



OPEN ACCESS

EDITED BY

Calin Mircea Gherman,
University of Agricultural Sciences and
Veterinary Medicine of Cluj-Napoca,
Romania

REVIEWED BY

Bersissa Kumsa,
Addis Ababa University,
Ethiopia

Luis Garcia Prieto,
National Autonomous University of Mexico,
Mexico

*CORRESPONDENCE

Alireza Sazmand

✉ Alireza.Sazmand@basu.ac.ir

[†]These authors have contributed equally to
this work

RECEIVED 19 October 2023

ACCEPTED 12 December 2023

PUBLISHED 02 February 2024

CITATION

Bahiraei Z, Sazmand A, Khedri J, Babaei M,
Moeinifard E and Dik B (2024) Chewing lice of
wild birds in Iran: new data and a checklist of
avian louse species reported in Iran.
Front. Vet. Sci. 10:1324619.
doi: 10.3389/fvets.2023.1324619

COPYRIGHT

© 2024 Bahiraei, Sazmand, Khedri, Babaei,
Moeinifard and Dik. This is an open-access
article distributed under the terms of the
[Creative Commons Attribution License
\(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution or reproduction
in other forums is permitted, provided the
original author(s) and the copyright owner(s)
are credited and that the original publication
in this journal is cited, in accordance with
accepted academic practice. No use,
distribution or reproduction is permitted
which does not comply with these terms.

Chewing lice of wild birds in Iran: new data and a checklist of avian louse species reported in Iran

Zahra Bahiraei^{1†}, Alireza Sazmand^{1*†}, Javad Khedri²,
Mohammad Babaei³, Erfan Moeinifard⁴ and Bilal Dik⁵

¹Department of Pathobiology, Faculty of Veterinary Medicine, Bu-Ali Sina University, Hamedan, Iran,

²Department of Pathobiology, Faculty of Veterinary Medicine, Ferdowsi University, Mashhad, Iran,

³Department of Clinical Sciences, Faculty of Veterinary Medicine, Bu-Ali Sina University, Hamedan,

Iran, ⁴Provincial Department of Environment, Hamedan, Iran, ⁵Department of Parasitology, Veterinary
Faculty, Selçuk University, Konya, Türkiye

Between September 2019 and December 2023, a total of 612 wild birds representing 16 orders, 33 families, 60 genera, and 78 species from nine provinces of Iran with different climates namely Hamedan ($n = 54$), Sistan-va-Baluchestan ($n = 372$), Kerman ($n = 73$), South Khorasan ($n = 52$), Mazandaran ($n = 7$), Chaharmahal-va-Bakhtiari ($n = 2$), Gilan ($n = 2$), Golestan ($n = 18$), North Khorasan ($n = 9$), and Razavi Khorasan ($n = 23$) were examined for chewing lice infestation. Naked eye examination revealed that 58 birds (9.5%) were infested with at least one chewing louse species. Collected lice specimens belonged to 28 species from the families Philopteridae, Menoponidae and Laemobothriidae including *Strigiphilus strigis* ($n = 55$, 15.6%), *Falcolipeurus quadripustulatus* ($n = 41$, 11.6%), *Craspedorrhynchus platystomus* ($n = 40$, 11.3%), *Colpocephalum turbinatum* ($n = 36$, 10.2%), *Laemobothrion maximum* ($n = 25$, 7.1%), *Nosopon lucidum* ($n = 20$, 5.6%), *Degeeriella fulva* ($n = 18$, 5.1%), *Colpocephalum eucarenum* ($n = 16$, 4.5%), *Laemobothrion vulturis* ($n = 15$, 4.2%), *Anaticola crassicornis* ($n = 13$, 3.7%), *Craspedorrhynchus aquilinus* ($n = 9$, 2.5%), *Degeeriella fusca* ($n = 7$, 2.0%), *Aegypococcus trigonoceps* ($n = 7$, 2.0%), *Quadriceps obscurus* ($n = 6$, 1.7%), *Colpocephalum impressum* ($n = 6$, 1.7%), *Trinoton querquedulae* ($n = 6$, 1.7%), *Colpocephalum heterosoma* ($n = 5$, 1.4%), *Colpocephalum nanum* ($n = 5$, 1.4%), *Luniceps holophaeus* ($n = 4$, 1.1%), *Quadriceps* spp. ($n = 4$, 1.1%), *Actornithophilus uniseriatus* ($n = 2$, 0.6%), *Nosopon chanabense* ($n = 2$, 0.6%), *Actornithophilus cornutus* ($n = 1$, 0.3%), *Cuclotogaster heterographus* ($n = 1$, 0.3%), *Falcolipeurus suturalis* ($n = 1$, 0.3%), *Laemobothrion atrum* ($n = 1$, 0.3%), *Colpocephalum gypsi* ($n = 1$, 0.3%), and *Rallicola cuspidatus* ($n = 1$, 0.3%). All of these species except six, i.e., *Trinoton* spp., *C. aquilinus*, *L. vulturis*, *L. maximum*, *C. impressum*, *C. turbinatum*, and *C. heterographus* are recorded for the first time from Iran. This study is the largest epidemiological study to date performed in the country. Data reported herein contribute to our knowledge about diversity of avian chewing lice from wild birds in Iran. In this paper, an updated checklist of louse species reported from Iran according to their avian hosts is presented.

KEYWORDS

birds of prey, chewing louse species, fauna, host–parasite associations, Iran, Middle-east, new record, Phthiraptera

Introduction

Lice are small (0.35–11 mm long as adults), wingless, dorsoventrally flattened insects. They are obligatory, permanent ectoparasites of birds and mammals throughout the world which typically, parasitize individuals in small numbers and cause no apparent discomfort however, some of the lice can cause skin lesions and act as vectors or intermediate hosts of several bacteria, viruses and filarial parasites (1, 2). In addition, it has been shown that *Piagetiella titan* infesting white pelicans may invade the oral cavity causing erosions and petechial hemorrhages (3–5).

Lice (Insecta: Psocoptera: Phthiraptera) with about 5,000 known species, present on roughly 4,000 species of birds and 800 mammals, are categorized in four suborders (6). Species of the suborder Anoplura have adapted to suck blood from capillaries of mammals and ingest it, while Amblycera, Ischnocera, and Rhynchophthirina (formerly known as Mallophaga) have chewing mouth pieces, adapted to eat hairs and feathers, and sometimes also the skin and blood of birds and mammals (7). Avian chewing lice belong to one of two sub-orders: Amblycera, which occur on feathers and skin, or Ischnocera, which are more restricted to feathers (1). Most of the lice species are strongly associated with hosts, their phylogeny parallels that of hosts, sometimes with different speeds however, “host specificity” cannot be assumed (7, 8). Among different fields of wildlife parasitology, studying avian chewing lice is important as their epizootiology is largely associated with geographical distribution of their hosts.

Iran is a country in western Asia with a territory of 1,648,195 km². It is the second largest country in the Middle East and the 17th largest in the world. In the country, 550 avian species are distributed which is almost equal to the richness of birds in Europe (9, 10). However, there is limited and scanty information about their parasites fauna specially the chewing lice (11–14) with several published in Persian language and presented in local congresses (15–19). Considering the scarcity of published records of lice in Iran, we aimed to gather new data and present an updated checklist of birds' Phthiraptera occurring in the country.

Materials and methods

Between September 2019 and December 2023, totally 612 wild birds belonging 16 orders, 33 families, 60 genera, and 78 species from Hamedan ($n = 54$), nine different regions of Sistan-va-Baluchestan ($n = 372$), Kerman ($n = 73$), South Khorasan ($n = 52$), Mazandaran ($n = 7$), Chaharmahal-va-Bakhtiari ($n = 2$), Gilan ($n = 2$), Golestan ($n = 18$), North Khorasan ($n = 9$), and Razavi Khorasan ($n = 23$) were collected (Figure 1). The birds were euthanized by the Provincial Department of Environment because of general health failure or were found dead in the environment. The time lapse from death to examination of birds for lice infestation could not be estimated however, only fresh carcasses were examined. Individual birds were sent to Laboratory of Parasitology, Faculty of Veterinary Medicine, Bu-Ali Sina University in sealed plastic bags for examination or were examined in the field. The bird identifications were made using the reference book *Atlas of Birds of Iran* (9), and a standard examination for searching chewing lice was performed (20). The collected lice were placed in tubes containing 70% ethanol, cleared in 10% KOH for at least 1 day, mounted in Canada balsam on glass slides (21), and

identified according to the original descriptions or keys (7, 22–35) using a Leica DM750 camera mounted trinocular microscope with Leica DFC295 application unit.

We also collected all the available information about chewing lice infesting birds in Iran. The databases and search engines employed for the literature review were Phthiraptera.info,¹ PubMed,² Google,³ Scientific Information Database of Iran,⁴ the collection of defended theses at all Iranian Universities,⁵ and the collection of proceedings of Iranian congresses.⁶ Valid names of the louse and bird species were obtained from Global Biodiversity Information Facility resources (36).

Results

In total, 352 lice specimens including *Strigiphilus strigis* $n = 55$; 15.6% (Pontoppidan, 1763), *Falcolipeurus quadripustulatus* $n = 41$; 11.6% (Burmeister, 1838), *Craspedorrhynchus platystomus* $n = 40$; 11.3% (Burmeister, 1838), *Colpocephalum turbinatum* $n = 36$; 10.2% (Denny, 1842), *Laemobothrion maximum* $n = 25$; 7.1% (Scopoli, 1763), *Nosopon lucidum* $n = 20$; 5.6% (Rudow, 1869), *Degeeriella fulva* $n = 18$; 5.1% (Giebel, 1874), *Colpocephalum eucarenum* $n = 16$; 4.5% (Burmeister, 1838), *Laemobothrion vulturis* $n = 15$; 4.2% (Fabricius, 1775), *Anaticola crassicornis* $n = 13$; 3.7% (Scopoli, 1763), *Craspedorrhynchus aquilinus* $n = 9$; 2.5% (Denny, 1842), *Degeeriella fusca* $n = 7$; 2.0% (Denny, 1842), *Aegypocetus trigonoceps* $n = 7$; 2.0% (Giebel, 1874), *Quadriceps obscurus* $n = 6$; 1.7% (Burmeister, 1838), *Colpocephalum impressum* $n = 6$; 1.7% (Rudow, 1866), *Trinoton querquedulae* $n = 6$; 1.7% (Linnaeus, 1758), *Colpocephalum heterosoma* $n = 5$; 1.4% (Clay, 1951), *Colpocephalum nanum* $n = 5$; 1.4% (Piaget, 1890), *Lunaceps holophaeus* $n = 4$; 1.1% Burmeister, 1838, *Quadriceps* spp. (new species) $n = 4$; 1.1% (Clay and Meinertzhagen, 1939), *Actornithophilus uniseriatus* $n = 2$; 0.6% (Piaget, 1880), *Nosopon chanabense* $n = 2$; 0.6% (Ansari, 1951), *Actornithophilus cornutus* $n = 1$; 0.3% (Giebel, 1866), *Cuclotogaster heterographus* $n = 1$; 0.28% (Nitzsch, 1866), *Falcolipeurus suturalis* $n = 1$; 0.3% (Rudow, 1869), *Laemobothrion atrum* $n = 1$; 0.3% (Nitzsch, 1818), *Colpocephalum gypsi* $n = 1$; 0.3% (Eichler & Zlotorzycza, 1971), and *Rallicola cuspidatus* $n = 1$; 0.3% (Scopoli, 1763) were collected from 58/612 birds (9.5%). Collected lice specimens belonged to 31 species from the families Philopteridae, Menoponidae, and Laemobothriidae. All of the identified lice species except *C. aquilinus*, *L. vulturis*, *L. maximum*, *C. impressum*, *C. turbinatum*, and *C. heterographus* are recorded for the first time from Iran (Table 1).

