

Earthworm fauna of Jordan – A review

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SUMMARY. The earthworm fauna of the Hashemite Kingdom of Jordan is reviewed. A checklist of the earthworms recorded so far is presented and the possible origin and zoogeographical connections of the Jordanian earthworm fauna is discussed.

INTRODUCTION

The Hashemite Kingdom of Jordan (abbreviated in the text as Jordan) borders with Iraq, Israel, Saudi Arabia and Syria. The span of Jordan is 91,971 km² and most of the country has an arid or hyperarid climate. However, the northern and central parts of the western Jordan bordering the Afro-Syrian Rift Valley is mesic and contains an autochthonous earthworm fauna studied until now, only by Rosa (1893) and Csuzdi and Pavlíček (2005).

In this paper, we present additional data about the earthworms of Jordan, thus increasing the total number of recorded species to 18. Nevertheless, more autochthonous and introduced species are expected, since species of some genera supposed to be native in the Levant (Pavlíček et al 2003) (*e.g.*, *Healyella*, *Perelia*) were not reported from this region, so far.

We collected earthworms by digging the soil (T. Pavlíček) and preserved the specimens in 75% alcohol. The material was identified by Cs. Csuzdi and is kept in the earthworm collection of the Natural History Museum in Budapest, Hungary.

RESULTS

Newly recorded earthworms of Jordan

a) Family Lumbricidae

1. *Aporrectodea caliginosa* (Savigny, 1826)

Localities: Oasis of el Azraq, 12.III.2005, Leg. T. Pavlíček

Distribution: Cosmopolitan.

2. *Aporrectodea rosea* (Savigny, 1826)

Localities: Um Quays, small valley, 13.III.2005, Leg. T. Pavlíček; Mt. Nebo, limestone hills with grass vegetation, 29.I.2005, Leg. T. Pavlíček.

Distribution: Cosmopolitan.

3. *Dendrobaena negevis* Csuzdi et Pavlíček, 1999

Localities: Mt. Nebo, 29.I.2005, Leg. T. Pavlíček, Mt. Nebo, limestone hills with grass vegetation, 29.I.2005, Leg. T. Pavlíček.

Distribution: Israel (Pavlíček et al. 2003), Jordan.

4. *Dendrobaena semitica* (Rosa, 1893)

Localities: Um Quays, small valley, 13.III.2005, Leg. T. Pavlíček

Distribution: Endemic of the Levant with extension to Cyprus (Pavlíček and Csuzdi, 2004).

5. *Dendrobaena veneta* (Rosa, 1886)

Localities: Mt. Nebo, limestone hills with grass vegetation, 29.I.2005, Leg. T. Pavlíček

Distribution: Cosmopolitan.

6. *Microscolex dubius* (Fletcher, 1887)

Localities: Oasis of el Azraq, 12.III.2005, Leg. T. Pavlíček.

Distribution: Perhaps of South American origin, widely introduced in Mediterranean countries.

7. *Bimastos parvus* (Eisen, 1874)

Localities: North of Shuna, banana plantation, 13.III. 2005, Leg. T. Pavlíček.

Distribution: Presumably a N. American species introduced in the Levant.

8. *Metaphire californica* (Kingberg, 1867)

Localities: North of Shuna, banana plantation, 13.III. 2005, Leg. T. Pavlíček.

Distribution: Cosmopolitan?

We also collected one specimen of a new *Dendrobaena* species that will be described later, because the only specimen at hand is preadult; therefore, additional material need to be collected.

