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Original article

# Ectoparasites in Some Wild Birds (Aves) in Turkey

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**Abstract.** *Study Objectives:* Ectoparasites, such as chewing lice, fleas, ticks, mites, etc. can infest domestic and wild birds; and they cause irritation, anorexia, allergic reactions, decrease in animal products, and may transmit some parasitic, rickettsial, and viral diseases to birds. This study was performed to detect ectoparasites on wild birds in the Wildlife Rescue Rehabilitation Practice Application and Research Center of Kocatepe University in Afyon (AKUREM). *Methods*: In this study, we performed to detect ectoparasites on wild birds between April 2018-2021. In this period, 79 injured or dead wild birds were macroscopically examined for ectoparasites. The ectoparasites collected from the birds were preserved in 70% ethanol, and they were identified to species in the microscopical examination. *Results:* In a total of 28 ectoparasite species, twenty-one lice, three ticks, two maggots, one hippoboscid fly, and one mite species were detected on the birds. In this study, *Upupicola upupae* (Schrank, 1803) was detected in Eurasian hoopoe for the first time in Turkey. *Conclusion:* It was concluded that wildlife rehabilitation centers could be suitable units to provide new findings if applied systematically in ectoparasitary studies.

**Key words:** Chewing lice, Ischnocera, Amblycera, Phthiraptera, *Lucilia sericata*, *Calliphora vicina*, *Pseudolynchia canariensis*, *Ixodes frontalis*, *Ornithonyssus bursa*

## Introduction

Turkey is a rich country in terms of biological diversity. Many wildlife animals are injured in nature due to restriction of habitats, injuries by firearms, car hit, receiving electric shocks, and poisoning. One of the ways to protect nature life is to cure injured animals and release them back to nature. In accordance with this purpose, Afyon Kocatepe University Wildlife Rescue, Rehabilitation, Training, Practice, and Research Center (AKUREM) came into operation in 2017 in the city center of Afyonkarahisar in order to support poor, sick, injured, or orphan animals in wildlife. Approximately 500 bird species have been detected in Turkey (1). Domestic and wild birds can be infested with chewing lice, fleas, bugs, ticks, mites, etc, especially chewing lice and feather mites, and some other mite species, ticks, and some flies in their larval or adult stages parasitizing on domestic and wild birds. These ectoparasites cause irritation, anorexia, allergic reactions, decrease in animal products, myiasis, and may transmit some parasitic, bacterial, rickettsial, and viral diseases to birds (2-21). In Turkey, studies on ectoparasites of wild birds have concentrated especially on chewing lice (7, 8, 22-42) and partly hippoboscid flies (10, 11, 43, 44) and mites (23, 45-47). While there were some data on tick species of birds (3, 13), no detailed study could be seen apart from the systematic ones carried out around the Kızılırmak delta (15, 48). This study was performed to detect ectoparasites of wild birds in AKÜREM, Turkey.

## Materials and Methods

This study was performed on injured or dead birds admitted to AKUREM between April 2018-2021. Between these dates, several hundred bird samples brought to the center, out of 79, belonging to the 14 bird species in 10 orders were examined for ectoparasites. In this study, the first 20-30 injured or dead birds were examined systematically by the first author of the paper, together with volunteer students of the Veterinary Faculty of Afyon Kocatepe University. The remaining injured birds were examined macroscopically by the voluntary students. The birds were examined macroscopically in terms of ectoparasites by spacing their feathers and oral cavities of pelicans were also examined in terms of a chewing lice, *Piagetiella titan* (Piaget, 1880). Ectoparasites were collected with pliers, taken into tubes containing 70% alcohol, and sent to Selçuk University Veterinary Faculty Parasitology Department lab for identification. The lice, maggots, and mites were transferred from 70% alcohol to 10% potassium hydroxide (KOH) solution, kept for 24-48 hours until they became transparent, washed with distilled water, passed through 70-99% series of alcohol, and mounted to slides by Canada balsam. They were examined with Leica DM 750 trinocular phase-contrast microscope, while the ticks and adult flies were examined with a Nikon SMZ745 stereo zoom microscope. Gill et al. (49) were followed in taxonomy and nomenclature of birds (49) and diagnosis of birds was performed by an expert ornithologist. In the identification of ectoparasites, our own experiences were useful as well as other sources on the topic, such as Clay (50), Clayton (51), Nelson and Price (52), Price and Beer (53), Price et al (54) in the identification of lice, Bequaert (55), Hutson (56) in diagnosing in the identification of *Pseudolynchia canariensis* (Macquart, 1839), Estrada-Peña et al (57, 58), Pfäffle et al (59) in the identification of ticks, Zumpt (21) in the identification of larvae of Diptera, and Bhowmick et al (60) and Takehara et al (61) in the identification of *Ornithonyssus bursa* (Berlese, 1888).

