

## Metazoan Endoparasites of Three Species of Anurans Collected from the Middle Black Sea Region of Turkey

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### Summary

In this report, European common toads; *Bufo bufo*, European green toads *Bufo viridis* and marsh frogs *Rana ridibunda* were collected in Amasya, Çorum, and Tokat Provinces (Middle Black Sea Region of Turkey) 2005 and 2006 and examined for helminths. Two of 2 (100 %) *Bufo bufo* and 8 of 8 (100 %) *Bufo viridis* and 57 of 63 (90.5 %) *Rana ridibunda* were infected with 1 or more helminths. The helminths of *B. bufo* included *Oswaldocruzia filiformis* and *Oxysomatium brevicaudatum*. The helminth fauna of *B. viridis* comprised 5 species: 1 species of trematode (*Pleurogenoides medians*), 1 species of cestode (*Nematotaenia dispar*) and 3 species of nematodes, (*Oswaldocruzia filiformis*, *Cosmocerca ornata*, and *Oxysomatium brevicaudatum*), while the helminth fauna of *Rana ridibunda* comprised 9 species: 4 species of trematodes (*Gorgoderia cygnoides*, *Gorgoderina vitelliloba*, *Haematoloechus breviansa*, and *Opisthioglyphe ranae*), 3 species of nematodes *Oswaldocruzia filiformis*, *Cosmocerca ornata*, and *Oxysomatium brevicaudatum*, and 2 species of acanthocephalans (*Pomphorhynchus laevis* and *Acanthocephalus ranae*). *Oswaldocruzia filiformis*, *Cosmocerca ornata*, and *Oxysomatium brevicaudatum* were collected from all three host species. In addition, *Pleurogenoides medians* represents a new host record for *Bufo viridis* in Turkey.

Keywords: *Bufo bufo*; *Bufo viridis*; *Rana ridibunda*; endoparasites; helminths; Middle Black Sea Region; Turkey

### Introduction

Little information is available on the helminths of anurans in the northern parts of Turkey. Yıldırımhan *et al.* (2005a) reported 3 species of Nematoda and 1 species of Acanthocephala in the marsh frog, *Rana ridibunda* collected from the Rize Province. Also, Yıldırımhan and Karadeniz

(2007) reported 5 species of Nematoda, and 1 species of Acanthocephala in European common toad, *B. bufo*, from Trabzon Province, (northeast part of Turkey). To our knowledge, there are no reports of helminths of *Bufo bufo*, European green toads, *Bufo viridis*, and *R. ridibunda* from Amasya, Çorum and Tokat provinces (Middle Black Sea Region of Turkey). Therefore, this is the first report of helminths collected from 3 species of the anuran community of these Turkish provinces.

### Material and methods

Seventy-three anurans representing 3 species were collected between 2005 – 2006. Two *B. bufo* (males), mean snout-vent length (SVL) = 80.5 mm, 8 *B. viridis* (6 males and 2 females), 80 ± 1.8 mm and 63 *R. ridibunda* (37 males and 26 females), 7.5 ± 1.8 mm were collected by dip net and hand from the Yeşilirmak River (Amasya Province, 40° 40' N; 35° 50' E), Tokat Province (40° 18' N; 36° 33' E) and Çorum Province (40° 33' N; 34° 57' E). Within 48 hr, frogs were overdosed in ether-filled glass containers. The body cavity was opened by a longitudinal ventral incision. The alimentary canal was excised and separated into stomach, small intestine, large intestine and rectum. The contents of each part and other organs (lungs, liver, gall bladder, kidneys and urinary bladder) were each mixed with 0.5 % saline solution and poured into petri dishes for examination under a stereomicroscope. The muscles, plus portions of peritoneum and spinal cord, were teased out with needles and examined under a stereomicroscope. Trematodes were immobilized by heat, fixed, and stored in 70 % ethanol. Nematodes were straightened by heat, fixed, and stored in 70 % ethanol with 5 % glycerol. Acanthocephalans were relaxed in saline and heat-fixed under slight coverslip pressure in warm alcohol-formalin-acetic acid. Digeneans and acanthocephalans were stained

with acetocarmine, dehydrated, cleared in cedar oil or xylol, and mounted in Canada Balsam; nematodes were cleared in glycerol and examined. Intensities are presented as mean values ( $\pm 1$  SD) followed by the range.

