A new earthworm species, *Dendrobaena rothschildae* sp. n. from Israel, and comments on the distribution of *Dendrobaena* species in the Levant (Oligochaeta: Lumbricidae)

By

Cs. CSUZDI*, T. PAVLÍČEK** and E. NEVO***

Abstract. A new earthworm species, *Dendrobaena rothschildae* sp. n. is described from Israel. A zoogeographical analysis of *Dendrobaena* species being autochthonous in Israel is presented.

Our recent knowledge of earthworm species in the Eastern Mediterranean and of their distribution is far from complete (Omodeo & Rota, 1989). No systematic earthworm surveys have been carried out in Israel and the surrounding countries so far (Pavlíček and Csuzdi, 1999). All registered records resulted from a few occasional and sporadic samples organized as a by-product of other field activities (e.g. insect collecting).

In the course of evolutionary-ecological researches conducted at Lower Nahal Oren, Mt. Carmel, Israel (summarized by Nevo, 1995, 1997), also earthworms had been studied for two years. The results showed a relatively high species amplitude as well as large ecological and genetic differences in the different biotopes (Pavlíček et al., 1996, and unpublished). These results inspired us to launch a more intensive investigation of earthworm fauna of Israel and the Sinai Peninsula. Thus, in Israel about 1500 earthworm specimens from nearly 60 localities have been collected. In the Sinai no representatives of the genus *Dendrobaena* could be observed.

Of the material, taxonomic and zoogeographical analyses of species of the genera *Dendrobaena* and *Bimastos* occurring in Israel have been completed (Csuzdi & Pavlíček, 1999). Also several juvenile *Dendrobaena* specimens showing morphological differences from the others were found, but unfortunately no adults were available to determine them at species level. Lately, several adult and preadult specimens were collected, and a new species, *Dendrobaena rothschildae* sp. n. was found which is described below.

*Dr. *Csaba Csuzdi,* ELTE Állatrendszertani és Ökológiai Tanszék, MTA Zootaxonómiai Kutatócsoport (Department of Systematic Zoology and Ecology of the Eötvös Loránd University, Zootaxonomy Research Group of the Hungarian Academy of Sciences), 1088 Budapest, Puskin u. 3, Hungary.

**Dr. *Tomáš Pavlíček,* Institute of Evolution, University of Haifa, 31905 Haifa, Israel, as well as Institute of Entomology, Czech Academy of Sciences, Branišovská 31, 37005 České Budéjovice, Czech Republic.

***Dr. *Eviator Nevo,* Institute of Evolution, University of Haifa, 31905 Haifa, Israel.

External characteristics. Holotype: length 60 mm, diameter just after the clitellum 5 mm. Number of segments 122. Preadult Paratypes 35–42 mm long and 4 mm wide just after the clitellum. Pigmentation dark violet. Prostomium tanylobous. First dorsal pore at the intersegmental furrow 5/6. Setae unpaired. Setal formula at segment XL: *aa:ab:bc:cd:dd* = 22:11:18:8:47. Three pairs of spermathecal pores present in furrows 8/9, 9/10 and 10/11, somewhat above the setal line *d*. Male pores on the segment XV were juxtaposed to glandular papillae and occupied also a part of the neighbouring segments. Nephridial pores irregularly alternated between setal line *b-d*. Clitellum constantly at segments XXVIII–XXXVI. Tubercula pubertatis in the segments XXX–XXXIV, *1/n* XXXV. Genital papillae on *cd* XI and XII. Genital setae of *cd xi* 0.82–0.9 mm long, spear-shaped with 0.46–0.48 mm long longitudinal grooves.

Internal characteristics. There are no septa thickened. Free testes and funnels paired in segments X–XI. Seminal vesicles present in segments and XII. Epididymis lacking. Spermathecae with short stalk localized in segments IX, X, XI, and with external openings above the setal line *d*. Calciferous lamellae present in segments X–XIII; in segment XII a strongly developed diverticulum was present. Paired lateral hearts present in segments VI–XI; the last pair smaller than the others. Nephridial bladders biscuit-shaped (*octaedra* type). Crop in segments XV–XVI, and gizzard in segments XVII–XVIII. Typhosolis large, anchor-shaped. Longitudinal muscle layers of pinnate type.

As for its morphology, the new species seems to be close to *Dendrobaena samarigera* (Rosa, 1893), but *D. samarigera* does not possess receptaculae seminis and tubercula pubertatis which are present in *D. rothschildae*. Presence of three pairs of receptacula seminis is quite rare among *Dendrobaena* species. Such a number was recorded in *D. octaedra* Eisen, 1874 and *D. alpina diplotritheca* Kvavadze, 1972; *D. rothschildae* sp. n. shows, however, different morphological characters from both mentioned species.

