

Distribution of two phthirapteran species (Insecta) on the goats *Capra aegagrus forma hircus* of India

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A. Introduction

Mammalian lice that live permanently and breed in hair coat are dependent on the microclimate furnished by the host. They show considerable site specificity but this is less marked than bird lice. The distribution on host body is probably controlled by many factors like hair type and body temperature. Host factors such as self and mutual grooming, thickness of skin, hairiness and resistance may also restrict the distribution of parasites as may atmospheric conditions. A thorough look at literature reveals that the distribution of Phthiraptera on goats has escaped the attention of workers of this field. However, some information on the distribution pattern of lice on other domestic ungulates is available. For instance, workers like FLORENCE (1921), BLAGOVESTCHENSKY & SERDUKOVE (1935), CRAUFURD-BENSON (1941), MATTHYSSE (1946), HOPKINS (1957), MURRAY (1957 a, b, c, & d), MELNIKOVA (1960), CHAUDHURI & KUMAR (1961), SCHARFF (1962), BENNET (1975), KETTLE (1977), KIM (1977), TWEDDLE et al. (1977), ROSARIO & MANUEL (1983), WATSON (1984), LOZOYA et al. (1986), WOOTEN-SAAFI et al. (1987), DE VANEY et al. (1988), GEDEN et al. (1990), RAWAT & SAXENA (1990 & 92) and RAWAT et al. (1991 & 92) have provided useful information relating to distribution of Phthiraptera on cattle, buffaloes, sheep and pigs. Present study provides detailed information on the distribution of two goat lice on the basis of examination of 59 goatskins.

B. Material

Distribution of two goat lice *Bovicola caprae* (GURLT, 1843) [Ischnocera, Trichodectidae] and *Linognathus africanus* (KELLOGG & PAINE, 1911) [Anoplura, Linognathidae] has been studied on 59 goatskins purchased/hired from the market. Fresh goatskins were obtained from butchers and kept in large polythene bags along with wad of cotton wool soaked with chloroform. After 15 minutes entire skin was taken out and spread on large plastic sheet. The entire area of goatskins was arbitrarily divided into eight regions. Now attempts were made to take out the entire ectoparasitic load from every region with the help of the brush, comb and forcep etc. The lice collected from each region were separated species-wise, sex-wise, stage-wise and counted.

C. Observation

Bovicola caprae – An examination of data relating to distribution of *B. caprae* on 59 goatskins indicates that back is the most heavily infested region (carried 37.98 % of the total population), narrowly followed by neck (27.17 %) (Tab. 1). These two regions carried 65 % of total lice population. Nape was the next preferred site (10.63 %) followed by abdomen (6.87 %) and brisket (6.81 %). The tail and hind-lags were scarcely infested (4.49 % and 3.55 % respectively) while fore-lags carried minimum infestation (2.5 %). It may be noted that the back area selected for present studies was comparatively large as it included hump, back rump, loin, tail (entire topline) as well as upper portions of the lateral side (this may be one reason for the high population counts in that area). The authors have examined the goat-head separately (on butcher's shop) as well as in fields during survey work and found it scarcely infested. The face (or head) of most of goats carries very small hair, hence the lice do not prefer to be there. Few lice may be found roaming singly in case of heavy infestation. Therefore, the exclusion of population counts from head has hardly affected the data. An examination of Table 1 indicates that the males, females and nymph do not show any specific difference in the distribution on the body of goats. All of them preferred back and neck followed by nape. However, tail was more infested by nymph than the adults. The females were more in number on hind-legs than the fore-legs. Such differences may be circumstantial and it does not seem that there is any basic difference in the distribution pattern of both sexes of adults and also the nymphs. Most of the sites of the body harbour mixed population.

As far as distribution of eggs *B. caprae* of on host body is concerned, they prefer to lay the eggs on the long hair of thigh region and the neck. The other preferred site was the hair of tail. These remarks are based on general observation made in field and thorough examination of goatskins studied in the laboratory. It has been further noted that on the hair belonging to back, nape, abdomen and head, the eggs normally occur singly dispersed while the hair of thigh, neck and tail region carry clusters of eggs.

