

# Distribution, Habitat, and Productivity of Tundra Swans on Victoria Island, King William Island, and Southwestern Boothia Peninsula, N.W.T.

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**ABSTRACT.** Data on tundra swans (*Cygnus columbianus columbianus*) were recorded in the central and eastern Canadian Arctic, south of 77°N latitude, and on Southampton Island during the summers of 1980-85. Swans were seen on Victoria, Royal Geographical Society, King William, Stanley, and Southampton islands and on southwestern Melville and Boothia peninsulas. Most swans inhabited low-lying areas that were inundated by the sea following glaciation and are now dotted with shallow tundra ponds. Breeding swans were common in the Minto Inlet, Lady Franklin Point, and Cambridge Bay areas of Victoria Island and on King William Island and southwestern Boothia Peninsula. In August, 52-89% of the adults and subadults in these areas were seen as potential breeders, and the remainder were in nonbreeding flocks. Between 17 and 33% of the pairs had cygnets, and 10-13% of all swans were cygnets. With brood sizes of 1-3 ( $1.5 \pm 0.7$  [ $\bar{X} \pm SD$ ] to  $1.6 \pm 0.5$ ), the apparent breeding success was low relative to other northern swan populations. However, these breeding populations are significant and should be considered in management plans for the eastern population of the tundra swan.

**Key words:** arctic birds, Canada, *Cygnus columbianus columbianus*, distribution, habitat, Northwest Territories, productivity

**RÉSUMÉ.** On a relevé des données sur les cygnes siffleurs (*Cygnus columbianus columbianus*) dans le centre et l'est de l'Arctique canadien, au sud du 77° parallèle, et dans l'île de Southampton, au cours des étés de 1980 à 1985. On a aperçu des cygnes dans les îles Victoria, Royal Geographical Society, King William, Stanley et Southampton ainsi qu'au sud-ouest des péninsules de Melville et de Boothia. La plupart des cygnes habitaient des zones surbaissées, inondées par la mer après la glaciation, qui sont maintenant parsemées d'étangs de toundra peu profonds. Les cygnes reproducteurs se retrouvaient fréquemment aux environs de Minto Inlet, de Lady Franklin Point et de Cambridge Bay dans l'île Victoria ainsi que dans l'île King William et le sud-ouest de la péninsule de Boothia. En août, de 52 à 89 % des adultes et jeunes adultes de ces régions apparaissaient comme des reproducteurs potentiels, et le reste se retrouvait dans des groupes non reproducteurs. De 17 à 33 % des couples avaient des jeunes cygnes, et de 10 à 13 % de tous les cygnes étaient des jeunes. Avec des nichées de 1 à 3 individus ( $1,5 \pm 0,7$  [ $\bar{x} \pm \sigma$ ] à  $1,6 \pm 0,5$ ), le taux apparent de réussite quant à la reproduction était bas comparé à celui d'autres populations de cygnes nordiques. Ces populations reproductrices sont cependant importantes et l'on devrait en tenir compte dans les programmes de gestion de la population de cygnes siffleurs de l'est de la région.

**Mots clés:** oiseaux arctiques, Canada, *Cygnus columbianus columbianus*, distribution, habitat, Territoires du Nord-Ouest, productivité

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## INTRODUCTION

Most tundra swans (*Cygnus columbianus columbianus*) in North America breed north of the tree line, many of them in the Canadian Arctic east of the Mackenzie Delta. They migrate northward in the spring, arriving in late May or early June to spend the summer in lowland coastal areas that are dotted with shallow tundra ponds. They remain there to breed and/or molt until late August or September and then migrate southward to overwinter (Bellrose, 1976).

During the summer tundra swans are widely distributed in the southern Canadian arctic islands and along the coastal mainland of northern Canada (Manning *et al.*, 1956; Fraser, 1957; Barry, 1960; Parmelee *et al.*, 1967; Lumsden, 1975, 1984; Allen and Hogg, 1978; McLaren and Alliston, 1981, 1985; McLaren and McLaren, 1984; Gaston *et al.*, 1986). However, because of the difficulties inherent in arctic travel, the extent of swan breeding areas in the Canadian Arctic, particularly on Victoria Island (Godfrey, 1986), remains to be delineated. It is important that the extent of these breeding areas be identified before northern development adversely affects populations of the tundra swan.

