

The distribution, habitat, and the nature conservation value of a Natura 2000 beetle, *Carabus hungaricus* Fabricius, 1792 in Hungary

Sándor Bérces¹, Győző Szél², Viktor Kődöböcz³, Csaba Kutasi⁴

¹Duna-Ipoly National Park Directorate H-1021 Budapest, Hűvösvölgyi út 52., e-mail: bercess@gmail.com,

²Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13.,

³Hortobágy National Park Directorate, H-4024 Debrecen, Sumen u. 2.

⁴Bakony Natural History Museum H-8420 Zirc, Rákóczi tér 3-5.

SUMMARY

Carabus hungaricus Fabricius, 1792 usually inhabits sandy grasslands and dolomitic grasslands in Hungary. It is listed in the Habitat Directive and it is a characteristic species of the Pannonian biogeographic region. This paper summarizes all available data (literature data, personal communications, all available museum specimens, original research) on the current distribution of *Carabus hungaricus* in Hungary making use of GIS. The most numerous populations of this carabid beetle live in Pannonic sand steppe biotopes, the most vulnerable of the dolomitic grasslands. In Hungary, *Carabus hungaricus* is a vulnerable species according to the IUCN criteria. Known habitat types, habitat preferences, co-occurring ground beetle species, and endangering environmental factors are discussed.

Keywords: Natura 2000, *Carabus hungaricus*, nature conservation, distribution, Hungary

INTRODUCTION

In the Pannonian biogeographical region, *Carabus hungaricus* Fabricius, 1792 is a species of community interest, whose conservation requires the designation of special areas of conservation. Hungary has enlarged the EU with its entry not only with one more country, but

also with a whole biogeographic region – the Pannonian biogeographic region. Thus the Hungarian government has greater responsibility to preserve this biogeographic region than other member states. When the designation process of the Natura 2000 network started, relatively little was known about the distribution and population size of *Carabus hungaricus*, which is a strictly protected beetle in Hungary.

Carabus hungaricus Fabricius, 1792 usually inhabits sandy grasslands and dolomitic grasslands in Hungary. The type locality “Hungaria” in Fabricius’s description from 1792 refers most likely to the Buda Mountains, which was undoubtedly a place frequently visited by collectors and naturalists of that time. The first exact locality recorded for this species should be attributed to T. Koy, who published in 1800 a specimen catalogue (of the Buda Mts.), which is regarded as the first Hungarian faunistic list (Koy 1800). In spite of this being the first record of the mentioned ground-beetle species, today *Carabus hungaricus* seems to be more frequent in the sandy grasslands of plains than in the dolomitic regions of the Buda Mts.

All subspecies of *Carabus hungaricus* are restricted to the Palearctic region. The European distribution of this species is disjunctive – three major distribution areas can be distinguished: 1) Ukrainian and Russian steppes, 2) Bulgaria, and 3) the Carpathian Basin. In the whole distribution area of the beetle, the habitats where this species occurs are fragmented, and as a result often isolated (Fig. 1).