Number of lice specimens collected from examined birds ranged from 1 to 55, the latter was a *Bubo bubo* Linnaeus, 1758. Mixed lice infestation was found in 11 birds, i.e., in one *Philomachus pugnax* (Linnaeus, 1758), two *Himantopus himantopus* Linnaeus, 1758, two *Anas crecca* Linnaeus, 1758, one *Aquila nipalensis* Hodgson, 1833, one *Aquila rapax* Temminck, 1828, two *Gyps fulvus* Hablitz, 1783, and two

1 <http://phthiraptera.myspecies.info/>

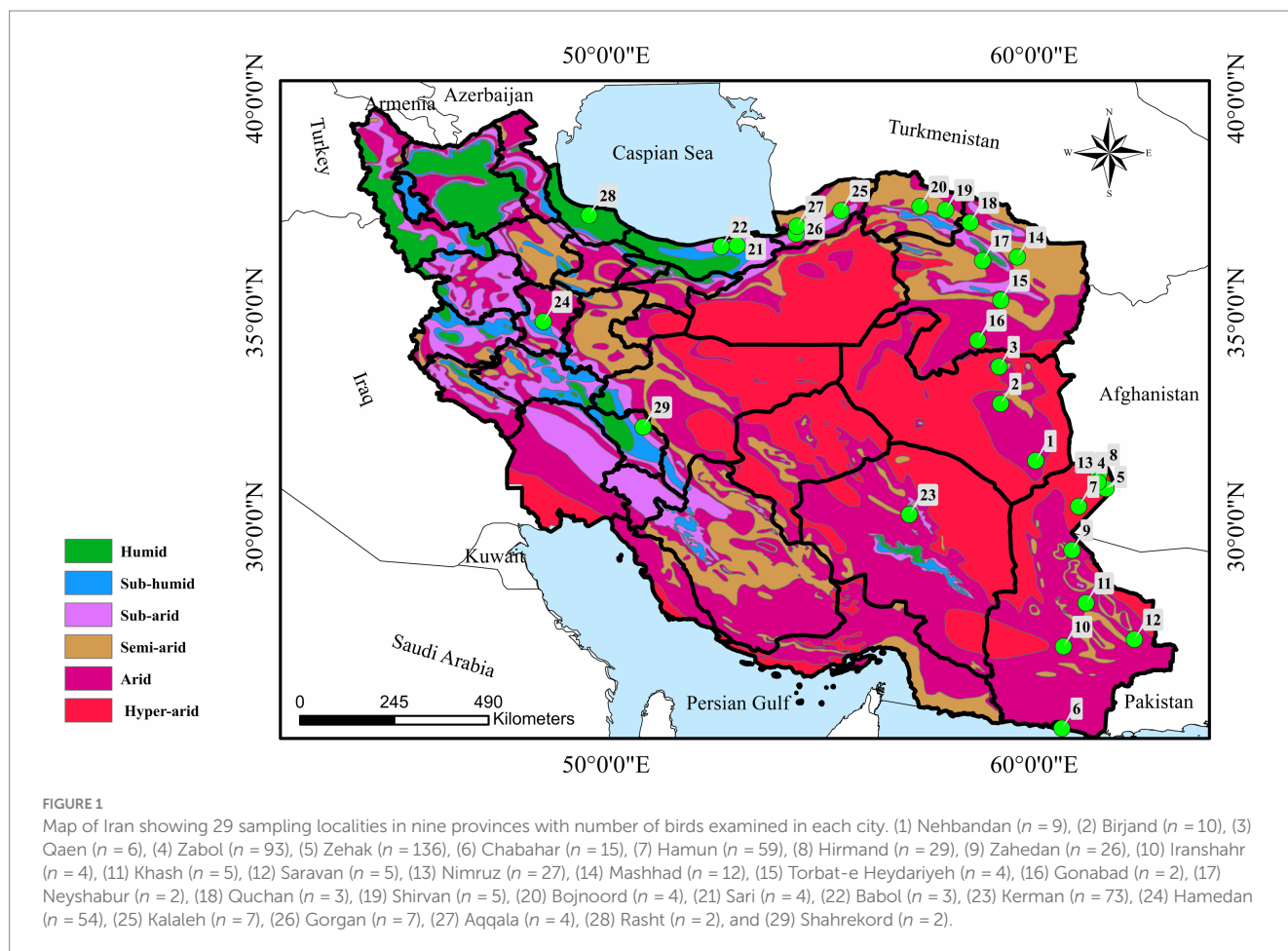
2 www.pubmed.gov

3 www.google.com

4 www.sid.ir

5 <https://irandoc.ac.ir/>

6 <https://www.civilica.com/>



Buteo buteo Linnaeus, 1758. Photomicrographs of examined lice specimens are presented in Figures 2–14.

Identification of few specimens could not be performed to species level including one damaged female *Strigiphilus* sp. collected from *Asio otus* Linnaeus, 1758, one female *Pectinopygus* spp. collected from *Anas clypeata* Linnaeus, 1758 which is an unusual host and possibly was a contamination, one *Laemobothrion* spp. nymph, and four *Quadriceps* spp. (Figures 10A–C, 13B, 14D). In addition, nits collected from one *Falco tinnunculus* Linnaeus, 1758 could not be identified.

In Supplementary Table 1, the information in Table 1 in addition to world conservation status according to International Union for Conservation of Nature (IUCN) and names of birds in Persian language are presented.

Discussion

This study is the largest epidemiological study to date performed in Iran. However, low number of collected lice from birds could be due to the fact that most of the ectoparasites including lice leave dead hosts rather quickly. Data reported herein contribute to our knowledge about diversity of avian chewing lice from wild birds in Iran and in a broader context in western Asia. Lice species in this

study belonged to both Ischnocera (15 species), Amblycera (14 species). We compiled our data and previous information about avian lice species in Iran in Table 2. So far, lice infestation of birds belonging to 16 orders, 33 families, 60 genera, and 78 species and subspecies has been recorded from Iran. In Supplementary Table 2, the information in Table 2 in addition to world conservation status and names of birds in Persian language are presented.

Review of all relevant publications indicated that in some reports from Iran, researchers identified the lice specimens only to genus level, i.e., *Brueelia* (nine documents), *Phlopterus*, *Menacanthus* (six documents), *Ricinus*, *Lipeurus* (three documents), *Sturnidoecus*, *Trinoton*, *Menopon*, and *Goniodes* (two documents), *Ardeicola*, *Colpocephalum*, *Craspedorrhynchus*, *Laemobothrion*, *Strigiphilus*, and *Myrsidea* (one document) (14, 16, 17, 19, 38, 40, 47, 50, 51, 62). The reason could be damage of the specimens, observation of a louse with morphological differences from identification keys or difficulty in identification of the species. It is necessary that researchers will try their best to identify the lice to species level correctly and provide the drawings, measurements, or photos.

Observation of one male poultry head louse specimen, *Cuclotogaster heterographus* (Nitzsch, 1866) which was collected from the buzzard *Buteo buteo* (Linnaeus, 1758) in this study was probably because the buzzard preyed with a galliform bird and the

TABLE 1 Distribution of louse species of wild birds in some regions of Iran (September 2019 and December 2023) according to their host bird species.

n birds examined	Host information			Parasite information										
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)					
									Male	Female	Nymph	Damaged	Total	
	ACCIPITRIFORMES													
	Accipitridae													
1		<i>Accipiter badius</i> (Gmelin, 1788)	Shikra	-	-	-	Zahedan	0/1						
8		<i>Accipiter nisus</i> (Linnaeus, 1758)	Eurasian sparrowhawk	-	-	-	Hamun	0/2						
							Hamedan	0/5						
							Zabol	0/1						
1		<i>Aegypius monachus</i> (Linnaeus, 1758)	Cinereous vulture	-	-	-	Zahedan	0/1						
4		<i>Aquila chrysaetos</i> (Linnaeus, 1758)	Golden eagle	<i>Craspedorrhynchus aquilinus</i> (Denny, 1842)	Ischnocera	Philopteridae	Hamedan	3/3	5	4	0	0	0	9
							Kerman	0/1						
1		<i>Aquila heliaca</i> (Savigny, 1809)	Asian imperial eagle	<i>Laemobothrion maximum</i> (Scopoli, 1763)	Amblycera	Laemobothriidae	Hamedan	1/1	0	0	3	0	3	
3		<i>Aquila nipalensis</i> (Hodgson, 1833)	Steppe eagle	<i>Laemobothrion maximum</i> (Scopoli, 1763)	Amblycera	Laemobothriidae	Hamedan	2/3	2	4	0	0	6	
				<i>Laemobothrion vulturis</i> (Fabricius, 1775)				1/3	0	2	2	0	4	
				<i>Colpocephalum impressum</i> Rudow, 1866	Menoponidae	1/3		0	1	0	0	1		
				<i>Craspedorrhynchus aquilinus</i> (Denny, 1842)	Ischnocera	Philopteridae		1/3	0	1	0	0	1	
				<i>Falcolipeurus suturalis</i> (Rudow, 1869)				1/3	0	1	0	0	1	

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
1		<i>Aquila rapax</i> (Temminck, 1828)	Tawny eagle	<i>Laemobothrion vulturis</i> (Fabricius, 1775)	Amblycera	Laemobothriidae	Hamedan	1/1	1	0	0	0	1
				<i>Colpocephalum impressum</i> (Rudow, 1866)		Menoponidae		1/1	4	0	1	0	5
				<i>Nosopon chanabense</i> (Ansari, 1951)				1/1	0	2	0	0	2
14		<i>Buteo buteo</i> (Linnaeus, 1758)	Buzzard	<i>Degeeriella fulva</i> (Giebel, 1874)	Ischnocera	Philopteridae	Hamedan	1/14	10	8	0	0	18
				<i>Degeeriella fusca</i> (Denny, 1842)				1/14	2	4	1	0	7
				<i>Cuclotogaster heterographus</i> (Nitzsch, 1866)				1/14	1	0	0	0	1
				<i>Craspedorrhynchus platystomus</i> (Burmeister, 1838)				2/14	18	19	3	0	40
				<i>Colpocephalum nanum</i> (Piaget, 1890)				1/14	0	2	2	1	5
				<i>Colpocephalum turbinatum</i> (Denny, 1842)				1/14	24	12	0	0	36
				<i>Laemobothrion maximum</i> (Scopoli, 1763)	Amblycera	Laemobothriidae	Kerman	1/12	3	3	6	0	12
3		<i>Buteo rufinus</i> (Cretzschmar, 1829)	The long-legged buzzard	<i>Laemobothrion maximum</i> (Scopoli, 1763)	Amblycera	Laemobothriidae	Kerman	1/1	1	1	1	0	3
							Zabol	0/1					
							Zahedan	0/1					

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
3		<i>Circus aeruginosus</i> (Linnaeus, 1758)	Eurasian marsh-harrier	<i>Nosopon lucidum</i> (Rudow, 1869)	Amblycera	Menoponidae	Hamedan	1/3	6	12	2	0	20
2		<i>Circaetus gallicus</i> (Gmelin, 1788)	Short-toed snake eagle	-	-	-	Zahedan	0/2					
4		<i>Gyps fulvus</i> (Hablizl, 1783)	Griffon vulture	<i>Laemobothrion vulturis</i> (Fabricius, 1775)	Amblycera	Laemobothriidae	Hamedan	2/4	1	5	4	0	10
				<i>Colpocephalum gypsi</i> (Eichler & Zlotorzycza, 1971)		Menoponidae	Zabol	1/4	1	0	0	0	1
				<i>Colpocephalum</i> spp.				1/4	0	0	0	1	1
				<i>Falcolipeurus quadripustulatus</i> (Burmeister, 1838)	Ischnocera	Philopteridae		2/4	23	18	0	0	41
				<i>Aegypocercus trigonoceps</i> (Giebel, 1874)			Kerman	1/4	3	3	1	0	7
	ANSERIFORMES												
	Anatidae												
6		<i>Aythya ferina</i> (Linnaeus, 1758)	Common pochard	-	-	-	Zehak	0/3					
							Zabol	0/1					
							Chabahar	0/2					
10		<i>Anas crecca</i> (Linnaeus, 1758)	Common Teal	<i>Trinoton querquedulae</i> (Linnaeus, 1758)	Amblycera	Menoponidae	Zehak	5/8	0	3	0	0	3
				<i>Anaticola crassicornis</i> (Scopoli, 1763)	Ischnocera	Philopteridae	Chabahar	0/2	3	5	1	0	9

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
7		<i>Anas platyrhynchos</i> (Linnaeus, 1758)	Mallard	<i>Anaticola crassicornis</i> (Scopoli, 1763)	Ischnocera	Phloptoridae	Zehak	0/1	3	1	0	0	4
							Zabol	2/2					
				<i>Trinoton querquedulae</i> (Linnaeus, 1758)	Amblycera	Menoponidae	Hamedan	1/1	0	1	0	0	1
							Chabahar	0/3					
1		<i>Anas penelope</i> (Linnaeus, 1758)	Eurasian wigeon	<i>Laemobothrion</i> spp.	Amblycera	Laemobothriidae	Zabol	1/1	0	0	1	0	1
9		<i>Spatula clypeata</i> (Linnaeus, 1758)	Northern shoveler	<i>Pectinopygus</i> spp.	Ischnocera	Phloptoridae	Zabol	1/3	0	1	0	0	1
							Zehak						
							Chabahar						
1		<i>Mergus merganser</i> (Linnaeus, 1758)	Common merganser	-	-	-	Zabol	0/1					
2		<i>Spatula querquedula</i> (Linnaeus, 1758)	Garganey	<i>Trinoton querquedulae</i> (Linnaeus, 1758)	Amblycera	Menoponidae	Zehak	1/2	1	0	0	0	1
2		<i>Tadorna tadorna</i> (Linnaeus, 1758)	Common shelduck	-	-	-	Zehak	0/2					
	BUCEROTIFORMES												
3	Upupidae	<i>Upupa epops</i> (Linnaeus, 1758)	Eurasian hoopoe	-	-	-	Nehbandan	0/1					
							Birjand	0/1					
							Zabol	0/1					
	CHARADRIIFORMES												
	Recurvirostridae												
4		<i>Himantopus himantopus</i> (Linnaeus, 1758)	Black-winged stilt	<i>Actornithophilus uniseriatus</i> (Piaget, 1880)	Amblycera	Menoponidae	Zehak	4/4	1	0	1	0	2
				<i>Quadriceps</i> spp.	Ischnocera	Phloptoridae							
	Scolopacidae												