Research on aquatic resources in the Northwest Territories afforded us the opportunity to record data on swans inhabiting the central and eastern Arctic, south of 77°N latitude, and Southampton Island during the summers of 1980-85. This paper documents our observations on the dis-

tribution, habitat, and productivity of swans in these areas and compares these findings with other studies.

## METHODS

Observations of tundra swans were made on an opportunistic basis during flights in a Bell 206 L helicopter to and from aquatic sampling sites (Fig. 1). The work was conducted from July through September of 1980-85 with a different area of northern Canada surveyed each year (Table 1). Observers on each side of the helicopter recorded observations on 1:250 000 scale maps and care was taken to ensure that sightings were not duplicated on those or subsequent flights. All swans observed from the air were assumed to be tundra swans; that assumption proved true in all cases that could be verified from the ground using binoculars.

Flying time in a given area varied, and in most areas a variety of coastal and inland habitats was covered (Table 1; Fig. 1). The altitude above ground, flight speed, and visibility varied during the surveys.

Data were gathered on pairs, singles, broods, and flocks of swans. The proportion of pairs with cygnets (young) was calculated by dividing the number of broods by the number of pairs of potential breeders (Lensink, 1973; Wilk, 1988). The potential breeding pairs included all pairs and half of the singles, since singles were considered to be half of a breeding pair. The pairs count included some prebreeders

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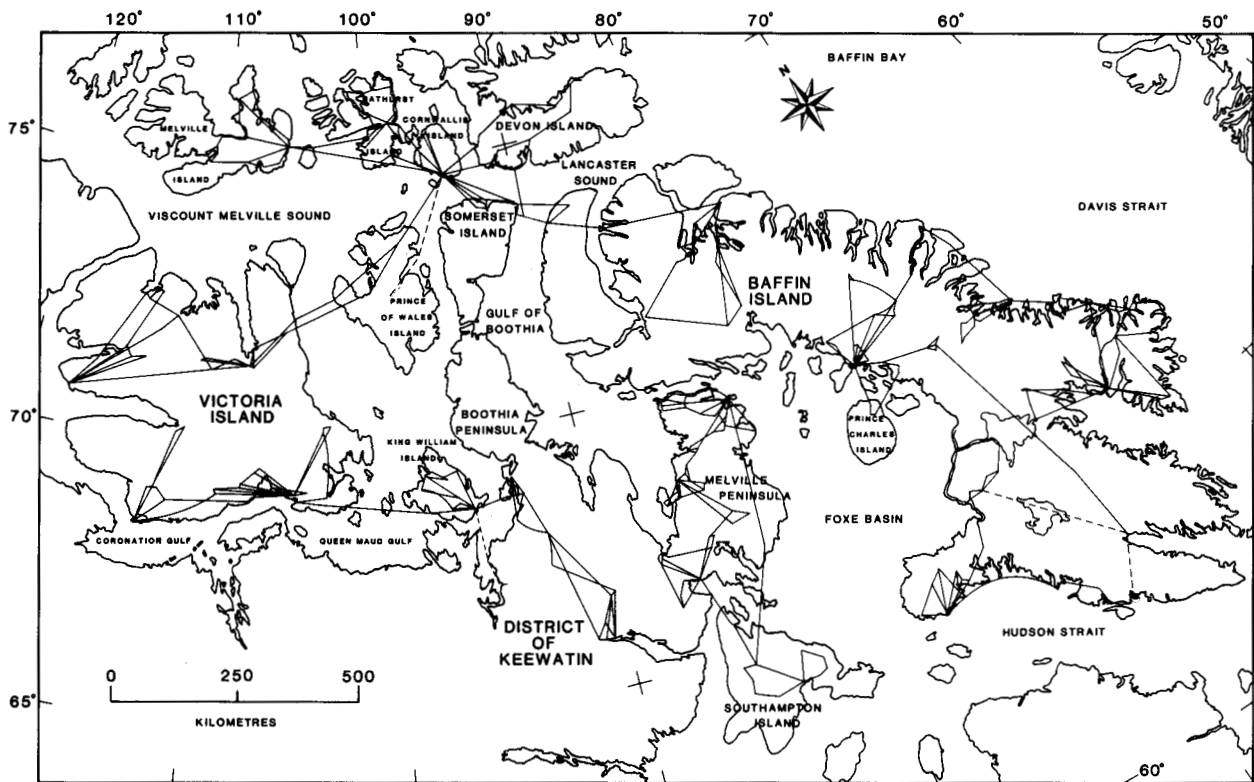


FIG. 1. Flight paths taken by helicopter (solid line) or fixed-wing aircraft (dashed line) during aquatic resource surveys conducted between July and early September 1980-85.

