

Earthworm (Clitellata: Lumbricidae) records from the Rila Mountains (Bulgaria)

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Abstract. The current study is a contribution to the knowledge of the earthworm diversity from the Rila Mountains (Bulgaria). During the investigation 13 earthworm species were collected altogether, belonging to eight genera. Among them *Aporrectodea handlirschi* (Rosa, 1897) and *Aporrectodea caliginosa* (Savigny, 1826) proved to be new records from the territory of the Rila Mountain.

Key words: earthworms, Lumbricidae, Rila Mountains.

Introduction

Rila is a mountain range in southwestern Bulgaria and the highest mountain range of Bulgaria and the Balkans, with its highest peak being Musala at 2.925 m a.s.l. The Rila Mountain has an area of 2.400 sq. km. The dome of the mountain rises over the surrounding mountain valleys, with the Borovets Saddle connecting the main Musala Ridge with the Shipochan and Shumnatitsa ridges that connect to the Ihtiman Sredna Gora Mountains through the Gate of Trajan pass. The Yundola Saddle and the Avramovo Saddle link the Rila Mountain with the Rhodopes Mountains to the east, while the connection with the Pirin Mountains is the Predel Saddle, the one with the Verila Mountain is the Klisura Saddle. The climate is typically alpine, with 2.000 mm of precipitation on Musala Peak yearly, of which about half is snow.

Exploration of the earthworm diversity in the Rila Mountain was launched by Černosvitov (1934, 1937). His work was continued by Plisko (1963), Šapkarev (1986) and Zicsi & Csuzdi (1986). Recently Uzunov (2010), Stojanović *et al.* (2012), Milutinović *et al.* (2013), Szederjesi (2013) and Valchovski & Szederjesi (2016) registered new records from the Rila Mountains.

Material and Methods

Investigations were carried out during March, April and May 2016. Earthworms were collected by the diluted formaldehyde method (Raw 1959) complemented with digging and hand-sorting. The combination of both methods provides a more complete sampling of species, because the formalin method alone is not efficient in collecting species living in horizontal burrows. The specimens were killed in 70% ethanol, fixed in 4% formalin solution and in 70% ethanol. Five localities were investigated in the Rila Mountains: Kostenets waterfall, Resilovo, Sapareva Banya, Rila Monastery and Kirilova Polyana.

The specimens were deposited in the Institute of Soil Science, Agrotechnologies and Plant Protection "N. Poushkarov", Sofia, Bulgaria in private earthworm collection of Hristo

Valchovski (PCHV). The earthworms were described and dissected under low power microscope. Identification of species was done in accordance to Mršić (1991).

Results and Discussion

Family Lumbricidae Rafinesque-Schmaltz, 1815

Genus *Allolobophoridella* Mršić, 1990

Allolobophoridella eiseni (Levinsen, 1884)

Material examined. Bulgaria: Kostenets waterfall, mixed forest, 896 m, 42° 15' 06"N 23° 48' 17"E, 19.03.2016, 3 ex., (H. Valchovski leg.) (PCHV/61); Bulgaria: Rila Monastery, deciduous forest, 1275 m, 42° 08' 43"N 23° 21' 49"E, 21.05.2016, 1 ex., (H. Valchovski leg.) (PCHV/77).

Genus *Aporrectodea* Örley, 1885

Aporrectodea caliginosa (Savigny, 1826)

Material examined. Bulgaria: Sapareva Banya, near a brook in mixed forest, 830 m, 42° 17' 01"N 23° 15' 34"E, 01.05.2016, 7 ex., (H. Valchovski leg.) (PCHV/71); Bulgaria: Resilovo, torrent west of the village, 676 m, 42° 16' 17"N 23° 12' 12"E, 01.05.2016, 2 ex., (H. Valchovski leg.) (PCHV/70).

Aporrectodea handlirschi (Rosa, 1897)

Material examined. Bulgaria: Kostenets waterfall, mixed forest, 870 m, 42° 15' 05"N 23° 48' 22"E, 19.03.2016, 2 ex., (H. Valchovski leg.) (PCHV/61).

Aporrectodea rosea (Savigny, 1826)

Material examined. Bulgaria: Kostenets waterfall, mixed forest, 870 m, 42° 15' 05"N 23° 48' 22"E, 19.03.2016, 1 ex., (H. Valchovski leg.) (PCHV/61).

Aporrectodea trapezoides (Dugès, 1828)

Material examined. Bulgaria: Kostenets waterfall, mixed forest, 870 m, 42° 15' 05"N 23° 48' 22"E, 19.03.2016, 2 ex., (H. Valchovski leg.) (PCHV/61).

