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Gastrointestinal helminthes of green-winged teal (*Anas crecca*) from North IranMohammad Reza Youssefi<sup>1</sup>, Seyed Hossein Hosseini<sup>2</sup>, Amir Hossein Alizadeh Tabarestani<sup>3</sup>, Hadi Alijani Ardeshir<sup>3</sup>, Farshid Jafarzade<sup>4</sup>, Mohammad Taghi Rahimi<sup>3\*</sup><sup>1</sup>Department of Veterinary Parasitology, Islamic Azad University, Babol Branch, Babol, Iran<sup>2</sup>Department of Veterinary Parasitology, Faculty of Veterinary Medicine, University of Tehran, Iran<sup>3</sup>Young Researchers Club, Islamic Azad University, Babol Branch, Babol, Iran<sup>4</sup>Department of Veterinary Parasitology, Islamic Azad University, Tonekabon Branch, Iran

## PEER REVIEW

## ABSTRACT

## Peer reviewer

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## Comments

In this research the authors presented the helminth species of *A. crecca* in Mazandaran province, north of Iran. *H. conoideum*, *Diorchis stefanskii*, *Echinocotyl* sp. and *Contracaecum* larvae were identified. Although further investigations are required in order to verify the seasonal parasites diversity and intensity of parasite infection, the results are interesting and can be used for the prevention of transmission of parasites from *A. crecca*.

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**Objective:** To determine the helminth parasites of *Anas crecca* (*A. crecca*) in one of proper refuges of Iran, Fereydunkenar.

**Methods:** A total number of one hundred thirty-six gastrointestinal tracts of green-winged teal (*A. crecca*) were collected from Fereydunkenar, Mazandaran province during September and October 2011. The gastrointestinal tracts were examined for helminth infection.

**Results:** The total infection rate was 70.50% (96) that 68.96% (40) of males and 71.79% (56) of females shown helminthes infection. The examined *A. crecca* harbored one species of Nematoda, Cestoda and two species of Digenea which were as following: *Contracaecum* larvae (from stomach wall), *Diorchis stefanskii* (*D. stefanskii*) (from small intestine), *Hypoderaeum conoideum* (from small intestine) and *Notocotylus attenuatus* (*N. attenuatus*) (from caecum), respectively. There was no significant difference in the prevalence of infection between examined males and females ducks in *Hypoderaeum conoideum*, *D. stefanskii* and *N. attenuatus* ( $P > 0.05$ ) whereas a significant relationship was observed between males and females in *Contracaecum* larvae ( $P < 0.05$ ).

**Conclusions:** Based on the results of the present study, we conclude that *A. crecca* plays a prominent role in transmission of mentioned parasites. In addition, this is the first report of *Contracaecum* larvae, *D. stefanskii* and *N. attenuatus* from *A. crecca* in Iran.

## KEYWORDS

Parasite, Helminth, Intestine, *Anas crecca*, Aquatic bird, Wild duck, Iran

## 1. Introduction

The Eurasian teal–*Anas crecca* (*A. crecca*) is a common and widespread duck in the Asia and Europe that migrates

in fall from breeding grounds in Siberia in Russia to wintering areas in the northern grounds of Iran and return to its breeding grounds in spring<sup>[1]</sup>. The Eurasian teal is the smallest extant dabbling duck at 34–43 cm length with

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an average weight of 360 g in males and 340 g in females. The wings are 17.5–20.4 cm long, yielding a wingspan of 53–59 cm. Besides, the bill measures 3.2–4.0 cm in length. Diet breeding in spring and summer of this species consists predominantly of animal matter such as mollusks, worms, insects and crustaceans[2,3].

The highest total number of *A. crecca* was recorded in Iran and Azerbaijan. Annually, a great number of aquatic migratory birds migrate from northern hemisphere to the Mazandaran province, northern Iran. Almost a total number of 93 000 *A. crecca* were counted at Fereydoon Kenar, Mazandaran province, Iran in 2003. *A. crecca* is called “Khotka” by local people of north of Iran[4].

