

**DISTRIBUTION OF *Lumbricus meliboeus* (ROSA 1884)
(OLIGOCHAETA, LUMBRICIDAE):
FIRST FINDING IN KOSOVO AND METOHIJA**

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ABSTRACT. The results of our study provide new data about a *Lumbricus meliboeus* (Rosa 1884) distribution. It is for the first time registered for the territory of Kosovo and Metohija. The new finding place Dubrava represents the southeasternmost point of the species' natural areal. Summarizing all the data reported so far, it can be concluded that this species possesses a wider distribution than was previously thought.

Keywords: *Lumbricus meliboeus*, earthworms, zoogeography, Kosovo and Metohija

INTRODUCTION

Lumbricus meliboeus Rosa, 1884

The first description of *Lumbricus meliboeus* was from Italy, given by ROSA in 1884. The native area of *L. meliboeus* includes the subalpine part of the Alps (SALOMÉ *et al.*, 2011). Until now, *L. meliboeus* has been known from several European countries: Italy (ROSA, 1884; CHINAGLIA, 1912; OMODEO, 1956, 1962), Austria (ZICSI, 1965, 1994; CHRISTIAN and ZICSI, 1999), Croatia (RUCNER D. and RUCNER R., 1971), Bosnia and Herzegovina (ŠAPKAREV, 1977, MRŠIĆ, 1991), Slovenia (MRŠIĆ, 1991), Montenegro (MRŠIĆ, 1991), Spain (COSIN *et al.*, 1992, LÓPEZ de MOLINA, 1988), Czech Republic (PIZL, 1994), Germany (RÖMBKE, 2006), the Alpine region of France (CASSAGNE, 2008) and Switzerland (BULLINGER-WEBER, 2011).

Morphology and anatomy

External characteristics: The body is 45 to 60 mm long, consisting of 75 to 93 segments. The body color is purple. The first dorsal pore is in the 6/7 intersegmental groove. Large male pore surrounded by a small glandular crescent lies on the 15th segment. The clitellum extends from segments 28, 29 to 33 and the tubercula pubertatis are present from segments 30 to 32, 1/n 33 (Fig. 1).

Internal characteristics: The crop occupies the 15th and 16th, and the gizzard the 17th and 18th segments. There are three pairs of seminal vesicles in the 9th, 11th, and 12th segments and two pairs of spermathecae in the 9th and 10th segments. The calciferous glands and lateral tubercles are situated in the 10th and 11th segments. The septa are thickened from 7/8 to 9/10.

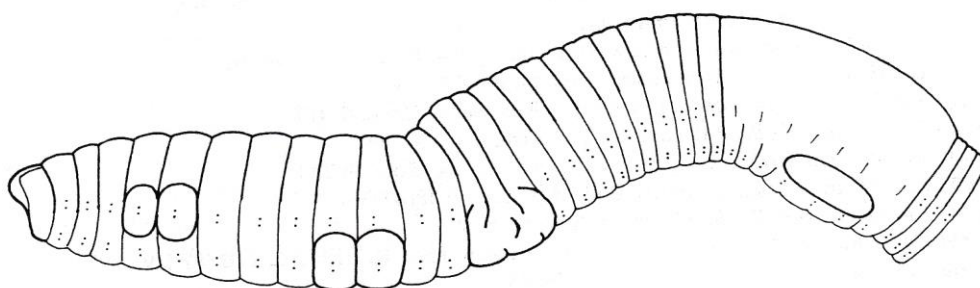


Figure 1. Anterior part of the body of species *Lumbricus meliboeus* (Mršić, 1991)

Ecology

Lumbricus meliboeus belongs to the epigeic species and inhabits the soil of oak forests, but also hilly and mountainous meadows (MILUTINOVIĆ, 2014; MILUTINOVIĆ *et al.*, 2013, 2015; STOJANOVIĆ *et al.*, 2018).

Distribution in Serbia

Lumbricus meliboeus till now was registered in the western part of Serbia: Perućac, Tara (MILUTINOVIĆ, 2014; MILUTINOVIĆ *et al.*, 2013, 2015; STOJANOVIĆ *et al.*, 2018).

Bearing in mind above mentioned, the objective of this paper is to analyze data from our own collected material, as well as the earlier published data, in order to supplement an overview of the *L. meliboeus* distribution in the European territory with fresh data from the territory of Kosovo and Metohija.

