

RESEARCH ARTICLE

Chewing Lice (Psocodea: Phthiraptera) Detected in Wild Birds in Hatay, Türkiye, a New Record of the *Colpocephalum ecaudati* Price and Beer from Black Kite (*Milvus migrans*)

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How to cite this article?

Zerek A, Erdem İ, Yaman M, Altuğ ME, Dik B: Chewing lice (Psocodea: Phthiraptera) detected in wild birds in Hatay, Türkiye, a new record of the *Colpocephalum ecaudati* price and beer from black kite (*Milvus migrans*). *Kafkas Univ Vet Fak Derg*, 30 (2): 201-205, 2024.
DOI: 10.9775/kvfd.2023.30713

Article ID: KVFD-2023-30713

Received: 18.09.2023

Accepted: 16.01.2024

Published Online: 22.01.2024

Abstract

This study was carried out to determine chewing lice species of the wild birds, which were brought to the Veterinary Health, Practice and Research Center and Wild Animal Rescue and Rehabilitation Center of Hatay Mustafa Kemal University, between May 2018-August 2022. For this purpose, 75 wild birds injured or sick, which needed medical treatment when they arrived at the hospital, were examined for chewing lice. A total of 356 lice specimens were collected, representing 148 males, 157 females and 51 nymphs. The majority of the bird lice collected (317 out of 356) belonged to Amlyceran suborder, while a small number of them (39 out of 356) were obtained in the Ischnoceran suborder. *Piagetiella titan* (47.8%) detected in *Pelecanus onocrotalus* was the most common louse species. This was followed by *Laemobothrion maximum* (16.0%) detected in *Clanga pomarina*, *Buteo rufinus*, *Circaetus gallicus*. *Ciconiphilus quadripustulatus* (16.0%), *Neophilopterus incompletus* (10.4%) and *Colpocephalum zebra* (7.3%) species were detected in *Ciconia ciconia*. Other species (*Colpocephalum ecaudati*, *Colpocephalum nanum*, *Pectinopygus forficulatus*) were in small numbers (2.5%). *Colpocephalum ecaudati* found on black kite (*Milvus migrans*) was reported for the first time in Türkiye. The results of this study contributed to the lice fauna obtained from wild birds in Türkiye.

Keywords: Chewing lice, Phthiraptera, Amblycera, Ischnocera, *Colpocephalum ecaudati*, Hatay, Türkiye

INTRODUCTION

There are approximately 5,000 known species of lice, the majority (90%) of which are ectoparasites of birds; the remaining (10%) are parasites of mammals ^[1]. Chewing lice (Ischnocera, Amblycera) consist of the egg, three nymphal stages and adult in the single host body. All stages are usually host specific and permanently ectoparasites that are common in bird species ^[2].

Although some species feed on blood, they feed mainly on feathers and dermal debris ^[3]. When lice are found in large numbers, they cause severe itching, weakness and loss of resistance, breakage and deterioration of feathers, negatively affecting the thermoregulation capacity, body mass, flight performance, metabolic rate, migration, grooming time, survival and sexual selection of birds ^[3-5]. Additionally, some chewing lice may transmit other parasites

to the birds, such as some filarial nematodes, and can also serve as vectors for some bacterial diseases ^[6]. *Piagetiella titan* (Piaget) can cause stomatitis in white pelicans ^[7].

Of the 4,000 bird species identified in the world ^[8], approximately 200 have been reported from 491 bird species ^[9] in Türkiye ^[3,9-20]. In some studies conducted worldwide, the incidence of chewing lice in wild birds was found between 10.8%-35% ^[6]. In some studies conducted in Türkiye, the incidence of chewing lice in wild birds was found to be 40.4% ^[21] and 41.4% ^[15]. However, it is believed that not all chewing lice found in birds in Türkiye can be detected, and additional data on the prevalence of chewing lice in wild birds in Türkiye are needed ^[16].

This study was carried out to determine chewing lice species of the wild birds which were brought to the Veterinary Health, Practice and Research Center and



Wild Animal Rescue and Rehabilitation Center of Hatay Mustafa Kemal University in Türkiye, between May 2018-August 2022.