Although northern provinces of our country are appropriate winter quarters for either migratory or resident aquatic birds, there is not enough published data on prevalence and intensity of helminthic infection of their gastrointestinal tract. Therefore, the objective of the current investigation was to scrutinized the gastrointestinal parasites of *A. crecca* in north of Iran.

## 2. Materials and methods

### 2.1. Sampling

A total number of one hundred thirty–six green–winged teal (*A. crecca*) heads and their gastrointestinal tract were collected from poultry product suppliers in Fereydunkenar, Mazandaran province, north of Iran during September and October 2011. The gastrointestinal tract of each duck and its head were placed on ice plastic bags after collecting and sent to parasitology laboratory for investigation. For aims of gender recognition, male ducks were recognized by their green head and dark bill that are characteristic features for them whereas females had pale brown head, neck and dark gray bill.

For screening endoparasites of *A. crecca*, the digestive tract (stomach, small intestine and large intestine) were separated and opened along its entire and frequently rinsed in order to gather the whole contents. The contents of each organ separately were screened by aid of Mesh 70 and in the next step the remnants were conveyed to Petri dishes for more investigation. For the purpose of collecting tiny helminthes which probably are attaching to mucosal layer of the stomach and intestinal tract, a stereomicroscope were used. The collected Digenean and Cestoda samples were fixed and preserved in 70% ethanol, stained with carminic acid procedures, dehydrated, then cleared and mounted in

Canada–balsam (Merk). Nematoda specimens were killed in hot saline solution, fixed in a solution composed 70% ethanol and 5% glycerin, cleared by a drop of lactophenol, mounted by Canada–balsam. Thereafter, nomenclature and identifications of the helminths were performed according to available systematic keys of Yamaguti and Baker[5–7].

### 2.2. Study area

Fereydunkenar is a city in Mazandaran province, north of Iran. The site is located at latitude, 36°41'11" N and longitude, 52°31'21" E and also 23 m below sea level, on the coastal plain of the Southeast Caspian lowlands (Figure 1). This site is a resort on the Caspian Sea. The maximum and minimum temperatures were 28.2 °C and 8.7 °C in the July and December, respectively. The maximum annual rainfall has been reported 220.2 mm in October, and the least 0.2 mm in July 2010[8,9].



**Figure 1.** Map of Iran, the highlighting position of Fereydunkenar Country in Mazandaran province.

The area comprises four “damgahs” or duck trapping areas (Fereydoon Kenar, Ezbaran, Eastern and Western Sorkh Rud) and also a Wildlife Refuge (Fereydoon Kenar WR, 48 hectares) which is located in the northeastern part of these damgahs. Each damgah consists of a complex of shallow freshwater impoundments situated in harvested rice paddies, developed as duck–hunting areas and surrounded by forest strips and reed enclosures. The area is situated in the southeast Caspian lowlands. It is of outstanding

importance as the winter quarters of the western population of the Siberian crane (*Grus leucogeranus*), but also extremely importance as a wintering area for more than 150 species of birds such as waterfowl, notably dabbling ducks (*Anas* spp.) and geese (*Anser* spp.). Furthermore, a forest surrounds Fereydunkenar creating a more secluded area for the birds<sup>[8]</sup>.

### 3. Results

From a total number of one hundred thirty-six head of *A. crecca*, 58 and 78 of them were recognized as female and male, respectively. In addition, the gastrointestinal tract of examined *A. crecca* harbored one species of Nematoda, Cestoda and two species of Digenea which were as following: *Contracaecum* larvae (from stomach wall), *Diorchis stefanskii* (*D. stefanskii*) (from small intestine), *Hypoderaeum conoideum* (*H. conoideum*) (from small intestine) and *Notocotylus attenuatus* (*N. attenuatus*) (from caecum), respectively. The total infection rate of examined ducks was 70.5% (96) that 68.96% (40) of males and 71.79% (56) of females shown helminthic infection. The most prevalent helminthes were *H. conoideum* 30.8% (42) followed by *N. attenuatus* 26.4% (36) and *D. stefanskii* 19.1% (26). Besides, the least prevalent parasite was *Contracaecum* larvae 0.2% (3). Table 1 depicts the extracted helminthes from 136 examined *A. crecca*.