Voucher specimens of parasites were deposited in the Ege University Museum of Zoology, Izmir, Turkey (ZDEU HEL-5-15/2007); host voucher specimens were deposited in the Atatürk University Department of Biology, Erzurum, Turkey.

## Results and Discussion

A total of 73 anurans from 3 species *Bufo bufo*, *Bufo viridis* and *Rana ridibunda* were investigated. In summary, 541 individuals of 11 helminth species were collected from 66 (91.8 %) of the 73 anurans examined. Helminths were observed from the intestine, urinary bladder and lungs of these species (Table 1).

No individual host harbored more than 4 helminth species. Of the infected anurans, 24 (36.4 %), harbored 1 species of helminth; 25 (37.9 %), harbored 2 species of helminth; 24 (10.6 %), harbored 3 species of helminth and 1 (1.5 %) harbored 4 species of helminth. There were  $1.74 \pm 0.74$  helminth species per infected host and  $9.13 \pm 7.50$  helminth individuals per infected host. Of the 11 helminth species found in this study, only 4 helminths had prevalences greater than 10 %, *C. ornata* was the most prevalent helminth, occurring in 40 of 73 hosts (54.8 %), followed by *O. ranae* with 24 of 73 hosts (32.9 %), *O. brevicaudatum* with 19 of 73 hosts (26.0 %), and *A. ranae* with 9 of 73 hosts (12.3 %).

### Family Gorgoderidae

*Gorgoderina cygnoides* (Zeder, 1800) Looss, 1899

(Syns. *Distoma cygnoides* Zeder, 1800; *Distomum cygnoides* Looss, 1894; *Gorgoderina loosi* Sinitzin, 1905) *G. cygnoides* is a common parasite of amphibians, *Bombina bombina* (Vojtková & Vojtek, 1975); *B. variegata*, (Vojtková & Vojtek, 1975; Buchvarov, 1977); *Bombinator igneus* (Yamaguti, 1958); *Bufo viridis* (Buchvarov, 1977; Shimalov & Shimalov, 2001); *Hyla arborea* (Yamaguti, 1958); *Rana arvalis* (Vojtková & Vojtek, 1975); *R. dalmatina* (Buchvarov, 1983), *R. esculenta* (Yamaguti, 1958; Vojtková & Vojtek, 1975; Buchvarov, 1977; Kuc & Sulgostowska, 1988b); *R. lessonae* (Vojtková & Vojtek, 1975); *R. clamitans* (Yamaguti, 1958); *R. temporaria* (Yamaguti, 1958; Vojtková & Vojtek, 1975); *R. ridibunda* (Kuc & Sulgostowska, 1988a; Kirin 2002b); *R. camerani* (Yıldırımhan *et al.*, 2006a) and *R. kurtmuelleri* (Hristovski *et al.*, 2006). *G. cygnoides* was reported several papers in Urinary bladder of *R. ridibunda* from Turkey (Yıldırımhan *et al.*, 1996; Yıldırımhan *et al.*, 2005; Düşen & Öz, 2006). The geographic range of this species is Western Europe (Yamaguti, 1958).

*Specimens deposited:* (ZDEU HEL-5/2007)

*Gorgoderina vitelliloba* (Olsson, 1876) Looss, 1902  
(Syn. *Distoma vitellilobum* Olsson, 1876)

*G. vitelliloba* was reported, *Bombinator igneus* (Yamaguti, 1958); *B. bombina* (Vojtková & Vojtek, 1975); *B. variegata*, (Yamaguti, 1958; Vojtková & Vojtek, 1975; Buchvarov, 1977) *B. bufo* and *B. calamita* (Cedhagen, 1988); *B. viridis* (Buchvarov, 1977); *R. arvalis* (Yamaguti, 1958; Vojtková & Vojtek, 1975); *R. dalmatina* (Buchvarov, 1977); *R. esculenta*, (Vojtková & Vojtek, 1975); *R. macrocnemis* (Yıldırımhan *et al.*, 1997b; Yıldırımhan *et al.*, 2006a); and *R. temporaria* (Yamaguti, 1958; Vojtková & Vojtek, 1975; Buchvarov, 1977; Cedhagen, 1988).