MATERIALS AND METHODS

Ethical Approval

This study was approved by Hatay Mustafa Kemal University Animal Experiments Local Ethics Committee (Decision number: 2022/07-07) and Directorate of Nature Conservation and National Parks (12/09/2023-303651).

Study Area

Hatay (37-38°N, 32-35°E) is a 5,403-km² area of plains, rivers, streams and high mountains, which is bordered by Syria to the south and the east, and the Mediterranean sea to the west. The summers are hot (20-33°C) with high humidity whereas the winters are wet and mild (5-14°C).

Sampling Data

This study was carried out in 75 wild birds in Hatay Province in Türkiye. The birds were brought from Antakya (10), Kırıkhan (15), Samandağ (17), İskenderun (18), Dört Yol (11) and Reyhanlı (4) districts of Hatay. All of the birds examined in this study were injured and sick, which needed medical attention when they arrived at the hospital.

The identification of birds was conducted according to the guide developed by Heinzel et al. [22]. The naming of the birds was based on Gill et al. [23]. A total of 75 wild birds, consisting of three families (Ciconiidae,

Pelecanidae, Accipitridae) in three orders (Ciconiiformes, Pelecaniformes, Accipitriformes) were examined for chewing lice (Table 1).

All the birds were examined immediately following their arrival at the hospital. To sample of chewing lice, the feathers of each bird were examined visually, and then carefully rubbed. The lice detected on the wild birds were collected with a forceps and taken into 70% alcohol, and stored in the laboratory until microscopic examination. The protocols for each bird species and the collected lice from all of the infested birds were recorded.

At the laboratory, the lice specimens were cleared in 10% KOH, rinsed in distilled water, kept for 24 hours in each step in alcohol 70%, 80%, 90%, and 99%, and mounted in Canada balsam on slides. All mounted specimens were examined under trinocular stereo zoom microscope (Nikon SMZ745T) in accordance with the keys or original descriptions utilized by Price and Beer [24], Pilgrim [25], Clay [26], Clayton [27], Martín-Mateo [28], Mey [29] and Adams et al. [30]. Photographs were made using the Leica DM750 trinocular phase contrast microscope with DFC295 camera for all species except larger specimens for which stereomicroscope was used. They were deposited at the Parasitology Department of the Veterinary Faculty of Selçuk University in Konya, Türkiye.

Parasitism Rate Analysis

The prevalence of chewing lice was evaluated for bird families and bird species with a minimum of a single collected individual. The abundance mean and intensity

Table 1. Chewing lice (*Phthiraptera*) species detected in the examined wild bird species

No.	Hosts Order/Family/Species	Common Name	Suborder	Chewing Lice Species	%	Abundance					
						NI	M	F	N	T	MI
24	CICONIIFORMES Ciconiidae <i>Ciconia ciconia</i>	White stork	Amblycera Ischnocera Amblycera	<i>Ciconiphilus quadripustulatus</i>	16.0	7	12	41	4	57	8.1
				<i>Neophilopterus incompletus</i>	10.4	4	14	17	6	37	9.2
				<i>Colpocephalum zebra</i>	7.3	7	10	15	1	26	3.7
5	PELECANIFORMES Pelecanidae <i>Pelecanus onocrotalus</i>	Great white pelican	Amblycera Ischnocera	<i>Piagetiella titan</i>	47.8	3	100	54	16	170	56.6
				<i>Pectinopygus forficulatus</i>	0.6	1	1	1	0	2	2.0
6	ACCIPITRIFORMES Accipitridae <i>Buteo rufinus</i>	Long-legged buzzard	Amblycera Amblycera	<i>Laemobothrion maximum</i>	14.9	3	10	22	21	53	17.6
				<i>Colpocephalum nanum</i>	0.8	1	1	2	0	3	3.0
11	Accipitridae <i>Clanga pomarina</i>	Lesser Spotted eagle	Amblycera	<i>Laemobothrion maximum</i>	0.8	1	0	0	3	3	3.0
9	Accipitridae <i>Circaetus gallicus</i>	Short-toed snake eagle	Amblycera	<i>Laemobothrion maximum</i>	0.3	1	0	1	0	1	1.0
17	Accipitridae <i>Buteo buteo</i>	Common buzzard	-	-	-	0	0	0	0	0	0
3	Accipitridae <i>Milvus migrans</i>	Black kite	Amblycera	<i>Colpocephalum ecaudati</i> ^a	1.1	1	0	4	0	4	4.0
75	Total					29	148	157	51	356	12.2