Genus *Dendrobaena* Eisen, 1873

Dendrobaena alpina (Rosa, 1884)

Material examined. Bulgaria: Rila Monastery, deciduous forest, 1275 m, 42° 08' 43"N 23° 21' 49"E, 21.05.2016, 3 ex., (H. Valchovski leg.) (PCHV/77).

Dendrobaena attemsi (Michaelsen, 1902)

Material examined. Bulgaria: Kostenets waterfall, mixed forest, 870 m, 42° 15' 05"N 23° 48' 22"E, 19.03.2016, 2 ex., (H. Valchovski leg.) (PCHV/61).

Dendrobaena hrabei (Černosvitov, 1934)

Material examined. Bulgaria: Kirilova polyana, near a brook in coniferous forest, 1485 m, 42° 09' 16"N 23° 24' 07"E, 21.05.2016, 1 ex. (H. Valchovski leg.) (PCHV/78).

Dendrobaena octaedra (Savigny, 1826)

Material examined. Bulgaria: Kirilova polyana, near a brook in coniferous forest, 1485 m, 42° 09' 16"N 23° 24' 07"E, 21.05.2016, 3 ex. (H. Valchovski leg.) (PCHV/78).

Genus *Dendrodrilus* Omodeo, 1956

Dendrodrilus rubidus rubidus (Savigny, 1826)

Material examined. Bulgaria: Resilovo, torrent west of the village, 676 m, 42° 16' 17"N 23° 12' 12"E, 01.05.2016, 1 ex., (H. Valchovski leg.) (PCHV/70).

Genus *Lumbricus* Linnaeus, 1758***Lumbricus rubellus* Hoffmeister, 1843**

Material examined. Bulgaria: Resilovo, mixed forest above the monastery, 820 m, 42° 15' 51"N 23° 12' 43"E, 01.05.2016, 4 ex., (H. Valchovski leg.) (PCHV/70); Bulgaria: Rila Monastery, deciduous forest, 1275 m, 42° 08' 43"N 23° 21' 49"E, 21.05.2016, 2 ex., (H. Valchovski leg.) (PCHV/77).

***Lumbricus terrestris* Linnaeus, 1758**

Material examined. Bulgaria: Resilovo, torrent west of the village, 676 m, 42° 16' 17"N 23° 12' 12"E, 01.05.2016, 1 ex., (H. Valchovski leg.) (PCHV/70); Bulgaria: Sapareva Banya, near a brook in mixed forest, 830 m, 42° 17' 01"N 23° 15' 34"E, 01.05.2016, 1 ex., (H. Valchovski leg.) (PCHV/71); Bulgaria: Rila Monastery, deciduous forest, 1275 m, 42° 08' 43"N 23° 21' 49"E, 21.05.2016, 1 ex., (H. Valchovski leg.) (PCHV/77).

Genus *Octolasion* Örley, 1885***Octolasion lacteum* (Örley, 1881)**

Material examined. Bulgaria: Kirilova polyana, near a brook in coniferous forest, 1485 m, 42° 09' 16"N 23° 24' 07"E, 21.05.2016, 3 ex. (H. Valchovski leg.) (PCHV/78); Bulgaria: Rila Monastery, deciduous forest, 1275 m, 42° 08' 43"N 23° 21' 49"E, 21.05.2016, 2 ex., (H. Valchovski leg.) (PCHV/77).

Two taxa are found for the first time in the explored region. *Aporrectodea handlirschi* (Rosa, 1897) and *Aporrectodea caliginosa* (Savigny, 1826) are proved to be new records for Rila Mountains. The Trans-Aegean *Aporrectodea handlirschi* is distributed in the southern parts of Bulgaria, so its presence in the Rila Mountains is not surprising. Also one of the most common peregrine species *Aporrectodea caliginosa* is recorded from the lower parts of the explored region.

According to the current study and literature data 23 earthworm species and subspecies are registered on the territory of the Rila Mountains, which is almost half of the earthworm diversity in Bulgaria (Valchovski 2012). Considering the zoogeographical distribution types, the lumbricid fauna of the Rila Mountains is dominated by peregrine species (11 taxa = 47.82%), followed by endemic (4 taxa = 17.39%) and Balkanic-Alpine species (3 taxa = 13.04%). Central-European, Trans-Aegean, Mediterranean, Holarctic and Palearctic earthworms take part with 1-1 taxon (4.34%).

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