### *Statistical Analysis*

Frequency and percentage analyses from descriptive statistics were used in the analysis of the data. Statistical analyzes were performed with the help of SPSS program.

## Results

As can be understood from Table 1, in this study, 30 (38.0%) bird samples belonging to Accipitriformes at most and 22 (27.8%) samples in Pelecaniformes orders were examined.

Again as can be seen in this table, the most common species of ectoparasites (eight species) were encountered in long-legged buzzards and common buzzards with five species and white pelican and white stork with four species followed.

Taxonomic status and common names of the ectoparasites detected in this study were given in Table 2. In this study, chewing lice were most commonly seen and 21 chewing lice species were detected as 11 Ambylceran and 10 Ischnoceran in infested birds. *Laemobothrion maximum* (Scopoli, 1763) was more common in long-legged and common buzzards while *Colpocephalum nanum* Piaget, 1890 and *Degeeriella. fulva* (Giebel, 1874) were found in greater numbers in infested buzzards.

While *Pi. titan* was the most common species in white pelicans, *Pectinopygus forficulatus* (Nitzsch [In Giebel], 1866) and *Colpocephalum eucarenum* (Burmeister, 1874) was encountered in lower rates and numbers. *Neophilopterus incompletus* (Denny, 1842) was the most common louse species in white storks, whereas only one sample of *Ardeicola ciconiae* (Linnaeus, 1758) could be detected. In the other bird species, so few lice species and samples could be found. Traumatic myiasis was seen in two of 22 long-legged buzzards examined in this study and the etiological agent was detected as *Calliphora vicina* (Robineau-Desvoidy, 1830) in one of the cases and *Lucilia sericata* (Meigen, 1826) in the other. In addition, traumatic myiasis was detected in a short-toed eagle due to *Calliphora* spp (L3) and in a white pelican caused by *Lucilia* spp (L2), however, identification for species of larva could not be performed. As can be seen in Table 1, in this study, ticks were found in only birds of Accipitriformes order, and one male *Haemaphysalis parva* (Neumann, 1897) was seen in

