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ECTOPARASITIC LOAD OF BLUE-FRONTED PARROT(*AMAZONA AESTIVA*, PSITTACIDAE) NESTLINGS

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Carga ectoparasitaria de pichones de Loro Hablador (*Amazona aestiva,* Psittacidae).

Key words: Blue-fronted Parrot, nestlings, ectoparasites, mites, *Ornithonyssus bursa*, chewing lice, *Paragoniocotes heterogenitalis, Paragoniocotes semicingulatus.*

INTRODUCTION

Ectoparasites are an important cause of mortality, morbidity, and/or reduced fecundity in birds (Feare 1976, Duffy 1983). The negative effects on clutch size (Møller 1991, 1993), growth and survival of nestlings (Merino & Potti 1995, Hurtrez-Boussés *et al.* 1997), parental behavior (Hurtrez-Boussés *et al.* 1997, Hurtrez-Boussés & Renaud 2000), natal dispersal (Brown & Brown 1992), future breeding success and host's survival (Brown *et al.* 1995, Richner & Tripet 1999) are known. These risks are increased in birds that breed in domed or cavity nests reused for several breeding seasons (Bucher 1988). Blue-fronted Parrots *(Amazona aestiva)* are common in Paraguay, Bolivia, Brazil, and Argentina (Meyer de Schauensee 1970, Forshaw 1989, Collar 1997, Juniper & Parr 1998). In Argentina, they occur mostly in chacoan woodlands where they nest in cavities of mature trees, at approximately 5 m from the ground. (Sauad *et al.* 1991).

Three chewing lice, *Paragoniocotes heterogenitalis heterogenitalis* Carriker, *Paragoniocotes semicingulatus bolivianus* Carriker (Phthiraptera: Ischnocera: Philopteridae), and *Heteromenopon* sp. (Phthiraptera: Amblycera: Menopodidae) has been cited as permanent parasites of Blue-fronted Parrots (Cicchino & Castro 1997a, 1997b).

The Blue- fronted Parrot is an important resource for the inhabitants of the chacoan region, because they harvest parrot nestlings for pet trade (Beissinger & Bucher 1992). The substantial pressure on this species from both legal and illegal harvest justifies the development of a comprehensive research on its reproductive biology (Snyder *et al.* 2000, Fernandes-Seixas & de Miranda-Mourão 2002). Ectoparasitic load data of psittacids are known for the Burrowing Parrot (*Cyanoliseus patagonus*) (Mey *et al.* 2002), and the Monk Parakeet (*Myiopsitta monachus*) (Aramburú *et al.* 2003). The objective of this work was to describe the ectoparasitic fauna of the nest-

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TABLE 1. Lice parasitological parameters for three Neotropical parrots' species. In order to standardize first infestation age, it was expressed as a percent of nestling period's duration. A = only adults; AN = adults and nymphs. Data on Burrowing Parrots (*Cyanoliseus patagonus*) and Monk Parakeets (*Myiopsitta monachus*) are from Mey *et al.* (2002) and Aramburú *et al.* (2003).

	Burrowing Parrot[1]		Monk Parakeet	Blue-fronted Parrot	
	P. meridionalis	*H. macrurum*	*P. fulvofasciatus*	*P. heterogenitalis*	*P. semicingulatus*
Prevalence	71%	100%	10%	65%	9%
Abundance	1.67 ± 1.53 (n = 3)	6.67 ± 3.51 (n = 3)	0.73 ± 3.11 (n = 52)	14.95 ± 16.11 (n = 23)	0.13 ± 0.46 (n = 23)
Intensity	3.2 ± 0.7	6.7 ± 3.5	7.6 ± 7.61	17.8 ± 14.4	1.5 ± 0.7
ID (Var/Mean)	1.40 (P > 0.05)	1.85 (P > 0.05)	13.26 (P < 0.05)	17.36 (P < 0.05)	1.61 (P < 0.05)
K aggregation index	1.40	23.65	0.031	0.25	0.13
Distribution	Random	Random	Aggregated	Aggregated	Aggregated
First infestation of nestling period's	35% AN	34% AN	63% A	55% AN	72% A
Nymph/Adult Ratio	0.06	0.67	2	0.34	0.5
Female/Male Ratio	2	0.65	2	1.68	-

[1]Parameters calculated or recalculated from published data.

ling population of this parrot species, and to determine the prevalence, abundance, and degree of dispersion of such species.

METHODS

Field studies of the breeding biology of the Blue-fronted Parrot were carried out during December and January 2003, 2004, and 2005, at Loro Hablador Natural Reserve (Chaco Province, Argentina). A total of 28 Blue-fronted Parrot nests were prospected by climbing trees. To have access to the chamber of the cavity and nestlings, we opened a small window on the trunk. Nestlings were sampled once to remove ectoparasites. We used a wide host age range (from 20 to 59 days) because nestlings leave the nest at approximately 60 days of age in order to establish the age at the first infestation. Because lice need feathered nestlings to colonize them, we only used those for analysis. Out of 28 nests, 23 had feathered nestlings. Average values of the ectoparasitic load were used when more that one nestling was sampled at the same nest. Each bird was fumigated during five minutes in a plastic bag containing cotton soaked in ethyl acetate for killing ectoparasites. The quantitative sampling method was feather agitation or brushing (Clayton *et al.* 1992). Moreover, nest chambers were inspected to find haematophagous arthropods.

For each parasite species obtained by brushing, the following parameters were determined: prevalence, abundance, mean intensity (Margolis *et al.* 1982, Bush *et al* .1997) and degree of dispersion (evaluated with the variance/mean ratio and the aggregation index K) (Southwood 1978, Elliot 1983). Data on the degree of dispersion were fitted to contagious distribution models (Hudson & Dobson 1997), and analyzed using the goodness of fit Chi Square test (Zar 1996). The age of hosts at the first infestation was determined for each parasite species. Nymph/adult and female/male ratios were tested using Chi-square test.

