



Chewing Louse Species (Phthiraptera: Amblycera, Ischnocera) on Roadkill Wild Birds in Van Province: Five New Species in Turkey

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ABSTRACT

Background: The present study was conducted to identify the lice species in birds that were struck and injured or killed by motor vehicles along the highway surrounding Lake Van, which is located between Van and Bitlis provinces in Turkey.

Methods: The bird feathers were inspected using a macroscope. The isolated lice were placed in tubes containing 70% alcohol and were made translucent by 10% KOH. They were then glued using Canadian balsam and identified under light microscopy.

Result: Of the 102 birds collected, 40 (40.8%) birds were infested with at least one louse species. In infested birds, 14 individual lice from 11 species were identified. Of these, *Coloceras damicorne* (Nitzsch, 1866), *Columbicola claviformis* (Denny, 1842), *Ricinus serratus* (Uchida, 1926), *Philopterus coarctatus* (Scopoli, 1763), *Upupicola upupae* (Schrank, 1803) were identified in birds for the first time in Turkey.

Key words: Chewing louse species, Lake Van, New records, Parasite, Wild birds.

INTRODUCTION

Birds are able to adapt to and live in different habitats thanks to their capacity to adjust to various environmental conditions and their diverse behavioural features (age, migrating, foraging, pursuing mates, building nests and defending themselves against predators) (Stotz *et al.* 1996; Sick, 1997; Azizoğlu *et al.* 2021).

After arriving in these habitats and throughout their habitation, birds encounter several threats such as natural enemies, climatic conditions and anthropogenic effects. Apart from anthropogenic effects, all natural enemies such as parasites (e.g. mites, lice) maintain a natural balance with birds (Özkazanç and Özyay, 2019).

Parasites constitute almost half of the known animal and plant species. Parasitism is an important life form representing a large component of biodiversity (Price, 1980; Poulin and Morand, 2000; de Meeûs and Renaud, 2002).

Chewing lice, a type of parasite, are small, wingless and dorsoventrally compressed insects that parasitize almost all birds and some mammals. The length of chewing lice varies between about 1 mm and 10 mm. Most of chewing lice are host-specific since they are found only in a single host species. All chewing lice are permanent ectoparasites and they complete their entire life cycle in the host's body, where they mainly feed on feathers and dead skin parts (Waterhouse, 1953).

Chewing lice have a hemimetabolous life cycle consisting of three stages: egg, three nymphs and adult (Marshall, 1981). In the modern classification, lice (Insecta: Phthiraptera) are divided into four sub-orders, of which Amblycera, Ischnocera and Rhynchophthirina are known as chewing lice and anoplura is known as sucking lice. To date,

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more than 4,000 louse species have been described around the world (Price *et al.*, 2003). When present in large numbers, chewing lice can cause severe irritation and can adversely affect the survival and reproduction of the host.

Studies investigating chewing lice in wild birds in Turkey have significantly increased in recent years. These studies have identified numerous species of lice (Price *et al.* 2003; Dik, 2006; Dik *et al.* 2011; Girisgin *et al.* 2013; Göz *et al.* 2015) as well as new hosts and geographical distributions have for large number of louse species. Nevertheless, to our knowledge, there have been very few studies that investigate ectoparasites on birds in certain regions of Turkey. In this study, we aim to contribute to the scientific knowledge about lice diversity in Turkey through identifying new chewing lice species in wild birds in the Lake Van region.

MATERIALS AND METHODS

The present study was conducted to identify the lice species in birds that were struck and injured or killed by motor vehicles. The research was performed along the highway surrounding Lake Van, which is located between Van and Bitlis provinces in Turkey. The highway is a four-lane road with an approximate length of 430 km. The maximum speed limit on the highway for automobiles in non-residential areas is 110 km/h (Fig 1).

Field study for this research was conducted between March 2018 and February 2019. Throughout this period, a total of 29 field trips were conducted, with 3 trips conducted per month during the breeding (April-May-June) and migration (March-April-May-August-September-October) seasons and 2 trips conducted per month in the other months depending on the density of the birds. Each trip started at daybreak, the time of day when the birds are usually most active and continued until the sunset. During each trip, the entire road was inspected while driving at a maximum speed of 70 km/h in order to identify and capture the dead and injured birds along the highway. Transect observations were conducted in the close vicinity of wetlands between the highway and the lake. The reason for this is that these wetlands are densely populated by bird as they provide important feeding and breeding opportunities. Each captured bird was photographed and the GPS coordinates of the location where the bird was captured was recorded. Dead birds were placed in sealed bags and placed in cold containers (-4°C) and then transferred to the laboratory for

examination. Injured birds, on the other hand, were placed in suitable cages and transported to Van Yüzüncü Yıl University Wildlife Protection and Rehabilitation Center for treatment and then examination. Bird species were identified by ornithologists using the bird guidelines available in the literature (Svensson, 2009; Kızıroğlu, 2015) (Table 1). Parasites isolated from the birds were identified by parasitologists.

