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ABSENCE OF BLOOD PARASITES IN THE RED-NECKED NIGHTJAR

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Abstract.—One-hundred and six Red-Necked Nighjars (*Caprimulgus ruficollis*) were sampled in southern Spain to determine the incidence of haematozoa infection in relation to their expression of sexual ornaments (i.e., white wing and tail patches). Birds were sampled just after breeding and during molt, when blood parasites could affect plumage coloration, but none of these birds was infected by haematozoa. The low prevalence of blood parasites in this and other nightjar species cannot be satisfactorily explained at present.

AUSENCIA DE PARÁSITOS SANGUÍNEOS EN *CAPRIMULGUS RUFICOLLIS*

Sinopsis.—Se muestrearon 106 individuos de *Caprimulgus ruficollis* con el fin de determinar la posible relación entre la presencia de parásitos sanguíneos y la expresión de ornamentos sexuales (manchas blancas en el ala y la cola) en esta especie. Las aves fueron capturadas en Doñana (sur de España), coincidiendo con el final de la reproducción y la muda, único momento en que podría verse afectada la coloración del plumaje. Sin embargo, ninguna de las aves estuvo parasitada. La baja prevalencia de parásitos sanguíneos en ésta y otras especies de chotacabras no puede ser explicada en base a la información disponible en la actualidad.

In recent years, the incidence of avian blood parasitism has received considerable attention from both evolutionists and behavioral ecologists. Several studies have focused on the possible detrimental effects on host fitness (Allander and Bennett 1995, Korpimäki et al. 1993, Rätti et al. 1993, Tella et al. 1996). Hamilton and Zuk (1982) have suggested a relationship between a heritable resistance to parasites and bright coloration in birds. Individuals could signal differences in parasite loads through the expression of bright colorations, and this would enable females to choose males of high genetic quality.

As a part of a study on secondary sexual characters of Red-Necked Nightjars (*Caprimulgus ruficollis*) (Forero et al. 1995, Forero and Tella 1997), our aim was to test if the expression of ornaments (wing and tail patches) reflects the parasite burden of their hosts. We examined blood samples from 106 nightjars captured from June–October in 1994 and 1995. This period coincides with the molt (Forero and Tella, unpubl. data; Gargallo 1994), when parasites could influence plumage coloration (Lozano 1994). The study area was Doñana National Park in southern Spain, a wetland region of marshes, mediterranean forests, and coastal scrub. Birds were caught during nocturnal car transects, using a flashlight and a hand net (Forero et al. 1995). We sexed and aged the birds (through capture-recapture data and molt patterns) into three age classes (juveniles, one-year-old birds [SY], and older birds [ASY]; Table 1). See

TABLE 1. Number of *Caprimulgus ruficollis* sampled at Doñana National Park (1994–1995) by year, sex, and age.

Sex	Year	Juvenile	SY	ASY
Male	1994	7	18	10
	1995	3	3	14
Female	1994	14	7	10
	1995	3	5	12
Total		27	33	46

Gargallo (1994) and Forero et al. (1995) for more details. A drop of blood was extracted from the brachial vein, smeared on an individually labelled slide, and air dried. We fixed smears with absolute methanol and stained them with Giemsa stain. One hundred oil microscope fields (1000x) were chosen from each smear in a line from one to the other border of the slide to avoid biases related to the thickness of the smear (Weatherhead and Bennett 1991).

None of the 106 examined birds was infected by blood parasites. This cannot be attributed to sampling bias due to season, sex, or age differences in parasitization rates (Weatherhead and Bennett 1991, Tella et al. 1996). All birds were caught during and just after breeding (when blood parasitism is expected to be the highest due to breeding effort; Ots and Horak 1996, Richner et al. 1995), adults were molting and juveniles had recently grown feathers, and samples were equally distributed with regard to sex and age. Our sample sizes were sufficient to establish that the high variable expression of sexual ornaments in Red-Necked Nightjars (Forero et al. 1995, Forero and Tella 1997) is not correlated with prevalence of blood parasites, at least in this population.