MATERIAL AND METHODS

Study area

Our investigations were carried out in Kosovo and Metohija. Located in the southwestern part of Serbia, the Kosovo and Metohija territory predominantly (63.5%) consists of mountainous terrain, whereas lowland units make up 36.5% of its relief. The area is characterized by complex climatic and orographic characteristics, and a very complex geological and geographical composition, primarily numerous valleys, and mountains. The climate varies from mountainous to temperate continental and continental. Leposavić city is bounded

on the east by the slopes of Kopaonik, and on the west by the slopes of Rogozna. Dubrava hill is located west of Leposavić city, with the highest point at an altitude of 763 m.

Methods

Our extensive earthworm field investigations throughout Kosovo and Metohija were carried out during the 2012-2021 period. In over 30 locations we collected 309 earthworm exemplars, from 40 species and subspecies, belonging to 11 genera. Specimens were collected in spring and summer, from forests, meadows, mountain pastures, as well as river and stream habitats, situated between 460 and 1600 m altitude, by the formalin method, digging ($0.4 \times 0.4 \text{ m}^2$) and hand sorting (CSUZDI and ZICSI, 2003). The earthworms were killed by 70% ethanol, fixed in 4% formalin solution, and later transferred and stored in 90% ethanol. Collected earthworms were identified in the laboratory of the Faculty of Science in Kragujevac, according to the keys written by ZICSI (1982), MRŠIĆ (1991), CSUZDI and ZICSI (2003). All specimens collected and/or examined are permanently archived in the Earthworm Collection of the University of Kragujevac, Serbia (CEKUS), and are publicly accessible.

In such a mass of collected earthworms, we have registered an interesting finding of *Lumbricus meliboeus*, about which this paper is. The figure with the distribution of this species was displayed using Google Maps.

RESULTS AND DISCUSSION

On April 10th 2013, on the hill Dubrava (700 m a.s.l) near Leposavić city, except the five earthworm species (*Aporrectodea caliginosa*, *Ap. rosea*, *Ap. smaragdina*, *Lumbricus rubellus*, *Octolasion lacteum*), in oak forest soil we found one specimen of *L. meliboeus*. This is the first record of *L. meliboeus* from Kosovo and Metohija (Fig. 2).

Biogeographical consideration

Lumbricus meliboeus was discovered for the first time in Serbia in Tara Mountain (MILUTINOVIĆ *et al.*, 2013) and it was only a known finding place in Serbia. Our research shows that the southern areal border of this species in Serbia has expanded 175 km to the south. Since the extreme parts of the Dinaric Mountains follow the flows of the rivers Drina and Ibar, it is quite expected that this species was also found in Kosovo and Metohija. If our assumption is correct, then it means, that species will be probably migrated over the neighbouring hills and lowlands to closely located mountains such as the Šara Mt., as a part of the Dinaric Massif. Bearing in mind that this species was found on Tara, as part of the Dinarides, it was expected to be found in the north of Kosovo, which belongs to the southernmost part of the slopes of the Dinaric Alps.

The most important distribution center of the *L. meliboeus* in Europe is the Alpine-Dinaric area, where it was registered in the largest number of records. That is why the Alps are taken as the center of its origin (SALOMÉ *et al.*, 2011; MILUTINOVIĆ *et al.*, 2013), from where it spreads across Dinarides (through Croatia, Bosnia and Herzegovina, and Montenegro) to western and southwestern parts of Serbia (Tara, Dubrava). Based on published data (CHRISTIAN and ZICSI, 1999; RÖMBKE, 2006; SALOMÉ *et al.*, 2011; MILUTINOVIĆ *et al.*, 2013), the northernmost findings of the species have been in Hesse (Germany), the southeasternmost point in its distribution is Parangalitz Park, on Rila Mt. in Bulgaria (MILUTINOVIĆ *et al.*, 2013) (Fig. 3).

This was the reason for researchers to classify the species into the Balkanic-Alpine distribution type (MILUTINOVIĆ *et al.*, 2013; STOJANOVIĆ-PETROVIĆ *et al.*, 2020). Unfortunately, only one specimen of *L. meliboeus* was registered in Bulgaria, while in North Macedonia, Albania, Greece, and the southeastern part of Serbia mentioned species was not registered (ŠAPKAREV, 1978; SZEDERJESI and CSUZDI, 2012; SZEDERJESI *et al.*, 2017; STOJANOVIĆ-PETROVIĆ *et al.*, 2020). Therefore, *L. meliboeus* belongs to the Alpine-Dinaric type of distribution (KUTUZOVIĆ D.H. and KUTUZOVIĆ B.H., 2013) till now. Generally, this study provides evidence for the extension of the areal of *L. meliboeus* to the northern area of Kosovo and Metohija (red dot signed as 2 on Fig. 2, and black square mark on Fig. 3).

