

Population characteristics of Phthiraptera occurring on Red Whiskered Bulbul (*Pycnonotus jocosus*)

Gaurav Arya, Nayanci Bansal, Vikram Khan, Aftab Ahmad and A.K. Saxena*

Department of Zoology, Govt. Raza P. G. College, Rampur (U.P.), INDIA

*Corresponding author. E-mail: akscsir@rediffmail.com

Abstract: Two phthirapteran species, *Menacanthus eurysternus* (Amblycera) and *Brueelia sp.* (Ischnocera) were recovered from 100 Red Whiskered Bulbuls (*Pycnonotus jocosus*) during March to December 2006. The occurrence of both the phthirapteran species on the aforesaid host are new host records. The prevalence, intensity of infestation, range of infestation, variance to mean ratio, sex ratio, adult nymph ratio, index of discrepancy (D) and exponent of negative binomial (k) were computed. The frequency distribution pattern of *M. eurysternus* conforms to negative binomial model. The frequency distribution pattern of *Brueelia sp.* was skewed but not described by the negative binomial.

Keywords: Phthiraptera, Lice, Prevalence, Ischnocera, Amblycera, Mallophaga

INTRODUCTION

Population characteristics of Phthiraptera on certain Indian birds (domestic fowls, ducks, pigeons, bank Myna's, sparrows, parrots, King fishers, Indian red Avadavats, common Myna's and house crows) have been noted by selected workers (Chandra *et al.*, 1990; Trivedi and Saxena, 1991, Trivedi *et al.*, 1992; Saxena *et al.*, 1995, 1997, 2004, 2007; Singh *et al.*, 1998, 2000a, b, 2009; Kumar *et al.*, 2004; Gupta *et al.*, 2007; Khan *et al.*, 2008, 2009; Beg *et al.* 2008; Rajput *et al.*, 2009). The negative binomial model is often used to describe the frequency distribution pattern of avian lice (Crofton, 1971; Rekasi *et al.*, 1997). A survey of literature revealed that population levels of Phthiraptera on the Red Whiskered Bulbul, *Pycnonotus jocosus* deserved investigation. The present report furnishes information on the prevalence and population structure of two phthirapteran species occurring on this bird.

MATERIALS AND METHODS

One hundred Red Whiskered Bulbul, *Pycnonotus jocosus* (Pycnotidae; Passeriformes; Aves) were live trapped between March 2006 to December 2006, in the district Rampur (India). After tying the legs, each bird was examined visually by deflecting feathers. Infested birds were subjected to delousing by the modified fair Isle method (Gupta *et al.*, 2007). Aforesaid fumigation method reportedly does not yield complete louse load (Clayton and Drown, 2001) but is the best option for securing the life of bird (killing the bird to collect the lice will not be accepted by scientific community). The head was separately examined after delousing. Deloused birds were released in wild. Entire louse load was transferred to 70

% alcohol and separated to species, stage and sex wise, for further analysis. The prevalence, mean intensity, sample mean abundance, variance to mean ratio, exponent (k) of the negative binomial distribution and index of discrepancy (D) were estimated with the help of software offered by Rozsa *et al.* (2000). The goodness of fit between the observed and the expected frequencies (negative binomial) was determined by the X^2 test.

RESULTS

Prevalence: The prevalence of Phthiraptera on Red Whiskered Bulbul was 58%. Two species (an Amblyceran, *Menacanthus eurysternus* and an Ischnoceran, *Brueelia sp.*) were recorded. The ischnoceran louse, *Brueelia sp.* was more prevalent (53%) than amblyceran, *M. eurysternus* (37%).

Intensity of Infestation: A total of 1331 specimens (all stages) were collected. The sample mean abundance of Phthiraptera was 13.31 (range 1-50, n=100). Total number of *Brueelia sp.*, collected was 798 (mean intensity-15.6, median intensity-11.0, sample mean abundance-7.98, range of infestation-1-50, n=100). Likewise, 533 specimens of *M. eurysternus* were recovered (mean intensity-14.41, median intensity-12.0, sample mean abundance-5.33, range of infestation-1-46, n= 100).

