

## Helminth fauna of the common toad, *Bufo bufo* Linnaeus, 1758 (Amphibia: Bufonidae) collected from the Karabük Province of Türkiye

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**Abstract.** In this study, the helminth parasites of 22 specimens of the common toad, *Bufo bufo* (14♂♂ 8♀♀), collected from Karabük Province were examined. Our investigation revealed the identification of two helminth species: *Oxysomatium brevicaudatum* (Nematoda) and *Acanthocephalus ranae* (Acanthocephala). There are several helminth studies from the same host and other Amphibian species from various regions in Türkiye. However, this is the first time that the helminth parasites of this host have been studied from Karabük. The parasite species found in Karabük Province is a new record for *B. bufo*, while the location itself represents a new location record for *O. brevicaudatum* and *A. ranae*.

**Keywords:** *Bufo bufo*, helminth, Nematoda, Acanthocephala, Türkiye.

### Introduction

A total of 34 amphibian species, 18 caudatans, and 16 anurans, are distributed in Türkiye (Baran et al. 2021). The first study on the helminth fauna of the amphibians in Türkiye was carried out in 1960 (Schad et al. 1960), and other studies on the subject were published after 1995 (Yıldırımhan & İncedoğan 2013). Today, *Bombina bombina*, *Pelophylax bedriagae*, *P. ridibundus*, *Bufo bufo*, *Pelodytes caucasicus*, *Rana dalmatina*, *R. holtzi*, *R. macrocnemis*, *R. tavasensis*, *Hyla orientalis*, *H. savignyi*, *Pelobates syriacus*, *Bufo viridis* from anurans have been investigated in terms of helminth fauna.

The host species, *Bufo bufo*, are 10-15 cm long, have abundant warts on their skin, and are generally brown. The species is found in Marmara, Aegean, the Western part of the Mediterranean, Central Anatolia, and Western Black Sea regions in Türkiye. It lives in moist

rocky areas with little vegetation or in forested areas. It is a species whose lifestyle is terrestrial. Males are smaller than females.

In this study, we examined the helminth parasites of *B. bufo* specimens collected from Karabük Province. The study aims to reveal the helminth fauna of *B. bufo*, contribute to the biodiversity of Türkiye, and shed light on other ecological studies to be conducted in the future.

### Material and methods

All specimens were obtained from the animal collection stored in the Zoology Lab of the Department of Biology at the Science Faculty, Dokuz Eylül University, to prevent sacrifice. We conducted a comprehensive examination on a total of 22 adult toad specimens (14 males and 8 females) from Karagöl, Eskipazar, Karabük. We found that the mean snout-vent length (SVL) was

72.89 ± 8.46 (ranging from 61.52 to 95.4).

The toads were positioned with their ventral sides up, and dissection began. With the help of thin forceps and scissors, the cloaca was opened anteriorly, and the internal organs were removed. The parts of the digestive tube were opened with the help of thin scissors and stretched. Physiological water was added, and the location and number of parasites found in the organs examined under a binocular microscope were recorded. Nematode specimens were detected in 70% of alcohol. In the diagnosis of parasites, Anderson (2000), Baker (1987), Yorke & Maplestone (1926), Amin (1985), and Yamaguti (1961) were followed.

## Results

One or more helminths parasitized 14 of 22 *B. bufo* specimens (63%). The 14 hosts in question had 354 parasites, including 339 Nematodes and 15 Acanthocephalans. 2 helminth species have been identified. Out of the infected hosts, 12 had parasitism by 1 species of helminth, while 2 had parasitism by 2 species of helminths. Table 1 presents prevalence, abundance, and average intensity values. The two parasite species identified are *Oxysomatium brevicaudatum* (Figures 1, 2, 3, and 4) from the phylum Nematoda and *Acanthocephalus ranae* (Figure 5) from the phylum Acanthocephala.

### Family: Cosmocercidae

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

*Oxysomatium brevicaudatum* was reported from diverse hosts of amphibians and reptiles in Europe and Asia, including *Bombina*, *Bufo*, *Hyla*, *Pelobates*, *Rana*, *Salamandra* (Yamaguti 1961), *S.*

