TÜBİTAK

Short Communication

Turk J Zool
2012; 36(1): 141-145
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doi:10.3906/zoo-1007-15

A general review of parasitic Annelida (Hirudinea) recorded from different habitats and hosts in Turkey

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Received: 13.07.2010

Abstract: To date, parasitic leech species have not been intensively studied in Turkey, and studies on the leeches of Turkey have concentrated primarily on lakes. According to literature data, a total of 13 parasitic leech species (3 species from marine fish, 8 species from freshwater fish, 1 species from brackish water fish, and 1 species from aquarium fish) have been recorded in different parts of Turkey. Interest in this group has increased during the last 2 decades, but a large part of the Turkish freshwater habitats remains to be studied with regard to the parasitic leech species. In this study, information is given on the distribution of the leech species that have been previously recorded. The collected data show that the freshwater parasitic leech fauna of Turkey is composed of cosmopolitan or widely distributed species.

Key words: Fish parasite, Annelida, Hirudinea

Türkiyenin farklı habitat ve konaklarından kaydedilen parasitik Annelidlerine (Hirudinea) genel bir bakış

Özet: Türkiye'de bugüne kadar parazit sülük türleri ile yapılan çalışmalar çok yoğun olmamakla beraber, yapılan çalışmalarında çoğu gölleri içermektedir. Literatür bilgilerine göre, Türkiye'nin farklı bölgelerinden 13 parazit sülük türü (3 tür deniz balıklarından, 8 tür tatlı su balıklarından, 1 tür acı su balığından ve 1 tür de akvaryum balığından) kaydedilmiştir. Parazit sülüklerle yapılan çalışmalar son 20 yılda artmış olmasına rağmen, Türkiye'deki pek çok tatlı su habitatının parazit annelidler açısından araştırılması gerekmektedir. Bu çalışmada daha once kaydedilmiş olan sülük türlerinin dağılışı hakkında bilgi verilmektedir ve literatür bilgiler doğrultusunda Türkiye'nin bilinen parazit annelida faunası kozmopolit veya geniş dağılım gösteren türlerden oluşmaktadır.

Anahtar sözcükler: Balık parazitleri, Annelida, Hirudinea

Based on molecular phylogeny, the leeches (Hirudinea), together with Branchiobdellida and Acanthobdellida, form a monophyletic clade whose ancestor was an oligochaetous clitellate related to the family Lumbriculidae (Erséus, 2005). They represent mainly thermophilous freshwater species, inhabiting stagnant as well as running waters, and a few species are amphibious. Leeches are common in eutrophic

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waters and often serve as indicators of pollution. Some of them are widespread and well described, such as the medicinal leech (*Hirudo medicinalis*). Kasparek et al. (2000) recorded leeches in 42 out of 65 wetlands in the western half of Anatolia, and Demirsoy et al. (2001) studied their seasonal distribution.

Leeches, namely the order Hirudinida, were traditionally divided into 2 suborders: Rhynchobdellida, in which leeches have a protrusible proboscis, and Arhynchobdellida, in which leeches lack a proboscis. The Rhynchobdellida included 3 families: the Ozobranchidae, the Glossiphoniidae, and the Piscicolidae. Members of the Piscicolidae are generally parasitic on fish, and they are found virtually anywhere on the external body surfaces of fish, such as the skin, mouth, branchial chamber, or cloaca (Burreson, 1995). They are most often found on fish during the early spring and late fall, and they leave for open water during the summer in order to lay their eggs. Studies on the freshwater leeches of Turkey have concentrated primarily on lakes. It is known that the Turkish fish fauna is composed of 448 marine and 236 freshwater fish species (Bilecenoğlu et al., 2002; Kuru, 2004) and among these, 22 fish species (12 freshwater, 9 marine, and 1 brackish water), along with 1 aquarium fish, were studied for parasitic Hirudinea. From 23 hosts, 10 species and 3 genera-level hirudineans were reported.

