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Population composition of poultry shaft louse, *Menopon gallinae* (Insecta, Phthiraptera, Amblycera, Menoponidae)

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A. Introduction

Only few workers have provided information on population composition of avian lice. However, other aspects like population levels and seasonal variations in population of lice have been recorded from time to time. Information on population levels of some avian lice has been given by HOYLE (1938), BOYD (1951), WOODMAN & DICKE (1954), ASH (1960), BAUM (1968), PFADT (1971), KLOCKENHOFF et al. (1973), EVELEIGH & THRELFALL (1976), AGARWAL & SAXENA (1979) and CHANDRA et al. (1988, 1990). Likewise, the population structure of chicken body louse, *Eomenacanthus stramineus* has been noted by TRIVEDI & SAXENA (1991). Recently, information on the population composition of a mammalian louse, *Bovicola caprae* has also been supplemented (Kumar et al. 1994). In present study an attempt has been made to record the population composition of poultry shaft louse, *Menopon gallinae* (L., 1758) upon 94 poultry birds belonging to DehraDun (India).

B. Material and Method

Different techniques available for recovering the lice from infested bird have been tried during the present investigation. The dissolving technique put forward by BEER & COOK (1957) (dissolving all the feathers in hot KOH and trypsin, followed by straining) proved quite troublesome and lengthy, due to practical difficulties involved in dissolving all the feathers. The dusting technique of FLOYD & TOWER (1956) (fluffing the bird after dusting with pyrethrum) and brushing technique of DUNN (1932) (brushing the individual feathers of anaesthetised bird) were also tried. However, in the present studies fluffing technique of HARSHBARGER & RAFFENSPERGER (1959) was found most suitable but Chloroform was used as fumigating agent instead of methyl bromide, as it took lesser time. Each bird, well secured to prevent any loss of lice by flopping the wings was placed in a fumigation chamber. A large wad of cotton wool thoroughly soaked in chloroform was placed in a steel meshed container and hanged in fumigation chamber. After 30 minutes, the bird was removed from chamber and suspended by a wire. A large polythene bag (previously threaded and carrying hole in bottom) was pulled over the bird. The feathers were then fluffed with hand so that the anaesthetised lice fall straight down to large white sheet of paper/plastic. It was found that more than 80 % population recovered in 10 minutes. Now, after removal of plastic bag, each feather as well as skin of bird was thoroughly searched for any louse present. The lice obtained through this method were then transferred to 70 % alcohol and examined under the stereozoom binocular microscope. *M. gallinae* population was sorted out and separated sexwise and stagewise.

C. Observations

An average of 702 *M. gallinae* were collected per bird (n = 94). Maximum number recorded from any bird was 4017 while minimum 27. To study the population composition, entire data has been divided into six categories (Table 1). Maximum number of birds (n = 31) carried 1–300 *M. gallinae* (mean number, 34 ♂, 52 ♀, 73 N (nymph); ♂ : ♀, 1 : 1.6 and A : N, 1 : 0.9), 20 birds had 301–600 lice (mean number, 86 ♂, 140 ♀, 204 N; ♂ : ♀, 1: 1.6 and A : N, 1 : 0.9) and 23 birds could be placed in 601–900 lice category (mean number, 110 ♂, 216 ♀, 424 N; ♂ : ♀, 1 : 2 and A : N, 1 : 1.3). Thus, more than 80 % of the examined birds had less than 900 *M. gallinae* (light to moderate infestation). As many as 10 birds had 901–1200 lice (mean number, 129 ♂, 260 ♀, 688 N; ♂ : ♀, 1 : 2 and A : N, 1 : 1.8) and four birds carried 1201–1500 *M. gallinae* (mean number, 192 ♂, 397 ♀, 664 N; ♂ : ♀, 1 : 2 and A : N, 1 : 1.1. Heavy infestation (above 1500 lice) could be observed on only six birds (mean number, 355 ♂, 709 ♀, 2165 N; ♂ : ♀, 1 : 2 and A : N, 1 : 2).

The overall ♂ : ♀ (including all categories remained 1 : 1.88 while overall A : N was 1 : 1.41. Furthermore, nymphal population was four times higher to that of ♂ (♂ : N, 1 : 4.07) and 2.16 times higher to that of ♀ (♀ : N, 1 : 2.16). Attempt was made to find out the degree of correlation between male, female and nymphal population. Significantly higher values (above ± 0.9) of r (Carl Pearsons correlation coefficient) have been recorded in all cases viz. ♂ : ♀, A : N, ♂ : N and ♀ : N.

