

Diversity of Earthworm (Clitellata, Annelida) Species in the Asian and European Part of Turkey

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Geliş (Received): 09.09.2016

Kabul (Accepted): 09.10.2016

ABSTRACT: Our country connects the Europe and Asia to each other. Overall, 3% (23,764 km²) of the land is located in Europe known as Eastern Thrace. The rest (756,816 km², 97%) is located in Asia named Anatolia. Because of the presence of the water barrier consisting of the Marmara Sea, Bosphorus and Dardanelles, the flora and fauna of the Asian and European part of Turkey could be somewhat different. So, the aim of this study is to determine the earthworm composition of the Asian and European parts of Turkey.

As a result of the taxonomic studies conducted in Turkey, 80 species of earthworm were recorded until now. Fifteen of which were found in the European part of the country. These are: a) family Lumbricidae: *Aporrectodea jassyensis jassyensis* (Michaelsen, 1891), *Aporrectodea caliginosa* (Savigny, 1826), *Dendrobaena byblica byblica* (Rosa, 1893), *Dendrobaena cognettii* (Michaelsen, 1903), *Dendrobaena hauseri* Zicsi, 1973, *Dendrobaena hortensis* (Michaelsen, 1890), *Dendrobaena veneta veneta* (Rosa, 1884), *Dendrodrilus rubidus rubidus* (Savigny, 1826), *Eisenia fetida* (Savigny, 1826), *Eiseniella tetraedra tetraedra* (Savigny, 1826), *Lumbricus rubellus* Hoffmeister, 1843, *Octodrilus complanatus* (Dugès, 1828), *Octodrilus transpadanus* (Rosa, 1884), *Proctodrilus tuberculatus* (Černosvitov, 1935) and b) family Acanthodrilidae: *Microscolex phosphoreus* (Dugès, 1837). *Dendrobaena hauseri* is the only species occurring in Thrace that has not yet been recorded from the Asian part of Turkey.

Keywords: Anatolia, Biodiversity, Fauna of Turkey, Thrace.

Türkiye'nin Asya ve Avrupa Bölümlerinin Topraksolucanı (Clitellata, Annelida) Tür Çeşitliliği

ÖZET: Ülkemiz Avrupa ve Asya'yı birbirine bağlayan ülkedir. Topraklarının %3'ü (23,764 km²) Avrupa'dadır ve Doğu Trakya olarak bilinir. Geri kalan toprakları (756,816 km², 97%) Asya'da yer alır ve Anadolu olarak adlandırılır. Marmara Denizi, İstanbul ve Çanakkale boğazlarından oluşan su bariyerinin varlığı nedeniyle Türkiye'nin Asya ve Avrupa bölümlerinin fauna ve florası farklı olabilir. Bu yüzden, bu çalışmanın amacı Türkiye'nin Avrupa ve Asya bölümlerinin topraksolucanı kompozisyonunu ortaya koymaktır.

Türkiye'de bugüne kadar yapılan taksonomik çalışmalar sonucunda 80 tür kaydedilmiştir. Bunların 15'i ülkemizin Avrupa bölümünde de bulunmuştur. Bunlar; a) Lumbricidae familyasından: *Aporrectodea jassyensis jassyensis* (Michaelsen, 1891), *Aporrectodea caliginosa* (Savigny, 1826), *Dendrobaena byblica byblica* (Rosa, 1893), *Dendrobaena cognettii* (Michaelsen, 1903), *Dendrobaena hauseri* Zicsi, 1973, *Dendrobaena hortensis* (Michaelsen, 1890), *Dendrobaena veneta veneta* (Rosa, 1884), *Dendrodrilus rubidus rubidus* (Savigny, 1826), *Eisenia fetida* (Savigny, 1826), *Eiseniella tetraedra tetraedra* (Savigny, 1826), *Lumbricus rubellus* Hoffmeister, 1843, *Octodrilus complanatus* (Dugès, 1828), *Octodrilus transpadanus* (Rosa, 1884), *Proctodrilus tuberculatus* (Černosvitov, 1935) and b) Acanthodrilidae familyasından: *Microscolex phosphoreus* (Dugès, 1837)'dur. *Dendrobaena hauseri* bugüne kadar Anadolu'da kaydedilmeyen tek Trakya türüdür.