Type material: *Holotype:* Z/12998, Israel, south of Bet-She'an, near the crossroad to Haifa; leg. T. Pavlíček, II. 28. 1998. *Paratypes:* Z/12999, 2 ex.; Z/12913, 7 ex., Israel, south of Bet-She'an, near the crossroad to Haifa; leg. T. Pavlíček, II. 28. 1998. Z/12953, 2 ex., Israel, Jordan valley, Tel el Hama; leg. T. Pavlíček, III. 06. 1998.

The new species is dedicated to Professor Miriam Rothschild in appreciation of her enormous contribution on behalf of biodiversity on our Planet.

Distribution of *Dendrobaena* species known in Israel

Eleven *Dendrobaena* species have been recorded from Israel hitherto. Most of them are endemic to the Israeli part of the Levant, to Levant and Eastern Mediterranean. (Zoogeographically, the Levant includes northern and central Israel, Lebanon and a part of Syria.) Only two species, *D. veneta veneta* (Rosa, 1886) and *D. hortensis* (Michaelsen, 1890) are cosmopolitan. Unfortunately, there are still some taxonomic and zoogeographical problems which do not allow to state accurately the distribution of *Dendrobaena* species in Israel.

Fig. 1. Distribution of *Dendrobaena byblica* species complex

First, there are certain problems regarding the species *Dendrobaena byblica* (Rosa, 1893). This species shows a circum-Mediterranean distribution, but it represents probably a superspecies complex of various sibling species (Fig. 1). Differently from *D. byblica* and the above-mentioned two cosmopolitan species, all other Israeli species of the genus *Dendrobaena* are generally distributed in the East Mediterranean or at least in a part of it. Seemingly, an East Mediterranean distribution is indicated in *D. hauseri* (Zicsi, 1973). The original description of this species was based on material collected in Turkey. Subsequently, it was also recorded in Israel (Zicsi, 1985; Csuzdi & Pavlíček, 1999). However, the latter specimens possess a number of seminal vesicles different from the Anatolian ones, their taxonomic status is therefore uncertain (Fig. 2). A similar problem is associated with the distribution of *D. semitica* (Rosa, 1893). This species was described from Palestine (Est del Giordano and Mesraah = Mezra'ah, Lebanon), and subsequently it has been recorded in Turkey (Omodeo, 1952; Omodeo & Rota, 1989, 1991). Furthermore, important morphological differences were found between specimens originating from Turkey and Israel. Omodeo and Rota (1991, p. 180) characterized the Turkish specimens as follows: *cl:* 24–33, *tb:* 30–32, last hearts in segment 10, receptacles' external openings on line *c*. It may be supposed that the specimens from Turkey are closely related to *D. semitica*, the differences in the position of clitellum and tubercular bands (original description: *cl:* 26–33, *tb:* 31–33) indicate, however,

Fig. 2. Distribution of *Dendrobaena hauseri*

that they might still belong to another species or, at least, subspecies. If our supposition is correct, the distribution of *D. semitica* would be limited to the Levant only (Fig. 3).

In our opinion, the distribution of *D. orientalis* Černosvitov, 1940 is also problematic. The original description was based on specimens collected in Palestine (Rosh Pinna, now: Israel). There is however a similar species, *D. ressli* (Zicsi, 1973); it was described from Turkey. Perel (1979) considered *D. ressli* a synonym of *D. orientalis*. In lack of Perel's specimens collected in Armenia or of a new material, this problem cannot be solved yet. If the receptacles of Armenian specimens described as

