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# DISTRIBUTION OF TWO SPECIES OF THE EARTHWORM FAUNA OF ŠUMADIJA (SERBIA) IN THE BALKANS AND NEIGHBORING TERRITORIES

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*Abstract* - The authors discuss the zoogeographic distribution in the Balkans of two species of the earthworm fauna of Šumadija, namely *Aporrectodea sineporis* (Omodeo, 1952) and *Helodrilus cernosvitovianus* (Zicsi, 1967). *Aporrectodea sineporis* has been recognized in the central and eastern parts of Serbia, *Helodrilus cernosvitovianus* only on the territory of Mt. Bukulja (in the central part of the country). These are new findings for the earthworm fauna of Šumadija. The available evidence indicates that *H. cernosvitovianus* is mainly a Balkan element, while *A. sineporis* has a distribution of the South European type.

Key words: *Aporrectodea sineporis, Helodrilus cernosvitovianus,* zoogeography, earthworms, Serbia

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## INTRODUCTION

*Aporrectodea sineporis* was described from Italy (Omodeo, 1952) and redescribed from Northern Italy (Zicsi, 1981), Slovenia (Zicsi, 1982), Austria (Zicsi, 1982), and Hungary (Zicsi, 1982; Csuzdi and Zicsi, 2003). We found this species in Central (Šumadija) and Eastern (Majdanpek, the cave Rajkova Pećina) Serbia. Our study showed that the new findings in Šumadija represent the southernmost limit of the distribution of *A. sineporis.*

*Helodrilus cernosvitovianus* was described from Komoro in Hungary (Zicsi, 1967). This species is distributed in Ukraine (Perel, 1964); in Kavala in Northern Greece (Zicsi and Michalis, 1981); in Aleksinac and around the Moravica in Southern Serbia, as well as in Ostrozub, Čemernik, Vidojevica, Vranje, Vlasina, Niš, and Leskovac in Southeast Serbia (Karaman and Stojanović, 1996; 2002); on Mt. Jastrebac in Central Serbia (Stojanović, 1996); and around the Timok in Eastern Serbia (Mršić and Šapkarev, 1987; Šapkarev, 2002). Our investigations showed that this rare species is also distributed in Šumadija, where *H. cernosvitovianus* was found for the first time (only one specimen in an oak forest on Mt. Bukulja).

## MATERIALS AND METHODS

Our investigations were carried out in the eastern (Majdanpek) and central (Kragujevac) parts of Serbia during 1988-1995 and in the central part of Serbia (Mts. Jastrebac and Bukulja) during 2003. Samples were collected in forests, meadows, and pastures. The specimens were obtained by digging and handsorting, as well as by turning over rocks, debris, and logs. The earthworms were killed in 70% ethanol, fixed in 4% formalin solution, and stored in 90% ethanol.

## RESULTS AND DISCUSSION

### *Aporrectodea sineporis* (Omodeo, 1952) (Fig. 1)

*Eiseniella balcanica sine-poris* Omodeo, 1952; *Arch. Zool. Ital.*, 37: 31.
*Eiseniona sine-poris:* Omodeo, 1956; *Arch. Zool. Ital.*, 41: 189.
*Allolobophora handlirschi* (part.): Zicsi, 1968; *Opusc. Zool. Budapest,* 8: 150.
*Allolobophora sineporis*: Zicsi, 1981; *Opusc. Zool. Budapest,* 17-18: 175.
*Allolobophora balcanica sineporis*: Zicsi, 1982; *Acta*

*zool. hung.*, 28: 444.

*Allolobophora* cf. *sineporis*: Zicsi, 1982; *Rev. suisse Zool.*, 89: 561.

*Allolobophora* (s. l.) *balcanica sineporis*: Easton, 1983; *Earthworm Ecology,* 476.

*Allolobophora sineporis*: Zicsi, 1991; *Opusc. Zool. Budapest*, 24: 184.

*Aporrectodea (Aporrectodea) sineporis*: Mršić, 1991; *Acad. Sci. Art. Slov. (Hist. Nat.),* 31: 287.

*Eiseniona balcanica sine-poris:* Qiu & Bouché, 2000; *Doc. pedozool. integrol,* 4: 188.

