of the Bulgarian Mycological Society. All the amended texts were consequently approved by the Bulgarian Parliament. However, the proposal to add fungal species to Appendix 3 – “Species protected by the law”, was rejected. Instead, 10 fungi were listed in Appendix 2a. They must be protected by protection of their habitats and localities, with the possibility of declaring of new protected territories. No fungi were added to the list of species for which collection and marketing are restricted.

### Recent activities in the fungal conservation in Bulgaria

Surveys for larger fungi have been carried out in some protected areas, notably the Central Balkan National Park (Fakirova *et al.* 2000, 2002), Pirin National Park (Denchev *et al.* 2007), Rila National Park (Gyosheva & Denchev 2000), and the Strandzha Nature Park (Denchev & Petrova 2005).

An up-to-date *Red List of fungi in Bulgaria* was prepared and published in 2006 (Gyosheva *et al.* 2006). It includes 215 species of larger ascomycetes and basidiomycetes. In the list, the current IUCN Red Data Book Categories (IUCN 2001, 2003) were put into practice for the fungi. The establishment of a new and contemporary official *Red list of fungi in Bulgaria* was an extremely important and promising step for fungal conservation in Bulgaria.

*Red Data Book of Republic of Bulgaria*, vol. 1, *Plants and Fungi* (2004–2010) is in preparation. Information about all included fungal species has been prepared. Every single species has been appropriately illustrated. The book is due to be published in 2010. It includes 146 larger fungi, including 37 *Critically Endangered* (CR), 105 *Endangered* (EN), and 4 *Vulnerable* (VU) species. The inclusion of fungi in the National Red Data Book will benefit fungal conservation in the country, supporting awareness building in the conservationist community.

The Important Plant Areas project was implemented in Bulgaria in 2006–2009 (Peev *et al.* 2009). The whole of the country has been covered and evaluated for inclusion in IPA's. Threatened fungal species are present in 32 sites. One site is designated especially for protection of a fungus – *Boletus dupainii*. IPA's are designated for species listed in the ECCF Berne Convention proposal which occur in Bulgaria. This project will hopefully encourage *in-situ* conservation of fungi and the designation of protected areas for fungi.

The initiative “Year of the fungi” a joint-venture of the Bulgarian Biodiversity Foundation, the Bulgarian Mycological Society and the Institute of Botany of the Bulgarian Academy of Sciences is an example of a publicity campaign aimed at building awareness of the importance of fungal diversity.

### Diversity and conservation of *Boletus* in Bulgaria

The genus *Boletus* is the core of *Boletaceae* family, being itself the largest family in the *Boletales* (Watling 2009). Most members are mycorrhizal, varying in host range from broad to narrow; few species are supposedly facultatively non-mycorrhizal and two are documented as parasites on other boletes. The extent of the genus is as yet unclear, although molecular studies have shown clearly that even in its strict sense it is an artificial grouping likely to be split further into smaller entities.

*Boletus* is a large genus, of which 40 species have been recorded to date in Bulgaria. Eighteen species have been evaluated for the National Red list. Five are *Critically Endangered*, eight *Endangered*, four *Vulnerable*, and one considered as *Data Deficient*.

Fourteen of the evaluated species are included in the National Red Data Book (those evaluated as *Vulnerable* were not included), and three are listed in the *Biodiversity Act*: *B. dupainii*, *B. permagnificus*, and *B. roseoalbidus*. Many localities of rare *Boletus*-species are covered by NATURA 2000, but it is currently uncertain if the network will contribute to fungal conservation as fungi are not recognized as objects for management and protection on the Bulgarian sites of the network. Many threatened species are also found in protected areas. This could be an effective measure to protect rare *Boletus*-species, but, there will be a need to strengthen control of activities in those areas as, in most, human activities still remain unregulated.

