

## TƏBİƏT ELMLƏRİ NATURAL SCIENCES

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### Comparative Analysis of Helminth Invasions Depending on Age, Sex and Seasons in Domestic Water Birds in Azerbaijan

#### Abstract

Helminths cause serious damage to the body of geese and ducks, reduce their productivity and negatively affect the quality of their meat. Therefore, studying the helminth fauna of domestic water birds and the dynamics of infection with parasites depending on the age, sex, distribution area and seasons of the year is one of the urgent issues. In total, 904 geese and ducks were examined by the method of complete parasitological dissection and 27 species of helminths were detected in the owners. In both geese and ducks, the percentage of infection was higher in males (77.27% and 50.45%) than in females (68.29% and 34.67%). The rate of infection with helminths was higher among birds up to 6 months of age than in other groups, regardless of the number of species. The species found in all age groups in birds are as follows: *N. attenuatus*, *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*. It has been determined that domestic waterfowl have a higher percentage of helminth invasions in summer than in other seasons. The nematodes recorded in both geese and ducks in all seasons are: *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*.

**Keywords:** *Anser anser dom.*, *Anas platyrhynchos dom.*, age, sex, seasons, comparative analysis, helminth fauna

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## Azərbaycanda ev su quşlarının helmintlərlə yoluxmasının yaş, cins və fəsillərdən asılı olaraq dəyişməsinin müqayisəli təhlili

### Xülasə

Helminthlər qazların və ördəklərin orqanizminə ciddi ziyan vurur, onların məhsuldarlığını azaldır, ətinin keyfiyyətinə mənfi təsir göstərir. Ona görə də ev su quşlarının helminth faunasının və parazitlərlə yoluxma dinamikasının yaşından, cinsindən, yayılma zonasından və ilin fəsillərindən asılı olaraq öyrənilməsi aktual məsələlərdən biridir. Ümumilikdə 904 ədəd qaz və ördək tam parazitoloji yarma üsulu ilə müayinə edilmiş və sahiblərdə 27 növ helminth aşkar edilmişdir. Həm qazlarda, həm də ördəklərdə yoluxma faizi erkəklərdə (77,27% və 50,45%) dişilərdən (68,29% və 34,67%) daha yüksək olmuşdur. Helminthlərə yoluxma dərəcəsi 6 aya qədər olan quşlar arasında növlərin sayından asılı olmayaraq digər qruplara nisbətən daha yüksək olmuşdur. Quşlarda bütün yaş qruplarında rast gəlinən növlər aşağıdakılardır: *N. attenuatus*, *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*. Müəyyən edilmişdir ki, ev su quşlarının digər fəsillərə nisbətən yayda helminthlərlə yoluxma faizi daha yüksəkdir. İstər qazlarda, istərsə də ördəklərdə bütün fəsillərdə qeydə alınan nematodlar bunlardır: *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*.

**Açar sözlər:** *Anser anser dom.*, *Anas platyrhynchos dom.*, yaş, cins, fəsillər, müqayisəvi təhlil, helminth fauna.

### Introduction

Helminthiasis is one of the causes of serious negative changes in the body of domestic waterfowl, including the quality of their meat. These diseases are caused by parasitic worms (cestodes, trematodes, nematodes, acanthocephals) and their course may vary depending on the host's organism, its age, sex, the intensity of parasites, and environmental parameters. The helminth fauna of geese and ducks has been studied at different times in the country (Shahtatinskaya, 1952, 1959; Shirinov, 1961; Vahidova, 1978; Vahidova et al., 1982). In recent years, studies have been conducted on the helminth fauna birds in various economic zones and ultrastructural study of some species of nematodes (Rzayev, 2021a, 2021b, 2023a, 2023b, 2024; Rzayev et al., 2020, 2021a, 2021b, 2023; Seyidbeyli & Maharramov, 2018; Seyidbeyli & Rzayev, 2018; Seyidbeyli et al., 2020). The researches of N. Shirinov (1961) and other scientists contain some information on the change of helminth fauna depending on ecological parameters (Shirinov, 1961; Seyidbeyli, 2021). However, these studies do not cover the entire territory of Azerbaijan. In this article, a comparative analysis of helminth infection of domestic waterfowl in Azerbaijan depending on age, sex, and seasons of the year was conducted.

### Material and methods

Domestic geese and ducks obtained from different regions of Azerbaijan were studied by the method of complete helminthological dissection (Dubinina, 1971). Helminths collected from the owners were fixed (70% alcohol or 4% formaldehyde), and permanent preparations were prepared from a part of them and studied under a light microscope (Leica DM1000). Parasitic worms were identified using a key book (Ryzhikov, 1967). During the study years (2012-2024), 904 domestic waterfowl were studied. Of them, 485 were geese (198 males, 287 females), 419 ducks (220 males, 199 females). Of the geese, 46 belonged to group I, 333 to group II, 106 to group III, and 30, 284 and 105 to ducks, respectively. Depending on the seasons, 29 geese were studied in spring, 50 in summer, 123 in autumn, and 283 in winter, and 29, 35, 93, and 262 ducks were studied, respectively.

