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Comunicaciones

Population expansion of the Common Baya louse, *Brueelia plocea* (Lakhsminarayana, 1968 (Phthiraptera: Ischnocera)

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ABSTRACT

Reproductive potentials of avian Ischnocera reportedly differ considerably. Some species are distinctly fast breeder than others. An ischnoceran louse, *Brueelia plocea* (infesting Common Baya, *Ploceus philippinus*) was subjected to *in vitro* experimentation. The data obtained was used to construct the life table and to determine its intrinsic rate of natural increase (rm). The value of rm was determined as 0.045. At this rate, the population of *B. plocea* is supposed to be double after 15.41 days, indicating that it is moderate breeder.

Key words: Population expansion, intrinsic rate of natural increase, life table, Phthiraptera, Ischnocera.

RESUMEN

Los potenciales reproductivos descritos para los Ischnocera aviares difieren considerablemente. Algunas especies se reproducen más rápidamente que otras. El piojo ischnocera, *Brueelia plocea* (parásito del Baya común, *Ploceus philippinus*) fue sometido a un estudio *in vitro*. Los datos obtenidos fueron utilizados para establecer su tabla de vida y para determinar su tasa intrínseca de aumento natural (rm). El valor rm fue 0,045, lo que supone que la población de *B. plocea* puede doblarse en 15,41 días, lo que indica que su potencial reproductor es moderado.

Palabras clave: Crecimiento poblacional, tasa intrínseca de aumento natural, tablas de vida, Phthiraptera, Ischnocera.

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INTRODUCTION

The intrinsic rate of natural increase (rm) provides vital clues regarding the rate of population expansion of an organism. Attempts to record the intrinsic rates of natural increase of few avian ischnocera have been made by Saxena *et al.,* (2007), Gupta *et al.,* (2007) and Saxena *et al.,* (in press). Intrinsic rate of natural increase of two mammalian ischnoceran lice have also been indicated (Murray and Gordon, 1969; Rust 1974). The value of rm of the species studied so far, differed considerably. Hence, it was found worthwhile to work out the life table statistics of few more ischnoceran species. In the present studies, the intrinsic rate of natural increase of an ischnoceran louse, *Brueelia plocea* (Lakshminarayana, 1968) infesting Common Baya (*Ploceus philippinus*) has been determined, on the basis of data obtained through *in vitro* rearing of lice.

MATERIALS AND METHODS

Fifteen to twenty feathers of Common Baya (bearing fresh eggs of *B. plocea*) were gently cut from the host body and incubated in culture vials (35 ± 1°C, 75-82% RH), to record the incubation period. After the eclosion, first nymphal instars were removed daywise and reared till adulthood (on the host feather diet), to obtain information regarding the duration of three nymphal instars. Three colonies of apparently freshly moulted healthier adults were reared to record the adult longevity (at 35 ± 1°C, 75-82% RH, on host feather diet). Culture vials were examined daily to record the number of survivors and the number of eggs laid. Detailed rearing technique has already been discussed elsewhere (Saxena *et al.,* 2007 and Gupta *et al.,* 2007). The intrinsic rates of natural increase of the louse was calculated by the formula $\sum e^{-rmx} lxmx = 1$ (where e is the base of natural logarithm, x is the age of individual in days, lx is the number of individuals alive at age x, as the proportion of 1 and mx is the number of female offsprings produced/ female in the age intervals x) (Howe, 1953). The net reproductive rate ($Ro= \sum lxmx$), the innate capacity of increase ($rc= \log_e Ro/ Tc$), the precise generation time ($T= \log_e Ro/ rm$) and the finite rate of increase ($\lambda= e^{rm}$) were also determined. The doubling time was calculated by the equation- $DT= \log 2/ \log \lambda$.

RESULTS AND DISCUSSION

The data obtained from *in vitro* rearing of *B. plocea* is presented in Table 1. The data was utilized for the construction of life table (Table 2) following the lines suggested by Birch (1948), Leslie and Park (1949), Evans and Smith (1952) and Howe (1953). Since the male/ female ratio in natural population of *B. plocea* was found to be 1:1.3, the maternal frequency (mx, the average number of female eggs produced) was determined by multiplying the daily average egg rate by a factor of 0.62. The lx function (Table 2), indicates the probability of birth of a

Table 1. *In vitro* bionomics of *Brueelia plocea* reared at 35 + 10C 75- 82% RH, at feather diet

Composition of colonies	90M:90F
Adult lifespan (male)	9.20+ 4.40 days (2-19 days, n=90)
Adult lifespan (female)	11.97+ 5.92 days (2-25 days, n=90)
Total number of egg produced	564
Egg produced during life span (egg laid / female during life span)	6.27
Egg rate / female /day	0.56
Incubation period	5.06+ 0.85 days (range; 4-7 days, n=77)
Duration of Ist nymphal instar	5.23+ 0.90 days (range; 4-7 days, n=57)
Duration of IInd nymphal instar	5.63+ 0.76 days (range; 5-7 days, n=41)
Duration of IIIrd nymphal instar	5.84+ 0.79 days (range; 5-7 days, n=25)
Net reproductive rate	3.74
Gross reproductive rate	7.74
Mean length of generation	28.19 days
Precise generation time	28.28 days