Distribution pattern: The frequency distribution pattern of *Brueelia sp.* was hollow curve type, in which most of the hosts have a few parasites and most of the parasites occur on a few hosts. The variance to mean ratio (16.3) also indicated the over dispersion. Computed values of the binomial exponent (k) and index of discrepancy (D) were 0.25 and 0.68, respectively. However, the frequency distribution pattern of *Brueelia sp.* did not conform the

negative binomial model ($X^2= 65.80$, $P= 0.05$). The frequency distribution pattern of *M. eurysternus* was also hollow curve type. The value of variance to mean ratio was much higher (19.9) than unity, indicating over dispersion. The values of binomial exponent (k) and index of discrepancy (D) were 0.13 and 0.79, respectively. The observed frequencies of the distribution of *M. eurysternus* conformed to frequencies expected by the negative binomial model ($X^2= 31.45$, $P= 0.05$). Thus, the negative binomial model was found to be a good fit in case of *M. eurysternus*.

Population structure: The population compositions of both the species were analyzed at different levels of infestation. Adult population had slight edge over nymphs, as the over all adult to nymph ratio was 1:0.9, in case of *Brueelia sp.* while the adult population equaled to the nymphs, in case of *M. eurysternus* (1:1). The sex ratios of both the species were female biased (*Brueelia sp.*- 1:1.2; *M. eurysternus*-1:1.3). The ratio of three nymphal instars exhibited considerable variation at different levels of infestation, in both species. However, the over all ratio of first, second and third instars were 1:1.1:1.2 for *Brueelia sp.* and 1:1:0.9 for *M. eurysternus*.

DISCUSSION

Lakshminarayana (1979) has provided a synoptic list of phthirapteran ectoparasites occurring on Asian birds and Price et al. (2003) have furnished a world checklist of avian Phthiraptera. The presence of only one amblyceran lice, *Myrsidea pycnonoti* has been recorded from Red Whiskered Bulbul (*Pycnonotus jocosus*). During present investigation none of the infested Bulbul was found infested with *Myrsidea species* and 53 % of examined

birds carried an ischnoceran louse *Brueelia species*, while, 37 % carried an amblyceran louse, *Menacanthus eurysternus*. Thus, the occurrence of *Brueelia sp.* and *M. eurysternus* on *Pycnonotus jocosus* are the new host records.

Lice population on avian host ranges from nil to thousands per host (Marshall, 1981). Population levels of Phthiraptera on selected birds have been occasionally reported (Price and Graham, 1997). However, lice population of avian hosts rarely reach alarming levels, due to various defense tactics (grooming, preening, moulting, dusting etc.) adopted by the host birds (Price and Graham, 1997).

Phthirapteran ectoparasites generally exhibit aggregated distribution that often conforms to the negative binomial model (Rekasi et al., 1997). The degree of aggregation is usually quantified as the exponent (k) of the negative binomial model (Rozsa et al., 2000). Use of index of discrepancy (D) has also been recommended, in this regard. In the present study, the observed distribution conformed to the distribution expected by the negative binomial model for the amblyceran species, *M. eurysternus*, but not for the ischnoceran louse, *Brueelia sp.*

An examination of the population structure of a species provides useful clues regarding the temporal stability of the population; presence of fewer adults and more nymphs in a population indicates that the population is expanding and vice-versa (Marshall, 1981). Since avian lice exhibit seasonal variation in population, the proportion of nymphs may vary with time. Apart from seasonality, many other factors can affect population structure (Marshall, 1981). During the present study, the

Table 1. Population characteristics of *Brueelia sp.* and *Menacanthus eurysternus* on 100 Red Whiskered Bulbul.

