Distribution Pattern of Phthirapterans Infesting Certain Common Indian Birds

Author(s): A. K. Saxena, Sandeep Kumar, Nidhi Gupta, J. D. Mitra, S. A. Ali, and Roshni Srivastava
Source: Journal of Parasitology, 93(4):957-958. 2007.
Published By: American Society of Parasitologists
DOI: http://dx.doi.org/10.1645/GE-978R1.1
URL: http://www.bioone.org/doi/full/10.1645/GE-978R1.1

bugs in southeast Georgia, U.S.A. Journal of Parasitology **81:** 324–326.

Rosypal, A. C., G. C. Troy, R. B. Duncan, Jr., A. M. Zajac, and D. S. Lindsay. 2005. Utility of diagnostic tests used in diagnosis on infection in dogs experimentally inoculated with a North American isolate of *Leishmania infantum infantum*. Journal of Veterinary Internal Medicine **19:** 802–809.

———, ———, A. M. Zajac, R. B. Duncan, Jr. K. Waki, K. P. Chang, and D. S. Lindsay. 2003. Emergence of zoonotic canine leishmaniasis in the United States: Isolation and immunohistochemical detection of *Leishmania infantum* from foxhounds from Virginia. Journal of Eukaryotic Microbiology **50:** S691–S693.

Rosypal, A. C., A. M. Zajac, and D. S. Lindsay. 2003. Canine visceral leishmaniasis and its emergence in the United States. Veterinary Clinics of North America Small Animal Practice **33:** 921–937.

Scalone, A., R. DeLuna, G. Oliva, L. Baldi, G. Satta, G. Vesco, W. Mignone, C. Turilli, R. R. Mondesire, D. Simpson, et al. 2002. Evaluation of the *Leishmania* recombinant K39 antigen as a diagnostic marker for canine leishmaniasis and validation of a standardized enzyme-linked immunosorbent assay. Veterinary Parasitology **104:** 275–285.

Yablsey, M. J., and G. P. Noblet. 2002a. Biological and molecular characterization of a raccoon isolate of *Trypanosoma cruzi* from South Carolina. Journal of Parasitology **88:** 1273–1276.

———, and ———. 2002b. Seroprevalence of *Trypanosoma cruzi* in raccoons from South Carolina and Georgia. Journal of Wildlife Diseases **38:** 75–83.

———, ———, and O. J. Pung. 2001. Comparison of serological methods and blood culture for detection of *Trypanosoma cruzi* infection in raccoons (*Procyon lotor*). Journal of Parasitology **87:** 1155–1159.

J. Parasitol., 93(4), 2007, pp. 957–958

Distribution Pattern of Phthirapterans Infesting Certain Common Indian Birds

A. K. Saxena, Sandeep Kumar, Nidhi Gupta, J. D. Mitra, S. A. Ali, and Roshni Srivastava, Department of Zoology, Government Raza Post Graduate College, Rampur (U.P.) 244 901, India. *e-mail: akscsir@rediffmail.com*

ABSTRACT: The prevalence and frequency distribution patterns of 10 phthirapteran species infesting house sparrows, Indian parakeets, common mynas, and white breasted kingfishers were recorded in the district of Rampur, India, during 2004–05. The sample mean abundances, mean intensities, range of infestations, variance to mean ratios, values of the exponent of the negative binomial distribution, and the indices of discrepancy were also computed. Frequency distribution patterns of all phthirapteran species were skewed, but the observed frequencies did not correspond to the negative binomial distribution. Thus, adult–nymph ratios varied in different species from 1:0.53 to 1:1.25. Sex ratios of different phthirapteran species ranged from 1:1.10 to 1:1.65 and were female biased.

Certain workers have provided useful information on the prevalence and frequency distribution pattern of Phthiraptera on selected avian hosts. Work done so far on the subject has been reviewed from time to time (Marshall, 1981; Price and Graham, 1997; Price et al., 2003). The patterns of abundance of different lice on their avian hosts have been further discussed by Rekasi et al. (1997), Rozsa (1997), and Reiczigel et al. (2005). Here, we report information on the prevalence and frequency distribution patterns of 10 different phthirapteran species parasitizing some common Indian birds: house sparrow (*Passer domesticus*), Indian parakeet (*Psittacula eupatria*), common myna (*Acridotheres tristis*), and white-breasted kingfisher (*Halcyon smyrnensis*).

All birds were captured live (with mist nets) in the district of Rampur (U.P.), India, during 2004 and 2005. After tying the legs, each bird was thoroughly searched for the presence of lice by visual examination. Infested birds were then subjected to delousing by fumigation (modified ''Fair-Isle'' method). The efficacy of different methods for delousing infested birds has been discussed elsewhere (Clayton and Drown, 2001). Head and body feathers were further examined using a stereozoom trinocular microscope to remove the remaining lice. The entire louse load was placed in 70% alcohol and separated according to species, age, and gender. The prevalence (%), mean (X), and variance (s^2) were calculated. The exponent (k) of negative binomial distribution and index of discrepancy (D) (Rozsa et al., 2000) were generated, and the goodness of fit between observed and expected frequency distribution was determined by chi-square tests.