RESULTS

Three species of ectoparasites were found by brushing method: *Paragoniocotes heterogenitalis heterogenitalis*, *Paragoniocotes semicingulatus bolivianus* and *Ornithonyssus bursa* Berlese (Acarina: Macronyssidae), and *Triatoma infestans* Klug (Hemiptera: Reduviidae: Triatominae) was found by nest prospection. The louse and mite parasitological parameters are showed in Table 1 and 2, respectively.

Out of 23 nests, 17 were infested (74%). A single species of parasite (mites or lice) or two species of parasite (mites + one louse species) were found on 12 (52%) and 5 (22%) parasitized nestlings, respectively.

Chewing lice. *Paragoniocotes h. heterogenitalis* was the most prevalent and abundant ectoparasite. The maximum number of individuals on a single nestling was 107. This species showed an aggregated distribution following a negative binomial probability distribution (χ^2 = 2.29; df = 1; $P > 0.05$). The zero class was the greatest one (36.4%). Significant differences were found between parasite sexes (χ^2 = 24.21; df = 1; $P < 0.01$), 61.4% (n = 464) of adults being female individuals.

P. s. bolivianus was the rarest species. The maximum number of lice on a single nestling was two. The distribution was aggregated. Out of two nymph-III, one showed a pharade adult male.

Heteromenopon sp. was not found in the local population examined.

Haematophagous arthropods. Ornithonyssus bursa., a blood-eating mite, is a temporary parasite (Clayton & Moore 1997) absent from host's body for varying periods. Therefore, the low prevalence could be explained by their feeding cycles. The maximum number of mites on a single nestling was 193. The distribution was aggregated. The zero class was the greatest one (73.9%). A few nymphs and no larvae were found. Significant differences were found between parasite sexes, 97.6% (n = 288) of adults individuals being females. This is the first record of *O. bursa* parasitizing this parrot species.

Triatoma infestans, a blood-sucking bugs was found on 15% of prospected nests. Nymphs and adults were found during all parrot's breeding period. This is the first record of this bug parasitizing Blue-fronted Parrots.

DISCUSSION

The mean prevalence of some *Phthiraptera Ischnocera* has been reported to be high for several Neotropical bird species (74.4%) (Clayton *et al.*1992). The prevalence of *P. h. heterogenitalis* was close to this percentage; however, the prevalence of *P. s. bolivianus* was very low. In many cases, low prevalence is related to effective preening (Clayton *et al.* 1992). The abundance of *P. h. heterogenitalis* was higher than that of other louse species parasitizing parrots, and on *P. s. bolivianus* was lower.

Lice are permanent ectoparasites transfered between parents and their offspring (Clayton *et al.* 1992, Clayton & Moore 1997). In this study, vertical transmission of lice (females, males and nymphal instars included) seems to take place when the feather sheaths are open (32-days old). For Monk Parakeets (*Myiopsitta monachus*), transmission takes place after acquisition of the full definitive plumage (25-days old) (Aramburú *et al.* 2003). *Cyanoliseus patagonus* showed an earlier acquisition. In this study, 32 days (55 % of nestling period duration) was the earliest age at whitch ectoparasites were found on parrot nestlings.

Adult lice were more abundant than nymphs. This result is similar to those for *P. meridionals* and *H. macrurum* (Mey *et al.* 2002) and the overall proportion reported by Wheeler & Threlfall (1986) and Clayton *et al.*

TABLE 2. *O. bursa* parasitological parameters for two Neotropical parrots' species. In order to standardize first infestation age, it was expressed as a percent of nestling period's duration. Data on Monk Parakeets (*Myiopsitta monachus*) are from Aramburú *et al.* (2003).

Parrot species	Monk Parakeet	Blue-fronted Parrot
Prevalence	48%	21%
Abundance	12.35 ± 25.97	6.26 ± 28.72
	(n = 52)	(n = 28)
Intensity	25.7 ± 32.8[1]	23.9 ± 55.9
ID (Variance/Mean)	54.65	131.79
K aggregation index	0.151	0.05
First infestation nestling period's	30%[1]	55%
Female/Male Ratio	9.0	13.9

[1]Parameters calculated or recalculated from published data.

(1992). Probably, this tendency toward an adult bias seems to show that vertical transmission takes place in adult lice.

Significant differences were found between sexes, showing female-biased in louse species. Similar results were found on compared *Paragoniocotes* species (Mey *et al.* 2002, Aramburú *et al.* 2003). This female-biased ratio is common on ischnocerans, because relatively few males are required to fertilize all of females in isolated populations (Clayton *et al.* 1992). Populations of ischnocerans on different host individuals are genetically isolated (Nadler & Hafner 1990), and they appear to be excellent for the evolution of female-biased sex ratios.

Sex ratio biased toward females is also found for *O. bursa* parasitizing Monk Parakeets (Aramburú *et al.* 2003).

Further studies are needed to evaluate the impact of this species on nestling development and breeding success. *O. bursa* had received attention recently, because of its effects on Barn Swallows (*Hirundo rustica*) life history (timing of reproduction, clutch and offspring sizes) (Møller 1990, 1991, 1993). Nevertheless, mite and louse species in this study showed aggregated distributions. This pattern has important consequences for the dynamics of the Blue-fronted Parrot parasite system, tending to stabilize parasite-host interactions (Anderson & May 1978). In highly aggregated distributions, parasites will be unable to regulate the host population. K values less than 1.0 in this study tend to promote stability within the system (Hudson & Dobson 1997).

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