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
3		<i>Philomachus pugnax</i> (Linnaeus, 1758)	Ruff	<i>Lunaceps holophaeus</i> (Burmeister, 1838)	Mallophaga	Philopteridae	Zehak	3/3	2	2	0	0	4
				<i>Actornithophilus cornutus</i> (Giebel, 1866)	Amblycera	Menoponidae			1	0	0	0	1
2		<i>Tringa stagnatilis</i> (Bechstein, 1803)	Marsh sandpiper	<i>Quadriceps obscurus</i> (Burmeister, 1838)	Ischnocera	Philopteridae	Zehak	2/2	3	3	0	0	6
14		<i>Phalaropus lobatus</i> (Linnaeus, 1758)	Red-necked phalarope	-	-	-	Zehak	0/14					
	Laridae												
17		<i>Sterna repressa</i> (Hartert, 1916)	White-cheeked tern	-	-	-	Zehak	0/7					
							Zabol	0/4					
							Hamun	0/6					
	CAPRIMULGIFORMES												
	Caprimulgidae												
8		<i>Caprimulgus aegyptius</i> (Lichtenstein, 1823)	Egyptian nightjar	-	-	-	Hamun	0/3					
							Zabol	0/1					
							Nimruz	0/2					
							Zehak	0/2					
	COLUMBIFORMES												
	Columbidae												
22		<i>Streptopelia decaocto</i> (Frivaldszky, 1838)	Eurasian collared dove	-	-	-	Hirmand	0/4					
							Zabol	0/4					
							Nimruz	0/3					
							Zehak	0/6					
							Hamun	0/5					

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
36		<i>Spilopelia senegalensis</i> (Linnaeus, 1766)	Laughing dove	-	-	-	Hirmand	0/1					
							Zabol	0/8					
							Nimruz	0/2					
							Zehak	0/5					
							Sari	0/1					
							Kerman	0/2					
							Zahedan	0/2					
							Mashhad	0/3					
							Kalaleh	0/2					
							Gorgan	0/2					
							Nehbandan	0/1					
							Birjand	0/1					
Hamun	0/6												
	FALCONIFORMES												
	Falconidae												
46		<i>Falco tinnunculus</i> (Linnaeus, 1758)	Kestrel	<i>Laemobothrion maximum</i> (Scopoli, 1763)	Amblycera	Laemobothriidae	Hamedan	1/12	0	0	1	0	1
							Kerman	0/26					
							Zabol	0/4					
							Zahedan	0/4					
4		<i>Falco cherrug</i> (Gray, 1834)	Saker falcon	-	-	-	Kerman	0/4					
1		<i>Falco naumanni</i> (Fleischer, 1818)	Lesser kestrel	-	-	-	Zabol	0/1					
2		<i>Falco peregrinus</i> subsp. <i>pelegrinoides</i> (Temminck, 1829)	Barbary falcon	-	-	-	Kerman	0/2					

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
	GALLIFORMES												
	Phasianidae												
22		<i>Ammoperdix griseogularis</i> (Brandt, 1843)	See-see partridge	-	-	-	Zahedan	0/8					
							Nehbandan	0/3					
							Iranshahr	0/1					
							Khash	0/3					
							Chabahar	0/1					
							Birjand	0/1					
							Qaen	0/1					
							Torbat-Heidarie	0/2					
							Gonaabaad	0/1					
Saravan	0/1												
11		<i>Alectoris chukar</i> (Gray, 1830)	Chukar	-	-	-	Iranshahr	0/3					
							Saravan	0/4					
							Chabahar	0/1					
							Zahedan	0/3					
15		<i>Coturnix coturnix</i> (Linnaeus, 1758)	Common quail	-	-	-	Kerman	0/14					
							Zabol	0/1					
5		<i>Francolinus francolinus</i> (Linnaeus, 1766)	Black francolin	-	-	-	Hirmand	0/1					
							Zehak	0/1					
							Hamun	0/3					
	GRUIFORMES												
	Rallidae												
1		<i>Rallus aquaticus</i> (Linnaeus, 1758)	Water rail	<i>Rallicola cuspidatus</i> (Scopoli, 1763)	Ischnocera	Phloptoridae	Hamedan	1/1	1	0	0	0	1

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information										
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)					
									Male	Female	Nymph	Damaged	Total	
18		<i>Fulica atra</i> (Linnaeus, 1758)	Coot	<i>Laemobothrion</i> (<i>Eulaemobothrion</i>) <i>atrum</i> (Nitzsch, 1818)	Amblycera	Laemobothriidae	Zehak	0/12						
							Zabol	1/3	0	1	0	0	1	
							Hamun	0/2						
							Nimruz	0/1						
	OTIDIFORMES													
	Otididae													
1		<i>Chlamydotis macqueenii</i> (Gray, 1832)	MacQueen's bustard	-	-	-	Kerman	0/1						
	PASSERIFORMES													
4	Acrocephalidae	<i>Acrocephalus scirpaceus</i> (Hermann, 1804)	Eurasian reed warbler	-	-	-	Zehak	0/2						
							Zabol	0/2						
	Alaudidae													
5		<i>Alaemon alaudipes</i> (Desfontaines, 1789)	Greater hoopoe-lark	-	-	-	Hirmand	0/2						
							Zabol	0/2						
							Zehak	0/1						
11		<i>Alauda arvensis</i> (Linnaeus, 1758)	Eurasian skylark	-	-	-	Hamun	0/2						
							Zehak	0/1						
							Hirmand	0/2						
							Zabol	0/4						
							Nimruz	0/2						

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
35		<i>Galerida cristata</i> (Linnaeus, 1758)	Crested lark	-	-	-	Hamun	0/4					
							Zabol	0/4					
							Hirmand	0/4					
							Birjand	0/2					
							Neishaboer	0/1					
							Quchan	0/1					
							Torbat-Heidarie	0/1					
							Gonaabaad	0/1					
							Gorgan	0/2					
							Shirvan	0/2					
							Bojnurd	0/2					
							Sari	0/2					
							Qaen	0/1					
Nimruz	0/4												
Zehak	0/4												
4		<i>Melanocorypha calandra</i> (Linnaeus, 1766)	Calandra lark	-	-	-	Mashhad	0/4					
	Cisticolidae												
7		<i>Prinia gracilis</i> (Lichtenstein, 1823)	Graceful prinia	-	-	-	Zehak	0/3					
							Hamun	0/2					
							Zabol	0/2					
	Fringillidae												
5		<i>Serinus pusillus</i> (Pallas, 1811)	Red-fronted serin	-	-	-	Kerman	0/5					

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
5		<i>Carduelis carduelis</i> (Linnaeus, 1758)	European goldfinch	-	-	-	Mashhad	0/1					
							Birjand	0/1					
							Gorgan	0/1					
							Kalaleh	0/1					
							Kerman	0/1					
11		<i>Rhodospiza obsoleta</i> (Lichtenstein, 1823)	Desert finch	-	-	-	Nehbandan	0/2					
							Qaen	0/3					
							Mashhad	0/3					
							Bojnurd	0/1					
							Birjand	0/1					
							Torbat-Heidarieh	0/1					
	Hirundinidae												
7		<i>Hirundo rustica</i> (Linnaeus, 1758)	Barn swallow				Hirmand	0/2					
							Hamun	0/1					
							Zehak	0/4					
	Passeridae												
19		<i>Passer hispaniolensis</i> (Temminck, 1820)	Spanish sparrow	-	-	-	Nimruz	0/3					
							Zabol	0/5					
							Zehak	0/6					
							Hamun	0/2					
							Hirmand	0/3					
23		<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow	-	-	-	Shirvan	0/3					
							Gorgan	0/1					
							Kalaleh	0/4					
							Aqqala	0/4					
							Rasht	0/2					
							Sari	0/1					
							Babol	0/3					
							Birjand	0/3					
							Nehbandan	0/1					
Quchan	0/1												

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
30		<i>Passer montanus</i> (Linnaeus, 1758)	Eurasian tree sparrow	-	-	-	Hamun	0/7					
							Zabol	0/9					
							Hirmand	0/3					
							Zehak	0/5					
							Nimruz	0/6					
	Pycnonotidae												
21		<i>Pycnonotus leucotis</i> (Gould, 1836)	White-eared bulbul	-	-	-	Hamun	0/4					
							Zabol	0/6					
							Hirmand	0/4					
							Zehak	0/5					
							Nimruz	0/2					
	Laniidae												
4		<i>Lanius phoenicuroides</i> (Schalow, 1875)	Red-tailed shrike	-	-	-	Hirmand	0/1					
							Hamun	0/1					
							Zehak	0/1					
							Zabol	0/1					
	Leiothrichidae												
14		<i>Turdoides caudata</i> (Dumont, 1823)	Common babbler	-	-	-	Hamun	0/4					
							Zabol	0/3					
							Hirmand	0/2					
							Zehak	0/3					
							Nimruz	0/2					
	Motacillidae												

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information										
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)					
									Male	Female	Nymph	Damaged	Total	
11		<i>Motacilla alba</i> (Linnaeus, 1758)	White wagtail	-	-	-	Gorgan	0/1						
							Quchan	0/1						
							Bojnurd	0/1						
							Neishaboor	0/1						
							Mashhad	0/1						
							Zabol	0/1						
							Qaen	0/1						
							Nehbandan	0/1						
							Zehak	0/2						
Hamun	0/1													
	Muscicapidae													
7		<i>Oenanthe albonigra</i> (Hume, 1872)	Hume's wheatear	-	-	-	Zehak	0/2						
							Hamun	0/1						
							Zabol	0/4						
1		<i>Cercotrichas galactotes</i> (Temminck, 1820)	Rufous-tailed scrub robin	-	-	-	Zabol	0/1						
	Scotocercidae													
5		<i>Scotocerca inquieta</i> (Cretzschmar, 1830)	Streaked scrub warbler	-	-	-	Zehak	0/2						
							Hamun	0/1						
							Zabol	0/2						
	PELECANIFORMES													
	Ardeidae													

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
6		<i>Ardea cinerea</i> (Linnaeus, 1758)	Gray heron	-	-	-	Hamedan	0/1					
							Zehak	0/5					
5		<i>Ardea alba</i> (Linnaeus, 1758)	Great egret				Zehak	0/3					
							Hamun	0/2					
1		<i>Botaurus stellaris</i> (Linnaeus, 1758)	Great Bittern (Eurasian bittern)	-	-	-	Hamedan	0/1					
2		<i>Ixobrychus minutus</i> (Linnaeus, 1766)	Little bittern	-	-	-	Zahedan	0/2					
		Pelecanidae											
4		<i>Pelecanus crispus</i> (Bruch, 1832)	Dalmatian pelican	<i>Colpocephalum eucarenum</i> Burmeister, 1838	Amblycera	Menoponidae	Zehak	0/2	6	5	5	0	16
							Zabol	1/2					
		PHOENICOPTERIFORMES											
		Phoenicopteridae											
3		<i>Phoenicopterus ruber</i> (Linnaeus, 1758)	American flamingo	<i>Colpocephalum heterosoma</i> Piaget, 1880, small specimen (Clay, 1951)	Amblycera	Menoponidae	Zabol	1/1	1	3	0	0	4
							Zehak	0/2	1	0	0	0	1
		PODICIPEDIFORMES											
		Podicipedidae											
9		<i>Podiceps cristatus</i> (Linnaeus, 1758)	Great crested grebe	-	-	-	Zehak	0/6					
							Zabol	0/3					

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information										
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)					
									Male	Female	Nymph	Damaged	Total	
	PTEROCLIDIFORMES													
	Pteroclididae													
1		<i>Pterocles orientalis</i> (Linnaeus, 1758)	Black-bellied Sandgrouse	-	-	-	Hamedan	0/1						
	PICIFORMES													
	Picidae													
1		<i>Dendrocopos syriacus</i> (Hemprich & Ehrenberg, 1833)	Syrian woodpecker	-	-	-	Hamedan	0/1						
	SULIFORMES													
	Phalacrocoracidae													
7		<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	Great cormorant	-	-	-	Zabol	0/2						
							Zehak	0/2						
							Chabahar	0/3						
	STRIGIFORMES													
	Strigidae													
2		<i>Asio otus</i> (Linnaeus, 1758)	Long-eared owl	<i>Strigiphilus</i> sp.	Ischnocera	Philopteridae	Hamedan	1/2	0	1	0	0	1	
9		<i>Athene noctua</i> (Scopoli, 1769)	Little owl	-	-	-	Hamedan	0/1						
							Kerman	0/4						
							Shahrekord	0/2						
							Khash	0/2						
8		<i>Bubo bubo</i> (Linnaeus, 1758)	Eagle owl	<i>Strigiphilus strigis</i> (Pontoppidan, 1763)	Ischnocera	Philopteridae	Hamedan	2/2	26	29	0	0	55	
							Zahedan	0/1						
							Zabol	0/1						
							Kerman	0/4						

(Continued)

TABLE 1 (Continued)

n birds examined	Host information			Parasite information									
	Host bird taxonomy	Host scientific name	Host vernacular name	Louse species	Suborder	Family	City	n total/infested	Louse prevalence (n)				
									Male	Female	Nymph	Damaged	Total
1		<i>Otus scops</i> (Linnaeus, 1758)	European scops owl	-	-	-	Hamedan	0/1					
2		<i>Otus brucei</i> (Hume, 1873)	Pallid scops owl	-	-	-	Kerman	0/2					
	Tytonidae												
4		<i>Tyto alba</i> (Scopoli, 1769)	Barn owl	-	-	-	Hamedan	0/1					
							Kerman	0/2					
							Zahedan	0/1					
Total 612								58	157	157	35	2	352

*according to International Union for Conservation of Nature (IUCN) Red List of Threatened Species (www.iucnredlist.org). Names of orders are capitalized, and names of families are showed in bold.

