Examination of Helminth Parasites in the Fecal Samples of Magpies (Pica pica), Jackdaws (Corvus monedula), and Rooks (Corvus frugilegus) in the Vicinities of Van Province/Turkey

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Abstract: The present study was designed to examine helminths in the gastrointestinal tract of corvid species including Pica pica, Corvus frugilegus, and Corvus monedula. A total of 43 fecal samples were collected from Pica pica, 42 samples from Corvus frugilegus, and 42 samples from Corvus monedula species. Feces were analyzed using sedimentation and flotation methods. Echinostoma spp. (2.32%), Capillaria spp. (6.97%), Syngamus spp. (2.32%), and Raillietina spp. (6.97%) were detected in Pica pica, Raillietina spp. (2.5%) and Capillaria spp. (10.0%) were detected in Corvus monedula, and only Capillaria spp. (9.52%) were detected in Corvus frugilegus. To our knowledge, this is the first study in Turkey identifying these helminth species in the fecal samples of these bird species.

Keywords: Corvidae, Helmint, Pica pica, Corvus frugilegus, Corvus monedula.

Van’da (Türkiye) Saksağan (Pica pica), Cüce Karga (Corvus monedula) ve Ekin Kargası (Corvus frugilegus) Dişkalarının Helmint Parazitler Açısından İncelenmesi

Öz: Bu çalışma Corvidae ailesine bağlı Saksağan (Pica pica), Cüce karga (Corvus monedula), Ekin kargası (Corvus frugilegus) türünü yabancı kuşlarla gastrointestinal sistem helmintlerini tespit etmek için yapıldı. Bu amaçla Saksağan’dan 43, Cüce karga’dan 40, Ekin kargasıdan 42 adet dışkı toplandı. Dışkılar sedimentasyon ve flotaşyon yöntemleri ile incelendi. İncelme sonucunda Saksağan’dan %2.32 oranında Echinostoma spp., %6.97 oranında Capillaria spp., %2.32 oranında Syngamus spp., %6.97 oranında Raillietina spp., Cüce karga’dan %2.5 oranında Raillietina spp., %10 oranında Capillaria spp., Ekin kargasıdan %9.52 oranında Capillaria spp. türü helmint yumurtalarını tespit etildi. Dışkı muayenelelerinde yumurtalarını tespit ettigimiz helmint türleri Pica pica, Corvus monedula ve Corvus frugilegus’da, Türkiye’de ilk kez bu çalışma ile bildirilmiştir.

Anahtar kelimeler: Corvidae, Helmint, Pica pica, Corvus frugilegus, Corvus monedula.

1. Introduction

Parasites are frequently seen in wild birds and these birds are known to harbor a wide variety of parasites throughout their life span. Nevertheless, there is little documentation of parasites harbored by wild birds and there is no taxonomy for most of these parasites. Moreover, although parasitic protozoa that reside in blood have been investigated extensively due to the ease of collecting blood samples from living birds, little is known about other species such as intestinal parasites (Moore & Clayton, 1997). The helminth communities of birds are closely associated with water due to their intermediary hosts and these communities are generally more diverse than those of fish and mammal hosts (Kennedy, Bush, & Aho, 1986; Bush, Aho, & Kennedy, 1990; Poulin, 1997).

Turkey is home to a wide variety of species due to its geographical location, topographic conditions, habitat biodiversity, and climatic richness (Kiziroğlu, 2001; Balkay & Çelikoba, 2005; Akın, 2009). On the other hand, birds play a vital role in the dissemination of parasites and both birds and their hosts are affected by migration and habitat quality (Webb, 2010; Kanarek & Zalesny, 2014).

The corvid species examined to date have been shown to live in a half-wild state. These species can disseminate in cultivated areas and natural habitats and typically feed on local trash sources and urban dump sites. These animals breed in the wildlife and may also reproduce in urbanized areas and get adapted to these environments. In their daily life, they keep contact with humans and domestic animals by frequently leaving their feces in their living quarters.

This study aimed to examine the helminths in the fecal samples of corvid species including Pica pica, Corvus frugilegus, and Corvus monedula which are commonly seen in urbanized areas in Van province. We also investigated the role of these bird species in infections caused by helminths.

2. Material and Methods

Fecal Samples: Samples of the three bird species were collected from their nesting sites at 18 different locations in Van Province between March and May 2019 (Figure 1).

Samples were collected from the fresh fecal matter underneath the nests of the birds. Throughout the sample collection processes, no contact was made with the birds and no bird was injured. A total of 43 fecal samples were
collected from *P. pica*, 42 samples from *C. frugilegus*, and 42 samples from *C. monedula* species. Birds selected for the study were identified by an expert ornithologist using the relevant literature (Svensson, Mularney & Zatterström, 2009). All the samples were placed in sealed specimen containers with labels indicating the date, location of sample collection, and the species. The samples were transferred to the laboratory on the same day. Feces were analyzed on the same day using sedimentation and flotation methods. In the flotation method, hazelnut-sized feces were homogenized in 33% Zinc Sulphate in the tube. The top of the tube was covered with a coverslip and after 30 minutes, the coverslip was taken on the slide. In the sedimentation method, the feces were suspended with tap water or saline and filtered. The top liquid was poured after centrifugation at 400-500 g for 2 minutes. By taking some amount from the sediment, the smear was prepared. The thin layer was coated with another slide and then was examined under a microscope (Leica DM500) at 10 × and 40 × objective lens. The helminth eggs detected in the samples were identified based on the literature data and then were photographed (Mshot Md 90) (Kaufman, 1996; Fernando & Barta, 2008).