Three phthirapteran species, *Brueelia subtilis* (Nitzsch, 1874), *Echinophilopterus chapini* (Ewing, 1927), and *Myrsidea quadrifasciata* (Piaget, 1880), were recovered from 100 house sparrows (Table I). Frequency distribution patterns of the 3 species were skewed, but were not

Table I. Summary of distribution patterns of phthirapterans infesting of house sparrows, Indian parakeets, common myna, and white-breasted kingfishers in the district of Rampur, India, during 2004 and 2005.

Host	Sample size	Louse species	Prevalence (%)	Sample mean abundance	Range of infestation	Mean intensity (X)	Variance to mean ratio (s^2)	Exponent of negative binomial (k)	Index of discrepancy (D)
House sparrow	100	*Brueelia subtilis*	31.0	4.1	1–41	13.3	16.0	0.11	0.79
	100	*Echinophilopterus chapini*	14.0	1.1	2–21	7.6	10.6	0.05	0.90
	100	*Myrsidea quadrifasciata*	20.0	1.5	2–28	9.7	12.8	0.07	0.87
Indian parakeet	100	*Neopsittaconirmus elbeli*	34.0	7.4	2–46	21.8	21.2	0.11	0.76
	100	*Echinophilopterus chapini*	17.0	13.8	1–28	13.8	16.6	0.05	0.88
Common myna	100	*Myrsidea invadens*	31.0	5.1	2–63	16.3	32.1	0.10	0.86
	100	*Menacanthus eurysternus*	13.0	2.3	2–32	17.5	20.8	0.03	0.90
	100	*Brueelia chayanh*	24.0	6.9	3–82	28.9	41.9	0.06	0.86
	100	*Sturnidoecus bannoo*	42.0	15.6	3–106	37.07	50.3	0.12	0.78
White-breasted kingfisher	30	*Meropoecus* sp.	40.0	7.1	6–44	17.75	20.09	0.15	0.71

TABLE II. The population composition of 10 phthirapteran species infesting house sparrows, Indian parakeets, common mynas, and white-breasted kingfishers in the district of Rampur, India, during 2004 and 2005.

Host	Species	Number of hosts	Frequency	Average		Ratios (overall)*		Ratio (summers)
				Adults	Nymphs	M:F	I N : II N: III N	A:N (n)
House sparrow	*Brueelia subtilis*	100	31	8.7	4.6	1:1.3	1 : 0.7 : 0.5	1:1.7 (6)
	Echinophilopterus chapini	100	14	4.5	3.1	1:1.3	1 : 0.8 : 0.5	1:1.1 (3)
	Myrsidea quadrifasciata	100	20	5.5	4.2	1:1.7	1 : 0.8 : 0.6	1:1.1 (5)
Indian parakeet	*Neopsittaconirmus elbeli*	100	34	10.5	11.4	1:1.4	1 : 0.8 : 0.8	1:1.3 (17)
	Echinophilopterus chapini	100	17	6.1	7.7	1:1.4	1 : 0.8 : 0.6	1:1.2 (7)
Common myna	*Myrsidea invadens*	100	31	8.6	7.8	1:1.5	1 : 0.7 : 0.6	1:1.3 (5)
	Menacanthus eurysternus	100	13	9.8	7.7	1:1.1	1 : 0.6 : 0.5	1:0.7 (2)
	Brueelia chayanh	100	24	15.6	13.3	1:1.2	1 : 0.8 : 0.7	1:1.1 (4)
	Sturnidoecus bannoo	100	42	20.2	16.8	1:1.3	1 : 0.9 : 0.9	1:1.0 (6)
White-breasted kingfisher	*Meropoecus* sp.	30	12	11.6	6.2	1:1.5	1 : 0.9 : 1.3	1:2.1 (2)

* Abbreviations: M – male, F – female, A – adult, N – nymph, I N – first instar nymph, II N – second instar nymph, III N – third instar nymph, n – number of birds.

described by a negative binomial pattern (χ^2 = 82.5, $P > 0.05$; χ^2 = 33.9, $P > 0.05$; and χ^2 = 53.3, $P > 0.05$, respectively).

Indian parakeets were found infested with 2 ischnoceran phthirapterans, *Neopsittaconirmus elbeli* (Guimaraes, 1974) and *Echinophilopterus chapini* (Ewing, 1927) (Table I). The occurrence of *E. chapini* on parrots is a new host record. Four specimens of the amblyceran, *Kelerimenopon psittaculae*, were also recovered from a single parakeet, but excluded from further analysis. The frequency distribution again remained skewed, but could not be described by the negative binomial model (χ^2 = 85.87, $P > 0.05$ and χ^2 = 85.49, $P > 0.05$, respectively).