*salamandra*, *S. atra*, *Pseudotriton ruber* and *B. bombina* (Walton 1933), *Triturus vittatus*, *T. karelinii* (Yıldırımhan 2008); *Bufo bufo* (Chikhlyayev et al. 2016); *Pelobates syriacus* (Yıldırımhan et al. 1997, Yıldırımhan & Bursey 2010); *Pelophylax bedriagae* (Demir et al. 2015); *B. viridis* (Walton 1933, Schad et al. 1960, Buchvarov 1977, Yıldırımhan 1999, Düşen et al. 2010a); *B. regularis* (Schad et al. 1960); *H. arborea* (Walton 1933, Yakar et al. 2016); *R. dalmatina* (Buchvarov 1977, Düşen et al. 2009, Yıldırımhan et al. 2016); *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, Düşen et al. 2010a, Düşen & Oğuz 2010, Düşen & Öz 2013, Koyun et al. 2015, Düşen et al. 2017); *R. temporaria* (Walton 1933, Buchvarov 1977, Kirin & Buchvarov 2002, Chikhlyayev & Ruchin 2014); *Pelobates fuscus* (Walton 1933); *Pelophylax lessonae* (Chikhlyayev & Ruchin 2022); *R. kurtmuelleri* (Hristovski et al. 2006); *A. fragilis* (Schad et al. 1960, Shimalov et al. 2000, Sharpilo 2003, Borkovcová & Kopřiva 2005, Düşen et al. 2010b, Sümer et al. 2019, Kirillov et al. 2019); *N. natrix* (Schad et al. 1960, Shimalov & Shimalov 2000); *Vipera berus* (Shimalov & Shimalov 2000); *Vipera seoanei* (Roca et al. 2023); *Amnirana albolabris*, *Aubria occidentalis*, *Hyperolius guttulatus*, *Ptychadena longirotris*, *Ptychadena mascareniensis*, *Ptychadena pumilio* (Oungbe et al. 2019). Schad et al. (1960) first time reported *O. brevicaudatum* in *Bufo regularis*, *B. viridis*, *R. macrocnemis*, *R. ridibunda* and *A. fragilis* from Türkiye. Sharpilo (2003) pointed out that *O. brevicaudatum* has a great disperse in *A. fragilis* in the Caucasian Region. The geographic range of *O. brevicaudatum* is in Europe and Asia (Yamaguti 1961).

Table 1. Infection sites, prevalence, mean intensity, and mean abundance of parasites.

Helminth species	Site of infection	Prevalence	Mean intensity	Mean abundance
Nematoda				
<i>Oxysomatium brevicaudatum</i>	Intestine	%45	33,9	15,4
Acanthocephala				
<i>Acanthocephalus ranae</i>	Intestine	%27	2,5	0,6



Figure 1. *Oxysomatium brevicaudatum* female anterior.



Figure 2. *Oxysomatium brevicaudatum* female posterior.



Figure 3. *Oxysomatium brevicaudatum* male posterior.



Figure 4. *Acanthocephalus ranae* anterior.

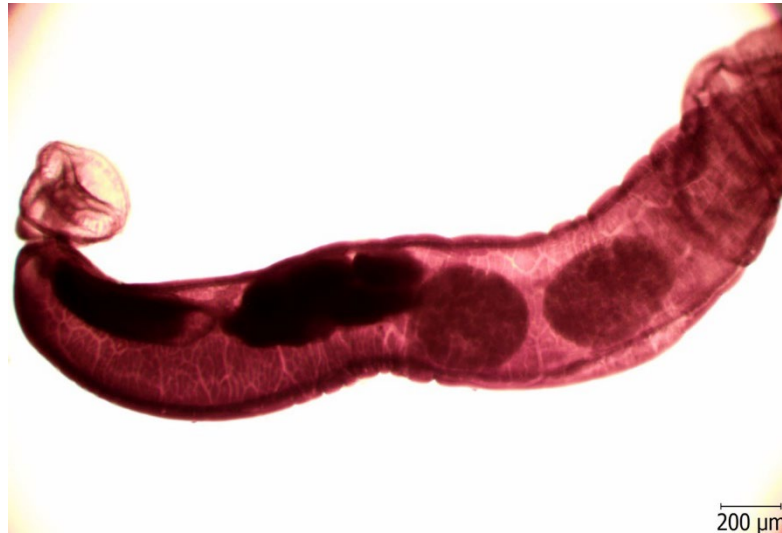


Figure 5. *Acanthocephalus ranae* posterior.

**Family: Echinorhynchidae**

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

Other reported hosts: *Rana* sp., *Bombinator* sp., *Hyla* sp., *Triturus* sp., *Salamandra* sp., *Diemictylus viridescens* (Yamaguti 1963); *B. bombina* (Buchvarov 1977, Grabda-Kazubska & Lewin 1989, Yıldırımhan et al. 2001a); *B. variegata* (Grabda-Kazubska & Lewin 1989); *B. viridis* (Buchvarov 1977, Yıldırımhan 1999, Vashetko & Siddikov 1999, Shimalov & Shimalov 2001); *B. calamita* (Shimalov & Shimalov 2001); *B. verrucosissimus* (Kidov et al. 2018); *H. arborea* (Düşen & Öz 2004, Düşen & Yaka 2014, Yakar et

