The swans and geese of Alaska's Arctic Slope

JAMES G. KING

Description of the area and a comparison with the Yukon Delta (Plate III, p. 48)

North from the Brooks Range, rolling hills blend into an uneven upland and finally a flat plain. Water areas increase in number the lower and flatter the terrain becomes until some areas near the coast are more than 50% water. Some 50 streams and rivers cross the plain, known locally as the Arctic Slope, lying between 70° and 71° North.

The area appears superficially to be very similar to the more productive waterfowl habitat of the Yukon Delta along the Bering Sea coast, lying between 60° and 63° North. Like the latter, the entire area is treeless tundra underlain by permafrost. Sedges *Carex* spp. and *Eriophorum* spp. are the dominant feature of the vegetation and shrubby willows *Salix* spp. and alders *Alnus* spp. are found along the streams. Detailed descriptions of the habitat near Wainwright are given by Maher (1959) and of that along the Colville River by Kessel and Cade (1958). There are approximately 23,000 square miles of waterfowl habitat on the Arctic Slope compared with some 26,000 square miles on the Yukon Delta. The mean tidal variation at Point Barrow is only six inches (compared with nine feet in the Yukon Delta) and lack of tidal action is evident in the estuaries and along the ocean shore.

Weather on the Arctic Slope tends to be cooler and drier in summer than on the Yukon Delta (Table I). Because the greatest known density of Whistling Swans *Cygnus c. columbianus*, Black Brants *Branta bernicla orientalis* and White-fronted Geese *Anser albifrons frontalis* nest on the Yukon Delta, we assume that weather and habitat conditions there are optimum for these species (Brandt 1943; Spencer *et al.* 1951; Hansen and Nelson 1957; Smith *et al.* 1964). The Arctic Slope conversely seems to be near the outside fringe of usable habitat for all species. Open water first occurs in the lakes on the Arctic Slope in late May or early June and the thaw progresses more rapidly a few miles inland than it does on the coast. Snow cover is so light that the first thawing day produces patches of bare ground. Sea ice is often visible from shore during the entire nesting season although there is usually enough open water for boat travel.

Table I. Comparative weather data, Arctic Slope and Yukon Delta.

	May	*June*	*July*	*Aug.*	*Sept.*	*Av. summer*	*Av. annual*
Barrow							
Av. precipitation (in.)	0.13	0.28	0.83	0.80	0.55	2.59	4.11
Av. temperature (°F.)	19	34	40	38	31	32	10
Bethel							
Av. precipitation (in.)	0.89	1.20	2.29	4.02	3.01	11.41	18.17
Av. temperature (°F.)	40	53	55	53	45	49	30

Methods

From 28th July to 2nd August 1966 survey flights totalling 24.3 hours flying time were made east and west from Point Barrow. The object was to (1) learn the species composition and abundance of geese, (2) explore possibilities for future study, and (3) determine if the habitat is threatened by the activities of man.

An amphibious Cessna 180 aircraft piloted by one of the two observers was used on this project. Observations were recorded on an IBM tape recorder. Because fog can blanket the coast, where all communities are located, for long periods, while just a few miles inland skies are clear, a complete camping outfit was carried as essential equipment in the aircraft.

Observations were made from 150 to 250 feet above ground level. The flight path included the entire coastline, the river deltas and all the principal lake areas from Barter Island on the east to Point Lay 360 miles to the west and up to 80 miles inland (Figure 1). All swans and Snow Geese *Anser caerulescens* accompanied by broods were actually counted. Other geese were counted or estimated depending on the flock size (Table II). As with all air surveys it is certain that some birds within the field