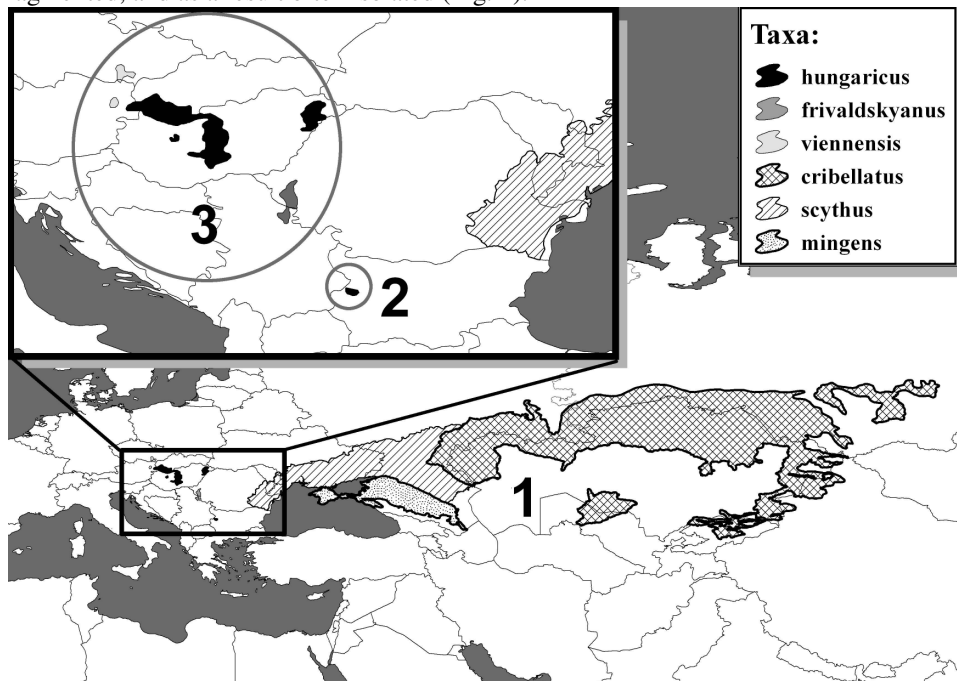


Fig. 1. The distribution area of subspecific taxa of *Carabus hungaricus*
1) Ukrainian and Russian steppes; 2) Bulgaria; 3) Carpathian Basin

Two further subspecies – *mingens* Quensel, 1806, and *cribellatus* M. F. Adams, 1812 live in the Russian and Ukrainian steppes. Some authors distinguish two further subspecies in this area: *scytus* Motschulsky, 1847 (Kryzhanovskij 1953; Turin et al. 2003), and *gastridulus* Fischer von Waldheim 1823 (Löbl & Smetana 2003). Furthermore, *cribellatus* M.F.Adams, 1812 is regarded as a distinct species and not a subspecies of *hungaricus* (Turin et al 2003).

In the Carpathian Basin, two taxa have been described besides the nominotypic subspecies: *hungaricus viennensis* Kraatz, 1877, living in the Vienna Basin (Austria) and in South Moravia (Czech Republic), and *frivaldskyanus* Breuning, 1933 occurring in the Banat Region (Romania, Serbia). Many authors (Freude 1976; Turin et al. 2003) question the subspecies rank of both forementioned taxa.

Carabus hungaricus is a typical steppe species, inhabiting dry calcareous and acidic sandy grasslands (in lowlands), and dolomitic grasslands (in mountains) in the Carpathian Basin. The majority of its populations inhabit calcareous sandy grasslands from the Deliblát (Serbia) throughout the Banat (Serbia, Romania) and sandy areas along the Danube River all the way to Vienna (Austria) and South Moravia (Czech Republic). Numerous populations occur on acidic types of sand grasslands in the Nyírség area, near the city of Debrecen (Hungary). A classical collecting place for this beetle was in the dolomitic grasslands of Buda Mountains, near Budapest. It also occurs on the same type of vegetation on dolomitic grasslands in the Eastern Bakony Mountains, north of Lake Balaton (Hungary).

Little is known about the populations living in the southern part of the Carpathian Basin in Romania. There are only three old records from Romania – Temesvár (Timișoara), Máslak (Masloc), and Németremete (Remetea Mica) (Turin et al. 2003). *Carabus hungaricus* was newly discovered in Temes County near Nagyzsám (Jamu Mare) by Lie (Lie 1994), who caught 13 and 105 specimens near a black locust (*Robinia pseudoacacia*) forest in 1994 and 1995, respectively (Lie 1994, 1995). In Serbia, only the Deliblát Region is known as a suitable habitat for *Carabus hungaricus* (Breuning 1933, Pavičević & Mesaroš 1997).

There are many published localities from South Slovakia: Pozsony (Bratislava) (Csiki 1905-08; Frivaldsky 1874; Majzlan 1998), Trenčsén (Trenčín), Peréd (Tešedíkovó) (Breuning 1933); Peres (Pereš), Szentgyörgyhalma (Jurský Chlm) (Majzlan 1998); Bassóc Hill in Marcelháza (Marcelová), Búcs (Búč), Köbölkút (Gbelce), and Helemba (Chľaba) (Majzlan 2005).

