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Source: Journal of Wildlife Diseases, 15(1) : 19-24

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-15.1.19>

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AVIAN CHOLERA IN WATERFOWL IN SASKATCHEWAN, SPRING 1977

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Abstract: Avian cholera was diagnosed in lesser snow geese (*Anser c. caerulescens*), Ross' geese (*Anser rossii*) and individuals of several other waterfowl species in a small area of south-western Saskatchewan over a 1 month period during the 1977 spring migration. Approximately 250 dead birds were found. This is apparently the first time avian cholera has been reported in migrating waterfowl in Canada. The site of the mortality was midway between the wintering and nesting areas of the two principal species, and the significance of the occurrence of the disease this far north is discussed.

INTRODUCTION

Avian cholera epornitics have caused large losses of waterfowl on wintering grounds or during early spring migration in the United States,^{4,5,6,7} but the only previous report of this condition in Canada described two outbreaks in nesting Common Eider (*Somateria mollissima*) in the St. Lawrence estuary.³ The present report describes the occurrence of avian cholera in migrating lesser snow geese (*Anser c. caerulescens*), Ross' geese (*Anser rossii*) and several other waterfowl species in a small area of Saskatchewan during the spring of 1977.

HISTORY

Migrating white geese (including both snow geese and Ross' geese) reached the Kerrobert area of Saskatchewan (Fig. 1) in large numbers on approximately 7 April 1977. On 12 April a farmer reported a number of dead geese on pond A (Fig. 1). Upon investigation, 24 dead snow geese, 1 dead Ross' goose and 1 apparently sick, white goose were found. Ap-

proximately 100 live geese composed of equal numbers of white and Canada geese (*Branta canadensis*) also were present. A single dead Ross' goose and two dead and decomposed snow geese were found on a nearby pond (B, Fig. 1). The dead birds were collected and submitted for necropsy to the Department of Pathology, Western College of Veterinary Medicine, University of Saskatchewan. On 14 April a limited survey was made of the area, and a single dead Ross' goose was found on pond A and three dead snow geese were found on pond D. On 15 April many of the waterbodies in the area were visited and affected waterfowl were found on waterbodies B (1 dead snow goose); C (18 dead and 2 sick snow geese, 1 dead individual each of Ross' goose, Canada goose, redhead (*Aythya americana*) and American wigeon (*Anas americana*), and 1 apparently sick gadwall (*Anas strepera*) which was not captured; K (3 dead snow geese). Live white geese were present on E and M but no dead birds were found. In addition to the species

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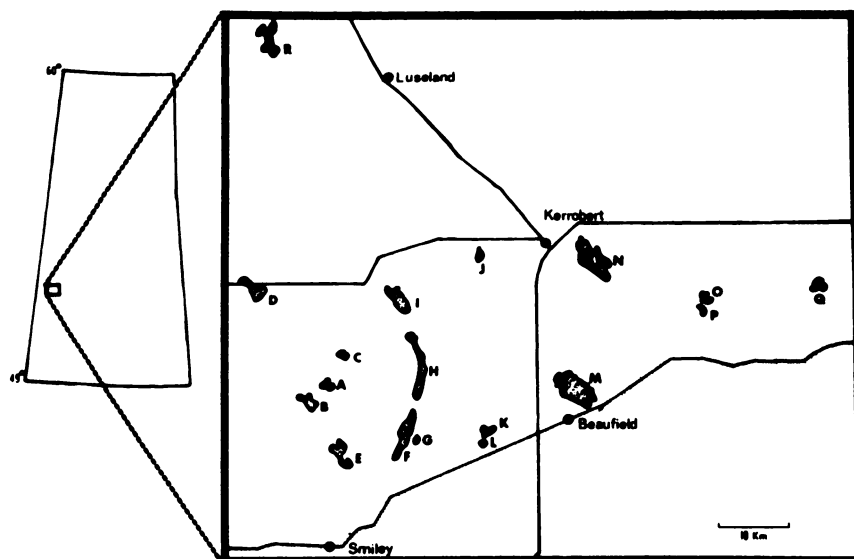


FIGURE 1. Map of Saskatchewan showing location of waterbodies where dead waterfowl were located. (Only waterbodies on which geese were observed are illustrated).

mentioned, several other species of ducks, notably pintails (*Anas acuta*) and mallards (*Anas platyrhynchos*), as well as whistling swans (*Olor columbianus*), white-fronted geese (*Anser albifrons*) and several thousand sandhill cranes (*Grus canadensis*) were present in the area.

