

Helminth fauna of Eurasian marsh frog, *Pelophylax ridibundus* (Pallas, 1771) (Anura: Ranidae) from Bingöl, Eastern Anatolia, Turkey

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Abstract. This study was conducted to investigate helminth parasites of Eurasian Marsh Frog (*Pelophylax ridibundus*) from Bingöl province, in 2012. A total of 42 specimen were collected from six localities from Bingöl (Eastern Anatolia, Turkey) Twelve helminthes species were found from the collected samples: *Haematolechus breviansa*, *Diplodiscus subclavatus* *Opisthio glyphe ranae*, *Pleurogenoides medians*, *Gorgoderina cygnoides*, *Gorgoderina vitelliloba*, *Cosmocerca ornate*, *Rhabdias bufonis*, *Oxysomatium brevicaudatum*, *Eustrongylides excisus*, *Oswaldocruzia filiformis* and *Acanthocephalus ranae*. Several studies on helminth fauna of Eurasian marsh frogs (*P. ridibundus*) have been published by different researchers and localities. All parasite species have been recorded previously but this study is the first helminthological study for host-frog from Bingöl province, Turkey.

Key words: *Pelophylax ridibundus*, helminth, endoparasites, Bingöl, Turkey.

Introduction

The amphibians in the region serve as intermediate reservoir hosts of most pathogenic helminthes of birds, wild and domestic animals and humans (Ikromov et al. 2004). The Eurasian marsh frog, *Pelophylax ridibundus* (Pallas 1771), is distributed in western, central and eastern Europe and West Asia (Kuzmin et al. 2009). It is a medium-sized aquatic anuran species and inhabits lakes, pools or slowly flowing streams with much vegetation (Baran & Atatür 1998). It has very diverse helminth fauna, too. This frog is large, able to leave the water to occupy aquatic and terrestrial habitats, and able to feed on a variety of aerial, terrestrial, and aquatic organisms; therefore, this diversity likely derives from transmission of helminths through various intermediate hosts (Sağlam & Arıkan, 2006).

The Eurasian marsh frog shows wide distribution so there are many studies as to its helminth fauna both abroad (Vojtkova & Vojtek 1975, Buchvarov 1977, Ryzhikov et al. 1980, Prudhoe & Bray 1982, Buchvarov et al. 1983, Kuc & Sulgostowska 1988, Fernando 1989, Mashai 1999) and Turkey (Schad et al. 1960, Saygı & Başbüyük 1990, Oğuz et al. 1994, Yıldırımhan et al. 1996, Yıldırımhan et al. 1997, Topçu & Bayrak 2000, Kir et al. 2001, Yıldırımhan et al. 2005, Düşen & Öz 2006, Sağlam & Arıkan 2006, Düşen & Oğuz 2008, Düşen et al. 2010, Düşen & Oğuz 2010, Heckmann et al. 2010, Heckmann 2011, Düşen & Öz 2013). The earliest report of helminth parasites of anurans in Turkey was published by Schad et al. (1960); they reported helminths of 5 species of anurans collected from different localities of Turkey. Most of the helminthological studies on these animals were carried out since 1995. Recently, a review study about helminth parasites of Turkish anurans was conducted (Amin et al. 2012). In this study, it was aiming to determine helminth fauna of for host-frog from Bingöl, Eastern Anatolia, Turkey. This study presents the first detailed helminthological study for host-frog from Bingöl, Eastern Anatolia, Turkey.

Material and methods

A total of 42 *P. ridibundus* specimens (19 males and 23 females) were

collected in 2012 at different localities from Bingöl province: Garip village [38° 77' 74" N, 40° 57' 70" E, 990 m] (04 February 2012 [n=4], 07 February 2012 [n=1], 16 February 2012 [n=1]; Ilıcalar creek [38° 99' 16" N, 40° 67' 18" E, 1176 m] (09 March 2012 [n=10]); Sarı Çiçek village [38° 88' 22" N, 40° 56' 80" E, 1025 m] (26 March 2012 [n=6], 14 April 2012 [n=1], 14 May 2012 [n=3], 25 June 2012 [n=5]); Kadran creek [38° 90' 51" N, 40° 48' 22" E 1099 m] (3 May 2012 [n= 2], 10 May 2012 [n=8]); Göynük (Beyaz toprak) [38° 94' 25" N, 40° 65' 38" E, 1123 m] (14 June 2012 [n=1]). Specimens were collected during scientific fieldtrips and moved to the laboratory for parasite investigation.

The body cavity was opened by a longitudinal incision and the gastrointestinal tract was removed by cutting across the esophagus and rectum. The esophagus, stomach, small intestine and large intestine of each specimen were examined separately for endoparasites.