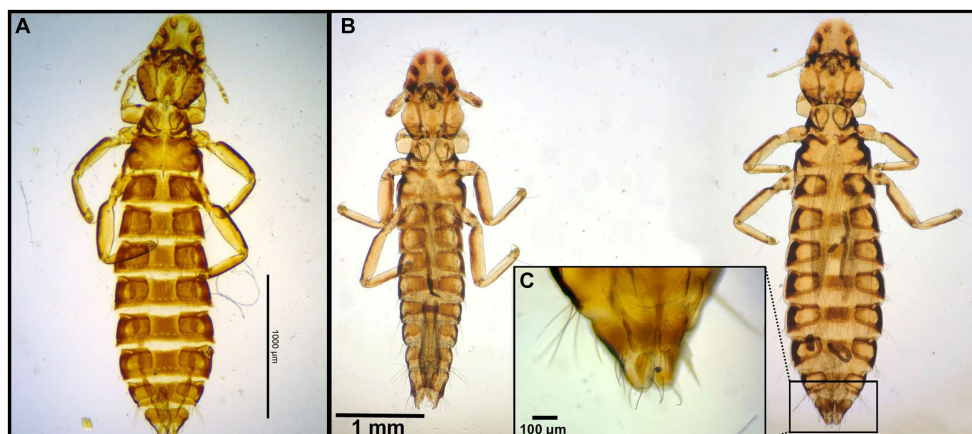


FIGURE 2
Chewing lice identified in this study part I: (A) *Falcolipeurus suturalis* ♀; (B) *Falcolipeurus quadripustulatus* left ♂, right ♀; and (C) ♀ posterior end. The map was drawn by using ArcGIS software version 10.3 (<https://enterprise.arcgis.com/en/portal/>).

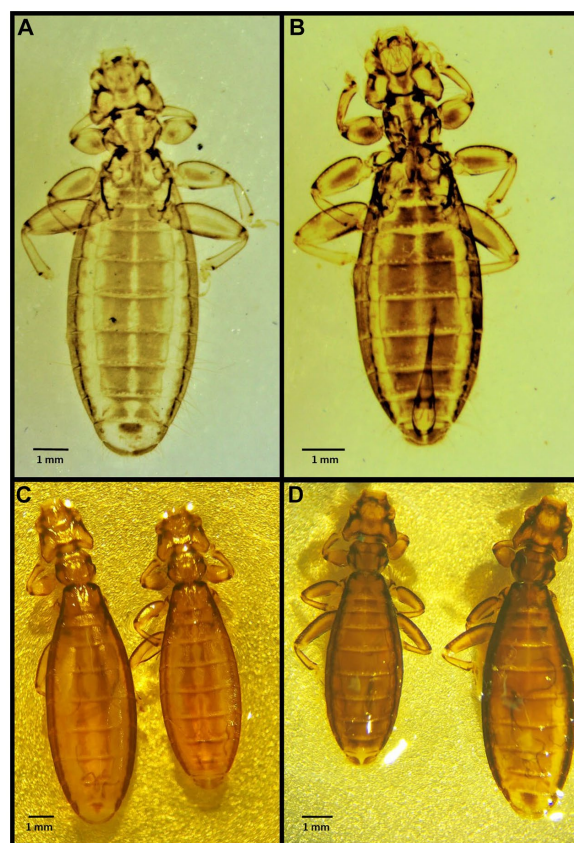


FIGURE 3
Chewing lice identified in this study part II: (A) *Laemobothrion maximum* ♀; (B) *Laemobothrion maximum* ♂; (C) Stereomicroscope picture of *Laemobothrion vulturis* left ♀, right ♂; and (D) Stereomicroscope picture of *Laemobothrion maximum* left ♂, right ♀.

louse was mechanically transferred to the predator. In some reports from Iran, lice species that normally infest other bird orders were documented on abnormal bird species. For instance, *Trinoton* sp. that infest Anseriform birds were collected from raptors *Buteo*

rufinus and *Gyps fulvus* (16, 17). It can be assumed that lice infestation occurred during feeding the raptors from their preys. In addition, in some reports, *Menacanthus stramineus*, *Menopon gallinae*, and *Cuclotogaster heterographus* that live on Galliformes

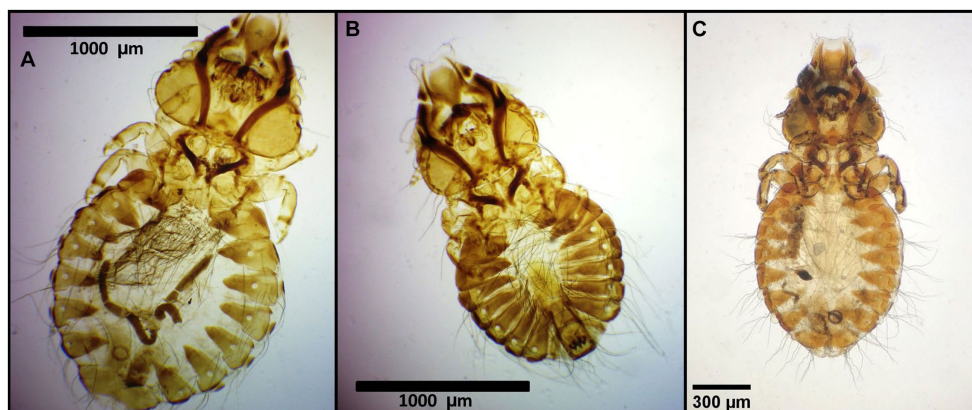


FIGURE 4 Chewing lice identified in this study part III: (A) *Craspedorrhynchus aquilinus* ♀, (B) *Craspedorrhynchus aquilinus* ♂; and (C) *Craspedorrhynchus platystomus* ♀.

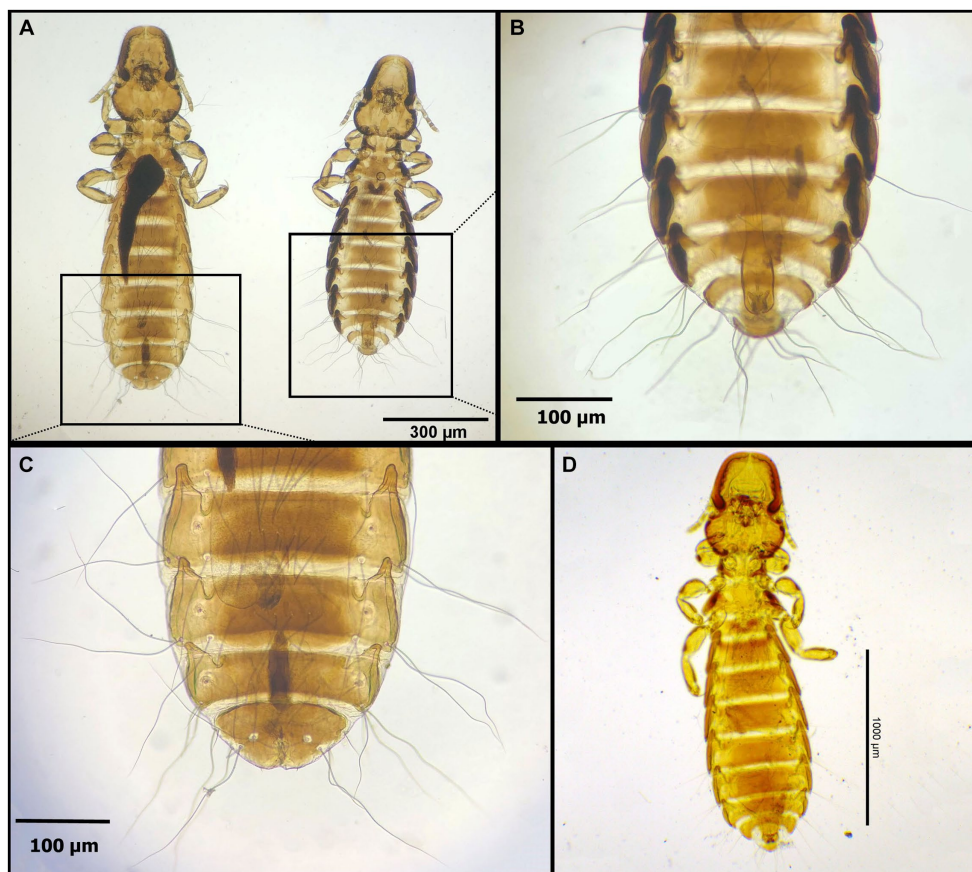


FIGURE 5 Chewing lice identified in this study part IV: (A–C) *Degeeriella fusca*, (A) left ♀, right ♂; (B) ♂, posterior part of the abdomen; (C) ♀, posterior part of the abdomen; and (D) *Degeeriella fulva* ♂.

were collected from mallards and geese (42, 43) as well as pigeons (47). These findings could be due to keeping mixed species together by nomads which is a normal practice in Iran although

misidentification cannot be ruled out. Special caution should be taken for interpretation of such findings.

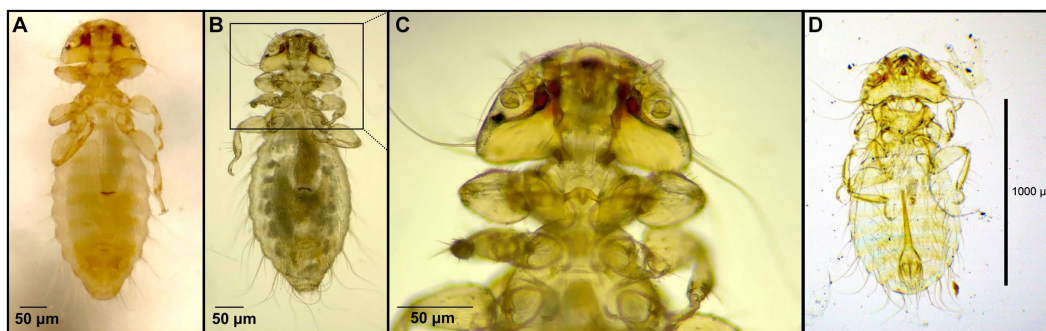


FIGURE 6

Chewing lice identified in this study part V: (A–C) *Nosopon chanabense* ♀; (A) Stereomicroscope picture; (B) Light microscope picture; (C) Head; and (D) *Nosopon lucidum* ♂.

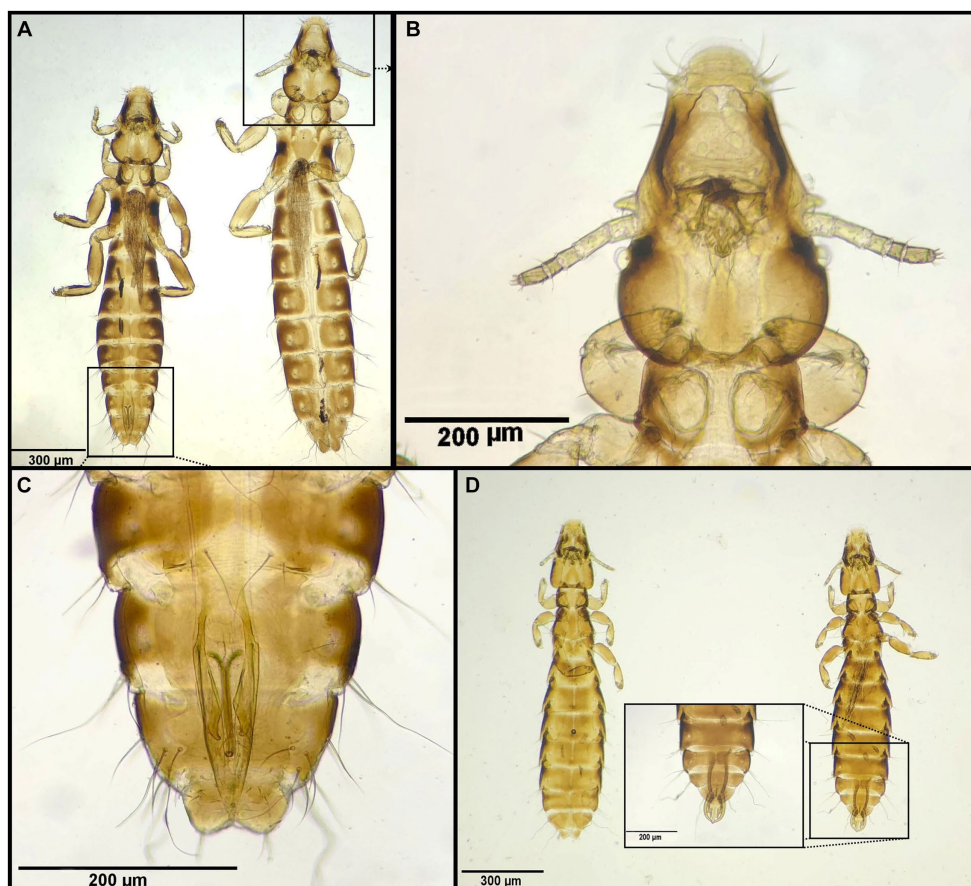


FIGURE 7

Chewing lice identified in this study part VI: (A–C) *Anaticola crassicornis* left ♂, right ♀; (B) ♀, Head; (C) ♂, posterior end; and (D) *Quadraceps obscurus* left ♀, right ♂.

