

The occurrence of helminth parasites (Nemathelminthes) in some freshwater fish from streams discharging into Antalya Bay in Antalya, Turkey: two new host records from Antalya

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Abstract: A total of 65 individuals from 3 different fish species, *Capoeta antalyensis* (n: 15), *Aphanius mento* (n: 29), and *Pseudophoxinus battalgil* (n: 21), were examined for helminth parasites (Nemathelminthes) between May and July of 2009. A total of 123 parasites of 3 species were found in these fish, consisting of 3 nematodes: *Rhabdochona denudata*, *Eustrongylides excisus* larvae, and *Contraecaecum* sp. larvae. Among these species, *R. denudata* was recorded in the intestine of *C. antalyensis*, with a total of 92 parasites found in 13 of the 15 *C. antalyensis* examined. The overall prevalence of this species was 86.6%. Two further species of nematodes, *Contraecaecum* sp. larvae and *E. excisus* larvae, were found in the abdominal cavities of *P. battalgil* and *A. mento*, respectively. *Contraecaecum* sp. larvae were found in 10 of 21 fish examined and a total of 29 specimens were recorded, making the overall prevalence of this species 47.6%. Only 2 *E. excisus* larvae were found in 2 of the 29 fish examined. This study provides the first ichthyoparasitological data for these host fish species in Turkey, and the occurrence of *R. denudata* in *C. antalyensis* and *Contraecaecum* sp. larvae in *P. battalgil* are considered to be new host records for these fish species.

Key words: Nematodes, *C. antalyensis*, *A. mento*, *P. battalgil*, new host records

Antalya körfezine dökülen derelerdeki bazı tatlısu balıklarında görülen helmint (Nemathelminthes) parazitler: Antalya'dan iki yeni konak kaydı

Özet: Bu çalışmada, 3 balık türüne ait *Capoeta antalyensis* (n: 15), *Aphanius mento* (n: 29) ve *Pseudophoxinus battalgil* (n: 21) toplam 65 balık bireyinin Mayıs 2009 – Haziran 2009 tarihleri arasında helminth parazitleri (Nemathelminthes) çalışılmıştır. Bu balık bireylerinde 3 nematod türüne ait toplam 123 adet parazit bulunmuştur: *Rhabdochona denudata*, *Eustrongylides excisus* larva ve *Contraecaecum* sp. larva. Bu parazitler arasında *R. denudata* *C. antalyensis*'in bağırsaklarında kaydedilmiştir. Çalışılan 15 balığın 13'ünde toplam 92 adet parazit bulunmuştur. Bu türün toplam enfeksiyon yüzdesi % 86,6'dır. İki nematod türü, *Contraecaecum* sp. larva ve *E. excisus* larvaları sırasıyla *P. battalgil* ve *A. mento*'nun vücut boşluğunda bulunmuştur. İki türün enfeksiyon bulgularına gelince, *Contraecaecum* sp. larvası, çalışılan 21 balığın 10'unda bulunmuş ve toplam 29 birey kaydedilmiştir. Bu türün enfeksiyon yüzdesi % 47,6'dır. Çalışılan 29 balığın 2'sinde yalnızca 2 adet *E. excisus* larvası bulunmuştur. Bu çalışma, konak balıklar için ilk ihtiyoparazitolojik verileri oluşturur ve *C. antalyensis*'de görülen *R. denudata* ile *P. battalgil*'de *Contraecaecum* sp. larvaları için konak balıklar yeni konak kaydı olarak ilk kez bildirilmiştir.

Anahtar sözcükler: Nematodlar, *C. antalyensis*, *A. mento*, *P. battalgil*, yeni konak kaydı

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Introduction

There are 236 taxa belong to 26 families that make up the inland water fish of Turkey (Kuru, 2004). Of these, 42 fish species and 28 subspecies belonging to these families are endemic to Turkey (Küçük, 2006). In spite of this biological richness, however, these populations are facing great losses and even extinction due to adverse environmental factors. Fish diseases are among the important factors that cause fish populations to fall from the food chain, and helminth parasites cause a significant proportion of fish diseases. Although the helminth parasites of fish in Turkey are extensive, only limited studies are available for helminth parasites of endemic fish species. Neither in Turkey nor in the rest of the world has there been any helminthological research on *P. battalgi*. Likewise, this is the first survey to present ichthyoparasitological data for *A. mento* in Turkey. As for *C. antalyensis*, to the best of our knowledge, there has only been one previous ichthyoparasitological study (Aydoğdu et al., 2011) on this host in the world. Therefore, in this study, we sought to present the initial formal list of nematode species harbored by *C. antalyensis*, *P. battalgi*, and *A. mento*.