Table 2. Lifetable, fecundity and rate of increase of *Brueelia plocea*

Days	lx	mx	lxmx	Xlxmx	rmx	e^{-rmx}	$\Sigma e^{-rmxlxmx}$
0-18			Immature Stage of Brueelia plocea				
18-19			Pre-oviposition period				
20.0	1.00	0.00	0.00	0.00	0.90	0.41	0.000
21.0	0.99	0.01	0.01	0.21	0.95	0.39	0.004
22.0	0.91	0.13	0.12	2.60	0.99	0.37	0.044
23.0	0.91	0.24	0.22	5.02	1.04	0.36	0.078
24.0	0.84	0.39	0.33	7.86	1.08	0.34	0.111
25.0	0.80	0.51	0.41	10.20	1.13	0.33	0.133
26.0	0.77	0.53	0.41	10.61	1.17	0.31	0.127
27.0	0.67	0.50	0.34	9.05	1.22	0.30	0.099
28.0	0.59	0.54	0.32	8.92	1.26	0.28	0.090
29.0	0.56	0.50	0.28	8.12	1.31	0.27	0.076
30.0	0.51	0.48	0.24	7.34	1.35	0.26	0.063
31.0	0.41	0.49	0.20	6.23	1.40	0.25	0.050
32.0	0.37	0.41	0.15	4.85	1.44	0.24	0.036
33.0	0.32	0.44	0.14	4.65	1.49	0.23	0.032
34.0	0.27	0.37	0.10	3.40	1.53	0.22	0.022
35.0	0.23	0.34	0.08	2.74	1.58	0.21	0.016
36.0	0.21	0.33	0.07	2.49	1.62	0.20	0.014
37.0	0.17	0.30	0.05	1.89	1.67	0.19	0.010
38.0	0.14	0.29	0.04	1.54	1.71	0.18	0.007
39.0	0.12	0.34	0.04	1.59	1.76	0.17	0.007
40.0	0.08	0.23	0.02	0.74	1.80	0.17	0.003
41.0	0.07	0.27	0.02	0.77	1.85	0.16	0.003
42.0	0.02	0.11	0.00	0.09	1.89	0.15	0.000
43.0	0.10	0.00	0.00	0.00	1.94	0.14	0.000
44.0	0.00	0.00	0.00	0.00	1.98	0.14	0.000
						Total-	1.025

female being alive at age X, when lo is taken as unity. However, while preparing the survivorship table, it was presumed that all the eggs laid were futile and the nymph mortality on the host (larval mortality) would be negligible *in vivo* conditions. The other vital statistics of the louse have been indicated in the Table 1. The intrinsic rate of natural increase was calculated by using the trial values of rm to find the value which satisfied the equation $\sum e^{-rmx}lxmx = 1$. Table 2 shows the value of e^{-rmx}, when rm= 0.045. With this value of rm, the summation of $e^{-rmx}lxmx$ for each age in which mx>0 appeared to be 1.021 (good approximation to formula). At this rate the population is supposed to double after 15.41 days.

The intrinsic rate of natural increase of seven ischnoceran species eg. *Goniocotes gallinae* (infesting the domestic fowl, *Gallus gallus domesticus*), *Brueelia amandavae* (occurring on Red avadavat, *Amandava amandava*), *B. cyclothorax* (parasitizing house sparrow, *Passer domesticus*), *Sturnidoecus bannoo* (parasitizing common Myna, *Acridotheres tristis*), *Neopsittaconirmus elbeli* (infesting Indian parakeet, *Psittacula eupatria*), *Columbicola columbae* (occurring on domestic pigeon, *Columba livia*), *Anaticola crassicornis* (parasitizing Mallard duck, *Anas platyrhynchos*) have been recorded (Saxena *et al.*, 2007; Gupta *et al.*, 2007; Saxena *et al.*, in press). The values of intrinsic rate of natural increase (0.07, 0.031, 0.032, 0.049, 0.050, 0.053 and 0.074) and the doubling time (10.63, 23.45, 21.35, 14.21, 13.93, 14.2 and 9.0) of aforesaid species exhibited considerable variations. In contrast to aforesaid species, the Common Baya louse, *B. plocea* appears to be moderate breeder as its rm equaled 0.045 and the doubling time has

been recorded as 15.41. Fast breeding species are supported to build up the population at faster rate (than moderate and slow breeder) and may be able to cause extensive damage to feathers of host. Slow breeders are supposed to have low prevalence and intensity of infestation and thus causing minimal effect on host plumage. The moderate breeders presumably exhibit intermediate condition in this respect.

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