It is known that both amblyceran and ischnoceran lice can act as vectors or intermediate hosts of helminths, bacteria, and viruses, so it was suggested to delouse the wild birds with insecticides (1) however, we disagree with manipulating host–parasite interactions in the wildlife. Additionally, from the conservation point of view some authors expressed their concerns about co-extinction of the lice with

their hosts, e.g., *Rallicola extinctus* (64) and their extinction during the conservation efforts to save the host, e.g., *Rallicola pilgrimi* (Clay, 1972) and *Colpocephalum californici* (31, 64, 65). According to International Union for Conservation of Nature (IUCN), there are concerns regarding decreasing population of several predators such as *Aquila nipalensis* Hodgson, 1833 steppe eagle (endangered) and



FIGURE 8
Chewing lice identified in this study part VII: (A) *Colpocephalum nanum* ♀; (B) *Colpocephalum gypsi* ♂; (C) *Colpocephalum eucarenum* left ♂, right ♀; (D–G) *Colpocephalum impressum*; (D) ♀; (E) ♂; (F) ♂, posterior end; and (G) ♂, head.

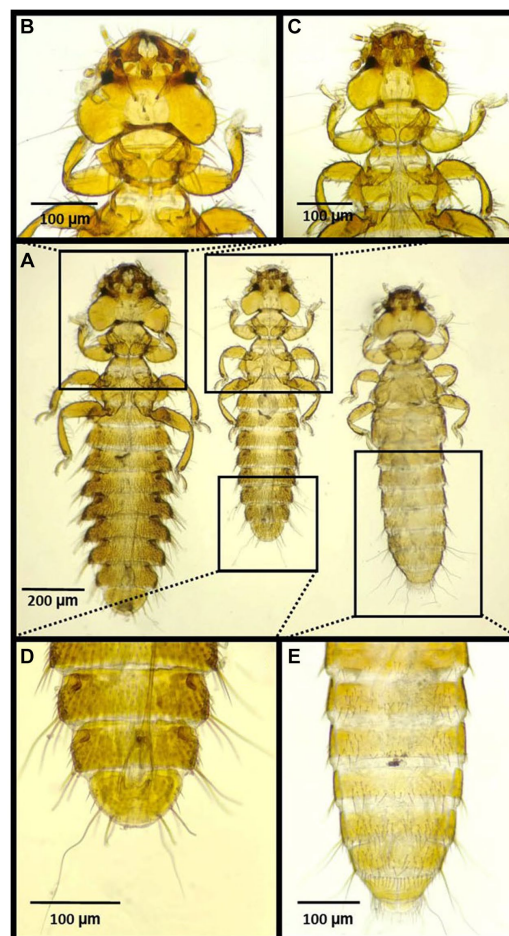


FIGURE 9
Chewing lice identified in this study part VIII: (A–E) *Colpocephalum heterosoma*; (B) Head of large specimen ♂; (C) Head of small specimen ♂; (D) Posterior end of small specimen ♂, and (E) Posterior end of small specimen ♀.

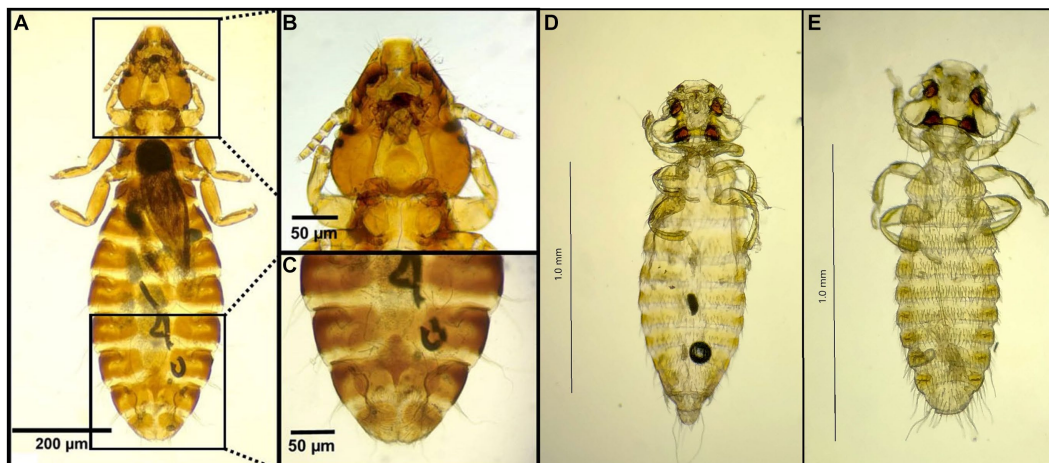


FIGURE 10
Chewing lice identified in this study part IX: (A–C) *Pectinopygus* spp. ♀; (B) Head; (C) Posterior end; (D) *Colpocephalum turbinatum* ♀; and (E) *Colpocephalum turbinatum* ♂.

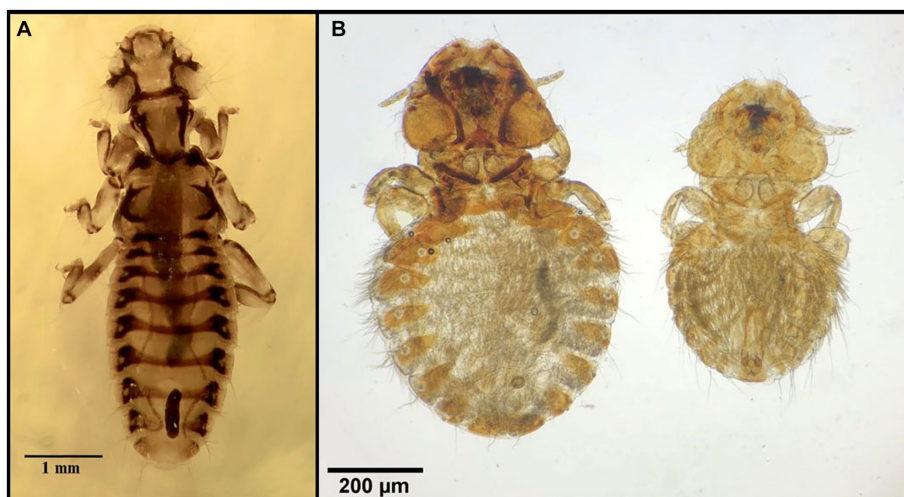


FIGURE 11
Chewing lice identified in this study part X: (A) *Trinoton querquedulae* ♀; (B) *Aegypocus trigonoceps* left ♀, right ♂.

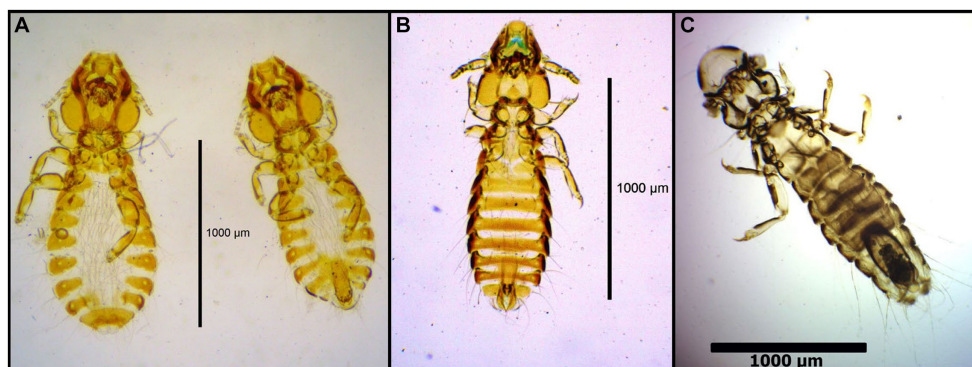


FIGURE 12
Chewing lice identified in this study part XI: (A) *Strigiphilus strigis* left ♀, right ♂; (B) *Rallicola cuspidatus* ♂; and (C) *Cuclotogaster heterographus* ♂.

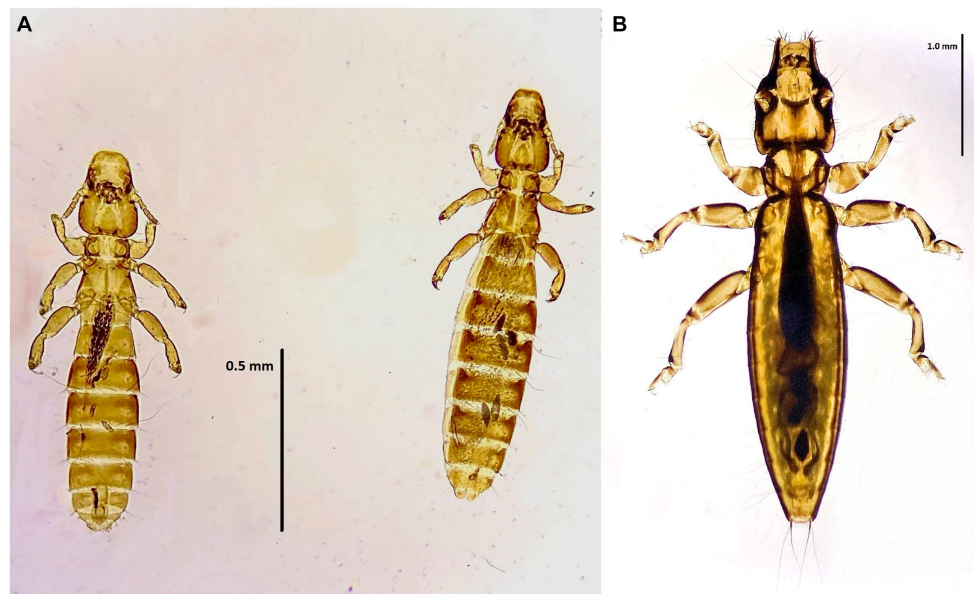


FIGURE 13
Chewing lice identified in this study part XII: (A) *Lunaceps holophaeus* left ♂, right ♀; (B) *Laemobothrion* spp. nymph.

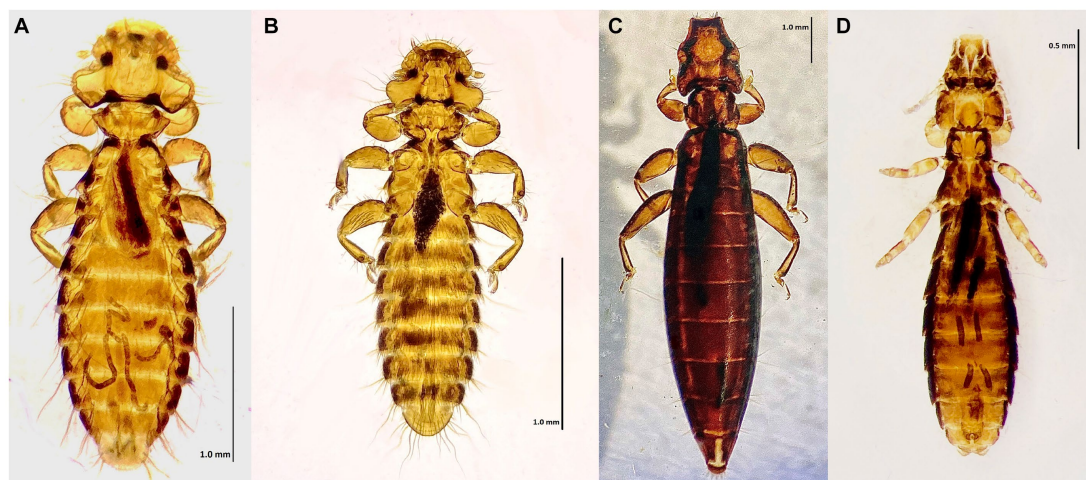


FIGURE 14
Chewing lice identified in this study part XIII: (A) *Actornithophilus uniseriatus* ♂; (B) *Actornithophilus cornutus* ♂; (C) *Lamobothrion atrum* ♀; and (D) *Quadriceps* spp. ♂.

Aquila heliaca Savigny, and 1809 Asian imperial eagle (vulnerable) (66). Hence, it is suggested that conservationists consider preserving host-specific lice as part of their efforts to save vertebrate hosts (65).