Common myna (*Acridotheres tristis*) were found infested with 2 amblyceran species, *Myrsidea invadens* (Kellogg and Chapman, 1902) and *Menacanthus eurysternus* (Burmeister, 1838), and 2 ischnoceran species, *Brueelia chayanh* (Ansari, 1955a) and *Sturnidoecus bannoo* (Ansari, 1955b) (Table I). The frequency distribution pattern did not conform to the negative binomial model (χ^2 = 20.01, $P > 0.05$; χ^2 = 14.45, $P > 0.05$; χ^2 = 32.28, $P > 0.05$; and χ^2 = 66.08, $P > 0.05$, respectively).

Only 1 ischnoceran species, *Meropoecus* sp., was recovered from 30 white-breasted kingfishers (Table I). A small sample size prevented curve fitting.

Table I contains further information regarding the mean intensities (X), values of binomial exponent (k), and the indices of discrepancy (D). Furthermore, the population composition of the lice on 4 avian hosts is shown in Table II. The overall adult–nymph ratio, sex ratio, and the ratio of 3 nymphal instars are also noted.

Present studies indicate that prevalence and intensities of different phthirapteran species on 4 Indian birds were not high. Frequency distribution patterns were generally skewed but failed to conform to the negative binomial model. Analysis of the population composition of any species provides clues regarding the temporal stability of the population (Marshall, 1981). The adult–nymph ratios varied in different species from 1:0.53 to 1:1.25. The population structure of bird lice is affected by several factors, including season. Detailed examination of the data shows that on 9 species (except *M. eurysternus*), the population of nymphs was comparatively higher (adult:nymph ranged from 1:0.69 to 1:2.06) than the average values shown in Table II on birds examined during the summers. The impact of seasons on the population structure of avian lice has rarely been investigated, but the seasonal variations in age structure among lice have been shown on seals (Kim, 1972). Moreover, in their study on the population dynamics of lice on 6 species of auks (Charadiiformes), Eveleigh and Threlfall (1976) found that nymphs did not predominate on adults, though they did on chicks, and that nymph populations increased rapidly. Hence, the adult–nymph ratio may vary with time. The sex ratios of different phthirapteran species ranged from 1:1.1 to 1:1.65 and were female biased. Sampling errors (being larger in size, the female lice are easier to collect), unequal longevity (the lifespan of adult males is generally shorter than that of females), differential killing by host birds (larger sized females are presumably more readily killed during preening by host birds), and local mate composition (if female lice disperse more effectively than males) have been linked to imbalances in sex ratios of phthirapteran populations (Marshall, 1981; Kim, 1985; Rozsa et al., 1996).

The authors are thankful to 2 anonymous referees for fruitful comments on the earlier draft of this paper; to the Principal, Govt. Raza P.G. College, Rampur, for laboratory facilities; to E. Mey (Naturhistorisches Museum im Thuringer Landesmuseum Heidecksburg, Schloßbezirk 1, D-07407 Rudolstadt Bundesrepublik, Germany) for the valuable help in identification of lice; and to the Department of Science and Technology, New Delhi, India for providing financial support to A.K.S. in the form of project SP/SO/AS-30-2002.

LITERATURE CITED

CLAYTON, D. H., AND D. N. DROWN. 2001. Critical evaluation of five methods for quantifying chewing lice (Insecta: Phthiraptera). Journal of Parasitology **87:** 1291–1300.

EVELEIGH, E. S., AND W. THRELFALL. 1976. Population dynamics of lice (Mallophaga) on auks (alcidae) from Newfoundland. Canadian Journal of Zoology **54:** 1694–1711.

KIM, K. C. 1972. Louse populations on the northern fur seal (*Callorhinus ursinus*). American Journal of Veterinary Research **33:** 2027–2036.

———. 1985. Evolution and host associations of Anoplura. *In* Coevolution of parasitic arthropods and mammals, K. C. Kim (ed.). John Wiley, New York, New York, p. 197–231.

MARSHALL, A. G. 1981. The ecology of ectoparasitic insects. Academic Press, London, U.K., 417 p.

PRICE, M. A., AND O. H. GRAHAM. 1997. Chewing and sucking lice as parasites of mammals and birds. U.S. Department of Agriculture, Technical Bulletin No. 1849: 309 p.

PRICE, R. D., R. A. HELLENTHAL, R. L. PALMA, K. P. JOHNSON, AND D. H. CLAYTON. 2003. The chewing lice: World checklist and biological overview, Vol. 24. Illinois Natural History Survey Special Publication, Champaign, Illinois, 501 p.

REICZIGEL, J., Z. LANG, L. ROZSA, AND B. TOTHMERESZ. 2005. Properties of crowding and statistical tools to analyze parasite-crowding data. Journal of Parasitology **91:** 245–252.

REKASI, J., L. ROZSA, AND B. J. KISS. 1997. Patterns in the distribution of avian lice (Phthiraptera: Amblycera, Ischnocera). Journal of Avian Biology **28:** 150–156.

ROZSA, L. 1997. Patterns in the abundance of avian lice (Phthiraptera: Amblycera, Ischnocera). Journal of Avian Biology **28:** 249–254.

———, J. REICZIGEL, AND G. MAJOROS. 2000. Quantifying parasites in samples of hosts. Journal of Parasitology **86:** 228–232.