**Table 1**

Helminths extracted from *A. crecca* according to their sex, prevalence and organ involvement (n=136).

Helminths	Organ involvement	Infected male (%)	Infected female (%)
Trematoda	<i>H. conoideum</i>	19/40 (47.50)	23/56 (41.07)
	<i>N. attenuatus</i>	15/40 (37.50)	21/56 (37.50)
Cestoda	<i>D. stefanskii</i>	9/40 (22.50)	17/56 (30.35)
Nematoda	<i>Contracaecum</i> larvae	0/40 (0.00)	3/56 (5.35)

There was no significant difference in the prevalence of infection between examined males and females ducks in *H. conoideum*, *D. stefanskii* and *N. attenuatus* ( $P > 0.05$ ) whereas a significant relationship was observed between males and females in *Contracaecum* larvae ( $P < 0.05$ ).

#### 3.1. *Contracaecum* larvae (Nematoda: Anisakidae)

Third stage of larvae had thick body with an annulated cuticle which formed collar at the anterior end. Lateral interruption at this part was observed (Figure 2). Besides, at anterior end excretory pore was opened. Esophagus ends was short and a subglobular ventriculus was seen in all of recovered specimens. Intestinal caecum of examined larvae

seemed much shorter than ventricular appendix. Moreover, pointed tail equipped with an obvious spin.



**Figure 2.** Anterior part of *Contracaecum* larvae from stomach wall of *A. crecca*.

#### 3.2. *D. stefanskii* (Cestoda, Hymenolepididae)

The length and width of specimen was 105×11 mm. Proglottids were shown nearly trapezoid shape. The width of proglottids was longer than length. Genital pores were located in one side of proglottids. Besides, the scolex was wider than neck and no hook and spine was observed. Rostellum equipped with ten hooks. Each proglottids contained two testis which were placed at the back of ovary (Figure 3).



**Figure 3.** Mature proglottid of *D. stefanskii* extracted from small intestine of *A. crecca*.

#### 3.3. *H. conoideum* (Trematoda: Echinostomatidae)

Body was elongated and some tiny spines were observed at the anterior part of the body. The collar was not completely developed with 45–55 spines. Oral sucker was subterminal ventral. Acetabulum was placed in the first sixth of the body.



Moreover that prepharynx seemed short but with a muscular pharynx and esophagus. The two intestinal caeca enlarged to near the posterior end of the specimens. The two tandem testes were smooth or slightly lobulated. Meanwhile, ovary was in median position, spherical or slightly ovoid. Seminal receptacle was not present. The uterus which contained many eggs runs intercaecally between anterior testis and acetabulum (Figure 4).



**Figure 4.** *H. conoideum* from small intestine of *A. crecca*.

### 3.4. *N. attenuatus* (Digenea, Notocotylidae)

Body was flat. The length and width of examined specimens were 1.5 mm and 1.1 mm, respectively. Oral sucker was observed in terminal position and esophagus was short. Anterior part was narrower and ventral sucker was absent. The ventral side was provided with three rows of spines. Uterus had numerous eggs (20  $\mu$ ) and a filament was observed in each side (Figure 5).



**Figure 5.** *N. attenuatus* from Caecum of *A. crecca*.

## 4. Discussion

Migratory birds play a significant role in transmission of

parasites not only as a final host but also as a main carrier owing to passing different geographic areas and territories. According to our literature review, an investigation was conducted on eight species of wild ducks of Mazandaran and Gilan provinces in Iran including *Anas platyrhynchos*, *A. crecca*, *Aythya nyroca*, *Aythya ferina*, *Aythya fuligula*, *Anas strepera*, *Anser anser* and *Cygnus cygnus*. The following helminthes from *A. crecca* were observed: *H. conoideum*, *Echinostoma revolutum*, *Cotylurus cornutus*, *Apatemon gracilis*, *Hymenolepis collaris* and *Amidostomum anseris*. Even though, *Coprinus comatus* was recorded as the most prevalent helminthes in that study, it was not detected in our investigation<sup>[10]</sup>.