No: Number of birds examined; NI: Number of birds infested; M: Male; F: Female; N: Nymph; T: Total, MI: Mean intensity; ^a New record for Türkiye

mean level of each species of chewing lice on the avian hosts were determined.

RESULTS

Twenty one (28%) of 75 birds examined were found to be infested with chewing lice. Eight chewing lice species; six amblyceran species in four genera: *Laemobothrion maximum* (Scopoli), *Ciconiphilus quadripustulatus* (Burmeister), *Piagetiella titan* (Piaget), *Colpocephalum zebra* (Burmeister), *Colpocephalum nanum* (Piaget) and *Colpocephalum ecaudati* (Price and Beer); and two ischnoceran species in two genera: *Neophilopterus incompletus* (Denny) and *Pectinopygus forficulatus* (Nitzsch) were detected. Fifteen (71.43%) of infested birds with one louse species, four (19.04%) with two lice species and two birds (9.52%) with three lice species were found to be infested.

A total of 356 lice specimens were collected, representing 148 males (41.57%), 157 females (44.10%) and 51 nymphs (14.32%). The majority of the lice (317 out of 356) were in the Amblyceran suborder, while a small number of them (39 out of 356) were in the Ischnoceran suborder.

Piagetiella titan (47.8%) detected in Great white pelican

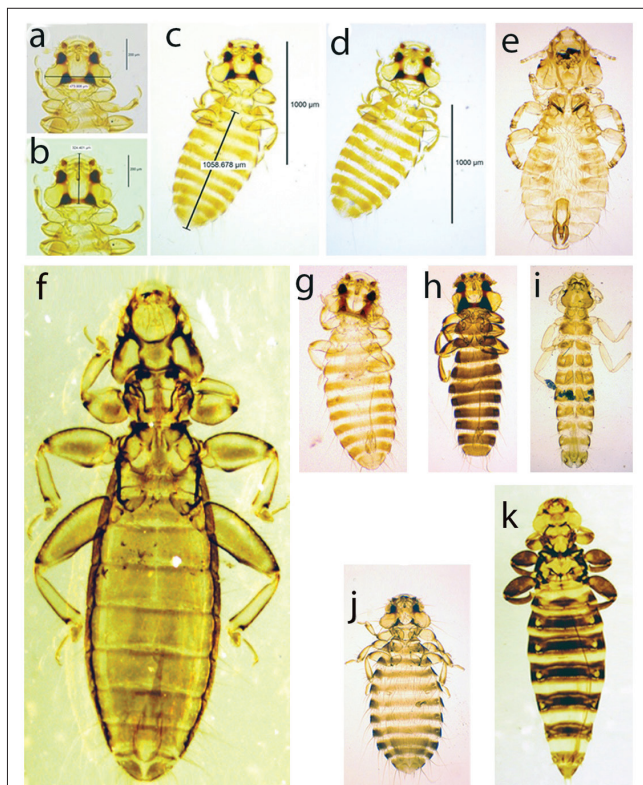


Fig 1. Chewing lice (Phthiraptera) species identified in this study, original. **a-d)** *Colpocephalum ecaudati*, female; **e)** *Neophilopterus incompletus*, male (40x magnification); **f)** *Laemobothrion maximum*, male; **g)** *Colpocephalum nanum*, male (40x magnification); **h)** *Colpocephalum zebra*, male (40x magnification); **i)** *Pectinopygus forficulatus*, male (25x magnification); **j)** *Ciconiphilus quadripustulatus*, female (40x magnification); **k)** *Piagetiella titan*, male

(*Pelecanus onocrotalus*) was the most abundant louse species. This was followed by *L. maximum* (16.0%) detected in *B. rufinus*, *C. pomarina*, *C. gallicus*. *Ciconiphilus quadripustulatus* (16.0%), *N. incompletus* (10.4%), and *C. zebra* (7.3%) detected in *C. ciconia*.