Our main objective was to identify some helminth species in the fish species mentioned above and to encourage the conservation of these species. We also hope that this study will serve as a database for future helminthological and ecological work in this field.

Materials and methods

C. antalyensis, also known as the Antalya barb, and *P. battalgi* are endemic to Turkey. *C. antalyensis* is known to inhabit the Aksu, Köprüçay, and Boğa streams in the Antalya region. *P. battalgi* inhabits the Manavgat River in the Antalya region as well as Lake Suğla (Seydişehir) and Lake Akgöl (Ereğli) in the Konya region of Turkey (Küçük and İkiz, 2004). *A. mento* prefers fresh to lightly brackish water, creeks, rivers, and small lakes. In Turkey, it inhabits the entire Ceyhan River and can also be seen in the southern coastal area, from Syria to the Antalya region. Some of its landlocked populations are found in central Anatolia (Küçük and İkiz, 2004).

A total of 65 samples were examined for helminth parasites. Fish specimens came from 3 species: *C.*

antalyensis (n: 15), *A. mento* (n: 29), and *P. battalgi* (n: 21). Samplings were performed between May and July of 2009. Fish species were collected from the Köprüçay and Manavgat rivers and Kırkgöz Stream and subsequently examined. From the Köprüçay River, *C. antalyensis* was collected, while the Kırkgöz stream offered *Aphanius mento* specimens and the Manavgat River provided *P. battalgi*. All collection was done using the electrofishing method, and specimens were transported alive to the laboratory of the Mediterranean Fisheries Research, Production, and Training Institute in Antalya. They were kept in aquaria and examined within a few days. Fish specimens were killed by vertebral separation. Length and weight were recorded, and the gastrointestinal tract was dissected for examination. It was removed, placed in a petri dish, cut open longitudinally, and examined for helminths using an Olympus stereoscopic microscope. All nematode specimens found in each individual fish were identified and counted. The living nematodes were fixed in hot 70% ethyl alcohol and cleared in glycerin alcohol or in hot lactophenol. All nematodes were identified using selected identification keys (Moravec, 1994; Markevich, 1951; Yamaguti, 1961) before being deposited at Uludağ University's Museum of Zoology in Bursa, Turkey. Classical epidemiological variables (prevalence and intensity) were calculated according to the methods of Bush et al. (1997). Standard statistical computation (standard deviation) was carried out using Microsoft Excel (Office 2000). We deposited the fish species in the laboratory of the Mediterranean Fisheries Research, Production, and Training Institute in Antalya. Finally, photomicrographs of the nematodes were taken using a photographic camera mounted on a research microscope (Nikon) in the Department of Parasitology of Veterinary Medicine, Uludağ University.

Results

During the survey, 3 fish species were caught, namely *C. antalyensis* (n: 15), *A. mento* (n: 29), and *P. battalgi* (n: 21). Of the 65 fish examined, only 25 fish were infected with any of the 3 species of nematodes. A total of 123 parasites were recorded in the 25 infected fish. Data concerning the total length (TL, cm) and weight (g) of the *C. antalyensis*, *A. mento*,

and *P. battalgil* specimens are given in the Table, as are the infection parameters of the nematodes species.

According to the Table, a total of 92 specimens of *R. denudata* (Figures 1-3) were found in 13 of 15 fish, for an overall prevalence of 86.6% and an average intensity of 7 (range: 3-15) nematodes per fish. An Antalya barb with a body length of 13.6 cm was most heavily infected by this parasite.

Contraecum sp. larvae (Figures 4 and 5) were localized in the abdominal cavity of *P. battalgil*,

with an overall prevalence of 47.6% and an average intensity of 3 (1-5) specimens per fish. Infection intensity was highest, at 5 nematodes per fish, in 2 specimens with total lengths of 8.9 and 8.2 cm.

