

Hematozoa in Two Populations of the Threatened Red-billed Chough in Spain

Authors: Blanco, Guillermo, Merino, Santiago, Telia, José L., Fargallo, Juan A., and Gajón, Alvaro

Source: Journal of Wildlife Diseases, 33(3) : 642-645

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-33.3.642>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Hematozoa in Two Populations of the Threatened Red-billed Chough in Spain

Guillermo Blanco,¹ Santiago Merino,¹ José L. Tella,² Juan A. Fargallo,³ and Alvaro Gajón⁴ ¹ Departamento de Biología Animal, Universidad de Alcalá de Henares, E-28871 Madrid, Spain; ² Estación Biológica de Doñana, Consejo Superior de Investigaciones Científicas, Apartado 1056, E-41080 Sevilla, Spain; ³ Museo Nacional de Ciencias Naturales, Consejo Superior de Investigaciones Científicas, Departamento de Ecología Evolutiva, José Gutiérrez Abascal 2, E-28006 Madrid, Spain; and ⁴ Servicio de Diagnóstico de Fauna Silvestre. Facultad de Veterinaria, Miguel Servet 177, 50013 Zaragoza, Spain

ABSTRACT: The prevalence of hematozoa in two populations of red-billed choughs (*Pyrrhonorax pyrrhonorax*) was sampled in 1992 and 1994 in Spain. Two blood parasites infected red-billed choughs. A species of *Plasmodium*, possibly *Plasmodium relictum*, and the piroplasm *Babesia frugilegica*, are described for the first time from this host. Low prevalence (1/178, <1%) of hematozoa in these populations, was evidence for a lack of effects of blood parasites on the life history and conservation of this threatened species in at least the two populations studied.

Key words: Red-billed chough, *Pyrrhonorax pyrrhonorax*, hematozoa, *Plasmodium* sp., piroplasm, *Babesia frugilegica*, new host record.

As part of a study on the biology of red-billed choughs (*Pyrrhonorax pyrrhonorax*) in northwestern Spain, we conducted a survey of blood parasites. Red-billed choughs are rare birds with a fragmented distribution in the Palearctic region and a history of declining populations and extinction over much of Europe (Guillou, 1981). Several factors may affect numbers and distribution of red-billed choughs in Europe, including human disturbance, especially changes in traditional agro-pastoral systems, persecution, (Bignal and Curtis, 1989) and disease (Bullock et al., 1983; Bignal et al., 1987a; Meyer and Simpson, 1988). Small isolated or fragmented populations of red-billed choughs may be especially vulnerable to the effects of chronic infections by parasites or to epizootics of disease because of their relatively slow recruitment rates (Bignal et al., 1987b; G. Blanco, J.L. Tella and J. Fargallo, unpubl. data). Despite the possible conservation implications of parasitic infections (May, 1988; Loye and Carroll, 1995) the impact

of parasites and other disease agents on red-billed chough populations are not documented except for the effects of gape-worms, *Syngamus trachea* (Bignal et al., 1987a; Meyer and Simpson, 1988). There are only two previous records of hematozoa in red-billed choughs: *Leucocytozoon sakharoffi* from Poland (Ramisz, 1961) and microfilariae from Russia (Shakhmatov et al., 1972). However, there are records of *Plasmodium* sp. in the alpine chough (*Pyrrhonorax graculus*) in Spain (Hamerton, 1936, 1937, 1944, cited in Bennett et al., 1982). Here we present data on prevalence of hematozoa in two populations of red-billed choughs at the southern part of their range in Spain.

During 1992, 1994, and 1995, data on red-billed choughs and their hematozoan parasites were collected in Los Monegros, Aragón, northwestern Spain (41°20'N, 0°11'W) and southeastern Madrid province, central Spain (40°19'N 3°32'W). The study areas are described by Blanco et al. (1991) and Tella et al. (1993). Red-billed choughs were captured at night with large butterfly nets while roosting inside abandoned buildings located in Los Monegros and in large caves and crevices in southeastern (SE) Madrid. Breeding pairs were captured while roosting at the nest site and non-breeding choughs were captured in communal roosts. We sampled 178 individuals. Samples were grouped into three seasons: breeding season (April through June; Los Monegros $n = 35$), autumn (August and September; Los Monegros $n = 54$, SE Madrid $n = 28$), and winter (November through January; Los Monegros $n = 7$, SE Madrid $n = 54$).