The compiled data were transferred to Microsoft Excel and then digital maps were created using ArcMap 10.2 software based on Geographical Information Systems (GIS) (Fig 1).

The lice isolated from the birds were placed in tubes containing 70% alcohol and were made translucent by 10% KOH (Palma, 1978). All the lice were washed with distilled water and passed through 70%, 80% and 90% alcohol series, respectively, on three consecutive days and then glued using Canadian balsam. Subsequently, each louse was identified under light microscopy (Leica DM 500) based on the relevant literature (Price *et al.* 2003; El-Ahmed, 2012; Dik *et al.* 2009; Adams *et al.*, 2005).

RESULTS AND DISCUSSION

A total of 102 individual birds from 18 species were collected and a total of 157 chewing lice were isolated from the birds. Of these, 40 (40.8%) birds were infested with at least one louse species.

No ectoparasites were isolated from the birds of nine species including house sparrow (*Passer domesticus*), common magpie (*Pica pica*), jackdaw (*Corvus monedula*),

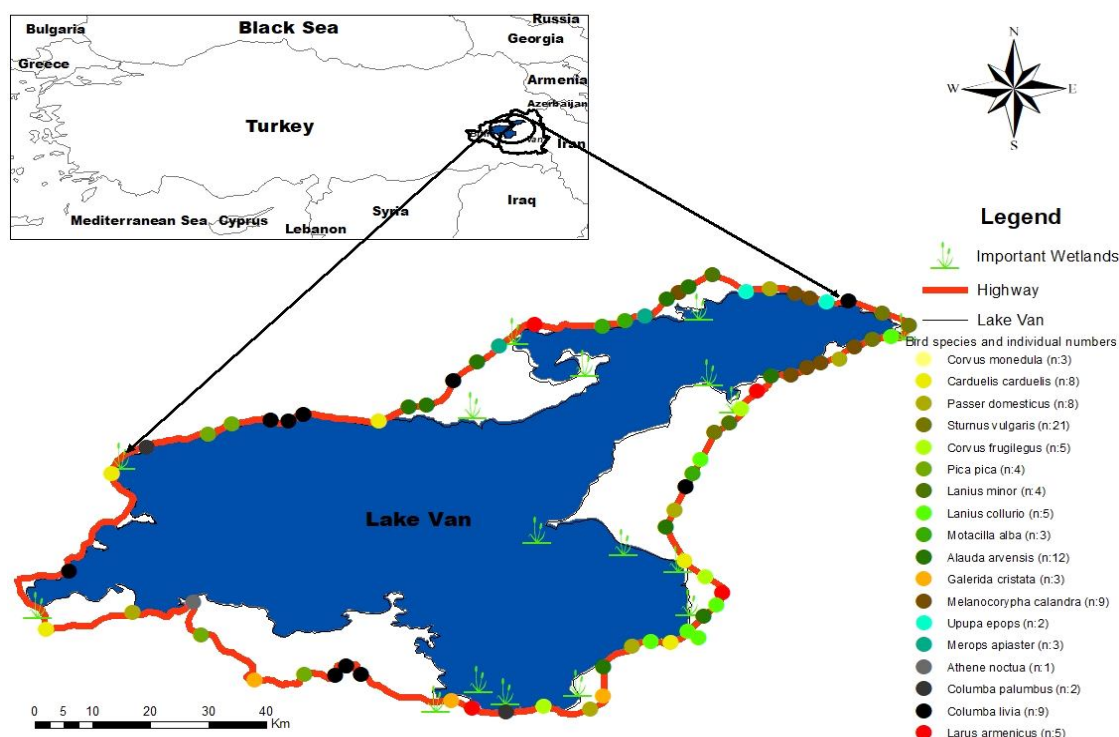


Fig 1: Research site and sampling locations.

carrion crow (*Corvus frugilegus*), goldfinch (*Carduelis carduelis*), red-backed shrike (*Lanius collurio*), white wagtail (*Motacilla alba*), crested lark (*Galerida cristata*) and calandra lark (*Melanocorypha calandra*).

