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Absence of Blood Parasites in Griffon Vultures from Spain

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ABSTRACT: Hematozoan parasites were not found on blood smears fron any of 82 Griffon vultures (*Gyps fulvus*) examined from Spain. These vultures represented samples of diverse temporal and spatial origin, and there was a great disparity in host ages (nestlings to >5-yr-old adults) and physiological condition (growing, food-stressed, injured, and healthy birds).
Key words: Avian hematozoa, Griffon vulture, *Gyps fulvus*, survey.

Despite increasing interest in the spatial variation in avian blood parasitism (Earlé et al., 1991; Bennett et al., 1995; Merilä et al., 1995), much basic information remains unknown regarding the epidemiology of haematozoa in the Iberian Peninsula (Merino et al., 1997). In addition, some avian groups such as raptors or cliff-nesting birds, have been poorly sampled for haematozoa (Bennett et al., 1982a; Peirce, 1981).

Old world vultures have been sampled mostly for haematozoa in Africa (Greiner and Mundy, 1979; Robertson, 1986; Earlé et al., 1991). Apart from the work of Greiner and Mundy (1979), no research dealing specifically with haematozoans of vultures has been published. Scavenging avian species play an important ecological role in many regions (Mundy et al., 1992) and the effect of blood parasites on these hosts need to be understood for conservation purposes (Peirce, 1981; Scott, 1988).

There is only one previous record of hematozoa (*Haemoproteus* sp.) from Griffon Vultures (*Gyps fulvus*) by Scott in 1926 (cited in Bennett et al., 1982b). Here, we present the results of a survey of blood parasites on griffon vultures in Spain, including the first samples from nestling and adult wild griffon vultures.

During banding activities we sampled nestling vultures for the presence of haematozoa in 1995 and 1996 in the gorges of the Riaza River (41°31′N, 3°36′W), northern Segovia Province, central Spain. This area includes a complex of river cliffs, ravines and canyons where an increasing population of griffon vultures breed in high densities (almost 340 pairs over 12 km of canyon in 1995). Nests were accessed by climbing gear in May, when nestlings had a mean ± SD age of 49 ± 6 days (range = 41–65) in 1995 (n = 14) and 60 ± 8 days (range = 42–72) in 1996 (n = 16), based on nest observations or wing chord. Young fledged from June to September, but mostly in July.

We also sampled food-stressed fledgling vultures that were held temporarily in several Spanish rehabilitation centers: La Alfranca in Zaragoza (n = 12), Las Cansinas in Cáceres (n = 5) and GREFA in Madrid (n = 17). These birds were undernourished and dehydrated when they were found in the wild. Several fledglings also had traumatic injuries. The fledglings were found near breeding colonies in Aragón (provinces of Zaragoza and Huesca in northeastern Spain), Extremadura (provinces of Cáceres and Badajoz in western Spain) and in central Spain (Madrid and Guadalajara provinces), respectively (Fig. 1) after their first flights. Two food-stressed vultures in their second year, one 4- to 5-yr-old vulture that had been injured by collision with a power line, one food-stressed and injured adult >5-yr-old and five dehydrated or injured vultures of unknown age also were sampled. Blood samples were taken between 1 and 60 days after arrival at the rehabilitation centers. After a variable period of captivity, all birds reaching a good nutritional condition were ringed and realesed in the wild. In addition we sampled nine wild vultures (5

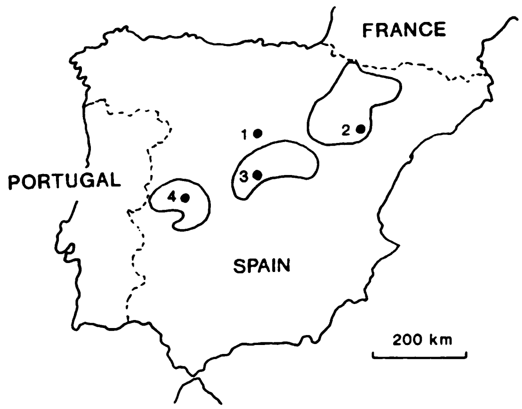

FIGURE 1. Sites in Spain where nestling Griffon vultures were sampled for hematozoa at Riaza River in northern Segovia Province (1) and fledglings at rehabilitation centers (black circles) near breeding colonies in Zaragoza and Huesca Provinces (2), Madrid and Guadalajara Provinces (3) and Cáceres and Badajoz Provinces (4).