D. Discussion

Poultry shaft louse, *Menopon gallinae* (and also the chicken body louse, *Eomenacanthus stramineus*) do not only affect the vitality and productivity of its host but may also act as reservoire and

transmitter of certain infectious diseases like fowl cholera, typhoid and toxoplasmosis (SAXENA et al. 1985). However, the studies on its population dynamics have escaped the attention of workers. The population levels of phthirapterans are highly variable and can be influenced by a number of factors (environmental factors like temperature, humidity, rainfall, photoperiod, solar radiations; host factors like preening, grooming, scratching, dusting; biological factors like host age, health, breed, sex, body size, mode of confinement and interspecies competition etc.). Nevertheless, ASH (1960) noted 10,000 (*Austromenopon* sp.) on common gull. Likewise, PFADT (1971) recorded 8000 *Eomenacanthus stramineus* on a single poultry. However, maximum number of *M. stramineus* recorded on 27 poultry birds of Dehradun was only 578 (TRIVEDI & SAXENA 1991). During present studies maximum number of *Menopon gallinae* recorded was 4017 while minimum remained 27. Thus, the figure was not so high. This may be due to the fact that poultry birds were purchased from owners/market/poultry farms. Being profitable from trade point of view, the owners might have prevented alarmingly high population build up using sprays/dusts. Anyway, present studies were primarily designed to record the population composition at different levels of infestation. The results indicate that female outnumbered the males at all the levels of infestation (nearly 1.5 to 2 times higher) and the difference was relatively more prominent at higher levels of infestation. There was higher degree of correlation between ♂ and ♀ population (r = + 0.99). The predominance of females in natural population has been noted by many workers (see MARSHALL, 1981). The imbalances in sex ratio may be due to fact that in phthirapteran population, males are generally shortlived than females (however, the bionomics of *M. gallinae* still remains unpublished). As far as adult nymph ratio is concerned, at two lower levels of infestations, the adults dominated the nymphs but as the level increased, the nymphal population outnumbered the adults and at highest level it became more than double. The high degree of correlation between adults and nymphs explains the simultaneous expansion of population. More or less similar results were obtained by EVELEIGH & THRELFALL (1976), TRIVEDI & SAXENA (1991) and KUMAR et al. (1994). However, it is just possible that brushing technique may not lead to full recovery of louse load, specially the nymphal population (as compared to dissolving method). But KUMAR et al. (1994) did not find the latter method to be so advantageous in this context (in case of goat lice).

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Tab. 1. Showing population composition of *Menopon gallinae* upon 94 poultry birds (*Gallus gallus* f. *dom*).

No. of lice	Frequency (Mean)	Mean number of					Ratio	
		Male	Female	Adult	Nymph	Total	♂ : ♀ : N	A : N
1– 300	31	33.52	52.13	85.65	73.06	158.71	1 : 1.56 : 2.18	1 : 0.85
301– 600	20	85.90	140.45	226.35	204.15	430.50	1 : 1.64 : 2.38	1 : 0.90
601– 900	23	110.48	216.09	326.57	424.09	750.65	1 : 1.96 : 3.84	1 : 1.30
901–1200	10	129.00	260.30	389.30	687.80	1077.10	1 : 2.02 : 5.33	1 : 1.77
1201–1500	4	192.25	397.00	589.25	663.50	1252.75	1 : 2.07 : 3.45	1 : 1.13
1501–above	6	354.50	708.83	1063.33	2164.50	3227.83	1 : 2.00 : 6.11	1 : 2.04

No. of lice	Sex & stage	Overall Total No.	Overall Mean No.	Overall Ratio
1– 300	Male	9484	100.89	♂ : ♀ – 1 : 1.88
301– 600	Female	17839	189.78	A : N – 1 : 1.41
601– 900	Adult	27323	290.67	♂ : N – 1 : 4.07
901–1200	Nymph	38621	410.86	♀ : N – 1 : 2.16
1201–1500	Total	65944	701.53	
1501–above	Range	27–4017		

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Summary

Population composition of poultry shaft louse, *Menopon gallinae* has been determined on 94 poultry birds, at different levels of infestation. The overall male, female ratio has been found to be 1: 1.9, while adult nymph ratio remained 1 : 1.4. High degree of correlation existed between male, female and also the adult, nymph population.

