

## First records of rare saproxylic beetle *Cucujus cinnaberinus* (Scopoli, 1763) in the Republic of North Macedonia and Montenegro

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### Abstract:

This paper provides first data of the species *Cucujus cinnaberinus* in the Republic of North Macedonia and Montenegro, with notes on its ecology and habitat preference. The material includes specimens collected by four experts on separate field trips on three mountains on the south, east and west parts in the Republic of North Macedonia, and in the central parts of Montenegro.

All of the records originate from mountain forested areas – four are from beech forests and two from Molika pine forests. Three of the records include larval specimens while single adult specimen was found in each of the remaining four localities.

The research suggests that the species inhabits broad-leaved forests and pine forests at higher altitudes in investigated area, but the possibility of its presence in other habitats should be considered also.

These records of *Cucujus cinnaberinus* will contribute to the identification of Special Areas of Conservation within the future Natura 2000 network in two countries.

**Key words:** *Cucujus cinnaberinus*, habitats, Montenegro, Republic of North Macedonia

### Introduction

The establishment of the Natura 2000 network and the transposition of the EU Bird and Habitats Directives into national legislation are one of the key goals that EU associate countries need to achieve in the process of approaching the EU. Among tasks to be fulfilled is to determine the presence, population status and distribution of species of the community interest. For the Republic of North Macedonia and Montenegro, as candidate countries for accession to EU, seven saproxylic beetle species: *Cerambyx cerdo* Linnaeus, 1758, *Lucanus cervus* (Linnaeus, 1758), *Morimus funereus* Mulsant, 1862, *Osmoderma eremita* (Scopoli, 1763), *Rosalia alpina* (Linnaeus, 1758), *Buprestis splendens* Fabricius, 1775 and *Cucujus cinnaberinus* (Scopoli, 1763) are considered as priority in identification of

Natura 2000 sites and management of forests. These species are tightly associated with the old-growth and well preserved forests, and many of them are with limited abilities to colonise other types of habitats.

Among them, *Cucujus cinnaberinus* is found throughout much of Europe but it is largely absent in the south and west. The strongest populations are in central Europe, expanding in central-eastern Europe but declining in the surrounding areas (Nieto et al. 2010). Nieto et al. (2010) even considered that *Cucujus cinnaberinus* may be extinct from the following countries: Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, Serbia, and Spain mainland. However, recent publications confirm its presence in the following Balkan countries: Albania, Bosnia and Herzegovina, Bulgaria and Croatia (Guéorguiev et al. 2008; Kovács et al. 2012; Šag et al. 2016; Kulijer & Miljević 2017).

This European endemic is listed in the following international legal instruments and agreements: Annex II and IV of the Habitats Directive; Appendix II of the Bern Convention and Appendix I of the Resolution 6 of the Bern Convention; International Union for Conservation of Nature (IUCN) Red List of Threatened Species with Near Threatened (NT) status on global level; as well as European Red List of saproxylic beetles with Near Threatened (NT) status. It was considered that fragmentation and degradation of forests are main factors causing the decrease of a long-term survival for most saproxylic beetles, including *C. cinnaberinus*. As a result of their stenotopic behavior, limited dispersal ability and microhabitat specialization, it has been listed as vulnerable (VU) (IUCN 2009), but many new records suggest that this species is more common and probably less threatened in Europe, or even going through a phase of expansion (Mazzei et al. 2011), thus the status is downlisted from Vulnerable to Near Threatened. The species was listed as Not Evaluated in the Red List of saproxylic mediterranean beetles (García et al. 2018), and its distribution in the Mediterranean region was considered marginal with more than 25% of its global population occurring outside the region.

This paper provides first data about the presence and distribution of *Cucujus cinnaberinus* in the Republic of North Macedonia and Montenegro with notes on its ecology and habitat preference.

#### Materials and methods:

The material includes specimens collected during separate field trips on three mountains (Bukovik, Malesh and Pelister) in the Republic of North Macedonia and in ancient Black Pine Nature Reserve Crna Poda in Montenegro.

The field trips carried out on Bukovik Mt. were in the scope of the project „Achieving Biodiversity Conservation through Creation and Effective Management of Protected Areas and Mainstreaming Biodiversity into Land Use Planning“, implemented by the Macedonian Ecological Society.

The research on Maleshevski Mt. was conducted as part of the project for Nature Conservation Programme in Republic of North Macedonia – related to the improvement of the status of natural values of Bregalnica region and defining areas of conservation importance -

Natura 2000, organized by Macedonian Ecological Society and Farmahem.

The research carried out on Pelister Mt. was part of the EU Twinning project „Strengthening the capacities for effective implementation of the acquis in the field of nature protection“, led by the Finnish Environment Institute.

Findings from the Nature Reserve Crna Poda, Durmitor National Park were result of EU project “Establishment of NATURA 2000 network - Montenegro “

Beetle fauna was collected manually with active searching under bark of the dead tree trunks.

