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Allolobophora ruzsai sp. n., a new earthworm species and new records from Montenegro (Oligochaeta: Lumbricidae)

Tímea SZEDERJESI

Department of Systematic Zoology and Ecology, Eötvös Loránd University, Pázmány P. sétány 1/C., H-1117 Budapest, Hunary.
E-mail: t.szederjesi@gmail.com

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Abstract. The results of the soil zoology expeditions carried out by the members of the Hungarian Natural History Museum in 2008 and 2012 to Montenegro are presented. Altogether 16 earthworm species and subspecies were found, of which *Allolobophora ruzsai* sp. nov. is new to science and *Dendrobaena luraensis* Szederjesi & Csuzdi, 2012 represents a new record for Montenegro. With these, the present list of Montenegrin earthworms consists of 41 species and subspecies.

Key words: earthworm, Oligochaeta, Lumbricidae, Montenegro, new species, new records.

Introduction

The beginning of investigations on the Montenegrin earthworm fauna goes back to the turn of the last century. Cognetti (1906) and then Černosvitov (1931, 1938) were the first to publish data from Montenegro. After a few decades, Karaman (1972), Šapkarev (1972, 1975, 1978) and Mršić (1983, 1989) followed their work. It was also Mršić (1991) who summarized the knowledge on the earthworms of Montenegro in his comprehensive work on the fauna of the Balkans.

The most complete summary of the Montenegrin earthworm fauna was presented by Karaman & Stojanović (1995, 1998) and Stojanović & Karaman (2003), recording 45 taxa from the country.

In the last decade, investigators of the Hungarian Natural History Museum organized several expeditions to the Balkan Peninsula. The results of the three collecting trips to Montenegro (2005, 2008, 2012) were partly published (Szederjesi 2013), the most recent data are herein presented.

Materials and methods

Earthworms were collected by the diluted formaldehyde method (Raw 1959), complemented with digging and searching under stones and the bark of fallen logs. The specimens were killed and fixed in 96% ethanol, then transferred into 75% ethanol and deposited in the earthworm collection of the Hungarian Natural History Museum (HNHM). For later molecular studies, the tail of some specimens were placed into 96% ethanol.

Results

***Allolobophora ruzsai* sp. nov.** (Fig. 1)
Holotype: HNHM/16094, Sinjajevina Mts., Gornja Polja, Zoljski Ljevak Stream above the village, 880 m, N42°57.808′ E19°31.597′, 14.06.2012, leg. Z. Fehér, T. Kovács, D. Murányi.

Paratype: HNHM/16095 1 ex., locality and date same as that of the Holotype.

Etymology: The new species is dedicated to the acknowledged philosopher and indologist, Dr. Ferenc Ruzsa.

Diagnosis. Length 28–45 mm, diameter 5 mm, setae closely paired. Pigmentation lacking. First dorsal pore in 2/3. Clitellum on ½ 24, 24–32, tubercles on 1/n 28–½ 32. Male pore on 15, surrounded by a glandular crescent. Nephridial pores irregularly alternated between setal line *b* and above *d*. Four pairs of vesicles in 9–12; spermathecae 9/10, 10/11 in *cd*. Calciferous glands with well-developed diverticula in 10. Hearts in segments 6–11, nephridial bladders U-shaped with ental part anteriorly oriented.

External characters. Holotype: 28 mm long and 5 mm wide. Number of segments is 62. Paratype: 45 mm long and 5 mm wide. Number of segments is 92. Colour pale, pigmentation lacking. Prostomium epilobous ½ closed. First dorsal pore at the intersegmental furrow 2/3. Setae closely paired. Setal arrangement behind clitellum: *aa*:*ab*:*bc*:*cd*:*dd* = 14.5:1.5:8:1:30.5. Male pores on segment 15, surrounded by a glandular crescent, protruding into the neighbouring segments as well. Nephridial pores irregularly alternated between setal line *b* and above *d*. Clitellum on segments ½ 24, 24–32. Tubercula pubertatis on segments 1/n 28–½ 32. Glandular tumescence on segments 10, 13, 14, 16, 25 *ab*.