In the Czech Republic, only two recent localities are known in South Moravia (Lukáš Čížek, personal communication).

In Austria, *Carabus hungaricus* is almost extinct and occurs in the region of Lake Fertő (Neuseedler See) (Müller-Motzfeld 2004, Turin et al. 2003). Published data on *Carabus hungaricus* localities in Austria: Niederösterreich (Lower Austria): Lajta Mountain (I. Frivaldsky 1865); Vienna (X. and XI. Bezirk (districts 10 and 11)), Hennersdorf, Deutsch-Altenburg (Breuning 1933); Burgenland: Bruck an der Leitha; Joiszer Trift; Neusiedel am See (Breuning 1933).

Carabus hungaricus is also listed in the Russian (Ivanenko 1999) and in the Ukrainian Red Book (Serbaka 1994), while in Moldavia it is critically endangered (Neculiseanu et al. 1999).

Our goal was to clarify the recent distribution, habitat choice, and nature conservation value of *Carabus hungaricus* in Hungary. To achieve this goal we processed and analyzed our data (see Materials and methods) with GIS and used the standardized criteria published by IUCN (IUCN 2001). We also provide information about the typical coexisting ground beetle species.

MATERIAL AND METHODS

We summarised all available data from the collection of the Hungarian Natural History Museum, where probably the most numerous material of *Carabus hungaricus* specimens are preserved. A database was built on the basis of museum data, and of all available literature data (Ádám & Merkl 1986; Csiki 1905-08, 1946; Húrka 1973; Kaszab & Székessy 1953; Kempelen 1868; Kutasi 1998; Kutasi et al. 2004; Kutasi et al. 2005; Kutasi & Szél 2006; Kuthy 1896; Merkl 1991; Nározsny 1938; Szél 1985; Szél & Ádám 1992; Szél & Bérces 2002; Tóth 1973). Additionally, amateur collectors (Imre Retezár, József Muskovits, György Rozner, László Somay), shared their unpublished data with us. All these data were processed with GIS. In some cases it was impossible to identify the current location of an old collection place. In such cases, the centre of the corresponding geographical entity from the description was geo-referenced. From 2004 to 2006 60 habitat patches known from the literature, personal communication, or just supposed to be a potential habitat of *Carabus hungaricus* were trapped, and marked in the field using GPS (type: eTrex Legend by Garmin). These data was summarized in a GIS database (ESRI shape file), which contained a total of 189 records.

To locate new localities for *C. hungaricus*, we analyzed orthophotos, and contacted several biologists who could point out such places mainly upon botanical characteristics.

RESULTS

Our research proved the presence of *Carabus hungaricus* in a total of 42 localities, out of which 17 were new records in Hungary. On many locations near Budapest (Tétényi-fennsík, Hármashatár-hegy) we were unable to find *Carabus hungaricus* again in places where this species has been extensively collected just 50 years ago.. New records were made in North-West Hungary in Kisalföld region (Csép, Mocsá: Bélapuszta); along the Danube River (Duna-Tisza Mid-Region sand area: Sződliget, Erdőkeres, Tatárszentgyörgy), and in the North-East Hungary (Nyírség area: Bánk, Nyíradony, Nyírbéltek, Nyírgelse, Vámospércs). New localities were also found in the dolomitic grasslands of Buda Mountains near Budapest (Budaörs: Farkas-hegy; Biatorbágy: Bolha-hegy).

According to the data gathered, *Carabus hungaricus* occurs mainly in sandy and dolomitic habitat types in Hungary. These habitats are heavily fragmented and are scat-

tered in over 200 habitat patches. On the distribution map (Fig. 2), five main distribution areas of *Carabus hungaricus* in Hungary can be distinguished.

