

The First Record of the Family Cerophytidae (Coleoptera) from Bulgaria: the Rare Saproxyllic Beetle *Cerophytum elateroides* (Latreille, 1804) in Beech Woodland in Sarnena Sredna Gora Mts.

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Abstract: The family Cerophytidae Latreille, 1834 (Coleoptera: Elateroidea), with the only European genus *Cerophytum* Latreille, 1806 and its species *C. elateroides* (Latreille, 1804), are reported with the first verified record from Bulgaria. The material was collected using a pitfall trap in an old and well-preserved beech forest on the ridge of the Sarnena Sredna Gora Mts., Central Bulgaria. *Cerophytum elateroides* is a rare species everywhere in Europe, being an indicator of the presence of rotting wood in old broad-leaved woodlands. The new locality is the most south-eastern point known in the geographical range of the species, probably representing a relict population.

Key words: rare click beetle, new record, Sarnena Sredna Gora Mts., *Cerophytum*

Introduction

The family Cerophytidae Latreille, 1834 (Coleoptera: Polyphaga: Elateriformia: Elateroidea) includes 22 species belonging to four genera worldwide. The only Holarctic genus is *Cerophytum* Latreille, 1806, which consists of four species. It is distributed in western and eastern USA, southern and central Europe and Japan (COSTA et al. 2003, 2010). The family is represented by a single European species, *Cerophytum elateroides* (Latreille, 1804), a dark-coloured medium-sized (around

6–7 mm) beetle (BOCÁK 2007). It is a saproxyllobiont associated with deciduous forest habitats (ARNETT et al. 2002, COSTA et al. 2010, KOVÁCS et al. 2010, NAKLÁDAL 2011, IRURZUN & MORENO 2012, Ladislav BOCÁK, pers. comm.). The only congeneric species distributed in East Asia, *C. japonicum* Sasaji, 1999, was also found in deciduous forest (SEUNG et al. 2019). *Cerophytum elateroides* feeds on laminated rotten xylem (ARNETT et al. 2002). Cerophytid larvae were described from rotten wood associated with fungi, which they most likely feed on (REY 1887, MAMAEV 1978,

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LAWRENCE 1991, COSTA et al. 2010). Larvae of *C. elateroides* have been collected in old decomposing (brown rotten) wood of elm (*Ulmus*) and alder (*Alnus*) (LAWRENCE et al. 2000) as well as lindens (*Tilia*) and poplars (*Populus*) (BURAKOWSKI 1991), in association with larvae of the family Oedemeridae (COSTA et al. 2003).

Cerophytum elateroides is considered quite rare in Europe. It is included in the European Red List of Saproxyllic Beetles as “Vulnerable” (NIETO & ALEXANDER 2010, CÁLIX et al. 2018). It is also included as “Endangered” in the Polish Red Data Book of Animals (BUCHHOLZ & OSSOWSKA 2004), “Critically endangered” in the Red List of Threatened Species in the Czech Republic (VÁVRA 2005) and “Data Deficient” in the Red List of Saproxyllic Beetles of Italy (AUDISIO & BAVIERA 2014).

The aim of this study is to present the first record of *Cerophytum elateroides* in Bulgaria, recognising this way the first verified report of the family Cerophytidae in the country and to add new data to the knowledge of its distribution and ecology.

Materials and Methods

Field work was carried out in 22 March – 7 July 2019 via pitfall trapping in the Sarnena Sredna Gora Mts. (easternmost part of the Sredna Gora Mts.) in the region of the Svezhen Hut. Formaldehyde was used as a fixative.

The habitat was located on the northern slope of the mountain, just below the highest ridge part of the Bratan region. It was an old and well-preserved beech forest, with relatively low anthropogenic impact. Some of the trees were very old, with a rotten or rotting core (Fig. 1). Often the rotting covered the entire log.

The identified specimen was pinned and deposited in the Zoological Collection of Sofia University, Faculty of Biology (BFUS).