This study provides the first information about lice infestation of wild birds in different regions of Iran and reports *Craspedorrhynchus platystomus*, *Colpocephalum nanum*, *Colpocephalum gypsi*, *Colpocephalum eucarenum*, *Colpocephalum heterosoma*, *Degeeriella fulva*, *Degeeriella fusca*, *Nosopon chanabense*, *Nosopon lucidum*, *Falcolipeurus quadripustulatus* *Falcolipeurus suturalis*, *Aegypocercus trigonoceps*, *Trinoton querquedulae*, *Anaticola crassicornis*, *Quadriceps*

obscurus, *Rallicola cuspidatus*, and *Strigiphilus strigis* for the first time from the country. Review of the published data on avian lice fauna of Iran shows that the information is available for almost 14% of the bird species. In contrast, researchers from the neighboring country Turkey have identified over 150 lice species from more than half of the bird species inhabiting the country (21). As Iran and Turkey share many bird species, it seems that many louse species remain to be discovered. Molecular phylogenetic analysis of avian lice from Iran will bring clearer understanding of the role of migratory birds in biogeographic distributions.

TABLE 2 Louse species reported from Iran according to their avian hosts until December 2023.

Avian host scientific name	Avian host vernacular name	Lice species	Reference
ACCIPITRIFORMES			
Accipitridae			
<i>Aquila chrysaetos</i> (Linnaeus, 1758)	Golden eagle	<i>Craspedorrhynchus aquilinus</i> (Denny, 1842)	This study (37, 38)
		<i>Laemobothrion maximum</i> (Scopoli, 1763)	
		<i>Laemobothrion</i> sp.	
<i>Aquila fasciata</i> (Vieillot, 1822)	Bonelli's eagle	<i>Laemobothrion maximum</i> (Scopoli, 1763)	Reported the bird as <i>Hieraetus fasciatus</i> (39)
<i>Aquila heliaca</i> (Savigny, 1809)	Asian imperial eagle	<i>Laemobothrion maximum</i> (Scopoli, 1763)	This study
<i>Aquila nipalensis</i> (Hodgson, 1833)	Steppe eagle	<i>Colpocephalum impressum</i> (Rudow, 1866)	This study (40)
		<i>Falcolipeurus suturalis</i> (Rudow, 1869)	
		<i>Laemobothrion maximum</i> (Scopoli, 1763)	
		<i>Craspedorrhynchus</i> sp.	
<i>Aquila rapax</i> (Temminck, 1828)	Tawny eagle	<i>Laemobothrion vulturis</i> (Fabricius, 1775)	This study
		<i>Colpocephalum impressum</i> (Rudow, 1866)	
		<i>Nosopon chanabense</i> (Ansari, 1951)	
<i>Buteo buteo</i> (Linnaeus, 1758)	Buzzard	<i>Degeeriella fulva</i> (Giebel, 1874)	This study
		<i>Degeeriella fusca</i> (Denny, 1842)	
		<i>Cuclotogaster heterographus</i> (Nitzsch, 1866)	
		<i>Craspedorrhynchus platystomus</i> (Burmeister, 1838)	
		<i>Colpocephalum nanum</i> (Piaget, 1890)	
		<i>Colpocephalum turbinatum</i> (Denny, 1842)	
		<i>Laemobothrion maximum</i> (Scopoli, 1763)	
<i>Buteo rufinus</i> (Cretzschmar, 1829)	Long-legged buzzard	<i>Trinoton</i> sp.*	This study (17)
		<i>Laemobothrion maximum</i> (Scopoli, 1763)	
<i>Circus aeruginosus</i> (Linnaeus, 1758)	Eurasian marsh-harrier	<i>Nosopon lucidum</i> (Rudow, 1869)	This study
<i>Gyps fulvus</i> (Hablizl, 1783)	Eurasian griffon vulture	<i>Trinoton</i> sp.*	This study (16)
		<i>Laemobothrion vulturis</i> (Fabricius, 1775)	
		<i>Colpocephalum gypsi</i> (Eichler & Zlotorzyska, 1971)	
		<i>Colpocephalum</i> spp.	
		<i>Falcolipeurus quadripustulatus</i> (Burmeister, 1838)	
		<i>Aegypocercus trigonoceps</i> (Giebel, 1874)	
<i>Neophron percnopterus</i> (Linnaeus, 1758)	Egyptian vulture	<i>Laemobothrion vulturis</i> (Fabricius, 1775)	(15)
ANSERIFORMES			
Anatidae			
<i>Anas clypeata</i> (Linnaeus, 1758)	Northern shoveler	<i>Anaticola crassicornis</i> (Scopoli, 1763)	This study (38)
		<i>Pectinopygus</i> spp.	
<i>Anas crecca</i> (Linnaeus, 1758)	Common Teal	<i>Trinoton querquedulae</i> (Linnaeus, 1758)	This study
		<i>Anaticola crassicornis</i> (Scopoli, 1763)	
<i>Anas platyrhynchos</i> (Linnaeus, 1758)	Mallard	<i>Lipeurus squalidus</i> (Piaget, 1880)*	This study (41, 42)
		<i>Menacanthus stramineus</i> (Nitzsch, 1818)*	
		<i>Trinoton anserinum</i> (Fabricius, 1805)*	
		<i>Anatolica crassicornis</i> (Scopoli, 1763)	
<i>Anas penelope</i> Linnaeus, 1758	Eurasian wigeon	<i>Laemobothrion</i> spp.	This study

(Continued)

TABLE 2 (Continued)

Avian host scientific name	Avian host vernacular name	Lice species	Reference
<i>Anas querquedula</i> (Linnaeus, 1758)	Garganey	<i>Trinoton querquedulaea</i> (Linnaeus, 1758)	This study
<i>Anser anser</i> (Linnaeus, 1758)	Greylag goose	<i>Anaticola anseris</i> (Linnaeus, 1758)	(15, 41, 43)
		<i>Trinoton anserinum</i> (Fabricius, 1805)	
		<i>Cuclotogaster heterographus</i> (Nitzsch, 1866) *. Also reported as <i>Liperus heterographus</i> *	
		<i>Lipeurus caponis</i> (Linnaeus, 1758)*	
		<i>Menopon gallinae</i> (Linnaeus, 1758)*	
BUCEROTIFORMES			
Upupidae			
<i>Upupa epops</i> (Linnaeus, 1758)	Hoopoe	<i>Upupicola upupae</i> (Schrank, 1803)	(38)
CHARADRIIFORMES			
Laridae			
<i>Chroicocephalus ridibundus</i> (Linnaeus, 1766)	Black-headed gull	<i>Austromenopon transversum</i> (Denny, 1842)	Reported the bird as <i>Larus ridibundus</i> (13)
<i>Sterna hirundo</i> (Linnaeus, 1758)	Tern	<i>Quadriceps legatus</i> (Timmermann, 1952)	This study (12)
		<i>Saemundssonina meridiana</i> (Timmermann, 1950)	This study
<i>Tringa stagnatilis</i> (Bechstein, 1803)	Marsh sandpiper	<i>Quadriceps obscurus</i> (Burm, 1838)	This study
Recurvirostridae			
<i>Himantopus himantopus</i> (Linnaeus, 1758)	Black-winged stilt	<i>Actornithophilus uniseriatus</i> (Piaget, 1880) <i>Quadriceps</i> spp.	This study
Scolopaciidae			
<i>Philomachus pugnax</i> (Linnaeus, 1758)	Ruff	<i>Luniceps holophaeus</i> Burmeister, 1838	This study
		<i>Actornithophilus cornutus</i> (Giebel, 1866)	This study
COLUMBIFORMES			
Columbidae			
<i>Columba livia</i> subsp. <i>domestica</i> (Gmelin, 1789)	Domestic pigeon	<i>Campanulotes compar</i> (Burmeister, 1838). Also reported as <i>Gonicotes bidentatus</i>	(41, 44–46)
		<i>Columbicola columbae</i> (Linnaeus, 1758)	
		<i>Columbicola tschulyschman</i> (Eichler, 1942)	
		<i>Lipeurus caponis</i> (Linnaeus, 1758)*	
		<i>Menopon gallinae</i> (Linnaeus, 1758)*	
<i>Columba livia</i> subsp. <i>livia</i> (Gmelin, 1789)	Rock dove	<i>Menacanthus stramineus</i> (Nitzsch, 1818)*. Also reported as <i>Menopon stramineum</i> *	(13, 47)
		<i>Campanulotes compar</i> (Burmeister, 1838)	
		<i>Colpocephalum turbinatum</i> Denny, 1842	
		<i>Columbicola columbae</i> (Linnaeus, 1758)	
		<i>Hohorstiella lata</i> (Piaget, 1880)	
		<i>Menacanthus stramineus</i> (Nitzsch, 1818)*	
<i>Streptopelia senegalensis</i> (Linnaeus, 1766)	Laughing dove	<i>Menopon gallinae</i> (Linnaeus, 1758)*	(48)
		<i>Goniodes</i> sp.	
<i>Streptopelia turtur</i> (Linnaeus, 1758)	European turtle dove	<i>Columbicola columbae</i> (Linnaeus, 1758)	(38)
		<i>Colpocephalum pectinatum</i> (Osborn, 1902) <i>Strigiphilus</i> sp.*	

(Continued)

TABLE 2 (Continued)

Avian host scientific name	Avian host vernacular name	Lice species	Reference
CORACIIFORMES			
Alcedinidae			
<i>Alcedo atthis</i> (Linnaeus, 1758)	Kingfisher	<i>Alcedoecus annulatus</i> (Ansari, 1955)	(38)
Meropidae			
<i>Merops apiaster</i> (Linnaeus, 1758)	Bee-eater	<i>Meromenopon meropis</i> Clay & Meinertzhagen, 1941	(49)
		<i>Meropoecus meropis</i> (Denny, 1842)	
		<i>Meropsilla apiastri</i> (Denny, 1842). Reported as <i>Brueelia apiastri</i>	
<i>Merops persicus</i> (Pallas, 1773)	Blue-cheeked bee-eater	<i>Meromenopon meropis</i> Clay & Meinertzhagen, 1941	(49)
		<i>Meropoecus meropis</i> (Denny, 1842)	
		<i>Meropsiella erythropteri</i> (Piaget, 1885). Reported as <i>Brueelia erythropteri</i>	
CUCULIFORMES			
Cuculidae			
<i>Cuculus canorus</i> (Linnaeus, 1758)	Cuckoo	<i>Cuculoecus latifrons</i> (Denny, 1842). Reported as <i>Philopterus latifron</i>	(11)
FALCONIFORMES			
Falconidae			
<i>Falco cherrug</i> (Gray, JE, 1834)	Saker falcon	<i>Colpocephalum</i> sp.	(38)
<i>Falco tinnunculus</i> (Linnaeus, 1758)	Kestrel	<i>Laemobothrion maximum</i> (Scopoli, 1763)*	This study (38)
GALLIFORMES			
Phasianidae			
<i>Coturnix coturnix</i> (Linnaeus, 1758)	Quail	<i>Amyrsidea fulvomaculata</i> (Denny, 1842)	(38)
<i>Gallus gallus domesticus</i> (Linnaeus, 1758)	Chicken	<i>Cuclotogaster heterographus</i> (Nitzsch, 1866). Also reported as <i>Lipeurus heterographus</i>	(18, 41, 46, 50–59)
		<i>Goniodes dissimilis</i> Denny, 1842	
		<i>Goniocotes gallinae</i> (de Geer, 1778)	
		<i>Goniodes gigas</i> (Taschenberg, 1879). Also reported as <i>Goniocotes gigas</i>	
		<i>Lipeurus caponis</i> (Linnaeus, 1758)	
		<i>Menacanthus pallidulus</i> (Neumann, 1912). Also reported as <i>Menopon pallidulum</i>	
		<i>Menacanthus stramineus</i> (Nitzsch, 1818). Also reported as <i>Menopon stramineum</i>	
		<i>Menopon gallinae</i> (Linnaeus, 1758)	
		<i>Goniodes</i> sp.	
		<i>Lipeurus</i> sp.	
<i>Meleagris gallopavo</i> (Linnaeus, 1758)	Turkey	<i>Chelopistes meleagridis</i> (Linnaeus, 1758)	(41, 46, 60)
		<i>Goniocotes gallinae</i> (de Geer, 1778)	
		<i>Goniodes gigas</i> (Taschenberg, 1879)	
		<i>Menacanthus stramineus</i> (Nitzsch, 1818)	
		<i>Menopon gallinae</i> (Linnaeus, 1758)	

(Continued)

TABLE 2 (Continued)