Other species (*C. ecaudati*, *C. nanum*, *P. forficulatus*) were identified in small numbers (2.5%). In addition, four female *C. ecaudati* (1.1%) specimens identified according to Price and Beer's description^[24] and found on one black kite (*Milvus migrans*) have been reported for the first time in Türkiye with this study (Table 1). The morphological characteristics of female *C. ecaudati* in this study are as follows; the head length is 0.32 mm; head width, 0.47 mm; thorax length, 0.34 mm; thorax width, 0.41 mm; abdomen length, 1.06 mm; abdomen width, 0.60 mm; and total length, 1.55 mm (Fig. 1).

DISCUSSION

Several studies on chewing lice species of wild birds have been conducted in recent years in Türkiye; however, the faunal composition of chewing lice of Turkish wild birds is still far from being understood^[3,9,16,17,19,20]. In the present study, it was conducted to determine the chewing lice species found on wild birds which were injured, sick or in need of medical attention in Hatay Province. In this study, the majority of the bird lice (317 out of 356) belonged to the suborder Amblycera (*C. quadripustulatus*, *C. zebra*, *C. nanum* and *C. ecaudati*, *L. maximum*, *P. titan*), while a small number of them (39 out of 356) were obtained in the Ischnoceran suborder (*N. incompletus*, *P. forficulatus*). Fifteen (71.43%) of 21 infested birds were infested with one louse species, four birds (19.05%) with two lice species and two birds (9.52%) with three lice species.

Ciconiphilus quadripustulatus (4.40-34.50%), *N. incompletus* (0.46-25.83%), *C. zebra* (0.23-93.63%) and *A. ciconiae* (0.86-20.06%) have been recorded on white stork previously in Türkiye^[3,12,15,18,31] and such countries as Algeria^[32,33], Romania^[34], Poland^[35] and Egypt^[36]. Twenty four white stork species were examined in this study, and the species of *C. quadripustulatus* (16.0%), *N. incompletus* (10.4%) and *C. zebra* (7.3%) were detected, yet *A. ciconiae* could not be found. According to the findings of the studies; *C. quadripustulatus*, *N. incompletus*, *C. zebra* were the most common lice species on white stork.

Piagetiella titan (1.01-63.00%), *P. forficulatus* (28.90-34.74%), and *C. eucarenum* (0.07-28.09%) in some studies have been recorded on great white pelican. Previous studies performed in Türkiye^[3,10,19,20,31,37] and such countries as Irak^[38], Iran^[39], Central Ciscaucasia^[40], and Romania^[41]. According to the findings of these studies; *P. titan*, *P. forficulatus* and *C. eucarenum* were the most common lice species on great white pelican. Five great white pelican

species were examined in this study, and *P. titan* (47.8%) was detected as common species. While *P. forficulatus* was found rarely (0.6%) on the infested pelicans, *C. eucarenum* could not be detected in this study.

Many well-known wild carnivorous birds such as the buzzards, eagles, snake-eagles, kites belong to the family of Accipitridae. In various studies conducted in the world and in Türkiye, there are six genera of chewing lice in this family that have been reported: the genera *Laemobothrion*, *Colpocephalum* and *Kurodaia* in the suborder Amblycera; and the genera *Craspedorrhynchus*, *Degeeriella*, *Falcolipeurus* in the subgenera Ischnocera. *Laemobothrion maximum* [3,10,13-15,17,36,41-46], *C. nanum* [3,13,15,17,36,44,45,47], *C. turbinatum* [42,45,48], *C. platystomus* [3,10,13-15,17,36,44,45,48], *D. fulva* [3,10,14,15,17,36,44,45,47,48], *D. leucopleura* [3,45], *D. nisus* [3,45], *K. fulvofasciata* [17,18,36,45], *F. quadripustulatus* [45] and *F. suturalis* [3,45] species have been reported in this family. While *L. maximum* (16.0%) was detected in 6 Long-legged buzzards (14.9%), 11 Lesser Spotted eagles (0.8%), and 9 Short-toed snake eagles (0.3%); *C. nanum* (0.8%) species were detected in 6 Long-legged buzzards examined in this study. In 17 Common buzzards examined, no lice species were found. *Colpocephalum turbinatum*, *C. platystomus*, *D. fulva*, *D. leucopleura*, *D. nisus*, *K. fulvofasciata*, *F. quadripustulatus*, and *F. suturalis* species could not be identified in this study.

