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A descriptive-taxonomic study of two types of lice isolated from goats in the Basrah Governorate, Iraq

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ABSTRACT

Background: Pediculosis is an infestation of warm-blooded animals, and it is an important economic problem for various livestock and poultry hosts. Lice are termed direct parasites because they produce skin imperfections at tanneries because of the irritation they create during feeding. The feeding process triggers irritation or itching in the skin, resulting in rubbing and scratching.

Aim: The study isolated, described, and diagnosed two biting and sucking lice species in goats in Basrah City, Basrah Governorate, Iraq.

Methods: A total examination of 50 male and female goats was performed for lice collection and isolation from October 1, 2018 to April 1, 2019, noted. The lice were preserved in clean vials containing 70% ethyl alcohol.

Results: The study identified two groups of veterinary lice infesting goats: sucking lice in the order Anoplura and biting lice in the order Mallophaga. *Haematopinus tuberculatus* was observed (prevalence of 64%), *Linognathus africanus* (prevalence of 38%), and *Bovicolaovis* (prevalence of 24%). Notably, the overall infection rate with lice was 100%, and examples of mixed infections with greater than one lice species on individual animals were observed on the animals in localized areas of the body, such as the back, udder, and other regions.

Conclusion: This study documents the first-ever report of a new species of sucking and chewing lice in Basrah City, indicating that both species share a common host.

Keywords: Lice, Goats, Anoplura, Mallophaga.

Introduction

Lice have been recognized as a small, wingless parasitic insects that live on the skin of mammals and birds causing severe itching, damage and scratching of the host skin while feeding on its blood (Mersha, 2013; Yacob, 2014). To date, nearly five thousand species of lice have been classified into four suborders. Sucking lice, which only feed on the blood of eutherian mammals, are classified into the Anoplura suborder (Durden and Musser, 1994). Chewing lice infest birds and mammals and consume feathers, dead skin, blood, or secretions. They are classified into three other suborders: Amblycera, Ischnocera, and Rhynchophthirina (Johnson and Clayton, 2003). Sucking lice (Phthiraptera: Anoplura) are permanent host-specific ectoparasites of eutherian mammals that cause economic stress to farmers through weight loss, hide damage, and varying states of anemia from too much (Otter *et al.*, 2003). Lice have been reported to infest a variety of domestic mammals, such as cows, buffalo, sheep, horses, goats, dogs, and camels; and humans (Hasson and Al-Zubaidi, 2014). Host animals

infested with lice generally show poor bodily condition indicative of a common aspect of infestation, i.e., they appear anemic, lethargic, and clearly have matted oily coats. (Otter *et al.*, 2003). Furthermore, infestations lead to significant economic losses when the hide and skin are damaged and show light patches and flecks, which normally give way to secondary bacterial infection or inflammation caused by scratching (Geden *et al.*, 1999). Phthirapterosis or lice infestation is significant in goats because lice are permanent ectoparasites with high host specificity. There are two types of lice: sucking and biting (Nizamov and Prelezov, 2019). Lice infestation occurs significantly in goat flocks worldwide, especially in winter (Iqbal *et al.*, 2014). Clinical presentation for lice infestations includes itching and hair loss caused by hypersensitive cutaneous responses (Ajith *et al.*, 2019), but many factors can worsen lice infestations in animals, including herd density, unsanitary conditions, low temperatures, and high humidity (Taylor *et al.*, 2007). Furthermore, lice are pathogens and able to vector a range of pathogens to susceptible hosts, including viruses, bacteria, protozoa,

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and fungi (Otter *et al.*, 2003). Basrah Province animals had one or more ectoparasite infestations, including three species of lice (two sucking lice, *Damalinea caprae* Gurlt, 1843, *Haematopinus eurysternus* Denny, 1842, and one biting louse, *Haematopinus tuberculatus* Brumeister, 1839) (Al-Mayah and Hatem, 2018).