On 18 April the area was surveyed from the air (fixed-wing aircraft, three observers) and an estimated 44,000 white geese were observed. Dead or apparently sick birds were observed at the following locations: Q, J - one dead and one sick white goose; O - six dead white geese; M - five dead and one sick white goose; one dead dark goose (Canada or white-fronted goose); I, L, P, E - one dead white goose; G - one dead dark goose.

No further mortality was reported and no surveys were conducted until 11 May when a farmer reported dead birds on waterbody R. The farmer had seen a few dead birds in the area on 4 May but had

not reported until more were seen on 10 May. On 11 May approximately 3,000 live white geese were present and 76 dead snow geese, 24 dead Ross' geese, 10 unidentified dead white geese and 1 unidentified dead duck were found. A further 53 dead or sick white geese were observed in the general area during an aerial survey on 13 May.

The geese migrated from the area about this time and no further mortality was reported.

Pathologic and Microbiologic Findings

Necropsies were performed on birds collected 12 April (21 snow geese, 2 Ross' geese), 14 April (3 snow geese, 1 Ross' goose), 15 April (21 snow geese, 1 each of Ross' goose, Canada goose, American wigeon and redhead) and 12 May (17 snow geese and 4 Ross' geese).

All of these birds were in good body condition, and those birds collected in

May had larger fat depots than did the birds examined in April. The most consistent lesions found were focal hepatic necrosis and catarrhal enteritis (Table 1). Fibrin deposition on serous surfaces was evident in only three birds. Gizzard worms (*Amidostomum* sp.) were common in the snow geese.

The histologic lesions were those of an acute septicemia with focal necrosis in association with bacterial colonies in most organs.

Several organs from each of 10 snow geese, 2 Ross' geese, and the single American wigeon, redhead and Canada goose collected between 11 and 15 April and from 5 snow geese collected 11 May were cultured for bacteria. Heavy growth of *Pasteurella multocida* was obtained from all organs cultured.

Experimental Transmission

A limited infection trial was performed to determine the pathogenicity of this organism for other avian species. A 24-hr broth culture of *P. multocida* isolated from a snow goose was diluted serially for use as an inoculum. The number of organisms in each dilution was determined by plate count.

Adult and 8 week-old domestic chickens, 16 week-old laboratory-reared mallards, and wild caught American coots (*Fulica americana*) and pintails were challenged by intra-air sac injection with 0.5 ml of diluted broth culture. The organism was highly pathogenic for all species challenged by this route, and mortality also occurred in chickens, mallards, pintails and coots inoculated by swabbing the pharynx with broth culture (Table 2). House sparrows (*Passer domesticus*) were less susceptible to pharyngeal swab challenge, with mortality occurring in only one of eight birds inoculated.

DISCUSSION

The number of birds known to have died of avian cholera in this "outbreak"

TABLE 1. Occurrence of gross lesions in waterfowl collected in area of avian cholera outbreak.

	Focal Hepatic Necrosis	Catarrhal Enteritis	Splenomegaly	Focal Splenic Necrosis	Epicardial Petechiae	Fibrinous pericarditis and/or perihepatitis	Esophagus filled with feed
Snow goose	56/62 ^a	55/62	17/62	18/62	29/62	3/62	17/62
Ross' goose	5/6	4/6	1/6	1/6	5/6	0/6	5/6
Canada goose	1/1	1/1	1/1	0/1	1/1	0/1	0/1
American widgeon	0/1	1/1	1/1	1/1	1/1	0/1	0/1
Redhead	1/1	0/1	1/1	1/1	1/1	0/1	1/1

^anumber with lesion/number examined

TABLE 2. Results of experimental infection with *Pasteurella multocida* isolated from snow goose.

