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# Seasonal dynamics of goat biting louse *Bovicola caprae* (Phthiraptera: Ischnocera: Trichodectidae)

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## A. Introduction

Seasonal fluctuation in the population of mammalian Phthiraptera have been studied from time to time. Several reasons have been attributed for seasonal population variations, changes in population densities and host anatomical preferences. For instance, the cattle lice viz. *Bovicola bovis*, *Linognathus vituli*, *Haematopinus eurysternus* and *Solenopotes capillatus* (CRAUFURD-BENSON 1941, MATTHYSSE 1946, LANCASTER 1957, GOJMERAC et al. 1959, SCHARFF 1962, JENSEN & ROBERTS 1966, LEWIS et al. 1967, GIBNEY et al. 1985, RAWAT & SAXENA 1992, RAWAT et al. 1992 a), dog louse, *Heterodoxus spiniger* (AMIN & MADBOULY 1973), buffalo louse, *Haematopinus tuberculatus* (BLAGOVESHTCHENSKY & SERDUKOVE 1935, CHAUDHURY & KUMAR 1961, ROSARIO & MANUEL 1983, RAWAT et al. 1992 b), pig louse, *Haematopinus suis* (MELNIKOVA 1960, HENRY & CONLEY 1970, KADULSKI 1974, BYNUM et al. 1978, WILLIAM 1986, WOOTEN-SAADI et al. 1987, RAWAT et al. 1991), sheep louse, *Bovicola ovis* (SCOTT 1952, MURRAY & GORDON 1969), deer louse, *Trichodectis parallelus* (SAMUEL & TRAINER 1971), horse biting louse, *Bovicola equi* (PFADT 1971) have studied from this point of view. However, phthirapteran species occurring on goats have been escaped studies from this point of view. In the present studies an attempt has made to furnish information on natural population levels of one goat biting louse, *Bovicola caprae* (Gurlt), 1843 during different months of year in order to record trends of fluctuation in their population.

## B. Material and Method

Two goats were subjected to fortnightly *in vivo* examination at Rishikesh (India) during the period July, 1991 to June, 1992. These goats were maintained in natural condition at home (allowed to move freely during day hours and then tied in shade during nights and mornings). They were offered food (oil cake, grasses and leaves of shrubs etc.) twice a day plus whatever they grazed during day time. Since, other goats where not available in neighbouring houses chances of mixing (population) were not available (except the mutual one). Lice population was assessed by hair parting method similar to that of LEWIS et al. (1967) for cattle lice. The goats hair was repeatedly parted close to the skin at each of 30 anatomical sites typically infested by the lice. Louse population was estimated by counting the lice/inch$^2$ at the above said 30 sites. Use of light source and hand lens proved fruitful. The total number of lice recorded at all the sites was divided by 30 to obtain the clue regarding the lice index. In absence of any reliable method to obtain the data relating to in vivo population of lice, the method proved quite useful because it also allowed to study the spread of lice on different body parts during different months of year.

## C. Observations

On goat No. 1, the I. $I_{\cdot 30}$ (infestation index based on the examination of 30 anatomical sites) was found to be 0.97 in the month of July, 91. It further lowered and reached minimum level in August (0.45) but showed significant increase in September (1.56). Thereafter, it rose, continuously in succeeding four months (1.68, 2.05, 3.31 and 3.39 in October, November, December and January, 92 respectively). Maximum I. $I_{\cdot 30}$ was recorded in February, 92 (4.22) and decreasing trend continued till June, 92 (1.59, 1.09 and 0.98 in April, May and June respectively).

More or less similar result has been obtained from goat No. 2. However, minimum I. $I_{\cdot 30}$ was recorded in July, 91 (0.62). It rose continuously in succeeding six months (0.72, 1.53, 2.11, 3.23, 4.23 and 4.68 in August, September, October, November, December and January, 92 respectively) and reached the peak level in February (5.03) but the-

Table 1. Showing correlation between mean monthly I. $I_{\cdot 30}$ and four ecofactors.

| | Goat No. 1 | Goat No. 2 |
|---|---|---|
| $r_{12}$ | −0.92 | −0.92 |
| $r_{13}$ | +0.17 | +0.04 |
| $r_{14}$ | −0.52 | −0.65 |
| $r_{15}$ | −0.77 | −0.80 |

Note: r – Karl Pearson's correlation;
1 – meanmonthly I. $I_{\cdot 30}$;
2 – mean monthly temperature;
3 – mean monthly relative humidity;
4 – mean monthly rain-fall;
5 – mean monthly photoperiod.

reafter decreased continuously in next four months, 3.45, 2.5, 1.72 and 1.32 in March, April, May and June respectively. Thus, the trend of population fluctuation (as indicated by I. $I_{\cdot 30}$) remained more or less identical on two goats.

