

# The Status and Occurrence of *Bolbelasmus unicornis* Schrank, 1789 (Coleoptera: Geotrupidae) in Croatia

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**Abstract:** *Bolbelasmus unicornis* is a rare thermophilous species distributed in Central Europe and the Balkan Peninsula. It is listed in both Annexes II and IV of the Habitat Directive, and is of special conservation concern within the European Union. No Special Areas of Conservation (SACs) were assigned for this species in Croatia due to the poor knowledge of its occurrence in the country. In order to assess the presence and status of this species in Croatia all the available knowledge about the occurrence in the country and neighbouring regions is summarised. As a result, only a single historical record was found originating from north-western Croatia. In 2014, this species was recorded from a second locality, close to the region of the first record. Due to the small number of records, and its evident decline in other European countries, the inclusion of *Bolbelasmus unicornis* in the list of protected species of Croatia as well as the designation of a new SAC for it are suggested.

**Key words:** distribution, conservation status, Natura 2000, SAC site

## Introduction

The Habitats Directive of the European Union can be regarded as the most crucial document for the conservation of biodiversity on the European continent. Its aim is to ensure the preservation of natural habitats and wild fauna and flora in Europe (COUNCIL DIRECTIVE 92/43/EEC). Especially important conservation measures are those focused on habitats and species listed in Annexes II and IV of the Directive: Annex II contains species requiring the designation of Special Areas of Conservation (SACs), while Annex IV contains species in need of strict protection. Invertebrates represent an important portion of the species listed in Annex II; among them, 38 species of beetles are included.

One of the best mechanisms to protect biodiversity in the European Union is the designation of SACs in accordance to the Habitats Directive. These sites, together with Special Protection Areas (or SPAs), are called Natura sites and they are internationally important for threatened habitats and species. During the designation of SACs in Croatia, such sites were designated for eight coleopteran species: *Lucanus*

*cervus* (L., 1758), *Osmoderma eremita* (SCOPOLI, 1763), *Rosalia alpina* (L., 1758), *Morimus asper funereus* MULSANT, 1862, *Cerambyx cerdo* L., 1758, *Leptodirus hochenwarti* SCHMIDT, 1832, *Carabus nodulosus* CREUTZER, 1799 and *Graphoderus bilineatus* (DE GEER, 1774) (ANONYMOUS 2015). For two additional species, *Cucujus cinnaberinus* (SCOPOLI, 1763) and *Rhysodes sulcatus* (FABRICIUS, 1787), no SACs have been declared, and these species have been placed into the scientific reserve (SR) category, for which additional research is needed to identify the best sites (ANONYMOUS 2015). However, the presence of another beetle species listed in Annexes II and IV of the Directive, *Bolbelasmus unicornis* SCHRANK, 1789 (Geotrupidae: Bolboceratinae), was completely overlooked (HRAŠOVEC 2009).

The habitat of *Bolbelasmus unicornis* includes thermophilous sites such as open oak forests, meadows and forest edges. It is a stenotopic species, whose larval stage feeds on truffles and other subterranean fungi like *Glomus macrocarpum* (SZWALKO 2004; MIQUEL & VASKO 2014). Adults are active from June to

August. Males fly low above ground before and after sunset in search of females (HORION 1958). Adults are attracted by light (BALLERIO *et al.* 2010). *Bolbelasmus unicornis* is an Eurasian species distributed in the continental parts of Europe, including Switzerland, France, Germany, Great Britain, Austria, Hungary, northern Italy, Greece, the Balkan Peninsula, Poland, Romania, the Czech Republic, Slovakia, Ukraine, Crete and the Rhodes islands (ARNONE & MASSA 2010). While this species has been recorded in all of Croatia's neighbouring countries except Montenegro, the knowledge about its distribution is still very poor, and differs greatly in extent between the countries. In Italy only several records are known and *B. unicornis* is considered to be extremely rare. So far it has been recorded from Piedmont, Lombardy, Trentino, Veneto and Friuli (ARNONE & MASSA 2010; BALLERIO *et al.* 2010). In Hungary, *B. unicornis* is more widely distributed and there are numerous historical and several recent records (NÁDAI 2006; MERKL *et al.* 2014). In neighbouring Slovenia only old records are known, from the mid-19<sup>th</sup> and the first half of the 20<sup>th</sup> centuries (in total seven individuals: BRELIH *et al.* 2010). No recent records exist from Bosnia and Herzegovina (LELO & KAŠIĆ-LELO 2010) but it has been historically recorded from two localities in the south-eastern part of the country, mainly Sarajevo and Babin potok (MIKŠIĆ 1970). In the Catalogue of Scarabaeoidea of Yugoslavia, there are no records of the species from Serbia (MIKŠIĆ 1970) but ARNONE & MASSA (2010) confirmed its occurrence in the country.