TABLE 1. Location, observation period (day/mo/yr), and flying time (h) in areas where tundra swans were recorded, 1980-85

Area	Observation period <sup>1</sup>	Flying time
Devon Island	31/7-9/8/80	20
Cornwallis Island (south & east)	1-12/8/80	7
(west)	19/7-2/8/81	5
Little Cornwallis Island	1-2/8/81	2
Bathurst Island	19-31/8/81	14
Melville Island	20-24/8/81	23
Victoria Island (north)	6-13/8/81	33
(south)	3-28/8/82	35
Royal Geographical Society Islands	26/8/82	<1
Prince of Wales Island	6-13/8/81	3
King William Island	15-26/8/82	12
Somerset Island	13-18/8/80	3
Boothia Peninsula-Wager Bay	19-26/8/82	22
Repulse Bay area	29/8-3/9/83	13
Melville Peninsula	15/8-8/9/83	34
Southampton Island	4-8/9/83	14
Baffin Island (north)	18-29/8/80	35
(central)	19/7-15/8/85	77
(south)	18/8-2/9/84	21

<sup>1</sup> These are the earliest and latest dates on which each area was visited.

that established territories but could not be distinguished from adult pairs. Swans in flocks were primarily nonbreeders.

## RESULTS AND DISCUSSION

### Distribution

Tundra swans were observed on Victoria, Royal Geographical Society, King William, Stanley, and Southampton islands and on Boothia and Melville peninsulas (Table 2; Figs.

2 and 3). Swans were not seen on Melville, Bathurst, Cornwallis, Little Cornwallis, Devon, Baffin, Wales, Prince of Wales, or Somerset islands. With the notable exception of the Foxe Basin coast of Baffin Island, where extensive coastal lowlands provide breeding habitat for many geese and some swans (Gaston *et al.*, 1986), these latter areas offer less suitable habitat and fewer days with mean temperatures greater than 0°C (Maxwell, 1981). Swans have been seen on Melville (Sabine, 1824), Bathurst (R. Decker, unpubl. data), Prince of Wales (Manning and Macpherson, 1961; T.W. Barry, unpubl. data), and northern Baffin (Mary-Rousselière and Heyland, 1973) islands.

### Habitat

With a few exceptions, the swans occurred in low-lying coastal areas. Indeed, 79% of the swans occurred at elevations of less than 60 m above sea level (asl), 17% between 60 and 120 m, 4% between 120 and 300 m, and none was observed at elevations greater than 300 m. The distribution of breeding pairs was similar, and all of the swans at higher elevations (>120 m) were seen on Victoria Island. Ponds above 100 m in elevation generally lacked adequate emergent and shoreline vegetation for feeding, nesting, and cover, but there were small vegetated wetlands on upland areas of Victoria Island. Swans were common in the interior of King William Island, which is less than 100 m asl. In the Bristol Bay area of Alaska, Wilk (1988) found breeding swans in most wetland habitats below 100 m asl and only one pair at 183 m.

Virtually all of the swans occurred in areas that were inundated by the sea following the Wisconsin glaciation and

have subsequently rebounded (Andrews, 1972). Ponds and lakes in these areas tend to be shallow and have lush patches of shoreline vegetation. Their waters, and probably their soils, are rich in calcium (Stewart and Bernier, 1982, 1983, 1984), which the swans require for egg production. Similar trends in habitat use have been observed among swans in Foxe Basin (Gaston *et al.*, 1986) and Hudson Bay (Lumsden, 1984).

Ponds or lakes used by the swans were often shallow and subject to fish winterkill (Stewart and Bernier, 1982, 1983, 1984). Many had surface areas of less than 10 hectares and became turbid when winds stirred up the bottom sediment. They were commonly inhabited by at least one macroinvertebrate species — for example, the crustaceans *Mysis relicta*, *Gammarus lacustris*, *Branchinecta paludosa*, or *Lepidurus arcticus* — but few, if any, supported aquatic macrophytes. There were patches of tundra vegetation along their shores, and swans were often seen grazing or resting on gradually sloping areas of grasses, sedges, or moss near the water, sometimes near a large nest. None of the small ponds supported more than a single breeding pair.