The specimens were freshly collected from the lungs and intestines, of their hosts, fixed in hot water, and stored in fresh 70% ethanol. Helminths were removed and fixed in 70% ethanol. Each helminth was counted and examined in total preparations. For microscopic study, specimens were cleared in glycerol, or lactophenol. Digeneans were regressively stained with hematoxylin and mounted in balsam for identification. Nematodes were placed in glycerin, allowed to clear and examined under a light microscope. All nematodes were identified according to the morphological characters. Specimens were identified using a compound microscope and diagnostic keys (Yorke & Maplestone 1926, Schmidt 1986, Anderson 1992, 2000, Anderson et al. 2009, Bray et al. 2008, Gibson et al. 2002). Nematodes and cestodes were identified using taxonomic keys (Yamaguti 1955, 1958, 1961, Skrjabin et al. 1979). The frogs and helminths were deposited in Uludag University Zoology Museum (Bursa/Turkey).

Results

A total of 42 *P. ridibundus* specimens were examined parasitologically and 419 individuals of 12 helminth species were collected from 31 (73%) of the 42 examined specimens. Helminths were collected from the intestine and lungs of the host frogs. The infection rate by trematodes was higher than the rate by nematodes. Of the infected marsh frogs, 8 (25.80%) harbored 1 parasite species, 12 (38.70%) harbored 2 parasite species, 5 (16.12%) harbored 3 parasite species, 4 (12.90%) harbored 4 parasite species, 1 (3.22%) harbored 7 parasite species and 1 (3.22%) harbored 8 parasite species.

Table 1. The review of reported helminths in *P. ridibundus*.

Locality	Digenea	Nematoda	Acanthocephala	Cestoda	Annelida	References
Turkey		<i>Cosmocerca ornata</i> <i>Oxyromatium brevicaudatum</i>				Schad et al. 1960
Sivas	<i>Diplodiscus</i> sp. <i>Diplodiscus subclavatus</i> <i>Gorgodera</i> sp. <i>Gorgoderina</i> sp. <i>Plagiorchis</i> sp.	<i>Cosmocerca</i> sp.	<i>Acanthocephalus</i> sp.			Saygi & Başbüyük 1990
Edirne, Bursa	<i>Pleurogenes claviger</i> <i>Pleurogenoides medians</i>		<i>Acanthocephalus ranae</i>			Oğuz et al. 1994
Edirne, Bursa	<i>Diplodiscus subclavatus</i> <i>Pleurogenoides medians</i> <i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnoides</i> <i>Rauschiella</i> sp. <i>Haematolechus variegatus</i> <i>Haematolechus brevicans</i> <i>Opisthoglyphe ranae</i> <i>Caniditrema loossi</i> <i>Prosotocus confusus</i> <i>Codonocephalus urnigerus</i>	<i>Rhabdias bufonis</i> <i>Oscaldocruzia</i> sp. <i>Cosmocerca</i> sp.	<i>Acanthocephalus ranae</i>		<i>H. medicinalis</i>	Yıldırımhan et al. 1996
Bursa		<i>Rhabdias bufonis</i> <i>Cosmocerca</i> sp.				Yıldırımhan et al. 1997
Niğde	<i>Diplodiscus subclavatus</i> <i>Pleurogenoides medians</i> <i>Opisthoglyphe ranae</i>	<i>Cosmocerca</i> sp.	<i>Acanthocephalus</i> sp. <i>Acanthocephalus ranae</i>			Topcu & Bayrak 2000
Eğirdir Lake	<i>Pleurogenes claviger</i> <i>Diplodiscus subclavatus</i> <i>Bucephalus polymorphus</i>	<i>Rhabdias bufonis</i>	<i>Acanthocephalus ranae</i>		<i>H. medicinalis</i>	Kır et al. 2001
Bursa, İstanbul, Kütahya	<i>Diplodiscus subclavatus</i> <i>Pleurogenoides medians</i> <i>Pleurogenoides stromi</i> <i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnoides</i> <i>Haematolechus brevicans</i> <i>Opisthoglyphe ranae</i> <i>Prosotocus confusus</i> <i>Codonocephalus urnigerus</i>	<i>Oscaldocruzia filiformis</i> <i>Cosmocerca ornata</i> <i>Neoxsromatium brevicaudatum</i>	<i>Acanthocephalus ranae</i> <i>Centrotyphichus</i> sp.		<i>H. medicinalis</i>	Yıldırımhan et al. 2005

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Table 1. (continued)

