BIRD SURVEYS AT STOKES POINT AND PHILLIPS BAY, YUKON IN 1983

D. Lynne Dickson
H. Loney Dickson
Gerry M. Aiudi

Technical Report Series No. 40
Western and Northern Region 1988
Canadian Wildlife Service

This report may be cited as:

Dickson, D.L., H.L. Dickson and G.M. Aiudi, 1988. Bird surveys at Stokes Point and Phillips Bay, Yukon in 1983. Technical Report Series No. 40 Canadian Wildlife Service, Western and Northern Region, Alberta

Issued under the Authority of the
Minister of Environment
Canadian Wildlife Service

Catalogue No. CW69-5/40E
ISBN 0-662-16105-X
ISSN 0831-6481

Copies may be obtained from:

Canadian Wildlife Service
Western and Northern Region
2nd Foor, 4999 - 98 Avenue
Edmonton, Alberta
T6B 2X3

ABSTRACT

The distribution, abundance and habitat preferences of birds were studied at Stokes Point, Phillips Bay and to a lesser extent, at King Point in the northern Yukon in 1983. These data were gathered to assist in decisions about future development of a port along the northern Yukon coast.

Nesting bird densities at Stokes Point were similar to those found elsewhere on the Yukon Coastal Plain due to the similarity in habitat. The lagoon at Stokes Point was locally important to moulting ducks, with peak numbers of over 500 ducks, mostly Oldsquaw, occurring in mid-August.

Several species of birds occurred in higher densities at Phillips Bay than elsewhere on the Yukon Coastal Plain, primarily due to the deltas and sandspits created by the Babbage and Spring rivers both of which flow into the Bay. Nesting species that were more abundant at Phillips Bay included the Red-throated Loon, Tundra Swan, Semipalmated Sandpiper, Red-necked Phalarope, Glaucous Gull, redpolls and Savannah Sparrow. The river deltas in Phillips Bay were locally important to moulting non-breeding Tundra Swans, Greater White-fronted Geese, Canada Geese, Brant and several duck species. In some years, Greater White-fronted Geese and Canada Geese also reared young there. In midsummer, migrant shorebirds concentrated on the mudflats and ponds at Phillips Bay. During fall migration in September, the Babbage River delta had the highest density of staging Snow Geese in the study area.

During the ground surveys in June, habitat was classified into 13 types and the nesting density of each bird species calculated for each habitat type. Overall, bird densities were more than three times higher in lowland than upland habitats. Shorebird densities and species richness were highest in Wet Sedge and Wet Sedge-Patterned Ground, the two most extensive lowland habitats. Passerine densities and species richness were highest in Tall Shrub, the habitat type dominated by shrubs over 0.5 m. high and found primarily in stream and river valleys.

The Yukon Coastal Plain is an important nesting area for the Stilt Sandpiper, which has a limited breeding range and which was a common nester throughout the study area. The Yukon Coastal Plain is also nationally important for nesting Long-billed Dowitchers and Yellow Wagtails. Both species were fairly common within the study area, but have a very limited breeding distribution within Canada. The Yukon Coastal Plain is also internationally important to fall staging Snow Geese, as this and several other studies have documented.

RÉSUMÉ

En 1983, on a étudié la répartition, l'abondance des oiseaux et leurs préférences en matière d'habitat à Stokes Point, Phillips Bay et, dans une moins large mesure, à King Point, dans le nord du Yukon. Ces données ont été recueillies en vue d'aider à la prise de décisions relatives à l'aménagement futur d'un port sur la côte du nord du Yukon.

Étant donné que les habitats de Stokes Point et de la plaine côtière du Yukon se ressemblent, la densité d'oiseaux nidifiant dans les deux endroits est la même. À l'échelle locale, la lagune de Stokes Point est importante pour les canards en mue. En effet, on en a relevé un maximum de plus de 500 (surtout des Canards kakawis) à la mi-août.

On a observé plusieurs espèces d'oiseaux à Phillips Bay, dont le nombre était plus élevé que n'importe où ailleurs dans la plaine côtière du Yukon, ce qui est principalement dû aux deltas et aux langues de sable créés par les rivières Babbage et Spring qui se déversent toutes deux dans la baie. Les espèces nidificatrices les plus abondantes dans la baie Phillips sont le Huart à gorge rousse, le Cygne siffleur, le Bécasseau semipalmé, le Phalarope hyperboréen, le Goéland bourgmestre, le Sizerin et le Pinson des prés. On a trouvé que, à l'échelle locale, les deltas de la baie Phillips étaient importants pour les espèces en mue non reproductrices telles que les Cygnes siffleurs, les Oies à front blanc, les Bernaches du Canada, les Bernaches cravants ainsi que plusieurs espèces de canards. Certaines années, les Oies à front blanc et les Bernaches du Canada élèvent leurs petits dans ces deltas. Au milieu de l'été, les oiseaux de rivage migrateurs se concentrent sur les bancs de vase et les étangs de la baie Phillips. Au cours de la migration de septembre, le delta de la rivière Babbage est le plus important point de rassemblement d'Oies blanches de toute la région étudiée.

Pendant les études de terrain effectuées en juin, on a classé les habitats en 13 catégories et, pour chacune de ces catégories, on a calculé la densité de nidification de chaque espèce d'oiseaux. En général, les densités étaient plus de trois fois plus élevées sur les basses terres que dans les habitats situés à l'intérieur des terres. Les densités et le nombre d'espèces d'oiseaux de rivage étaient les plus élevés dans les terres couvertes de laîches, en tout ou en partie (ces deux types de terrain constituent les plus importants habitats des basses terres). Les densités et les nombres d'espèce de passereaux les plus élevés se trouvaient dans les zones de grands arbustes (celles où dominent des arbustes de plus de 0.5 mètre) qu'on trouve surtout dans les vallées de ruisseaux et de rivières.

La plaine côtière du Yukon constitue un territoire de nidification important pour les Bécasseaux à échasses dont le territoire de reproduction est limité et dont on trouve les nids dans toute la région étudiée. Cette plaine est aussi importante à l'échelle nationale du fait qu'y nichent le Bécasseau à long bec et la Bergeronnette printanière. On trouve communément ces deux espèces dans la région faisant l'objet de l'étude bien que, à l'échelle nationale, leur territoire de reproduction soit très limité. Comme l'indiquent la présente et d'autres études, la plaine côtière du Yukon est un important point de rassemblement international en automne pour les Oies blanches.

ACKNOWLEDGEMENTS

The authors thank the following people for their contributions to this study: Michael Biro who helped gather the field data; Stuart Alexander and Susan Westover who suggested improvements to the original manuscript; Susan Popowich who drafted the figures; and Heather Breen and Janice DeRoche who typed the manuscript.

The project was funded by the Baseline Studies Program and Canadian Wildlife Service of Environment Canada. Generous logistical support was provided by Polar Continental Shelf Project of Energy, Mines and Resources, Canada.

TABLE OF CONTENTS

PAGE

ABSTRACT i

RESUME ii

ACKNOWLEDGEMENTS iii

LIST OF TABLES v

LIST OF FIGURES vii

LIST OF APPENDICES viii

1.0 INTRODUCTION 1

2.0 STUDY AREA 1

3.0 METHODS 3

3.1 Aerial Surveys 3

3.2 Ground Surveys 8
3.2.1 Breeding birds 8
3.2.2 Moulting, brood-rearing and fall staging birds .. 10

4.0 RESULTS AND DISCUSSION 12

4.1 Nesting 12
4.1.1 Density, distribution and species composition ... 12
4.1.2 Habitat preferences 29

4.2 Brood-rearing and Moulting 40

4.3 Fall Migration 48

4.4 Use of Stokes Point by Birds 58
4.4.1 Mid-June 58
4.4.2 Mid-August to early September 58

5.0 SUMMARY AND CONCLUSIONS 67

5.1 Distribution and Habitat Preferences 67

5.2 Regional Importance of Stokes Point and Phillips Bay to Birds..... 72

LITERATURE CITED 74

APPENDICES 78

LIST OF TABLES

Table		Page
1.	Densities of birds by species group observed on transect at each of the nine sites surveyed by foot on the Yukon Coastal Plain, 9-29 June 1983	13
2.	Density of birds observed on transect and number of birds observed off transect during ground surveys in each of the three regions on the Yukon Coastal Plain, 9-29 June 1983	14
3.	Densities of birds observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983	16
4.	A comparison of the number of different bird species seen at each site surveyed on the Yukon Coastal Plain, 9-29 June 1983	17
5.	Abundance of bird species encountered during ground surveys on the Yukon Coastal Plain between Roland Bay and King Point, 9-29 June 1983	18
6.	Species composition of ducks observed on the Yukon Coastal Plain during ground surveys, 9-29 June 1983	22
7.	Number of breeding and non-breeding ducks observed on the Yukon Coastal Plain during ground surveys, 9-29 June 1983	23
8.	Description of types of habitat encountered during ground surveys along the Yukon Coastal Plain, 9-21 June 1983	30
9.	Key to habitat types found on the Yukon Coastal Plain in 1983	32
10.	A comparison of bird densities in lowland versus upland habitat during ground surveys along the Yukon Coastal Plain, 9-29 June 1983	35
11.	A comparison of the number of different bird species encountered in lowland versus upland habitat during ground surveys along the Yukon Coastal Plain, 9-29 June 1983	35
12.	Habitat preferences of birds observed during ground surveys conducted on the Yukon Coastal Plain, 9-29 June 1983	36
13.	A comparison of the number of different bird species seen in each habitat type during ground surveys along the Yukon Coastal Plain, 9-29 June 1983	39

LIST OF TABLES (Continued)

Table		Page
14.	Habitat preferences of birds observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983	41
15.	Densities of birds observed during helicopter surveys along the Yukon Coastal Plain, 2 August 1983	42
16.	Densities of birds observed during helicopter surveys along the Yukon coast between Shingle Point and Stokes Point on 16 August 1983	43
17.	Broods observed during a survey by helicopter of the Yukon Coastal Plain on 2 August 1983	44
18.	Habitat preferences of birds observed during helicopter surveys along the Yukon Coastal Plain, 2 August 1983	46
19.	Density of birds observed during surveys byfixed-wing aircraft along the Yukon Coastal Plain, 26 August 1983	49
20.	Density of birds observed during surveys by fixed-wing aircraft along the Yukon Coastal Plain, 1 September 1983	50
21.	Density of birds observed during surveys by fixed-wing aircraft along the Yukon Coastal Plain, 7 September 1983	51
22.	Total number of birds counted on each of the aerial surveys conducted along the Yukon coast during fall migration in late August and early September, 1983	52
23.	Numbers, densities and species of birds observed during the ground survey at Stokes Point lagoon, 15 June 1983	59
24.	Number of birds observed each day during ground surveys at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983	60
25.	Number of birds in each habitat type surveyed at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983	61
26.	Direction of travel of birds in flight during surveys at Stokes Point from 27 August to 2 September 1983	63
27.	Broods seen at Stokes Point lagoon during ground surveys, 10-15 August 1983	65

LIST OF FIGURES

Figure		Page
1.	Map of the study area	2
2.	Flightlines for the helicopter survey conducted along the Yukon Coastal Plain, 21 June 1983	4
3.	Flightlines for the helicopter survey conducted along the Yukon Coastal Plain, 2 August 1983	5
4.	Flightlines for the helicopter survey along the Yukon coast, 16 August 1983	6
5.	Flightlines for the surveys by fixed-wing aircraft along the Yukon coast, 26 August, 1 September and 7 September 1983	7
6.	Location of the ground surveys conducted on the Yukon Coastal Plain, 9-29 June 1983	9
7.	Location of migration watch site and transect-line surveyed daily by foot at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983	11
8.	Location of nesting colonies of Arctic Terns and Glaucous Gulls observed during ground surveys from 9 to 29 June 1983 and during aerial surveys on 21 June and 2 August 1983	28

LIST OF APPENDICES

Appendix — Page

A. Location of the transect-lines surveyed by foot from 9 to 29 June 1983, on the Yukon Coastal Plain..... 78

B. Number of birds observed during ground surveys at each site along the Yukon Coastal Plain, 9-29 June 1983..... 88

C. Nests recorded during ground surveys on the Yukon Coastal Plain between Roland Bay and King Point in June 1983..... 92

D. Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983..... 95

E. Plant species recorded in each of the 13 habitat types encountered on the Yukon Coastal Plain in 1983..... 97

F. Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain on 2 and 16 August 1983..... 102

G. Density of loon, goose and duck species observed during fixed-wing aircraft surveys along the Yukon Coastal Plain, 26 August, 1 and 7 September 1983..... 105

H. Daily abundance and habitat preferences of birds at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983..... 109

I. Scientific names of bird species cited..... 115

1.0 INTRODUCTION

In July of 1978, 15000 square miles of the northern Yukon were withdrawn by Order-in-Council for a national park and other conservation purposes. Four years later, Gulf Canada Resources Inc. requested approval to establish a marine base at Stokes Point, in the northern Yukon, to suppport offshore drilling activities in the Beaufort Sea. A decision had to be made whether to develop Stokes Point into a marine base or to preserve it as part of a national wilderness park. In order to provide the best possible advice regarding the relative importance of the Stokes Point area to birds, the Canadian Wildlife Service conducted a study in 1983 with the following objectives:

1) to determine the species, abundance and habitat preferences of birds at Stokes Point and nearby Phillips Bay;

2) to identify areas and types of habitats important to birds on the northern Yukon Coastal Plain; and

3) to assess the regional importance of Stokes Point and Phillips Bay to birds.

Should port development proceed at Stokes Point, the data would also be used to assess the impact of port development on birds and to devise appropriate mitigative measures.

In November of 1983, Gulf Canada Resources' proposal was rejected due to outstanding land claims and because the federal government had been unable to reach consensus on a comprehensive package governing both conservation and development activities. By March of 1984, the land claim for the Canadian Original Peoples Entitlement had been settled, and the northern Yukon west of the Babbage River had been declared a national park.

This is a report on the bird study conducted by the Canadian Wildlife Service at Stokes Point in 1983.

2.0 STUDY AREA

The study area consisted of the narrow strip of coastal plain in the northern Yukon and the nearshore waters of the Beaufort Sea (Fig.1). The boundaries extended from Nunaluk Spit to the Mackenzie Delta, although emphasis was placed on Stokes Point (lat. 69°20'N, long. 138°45'W) and Phillips Bay (lat. 69°15'N, long. 138°30'W).

Much of the northern Yukon coastline is straight with exposed narrow beaches and bluffs. The only protected waters occur in Workboat Passage, Phillips Bay and behind several spits including the lagoon at Stokes Point. Inland lies a gently rolling morainal plain dotted with numerous shallow lakes and ponds. The permafrost is continuous and the depth of thaw is shallow (25 cm), so that much of the soils are wet and acidic (Wiken et al. 1981). Patterned ground due to surface frost wedges is common.

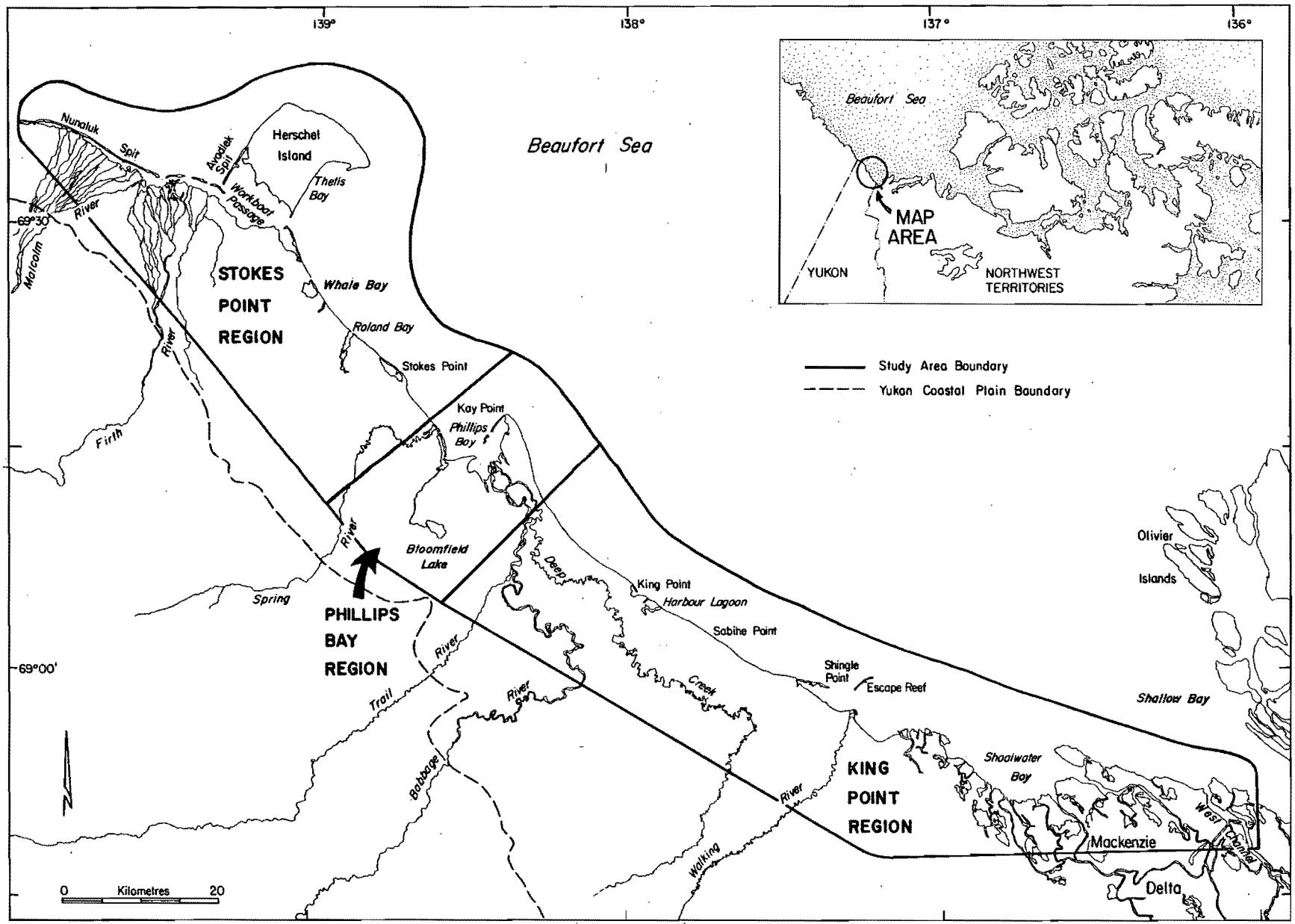

Figure 1. Map of the study area.

The summers are short and cool, with frequent fog and frosts. The average daily minimum temperature exceeds 0°C only in June and July (Wiken et al. 1981).

The tundra vegetation forms a continuous cover. Sedges dominate the lowlands, while a mixture of dwarf shrubs and cottongrass tussocks grow on the drier uplands.

3.0 METHODS

3.1 Aerial Surveys

Aerial surveys of the Yukon Coastal Plain between the Firth River and Shingle Point were conducted 21 June and 2 August, 1983, from a Bell 206 Jet Ranger helicopter (Figs. 2 and 3). The purpose of the first survey was to determine the number, distribution and species composition of nesting birds, whereas the second survey was for moulting and brood-rearing birds. A third survey was flown by helicopter on 16 August along the coast between Stokes Point and Shingle Point to record the number and species of birds using the nearshore area (Fig. 4). On 26 August, 1 and 7 September, three additional aerial surveys were conducted along the Yukon coast from Shallow Bay to Nunaluk Spit to record fall staging birds using the marine areas (Fig. 5). On our return, we flew approximately 8 km inland to record Snow Geese staging along the Yukon Coastal Plain. A Cessna 185 was used for these three fall surveys.

All surveys, with one exception, were conducted at approximately 30 m above ground and 160 km/h. There were two observers - one beside the pilot in the front seat and one on the other side of the aircraft in the back seat. Birds within 200 m of the aircraft were recorded as "on transect", whereas those beyond 200 m were recorded as "off transect". Only "on transect" data were used in the data analysis unless otherwise specified. For each bird observation, we recorded species, number, habitat and whenever possible, age, sex and general behavior. Sightings of nests and broods were also noted. At the beginning of each flight, the date, time of day and weather (temperature, wind speed and direction, cloud cover and precipitation) were noted.

The exception to the above methodology was the inland portion of the fall surveys when counting Snow Geese staging on the Yukon Coastal Plain. This survey was conducted at 150 m rather than 30 m above ground and the transect width used was 2000 m rather than 400 m.

To facilitate locating each bird sighting when analyzing the data, the survey lines were divided into segments. At the beginning of each segment both observers recorded the segment number and the time. The time was also noted for each observation. Thus, at a later date the approximate location of a given bird sighting could be calculated by converting to distance the time between the beginning of the segment and the bird sighting.

During all of the aerial surveys, the type of habitat where the

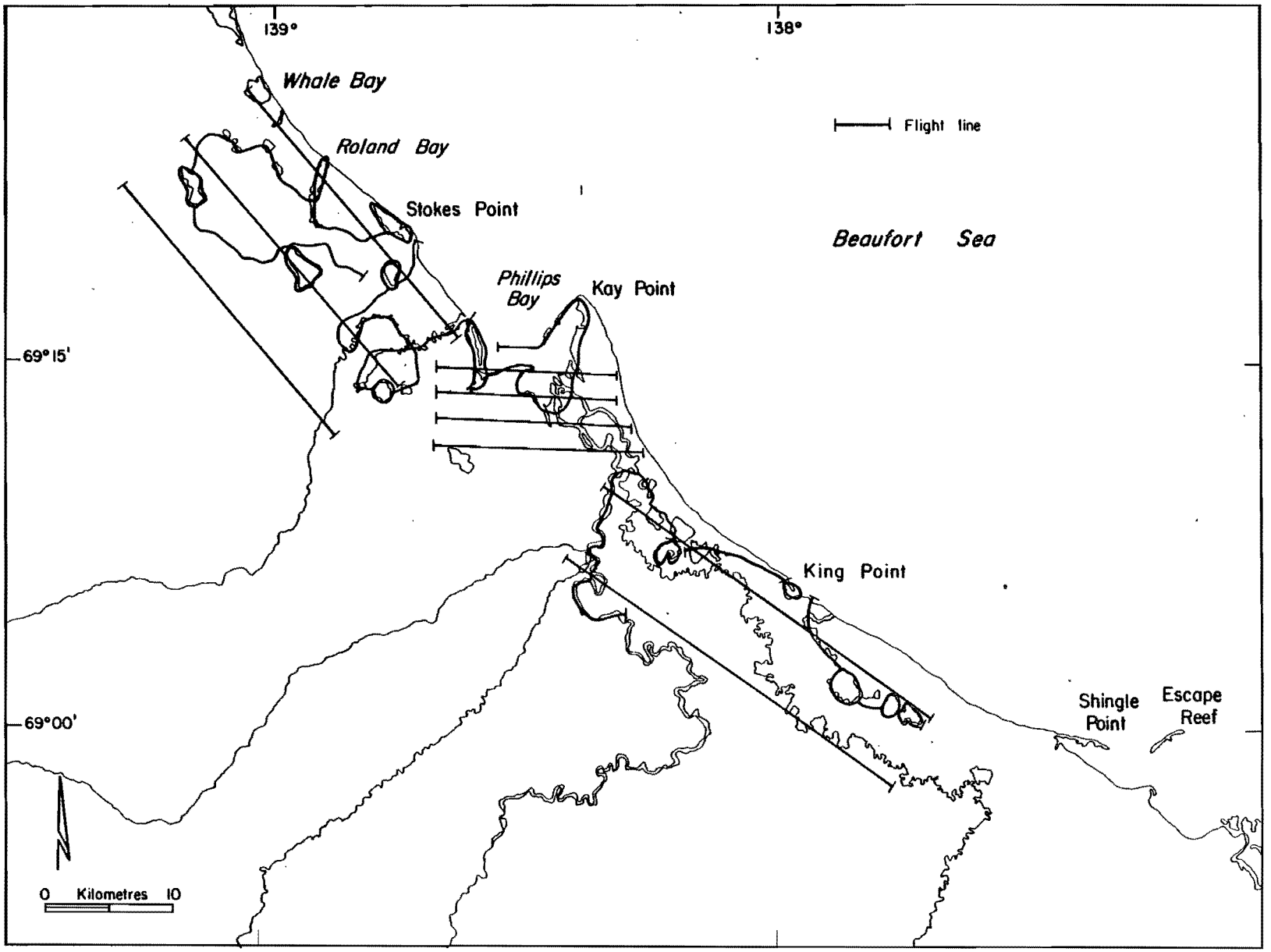

Figure 2. Flightlines for the helicopter survey conducted along the Yukon Coastal Plain, 21 June 1983.

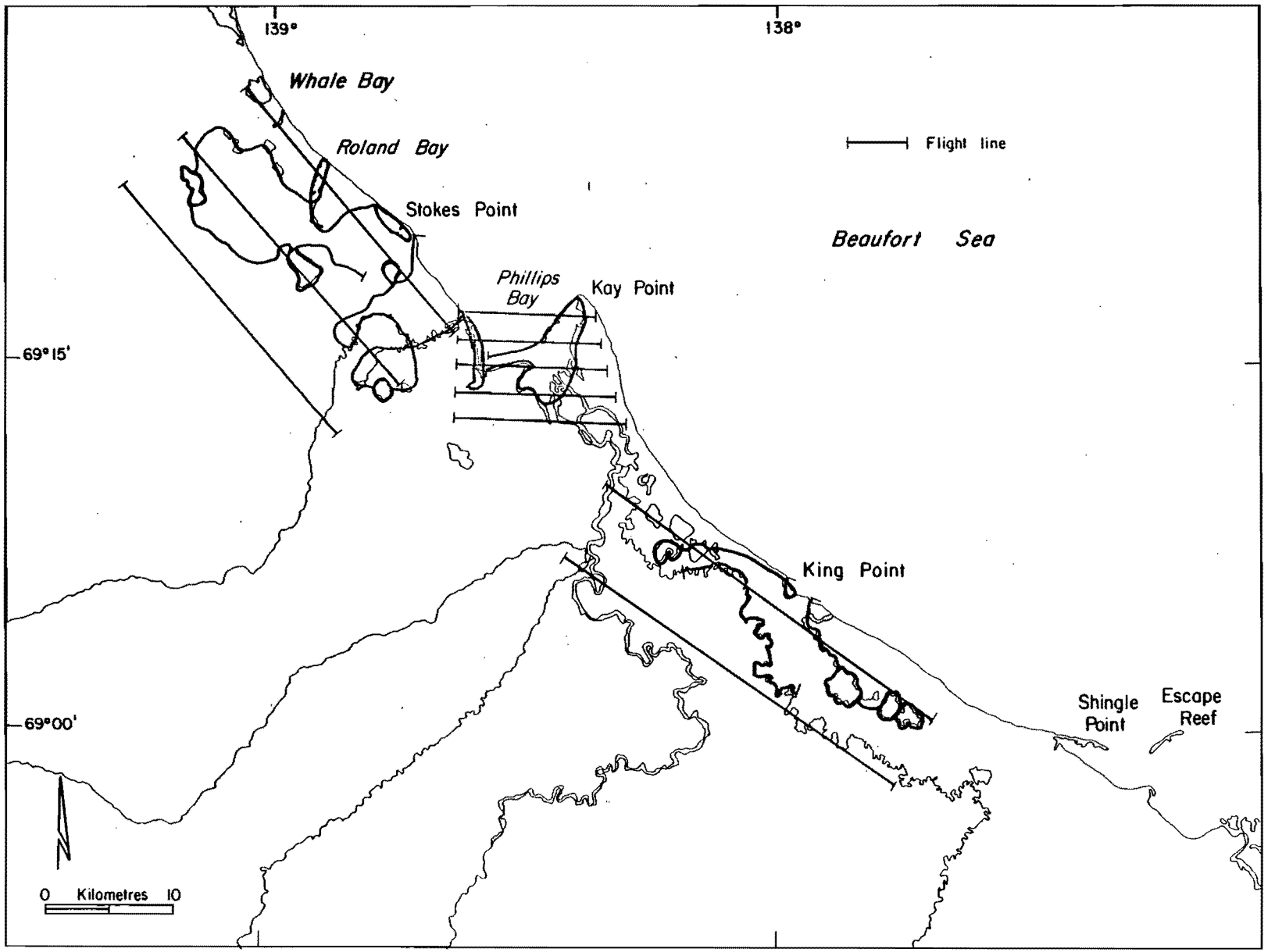

Figure 3. Flightlines for the helicopter survey conducted along the Yukon Coastal Plain, 2 August 1983.