Results

One female specimen of *Cerophytum elateroides* was collected (Fig. 2). Material examined: Central Bulgaria, Sarnena Sredna Gora Mts., 22 March – 7



Fig. 1. Habitat in the Sarnena Sredna Gora Mts. where *Cerophytum elateroides* was collected: A. Early spring. B. Late spring. C, D. Typical old trees, summer (C) and autumn (D).

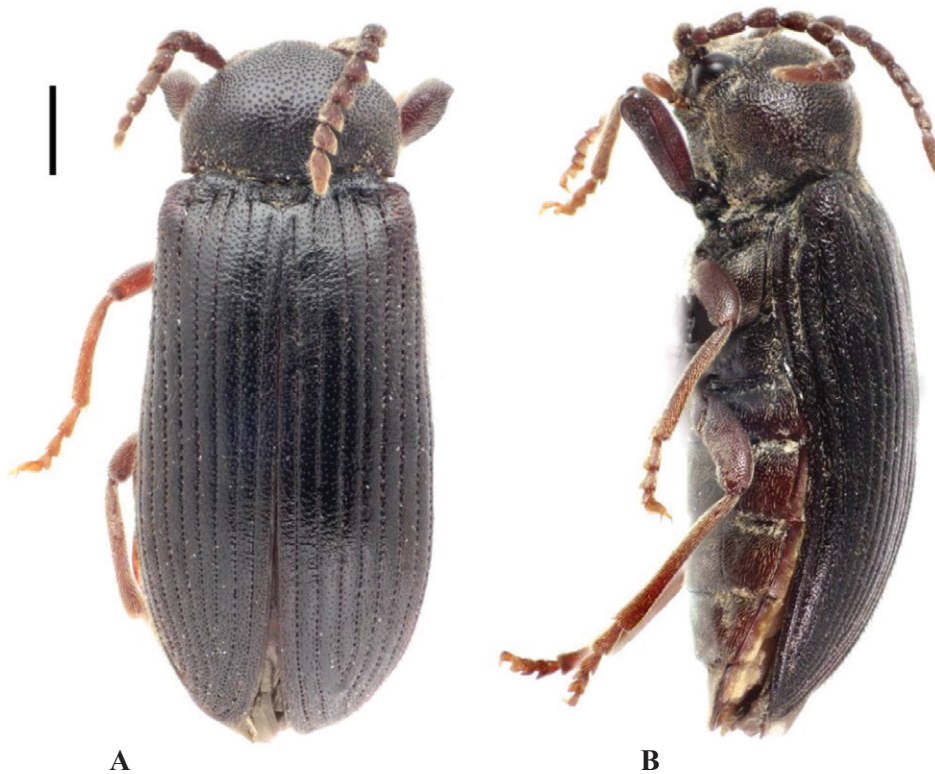


Fig. 2. General view of *Cerophytum elateroides* (Latreille, 1804) (female) in the Sarnena Sredna Gora Mts. A. Dorsal view. B. Lateral view. Scale bar 1 mm.

July 2019, 1 km NW Hut Svezhen, 42°31'03"N, 25°02'40"E, 1022 m, mesophilous beech forest at the ridge of the mountain, with many old trees (Fig. 1), 1 ♀, leg. T. Teofilova and N. Kodzhabashev, det. D. Gradinarov.

Discussion

We report the family Cerophytidae Latreille, 1834 (Coleoptera: Elateroidea), the genus *Cerophytum* Latreille, 1809 and the species *Cerophytum elateroides* (Latreille, 1804) with the first documented record from Bulgaria. The family Cerophytidae has been mentioned for Bulgaria in the Catalogue of Palaearctic Coleoptera (BOCÁK 2007). According to BOCÁK (2007), the geographical ranges of the two Palaearctic species of the genus *Cerophytum* include Austria, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Latvia, Luxembourg, The Netherlands, Poland, Romania, Slovakia, Slovenia and Switzerland for *C. elateroides*, and Japan for *C. japonicum*; the latter species has recently been reported from Korea (SEUNG et al. 2019). In Fauna Europaea (DE JONG et al. 2014), *C. elateroides* was reported also for Belgium, Britain, Central European

Russia, Italian mainland, Sardinia, and doubtfully for the Spanish mainland. However, this species has been confirmed for the Iberian Peninsula (PÉREZ-MORENO & IRURZUN 2010, IRURZUN & MORENO 2012). Generally, *C. elateroides* occurs in Central Europe and the areas bordering the west and south (LOMPE 2010). Recently, *C. elateroides* has been reported from Serbia (DUŠÁNEK 2014).