In Türkiye, two lice species have been previously reported in *M. migrans*. These are *L. maximum* (one nymph) and *C. milvi* (one female) [15]. In this study, four female *C. ecaudati* (1.1%) specimens obtained from the one black kite (*M. migrans*) were reported for the first time in Türkiye.

In conclusion, a great number of wild birds were infested by numerous lice species in the world. In Türkiye, the number of studies on lice of wild birds has been steadily increasing in recent years. As a result of the studies, it was stated that the number approached approximately 200 with the species identified in later studies [19,20,49,50]. In this study, 356 lice specimens, mostly *P. titan*, *L. maximum*, *C. quadripustulatus*, *N. incompletus* and *C. zebra*, were found in wild bird species of *B. rufinus*, *C. pomarina*, *C. gallicus*, *C. ciconia*. Other species such as *C. ecaudati*, *C. nanum*, *P. forficulatus* were identified in small numbers. In addition, a louse species, *C. ecaudati*, which has not been reported in Türkiye until now, was found in *M. migrans* for the first time in Türkiye.

DECLARATIONS

Availability of Data and Materials: The datasets used and/or analyzed during the current study are available from the corresponding author (A. Zerek) on reasonable request.

Acknowledgments: We express our condolences to the relatives of the people who lost their lives in the devastating earthquakes that occurred in different provinces of Türkiye, including our sampling

area (Hatay), and convey our best wishes to all people affected by the earthquakes.

Funding Support: The authors declare that this study has received no funding support.

Competing Interests: The authors declare that there is no conflict of interest.

Authors' Contributions: A.Z., I.E., M.Y., M.E.A. contributed to the conception and design of the experiments. A.Z., I.E., M.Y., and M.E.A. performed sample collection. A.Z., I.E., M.Y., and B.D. were involved in data collection and analysis, and helped draft and review the manuscript. All of the authors read and approved the final manuscript.