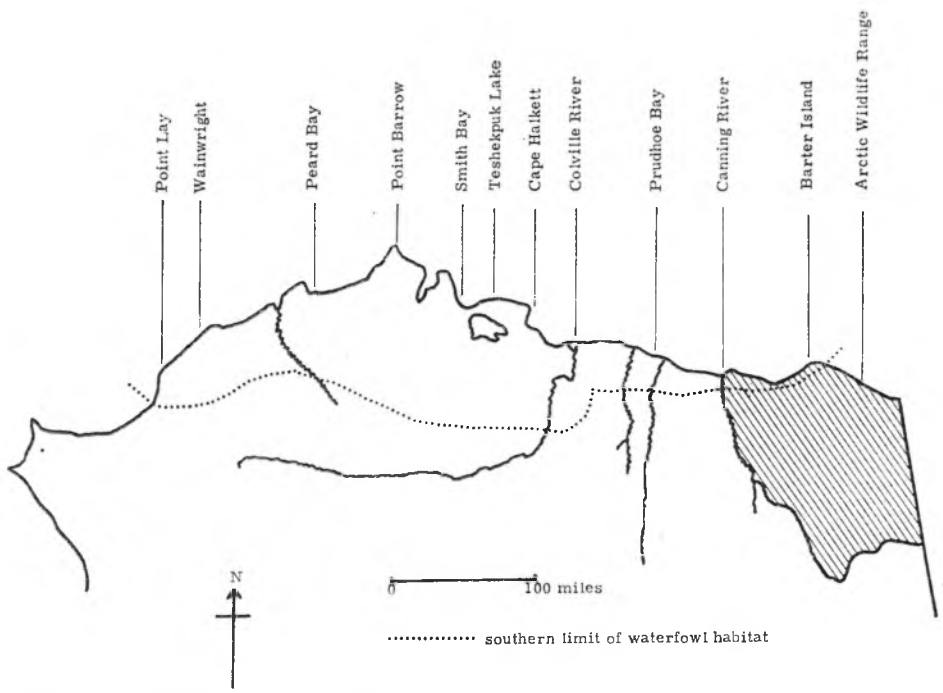

Figure 1. The Arctic Slope of Alaska.

Table II. Arctic Slope geese and swans—1966.

	Moulters	*Breeders*	*Young*	*Total*	% *Young*	*No. broods*	*Av. brood size*
Whistling Swan	117*	20*	22*	159*	13.8	10*	2.2*
Canada Goose	10,278			10,278			
Black Brant	18,365	1,308	1,308	20,981	6.2		2.0
White-fronted Goose	4,412	725	1,594	6,730	23.7	67*	4.4*
Snow Goose	343	38*	77*	458	16.8	19*	4.1*
Total geese	33,563	2,088	2,979	38,630			

* Starred numbers are actual counts. Other figures are estimates.

of vision of the observers were not seen but without concurrent ground studies this factor could not be evaluated. Rough estimates of total population were derived by estimating the number of square miles actually scanned in relation to total square miles of habitat and expanding bird observations accordingly.

Whistling Swan *Cygnus c. columbianus*

We observed 159 swans in the survey and estimate these to be about one-fifth of the Arctic Slope population of probably not over 800 birds. This area is near the ecological limit of swan habitat but enough cygnets were observed to indicate this is a self-perpetuating population. All young observed were in Age Class I with a mean brood size of 2.2 (Table II). We gathered no data on phenology in 1966 but local residents described spring on the Arctic Slope as being late. By way of comparison a late season on the Yukon Delta results in a reduced clutch and brood size of Whistling Swans. Yukon Delta broods averaged 3.4 young in July 1963, an average year, and 2.8 in July 1964, an extremely late season. The Arctic Slope brood size of 2.2 indicates a lower productive rate than has ever been observed farther south, even in the poorest years (King 1964). There may be some natural compensation for low productivity in the Arctic, for instance a lower density of predators.

Canada Goose *Branta canadensis*

The Arctic Slope Canada Geese are probably the *B. c. taverneri* identified by Kessel and Cade (1958). Moulting flocks were seen along the coast from Smith Bay to Canning River, most being in the area north of Teshekpuk Lake. We saw no broods, probably because we concentrated our search on the lakes and along the ocean shore. Canada Geese are known to nest on the bluffs of the Colville River where an estimated 200-300 breeding pairs were observed in 1952 (Kessel and Cade 1958). They probably nest along several other rivers. Our estimate of 15,000 Canada Geese for the area included moulting, non-breeding birds only. It is doubtful whether production on the Arctic Slope could maintain the large unproductive flocks observed. Probably most of these birds were produced on breeding grounds south of the Brooks Range and were exhibiting the northward wandering trait of sub-adults that has been observed among other races of Canadas (Hansen and Nelson 1964).

Black Brant *Branta bernicla orientalis*

Bailey *et al.* (1933) found Black Brant the most common nesting anseriform near Barrow. Hansen (1957) reported some 10,000 apparently unproductive Brant near Cape Halkett. Other references to Brant on the Arctic Slope are of very small numbers. Our count of 20,981 Brant fell into two groups, that of non-productive moulting adults or sub-adults and that of flocks with broods. We speculated there were at least 35,000 Brant on the Arctic Slope this year, 5,000 of which were goslings.