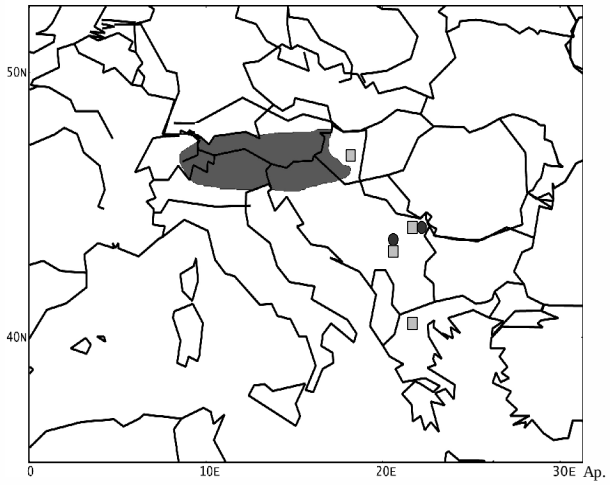


Fig. 1. Distribution of the species *Aporrectodea sineporis* ● (Central and Eastern Serbia, Austria, Italy, Hungary) and *Helodrilus cernosvitovianus* □ (Central and Eastern Serbia, Greece, Hungary) on Balkan and neghboring territories.

Body length 30-40 mm, diameter 3-5 mm, 87-115 segments. Color alive brownish, dorsally reddish with iridescence, preserved pale. Head epilobous, 1/2 open, dorsal pores lacking. Glandular tumescence usually on 11, 12, rarely also on 9 *ab*. Setae closely paired. Clitellum extends on segments 24,25-30,31, saddle-shaped. Tubercles on 27-29. Male pore on 15, between setae *b-c*, almost as small as the female pore on 14. Nephropores alternate irregularly between setal line *b* and above *d*. No dissepiments are notably thickened. Crop in 15-16, gizzards in 17-18. Two pairs of testes in 10,11. Three pairs of seminal vesicles in 9,11,12. Spermathecae two pairs, hanging on long stalk in 9/10, 10/11, and open in setal line *cd*. Calciferous glands in 10-11 with lateral pouches in 10. Excretory system holonephridial. Nephridial bladders J-shaped with backward-oriented ental part. The cross-section of longitudinal muscle layer is of the pinnate type.

Csuzdi and Zicsi (2003) described *A. sineporis* as a forest-inhabiting species that lives in the lower litter layer. Our study corroborates the cited authors. We discovered *A. sineporis* in beech and mixed forests (Majdanpek, Eastern Serbia), as well as in hills and meadows (Šumadija) with moderate soil humidity. This species is found most often in beech forests (as a subdominant and euconstant species), but in the remaining investigated biotopes it is a recendent and accidental species (Stojanović, 1996). According to ecological groupings, it belongs to the epigeic division.

Csuzdi and Zicsi (2004) maintain that *A. sineporis* is a Southern-Alpine species. Mršić (1991) indicates a larger range for this species. Based on previous findings of it on the border of Southern Europe (in Hungary and Austria) and the results of our study, we conclude that *A. sineporis* mainly has a distribution of the South Europe type.

Localities: Eastern Serbia (Rajkova Pećina, six specimens, 30.09.1988; Rajkova Pećina, 12 specimens, 20.10.1988; Majdanpek, 10 specimens, 22.10.1988). Central Serbia, Šumadija (Vraćevšnica, five specimens, 21.05.1995).

*Helodrilus cernosvitovianus* (Zicsi, 1967)
(Fig. 1)

*Allolobophora cernosvitovianus* Zicsi, 1967; *Acta zool. hung.*, 13: 248.

*Allolobophora cernosvitoviana*: Zicsi, 1968a; *Opusc. Zool. Budapest*, 8: 147.

*Helodrilus cernosvitovianus:* Perel, 1976b; *Zool. Zh.* 55: 833.

*Helodrilus cernosvitovianus*: Perel, 1979; Range and regularities in the distr. earthworms, 181.

*Helodrilus cernosvitovianus*: Zicsi & Michalis, 1981; *Acta zool. hung.* 27: 247.

*Allolobophora cernosvitoviana*: Zicsi, 1982a; *Acta zool. hung.*, 28: 444.

*Helodrilus cernosvitovianus*: Easton, 1983; *Earthworm Ecology,* 482.

*Helodrilus cernosvitovianus:* Zicsi, 1985; *Acta zool. hung.*, 31: 282.

*Allolobophora cernosvitoviana*: Rosen & Kostecka, 1988; *Przeglad Zoologiczny*, 32: 199.

*Helodrilus cernosvitovianus*: Zicsi, 1991; *Opusc. Zool. Budapest*, 24: 188.

*Helodrilus cernosvitovianus*: *Mršić*, 1991; *Acad. Sci. Art.*

*Slov. (Hist. Nat.)* 31: 115.
*Helodrilus cernosvitoviana*: Qiu & Bouché, 2000*; Doc. pedozool. integrol,* 4: 196.