Similarly *G. cygnoides*, *G. vitelliloba* has been recorded by different researchers in *R. ridibunda* from Turkey (Yıldırımhan *et al.*, 1996; Yıldırımhan *et al.*, 2005; Düşen & Öz, 2006; Sağlam & Arıkan, 2006). Geographic range of this species, Europe and Asia minor (Yamaguti, 1958), Czech Republic (Vojtková & Vojtek, 1975), Bulgaria (Batchvarov *et al.*, 1975; Buchvarov, 1977), Turkey (Yıldırımhan *et al.*, 1996).

*Specimens deposited:* (ZDEU HEL-6/2007)

### Family Lecithodendriidae

*Pleurogenoides medians* (Olsson, 1876) Travassos, 1921

(Syns. *Distomum medians* Olsson, 1876; *Pleurogenes medians* (Olsson, 1876))

*P. medians* has been reported in various amphibians and reptiles species, *Triturus cristatus* (Shimalov *et al.*, 2001); *T. vulgaris* (Vojtková & Vojtek, 1975; Shimalov *et al.*, 2001); *B. bombina*, (Vojtková & Vojtek, 1975); *B. variegata*, (Vojtková & Vojtek, 1975; Shimalov & Shimalov, 2001); *B. bufo* (Shimalov & Shimalov, 2000); *B. calamita*, (Vojtková & Vojtek, 1975); *B. vulgaris* (Yamaguti, 1958); *H. arborea* (Vojtková & Vojtek, 1975; Düşen & Öz, 2004); *R. arvalis* (Vojtková & Vojtek, 1975); *R. camerani* (Yıldırımhan *et al.*, 2006a; Düşen, 2007); *R. dalmatina* (Buchvarov, 1977); *R. esculenta* (Vojtková & Vojtek, 1975; Buchvarov, 1977, Kuc & Sulgostowska, 1988b); *R. macrocnemis* (Yıldırımhan *et al.*, 2006b, Düşen, 2007); *R. ridibunda* (Buchvarov, 1977; Kuc & Sulgostowska, 1988a; Oğuz *et al.*, 1994; Yıldırımhan *et al.*, 1996; Mashai *et al.*, 2000; Yıldırımhan *et al.*, 2005a; Düşen & Öz, 2006; Sağlam & Arıkan, 2006); *R. arvalis* (Vojtková & Vojtek, 1975); *R. temporaria* (Vojtková & Vojtek, 1975; Cedhagen, 1977); and *Lacerta trilineata* (Yamaguti, 1963; Yıldırımhan, 1999b).

The geographic range of *P. medians* is Europe and Asia (Yamaguti, 1958); Australasian Regions (Prudhoe & Bray, 1982). *P. medians* represent a new parasite record for *Bufo viridis* in Turkey, similarly, Buchvarov (1977) reported this helminth the small intestine of *B. viridis* from Bulgaria.

*Specimens deposited:* (ZDEU HEL-7/2007)

### Family Plagiorchiidae

*Haematoloechus breviansa* (Sudarikov, 1950)

Sey and Eory (1992) reported *H. breviansa* in *R. ridibunda* from Hungary, Mashai *et al.* (2000) reported *H. breviansa* in *R. ridibunda* from Northern parts of Iran. Yıldırımhan *et al.* (2005) and Düşen and Öz, (2006) recorded this