Avian host scientific name	Avian host vernacular name	Lice species	Reference
<i>Phasianus colchicus</i> (Linnaeus, 1758)	Pheasant	<i>Myrsidea perdicis</i> (Denny, 1842). Reported as <i>Myrsidea hexapilosus</i>	(38)
<i>Pavo cristatus</i> (Linnaeus, 1758)	Peafowl	<i>Goniodes pavonis</i> (Linnaeus, 1758)	(61)
<i>Perdix perdix</i> (Linnaeus, 1758)	Grey partridge	<i>Lipeurus</i> sp.	(62)
		<i>Menacanthus</i> sp.	
		<i>Menopon</i> sp.	
GRUIFORMES			
Rallidae			
<i>Rallus aquaticus</i> (Linnaeus, 1758)	Water rail	<i>Rallicola cuspidatus</i> (Scopoli, 1763)	This study
<i>Fulica atra</i> Linnaeus, 1758	Coot	<i>Laemobothrion atrum</i> (Nitzsch, 1818)	This study
PASSERIFORMES			
Acrocephalidae			
<i>Acrocephalus stentoreus</i> (Hemprich & Ehrenberg, 1833)	Clamorous reed warbler	<i>Brueelia</i> sp.	(14)
Alaudidae			
<i>Calandrella rufescens</i> (Vieillot, 1819)	Lesser short-toed lark	<i>Menacanthus</i> sp.	(14)
<i>Galerida cristata</i> (Linnaeus, 1758)	Crested lark	<i>Brueelia</i> sp.	(14)
		<i>Ricinus</i> sp.	
Corvidae			
<i>Corvus corax</i> (Linnaeus, 1758)	Raven	<i>Myrsidea anaspila</i> (Nitzsch, 1866)	(11, 15)
		<i>Philoapterus corvi</i> (Linnaeus, 1758)	
		<i>Cuculogaster heterographus</i> (Nitzsch, 1866)*	
<i>Corvus corone</i> (Linnaeus, 1758)	Carrion crow	<i>Philoapterus ocellatus</i> (Scopoli, 1763)	(11, 14, 63)
		<i>Brueelia</i> sp.	
		<i>Cuculoecus latifrons</i> (Denny, 1842). Also reported as <i>Philoapterus latifron</i> *	
<i>Pica pica</i> (Linnaeus, 1758)	Black-billed magpie	<i>Philoapterus picae</i> (Denny, 1842)	(38)
Emberizidae			
<i>Emberiza bruniceps</i> (Brandt, 1841)	Red-headed bunting	<i>Sturnidoecus rostratus</i> (Mey, 1982)	(14)
		<i>Menacanthus</i> sp.	
<i>Emberiza calandra</i> (Linnaeus, 1758)	Corn bunting	<i>Sturnidoecus rostratus</i> (Mey, 1982)	(14)
		<i>Brueelia</i> sp.	
Fringillidae			
<i>Chloris chloris</i> (Linnaeus, 1758)	European greenfinch	<i>Myrsidea</i> sp.	(14)
<i>Rhodospiza obsoleta</i> (Lichtenstein, 1823)	Desert finch	<i>Brueelia gobiensis</i> Mey, 1982	Reported the bird as <i>Carduelis obsoleta</i> (14)
		<i>Philoapterus</i> sp.	
<i>Fringilla coelebs</i> (Linnaeus, 1758)	Chaffinch	<i>Philoapterus fringillae</i> (Scopoli, 1772)	(14)
		<i>Brueelia</i> sp.	
Muscicapidae			
<i>Saxicola torquatus</i> (Linnaeus, 1766)	African stonechat	<i>Brueelia</i> sp.	(14)
<i>Luscinia megarhynchos</i> (Brehm, 1831)	Nightingale	<i>Brueelia</i> sp.	(14)

(Continued)

TABLE 2 (Continued)

Avian host scientific name	Avian host vernacular name	Lice species	Reference
<i>Oenanthe lugens</i> (Lichtenstein, 1823)	Mourning wheatear	<i>Philopterus</i> sp.	(14)
Paridae			
<i>Parus major</i> (Linnaeus, 1758)	Great tit	<i>Philopterus pallescens</i> (Denny, 1842)	(14)
Passeridae			
<i>Gymnoris xanthocollis</i> (Burton, 1838)	Yellow-throated sparrow	<i>Philopterus fringillae</i> (Scopoli, 1772)	Reported the bird as <i>Petronia xanthocollis</i> (14)
<i>Passer domesticus</i> (Linnaeus, 1758)	House sparrow	<i>Brueelia cyclothorax</i> (Burmeister, 1838). Reported as <i>Brueelia subtilis</i> (Nitzsch, 1874)	(14)
		<i>Philopterus fringillae</i> (Scopoli, 1772)	
		<i>Sturnidoecus refractariolus</i> (Zlotorzycza, 1964)	
<i>Passer montanus</i> (Linnaeus, 1758)	Eurasian sparrow	<i>Brueelia cyclothorax</i> (Burmeister, 1838). Reported as <i>Brueelia subtilis</i> (Nitzsch, 1874)	(14)
		<i>Philopterus montani</i> (Zlotorzycza, 1964)	
		<i>Sturnidoecus ruficeps</i> (Nitzsch, 1866)	
		<i>Campanulotes compar</i> (Burmeister, 1838)*	
<i>Petronia petronia</i> (Linnaeus, 1766)	Rock petronia	<i>Sturnidoecus refractariolus</i> (Zlotorzycza, 1964)	(14)
		<i>Brueelia</i> sp.	
		<i>Philopterus</i> sp.	
Phylloscopidae			
<i>Phylloscopus collybita</i> (Vieillot, 1817)	Chiffchaff	<i>Brueelia</i> sp.	(14)
		<i>Menacanthus</i> sp.	
		<i>Philopterus</i> sp.	
		<i>Sturnidoecus</i> sp.	
<i>Phylloscopus nitidus</i> (Blyth, 1843)	Green warbler	<i>Brueelia</i> sp.	(14)
		<i>Menacanthus</i> sp.	
Sturnidae			
<i>Acridotheres tristis</i> (Linnaeus, 1766)	Myna	<i>Brueelia chayanh</i> Ansari, 1955	(14, 40)
		<i>Myrsidea invadens</i> (Kellogg & Chapman, 1902)	
<i>Sturnus vulgaris</i> (Linnaeus, 1758)	Starling	<i>Brueelia nebulosa</i> (Burmeister, 1838)	(14)
Sylviidae			
<i>Sylvia communis</i> (Latham, 1787)	Whitethroat	<i>Sturnidoecus</i> sp.	(14)
Turdidae			
<i>Turdus ruficollis</i> (Pallas, 1776)	Black-throated Thrush	<i>Philopterus</i> sp.	(38)
<i>Turdus merula</i> (Linnaeus, 1758)	Blackbird	<i>Ricinus</i> sp.	(14)
PELECANIFORMES			
Ardeidae			
<i>Ardea purpurea</i> (Linnaeus, 1766)	Purple heron	<i>Menacanthus</i> sp.*	(13)
<i>Egretta garzetta</i> (Linnaeus, 1766)	Little egret		
		<i>Ardeicola</i> sp. Probably <i>Ardeicola expallidus</i> Blagoveshtchensky, 1940	(13)
		<i>Ciconiphilus decimfasciatus</i> (Boisduval & Lacordaire, 1835)	
Pelecanidae			
<i>Pelecanus onocrotalus</i> (Linnaeus, 1758)	Great white pelican	<i>Piagetiella titan</i> (Piaget, 1880)	(4), this study

(Continued)

TABLE 2 (Continued)

Avian host scientific name	Avian host vernacular name	Lice species	Reference
<i>Pelecanus crispus</i> (Bruch, 1832)	Dalmatian pelican	<i>Colpocephalum eucaenum</i> (Burmeister, 1838)	
PHOENICOPTERIFORMES			
Phoenicopteridae			
<i>Phoenicopterus ruber</i> (Linnaeus, 1758)	American flamingo	<i>Colpocephalum heterosoma</i> , (Clay, 1951)	This study
PODICIPEDIFORMES			
Podicipedidae			
<i>Podiceps cristatus</i> (Linnaeus, 1758)	Great crested grebe	<i>Aquanirmus podicipis</i> (Denny, 1842)	(13)
		<i>Pseudomenopon dolium</i> (Rudow, 1869)	
Scolopaciidae			
<i>Numenius arquata</i> (Linnaeus, 1758)	Curlew	<i>Cummingsiella ovalis</i> (Scopoli, 1763)	(11, 12, 15)
		<i>Quadriceps obtusus</i> (Kellogg & Kuwana, 1902)	
		<i>Saemundssonina scolopacis phaeopodis</i> subsp. <i>humeralis</i> (Denny, 1842)	
<i>Scolopax rusticola</i> (Linnaeus, 1758)	Eurasian woodcock	<i>Lipeurus</i> sp.	(19)
		<i>Philopterus</i> sp.	
STRIGIFORMES			
Strigidae			
<i>Asio otus</i> (Linnaeus, 1758)	Long-eared owl	<i>Strigiphilus</i> sp.	This study
<i>Athene noctua</i> (Scopoli, 1769)	Little owl	<i>Colpocephalum pectinatum</i> (Osborn, 1902)	(38)
		<i>Philopterus ocellatus</i> (Scopoli, 1763)*	
<i>Bubo bubo</i> (Linnaeus, 1758)	Eagle owl	<i>Strigiphilus strigis</i> (Pontoppidan, 1763)	This study
SULIFORMES			
Phalacrocoracidae			
<i>Phalacrocorax carbo</i> (Linnaeus, 1758)	Cormorant	<i>Pectinopygus gyricornis</i> (Denny, 1842)	(13)

Names of orders are capitalized, and names of families are showed in bold. *The louse species is not normally found on this bird. Its report is probably due to contamination or misidentification.

Data availability statement

The original contributions presented in the study are included in the article/[Supplementary material](#), further inquiries can be directed to the corresponding author.

Ethics statement

Ethical approval was not required for the study involving animals in accordance with the local legislation and institutional requirements because examined birds Hamedan province were euthanized by a certified veterinarian of the Provincial Department of Environment because of general health failure prior to transfer to the Faculty of Veterinary Medicine, Bu-Ali Sina University. Birds in other provinces were dead animals.

Author contributions

ZB: Methodology, Writing – original draft. AS: Conceptualization, Funding acquisition, Investigation, Methodology, Project

administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. JK: Methodology, Writing – original draft. MB: Methodology, Writing – original draft. EM: Methodology, Writing – original draft. BD: Investigation, Methodology, Supervision, Writing – original draft, Writing – review & editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. This work was supported by the Bu-Ali Sina University, Hamedan, Iran (Grant Number 1/1/28864).

Acknowledgments

The authors wish to thank Dr. Mehdi Safikhani, Majid Shabanloo, Reza Daneshpajooh, Dr. Alireza Mohammadi, Javad Noori Azhar (Provincial Department of Agriculture, Hamedan, Iran) and Shirdarreh for their kind cooperation in sample collection; Atabak Roohi-Aminjan (Bu-Ali Sina University, Hamedan, Iran) and