### Results and discussion

**1. Comparative analysis of helminth fauna depending on the sex of birds.** In order to determine the species composition of the helminth fauna of domestic water birds in the territory of Azerbaijan, a total of 904 birds (485 geese, 419 ducks) were studied. As a result of the analysis of the conducted studies, it was determined that 198 of the domestic geese were male, 287 were female, and 220 of the domestic ducks were male and 199 were female individuals. It was determined that the total parasite infection of domestic water birds was 58.83%, 34.17% for domestic ducks, and 75.52% for domestic geese. The infection of hosts by sex (male and female) was as follows. Of the domestic

geese studied, 45 males were uninfected, with an invasion prevalence of 77.27%, and 91 females were uninfected, with an invasion prevalence of 68.29%. Of the domestic ducks, 109 males were uninfected, with an invasion prevalence of 50.45%, and 130 females were uninfected, with an invasion prevalence of 34.67%. The obtained data show that in both geese and ducks, the percentage of invasion in males is higher than in females. This is most likely due to the lifestyle of male domestic water birds.

Parasite infection was analyzed separately for both geese and ducks, according to male and females. In general, although 21 species of helminths were recorded in both domestic geese and domestic ducks, the composition of the helminth fauna was different in male and females. Thus, in domestic geese, 18 (cestodes – 5, trematodes – 2, nematodes – 10, acanthocephala – 1) parasitic worms were detected in males, 15 (cestodes – 5, trematodes – 2, nematodes – 8) in females, and a total of 12 species (cestodes – 4, trematodes – 1, nematodes – 7) in both males and females. Parasite worms belonging to all systematic groups are found in males. Acanthocephala is not recorded in female individuals. In both male and female geese, nematodes predominate in terms of species number compared to other groups of helminths. The helminths recorded only in male geese (not found in female geese) are the following: *L. intestinlis*, *E. revolutum*, *A. acutum*, *H. altaica*, *T. fissispina*. The parasites recorded only in female geese (not found in male geese) are the following: *T. setigera*, *P. novum*, *A. galli*. It was also found that male geese are superior to females in this parameter.

In domestic ducks, 15 (cestodes – 4, trematodes – 2, nematodes – 8, acanthocephala – 1) species of helminths are recorded in males, 14 (cestodes – 2, trematodes – 4, nematodes – 8) in females, and 8 (cestodes – 1, trematodes – 2, nematodes – 5) in both hosts. As in male domestic geese, worms belonging to 4 systematic groups are found in male ducks. In female ducks, with the exception of acanthocephalans, other groups of parasites are found – cestodes, trematodes and nematodes. Nematodes predominate in terms of the number of species in individuals of both sexes of ducks. The following helminths are recorded only in male ducks (not found in female ducks): *C. megalops*, *D. inflata*, *M. paramicrosoma*, *H. tricolor*, *B. obsignata*. The parasites recorded only in female ducks (not found in male ducks) are the following: *T. setigera*, *E. recurvatum*, *E. revolutum*, *A. acutum*, *P. crassum*, *E. contortus*. From the above, it is clear that among the species that do not repeat each other between the sexes, cestodes predominate in males, and nematodes in females. A comparative analysis of the helminth fauna of male and female domestic waterfowl was also conducted by hosts. Species that are identical for both males and females of both birds and belong to 3 systematic groups were identified. Thus, the tapeworm *F. fasciolaris*, the trematode *N. attenuatus*, the nematodes *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis* were found in both hosts and simultaneously in both males and females. The helminths mentioned above are parasitic worms that are widespread in waterfowl.

**2. Comparative analysis of helminth fauna depending on the age of birds.** It was determined that domestic waterfowl involved in the studies conducted by us in the direction of studying the helminth fauna of domestic waterfowl throughout the country were of different age groups. In order to determine the characteristics of changes in helminth fauna depending on the age of the owners, the studied birds were conditionally divided into 3 groups: 1 - birds up to six months old; 2 - birds from six to twelve months old; 3 - birds twelve months and older. It was determined that the total infection in geese and ducks included in group I was 84.2%, only in geese 93.48%, and in ducks 70.0%, the total infection in waterfowl belonging to group II was 48.46%, in domestic geese 61.56%, and in domestic ducks 33.09%, the infection in owners included in group III was 76.3%, in geese 85.85%, and in ducks 66.67%. Analysis of the data revealed that the overall infection rate in domestic waterfowl, regardless of the number of species, was higher among hosts under 6 months of age than in other groups.