Chicken	24 weeks	Air sac	5.8 × 101 - 5.8 × 107	6/6 ^a	12 - 96 hours
	8 weeks	Air sac	5.8 × 101 - 5.8 × 107	4/5 ^b	12 - 25 hours
		Palatine swab	(24 hr culture)	2/2	
Mallard	16 weeks	Air sac	4.2 × 101 - 4.2 × 108	6/6	12 - 25 hours
		Palatine swab	(24 hr culture)	2/2	90 - 96 hours
American coot		Air sac	1.2 × 101 - 1.2 × 108	8/8	12 - 46 hours
		Palatine swab	(24 hr culture)	1/2	46 hours
Pintail		Air sac	6.8 × 101 - 6.8 × 107	7/7	12 - 71 hours
		Palatine swab	(24 hr culture)	2/2	70 - 96 hours
House sparrow		Palatine swab	(24 hr culture)	1/8	45 hours

^anumber dying/number infected

^bone 8-week old chicken given the lowest number of organism (5.8 × 101) survived

is very small when compared to the massive epornitics which have occurred farther to the south; however, the occurrence of the disease in Saskatchewan may be of greater significance than the numerical losses would indicate. Rosen⁴ suggested that waterfowl might carry avian cholera north from wintering areas to the breeding grounds, and our findings support that hypothesis. The site of the present mortality is midway between wintering and breeding areas of the Ross' goose and of some populations of snow geese (Fig. 2). Crowding often has been suggested as a contributing factor in avian cholera outbreaks and as both snow and Ross' geese are colonial nesters,¹ the disease could occur under the crowded conditions of the nesting colonies as has been reported in colonies of common eider.^{2,3}

The area in which mortality was reported represents only a small portion of the total staging area of geese in Western Canada and it is not known if mortality was confined to this local area. The present area and adjacent portions of south-eastern Alberta are important spring staging areas for both snow and Ross' geese and the birds spend several weeks in the area feeding on grain.¹ One of the farmers who reported mortality stated that he had seen dead geese in the area in the spring of other years, suggesting that the die-off in 1977 may not have been an isolated occurrence.

The large number of waterbodies and the continual movement of birds within the area would make it difficult to assess accurately the total mortality without extensive aerial surveys, and would also severely hamper any control procedure based on carcass disposal. However, these same factors may serve to limit mortality by "diluting" contamination of water by *P. multocida*.

The high pathogenicity for other avian species of the strain of *P. multocida* isolated from a snow goose suggests that spread to other species might occur easily.

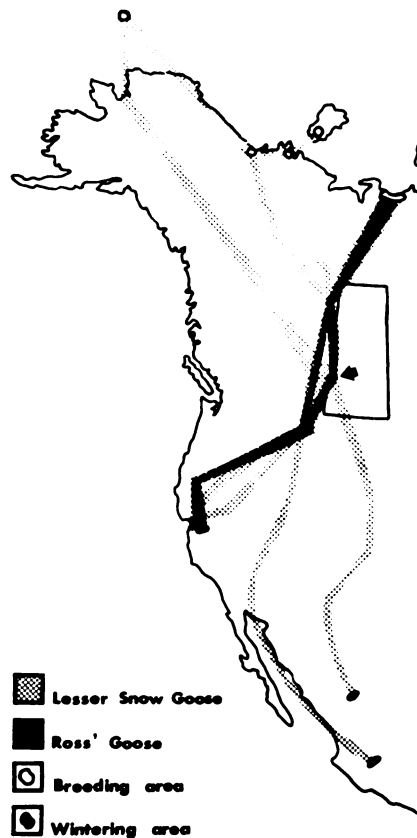


FIGURE 2. Map of western North America showing relationship of breeding and wintering areas and migration paths of snow and Ross' geese to site of avian cholera outbreak (arrow). (Redrawn from Bellrose, only those portions of the snow goose population which migrate through Alberta and Saskatchewan are included).

The recognition of avian cholera in migrating snow and Ross' geese that were midway to the breeding grounds indicates clearly the need for further study to determine the occurrence and prevalence of this disease in these species both during migration and in the breeding colonies.

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Received for publication 5 December 1977