Therefore, it is clear that *B. unicornis* is a rare species declining in the whole range of its distribution and therefore it is in a need of conservation actions (BRELIH *et al.* 2010). Due to the limited number of recent records from most countries where this species occurs, each record is very important and can be used to plan future conservation actions and to protect its habitats. Till now, 36 SACs were designated across Europe for the conservation purposes of *B. unicornis*: 15 in Bulgaria, 14 in Hungary, four in Romania, two in Slovakia and one in the Czech Republic (EEA 2016). No sites were proposed in Slovenia, Croatia and Greece, due to the absence of recent records.

The aim of the present study is to compile a list of the records of *B. unicornis* in Croatia based on museum specimens and published data as well as to assess the status of this species in the country based on historical records and recent field surveys.

## Materials and Methods

Entomological collections of the three main museums in Croatia were revised: the Croatian



Fig. 1. *Bolbelasmus unicornis* from Gradište, Croatia

Natural History Museum (Novak Insect Collections, Mikšić Beetle Collection, Koča Beetle Collections, Korlević Beetle Collections), Natural History Museum in Rijeka (Depoli Beetle Collections) and the entomological collection of the Entomological Department of the Varaždin City Museum (Koščec Beetle Collections). Additionally, the literature data were reviewed (e.g. NOVAK 1952; MIKŠIĆ 1958, 1970). In order to confirm the current presence of *B. unicornis* in Croatia, field trips were carried out in 2012–2014 across northern Croatia, mainly in the Slavonia and Baranja Regions.

## Results

We found four specimens of *B. unicornis* in the Mikšić Beetle Collection but none of them was from Croatia. A single specimen had a label "Babin potok", a locality in Bosnia and Herzegovina. The collections of the Natural History Museum in Rijeka held no specimens of this species, while a single specimen was found in the Entomological Department of the Varaždin City Museum but unfortunately without any locality information.

The overview of the literature yielded only a single species record originating from the north-eastern part of the country, the town of Vinkovci, Slavonia (MIKŠIĆ 1970).

The field surveys done in Slavonia (northern Croatia) were successful and an additional record

of *B. unicornis* was registered. This was a male individual, with poorly developed secondary characteristics. It was found in the vicinity of the village Gradište, 45°10'33.7"N 18°44'54.7"E, 81 m a.s.l., 5 June 2014 (Fig. 1). This new locality is at approximately 17 km from the locality of the only published record.

The specimen was attracted to a pyramid light trap used for moth surveys around 20:00 h. The habitat was a mixed lowland forest (surface of 253.19 ha). The forest was not actively grazed by cattle but a community of large mammals such as roe deer *Capreolus capreolus* (L., 1758) and red deer *Cervus elaphus* L., 1758 presented in the area. The forest was in semi-natural state. No visible removal of wood was noticed during our visit but probably the forest management included the standard practice of removal of dead or diseased trees. A macadam road passed through the forest, obviously rarely used.

## Discussion

Review of the relevant literature had yielded only a single record of *B. unicornis* from Croatia. Therefore, the recent record from Gradište is the second record for the country, confirming that the species is still inhabiting Croatia. Such a limited number of records indicates that *B. unicornis* is indeed extremely rare in Croatia, as is the case in most countries where it occurs (BRELIH *et al.* 2010) except for Hungary (NÁDAI 2006; MERKL *et al.* 2014).

Since so far no SAC exists in Croatia for this protected species, we recommend the establishment of a new site (Fig. 2) based on the recently collected material. The properly documented new Croatian locality of *B. unicornis* would be a cogent argument for the state administration to take measures for protection of the habitat and surrounding area where the new locality is recorded. Similar forest fragments are present to the north and south of this locality, and further surveys of this and other nearby potential habitats are needed to infer the extent of the distribution and status of this species in the region. As the forest fragment is situated within an intensive arable landscape, the habitat where *B. unicornis* has been recorded should be surveyed in details, and basic conservation management guidelines for the beetle populations should be formulated based on the results.