**Table 1.** Bird species examined and detected ectoparasite species in this study

| No | Bird order (n) | Bird species (Scientific name) (n) | Ectoparasite species |
|---|---|---|---|
| 1. | Accipitriformes (30) | Long-legged buzzard (*Buteo rufinus*) (22) | *Colpocephalum nanum*<br>*Kurodaia fulvofasciata*<br>*Laemobothrion maximum*<br>*Craspedorrhynchus platystomus*<br>*Degeeriella fulva*<br>*Calliphora vicina*<br>*Lucilia sericata*<br>*Hyalomma* spp. |
| | | Common buzzard (*Buteo buteo*) (5) | *Colpocephalum nanum*<br>*Kurodaia fulvofasciata*<br>*Laemobothrion maximum*<br>*Degeeriella fulva*<br>*Haemaphysalis parva* |
| | | Short-toed snake eagle (*Circaetus gallicus*) (2) | *Ixodes* spp.<br>*Calliphora* spp. |
| | | Northern harrier (*Circus cyaneus*) (1) | *Ixodes frontalis* |
| 2. | Pelecaniformes (22) | White Pelican (*Pelecanus onocrotalus)* (22) | *Colpocephalum eucarenum*<br>*Piagetiella titan*<br>*Pectinopygus forficulatus*<br>*Lucilia* spp. |
| 3. | Falconiformes (4) | Lesser kestrel (*Falco tinnunculus*) (3) | *Laemobothrion tinnunculi*<br>*Degeeriella rufa* |
| | | Eurasian sparrowhawk (*Accipiter nisus*) (1) | - |
| 4. | Strigiformes (3) | Long-eared owl (*Asio otus*) (3) | *Degeeriella fulva* (contamination?)<br>*Ornithonyssus bursa* |
| 5. | Ciconiiformes (9) | White stork (*Ciconia ciconia*) (9) | *Ciconiphilus quadripustulatus*<br>*Colpocepahlum zebra*<br>*Neophilopterus incompletus*<br>*Ardeicola ciconiae* |
| 6. | Bucerotiformes (1) | Eurasian hoopoe (*Upupa epops*) (1) | *Upipicola upupae* |
| 7. | Columbiformes (7) | Rock dove (*Columba livia*) (7) | *Pseudolynchia canariensis* |
| 8. | Cuculiformes (1) | Cuckoo (*Cuculus canorus*) (1) | *Cuculiphilus fasciatus* |
| 9. | Coraciiformes (1) | Bee-eater (*Merops apiaster*) (1) | *Meropoecus meropis*<br>*Meromenopon meropis* |
| 10. | Phoenicopteriformes (1) | Greater Flamingo *Phoenicopterus roseus* (1) | *Anaticola phoenicopteri*<br>*Colpocephalum heterosoma*<br>*Trinoton femoratum* |
| Total | 79 | 79 | |

one common buzzard, one female *Ixodes frontalis* (Panzer, 1798) in one northern Harrier, four *Hyalomma* spp nymphs in one long-legged buzzard and seven *Ixodes* spp nymphs in one short-toed snake eagle. In the study, one female *O. bursa* was detected in only one Long-eared owl.

**Table 2.** Taxonomy and common names of ectoparasites detected in this study

| Class | Order | Common name | Sub order or Family | Ectoparasite species |
|---|---|---|---|---|
| Insecta | Phthiraptera | Chewing lice | Amblycera | *Ciconiphilus quadripustulatus*<br>*Colpocephalum eucarenum*<br>*Colpocephalum heterosoma*<br>*Colpocephalum nanum*<br>*Colpocepahlum zebra*<br>*Kurodaia fulvofasciata*<br>*Laemobothrion maximum*<br>*Laemobothrion tinnunculi*<br>*Meromenopon meropis*<br>*Piagetiella titan*<br>*Trinoton femoratum* |
| | | | Ischnocera | *Anaticola phoenicopteri*<br>*Ardeicola ciconiae*<br>*Craspedorrhynchus platystomus*<br>*Cuculiphilus fasciatus*<br>*Degeeriella fulva*<br>*Degeeriella rufa*<br>*Meropoecus meropis*<br>*Neophilopterus incompletus*<br>*Pectinopygus forficulatus*<br>*Upipicola upupae* |
| | Diptera | Flies | Calliphoridae | *Calliphora vicina* (third instar larva)<br>*Calliphora* spp. (third instar larva)<br>*Lucilia sericata* (third instar larva)<br>*Lucilia* spp. (second instar larva) |
| | | | Hippoboscidae | *Pseudolynchia canariensis* |
| Arachnida | Ixodida | Ticks | Ixodidae | *Haemaphysalis parva*<br>*Hyalomma* spp.<br>*Ixodes frontalis*<br>*Ixodes* spp. |
| | Mesostigmata | Mites | Macronyssidae | *Ornithonyssus bursa* |

