



Prevalence of chewing lice species on migratory birds in Razzaza lake

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Abstract

Chewing lice (Phthiraptera: Ischnocera and Amblycera) are permanent, obligate, and host-specific ectoparasites commonly found in birds. This study detects the types of chewing lice on living migratory birds. 436 birds were detected in Razzaza Lake that included lice and were captured during migration from October 2021 to February 2022 like *Anas strepera*, *Anas crecca*, *Anas platyrhynchos*, and *Anas clypeata*. The lice were soaked in 70% of ethyl alcohol and three species were found on 48 (10.98%) of four different bird species; *Columbicola columbae*, *Campanulotes bidentatus*, and *Menacanthus camelinus*. A new species is the *M. camelinus* that was found among new types of birds; *A. platyrhynchos* and *A. clypeata*, recording 1(2.04%). The prevalence sex of the infested birds and the lice species was *A. strepera*; 13(27.08%), 13(26.53%), *A. crecca*; 3(0.80%), 3(6.12%), *A. platyrhynchos*; 31(8.27%), 31(63.27%), *A. clypeata*; 1(0.27%), 2(4.08%), respectively. The Natural History Research Center and Museum at Baghdad University confirmed the parasite and type of birds. Migratory birds are one of the infectious resources for local and domestic birds that should be treated continuously to prevent pathogen transmission and preservation of bird flocks. The insecticide should be used on all bird flocks to prevent the completion concerning the stages of the cycle of life.

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Introduction

Chewing lice (Phthiraptera: Ischnocera and Amblycera) are permanent, obligate, and host-specific ectoparasites commonly found in birds. Including their eggs, the life cycle of these insects is divided into three nymphal stages and an adult one, in which the host's body is completed. Although chewing lice are relatively benign parasites, when large numbers occur, they can cause severe pruritus, plumage quality decay, small holes in feathers, and an increase in feather breakage (1). Ectoparasites from the Middle East marine birds are poorly known, especially those from the Red Sea (2). Ectoparasites, such as chewing lice, fleas, ticks, and mites, can infest domestic and wild birds (3-6). They cause irritation, anorexia, allergic reactions, and a decrease in animal products (7,8). Additionally, they may transmit

parasitic, rickettsia, and viral agents to birds (9-11). Chewing lice are one of the most diverse parasites of avian hosts, of which more than 4,000 species are globally known to be valid (12). The pigeon lice are called *Columbicola columbae* and are universally distributed to infest domestic and wild birds, in addition to a model of ectoparasite (13,14). Campanulate sp. is a bird chewing louse that infest pigeons, doves, and wild birds (15,16). *Menacanthus sp.* is a genus of chewing lice that parasitizes various birds and harbors dozens of species (17,18). The bird species *A. strepera*, *A. crecca*, *A. platyrhynchos*, and *A. clypeata* have become a vital component of the Iraq Key Biodiversity Areas (KBA) Project. They have been identified by Nature Iraq (NI) since 2004 as winter visitors, while *A. platyrhynchos* and *A. clypeata* can be either winter or summer visitors (19,20). Migratory Wild Birds were frequented in Iraq and Syria, and

many factors play roles in the distribution of birds and species. Examples are the moderate climate in the winter, lack of predators, the abundance of water, green spaces, and 400 species of migratory birds that visit Iraq and Syria (20). At least 185 species of birds are recorded, among them *A. platyrhynchos* (Mallard). This species is considered a winter visitor and a passage migrant, of which some may breed. *A. crecca* (Eurasian Teal) is also a winter visitor and passage migrant in Kurdistan, northern Iraq (21). In southern Iraq, the Central Marsh (CM) is known to give important habitats for resident and migrant birds. The marshy areas harbor high levels of biodiversity that hold 125 bird species, of which 31 species are recorded for the first time (22). In Basra, the helminth parasites of aquatic birds are reviewed in the marshy areas (23), among them twenty-three species of aquatic birds like the *A. strepera* and *A. clypeata*. In the southern marshes of Iraq, several 159 species of birds have been recorded (19). Thirty-four are considered to be of conservational concern, including eight globally threatened. Finally, the previous studies in Karbala were done on the domesticated pigeons of (*Columba livia domestica*) to identify internal parasites (24) and chewing lice (16).