In geese up to six months of age, 6 (cestode-1, trematode-1, nematodes-4) helminths were recorded, and in domestic ducks - 1 species (*T. fissispina*). In geese up to one year of age, 19 (cestodes-4, trematodes-3, nematodes-11, acanthocephala-1) and also 19 species of parasites (cestodes-4, trematodes-4, nematodes-10, acanthocephala-1) were detected. In domestic geese one year of age and older, 11 (cestodes-4, trematode-1, nematodes-6) helminths were identified, and in domestic ducks 9 species (cestodes-2, trematode-1, nematode-1) helminths were identified. Thus,

when comparing different age groups of domestic waterfowl, in terms of species, more helminths were recorded in the hosts in both geese and ducks in group II (birds up to 1 year of age). Cestodes, trematodes, nematodes, and acanthocephala, which are systematic groups of helminths, were observed in domestic waterfowl up to one year of age. This was not observed in other age groups. In all age groups, including birds in group II, nematodes were more numerous than others.

The number of helminth species found in domestic geese in all age groups are six: cestode – *D. lanceolata*, trematode – *N. attenuatus*, nematodes – *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*. In domestic ducks, the only parasite found in all age groups is the nematode *T. fissionis*. This is due to the fact that only 1 species of parasitic worm was detected in ducks up to 6 months old. It should also be noted that only 30 ducks of this age were studied. In domestic geese, only 1 species of cestode was detected in individuals over 1 year old, and this tapeworm was not found in owners of a different age group. This is the cestode *T. setigera*. In geese belonging to age group II, species (9 species) not found in other age groups were also detected: cestodes – *F. fasciolaris*, *L. intestinalis*, trematodes – *E. revolutum*, *P. novum*, nematodes – *A. acutum*, *H. altaica*, *A. galli*, *T. fissionis*, *E. contortus* and acanthocephala – *P. magnus*. In domestic ducks belonging to group III, *M. paramicrosoma* and *P. crassum* are not found in birds of other age groups. In domestic ducks belonging to age group II, 12 species of helminths (cestodes-3, trematodes-3, nematodes-5 and acanthocephala-1) belonging to 4 systematic groups are not found in others. For both geese and ducks, the species found in almost all age groups are as follows: *N. attenuatus*, *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*.

**3. Comparative analysis of helminth fauna depending on the seasons.** During helminthological studies conducted throughout the country, in addition to determining the helminth fauna of domestic water birds, the characteristics of parasite infection of hosts in all seasons were also studied. The total infection of domestic waterfowl with helminths in the spring was 56.89%, in the summer 64.72%, in the autumn 59.52%, and in the winter 51.29%. It was determined that the infection rate was higher in the summer than in other seasons. The percentage of helminth infection by hosts was also studied separately. Thus, the extensiveness of helminth infection in domestic geese was 75.86% in the spring, 78.0% in the summer, 67.48% in the autumn and 67.84% in the winter.

The percentage of parasite infection in domestic geese was the highest in the summer. The prevalence of helminth infection in domestic ducks was determined to be 37.93% in spring, 53.43% in summer, 51.61% in autumn, and 34.73% in winter. The highest prevalence of helminth infection in domestic ducks also occurred in summer. Thus, the highest prevalence of parasitic worm infection in domestic waterfowl, both individually and in general, was recorded in summer.

It was determined that the species composition of helminth fauna of geese and ducks varies depending on the season. Thus, 8 species (cestodes – 2, trematodes – 1, nematodes – 5) were found in domestic geese in the spring, 9 species (cestodes – 2, trematodes – 1, nematodes – 6) in the summer, 12 species (cestodes – 2, trematodes – 1, nematodes – 9) in the fall, and 16 species (cestodes – 4, trematodes – 2, nematodes – 9, acanthocephala – 1) in the winter. In terms of species, more parasites are observed in domestic geese in the winter. Helminths belonging to all systematic groups (cestodes, trematodes, nematodes, acanthocephala) were also found in domestic geese only in winter. Nematodes predominate in domestic geese in all seasons. In domestic ducks, 7 species (cestodes – 1, nematodes – 6) were recorded in spring, 7 species (cestodes – 2, nematodes – 5) in summer, 9 species (cestodes – 3, trematodes – 1, nematodes – 5) in autumn, and 19 species (cestodes – 3, trematodes – 4, nematodes – 11, acanthocephala – 1) in winter. More parasite species (19) are observed in ducks in winter. On the other hand, helminths belonging to all systematic groups (cestodes, trematodes, nematodes, acanthocephala) were detected in domestic ducks only in winter. It was also known that nematodes dominate in ducks in all seasons.

The number of species found in domestic geese, which are widespread and occur in all seasons, are six: *D. lanceolata*, *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*, *B. obsignata*. Here too, the predominance of nematodes is striking. The number of species recorded in all seasons in domestic ducks are also six: *F. fasciolaris*, *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*, *T. fissionis*. Among the species found in all seasons in domestic ducks, nematodes predominate. The number of helminths recorded in all seasons in both geese and ducks are four: *A. anseris*, *T. tenuis*, *H. dispar*, *C. anatis*.

Thus, there are 4 species of nematodes found in domestic water birds in all four seasons, 3 of which are geohelminths and *C. anatis* is a biohelminth.

### Conclusion

Male geese and ducks have a higher percentage of helminth infection than females. In domestic waterfowl, more helminths were recorded in birds under 1 year of age. The highest prevalence of parasitic worms infection was recorded in the summer months.

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