## Discussion and Conclusion

During the studies carried out so far, more than half of nearly 500 bird species in Turkey have been examined in terms of especially lice, mites, and/or ticks. Ectoparasites were detected in some of these birds while they could not be found in others. Seventy-nine of several hundred injured wild birds brought to AKUREM (some of them died there) between April 2018-2021 were examined for ectoparasites in this study. It was observed that almost all of the birds were infested with chewing lice, and 21chewing lice species were identified. In addition to this, two maggots, *C. vicina* and *L. sericata*, one hippoboscid fly, *Ps. canariensis*, three ticks species, *Ha. parva, Hyalomma* spp, *I. frontalis*, and one mite species, *O. bursa* were detected on the infested birds. Lice infestations are frequently seen in wild birds. In the studies performed in Turkey, lice were seen commonly in birds of especially Accipitriformes, Pelecaniformes, Anseriformes, Ciconiiformes, and Strigiformes orders, yet lice infestation was found at lower rates in smaller birds of Passeriformes order (7, 38, 39). In this study, birds of Accipitriformes, Falconiformes, and Pelecaniformes orders, generally found as injured and brought to AKUREM, were examined, however, no passerine birds could be brought to AKUREM since they were so small and were found dead most of the time, therefore no bird sample of Passeriformes order could be examined in the study. *Colp. nanum, Kurodaia fulvofasciata* (Piaget,

1880), *L. maximum, D. fulva, Craspedorrhynchus platystomus* (Burmeister, 1838) species, previously declared as long-legged and common buzzards in the studies carried out in Turkey (24, 25, 27, 30, 37, 40- 42) and various countries (52 - 54, 62- 66) were also encountered in this study. In this study, *L. maximum* was identified more than *K. fulvofasciata* by volunteer students since it is approximately 1 cm in size and can be easily seen on the buzzard. However, *K. fulvofasciata* is a more common species than *L. maximum*. As other species were really small, students probably missed them and the collected samples were obtained during the systematic examination of the birds while the first author was lecturing the students. This condition is also valid for possible lice and mites in the other bird species. The fact that *D. fulva*, normally living in Long-legged buzzards and Common buzzards, was encountered in long-eared owls in this study was probably a result of contamination. Lice infestations are frequently seen in pigeons (10, 25, 34, 39, 44, 67- 72). During the studies in Turkey, *Columbicola columbae* (Linnaeus, 1758) was considered the most common species in Rock pigeons (*Columba livia*) and *Campanulotes compar* (Burmeister, 1838) (this species was reported as *Goniodes bidentatus* or *Goniocotes bidentatus* in some papers), *Hohorstiella lata* (Piaget, 1880) (this species was reported as *Menopon gallinae* or *Menopon latum* in some papers) and *Coloceras israelensis* (Tendeiro, 1974) were also reported (10, 37, 44, 72, 73). No louse could be seen in any of those seven Rock pigeons examined in this study. Why could not be detected *Colu. columbae* or any of the other species commonly detected in previous studies in Turkey, the possible reason, the pigeons were not examined carefully and lice and possible mites were too small to see as mentioned above.

Three lice species, *Colp. eucarenum, Pi. titan, Pe. forficulatus*, were detected in white pelicans and all these species were previously reported in white pelicans in Turkey (29). *Pi. titan* lives in the oral cavity of white pelicans and might cause erosive stomatitis (74). In this study, especially *Pi. titan* was encountered frequently, yet *Pe. forficulatus* and *Col. eucarenum* were seen less frequently. This condition appeared just because voluntary students were told that lice could be present in oral cavities of pelicans, therefore these oral cavities must be examined, all pelicans examined must first be studied in their oral cavities, and a quite large species, *Pi. titan* could easily be seen. On the other hand, as in the other birds, other species were less encountered since the feathers of the white pelicans were not examined carefully by the students. In previous studies, *Anaticola phoenicopteri* (Coinde, 1859), *Colpocephalum heterosoma* Piaget, 1880 and *Trinoton femoratum* Piaget, 1880 detected in Greater flamingo (as *Phoneicopterus ruber*) (75), *Ardeicola ciconiae* (Linnaeus, 1758), *Ciconiphilus quadripustulatus* (Burmeister, 1838), *Colpocephalum zebra* (Burmeister, 1838) and *Neophilopterus incompletus* (Denny, 1842) detected in white storks (*Ciconia ciconia*) (28), *Laemobothrion tinnunculi* (Linnaeus, 1758) and *Degeeriella rufa* (Burmeister, 1838) detected in Lesser kestrel (*Falco tinnunculus*) (41, 76), *Cuculiphilus fasciatus* (Scopoli, 1763) detected in Cuckoo (*Cuculus canorus*) (7, 39), *Meropoecus meropis* (Denny, 1842) and *Meromenopon meropis* Clay and Meinertzhagen, 1941 (39, 41, 75) detected in Bee-eater were also seen in this study. In addition, in a previous study (7), *Menacanthus fertilis* (Nitzsch, 1866) detected in Eurasian hoopoe (*Upupa epops*) was not seen in this study; yet *Upupicola upupae* (Schrank, 1803) was found in a Eurasian hoopoe examined, and therefore this species was recorded for the first time in Turkey.