Anahtar Kelimeler: Anadolu, Biyoçeşitlilik, Türkiye Faunası, Trakya

INTRODUCTION

The total land size of Turkey is about 783,562 km², of which 756,816 km² (97%) is in Western Asia (Anatolia) and 23,764 km² (3%) is in Southeastern Europe, on the Balkan Peninsula (Eastern Thrace). Turkey is bordered by the Black sea between Bulgaria and Georgia, and by the Aegean and the Mediterranean sea between Greece and Syria.

Anatolia is situated like a bridge between Europe and Asia. It is also known as Asia Minor, Asiatic Turkey or the Anatolian Plateau. The term Anatolia is most frequently used in specific reference to the large, semiarid central plateau, which is rimmed by hills and

mountains that in many places limit access to the fertile, densely settled coastal regions.

The European portion of Turkey, known as Thrace, is separated from Anatolia by the Bosphorus, the Marmara Sea, and the Dardanelles; which collectively form the strategic Turkish Straits that link the Aegean Sea with the Black Sea (Atalay and Mortan, 1995).

Because of the water barrier formed by the Marmara Sea, Bosphorus and Dardanelles, the flora and fauna of the Asian and European part of Turkey could be somewhat different. The water barrier slows down or ceases the dispersion of the terrestrial animals especially.

For this reason, I would like to check for differences in the earthworm fauna of the European and the Asiatic parts of Turkey.

MATERIAL and METHOD

To determine the earthworm fauna of the two parts of the country, in addition to some new data, Rosa (1893, 1905), Michaelsen (1907, 1910), Pop (1943) Omodeo (1952, 1955) Zicsi (1973, 1981), Zicsi and Michalis (1981), Omodeo and Rota (1989, 1991, 1999), Mısırlıoğlu, (2002, 2004, 2007a, 2007b, 2008a, 2008b, 2009, 2010; 2011), Csuzdi et al. (2006), Csuzdi et al. (2007), Mısırlıoğlu et al. (2007), Pavliček et al. (2010), Szederjesi et al. (2014a, 2014b) and Mısırlıoğlu and Szederjesi (2015) were used.

RESULTS

Species recorded in the Asian and European part of Turkey are shown in Table 1 and 2.

DISCUSSION

As a result of the studies done in Turkey, 80 earthworm species were recorded. It is known that approximately 1/3 of them are endemic to Turkey.

In Thrace, there are eight peregrine (*Aporrectodea caliginosa*, *Dendrobaena hortensis*, *Dendrobaena veneta veneta*, *Dendrodriulus rubidus rubidus*, *Eisenia fetida*, *Eiseniella tetraedra tetraedra*, *Lumbricus rubellus*, *Microscolex phosphoreus*), two Circum-Mediterranean (*Dendrobaena byblica byblica*, *Octodrilus complanatus*) two Trans-Aegean (*Octodrilus transpadanus*, *Proctodrilus tuberculatus*) one East-Mediterranean (*Aporrectodea jassyensis jassyensis*), one Levant-Anatolia (*Dendrobaena hauseri*), and one Balkan-Anatolian (*Dendrobaena cognettii*) species.

In comparison to Anatolia, the members of genus *Healyella* and *Spermophorodrilus*, and families Criodrilidae and Megascolecidae are missing from Turkish Thrace. Also some peregrine species are missing, which are common in Anatolia such as *Allolobophora chlorotica*, *Aporrectodea rosea* and *Octolasion lacteum*. But, most probably, peregrine species will be recorded in the future.