Table 1. Helminths of three frogs species of Middle Black Sea Region, Turkey

Host species	N	In & (%)	Identified helminths group	Max (Me) $\Sigma$
<i>Bufo bufo</i>	2	2 (100 %)	<i>Oswaldocruzia filiformis</i>	1 (1) 1
<i>Bufo bufo</i>	2	2 (100 %)	<i>Oxysomatium brevicaudatum</i>	1 (1) 1
<i>Bufo viridis</i>	8	1 (12.5 %)	<i>Pleurogenoides medians</i>	1 (1) 1
<i>Bufo viridis</i>	8	5 (62.5 %)	<i>Nematotaenia dispar</i>	12 (5.4) 27
<i>Bufo viridis</i>	8	1 (12.5 %)	<i>Oswaldocruzia filiformis</i>	3 (1) 3
<i>Bufo viridis</i>	8	4 (50 %)	<i>Oxysomatium brevicaudatum</i>	22 (9.3) 37
<i>Bufo viridis</i>	8	2 (25 %)	<i>Cosmocerca ornata</i>	2 (1.5) 3
<i>Rana ridibunda</i>	63	5 (8 %)	<i>Gorgoderia cygnoides</i>	4 (2) 10
<i>Rana ridibunda</i>	63	1 (1.6 %)	<i>Gorgoderina vitelliloba</i>	5 (1) 5
<i>Rana ridibunda</i>	63	2 (3.2 %)	<i>Haematoloechus breviansa</i>	2 (2) 4
<i>Rana ridibunda</i>	63	24 (38 %)	<i>Opisthioglyphe ranae</i>	22 (5) 121
<i>Rana ridibunda</i>	63	3 (4.8 %)	<i>Oswaldocruzia filiformis</i>	3 (2) 6
<i>Rana ridibunda</i>	63	14 (22.2 %)	<i>Oxysomatium brevicaudatum</i>	9 (4.4) 61
<i>Rana ridibunda</i>	63	38 (60.3 %)	<i>Cosmocerca ornata</i>	30 (7.3) 277
<i>Rana ridibunda</i>	63	1 (1.6 %)	<i>Pomphorhynchus laevis</i>	1 (1) 1
<i>Rana ridibunda</i>	63	9 (14.3 %)	<i>Acanthocephalus ranae</i>	9 (3.4) 31

N - number of examined frog, In - number of infected frog, % - percentage, Max - maximum, Me - mean and  $\Sigma$  - total number of parasite

helminths in the lungs of *R. ridibunda* from Turkey. The geographic range of *H. breviansa*, Russia (Yamaguti, 1958), Turkey (Yıldırımhan *et al.*, 1996), Iran (Mashai *et al.*, 2000).

*Specimens deposited:* (ZDEU HEL-8/2007)

*Opisthioglyphe ranae* (Froelich, 1791)

(*Syn. Opisthioglyphe endoloba* (Dujardin, 1845) Looss, 1899)

The reported hosts of *O. ranae* were, *Salamandra maculosa* (Vojtková & Vojtek, 1975; Buchvarov, 1977); *T. cristatus* (Yamaguti, 1958; Shimalov *et al.*, 2001); *T. vulgaris* (Shimalov *et al.*, 2001); *B. bombina* and *B. variegata* (Vojtková & Vojtek, 1975; Yıldırımhan *et al.*, 2001a); *R. ridibunda* (Batchvarov *et al.*, 1975; Kuc & Sulgostowska, 1988a; Fernando, 1989; Masshai *et al.*, 2000; Kirin, 2003a, b); *B. bufo* (Shimalov & Shimalov, 2001); *B. calamita* (Yamaguti, 1958; Shimalov & Shimalov, 2001); *B. vulgaris*, *B. variabilis*, (Yamaguti, 1958); *B. viridis*, (Vojtková & Vojtek, 1975; Buchvarov, 1977); *H. arborea* (Vojtková & Vojtek, 1975); *Pelobates fuscus* (Vojtková & Vojtek, 1975); *R. dalmatina* (Vojtková & Vojtek, 1975; Buchvarov, 1977); *R. esculenta* (Yamaguti, 1958; Vojtková & Vojtek, 1975; Buchvarov, 1977); *R. lessonae* (Vojtková & Vojtek, 1975); *R. temporaria* (Yamaguti, 1958; Vojtková & Vojtek, 1975; Buchvarov, 1977); *R. arvalis* (Vojtková & Vojtek, 1975); *Natrix natrix* (Shimalov & Shimalov, 2000) and *V. berus* (Shimalov & Shimalov, 2000).

Geographic range of *O. ranae*, Europe (Yamaguti, 1958), Turkey (Yıldırımhan *et al.*, 1996), Saudi Arabia (Fernando,

1989), Iran (Masshai *et al.*, 2000).