This study is considered the first report of some migratory bird species and the identification of chewing lice species in this region, aiming to investigate the chewing lice of these wintering migratory birds in Razzaza Lake.

Materials and methods

The study area is located in Karbala, about one hundred kilometers southwest of Baghdad. In the west of Karbala (32°41'N, 43°40'E) lies the Razzaza or (Razaza) Lake, which is the second biggest freshwater lake in Iraq. It has been used as a significant source of fish and tourism. The water source comes from the river's canal called the Euphrates, as Al-Habbaniyah Lake is sent through a controlled exit route.

Ethical approve

Ethics required are approved by the Ethical Committee of University of Kerbala, College of Veterinary Medicine at S/6/10 in 8/1/2023.

Bird collection and macroscopic examination

Annually, migratory birds aggregate in all lakes of Iraq. Wild birds migrate from all different regions around the world and settle in these lakes during winter. Using mist nets, the birds were captured during migration from October 2021 to February 2022. The feathers and skin were examined

directly with a magnifying glass. The birds were transferred to the veterinary parasitology lab College of Veterinary Medicine at the University of Karbala, and all the data was recorded.

Morphological identification

With the help of forceps, ectoparasites were collected and put in capped tubes that contained 70% of ethyl alcohol. The collected lice of each bird were put in single tubes and numbered according to the same number of birds. Next, the lice were transferred to a 10% potassium hydroxide (KOH) solution and were kept for 24-48 hours until they became transparent. Then, they were washed with distilled water, passed through a 70-99% series of alcohol, and mounted to slides by Canadian balsam. They were examined with a microscope (9), on which the identification of the lice depended (18,25). Statistical analysis and results data were analyzed by the SPSS statistical software (version 20).

Results

The study is showing the prevalence of chewing lice on migratory birds that recorded 48 (10.98%) out of 437 birds. The results revealed that each bird had been infested with double or triple-chewing lice species. The bird species *A. strepera*, *A. crecca*, and *A. clypeata* have double infestations, while *A. platyrhynchos* shows triple infestation (Table 1).

Figures 1-4 shows the species of migratory birds, while Figures 5-8 shows the chewing lice. The total infestation rate of the sex of the lice species *A. strepera* was 13 (27.08%), 13 (26.53%); *A. crecca* 3 (0.80%), 3 (6.12%); *A. platyrhynchos* 31 (8.27%), 31 (63.27%) and *A. clypeata* 1 (0.27%), 2 (4.08%) respectively. No differences were observed between males, females, and species of lice (Table 2).

The prevalence of lice species for the male *A. strepera* was 2 (4.08%) in *C. columbae*, 1 (2.04%) in *Ca. bidentatus*, while the female was 5 (10.20%) for both *C. columbae* and *Ca. bidentatus*. As *A. crecca* was 2 (4.08%) in *C. columbae* and 1 (2.04%) in *Ca. bidentatus* for the female, the male of *A. platyrhynchos* was 3 (6.12%) in *C. columbae* and 9 (18.37%) in *Ca. bidentatus*. Continuously, the female in *C. columbae* was 11 (22.45%) and 7 (14.29%) in *Ca. bidentatus* and 1 (2.04%) in *M. camelinus*. Lastly, in *A. clypeata*, males and females were 1 (2.04%) in *Ca. bidentatus* and *M. camelinus*. New species were reported in Iraq; *M. camelinus* on new birds *A. platyrhynchos* and *A. clypeata* (Table 2). No significant differences were observed between males, females, and species.

Table 1: Infestation type with chewing lice according to migratory bird species

Bird species	No. <i>C. columbae</i>	No. <i>Ca. bidentatus</i>	No. <i>M. camelinus</i>	Infestation type
<i>A. strepera</i>	7	6	0	Double
<i>A. crecca</i>	2	1	0	Double
<i>A. platyrhynchos</i>	14	16	1	Triple
<i>A. clypeata</i>	0	1	1	Double

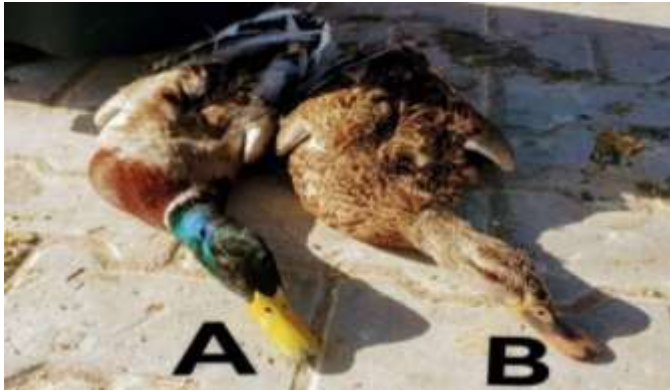


Figure 1: *A. platyrhynchos* (A- Male, B- Female).