Upon capture, each red-billed chough was banded, measured, weighed, and released. Blood samples were taken from the brachial vein and thin blood smears were prepared, air-dried, fixed with absolute ethanol and stained with Giemsa stain. On mounted slides, half a smear chosen at random was entirely scanned at 200 \times along its longitudinal axis, looking for extraerythrocytic protozoa (Merino and Potti, 1995). Numbers of intraerythrocytic parasites were estimated under oil at 1000 \times by counting the number of parasites per 2000 erythrocytes (Godfrey et al., 1987).

We distinguished first year from second-year birds and older birds (≥ 3 yr old) on the basis of plumage characteristics (Blanco et al., 1996) and because most of them were banded in previous years. Sex was determined according to discriminant functions extracted from morphological variables (Tella and Torre, 1993; Blanco et al., 1996).

We sampled all age and sex classes in both Los Monegros (1-yr-old: six males, eight females; 2-yr-old: 23 males, 21 females; ≥ 3 -yr old: 19 males, 19 females) and SE Madrid (1-yr-old: 12 females; 2-yr-old: six males, five females; ≥ 3 -yr-old: 28 males, 31 females) except for 1-yr-old males in SE Madrid. Within the older age class (≥ 3 -yr-old) there were at least 14 breeders (six males, eight females).

We did not find blood parasites in smears from the 96 red-billed choughs captured in Los Monegros. In SE Madrid we found only one (1%) of 82 birds infected with two blood parasites (*Plasmodium* sp., and *Babesia frugilegica*). The infected bird, a male >3 -yr-old, was captured and banded in November 1992 at a large communal roost comprising about 250 choughs; it had an intensity of infection of 52 parasites/2,000 erythrocytes. The round gametocyte displaced the nucleus of the host cell towards a pole (Fig. 1), characteristic of *Plasmodium* spp. from the subgenus *Haemamoeba*. This species of *Plasmodium* may be part of the group



FIGURE 1. Chough erythrocytes infected by round gametocytes of *Plasmodium* sp. and forms of *Babesia frugilegica*. Giemsa. Scale bar = 14 μ m.

cludes *P. relictum*, *P. giovannolai*, and *P. subpraecox*, which cannot be identified by morphological characters and host family (Greiner et al., 1975). Because *P. relictum* is cosmopolitan and reported from the family Corvidae (Greiner et al., 1975; Bennett et al., 1993) it may be the species involved. This is the first record of *Plasmodium* spp. infection in red-billed choughs. The piroplasm species was identified as *Babesia frugilegica*, a parasite founded in other two Corvid species before (M. A. Peirce, pers. comm.). The positive slide was deposited in the collection of the Museo Nacional de Ciencias Naturales, Madrid, Spain (access number: MNCN35.01/4).

The parasitized red-billed chough was never resighted or recaptured during a 3-yr period during which we eventually observed 15 (83%) of the 18 choughs of the same age and sex banded the same day as the infected individual. The weight of the infected red-billed chough (344 g) was typical (320 to 390 g) for ≥ 3 -year-old male choughs weighed on the same date at the same site, although slightly below the mean \pm SD (353.3 \pm 15.2 g, n = 24). The

infected bird also had a slightly higher than average intensity of infestation by the mite ($n = 10$) *Neotrombicula autumnalis* (Acari, Trombiculidae; Suborder Actinedida) than choughs of the same age and sex captured at the same site and date (5.6 ± 6.6 , $n = 20$; prevalence = 88%, $n = 25$; intensity of infection was not recorded on five individuals). The mite was deposited in the Museo Nacional de Ciencias Natural de Madrid; accession number 20.02/9023.