*Specimens deposited:* (ZDEU HEL-9/2007)

Family Nematotaeniidae

*Nematotaenia dispar* (Goeze, 1782) Lühe, 1899

(*Syns. Taenia dispar* Goeze, 1782; *Taenia dispar salamandrae* Frölich, 1789; *Taenia bufonis* Gmelin, 1790; *Halysis obvoluta* Zeder, 1803; *Nematotaenia kashmirensis* Fotedar, 1966; *Nematotaenia dollfusi* Yuen and Fernando, 1974; *Nematotaenia viride* Mokhtar-Maamouri and Chakroun, 1984)

*N. dispar* is commonly parasitic in the intestine of amphibians, rarely reptiles, of the Oriental, Nearctic, Palearctic (Prudhoe & Bray, 1982); *Mertensiella caucasica* (Yıldırımhan *et al.*, 2005b); *B. bombina* (Buchvarov, 1977); *B. variegata* (Buchvarov, 1977; Prudhoe & Bray, 1982); *B. bufo* (Prudhoe & Bray, 1982); *B. viridis* (Mashai, 2005); *B. alvarius* (Goldberg & Bursey, 1991); *H. arborea* (Buchvarov, 1977, Prudhoe & Bray, 1982; Vashetko & Siddikkov, 1999); *H. savignyi* (Al-Sorkhy & Amr, 2003; Mashai, 2005); and *R. ridibunda*, *R. temporaria* (Buchvarov, 1977); *R. bedriagae* (Al-Sorky & Amr, 2003). Yıldırımhan (1999) reported *N. dispar* in *B. viridis* from Turkey.

*Specimens deposited:* (ZDEU HEL-10/2007)

Family Molineidae

*Oswaldocruzia filiformis* (Goeze, 1782) Travassos, 1917

(*Syns. Ascaris filiformis*, Goeze, 1782; *Cucullanus ranae* Goeze, 1782; *Ascaris tennissima* Scharf, 1788; *Ascaris intestinalis* Gmelin, 1790; *Ascaris bufonis* Gmelin, 1790;

*Strongylus auricularis* Zeder, 1800; *Ascaris setiformis* Goeze in Zeder, 1800; *Strongylus dispar* Dujardin, 1845; *Oswaldocruzia insulae* Morishita, 1923; *Strongyluris biolata* Molin, 1861; *Oswaldocruzia molgeta* Lewis, 1928; *Oswaldocruzia skrjabini* Travassos, 1937; *Oswaldocruzia problematica* Ivanitzky, 1940; *Oswaldocruzia goezi* Skrjabin and Schulz, 1952)

*O. filiformis* appear to be that known various amphibian and reptiles species, *S. salamandra* (Buchvarov, 1977); *T. alpestris*, *T. karelini* (Buchvarov, 1977; Cedhagen, 1988; Kirin & Buchvarov, 2002); *T. vulgaris* (Buchvarov, 1977; Shimalov *et al.*, 2001); *Bombina bombina*, *B. variegata* (Buchvarov, 1977; Kirin & Buchvarov, 2002); *B. regularis* (Schad *et al.*, 1960); *B. viridis* (Schad *et al.*, 1960; Batchvarov *et al.*, 1975; Buchvarov, 1977; Vashetko & Siddikov, 1999; Yıldırımhan, 1999a; Shimalov & Shimalov, 2001); *H. arborea* (Buchvarov, 1977; Yıldırımhan *et al.*, 2006c); *R. arvalis* (Yıldırımhan *et al.*, 2006a); *R. camerani* (Yıldırımhan *et al.*, 2006a); *R. dalmatina*, (Batchvarov *et al.*, 1975; Buchvarov, 1977; Kirin & Buchvarov, 2002); *R. kurtmuelleri* (Hristovski *et al.*, 2006); *R. macrocnemis* (Schad *et al.*, 1960; Yıldırımhan *et al.*, 1997a; Yıldırımhan *et al.*, 2006b); *R. ridibunda* (Buchvarov, 1977; Yıldırımhan *et al.*, 1996; Batchvarov *et al.*, 1975; Kirin & Buchvarov, 2002; Yıldırımhan *et al.*, 2005a; Sağlam and Arıkan, 2006); *Rana temporaria*, (Buchvarov, 1977; Cedhagen, 1988; Kirin & Buchvarov, 2002); *R. graeca* (Božkov & Stojkova, 1970; Buchvarov, 1977); *Lacerta agilis*, (Shimalov *et al.*, 2000; Mihalca *et al.*, 2007); *L. trilineata* (Yıldırımhan, 1999b); *L. viridis* (Biserkov & Kostadinova, 1998; Yıldırımhan 1999b; Kirin, 2002a; Borkovcová & Kopřiva, 2005); *L. vivipara* (Shimalov *et al.*, 2000); *Anguis fragilis* (Schad *et al.*, 1960; Bertman & Okulewicz, 1987; Shimalov *et al.*, 2000; Borkovcová & Kopřiva, 2005); *Zootoca vivipara* (Sanchis *et al.*, 2000); *N. natrix* (Bertman & Okulewicz, 1987; Shimalov & Shimalov, 2000) and *V. berus* (Shimalov & Shimalov, 2000).