***Merops apiaster* (Coraciiformes)**

All three birds were found to be infested with chewing lice and a total of 38 chewing lice were isolated. *Brueelia apiastri*

Table 1: Characteristics of the birds sampled.

Orders	Families	Species
Columbiformes	Columbidae	<i>Columba palumbus</i> <i>Columba livia</i>
Strigiformes	Strigidae	<i>Athene noctua</i>
Passeriformes	Corvidae	<i>Corvus monedula</i> <i>Corvus frugileus</i> <i>Pica pica</i>
	Sturnidae	<i>Sturnus vulgaris</i>
	Alaudidae	<i>Alauda arvensis</i> <i>Melanocorypha calandra</i> <i>Galerida cristata</i>
	Laniidae	<i>Lanius minor</i> <i>Lanius collurio</i>
	Motacillidae	<i>Motacilla alba</i>
	Passeridae	<i>Passer domesticus</i>
	Fringillidae	<i>Carduelis carduelis</i>
Coraciiformes	Meropidae	<i>Merops apiaster</i>
Bucerotiformes	Upupidae	<i>Upupa epops</i>
Charadriiformes	Laridae	<i>Larus armenicus</i>

(Denny, 1842) ♂ 10 ♀ 13, 2 nymphs, *Meropoecus meropis* (Denny, 1842) ♂ 3 ♀ 6, *Meromenopon meropis* (Clay and Meinertzhagen, 1941) ♀ 6, 1 nymph.

***Columba palumbus* (Columbiformes)**

Both two birds were found to be infested with chewing lice and a total of 33 chewing lice were isolated. *Coloceras damicorne* (Nitzsch, 1866): ♂ 8 ♀ 13, 4 nymphs, *Columbicola claviformis* (Denny, 1842): ♂ 8 ♀ 8, 4 nymphs.

***Columba livia* (Columbiformes)**

All nine birds were found to be infested with chewing lice and a total of 21 chewing lice were isolated. *Columba columbae* (Linnaeus, 1758): ♂ 14 ♀ 7, 8 nymphs.

***Athene noctua* (Strigiformes)**

The one bird of this species was found to be infested with chewing lice and a total of 6 chewing lice were isolated. *Strigiphilus cursitans* (Nitzsch, 1861): ♂ 4 ♀ 2, 1 nymph.

***Sturnus vulgaris* (Passeriformes)**

Out of 25 birds, 14 of them were found to be infested with chewing lice and a total of 4 chewing lice were isolated. *Brueelia nebulosa* (Burmeister, 1838): ♀ 4.

***Alauda arvensis* (Passeriformes)**

Out of 12 birds, 8 of them were found to be infested with chewing lice and a total of 7 chewing lice were isolated. *Brueelia sp.*: ♂ 2, 7 nymphs, *Ricinus serratus* (Uchida, 1926): ♀ 5, 2 nymphs.

Table 2: Characteristics of the louse species isolated from the birds.

Bird species	Birds examined (n)	Birds infested (n)	Louse species	Gender
<i>Columba palumbus</i>	2	2	<i>Coloceras damicorne</i>	♂ 8 ♀ 13 4N
			<i>Columba claviformis</i>	♂ 8 ♀ 4
<i>Columba livia</i>	9	4	<i>Columba columbae</i>	♂ 14 ♀ 7 8N
<i>Athene noctua</i>	1	1	<i>Strigiphilus cursitans</i>	♂ 4 ♀ 2 1N
<i>Corvus monedula</i>	3	0		
<i>Corvus frugileus</i>	5	0		
<i>Pica pica</i>	4	0		
<i>Sturnus vulgaris</i>	21	14	<i>Brueelia nebulosi</i>	♀ 4
<i>Alauda arvensis</i>	12	8	<i>Ricinus serratus</i>	♀ 5 2N
<i>Melanocorypha calandra</i>	9	0		
<i>Galerida cristata</i>	3	0	<i>Brueelia spp.</i>	♂ 2 7N
<i>Lanius minor</i>	4	4	<i>Menacanthus camelinus</i>	♀ 7 4N
			<i>Philopterus coarctatus</i>	♀ 2 6N
<i>Lanius collurio</i>			<i>Brueelia spp.</i>	♀ 3 2N
<i>Motacilla alba</i>	3	0		
<i>Passer domesticus</i>	8	0		
<i>Carduelis carduelis</i>	8	0		
<i>Merops apiaster</i>	3	3	<i>Brueelia apiastri</i>	♂ 10 ♀ 13 2N
			<i>Meromenopon meropis</i>	♀ 6 1N
			<i>Meropoecus meropis</i>	♂ 3 6
<i>Upupa epops</i>	2	1	<i>Upupicola upupae</i>	♂ 7 6N
<i>Larus armenicus</i>	5	3	<i>Saemundssonina lari</i>	♂ 12 ♀ 8
Total	102	40		