### Productivity

Swans with cygnets were seen in the Lady Franklin Point, Minto Inlet, and Cambridge Bay areas of Victoria Island; on Royal Geographical Society, King William, and Southampton islands; and on southwestern Boothia Peninsula (Table 2).

It was not possible to accurately determine breeding effort or success, since most of our swan records were based on August sightings. However, 63% of the swans seen on Victoria Island were paired and 33% of those pairs were accompanied by cygnets. This compares to 52 and 29% respectively for King William Island, and 89 and 17% for Boothia Peninsula. Similar proportions were observed in August on the Yukon Delta of Alaska (22-95% paired, 15-48% with broods; Lensink, 1973) and on the northern Alaska Peninsula (50-67% paired, 25-55% with broods; Wilk, 1988).

In August, cygnets constituted 13% of all swans observed on Victoria Island, 10% on King William Island, and 11% on Boothia Peninsula — half the percentage found in Alaska's Bristol Bay population in July (24-28%; Wilk, 1988). Brood sizes ranged from 1 to 3, with averages of 1.5 cygnets per family on Victoria and King William islands and 1.6 on

Boothia Peninsula (Table 2). The apparent breeding success was low relative to swans observed in August on the Rasmussen Lowlands of Boothia Peninsula (1.6-2.5,  $n = 2$  yr; McLaren and McLaren, 1984), the northeastern coast of Hudson Bay (2.8-3.7,  $n = 3$  yr; Heyland *et al.*, 1970), the northern Alaska Peninsula (2.7-3.3,  $n = 4$  yr; Wilk, 1988), and the Yukon Delta of Alaska (2.6-3.6,  $n = 9$  yr; Lensink, 1973). This may be attributable to later springs in the northern part of their range rather than to predation or disease. Lensink (1973) found that a late spring ice break-up caused by low temperatures reduced both the proportion of the swans that nested and the size of clutches.

Cygnets were flightless throughout August and into early September. Swans without broods were in flying flocks of up to 33 birds by mid-August and were moving southward in late August and early September on both Victoria and King William islands.

### Population Management

No population estimates are possible from our data. However, the estimated number of swans on King William Island was 300 in 1960 (Barry, 1960) and between 1000 and 2000 in 1982 (R. Decker, unpubl. data). This may reflect a substantial increase in the eastern population of tundra swans, which, based on winter surveys, increased from an estimated 41 000 birds in 1960 to 73 000 in 1982 (United States Department of the Interior, 1988). In 1988 the eastern population was an estimated 77 100 birds (J.R. Serie, unpubl. data).

The presence of breeding tundra swans in the Lady Franklin Point, Minto Inlet, and Cambridge Bay areas of Victoria Island; on Royal Geographical Society, King William, and Southampton islands; and on western Boothia Peninsula reaffirms the importance of these areas as swan breeding habitats (Figs. 2 and 3). These populations are more extensive than we thought and should be considered in management plans for the eastern population of the tundra swan.

Tundra swans are hunted for food by Inuit in many northern communities (Brice-Bennett, 1976; Jacobson, 1980; Gamble, 1987). As populations in the communities increase and hunting technologies improve, it is important that the hunting be managed to prevent the over-exploitation and subsequent disappearance of swans from an area — such as occurred in the Hudson Bay-James Bay region during the last century (Lumsden, 1975, 1984).

TABLE 2. Observation period (day/mo/yr), location seen, number (n), and brood size ( $\bar{X} \pm SD$ ) of tundra swans in northern Canada, 1980-85

Period	Location	Swans in flocks	Pairs or singles	Cygnets	Total swans	Brood size
6-13/8/81, 3-28/8/82	Victoria Island	98	166	41	305	1.5 $\pm$ 0.7 (27) <sup>1</sup>
26/8/82	Royal Geographical Society Islands	0	2	1	3	1.0 (1)
15-26/8/82	King William Island	199	219	47	465	1.5 $\pm$ 0.6 (32)
26/8/82	Stanley Island	0	1	0	1	
22-26/8/82	Boothia Peninsula	7	58	8	73	1.6 $\pm$ 0.5 (5)
3/9/83	Melville Peninsula <sup>2</sup>	0	1	0	1	
7/9/83	Southampton Island <sup>3</sup>	0	6	6	12	3.0 $\pm$ 0.0 (2)

<sup>1</sup>Number of broods in parentheses.

