

Bacteremia and Aortic Valvular Endocarditis in a Eurasian Stone-curlew (*Burhinus oedicephalus distinctus*) due to *Streptococcus dysgalactiae*

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ABSTRACT: *Burhinus oedicephalus distinctus* is an endemic subspecies of Eurasian Stone-curlew present in the Canary Islands. Their populations are rapidly declining, mainly because of anthropogenic impacts. This report describes valvular endocarditis and septicemia in a Eurasian Stone-Curlew with left foot loss and severe contralateral bumblefoot.

The Eurasian Stone-curlew (*Burhinus oedicephalus*) is a steppe bird with crepuscular activity and a diet mainly of insects and sporadic small vertebrates (Cramp et al. 1983). Although widely spread throughout the Palearctic south, this species is threatened and some populations are rapidly declining (Birdlife International 2018). *Burhinus o. distinctus* is an endemic subspecies found in the Canary Islands (Giannangeli et al. 2004) that has been pushing near extinction by rapid human settlement of the islands (García-del-Rey and Rodríguez-Lorenzo 2011). Few studies describe infectious diseases in the Canarian avifauna (Poveda et al. 1990; Quesada-Canales et al. 2013), and there are no disease reports on the Canarian Stone-curlews. We report the lesions observed in one Eurasian Stone-curlew (*B. o. distinctus*) submitted for necropsy by the Canary Islands Government.

An injured Eurasian Stone-curlew was found near an urban area of Gran Canaria. It was referred to specialized veterinary assistance but died shortly afterwards. The corpse was refrigerated and submitted to the Institute of Animal Health and Food Security, University of Las Palmas de Gran Canaria, Canary Islands, where a complete standardized necropsy was performed. The bird was a

314-g adult male in poor nutritional condition (muscle atrophy and fat depletion). On external examination, lice infestation (pediculosis) and poor plumage condition were noted. The left foot was missing at the level of the distal tarsometatarsus, with complete healing of the stump. The right foot sole was markedly swollen with coalescence of footpads (Fig. 1A); incision revealed a thickened dermis with multifocal caseous areas. Marked hepatomegaly, multiorgan petechial hemorrhages, and hydropericardium were observed. In the heart, the left ventricle had a focally extensive, yellow, friable mass attached to the aortic valve (Fig. 1B), narrowing the outflow tract and with mild poststenotic dilation of the aorta. Representative tissue samples were fixed in 10% neutral-buffered formalin for 24 h, and routinely processed for histologic analysis.

Microscopically, the aortic valve was markedly expanded by a large coagulum composed of cellular debris, fibrin, degenerated and viable heterophils, with numerous Gram-positive extracellular (forming clusters) and intraphagocytic cocci (Fig. 1C). Often, bacterial clusters exhibited arrangements in pairs and chains (Fig. 1D). The periphery of the coagulum had greater amount of lymphohistiocytic and heterophilic inflammation admixed with reactive fibroblasts, hemorrhage, and fibrin that infiltrated into the interventricular septum, with associated cardiomyocyte degeneration and necrosis (Fig. 1E). Numerous fibrinocellular thrombi associated with bacterial emboli were seen throughout the myocardium (Fig. 1F).