Table 1. Showing percentage of *Bovicola caprae* on different parts of 59 goatskins examined during study period.

Body parts	%age distribution of lice on different parts				Total
	Male	Female	Adult	Nymph	
Neck	29.98	26.40	27.59	26.83	27.17
Nape	12.52	13.67	13.29	8.47	10.63
Brisket	5.78	6.92	6.54	7.03	6.81
Back	37.59	35.22	36.01	39.59	37.98
Abdomen	8.96	9.34	9.21	4.97	6.87
Fore-legs	1.88	2.23	2.12	2.81	2.50
Hind-legs	1.63	4.23	3.36	3.69	3.55
Tail	1.66	1.99	1.88	6.61	4.49

Table 2. Showing percentage of *Linognathus africanus* on different parts of 55 goatskins examined during study period.

Body parts	%age distribution of lice on different parts				Total
	Male	Female	Adult	Nymph	
Neck	25.66	25.75	25.72	20.86	23.74
Nape	14.19	15.78	15.29	16.13	15.63
Brisket	8.36	9.67	9.26	8.79	9.07
Back	28.94	25.83	26.80	30.18	28.17
Abdomen	7.52	9.28	8.73	10.93	9.63
Fore-legs	5.49	6.44	6.14	4.12	5.32
Hind-legs	8.04	5.43	6.24	6.02	6.15
Tail	1.80	1.82	1.82	2.97	2.29

Linognathus africanus - *L. africanus* was present upon 55 (out of 59) goatskins examined for the purpose. Maximum population of *L. africanus* preferred to live in back (28.17%), neck (23.74%) and nape (15.63%) areas (Tab. 2). These three regions harboured more than 66% of total *L. africanus* population. Abdomen (9.63%) and brisket (9.07%) were the next preferred sites. Small numbers of lice have also been recorded from hind-legs (6.15%) and fore-legs (5.32%) while the tail was minimally infested (2.29%). An examination of the Table 2 indicates that both the sexes of adults and the nymphs followed similar pattern (except minor differences which may be circumstantial). Thus, it seems that most of the areas of goats harbour mixed population and the phenomenon of colonization or aggregation was not observed (neither in case of adults nor the nymphs).

The distribution of the eggs of *L. africanus* has also been noted. They are generally found on the hair belonging to neck, nape and fore-legs. However, they are normally laid singly and the clustering (as seen in case of *Bovicola caprae*) has not been noted. Thus, the *L. africanus* eggs can

occur on the hair belonging to other regions of the body also.

D. Discussion

The present report provides information on the distribution of two goat lice (*Bovicola caprae* and *Linognathus africanus*) on the body of infested goats. Earlier workers (HOPKINS 1949) made some casual remarks on the site preference of goat lice (based on general observations). Even KETTLER (1977) and LOZOYA et al. (1986) did not furnish information on this problem. However, the present studies have utilised 59 infested goatskins to investigate the problem and it has been found the distribution of two species resembles to considerable extent. Back, neck and nape remain the most heavily populated areas. Lice tend to occupy these areas even during the days of lower infestation. On the other hand, they tend to occupy the other areas with the increase in infestation levels. Thus, there is hardly any change in distribution pattern of both lice on the body of infested hosts. It seems that grooming behaviour is more important in determi-

ning the distribution of lice on goats. They tend to confine themselves on those areas which normally escape the grooming by the host.