Internal characters. Septa 13/14–14/15 slightly thickened. Testes and funnels paired in segments 10–11, covered by perioesophageal testis sac in

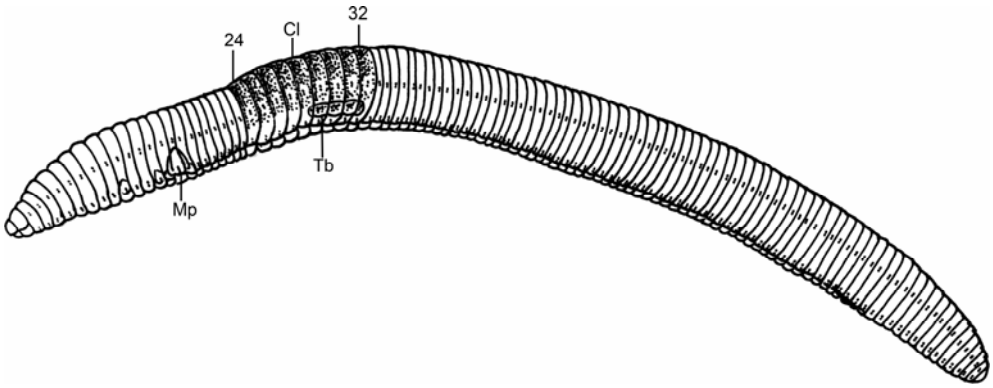

Figure 1. *Allolobophora ruzsai* sp. nov. lateral view. Cl = clitellum, Tb = tubercula pubertatis, Mp = male pore.

segment 10. Four pairs of seminal vesicles in 9–12. Two pairs of spermathecae in 9/10, 10/11 with external openings in setal line *cd*. Calciferous glands in 10–11 with well-developed diverticula in segment 10. Paired hearts appear in segments 6–11, with a pair of small extraoesophageal vessels in 12. Nephridial bladders U-shaped with ental part forward oriented. Crop in segments 15–16, and gizzard in segments 17–18. Typhosolis T-shaped, large. The cross-section of the longitudinal muscle layer is of fasciculated type.

Remarks. The new species resembles *Aporrectodea macvensis* Šapkarev, 2002, but besides the difference in the position of the clitellum (*A. ruzsai*: ½ 24, 24–32 vs. *Ap. macvensis*: 25–33), the tubercula pubertatis (1/n 28–½ 32 vs. ½ 28, 28–32) and the number of vesicles (4 vs. 2), the main difference between the two species is the orientation of the ental part of the nephridial bladders, which is forward in case of *A. ruzsai* and backward in the case of *Ap. macvensis*. Also, this is the main character which separates the genus *Allolobophora* and *Aporrectodea*.

***Allolobophoridella eiseni* (Levinsen, 1884)**

Lumbricus eiseni Levinsen, 1884: 241.

Allolobophoridella eiseni: Mršić 1991: 254., Szederjesi 2013: 62.

Bimastos eiseni: Karaman & Stojanović 1995: 140.

Eisenia eiseni: Stojanović & Karaman 2003: 57.

Material examined. HNHM/16200 2 ex., Sinjajevina Mts., 4 km NW of Gornji Lipovo, beech forest and forest brook, 1351 m, N42°53.829′ E19°23.140′, 11.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi; HNHM/16205 1 ex., Visitor Mts., gorge of the sidestream of Dosova stream at a sink-hole, 1425 m, N42°38.022′ E19°51.005′, 12.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi; HNHM/16216 1 ex., Vojnik Mts., Mokro, ca. 5 km S of Šavnik, spring and its outlet brook in beech forest, 1062 m, N42°56.858′ E19°05.463′, 09.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Aporrectodea caliginosa caliginosa* (Savigny, 1826)**

Enterion caliginosum Savigny, 1826: 180.

Aporrectodea (Aporrectodea) caliginosa caliginosa: Mršić 1991: 321.

Allolobophora caliginosa caliginosa: Karaman & Stojanović 1995: 141.

Aporrectodea caliginosa caliginosa: Stojanović & Karaman 2003: 56.