The low prevalence of hematozoa in the birds sampled, along with the infection appearing in a season with low probability of transmission due to the effects of climate (cold, scanty rainfall and thermic reversal characterizing inland Mediterranean latitudes) on suitable vectors (ornitophilic mosquitoes) are evidence that we detected an accidental infection. However, the survival of high numbers of mosquitoes (G. Blanco and J. Fargallo, pers. observation) and possibly the transmission of *Plasmodium* spp. by these mosquitoes (Seed and Manwell, 1977) may be allowed by the warm temperatures maintained during winter in large crevices where choughs congregate in large numbers to roost communally (Blanco et al., 1993). In fact, colonial birds attract ectoparasites and have frequent inter-individual contacts (Hubálek, 1994). The absence of suitable vectors in the abandoned farm-houses used by red-billed choughs in Los Monegros (Tella et al., 1995) may be a possible cause of the low prevalence of hematozoa in another threatened bird species, the lesser kestrel (*Falco naummani*), which also breeds in these houses. Ticks are vectors of *Babesia* spp. in birds (Peirce, 1973), and possibly that is the case in choughs. Although ticks may be present on the chough populations we studied, they are difficult to find in the intricate plumage of birds. However, unidentified ticks has been observed on crevices used by choughs (G. Blanco and J. Fargallo, pers. obs.).

The bird infected was never seen after capture and had a slightly higher infection

by ectoparasites and a slightly lower mass than the other birds of the same sex and similar age. The symptoms of birds infected with *Plasmodium* sp. may include anemia, splenomegaly, and myocarditis (Seed and Manwell, 1977; Hubálek, 1994), and may cause death, at least in those species or birds not commonly infected with this parasite (Warner, 1968; Bennett et al., 1993). We do not know the extent of pathogenicity caused by *Babesia* spp. in birds, but the mixed infection may enhance pathogenicity in these hosts.

In conclusion, blood parasites do not appear to be a serious threat to the adults of two populations of red-billed choughs studied in Spain, although the presence of *Plasmodium* spp. may indicate a potential mortality factor in nestlings and fledglings. More work is required, especially studies of pathogens that might affect recruitment by causing nestling and juvenile mortality.

We thank J. Blasco Zumeta for identification of the mite species and J. A. Cuevas, J. Morato, M. C. Blanco, M. Herrera, F. Gómez and R. López for their help in capturing choughs. J. Potti commented on and improved the manuscript. J. Gamo and L. Diaz helped with photographs and I. Nogueras helped with both lab and field work. Dr. M. A. Peirce kindly confirm the infection by *Plasmodium* sp. and identified the piroplasm. Dr. W. J. Wreen identified the mite species. Two anonymous referees improve considerably the previous manuscript. This work was partially financed by Spanish DGICYT project PB91 0084-C03-03 (to J. Potti).

LITERATURE CITED

- BENNETT, G. F., M. WHITEWAY, AND C. B. WOODWORTH-LYNAS. 1982. A host parasite catalogue of the avian hematozoa. Memorial University of Newfoundland, Occasional Papers in Biology No. 5, St. John's, Newfoundland, Canada, 243 pp.
- , M. A. PEIRCE, AND R. W. ASHFORD. 1993. Avian hematozoa; mortality and pathogenicity. *Journal of Natural History* 27: 993–1001.
- SIGNAL, E., AND D. J. CURTIS (editors). 1989. Choughs and land-use in Europe. Scottish