<sup>2</sup>This swan was seen at the head of Committee Bay on the west side of Melville Peninsula (67°11'N, 87°32'W).

<sup>3</sup>These swans were seen on the Boas River between 64°14'N, 84°52'W and 64°37'N, 85°18'W.

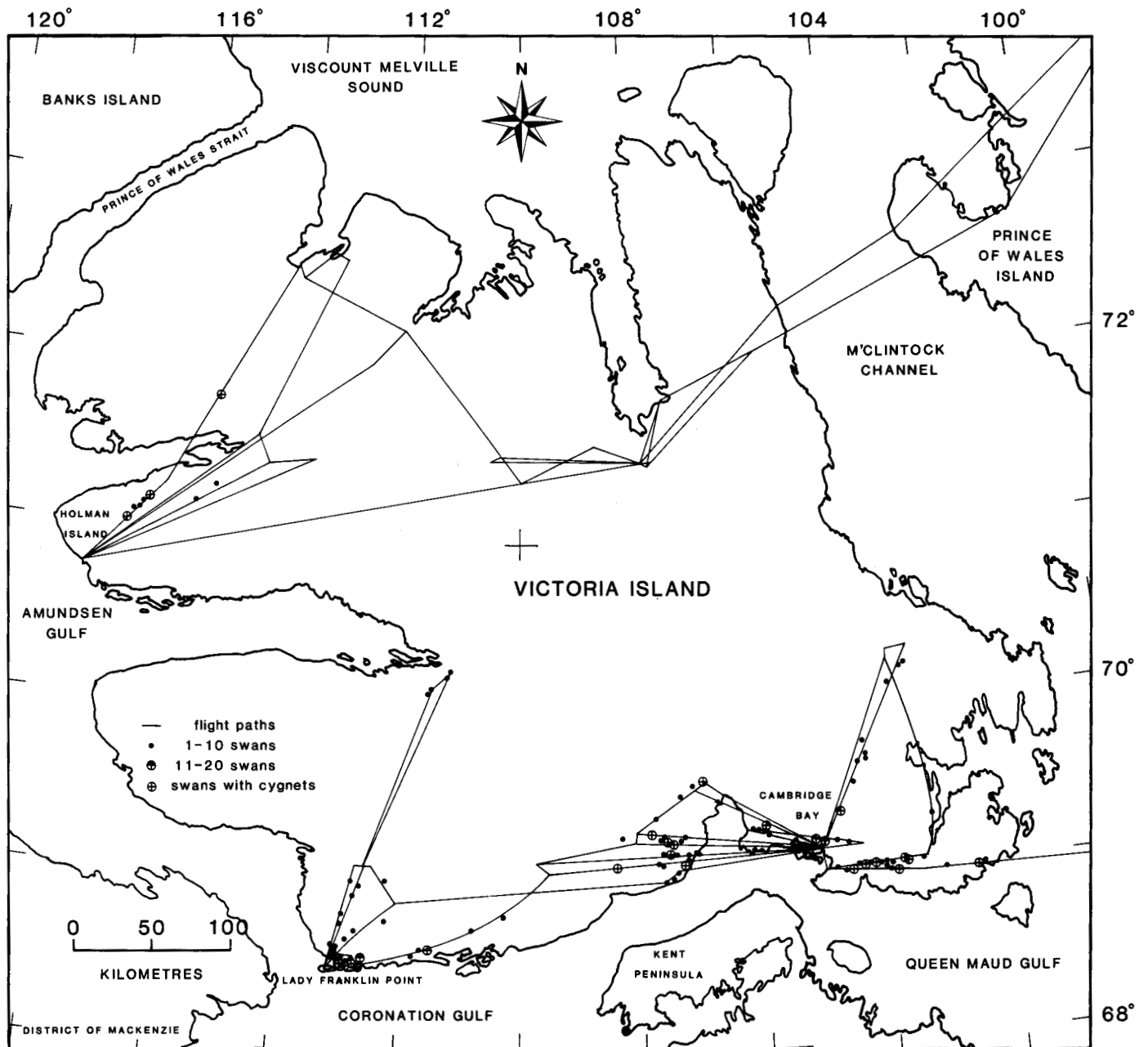


FIG. 2. Flight paths and distribution of sightings of tundra swans on Victoria Island, N.W.T.

