POLISH POLAR RESEARCH	22	3–4	227–231	2001

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Preliminary studies on some avian diseases in Antarctic birds

ABSTRACT: A serological study to detect antibodies against microbes in avian mycoplasmosis (*Mycoplasma gallisepticum* and *M. synoviae*), and salmonellosis (*Salmonella gallinarum* and *S. pullorum*) was carried out. A hundred and twelve Antarctic birds (42 Adélie penguins, *Pygoscelis adeliae*, 30 southern giant petrels, *Macronectes giganteus* and 40 skuas, *Catharacta antarctica* and *C. maccormicki*) from King George Island, the South Shetland Islands, and Laurie Island, the South Orkney Islands in Antarctica were studied. The serological test used in this study was a rapid agglutination test. According to the results and considering the number of samples analysed, it is reasonable to believe that Adélie penguins, southern giant petrels, and skuas populations of the areas mentioned above are free from mycoplasmosis and salmonellosis.

Key words: Antarctica, birds, *Mycoplasma*, *Salmonella*.

Introduction

The study of the diseases which affect Antarctic migratory birds has been an area of great interest for numerous scientists (McNeill Sieburth 1958, Sladen 1962, Moore and Cameron 1968, Graczyk *et al.* 1995). Some of these studies describe the death of southern giant petrels, *Macronectes giganteus* (Gmelin) (Parmelee *et al.* 1979), palefaced sheathbil, *Chionis alba* (Gmelin) (Howie *et al.* 1968) and skuas (Parmelee *et al.* 1979, Montalti *et al.* 1996, Leotta *et al.* 1999). At present,

these studies are focused on those infectious diseases which affect poultry production, such as Gumboro or Newcastle (Gardner *et al.* 1997).

Among the bacterial diseases that cause the greatest economic loss in avian production are avian mycoplasmosis and salmonellosis. Avian mycoplasmosis is caused by *Mycoplasma gallisepticum* (MG) and *Mycoplasma synoviae* (MS), and can be either a chronic respiratory disease or infectious synovitis (Olson *et al.* 1956). Salmonellosis is caused by *Salmonella gallinarum* (Sg) and *Salmonella pullorum* (Sp) respectively. These diseases have a worldwide distribution and were detected in various wild birds (Johnson and Anderson 1933, Snoeyenbos *et al.* 1967, Goodchild and Tucker 1968, Kleven and Fletcher 1983, Cizek *et al.* 1994, Ley *et al.* 1996, Literak *et al.* 1996, Fischer *et al.* 1997, Dhondt *et al.* 1998, Kerry *et al.* 1999). They could even spread to other areas, especially if the affected birds are migratory (Parmelee *et al.* 1979). However, there are no studies of these microorganisms in Antarctic migratory birds.

Some of the Antarctic birds feed on the waste produced by scientific stations and Antarctic explorers (Harris 1991). This activity has notably increased in recent years (Peter *et al.* 1989), which could increase the possibilities of acquiring infectious diseases by the birds.

The purpose of this work was to carry out a serological survey of mycoplasmosis and salmonellosis in Antarctic migratory birds in order to determine their possible role as reservoirs and/or vectors of these diseases.

Material and methods

This study was carried out at Potter Peninsula (62°14'S, 58°40'W), King George Island, South Shetland Islands, Antarctica, during the 1997/98 austral summer and at Cape Geddes (60°41'S, 44°34'W), Laurie Island, South Orkney Islands, Antarctica, during the 1998/99 austral summer. The species selected at Potter Peninsula were Adélie penguin, *Pygoscelis adeliae* (Hombron et Jacquinot), brown skua, *Catharacta antarctica lonnbergi* (Mathews), south polar skua, *Catharacta maccormicki* (Saunders), and their hybrids (*C. antarctica* × *C. maccormicki*), whereas those selected at Cape Geddes were southern giant petrel (*Macronectes giganteus*) (Table 1). The specimens studied for the purpose of this work were selected at random and they include both breeding and non-breeding individuals. Once the animal was immobilised, 3 ml of blood were taken from the brachial vein. The serum samples were kept at –20°C. The rapid agglutination test was applied for the serological study. The antigens used for MG and MS were the S-6 and wwvu-1853, respectively (Intervet International B.V. Boxmeer – Holland). The antigen utilised to detect antibodies against Sg and Sp was Pvllorum Stained Antigen K. Polyvalent (Solvay Animal Health). The serum samples were rendered inactive by heating in a double boiler at 56°C for thirty minutes. In order to carry out

Table 1.
List of species sampled indicating breeding pairs, location (in brackets), number of samples, and breeding status. PP – Potter Peninsula; CG – Geddes.

Species	Breeding pairs	Number of samples	Sampled individuals		
			Breeding	Nonbreeding	Chicks
Pygoscelis adeliae	14554[a] (PP)	42	22	–	20
Catharacta antarctica	42[b] (PP)	14	7	–	7
Catharacta maccormicki	40[b] (PP)	13	6	–	7
C. antarctica × *C. maccormicki*	13[b] (PP)	13	–	13	–
Macronectes giganteus	228[c] (CG)	30	–	–	30

[a] Aguirre (1995), [b] Hahn *et al.* (1998), [c] Coria *et al.* (1996).

the test, 50 µl of serum and 50 µl of antigen were mixed and homogenised by means of plastic sticks on glass plates for 2 minutes. Control positive and negative sera from chickens were used.

Results and discussion

None of the sera analysed were positive for the *Mycoplasma* and *Salmonella* antigens employed. The positive and negative control sera reacted as expected.

Although there have been well documented false positive reactions in the rapid agglutination test (Ahmad *et al.* 1988), it is still used as a screening test for avian mycoplasmosis and salmonellosis serodiagnoses due to its many advantages such as high sensitivity, high rate and low cost (Roberts 1970). This is the main reason why it was chosen in this study. Serological monitoring constitutes the most important part of the eradication and control programmes for infectious diseases. In these areas where these kinds of programmes have not been utilised, such as the Antarctic continent, knowledge of the immunological status of the birds from these areas is of great epidemiological value. Taking into account the number of samples analysed, it could be concluded that the Adélie penguin, southern giant petrel, brown and south polar skuas populations from the areas above mentioned were free from MG, MS, Sg and Sp. The negative results could evidence either that the birds studied were not in contact with infected birds or other sources of infection, or that they were immune against the type of bacteria studied. However, more specific and precise studies should be carried out such as culture and isolation (Frey *et al* 1968, Branton and Deaton 1984), DNA hybridisation or PCR (Lauerman *et al.* 1993).

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Received May 29, 2000
Accepted May 7, 2001