REFERENCES

- Durden LA:** Lice (Phthiraptera). In, Samuel WM, Pybus MJ, Kocan AA (Eds): Parasitic Diseases of Wild Mammals. 2nd ed., 3-17, Iowa State University Press/Ames, Iowa, USA, 2001.
- Yılmaz AB, Azizoglu E, Adizel Ö:** Chewing louse species (Phthiraptera: Amblycera, Ischnocera) on roadkill wild birds in Van province: Five new species in Turkey. *Indian J Anim Res*, 56 (6): 724-729, 2022. DOI: 10.18805/IJAR.B-1405
- Girişgin AO, Dik B, Girişgin O:** Chewing lice (Phthiraptera) species of wild birds in northwestern Turkey with a new host record. *Int J Parasitol Parasites Wildl*, 2, 217-221, 2013. DOI: 10.1016/j.ijppaw.2013.07.001
- Tomás A, Palma RL, Rebelo MT, da Fonseca IP:** Chewing lice (Phthiraptera) from wild birds in southern Portugal. *Parasitol Int*, 65 (3): 295-301, 2016. DOI: 10.1016/j.parint.2016.02.007
- Ošlejšková L, Křištofik J, Trnka A, Sychra O:** An annotated checklist of chewing lice (Phthiraptera: Amblycera, Ischnocera) from Slovakia. *Zootaxa*, 5069 (1): 1-80, 2021. DOI: 10.11646/ZOOTAXA.5069.1.1
- Diakou A, Soares, JBPC, Alivizatos H, Panagiotopoulou M, Kazantzidis S, Literák I, Sychra O:** Chewing lice from wild birds in northern Greece. *Parasitol Int*, 66 (5): 699-706, 2017. DOI: 10.1016/j.parint.2017.07.003
- Dik B:** Erosive stomatitis in a white pelican (*Pelecanus onocrotalus*) caused by *Piagetiella titan* (Mallophaga: Menoponidae). *J Vet Med B*, 53, 153-154, 2006b. DOI: 10.1111/j.1439-0450.2006.00927.x
- Price RD, Hellenthal RA, Palma RL, Johnson KP, Clayton DH:** The chewing lice: World checklist and biological overview. Illinois Natural History Survey Special Publication, Illinois, 2003.
- Açııcı M, Erciyas Yavuz K, Gürler T, Eren G, Tuygun T, Koç Ö, Bölükbaş CS, Umur Ş:** Kızılırmak deltası kuşlarının bitleri üzerine çalışmalar: Türkiye bit faunası için yeni bildirimler. *Uluslararası 22. Parazitoloji Kongresi*, Didim, Aydın, 11-15 Ekim, 2021.
- Dik B:** Mallophaga species on long-legged buzzards (*Buteo rufinus*): New records from Turkey. *Türkiye Parazitol Derg*, 30 (3): 226-230, 2006.
- Dik B, Uslu U:** Konya'da halkalı sülünlerde (*Phasianus colchicus*) *Cuclotogaster heterographus* (Mallophaga: Lipeuridae) enfestasyonu. *Türkiye Parazitol Derg*, 30 (2): 125-127, 2006.
- Dik B, Uslu U:** Beyaz leyleklerde (*Ciconia ciconia* Linnaeus, 1758) görülen *Mallophaga* (Insecta) türleri. *Türkiye Parazitol Derg*, 30 (3): 220-225, 2006.
- Dik B, Aydenizöz Özkayhan M:** Mallophaga species on longlegged buzzards (*Buteo rufinus*) in Turkey. *Türkiye Parazitol Derg*, 31 (4): 298-301, 2007.
- Dik B, Uslu U:** Konya Hayvanat Bahçesi'ndeki kanatlı hayvanlarda görülen çiğneyici bit (Phthiraptera: Amblycera, Ischnocera) türleri. *Türkiye Parazitol Derg*, 33 (1): 43-49, 2009.
- İnci A, Dik B, Kibar M, Yıldırım A, Düzlü O:** Chewing lice (Phthiraptera) species on wild birds in the Cappadocia region. *Türkiye Parazitol Derg*, 34, 174-178, 2010.
- Dik B, Kirpik MA, Şekercioğlu ÇH, Şaşmaz Y:** Chewing lice (Phthiraptera) found on songbirds (Passeriformes) in Turkey. *Türkiye*

Parazitol Derg. 35, 34-39, 2011.