Body length is 28 mm/1,5 mm. The body has 97 segments. The prostomium is proepilobic, closed. The first dorsal pore is in intersegmental groove 4/5. Glandular papillae surround setae *ab* and *cd* on segment 12 and *ab* on the 13,23 to 25, or 26 to 28. Setae closely paired. Spermatophore on intersegment 22/23. Clitellum saddle-shaped, extending on segments 21, 22-28, and 29. Tubercula pubertatis in the form of a band on ½ 26- ½ 28. Male pore on 15, large, partly covering the neighboring segments as well. Dissepiments 5/6-9/10 strongly thickened. Crop in 15-16, gizzards in 17-18. Two pairs of testes in 10/11 free, and two pairs of seminal vesicles in 11/12. Spermathecae two pairs (in 9/10 and 10 /11), open above setal line *cd*, close to the mid-dorsal line. Calciferous glands in 10-12, with lateral pouches in 10. Excretory system exonephric and holonephridial. Nephridial bladders lacking. The cross-section of the longitudinal muscle layer is of the fasciculated type.

From the zoogeographical standpoint, the new locality contributes to a better insight into the wide range of this species. According to literature data, this species has been found in Hungary (Z i c s i, 1967), Ukraine (P e r e l, 1964), Greece (Z i c s i and M i c h a l i s, 1981), Poland (K o s t e c k a and S k o c z e n, 1993, 1997), the eastern part of Serbia (Š a p k a r e v, 1980, 2002; M r š i ć and Š a p k a r e v, 1987), and Central and Southeast Serbia (K a r a m a n and S t o j a n o v i ć, 1996: S t o j a n o v i ć, 1996). On the basis of our recent investigations and previous study, the species *Helodrilus cernosvitovianus* seems to be mainly a Balkan element.

Locality: A single specimen was found (in an oak forest in Šumadija). One specimen, 10.05.2003, Mt. Bukulja.

## CONCLUSIONS

Recent investigations of the earthworm fauna in the central and eastern parts of Serbia showed that the Serbian earthworm fauna has some rare species, namely *Aporrectodea sineporis* and *Helodrilus cernosvitovianus.* Only one specimen of *H. cernosvitovianus* was found (in an oak forest on Mt. Bukulja in Šumadija). This species is new for the earthworm fauna of Šumadija. To judge from literature data and our investigations, it can be said that *Helodrilus cernosvitovianus* zoogeographically seems to be mainly a Balkan element. We found *Aporrectodea sineporis* in beech and mixed forests (Majdanpek, Eastern Serbia), as well as in hills and meadows (Šumadija). Our recent finding places throw new light on the distribution of *A. sineporis* and represent its southernmost limit. We think that the given species has a distribution of the South European type.

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## РАСПРОСТРАЊЕЊЕ ДВЕ ВРСТЕ КИШНИХ ГЛИСТА (OLIGOCHAETA, LUMBRICIDAE) ИЗ ШУМАДИЈЕ НА БАЛКАНУ И У СУСЕДНИМ ПОДРУЧЈИМА

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Истраживања фауне лумбрицида на подручју Србије, као централног дела Балкана, указују на присуство и ретких врста као што су: *Aporrectodea sineporis* и *Helodrilus cernosvitovianus.* Подаци из литературе наводе ретка налазишта ових врста изван Балканског полуострва. За *H. cernosvitovianus* то су Пољска и Украјинато. Заступљеност *H. cernosvitovianus* у Пољској и Украјини указује да ова врста има и шире подручје простирања него што су Балкан и суседне територије, како се до недавно мислило. Ипак, на основу великог броја налазишта на територији Србије (Љаркарев, 1980, 2002; Мрљиж and Љарkарев, 1987; Karaman and Stojanović, 1996: Stojanović, 1996) za *H cernosvitovianus* се може рећи да је углавном балкански елемент. Најновија фаунистичка истраживања ће свакако допринети јаснијој слици географског распространења ове врсте.

За врсту *A. sineporis,* неки аутори (Csuzdi and Zicsi, 2003) наводе да има јужно-алпски тип распространења, док је Мрљиж (1991) сврстава у ендеме ширег подручја. Али, најновија налазишта ове врсте на подручју Шумадије и источне Србије дају нешто јаснију слику распространења. Због чињенице да су налазишта у Аустрији и Мађарској на граници са земљама јужне Европе, а сва остала налазишта, укључујући и она која су у раду наведена су јужније, наше је мишљење да *A. sineporis* има углавном јужноевропско распространење.