The status of *B. unicornis* in the European Union is evaluated as “unknown”. Nevertheless, its legal status is still not regulated in all the countries. It is not listed in the Slovenian Red list of beetles and thus does not have a legal protection status (ANONYMOUS 2002). The same applies for Croatia, where this species has not been included in the list of protected species (ANONYMOUS 2013). In Bosnia and Herzegovina, it is listed as Least Concern (LC) in the Red Book of the fauna (ŠKRIJELJ *et al.* 2013). This is very surprising, since only two historical records exist, without any new findings (LELO & KAŠIĆ-LELO 2010) and this categorisation is not supported by re-

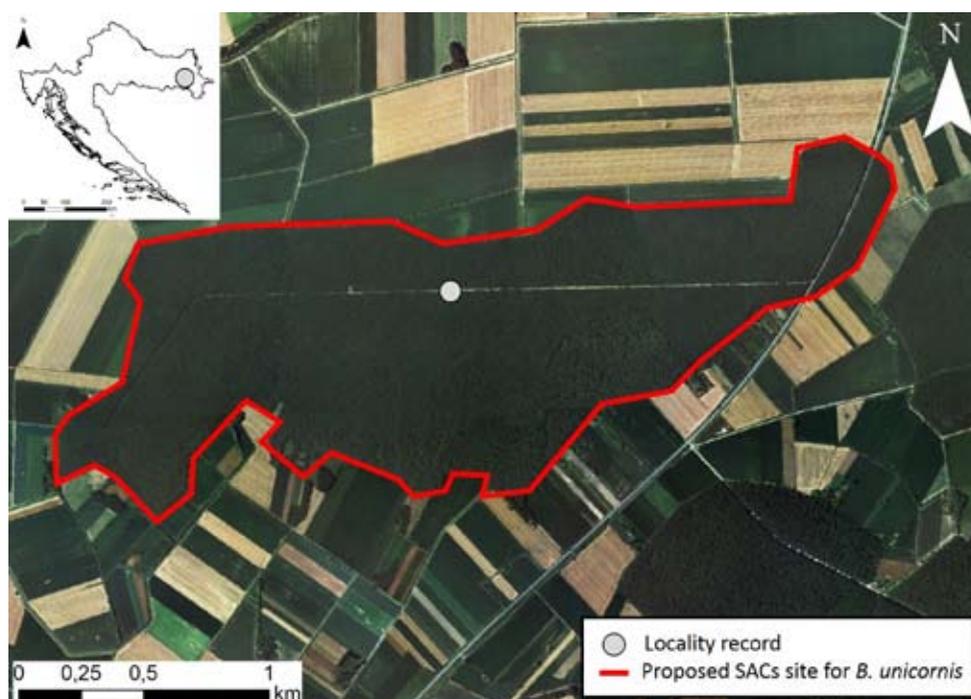


Fig. 2. Proposed Special Area of Conservation for *Bolbelasmus unicornis* in Croatia

cent data. Also, in the same document, it is stated that its status in Europe is considered to be Least Concern, and the Red list of saproxylic beetles is cited as a source (NIETO & ALEXANDER 2010). However, *B. unicornis* is neither saproxylic nor mentioned in the last cited publication. In Serbia, this species is also not present in the list of protected species (ANONYMOUS 2010/2011). In general, it would be beneficial to include this species in the regional Red lists as well as in the lists of protected species for each individual country. Such inclusion would facilitate the implementation of the Habitats Directive and the protection of this species in the EU member states as well as in the countries outside the EU.

Further surveys are needed in Croatia as well as in neighbouring Bosnia and Herzegovina and Serbia, in order to establish the current distribution and the conservation status of this species. Currently, the inclusion of this species in the list of protected species in Croatia is highly recommended. As the specimen was attracted to light traps, a method already registered to attract the species in other parts of Europe (e.g. BALLERIO *et al.* 2010), this way of collecting could be used as a method for the monitoring of *B. unicornis*.

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