Studies showing low blood parasitism in birds are scarce and the results are usually attributed to the lack of suitable ornithophilic vectors in some habitats (Bennett et al. 1992a, Little and Earlé 1995, Tella et al. 1996), an insufficient time for the coevolution of host, vector, and parasite in a biogeographical region (Earlé and Underhill 1993), or host behavior (Bennett et al. 1992b). Ours is the first survey for blood parasites in the Red-Necked Nighjar, so we have not been able to test these hypotheses intraspecifically. Several species of blood parasites have been reported to parasitize other nightjars (Bennett et al. 1982), but at a low rate. Out of 23 species examined, only seven were infected, and the prevalences (number of infected birds/sampled birds) were low (Table 2). Furthermore, Bennett et al. (1982) reported additional records on the lack of parasitization in nine of ten nightjar species, but they did not mention the sample sizes.

Overall, these results could be influenced by their generally small sample sizes (Table 2). However, the variety of habitats and broad biogeographical range of these sampled nightjars (Table 2) make unlikely the first two hypotheses explaining the absence of blood parasites. Taking into

TABLE 2. Prevalence of blood parasites and sample sizes for 23 different nightjar species (References: 1: Bennett et al. 1992c; 2: Earlé et al. 1991; 3: Peirce 1981; 4: This study; 5: Williams et al. 1975; 6: Greiner et al. 1975; 7: White et al. 1978). Ranges and main habitats for each species were obtained from Sibley and Monroe (1990).

Species	Infected	Sample	Range	Habitat	References
Caprimulgus climacurus	0	1	W, C Africa	Woodland, savanna, scrub	1
C. donaldsoni	0	1	NE Africa	Dry thornbush	1
C. madagascariensis	0	4	Madagascar	Woodland, brush	1
C. natalensis	0	20	Africa	Wet meadows, marshes	1
C. pectoralis	1	5	C, S Africa	Woodland	1
C. poliocephalus	0	1	Africa	Grassland, forest edge	1
C. rufigena	0	3	Africa	Savanna, arid scrub	1
C. tristigma	0	2	Africa	Riparian woodland, towns	1
C. fossii	5	98	C, S Africa	Woodland, savanna, scrub	1, 2
C. europaeus	2	14	Africa, Palearctic	Open country	1, 2, 3
C. ruficollis	0	106	SW Palearctic	Arid open country, scrub	4
C. macrurus	0	22	Asia, Australia	Forest edge, woodland, town	5
C. carolinensis	0	1	N America	Woodland	6
C. vociferus	3	6	C. America	Open woodland	7
C. rufus	0	2	C, S America	Open woodland	7
Chordeiles minor	5	50	N, S America	Savanna, grassland, towns	5, 6, 7
C. acutipennis	0	1	C America	Woodland	7
Eurostopodus macrotis	3	3	SE Asia	Forests	5
E. temminckii	1	2	Malaysia	Forest edge, open country	5
Nyctidromus albicollis	0	9	C, S America	Open woodland, riparian	5, 7
Hydropsalis brasiliana	0	1	C, S America	Open woodland, riparian	7
Lurocalis semitorquatus	0	3	C, S America	Forest edge	7
Nyctiphrynus ocellatus	0	3	C, S America	Humid forest	7
Total	20	358			

account the generalized absence of blood parasites in nightjars, two factors could preclude these species from parasitization (Combes 1991, Hart 1994). The physiological or immunological characteristics of nightjars could constitute a barrier to parasites. On the other hand, the generally nocturnal and/or ground-dwelling behavior of this group of birds could minimize encounters with appropriate vectors. In fact, Greiner et al. (1975) found that ground-nesting species tend to have low frequencies of hematozoan infections, presumably related to the preference of vectors to feeding in higher vegetation strata. However, as Tarof et al. (1997) pointed out, parasite life cicles, feeding activity of vectors, and their interaction with hosts are largely unknown for most avian species. A considerable research effort is required to find a clear explanation for the high variability of blood parasitization rates shown by birds.

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