Material examined. HNHM/16204 1 ex., Visitor Mts., 3 km S of Murino, Dosova stream and its gallery, 971 m, N42°38.458′ E19°52.113′, 12.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Aporrectodea smaragdina* (Rosa, 1892)**

Allolobophora smaragdina Rosa, 1892: 1.

Aporrectodea (Aporrectodea) smaragdina: Mršić 1991: 308.

Allolobophora smaragdina: Karaman & Stojanović 1995: 139.

Aporrectodea smaragdina: Stojanović & Karaman 2003: 55., Szederjesi 2013: 65.

Material examined. HNHM/16217 1 ex., Prokletije Mts., 2 km S of Vušanje, Oko spring and Grlja stream, 1034 m, N42°30.704′ E19°50.088′, 12.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Dendrobaena byblica byblica* (Rosa, 1893)**

Allolobophora byblica Rosa, 1893: 4–5.

Dendrobaena byblica: Mršić 1991: 566., Karaman & Stojanović 1995: 140., Stojanović & Karaman

2003: 56.

Material examined. HNHM/16214 3 ex., Sinjajevina Mts., 3 km W of Boan, Bukavica stream, 1007 m, N42°57.042′ E19°10.410′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Dendrobaena luraensis* Szederjesi & Csuzdi, 2012**
Dendrobaena luraensis Szederjesi & Csuzdi, 2012: 266.

Material examined. HNHM/16202 1 ex., Sinjajevina Mts., 4 km NW of Gornji Lipovo, beech forest and forest brook, 1351 m, N42°53.829′ E19°23.140′, 11.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

Remark. This species was described from Fushë Lurë, Albania, and this is the first record from Montenegro.

***Dendrobaena octaedra* (Savigny, 1826)**
Enterion octaedrum Savigny, 1826: 183.

Dendrobaena octaedra: Mršić 1991: 607., Karaman & Stojanović 1995: 139., Stojanović & Karaman 2003: 56.

Material examined. HNHM/16201 1 ex., Sinjajevina Mts., 4 km NW of Gornji Lipovo, beech forest and forest brook, 1351 m, N42°53.829′ E19°23.140′, 11.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi; HNHM/16212 2 ex., Treskavac Mts., Pošcenje (near Šavnik), Kanjon Nevidio, Komarnica stream, 950 m, N42°59.298′ E19°04.070′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Dendrobaena veneta veneta* (Rosa, 1886)**
Allolobophora veneta Rosa, 1886: 674.

Dendrobaena veneta veneta: Mršić 1991: 613., Karaman & Stojanović 1995: 141., Stojanović & Karaman 2003: 56.

Material examined. HNHM/16206 3 ex., Žijovo Mts., Rikavačko Jezero near Katun Rikavac, inflow brook, 1326 m, N42°34.165′ E19°36.150′, 13.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Dendrodrilus rubidus rubidus* (Savigny, 1826)**
Enterion rubidum Savigny, 1826: 182.

Dendrodrilus rubidus rubidus: Mršić 1991: 263., Stojanović & Karaman 2003: 57.

Dendrobaena rubida rubida: Karaman & Stojanović 1995: 140.

Dendrobaena rubida tenuis: Karaman & Stojanović 1995: 140.

Dendrodrilus rubidus tenuis: Stojanović & Karaman 2003: 56.

Material examined. HNHM/16207 1 ex., Bjelasica Mts., 1 km E of Biogradsko Jezero, forest brook, 1193 m, N42°54.126′ E19°36.108′, 11.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Dendrodrilus rubidus subrubicundus* (Eisen, 1873)**
Allolobophora subrubicunda Eisen, 1873: 51.

Dendrodrilus rubidus subrubicundus: Mršić 1991: 267., Szederjesi 2013: 69.

Material examined. HNHM/16213 3 ex., Sinjajevina Mts., 3 km W of Boan, Bukavica stream, 1007 m, N42°57.042′ E19°10.410′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Eisenia fetida* (Savigny, 1826)**
Enterion fetidum Savigny, 1826: 182.

Eisenia fetida: Mršić 1991: 497.

Eisenia foetida: Karaman & Stojanović 1995: 140., Stojanović & Karaman 2003: 57.