3. Results

It was revealed that all three corvid species nested on trees in urbanized areas. It was also found that both *C. frugilegus* and *C. monedula* established hundreds of breeding and feeding communities, while *P. pica* lived in individual communities. However, the territories of all three species overlapped with each other.

A total of four distinct helminth species were identified in the three bird species. *Echinostoma* spp., *Capillaria* spp., *Syngamus* spp., and *Raillietina* spp. were detected in *Pica pica*; *Raillietina* spp. and *Capillaria* spp. were detected in *C. monedula*; and only *Capillaria* spp. were detected in *C. frugilegus* (Table 1). The egg sizes of *Echinostoma* spp., *Capillaria* spp., *Syngamus* spp., and *Raillietina* spp. were ~95×119µm, ~47×25µm, ~92×47µm, and ~45×38µm, respectively (Figure 2).

4. Discussion

Turkey is home to a wide variety of bird species due to its natural features. These species act as hosts to various parasites. The biodiversity of bird species and their hosts are associated with numerous factors such as habitat quality and distribution as well as seasonal changes (Webb, 2010; Kanarek & Zalesny 2014).

In the present study, *Echinostoma* spp. were detected as a mixed infection with *Capillaria* spp. in 2.32% (n=1) of the fecal samples obtained from *P. pica* species. Similarly, in the previous studies, *Echinostoma* spp. have been shown to cause severe enteritis in both domestic and wild birds, particularly ducks and geese, by settling down in their cecum and rectum and have also been reported in humans and others mammals, though rarely. (Griffiths, Gonder, & Pomeroy, 1976; Hossain, Dewan, Baki, & Mondad, 1980). In Turkey, *Echinostoma* spp. have been reported in chickens, turkeys, and geese with an infection rate of 0.06-10% (Merdıvenci, 1967; Kurt & Acici, 2008; Güçlü, 1992; Aydn, Göz, & Değer, 2010). In other countries, however, *Echinostoma* spp. have been mostly reported in birds and their most common species, *E. revolutum*, has been reported in ducks, wild water birds, and pigeons (Kaufmann, 1996; Farias & Canaris, 1986; Yousuf, Das,
In our study, however, Raillietina spp. were detected as a mixed infection with Capillaria spp. in a single fecal sample and as a single parasite in two fecal samples obtained from P. pica species.

Halajian et al. (2011) evaluated P. pica, C. frugilegus, and C. corone in Iran and diagnosed Syngamus trachea in 6.3% of P. pica and 6.2% of C. corone and identified Capillaria spp. in 9% of C. frugilegus. The differences between these rates and the rates found in our study could be attributed to regional differences and to the fact that Halajian et al. (2011) examined the animals at post-mortem.

Girişgin et al. (2019) conducted a helminthological

Figure 2. Helminth parasites eggs detected in fecal samples (A: Echinostoma spp. egg, B: Capillaria spp. egg, C: Raillietina spp. egg, D: Syngamus spp. egg)
examination on *P. pica* species at post necropsy and identified *Passerellepis* spp. and *Brachylaima* spp. in the animals. Interestingly, these helminth species were not detected in any of the animals examined in our study which could be associated with regional differences and with the fact that Girişgin et al. (2019) only examined eight animals that were brought to the animal hospital for medical intervention. In our study, one trematode (*Echinostoma* spp.) one cestode (*Raillietina* spp.), and two nematodes (*Capillaria* spp. and *Syngamus* spp.) were identified in the helminth eggs detected in the fecal samples of *C. frugilegus*, *C. monedula*, and *P. pica* species (Table 1). To our knowledge, this is the first study in the literature identifying these helminth species in these bird species.

Table 1. Helminth species identified in the study

| Bird species       | Fecal samples (n) | Positive samples (n) | Helminth species       | Infection Rate   |
|--------------------|-------------------|----------------------|------------------------|------------------|
| *Pica pica*        | 43                | 1                    | *Echinostoma* spp.     | 2.32%            |
|                    |                   | 3                    | *Capillaria* spp.      | 6.97%            |
|                    |                   | 1                    | *Syngamus* spp.        | 2.32%            |
|                    |                   | 3                    | *Raillietina* spp.     | 6.97%            |
| *Corvus frugilegus*| 42                | 4                    | *Capillaria* spp.      | 9.52%            |
| *Corvus monedula*  | 40                | 1                    | *Raillietina* spp.     | 2.5%             |
|                    |                   | 4                    | *Capillaria* spp.      | 10.0%            |

5. Conclusion
In conclusion, wild birds harbor a wide variety of parasites throughout their life span and little is known about the importance of infections caused by these parasites in wild birds. Mixed parasitic infections are highly common in wild birds and the effects of these infections on wild birds are associated with the type of the parasite, coexisting parasitic diseases, and stress factors. The results indicated that the corvid species examined in the study had large populations in urbanized areas in the vicinities of Van province which could be related to the abundance of food in those areas. Additionally, this finding could most probably be related to the fact that these species need trees for reproduction and there are almost no trees in the areas other than those areas.

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