Figure 2: *A. clypeata* (A- Male, B- Female)



Figure 3: *A. crecca* (A- Male, B- Female).



Figure 4: *A. strepera* (A- Male, B- Female).



Figure 5: *Ca. bidentatus* (Male).



Figure 6: *Ca. bidentatus* (Female).



Figure 7: *C. columbae*(Male), (Female).



Figure 8: *M. camelinus* (Female).

Table 2: The recorded prevalence of infested birds and distribution of lice species

Bird species	Bird sex	n (%)	Lice sex	n (%)	Lice species	n (%)
<i>A. strepera</i>	Male	3 (6.25)	Male	3 (6.12)	<i>C. columbae</i>	2 (4.08)
					<i>Ca. bidentatus</i>	1 (2.04)
	Female	10 (20.83)	Female	10 (20.41)	<i>C. columbae</i>	5 (10.20)
					<i>Ca. bidentatus</i>	5 (10.20)
	Total	13 (27.08)		13 (26.53)		13 (26.53)
<i>A. crecca</i>	Male	1 (0.27)	Male	0 (0.00)		0 (0.00)
	Female	2 (0.53)	Female	3 (6.12)	<i>C. columbae</i>	2 (4.08)
					<i>Ca. bidentatus</i>	1 (2.04)
	Total	3 (0.80)		3 (6.12)		3 (6.12)
<i>A. platyrhynchos</i>	Male	12 (3.20)	Male	12 (24.49)	<i>C. columbae</i>	3 (6.12)
					<i>Ca. bidentatus</i>	9 (18.37)
	Female	19 (5.07)	Female	17 (34.69)	<i>C. columbae</i>	11 (22.45)
					<i>Ca. bidentatus</i>	7 (14.29)
					<i>M. camelinus</i>	1 (2.04)
	Total	31 (8.27)		31 (63.27)		31 (63.27)
<i>A. clypeata</i>	Male	2 (4.08)	Male	1 (2.04)	<i>Ca. bidentatus</i>	1 (2.04)
	Female	0 (0.00)	Female	1 (2.04)	<i>M. camelinus</i>	1 (2.04)
	Total	2 (4.08)		2 (4.08)		2 (4.08)

Discussion

Chewing lice (Insecta: Phthiraptera) are abundant ectoparasites of mammals on birds. In this research, four birds infected with three chewing lice are studied. They are attached to six species of Anatidae: *A. acute* Linnaeus, 1758; *A. clypeata* Linnaeus, 1758; *A. crecca* Linnaeus, 1758; *A. platyrhynchos* Linnaeus, 1758; *A. Penelope* Linnaeus, 1758, *A. strepera* Linnaeus, 1758. The migratory birds *A. clypeata*, *A. crecca*, *A. platyrhynchos*, and *A. strepera* are distributed worldwide. In the Danube Delta, Romania, 176 bird species out of 233 were infested, including 79 Amblycera and 191 species of Ischnocera (26). The infested birds are 48(10.98%) out of 436. The parasite results agree with the findings of Diakou *et al.* (27) those who reported chewing lice species on wild bird species in Northern Greece. In total, 80(11%) out of 729 birds migrating and sedentary passerine birds (7.4%,13.2%) were infested with four new lice: *Menacanthus curuccae* from *Acrocephalus melanopogon*, *Menacanthus agilis* from *Cettia cetti*, *Myrsidea* sp. from *Acrocephalus schoenobaenus*, and *Philopretus citrinellae* from *Spinus spinus*. Another study agreed with the findings of Alasadiy *et al.* (28) the prevalence that recorded 25(20%) wild pigeons in parasitic infections out of 125 (*Columba livia*) in Samawah, Iraq. Among them are arthropods, as a part of lice (*Menacanthus stramineus*), with a prevalence of 3(2.4%) in wild pigeons. Another study Al-Aredhi and Al-Mayali (29) agreed that those recorded migratory aquatic birds distributed by Al-Delmaj marsh, including nine species of ectoparasites like *M. stramineus* 37.01%, *M. cornutus* 18.18%, *M. eurysternus* 11.04% and *C. columbae* 8.44%. In Kirkuk Ali and Hassan

(30), isolated lice species from 187 birds in *Columba livia*, of which six species of wild birds in Daquq distnet, *C. columbae*, and *Ca. compar* were found (4%).