It may be noted that many of phthirapteran species show variation in pattern of distribution on host body during different seasons of year. For instance, *Bovicola bovis* abundantly occurs on sides, top of neck and topline during winter but migrates to lateral areas as temperatures rises and finally occupies belly portion during summer (CRAUFURD-BENSON 1941, MATTHYSSE 1946, SCHARFF 1962 and RAWAT & SAXENA 1992). Another louse, *Haematopinus eurysterus* (Anoplura), maximally occurs on sides and top of the neck (and above shoulders) during winters but tend to cluster on forehead (base of horns, ears and eyelids) and tailhead during summers (CRAUFURD-BENSON 1941, MATTHYSSE 1946, SCHARFF 1962, TWEDDLE et al. 1977, GEDEN et al. 1990). However, third cattle louse, *Linognathus vituli* remains confined to neck develop and shoulders throughout year and does not show variation in distribution pattern during different months (CRAUFURD-BENSON 1941, MATTHYSSE 1946, DE VANEY et al. 1988, GEDEN et al. 1990 and RAWAT & SAXENA 1990). In case of buffalo louse, *Haematopinus tuberculatus* (anopluran) neck, ribs and back remain populated during different months but there is marked increase in louse population on belly during summers (CHOUHURI & KUMAR 1961 and RAWAT et al. 1992). Likewise, pig louse, *Haematopinus suis* also prefers to live inside thighs during summers (RAWAT et al. 1991). Thus, it seems that distribution pattern of lice on bigger mammals (like cattle and buffalo) is determined by temperature preference as well as grooming behaviour of host. But in case of goat lice, both the species prefer the neck and nape and do not show any marked change in distribution pattern. It seems that grooming behaviour plays dominant role in determining distribution pattern and the lice do not tend to occupy those areas which can be readily groomed by the host.

Furthermore, any appreciable change in distribution pattern of male, female and nymph has not been noted. Such differences have been noted in case of cattle lice, *Bovicola bovis* (CRAUFURD-BENSON 1941, MATTHYSSE 1946, SCHARFF 1962 and RAWAT & SAXENA 1992). However, in case of this louse, males are rare in natural population (reported to reproduce parthenogenetically) and females and nymphs from colonies on host bodies. Such colonial existence of adults and nymphs have also been noted in case of *Haematopinus eurysterus* (CRAUFURD-BENSON 1941 and MATTHYSSE

1946). However, such phenomenon has not been noted in case of *Linognathus vituli*, *Haematopinus tuberculatus* and *H. suis*.

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Summary

The distribution of an ischnoceran, *Bovicola caprae* and an anopluran, *Linognathus africanus* on host body has been noted. Both the species prefer to occupy hair belonging to back, neck and nape areas. The other areas carry low louse population. The distribution pattern of both the sexes of adults and the nymphs was almost identical. The louse remains confined to those areas which are not easily groomed by host. The egg laying sites have also been discussed.

Zusammenfassung

Die Wohnbezirke von zwei Phthirapteren-Arten (*Insecta*) auf Ziegen (*Capra aegagrus forma hircus*) in Indien. – Die Ischnozere *Bovicola caprae* (GURLT, 1843) und die Anoplure *Linognathus africanus* KELLOGG & PAINE, 1911 [Synonymie mit *Linognathus oviformis* (RUDOW, 1869) ?] besiedelten syntopisch bevorzugt die Haarpartien von Hals, Nacken und Rücken von 55 bzw. 59 untersuchten Hausziegen. Es wurden dabei die Körperpartien genutzt, die vom Wirt selbst kaum bei der Körperpflege erreicht werden. Die Aufenthaltsorte der Imagines (♂♂ + ♀♀) waren mit denen ihrer Larven fast identisch. Von *Bovicola caprae* wurden die Eier an Haare besonders von Oberschenkeln und Hals sowie Schwanz angeklebt; auf Rücken, Nacken, Rumpf und Kopf befanden sie sich normalerweise einzeln, auf Oberschenkeln, Hals und Schwanz aber meist gruppenweise. Von *Linognathus africanus* sind Hals, Nacken und Vorderbeine der Wirte bevorzugte Eiablageorte. Seine Nisse fanden sich dort und gelegentlich auf anderen Körperpartien einzeln, niemals gruppenweise.

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