The material is deposited in the personal collection of J. Mattila from Helsinki, Finland (specimens from Pelister Mt.), and the National Collection of Invertebrates at the Institute of Biology, Faculty of Natural Sciences and Mathematics in Skopje (specimens from Maleshevo Mt. and Bukovik Mt.).

#### Research area:

Pelister Mt. (2601 m a.s.l.) is located in the southwestern part of Republic of North Macedonia. In 1948, due to the special natural beauties, historical and scientific significance of forest areas, part of Pelister Mt. was declared as a National Park and covers an area of 17150 hectares. Forests of the Macedonian five-needle pine - Molika *Pinus peuce* Griseb. are remarkable value of the Pelister National Park. Beech *Fagus sylvatica* L. forests are also dominant forest habitat on Pelister Mt.

Bukovik Mt. (1528 m a.s.l.) is situated in the western part of the country. This is a small mountain (98 km<sup>2</sup>) that borders with high mountains of Suva Gora, Dobra Voda and Bistra. The mountain is dominated by climazonal vegetation of mountain beech forest (as. *Calamintho grandiflorae-Fagetum* Em), and is recognized as core of corridor areas in the national ecological network.

The Maleshevski Planini or Maleshevo Mt. (1748 m a.s.l.) occupies the eastern part of Republic of North Macedonia and comprise the upper watershed of the Bregalnica River. Dominant forest vegetation is beech, Black pine *Pinus nigra* J.F.Arnold and Scots pine *Pinus sylvestris* L. forest.

Nature Reserve „Crna Poda“ is part of the Durmitor National Park in Montenegro. On the other hand, Durmitor National Park is core zone of the Tara Biosphere Reserve. Old-growth stand of European black pine for-

est dominates the Reserve.

## Results and discussion

The first records of very rare saproxylic beetle *Cucujus cinnaberinus* from the territory of the Republic of North Macedonia and Montenegro are presented.

### Republic of North Macedonia

#### Records on Pelister Mountain:

Locality: Baba Mountain, Pelister National Park; 41.026693°, 21.181050°; 1610 m a.s.l.

Habitat: managed mountain forest dominated by Molika pine *Pinus peuce*, near the road to Mt. Pelister. This forest had very few dead trees, at least in the vicinity of mountain road. The beetle was registered under the bark of dead standing *Pinus peuce* with diameter approximately 40 cm. Most of the bark had already fallen on the upper parts of the trunk and specimen was found on the base of the tree, where there was still some bark left. Tree was partially exposed to sunlight.

Date: 16.5.2018

Collecting method: active searching

Material: 1 adult specimen

Leg. & det.: Jaakko Mattila



Figure 1. Molika pine forest on Pelister Mt. (photo Jaakko Mattila)

Locality: Nizhepole, Pelister National Park; 40.978980°, 21.252964°; 1372 m a.s.l.

Habitat: close to alpine ski center in open landscape with very few trees. Under the bark of dead standing fire damaged *Pinus peuce*, diameter 15 cm. Tree was

completely exposed to sunlight. This particular trunk was a real surprise, as it did not seem to be suitable for *Cucujus*. It was already very dry and small diameter of tree did not suggest that it could be habitat for this species. Location was also open and only scarce growing small pine trees occurred there, while more dense forests were nearby in the west of the mountain.

Date: 20.5.2018

Collecting method: active searching

Material: 1 fragment of dead adult specimen

Leg. & det.: Jaakko Mattila

Larvae were not recorded in Pelister National Park, so it is not clear if specimens actually developed in *Pinus peuce* trunks they were found. However, *Pinus peuce* is the dominant tree species in both locations, and as such, most probable larval host tree. More investigations are needed to confirm this host relationship.

#### Records on Malesevski Mt.

Locality: Zamenicka River, Malesevski Mt. 41.657332°, 22.912396°, 1005 m a.s.l.

Habitat: Beech forest near Zamenicka River, under a bark of a fallen beech tree. The narrow riparian belt is represented by old beech trees. The surrounding was also mature beech forest without old trees. *Cucujus* larva was found under bark of large beech stump.

Date: 15.07.2020

Collecting method: active searching

Material: 1 larval specimen

Leg. & det.: S. Hristovski and A.C. Gjorgjievska

Locality: Studena Voda, Malesevski Mt., 41.693529°, 22.990575°, 1520 m a.s.l.

Habitat: The locality is a managed beech forest with presence of some very old beech and aspen trees *Populus tremula* L. (Fig. 2). There were a considerable number of dead trunks of beech and aspen. All of the larvae were found on a fallen dead tree of aspen with a diameter of approximately 40 cm.

Date: 16.07.2020

Collecting method: active searching

Material: adult and 21 larval specimens

Leg. & det.: S. Hristovski and A.C. Gjorgjievska

Notes: The adult specimen was missing its left antenna.