The non-productive Brant, which made up nearly 90% of our count, were found exclusively north of Teshekpuk Lake, by Cape Halkett. In this area there are some thirty elongated lakes of a mile or more in extent. Flocks of flightless Brant numbering from 50 to 1,500 birds were present on most of these lakes. As geese without nests or young invariably fly if they can at the approach of an aircraft, it was easy to identify and estimate numbers in the flightless flocks. We covered this moulting area fairly intensively and estimated that there were at least 25,000 Brant here. There did not seem to be enough productive Brant on the Arctic Slope to maintain indefinitely so many unproductive birds. Possibly Brant produced farther south or east in Canada congregate in the Cape Halkett area during non-productive years. It is also possible that we failed to find a substantial number of the brood flocks or that in some years a much larger portion of the Arctic Slope population is productive.

Small flocks of downy young and adults in about a 50:50 ratio were observed from Peard Bay to Barter Island on the river deltas and up to 20 miles inland in areas of larger lakes. Thus, one-third of the area surveyed appeared to be Brant habitat. About 40% of the broods were adjacent to salt water and tidal estuaries on habitat similar to that which they use on the Yukon Delta. The rest of the Brant broods were near freshwater lakes some distance from the influence of the sea in a type of habitat never used on the Yukon Delta. The largest brood flock consisting of about 40 young and 40 adults was on Teshekpuk Lake. Many single broods were seen away from any others of their kind. This is also contrary to conditions on the Yukon Delta where Brant are more typically colonial (Hansen and Nelson 1957).

The presence of substantial Black Brant production widely scattered on Alaska's Arctic Slope opens a new area of speculation. The breeding range of the Black Brant has been described as from the Yenisei River, Siberia, to Melville Island, Canada, and south to Nelson Island, Alaska (A.O.U. 1957). The Black Brant is thus distributed along more than 4,000 miles of coastline with an unknown acreage of suitable habitat.

Manning *et al.* (1956) reported 80,000 Brant on Banks Island and Uspenski (1964) reported some 14,000 Brant on Wrangel Island. There could well be a much greater portion of Black Brant produced north of the Yukon Delta than previously thought. Circumstantial verification of this theory has been made by Robert D. Jones, Refuge Manager of the Aleutian Islands National Wildlife Refuge. Virtually the entire Black Brant population is present in Izembek Bay near the tip of the Alaska Peninsula during October each year. Jones has made extensive population composition counts on the basis of plumage at Izembek Bay since 1963 (Table III) (Jones 1964, 1968).

Table III. Autumn Black Brant age ratios —Izembek Bay (from Jones 1968).

Year	*No. counted*	% *Young of year*
1963	5211	23.0
1964	15159	29.3
1965	31124	22.1
1966	21194	40.3
1967	19362	17.5
1968	21278	17.6

The almost total nest failure caused by flooding on the Yukon Delta in 1963 was not particularly obvious at Izembek that fall. It is likely that a late spring reduced Arctic production in 1964, 1965 and 1967 when the Yukon Delta production was fair. Production in 1966 must have been fairly good throughout the breeding range as indicated by the large percentage of young in the population at Izembek Bay. Hansen and Nelson (1957), discussing some 8,000 Brant banded in mid-summer on the Yukon Delta, reported eight recoveries from northern Siberia and 28 recoveries from northern Alaska and Arctic Canada. More than an accidental exchange between breeding areas is indicated, possibly as a result of pairing on the wintering grounds.

Considering these circumstances, it seems unlikely that Black Brant would ever suffer a complete production failure throughout their range even though individual flocks may fail somewhere almost every year. Thus, the vast, undescribed, low density breeding areas may be extremely important to survival of the Black Brant.

White-fronted Goose *Anser albifrons frontalis*

White-fronted Geese are fairly evenly distributed throughout the lake areas of the Arctic Slope. Although their density is low they appeared to be the commonest breeding species of goose present. We saw some 6,700 White-fronted Geese but we covered only about 12% of the usable habitat. Thus, there could be as many as 50,000 present on the Arctic Slope.

A fairly complete census of White-fronted Geese in this area could be made during the moulting period using an aircraft to search random plots. They would be fairly easy to count accurately because the flocks seldom include more than 100 birds. This method would be better than using line transects because positive boundaries could be established for each plot; visibility problems due to wind or sun could be eliminated by circling; it would be possible to remain in the area until all geese had entered the water, as they tend to do; and as much time as necessary could be devoted to counting each flock. A somewhat smaller area might be surveyed in the same fashion for Black Brant production.

Snow Goose *Anser caerulescens*

We saw 19 broods of Snow Geese and 343 flocked, moulting adults east of Barrow. The broods were widely scattered on lakes within two or three miles of the coast from Barrow eastward to the Colville River. Usually there was just a single brood on any one lake. The non-productive Snow Geese were with flocks of Brant near Cape Halkett. These birds could be a remnant of what was once a much larger population or they could be drop-outs from large flocks of spring migrants. We thought we may have seen approximately half the Snow Geese present and that there were probably not more than 1,000 on the Arctic Slope in 1966.