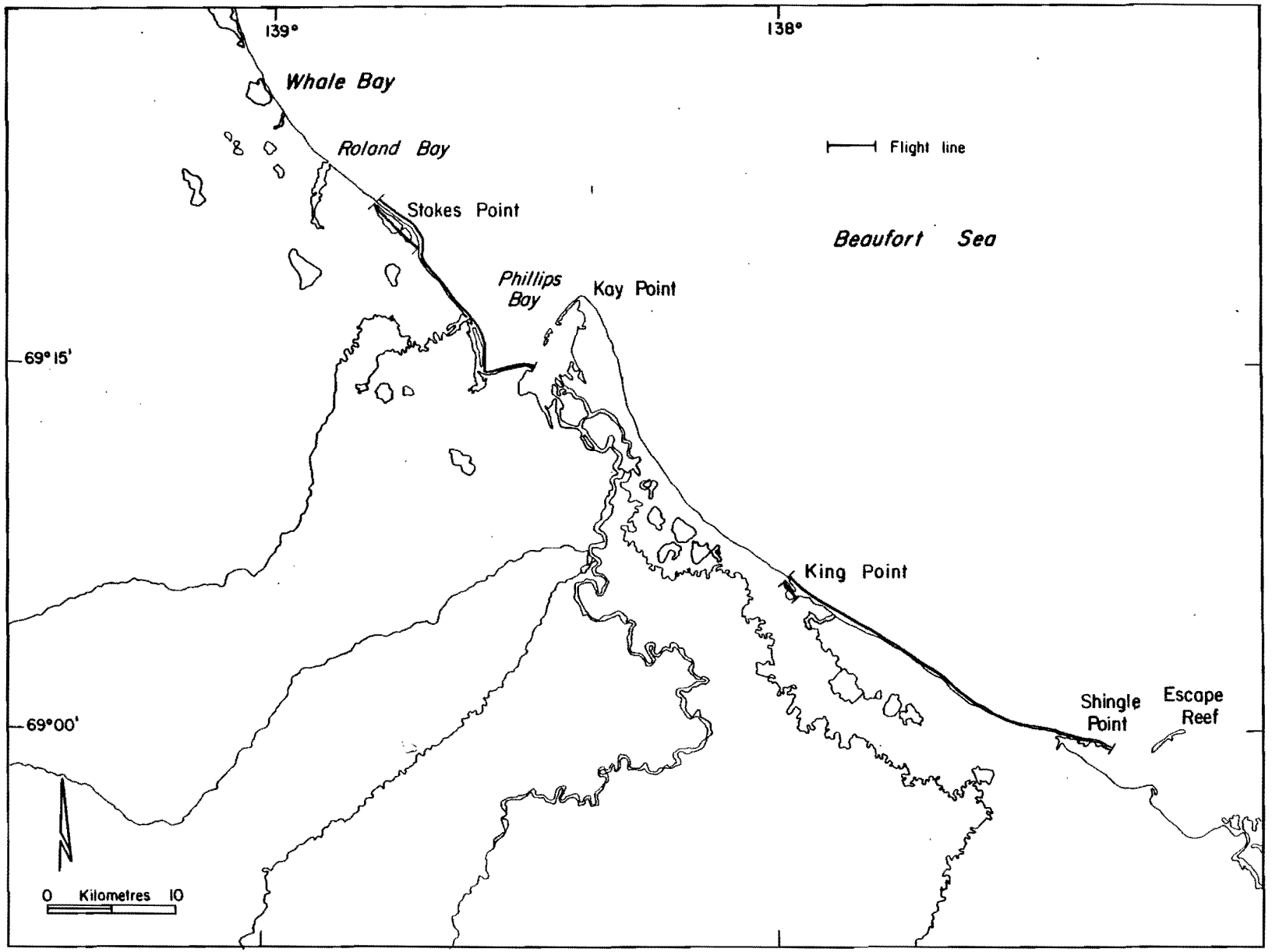

Figure 4. Flightlines for the helicopter survey conducted along the Yukon coast, 16 August 1983.

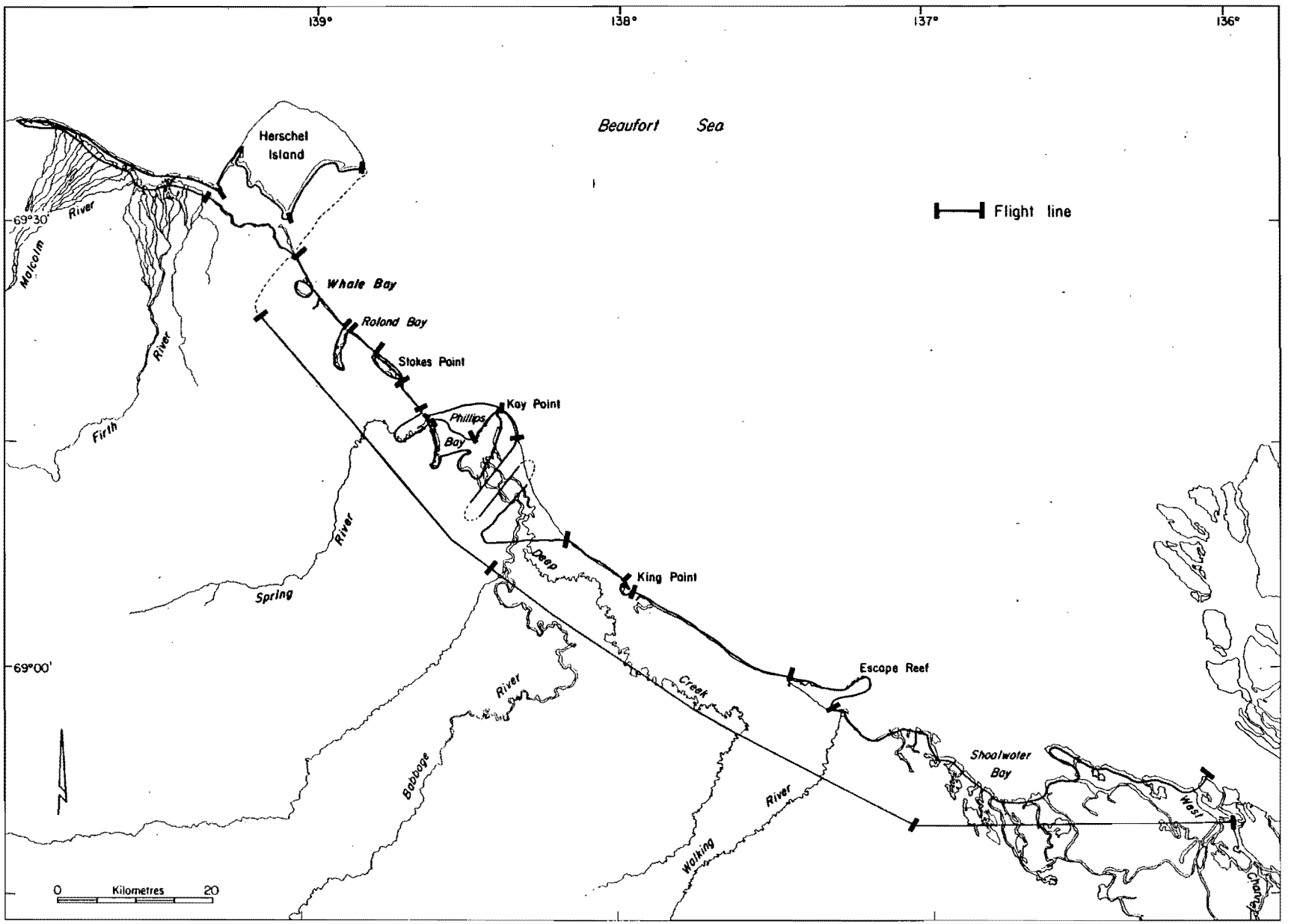

Figure 5. Flightlines for the helicopter survey conducted along the Yukon coast, 26 August, 1 September and 7 September 1983.

birds were sighted was recorded whenever time permitted. Habitat categories used were as follows:

- lake (waterbody $\geq$0.25 km^2),
- pond (waterbody $<$0.25 km^2),
- wetland,
- wetland with patterned ground (high or low-centered polygons),
- river (Spring River, Babbage River),
- stream (all except the above named rivers),
- lagoon (King Point lagoon, Stokes Point lagoon, Roland Bay and Whale Bay),
- upland,
- coast (included the shoreline of Phillips Bay),
- spit (sandspits along coast), and
- mudflat (primarily the Babbage River delta).

To examine regional differences, the study area was divided into three regions: Stokes Point, Phillips Bay and King Point (Fig. 1).

3.2 Ground Surveys

3.2.1 Breeding birds

While aerial surveys are an effective means of obtaining information on the abundance, distribution and habitat preferences of the larger more visible species of birds such as loons and waterfowl, only a small percentage of shorebirds, passerines and other small birds are seen from the air. Thus, a series of ground surveys were conducted from 9 to 29 June in 1983 to obtain more detailed information on nesting birds, particularly the less visible species. Data on habitat types were also gathered during the ground surveys.

Nine sites were chosen for the ground surveys: four in the Stokes Point region, four in the Phillips Bay region and one at King Point. The site chosen at King Point was one that had been surveyed in 1981. It was surveyed during this study in order to get a between year comparison of bird densities. The location of each site is shown in Figure 6 and the transects surveyed at each site are presented in Appendix A.

A transect survey method was used where two observers walked parallel to each other 25 m apart and recorded all birds seen or heard on a 55 m wide transect. Birds observed or heard beyond the transect width were recorded as "off transect". One observer kept track of the number of paces they had walked, so that all observations of birds and habitats could be located along the transect. For each bird observation, the species, number, age, sex, flock size, behavior and pace number were recorded. All nests, eggs and young were also noted. If the bird was associated with a waterbody (pond ($<$0.25 km^2), lake ($\geq$0.25 km^2), river (Spring River or Babbage River), stream, lagoon or ocean) this was recorded as well. Prior to each survey the weather conditions were described.

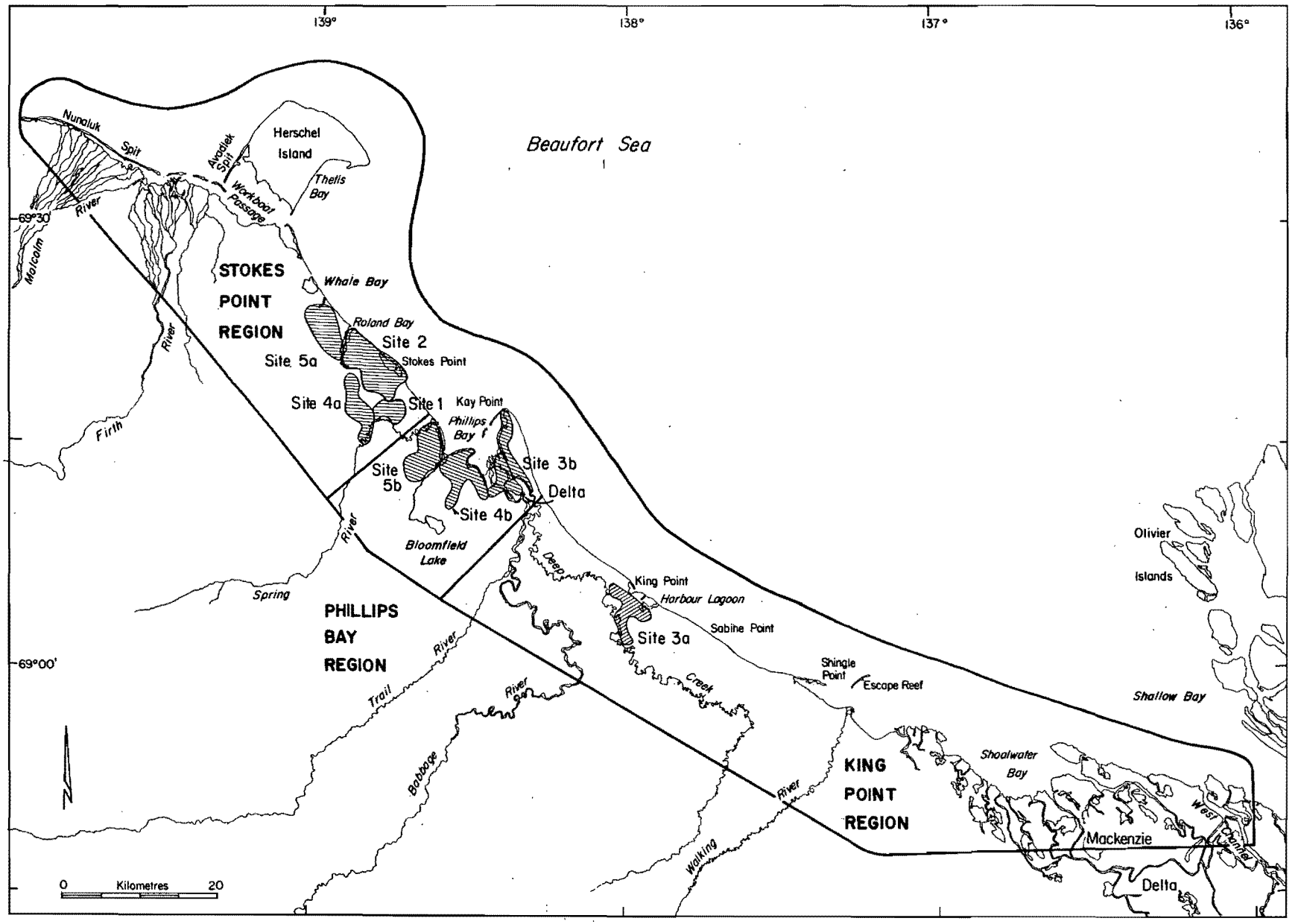

Figure 6. Location of the ground surveys conducted on the Yukon Coastal Plain, 9-29 June 1983.

Whenever the habitat changed along the transect, the pace was noted. The observers continued along the transect surveying for birds in that habitat until they were familiar with its characteristics. At that point they would describe the habitat by recording the following details:

- micro relief - lowland or upland,
  - flat, rolling or steeply sloped;
- micro relief - tussocks, hummocks, high-centred polygons or low-centred polygons;
- moisture - dry, moist (moist to touch), wet (water is released when pressure is applied), wet with standing water (estimate given for % cover of area with standing water);
- percent cover of vegetation (waterbodies excluded);
- dominant classes of vegetation - tall shrub ($\geq$0.5 m. high), dwarf shrub (<0.5 m high), graminoid (grasses, sedges and rushes), heath (Ericaceae and Dryas), forb (broad-leafed herbaceous vegetation), lichen and moss;
- percent cover of each dominant class of vegetation (estimated to the nearest 10% and waterbodies excluded);
- dominant species of vegetation and their percent cover (estimated to the nearest 10%); and
- waterbodies within 100 m of the transect (lakes, ponds, etc. as defined above for aerial surveys).

In order to verify the identification of the dominant species of vegetation in each habitat type, plant collections were made on 16 August in 25 of the habitat segments which had been surveyed in June. For each plant collected, its location (transect and approximate pace), the associated plant species, soil moisture, micro and macro relief, and percent cover of vegetation were recorded. The plant was then dried in a press for future identification. Additional collections were made between 9 and 15 August along the transects surveyed near Stokes Point.

Unless otherwise specified, all bird density calculations from the ground surveys were based on data from "on transect" only. The limitations and biases of the ground survey method used in this study in June are discussed by McLaren and Alliston (1981).

3.2.2 Moulting, brood-rearing and fall staging birds

A ground survey was conducted daily at Stokes Point from 10 to 15 August and from 28 August to 2 September to determine the number and species of birds that used Stokes Point during brood-rearing, moulting and fall migration. A single observer walked the transect-line shown in Figure 7, stopping every 500 paces to scan the ocean, the lagoon and nearby ponds for birds. For each bird observation, the species, number, flock size, age, sex, behavior and habitat were recorded. If the bird was flying, its direction of travel was noted. The date, time of day and weather conditions were recorded prior to each survey.

Between 28 August and 2 September, in addition to the daily survey at Stokes Point, six two-hour migration watches were conducted from a

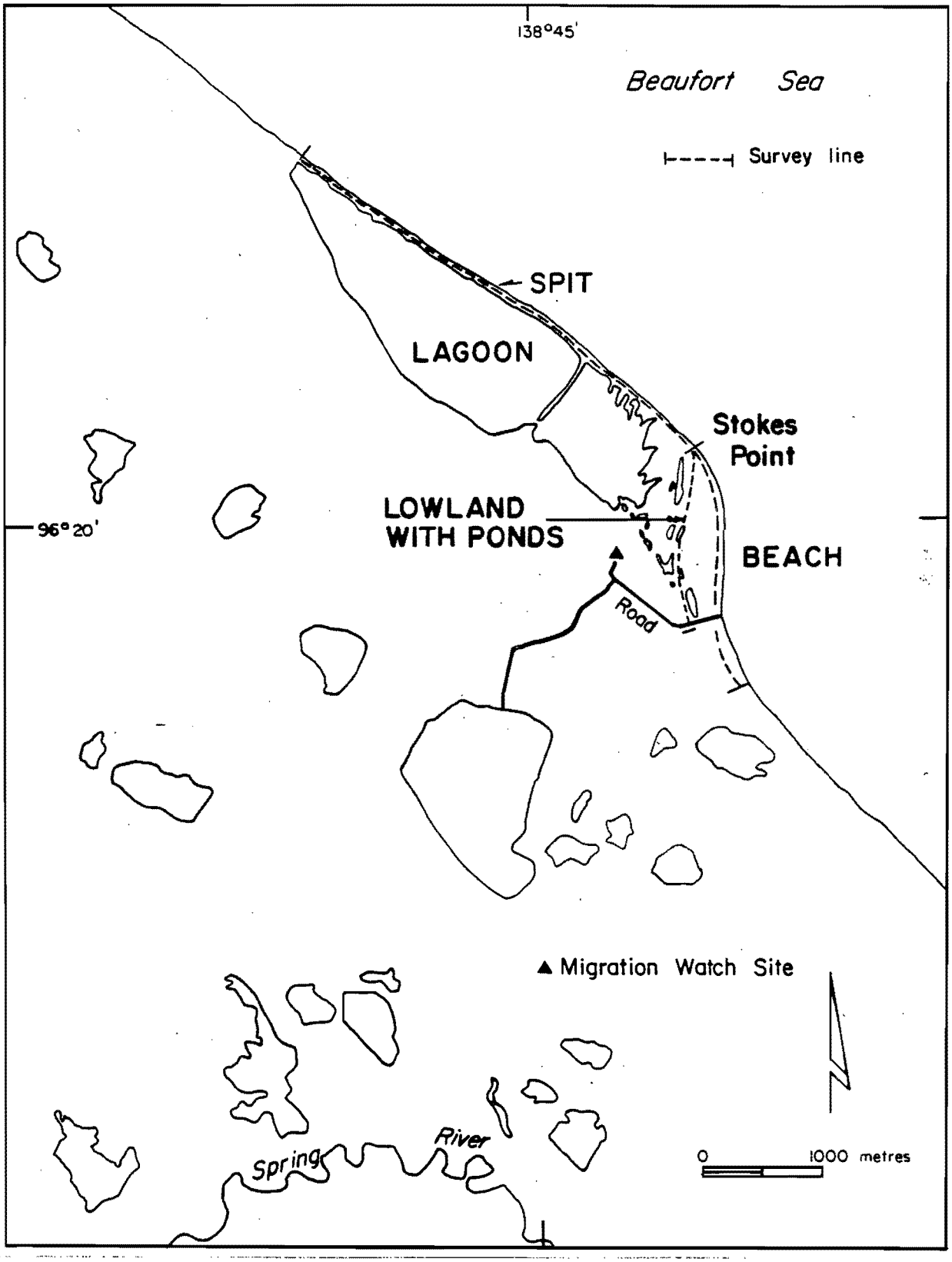

Figure 7. Location of migration watch site and transect-line surveyed daily by foot at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

nearby hill, using a 45 x power spotting scope (Fig. 7). For each bird observation within the two-hour watch, the species, number, flock size, sex, age, behavior and habitat were recorded. For birds in flight, their direction of travel, height above the ground and distance inland were also recorded. Again, the date, time of day and weather conditions including visibility were noted prior to each survey.

4.0 RESULTS AND DISCUSSION

4.1 Nesting

4.1.1 Density, distribution and species composition

In June, the highest densities of birds in the study area occurred at Phillips Bay, where Red-throated Loons, Tundra Swans and Glaucous Gulls, as well as several species of ducks, geese and passerines were all more numerous (Tables 1, 2 and 3). During the ground surveys conducted from 9 to 29 June, the average density of birds at Phillips Bay was 404.8 birds/km^2 compared to 311.6 birds/km^2 at Stokes Point and 301.6 birds/km^2 at King Point (Table 1). Likewise, during the aerial survey on 21 June, straight-line transects flown over the Babbage River delta and Phillips Bay had an average of 9.9 birds/km^2, whereas transects flown over the Stokes Point and the King Point study areas averaged 4.5 birds/km^2 and 4.6 birds/km^2 respectively (Table 3). On the other hand, species richness was slightly higher at Stokes Point than at Phillips Bay; the average number of species at each site in the Stokes Point region was 39.5 compared to 34.5 at Phillips Bay (Table 4).

A total of 65 species were identified during the ground surveys in June, the most abundant species being the Northern Pintail, Oldsquaw, Lesser Golden-Plover, Pectoral Sandpiper, Semipalmated Sandpiper, Red-necked Phalarope, redpoll spp., Savannah Sparrow, and Lapland Longspur. The relative abundance of each of the 65 species is presented in Table 5. Abundance was based on the number of sites where the species occurred, the total number of birds seen and their overall density.

Loons

Nesting pairs of Red-throated Loons and Pacific Loons occurred at all nine ground survey sites (Appendix B). Although both species were ubiquitous and common, Red-throated Loon densities were higher at Phillips Bay than elsewhere in the study area (Tables 2 and 5).

The Red-throated Loon and Pacific Loon both nest in moderate numbers throughout the Beaufort Sea region (Derksen et al. 1981; Salter et al. 1980; Alexander et al. 1988; Dickson 1987). However, west of the Mackenzie Delta, the Pacific Loon is the more common of the two species (Derksen et al. 1981; Dickson 1985; Salter et al. 1980).

Swans

Tundra Swans were found throughout the study area, although the densities were twice as high at Phillips Bay as they were at Stokes Point

Table 1. Densities of birds by species group observed on transect at each of the nine sites surveyed by foot on the Yukon Coastal Plain, 9-29 June 1983.

Location	Distance surveyed (km)	Density (birds/km^2)												
		Loons	Swans	Geese	Ducks	Ptar-migan	Cranes	Shorebirds	Jaegers	Gulls	Terns	Raptors	Passerine	All birds
Stokes Point														
Site 1	12.14	3.0	7.5	3.0	47.9	24.0		113.8	6.0				137.8	343.0
Site 2	40.65	2.7	0.9	1.8	34.0	0.9		82.7	0.9	3.1	0.4	0.4	160.1	288.0
Site 4a	18.49	3.0		3.9	9.8	4.9		121.0	4.9		1.0		169.1	317.6
Site 5a	20.20	0.9			35.1	2.7		96.3	1.8	1.8			196.2	334.8
Phillips Bay														
Site 3b	10.32				38.8	3.5		111.0			3.5	3.5	317.1	477.4
Site 4b	16.22	3.4	6.7	3.4	85.2	2.2		153.6		3.4	16.8	1.1	209.6	485.4
Site 5b	18.68	6.8		1.0	40.9	3.9	1.9	47.7	1.0	1.0	3.9		245.3	353.3
Delta	7.96	6.8	4.6	18.3	77.7			45.7					114.2	267.2
King Point														
Site 3a	14.95	2.4			1.2	6.1		59.6	4.9				227.4	301.6
Average - Stokes Point	91.48	2.4	1.4	2.0	31.2	5.2		97.6	2.6	1.8	0.4	0.2	167.0	311.6
Average - Phillips Bay	53.18	4.4	2.7	4.1	59.5	2.7	0.7	92.0	0.3	1.4	7.2	1.0	228.7	404.8

Table 2. Density of birds observed on transect and number of birds observed off transect during ground surveys in each of the three regions on the Yukon Coastal Plain, 9–29 June 1983.

Species	Density on transect (birds/km^2)				Number off transect (birds/km)[I]			
	Stokes Point	Phillips Bay	King Point	Entire study area	Stokes Point	Phillips Bay	King Point	Entire study area
Pacific Loon	0.6	1.0		0.7	1.0	0.5	0.7	0.8
Red-throated Loon	1.8	3.4	2.4	2.4	0.1	0.5	0.3	0.3
Loon sp.					0.1		0.2	0.1
Tundra Swan	1.4	2.7		1.7	0.3	0.9	0.3	0.5
Canada Goose	0.8	0.3		0.6	0.2	*	0.1	0.1
Brant		2.7		0.9		1.7		0.6
Greater White-fronted Goose	1.2	1.0		1.0	0.4	0.9	0.6	0.6
Dark goose					0.1			*
Mallard	0.2			0.1				
Northern Pintail	12.5	39.0	1.2	20.3	3.7	9.7	1.2	5.5
American Wigeon					0.3	1.4	0.1	0.6
Northern Shoveler		2.0		0.7	*	0.2		0.1
Green-winged Teal	0.8	2.7		1.4	0.2	0.2	0.2	0.2
Scaup sp.	1.4	1.4		1.2	0.8	1.0	0.8	0.8
Common Eider	0.2			0.1				
Oldsquaw	12.7	13.7		11.8	1.3	2.9	1.7	1.9
Black Scoter						*		*
White-winged Scoter	0.2			0.1	*	1.1	0.1	0.4
Surf Scoter						0.6		0.2
Red-breasted Merganser	3.2	0.7		2.1	0.4	0.4	0.2	0.4
Unidentified duck					0.5			0.3
Northern Harrier					0.1	*	0.1	0.1
Rough-legged Hawk					0.1	*		*
Golden Eagle					*			*
Gyrfalcon		0.3		0.1				
Willow Ptarmigan	3.4	0.7	6.1	2.7	*		0.2	*
Rock Ptarmigan	1.8	2.0		1.7	0.1	*		0.1
Ptarmigan sp.					0.1	*		0.1
Sandhill Crane		0.7		0.2	0.1	0.1	0.1	0.1
Lesser Golden-Plover	9.9	17.4	9.7	12.4	0.8	0.7	1.2	0.8
Semipalmated Plover	2.6			1.5	0.1	*		*
Whimbrel			6.1	0.6		0.1	1.3	0.2
Hudsonian Godwit		2.0		0.7		*		*
Spotted Sandpiper					*			*
Lesser Yellowlegs	0.6			0.3				
Stilt Sandpiper	6.2	1.4	1.2	4.1	0.7	0.2	0.6	0.5
Long-billed Dowitcher	5.0	5.5	4.9	5.1	0.2	*	0.3	0.2
Pectoral Sandpiper	35.2	19.8	20.7	28.7	1.3	0.6	0.9	1.0
Baird's Sandpiper	0.4	0.3		0.3				
Semipalmated Sandpiper	18.9	23.9	2.4	19.0	0.8	2.1	0.2	1.2
Red Phalarope	2.4	0.7		1.6	0.2		0.1	0.1
Red-necked Phalarope	15.5	20.2	12.2	16.7	0.6	1.0	0.4	0.7
Common Snipe	0.6	0.7		0.6	0.5	0.4	0.8	0.5

Table 2. Continued.

Species	Density on transect (birds/km^2)				Number off transect (birds/km)[I]			
	Stokes Point	Phillips Bay	King Point	Entire study area	Stokes Point	Phillips Bay	King Point	Entire study area
Unidentified shorebird	0.4		2.4	0.4	0.1	0.1	0.1	0.1
Parasitic Jaeger	1.0		3.6	0.9	0.4	0.2	0.3	0.4
Pomarine Jaeger	0.2			0.1	*		0.1	*
Long-tailed Jaeger	1.4	0.3	1.2	1.0	0.3	0.3	0.4	0.3
Jaeger sp.					*		0.1	*
Glaucous Gull	1.4	1.4		1.2	1.1	3.0	0.8	1.7
Herring/Thayer's Gull					*	*	0.2	0.1
Ring-billed Gull						*		*
Sabine's Gull	0.4			0.2				
Arctic Tern	0.4	7.2		2.6	1.2	0.9	1.5	1.1
Short-eared Owl	0.2	0.7		0.3	0.1	0.1	0.2	0.1
Horned Lark		0.3		0.1				
Cliff Swallow					*			*
Common Raven	0.4			0.2	0.4	0.3	0.1	0.3
Water Pipit		1.0		0.3	*			*
Yellow Wagtail	3.2	2.0		2.5	0.1	0.1		0.1
Yellow Warbler	1.0		1.2	0.7	*		0.1	*
Redpoll spp.	12.3	27.0	38.9	19.7	1.4	2.2	3.9	1.9
Savannah Sparrow	25.2	51.3	43.8	35.6	1.1	1.5	3.6	1.5
American Tree Sparrow	4.0	2.7	6.0	3.8	0.2	0.3	0.6	0.2
White-crowned Sparrow		0.3	3.6	0.5	*	0.1	0.4	0.1
Fox Sparrow	0.6			0.3	0.1		0.1	*
Lapland Longspur	118.6	141.5	132.6	127.6	3.5	3.3	6.0	3.7
Smith's Longspur	0.2			0.1				
Snow Bunting	1.0	2.4		1.4	0.1			*
Unidentified passerine	0.4		1.2	0.3			0.1	*
All species	311.6	404.8	301.6	341.7	25.2	39.6	31.3	30.6
Distance surveyed (km)	91.48	53.18	14.95	159.61	91.48	53.18	14.95	159.61

I Since most of the water-oriented birds were off transect, these data have been included in the table (presented as number of birds seen per kilometre surveyed). The off transect data do not indicate true abundance, but do show the relative number of birds seen in one part of the study area compared to another.