Two of three species belonging to *Spermophorodrilus* genus are endemic to Anatolia: *Spermophorodrilus vignai* and *Spermophorodrilus simsoni*. Other one (*Spermophorodrilus antiquus*) lives in Greece and Bulgaria and did not recorded from Turkey until now.

Table 1: Species recorded on the European part of Turkey.

Family: LUMBRICIDAE Rafinesque-Schmaltz, 1815	
Species	Recorded Locality
<i>Aporrectodea jassyensis jassyensis</i> (Michaelsen, 1891)	Keşan-Gelibolu (Szederjesi et al., 2014a)
<i>Aporrectodea caliginosa</i> (Savigny, 1826)	Tekirdağ (Omodeo & Rota, 1989), Edirne-Merkez, Edirne-Sarayakpınar köyü, Kırklareli-Lüleburgaz (Author's unpublished data)
<i>Dendrobaena byblica byblica</i> (Rosa, 1893)	İstanbul (Zicsi, 1973), Istranca Mts. Pınarhisar-Demirköy (Szederjesi et al., 2014a)
<i>Dendrobaena cognettii</i> (Michaelsen, 1903)	Keşan-Gelibolu (Szederjesi et al. 2014a)
<i>Dendrobaena hauseri</i> Zicsi, 1973	İstanbul (Zicsi, 1973)
<i>Dendrobaena hortensis</i> (Michaelsen, 1890)	İstanbul (Omodeo & Rota, 1989), Tekir Mts., Marmarköy, Istranca Mts., Pınarhisar-Demirköy road (Szederjesi et al., 2014a)
<i>Dendrobaena veneta veneta</i> (Rosa, 1884)	İstanbul (Zicsi, 1973), Istranca Mts, Değirmen stream-Demirköy, (Szederjesi et al., 2014a)
<i>Dendrodriulus rubidus rubidus</i> (Savigny, 1826)	Istranca Mts., Pınarhisar-Demirköy road (Szederjesi et al., 2014a)
<i>Eisenia fetida</i> (Savigny, 1826)	İstanbul (Omodeo & Rota, 1989), Istranca Mts., Pınarhisar-Demirköy road (Szederjesi et al., 2014a)
<i>Eiseniella tetraedra tetraedra</i> (Savigny, 1826)	Tekirdağ (Omodeo & Rota, 1989)
<i>Lumbricus rubellus</i> Hoffmeister, 1843	İstanbul (Omodeo & Rota, 1989), İstanbul (Zicsi, 1973), Edirne-Kırkpınar (Author's unpublished data)
<i>Octodrilus complanatus</i> (Dugés, 1828)	İstanbul (Zicsi, 1973), Istranca Mts., Pınarhisar-Demirköy road (Szederjesi et al., 2014a), Edirne-Kırkpınar (Author's unpublished data)
<i>Octodrilus transpadanus</i> (Rosa, 1884)	İstanbul (Omodeo & Rota, 1989), İstanbul (Zicsi, 1973)
<i>Proctodrilus tuberculatus</i> (Černosvitov, 1935)	İstanbul (Omodeo & Rota, 1989)
Family: ACANTHODRILIDAE Claus, 1880	
<i>Microscolex phosphoreus</i> (Duges, 1837)	İstanbul (Omodeo, 1952)

Table 2: All Turkish Earthworms (Species which also recorded in Thracia signed by bold letters).