The present study aims to summarize the results of previous studies on the distribution of parasitic annelids and their hosts in Turkey, with special attention paid to rare species and to some identification problems in order to contribute to our knowledge of parasitic annelids. According to the literature data, 13 different freshwater leeches were recorded from the different host fish species. The authors compiled a list (Table) according to the literature data on parasitic annelids found on fish during a 78-year survey, from 1931 to 2009, and the second author's records (unpublished data) were used.

Studies to determine the fish parasites of Turkey began in 1931; Monod (1931) reported *Ceratothoa* sp. (Cymothoidae: Isopoda) on the Mediterranean coastline and *Boops boops* (Linnaeus, 1758) (Perciformes: Sparidae) on the Turkish coast. Since 1931, several Turkish scientists have contributed to the knowledge of fish parasites in Turkey. This knowledge is based on the studies of Geldiay and Balık (1974), Oğuz (1989), Soylu (1990), Sağlam (1992), Ergüven and Candan (1992), Özdemir and Sarıeyyüpoğlu (1993), Çiltaş et al. (2000), Ceylan (2002), Öztürk (2002), Sağlam et al. (2003), Akmirza (2004), Karatoy (2004), Kahveci (2004), Özan and Kır (2005), Karabiber (2006), and Öktener et al. (2007).

As mentioned above, a total of 13 parasitic annelids have already been recorded on different fish species in Turkey. It is clear that our knowledge of the parasitic annelids and their hosts in Turkey is still limited, and, therefore, it is impossible to speculate about zoogeographical aspects. However, it may be pointed out that some species are of cosmopolitan or wide distribution. The majority of parasitic annelid species were associated with freshwater fish (53%). The others were associated with marine fish (39%), brackish water fish (4%), and aquarium fish (4%). Most systematic reports on leeches from the fish of Turkey have focused on Cyprinidae species (10 species).

Of the 13 species occurring in Turkey, *Piscicola geometra* is a very common parasitic annelid with regard to host distribution and location. Further species can be locally abundant. *Piscicola geometra* has been reported from a broad range of freshwater fish hosts in Europe and Asia. It is easily distinguishable by pigmentation patterns and especially by the relative proportions of the oral and caudal suckers. In *P. geometra*, sucker diameters are conspicuously greater than the width of the body. Specimens of *P. geometra* possess 2 pairs of cephalic ocelli, alternating bands of dark and light pigment cells, 14 pairs of ocelli along the body, and 15 pigmented rays extending from the center of the caudal sucker. These morphological characteristics are consistent with descriptions of *Piscicola geometra*, a parasitic fish leech that is native to Eurasia.

It is known that Glossiphoniidae is a diverse family of freshwater leeches, with representatives found on all continents except Antarctica. *Helobdella stagnalis* is a member of this family. Ceylan (2002) presented *Helobdella stagnalis* on *Esox lucius*. It has been reported that *Helobdella* is by far the most diverse genus of leeches in South America (Christoffersen,

Table. List of parasitic Annelida species recorded from different habitats and hosts in Turkey.