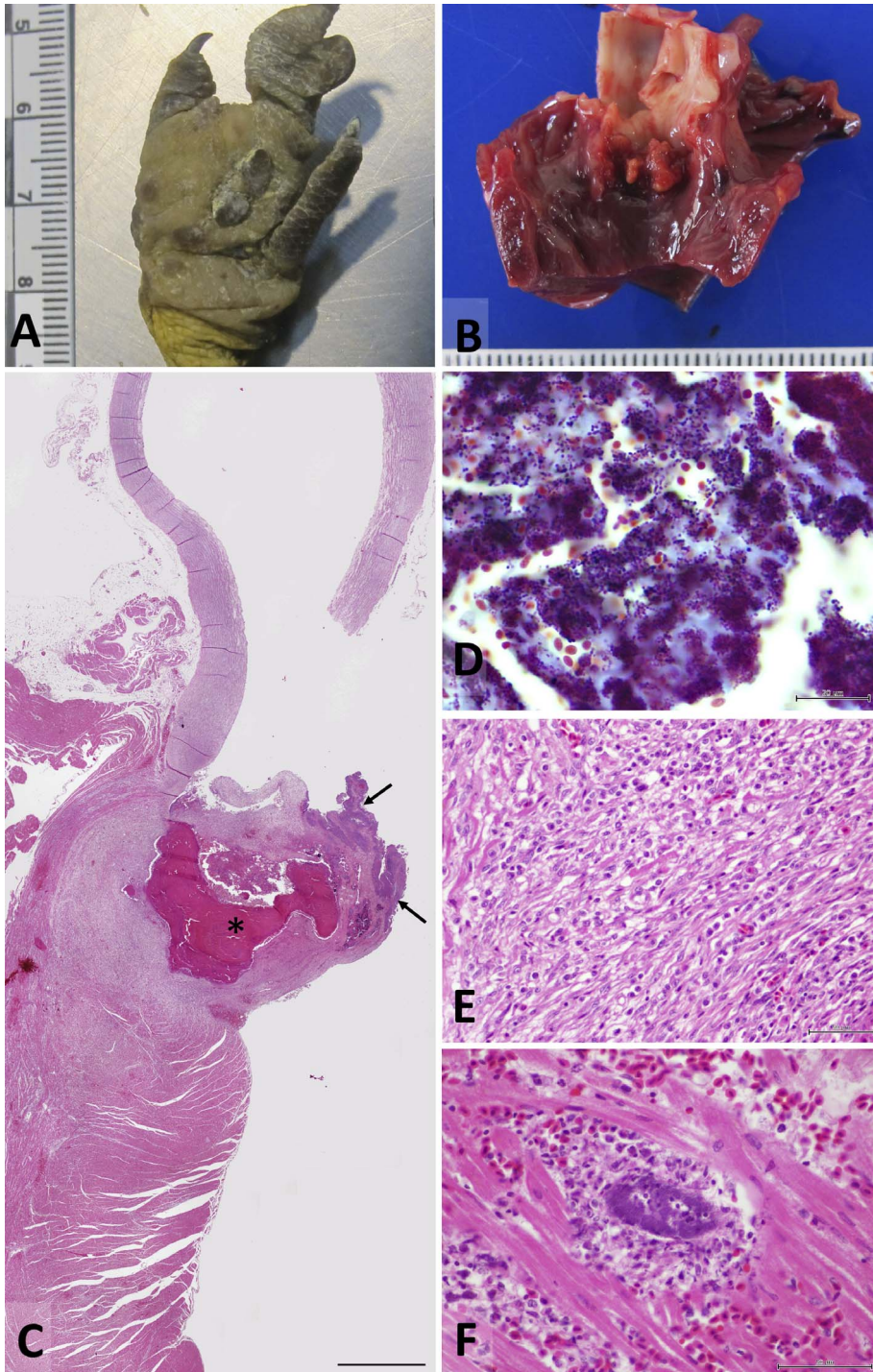


FIGURE 1. Gross and histological lesions observed in a free-living Eurasian Stone-curlew (*Burhinus oedicanus distinctus*) found on the Canary Islands. A) Severe chronic pododermatitis with enlargement, coalescence, and ulceration of the footpads. B) Vegetative endocarditis characterized by focally extensive, yellow, friable mass attached to the aortic valve. C) The aortic valve is expanded by heterophilic inflammation (asterisk) with bacterial colonies on the valvular surface (arrows). H&E. Low power. Scale=500 μ m. D) Gram-positive cocci forming pairs and chains. Gram stain. 100 \times . Scale=10 μ m. E) Large numbers of histiocytes and lymphocytes infiltrate the myocardium, causing necrosis of cardiomyocytes. H&E. 40 \times . Scale=50 μ m. F) Intravascular bacterial embolus with severe perivascular histiocytic and heterophilic inflammation in a cardiac vessel. H&E. 60 \times . Scale=50 μ m.

On the right foot, multifocal variably sized histiocytic granulomas expanded the dermis. In the center of some granulomas bacterial colonies were seen, plus a moderate number of fungal hyphae characterized by nonparallel walls, paucity of septa, nondichotomous branching, and bulbous dilations (possible zygomycetes).