Abolghasem Khaleghizadeh (Iranian Research Institute of Plant Protection, Agricultural Research, Education and Extension Organization, Tehran, Iran) for the confirmation of bird species; Fatemeh Nikbin and the staff of Laboratory of Parasitology, Faculty of Veterinary Science, Bu-Ali Sina University for their assistance. The authors also thank Mohamad-Parsa Meeaadfar for providing us with the *Trinoton quercuedulae* specimen.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Clayton DH, Adams RJ, Bush SE. Phthiraptera, the chewing lice In: CT Atkinson, NJ Thomas and DB Hunter, editors. *Parasitic Diseases of Wild Birds*. Ames, USA: Wiley-Blackwell (2009)
2. Marcondes CB, Linardi PM. Sucking and chewing lice In: CB Marcondes, editor. *Arthropod Borne Diseases*. Cham, Switzerland: Springer (2016). 503–15.
3. Dik B. Erosive Stomatitis in a White Pelican (*Pelecanus onocrotalus*) Caused by *Piagetiella titan* (Mallophaga: Menoponidae). *J Vet Med.* (2006) 53:153–4. doi: 10.1111/j.1439-0450.2006.00927.x
4. Tavassoli M, Salmanzadeh R, Jabbari H. Infestations of *Piagetiella titan* (Menoponidae: Mallophaga) on juvenile white pelicans (*Pelecanus onocrotalus*, L.) in Urmia Lake National Park, northwest Iran. *Iran J Vet Med.* (2011) 5:105–8. doi: 10.22059/IJVM.2011.23106
5. Wobeser G, Johnson GR, Acompanado G. Stomatitis in a juvenile white pelican due to *Piagetiella peralis* (Mallophaga: Menoponidae). *J Wildl Dis.* (1974) 10:135–8. doi: 10.7589/0090-3558-10.2.135
6. Smith V. S., Broom Y., Dalglish R. (2023). Louse-host associations. International Society of Phthirapterists. Available at: <http://phthiraptera.myspecies.info> (Accessed December 10, 2023).
7. Price R., Hellenthal R., Palma R., Johnson K., Clayton D. (2003). The chewing lice: world checklist and biological overview. Illinois Natural History Survey, Illinois, USA.
8. Barker SC. Phylogeny and classification, origins, and evolution of host associations of lice. *Int J Parasitol.* (1994) 24:1285–91. doi: 10.1016/0020-7519(94)90195-3
9. Kaboli M., Aliabadian M., Tohidifar M., Hashemi A., Musavi S. B., Roselaar C. C. (2016). Atlas of birds of Iran. Department of Environment of Iran, Tehran, Iran.
10. Khaleghizadeh A., Roselaar C., Scott D. A., Tohidifar M., Mlíkovský J., Blair M., et al. (2017). Birds of Iran: annotated checklist of the species and subspecies. Iranian Research Institute of Plant Protection, Tehran, Iran.
11. Ardalan A. Mallophaga of Iran: new records. *Bull Soc Pathol Exot Fil.* (1971) 64:236–7.
12. Ardalan A. Mallophaga of Iran. II. 5 new records of Mallophaga from Iran. *Bull Soc Pathol Exotique.* (1975) 68:93–4.
13. Dik B, Halajian A. Chewing lice (Phthiraptera) of several species of wild birds in Iran, with new records. *J Arthropod Borne Dis.* (2013) 7:83–9.
14. Moodi B, Aliabadian M, Moshaverinia A, Kakhki OM. New data on the chewing lice (Phthiraptera) of passerine birds in East of Iran. *Sci Parasitol.* (2013) 14:63–8.
15. Ardalan A. (1972). "Notes on the Mallophaga of Iran" in *4th National Congress of Plant Medicine*. Tehran, Iran.
16. Ghaemi P., Roshanian S. (2009). "First report of *Trinoton* sp infestation in *Gyps fulvus* in Golestan National Park" in *1st National Congress of Veterinary Laboratory Sciences*, Tehran, Iran. pp. VETLAB01_32.
17. Ghaemi P., Roshanian S., Ghaemi P. (2010). "First report of *Trinoton* sp lice infestation in *Buteo rufinus* in Golestan province" in *16th Iranian Veterinary Congress*, Tehran, Iran. pp. THVC16_0485
18. Oormazdi H. (1958). Mallophaga of poultry in Tehran and outskirt. DVM Thesis. University of Tehran.
19. Youssefi MR, Asadi-Irayi M, Rezazadeh-Kalashami A, Mashayekhnia MJ, Roudaki-Sarvandani MR, Eslami-Amoli A. Study of endo- and ectoparasites of *Scolopax rusticola* in northern Iran. *J Vet Lab Res.* (2018) 10:166.
20. Tomás A, Palma RL, Rebelo MT, da Fonseca IP. Chewing lice (Phthiraptera) from wild birds in southern Portugal. *Parasitol Int.* (2016) 65:295–301. doi: 10.1016/j.parint.2016.02.007
21. Dik B, Erciyas-Yavuz K, Per E. Chewing lice (Phthiraptera: Amblycera, Ischnocera) on birds in the Kızılırmak delta, Turkey. *Rev Med Vet.* (2017) 167:53–62.
22. Clay T. Revisions of the genera of Mallophaga.—I. The *Rallicola*-complex. *Proc Zool Soc London.* (1953) 123:563–88. doi: 10.1111/j.1096-3642.1953.tb00188.x
23. Clay T. Revisions of Mallophaga genera. *Degeeriella* from the Falconiformes. *Bull Br Mus Nat Hist.* (1958) 7:123–207.
24. Clay T. A new species of *Strigiphilus* (Phlopteridae: Mallophaga). *Pacific Insects.* (1966) 8:835–47.
25. Dik B, Uslu U. *Strigiphilus strigis* (Mallophaga: Phlopteridae) in a Eurasian Eagle owl (*Bubo bubo interpositus*) in Turkey. *Türk Parazitol Derg.* (2007) 31:69–71.
26. Emerson K. A review of the genus *Rallicola* (Phlopteridae, Mallophaga) found on Aramidae, Psophiidae and Rallidae. *Ann Entomol Soc Am.* (1955) 48:284–99. doi: 10.1093/aesa/48.4.284
27. Gallego M, Martín Mateo M, Aguirre Y. Malofagos de rapaces Espanolas. II. Las especies del género *Craspedorrhynchus* Keler, 1938 parasitas de falconiformes, con descripción de tres especies nuevas. *EOS-Rev Esp Entomol.* (1987) 63:31–66.
28. Mey E. A new *Craspedorrhynchus* species (Phthiraptera, Ischnocera) from Australia, with an annotated checklist of this chewing louse genus. *Deutsch Entomol Zeitsch.* (2001) 48:117–32. doi: 10.1002/dez.200100012
29. Nelson RC, Price RD. The *Laemobothrion* (Mallophaga: Laemobothriidae) of the Falconiformes. *J Med Entomol.* (1965) 2:249–57. doi: 10.1093/jmedent/2.3.249
30. Price R. A new species of *Colpocephalum* (Phthiraptera) on Threskiornis (Aves) from Aldabra. *Syst Entomol.* (1976) 1:61–3. doi: 10.1111/j.1365-3113.1976.tb00031.x
31. Price RD, Beer JR. Species of *Colpocephalum* (Mallophaga: Menoponidae) parasitic upon the Falconiformes. *Can Entomol.* (1963) 95:731–63. doi: 10.4039/Ent95731-7
32. Rudow F. Charakteristik neuer Federlinge. *Zeitsch Gesam Naturwissensch.* (1866) 27:465–77.
33. Tandan B. Mallophaga from birds of the Indian subregion. Part VI Falcolipeurus Bedford. *Proc Roy Entomolog Soc London Ser B Taxon.* (1964) 33:173–80. doi: 10.1111/j.1365-3113.1964.tb01599.x
34. Tendeiro J. Études sur les mallophages. Sur quelques espèces et sous-espèces du genre *Nosopon* Hopkins (Amblycera, Menoponidae), parasites de Falconiformes. *Bolet Cult Guiné Portug.* (1959) 14:193–211.
35. Zlotorzycja J. Revision der europäischen Strigiphilini (Mallophaga, Strigiphilinae). Polskie pismo entomologiczne. *Bull Entomol Pologne.* (1974) 44:319–58.
36. GBIF.org (2023). Global Biodiversity Information Facility. Available at: <https://www.gbif.org> (Accessed December 10, 2023).
37. Azizi H, Adel M, Sayahi E, Moghadam AZ, Dehkordi AE, Hematzadeh M. *Laemobothrion maximum* (chewing lice) in Iranian golden eagles. *J Anim Poultry Sci.* (2013) 2:85–90.
38. Rak H, Anwar M, Niak A. The species of mallophaga in wild birds in Iran. *Bull Soc Pathol Exot Fil.* (1975) 68:588–91.
39. Alborzi A. R., Naddaf H. (2008). "First report of *Laemobothrion* (*Laemobothrion*) *maximum* (Scopoli, 1763) in Bonelli's eagle (*Hieraetus fasciatus*) from Khuzestan province—Iran" in *4th National Congress of Poultry Health and Diseases*, Shahrekord, Iran.
40. Ahooh MB, Hosseini SH, Mobedi I, Fathi S, Soltani M, Tolouei T. Parasites of wildlife birds in samples referred to the Iranian National Parasitology Museum (INPM). *Iran J Vet Med.* (2018) 12:20.
41. Rafiyi A, Alavi A, Rak H. Bird lice in Iran. *J Faculty Vet Med Univ Tehran.* (1968) 25:107–22.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fvets.2023.1324619/full#supplementary-material>

42. Shemshadi B, Ranjbar-Bahadori S, Delfan-Abazari M. Prevalence and intensity of parasitic infection in domestic ducks (*Anas platyrhynchos*) in Gilan Province, Northern Iran. *Comp Clin Pathol*. (2017) 26:165–7. doi: 10.1007/s00580-016-2361-7
43. Hosseini SH, Saifuri P, Eslami A, Nabieian S. Parasitic infections of graylag goose (*Anser anser*) in Gilan Province, Iran. *J Faculty Vet Med Univ Tehran*. (2001) 56:57–60.
44. Borji H, Moghaddas E, Razmi GR, Azad M. A survey of ecto-and endo-parasites of domestic pigeons (*Columba livia*) in Mashhad, Iran. *Iran J Vet Sci Technol*. (2013) 4:37–42. doi: 10.22067/VETERINARY.V4I2.3215
45. Radfar MH, Asl EN, Seghinsara HR, Dehaghi MM, Fathi S. Biodiversity and prevalence of parasites of domestic pigeons (*Columba livia domestica*) in a selected semiarid zone of South Khorasan, Iran. *Trop Anim Health Prod*. (2012) 44:225–9. doi: 10.1007/s11250-011-0002-3
46. Rezaei F, Hashemnia M, Chalechale A, Seidi S, Gholizadeh M. Prevalence of ectoparasites in free-range backyard chickens, domestic pigeons (*Columba livia domestica*) and turkeys of Kermanshah province, west of Iran. *J Parasit Dis*. (2016) 40:448–53. doi: 10.1007/s12639-014-0524-5
47. Chaechi-Nosrati MR, Eslami A, Rahbari S, Houshmand E, Yousefi A. The survey of parasitic infections of wild pigeons (*Columba livia*) in Lahijan city, Guilan, Iran. *Comp Clin Pathol*. (2018) 27:1405–8. doi: 10.1007/s00580-018-2779-1
48. Mahmoudian J. (2015). Investigation on external and internal parasites of wild pigeon (*Columba livia*) and dove (*Streptopelia senegalensis*). M.Sc. Thesis, Urmia University, Iran.
49. Nazarbeigy M., Halajian A., Yakhchali M. (2019). "Lice and Mites Infestation in Bee-Eaters (Aves: *Meropidae*) from Western Iran" in *4th International and 11th National Congress of Parasitology and Parasitic Diseases of Iran*, Urmia, Iranpp. 94.
50. Maghami G. External parasites of livestock in Iran. *Arch Razi Inst*. (1968) 20:81–3.
51. Vazirianzadeh B, Rahdar M, Molaee S. Mallophaga of domestic birds of Ahvaz. *Iran J Exp Zoo India*. (2007) 10:75–7.
52. Eslami A, Ghaemi P, Rahbari S. Parasitic infections of free-range chickens from Golestan Province, Iran. *Iran J Parasitol*. (2009) 3:10–4.
53. Hashemzadeh-Farhang H, Namdarian M, Shirazi S, Shahbazi P. Ectoparasites of local chickens from Tabriz county. *Iran Vet J*. (2009) 4:97–100.
54. Mamashly M, Ranjbar-Bahadori S, Safdari A, Aghaebrahimi-Samani R. Study on parasitic infections of native poultry in Golestan province. *J Comp Pathobiol*. (2010) 7:189–92.
55. Nazarbeigy M, Eslami A, Rahbari S. Study of parasitic infections of local chickens from Ilam county. *J Compar Pathobiol*. (2013) 10:907–12.
56. Ebrahimi M, Samiei K, Anousheh D, Razi Jalali M. Identification of ectoparasites in indigenous poultry in southern areas of West Azerbaijan, Iran: a study on the prevalence and importance of these parasites. *Arch Razi Instit*. (2016) 71:253–8. doi: 10.22034/ARI.2016.107510
57. Zakian N, Nayebzadeh H, Dezfoulian O, Aghaebrahimi-Samani R. Parasitic infection of local chickens from Lorestan province. *Iran Vet Res Biol Products*. (2016) 28:18–20. doi: 10.22092/VJ.2015.103025
58. Hossienzadeh Marzenaki J. Survey of ectoparasites in native poultry of Langroud city in 1395. *Q J Vet Histobiol*. (2017) 5:43–6.
59. Shamsi L, Samaeinasab S, Haghighatkah A. Prevalence of ectoparasites in free-ranging backyard chickens of Sabzevar city, Iran. *J Med Microbiol Infect Dis*. (2020) 8:124–19. doi: 10.29252/JoMMID.8.3.124
60. Rassouli M, Darvishi MM, Rosstami Lima SR. Ectoparasite (louse, mite and tick) infestations on female turkeys (Galliformes, Phasianidae. *Meleagris gallopavo*) in Iran. *J Parasit Dis*. (2016) 40:1226–9. doi: 10.1007/s12639-015-0657-1
61. Ganjali M, Keighobadi M, Hajjipour N. First report of new species of *Goniodes pavonis* (the chewing lice) from Indian Peacock in Iran. *J New Biol Rep*. (2015) 4:76–8.
62. Sadaghian M., Nouri M. (2014). "Grey partridge pediculosis case report" in *4th International Veterinary Poultry Congress*, Tehran, Iran, 231.
63. Imanibaran A. Report of chewing louse infestation *Philopterus ocellatus* (Mallophaga: Ischnocera) from Black Crows (*Corvus corone*) in Miandoab region, West Azerbaijan province in 2010. *J Vet Clin Pathol*. (2014) 8:604–11.
64. Mey E. Eine neue ausgestorbene vogel-Ischnozere von neuseeland, *Huiacola extinctus* (Insecta, Phthiraptera). *Zool Anz*. (1990) 224:49–73.
65. Rózsa L, Vas Z. Co-extinct and critically co-endangered species of parasitic lice, and conservation-induced extinction: should lice be reintroduced to their hosts? *Oryx*. (2015) 49:107–10. doi: 10.1017/S0030605313000628
66. IUCN (2020). The International Union for Conservation of Nature Red List of Threatened Species. International Union for Conservation of Nature.