Figure 2. Studena Voda on Maleshevski Mt. (photo Slavčo Hristovski)

Locality: Strednjacka River, Malesevski Mt., 41.700951°, 22.996936°, 1400 m a.s.l.

Habitat: A pile of beech trunks (several years old) in a mountain meadow surrounded by a beech forest. The beech forest was under intensive logging. The single adult specimen was found under the bark of a fallen beech tree next to the river.

Date: 16.07.2020

Collecting method: active searching

Material: 1 adult specimen

Leg. & det.: S. Hristovski and A.C. Gjorgjievska

Notes: The species was collected with other saproxylic beetles (*Sinodendron cylindricum* (Linnaeus, 1758) - Lucanidae, *Melasis buprestoides* (Linnaeus, 1761) - Eucnemidae, *Morimus funereus* Mulsant, 1862 and *Leptura quadrifasciata* Linnaeus, 1758 – Cerambycidae). All of these specimens of other species were collected by air-traps placed on logs.

#### Records on Bukovik Mt.:

Locality: Bukovik Mt.; 41.672171°, 20.877628°; 1360 m a.s.l.

Habitat: Old-growth beech forest. The forest was intensively logged during the field research. The adult specimen was found on a fallen beech tree with a diameter of approximately 60 cm.

Date: 11.07.2020

Collecting method: active searching

Material: 1 adult specimen

Leg. & det.: S. Hristovski

Notes: The specimen was missing its left metatibia.

#### **Montenegro**

##### Records from Crna Poda:

Locality: Crna Poda, Mojkovac, Montenegro; 43.0086903°, 19.4233063°; 883,74 m a.s.l.

Habitat: Under the bark of couple of large fallen trunks of Black pine *Pinus nigra* diameter over 50 cm. This forest stand was rather open and sun exposed. It had suffered from the forest fire, which had killed several trees.

Date: 7.05.2017

Collecting method: active searching

Material: several larvae and few pupae

Leg. & det.: Jaakko Mattila, Tapio Kujala and Petri Ahlroth, photographed by Tapio Kujala.

This paper presents the first confirmed records of the species *Cucujus cinnaberinus* from the Republic of North Macedonia and Montenegro. In the Republic of North Macedonia it was found on three mountains on the south, east and west parts (Fig. 3). The record from Montenegro is situated in the central parts of the country (Fig. 4).

All of the records are from mountain forested areas – four are from beech forests and two from Molika pine forests. Three of the records are based on larval specimens while single adult specimen was found in each of the remaining four localities (Fig. 5).

The species prefers broad-leaved forests and pine forests at higher altitudes, but the possibility of its presence in a riverine willow and poplar forests in low-land areas should be considered as well.

In the Republic of North Macedonia and Montenegro this species was registered in localities with high ecological importance. All of them are Nature Reserve, nationally protected areas (or proposed for protection), proposed Emerald sites, Important Plant Areas (Brajanoska et al. 2009), etc. We hope that the presented records of *Cucujus cinnaberinus* will also contribute to the identification of Special Areas of Conservation within the future Natura 2000 network in both countries.



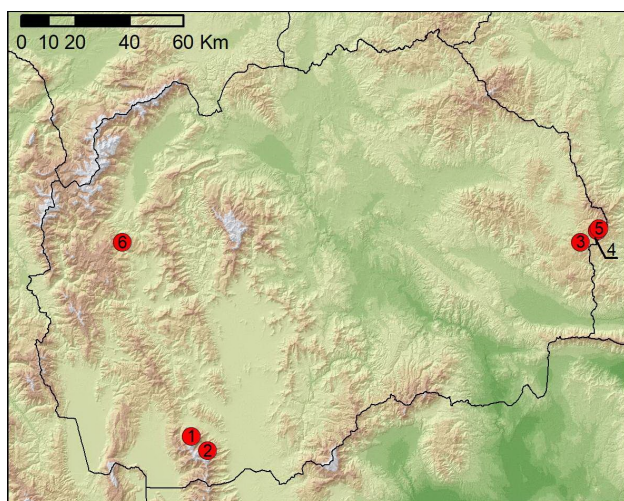


Figure 3. Distribution of *Cucujus cinnaberinus* in the Republic of North Macedonia (1. Pelister National Park, Pelister Mt., 2. Pelister National Park, Nizhepole, 3. Malesevski Mt., Zamenicka River, 4. Malesevski Mt., Studena Voda, 5. Malesevski Mt., Strednjacka River, 6. Bukovik Mt.)



Figure 4. Distribution of *Cucujus cinnaberinus* in Montenegro



Figure 5. *Cucujus cinnaberinus* larva from Studena Voda, Maleshevo Mt., photo Slavčo Hristovski (right) and imago from Pelister Mt., photo Olli Pihlajamaa (left)

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