We suppose that the record of *C. elateroides* from Bulgaria in the Catalogue of Palaearctic Coleoptera is a technical error – instead of BE (for “Belgium”, which is omitted from the catalogue), it has been typed BU (Bulgaria). Besides, the author has also confirmed that the catalogue was based only on general information on the range of *C. elateroides* in Europe, without specimens or published records from Bulgaria (L. BOCÁK, pers. comm.). These circumstances make our finding the first verified record of Cerophytidae and *C. elateroides* from Bulgaria.

In Central Europe, almost all reports of *C. elateroides* are from lowlands and mid-elevation forests (ARNETT et al. 2002, L. BOCÁK, pers. comm.). The only records from above 1000 m a.s.l. are in our study and the finding from Drôme, Rhône-Alpes (South-eastern

France) at 1120 m (DODELIN & LESEIGNEUR 2010). It seems that in the Bulgarian part of the geographical range, this species occupies forest habitats at higher altitudes. In Spain, *C. elateroides* has also been found in mountainous areas (Sistema Ibérico), although no altitudes of the localities have been mentioned (PÉREZ-MORENO & IRURZUN 2010, IRURZUN & MORENO 2012). The latter authors consider the populations of the species in the interior of the Iberian Peninsula as relict, left after the climate changes during the Pleistocene. It is possible that the population of this species in Sarnena Sredna Gora Mts. is also relict, situated at the south-eastern border of the species' range.

Cerophytum elateroides is a saproxylobiont and its development takes place in the rotten and moulder wood of old deciduous trees and tree trunks (LOHSE 1979, BURAKOWSKI 1991, LOMPE 2010). It has been found in open cavities with musty mould (TROUKENS 2017) and in leaf litter or underground debris (ARNETT et al. 2002). It is reported from forests consisting of maple (*Acer*) (Aceraceae), birch (*Betula*) (Betulaceae), walnut (*Juglans*) (Juglandaceae), willow (*Salix*) and poplar (*Populus*) (Salicaceae), linden (*Tilia*) (Tiliaceae) and elm (*Ulmus*) (Ulmaceae), more seldom also oak (*Quercus*) and beech (*Fagus*) (Fagaceae) (ARNETT et al. 2002, COSTA et al. 2010, KOVÁCS et al. 2010, NAKLÁDAL 2011, IRURZUN & MORENO 2012, L. BOČÁK, pers. comm.). However, most of the records are from "soft-wood forests" (e.g. lindens, poplars) (BURAKOWSKI 1991). In northern Moravia, it is known from old laying trunks of Canadian poplar (*Populus × canadensis*) in riparian forests (GABRIŠ & VÁVRA 2015); their description ("*Populus* mixed with *Fraxinus*, periodically flooded, especially in spring") refers to the most common habitat in the Czech Republic and also along the Danube between Bratislava and Vienna (L. BOČÁK, pers. comm.). In Belgium, the species has been found in oak stands in Meerdaal forest (VANDEKERKHOVE et al. 2016) as well on dead oak branches in another study (TROUKENS 2017).

We collected *C. elateroides* in old and well-preserved beech forest, which is probably another suitable type of habitat for this species. Other similar reports are from oak and beech forest in Spain (PÉREZ-MORENO & IRURZUN 2010, IRURZUN & MORENO 2012), and from beechwoods at 770 m a.s.l. in Serbia (DUŠÁNEK 2014). It seems that in the extreme southern points of its range, the species occupies mountain habitats. We have found the species only in this particular part of the Sarnena Sredna Gora Mts., although we have studied many similar habitats in other parts of Sarnena Gora and also in other Bulgarian mountains.