In Saudi Arabia, our neighbor country, an elaborate study was undertaken on different species of 122 aquatic birds. Only two *A. crecca* (13.3%) were infected by helminthes. Considering that the all isolated helminthes belong to six families and eight species, none of our detected helminthes corresponds to above mentioned study<sup>[11]</sup>.

In southwestern Texas, intensity of infection in *A. crecca* with *H. conoideum* in fall and spring was 0% and 5%, respectively<sup>[12]</sup>. In similar study in central of Oklahoma, the infection of *A. crecca* with *H. conoideum* and *D. longiovum* was reported 0%<sup>[13]</sup>. Infection of Mexican ducks with *H. conoideum* 14.7%, *Diorchis bulbodes* 6.2%, *Diorchis* sp. 3.9% and *Echinocotyle rosseteri* 5.4% were observed in north central Mexico and southwestern United states<sup>[14]</sup>. In Florida, the prevalence rate of *N. attenuatus* was reported 8.7% examining 184 blue-winged teal (*A. discors*)<sup>[15]</sup>.

Parasites infecting migratory birds are a matter of high importance because they may be transported over long distances and it is also apparent that some parasites are capable of infecting proper hosts over extensive geographic areas<sup>[16,17]</sup>. By comparing the helminthes diversity from ducks collected in this study with those collected in other areas, it can be concluded that there is a seasonal variations in helminthes populations. Moreover, migratory routes should not be neglected because of its probable influence on parasite species of birds. This is a noteworthy point to mention that this study presents the first report of *Contracaecum* larvae, *D. stefanski* and *N. attenuatus* from *A. crecca* in Iran. Furthermore, among obtained parasites *Contracaecum* larvae has a zoonotic importance to public health<sup>[18]</sup>. Considering the results of current investigation, further helminthological investigations are required in order to prepare more information on helminthes diversity of aquatic birds in Iran particularly in different seasons of year in order to determine the taxonomic structure and seasonal parasites diversity of the helminthes and elucidate their putative role in transmission of parasites.

## Conflict of interest statement

We declare that we have no conflict of interest.

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## Comments

### Background

The aquatic birds are host of a diversity of parasites. The knowledge about the helminth parasites is very important for the conservation of wildlife with implications in host population biology.

### Research frontiers

Studies are being performed in order to identify the gastrointestinal parasites of migratory and resident aquatic birds in Iran, particularly *A. crecca*.

### Related reports

Dalimi and Mobedi (1998) reported the following helminths from *A. crecca* in the Iranian provinces of Mazandaran and Gilan: *H. conoideum*, *Echinostoma revolutum*, *Cotylurus cornutus*, *Apatemon gracilis*, *Hymenolepis collaris* and *Amidostomum anseris*. *Coprinus comatus* was recorded as the most prevalent helminth for these authors, it was not detected in our investigation.

### Innovations and breakthroughs

Studies about the helminth parasites of wild ducks are scarce in Iran. This is a recent study that presents the first report of *Contracaecum* larvae, *Diorchis stefanskii* and *Echinocotil* sp. from *A. crecca* in Iran.

### Applications

The knowledge about the helminth parasites of *A. crecca* is very important and can be used to endorse management decisions for the conservation of this specie.

### Peer review

In this research the authors presented the helminth species of *A. crecca* in Mazandaran province, north of Iran. *H. conoideum*, *Diorchis stefanskii*, *Echinocotil* sp. and *Contracaecum* larvae were identified. Although further investigations are required in order to verify the seasonal parasites diversity and intensity of parasites' infection, the results are interesting and can be used for the conservation of *A. crecca*.

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