Catts and Mullen (77) stated that myiasis was the invasion of living vertebrates by fly larvae that can or cannot be related to feeding on the tissues of the host. According to Zumpt (21), myiasis is an infestation of live humans and vertebrate animals with dipterous larvae which, at least for a certain period, feed on the host's dead or living tissue, liquid substances, or ingested food. Etiologic agents causing traumatic myiasis in birds were reported to be in Calliphoridae and Sarcophagidae families flies causing traumatic myiasis in birds were summarized in Table 1 and traumatic myiasis agents in birds of Accipitriformes, Falconiformes, and Strigiformes orders was considered as *L. sericata* (78). In the same table, the case of myiasis caused by *Challiphora* sp. in Peregrine falcon (*Falco peregrinus*) *was emphasized.* In Turkey, many presentations were performed on myiasis cases belonging to many species of flies that cause myiasis in humans and mammals, however, in general, *Wohlfahrtia magnifica* (Schiner, 1862) and *L. sericata* were stated as the dominant ones

(6). In the same study (6), traumatic myiasis cases due to *L. sericata* in Carrion crow (*Corvus corone*) and a long-legged buzzard were reported. In this study, since many of the examined birds were injured, some of them showed traumatic myiasis cases, traumatic myiasis was found in two of 22 long-legged buzzards and the etiological agent was stated as *Challiphora vicina* Robineau-Desvoidy, 1830 in one case and *L. sericata* in the other. The third instar larvae of *Calliphora* spp obtained from Harrier eagle and the second instar larvae of *Lucilia* spp obtained from white pelican could not be identified at the species level.

Hippoboscid flies are occasionally seen in birds, but frequently in pigeons. *Ps. canariensis* is commonly seen in pigeons (10, 11, 44), and occasionally in some other bird species (43). In performed studies in Turkey, the prevalence of *Ps. canariensis* in pigeons was found as between 17.8% and 36.59% (10, 11, 44). In the current study, only *Ps. canariensis* was detected as ectoparasite in all of seven pigeons examined.

