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On the diversity of the earthworms (Lumbricidae) from the Rhodope Mts in Bulgaria

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Abstract. The research is a contribution to the knowledge of the earthworm diversity from the Western Rhodope Mts (Bulgaria). In this study, are presented new records of the rare Balkan endemic species *Dendrobaena balcanica* (Černosvitov, 1937). The paper also provides information about distribution, zoogeography and ecology of earthworm species from the mountain.

Key words: new data, Lumbricidae, earthworms.

Introduction

The Rhodopes are a mountain range in Southeastern Europe, and are the largest by area in Bulgaria, with over 83% of its area in the southern part of the country and the remainder in Greece. The earthworm fauna from the Rhodope Mts. was studied first by Černosvitov (1934, 1937) and Mihailova (1966). Recently, Uzunov (2010) and Szederjesi (2013) published some new data. According to the literature, 22 earthworm species are known from the territory of the Rhodope Mts. (Valchovski *et al.*, 2018). However, the knowledge of the earthworm fauna is still insufficient, because the mountain is still not well explored.

The aim of the present study is to combine and summarize the previous records on the earthworm fauna in the Rhodope Mts with some new data.

Material and Methods

Investigations were carried out in 2019 and 2020. Earthworms were collected by the second author in the village of Grashtitsa (42°50'59"N, 23°08'07"E), at about 1350 m a.s.l. The area of the yard was about 500 m^2 and was missing any agricultural treatment and processing, except of a few planted trees and not very regular (twice-a-year) mowing.

Earthworms were killed in 4% formaldehyde solution and fixed in 70% ethanol. They were dissected under microscope. Identification of species was done in accordance to Mršić (1991). The specimens were deposited in the Institute of Soil Science, Agrotechnologies and Plant Protection “N. Poushkarov”, Sofia, Bulgaria.

Results

During the study, nine species and five genera were collected. Known data from Rhodope Mts. were exposed with new material.

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***Aporrectodea rosea* (Savigny, 1826)**

Known data: Debrashtitca, Patalenitsa, Tunkovo, Vishegrad, Cruncha, Bachkovo vill. (Mihailova 1966). New material: 6 ex.

***Dendrobaena alpina alpina* (Rosa, 1884)**

Known data: Kostenets (Černosvitov 1937), Tunkovo vill. (Mihailova 1966), Pavelsko vill. (Szederjesi 2013). New material: 8 ex.

****Dendrobaena balcanica* (Černosvitov, 1937)**

This is the first record of this species from the Rhodope Mts. New material: 2 ex.

***Dendrobaena hrabei* (Černosvitov, 1934)**

Known data: Kostenets (Černosvitov 1937). New material: 1 ex.

***Dendrobaena rhodopensis* (Černosvitov, 1937)**

Known data: Kostenets (Černosvitov 1937). New material: 2 ex.

***Eisenia lucens* (Waga, 1857)**

Known data: Bachkovo vill. (Černosvitov 1937) Smolian (Szederjesi 2013). New material: 4 ex.

***Lumbricus rubellus* Hoffmeister, 1843**

Known data: Asenovgrad (Černosvitov 1937), Patalenitsa, Tunkovo, Cruncha, Bachkovo, Malko Gradishte vill. (Mihailova 1966). New material: 2 ex.

***Lumbricus terrestris* Linnaeus, 1758**

Known data: Smolian (Szederjesi 2013). New material: 9 ex.

***Octolasion lacteum* (Örley, 1881)**

Known data: Asenovgrad, Kostenets (Černosvitov 1937) Bachkovo, Tunkovo vill. (Mihailova 1966), Smolian (Szederjesi 2013). New material: 2 ex.

One taxon, *D. balcanica*, is found for the first time in the Rhodope Mts. It is a Balkan endemic species, previously found in Bulgaria only in the Slavyanka Mts (Černosvitov, 1937), Pirin Mts (Zicsi & Csuzdi 1986) and Sarnena Sredna Gora Mts (Zdravkova et al. 2020). Thus, the present study added one species to the so far known lumbricid fauna of the mountain, which currently includes 23 species, presented in the Table 1. This is almost the half of the earthworm diversity in Bulgaria (Valchovskiet al., 2018). Similarly, an extremely rich lumbricid fauna (21 species, 42% of Bulgarian lumbricid fauna) has been found in the Sarnena Sredna Gora Mts., which was supposed to be resulting from its specific location, relief and contact areas (Zdravkova et al. 2020).

The analysis of our results and the data already known for the mountain shows that according to the zoogeographical distribution types, the earthworm fauna of the Rhodope Mt. is dominated by peregrine species (10 taxa, 43.5%), followed by endemic species (5 taxa, 21.7%). This is typical for earthworm biodiversity of the country (Valchovski, 2012). Less numerous are the Balkanic-Alpine, Central-European and Trans-Aegean earthworms (each with 2 taxa, 8.7%). Mediterranean and Holarctic species take part with one species each (4.3%). Most of the species (9) are epigeic, distributed on the surface of the soil layer. Also numerous are endogeic earthworms (7) living in the humus soil layer. Rest of the species are anecic (from deep soil layers), amphibiotic, corticolous or epi-endogeic.

Table1. Earthworm biodiversity from the Rhodope Mts.

Taxa	**Zoogeography**	**Ecology**
Allolobophoridella eiseni	Holarctic	Corticolous
Aporrectodea handlirschi	Trans-Aegean	Endogeic
Aporrectodea jassyensis	Trans-Aegean	Endogeic
Aporrectodea longa	*Peregrine*	Anecic
Aporrectodea rosea	*Peregrine*	Endogeic
Bimastos rubidus	*Peregrine*	Epigeic
Cernosvitovia biserialis	Balkan endemic	Endogeic
Cernosvitovia rebeli	Balkan endemic	Endogeic
Criodrilus lacuum	*Peregrine*	Amphibiotic
Dendrobaena alpina alpina	Balkanic-Alpine	Epigeic
Dendrobaena attemsi	Balkanic-Alpine	Epigeic
Dendrobaena balkanica	Balkan endemic	Epigeic
Dendrobaena hrabei	Balkan endemic	Epigeic
Dendrobaena octaedra	*Peregrine*	Epigeic
Dendrobaena rhodopensis	Balkan endemic	Epigeic
Eisenia fetida	*Peregrine*	Epigeic
Eisenia lucens	Central European	Epigeic
Eiseniella tetraedra	*Peregrine*	Amphibiotic
Lumbricus rubellus	*Peregrine*	Epi-endogeic
Lumbricus terrestris	*Peregrine*	Anecic
Octodrilus complanatus	Mediterranean	Anecic
Octolasion lacteum	*Peregrine*	Endogeic
Proctodrilus antipai	Central European	Endogeic

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