17. **Dik B, Per E, Yavuz KE, Yamaç E:** Chewing lice (Phthiraptera: Amblycera, Ischnocera) species found on birds in Turkey, with new records and a new host association. *Turk J Zool*, 39 (5): 790-798, 2015. DOI: 10.3906/zoo-1411-45
18. **Göz Y, Dik B, Oruç Kılıç Ö, Yılmaz AB, Aslan L:** Chewing lice (Phthiraptera: Amblycera, Ischnocera) on several species of wild birds around the Lake Van Basin, Van, eastern Turkey. *Kafkas Univ Vet Fak Derg.* 21 (3): 333-338, 2015. DOI: 10.9775/kvfd.2014.12484
19. **Dik B, Hügül F, Ceylan O:** Chewing lice (Phthiraptera: Amblycera, Ischnocera) of some aquatic birds in Konya province, Turkey, new records for Turkish fauna. *Ankara Üniv Vet Fak Derg.* 64, 307-312, 2017. DOI: 10.1501/Vetfak_0000002814
20. **Eren G, Özkoç ÖÜ, Açıç M:** Contribution to the knowledge of the diversity of the chewing lice fauna in Turkey. *Turk J Zool*, 46 (6): 444-455, 2022. DOI: 10.55730/1300-0179.3099
21. **Girişgin O, Girişgin A, Cimenlikaya N, Saygin B:** A survey of the ectoparasites found on wild birds in Northwest Turkey. *Indian J Anim Res*, 57 (8): 1059-1065, 2023. DOI: 10.18805/ijar.bf-1474
22. **Heinzel H, Fitter R, Parslow J:** Pocket guide to birds of Britain and Europe with North Africa and the Middle East. Harper Collins Publishers Ltd., UK, 1995.
23. **Gill F, Donsker D, Rasmussen P (Eds):** IOC World Bird List (v13.1). <https://www.worldbirdnames.org/new/ioc-lists/crossref/>. Accessed: 28.08.2023.
24. **Price RD, Beer JR:** Species of *Colpocephalum* (Mallophaga: Menoponidae) parasitic upon the Falconiformes. *Can Entomol*, 95 (7): 731-763, 1963.
25. **Pilgrim RIC:** Mallophaga on the Rock Pigeon (*Columba livia*) in New Zealand, with a key to their identification. *N Z Entomol*, 6, 160-164, 1976.
26. **Clay T:** The *Strigiphilus cursitans* Group (Phthiraptera: Insecta). Rec Queen Victoria Mus, Launceston, 1-4, 1977.
27. **Clayton DH:** Host specificity of *Strigiphilus* owl lice (Ischnocera: Philopteridae), with the description of new species and host associations. *J Med Entomol*, 27, 257-265, 1990. DOI: 10.1093/jmedent/27.3.257
28. **Martín-Mateo MP:** Phthiraptera from *Platalea leucorodia* L. (Aves: Ciconiiformes: Threskiornithidae) in Spain. *Res Rev Parasitol*, 54, 109-115, 1994.
29. **Mey E:** Zur Taxonomie, Lebensweise und parasitophyletischen Evidenz der Federlingsgattung *Struthiolipeurus sensu lato* (Insecta, Phthiraptera, Ischnocera). *Mitt Mus Natkd Berl Zool Reihe*, 74, 65-93, 1998.
30. **Adams RJ, Price RD, Clayton DH:** Taxonomic revision of old world members of the feather louse genus *Columbicola* (Phthiraptera: Ischnocera), including descriptions of eight new species. *J Nat Hist*, 39, 3545-3618, 2005. DOI: 10.1080/00222930500393368
31. **Dik B, Kandir EH:** Ectoparasites in some wild birds (Aves) in Turkey. *Prog Nutr*, 23 (2):e2021261, 2021. DOI: 10.23751/pn.v23iS2.11919
32. **Bouguessa-Cherik L, Doumandji S, Messaoud SO, Marniche F:** Insect ectoparasites on the white stork, *Ciconia ciconia* (L.) (Ciconiiformes: Ciconiidae), during the breeding period in the extreme east of Algeria. *Oltenia Studii și comunicări. Științele Naturii*, 33 (2): 72-78, 2017.
33. **Touati L, Athamnia M, Nedjah R, Boucheker A, Samraoui F, El-Serehy HA, Samraoui B:** Composition and distribution on a host of avian lice of white storks in North-Eastern Algeria. *Diversity*, 14 (2):77, 2022. DOI: 10.3390/d14020077
34. **Adam C:** Data on the chewing louse fauna (Phthiraptera: Amblycera, Ischnocera) from some Romanian autochthonous and exotic birds. *Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa"*, 50, 145-210, 2007.