Family: LUMBRICIDAE Rafinesque-Schmaltz, 1815	
Species	Origin
<i>Eisenia kattoulasi</i> Zicsi & Michalis, 1981	Balkan-Anatolia
<i>Dendrobaena cognettii</i> (Michaelsen, 1903)	Balkan-Anatolia
<i>Allolobophora brunnecephala</i> Kvavadze, 1985	Caucasus-Anatolia
<i>Dendrobaena alpina armeniaca</i> (Rosa, 1893)	Caucasus-Anatolia
<i>Dendrobaena decipiens</i> (Michaelsen, 1910)	Caucasus-Anatolia
<i>Dendrobaena montana</i> (Michaelsen, 1910)	Caucasus-Anatolia
<i>Dendrobaena pentheri</i> (Rosa, 1905)	Caucasus-Anatolia
<i>Dendrobaena resslii</i> Zicsi, 1973	Caucasus-Anatolia
<i>Dendrobaena schmidti marinae</i> Kvavadze, 1985	Caucasus-Anatolia
<i>Dendrobaena schmidti tellermanica</i> Perel, 1966	Caucasus-Anatolia
<i>Eisenia grandis grandis</i> (Michaelsen, 1907)	Caucasus-Anatolia
<i>Eisenia grandis polysegmentica</i> Kvavadze, 1973	Caucasus-Anatolia
<i>Eisenia hydrophilica</i> Kvavadze, 1979	Caucasus-Anatolia
<i>Eisenia patriciae</i> Szederjesi, Pavlicek, Coşkun & Csuzdi, 2014	Caucasus-Anatolia
<i>Eiseniella colchidica</i> Perel, 1967	Caucasus-Anatolia
<i>Dendrobaena byblica byblica</i> (Rosa, 1893)	Circum-Mediterranean
<i>Eiseniella neapolitana</i> (Örley, 1885)	Circum-Mediterranean
<i>Octodrilus complanatus</i> (Dugés, 1828)	Circum-Mediterranean
<i>Aporrectodea jassyensis jassyensis</i> (Michaelsen, 1891)	East Mediterranean
<i>Helodrilus patriarchalis</i> (Rosa, 1893)	East Mediterranean
<i>Murchieona minuscula</i> (Rosa, 1896)	East Mediterranean
<i>Allolobophora immaculata</i> Omodeo & Rota, 1989	Endemic
<i>Aporrectodea handlirschi mahnerti</i> (Zicsi, 1973)	Endemic
<i>Cernosvitovia schweigeri</i> Zicsi, 1973	Endemic
<i>Dendrobaena bruna</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena cevdeti</i> Szederjesi, Pavlicek, Coşkun & Csuzdi, 2014	Endemic
<i>Dendrobaena fridericae</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena fridericae uludagi</i> Omodeo & Rota, 1991	Endemic
<i>Dendrobaena mahunkai</i> Csuzdi, Pavliček & Mısırlıoğlu 2007	Endemic
<i>Dendrobaena nivalis</i> Omodeo & Rota 1989	Endemic
<i>Dendrobaena omodeoi</i> Csuzdi, Pavliček & Mısırlıoğlu, 2007	Endemic
<i>Dendrobaena orientaloides</i> Zicsi, 1985	Endemic
<i>Dendrobaena persimilis</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena perula</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena proandra</i> Omodeo & Rota, 1989	Endemic
<i>Eisenia kotschani</i> Szederjesi, Pavliček & Csuzdi 2014	Endemic
<i>Eophila cavazzutii cavazzutii</i> Omodeo, 1988	Endemic
<i>Eophila cavazzutii pascuorum</i> Omodeo, 1988	Endemic
<i>Fitzingeria loebli</i> Zicsi, 1985	Endemic
<i>Healyella baloghi</i> (Zicsi, 1981)	Endemic
<i>Healyella boluana</i> Omodeo & Rota, 1989	Endemic
<i>Healyella mariae</i> Omodeo & Rota, 1989	Endemic
<i>Healyella michaelseni</i> Omodeo & Rota, 1989	Endemic
<i>Healyella naja</i> Omodeo & Rota, 1989	Endemic
<i>Healyella schweigeri</i> (Zicsi, 1981)	Endemic
<i>Healyella zapparolii</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena pantaleonis eotypica</i> Omodeo & Rota, 1989	Endemic
<i>Perelia hatayica</i> Csuzdi, Pavliček & Mısırlıoğlu, 2007	Endemic
<i>Spermophorodrilus simsoni</i> Omodeo & Rota, 1989	Endemic
<i>Spermophorodrilus vignai</i> Omodeo & Rota, 1989	Endemic
<i>Dendrobaena orientalis</i> Cernosvitov, 1940	Levante

Table 2: All Turkish Earthworms (Species which also recorded in Thracia signed by bold letters).