Lanius minor (Passeriformes)

All four birds were found to be infested with chewing lice and a total of 12 chewing lice were isolated. *Menacanthus camelinus* (Nitzsch [In Giebel], 1874): ♀ 7, 4 nymphs, *Philopterus coarctatus* (Scopoli, 1763): ♀ 2, 6 nymphs, *Brueelia* sp.: ♂ 3, 2 nymphs.

Upupa epops (Bucerotiformes)

One of the two birds was found to be infested with chewing lice and a total of 16 chewing lice were isolated. *Upupicola upupae* (Schrank, 1803): ♂ 7 ♀ 9, 6 nymphs.

Larus armenicus (Charadriiformes)

Three out of five birds were found to be infested with chewing lice and a total of 20 chewing lice were isolated. *Saemundssonina lari* (Fabricius, 1780): ♂ 12 ♀ 8.

In the present study, wild birds that were struck and injured or killed by motor vehicles were used as study material due to the difficulty of capturing wild birds alive. Chewing lice are leading ectoparasites found on wild birds and are highly specific to the host and the geographical distribution of these birds (Clayton *et al.* 2008). In the present study, 102 individual birds from 18 species were examined and 14 louse species were identified. To our knowledge, this is the first study conducted in Turkey investigating the louse species isolated from common wood pigeon (*Columba palumbus*), Eurasian skylark (*Alauda arvensis*), Lesser Gray Shrike (*Lanius minor*) and Eurasian hoopoe (*Upupa epops*). In our study, 14 louse species, including 11 Ischnocera lice and 3 Amblycera lice, were collected from the birds (Table 2). Although significant efforts have been made in recent years in Turkey, research on louse species found on certain bird species is still missing.

In our study, two louse species including *Coloceras damicorne* (Nitzsch, 1866) and *Columbicola claviformis* were isolated from the common wood pigeon (*Columba*

palumbus). In the previous research conducted in Turkey, *Coloceras chinense* was isolated from *Coloceras*, *Coloceras hilliard* and *Conoceras piaget* were isolated from the laughing dove (*Spilopelia senegalensis*) and the Eurasian collared dove (*Streptopelia decaocto*) and *Coloceras israelensis* was isolated from the rock dove (*Columba livia*) (Girisgin *et al.* 2013; Dik *et al.* 2013). In other countries, *Coloceras damicorne* was isolated from the common wood pigeon (*Columba palumbus*) by Rékási and Kiss (1980), from the white-eared bulbul (*Pycnonotus leucotis*) in Iraq by Hamza *et al.* (2011) and from the rock dove (*Columba livia*) by Jasim (2017). On the other hand, *Columbicola claviformis* is another louse species that was isolated from the common wood pigeon (*Columba palumbus*) in our study (Fig 2). In Turkey, *Columbicola bacillus* has been isolated from the European turtle dove (*Streptopelia turtur*) (Girisgin *et al.* 2013) and *Columbicola columbae* has been isolated from the pigeon (Gıcık, 1999; Köroğlu and Şimşek, 2001; Şenlik *et al.* 2005) (Fig 2). In a study by Jhonson *et al.* (2007), *Columbicola claviformis* was isolated from the common wood pigeon and *Ricinus serratus* and *Brueelia* sp. were isolated from the Eurasian skylark. In Turkey, to our knowledge, there has been no study reporting on *Ricinus serratus* lice. It has been shown that *Ricinus serratus* can be easily distinguished from other *Ricinus* species due to the presence of unique serrated pleural nodi. To date, *Ricinus serratus* has been reported in 14 bird species belonging to the Alaudidae family (Valan, 2016). In a study by Güler *et al.* (2010), *Menacanthus camelinus* was isolated from the red-backed shrike, whereas in the present study, this species was isolated from a different bird species from the same bird family, the lesser grey shrike. Additionally, *Philopterus coarctatus* was also isolated from the lesser grey shrike in our study. This louse species was isolated from the great grey shrike (*Lanius excubitor*) in Slovakia by Szczykutowicz *et al.* (2006). The authors in that study noted that the prevalence of lice infestation was over