Materials and Methods

Sample collection

For the research, 50 lice samples were obtained from 50 male and female goats of differing ages during the months of October 2018 and April 2019. The lice samples were collected by mixing a tuft of wool and hair and manually collecting the lice (maintaining anatomical integrity).

Sample preservation

The lice samples were preserved in various ways: in a sterile vial with 70% ethyl alcohol or 10% formalin and in other vials with a few drops of cedar oil in 70% ethyl alcohol (Karim, 2006). Upon collection, all samples were transported to a designated laboratory (Parasite Laboratory, Veterinary Medicine College/ Basrah University) where they were placed in 10% sodium hydroxide solution overnight to allow for internal tissues to dissolve and clear. The samples were then subjected to a series of progressively increasing percentages of ethanol (70, 80, 90, 100) with a series of 5-minute dips in xylol solution. The proposed samples were then mounted with a drop of Canada balsam on glass slides, covered, allowed to dry for two days, and viewed with a light microscope at 10×, 4×, and photos were taken with an iPhone 14.

Ethical approval

Not needed for this study.

Results

The present study found that Basrah Province goats were heavily infested with three species of lice: two sucking species—*Haematopinus tuberculatus*, which is a parasite of buffalo by origin but was found on cattle in Iraq, was measured as 5.5 mm, and was dark brown to black in color, and *Linognathus africanus*, which is known as the sheep foot louse, also had a conical head and antennae that were short with no visible adaptation for piercing and sucking blood. We also identified a chewing louse that had the species name of *Bovicola bovis*, which is also called the red louse, and it exclusively chews food. The chewing louse species had an entirely dark red head, but its body was yellowish-white and characterized by transverse dark bands running along each abdominal segment. It was the smallest of the lice species with adults measured from 1 to 2 mm. In evaluating the 63 goats used in our study, *Haematopinus tuberculatus* had the greatest prevalence of 64%, whereas the least infestation was the chewing louse species *Bovicola bovis* at 24% (Table 1).

For cite (d) lice: single infestations were highest at ($n = 39$) over double infestations ($n = 5$), single

Table 1. The percentage infestation of lice for the three species.

Type of lice	No. of goats inf.	Percentage inf. %
<i>Haematopinus tuberculatus</i>	32	64
<i>Linognathus africanus</i>	19	38
<i>Bovicola bovis</i>	12	24

Table 2. Number of examined and infected goats according to sex and type of infestation.

No. of goats examined		No. inf. with a single		No. inf. with double	
Male	Female	Male	Female	Male	Female
31	32	22	20	9	12
Total: 63		Total: 42		Total: 21	



Fig. 1. Male and female lice of *Haematopinus tuberculatus*.

infestations also occurred in the form of triple infestations but were not identified in the sampling, and there were no differences (ns, $p \geq 0.05$, 0.03). The infestation rate was similar for male and female goats (ns, $p \geq 0.05$, 0.45) (Table 2), and each sample had clear taxonomic characters distinct for sucking and chewing lice (Figs. 1–5).

Discussion

Lice are a group of external parasites that most commonly infest a range of domesticated animals, including goats, with a substantially harmful impact on productivity. In fact, lice infestation can produce a variety of harmful outcomes, such as loss of appetite, loss of strength, emaciation, decreased milk yields, and weight loss. Furthermore, ectoparasites may



Fig. 2. Female (Left) and male (Right) lice of *Haematopinus tuberculatus*.

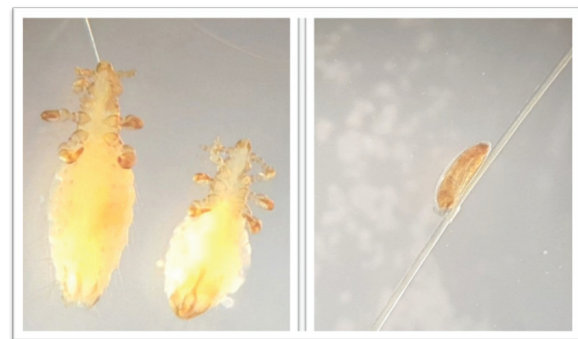


Fig. 3. Male, female (Left), and egg (Right) lice of *Linognathus africanus*.

