

New Data on the Distribution of Earthworms (Oligochaeta: Lumbricidae) in Bulgaria, with First Record of *Proctodrilus opisthoductus* Zicsi, 1985 in the Country

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Abstract: Earthworm samples were collected from four insufficiently studied regions of Bulgaria: Central Stara Planina Mts., Ruy Mt., Breznik Plain and Sofia Plain. Ten earthworm species belonging to nine genera were identified: *Allolobophora chlorotica* (Savigny, 1826), *Aporrectodea rosea* (Savigny, 1826), *A. trapezoides* (Dugès, 1828), *Cernosvitovia rebeli* (Rosa, 1897), *Dendrobaena alpina* (Rosa, 1884), *Dendrodrilus rubidus rubidus* (Savigny, 1826), *Eisenia lucens* (Waga, 1857), *Lumbricus terrestris* (Linnaeus, 1758), *Octolasion lacteum* (Örley, 1881) and *Proctodrilus opisthoductus* Zicsi, 1985. This study presents the first record of *P. opisthoductus* in Bulgaria. *Dendrobaena alpina*, known from other mountains in Bulgaria, was recorded for the first time from the Stara Planina Mts.

Key words: earthworms, Oligochaeta, Lumbricidae, Bulgaria

Introduction

The examination of the lumbricid fauna of Bulgaria was initiated by ROSA (1897). Subsequent studies provided data on the composition and distribution of earthworm species in the country (ČERNOSVITOV 1934, 1937, PLISKO 1963, MIHAILOVA 1964, 1965, 1966, 1968, ŠAPKAREV 1986, ZICSI & CSUZDI 1986). VALCHOVSKI (2012) summarised the information on the lumbricid earthworm species occurring in Bulgaria. After the publication of this review, several additional publications (STOJANOVIĆ et al. 2012, SZEDERJESI 2013, VALCHOVSKI 2014, VALCHOVSKI & SZEDERJESI 2016) provided new data about the earthworm fauna of Bulgaria, raising the number of the recorded earthworm species up to 48. However, the lumbricid fauna of Bulgaria has remained poorly studied because large areas of the country have never been examined.

The aim of the present article is to report results of the examination of the lumbricid fauna of several insufficiently studied regions in Bulgaria.

Materials and Methods

In 2015 and 2016, four regions were studied: Central Stara Planina (Balkan) Mts., Ruy Mt., Breznik Plain and Sofia Plain. Earthworms were collected using the diluted formaldehyde method (RAW 1959) complemented with digging and hand-sorting. The specimens were killed in 70% ethanol, fixed in 4% formalin solution and in 70% ethanol.

One specimen of *Proctodrilus opisthoductus* has been deposited in the Hungarian Natural History Museum, Budapest (HNHM). The other specimens are deposited in the *Institute of Soil Science, Agrotechnologies and Plant Protection “N. Poushkarov”, Sofia, Bulgaria*, in the personal collection of the author (PCHV). The earthworms were described and dissected using a low-power microscope. The identification of the species follows MRŠIĆ (1991).

Results

Family Lumbricidae Rafinesque-Schmaltz, 1815

Genus *Allolobophora* Eisen, 1874

Allolobophora chlorotica (Savigny, 1826)

Material examined: PCHV54, one specimen, Sofia Plain, meadow near the Kakach River, 556 m a.s.l., 42°43'50"N, 23°14'07"E, 03.02.2016.

Genus *Aporrectodea* Örley, 1885

Aporrectodea rosea (Savigny, 1826)

Material examined: PCHV59, one specimen, Breznik Plain, near the Konska River, 738 m a.s.l., 42°44'51"N, 22°51'32"E, 06.03.2016.

Aporrectodea trapezoides (Dugès, 1828)

Material examined: PCHV59, nine specimens, Breznik Plain, near the Konska River, 738 m a.s.l., 42°44'51"N, 22°51'32"E, 06.03.2016.

Genus *Cernosvitovia* Omodeo, 1956

Cernosvitovia rebeli (Rosa, 1897)

Material examined: PCHV76, four specimens, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016.

Genus *Dendrobaena* Eisen, 1873

Dendrobaena alpina (Rosa, 1884)

Material examined: PCHV76, four specimens, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016.

Genus *Dendrodrilus* Omodeo, 1956

Dendrodrilus rubidus rubidus (Savigny, 1826)

Material examined: PCHV76, four specimens, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016.

Genus *Eisenia* Malm, 1877

Eisenia lucens (Waga, 1857)

Material examined: PCHV76, two specimens, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016.

Genus *Lumbricus* Linnaeus, 1758

Lumbricus terrestris Linnaeus, 1758

Material examined: PCHV/59, two specimens, Breznik Plain, meadow near the Konska River, 738 m a.s.l., 42°44'51"N, 22°51'32"E, 06.03.2016.

Genus *Octolasion* Örley, 1885

Octolasion lacteum (Örley, 1881)

Material examined: PCHV76, five specimens, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016; PCHV60, one specimen, Ruy Mt., near the town of Trun, in beech forest near the River Erma, 725 m a.s.l., 42°51'41"N, 22°39'09"E, 06.03.2016; PCHV59, one specimen, Breznik Plain, meadow

near the Konska River, 738 m a.s.l., 42°44'51"N, 22°51'32"E, 06.03.2016.

Genus *Proctodrilus* Zicsi, 1985

Proctodrilus opisthoductus Zicsi, 1985

Material examined: PCHV76, one specimen, HNHM/17187, one specimen, Central Balkan Mts., Ribaritsa, elm forest near torrent, 757 m a.s.l., 42°49'35"N, 24°25'41"E, 07.05.2016.

External characteristics: Length 25–30 mm, number of segments 62–70. Setae closely paired. Prostomium epilobous ½ closed. First dorsal pore in intersegmental furrow 4/5. Colour pale, unpigmented. Clitellum on ½ 25, 25–33. Tubercula pubertatis strongly protuberant on 30–31. Male pore on segment 15. Setal arrangement after the clitellum: aa:ab:bc:cd:dd = 11:1:8:1:25 (according to CSUZDI & ZICSI 2003).

Internal characteristics: Dissepiments 6/7–9/10 thickened. Spermathecae two pairs in 9/10, 10/11 open in the mid-dorsal line. Crop in 15–16, gizzards in 17–18. Two pairs of testes in 10, 11 and two pairs of seminal vesicles in 11, 12. Calciferous glands in segment 10–12 with lateral diverticula in segment 10. Typhlosolis branched. Nephridial bladders lacking. Longitudinal musculature of fasciculated type.

Discussion

In the present study, a total of 10 earthworm species and subspecies have been collected from Bulgaria. The Central-European species *Proctodrilus opisthoductus* is newly-recorded for the fauna of the country. Its geographical range includes Hungary (ZICSI 1985), Austria (CHRISTIAN & ZICSI 1999), Slovenia (MRŠIĆ & ŠAPKAREV 1988), Serbia (STOJANOVIĆ et al. 2008), Romania (CSUZDI et al. 2011) and Greece (ZICSI & MICHALIS 1993).

Another interesting record is that of the Balkan-Alpine species *Dendrobaena alpina* in the central part of the Balkan Range.

The earthworm fauna was studied for the first time in Breznik Plain and Ruy Mt. and four and one lumbricid species, respectively, were recorded.

Together with the newly-recorded *P. opisthoductus*, the number of earthworm species and subspecies recorded for Bulgaria is raised to 49.

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