

## Occurrence of the Swimbladder Parasite *Anguillicola crassus* (Nematoda, Dracunculoidea) in European Eels (*Anguilla anguilla*) in Ceyhan River, Turkey

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**Abstract:** European eels (*Anguilla anguilla*), collected from the Ceyhan River (Adana, Turkey) in 2002, were examined in terms of the presence of swimbladder nematoda. The existence of infection with *Anguillicola crassus*, a pathogenic swimbladder parasite, was identified in 50 out of 64 specimens. The total number of parasites, prevalence (%), parasite abundance and mean intensity of parasite values of July and November samples were 93, 82.86%, 2-7, 3.31 ± 1.32 and 56, 72.41%, 1-5, 3.20 ± 1.30, respectively. There was no significant histopathological destruction in the internal organs of the infected eels.

**Key Words:** *Anguilla anguilla*, swimbladder parasite, *Anguillicola crassus*

### Ceyhan Nehri (Türkiye) Avrupa Yılan Balıklarında (*Anguilla anguilla*) Rastlanılan Yüzme Kesesi Paraziti, *Anguillicola crassus* (Nematoda, Dracunculoidea)

**Özet:** 2002 yılında Ceyhan Nehri (Adana, Türkiye)'nden avlanan Avrupa yılan balıkları (*Anguilla anguilla*), yüzme kesesi nematodunun varlığı yönünden incelenmişlerdir. İncelenen 64 balığın 50'sinde, yüzme kesesi paraziti *Anguillicola crassus* enfeksiyonuna rastlanılmıştır. Temmuz ve Kasım örneklerindeki; parazit sayıları, prevalans (%) aralığı ve ortalama parazit yoğunluğu değerleri, sırasıyla; 93, % 82,86, 2-7, 3,31 ± 1,32 ve 56, % 72,41, 1-5, 3,20 ± 1,30 olarak bulunmuştur. İnfekte balıklarının iç organlarında histopatolojik bir olguya rastlanmamıştır.

**Anahtar Sözcükler:** *Anguilla anguilla*, yüzme kesesi paraziti, *Anguillicola crassus*

### Introduction

The Ceyhan River is located in the northeastern part of the Mediterranean region (Adana, Turkey), and runs into the Mediterranean Sea. This river is a natural habitat of the European eel (*Anguilla anguilla*). It is known that *Anguillicola crassus* (1) is one of the most common pathogenic parasite of eels in some regions of Europe. The swimbladder parasite *Anguillicola crassus* belongs to the family Dracunculoidea. This parasite is a blood-sucking nematode indigenous to Eastern Asia, where it is widespread amongst its native host, the Japanese eel

*Anguilla japonica* (2,3). It is thought that *A. crassus* was introduced accidentally into Europe with Japanese eels from Asia in the early 1980s (4,5). Researchers (2-5) claim that infection of the European eel with the swimbladder parasite *A. crassus* is widespread in natural basins in Europe. Thus, these parasites seem to be endemic. The eels are infected via ingested copepod and small fish, which are the intermediate hosts for infective third-stage larvae (L3) of the parasite (3,6). The full life-cycle of *A. crassus* has been elucidated by various investigators (7-8). The parasite eggs are laid in the swimbladder and along with L2 larvae newly hatched

eggs pass through the pneumatic duct into the gut of the eel and are discharged with the feces (3,7). According to Nagasawa et al. (2), the parasite causes little or no pathological damage to its native eel (*Anguilla japonica*) host. However, the subsequent infection of the swimbladder possibly causes undesirable pathologic effects such as rupture (3) and thickened swimbladder wall or increased anal redness (9) in European eels. In the present study, we seek to clarify the status of *A. crassus* in European eels from the Ceyhan River in Turkey.

### Materials and Methods

This study was carried out during July-November 2002. The samples were collected from (lower region of the Ceyhan River) the Buyukmangit village area, which is located on the edge of Ceyhan town, Adana, Turkey. Eel samples were collected using long line nets and labeled in separate plastic bags. Total length and weight of the examined eels were  $41.83 \pm 11.49$  cm and  $264.91 \pm 115.05$  g, respectively. Endoparasitologic examinations and evaluation were conducted utilizing standard techniques (3,8,10,11). European eels were dissected and the presence and number of *A. crassus* recorded. The other internal organs such as the liver, kidney, and spleen from all samples were rapidly removed and stored in a calcium buffered 4% formaldehyde solution. Tissues (including the swimbladder) were histopathologically examined within 24-36 hours after the storage (10). Specimens for histology were processed manually and embedded in paraffin wax. Sections ( $5 \mu$ ) were cut and

mounted on glass slides before staining with Mayers Hematoxylin and Eosin. Stained sections were examined under light microscopy (Olympus CH40).

### Results

*Anguillicola crassus* (Figure) were found in European eels in Ceyhan River. The status of *A. crassus* infection in eels is shown in the Table. Fifty out of 64 eel samples were found to be infected. In the July samples, totally 93 nematodes were counted in 29 infected fish. Parasite abundance ranged from 2 to 7. The total numbers of parasites in infected specimens in November samples were 56 and the abundance was between one and five. Mean intensity of parasite values of the July and November samples were  $3.31 \pm 1.32$  and  $3.20 \pm 1.30$ , respectively. There were no differences in the histological investigation of the parasitized and non-parasitized eel swimbladder samples or the other internal organs. Thus, no lesions were observed in examined tissue.

### Discussion

In our study, *A. crassus* prevalence (infection levels) in July and November samples was 82.86% and 72.41%, respectively. Würtz et al. (12) showed that there were no significant similarities between the prevalence and the seasonal changes and also no correlations between the number of parasites per samples and the length of eels. Our findings showed some similarity with those of Würtz et al. (12).



Figure. Dissected swimbladder and *Anguillicola crassus*.

Table. The *Anguillicola crassus* infection status of eels in Ceyhan River.\*

	July (2002)	November (2002)
Samples number (N)	35	29
Number of infected fish	29	21
Prevalence (%)	82.86	72.41
Total number of parasites	93	56
Parasite abundance	2-7	1-5
Mean intensity $\pm$ S.D.	$3.31 \pm 1.32$	$3.20 \pm 1.30$

\* Büyükmangit village's area, Adana, Turkey

Pilcher and Moore (8) have reported that prevalence of *A. crassus* for the four locations in the tidal Thames (UK) catchment was 12-32%. According to Evans and Matthews (3) and Evans et al. (13), the prevalence of *A. crassus* on the Erne catchment and Erne system (Ireland) was 2%-14% and 9.9%, respectively. Evans et al.'s (13) mean intensity results were six to seven parasites per fish in the Erne system. In our study, mean parasite intensity for all samples was  $3.26 \pm 0.08$  (July 3.31 and November 3.20). Consequently, our results agree with Evans et al. (13)'s mean intensity findings. On the other hand, in our study, prevalence's were higher than those found in Pilcher and Moore (8) and Evans and Matthews (3). Additionally, histopathological investigation showed that there was no pathological damage due to the infection. These findings are consistent with Nagasawa et

al.'s (2) study, which also showed that *A. crassus* did little or no pathological damage to its native eel host.

The literature showed that there was no report on *A. crassus* infection of eels in this region. Thus, this is the first documented report on the occurrence of *Anguillicola crassus* in European eels caught in the Ceyhan River (Ceyhan, Adana, Turkey).

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