So far, around 900 tick species have been identified all over the world (79). Ticks act as vectors against many viral, rickettsial, and parasitary diseases (3, 12-15, 18, 20, 48, 57). The adults of many tick species in the family Ixodidae become parasitic usually in mammals, and their larvae and nymphs live in birds, reptiles, and mammals (13). In the studies in various countries of Europe, *Argas persicus* (Oken, 1818), *Argas reflexus* (Fabricius, 1794), *Dermacentor marginatus* (Sulzer, 1776), *Haemaphysalis punctata* Canestrini and Fanzago, 1874, *Ha. parva*, *Hyalomma aegypticum* (Linnaeus, 1758), *Hyalomma marginatum marginatum* Koch, 1844, *Ixodes acuminatus* Neumann, 1901, *I. frontalis*, *Ixodes redikorzevi* Olenev, 1927, *Ixodes ricinus* (Linnaeus, 1758), *Ixodes ventalloi* Gil Collado, 1936, *Rhipicephalus turanicus* Pomerantzev, 1940 were reported in the wild birds (5, 12, 20, 80). In Turkey, 49 tick species have been recorded so far (15). *Amblyomma* spp., *Der. marginatus*, *Haemaphysalis concinna* Koch, 1844, *Ha. punctata*, *Haemaphysalis sulcata* Canestrini and Fanzago, 1877, *Hy. marginatum* gr, *Hyalomma* spp, *Ixodes eldaricus* Djaparidze, 1950, *Ixodes festai* Tonelli-Rondelli, 1926, *I. frontalis*, *I. redikorzevi* and *I. ricinus* were found in some individuals of several thousands of passerine birds examined, during the studies carried out in the Kızılırmak delta, and a great portion of ticks were found in their larva or nymph period (15, 18). It was stated that *Ixodes* (12, 14, 20) and *Hyalomma* (20) species were commonly seen in wild birds. Except a male *Ha. parva* detected in this study, the fact that all of the other tick species belonged to *Ixodes* and *Hyalomma* species supported this notion. Even though no passerine bird was examined in this study. *Ixodes* specimens were detected more in the examined birds, and *Ha. parva* on a Common buzzard, four *Hyalomma* spp nymphs on a Long-legged buzzard, seven *Ixodes* spp nymphs on Short-toed snake eagle belonging to the order Accipitriformes were detected, while *I. frontalis* on *Northern harrier* (*Circus cyaneus*) was detected in the order Falconiformes. *I. frontalis* is an ornitophilic species (5, 59), and some *Rickettsia* species were detected in this species (5, 9, 14, 15, 18, 20, 59). *Amblyomma* spp., *Der. Marginatus, Ha. concinna, Ha. punctata, Ha. sulcata, Hy. marginatum* gr., *I. eldaricus, I. festai, I. redikorzevi,* and *I. ricinus* detected on passerine birds by Keskin and Erciyas-Yavuz (15, 18), could not found in this study. Santos-Silva et al (20) found adult and nymphal stages of *I. frontalis* on Long-eared owl (*Asio otus*) and adult samples of *R. turanicus* on Common buzzard (*B. buteo*). While no tick sample was found on the three Long-eared owls examined in this study, however, a male of *Ha. parva* was detected on one of five Common buzzards, yet *Rh. turanicus* was not seen on this bird species.

Mites are frequently found on birds. Because they are so small, they might be missed macroscopically, and might be hardly noticed even in examinations with magnifiers by experts. On the other hand, macronyssid mites such as *O. bursa*, *Ornithonyssus sylviarum* (Canestrini & Fanzago, 1877) and *Dermanyssus gallinae* De Geer in 1778 (19, 60, 61, 81), and feather mites (23, 45-47, 82) are frequently seen in wild birds, particularly passerine birds, however, there are very few studies on feather mites of birds in Turkey (23, 45- 47, 82). Feather mites could not found on the birds examined in this study. This situation might be relevant both because mites were too small to be detected by voluntary students, and feather mites of the birds examined in this study, could not have parasites. Macronyssid mites, *O. bursa, O. sylviarum* and *De. gallinae* are quite similar to each other morphologically and could identify according to the shapes of especially dorsal shield, sternal and anal plates, and the number of setae on sternal plate (60, 61, 81). *De. gallinae*

is known to be common on chickens in Turkey, while *O. bursa* and *O. sylviarum* are not common on birds in Turkey. *O. bursa* is a common mite species in domestic and wild birds, and it has been detected in many bird species belonging to the orders Accipitriformes and Strigiformes (19). In this study, a female *O. bursa* was found on a Long-eared owl. In the studies were done in Turkey so far, both more lice species and huge numbers of their samples have been detected in Long-legged buzzards, White pelicans, Rock pigeons, and White storks. Unfortunately, fewer number and species were detected in the current study. This is related to the fact that the volunteer students who took part in the collection of the samples did not behave meticulously enough or that these students changed from time to time and the students who replaced them did not know how to collect the samples. Therefore, the mean abundance and mean intensity of ectoparasites could not be calculated in this study. This study has been the first pilot study on ectoparasites of wild birds in AKUREM and provided an experience to illuminate future ones. These kinds of studies performed with people wanting to be experts in this field in a systematic order within Wildlife Rescue Centers are believed to have great contributions to literature. Further systematic, even phylogenetic studies are needed to complete the deficiencies in this topic.

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