### Evaluation of *Boletus* species against IUCN Criteria

For practical purposes *Boletus* has been treated in its wider sense, including another artificial entity, *Xerocomus*. Doubtful and ill-defined species were excluded, e.g. *Boletus gabretae*, an enigmatic bolete, described from the Czech Republic. Difficult taxonomic groups were also excluded from the selection, as

prior records of those taxa would be in most cases unreliable. A good example is the *Boletus chrysenteron* group, and the similar *B. appendiculatus* and *B. subappendiculatus* group. Next, taxa well documented to be widespread and apparently not qualifying for any threat category were removed, among them, for example, *Boletus luridus*, an extremely widespread, abundant and probably highly adaptable species. As a result, eighteen species were selected for evaluation against the IUCN Criteria at regional level. Below are some examples of how the Criteria were applied.

***Boletus permagnificus*** Pöder, CR B2ab(iii)

The area of occupancy of the species is estimated to be less than 10 sq. km. The preferred habitat is rare in Bulgaria, has declined rapidly during the last decade, and seems likely to continue that way in future. Habitat quality has been rapidly deteriorating during the last ten years and this trend is also likely to continue. Imminent development of tourism is probably the most significant threat to survival. Fruitbodies are often heavily damaged (up to 90%) by *Sepedonium chrysospermum*. Although known localities are situated in a NATURA 2000 site, this does not contribute much to conservation of the species. The species is included in the *Biodiversity Act* and its localities are in an Important Plant Area. Protection of the habitat and sustaining current management are an efficient measure for conservation.

***Boletus rosealbidus*** (Alessio & Littini) Moreno & Heykoop, EN B1ab(iii)+2ab(iii)

The area of occupancy of *B. rosealbidus* is estimated to be less than 200 sq. km and extent of occurrence less than 500 sq. km. The habitat of the fungus is rare in Bulgaria and has declined rapidly over the last ten years. Habitat quality has been rapidly deteriorating during the last decade. Both trends are likely to continue. Development of tourism with accompanying activities is the most significant threat to survival of the species. Localities are included in a NATURA 2000 site. The species is included in the *Biodiversity Act* and its localities are situated in Important Plant Areas. Protection of habitat and encouraging current management are assumed to be efficient conservation actions.

***Boletus dupainii*** Boud., EN B1ab(iii)+2ab(iii)

The species is currently known to occur in 4 localities. The area of occupancy is less than 200 sq. km and the extent of occurrence is estimated to be less than 5000 sq. km. The habitat is declining and its quality has deteriorated during the last decade, and this trend is likely to continue. Development of coastal tourism, and unsympathetic forest management in the other localities are the most significant threats to survival. Two localities are in NATURA 2000 sites and one station is in the Sinite Kamuni Nature Park. All known localities are included in Important Plant areas. The species is listed under the *Biodiversity Act*. Protection of the habitat and maintaining current management are thought to be crucial for protection of this species.

***Boletus regius*** Krombh., VU B1ab(iii)+2ab(iii)

The species is known from 13 localities and its distribution in the country is very fragmented. The area of occupancy is estimated to be less than 1300 sq. km and the extent of occurrence less than 20000 sq. km. The habitat is declining and its quality has deteriorated during the last decade, and it seems that this will continue. Development of coastal tourism and unsympathetic forest management in the other localities are the most significant threats to survival. This species is collected for food, though at a small scale, and the effect of this is currently unknown. Protection of the habitat and maintaining current management are considered to be an efficient conservation approach.

***Boletus torosus*** Fr., DD

This rare and bolete with an apparently southern distribution has been reported only twice from Bulgaria. The first record dates back to 1936 and no specimen has been found in Bulgarian collections to support it, nor there are surviving field notes which might help confirm the identification. The second record was made in 1984 and a specimen of that collection is available in the Mycological Collection of the Institute of Botany (SOMF). The collection consists of a single very young fruit-body, and the identification could not confidently be verified as, again, no description of the fresh collection has survived. Although being predominantly a southern species, *B. torosus* has been found repeatedly in Central and Western Europe. It must be present in Bulgaria, but however no certain evidence is so far available.

## Conclusions

There has been a markedly positive change in attitude to fungal conservation in Bulgaria during the last few years. This has resulted in some major state-funded activities, e.g. the preparation of a new National Red List of Fungi, and the inclusion of fungi in the *Biodiversity Act* and the new edition of the National Red Book. This will hopefully further draw public attention towards the complicated problems of conserving fungi and using fungal resources sustainably.

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