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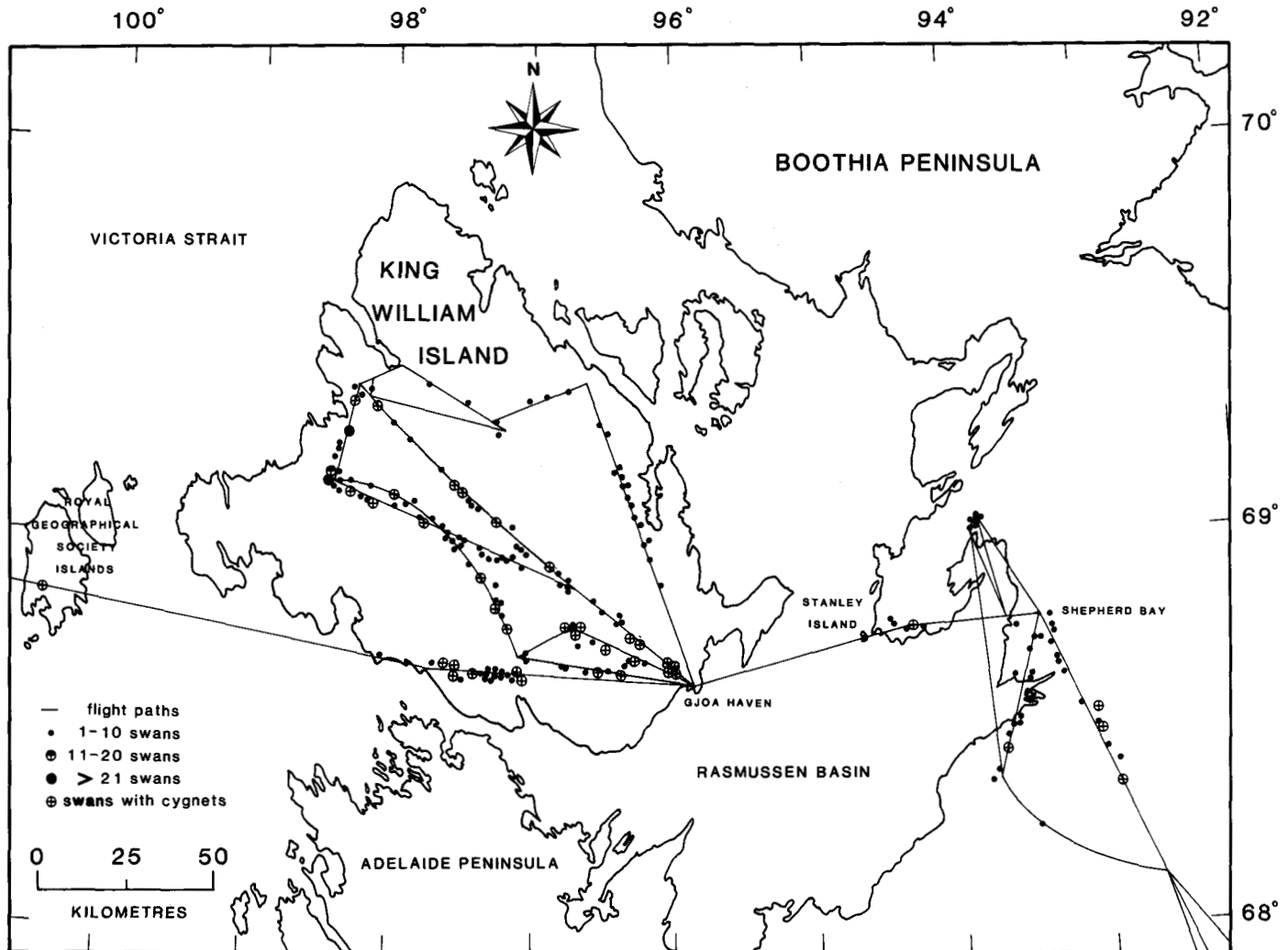


FIG. 3. Flight paths and distribution of sightings of tundra swans on Royal Geographical Society, King William, and Stanley islands and on Boothia Peninsula, N.W.T.

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