Parameters	<i>Brueelia sp.</i>	<i>M. eurysternus</i>
Sample size	100	100
Prevalence	53% (n=100)	37% (n=100)
Sample mean abundance	7.98 (n= 53)	5.33 (n=37)
Mean intensity	15.06	14.41
Median intensity	11.0	12.0
Range of infestation	1-50 (n=100)	1-46 (n=100)
Variance to mean ratio of population	16.344	19.998
Exponent of negative binomial (k)	0.25	0.13
Index of discrepancy (D)	0.686	0.797
Weather conforms to -ve Binomial	No	Yes
Total number of specimens collected	798	533
M:F	1:1.2	1:1.3
A:N	1:0.9	1:10
IN:IIN:IIIN	1:1.1:1.2	1:1:0.9

adult to nymph ratio remained 1:0:9 for *Brueelia sp.* and 1:1 for *M. eurysternus*. Thus, the over all adult to nymph ratios did not indicate expanding populations.

Skewed sex ratios are quite common among phthirapteran population. Sampling bias and unequal longevity of the sexes have been considered responsible for sex ratio biases (Marshall, 1981). Louse sex ratios have been predicted to be less skewed in colonial birds than in terrestrial ones (Rozsa *et al.*, 1996). Both phthirapteran species infesting the Red Whiskered Bulbul exhibited a skewed sex ratio, as females outnumbered the males in natural population. However, it is generally agreed that sex ratios in natural populations may be altered by factors such as season, population density and nutrition (Marshall, 1981).

ACKNOWLEDGEMENTS

We thank to the Principal, Govt. Raza P. G. College, Rampur, India for laboratory facilities; to Prof. E. Mey (Naturhistorisches Museum in Thuringer Landesmuseum Heidecksburg, schlobbezirk 1, D-07407 Rudolstadt Bundesrepublik, Germany) for the identification of lice and to the Department of Science and Technology, New Delhi, for sanctioning the project to Dr. A.K. Saxena.