Reports of the odd Snow Goose brood are not unusual in coastal areas north of the Yukon Delta. Hansen (1957) reported 1,300 moulting adults near Cape Halkett. Gabrielson and Lincoln (1959) indicate that nesting Snow Geese were much more common east of Barrow in the past and that depredations by Reindeer *Rangifer taranda* and Reindeer herders may have wiped out nesting concentrations. Reindeer are known to eat eggs and nests of waterfowl as well as causing nest damage by trampling (Nelson and Hansen 1959).

On Wrangel Island it has been observed that Snow Geese nest successfully in two situations. First, small numbers succeed in the vicinity of nesting Snowy Owls *Nyctea scandiaca* because the Owls will drive away all avian predators and can actually dispatch a persistent fox. Second, large colonies succeed by sheer weight of numbers in spite of some predation on the periphery of the colony (Uspenski 1964). Snowy Owls were common along the coast where the Snow Goose broods were seen and possibly there is some relation. Also possibly a Snow Goose can nest successfully if isolated far from any other attractions for predators.

Probably a Snow Goose colony reduced to a certain threshold can no longer succeed because of predation except as a scattered remnant. If nesting colonies did exist in this area it seems entirely possible that Reindeer could have upset the colonial structure and caused their destruction. Obviously Snow Geese can reproduce here successfully even in very small numbers.

The domestic Reindeer are now gone from the Barrow area although Caribou *Rangifer arcticus* are common. Snow Geese might re-establish former nesting abundance naturally as the loose bands of unherded Caribou pose far less threat than Reindeer. Cooch (1964) described the development of a Snow Goose colony in Ontario. In 1947 several hundred birds

dropped out of migrant flocks and nested at Cape Henrietta Maria. During the next ten years this colony grew to exceed 15,000 birds.

Uspenski (1963) suggests that former Snow Goose colonies in Russia might be re-established by releasing juvenile birds with White-fronted Geese or by placing eggs in the nests of White-fronted Geese. If the Russians succeed in re-establishing nesting colonies of Snow Geese in Siberia, it is likely the same thing could be done on Alaska's Arctic Slope.

Ducks

Because our survey was directed mainly at geese, we did not devote much attention to ducks. Ducks, of course, are more difficult to see and identify from the air in mid-summer. A comparison of breeding duck populations on the Arctic Slope and the Yukon Delta is possible from aerial surveys by Hansen and King in 1957. A density of 3.1 ducks per square mile, 68% of which were Long-tailed Ducks (Old Squaws) *Clangula hyemalis*, was recorded on the Arctic Slope whereas the Yukon Delta had 16.1 ducks per square mile (Hansen 1957).

We observed occasional flocks of diving ducks on the lakes and lagoons during the survey in 1966. Some Eider broods *Somateria* sp. were observed in the lakes along the lower Colville River. On 26th-27th July 1966 a steady stream of Eider flocks passed Point Barrow, headed west, with a favourable tail wind. Every few minutes a flock of 20 to 200 Eiders would cross the point east of the airfield at an elevation of about 50 feet. On 28th July the wind swung around to the west and the Eider migration ceased. These are a portion of approximately one million King Eiders *Somateria spectabilis* that migrate along the Arctic Coast each year (Thompson and Pearson 1963).

Snowy Owl *Nyctaea scandiaca*

Snowy Owls seemed to be quite numerous within two or three miles of the coast from Smith Bay to Prudhoe Bay. They sit by themselves on little hummocks on the tundra but frequently as many as five would be in sight from one side of the plane at a time. Because large gulls, probably Glaucous Gulls *Larus hyperboreus*, occupy the same type of hummocks it was necessary to fly directly over them to make a positive indentification. We identified only 79 owls but there must have been some hundreds in the area.

Discussion

Waterfowl are not very abundant nor greatly concentrated on the Arctic Slope of Alaska as reported by numerous observers, going back to whaling days before the turn of the century (Gabrielson and Lincoln 1959). There are several other places in these high latitudes where spectacular concentrations of waterfowl, particularly geese, are found. Most waterfowl studies in the Arctic have been directed toward these concentration areas. There is virtually no quantitative waterfowl data on what may be an enormous amount of low density habitat such as occurs in Arctic Alaska.

By use of the aircraft we were able to get a more comprehensive picture of the goose populations of the Arctic Slope than have ground-bound observers in the past. Our observations, though scattered over a wide area, when totalled indicated that this area is making a valuable contribution to the continental goose population. The value of such low density habitat may be underrated. Such dispersed production may be of real value in years when the high density production areas fail. There is also a possibility that because of depredations and habitat damage in the wintering grounds as well as on the breeding range, goose populations using the Arctic Slope are now considerably reduced from what they once were or still could be.