An attempt has been made to find correlation between mean monthly I. $I_{\cdot 30}$ and four ecofactors i. e. mean monthly temperature, relative humidity, rainfall and photoperiod. An examination of Table 1 indicate high degree of negative correlation between I. $I_{\cdot 30}$ and mean monthly temperature ($r_{12}$ = – 0.92 and – 0.92 respectively). Similar negative correlation (but lesser value) also existed between I. $I_{\cdot 30}$ and mean monthly photoperiod ($r_{15}$ = – 0.77 and – 0.80 respectively). Moderate negative correlation also existed between lice index and mean monthly rainfall ($r_{14}$ = – 0.53 and – 0.65). However, the correlation between I. $I_{\cdot 30}$ and mean monthly R. H. have been found insignificant ($r_{13}$ = + 0.17 and + 0.04 respectively). The lice index remained comparatively lesser during the month having high temperature and light period and also the rainfall. However, the relationship between population levels and R. H. remained insignificant.

## D. Discussion

It is generally agreed that lice of domestic ungulates normally peak during winter months. However, there is considerable dispute over the reasons responsible for summer decline in their population. Seasonal changes in climate notably temperature, humidities, rainfall, photoperiod and thunderstorm etc. affect ectoparasite numbers. On large mammals the climatic extremes may kill the lice. MURRAY & GORDON (1969) have discussed the factors regulating seasonal cycle in sheep ischnoceran, *Bovicola ovis,* in Australia. They concluded that major factor were shearing, solar radiations and thunderstorms reducing louse number over a six months summer's period which was basically unfavourable for lice (MURRAY 1963, 1968). The factors causing seasonal variation in the population of four cattle lice (*Bovicola bovis*, *Linognathus vituli, Solenopotes capillatus* and *Haematopinus eurysternus*) have also been discussed by the workers. A number of factors reportedly affect the lice population. These include host crowding, host skin secretion, hair condition, thickness of hair coat, hair length and shedding, breed resistance, host nutrition, environmental humidities, rainfall, photoperiod and host grooming behaviour (CRAUFURD-BENSON 1941, MATTHYSSE 1946, LANCASTER 1957, JENSEN & ROBERTS 1966, LEWIS et al. 1967, ELY & HARVEY 1969, GIBNEY et al. 1985, RAWAT & SAXENA 1992 a, b).

Thus, the seasons may directly or indirectly affect the ectoparasite population causing morphological, physiological and behavioural changes in the hosts. The hair may alter the host physiologically (mobility, migration, grooming etc.). The impact of host reproductive hormones on the population of mammalian lice has not been investigated so far. However, in case of avian lice, FOSTER (1969) has indicated the synchronization of population levels of amblyceran lice with the levels of birds gonadal hormones. However, present studies were primarily designed for recording the variation in natural population of goat biting louse. In absence of any reliable method for recording louse population on alive hosts, the method based on examination of 30 anatomical sites (measuring 1 inch$^2$) has given satisfactory results.

More or less similar results have been obtained from two goats. Strong negative correlation existed between infestation levels and environmental temperature and also the photoperiod. Moderately negative correlation occurred between infestation levels and rainfall. Factors like temperature and photoperiod possibly alter the microclimate of host hair coat, causing changes in louse population. However, present observation were made under natural condition and conclusion cannot be verified until the experiment were performed under extremely controlled condition (in room equipped with thermostatically controlled unit) after harbouring statistically adequate numbers of host. Such a study (a part of big set up) may provide exact information about factors responsible for seasonal variation in goat lice population.

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## Summary

Seasonal variation in the natural population levels of *Bovicola caprae* have been recorded on two goats during July, 1991 to June, 1992. Trends of population fluctuation remained nearly similar on two goats. The infesta-

tion index (I. $I_{30}$) remained minimum during July to August. It rose continuously in following month and peak index was obtained in February, followed by regular decline. Strongly negative correlation existed between infestation level and mean monthly temperature and also the photoperiod. Moderately negative correlation occurred between lice index and mean monthly rainfall also. However, correlation with environmental relative humidity remained insignificant.

## Zusammenfassung

*Jahreszeitliche Populationsdynamik beim Ziegenhaarling, Bovicola caprae (Insecta, Phthiraptera, Ischnocera, Trichodectidae).* – Auf zwei unter „natürlichen" Bedingungen gemeinsam gehaltenen Hausziegen (*Capra aegagrus* f. *dom.*) wurde bei Rishikesh, (Dehra Dun, Indien) von Juli 1991 bis Juni 1992 die Populationsentwicklung von *Bovicola caprae* (Gurlt, 1843) verfolgt. Sie entwickelte sich bei beiden Wirten nahezu gleich. Der Befallsindex (I. $I_{30}$: nach jeweils 30 Probestellen im Haarkleid) blieb im Juli und August minimal, stieg aber während der folgenden Monate kontinuierlich an und erreichte im Februar den höchsten Wert. Danach sank der Befall. Die Befallsintensität korrelierte straff negativ mit Monatstemperatur und Tageslichtdauer. Eine Korrelation mit gewisser Streuung ergab sich mit den Regentagen. Die relative Luftfeuchtigkeit blieb insignifikant.

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