Schad *et al* (1960) were first time reported *O. filiformis* in *Bufo regularis* and *R. macrocnemis* from Turkey. We observed this species in small and large intestines from three frogs species in this study. The geographic range of *O. filiformis* is Europe and Asia (Yamaguti, 1961).

*Specimens deposited:* (ZDEU HEL-11/2007)

#### Family Cosmocercidae

*Oxysomatium brevicaudatum* (Zeder, 1800) Railliet and Henry, 1916

(*Syns. Neoxysomatium brevicaudatum* (Zeder, 1800), *Fusaria brevicaudata* Zeder, 1800; *Oxysomatium longispiculum* Railliet and Henry, 1916, *Oxysoma contortum* Linstow, 1906)

*O. brevicaudatum* was reported different hosts of amphibians and reptiles in Europe and Asia; *Bombina*, *Bufo*, *Hyla*, *Pelobates*, *Rana*, *Salamandra* (Yamaguti, 1961); *S. salamandra*, *S. atra*, *Pseudotriton ruber* and *B. bombina* (Walton, 1933); (Walton, 1933); *B. bufo* (Walton, 1933; Shimalov & Shimalov, 2001; Galli *et al*, 2001); *B. viridis* (Walton, 1933; Schad *et al.*, 1960; Buchvarov, 1977;

Yıldırımhan, 1999a); *B. regularis* (Schad *et al.*, 1960); *H. arborea* (Walton, 1933); *R. dalmatina* (Buchvarov, 1977); *R. graeca* (Božkov & Stojkova, 1970; Buchvarov, 1977); *R. esculenta* (Walton, 1933); *R. kurtmuelleri* (Hristovski *et al.*, 2006); *R. macrocnemis* (Schad *et al.*, 1960); *R. ridibunda* (Schad *et al.*, 1960; Kirin & Buchvarov, 2002; Yıldırımhan *et al.*, 2005a; Sağlam & Arıkan, 2006); *R. temporaria* (Walton, 1933; Buchvarov, 1977; Kirin & Buchvarov, 2002); *P. fuscus* (Walton, 1933); *A. fragilis* (Schad *et al.*, 1960; Shimalov *et al.*, 2000; Sharpilo, 2003; Borkovcová & Kopřiva, 2005); *N. natrix* (Schad *et al.*, 1960; Shimalov & Shimalov, 2000) and *V. berus* (Shimalov & Shimalov, 2000).

Schad *et al* (1960) were first time reported this helminth in Turkey. Sharpilo (2003) pointed out that *O. brevicaudatum* has a great disperse in *A. fragilis* in Caucasian Region. *O. brevicaudatum* was observed from three frogs species intestines in this research.