The first of these distribution areas in the eastern part of Hungary is the so called Nyírség area, where sand steppe habitats are of acidic type. The second one is located along the Danube, south of Budapest, mainly between the rivers Danube and Tisza, where *Carabus hungaricus* lives in calcareous sandy grasslands, while in the most southern part of this distribution area, a loess habitat was also found. West of Budapest, along the Danube River, calcareous sandy habitats, where the sand is more or less mixed with loess are found. Dolomitic type of habitats are located in the Buda Mountains and in the East Bakony Mountains. *Carabus hungaricus* was also collected on Sarmatian (Upper Miocenic age) limestones, near Budapest on the Érd-Tétényi table.

On two occasions *Carabus hungaricus* was found in not natural habitat: in the Nyírség area, near Újfehértó (Kutasi et al. 2004), one specimen was collected from an abandoned apple plantation; and near Nyíradony one more specimen has been collected in an abandoned arable land.

Carabus hungaricus lives in habitats where mainly no other *Carabus* species occur, however, some other *Carabus* species can also be found in its habitat (Fig 3). Most often we find *Carabus scabriusculus* Olivier, 1795, which is a typical steppe species. In dolomitic

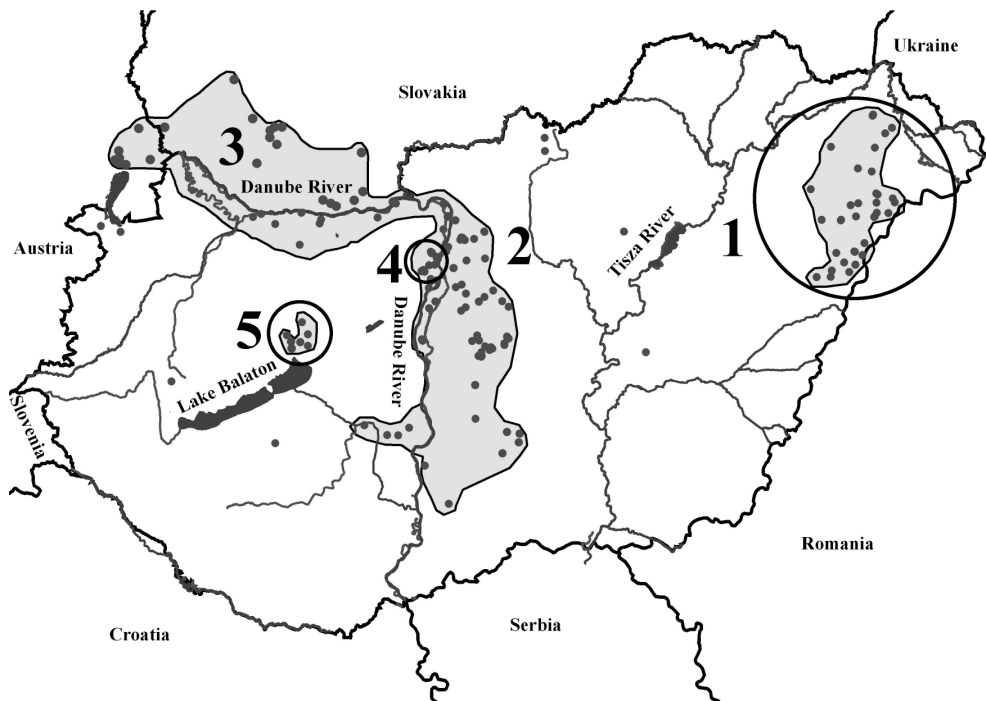


Fig. 2. The distribution of *Carabus hungaricus* in Hungary

1) Nyírség; 2) Area between Duna and Tisza Rivers; 3) West of Budapest along the Danube River; 4) Buda Mountains; 5) East-Bakony Mountains