* Present but $\leq$ 0.05 birds/km

Table 3. Densities of birds observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983.

Survey segment	Distance surveyed (km)	Density (birds/km^2)												
		Loons	Swans	Geese	Ducks	Ptarmigan	Cranes	Shorebirds	Jaegers	Gulls	Terns	Raptors	Passerines	All birds
Stokes Point														
Lagoon	9.4	0.5	0.8		8.0			1.1		0.8				11.2
Roland Bay	10.6	0.2	1.2	0.2	9.9					2.4	0.5		0.2	14.6
Lakes	27.0	0.5	0.4		2.4		0.2	2.7	0.1		1.0		0.7	8.0
Streams	4.7	0.5			21.8			0.5						22.9
Spring River	15.5	0.2	0.3		0.8			1.1		0.3		0.2	0.6	3.5
Cross-country	53.3	0.4	0.4	0.2	2.4		0.1	2.1	*	0.7	0.7	0.1	*	7.2
Transect 2 km inland	24.4	0.2			0.4	0.1		2.6	0.4	0.7	0.4	0.2	0.1	5.1
Transect 8 km inland	25.1		0.4	0.2	1.1	0.6		2.2	0.2		0.2			4.9
Transect 14 km inland	25.3				0.1			2.6	0.2				0.6	3.4
King Point														
Lagoon	4.2	1.2			0.6			1.2		0.6	0.6			4.2
Lakes	25.5	0.4			7.2			0.1			0.8		0.2	8.7
Babbage River	17.1		0.4		1.8			0.7	0.1			0.3	0.1	3.5
Cross-country	25.2	0.2	0.5		2.5	0.1		0.8	0.2	0.1	1.6		0.7	6.6
Transect 2 km inland	30.8	0.6	0.2		2.1	0.2		0.4	0.3		1.1		0.4	5.4
Transect 8 km inland	31.8	0.2			2.4	0.1		0.5	0.3			0.1	0.2	3.8
Phillips Bay														
Shoreline	41.0	0.4	0.4	1.7	8.5		0.1	1.5		5.1	0.6			18.4
Transects over delta and bay	34.2	0.2	0.4	0.4	5.6	0.3		1.0	0.1	1.2	0.1		0.5	9.9
Transects SW of bay	26.9	0.1	0.6		1.0			1.2	0.2	0.1	0.2	0.1	0.6	4.0

* Refers to densities $\leq$ 0.05 birds/km2.

Table 4. A comparison of the number of different bird species seen at each site surveyed on the Yukon Coastal Plain, 9-29 June 1983.

Survey segment	Distance surveyed (km)	Number of species[I]								
		Loons	Swans	Geese	Ducks	Raptors	Shorebirds	Passerines	Others	Total
Stokes Point										
Site 1	12.14	2	1	2	7	4	7	8	8	39
Site 2	40.65	2	1	2	9	3	9	7	10	43
Site 4a	18.49	2	1	2	6	1	11	10	7	40
Site 5a	20.20	2	1	2	7	3	10	6	6	36
Phillips Bay										
Site 3b	10.32	2	1		9	2	7	9	6	36
Site 4b	16.22	2	1	2	8	2	10	6	7	38
Site 5b	18.68	2	1	3	6	1	10	7	7	37
Delta	7.96	2	1	2	6	2	6	5	3	27
King Point										
Site 3a	14.95	2	1	2	7	2	9	8	8	39
Mean - Stokes Point	91.48	2	1	1.8	7.2	2.8	9.2	7.8	7.8	39.5
Mean - Phillips Bay	53.18	2	1	1.8	7.2	1.8	8.2	6.8	5.8	34.5

[I] Includes both on and off transect observations.

Table 5. Abundance of bird species encountered during ground surveys on the Yukon Coastal Plain between Roland Bay and King Point, 9-29 June 1983.

Common name	No. of sites where species occurred[I] (total of 9)	Total number of birds seen[I]	Density[II] (birds/km^2)	Abundance[III]
Pacific Loon	9	131	0.7	C
Red-throated Loon	9	66	2.4	C
Tundra Swan	9	91	1.7	FC
Canada Goose	5	24	0.6	FC
Brant	3	98	0.9	U
Greater White-fronted Goose	8	106	1.0	C
Mallard	1	1	0.1	R
Northern Pintail	9	1052	20.3	A
American Wigeon	8	101		C
Northern Shoveler	5	18	0.7	FC
Green-winged Teal	9	49	1.4	FC
Greater/Lesser Scaup	9	146	1.2	C
Common Eider	1	1	0.1	R
Oldsquaw	9	405	11.8	A
Black Scoter	1	1		R
White-winged Scoter	4	60	0.1	U
Surf Scoter	1	31		U
Red-breasted Merganser	8	76	2.1	C
Northern Harrier	6	9		FC
Rough-legged Hawk	4	6		U
Golden Eagle	1	1		R
Gyrfalcon	1	1	0.1	R
Willow Ptarmigan	5	31	2.7	FC
Rock Ptarmigan	6	26	1.7	FC
Sandhill Crane	7	10	0.2	FC
Lesser Golden-Plover	9	234	12.4	A
Semipalmated Plover	3	19	1.5	U
Whimbrel	3	31	0.6	U
Hudsonian Godwit	2	7	0.7	U
Spotted Sandpiper	1	1		R
Lesser Yellowlegs	2	3	0.3	U
Stilt Sandpiper	9	117	4.1	C
Long-billed Dowitcher	7	71	5.1	FC
Pectoral Sandpiper	9	418	28.7	A
Baird's Sandpiper	2	3	0.3	U
Semipalmated Sandpiper	9	358	19.0	A
Red Phalarope	5	30	1.6	FC
Red-necked Phalarope	9	257	16.7	A
Common Snipe	9	82	0.6	FC

Table 5. Continued.

Common name	No. of sites where species occurred[I] (total of 9)	Total number of birds seen[I]	Density[II] (birds/km^2)	Abundance[III]
Parasitic Jaeger	9	65	0.9	FC
Pomarine Jaeger	3	6	0.1	U
Long-tailed Jaeger	8	59	1.0	FC
Glaucous Gull	9	284	1.2	C
Herring/Thayer's Gull	4	9		U
Ring-billed Gull	1	1		R
Sabine's Gull	1	2	0.2	U
Arctic Tern	9	198	2.6	C
Short-eared Owl	8	25	0.3	FC
Horned Lark	1	1	0.1	R
Cliff Swallow	1	1		R
Common Raven	9	49	0.2	FC
Water Pipit	3	4	0.3	U
Yellow Wagtail	3	35	2.5	FC
Yellow Warbler	2	8	0.7	U
Hoary/Common Redpoll	9	478	19.7	A
Savannah Sparrow	9	545	35.6	A
American Tree Sparrow	9	72	3.8	C
White-crowned Sparrow	5	16	0.4	FC
Fox Sparrow	3	10	0.3	U
Lapland Longspur	9	1708	127.6	A
Smith's Longspur	1	1	0.1	R
Snow Bunting	2	19	1.4	U

I Based on data from both on and off transect.
II Based on data from on transect only.
III Categories of abundance are similar to Salter et al. (1980).
A - abundant - found in high densities (>10 birds/km^2, and on and off-transect observations totalled at least 200 birds); and found throughout the study area (at 8 or 9 of the 9 sites).
C - common - found in moderate densities (either density was 2.0 to 9.9 birds/km^2 or on and off-transect observations totalled at least 100 birds); and found throughout the study area (at 8 or 9 sites).
FC - fairly common - found in low densities (<2.0 birds/km^2) throughout the study area (5 or more of the 9 sites); or found in moderate densities (2.0 to 9.9 birds/km^2), but distribution is limited (7 or less of the 9 sites).
U - uncommon - found in low densities (<2.0 birds/km^2) in only parts of the study area (4 or less of the 9 sites).
R - rare - only seen once.

(Table 2). About 75% of the swans seen during both the aerial and ground surveys in June were single or in pairs, and the remainder were in flocks of six or less. Four of the five swan nests found during the ground surveys were on the Babbage River delta at Phillips Bay. The fifth nest was at Roland Bay (Appendix C).

The Tundra Swan nests in low densities throughout the Yukon and Alaska coastal plains (Derksen et al. 1981; Dickson 1985; Salter et al. 1980; Barry 1976). The Babbage River delta at Phillips Bay is locally important to nesting and moulting swans, for several studies have reported higher densities of swans in the Phillips Bay area in June (Dickson 1985; Schweinsburg 1974; Barry 1976). However, results of studies by T.W. Barry (pers. comm.), Slaney and Co. Ltd. (1974), Mossop (1974) and Campbell and Weber (1973) indicate that parts of the outer Mackenzie Delta support much higher numbers of nesting and moulting swans.

Geese

The Greater White-fronted Goose was common in the study area in June of 1983 (Table 5). It accounted for 46% of the geese recorded during the June ground surveys and occurred in small flocks, singles and pairs in all three regions of the study area (Table 2, Appendices B and D). The largest flock seen in June was 31 birds on the west side of the Babbage River delta. During the aerial survey on 21 June, a flock of 14 geese was on the spit near the Spring River on the west side of Phillips Bay (off transect observation). Although only one Greater White-fronted Goose nest was found (Appendix C), the presence of pairs scattered throughout the study area suggests that more were nesting.

During studies in the early 1970s, the Greater White-fronted Goose was a rare visitor on the Yukon Coastal Plain and no evidence of nesting was found (Salter et al. 1980). In 1982, however, 23 adults and 30 young were seen in midsummer on the Babbage River delta (Hogg et al. 1986), so that nesting is common at least in some years. On the Alaskan Coastal Plain, the Greater White-fronted Goose is considered a common breeder (Derksen et al. 1981).

Brant, which accounted for 43% of the geese seen during the ground surveys, occurred only in the Phillips Bay region (Table 2). A flock of 20 Brant appeared to be nesting on an island on the east side of the Babbage River delta, although the river channel prevented confirmation of this observation. During aerial surveys in July of 1981, a small flock of 10 Brant were noted in the same area of the Babbage River delta (Dickson 1985). Salter et al. (1980) reported that Brant were uncommon nesters along the Yukon Coastal Plain; along the northern coast of Alaska they are uncommon to common breeders (Derksen et al. 1981); and on the outer Mackenzie Delta there are several small colonies (Barry 1976; Dickson et al. 1983).

Most of the 24 Canada Geese recorded during the ground surveys in June were in the Stokes Point study area, 13 of which were at Site 4a

(Fig. 6; Appendix B). With the exception of a flock of four, all Canada Goose observations were of single birds or pairs, which suggests they were nesting. Two nests were found: both on islets in ponds, on the west side of Phillips Bay (Appendix C). A pair with a brood was reported in the same area in July of 1981 (Dickson 1985). During the aerial survey, a total of two pairs, three single birds and a flock of 11 Canada Geese were seen. The flock was at the mouth of the Spring River. Although there were no confirmed nest sightings during the studies in the 1970s, localized breeding was suspected due to reports of pairs in June and July (Salter et al. 1980). On the Alaska Coastal Plain, the status of the Canada Goose varies from an uncommon breeder to a nonbreeding visitor (Derksen et al. 1981).

Ducks

During the aerial survey on 21 June (Fig. 2), duck densities were highest in the coastal areas, specifically Roland Bay (9.9/km^2), Phillips Bay shoreline (8.5/km^2) and Stokes Point lagoon (8.0/km^2) (Table 3). Duck densities were also high on the streams near Stokes Point (21.8/km^2), but the sample size was very small (only 4.7 km of stream habitat was surveyed). All of the ducks seen on the Stokes Point lagoon were Oldsquaws and most were single or in pairs (Appendix D). Other species common in coastal bays and lagoons were the Northern Pintail, American Wigeon, scaup, Surf Scoter, Red-breasted Merganser and Green-winged Teal.

The ground survey results indicate that duck densities were higher in the Phillips Bay region than the Stokes Point region (59.5 ducks/km^2 at Phillips Bay compared to 31.2 ducks/km^2 at Stokes Point) (Table 1). Within the Phillips Bay region, the ducks were most numerous on ponds in the Babbage River delta and at the mouth of the Spring River. The Northern Pintail was the most abundant species, with fewer Oldsquaw, American Wigeon, scaup, White-winged Scoter and Surf Scoter (Table 6). Most were flocks of nonbreeders (72%), assuming ducks in flocks of five or more were nonbreeding birds (Table 7). In comparison, at Stokes Point only 39% of the ducks were nonbreeders. In fact, the number of nesting ducks recorded in the Stokes Point and Phillips Bay regions were quite similar (5.2 ducks/km and 5.8 ducks/km respectively, if both on and off transect observations are considered).

The most common species of duck in all three regions of the study area were the Northern Pintail and Oldsquaw which accounted for 54% and 21% respectively of all observations that were identified to species during the ground surveys (Table 6). Although the Northern Pintail was more abundant, the number of breeding Pintails and Oldsquaws in the study area were almost the same, since a greater portion of the Pintails were nonbreeding birds (Table 7). Less abundant, but found at all or nearly all of the ground survey sites were the scaup, Red-breasted Merganser and American Wigeon, the latter being mostly nonbreeding birds (Tables 5, 6 and 7; Appendix B).

The study area did not appear to be unique for breeding ducks. The Oldsquaw is the most abundant breeding duck throughout both the Yukon

Table 6. Species composition of ducks observed on the Yukon Coastal Plain during ground surveys, 9-29 June 1983.

Species	Percent composition[I]			
	Stokes Point	King Point	Phillips Bay	Entire study area
Mallard	<1			<1
Northern Pintail	52	30	57	54
American Wigeon	4	2	7	5
Northern Shoveler	<1		1	1
Green-winged Teal	3	4	2	2
Scaup sp.	10	19	5	8
Common Eider	<1		6	<1
Oldsquaw	24	39	18	21
Black Scoter			<1	<1
White-winged Scoter	<1	2	5	3
Surf Scoter			3	2
Red-breasted Merganser	7	4	2	4
Number of ducks (N)	(774)	(64)	(1103)	(1941)

[I] Calculations were based on data from on and off transect.

Table 7. Number of breeding and non-breeding ducks observed on the Yukon Coastal Plain during ground surveys, 9-29 June 1983.[I]

Species	Number of ducks							
	Breeding ducks[II]				Non-breeding ducks			
	Stokes Point	King Point	Phillips Bay	Entire study area	Stokes Point	King Point	Phillips Bay	Entire study area
Mallard	1			1				
Northern Pintail	190	19	92	301	211		540	751
American Wigeon	15	1	9	25	13		63	76
Northern Shoveler	2		16	18				
Green-winged Teal	21	3	20	44	5			5
Scaup sp.	63	6	24	93	15	6	32	53
Common Eider	1			1				
Oldsquaw	140	18	122	280	44	7	74	125
Black Scoter			1	1				
White-winged Scoter	2	1	2	5			55	55
Surf Scoter			1	1			30	30
Red-breasted Merganser	38	3	22	63	13			13
Total	476	51	309	833	301	13	794	1108

[I] Calculations were based on data from on and off transect.
[II] All ducks observed in groups of 4 or less were considered breeding ducks.

and Alaska coastal plains (Salter et al. 1980; Derksen et al. 1981). The Northern Pintail is the most abundant duck on the Alaska Coastal Plain and the outer treeless portion of the Mackenzie Delta, but as in our study area, many are likely nonbreeders (Derksen et al. 1981; U.S. Fish and Wildlife survey 1948-1954 in Martell et al. 1984; Alliston 1984).

Scaup, which were the third most common breeding ducks in the study area, nest only near the foothills on the Alaska Coastal Plain (Derksen et al. 1981), but are common breeders all along the Yukon Coastal Plain (Salter et al. 1980). They are also the most abundant breeding duck species throughout the Mackenzie Delta (U.S. Fish and Wildlife surveys 1975-1984; Alliston 1984).

Although the American Wigeon was common in the study area, about 75% were in nonbreeding flocks of five or more birds (Tables 5 and 7). Nesting American Wigeons are likely rare on the Yukon Coastal Plain as Salter et al. (1980) suggests. The American Wigeon is a common breeder in the wooded part of the Mackenzie Delta (Alliston 1984), but only an accidental visitor on the Alaska Coastal Plain (Derksen et al. 1981).

The Red-breasted Merganser was common in the study area in June and most were in flocks of less than five birds, hence considered nesting. The Red-breasted Merganser was also common at King Point in 1981 (Dickson 1985). Salter et al. (1980) reported fewer Red-breasted Mergansers, but found three broods. On the Mackenzie Delta, the Red-breasted Merganser is an uncommon breeder confined primarily to wooded areas (Alliston 1984), and on the Alaska Coastal Plain, it is only accidental (Derksen et al. 1981).

Species richness of ducks at the nine ground survey sites varied from 6 to 9 duck species with an average of 7.2 at both Stokes Point and Phillips Bay (Table 4). Most of the Northern Shovelers and White-winged Scoters, all of the Surf Scoters and the single Black Scoter occurred at Phillips Bay (Appendix B). The only Common Eider seen during the ground surveys in June was nesting on the sandspit at Stokes Point lagoon (Appendix C).

Ptarmigan and cranes

Ptarmigan were fairly common throughout the study area (Table 5), although Site 1 near Stokes Point had nearly half of the ptarmigan recorded during the ground surveys (Appendix B; Fig. 6). The Willow Ptarmigan was the more abundant of the two species (62% Willow Ptarmigan and 38% Rock Ptarmigan), as has been reported previously for the Yukon Coastal Plain (Dickson 1985; Salter et al. 1980).

The Sandhill Crane was recorded in small numbers at seven of the nine sites for a total of 20 cranes (Table 5; Appendix B). Although most sightings were pairs or single birds, no nests were found. There have only been two confirmed records of Sandhill Cranes breeding on the Yukon Coastal Plain (Hawkings 1987).

Shorebirds

Densities of shorebirds averaged 97.6/km^2 in the Stokes Point region with a species richness of 9.2, while densities at Phillips Bay averaged 92.0/km^2 with a species richness of 8.2 (Tables 1 and 4). Although the overall shorebird densities and species richness were similar in both regions of the study area, the distribution of several shorebird species varied considerably. The Stokes Point area supported substantially more Stilt Sandpipers (6.2/km^2 compared to 1.4/km^2 at Phillips Bay) and Pectoral Sandpipers (35.2/km^2 compared to 19.8/km^2), whereas the Phillips Bay area supported more Semipalmated Sandpipers (23.9/km^2 compared to 18.9km^2 at Stokes Point), and Red-necked Phalaropes (20.2/km^2 compared to 15.5/km^2) (Table 2; Appendix B). The Spotted Sandpiper (1 sighting) and Lesser Yellowlegs (3 sightings) occurred only in the Stokes Point region, whereas the Hudsonian Godwit was seen only at Phillips Bay.

The most common shorebirds were the Pectoral Sandpiper (26% of the shorebird observations), Semipalmated Sandpiper (22%), Lesser Golden-Plover (14%), Red-necked Phalarope (16%), Stilt Sandpiper (7%), Common Snipe (5%) and Long-billed Dowitcher (4%). Of these seven species, the Stilt Sandpiper and Long-billed Dowitcher have the most limited breeding ranges (Hayman et al. 1986).

The Stilt Sandpiper nests on the low arctic coastal tundra of northern Alaska and western Canada, as well as along the west side of Hudson Bay (Godfrey 1986). In northern Alaska, it varies from a common breeder to accidental visitor (Derksen et al. 1981; Martin and Moitoret 1981), while on the Mackenzie Delta it is known to nest, but field data are needed to clarify its abundance. In this study, the Stilt Sandpiper was found in moderate numbers at all nine ground survey sites (Table 5), and nearly all of the 117 sightings were pairs or single birds doing territorial displays. Likewise, at King Point in 1981, the Stilt Sandpiper was common during June (Dickson 1985). Considering the limited breeding range of the Stilt Sandpiper, the Yukon Coastal Plain is likely an important nesting area for this species.

During the ground surveys in June, 71 Long-billed Dowitchers were recorded, all pairs or single birds except for three small flocks of 4, 4 and 6 birds. There was an unconfirmed sighting of a Long-billed Dowitcher on a nest located in a sedge marsh with low-centered polygons by a small lake about 2 km inland from Stokes Point lagoon (Appendix C). The Long-billed Dowitcher was also fairly common at King Point in 1981, although no nests were found (Dickson 1985). This shorebird species breeds primarily in Siberia and western Alaska (Hayman et al. 1986). It may nest occasionally on the Mackenzie Delta (Martell et al. 1984), but the extent that it nests in Canada needs to be clarified. Given the numerous sightings of pairs and single birds in 1983, the Yukon Coastal Plain is likely the most important area within Canada for nesting Long-billed Dowitchers.

During the June ground surveys, 34 Whimbrels were seen in the King Point area, another 6 at Phillips Bay and none west of there. At King Point in 1981, the Whimbrel was the fourth most common shorebird species (Dickson 1985). During studies on the Yukon Coastal Plain in the early 1970s, Salter et al. (1980) reported three nests, all of which were near the Babbage River delta. However, they considered the Whimbrel an uncommon nester for the entire Yukon Coastal Plain. On the Alaska Coastal Plain, the Whimbrel is uncommon with little evidence of breeding (Derksen et al. 1981; Martin and Moitoret 1981), and although it breeds on the Mackenzie Delta, it is unknown to what extent (Martell et al. 1984). The abundance of Whimbrels in the King Point area in 1981 and 1983 suggests it is an important area for this species.

Of the 19 Semipalmated Plovers seen during the June ground surveys in 1983, 13 (5 pairs and 3 single birds) were along the gravel shores of the Spring River, and four (1 and 3 birds) were on the gravel beach east of the Stokes Point lagoon. No nests were located, but displays by pairs at four sites along the Spring River suggest that nesting occurred. Salter et al. (1980) likewise noted that the Semipalmated Plover occurred along braided rivers and gravel beaches on the Yukon Coastal Plain , and probably nested. The Spring River is likely locally important habitat for nesting Semipalmated Plovers.

In 1983, the Hudsonian Godwit was seen only on the Babbage River delta at Phillips Bay (sightings of 3, 2, 1 and 1), and there was no evidence of nesting. During the 1970s, the occasional single bird or pair was reported on the Yukon Coastal Plain (Salter et al. 1980), although at King Point in 1981, none were seen (Dickson 1985). The Hudsonian Godwit is considered a scarce bird with a very limited breeding distribution (Hayman et al. 1986). Within Canada, it nests only on the Mackenzie Delta and in parts of the Hudson Bay lowland.

When one of the ground survey transects near Stokes Point surveyed on 8 June was resurveyed on 15 June in 1983, the number of shorebirds on the transect more than doubled from 30 to 66 sightings. The influx was primarily Lesser Golden-Plovers, Pectoral Sandpipers, Semipalmated Sandpipers and Red-necked Phalaropes.

Gulls, terns, and jaegers

Almost equal numbers of Parasitic and Long-tailed Jaegers were recorded during the ground surveys in June (Appendix B). The Parasitic Jaeger was more abundant at Stokes Point than Phillips Bay, whereas the Long-tailed Jaeger occurred in about the same density in both regions (Table 2). Nine Long-tailed Jaeger nests and two Parasitic Jaeger nests were found (Appendix C). According to Salter et al. (1980), both jaeger species are common summer residents throughout the Yukon Coastal Plain.

Only six Pomarine Jaegers were seen during the ground surveys, and all sightings occurred before 19 June. In some years, the eastward migration of the Pomarine Jaeger in late May and the first half of June is followed by a westward migration in mid-June (Barry 1976; Richardson

and Johnson 1981; Salter et al. 1980). The westward migration likely occurs in years when lemmings, their main food source, are scarce, since they are known to abandon parts of their nesting range soon after arrival if lemming numbers are low (Barry 1976; Richardson and Johnson 1981). The lack of sightings during the second half of June in 1983 suggests that this westward migration did not occur that year. Similarly, at King Point in 1981 only one Pomarine Jaeger was seen after 10 June (Dickson 1985).

Nearly all (96%) of the gull sightings were Glaucous Gulls, and although they were more numerous at Phillips Bay, they were found throughout the study area (Tables 2 and 3; Appendix B). A total of nine Herring/Thayer's Gulls were seen at four sites (at King Point one of each was identified to species), and two Sabine's Gulls were recorded at Stokes Point lagoon. There was also an unconfirmed sighting of a Ring-billed Gull on the Babbage River delta (Appendix B).

Single nests of Glaucous Gulls were found in ponded wetlands throughout the study area (Appendix C). A colony of at least 16 gulls was located about 5 km inland from Stokes Point (Fig. 8). Two nesting colonies were noted in Phillips Bay: one with at least 37 gulls on the spit near Kay Point and one with at least 48 gulls on the spit on the west side of the bay. In addition, a flock of 23 loafing Glaucous Gulls was recorded at Stokes Point, and flocks of 63 and 11 were recorded at Phillips Bay.

Arctic Terns were recorded at all nine ground survey sites, and if both on and off transect data are considered, their densities were similar throughout the study area (Table 2; Appendix B). Six small nesting colonies of 8 to 16 terns were located in wetland areas all along the coastal plain from Roland Bay to King Point (Fig.8).

The Arctic Tern is widely distributed and abundant throughout the Yukon Coastal Plain (Table 5) (Salter et al. 1980; Schweinsburg 1974) and the Mackenzie Delta (Campbell and Weber 1973; Wiseley et al. 1977), although there may be fewer terns west of Herschel Island (Vermeer and Anweiler 1975). Further west on the Alaska Coastal Plain, the Arctic Tern is considered an uncommon breeder (Derksen et al. 1981). On the Yukon Coastal Plain, the Arctic Tern nests both offshore on barrier islands and inland on marshes or by lakes (Salter et al. 1980; Dickson 1985). Barry (1976) identified Escape Reef and Phillips Bay as critical areas for nesting Arctic Terns; however, tern use of an area is known to be erratic in the Beaufort Sea region (Barry et al. 1981).

Raptors

We encountered five species of raptor during the June ground surveys: the Short-eared Owl, Northern Harrier, Rough-legged Hawk, Gyrfalcon and Golden Eagle in that order of abundance (Tables 2 and 5; Appendix B). The only raptor nest found was a Short-eared Owl nest containing seven eggs which was located on a hillside facing the Babbage River delta (Appendix C).