A positive correlation is reported between the body sizes of some parasites and their hosts. The ability of host-specific rock pigeon lice (*Columbicola columbae*) to remain attached is equal to all host species (13). They are the most specific lice species (31) settled by morphological specialization for attachment to mobile hosts. This study shows that the most dominant chewing lice infestation is *C. columbae*, *C. bidentatus*, and *M. camelinus*. The variety in prevalence rate was recorded among host species. This difference is not in agreement with other studies Enout *et al.* (32) by those who recorded a high prevalence rate of chewing lice in non-Passeriformes 66.7% and Passeriformes 57.8% birds. Several 1,479 feather-chewing lice on wild birds are recorded in the Riparian Forest of the *Cerrado biome*, Brazil. The southern region of China and Bursa, Turkey (29) reported chewing lice on wild forest birds 622 (28.1%). Turkey Girisgin *et al.* (33) reported 68 58.8% prevalence in migratory and non-migratory wild birds. The infestation rate of lice on migratory birds is higher than the non-migratory ones; 72.7 and 43.7%, respectively. In the same region, local pigeons in Karbala, the rate was different from Alali *et al.* (16) those who reported chewing lice; 180(81%) on sedentary pigeons, recording three species of ectoparasites: *C. columbae* (Linnaeus 1758), *C. tschulyschman* (Eichler, 1942) and *Ca. compar* (Burmeister, 1838).

Migratory birds are distributed in all parts of the world and are classified as Migratory and Partially Migratory (34). In northern Iraq, specifically Sulaymaniyah, Erbil, and Dohuk, 185 different bird species were surveyed, of which

124 were observed while recorded or breeding. Also, 59 of them were winter visitors and passage migrants *A. crecca* (Eurasian Teal) and *A. platyrhynchos* (Mallard) (21). Migratory aquatic birds are distributed in the south of Iraq. At the same time, those in the Iraqi marsh of Al-Delmaj are (*Anas crecca*, *Netta rufina*, *Anas strepera*, *Aythya ferina*, *Aythya nyroca*, *Anas platyrhynchos*, *Anas acuta*, *Anas Penelope*, *Anas clypeata*, *Fulica atra*, and *Larus ridibundus*) (29). In the Iraqi marshes of Al-Sanaf and Thi-Qar, aquatic birds were infested with six chewing lice species. These species include *Actornithophilus piceus lari*, which infested the Slender-billed (*Gull Larus geni*), *Piagetiella titan*, *Pectinopygus forficulatus* that infested the White Pelican (*Pelecanus onocrotalus*), *Actornithophilus himantopus* that infested the Black-Winged stilt (*Himantopus himantopus*), *Rallicola parani* that infested the moorhen (*Gallinula chloropus*), and *Rallicola fulicae* that was isolated from the coot (*Fulica atra*) (35).

This study mirrors the low number of migratory birds in Iraq. It may be related to past wars, overhunting with guns and mist nets, food habitats, other predatory birds, and low water levels in all water depressions. This study also shows how all birds are infested with *C. columbae*, *C. bidentatus*, and *M. camelinus* except for *A. clypeata*. The low number of lice may explain one possible cause, for many factors have been found in this study: the number of birds, a combination of domesticated and non-domesticated populations, and the probability of other mammals in the same region. A study site Enout *et al.* (32) investigated the association between two species of chewing lice of feathers in wild birds of the riparian forest in the Cerrado Biome, Brazil. The new host-parasite associations were fixed on chewing lice, expanding the geographical distribution in Brazil of six chewing lice species. *Ca. bidentatus* is the most ectoparasite that has been recorded, although *C. columbae* is the most common one in distribution. The aggregated nature of distributions may be related to parasite ecology. The feeding position and the host habitat of chewing lice on their hosts have a role in insect group development (36).