Only 2 *E. excisus* larvae (Figures 6 and 7) were found in 2 of 29 fish examined. The 2 specimens of this nematode species were found in the abdominal cavity of the host fish. The 2 host fish were 6.5 and 5.5 cm in TL, respectively.

Table. Data on the total length (TL, cm) and weight (g) of the *C. antalyensis*, *A. mento*, and *P. battalgil* specimens and infection parameters of the nematode species.

| | <i>C. antalyensis</i> (n: 15) | <i>A. mento</i> (n: 29) | <i>P. battalgil</i> (n: 21) |
|---------------------------|-----------------------------------|---|---|
| Host mean TL (cm) ± SD | 14.6 ± 3.6 | 5.5 ± 0.61 | 9.13 ± 1.15 |
| Host mean weight (g) ± SD | 24.4 ± 6.8 | 3.43 ± 1.22 | 7.2 ± 2.64 |
| | Infection with <i>R. denudata</i> | Infection with <i>E. excisus</i> larvae | Infection with <i>Contraecum</i> sp. larvae |
| Prevalence (%) | 86.6 | 6.8 | 47.6 |
| Intensity range (min-max) | 3-15 | 1 | 1-5 |
| Mean intensity ± SD | 7.08 ± 3.86 | 1 | 2.90 ± 1.52 |
| Total number of worms | 92 | 2 | 29 |



Figure 1. *R. denudata* anterior, ×200.



Figure 2. *R. denudata* female posterior, ×200.

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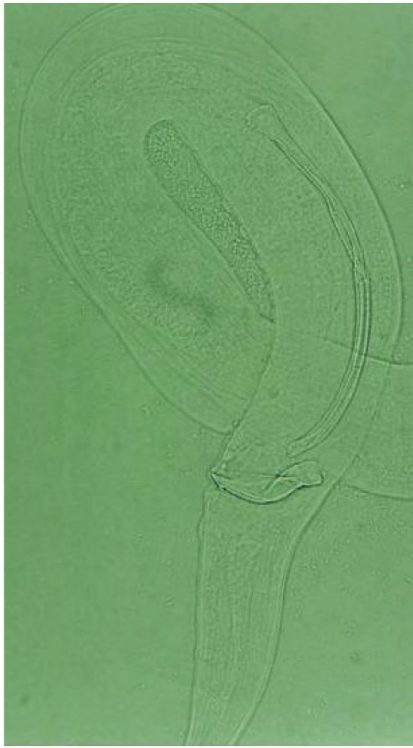


Figure 3. *R. denudata* male posterior, $\times 425$.



Figure 4. *Contracaecum* sp. larvae anterior, $\times 100$.



Figure 5. *Contracaecum* sp. larvae posterior, $\times 100$.

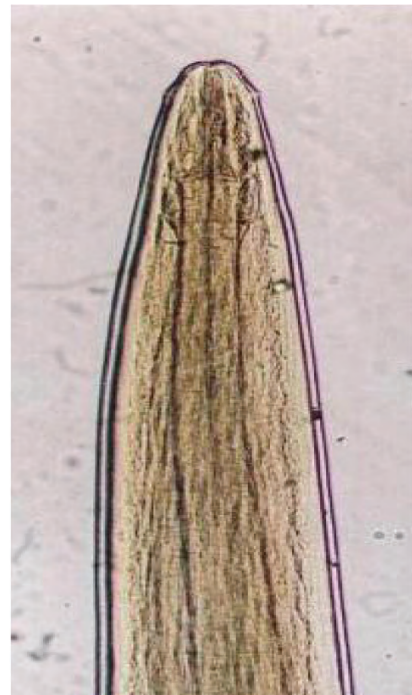


Figure 6. *E. excisus* larvae anterior, $\times 100$.



Figure 7. *E. excisus* larvae posterior, $\times 100$.