*Specimens deposited:* (ZDEU HEL-12/2007)

#### *Cosmocerca ornata* (Dujardin, 1845)

(*Syns. Oxyuris ornata* (Dujardin, 1845) Schneider, 1866; *Anancous commutatus* Railliet and Henry, 1976; *Cosmocerca minuscula* Travassos, 1931; *Paracosmocerca mucronata* Kung and Wu, 1945; *Cosmocercella polissensis* Maguzo, 1972; *Cosmocerca indica* Nama and Khichi, 1973; *Paracosmocerca spinocerca* Rao, 1979; *Cosmocerca macrogubernaculum* Rao, 1979)

There are several papers reporting *C. ornata* from many species of amphibians and reptiles, *Bufo*, *Hyla*, *Rana*, *Triturus* (Yamaguti, 1961); *T. alpestris* (Walton, 1933; Buchvarov, 1977; Shimalov *et al.*, 2000); *T. cristatus* (Walton, 1933; Shimalov *et al.*, 2001, *T. vulgaris* (Shimalov *et al.*, 2001); *B. bombina*, (Buchvarov, 1977; Grabda-Kazubska & Lewin, 1989); *B. variegata* (Buchvarov, 1977; Grabda-Kazubska & Lewin, 1989; Kirin & Buchvarov, 2002); *B. bufo* (Walton, 1933; Buchvarov, 1977; Shimalov & Shimalov 2001; Galli *et al.*, 2000; Galli *et al.*, 2001); *B. viridis* (Batchvarov *et al.*, 1975; Buchvarov, 1977; Vashetko & Siddikov, 1999; Mashaii, 2005); *H. arborea* (Buchvarov, 1977; Yıldırımhan *et al.*, 2006c); *P. syriacus* (Shimalov *et al.*, 2000); *R. esculenta* (Walton, 1933; Buchvarov, 1977); *R. arvalis* (Cedhagen, 1988; Kuc & Sulgostowska, 1988b); *R. temporaria*, (Walton, 1933; Buchvarov, 1977; Kuc & Sulgostowska, 1988b); *R. graeca* (Božkov & Stojkova, 1970; Buchvarov, 1977); *R. holtzi* (Yıldırımhan *et al.*, 2006b); *R. macrocnemis* (Yıldırımhan *et al.*, 2006b; Düşen, 2007); *R. ridibunda* (Batchvarov *et al.*, 1975; Buchvarov, 1977; Kuc & Sulgostowska, 1988a; Mashaii *et al.*, 2000; Kirin & Buchvarov, 2002; Kirin, 2003a, b; Yıldırımhan *et al.*, 2005a; Düşen, 2006); *R. camerani* (Yıldırımhan *et al* 2006a; Düşen 2007); *Chiasmocleis capixaba* (Van Sluys *et al.*, 2006) and *A. fragilis* (Shimalov *et al.*, 2000). Schad *et al* (1960) were first time reported *C. ornata* in *B. viridis*, *R. macrocnemis* and *R. ridibunda* from Turkey. The Geographic range of *C. ornata* New and Old Worlds (Baker, 1987).

*Specimens deposited:* (ZDEU HEL-13/2007)

#### Family Pomphorhynchidae

*Pomphorhynchus laevis* (Zoega in Müller 1776)

(Syns. *Echinorhynchus salvelini* Schrank, 1788; *Echinorhynchus nodulosus* Schrank, 1790; *Echinorhynchus annulatus* Gmelin, 1791; *Echinorhynchus barbi* Schrank, 1792; *Echinorhynchus gobii* Viborg, 1795; *Echinorhynchus proteus* Westrumb, 1821; *Acanthocephalus lavareti* Koelreuter, 1771)

*P. laevis*, occurs predominantly in cyprinid and also in salmonid fishes with the Palaearctic distribution (Dudiňák & Šnábel, 2001). *P. laevis*, is recorded in several fish species in Turkey: barbel (*Barbus plebejus escherichii*), bleak (*Alburnus alburnus*), chub (*Leuciscus cephalus*), common carp (*Cyprinus carpio*), crucian carp (*Carassius carassius*), loach (*Nemachilus* sp.), nase (*Chondrostoma nasus*), pike (*Esox lucius*), sheatfish (*Silurus glanis*), (Öktener, 2003), and tench (*Tinca tinca*) (Yıldız, 2003; Yıldız & Çavuşoğlu, 2003).