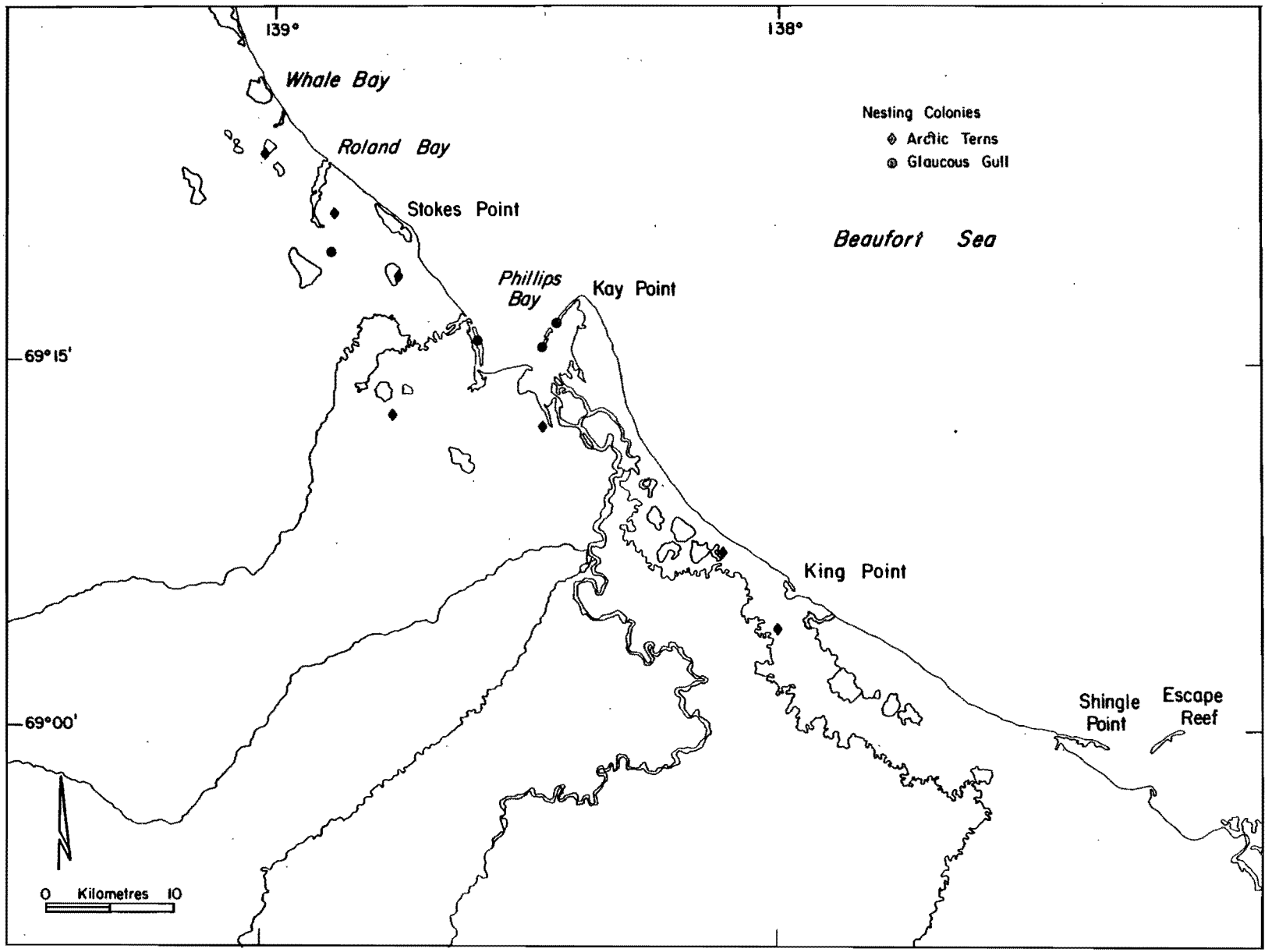

Fig. 8 Location of nesting colonies of Arctic Terns and Glaucous Gulls observed during ground surveys from 9 to 29 June 1983, and during aerial surveys on 21 June and 2 August 1983.

Passerines

The most common passerine species in both study areas in June were the Lapland Longspur, Savannah Sparrow and Common/Hoary Redpoll (58%, 18%, and 16% of all passerine observations respectively) (Tables 2 and 5; Appendix B). These same species were the most abundant passerines at King Point in 1981 and are common throughout the Yukon Coastal Plain (Salter et al. 1980) and Mackenzie Delta (Patterson et al. 1977). The Lapland Longspur is also a common breeder on the Alaska Coastal Plain, although the other species are less abundant (Derksen et al. 1981).

Passerine densities were higher at Phillips Bay (228.7/km^2) than in the Stokes Point area (167.0/km^2) primarily due to the abundance of Savannah Sparrows and redpolls at Phillips Bay (densities twice as high) (Tables 1 and 2). The Lapland Longspur was found in high densities throughout the study area (118.6 to 141.5/km^2), while the American Tree Sparrow, Common Raven and White-crowned Sparrow were also ubiquitous but in much fewer numbers (Tables 2 and 5). Species uncommon in the study area were the Water Pipit, Yellow Warbler, Fox Sparrow and Snow Bunting (Table 5; Appendix B).

All of the 35 sightings of Yellow Wagtails in June were along the Spring River and a nearby river which flows from Bloomfield Lake into Phillips Bay. No nests were found; however, they have previously been reported nesting by the lower Babbage River (Black 1972). This species, which is Asiatic in origin, does not occur on the Mackenzie Delta (Tull et al. 1974) and is an uncommon breeder on the Yukon Coastal Plain. Rivers like the Babbage and Spring, are likely critical habitat for this bird species in Canada.

4.1.2 Habitat preferences

During the ground surveys from 9 to 29 June, a total of 145 836 m were surveyed and 274 habitat descriptions were recorded (Table 8). A key was developed in order to classify the habitats based on dominant vegetation, moisture and physical relief (Table 9).

The vegetative cover in the study area was nearly always complete (100%), the major exceptions being the tidal flats and river banks where the mean vegetative covers were 90% and 80% respectively (Table 8).

Habitat was classified into thirteen types, the most abundant ones being Wet Sedge-Patterned Ground, Wet Sedge, Tussocky Tundra and Graminoid/Dwarf Shrub (Table 8). The former two habitat types occurred in lowlands, and were usually associated with ponds. They both had more than 50% standing water cover in June and were dominated by the sedges, Carex aquatilis ssp. aquatilis and Carex chordorrhiza. The main difference between these two habitat types was that Wet Sedge-Patterned Ground had low-centred polygons, whereas Wet Sedge had very little or no micro relief. The other two common habitats, Tussocky Tundra and Graminoid/Dwarf Shrub, were drier and occurred in either uplands or lowlands. The dominant vegetation in Tussocky Tundra was a tussock

Table 8. Description of types of habitat encountered during ground surveys along the Yukon Coastal Plain from 9 to 29 June 1983.

Habitat type	Metres surveyed	No. of samples	Total % cover	Vegetation class (% cover)					Macro relief	Micro relief	Moisture	% standing water	Water-bodies within 100 m	Dominant species of vegetation
				Tall shrub	Dwarf shrub	Heath	Graminoid	Moss						
Tall Shrub	7432	9	80	60	15	P	20	5	Lowland		Moist	10	Edge of creek or river	Eriophorum sp., Salix sp.
Dwarf Shrub	4485	8	100	P	50	15	25	10	Lowland, (flat or sloping); (Upland)	Hummocks (Tussocks)	Dry-Wet	0 (5)	Ponds, River	Betula cf. glandulosa, Cassiope tetragona, Graminoides, Salix spp.
Dwarf Shrub - Patterned Ground	2721	4	100		55	10	35	P	Lowland	Hummocks	Moist-Wet (Dry)	20	Creek	Betula cf. glandulosa, Cyperaceae
Wet Dwarf Shrub	380	1	100		60		40		Lowland, flat		Wet	90	Ponds, River	Tall Gramineae, Salix sp.
Graminoid/Dwarf Shrub	18111	43	95	P	30	20	40	10	Upland, sloping; Lowland, (sloping)	Tussocks & Hummocks	Dry-Moist (Wet)	0	(Creek) (Ponds)	Betula sp., Cassiope t. ssp. tetragona, Eriophorum vaginatum, Salix sp., Vaccinium vitis-idaea.
Graminoid/Dwarf Shrub - Patterned Ground	3179	10	100	P	30	20	40	10	Lowland	Tussocks (Hummocks)	Dry-wet	25	(Ponds) (Creek)	Betula cf. glandulosa, Carex aquatalis, C. chordorrhiza, C. physocarpa, Eriophorum v. ssp. vaginatum, Ledum decumbens, Salix planifolia ssp. pulchra.
Wet Sedge	29018	43	100		10	P	85	5	Lowland, flat	(Hummocks)	(Moist)-Wet	70	Ponds	Carex aquatalis ssp. aquatalis, C. chordorrhiza, Eriophorum russeolum, Salix planifolia ssp. pulchra.
Wet Sedge - Patterned Ground	40268	76	100		15	10	65	10	Lowland, (flat)	(Tussocks) (Hummocks)	Moist-Wet (Dry)	55	Ponds	Betula cf. glandulosa, Carex ssp. aquatalis, C. Chordorrhiza, Ledum decumbens Salix planifolia ssp. pulchra.

Table 8. Continued.

Habitat type	Metres surveyed	No. of samples	Total % cover	Vegetation class (% cover)					Macro relief	Micro relief	Moisture	% standing water	Water-bodies within 100 m	Dominant species of vegetation
				Tall shrub	Dwarf shrub	Heath	Graminoid	Moss						
Dry Sedge	2071	3	95		15	10	65	5	Lowland, (flat); (Upland, slope)	Hummocks Tussocks	Dry-Moist	0	(Creek) (Marine)	Eriophorum sp.
Tussocky Tundra	20592	43	100		10	15	65	10	Lowland, (flat, sloping); (Upland, slope)	Tussocks (Hummocks)	Dry-Moist (Wet)	0 (5)	(Creek) (Marine)	Eriophorum vaginatum ssp., Salix planifolia ssp. pulchra, Vaccinium vitis-idaea.
Tussocky Tundra - Patterned Ground	9515	22	100		10	15	65	10	Lowland, flat; (Upland, rolling)	Tussocks (Hummocks)	Dry-Wet	15	(Ponds)	Betula cf. glandulosa, Eriophorum sp., Ledum decumbens, Vaccinium vitis-idaea.
Heath	1995	6	100		20	60	15	5	Upland, slope; (Lowland)	Hummocks	Dry-Moist	0		Dryas integrifolia, Salix sp.
Tidal Flats	6069	6	90		P		90		Lowland, flat		Wet	5	Pond (Creek) (Marine)	Carex subspathacea, Elymus arenarius ssp. mollis var. villosissimus, Potentilla egedii.

P Present, but less than 3%.
† Brackets "( )" in Table mean "sometimes". Thus, "(lowlands)" means "sometimes lowlands".

Table 9. Key to habitat types found on the Yukon Coastal Plain in 1983.

1. 10% or more of the cover is Tall Shrub (≥0.5 m) ..... 1. Tall Shrub
1. Less than 10% of the cover is Tall Shrub 2

2. 50% or more of the cover is Heath ..... 2. Heath
2. Less than 50% of the cover is Heath 3

3. 80% or more standing water present 4

4. More than 40% of the cover is Dwarf Shrub ..... 3. Wet Dwarf Shrub
4. 40% or less of the cover is Dwarf Shrub 5

5. Patterned ground (polygons) with
30% to 95% Graminoid* cover .....4. Wet Sedge
- Patterned Ground

5. Patterned ground is not common and there is
60% to 100% Graminoid cover ..... 5. Wet Sedge

3. Less than 80% standing water present 6

6. Heath is present ..... 7.

7. 45% or more of the cover is Dwarf Shrub 8

8. Patterned ground (polygons) abundant,
15% to 35% standing water present ..... 6. Dwarf Shrub
- Patterned Ground

8. Patterned ground (polygons) not abundant,
0% to 20% standing water present ..... 7. Dwarf Shrub

7. Less than 45% of the cover is Dwarf Shrub 9

9. Greater than 50% of the cover is Graminoid 10

10. 60% to 70% of cover is Graminoid <65% Eriophorum)
10% to 15% of cover is Heath
10% to 20% of cover is Dwarf Shrub
0% to 5% of cover is moss,
no standing water present ..... 8. Dry Sedge

10. Not as above 11

11. Less than 50% of cover is
Graminoid, or if 50% to 65% of
cover is Graminoid, then more than
30% of cover is Dwarf Shrub ..... 9. Graminoid/Dwarf Shrub

Table 9. Continued

11. Not as above 12

12. Patterned ground (polygons) common, greater than 5% standing water present ..... 10. Tussocky Tundra - Patterned Ground

12. Patterned ground (polygons) not common, less than 5% standing water present ..... 11. Tussocky Tundra

9. Less than 50% of the cover is Graminoid 10

10. Patterned ground (polygons) common, 5% to 40% (mean 25%) standing water present, not sloping and not an upland ..... 12. Graminoid/Dwarf Shrub - Patterned Ground

10. Patterned ground (polygons) not common, 0% to 20% (Mean approaching 0%) standing water present, sloping upland, or flat or sloping lowland ..... 9. Graminoid/Dwarf Shrub

6. Heath is absent, coastal marine habitat usually with less than 100% vegetation cover ..... 13. Tidal Flats

* Graminoid: represents Gramineae and Cyperaceae.

forming cottongrass (Eriophorum vaginatum) with lesser amounts of willow (Salix sp.) and heath. In comparison, Graminoid/Dwarf Shrub habitat had primarily willow (Salix sp.) and birch (Betula sp.) with lesser amounts of cottongrass (Eriophorum vaginatum) and heaths. Tussocky Tundra-Patterned Ground was another fairly abundant habitat type. Generally it occurred in lowlands, was moist, had polygons and was dominated by cottongrass (Eriophorum sp.). For a more complete description of each of the habitat types encountered, refer to Table 8. Appendix E provides a complete breakdown of dominant, subdominant and other vascular plant species associated with each habitat.

Both overall bird density and species richness were much higher in lowland areas than uplands (Tables 10 and 11). The only species groups more abundant in upland habitats were the passerines, ptarmigan and raptors (Table 10). Loons, swans, geese, cranes, gulls and terns occurred only in lowland habitat, while ducks and shorebirds occurred in both, but were much more abundant in lowlands. The species richness in lowland habitats averaged 21.7 birds at each site surveyed, whereas on uplands it averaged only 6.0 birds (Table 11).

Shorebird densities and species richness were highest in Wet Sedge-Patterned Ground and Wet Sedge habitats (densities of 176.9/km^2 and 175.8/km^2 respectively) (Tables 12 and 13). The Red-necked Phalarope, Pectoral Sandpiper and Long-billed Dowitcher all preferred these two types of habitat. The Semipalmated Sandpiper showed preference for Dwarf Shrub habitat as well as these habitats, while the Stilt Sandpiper showed a strong preference for only the Wet Sedge-Patterned Ground habitat. The Red-necked Phalarope and Semipalmated Sandpiper also occurred in relatively high numbers along the coast on the Tidal Flats (the former species was in the tidal pools and the latter on the mudflats).

The Lesser Golden-Plover was the only shorebird species which showed a preference for two upland habitats: Dwarf Shrub and Dwarf Shrub-Patterned Ground. Although all Semipalmated Plover observations were recorded within Tall Shrub habitat, this shorebird was actually using the gravel banks of the rivers and creeks at the edge of the Tall Shrub habitat.

For passerines, both densities and species richness were greatest in Tall Shrub habitat (Tables 12 and 13). The Yellow Warbler, Yellow Wagtail, White-crowned Sparrow and Fox Sparrow were found only in Tall Shrub habitat. In addition, the redpoll, Savannah Sparrow and American Tree Sparrow all showed a strong preference for Tall Shrub habitat. Unlike any of the other passerines, the Lapland Longspur showed preference for Dwarf Shrub-Patterned Ground habitat. The redpoll, Savannah Sparrow and Lapland Longspur also occurred in fairly high densities in Tussocky Tundra-Patterned Ground, Dwarf Shrub and Graminoid/Dwarf Shrub habitat.

The Willow Ptarmigan occurred primarily in Tall Shrub habitat, whereas the Rock Ptarmigan was most frequently seen in Tussocky Tundra-Patterned Ground.

Table 10. A comparison of bird densities in lowland versus upland habitat during ground surveys along the Yukon Coastal Plain, 9-29 June 1983.

		Density (birds/km^2)[I]												
	Distance surveyed (km)	Loons	Swans	Geese	Ducks	Ptarmigan	Cranes	Shore-birds	Jaegers	Gulls	Terns	Raptors	Passerines	All birds
Lowland	129.07	3.8	2.1	3.1	45.4	3.7	0.3	109.9	2.1	1.8	3.2	0.3	186.4	362.0
Upland	30.55				6.0	7.7		17.2	1.8			1.2	209.5	243.4

[I] Based on data from on transect only.

Table 11. A comparison of the number of different bird species encountered in lowland versus upland habitat during ground surveys along the Yukon Coastal Plain, 9-29 June 1983.

		Number of species[I]								
	Distance surveyed (km)	Loons	Swans	Geese	Ducks	Shorebirds	Raptors	Passerines	Others	Total
Lowland	129.07	1.3	0.4	0.9	3.9	7.2	0.2	4.9	2.8	21.7
Upland	30.55				0.6	1.6	0.2	2.6	1.1	6.0

[I] Mean of number of species at each of the nine sites. Based on data from on transect only.

Table 12. Habitat preferences of birds observed during ground surveys conducted on the Yukon Coastal Plain, 9-29 June 1983.[1]

Species	Density (birds/km^2)								
	Tall Shrub	Dwarf Shrub	Dwarf Shrub - Patterned Ground	Graminoid /Dwarf Shrub	Wet Sedge	Wet Sedge - Patterned Ground	Tussocky Tundra	Tussocky Tundra - Patterned Ground	Tidal Flats
Tundra Swan					2.8	2.4			5.5
Canada Goose					0.7				
Brant									22.0
Greater White-fronted Goose		17.0				2.9			
All geese		17.0			0.7	2.9			22.0
Mallard				1.6					
Northern Pintail	2.3	11.4		4.8	69.6	11.5	2.6		33.1
Northern Shoveler					3.5				
Green-winged Teal					3.5	1.4			5.5
All dabbling ducks	2.3	11.4		6.4	76.6	12.9	2.6		38.6
Gyrfalcon					0.7				
Short-eared Owl				1.6			1.3		
Willow Ptarmigan	13.7			1.6	1.4	3.3	2.6		
Rock Ptarmigan				1.6		1.0	1.3	7.0	
All ptarmigan	13.7			3.2	1.4	4.3	3.8	7.0	
Sandhill Crane						1.0			

Table 12. Continued.

Species	Density (birds/km^2)								
	Tall Shrub	Dwarf Shrub	Dwarf Shrub - Patterned Ground	Graminoid /Dwarf Shrub	Wet Sedge	Wet Sedge - Patterned Ground	Tussocky Tundra	Tussocky Tundra - Patterned Ground	Tidal Flats
Lesser Golden-Plover		45.4	39.7	8.0	21.8	12.0	11.5	10.5	11.0
Semipalmated Plover	27.4								
Whimbrel						1.4			
Hudsonian Godwit					3.5				
Lesser Yellowlegs	2.3								
Stilt Sandpiper					2.1	14.8		3.5	
Long-billed Dowitcher					12.7	12.9			
Pectoral Sandpiper				4.8	45.7	68.9	5.1	14.0	
Baird's Sandpiper					1.4	1.0			
Semipalmated Sandpiper		45.4		4.8	35.2	36.3	2.6		24.8
Red Phalarope					9.1	0.5			
Red-necked Phalarope	5.7	9.9			42.9	28.7	2.6	3.5	24.8
Common Snipe					1.4				
Unidentified shorebird	4.6					0.5			
All shorebirds	34.2	96.6	49.7	17.5	175.8	176.9	21.8	31.5	60.6
Parasitic Jaeger						2.9			
Pomarine Jaeger						0.5			
Long-tailed Jaeger			9.9		0.7	2.9			
All jaegers			9.9		0.7	6.2			
Glaucous Gull					4.9	1.0			
Arctic Tern					14.1	3.8			

Table 12. Continued.

Species	Density (birds/km^2)								
	Tall Shrub	Dwarf Shrub	Dwarf Shrub - Patterned Ground	Graminoid /Dwarf Shrub	Wet Sedge	Wet Sedge - Patterned Ground	Tussocky Tundra	Tussocky Tundra - Patterned Ground	Tidal Flats
Horned Lark					0.7				
Common Raven							2.6		
Water Pipit								3.5	
Yellow Wagtail	27.4								
Yellow Warbler	27.4								
Redpoll spp.	141.4	68.2		23.9	9.1	3.8	5.1	55.9	
Savannah Sparrow	118.6	34.1	9.9	52.6	35.2	16.7	18.0	42.0	5.5
American Tree Sparrow	43.3			17.5				3.5	
White-crowned Sparrow	6.8								
Fox Sparrow	4.6								
Lapland Longspur	54.8	170.4	327.9	141.8	95.6	125.3	186.0	206.3	38.6
Smith's Longspur				1.6					
Snow Bunting					3.5		2.6	7.0	
Unidentified passerine	2.3					0.5			
All passerines	426.6	272.7	337.8	237.4	144.2	146.3	214.3	318.2	44.1
Distance surveyed (km)	7.97	3.20	1.83	11.41	25.85	38.02	14.17	5.20	6.60

I - calculations based on data from on transect only.
- habitat segments less than 500 m long were excluded from the analysis.
- habitats which had less than 1500 m total of habitat segments over 500 m long were also excluded.

Table 13. A comparison of the number of different bird species seen in each habitat type during ground surveys along the Yukon Coastal Plain, 9-29 June 1983.

Habitat Type[I]	Distance surveyed (km)	Number of species[II]							
		Swans	Geese	Dabbling ducks	Raptors	Shorebirds	Passerines	Others	Total
Tall Shrub	8.0			1		2	9	1	13
Dwarf Shrub	3.2		1	1		3	3		8
Dwarf Shrub - Patterned Ground	1.8					2	2	1	5
Graminoid/Dwarf Shrub	11.4			2	1	3	5	2	13
Wet Sedge	25.8	1	1	3	1	10	5	4	25
Wet Sedge - Patterned Ground	38.0	1	1	2		9	3	8	24
Tussocky Tundra	14.2			1	1	4	5	2	13
Tussocky Tundra - Patterned Ground	5.2					4	6	1	11
Tidal Flats	6.6	1	1	2		3	2		9

I Data from habitat segments less than 500m long were excluded; Graminoid/Dwarf Shrub - Patterned Ground and Heath were excluded because total distance surveyed in each of these habitats was less than 1500m.

II Based on data from on transect only. Loons and diving ducks were excluded as their presence was usually due to a waterbody associated with the habitat.

Dabbling ducks, especially the Northern Pintail, showed a strong preference for Wet Sedge habitat, largely due to the small ponds associated with this habitat (Table 12). Likewise, during the aerial surveys in June the majority of dabblers were on ponds (Table 14). Most of the diving ducks were on lakes or ponds, although nearly all Surf Scoters were off the coast and almost half of the Oldsquaws were on coastal lagoons (Table 14).

The Arctic Tern occurred on the freshwater lakes, ponds and wetlands, whereas the Glaucous Gull was more common along the coast, particularly along the spits (Table 14).

The Red-throated Loon was usually seen on small shallow ponds during the aerial survey in June, whereas the Pacific Loon was on the lakes and the larger deeper ponds (Table 14). This difference in habitat preferences between the two loon species has been well documented (Bergman and Derksen 1977; Davis 1972; Barry 1976).

4.2 Brood-rearing and Moulting

During the survey by helicopter on 2 August, the cloud cover was about 80% and the wind speed was 15 kph, resulting in good survey conditions (Fig. 3). The highest densities of birds in the study area occurred along the coast at Stokes Point and King Point lagoons, and at Phillips Bay (48.7 birds/km^2, 35.7/km^2 and 38.0/km^2 respectively) (Table 15). The high count at Stokes Point lagoon was primarily due to moulting Oldsquaws (count of 95) and scaup (count of 52), whereas at the smaller lagoon at King Point, most of the birds were moulting Oldsquaws (18 birds), Glaucous Gulls (12 birds) and staging shorebirds (26 birds) (Table 15; Appendix F1). Phillips Bay had several large flocks of shorebirds (total count of 937 birds) most of which were on the Babbage River delta (Table 15). Phillips Bay also had 85% of all Glaucous Gull sightings (113 on transect plus 67 birds off transect).

On 16 August, two segments of the coast between Stokes Point and Shingle Point were surveyed by helicopter (Fig. 4). Conditions were good to excellent, for it was cloudy and nearly calm, with the occasional light rain shower which reduced visibility slightly. The density of moulting ducks at Stokes Point lagoon had increased to 226.0 ducks/km^2 (total count of 452 ducks, mostly Oldsquaw) (Table 16; Appendix F2). As on 2 June, this was the highest density of moulting ducks encountered. King Point lagoon had the second highest density at 52.5 ducks/km^2 (total count of 42 birds) all of which were Oldsquaw. During the same survey, over 1000 phalaropes were seen staging on the windward side of the Shingle Point spit. The spit also had the highest density of Glaucous Gulls (46.5/km^2 or 93 birds) encountered that day.

During the 2 August aerial survey, broods of the following species were seen: Pacific Loon, Tundra Swan, Canada Goose, Northern Pintail, scaup, Parasitic Jaeger, Red-necked Grebe and Glaucous Gull (Table 17). No broods were seen during the aerial survey along the coast on 16 August.

Table 14. Habitat preferences of birds observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983.

Species[I]	Percentage of each bird species observed in each habitat[II]											Sample size (no. of birds)
	Lake	Pond	Wetland	Wetland-patterned ground	River	Stream	Lagoon	Upland	Coast	Spit	Mudflat	
Pacific Loon	53	41			6							17
Red-throated Loon	20	60					20					10
Loon sp.	21	76					3					29
Tundra Swan	19	23	10	4	12	19	7		4		2	57
Canada Goose		33		13					53			15
Brant		100										15
Gr. White-fronted Goose		100										16
Northern Pintail	4	49	3	3	17	13	10					133
American Wigeon	20	57			7	7	10					30
Northern Shoveler		56				44						9
Green-winged Teal				43	14		43					7
Unidentified dabbler		67		7	7	20						15
Scaup sp.	45	34	1	2	5	10	1		2			100
Oldsquaw	30	26					43		1			70
White-winged Scoter	14	57			14	14						7
Surf Scoter	3						5		92			37
Red-breasted Merganser	36	23		4	14	11	2		9			44
Unidentified diver	70				10	20						10
Unidentified duck	28	35	4	6	17		4		4			46
Willow Ptarmigan			20	20				60				5
Rock Ptarmigan			12	12				75				8
Sandhill Crane		33		67								6
Unidentified shorebird	7	8	38	31	5	4	1	3	1		1	186
Parasitic Jaeger	10		30	40				20				10
Long-tailed Jaeger		12	38					50				8
Glaucous Gull	4	15	2	1	2		10	1	9	55	1	137
Arctic Tern	37	27	13	18	1	1	1					67
Common Raven				40				60				5
Unidentified passerine	17	5	2	2	20	17	5	32				41

[I] Species omitted if less than 5 sightings.
[II] Includes both on and off-transect data.

Table 15. Densities of birds observed during helicopter surveys along the Yukon Coastal Plain, 2 August 1983.

Survey segment	Distance surveyed (km)	Density (birds/km^2)													
		Grebes	Loons	Swans	Geese	Ducks	Ptar-migan	Cranes	Shore birds	Jaegers	Gulls	Terns	Raptors	Pass-erine	All birds
Stokes Point															
Lagoon	9.4		0.3			47.9			0.3		0.3				48.7
Roland Bay	10.6		0.7	2.6		6.8			2.6	0.5		0.9		1.9	16.0
Lakes	27.0		1.5	1.1		2.6			0.3			0.7		0.7	6.9
Streams	4.1		1.2			6.7			9.8				0.6	2.4	20.7
Spring River	15.5					0.2			0.2					4.0	4.4
Cross-country	49.7	0.3	0.9	1.1	1.4	2.5	*		0.9	0.2	0.2	1.4	0.2	1.9	11.0
Transect 2 km inland	25.0		0.9	1.4		1.6			0.5	0.1		0.2	0.1	0.1	4.9
Transect 8 km inland	25.0		0.7			3.7			.	0.2				1.5	6.1
Transect 14 km inland	25.0		0.4			0.5	0.1		0.1	0.3		0.1	0.1	3.2	4.8
King Point															
Lagoon	4.2					12.5			15.5		7.1		0.6		35.7
Lakes	25.5		0.5	2.4		4.4			1.4			0.5	0.1		9.2
Deep Creek	20.0						0.1		0.2					2.1	2.5
Cross-country	8.7		1.4			0.3			0.3			1.4	0.3	0.9	4.6
Transect 2 km inland	30.0		1.7	0.5		3.1			0.2	0.1	0.1	0.7	0.1	0.2	6.6
Transect 8 km inland	30.0		0.1			2.1			0.3	0.2		0.5	0.2	1.1	4.5
Phillips Bay															
Shoreline	41.0		1.6	0.2		4.6			22.2		6.8	2.1	0.1	0.4	38.0
Transects	59.5		0.5	0.9		4.6		0.1	24.1	0.1	0.2	0.4	0.1	1.6	32.5

* Refers to densities $\leq$ 0.05 birds/km^2.

Table 16. Densities of birds observed during helicopter surveys along the Yukon coast between Shingle Point and Stokes Point on 16 August 1983.

Survey segment	Distance surveyed (km)	Density (birds/km^2)								
		Loons	Geese	Ducks	Shorebirds	Jaegers	Gulls	Terns	Passerines	All birds
Stokes Point lagoon	5.0	2.5	2.0	226.0	12.5					243.0
Stokes Point to Phillips Bay along coast	21.0	1.2		21.4			0.5	0.8		23.9
King Point lagoon	2.0	1.2		52.5						53.8
King Point to Shingle Point along coast	24.0	1.1		4.5			0.9	0.4		7.0
Shingle Point spit	5.0	2.0			512.5	0.5	46.5		0.5	563.5

Table 17. Broods observed during a survey by helicopter of the Yukon Coastal Plain on 2 August 1983.