1-yr-old, 1 3- to 4-yr-old subadult, and three adults ≥ 5-yr-old). These birds were captured in August 1995 with a cannon net baited with a sheep carcass in the gorges of the Riaza river. Griffon vultures were aged according to their general body color, bill color and especially the color, length, and shape of the ruff feathers (Blanco and Martínez, 1996).

Blood samples were obtained by venipuncture from the brachial vein. A thin smear was prepared in the field, air dried, fixed with absolute methanol and stained with Giemsa solution. Extracellular parasites (trypanosomes, microfiliariae) were searched for by scanning the smear under 10× and 40× objectives. A 100× oil-immersion lens was used to search for blood parasites in 200 microscopic fields on each slide. Fields were chosen in a line from one end of the slide to the other to compensate for differences in blood thickness (Weatherhead and Bennett, 1991).

None of the 82 individual vultures we examined were infected with blood parasites. The wide temporal and geographic origin of the samples (Fig. 1) and the great disparity in age and physiological condition of individual birds makes this finding particularly significant. A small sample of captive griffon vultures from Spain also was found to be negative for haematozoan parasites (Peirce et al., 1983).

Because relapse of latent infections can occur in birds suffering from stress caused by poor nutrition, injury, capture, or captivity (Peirce, 1981), it is especially significant that none of the injured or food-stressed vultures had haematozoan infections. Higher prevalence of blood parasites may occur in nestlings because of greater exposure to vectors at the nest site (Peirce, 1981; Robertson, 1986; Merino and Potti, 1995), or because nutritional or environmental stress affects suceptibility to blood parasites (Norris et al., 1994; Merino et al., 1996). However, none of the food-stressed fledglings were positive for blood parasites, although incomplete bone development (authors, unpubl. data) probably indicated poor nutrition in the nest. Because environmental and nutritional stress did not induce parasitemia in peripheral blood, it is likely that these vultures were truly not infected.

What is the basis for this absence of blood parasites in griffon vultures? Greiner and Mundy (1979) argued that use of rocky crags as nesting and roosting sites may isolate cape Vultures (*Gyps coprotheres*) from potential arthropod vectors. Conversely, tree-nesting vulture species showed haematozoa prevalences that varied between 31% in the white-headed vulture (*Trygonoceps occipitalis*) and 63% in the lappet-faced vulture (*Torgos tracheliotus*) (Greiner and Mundy, 1979). The absence or scarcity of suitable vectors also was the argument presented by Bennett et al. (1992) and Earlé and Underhill (1992) to explain the lack of haematozoa in birds living in the artic tundra. Therefore, there may be few vectors biting griffon vultures in their particular microhabitat in Spain, including cliffs in mountainous areas, highlands and windy semi-arid and open country. This is suported by the low rate of parasitism in other cliff-nesting species in Spain (Tella et al., 1995, 1996; Blanco et al., 1997), versus the high prevalences of hematozoan in passerine birds from forested habitats (Merilä et al., 1995; Merino and Potti, 1995; Merino et al., 1997). Nevertheless, cliff nesting vultures may be in contact with vectors at the feeding areas or when they gather to drink and bathe in pools and streams where arthropod vectors may be more common (Earlé et al., 1991). Biting flies are the most common vectors of blood parasites in birds (Peirce, 1981; Atkinson and van Riper, 1991). However, other non volant ectoparasites such as mites, ticks and bugs are common on vultures and in nest material (G. Blanco, unpubl. data), and most vultures entering in rehabilitation centers are heavily infested with such parasites. Therefore, microhabitat may explain the lack of haematozoa in cliff-nesting species only if most biting vectors are flies feeding at the nesting and roosting sites (Greiner and Mundy, 1979).

Alternatively, a well-developed inmune system (Ricklefs, 1992) and/or presence of highly host-specific blood parasites in the avian community could explain absence of infections in griffon vultures. More research is required to determine prevalence of hematozoa in vultures, especially comparative studies on cliff and tree-nesting species that sample nestlings and assess ecological conditions regulating host-vector-parasite relationships.

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