New species are recorded in Razzaza Lake, which is *M. camelinus* on new hosts, *A. platyrhynchos* and *A. clypeata* was 1(2.04%). This result agreed with Sychra *et al.* (37) those who recorded many of the wild passerine birds that were examined during the season of post-breeding migrations from the northeastern part of the Czech Republic. Among them is the *Lanius collurio*, infested with *M. camelinus* (Nitzsch, 1874) 2.6% (7/262). Moreover, *M. sinuatus* was detected on *Poecile lugubris*, rendering this report the first record of lice infestation among this bird species (32).

All above explain the diversity of lice as single, double and triple different lice species. The current study has double and triple infestation in agreement with Enout *et al.* (32) who have been confirmed mixed infestations in 11 cases of birds that were infested with double and triple different lice

species, and in agreement with Sychra *et al.* (38) were evidence the small communities of lice extended from (one-four species) that live on individual birds. Our study is in agreement with other studies in Iraq, by single, double and triple infestation (34,39-42). However, the prevalence of these chewing lice in the world is rather vary from the results of the current study maybe due to differences in feeding habits, nutrition, geographical zone, environmental conditions.

Conclusion

This study provides data about the diversity of migratory bird species, chewing lice species, and the type of infestation. Overhunting birds by shooting and mist nets should be prevented to increase biodiversity in this region. Also, cutting plant groups in Razzaza Lake should be prevented because they constitute safe nesting regions for breeding birds. More studies should be supported to confirm data for all migratory bird species in Iraq, specifically Razzaza lake, to produce an examination for internal and external parasites. This paper is considered the first study of external parasites on migratory birds in Razzaza lake.

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Conflict of interest

The authors declared no conflicts of interest regarding this manuscript's publication and/or funding.

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اصطياد الطيور أثناء هجرتهم من أكتوبر ٢٠٢١ إلى فبراير ٢٠٢٢ وفحصهم. كانت الطيور من نوع أنواع مختلفة وشملت أنس ستربير، أنس كريك، أنس بلاتيرينشوس، وأنس كليبيتا. تم تنقيع القمل في ٧٠٪ من الكحول الإيثيلين وصار بالإمكان تصنيفها إلى ثلاثة أنواع موجودة في ٤٨ (٩٨،١٠٪) من أربعة أنواع مختلفة من الطيور وهي (كولمبيكولا كولمبي، كمبنيولتس بدينتيتيس وميناكانثس كاميلينس). تم تسجيل نوع جديد من القمل الا وهو ميناكانثس كاميلينس، وجد بين أنواع جديدة من الطيور. أنس بلاتيرينشوس، وأنس كليبيتا أنس بلاتيرينشوس، وأنس كليبيتا مسجلة ١ (٢،٠٤٪). كان جنس انتشار الطيور المصابة وأنواع القمل هو ١٣ (٢٧،٠٨٪) أنس ستربير ١٣ (٢٦،٥٣٪) ، أ. ٣ (٠،٨٠٪) ، ٣ (٦،١٢٪) ، أنس بلاتيرينشوس ؛ ٣١ (٨،٢٧٪) ٣١ (٦٣،٢٧٪) أ. ١ (٠،٢٧٪) ، ٢ (٤،٠٨٪) ، على التوالي. أكد مركز أبحاث التاريخ الطبيعي والمتحف في جامعة بغداد وجود طفيلي ونوع الطيور. الطيور المهاجرة هي أحد الموارد المعدي للطيور المحلية والداجنة والتي يجب معالجتها باستمرار لمنع انتقال العوامل الممرضة والحفاظ على الطيور. يجب استخدام المبيد الحشري على أصناف الطيور لمنع اكتمال دورة حياة هذه الطفيليات.

نسبة الإصابة بأنواع القمل العارض في الطيور المهاجرة في بحيرة الرزازة، محافظة كربلاء، العراق

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الخلاصة

قمل المضع (فثيرايتيرا: اسكنوسيرا والامبليسيرا) هي طفيليات خارجية دائمة وملزمة ومخصصة للمضيف موجودة في الطيور. تكشف هذه الدراسة عن أنواع قمل المضع على الطيور المهاجرة الحية. تم الكشف عن ٤٣٦ طائراً في بحيرة الرزازة شملت تشخيص القمل. تم