Location (km surveyed)	Species group	Number of broods	Aver. size of brood	habitat	Species
Stokes Point (191.3 km)	Loons	4	1.0	lakes(2); ponds(2)	Pacific Loon(2); Red-throated Loon (2)
	Swans	6	2.8	Roland Bay(3); ponds(2); lake(1)	
	Geese	25 young in 1 flock		pond in Spring River valley	Canada Goose
	Ducks	7	5.1	ponds(3); wetlands(3); stream(1)	Northern Pintail(4); dabbler(1); unidentified(2)
	Jaegers	1	1	wetland	Parasitic Jaeger
	Grebe	1	4	pond in Spring River valley	Red-necked Grebe
King Point (118.4 km)	Loons	1	2	lake	Pacific Loon
	Ducks	6	5.8	lakes(6)[I]	Northern Pintail(1); scaup(1); unidentified(4)
Phillips Bay (100.5 km)	Loons	1	1	bay behind spit	Pacific Loon
	Ducks	1	6	lake near bay	Northern Pintail
	Gulls	2 or 3	1 or 2	spit	Glaucous Gull

[I] At King Point very little wetland and pond habitat was sampled.

Loons

As was found during the June surveys, loons occurred in low densities throughout the study area (Table 15). The Pacific Loon was found on lakes (64% of sightings) and to a lesser extent along the coast (23%), whereas the Red-throated Loon was usually seen either along the coast (45%) or on small ponds (38%) (Table 18). Four Pacific Loon broods were sighted, three of which were on lakes and one behind the spit on the west side of Phillips Bay (Table 17).

Swans

Nearly half of the Tundra Swans seen during the aerial survey on 2 August were on lakes (Table 18). Excluding Roland Bay, the lakes in the King Point region had the highest density of swans in the study area (Table 15). Previous studies in the Beaufort Sea region have likewise found that swans preferred large freshwater lakes (Dickson 1985; Searing et al. 1975; Barry 1976; Derksen et al. 1981). Derksen et al. (1981) noted that most of the lakes that were occupied by swans on the Alaska Coastal Plain had the emergent vegetation Arctophila fulva, and suggested that this was a prime source of food for the swans.

Most swan sightings were of pairs or family groups, the major exceptions being flocks of 9 and 15 on large lakes near King Point, two flocks of 9 each on the Babbage River delta, and a flock of 11 on a pond adjacent to Phillips Bay.

The six Tundra Swan broods that were found averaged 2.8 cygnets (Table 17). Three of these broods were in Roland Bay and the other three were on lakes and ponds elsewhere in the Stokes Point region of the study area.

Geese

The only sighting of geese during the 2 August survey was a flock of three adults and about 25 gosling Canada Geese on a pond near the mouth of the Spring River (Appendix F1). These broods likely floated down the Spring River to the delta from nest sites upstream.

During the survey on 16 August along the coast, the only geese seen were four Brant at Stokes Point lagoon (Appendix F2). This survey, however, did not include Phillips Bay where small flocks of moulting geese would most likely have occurred.

Ducks

The aerial survey on 2 August showed that since 21 June there had been a decline in the number of ducks inland on the coastal plain, but an increase in ducks along the coast (Tables 3 and 15). Both Oldsquaw and scaup densities had increased in the lagoons and bays along the coast, but decreased inland suggesting a local movement to the coast (Appendices D and F1). In fact, nearly all of the Oldsquaws seen on 2 August were

Table 18. Habitat preferences of birds observed during helicopter surveys along the Yukon Coastal Plain, 2 August 1983.

	Percentage of bird species observed in each habitat[II]											
Species[I]	Lake	Pond	Wetland	Wetland-patterned ground	River	Stream	Lagoon	Upland	Coast	Spit	Mudflat	Sample size (no. of birds)
Pacific Loon	64	2					6		23	4		47
Red-throated Loon	3	38		5	8		3		45			40
Loon sp.	36	50					7		4		2	44
Red-necked Grebe	100											5
Tundra Swan	47	23		2		2	14		2		10	125
Canada Goose		100										28
Northern Pintail	11	42	7	7		1	9		16	3	4	115
American Wigeon	25				42				8		25	12
Unidentified dabbler		50		23	14		14					22
Scaup sp.	32	13			1		53					112
Oldsquaw	2						70		13	14		175
Surf Scoter									77	23		26
Unidentified diver	17	56			11				17			18
Unidentified duck	37	9		1	1	2	37		11	2		312
Northern Harrier	25	25		12				38				8
Phalarope sp.	6									94		16
Unidentified shorebird	2	37	1	1	1	1	2	1	19	14	23	1019
Parasitic Jaeger				70				30				10
Jaeger sp.	17			33				17		33		6
Glaucous Gull	1	4		3			9		55	26	1	140
Arctic Tern	22	28	3	4					30	10	3	106
Short-eared Owl				20	20			60				5
Common Raven		33				17		50				6
Unidentified passerine	4	13	2	8	8	22	4	35		4		195

I Species omitted if less than 5 sightings.
II Includes both on and off-transect data.

either in the coastal lagoons (70% of observations) or just offshore (27%.) (Table 18). Scaup were in the lagoons (53%) and to a lesser extent on the large lakes by the coast (32%). During the aerial survey along the coast on 16 August, several flocks of scoters (primarily Surf Scoters) were seen offshore. Furthermore, the number of Oldsquaws in the lagoons had quadrupled between 2 and 16 August indicating an additional influx of sea ducks along the Yukon coast (Appendix F).

The influx of sea ducks, primarily male Oldsquaw, Surf Scoter and scaup sp. in July to moult in the bays and lagoons along the Yukon coast, has been well documented (Schweinsburg 1974; Searing et al. 1975; Barry 1976; Barry et al. 1981; Johnson and Richardson 1982). Likewise, the local movement of ducks from mainland to the coast to moult has been suggested previously by Searing et al. (1975), Barry (1976), and Johnson and Richardson (1982).

As in June, the most numerous dabbling duck was the Northern Pintail. It still occupied a variety of habitats including ponds, wetlands, lakes and coastal waters, although it was most frequently seen on ponds (42% of observations) (Table 18).

During the aerial survey on 2 August, seven duck broods were seen in the Stokes Point region, six in the King Point region and one at Phillips Bay (Table 17). The single duck brood observed at Phillips Bay was further evidence that although the Phillips Bay region had more ducks than the other regions during the nesting season in June, the majority of these ducks were nonbreeding.

The high density of dabblers along Deep Creek in late July of 1981 did not occur in 1983. In 1981, a density of 21.7 ducks/km^2 was recorded on Deep Creek, the duck species being primarily Northern Pintail, American Wigeon and Mallard (Dickson 1985). When a 20 km segment of Deep Creek was resurveyed on 2 August in 1983, there were no ducks (Table 15). This is an example of the large year-to-year variation in the use of an area by birds that often occurs in the Arctic; hence a reminder of the shortcoming of a one-year study.

Shorebirds

Nearly 90% of the shorebirds seen on 2 August were in the Phillips Bay region (Table 15). The majority (85%) of these shorebirds were in flocks of ten or greater. About one third were staging on the ponds in the Babbage River delta and adjacent Phillips Bay, while the rest were along the coast primarily on the mudflats of the outer Babbage River delta and along the spits.

During the survey along the coast from Stokes Point to Shingle Point on 16 August, over 1000 phalaropes sp. were seen staging on the windward side of the sandspit at Shingle Point (Table 16).

Gulls and terns

During the aerial surveys on 2 and 16 August, the gull sightings were all Glaucous Gulls except for three Thayer's/Herring Gulls seen near

the shore of Phillips Bay. Most of the Glaucous Gulls (over 90% during the survey on 2 August) were in coastal habitats (Table 18), with concentrations occurring at Phillips Bay and King Point lagoon on 2 August (Table 15), and on Shingle Point spit on 16 August (Table 16).

By 2 August, Arctic Terns had started to stage along the coast. Almost half of the terns sighted were along the coast, while the rest were still occupying the lakes, ponds and wetlands where they had been in June (Table 18).

Raptors

As in June, the most abundant raptor species in the study area on 2 August were the Northern Harrier, Short-eared Owl and Rough-legged Hawk.

4.3 Fall Migration

Survey conditions were good to excellent on all three fixed-wing aerial surveys for fall migrating birds. On the first survey on 26 August, the winds were light (<10 kph) and from the southeast, creating small waves, but no white-caps on the sea. However, there were no clouds, so that the glare on the water made it sometimes difficult to identify birds to species. Despite the glare and an occasional fog patch, overall survey conditions were good. On 1 September, the wind and sea state were nearly calm, and cloud cover was complete with occasional light rain and fog. With the exception of the light rain and fog, survey conditions were excellent. On 7 September, the winds were variable, although for the majority of the survey they were nearly calm. The sea state varied from being calm to having small waves. Cloud cover was nearly complete, so that there were very few problems with glare. Overall, survey conditions were excellent on 7 September.

During all three aerial surveys conducted along the coast on 26 August, and 1 and 7 September, the highest densities of Tundra Swans, Brant, Greater White-fronted Geese, Glaucous Gulls, Arctic Terns and shorebirds occurred in the lagoons, spits, river deltas and protected bays. Specifically, coastal areas with repeatedly high concentrations of birds were the west side of the Mackenzie Delta, Escape Reef, Shingle Point spit, Phillips Bay, the Babbage River delta, Stokes Point lagoon, Roland Bay, Whale Bay, Workboat Passage, the lagoon and spit at Nunaluk Spit and Thetis Bay (Tables 19, 20 and 21; Appendix G). Barry (1976) likewise noted the importance of the spits, mudflats and protected waters along the Yukon coast to birds during fall migration.

With the exception of geese, bird numbers remained about the same on 26 August and 1 September, but had declined noticeably by 7 September (Table 22). The total count of all species, geese excluded, was 6562, 6127 and 3400 birds respectively. Between 1 and 7 September, there was a major influx of geese, particularly Snow Geese whose total count rose from 971 to 15094 birds. The increase in number of some species, notably loons and ducks, on the second aerial survey may have been partly due to superior survey conditions on the second survey.

Table 19. Density of birds observed during surveys by fixed-wing aircraft along the Yukon Coastal Plain, 26 August 1983.

Site	Distance surveyed (km)	Density (birds/km^2)												
		Loons	Swans	Geese	Ducks	Ptar-migan	Cranes	Jaegers	Gulls	Terns	Raptors	Shore-birds	Pass-erines	All birds
Survey along coast at 30 m asl														
West Channel to Walking River	62.4	0.3	5.8	8.1	9.3		0.3		3.2	0.1	*	4.9	0.9	32.9
Escape Reef and Shingle Point spit	11.2	0.4							87.5	6.0		92.6		186.6
Shingle Point to Kay Point	45.6	0.3			4.1				8.0	0.1		2.9		15.5
King Point lagoon	4.0	0.6	3.1		10.6									14.4
Babbage River delta	35.2	0.5	2.2	2.1	3.0				0.1		0.1	5.0	8.7	21.9
Phillips Bay - shoreline	28.0	1.2	0.9	16.7	10.4			0.2	5.5	1.3	0.2	7.0	0.3	43.7
Phillips Bay - spit at Kay Point	4.0				19.4			0.6	12.5	16.2		2.5		51.2
Phillips Bay - offshore	17.6	0.4			7.8									8.2
Spring River and lowlands	9.6	2.3	0.8	6.5	1.8				0.3		0.5	0.8	1.6	14.6
Spring River to Workboat Passage	25.6	1.0		12.0	4.3				1.1	1.0		4.2		23.5
Stokes Point lagoon	9.6			11.7	176.8				1.0				0.3	189.8
Roland Bay	8.8	0.6	4.0	4.0	4.3		0.6		0.6		0.6	1.4	3.4	18.8
Whale Bay	7.2			151.0	34.7				1.7			26.0	2.1	215.6
Workboat Passage	37.6	0.3	0.2		69.9				0.8	1.3	0.1	1.4		73.9
Thetis Bay[I]	15.2													
Nunaluk Spit	60.8	0.4	1.1	37.2	19.0		0.1		18.0	6.8		19.9	1.6	104.2
Survey inland 8 km at 150 m agl														
Firth River to Babbage River	44.8		0.1		0.6									0.6
Babbage River to Blow River	69.6		*		0.1									0.1
West side of Mackenzie Delta	33.6		1.3	2.1	0.6		0.2		0.3			0.4		5.0

[I] Not surveyed due to fog.

* Refers to densities $\leq$ 0.05 birds/km^2.

Table 20. Density of birds observed during surveys by fixed-wing aircraft along the Yukon Coastal Plain, 1 September 1983.

Site	Distance surveyed (km)	Density (birds/km^2)												
		Loons	Swans	Geese	Ducks	Ptar-migan	Cranes	Jaegers	Gulls	Terns	Raptors	Shore-birds	Pass-erines	All birds
Survey along coast at 30 m asl														
West Channel to Walking River	62.4	0.3	2.7	37.6	9.0		0.2	0.1	1.3		0.1	1.8	0.4	53.5
Escape Reef and Shingle Point spit	11.2	0.9		0.7	1.6			0.2	50.7			124.3		178.4
Shingle Point to Kay Point	45.6	1.4		16.0	11.1				3.0	0.3	*			31.8
King Point lagoon	4.0	1.2			26.9				0.6					28.8
Babbage River delta	35.2	0.1	1.1	71.1	6.2						0.1	6.7	3.0	88.3
Phillips Bay - shoreline	28.0	1.4	0.9	17.6	10.5	1.1			1.1	0.2	0.1	6.6	0.1	39.6
Phillips Bay - spit at Kay Point	4.0	6.9			32.5			1.2	6.9	41.9		5.0		94.4
Phillips Bay - offshore	17.6	1.0			1.3			0.4	0.6	1.1	0.1			4.6
Spring River and lowlands	9.6	0.5	2.1		7.6							3.9	19.5	33.6
Spring River to Workboat Passage	25.6	3.1		4.9	36.7				1.3	0.1		3.3		49.4
Stokes Point lagoon	9.6	1.8	0.5	20.8	145.3			0.3	1.0			16.4	10.4	196.6
Roland Bay	8.8	0.3	3.7	45.2	7.1				0.3		0.3	0.8	3.4	61.1
Whale Bay	7.2	0.4		5.2	37.8							0.4		43.8
Workboat Passage	37.6	0.9	0.1	1.3	50.3				0.9	0.3	0.1	2.3		56.0
Thetis Bay	15.2	0.7			40.5				0.7		0.2		2.0	43.9
Nunaluk Spit	60.8	0.6	0.7	11.2	24.0				12.5	2.3		2.0	3.0	56.2
Survey inland 8 km at 150 m agl														
Firth River to Babbage River	44.8		*	6.4	0.1									6.5
Babbage River to Blow River	69.6	*	0.1	4.8			*		*			1.4		6.4
West side of Mackenzie Delta	33.6	*	0.6	0.5	0.2		*		0.4					1.7

* Refers to densities $\leq$ 0.05 birds/km^2.

Table 21. Density of birds observed during surveys by fixed-wing aircraft along the Yukon Coastal Plain, 7 September 1983.

Site	Distance surveyed (km)	Density (birds/km^2)												
		Loons	Swans	Geese	Ducks	Ptar-migan	Cranes	Jaegers	Gulls	Terns	Raptors	Shore-birds	Pass-erines	All birds
Survey along coast at 30 m asl														
West Channel to Walking River	62.4	0.2	2.4	11.1	4.7		0.2		2.0		0.1	1.2		21.8
Escape Reef and Shingle Point spit	11.2			0.9	0.4				31.7	2.2		11.2		46.4
Shingle Point to Kay Point	45.6	0.4		18.2	1.8				1.7				*	22.2
King Point lagoon	4.0			2.5	9.4				0.6			2.5		15.0
Babbage River delta	35.2	0.1	1.0	128.6	3.1	0.7	0.1						0.1	133.8
Phillips Bay - shoreline	28.0	1.2	0.6	86.1	7.9				2.6	1.0	0.2	3.9	1.8	105.4
Phillips Bay - spit at Kay Point	4.0	4.4			11.2				29.4	16.9				61.9
Phillips Bay - offshore	17.6	0.7		3.6	22.9			0.1	0.3	1.1				28.7
Spring River and lowlands	9.6	0.3	0.5	9.4									0.3	10.4
Spring River to Workboat Passage	25.6	0.3	0.2	15.0	25.2				0.9			0.1		41.7
Stokes Point lagoon	9.6	1.8	0.5	3.1	126.8				0.3		0.3	1.3		134.1
Roland Bay	8.8	1.1	4.0	17.0	4.8				2.6		0.6	1.4		31.5
Whale Bay	7.2	0.7			1.4									2.1
Workboat Passage	37.6	0.3		2.6	19.1				5.4	0.3	0.1	0.3		28.2
Thetis Bay	15.2	0.2		6.7	17.6				4.3		0.2	0.2		29.1
Nunaluk Spit	60.8	0.2	0.3	4.9	15.6				3.8	1.2	*	4.6	1.6	32.3
Survey inland 8 km at 150 m agl														
Firth River to Babbage River	44.8		*	16.4	0.4									16.8
Babbage River to Blow River	69.6		*	82.1	0.1									82.3
West side of Mackenzie Delta	33.6		0.5	4.5	2.3				*					7.3

* Refers to densities $\leq$ 0.05 birds/km^2.

Table 22. Total number of birds counted on each of the aerial surveys conducted along the Yukon coast during fall migration in late August and early September, 1983.

Date of survey	Number of birds												
	Loons	Swans	Geese	Ducks	Ptarmigan	Cranes	Jaegers	Gulls	Terns	Raptors	Shorebirds	Passerines	Total
26 August	74	338	2106	3032	0	22	3	1199	268	9	1405	212	8668
1 September	153	190	4294	3448	12	11	9	711	144	9	1177	263	10421
7 September	68	143	17083	2226	10	6	1	525	89	10	258	64	20483

Loons

During all three autumn aerial surveys, both Pacific and Red-throated Loons occurred all along the Yukon coast (Tables 19, 20 and 21; Appendix G). However, on 1 and 7 September, the leeward side of the spit near Kay Point in Phillips Bay had a considerably higher density of loons than elsewhere in the study area (6.9 loons/km^2 or 11 birds on 1 September and 4.4 loons/km^2 or 7 birds on 7 September). Loon numbers peaked on 1 September (total of 74 on 26 August, 153 on 1 September and 68 on 7 September) (Table 22).

Although Red-throated and Pacific Loons were the most abundant loon species during the fall surveys (average of 57% and 30% respectively), 23 Common Loons and two Yellow-billed Loons were also recorded. The largest group of Common Loons was a flock of 12 which occurred west of Roland Bay on 1 September (Appendix G). The two Yellow-billed Loons were seen in Phillips Bay on 7 September. Both species are known to occur in low numbers along the Yukon coast during fall migration (Salter et al. 1980; Vermeer and Anweiler 1975).

Red-throated Loon counts were higher than Pacific Loon counts during all three surveys, likely because the surveys were concentrated along the coastline which is the preferred feeding habitat of the Red-throated Loon (Davis 1972; Barry 1976; Bergman and Derksen 1977).

Swans

Tundra Swan densities during all three fall surveys along the Yukon coast were highest between West Channel and Walking River, and at Roland Bay (Tables 19, 20 and 21). The Babbage River delta, Spring River delta, Stokes Point lagoon, and Nunaluk Spit had moderate numbers of Tundra Swans. Very few were seen on the inland transect across the Yukon Coastal Plain; however, there were moderate numbers of Tundra Swans inland on the west side of the Mackenzie Delta.

During all three fall surveys, almost all of the Tundra Swans were in singles, pairs or family groups. Flocks of more than ten birds were seen only during the first fall survey and only on the west side of the Mackenzie Delta (a flock of 70 and a flock of 30 swans).

On 26 August, 18 family groups of Tundra Swans were encountered compared to 11 on 1 September and 17 on 7 September. The average number of cygnets was 2.5 for all three surveys combined.

The peak number of Tundra Swans occurred on 26 August when 338 were counted (Table 22). By 1 September, the number had dropped to 190 swans and by the last survey, there were only 143 swans. The disappearance of flocks, but maintenance of the same number of family groups indicates that the decline in the number of Tundra Swans was primarily due to the departure of the nonbreeding segment of the population. Similarly, Koski (1977a) found that many of the Tundra Swans without broods left the outer Mackenzie Delta before those with young.

Geese

Brant were present in the study area during all three fall surveys (total on transect counts of 812, 441 and 610 on 26 August, 1 and 7 September respectively). On 26 August, most of the Brant were along the coast from Phillips Bay westward, including the Babbage River delta where a large flock of 220 Brant was recorded off transect (Appendix G1). On 1 September, most of the Brant were on the west side of the Mackenzie Delta, at Phillips Bay, particularly the Babbage River delta, and on the lagoon at Nunaluk Spit (Appendix G2). On 7 September, they were concentrated on the Babbage River delta and on the littoral flats at Phillips Bay (Appendix G3).

Previous studies have identified the Phillips Bay area as important for Brant during their westward migration in the fall (Mossop 1975; Koski 1977b; Barry et al. 1981). For example, Barry et al. (1981) estimated that 12000 Brant were staging on the west side of Phillips Bay during an aerial survey in mid-September, 1980. During fall migration in the Beaufort Sea region, Brant tend to stop in an area for only short periods (sometimes less than a day) (T.W. Barry pers. comm.) which may explain why the number of Brant observed at Phillips Bay in the fall has varied so much from one survey to the next. Nevertheless, Brant are restricted to very specific habitat during migration: the vegetated tidal flats that occur at river deltas, lagoons and bays (Vermeer and Anweiler 1975; Koski 1977a; Mossop 1974; Salter et al. 1980). Thus, although Brant may not stop over for very long, Phillips Bay should be considered a key area for Brant during fall migration. Peak numbers tend to occur in late August and early September (Koski 1977a; Gollop and Davis 1974; Vermeer and Anweiler 1975; Barry et al. 1981).

A small number of Greater White-fronted Geese were seen on the latter two fall surveys (252 on 1 September and 126 on 7 September). Most were found on river deltas, primarily the Babbage, Spring and Mackenzie river deltas (Appendix G). The largest flock (159 geese) occurred at the mouth of a stream that flowed into Roland Bay. In some years, large concentrations of Greater White-fronted Geese stage along the Yukon coast as they migrate eastward from Alaska to a major staging area on the Mackenzie Delta. For example, in 1976 Koski (1977b) estimated that 18000 birds occurred along the Yukon coast, primarily at Shingle Point and Blow River, and to a lesser extent at Phillips Bay.

The only Canada Geese seen during the fall surveys were ten birds off transect at the mouth of the Blow River. Very few Canada Geese have ever been reported on the Yukon Coastal Plain during fall migration (Dickson 1985; Koski 1977b; Mossop 1974; Salter et al. 1980).

During all three aerial surveys, some of the dark geese were not identified to species. The majority of these geese were either on the river deltas (Mackenzie, Babbage and Spring) or in the lagoons (Stokes Point, Roland Bay and Nunaluk Spit) (Appendix G).

On 26 August, 955 Snow Geese (none seen off transect) were recorded in the study area (Table 22). There were no sightings on the

inland transect; all were along the coast with the highest concentrations at Whale Bay (76.4/km^2) and at Nunaluk Spit (25.5/km^2) (Appendix G1). On 1 September, there was little change in the number of geese in the study area (a total count of 971 birds on transect and an additional 1390 off transect), but the area of concentration had shifted to the Babbage River delta (35.2/km^2) (Appendix G2). By 7 September, there had been a substantial influx of Snow Geese into the study area, for the count had risen to 15094 on transect birds plus another 11251 off transect (Appendix G3). The highest density of Snow Geese occurred between the Blow River and Babbage River, both along the coast and inland. Densities were especially high on the Babbage River delta where 107.3 Snow Geese/km^2 were recorded.

Previous studies have shown that the Babbage River valley is a major staging area for Snow Geese (Koski 1977b; T.W. Barry pers. comm.). However, concentration areas for staging Snow Geese vary from one year to the next, so that any area of the Yukon Coastal Plain may serve as a concentration area at some point over the years (T.W. Barry pers. comm.).

Snow Geese usually arrive on the Yukon Coastal Plain in late August and remain until adverse weather such as a heavy snowstorm drives them out (T.W. Barry pers. comm.). According to T.W. Barry (pers. comm.), the average length of stay between 1973 and 1983 was 18 days.

Ducks

During all three fall surveys, the most numerous species of ducks were scoter (more Surf Scoter than White-winged Scoter), Oldsquaw and scaup (38%, 29%, and 18% respectively). Other species present, in order of abundance, were the Red-breasted Merganser, Northern Pintail, eider, American Wigeon and Green-winged Teal. In addition, a flock of nine Harlequin Ducks were seen along the south shore of Herschel Island in Workboat Passage on 7 September, and a single Common Goldeneye was seen in the same area on 26 August.

The total number of ducks recorded on transect during the aerial survey on 26 August was 3032 (Table 22). On 1 September, the total number increased slightly to 3448 ducks, then on 7 September dropped to 2226 ducks. The decline was primarily due to lower counts of Oldsquaws, scoters and eiders.

The amount of time diving ducks spend along the Yukon coast after the moult varies from one year to the next. Gollop and Davis (1974) reported that in 1972 the peak movement of Oldsquaws westward past Nunaluk Spit occurred between 30 August and 6 September and the peak eastward movement of scoters was in mid-September. On the other hand, Vermeer and Anweiler (1975) noted an influx of Oldsquaws, eiders, scaup and Red-breasted Mergansers as late as 21 September in 1973. Like geese, the timing and degree of use of the Yukon coast by fall staging diving ducks is likely dependent on the weather (Barry and Barry 1982). Large concentrations of ducks occurred along the Yukon coast in the second week of September in 1980, whereas at the same time the following year,

there were very few diving ducks. Barry and Barry (1982) speculated that fog and snowstorms along the Yukon coast delayed the westward movement of ducks from the eastern Beaufort Sea in 1981.

The coastline from Phillips Bay westward generally had higher densities of ducks than east of Phillip Bay, during all three fall surveys (Tables 19, 20 and 21). As in early August, Stokes Point lagoon had the highest density of ducks in the study area (176.8/km^2 on 26 August, 145.3/km^2 on 1 September and 126.8/km^2 on 7 September) (Tables 19, 20 and 21). Most of the ducks at Stokes Point lagoon were Oldsquaws and scaup (355 and 304 respectively on 26 August when highest count occurred) (Appendix G). Workboat Passage had the second highest density of ducks during the first two surveys (69.9/km^2 on 26 August and 50.3/km^2 on 1 September). These ducks were primarily Oldsquaws and scoters. In Workboat Passage, there were also some scaup and Red-breasted Mergansers including a flock of 60 Red-breasted Mergansers off transect. Thetis Bay had 40.5 ducks/km^2 on 1 September, which were mostly scoters. Whale Bay had 34.7 ducks /km^2 on 26 August (including a flock of 70 scaup), and 37.8 ducks /km^2 on 1 September (both scaup and Oldsquaws). Two other areas with moderate densities of ducks were Phillips Bay, particularly along the leeward side of Kay Point spit, and the lagoon behind Nunaluk Spit.

On 1 September, due to the excellent survey conditions, several large flocks of sea ducks were noted off transect: 920 scoters in Thetis Bay; 380 scoters in Phillips Bay; 290 scoters along the coast between Shingle Point and King Point; and 350 sea ducks between Stokes Point lagoon and Workboat Passage.

Ptarmigan and cranes

A total of 22 ptarmigan were seen during the fall surveys, all of which were on the Babbage River delta (Table 22). Thirty-nine Sandhill Cranes were recorded, 30 of which were on the west side of the Mackenzie Delta. The count of ptarmigan and Sandhill Cranes was predictably low, since most of the survey flightlines were over water.

Shorebirds

The number of shorebirds recorded on the first two fall surveys remained about the same (1405 on 26 August compared to 1177 on 1 September), but had declined considerably by 7 September (258 shorebirds) (Table 22).

The highest density of shorebirds during the fall surveys occurred at Escape Reef and Shingle Point spit, where hundreds of phalaropes were seen staging along the windward side of these spits. Over 400 phalaropes were counted off Escape Reef on 26 August and over 550 phalaropes were off Shingle Point spit on 1 September. By 7 September there were only 50 phalaropes in both areas combined (Tables 19, 20 and 21). During all three aerial surveys in late August and early September, only 28 phalaropes were seen at Nunaluk Spit and Avadlek Spit. Thousands of

phalaropes stage along these two spits during the first half of August (Salter et al. 1980; Barry and Barry 1982: Vermeer and Anweiler 1975); however, according to Vermeer and Anweiler (1975), most phalaropes have left the area by late August.