al. 2016); *B. viridis* (Karakaş 2015); *R. dalmatina* (Düşen et al. 2009, Yıldırımhan et al. 2016); *R. temporaria* (Buchvarov 1977, Cedhagen 1988, Kuc & Sulgostowska 1988, Grävele et al. 2022); *R. esculenta* (Buchvarov 1977, Kuc & Sulgostowska 1988b); *R. macrocnemis* (Yıldırımhan et al. 1997, Yıldırımhan et al. 2006b, Düşen 2007, Tepe & Yılan 2021); *R. camerani* (Yıldırımhan et al. 2006a); *R. tavasensis* (Düşen 2012); *Mertensiella caucasica* (Yıldırımhan et al. 2001b, 2005b); *R. kurtmuelleri* (Hristovski et al. 2006); *Rhinella icterica* (Pilati et al. 2013); *Anguis fragilis* (Shimalov et al. 2000, Kirillov et al. 2019); *N. natrix* (Yamaguti 1963, Shimalov & Shimalov

2000); *R. ridibunda* (Oğuz et al. 1994, Yıldırımhan et al. 1996, 2005a, Düşen & Öz 2006, Sağlam & Arıkan 2006, Düşen & Oğuz 2010, Popiołek et al. 2011, Düşen & Öz 2013, Koyun et al. 2015, Kuzmin et al. 2020, Tepe & Yılan 2021, Iacob 2021); *Pelophylax bedriagae* (Demir et al. 2015); *Pelophylax lessonae* (Popiołek et al. 2011); *P. esculentus* (Herczeg et al. 2016, Kuzmin et al. 2020).

## Discussion

The host species in the present study is the common toad, which exhibits a wide distribution throughout Turkey. With this in mind, extensive research has been undertaken to examine the helminth fauna in various localities within Türkiye. Table 2 provides information on the studies and the localities where host specimens were collected. The studies mentioned above led to the identification of a total of 9 parasitic forms

from the frog host specimens, with 8 of them falling under the phylum Nematoda (*Rhabdias bufonis*, *Oswaldocuriza* sp., *O. filiformis*, *Aplectana acuminata*, *Aplectana macintoshii*, *Cosmocerca* sp., *Cosmocerca ornata*, *Oxysomatium brevicaudatum*) and 1 from the phylum Acanthocephala (*Acanthocephalus ranae*).

This study is the first helminth fauna study conducted on the host from Karabük Province, Türkiye. The species identified in our study are consistent with those recorded in previous studies. In previous studies for this host, *Oxysomatium brevicaudatum* was found in the provinces of Bursa, Denizli, Amasya, Çorum, Tokat, and Çanakkale; *Acanthocephalus ranae* was reported from Trabzon and Denizli provinces. The helminth species identified are new records for the *B. bufo* host from Karabük Province. As the parasite fauna of *B. bufo* from the location Karabük has not been studied before, our study is important for its contribution to helminth fauna.

Table 2. Helminth infections recorded in *Bufo bufo* from various localities of Türkiye.

Helminths	Yıldırımhan et al. (1997) -Bursa	Yıldırımhan & Karadeniz (2007) -Trabzon	Düşen & Oğuz (2010) -Amasya, Çorum, Tokat	Düşen et al. (2010a) -Çanakkale	Düşen (2011) -Denizli	Heckmann et al. (2011) -Denizli	This study (2024) -Karabük
<b>Nemathelminths</b>							
<i>Aplectana acuminata</i>		+					
<i>Aplectana macintoshii</i>		+					
<i>Cosmocerca ornata</i>		+		+	+		
<i>Cosmocerca</i> sp.	+						
<i>Oswaldocuriza filiformis</i>		+	+		+		
<i>Oswaldocuriza</i> sp.	+						
<i>Rhabdias bufonis</i>	+	+			+		
<i>Oxysomatium brevicaudatum</i>	+		+	+	+		+
<b>Acanthocephala</b>							
<i>Acanthocephalus ranae</i>		+			+	+	+

Despite 339 nematode specimens in our study, 15 were acanthocephalans, showing that nematodes are the dominant parasite species in these hosts. Nematodes exhibit broad ecological adaptability, habitat diversity, rapid reproductive rates, and evolutionary flexibility, which enables them to sustain and proliferate their populations. Acanthocephalans typically possess complex life cycles, which may constrain their adaptive capacities or proliferate abilities.

As the parasite fauna of *Bufo bufo* of Karabük province has not been studied before, our study is very important for contribution to fauna. *Oxysomatium brevicaudatum* and *Acanthocephalus ranae* are the first records of parasite fauna of Karabük. Increasing similar studies on the detection of helminth fauna will contribute to determining the faunal community of Türkiye.

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