A number of marine and freshwater fishes have been reported as definitive hosts of acanthocephalan *P. laevis* (Ziolkowska & Rokicki, 2003). Buchvarov (1977) observed in *Rana ridibunda* and Veith and Erpelding (1995) in fire salamander (*Salamandra salamandra*) are reported *P. laevis*. So far, there have been no published studies on *P. laevis*, for frog species, which are distributed in Turkey. *Specimens deposited:* (ZDEU HEL-14/2007)

#### Family Echinorhynchidae

*Acanthocephalus ranae* (Schrank, 1788) Lühe, 1911

(Syns. *Echinorhynchus ranae* Schrank, 1788; *Echinorhynchus haeruca* Rudolphi, 1808)

A number of amphibians and reptiles species have been reported hosts of acanthocephalan *A. ranae*; *Bombinator* sp., *Diemictylus viridescens*, *Hyla* sp., *Rana* sp., *Triturus* sp., *Salamandra* sp. (Yamaguti, 1963); *M. caucasica* (Yıldırımhan et al., 2005b); *B. calamita* (Shimalov & Shimalov, 2001); *B. viridis* (Buchvarov, 1977; Yıldırımhan, 1999a; Vashetko & Siddikov 1999; Shimalov & Shimalov, 2001); *B. bombina* (Buchvarov, 1977; Grabda-Kazubska & Lewin, 1989; Yıldırımhan et al., 2001a); *B. variegata* (Grabda-Kazubska & Lewin, 1989); *H. arborea* (Düşen & Öz, 2004); *R. arvalis* (Buchvarov, 1977; Cedhagen, 1988; Kuc & Sulgostowska, 1988b); *R. dalmatina* (Buchvarov, 1977); *R. esculenta* (Buchvarov, 1977; Kuc & Sulgostowska, 1988b); *R. temporaria* (Buchvarov, 1977; Cedhagen, 1988; Kuc & Sulgostowska, 1988b); *R. kurtmuelleri* (Hristovski et al., 2006); *R. ridibunda* (Buchvarov, 1977; Kuc & Sulgostowska, 1988b; Sey & Eory, 1992); *R. camerani* (Yıldırımhan et al., 2006a); *R. macrocnemis* (Yıldırımhan et al., 1997a; Yıldırımhan et al., 2006b; Düşen, 2007); *A. fragilis* (Shimalov et al., 2000); *N. natrix* (Yamaguti, 1963; Shimalov & Shimalov, 2000).

Oğuz et al. (1994), Yıldırımhan et al. (1996), Yıldırımhan et al. (2005a), Düşen and Öz, (2006), and Sağlam and Arıkan (2006) recorded *A. ranae* in *R. ridibunda* from Turkey. The geographic range of this helminth, Europe, U. S. A., Russia (Yamaguti, 1963); Turkey (Oğuz et al., 1994).

*Specimens deposited:* (ZDEU HEL-15/2007)

This is the first published study of helminths of *Bufo bufo*, *Bufo viridis*, and *Rana ridibunda* from Middle Black Sea Region of Turkey. Yıldırımhan et al. (2005a) reported 3 species of Nematoda (*O. filiformis*, *C. ornata* and *O. brevicaudatum*) and 1 species of Acanthocephala (*Acanthocephalus ranae*) in *R. ridibunda* collected from the Rize Province. Also, Yıldırımhan and Karadeniz (2007) reported in *B. bufo*, from Trabzon Province, 5 species of Nematoda: *Aplectana acuminata*, *A. macintoshii*, *C. ornata*, *O. filiformis*, and *Rhabdias bufonis*, and 1 species of Acanthocephala, *Acanthocephalus ranae*.

In both investigations (Yıldırımhan et al., 2005a and Yıldırımhan & Karadeniz, 2007), *C. ornata* was the most prevalent parasite of hosts. Similarly, in this study *C. ornata* was observed the most prevalent parasite. *Gorgoderina cygnoides*, *Gorgoderina vitelliloba*, *Haematoloechus breviansa*, *Opisthioglyphe ranae* and *Pomphorhynchus laevis* were not recorded by Yıldırımhan et al. (2005a) and helminths reported by Yıldırımhan et al. (2005a), not observed in this study were *Aplectana acuminata*, *A. macintoshii*, *Rhabdias bufonis*.

The trematode *Pleurogenoides medians* represents a new host record for *B. viridis* in Turkey. Further helminthological investigations are needed in amphibians from Turkey, to add other metazoan endoparasites to Turkish amphibian helminthofauna.

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