Locality	Digenea	Nematoda	Acanthocephala	Cestoda	Annelida	References
Antalya	<i>Diplodiscus subclavatus</i> <i>Pleurogenoides medians</i> <i>Encyclometra colubrinurorum</i> <i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnooides</i> <i>Haematolechus breviansa</i> <i>Opisthoglyphe ranae</i> <i>Protocus confusus</i> <i>Codonocephalus urnigerus</i> <i>Brachycoelium salamanbrae</i>	<i>Rhabdias bufonis</i> <i>Cosmocerca commutata</i> <i>Neoxysomatium</i> sp. <i>Eustrongylides</i> sp. <i>Abbreviata</i> sp.	<i>Acanthocephalus ranae</i>			Düßen & Öz 2006
Hazar Lake	<i>Pleurogenoides medians</i> <i>Gorgoderina vitelliloba</i> <i>Haematolechus variegatus</i>	<i>Rhabdias bufonis</i> <i>Oscatodocruzia filiformis</i> <i>Cosmocercoides</i> sp. <i>Neoxysomatium brevicaudatum</i> <i>Eustrongylides exitus</i>	<i>Acanthocephalus ranae</i>			Sağlam & Arıkan 2006
Amasya, Denizli			<i>Pomphorhynchus laevis</i>			Düßen & Oğuz 2008
Çanakkale	<i>Diplodiscus subclavatus</i> <i>Pleurogenoides medians</i> <i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnooides</i> <i>Brachycoelium salamanbrae</i>	<i>Cosmocerca ornata</i> <i>Oxysonmatium brevicaudatum</i>				Düßen et al. 2010
Amasya, Çorum, Tokat	<i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnooides</i> <i>Haematolechus breviansa</i> <i>Opisthoglyphe ranae</i>	<i>Oscatodocruzia filiformis</i> <i>Cosmocerca ornata</i> <i>Oxysonmatium brevicaudatum</i>	<i>Acanthocephalus ranae</i> <i>Pomphorhynchus laevis</i>			Düßen & Oğuz 2010
Denizli			<i>Pomphorhynchus spindlettruncatus</i>			Heckmann et al. 2010
Antalya			<i>Acanthocephalus ranae</i>			Heckmann, 2011
Denizli	<i>Diplodiscus subclavatus</i> <i>Gorgoderina vitelliloba</i> <i>Gorgodera cygnooides</i> <i>Pleurogenoides medians</i> <i>Protocus confusus</i> <i>Skriptimoecces breviansa</i> <i>Encyclometra colubrinurorum</i> <i>Opisthoglyphe ranae</i>	<i>Rhabdias bufonis</i> <i>Oscatodocruzia filiformis</i> <i>Cosmocerca ornata</i> <i>Oxysonmatium brevicaudatum</i> <i>Eustrongylides</i> sp. <i>Abbreviata</i> sp.	<i>Acanthocephalus ranae</i> <i>Pomphorhynchus laevis</i>	<i>Nematofaenia dispar</i>		Düßen & Öz 2013

Six of Digenea, five of Nematoda, and one of Acanthocephala species were encountered in examined 42 host frogs. The digenean species were *Haematolechus breviansa*, *Opisthoglyphe ranae*, *Pleurogenoides medians*, *Gorgodera cygnoides*, *Gorgoderina vitelliloba*, *Diplodiscus subclavatus*; the nematode species were *Cosmocerca ornata*, *Rhabdias bufonis*, *Eustrongylides excisus*, *Oxysomatium brevicaudatum*, *Oswaldocruzia filiformi* and this acanthocephalan species was *Acanthocephalus ranae*.

Discussions

There are several above-mentioned studies of helminth fauna of *P. ridibundus* (formerly *Rana ridibunda*). The reported helminth species, localities and references from these studies are given in Table. 1. According to previously studies on this host, the helminth fauna of marsh frog differ to localities. This shows that the helminth fauna of this frog increase or decrease because of effects of environment factors (e.g. acclimate, diet, biotope). In some seasons, some species of helminth may not infect *P. ridibundus* owing to environmental temperature, which affects the life-cycles of intermediate and definitive hosts and parasites: temperature affects the abundance of intermediate hosts, and is correlated with the population dynamics, feeding behavior and breeding cycle of *P. ridibundus* (Sağlam & Arıkan 2006).

Excess of helminth parasites is not related excess of host. Considering several studies from neighboring countries, the determination of most species from this host observed from Soviet Union the second most record in Bulgaria and then following Poland 17 species; Saudi Arabia 12 species; Old Czechoslovak 11 species; Persia 2 species (Yıldırımhan et al. 2005).

The helminth species that were observed in *P. ridibundus*, are common parasites of European anurans and also, some reptiles (e.g. *E. colubrimurorum*), aquatic birds (e.g. *Eustrongylides* sp.) fishes (e.g. *P. laevis*) (Yamaguthi 1958, 1961, 1963, Liang-Sheng 1958, Buchvarov 1977, Yıldırımhan 1999, Anderson 2000, Dudinac & Snabel 2001, Düşen & Öz 2006, Yıldırımhan et al. 2007, Düşen et al. 2010a, Düşen 2012).

This study revealed the species composition of the helminth fauna of the lake frog inhabiting the Bingöl province of Turkey, comprising 12 species (6 species of digeneans and 5 species of nematodes and one species of acanthocephalan) belonging to 9 families. All of helminth species were recorded previously for the fauna of Turkey but firstly from Bingöl for this host frog. The present study is contributed on the helminth fauna of Eurasian marsh frog, *P. ridibundus*, from Bingöl (Eastern Anatolia, Turkey).

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