Leech species/Host	Infestation region	Locality	Literature data
Leeches from marine fish in Turkey			
***Pontobdella muricata* L., 1758**			
Raja sp.	Ventral region	Marmara Sea	Ergüven and Candan (1992)
Torpedo marmorata	Base of dorsal fin, abdomen	Aegean Sea	Sağlam et al. (2003)
Raja clavata	Base of dorsal fin	Aegean Sea	Sağlam et al. (2003)
***Stibarobdella loricata* (Harding, 1924)**			
Trachinus draco		Aegean Sea	Akmirza (2004)
***Trachelobdella lubrica* (Grube, 1840)**			
Scorpaena porcus	Base of pectoral, pelvic fin; gills	Aegean Sea	Sağlam et al. (2003)
Scorpaena scrofa	Base of pectoral, pelvic fin; gills	Aegean Sea	Sağlam et al. (2003)
Labrus bergylta	Gill cavity	Marmara Sea	Öktener and Utevsky (unpublished)
Diplodus vulgaris	Mouth, gill cavity	Aegean Sea	Öktener and Utevsky (unpublished)
Epinephelus aeneus	Body surfaces	Aegean Sea	Öktener and Utevsky (unpublished)
Leeches from freshwater fish in Turkey			
***Piscicola geometra* L., 1761**			
Rutilus rutilus	Body surface, fins	Sapanca Lake	Soylu (1990)
Scardinius erythrophthalmus	Body surface, fins	Sapanca Lake	Soylu (1990)
Blicca bjoerkna	Body surface, fins	Sapanca Lake	Soylu (1990)
Tinca tinca	Body surface, fins	Sapanca Lake	Soylu (1990)
Esox lucius	Body surface, fins	Sapanca Lake	Soylu (1990)
Barbus rajanorum mystaceus	Gills	Keban Dam Lake	Sağlam (1992)
Tinca tinca	Body surface	Uluabat Lake	Öztürk (2002)
Abramis brama	Body surface	Terkos Lake	Karatoy (2004)
Scardinius erythrophthalmus		Terkos Lake	Kahveci (2004)
Rutilus rutilus	Body surface	Sapanca Lake	Karabiber (2006)
Cyprinus carpio	Body surface, fins	Çavuşçu Lake	Öktener et al. (2007)
Carassius gibelio	Operculum	Uluabat Lake	Arslan and Emiroğlu (2011)
***Piscicola* sp.**			
Barbus pectoralis	Fins	Keban Dam Lake	Özdemir and Sarıeyyüboğlu (1993)
***Hirudo medicinalis* L., 1758**			
Esox lucius	Mouth, dorsal region	Çapalı Lake	Ceylan (2002)
Cyprinus carpio	Mouth, dorsal region	Çapalı Lake	Ceylan (2002)
***Actinobdella* sp.**			
Barbus rajanorum mystaceus	Gills	Keban Dam Lake	Sağlam (1992)
Trachelobdella torquata (Grube, 1871)			
Carassius carassius		Kovada Lake	Özan and Kır (2005)
***Hemiclepsis marginata* Müller, 1774**			
Cyprinus carpio		Marmara Lake, Bafa Lake	Geldiay and Balık (1974)
Cyprinus carpio	Mouth, dorsal region	Çapalı Lake	Ceylan (2002)
Esox lucius	Mouth, dorsal region	Çapalı Lake	Ceylan (2002)
***Helobdella stagnalis* L., 1758**			
Esox lucius	Mouth, dorsal region	Çapalı Lake	Ceylan (2002)
---	---	Fish pond and discharge channel, Elazığ	Sağlam and Dörücü, (2002)
***Cystobranchus respirans* (Troschel, 1850)**			
Salmo trutta fario	Ventral region	Kaz Dağı brooks	Geldiay and Balık (1974)
Leeches from brackish water fish in Turkey			
***Hirudinea* sp.**			
Platichthys flesus		Ekinli Lagoon	Oğuz (1989)
Leeches from aquarium fish in Turkey			
***Piscicola punctata* (Verrill, 1871)**			
Poecilia reticulata	Body surface	Erzurum	Çiltaş et al. (2000)

2009). Although a few species extend their known ranges variously into Central America, North America, and Europe, or as far as western Asia, this taxon is thought to have originated in South America (Siddall et al., 2005). According to the literature data, this species has been reported from only one fish sample in Turkey (Ceylan, 2002). It has, however, been recorded from fishponds and discharge channels in Elazığ by Sağlam and Dörücü (2002). *Trachelobdella torquata*, *Cystobranchus respirans*, and *Hirudinea* sp. were recorded from only one region in Turkey; therefore, their distribution in Turkey is still largely unknown. It appears that they only rarely occur in limited habitats. However, according to literature data, *Trachelobdella torquata*, known as a Baikalian species, was recorded for the first time in Turkey by Özan and Kır (2005). The occurrence of *Hemiclepsis marginata* was recorded in 3 localities (Table) within the country (Geldiay and Balık, 1974; Ceylan, 2002). Owing to its presence in Europe, its occurrence in other areas of Turkey can be assumed.

The parasitic annelid fauna of many aquatic ecosystems still has not been investigated in Turkey, and further studies are necessary. In addition, there are few records of parasitic annelids from the eastern and southern parts of Turkey. It is necessary to intensify the studies on parasitic annelids from diverse lentic or lotic habitats of these different Turkish regions.

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