REFERENCES

- Beg, S., Gupta, N., Kumar, S., Khan, V., Bhatnagar, S. and Saxena, A.K. (2008). Occurrence of Phthiraptera on the house crow, *Corvus splendens* (Passeriformes: Corvidae). *Entomon*, 33:75-78.
- Chandra, S., Agarwal, G.P., Singh, S. P. N. and Saxena, A. K. (1990). Seasonal changes in a population of *Menacanthus eurysternus* (Mallophaga: Amblycera) on the common Myna, *Acridotheres tristis*. *Int. J. Parasitol.*, 20: 1063-1065.
- Clayton, D.H. and Drown D.M. (2001). Critical evaluation of five methods for quantifying chewing lice (Insecta: Phthiraptera). *J. Parasitol.*, 87: 1291-1300.
- Crofton, H.D. (1971). A quantitative approach to parasitism. *Parasitology*, 62: 179-193.
- Gupta, N., Kumar, S. and Saxena, A. K. (2007). Prevalence and population structure of lice (Phthiraptera) on the Indian Red Avadavat. *Zool. Sci.*, 24: 381-383.
- Khan, V., Kumar, S., Gupta, N., Ahmad, A. and Saxena, A. K. (2008). Prevalence of phthirapteran ectoparasites on selected poultry in the district, Rampur (U.P.). *Indian Vet. J.*, 85: 447-448.
- Khan V., Kumar, S. Gupta, N., Ahmad, A. and Saxena, A. K. (2009). Prevalence of lice in pigeons. *Indian Vet. J.*, 86: 531-532.
- Kumar Sandeep, Nidhi Gupta and Saxena, A. K. (2004). Population composition of selected poultry lice (Phthiraptera). *Res. Rev. Parasitol.*, 64: 49 - 54.
- Lakshminaryana, K.V. (1979). A synoptic list of Mallophaga. *Rec. Zool. Surv. India*, 75: 39-201.
- Marshall, A. G. (1981). The ecology of ectoparasitic insects. Academic Press, London.
- Price, M.A. and Graham, O.H. (1997). Chewing and Sucking lice as parasites of mammals and birds. *USDA Agr. Res. Serv. Tech. Bull.* No. 1-1849: 1-1257.
- Price, R.D., Hellenthal, R.A., Palma, R.L., Johnson, K.P. and Clayton, D.H. (2003). The chewing lice: World checklist and biological overview. *Illinois Natural History Survey special Publication*, 1- 501.
- Rajput, S., Joshi, V. D., Gupta, N., Khan, V. and Saxena, A. K. (2009). Population dynamics of Phthiraptera on Indian Bank Myna, *Acridotheres ginginianus*. *Entomon*, 34 (2): 99- 102.
- Rekasi, J., Rozsa, L. and Kiss, B. J. (1997). Patterns in the distribution of avian lice (Phthiraptera : Amblycera, Ischnocera). *J. Avian Biol.*, 28: 150-156.
- Rozsa, L., Rekasi, J. and Reiczigel, J. (1996). Relationship of host coloniality to the population ecology of avian lice (Insecta: Phthiraptera). *J. Anim. Ecol.*, 65: 242-258.
- Rozsa, L., Reiczigel, J. and Majoros, G. (2000). Quantifying parasites in sample of hosts. *J. Parasitol.*, 86: 228- 232.
- Saxena, A. K., Kumar, A., Surman and Singh, S. K. (1995). Prevalence of *Menopon gallinae* Linne. (Phthiraptera : Amblycera) on poultry birds of Garhwal. *J. Parasitic Dis.*, 19 (1): 69-72.
- Saxena, A. K., Surman, Singh, S. K., Kumar, A. and Trivedi, M. C. (1997). Population composition of poultry shaft louse, *Menopon gallinae* (Insecta, Phthiraptera, Amblycera, Menoponidae). *Rudolst. Nat. Sch.*, 7: 49-51.
- Saxena, A. K., Kumar, S., Gupta, N. and Singh, S.K. (2004). Prevalence of phthirapteran ectoparasitic insects on domestic hens of Rampur. *J. Parasitic Dis.*, 28(1): 57-60.
- Saxena A. K., S. Kumar, N. Gupta, J. D. Mitra, S. A. Ali and R. Srivastava (2007). Distribution pattern of phthirapterans infesting certain common Indian birds. *J. Parasitol.*, 93/4: 957-958.
- Singh, S. K., Surman, A. Kumar and A. K. Saxena (1998). Population composition of four phthirapteran ectoparasites infesting blue rock pigeon *Columba livia*. *J. Parasitic Dis.*, 22(2): 144-147.
- Singh, S. K., Surman, A. K. Saxena and J. D. Mitra (2000a). Seasonal variation in the population of poultry shaft louse, *Menopon gallinae* (Phthiraptera : Amblycera). *Ind. J. Env. Ecoplan.*, 3(3): 615-618.
- Singh, S. K., A. Kumar, Surman, Smita Badola and A. K. Saxena (2000b). Seasonal variation in population of one amblyceran and one ischnoceran pigeon lice (Phthiraptera, Insecta). *J. Parasitol. Appl. An. Biol.*, 9(2): 89-96.
- Singh, S. K., Surman, Saxena, A. K., Maurya, N. and Suresh Chandra (2009). Prevalence of *Eomenacanthus stramineus* (Insecta, Phthiraptera, Amblycera, Memoponidae) on poultry birds (*Gallus gallus* F. *Domesticus*) of Jaunpur. *J. App. Nat. Sci.*, 1(2): 235-240.
- Trivedi, M. C. and Saxena, A. K. (1991). Population dynamics of chicken body louse, *Menacanthus stramineus* (Phthiraptera : Amblycera). *J. Zool Res.*, 4 (1&2):37-42.
- Trivedi, M. C., A. K. Saxena and B. S. Rawat (1992). Incidence of Mallophaga on poultry in Dehradun (India). *Angew. Parasitol.*, 33: 69-78.