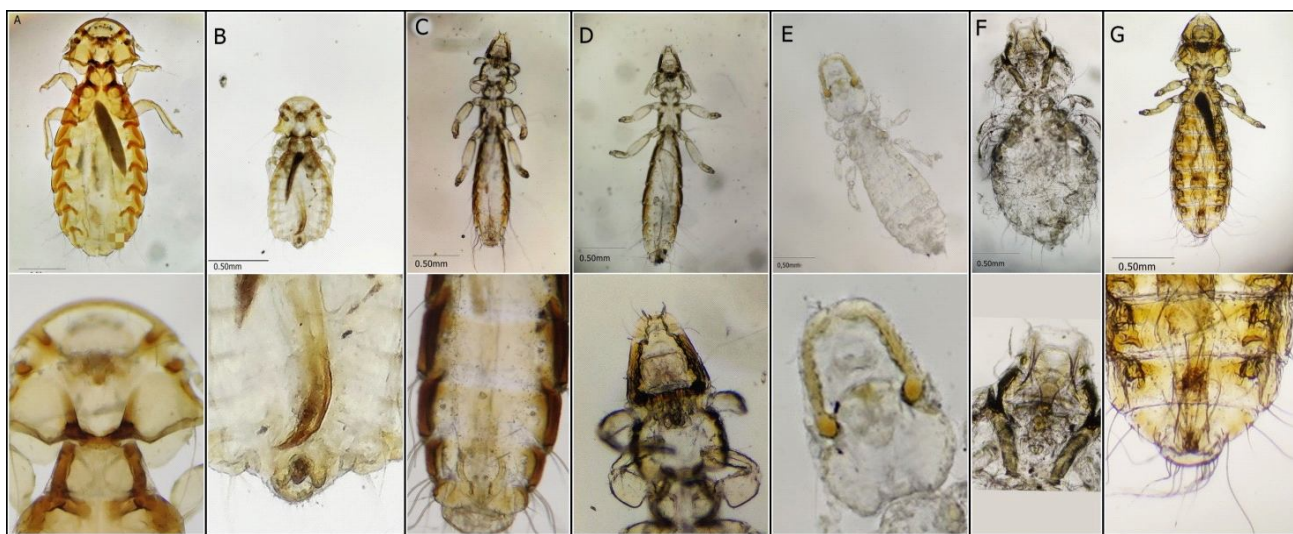


Fig 2: In this study, first reported lice pictures in Turkey and photographs of important parts for diagnosis. A-C. *C. damicorne* female, B- *C. damicorne* male, C- *C. claviformis* male, D- *C. claviformis* fe-male, E- *R. serratus* female, F- *P. coarctatus* female, G- *U. upupae* male.

90% in the birds they examined. Price *et al.* (2003) reported that *Philopterus coarctatus* and *Philopterus magnus* are synonyms and noted that the *Brueelia* lice isolated from the Eurasian skylark and the lesser grey shrike samples were identified at the species level due to excessive translucency during the procedure. In our study, hoopoe was another bird species in which the presence of lice was discovered for the first time in Turkey. Of the two birds captured, one of them was infested with lice and the lice were identified as *Upupicola upupae*. A study investigating the population characteristics of *Upupicola upupae* reported that 468 *Upupicola upupae* samples from only one species were isolated from 30 hoopoes (Agarwal, 2011) (Fig 2). On the other hand, in previous studies conducted in Turkey, *Columbicola columbae* was isolated from the rock dove (Dik, 2006; Dik *et al.* 2015), *Strigiphilus cursitans* was isolated from the little owl (*Athene noctua*) (14), *Brueelia nebulosa* was isolated from the European starling (*Sturnus vulgaris*) (19) and *Brueelia apiastri*, *Meromenopon meropis* and *Meropoecus meropis* were isolated from the European bee-eater (*Merops apiaster*) (Göz *et al.* 2015; Dik *et al.* 2015). Additionally, *Saemundssonina lari* was isolated from *Larus armenicus* by Göz *et al.* (2015), from *Larus genei* by Dik (2006) from *Larus cachinnans* by Girişgin *et al.* (2013).

CONCLUSION

Our study was limited since the number of lice identified was relatively lower, which could be attributed to the use of dead birds as study material. However, our study is of high value since it identified *Ricinus serratus*, *Philopterus coarctatus*, *Coloceras damicorne*, *Columbicola claviformis* and *Upupicola upupae* in birds for the first time in Turkey. Additionally, the lice in the common wood pigeon, lesser grey shrike and hoopoe were investigated for the first time in the literature. Given that there are three major bird migration routes passing through Turkey, further research based on larger bird samples is required.

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