- Chough Study Group, Argyll, United Kingdom, 112 pp.
- , E., S. BIGNAL, AND E. STILL. 1987. Gape-worm infection in choughs. *Ring and Migration* 8: 56–58.
- , P. MONAGHAN, S. BENN, S. BIGNAL, E. STILL, AND P. M. THOMPSON. 1987. Breeding success and post-fledging survival in the chough *Pyrhcorax pyrrhcorax*. *Bird Study* 34: 39–42.
- BLANCO, G., J. A. CUEVAS, AND J. A. FARGALLO. 1991. La población de Chova Piquirroja (*Pyrhcorax pyrrhcorax*) en el sureste de Madrid (Centro de España). *Ardeola* 38: 91–99.
- , J. A. FARGALLO, AND J. A. CUEVAS. 1993. Seasonal variations in numbers and levels of activity in a communal roost of choughs *Pyrhcorax pyrrhcorax* in central Spain. *Avocetta* 17: 41–44.
- , J. L. TELLA, AND I. TORRE. 1996. Age and sex determination of monomorphic non-breeding choughs *Pyrhcorax pyrrhcorax*: A long-term study. *Journal of Field Ornithology* 67: 428–433.
- BULLOCK, I. D., D. R. DREWETT, AND S. P. MICKLEBURGH. 1983. The chough in Britain and Ireland. *British Birds* 76: 377–401.
- GODFREY, R. D., A. M. FEDYNICH, AND D. B. PENCE. 1987. Quantification of hematozoa in blood smears. *Journal of Wildlife Diseases* 23: 558–565.
- GREINER, E. C., G. F. BENNETT, M. LAIRD, AND C. M. HERMAN. 1975. Avian Hematozoa 2. Taxonomic keys and color pictorial guide to species of *Plasmodium*. *Wildlife Diseases Number 68*, Wildlife Diseases Association, Lawrence, Kansas, 58 pp.
- GUILLOU, J. J. 1981. Problèmes de la distribution du Crave (*Pyrhcorax pyrrhcorax*) en Europe occidentale. *L'Oiseau et la Revue Française d'Ornithologie* 51: 177–188.
- HUBÁLEK, Z. 1994. Pathogenic microorganisms associated with free-living birds (a review). *Acta Scientiarum Naturalium Academiae Scientiarum Bohemicae Brno* 5: 1–74.
- LOYE, J., AND S. CARROLL. 1995. Birds, bugs and blood: Avian parasitism and conservation. *Trends in Ecology and Evolution* 10: 232–235.
- MAY, R. M. 1988. Conservation and disease. *Conservation Biology* 2: 26–30.
- MERINO, S., AND J. POTTI. 1995. High prevalence of hematozoa in nestlings of a passerine species, the pied flycatcher (*Ficedula hypoleuca*). *The Auk* 112: 1041–1043.
- MEYER, R., AND V. R. SIMPSON. 1988. Gapeworm infection in choughs *Pyrhcorax pyrrhcorax*: further evidence. *Bird Study* 35: 223–226.
- PEIRCE, M. A. 1973. *Nuttalea balearicae* sp.n., an avian piroplasm from crowned cranes (*Balearica* spp.). *The Journal of Protozoology* 20: 543–546.
- RAMISZ, A. 1961. Protozoans from the genus *Leucocytozoon* in birds from vicinity of Warsaw (In Polish). *Wiadomości Parazytologiczne* 7: 203–206.
- SEED, T. M., AND R. D. MANWELL. 1977. Plasmodia of birds. In *Parasitic protozoa Vol. 3*, J. P. Kreier (ed.). Academic Press, New York, New York, pp. 311–357.
- SHAKHMATOV, G. N., A. U. KUIMA, AND G. A. BALASANOVA. 1972. Addition to the fauna of bird blood parasites in Tadzhikistan (In Russian). *Doklady Akademii Nauk Tadzhikskoi SSR* 15: 56–58.
- TELLA, J. L., AND I. TORRE. 1993. Sexual size dimorphism and determination of sex in the chough (*Pyrhcorax pyrrhcorax*). *Journal für Ornithologie* 134: 187–190.
- , M. POMAROL, E. MUNOZ, AND R. LOPEZ. 1993. Importancia de la conservación de los mases para las aves en Los Monegros. *Alytes* 6: 335–350.
- , M. G. FORERO, A. GAJON, F. HIRALDO, AND J. A. DONAZAR. 1995. Absence of blood parasitism effects on Lesser Kestrel fitness. *The Auk* 113: 253–256.
- WARNER, R. E. 1968. The role of introduced diseases in the extinction of the endemic Hawaiian avifauna. *The Condor* 70: 101–120.

Received for publication 4 January 1996.