35. **Fryderyk S, Izdebska JN:** Chewing Lice (Insecta, Phthiraptera) of the White Stork (*Ciconia ciconia* L.) in Poland. *Ann Univ Mariae Curie Sk*, 64 (2): 83-85, 2009. DOI: 10.2478/v10067-010-0017-6
36. **Riad SA:** Ectoparasites associated with migratory birds, Eastern Desert, Red Sea, Egypt. *Egypt Acad J Biol Sci B Zool*, 14 (2): 19-33, 2022. DOI: 10.21608/eajbsz.2022.249312
37. **Dik B, Uslu U:** The first recording of *Piagetiella titan* (Menoponidae: Mallophaga) on a white pelican (*Pelecanus onocrotalus*, Linnaeus) in Turkey. *Türkiye Parazitol Derg.* 30 (2): 128-131, 2006.
38. **Mohammad ZA:** Some chewing lice (Phthiraptera) species as ectoparasites infested aquatic birds with a new record of three species from Al-Sanaf marsh/southern Iraq. *Iraqi J Vet Sci*, 34 (1): 173-180, 2020. DOI: 10.33899/IJVS.2019.125721.1139
39. **Tavassoli M, Salmazadeh R, Jabbari H:** Infestations of *Piagetiella titan* (Menoponidae: Mallophaga) on juvenile white pelicans (*Pelecanus nocrotalus*, L.) in Urmia Lake National Park, northwest Iran. *Int J Vet Res*, 5 (2): 105-108, 2011.
40. **Lyakhova OM, Kotti BC:** Chewing lice (Mallophaga: Insecta) of birds in the Central Ciscaucasia. *Entomol Rev*, 91, 367-376, 2011.
41. **Rékási J, Kiss JB:** New data on the lice (Phthiraptera) of some birds in Northern Dobrogea (Romania). *Acrocephalus*, 27 (130/131): 139-145, 2006.
42. **Saxena AK:** Population characteristics of black kite lice. *J Parasit Dis*, 41 (3): 684-686, 2017. DOI: 10.1007/s12639-016-0866-2
43. **Anand KM, Meghna P, Silambarasan R, Navas S, Latha BR:** A report on the occurrence of *Laemobothrion maximum* in black kites (*Milvus migrans*). *J Vet Parasitol*, 33 (2): 50-52, 2019. DOI: 10.5958/0974-0813.2019.00020.2
44. **Yosef R, Strutzer O, Tabibi R, Rózsa L:** Infestations of lice of steppe buzzards (*Buteo buteo vulpinus*) differ from those of common buzzards (*Buteo buteo buteo*). *J Raptor Res*, 53 (1): 102-108, 2019. DOI: 10.3356/JRR-18-21
45. **Dik B, Naz S, Sajid MS:** Data on the chewing lice (phthiraptera) parasitizing the accipitrid birds (accipitriformes) in Turkey. *J Anim Health Prod*, 10 (4): 443-453, 2022.
46. **Adly E, Gustafsson DR, Nasser M, Baeshen R, Kamal M:** Host-parasite associations and new records of chewing lice (Phthiraptera: Amblycera, Ischnocera) from raptors (Accipitriformes, Falconiformes, Strigiformes) encountered in Egypt. *J Entomol Sci*, 57 (3): 394-410, 2022. DOI: 10.18474/JES21-75
47. **Adam C, Chisamera G, Daróczi SJ, Sándor AD, Gogu-Bogdan M:** Data on the chewing louse fauna (Phthiraptera: Amblycera, Ischnocera) from some wild and domestic birds of Romania. *Travaux du Muséum National d'Histoire naturelle "Grigore Antipa"*, 52, 177-232, 2009.
48. **Gherardi R, D'Agostino C, Perrucci S:** Lice, flies, mites, and ticks on raptors (Accipitriformes, Falconiformes and Strigiformes) in rescue centers in Central Italy. *Parasitologia*, 1 (2): 61-68, 2021. DOI: 10.3390/parasitologia1020008
49. **Yamaç E, Dik B, Cavus M:** The environment and host effects on chewing lice prevalence, richness, and abundance on birds in Turkey. *Ornithol Res*, 31, 193-206, 2023. DOI: 10.1007/s43388-023-00133-5
50. **Dik B, Yamaç E, Uslu U:** Studies on chewing lice (Phthiraptera: Amblycera, Ischnocera) species from domestic and wild birds in Turkey. *Kafkas Univ Vet Fak Derg.* 19 (4): 553-560, 2013. DOI: 10.9775/kvfd.2012.8207