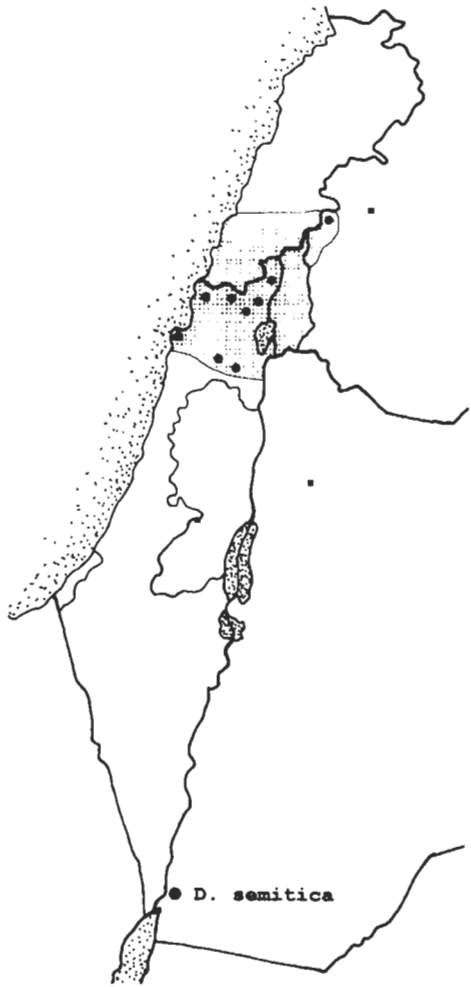

Fig. 3. Distribution of *Dendrobaena semitica*

D. orientalis have external openings on line *d*, they would belong to *D. ressli*. Thus, the distribution of *D. orientalis* would also be restricted to the Levant (Fig. 4). If the receptacles' openings are on line *c*, the two names must be regarded as synonyms and *D. orientalis* would have a wider East Mediterranean distribution from Israel up to Armenia.

The remaining 5 species (*Dendrobaena negevis* Csuzdi & Pavlíček, 1999; *D. nevoi* Csuzdi & Pavlíček, 1999; *D. rothschildae* sp. n.; *D. samarigera* (Rosa, 1893) and *D. veneta kervillei* (Michaelsen, 1910) are endemic to the Levantine part of Israel (Figs. 5–6).

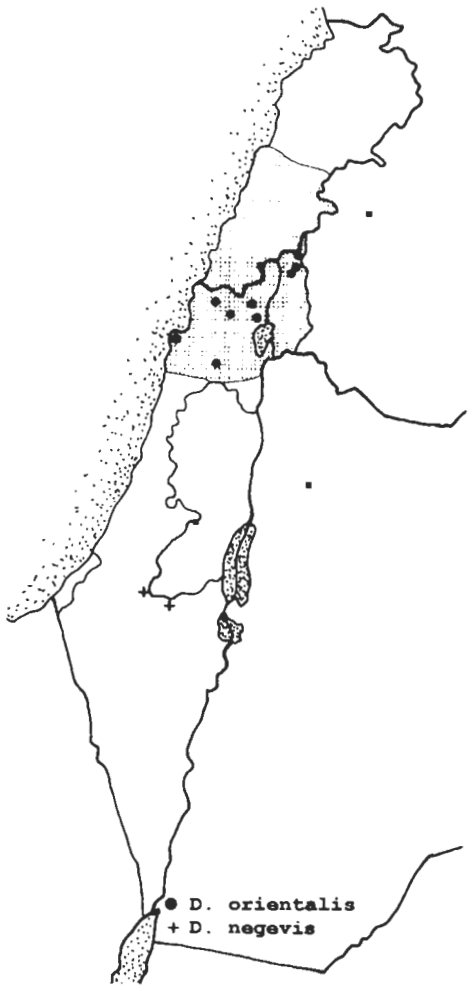

Fig. 4. Distribution of *Dendrobaena orientalis* and *D. negevis*

The presence of the above-mentioned three vicarious sister-taxa may presumes a historical relationship in the earthworm fauna between Israel and Anatolia on the one hand, but the great number of endemisms of *Dendrobaena* species in Israel (64%) supposes a long independent history of both regions on the other hand.

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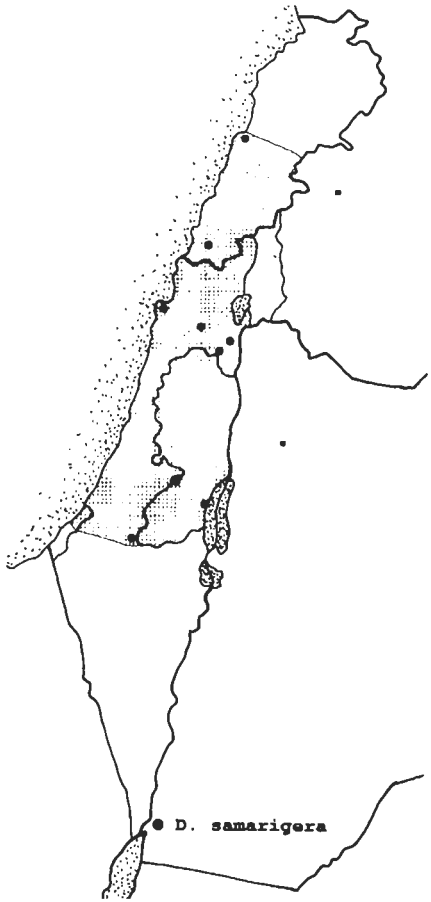

Fig. 5. Distribution of *Dendrobaena samarigera*

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