Dendrobaena hauseri Zicsi, 1973	Levante-Anatolia
<i>Dendrobaena samarigera</i> (Rosa, 1893)	Levante-Anatolia
<i>Dendrobaena semitica</i> (Rosa, 1893)	Levante
<i>Dendrobaena szalokii</i> Szederjesi, Pavlíček, Coşkun & Csuzdi, 2014	Levante-Anatolia
<i>Healyella syriaca</i> (Rosa, 1893)	Levante-Anatolia
<i>Perelia galileana</i> Csuzdi & Pavlíček, 2005	Levante-Anatolia
<i>Allolobophora chlorotica</i> (Savigny, 1826)	Peregrine
Aporrectodea caliginosa (Savigny, 1826)	Peregrine
<i>Aporrectodea rosea</i> (Savigny, 1826)	Peregrine
Dendrobaena hortensis (Michaelsen, 1890)	Peregrine
Dendrobaena veneta veneta (Rosa, 1884)	Peregrine
Dendrodrius rubidus rubidus (Savigny, 1826)	Peregrine
<i>Dendrodrius rubidus subrubicundus</i> (Eisen, 1874)	Peregrine
Eisenia fetida (Savigny, 1826)	Peregrine
Eiseniella tetraedra tetraedra (Savigny, 1826)	Peregrine
Lumbricus rubellus Hoffmeister, 1843	Peregrine
<i>Octolasion lacteum</i> (Örley, 1881)	Peregrine
<i>Allolobophora leoni</i> Michaelsen, 1891	Trans-Aegean
<i>Aporrectodea dubiosa dubiosa</i> (Örley, 1881)	Trans-Aegean
<i>Aporrectodea handlirschi handlirshi</i> (Rosa, 1897)	Trans-Aegean
<i>Dendrobaena attemsi</i> (Michaelsen, 1902)	Trans-Aegean
Octodrilus transpadanus (Rosa, 1884)	Trans-Aegean
Proctodrilus tuberculatus (Černosvitov, 1935)	Trans-Aegean
Family: ACANTHODRILIDAE Claus, 1880	
<i>Microscolex phosphoreus</i> (Duges, 1837)	Peregrine
<i>Microscolex dubius</i> (Fletcher, 1887)	Peregrine
Family: CRIODRILIDAE Vejdovsky, 1884	
<i>Criodrilus lacuum</i> Michaelsen, 1899	European
Family: MEGASCOLECIDAE Michaelsen	
<i>Amyntas corticis</i> (Kingberg, 1867)	Peregrine
<i>Amyntas gracilis</i> (Kingberg, 1867)	Peregrine
<i>Metaphire californica</i> (Kinberg, 1867)	Peregrine

Healyella genus has a dozen species. Among them *Healyella syriaca* lives in Anatolia and Levantine region and *Healyella jordanis* lives in Israel, Syria, Jordan and Lebanon. Except these, all *Healyella* species endemic to Anatolia and there is no any *Healyella* record in European part of Turkey. It looks that any *Spermophorodrilus* or *Healyella* species could not recorded in both side of the water barrier.

Dendrobaena byblica is a rare recorded species in Thrace. *Dendrobaena hauseri* is a unique species that has not yet been found in Anatolia, but it was recorded in one locality in Turkish Thrace (İstanbul). It also exists in the Levantine region. It is thought that still the presence of large unsampled areas in Anatolia is the main reason of absence of the species record. It can be found in Anatolia in future probably.

At the same time, *Eisenia kattoulasi*, which is a Balkanic-Anatolian species, was not recorded in Turkish Thrace.

ACKNOWLEDGMENTS

I would like to thank Dr. Tomas Pavlíček (Institute of Evolution, University of Haifa, Israel), for his kind help during preparation of this paper.

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