Other areas which had flocks of staging shorebirds in the fall of 1983 were the sandspits and mudflats at Whale Bay, Nunaluk Spit, Stokes Point lagoon, and Phillips Bay (Tables 19, 20 and 21). A siting of a flock of over 200 shorebirds by a shallow lake while surveying the inland transect on 1 September at 150 m above ground indicated that shorebirds were staging on the freshwater wetlands as well as along the coast.

Gulls, terns and jaegers

All but five of the gulls seen during the fall aerial surveys were Glaucous Gulls. The exceptions were one Herring/Thayer's Gull seen near Nunaluk Spit on each survey, and two Sabine's Gulls seen in Phillips Bay on 1 September. The Glaucous Gulls were scattered along the coastline, but as in spring and midsummer, a concentration was found on the spit near Kay Point in Phillips Bay (peak number of 47 gulls on 7 September) (Tables 19, 20 and 21). Additional concentrations were found on Nunaluk Spit and Escape Reef, two areas which were not surveyed earlier in the year (peak numbers of 438 on Nunaluk Spit and 392 on Escape Reef on 26 August).

On the latter two surveys, immatures were tallied separately from adult Glaucous Gulls. Just over a third of the gulls were young of the year; 40% on 1 September and 35% on 7 September.

The number of gulls in the study area declined from 1199 birds on 26 August to 711 on 1 September and 525 on 7 September (Table 22). Departure of the Glaucous Gull from the Yukon coast started early compared to 1972 when westward migration did not begin until mid-September (Gollop and Davis 1974).

Arctic Terns were still present along the Yukon coast during the fall surveys. Areas of concentration were the spit off Kay Point in Phillips Bay (peak number of 67 on 1 September), Nunaluk Spit (peak number of 166 on 26 August), and Escape Reef (peak number of 27 on 26 August) (Tables 19, 20 and 21). The terns were most numerous on 26 August when 268 birds were recorded (Table 22). By 1 September, there were 144 terns and by 7 September only 89. Departure of the Arctic Tern was late in 1983, compared to other years when very few terns are seen along the Yukon coast by the end of August (Campbell and Weber 1973; Dickson 1985; Vermeer and Anweiler 1975; Gallop and Davis, 1974; Wiseley et al. 1977). According to Gollop and Davis (1974), the peak fall migration of Arctic Terns occurs in mid-August.

A total of 13 jaegers were recorded during the fall surveys most of which were in Phillips Bay.

Raptors

Seven raptor species were seen during the fall surveys. In order of abundance, these were the Northern Harrier, Rough-legged Hawk, Short-eared Owl, Golden Eagle, Bald Eagle, Snowy Owl and Merlin. A Merlin was also seen from the ground at Stokes Point lagoon on both 26 August and 1 September.

4.4 Use of Stokes Point by Birds

4.4.1 Mid-June

On 15 June, a ground survey 10.2 km in length was conducted adjacent the lagoon at Stokes Point (Appendix A2). Although the ocean was still frozen along the coast, the east side of the lagoon was nearly ice-free and the west side had open water around the shore. The ponds in the lowlands to the east of the lagoon were entirely ice free.

Higher than average densities of ducks, gulls and loons were recorded at Stokes Point lagoon than in surrounding areas during the ground surveys in June (Tables 1 and 23). Duck densities at the lagoon were 96.6/km^2 compared to 31.2 ducks/km^2 which was the average for the Stokes Point region. Similarly, gull densities at the lagoon were 10.7km^2 compared to the 1.8/km^2 average, and loon densities were 5.4/km^2 at the lagoon compared to the 2.4/km^2 average for the region.

The most abundant species of ducks were the Northern Pintail (count of 98 on and off transect) and Oldsquaw (count of 57 on and off transect), both of which occurred in small flocks on the lagoon and in the wetland on the east side of the lagoon. Nine different species of ducks were found (Table 23), including a Northern Shoveler and a Common Eider. The latter was incubating six eggs on a nest amongst driftwood on the spit.

Other notable bird observations at the Stokes Point lagoon on 15 June were three Semipalmated Plovers, a flock of 12 Snow Buntings, two Sabine's Gulls, and eight Common Ravens (Table 23).

4.4.2 Mid-August to early September

The results of the ground surveys conducted at the lagoon from 10 to 15 August and 28 August to 2 September indicated that the number of birds in the vicinity of Stokes Point lagoon had increased since June (Fig. 7; Tables 23 and 24; Appendix H1). A total of 51 species were recorded during these surveys including the Common Loon, King Eider, Black Guillemot, Bank Swallow and Merlin. Several hundred Oldsquaws, as well as scaup and scoters moulted in the lagoon in mid-August (Tables 24 and 25; Appendix H). Shorebirds migrated passed Stokes Point throughout August. Fifteen species of shorebirds were recorded including the Black-bellied Plover, Ruddy Turnstone, Dunlin and Sanderling, none of which nest on the Yukon Coastal Plain (Salter *et al.* 1980; Dickson 1985). Large flocks of Lapland Longspurs staged at Stokes Point,

Table 23. Numbers, densities and species of birds observed during the ground survey at Stokes Point lagoon, 15 June 1983.

Species group	Number of birds[I]	Density (birds/km^2)[II]	Species[III]
Loons	15	5.4	Pacific Loon, Red-throated Loon
Swans	10		Tundra Swan
Geese	7		Greater White-fronted Goose
Ducks	187	96.6	Northern Pintail, Oldsquaw, American Wigeon, Greater Scaup, Green-winged Teal, Red-breasted Merganser, White-winged Scoter, Northern Shoveler, Common Eider
Ptarmigan	1	1.8	Rock Ptarmigan
Jaegers	1		Long-tailed Jaeger
Gulls	16	10.7	Glaucous Gull, Sabine's Gull
Terns	6		Arctic Tern
Raptors	6		Short-eared Owl, Northern Harrier, Rough-legged Hawk
Shorebirds	66	37.6	Northern Phalarope, Semipalmated Sandpiper, Pectoral Sandpiper, Lesser Golden-Plover, Semipalmated Plover, Common Snipe, Stilt Sandpiper
Passerines	124	130.6	Lapland Longspur, Snow Bunting, Savannah Sparrow, redpoll sp., Common Raven, Tree Sparrow
Total	439	282.7	
km surveyed	10.2		

I Based on data from on and off transect.
II Based on data from on transect only.
III Listed in order of abundance.

Table 24. Number of birds observed each day during ground surveys at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

Date		Number of birds											
		Loons	Swans	Geese	Ducks	Cranes	Shorebirds	Jaegers	Gulls	Terns	Raptors	Passerines	Total
August	10	34			589		269	2	8	36	2	1186	2126
	11	33			350		116	1	10	49	1	1263	1823
	12	39			471		35	2	6	76	1	460	1090
	13	53		4	586		155	3	6	55	2	593	1457
	14	24		4	361		155		9	80	2	506	1141
	15	27		96	587		194		14	58	3	102	1081
August	28	45	26	107	151		190	3	29		1	149	701
	29	49	2	103	192		450	2	42		1	110	951
	30	37	4	20	118		35		18			33	265
	31	42	6	1532	180		250		21	11		482	2524
September	1	66	2	298	337		138	1	14		2	21	879
	2	25	4	1726	272	7	31	1	46			67	2179
Total		474	44	3890	4194	7	2018	15	223	365	15	4972	16217

Table 25. Number of birds in each habitat type surveyed at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

Habitat type	Number of birds											
	Loons	Swans	Geese	Ducks	Cranes	Shore-birds	Jaegers	Gulls	Terns	Raptors	Passe-rines	Total
Lowland with ponds	106	17	1177	371		783	5	49	21	12	2434	4975
Lagoon	41	19	191	2789	7	426	3	40	2	2	37	3557
Spit and beach	3		360	47		251	2	61	186	1	2436	3347
Ocean	324	8	2162	987		558	5	73	156		65	4338
Total	474	44	3890	4194	7	2018	15	223	365	15	4972	16217

particularly in mid-August, although smaller flocks were still present in late August (Appendix H1). In mid-August, as many as 80 Arctic Terns were recorded loafing on the spit at Stokes Point or feeding just offshore. In late August, flocks of geese, particularly Brant and Greater White-fronted Geese, migrated past Stokes Point.

Loons

Both Pacific and Red-throated Loons were seen daily feeding offshore during the ground surveys in late summer at Stokes Point (Appendix H). There was one sighting of a Common Loon offshore on 2 September. Two Red-throated Loon broods, each with two chicks, occupied small ponds on the east side of the lagoon.

Swans

Tundra Swans did not start to migrate past Stokes Point until late August and early September (Table 24). Most sightings were of single birds or small flocks of adult birds migrating southeastward along the coast. Occasionally one or two birds were seen in the wetlands on the east side of the lagoon (Table 26). Salter et al. (1980) likewise noted a small number of Tundra Swans migrated eastward past Nunaluk Spit in late August and early September in 1971. In 1973, a peak migration occurred in late September (Salter et al. 1980).

Geese

Nearly all of the geese seen at Stokes Point in late summer were migrating through, without stopping. The exceptions were a flock of 48 Brant on the lagoon on 1 September and a flock of 7 Greater White-fronted Geese on 28 August.

Brant, which was the species seen most frequently (79% of all sightings identified to species), first appeared at Stokes Point on 13 August. The maximum count (1643 Brant) occurred on the last day of surveys which was 2 September (Appendix H1). Most of the Brant were in small flocks of less than 100 birds and were flying northwest along the coast within several hundred metres of shoreline and just above the water (Table 26). Most years, the peak westward movement of Brant along the Yukon coast occurs in late August and early September (Koski 1977a; Salter et al. 1980).

The second most abundant species of goose was the Greater White-fronted Goose. Most were in small flocks flying parallel to the coast in a southeasterly direction (Table 26; Appendix H1). None were seen in mid-August and a maximum count of 460 occurred on 31 August. During migration watches on the Yukon Coastal Plain in 1973, the peak migration occurred on 10-11 September (Salter et al. 1980).

Ducks

The Oldsquaw, which was the most abundant duck species in the lagoon at Stokes Point, was most numerous in mid-August when a maximum

Table 26. Direction of travel of birds in flight during surveys at Stokes Point from 27 August to 2 September 1983.[I]

Species	Direction of travel (% of birds)								Sample size (No. of birds)
	S	SE	E	NE	N	NW	W	SW	
Tundra Swan	48	33	18						33
Brant			1		<1	99			2391
Greater White-fronted Goose	7	42	49	1	<1	1			1338
Snow Goose	14	10	18			18	5	35	432
Surf Scoter		74				26			34
Scoter sp.	36	64							14
Long-billed Dowitcher[II]	24	58	2	1		14			78
Sanderling[II]		5				95			103
Pectoral Sandpiper[II]	10	88		2					105
Semipalmated Sandpiper[II]		100							36
Red-necked Phalarope[II]		71				26		2	201
Lapland Longspur[II]	3	67	1	<1	1	19	<1	8	3190

[I] Based on both the transect surveys and migration watch.
[II] Also based on transect surveys from 10 to 15 August 1983.

count of 498 birds occurred (Appendix H). Scoters, the second most abundant duck, had a maximum count of 172 birds which also occurred in mid-August. Nearly all of the scoters were in the ocean offshore, and Surf Scoters outnumbered White-winged Scoters by a ratio of three to one. Scaup, which had a maximum count of 58 birds in late August, were found primarily on the lagoon. Similar numbers of Northern Pintails were recorded, but they were primarily in the wetlands east of the lagoon and were most numerous in mid-August. Small numbers of Common Eiders and King Eiders were seen offshore, while in the lagoon and wetland there were small numbers of Red-breasted Mergansers, Green-winged Teal, American Wigeons, Northern Shovelers and Mallards.

In mid-August, broods of Oldsquaws, Northern Pintails and Common Eiders were found on the lagoon and in the ponds east of the lagoon (Table 27).

There were more ducks at Stokes Point in mid-August than late August (average daily counts of 490 and 208 respectively) (Table 24). The decline was primarily due to fewer Oldsquaws and Northern Pintails (Appendix H1). Although Oldsquaws normally occur along the Yukon coast throughout September (Salter et al. 1980; Vermeer and Anweiler 1975), most dabblers such as the Northern Pintail have left the Yukon Coastal Plain by early September (Dickson 1985; Vermeer and Anweiler 1975; Schweinsburg 1974). Gollop and Davis (1974) found that the peak eastward migration of Northern Pintails along the Yukon coast in 1972 occurred in the second half of August.

Shorebirds

The most numerous shorebird species at Stokes Point in mid-August was the Red-necked Phalarope (maximum daily count of 130 birds) (Appendix H1). Small flocks staged just offshore in the surf along the sandspit, and movement was generally eastward (Table 26; Appendix H2). Very few phalaropes migrated past Stokes Point in late August, because most were already east of Stokes Point, as was confirmed by the aerial surveys in late August and early September (Tables 19, 20 and 21). The eastward migration of phalaropes along the Yukon coast, which was also reported by Salter et al. (1980), suggests migration south occurs along an inland route.

In late August and early September, the Long-billed Dowitcher was the most numerous shorebird species at Stokes Point (maximum daily count of 146) (Appendix H1). Nearly all were in the sedge wetlands east of the lagoon, and migratory movement was primarily southeast along the coast (Table 26; Appendix H2). Salter et al. (1980) likewise reported an eastward movement of Long-billed Dowitchers along the Yukon coast in late August and early September in 1972. Large numbers are found on the Mackenzie Delta during fall migration (Martell 1984).

The Pectoral Sandpiper, which had a maximum daily count of 117 birds, was present at Stokes Point in small numbers throughout the ground surveys from 10 August to 2 September (Appendix H1). Migration was in a

Table 27. Broods seen at Stokes Point lagoon during ground surveys, 10-15 August 1983.

Species	Number of broods	Mean brood size	Habitat		
			Ponds	Lagoon	Ocean
Red-throated Loon	2	2.0	2		
Oldsquaw	4	5.0	3	1	
Northern Pintail	1	6.0	1		
Common Eider	1	8.0		1	and 1
Unidentified duck	1	1.0	1		
Glaucous Gull	1	2.0	1 and	1	

southeasterly direction (Table 26), as was found at Nunaluk Spit in 1971 and 1972 (Schweinsburg 1974; Gollop and Davis 1974). At Stokes Point, staging Pectoral Sandpipers were most abundant in the wetlands east of the lagoon (Appendix H2). However, casual observations of large flocks indicated that they were more abundant inland than along the coast.

The Semipalmated Sandpiper was seen only in mid-August (Appendix H1). These were likely young-of-the-year, for the females leave the breeding area right after hatch and the males leave as soon as the young can fly (MacLean 1969). Direction of travel was generally southeast and preferred habitats were both the wetlands and beaches (Table 26; Appendix H2). Other species which were present in small numbers and only in mid-August were the Lesser Golden-Plover, Dunlin and Baird's Sandpiper. Most of the Ruddy Turnstones migrated past Stokes Point in mid-August as well (Appendix H1).

The Sanderling occurred at Stokes Point primarily in late August and early September (Appendix H1). Small flocks were seen staging on the beach and spit, and flying northwest along the coast (Table 26; Appendix H2). Gollop and Davis (1974) likewise recorded a westward movement of Sanderlings past Nunaluk Spit in 1972. Sanderlings tend to migrate either along a coast or offshore, and winter along both the Pacific and Atlantic coasts (Hayman et al. 1986). Thus, the Sanderlings that migrate past Stokes Point likely follow the coast of Alaska south to winter along the Pacific coast.

The Black-bellied Plover which was seen only in late August and early September, preferred the wetlands and lagoon for resting and feeding. Single sightings of a Spotted Sandpiper, Lesser Yellowlegs and Stilt Sandpiper were also recorded in August at Stokes Point (Appendix H1).

Gulls, terns and jeagers

A few Glaucous Gulls were seen daily at Stokes Point in mid-August, and the number increased slightly by late August (average daily counts of 9 and 28 gulls respectively) (Table 24). No other gull species was recorded during that period at Stokes Point.

Between 36 and 80 Arctic Terns, including several young-of-the-year, were seen daily at Stokes Point in mid-August either resting on the spit or feeding offshore (Tables 24 and 25). By late August, few terns were seen at Stokes Point (only one sighting of 11 birds on 31 August).

Both Parasitic and Long-tailed Jaegers were present in mid-August, but by late August only the Parasitic Jaeger remained (Appendix H1). Salter et al. (1980) reported that the Long-tailed Jaeger was uncommon on the Yukon Coastal Plain after the first week of August. They also noted that the peak in the number of Parasitic Jaegers along the coast coincided with the peak abundance of phalaropes. We found no correlation between the number of phalaropes and Parasitic Jaegers at Stokes Point, perhaps due to the abundance of other species of shorebirds in the area in late August when phalaropes were less plentiful (Appendix H).

Raptors

One or two Short-eared Owls were seen in the wetland east of the lagoon on seven of the twelve days of surveys (Appendix H1). There was a Northern Harrier in the wetland on three occasions, a Rough-legged Hawk at the west end of the spit twice in mid-August, and a Merlin over the lagoon once on 1 September.

Passerines

Large flocks of Lapland Longspurs staged at Stokes Point in mid-August and to a lesser extent in late August (Appendix H1). The highest daily count at the lagoon was 1252 birds on 11 August, although over 2000 longspurs were seen flushing from the tundra several hundred metres inland from the lagoon on 9 August. The longspurs at the coast occupied both the wetland east of the lagoon and the spit (Appendix H2). When migrating, their direction of travel was generally southeast (Table 26).

Each day from mid-August to early September, small numbers of Snow Buntings were seen at Stokes Point, most of which were on the spit and beach (Appendix H). In 1972, although migration began in August, the major eastward movement of Snow Buntings did not occur until mid-September (Salter et al. 1980). Other species seen occasionally were the Savannah Sparrow, Common Raven, Water Pipit, Smith's Longspur and Bank Swallow (Appendix H1).

5.0 SUMMARY AND CONCLUSIONS

5.1 Distribution and Habitat Preferences

Loons and grebes

Both the Pacific Loon and Red-throated Loon nested throughout the study area. The Red-throated Loon tended to use small shallow ponds for nesting, whereas the Pacific Loon was most often seen on larger deeper lakes. Both fed in the marine nearshore waters, although the Red-throated Loon was more abundant there due to its greater dependence on marine waters for food during the nesting season (Davis 1972; Bergman and Derksen 1977; Barry 1976). Both species were still present along the Yukon coast in late August and early September, as well as a small number of Common and Yellow-billed Loons.

A brood of four Red-necked Grebes was found on a pond in the Spring River valley. Although Red-necked Grebes have been seen occasionally on the Yukon Coastal Plain, there has been no previous evidence of breeding (Salter et al. 1980). The nearest known nesting area for the Red-necked Grebe is the Mackenzie Delta (Godfrey 1986).

Swans

Tundra Swans nested in low densities throughout the study area, but both breeding and nonbreeding birds were more numerous at Phillips

Bay, particularly on the Babbage River delta. Their preferred habitats were the lakes on the coastal plain, as well as the lagoons, ponds and channels associated with the river deltas. By late August, small flocks of non-breeding swans had started to migrate eastward along the Yukon coast. At that time, swan densities within the study area were highest on the west side of the Mackenzie Delta and at Roland Bay, although the deltas, lagoons and bays all had moderate densities.

Geese

The Greater White-fronted Goose was the most abundant goose species during the breeding season, with pairs and small flocks at scattered locations throughout the study area. A nest with seven eggs was found in a wetland near Stokes Point. The only previous nest record for the northern Yukon was a flock of 23 adults and 30 young on the Babbage River delta in 1982 (Hogg et al. 1986). By late August, small flocks had started to migrate southeastward along the Yukon coast. Some staging occurred on the deltas of rivers such as the Spring and Babbage rivers, but their major staging area is the Mackenzie Delta (Koski 1977a; Koski 1977b; Alexander et al. 1988).

In June, Brant occurred only in Phillips Bay where there were several small flocks including 20 Brant which were possibly nesting on the Babbage River delta. The first fall migrants passed Stokes Point on 13 August, but they were more numerous in late August and early September. They moved westward in small flocks along the coast just offshore. Staging occurred on the vegetated tidal flats of the lagoons, bays and deltas, especially Phillips Bay, but also in the lagoon at Nunaluk Spit and on the west side of the Mackenzie Delta.

In June, several pairs of Canada Geese were found at scattered locations in the study area, including two pairs nesting on islets in ponds west of Phillips Bay. A flock of three adults and 25 young on a pond at the mouth of the Spring River in early August were further evidence of breeding. The only previous records of Canada Geese breeding in the northern Yukon were a pair with a brood on a pond west of Phillips Bay in 1981 (Dickson 1985) and a general reference by Godfrey (1986) to nesting on Herschel Island. Very few Canada Geese were seen during fall migration.

Snow Geese were not seen in the study area until fall migration. Several thousand had arrived by 26 August, but the major influx did not occur until around 7 September when over 26000 birds were recorded during an aerial survey. At that time, the highest densities of staging Snow Geese on the Yukon Coastal Plain were between the Blow and Babbage rivers, and especially at the Babbage River delta.

Ducks

The Oldsquaw, Northern Pintail and scaup were the most abundant species of nesting ducks, and all were found throughout the study area. During June, the Oldsquaw primarily used ponds, lakes and lagoons,

whereas the scaup were mostly on lakes and larger ponds. On the other hand, the Northern Pintail showed a preference for ponds and rivers. Other less common nesters were the Red-breasted Merganser, Green-winged Teal, American Wigeon, Northern Shoveler and Common Eider. The mergansers and teal were found throughout the study area, the former usually on the lakes, ponds, rivers and streams and the latter in the lagoons, wetlands and rivers. Most of the nesting shovelers and wigeons were on the Babbage River delta, and the only nesting Common Eider found was on the sandspit at Stokes Point.

Small flocks of moulting ducks occurred throughout the study area, but the highest densities were along the coast in the lagoons, bays and river deltas. The Stokes Point lagoon had the highest density of moulting ducks, most of which were Oldsquaws. High densities of moulting ducks also occurred at the Babbage and Spring river deltas in Phillips Bay where there were mainly Northern Pintails, Oldsquaws and American Wigeons. Most of the moulting scaup were on the coastal lagoons and large lakes, whereas the scoters and mergansers were offshore along the coast.

Overall, the most abundant species of moulting ducks were the Oldsquaw, Northern Pintail, Surf Scoter, and scaup. There were three to four times more Surf Scoters than White-winged Scoters during the moult.

In late August and early September, duck densities along the Yukon coast were still highest in lagoons, river deltas, bays and other sheltered areas of coastline. Stokes Point lagoon and Phillips Bay (especially behind the spit at Kay Point) both had concentrations of ducks, as well as Workboat Passage, Thetis Bay, Whale Bay and Nunaluk Spit lagoon which had not been surveyed earlier in the year. The most abundant species along the coast in late August and early September were the scoters (still more Surf Scoter than White-winged Scoter), Oldsquaw and scaup.

Ptarmigan and cranes

Willow and Rock Ptarmigan occurred throughout the study area, the former being the more abundant species. Most of the Willow Ptarmigan were in Tall Shrub habitat, whereas the Rock Ptarmigan were in Tussocky Tundra-Patterned Ground habitat.

Pairs and single Sandhill Cranes occurred in low densities throughout the study area in June, but there was no evidence of nesting.

Shorebirds

The most common species of shorebird nesting in the study area in June were the Pectoral Sandpiper, Semipalmated Sandpiper, Lesser Golden-Plover, Red-necked Phalarope and Stilt Sandpiper. The Stilt Sandpiper and Pectoral Sandpiper occurred in higher densities at Stokes Point than Phillips Bay, whereas the Semipalmated Sandpiper and Red-necked Phalarope

were more numerous at Phillips Bay. Other species which occurred in low numbers throughout the study during the nesting season were the Long-billed Dowitcher and Common Snipe. The Whimbrel was fairly common at King Point, but none occurred west of Phillips Bay. Conversely, most of the Red Phalaropes were nesting west of Phillips Bay in the Stokes Point region.

Nesting shorebird densities and species richness were highest in Wet Sedge and Wet Sedge-Patterned Ground habitats. The Red-necked Phalarope, Pectoral Sandpiper and Long-billed Dowitcher all preferred these two types of habitat. The Semipalmated Sandpiper was found in a broad spectrum of habitats: the two mentioned above, as well as Dwarf Shrub and the Tidal Flats along the coast. The Stilt Sandpiper, on the other hand, was restricted primarily to Wet Sedge-Patterned Ground habitat, and the Semipalmated Plover was seen only along the gravel banks of rivers and occasionally along gravel beaches at the coast. The Lesser Golden-Plover was the only shorebird which preferred two upland habitats: Dwarf Shrub and Dwarf Shrub-Patterned Ground.

By early August, most of the shorebirds had gathered in small flocks and moved to the coast. Almost 90% of the shorebirds seen during the aerial survey on 2 August were at Phillips Bay on the mudflats, spits and nearby ponds.

At Stokes Point in mid-August, the most numerous shorebird species was the Red-necked Phalarope. Small flocks staged in the surf by the sandspit, and when in flight movement was generally southeastward. By the end of August nearly all of the phalaropes seen were east of Stokes Point at Escape Reef (400 birds on 26 August) and Shingle Point Spit (550 birds on 1 September). At that time, there were very few at Nunaluk Spit and Avadlek Spit where they traditionally stage in the first half of August (Salter et al. 1980; Barry and Barry 1982; Vermeer and Anweiler 1975).

In late August, the Long-billed Dowitcher was the most numerous species of shorebird at Stokes Point. Staging occurred in the sedge wetlands east of the lagoon and most migratory movement was towards the southeast.

The Semipalmated Sandpiper, Lesser Golden-Plover, Ruddy Turnstone, Dunlin and Baird's Sandpiper all migrated past Stokes Point in mid-August, but were nearly all gone by late August. The Pectoral Sandpiper moved southeastward past Stokes Point throughout August, but was more abundant inland than along the coast. The Sanderling occurred at Stokes Point primarily in late August. Most sightings were either on the beach or flying just offshore in a northwesterly direction. The Black-bellied Plover was not seen at Stokes Point until late August.

In late August and early September, the areas of coastline with concentrations of shorebirds other than phalaropes were the sandspits and mudflats at Whale Bay, Nunaluk Spit lagoon, Stokes Point lagoon and Phillips Bay.

Gulls, terns and jaegers

Nesting pairs of Glaucous Gulls were found scattered in wetlands throughout the study area. However, the majority of both breeding and nonbreeding flocks were on the spits, in the lagoons and in the bays along the coast. In late August and early September, there were Glaucous Gulls all along the coast, with concentrations at Kay Point Spit, Nunaluk Spit, and Escape Reef, three known sites of nesting colonies (Alexander et al. 1988). About one third of the Glaucous Gulls in early September were young-of-the-year. The number of Glaucous Gulls along the coast increased through August, then in early September they began to depart from the Yukon coast (less than half as many on 7 September as on 26 August).

A small number of Herring/Thayer's Gulls and the occasional Sabine's Gull occurred along the Yukon Coastal Plain throughout the summer. It is not known whether these species nested.

The Arctic Tern was common throughout the study area in June, inhabiting primarily the freshwater lakes, ponds and wetlands. Small nesting colonies were found in several wetland areas. By early August, about half had moved to the coast where they foraged just offshore. A flock of up to 80 Arctic Terns (adults and young) staged on the spit at Stokes Point lagoon in mid-August, but were gone by the end of August. At that time, however, Arctic Terns were still present elsewhere along the coast, with concentrations at Nunaluk Spit, Kay Point spit and Escape Reef. Numbers declined steadily from 268 on 26 August to 89 on 7 September.

Nesting Parasitic Jaegers and Long-tailed Jaegers were both fairly common throughout the study area. Both species were still present in mid-August, but by late August only the Parasitic Jaeger remained. During the fall aerial surveys along the coast, the Parasitic Jaeger was most abundant in Phillips Bay.

A few Pomarine Jaegers migrated through the study area in the spring, but none were seen after 18 June.

Raptors

The most common raptor species in the study area were the Northern Harrier, Short-eared Owl and Rough-legged Hawk. Although all three species likely breed on the Yukon Coastal Plain, the only nest found was a Short-eared Owl's. The Gyrfalcon and Golden Eagle also occurred in the study area, but likely did not nest there. Both species are known to nest on the bluffs and cliffs in the foothills and mountains to the southwest of the study area (Dickson 1985; Salter et al. 1980). In late August and early September, several Bald Eagles, Snowy Owls and Merlins were also seen.

Passerines

Over half of the passerine observations in June were Lapland Longspurs which were found in high densities throughout the study area.