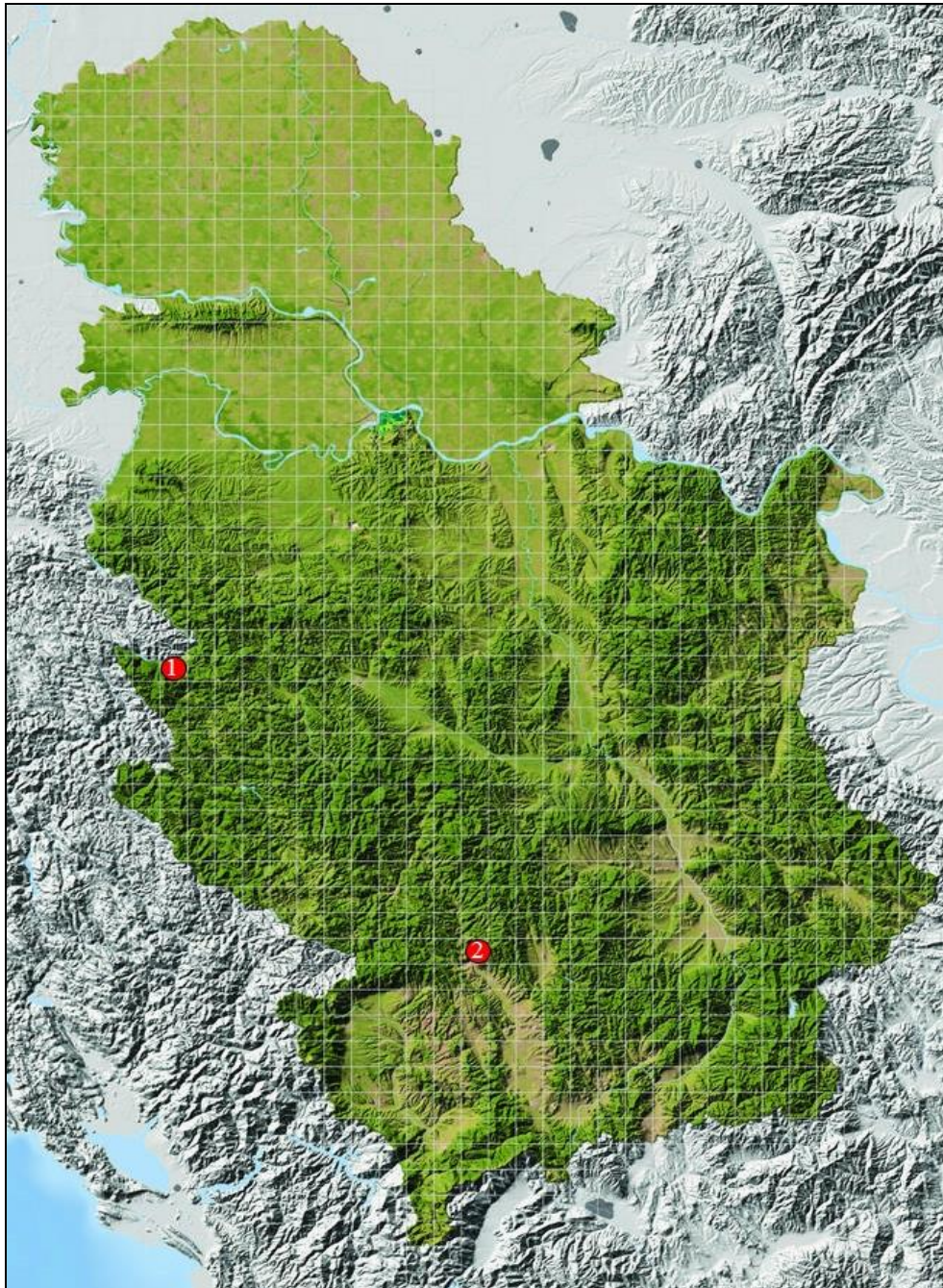


Figure 2. Distribution of *Lumbricus meliboeus* in Serbia (1 – literature data; 2 – new data).

Our knowledge of the distribution of *L. meliboeus* is still incomplete. Further research is needed in other Dinaric Mountain branches in Kosovo and Metohija, North Macedonia and Albania, as well as through the Pirin-Rila-Balkan Mountain chains in Bulgaria, to explain the real distribution of *L. meliboeus* on the Balkan Peninsula. For now, the southernmost point on the territory of ex-Yugoslavia (till 1992) is Lovćen Mt. in Montenegro (Fig. 3; MILUTINOVIĆ *et al.*, 2013).



Figure 3. Distribution of *Lumbricus meliboeus* in Europe (circles – literature data (seen MILUTINOVIĆ *et al.*, 2013); square – new data).

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