Material examined. HNHM/16208 1 ex., 1 km S of Šavnik, gorge of Bijela Reka, river and its side torrent, 856 m, N42°56.985′ E19°05.958′, 09.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Eisenia lucens* (Waga, 1857)**
Lumbricus lucens Waga, 1857: 161.

Eisenia lucens: Mršić 1991: 500., Karaman & Stojanović 1995: 140., Stojanović & Karaman 2003: 57.

Material examined. HNHM/16209 2 ex., Sinjajevina Mts., 13 km E of Boan, forest brooks in secondary mixed forest, 1417 m, N42°54.765′ E19°16.847′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi; HNHM/16210 1 ex., Sinjajevina Mts., pass of the Šavnik–Kolašin road, outflow brook of a peatbog, 1587 m, N42°54.541′ E19°16.271′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Lumbricus rubellus* Hoffmeister, 1843**
Lumbricus rubellus Hoffmeister, 1843: 187., Mršić 1991: 474., Karaman & Stojanović 1995: 141., Stojanović & Karaman 2003: 56.

Material examined. HNHM/16199 1 ex., Prokletije Mts., 2 km S of Vušanje, Oko spring and Grlja stream, 1034 m, N42°30.704′ E19°50.088′, 12.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Lumbricus terrestris* Linneaus, 1758**
Lumbricus terrestris (part.) Linneaus, 1758: 647.

Lumbricus terrestris: Mršić 1991: 481., Stojanović & Karaman 2003: 56.

Material examined. HNHM/16203 1 ex., Visitor Mts., 3 km S of Murino, Dosova stream and its

gallery, 971 m, N42°38.458′ E19°52.113′, 12.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

***Octodrilus lissaensis* (Michaelsen, 1891)**

Allolobophora lissanesis Michaelsen, 1891: 18.

Octodrilus lissaensis: Mršić 1991: 381.

Octolasium lissaense: Karaman & Stojanović 1995: 142.

Octolasion lissaense: Stojanović & Karaman 2003: 57.

Material examined. HNHM/16215 2 ex., Krivošije Mts., near Dragalj, on the Morinj–Vilusi road, pine forest and pasture, 667 m, N42°36.163' E18°40.490', 09.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

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

Lumbricus terrestris var. *lacteus* Örley, 1881: 584.

Octolasion tyrtaeum: Mršić 1991: 347.

Octolasium lacteum: Karaman & Stojanović 1995: 141.

Octolasion lacteum: Stojanović & Karaman 2003: 56.

Material examined. HNHM/16211 1 ex., Treskavac Mts., Pošcenje (near Šavnik), Kanjon Nevidio, Komarnica stream, 950 m, N42°59.298′ E19°04.070′, 10.10.2008, leg. L. Dányi, Z. Fehér, J. Kontschán, D. Murányi.

Discussion

With our results and the literature data, the number of earthworm species and subspecies recorded from Montenegro presently is 48. This is relatively high, but we have to take into account that there are some uncertainties in the published data.

Stojanović & Karaman (2003) recorded *Octodrilus hemiandrus* (Cognetti, 1901) and *Octodrilus pseudocomplanatus* (Omodeo, 1962) from Montenegro. These species were described from Italy, *Oc. hemiandrus* is from Tino Isle (Zicsi 1981) and *Oc. pseudocomplanatus* is from Brunate, Northern Italy, and have no other occurrence data from the Balkans (Mršić 1991). The presence of both species in Montenegro needs further confirmation.

The situation is the same in case of a few other species. *Dendrobaena vejdovskyi* (Černosvitov, 1935) is a narrowly distributed Eastern Alpine species and reaches the southernmost border of its range in Austria and Hungary (Csuzdi & Zicsi 2003). The presence of *Allolobophora cryptocystis* (Černosvitov, 1935), *Dendrobaena zicsi* Karaman, 1973 and *Eisenia spelaea* (Rosa, 1901) is also doubtful due to the fact that these species were recorded from Prokletije Mts., Čakor (Karaman 1973), near the Montenegrin border, but on the territory of Serbia.

Table 1. List of earthworm species and subspecies in Montenegro.