Zusammenfassung

Populationsstruktur der „Schaftlaus" Menopon gallinae (Phthiraptera, Amblycera, Menoponidae) beim Haushun (Gallus gallus f. domestica). – Bei 94 frischtoten, aus verschiedenen Haltungen stammenden und für jeweils 30 min chloroformierten Haushühnern in Derahdun (Indien) wurden durchschnittlich 702 (27–4017) Exemplare von *Menopon gallinae* festgestellt. Bei 80 % der untersuchten Wirtsindividuen lebten nicht mehr als 900 Ex. von *M. gallinae*. Die ♀waren gegenüber den ♂ stets in der Überzahl (1 : 1,9). Das Verhältnis von Imagines zu Larven betrug 1 : 1,4. die ermittelten Korrelationen zwischen ♂ und ♀, Imagines und Larven sind hochsignifikant.

Literature

AGARWAL, G. P. & A. K. SAXENA (1979): Studies on seasonal dynamics of *Lipeurus lawrensis tropicalis* PETERS (Phthiraptera : Ischnocera) infesting poultry birds. – Z. angew. Entomol. **88**, 470–476.

ASH, J. S. (1960): A study of the Mallophaga of birds with particular reference to their ecology. – Ibis. **102**, 93–110.

BAUM, H. (1968): Biologe and Ökologie der Amselfederläuse. – Angew. Parasitol. **9**, 129–175.

BOYD, E. M. (1951): A survey of parasitism of the starling, *Sturnus vulgaris* L. in North America – J. Parasitol. **57**, 56–84.

BEER, J. R. & E. F. COOK (1957): A method of collecting ectoparasites from birds. – J. Parasitol. **43**, 445.

CHANDRA S., G. P AGARWAL, S. P. SINGH & A. K. SAXENA (1988): Seasonal variation in population of two ischnoceran phthirapterans infesting common Myna, *Acridotheres tristis*. – J. Zool. Res. **1**, 105–108.

–, G. P. AGARWAL, S. P. N. SINGH & A. K. SAXENA (1990): Seasonal changes in population of *Menacanthus eurysternus* (Mallophaga: Amblycera) on the common Myna, *Acridotheres tristis*. – Int. J. Parasitol. **20**, 1063–1065.

DUNN L. H. (1932): An effective method for collecting ectoparasites from live animals and birds. – Psyche (Boston) **39**, 26–29.

EVELEIGH E. S. & W. THRELFALL (1976): Population dynamics of lice (Mallophaga) on auks (Alcidae) from Newfoundland – Can. J. Zool. **54**, 1694–1711.

FLOYD E. H. & B. A. TOWER (1956): Insecticide impregnated litter for control of Chicken body lice, *Eomenacanthus stramineus* (NITZSCH) on poultry – Poultry Sci. **35**, 96–900.

HARSHBARGER J. C. & E. M. RAFFENSPERGER (1959): A method for collecting and counting populations of the shaft louse. – Econ. Entomol. **52**, 1215–1216.

HOYLE W. L. (1938): Transmission of poltry parasite by birds with a special reference to english or house sparrow and chicken. – Trans. Kanas Entomol. Soc. **41**, 379–384.

KLOCKENHOFF, H., G. RHEINWALD & M. WINK (1973): Mallophagenbefall bei Vögeln. Massenbefall als Folge von Schäden an den Wirten. – Bonn. zool. Beitr. **24**, 122–133.

KUMAR, A., B. S. RAWAT, A. K. SAXENA & G. P. AGARWAL (1994): Population structure of goat biting louse, *Bovicola caprae* (Phthiraptera : Ischnocera). – Appl. Parasitol. **35**, 141–145.

MARSHALL A. G. (1981): The ecology of ectoparasitic insects. – London etc.

PFADT R. E. (1971): Fundamentals of Applied Entomology. – New York.

SAXENA, A. K., G. P. AGARWAL, S. CHANDRA & O. P. SINGH (1985): Pathogenic involvement of Mallophaga. – Z. angew. Entomol. **99**, 294–300.

TRIVEDI M. C. & A. K. SAXENA (1991): Population dynamics of chicken body louse, *Menacanthus stramineus* (Phthiraptera: Amblycera). – J. Zool. Res. **4**, 37–42.

WOODMAN W. J. & R. J. DICKE (1954): Population fluctuations of the mallophagan parasites *Brueelia vulgata* (Kellogg) upon the sparrow – Trans. Wisconsin. Acad. Sci. **43**, 133–135.

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