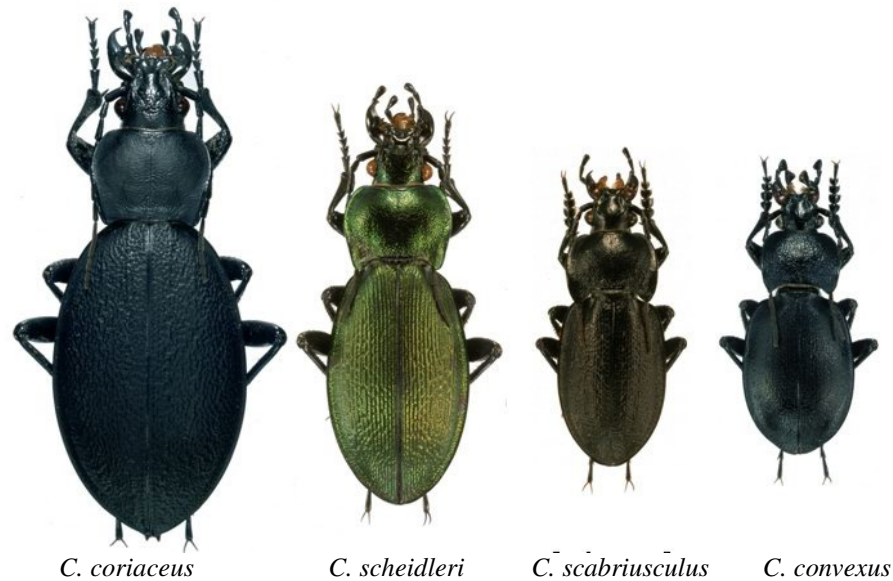


Fig. 3. *Carabus* species occurring with *C. hungaricus* (Photo: Imre Retezár).

grassland habitats we find other numerous species like *Carabus scheidleri* Panzer, 1799, or *Carabus convexus* Fabricius, 1775. *Carabus coriaceus* Linnaeus, 1758, another accompanying carabid species, is a species inhabiting mainly forests and forest edges, but has a great dispersal power and can easily enter the habitats of *Carabus hungaricus* (in lowlands, but especially in the hills).

Other typical ground beetles found in the habitats of *Carabus hungaricus* were *Calathus erratus* (C. R. Sahlberg, 1827), *Calathus ambiguus* (Paykull, 1790), *Calathus fuscipes* (Goeze, 1777) and *Zabrus spinipes* (Fabricius, 1798). *Licinus cassideus* (Fabricius, 1792) is considered to be rare in Hungary and lives in the same habitats as *Carabus hungaricus* both in hills and lowlands. In the open sandy steppe habitat, *Osimus ammophilus* Dejean, 1829, (a Hungarian Red Data Book species) can be found occasionally.

DISCUSSION

In its whole distribution area *Carabus hungaricus* is endangered, in some countries almost extinct or critically endangered (Austria, Müller-Motzfeld 2004; Moldova, Neculiseanu et al. 1999). The populations in Czech Republic and Slovakia are local (Turin et al. 2003). On the basis of this investigation, it can be summarized that in Hungary *Carabus hungaricus* can be found in many places, but the habitat of this species is extremely fragmented. The further fragmentation of its habitat is would cause a decrease in *C. hungaricus* population size, especially in the agglomeration of the capital city Budapest or near larger cities like Győr, Komárom, Ócsa.

As endangering factors could be regarded the ongoing urbanization near big cities like Budapest, Győr or Komárom. The habitats of *Carabus hungaricus* – due to our experiences – could be harmed by waste deposition, building of industrial areas and roads, mining practises, sports (quad, motorcycling), the afforestation of its habitat with black locust (*Robinia pseudoacacia*), scots pine (*Pinus sylvestris*) or European black pine (*Pinus nigra*), and cultivated hybrid poplar (*Populus x hybrida*). It seems that the populations in dolomitic habitats are more vulnerable, mainly because they are more fragmented, and smaller in size. In the last 50 years over 10,000 hectares of dolomitic grasslands were forested with European black pine plantations (Tamás 2001) in Hungary.

Without maintaining the open habitats by grazing, these could become spontaneously reforested with bushes or trees, causing the extinction of *Carabus hungaricus*.

To preserve this Pannonian beetle, which is of community importance, the proper designation of the Natura 2000 network is needed. The responsibility to preserve the populations of *Carabus hungaricus* is higher for the Hungarian decision makers, because the majority of the populations of this beetle are situated in Hungary, where it is a vulnerable species (Bérces et al 2007). The further habitat loss can lead to local extinctions, which endanger the survival of *Carabus hungaricus* in Hungary.

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