DISCUSSION

Earthworm species richness in Jordan

So far, 18 species of earthworms were recorded in Jordan (Table 1). Out of them, four species (22%) were collected by us in the spring of 1995 year. This fact alone indicates an underestimation of the earthworm species richness in Jordan. In addition, the number of the recorded species is low in comparison with adjacent Israel where 32 earthworm species were reported by Pavlíček *et al.*, (2003) and Csuzdi and Pavlíček (2005b). Out of all species recorded, seven to ten species (39-56%) are autochthonous and 8 to 11 species

are introduced. (Table 1). There is uncertainty about the origin of *Ap. jassyensis*, *D. veneta*, and *O. transpadanus* in Jordan. No endemism on the species level was observed (*Dendrobaena* n. sp. is technically endemic to Jordan, but its distribution is unknown). More certain is the endemism of the subspecies *D. orientalis karak* Csuzdi et Pavlíček, 1995, described from Al-Karak by Csuzdi and Pavlíček (2005a). Apart from *D. orientalis karak* and *D. n. sp.*, there are no indications that the species composition of the earthworm fauna of Jordan is different from the the rest of the Levant. Vice versa, the absence of the three autochthonous Levantine genera (*Healyella*, *Murchieona*, *Perelia*) in Jordan might indicate an impoverishment of the Jordanian earthworm fauna. However, this absence could perhaps vanish with more extensive sampling. As expected, a large part of the Jordanian territory is inhospitable for a long-term earthworm survival.

Table 1. A list of earthworm species known from Jordan

Name	Source of data	Comments
1. <i>Aporrectodea caliginosa</i> (Savigny, 1826)	1, 3	Introduced in Jordan
2. <i>Ap. jassyensis</i> Michaelsen, 1891	1, 3	Possibly autochthonous in Jordan
3. <i>Ap. rosea</i> (Savigny, 1826)	1, 2	Introduced in Jordan
4. <i>Bimastos parvus</i> (Eisen, 1874)	New record	Introduced in Jordan
5. <i>Dendrobaena byblica</i> (Rosa, 1893)	1, 2	Autochthonous in Jordan
6. <i>D. negevis</i> Csuzdi et Pavlíček, 1999	New record	Autochthonous in Jordan
7. <i>D. semitica</i> (Rosa, 1893)	1, 3	Autochthonous in Jordan
8. <i>D. orientalis karak</i> Csuzdi et Pavlíček, 2005	1	Autochthonous in Jordan
9. <i>D. veneta veneta</i> (Rosa, 1886)	1, 3	Possibly autochthonous in Jordan
10. <i>Dendrobaena n. sp.</i>	New record	Autochthonous in Jordan
11. <i>Eisenia fetida</i> (Savigny, 1826)	1	Introduced in Jordan
12. <i>Eiseniella neapolitana</i> (Örley, 1855)	1, 3	Autochthonous in Jordan
13. <i>E. tetraedra</i> (Savigny, 1826)	1, 3	Introduced in Jordan
14. <i>Helodrilus patriarchalis</i> (Rosa 1893)	1, 3	Autochthonous in Jordan
15. <i>Metaphire californica</i> (Kinberg, 1867)	New record	Introduced in Jordan
16. <i>Microscolex dubius</i> (Fletcher, 1887)	1	Introduced in Jordan
17. <i>Ocnodrilus occidentalis</i> Eisen, 1878	1, 2	Introduced in Jordan
18. <i>Octodrilus transpadanus</i> (Rosa, 1884)	1	Possibly autochthonous in Jordan

Desert regions

Not surprisingly, the introduced *Aporrectodea caliginosa* and *Microscolex dubius* were collected in Jordanian deserts. *Ap. caliginosa* is known to be present in temporary or permanently wet habitats in the Levantine deserts (Pavliček *et al.*, 1997). So far, *M. dubius* was recorded in mesic parts of Israel only (Pavliček *et al.*, 1996), but it is also known from the Thar desert in India (Tripath and Bhardwaj, 2002). Their presence and successful, but mostly temporary survival in some desert habitats is due to their introduction by humans, to the resistance of *Ap. caliginosa* to high temperatures (El-Duweini and Ghabbour, 1965), to its ability to reabsorb water from urine (Ghabbour, 1999) and to *M. dubius* surviving the hot, dry summer periods in dormant cocoons (Doubé and Auhl, 1998). The presence of semi-aquatic *Helodrilus patriarchalis* in the desert part of Wadi Zarqa near the Dead Sea (Csuzdi and Pavliček, 2005a) represents an example of desert penetration along the permanent streams or the survival in and around permanent springs but not the survival of this species in desert.