Interestingly, during the same study and at the same sampling site, we also captured the lesser glow-worm *Phosphaenus hemipterus* (Goeze, 1777) (Lampyridae) (TEOFILOVA et al. 2020). A number of typical mountain animal species of various systematic groups have also been registered in the same habitat, such as the mesophilous earthworms *Dendrobaena alpina* (Rosa, 1884) and *D. balcanica* (Černosvitov, 1937) (ZDRAVKOVA et al. 2020), and the beetles *Carabus hortensis* L., 1758, *Cychnus semigranosus* Palliardi, 1825, *Xenion ignitum* (Kraatz, 1875) and *Molops* spp. (Carabidae) (TEOFILOVA & KODZHBASHEV 2020) as well as *Morimus funereus* Mulsant, 1862 (Cerambycidae) (GRADINAROV & PETROVA 2020). During the same study, some vertebrates requiring microhabitats with relatively constant high air humidity, which is characteristic of old beech forests in this mountainous zone, were also recorded: fire salamander *Salamandra salamandra* (L., 1758), pygmy shrew *Sorex minutus* L., 1766, bank vole *Myodes glareolus* (Schreber, 1780) and European pine marten *Martes martes* (L., 1758) (TEOFILOVA & KODZHBASHEV, unpublished data). These records demonstrate the importance of this type of habitat (rotting wood, both standing and fallen, which, along with the thick leaf layer, is substantial for maintaining high ground humidity for the most of the year) for the conservation of the biodiversity. These habitats, however, are severely limited in the Sarnena Sredna Gora Mts. (and in Bulgaria) due to irrational forestry activities, as well as to the relatively small area of the beech forests.

Cerophytum elateroides is active from April to June (TROUKENS 2017, LOMPE 2010). In Spain, it was found in the summer (PÉREZ-MORENO & IRURZUN 2010, IRURZUN & MORENO 2012). We also found it in the spring-summer period, although the sampling was conducted during the whole year.

Adult cerophytids have been collected at light traps or Malaise traps, by beating vegetation, in association with rotten wood or bark, and in leaf litter and underground debris (STEINER 2000, COSTA et al. 2003, COSTA & VANIN 2011). *Cerophytum elateroides* is also netted in flight (ARNETT et al. 2002). The larvae could be found under bark if tree falls down and the dead branches in the crown are accessible (L. BOČÁK, pers. comm.). Adults are seldom collected, especially in pitfall traps, so we may consider our finding a "lucky strike". According to BURAKOWSKI et al. (1985) and DUŠÁNEK (2014), beetles are active during the twilight and the night. Adults are usually discovered under the bark or inside of the wood, where they are hidden during the day (VÁVRA 2005). It is possible that collecting this species can be more

successful by using proper sampling techniques, such as intercept traps installed in higher levels of the canopy (L. BOČÁK, pers. comm.).

Currently, this species is rare probably everywhere in Europe (LOMPE 2010, TROUKENS 2017). It is rare in Hungary (KOVÁCS et al. 2010), Czech Republic (NAKLÁDAL 2011) and considered very rare in Belgium (TROUKENS 2017). It is probably extinct in Britain (CROWSON 1981) and in Poland, where it is known from one old locality (BUCHHOLZ & OSSOWSKA 2004). Its rarity may be attributed to the great scarcity of suitable habitats, i.e. forests with old dying deciduous trees (BUCHHOLZ & OSSOWSKA 2004). Habitat loss is mostly related to logging and wood harvesting and the decline of veteran trees throughout the landscape as well as the lack of land management targeted at promotion of recruitment of new generations of trees (NIETO & ALEXANDER 2010). The conservation of *C. elateroides* is to be focused on the maintenance and preservation of its preferred habitats and limiting the tree tending (BUCHHOLZ & OSSOWSKA 2004).

Further studies may provide more comprehensive information on the ecology of the species and its distribution in both Bulgaria and Europe.

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