The Savannah Sparrow and redpoll were also abundant, but more numerous at Phillips Bay then at Stokes Point. Other species seen in the study area in June and likely nesting were: the American Tree Sparrow which was common; White-crowned Sparrow, Yellow Wagtail and Common Raven which were all fairly common; and the Water Pipit, Yellow Warbler, Fox Sparrow and Snow Bunting which were all uncommon. Although 35 Yellow Wagtails were recorded, their distribution was restricted to the rivers which flow into Phillips Bay.

Both the density and species richness of passerines was greatest in Tall Shrub habitat. The Yellow Warbler, Yellow Wagtail, White-crowned Sparrow and Fox Sparrow occurred only in Tall Shrub habitat, while the redpoll, Savannah Sparrow and American Tree Sparrow all showed a strong preference for that habitat. Unlike any other passerines, the Lapland Longspur was most abundant in Dwarf Shrub-Patterned Ground habitat.

Other than Lapland Longspurs and Snow Buntings, there were very few passerines along the coast at Stokes Point in mid-August. Large flocks of Lapland Longspurs staged at Stokes Point in mid-August and to a lesser extent in late August. The largest flock, which was over 2000 birds, occurred on 9 August inland several hundred metres from Stokes Point. At the coast, the Lapland Longspur staged both in the wetland beside the lagoon and along the spit. Movement was generally southeastward.

A few Snow Buntings also occurred along the coast at Stokes Point in mid-August. By late August, their numbers had increased slightly. Direction of travel at Stokes Point was not consistent which suggests migration had not begun. According to Salter et al. (1980), a major movement eastward along the Yukon coast occurs in mid-September.

5.2 Regional Importance of Stokes Point and Phillips Bay to Birds

Nesting bird densities at Stokes Point were similar to those found elsewhere on the Yukon Coastal Plain due to the similarity in habitat. Wetlands containing the five most heavily used habitat types (Wet Sedge, Wet Sedge-Patterned Ground, Tall Shrub, Dwarf Shrub and Dwarf Shrub-Patterned Ground) were relatively evenly dispersed among the drier less productive rolling uplands throughout the Yukon Coastal Plain.

The lagoon at Stokes Point had the highest densities of moulting and fall staging ducks in the study area in 1983. However, the maximum count was only 500 birds compared to the thousands of sea ducks that have been reported in Workboat Passage and the waters adjacent Nunaluk Spit (Alexander et al. 1988). Thus, although Stokes Point lagoon had good habitat for sea ducks, it was not regionally a key area for moulting and staging sea ducks due to its small size.

Unlike the Stokes Point region, which was typical of the Yukon Coastal Plain, the area around Phillips Bay had noticeably different patterns of habitat. Delta ponds and channels, mudflats, sandspits and protected bay waters were all features of Phillips Bay. As a result,

this area was locally important to several bird species for nesting, moulting and staging.

The sandspits at Phillips Bay had two nesting colonies of Glaucous Gulls, while the river deltas supported higher densities of nesting Tundra Swans than elsewhere on the Yukon Coastal Plain. A small flock of Canada Geese reared their young on the Spring River delta in 1983, although this may not occur every year. Similarly, in 1982, a small flock of Greater White-fronted Geese congregated on the Babbage River delta to rear young (Hogg et al. 1986). Other species which nested in higher densities adjacent to Phillips Bay than elsewhere on the Yukon Coastal Plain were the Red-throated Loon, Red-necked Phalarope, Semi-palmated Sandpiper, redpoll sp. and Savannah Sparrow.

In early summer, Phillips Bay was locally an important area for moulting waterfowl. During the latter half of June, it had the highest density of nonbreeding ducks in the study area. Most were on the ponds, mudflats and channels of the Babbage and Spring river deltas. There were also small flocks of nonbreeding Tundra Swans, Greater White-fronted Geese and Brant moulting on the river deltas.

In mid-summer, delta ponds and mudflats in Phillips Bay were key areas for staging shorebirds. During the aerial survey on 2 August, almost 90% of the shorebirds seen were at Phillips Bay on the ponds, mudflats and sandspits. Similarly, over 85% of the Glaucous Gulls counted were on the sandspits and beaches at Phillips Bay.

In early September, the Babbage River delta had the highest concentration of fall staging Snow Geese in the study area. Likewise, the littoral flats at Phillips Bay had the greatest number of Brant. In other years, as many as 12000 Brant have been reported in Phillips Bay during fall migration (Barry et al. 1981). In the fall of 1983, there were also flocks of Glaucous Gulls and Arctic Terns staging on the sandspits in Phillips Bay.

LITERATURE CITED

Alexander, S.A., T.W. Barry, D.L. Dickson, H.D. Prus and K.E. Smyth. 1988. Key areas for birds in coastal regions of the Canadian Beaufort Sea - 2nd edition. Unpubl. Rep. Can. Wildl. Serv., Edmonton, Alta. 152 pp.

Alliston, W.G. 1984. A study of the numbers, distribution, habitat use and productivity of breeding waterfowl populations in the Mackenzie Delta, summer 1982. Unpubl. LGL Ltd. Rep. for B.C. Hydro, Vancouver, B.C. 201 pp.

Barry, S.J. and T.W. Barry. 1982. Sea-bird surveys in the Beaufort Sea, Amundsen Gulf and Prince of Wales Strait - 1981 season. Unpubl. Rep. Can. Wildl. Serv., Edmonton, Alta. 52 pp.

Barry, T.W. 1976. Seabirds of the southeastern Beaufort Sea: summary report. Beaufort Sea Tech. Rep. 3a. Can. Dep. Environ., Victoria, B.C. 41 pp.

Barry, T.W., S.J. Barry and B. Jacobson. 1981. Sea-bird surveys in the Beaufort Sea, Amundsen Gulf, Prince of Wales Strait and Viscount Melville Sound - 1980 season. Unpubl. Rep. Can. Wildl. Serv., Edmonton, Alta. 69 pp.

Bergman, R.D. and D.V. Derksen. 1977. Observations on Arctic and Red-throated Loons at Storkersen Point, Alaska. Arctic 30:41-51.

Black, J.E. 1972. First Yellow Wagtail nest record for Canada. Can. Field-Nat. 86:385.

Campbell, R.W. and W.C. Weber. 1973. Abundance and species composition of birds in selected areas along the pipeline route, 1972. Section 4. 42 pp. In: Environment Protection Board. Towards an environmental impact assessment of the portion of the Mackenzie gas pipeline from Alaska to Alberta. Interim Rep. 3. Appendix III, ornithology. Winnipeg, Man.

Davis, R.A. 1972. A comparative study of the use of habitat by Arctic Loons and Red-throated Loons. Unpubl. Ph.D. thesis. Univ. Western Ontario, London. 290 pp.

Derksen, D.V., T.C. Rothe and W.D. Eldridge. 1981. Use of wetland habitats by birds in the National Petroleum Reserve - Alaska. U.S. Fish and Wildl. Serv., Resour. Publ. 141. Washington, D.C. 27 pp.

Derksen, D.V. and W.D. Eldridge. 1980. Drought-displacement of pintails to the Arctic Coastal Plain, Alaska. J. Wildl. Manage. 44(1):224-229.

Dickson, D.L. 1987. Monitoring the impact of oil development on birds in the Beaufort Sea region - interim report. Unpubl. Rep. Can. Wildl. Serv., Edmonton, Alta. 74 pp.

Dickson, D.L. 1985. Bird surveys at King Point, Yukon in 1981 to assess the potential impact of development. Unpubl. Rep. Can. Wildl. Serv. Edmonton, Alta. 113 pp.

Dickson, H.L., T.W. Barry, K.J. McCormick and R.W. Prach. 1983. Areas of interest to the Canadian Wildlife Service. Unpubl. Rep. Can. Wildl. Serv., Edmonton, Alta. 222 pp.

Godfrey, W.E. 1986. The birds of Canada: revised edition. Nat. Mus. Can., Ottawa. 595 pp.

Gollop, M.A. and R.A. Davis. 1974. Autumn bird migration along the Yukon Arctic coast, July, August, September, 1972. Arctic Gas Biol. Rep. Ser. 13(3):83-162.

Hawkings, J.S., 1987. Population status of migratory waterbirds on the Yukon coastal plain and adjacent Mackenzie Delta. Technical Report Series No. 28. Can. Wildl. Serv. B.C. 65 pp.

Hayman, P., J. Marchant and T. Prater. 1986. Shorebirds - an identification guide to the waders of the world. Houghton Mifflin Co., Boston. 412 pp.

Hogg, E.H., H.L. Dickson and D.L. Dickson. 1986. Ground surveys to evaluate habitat use by birds along the Beaufort Sea coast, Yukon and Northwest Territories, 1981-1982. Can. Wildl. Serv., Edmonton, Alta. 70 pp.

Johnson, S.R. and W.J. Richardson. 1982. Waterbird migration near the Yukon and Alaskan coast of the Beaufort Sea: II: moult migration of seaducks in summer. Arctic 35(2):291-301.

Koski, W.R. 1977a. A study of the distribution and movements of Snow Geese, other geese, and Whistling Swans on the Mackenzie Delta, Yukon North Slope, and Alaskan North Slope in August and September, 1975. Arctic Gas Biol. Rep. Ser. 35(2). 54 pp.

Koski, W.R. 1977b. A study of the distribution and movements of Snow Geese, other geese, and Whistling Swans on the Mackenzie Delta, Yukon North Slope, and eastern Alaskan North Slope in August and September 1976. Unpubl. LGL Ltd. Rep. for Canadian Arctic Gas Study Ltd., Calgary, Alta. 69 pp.

MacLean, S.F. 1969. Ecological determinants of species diversity of arctic sandpipers near Barrow, Alaska. Unpubl. Ph.D. Thesis. Univ. of California, Berkeley.

Martell, A.M., D.M. Dickinson and L.M. Casselman. 1984. Wildlife of the Mackenzie Delta Region. Boreal Inst. for Northern Studies, Occ. Publ. No. 15, Univ. Alberta, Edmonton. 214 pp.

Martin, P.D. and C.S. Moitoret. 1981. Bird populations and habitat use, Canning River Delta, Alaska. Unpubl. Rep. U.S. Fish and Wildl. Serv., Fairbanks, Alaska.

McLaren, M.A. and W.G. Alliston. 1981. Summer bird populations on western Victoria Island, N.W.T., July 1980. Polar Gas Environmental Program, Toronto, Ont. 147 pp.

Mossop, D. 1974. Bird notes from arctic coast area - Yukon Game Branch patrol. Unpubl. Rep. Yukon Game Branch, Yukon. 29 pp.

Mossop, D. 1975. Waterfowl counts and observations from the coastal plain, Yukon Territory, 1975. Unpubl. Rep. Yukon Game Branch, Whitehorse, Yukon. 9 pp.

Patterson, L.A., W.R. Koski and C.E. Tull. 1977. Ground surveys of terrestrial breeding bird populations along the cross delta gas pipeline route, Yukon Territory and Northwest Territories, June and July 1975. Arctic Gas Biol. Rep. Ser. 35(4). 58 pp.

Richardson, W.J. and S.R. Johnson. 1981. Waterbird migration near the Yukon and Alaskan coast of the Beaufort Sea. I. Timing, routes and numbers in spring. Arctic 34(2):108-121.

Salter, R.E., M.A. Gollop, S.R. Johnson, W.R. Koski and C.E. Tull. 1980. Distribution and abundance of birds on the Arctic Coastal Plain of northern Yukon and adjacent Northwest Territories, 1971-1976. Can. Field-Nat. 94(3):219-238.

Schweinsburg, R.E. 1974. An ornithological study of proposed gas pipeline routes in Alaska, Yukon Territory and the Northwest Territories, 1971. Arctic Gas Biol. Rep. Ser. 10. 215 pp.

Searing, G.F., E. Kuyt, W.J. Richardson and T.W. Barry. 1975. Seabirds of the southeastern Beaufort Sea: aircraft and ground observations in 1972 and 1974. Beaufort Sea Tech. Rep. 3b. Can. Dep. Environ., Victoria, B.C. 257 pp.

Slaney, F.F. and Co. Ltd. 1974. 1972-1974 environmental program, Mackenzie Delta, N.W.T., Canada. Vol. 4, birds. Unpubl. Rep. for Imperial Oil Ltd., Gulf Oil Canada Ltd., Shell Canada Ltd., and Canadian Arctic Gas Study Ltd., Calgary, Alta. 133 pp. + figures, tables and appendices.

Tull, C.E., I.D. Thompson and P.S. Taylor. 1974. Continuing surveys of terrestrial bird populations in Northwest Territories, Yukon Territory, and Alaska: June and July 1973. Arctic Gas Biol. Rep. Ser. 29(3). 217 pp.

Vermeer, K. and G.G. Anweiler. 1975. Oil threat to aquatic birds along the Yukon coast. Wilson Bull. 87:467-480.

Wiken, E.B., D.M. Welch, G.R. Ironside and D.G. Taylor. 1981. Eco-districts of the northern Yukon. Lands Directorate, Environmental Conservation Service, Ottawa, Ont.

Wiseley, A.N., L.D. Roy and C.E. Tull. 1977. Aerial surveys of bird populations along the proposed cross delta pipeline route, Yukon Territory and Northwest Territories, June-August 1975. Arctic Gas Biol. Rep. Ser. 35(3). 45 pp.

Appendix A.

Location of the transect-lines surveyed by foot from 9 to 29 June 1983, on the Yukon Coastal Plain.

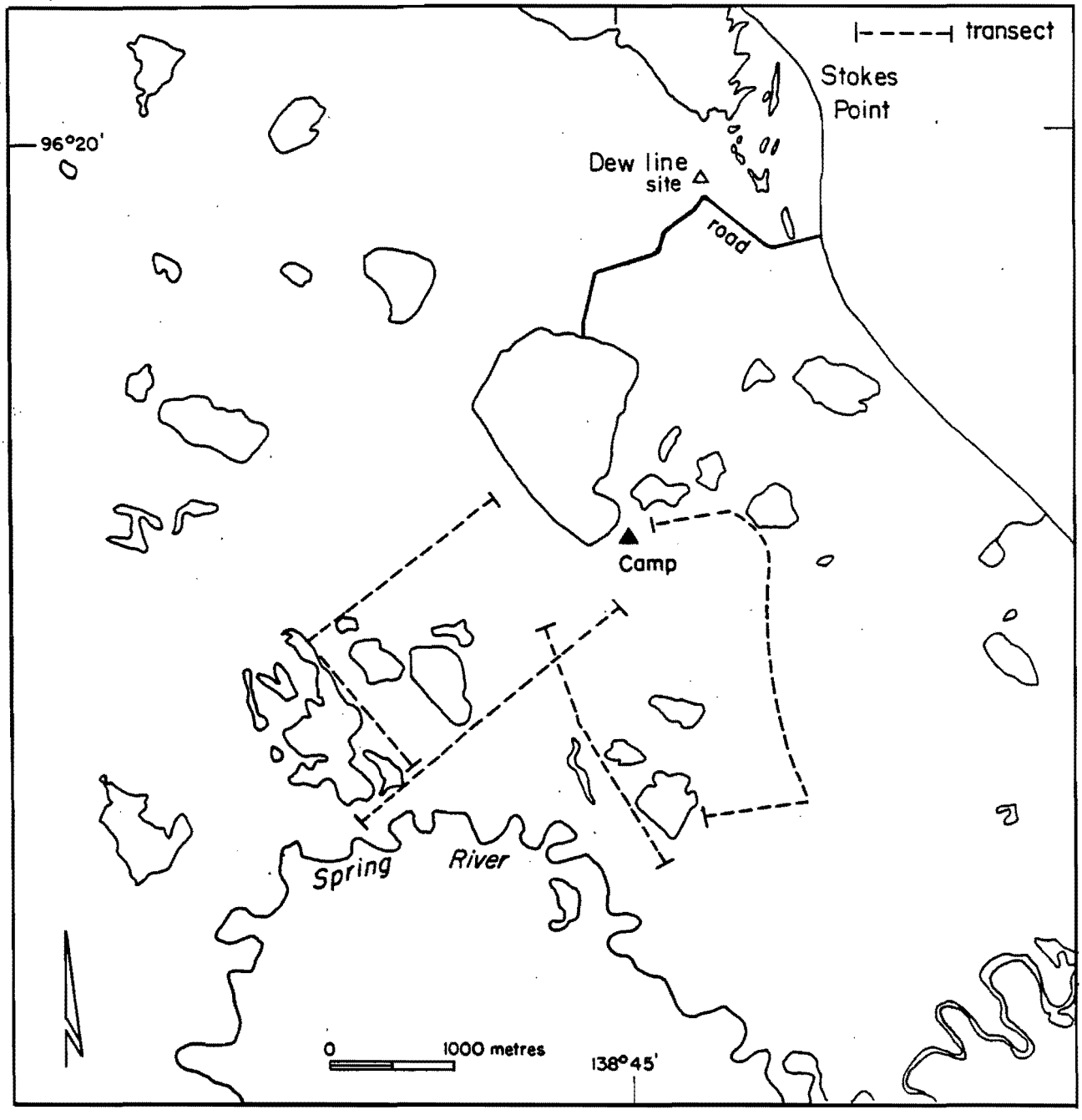

Figure A1. Ground transects conducted at Site 1 near Stokes Point, 9 to 11 June 1983.

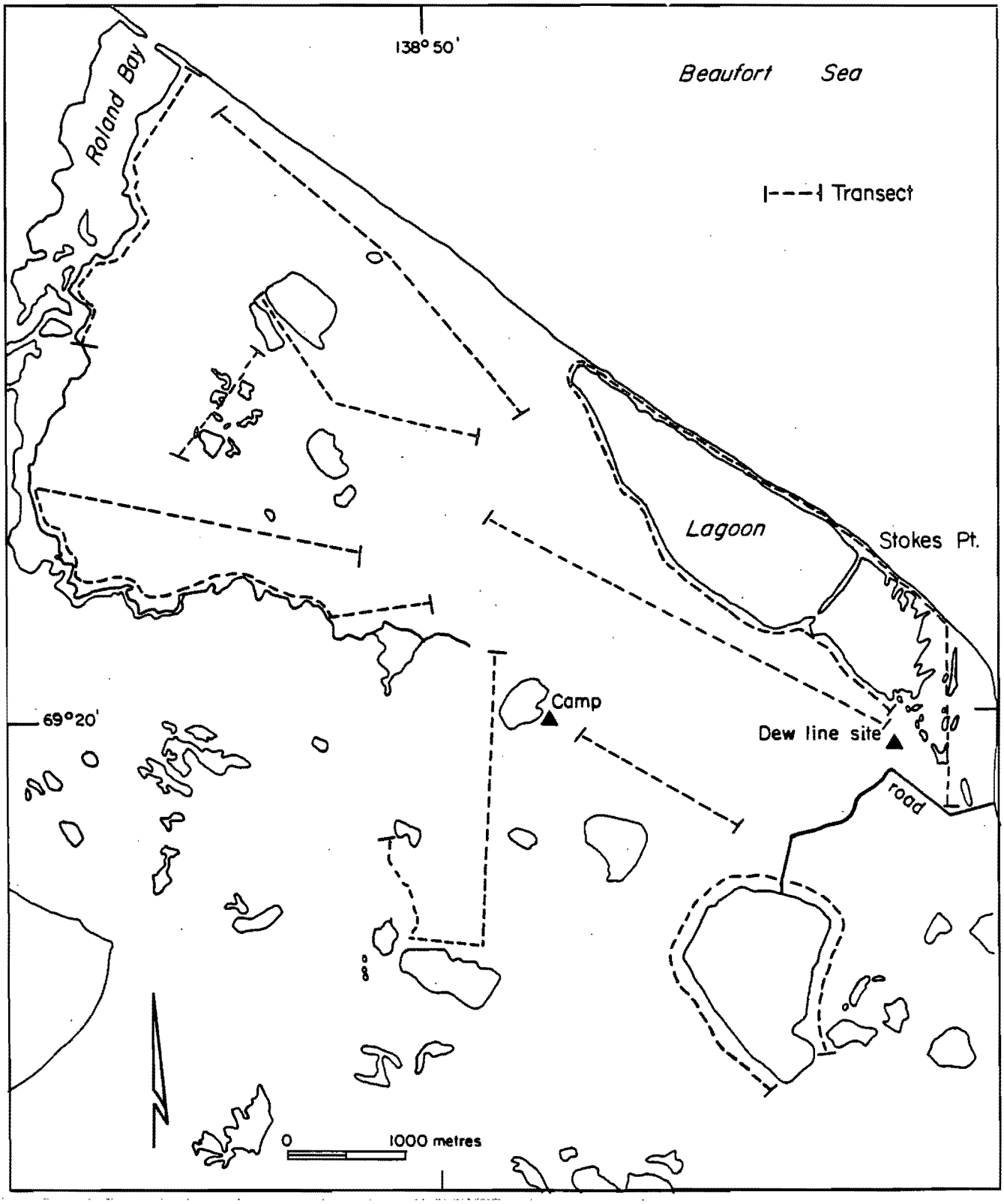

Figure A2. Ground transects conducted at Site 2 near Stokes Point, 13 to 16 June 1983.

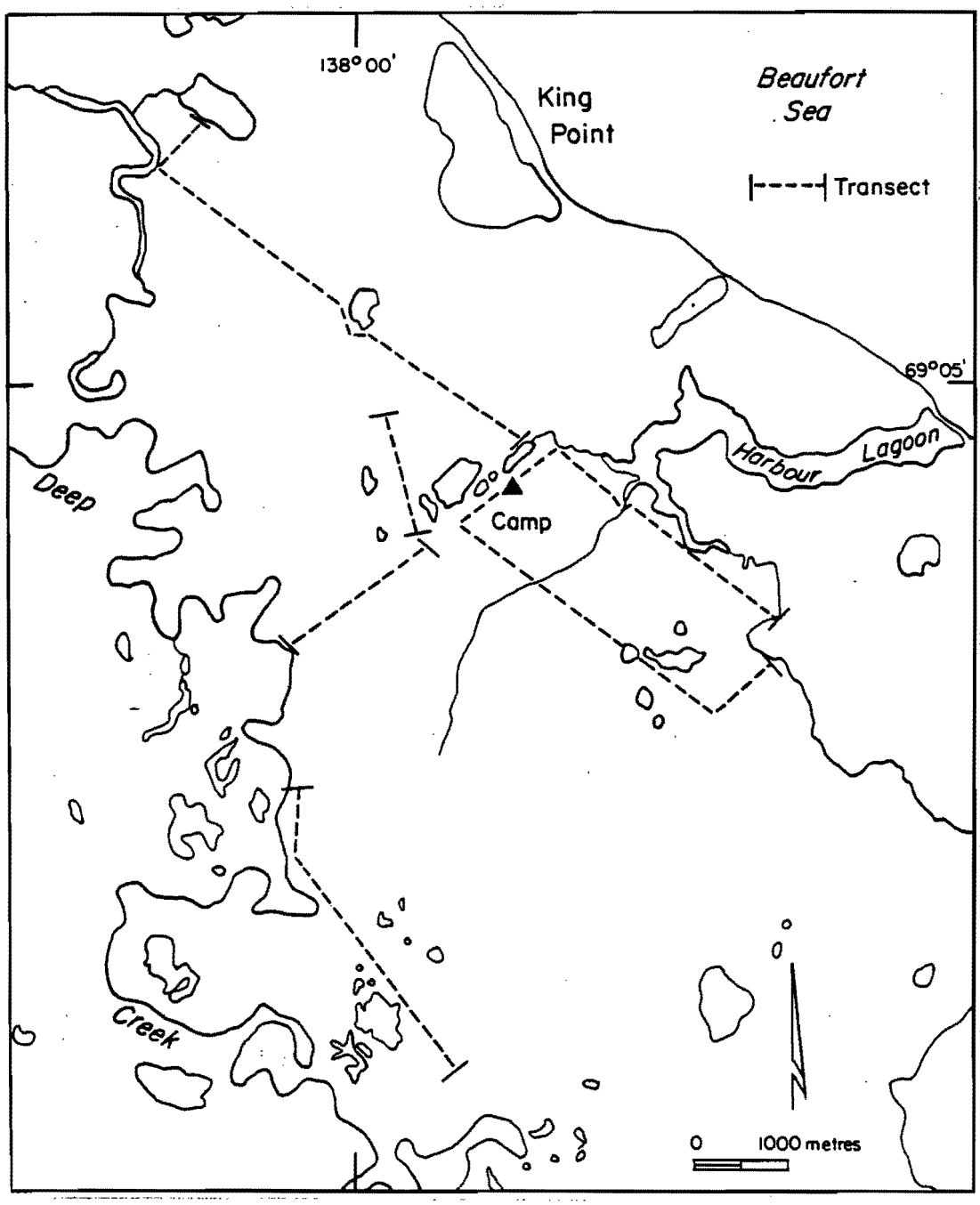

Figure A3. Ground transects conducted at Site 3a near King Point, 18 to 20 June 1983.

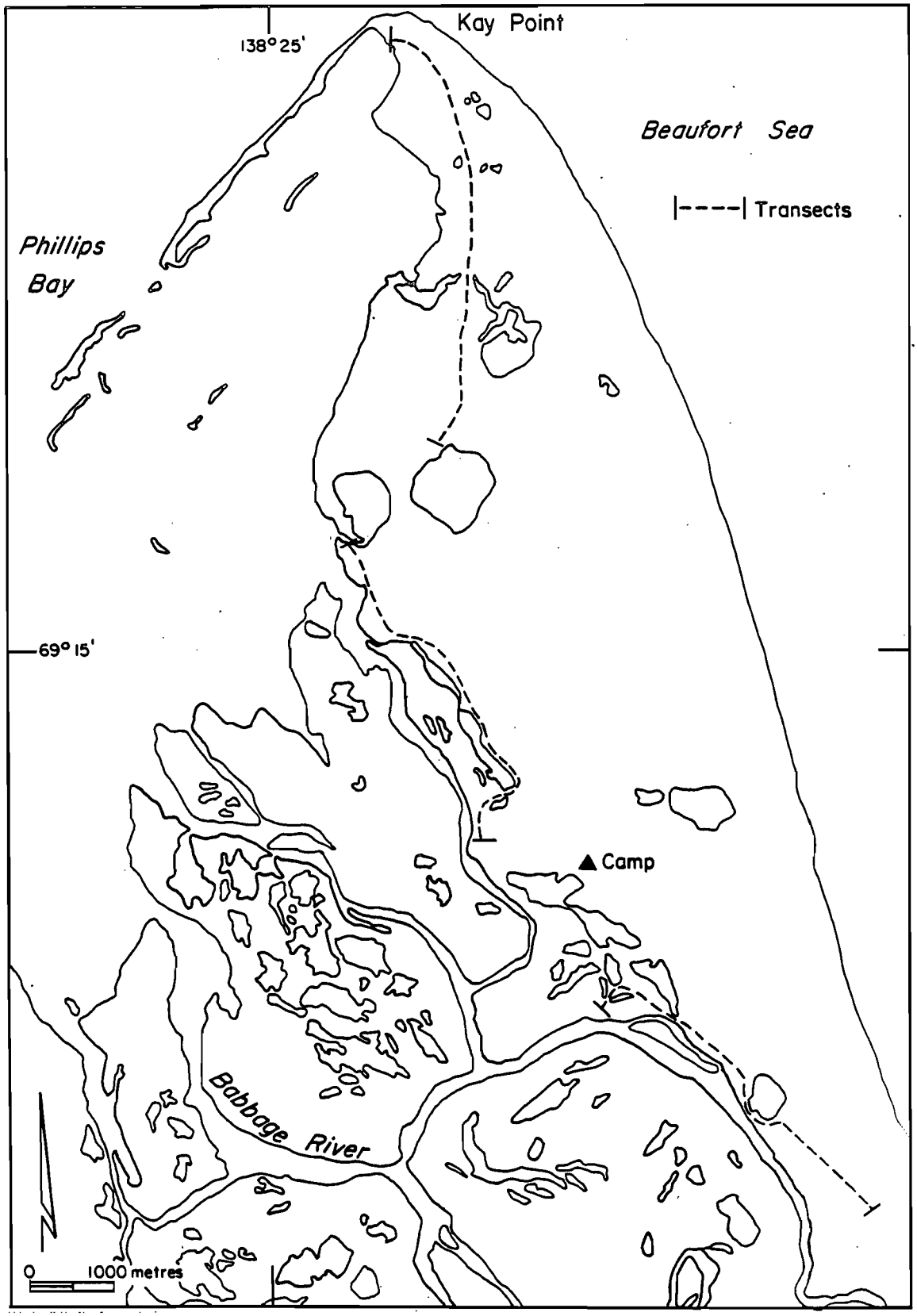

Figure A4. Ground transects conducted at Site 3b near Phillips Bay, 18 to 20 June 1983.