Border of deserts and desert isolates

In contrast to the desert itself, the border of the desert regions receiving about 200 mm annual rainfall also shows an autochthonous earthworm fauna. In such a region, near to Mt. Nebo, we collected the introduced *Ap. rosea*, the possibly introduced *Dendrobaena veneta* and the autochthonous *D. negevis*. *D. negevis* is also known from similar arid habitats bordering desert in Israel (Csuzdi and Pavliček, 1999). An extremely interesting case of morphological differentiation in the mesic enclave of Al-Karak surrounded by desert is *D. orientalis karak* Csuzdi et Pavliček, 2005. This subspecies is well-differentiated from the nominal species by the extension of the clitellum, the position of the tubercle bands and the shape of the genital setae (Csuzdi and Pavliček, 2005a). It is isolated from the nearest distribution border of the nominal species by a distance of about 200 km (Fig. 1.). We do not know for how long this population was isolated in Al-Karak, but it is most probably that this happened for much less than 20 millions years. It makes this case remarkable since Coboli Sbordoni *et al.* (1992) reported allozyme differentiation between species of the genus *Hormogaster*, but almost no morphological differences after 20 millions years of isolation.

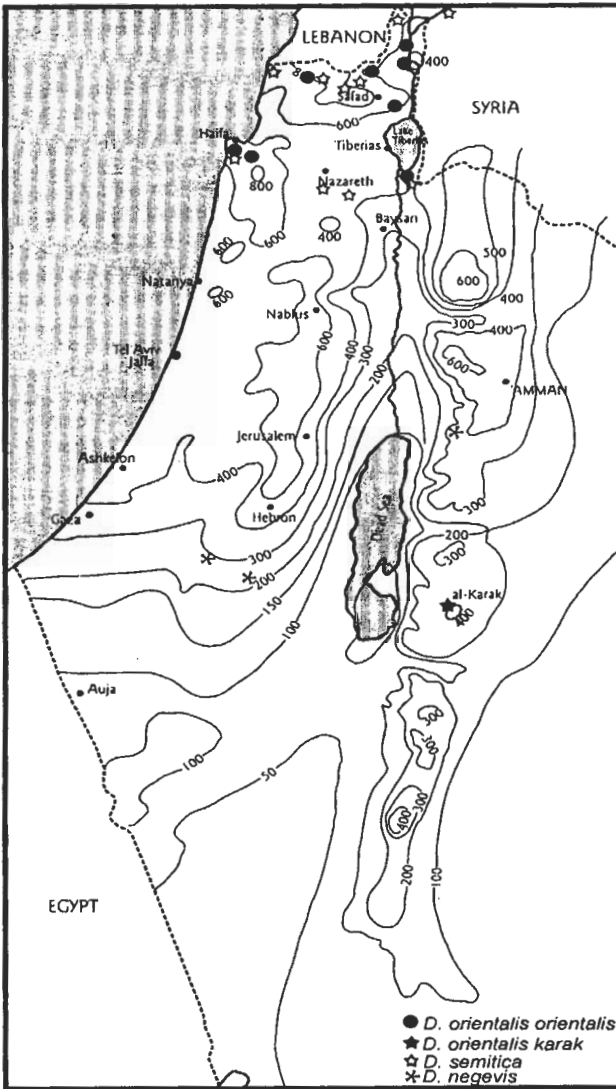


Fig. 1. Distribution of several Levantine species in Jordan and Israel

The main characteristics of the Jordanian native earthworm fauna

The data obtained so far allow us to characterize the Jordanian autochthonous earthworm fauna as follows: 1. Part of the Levantine fauna, possibly impoverished. 2. Exclusively Palearctic origin. 3. Endemism on the subspecies level. 4. A relict character (observed in some species) which indicates probably insular fragments of a previously, more widely distributed tertiary fauna.

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