Multiorganic intravascular bacterial and fibrinocellular thrombi, congestion and hemorrhages were also noted.

Microbiological analysis was performed on frozen samples of lung, liver, kidney, cardiac blood, pericardial effusion, and tissue from the pododermatitis lesion. Samples were cultured on blood agar and incubated at 37 C for 24 h under aerobic and anaerobic conditions (anaerobic with 4–10% CO₂ using a GasPak Plus system, BD BBL, Mississauga, Toronto, Canada). Pure cultures of beta-hemolytic colonies were obtained from all cultured samples. The biochemical profile using the API® Rapid ID 32 Strep system (bioMérieux, Madrid, Spain) matched *Streptococcus dysgalactiae*. The diagnosis was bacteremia and valvular endocarditis due to *S. dysgalactiae*. This animal had suffered loss of the left foot and had developed severe pododermatitis (bumblefoot) of the contralateral extremity. The cause of the amputation is unknown; either anthropogenic (e.g., vehicular trauma) or natural causes (e.g., osteomyelitis) are possible.

Bumblefoot is a common condition affecting many avian species (Blair 2013). Its pathogenesis usually starts with ischemic necrosis of the tissues compressed between the skin and the bone, which progresses because of further damage, thrombosis, and reperfusion injury. With chronicity, deposition of connective tissue, abscess formation, ulceration, and secondary bacterial (frequently *Staphylococcus* spp. and *Escherichia coli*) or mycotic infection may occur (Stoute et al. 2009; Blair 2013). Advanced pododermatitis may affect tendons, bone, and joints, causing dysfunction of the extremity and leading to systemic disease such as vegetative endocarditis and polyarthritis (Blair 2013). In this case, overuse of the bird's remaining foot

probably caused the pododermatitis, which predisposed it to secondary infection, septic thrombi, and valvular endocarditis.

Bacterial valvular endocarditis has been reported in numerous wild birds. *Escherichia coli* and *Staphylococcus aureus* have been documented as causative agents in raptors, with bumblefoot often reported as a predisposing condition (Willette et al. 2009). *Erysipelothrix rhusiopathiae* has been described causing chronic septicemic disease in wild galliformes, with arthritis and endocarditis, and *Streptococcus* spp. and *Enterococcus faecalis* have been associated with endocarditis in wild pigeons (Crespo et al. 2018). Valvular endocarditis of probable streptococcal origin has been reported in a Waldrapp ibis (*Geronticus eremita*; Greenwood et al. 1996). Valvular vegetations may cause secondary infarcts of the myocardium, liver, and spleen (Thayer and Waltman 2008). Differential diagnosis includes other bacterial septicemic diseases such as pasteurellosis and *Avibacterium paragallinarum* (Thayer and Waltman 2008).

Streptococci are part of the normal intestinal and mucosal flora in birds (Thayer and Waltman 2008), but may act as opportunistic pathogens under certain conditions. Streptococcal pododermatitis has been documented in domestic and wild mammals (Gardner et al. 1990; Chalmers et al. 2015), and more sporadically in birds (Clark et al. 1991). Suppurative and necrotizing osteomyelitis is a common sequela (Clark et al. 1991; Thayer and Waltman 2008). Lesions of chronic streptococcal infections in birds include fibrinous arthritis, tenosynovitis, osteomyelitis, salpingitis, pericarditis, myocarditis, and valvular endocarditis (Thayer and Waltman 2008).

In vivo diagnosis of streptococcal septicemia may be suspected by demonstration of bacteria in blood films or cytology, but confirmation requires microbiologic isolation of the bacteria (Thayer and Waltman 2008). Although *Streptococcus* spp. infections respond well to common broad-spectrum antibiotics, there is no effective treatment for

chickens with bacterial endocarditis, and the prognosis is poor (Thayer and Waltman 2008).

This report of aortic valvular endocarditis due to *Streptococcus dysgalactiae* in a Canary Island Eurasian Stone-curlew following loss of a foot and contralateral bumblefoot adds to our knowledge of health and disease in these birds.

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