Obviously further study is needed. Population counts from the air, using a plot sampling method, would be practical from mid-July to early August when geese are flightless. It would likewise be possible by use of aircraft for transport to catch adequate numbers of young and moulting geese and diving ducks for banding studies. Very likely small nesting colonies could be located from the air in June for the purpose of production and ecological studies. Although the numbers of geese present on the Arctic Slope may not warrant a crash study programme now, we should regard it as a valuable piece of habitat which may have a greater potential for goose production in the future. The tracks and litter of oil development are much in evidence in many places. Most of the waterfowl habitat is outside the protection of the Arctic Wildlife Range, on public lands subject to commercial development or within the Naval Petroleum Reserve No. 4. The Naval Reserve covers all the lowlands from the Colville River almost to Point Lay and includes well over half the Arctic Slope waterfowl habitat. No

serious conflict between waterfowl and oil development was noted but this industrial activity is increasing rapidly.

If proper precautions are taken there is no need for oil development or Reindeer production to interfere with the bird resources. There is a danger, however, that the old concept of 'Arctic waste land' is leading to inadequate observance of normal procedures for safeguarding the habitat. Arctic habitat, once damaged, takes generations to recover so every care should be taken to preserve it in its present condition. The moulting area between Teshekpuk Lake and Cape Halkett in particular may well need special protection. Perhaps this area should be included in the National Refuge system.

Oil spills in the sea lanes between the ice pack and the shore line could be devastating to the huge numbers of eider, geese and other water birds that migrate along the Arctic Coast. Every effort should be made to see that oil is kept out of any of the waters. An active programme of pollution surveillance and control should receive a high priority in management of this area.

Supplement

In 1966 several small oil prospecting crews were on the Arctic Slope. Most of the litter referred to was on the Naval Petroleum Reserve and had resulted from rather extensive seismic and drilling operations conducted by the Navy between 1944 and 1953.

In the summer of 1968 a major oil strike was reported near Prudhoe Bay. The rush was on immediately. Now roads, tractor trails, airfields, gravel pits and drilling pads litter the tundra from the Arctic Wildlife Range to the Colville River. A winter road has been built from Fairbanks to Prudhoe Bay, a tanker has pioneered a shipping lane across the top of Canada and the State of Alaska has received 900 million dollars for additional oil leases near Prudhoe Bay. Construction has started on a 48-inch diameter pipeline and a permanent highway from southern Alaska. And this is just the beginning.

Experts estimate there are 10 to 50 billion barrels of oil in the Prudhoe Bay area and up to 400 billion barrels in the region including the Arctic Slope and adjacent parts of Canada.

No one was prepared for the magnitude of developments now occurring in the Arctic. Dr. Robert Weeden of the Alaska Conservation Society made a pertinent observation: 'My main conclusion from seven months of thinking about Prudhoe Bay is that neither science nor government was—or is—prepared for discovery of oil in the Arctic. Science cannot predict the quantitative effects of the industry's disturbance of arctic soils and vegetation on biological communities, nor can science estimate the economic and social costs of these disturbances. Partly in consequence, government has not equipped itself with laws or funds to meet fully its responsibility to protect public values on public arctic lands.'

It is impossible at this point to predict the full extent of the oil boom or what its eventual impact on waterfowl will be. We can assume it will not be good and we can only hope that science, government and industry will be able to join in preventing it from being overly destructive.

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Summary

A mid-summer aerial waterfowl survey was made in 1966 on the 23,000 square miles of Alaska's Arctic Slope. Birds observed included 159 Whistling Swans *Cygnus c. columbianus*, 10,278 Canada Geese *Branta canadensis taverneri*, 20,981 Black Brants *Branta bernicla orientalis*, 6,730 White-fronted Geese *Anser albifrons frontalis* and 458 Snow Geese *Anser caerulescens*. An extensive goose moulting area near Cape Halkett was searched. Expanded population estimates are given. Discussion includes: better census methods; the relation of these birds to areas of greater nesting concentration; possibility for banding and other

studies; and the possibility of increasing the abundance of Snow Geese, including the control of Reindeer *Rangifer taranda.* It is concluded that this large block of habitat could be representative of a vast Arctic area of low production that may be of considerable importance to the species involved. Measures to protect the habitat from industrial damage are warranted.

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James G. King, Bureau of Sport Fisheries and Wildlife, P.O. Box 1287, Juneau, Alaska, 99801.