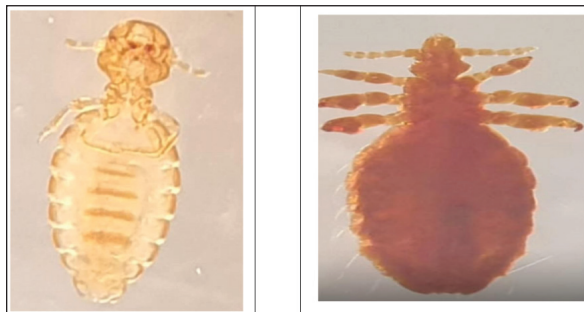


Fig. 4. Male (Left) and female (Right) lice of *Linognathus africanus*.

cause skin infections, pruritus, and degradation of skin quality and may contribute to anemia. Goat lice are specialized epidermal skin parasites of goats and sheep that often induce skin infection and pruritus. Lice are ectoparasitic blood-sucking flies that are permanent hosts of their hosts and thus suck blood for their entire life as nodes as full-grown nymphs.

The veterinary implications of ectoparasites are twofold. First, they can result in economic loss due to the creation of pathophysiological changes in

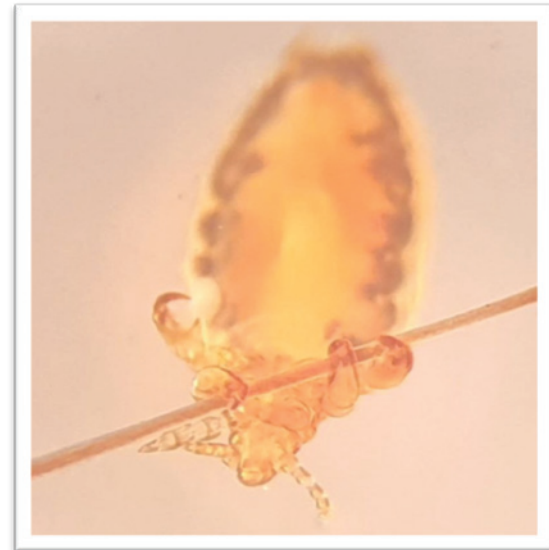


Fig. 5. The lice *Bovicola bovis*.

treatments considering inhibitors for space inflected, such as feed loss, hide loss, various grades of anemia, hyperproteinemia, nutritional deficiencies, and reduced vitality (Paul *et al.*, 2012). Second, ectoparasites can be vectors of louse-borne zoonotic diseases that can spread louse-borne viruses, bacteria, fungi, and protozoa to infected hosts (Hornok *et al.*, 2010). One of the most commonly reported situations includes an infestation of a single species of lice to an infestation of a double infestation with lice, where the two species occur together. However, triple infestations are noted not to be present. This may be based on biological and environmental competition for survival among various species and strains of ectoparasites. This is consistent with Al-Karkhy *et al.* (2013) and may have been due to the close age and physical interaction among goats, which facilitates lice transmission.

It is interesting to note that lice are not observed to have specific infectivity preference for any age group, as reported by Karim (2006). Furthermore, the infestation of sucking and chewing lice on the same host may be due to compatibility that allows these two types of infestation to occur, a point echoed by Karim (2006).

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Author's contributions

Suzan A. Al-Azizz conceived the study design; Nadia K. Thamer performed the laboratory work. Huda Sh. Farhan read and approved the final manuscript.

Conflict of interest

The authors declare that there is no conflict of interest.

Data availability

All the information supporting the discoveries in this regard are accessible in the manuscript.

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