Allolobophora chlorotica chlorotica (Savigny, 1826)
Allolobophora kosowensis kosowensis Karaman, 1968
Allolobophora kosowensis montenegrina Šapkarev, 1975
Allolobophora ruzsai sp. nov.
Allolobophora sturanyi sturanyi Rosa, 1895
Allolobophoridella eiseni (Levinsen, 1884)
Aporrectodea caliginosa caliginosa (Savigny, 1826)
Aporrectodea caliginosa trapezoides (Dugès, 1828)
Aporrectodea georgii (Michaelsen, 1890)
Aporrectodea handlirschi handlirschi (Rosa, 1897)
Aporrectodea jassyensis (Michaelsen, 1891)
Aporrectodea rosea (Savigny, 1826)
Aporrectodea smaragdina (Rosa, 1892)
Dendrobaena alpina alpina (Rosa, 1884)
Dendrobaena attemsi (Michaelsen, 1902)
Dendrobaena bokakotorensis Šapkarev, 1975
Dendrobaena byblica byblica (Rosa, 1893)
Dendrobaena kozuvensis (Šapkarev, 1971)
Dendrobaena luraensis Szederjesi & Csuzdi, 2012
Dendrobaena montenegrina Mršić, 1988
Dendrobaena octaedra (Savigny, 1826)
Dendrobaena rhodopensis (Černsovitov, 1937)
Dendrobaena serbica Karaman, 1973
Dendrobaena veneta veneta (Rosa, 1886)
Dendrodrilus rubidus rubidus (Savigny, 1826)
Dendrodrilus rubidus subrubicundus (Eisen, 1873)
Eisenia fetida (Savigny, 1826)
Eisenia lucens (Waga, 1857)
Eiseniella tetraedra (Savigny, 1826)
Helodrilus balcanicus balcanicus (Černosvitov, 1931)
Helodrilus balcanicus plavensis (Karaman, 1972)
Lumbricus castaneus (Savigny, 1826)
Lumbricus meliboeus Rosa, 1884
Lumbricus rubellus Hoffmeister, 1843
Lumbricus terrestris Linneaus, 1758
Octodrilus bretscheri (Zicsi, 1969)
Octodrilus complanatus (Dugès, 1828)
Octodrilus lissaensis (Michaelsen, 1891)
Octodrilus transpadanus (Rosa, 1884)
Octolasion lacteum (Örley, 1881)
Perelia nematogena (Rosa, 1903)

The list of Stojanović & Karaman (2003) also contains *Dendrobaena jastrebensis* Mršić & Šapkarev, 1987 and *D. durmitorensis* Mršić, 1988. According to the online database of Csuzdi (2012), *D. jastrebensis* is a synonym of *D. attemsi* (Michaelsen, 1902) and *D. durmitorensis* is a synonym of *D. rhodopensis* (Černsovitov, 1937).

The disputed subspecies *Dendrodrilus rubidus tenuis*, *Eiseniella tetraedra hercynia* and *Octolasion lacteum giganteum* seem to be parthenogenetic forms (Csuzdi & Zicsi 2003).

Mršić (1991) indicates a few more species,

such as *Allolobophora kosowensis montenegrina* Šapkarev, 1975, *Dendrobaena alpina popi* Šapkarev, 1971, *D. illyrica* (Cognetti, 1906) and *Helodrilus balcanicus balcanicus* (Černosvitov, 1931). However, the list of Stojanović & Karaman (2003) does not include these species. Among these, the presence of two species remains questionable. Occurrence of *D. alpina popi* in Montenegro is plausible, but there is no further data in the literature. *D. illyrica* has only been mentioned by Šapkarev (1975) and due to uncertainty in the identification, he also gives a detailed description. According to the morphological characters given, this specimen seem to be a *Dendrobaena serbica* Karaman, 1973 (clitellum on 29–34, tubercula pubertatis lacking, three pairs of vesicles in 9, 11, 12, two pairs of spermathecae in 9/10, 10/11 opening in setal line *d*). Besides, the locality of the questionable *D. illyrica* (Čakor Mts.) actually is very close to the type locality of *D. serbica* (Čakor near Peć). Consequently, we should interpret these data as the first record of *D. serbica* from Montenegro.

Considering all these comments, the total number of earthworm species and subspecies in Montenegro is 41 (Table 1).

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