Discussion

In this study, the occurrence of nematode parasites in 2 endemic fish species (*C. antalyensis* and *P. battalgil*) and *A. mento* in Turkey was examined. The current study has demonstrated the nematode parasites of the host fish species for the first time in Turkey. Among the parasites, *R. denudata* and *Contracaecum* sp. larvae were reported with a new host record for the first time from *C. antalyensis* and *P. battalgil*, respectively.

R. denudata was the most common parasite species found in this study. This nematode species is a common intestinal parasite of many species of cyprinid fishes (Moravec, 1994). To the best of our knowledge, *R. denudata* has been reported twice in Turkey, from the chub (*Leuciscus cephalus*) (Aydođdu et al., 2001) and the bleak (*Alburnus alburnus*) (Aydođdu and Selver, 2006). As to the infection results of this species, Aydogdu et al. (2001) recorded 47 *R. denudata* in 21 out of 77 chub. Aydođdu and Selver (2006) studied helminth parasites in bleak from Mustafakemalpařa Stream in Bursa; they sampled 24 fish specimens and recorded 167 *R. denudata* in 10 of the 24 bleak. In our study, *R. denudata* is recorded for

the first time in *C. antalyensis*. However, there are no records mentioning the distribution of this species at this locality. Knowledge about the geographical distribution of the species will be expanded as a result of our study in Turkey and new data about cyprinid fishes from species formerly known to be parasitized with *R. denudata* can be added.

E. excisus larvae were found in the abdominal cavity of *A. mento*. This parasite species has been found in the gut of aquatic birds and oligochaetes. According to Moravec (1994), various fish (*Esox lucius*, *Silurus glanis*), amphibian (*Rana ridibunda*), and reptile (*Natrix tessellate*) species are known to be paratenic hosts of the parasite. To our knowledge, there have been 4 reports of *E. excisus* larvae from Turkey; they were recorded in bream (*Abramis brama*) from Lake Durusu by Karatoy and Soylu (2006) and in sandy goby (*Gobius fluviatilis*) from both Lake Manyas and Lake Uluabat by Öztürk et al. (2001) and Ozturk et al. (2002). Larvae of this species have also been recorded in marsh frogs (*Rana ridibunda*) from Lake Hazar by Sađlam and Arıkan (2006) and in grass snakes (*Natrix natrix*) and dice snakes (*N. tessellate*) by Yıldırimhan et al. (2007). In view of the results obtained in our study, the record of *E. excisus* larvae continues to be expanded, contributing to our increasing knowledge on the occurrence of this species. As our findings concern a different host, it can be concluded that *E. excisus* was recorded for the first time in *A. mento* from Turkey.

Contracaecum sp. larvae were recorded in the abdominal cavity of *P. battalgil* in our study. According to Moravec (1994), fish are known to be intermediate or paratenic hosts of the larvae of this genus. The larvae are found in different internal organs of fish, while adult nematodes are known to parasitize the digestive tract of fish-feeding birds and marine mammals. Moravec further stated that the identification of species is done according to the morphology of adults and that it is nearly impossible to identify the larvae of the genus *Contracaecum* at the species level without carrying out feeding experiments. Due to insufficient knowledge of the morphology of the *Contracaecum* larvae found in our study, we were unable to identify the specimens at the species level. In Turkey, the larvae of the genus *Contracaecum* were previously recorded in *Rutilus*

rutilus from Kocadere Stream by Selver et al. (2009). As indicated by those researchers, *Contracaecum* sp. larvae were present in *Vimba vimba*, *Carassius carassius*, *C. auratus*, *Capoeta tinca*, *Barbus plebejus escherichi*, and *Scardinius erythrophthalmus* in Turkey.

In conclusion, the present study is the first for parasites of *P. battalgil* in the world. Similarly, this is also the first survey of ichthyoparasitological data for *A. mento* conducted in Turkey. As far as we know, *E.*

excisus larvae were recorded for the first time from *A. mento* in Turkey as a result of this investigation. In addition, *R. denudata* and *Contracaecum* sp. larvae were reported for the first time from *C. antalyensis* and *P. battalgil*, respectively, as new host records. The present survey will be useful as a baseline for further studies concerning the helminth parasites of endemic fish species. Additionally, in order to ascertain the component community of the helminths harbored by the fishes examined in our research, more studies conducted in Turkey are required in the future.

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