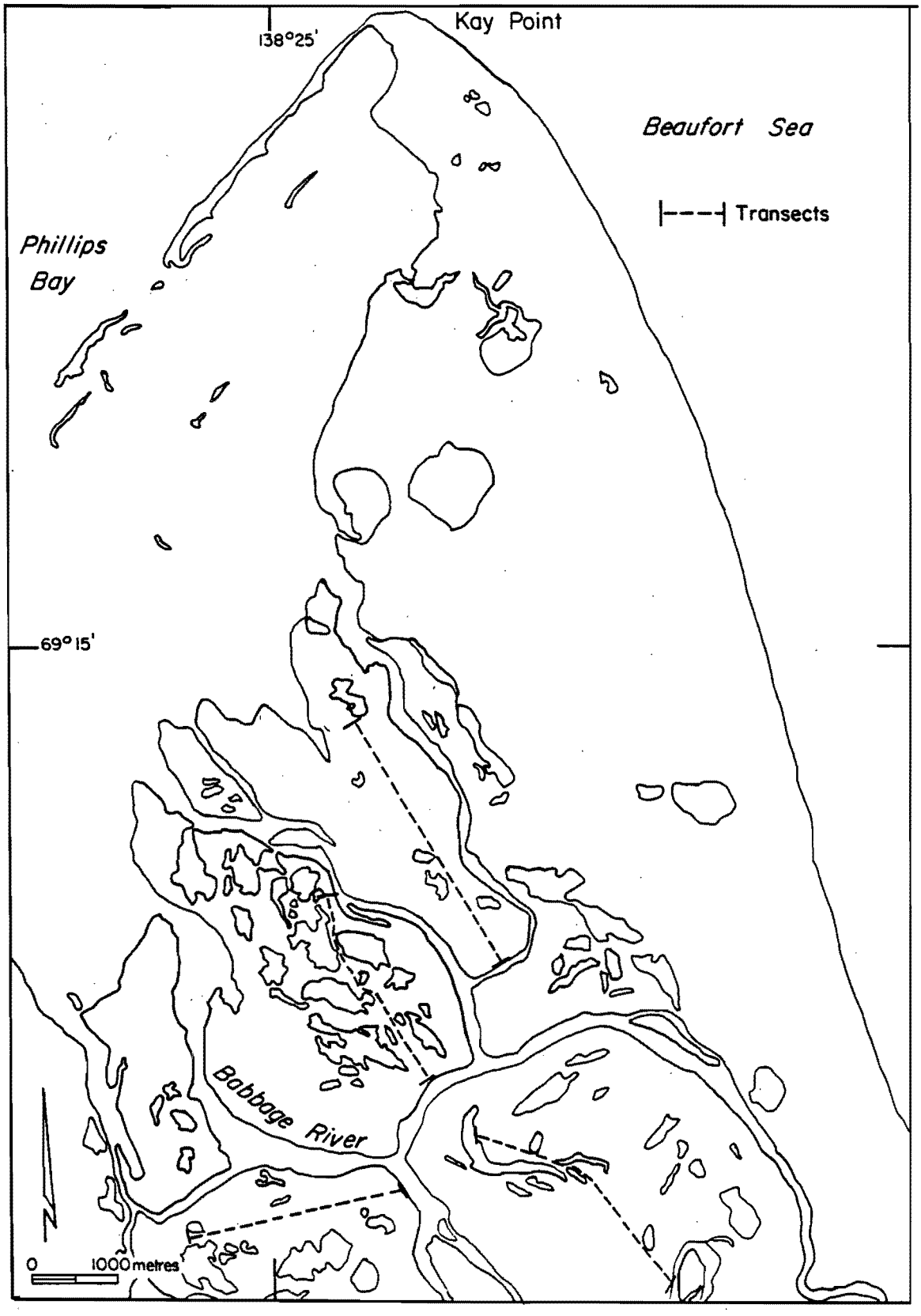

Figure A5. Ground transects conducted on the Babbage River delta, 21 and 25 June 1983.

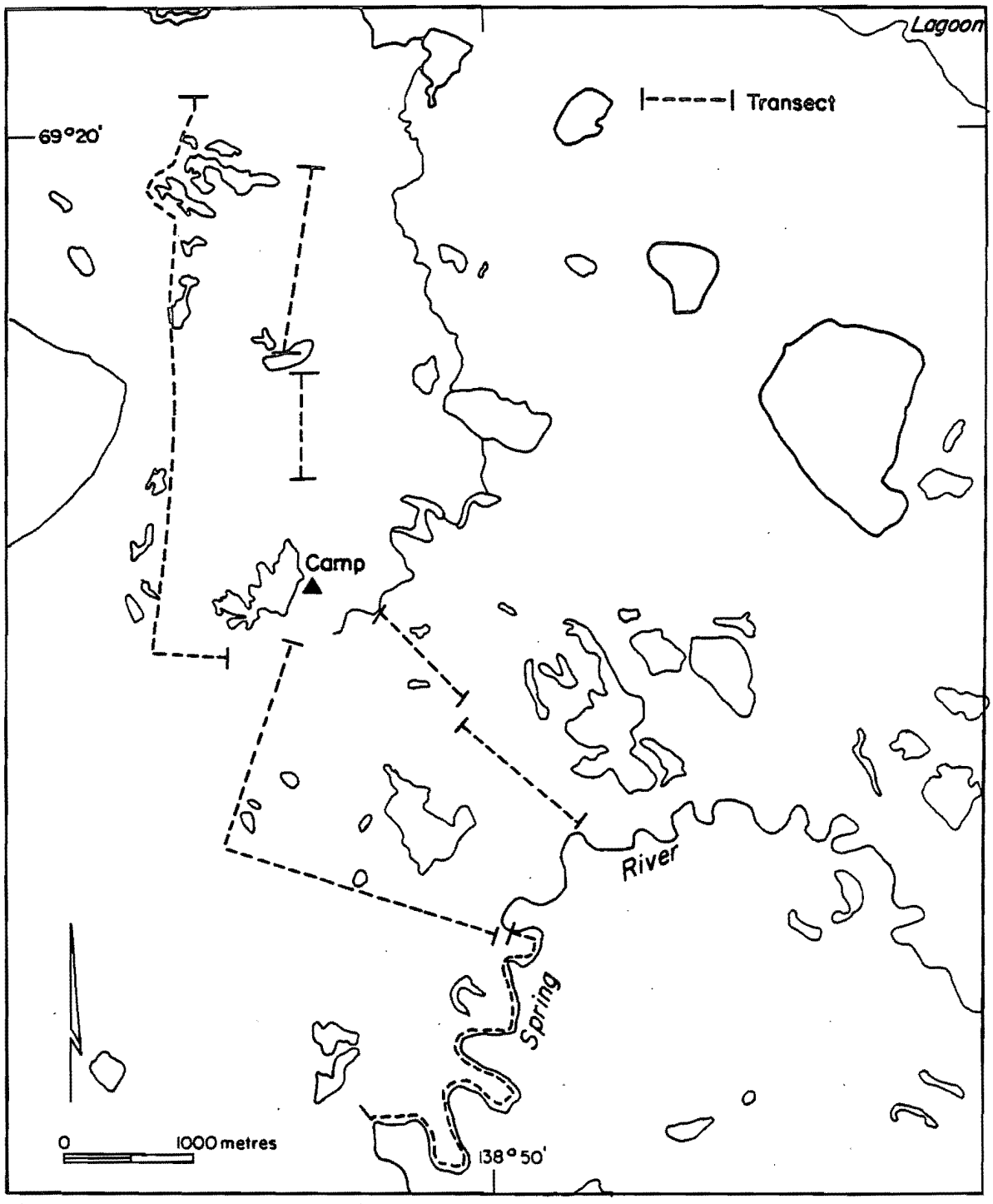

Figure A6. Ground transects conducted at Site 4a near Stokes Point, 23 to 25 and 29 June 1983.

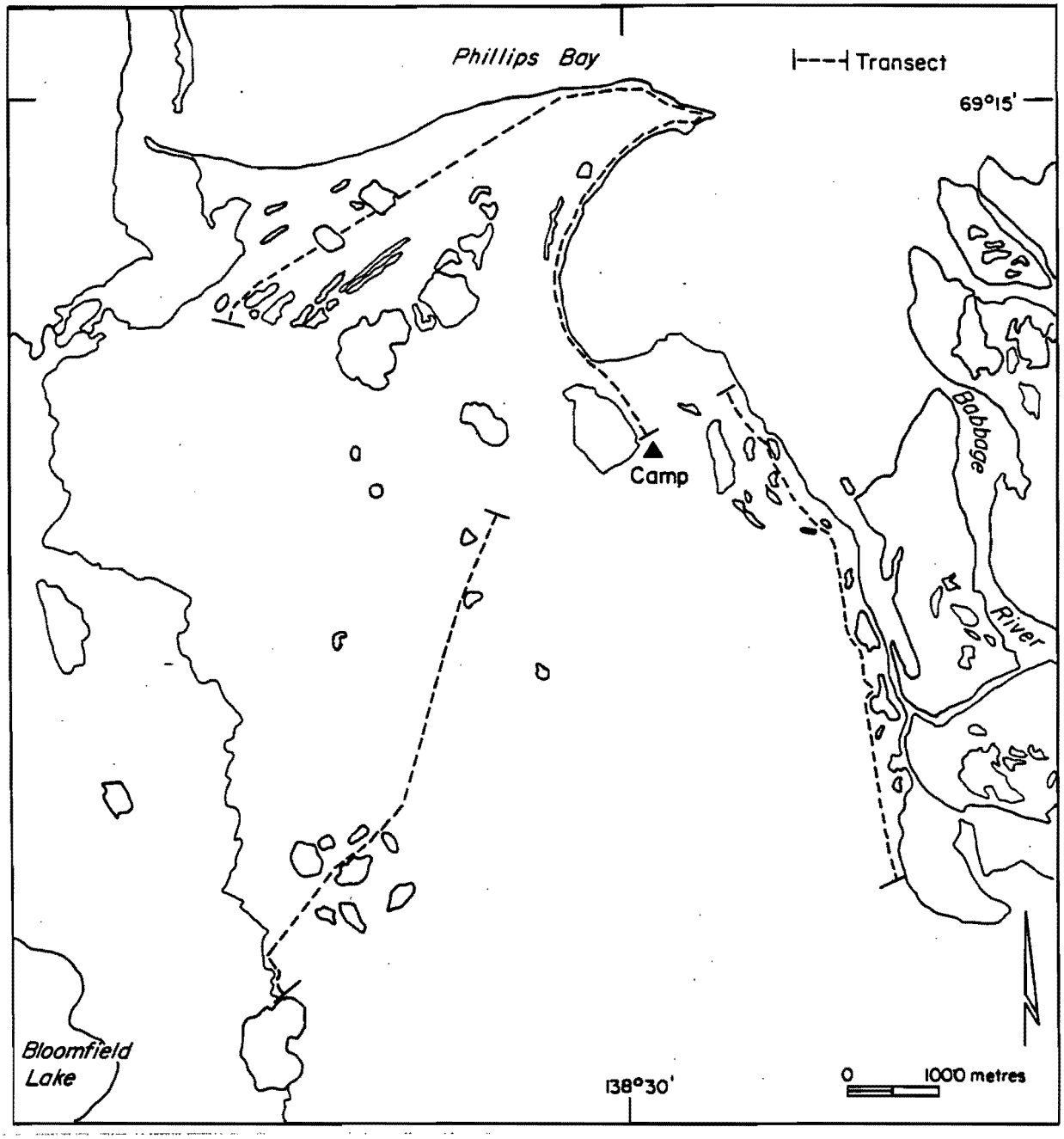

Figure A7. Ground transects conducted at Site 4b near Stokes Point, 23 to 24 June 1983.

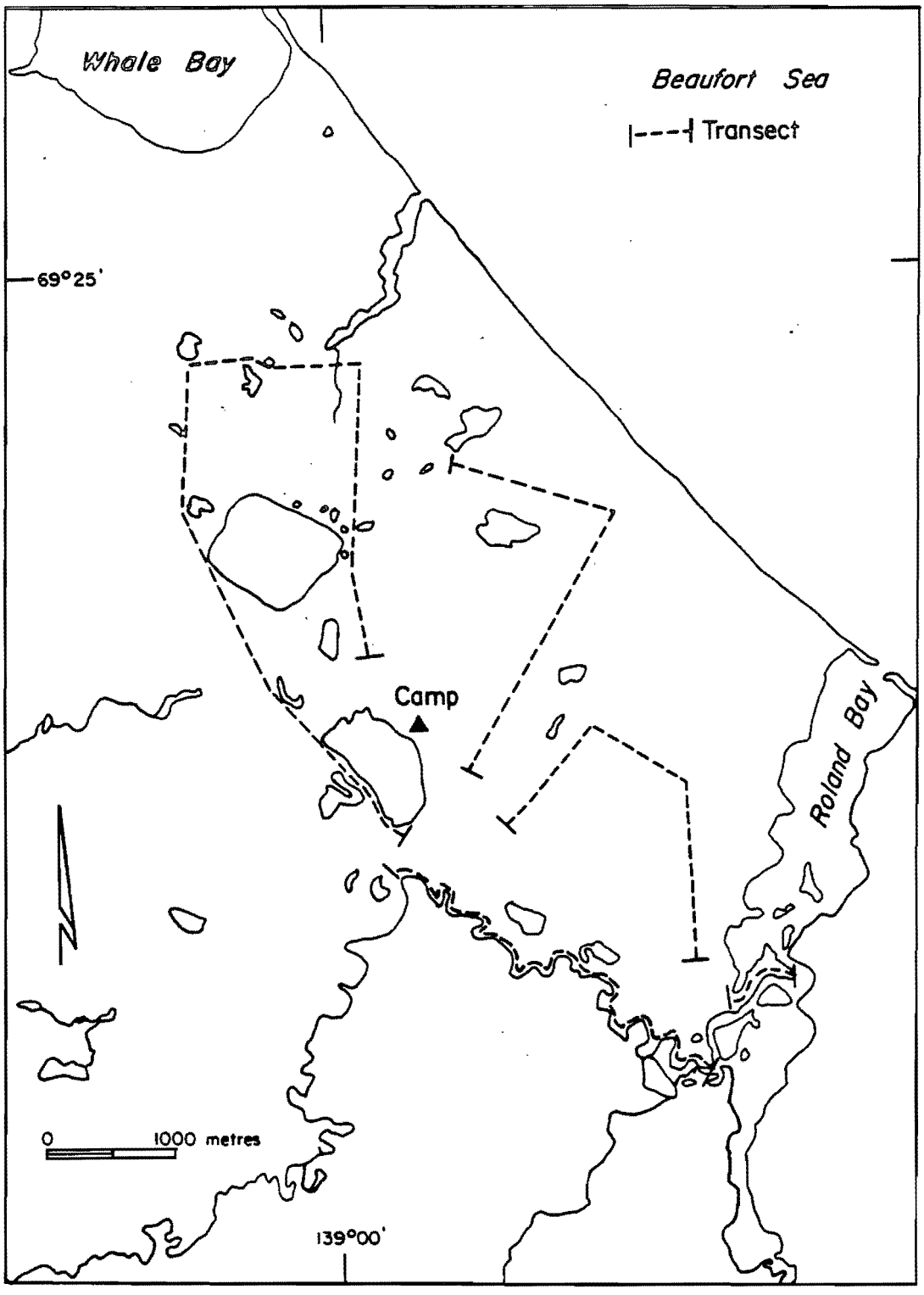

Figure A8. Ground transects conducted at Site 5a near Stokes Point, 26 to 28 June 1983.

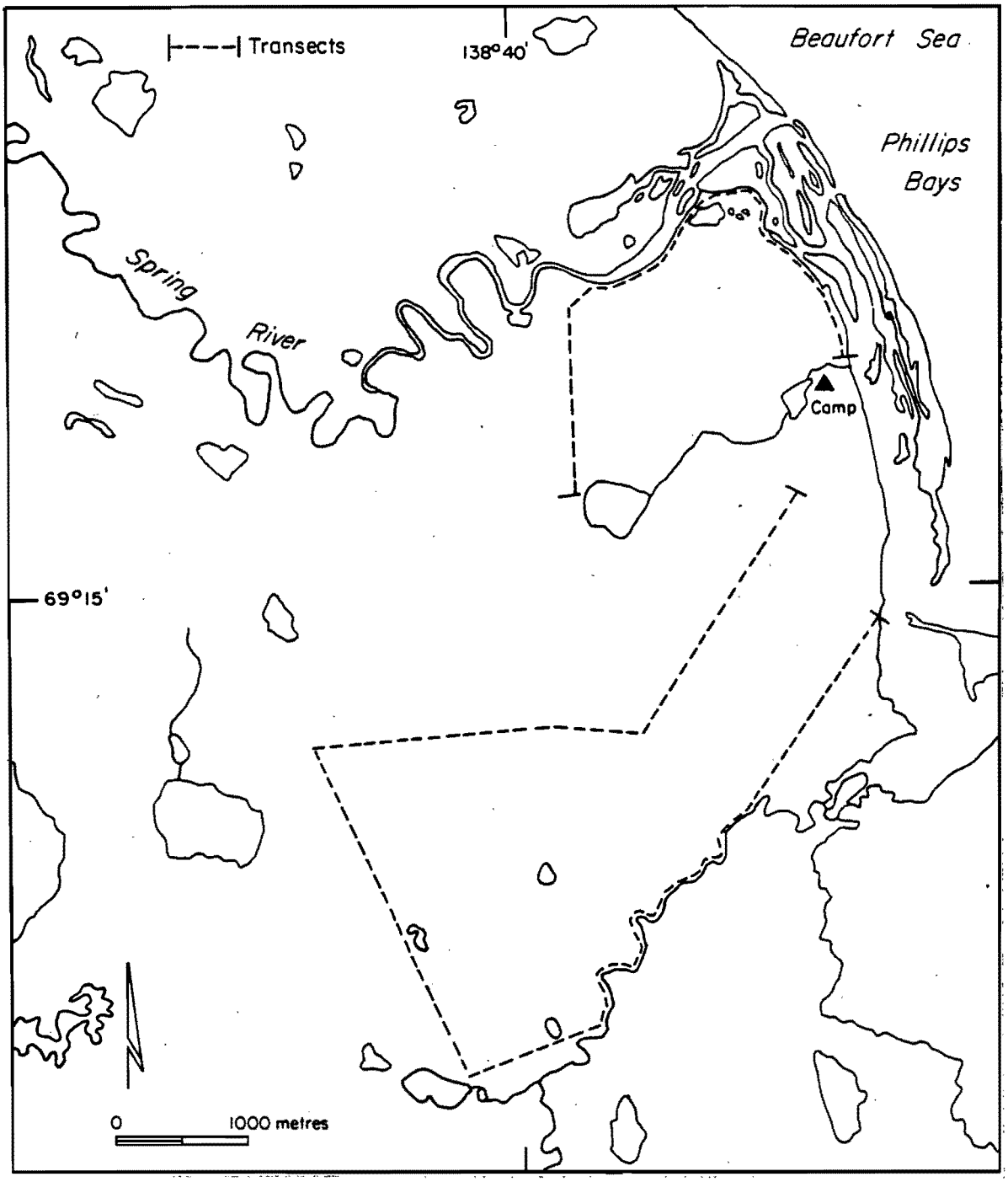

Figure A9. Ground transects conducted at Site 5b near Phillips Bay, 26 to 27 June 1983.

Appendix B.

Number of birds observed during ground surveys at each site along the Yukon Coastal Plain, 9 - 29 June 1983.

Appendix B. Number of birds observed during ground surveys at each site along the Yukon Coastal Plain, 9–29 June 1983.

Species	Number of birds																			
	Stokes Point								Phillips Bay								King Point		Total	
	Site 1		Site 2		Site 4a		Site 5a		Site 3b		Site 4b		Site 5b		Delta		Site 3a			
	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off
Pacific Loon		8	2	46		15	1	18		2	1	16	1	3	1	7		10	6	125
Red-throated Loon	2	4	4	4	3	3		2		8	2	1	6	14	2	5	2	4	21	45
Loon sp.		1		3		4		2										3		13
Tundra Swan	5		2	18		3		5		13	6	8		8	2	17		4	15	76
Canada Goose		2	2	2	2	11							1	2				2	5	19
Brant												49		18	8	23			8	90
Greater White-fronted Goose	2	9	2	18	2	2		12			3	40		3		4		9	9	97
Unidentified dark goose								5												5
Mallard							1												1	
Northern Pintail	15	52	20	191	7	35	21	60	13	77	44	39	36	21	21	381	1	18	178	874
American Wigeon		2		18		1		7		3		2				67		1		101
Northern Shoveler				2					1	4	2			4	3	2			6	12
Green-winged Teal	4	2		14		1		5	4	4	3		1			8		3	12	37
Scaup sp.	2	23		30	3	2	2	16	2	20	2	5		6		21		12	11	135
Common Eider			1																1	
Oldsquaw	9	25	52	67		10	3	18	2	12	23	62	5	12	10	70		25	104	301
Black Scoter												1								1
White-winged Scoter		1	1							57								1	1	59
Surf Scoter										31										31
Red-breasted Merganser	2	4	2	26		1	12	4		5	2	10		5				3	18	58
Duck sp.				7		20		17												44
Northern Harrier		2		3				1		1						1		1		9
Rough-legged Hawk		1		3				1				1								6
Golden Eagle		1																		1
Gyrfalcon											1								1	

Appendix B. Continued.

Species	Number of birds																			
	Stokes Point								Phillips Bay								King Point		Total	
	Site 1		Site 2		Site 4a		Site 5a		Site 3b		Site 4b		Site 5b		Delta		Site 3a			
	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off
Willow Ptarmigan	12	3		1	5								2				5	3	24	7
Rock Ptarmigan	4	3	2	6			3		2	2	2		2						15	11
Ptarmigan sp.		9		1										1						11
Sandhill Crane		1		6		3		3		4			2					1	2	18
Lesser Golden-Plover	6	8	20	46	7	8	17	9	10	9	33	14	8	6		7	8	18	109	125
Semipalmated Plover			1	4	12	1								1					13	6
Whimbrel												3		3			5	29	5	26
Hudsonian Godwit										1	6								6	1
Spotted Sandpiper						1														1
Lesser Yellowlegs					1		2												3	
Stilt Sandpiper	3	11	15	33	10	8	3	11	1	2	2	3	1	3		1	1	9	36	81
Long-billed Dowitcher	7		10	7	5	6	3	6			11	2	5				4	5	45	26
Pectoral Sandpiper	37	14	72	63	32	31	36	13	12	15	31	8	12	5	3	4	17	13	252	166
Baird's Sandpiper							2						1						3	
Semipalmated Sandpiper	12	15	38	41	20	12	25	10	29	28	27	29	10	7	4	46	2	3	167	191
Red Phalarope			1		3	4	8	11			2							1	14	16
Red-necked Phalarope	11	7	26	35	31	9	10	2	11	9	23	12	12	5	13	25	10	6	147	110
Common Snipe		12		13	2	11	1	7		6	2	8		4		4		12	5	77
Shorebird sp.			2	12				1						4			2	1	4	18
Parasitic Jaeger	1	1		22	4	7		9		5		2		1		5	3	5	8	57
Pomarine Jaeger	1	3		1														1	1	5
Long-tailed Jaeger	2	9	2	10	1	5	2	2		6		4	1	8			1	6	9	50
Jaeger sp.		1						1										2		4
Glaucous Gull		4	5	63		22	2	15		38	3	81	1	14		24		12	11	273
Herring/Thayer's Gull				3		1						2						3		9
Ring-billed Gull												1								1

Appendix B. Continued.

Species	Number of birds																			
	Stokes Point								Phillips Bay								King Point		Total	
	Site 1		Site 2		Site 4a		Site 5a		Site 3b		Site 4b		Site 5b		Delta		Site 3a			
	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off	on	off
Sabine's Gull			2															2		
Arctic Tern		21	1	49	1	18		19	2	16	15	17	4	8		4		23	23	175
Short-eared Owl		1	1	7		2		1	2	3				4		1		3	3	22
Horned Lark									1									1		
Cliff Swallow				1																1
Common Raven		4	1	24		1	1	3		1		7		3		2		2	2	47
Water Pipit						1			2		1								3	1
Yellow Wagtail	3	1			13	5							6	7					22	13
Yellow Warbler					5	1											1	1	6	2
Redpoll spp.		17	11	45	29	53	22	13	13	32	22	30	32	53	12	3	32	59	173	305
Savannah Sparrow	9	19	41	52	40	20	37	8	44	31	35	11	58	29	13	8	36	54	313	232
American Tree Sparrow	1	1		2	7	13	12	1		4	1	3	7	4		2	5	9	33	39
White-crowned Sparrow		2				1			1	2				1			3	6	4	12
Fox Sparrow		2			3	3												2	3	7
Lapland Longspur	79	60	298	167	75	44	145	51	112	63	128	41	149	58	25	14	109	90	1120	588
Smith's Longspur							1												1	
Snow Bunting			5	7					7										12	7
Passerine sp.			2														1	2	3	2
All species	229	366	644	1173	323	399	372	369	271	514	433	512	363	325	117	756	248	468	3000	4882
Distance surveyd (km)	12.4		40.65		18.49		20.20		10.32		16.22		18.68		7.96		14.95			

Appendix C.

Nests recorded during ground surveys on the Yukon Coastal Plain between Roland Bay and King Point in June, 1983.

Appendix C. Nests recorded during ground surveys on the Yukon Coastal Plain between Roland Bay and King Point in June, 1983.

Species	Number of nests/ broods	Average size		Location			Habitat
		Clutch	Brood	Stokes Point	King Point	Phillips Bay	
Red-throated Loon	2	2				x	Islet in Wet Sedge habitat; islet in pond
Pacific Loon	2	1.5		x		x	By pond in Wet Sedge habitat
Tundra Swan	5	4		x		x	Wet Sedge habitat and Tidal Flats habitat by bay or pond; on island in bay; on peninsula in lake
Greater White-fronted Goose	1	7		x			Wet Sedge - Patterned Ground habitat
Canada Goose[I]	2	?				x	Wet Sedge habitat with ponds; on island in pond
Northern Pintail	5	6.5		x			Wet Sedge - Patterned Ground habitat; on tussocky slope adjacent wetland; by pond
Greater Scaup[I]	1	?		x			Wet Sedge - Patterned Ground habitat near bay
Common Eider	1	6		x			Sandy spit amongst drift wood
Willow Ptarmigan	1	9		x			Dwarf Shrub habitat on hillside
Short-eared Owl	1	7				x	Dwarf Shrub habitat on hillside facing delta
Long-billed Dowitcher[II]	1	4		x			Wet Sedge - Patterned Ground Habitat by small lake
Semipalmated Sandpiper	2	4		x		x	Wet Sedge - Patterned Ground habitat; rolling upland near bay

Appendix C. Continued.

Species	Number of nests/ broods	Average size		Location			Habitat
		Clutch	Brood	Stokes Point	King Point	Phillips Bay	
Pectoral Sandpiper	1	4		x			Wet Sedge - Patterned Ground habitat
Red-necked Phalarope	2	4				x	Wet Sedge habitat with ponds
Lesser Golden-Plover	1	5			x		Dry Sedge habitat on slope
Parasitic Jaeger	2	2		x	x		On ridge in Wet Sedge - Patterned Ground habitat
Long-tailed Jaeger	9	2		x		x	Wet Sedge - Patterned Ground habitat; Dwarf Shrub - Patterned Ground habitat; Tussocky Tundra - Patterned Ground habitat; rolling uplands
Glaucous Gull	9	2.5		x		x	Islets in ponds; barrier islands
Arctic Tern	6	1.5		x		x	Islets in ponds in either Wet Sedge or Wet Sedge - Patterned Ground habitat
Savannah Sparrow	7	5			x	x	Wet Sedge - Patterned Ground habitat; Tussocky Tundra habitat and Shrub habitat by a creek
White-crowned Sparrow	1	5			x		Shrub habitat by a creek
Lapland Longspur[III]	43	5	4	x	x	x	Mainly Tussocky Tundra habitat, but found in nearly every type of habitat

I Unable to reach nest to record clutch size.
II Unconfirmed sighting.
III Mean date of hatch for Lapland Longspurs was June 25.

Appendix D.

Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983.

Appendix D. Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain, 21 June 1983.

Survey segment	Distance Surveyed (km)	Density (birds/km^2)														
		Pacific Loon	Red-throated Loon	Canada Goose	Brant	Greater White-fronted Goose	Northern Pintail	American Wigeon	Northern Shoveler	Green-winged Teal	Greater Scaup	Scaup sp.	Oldsquaw	White-winged Scoter	Surf Scoter	Red-breasted Merganser
Stokes Point																
Lagoon	9.4		0.5										8.0			
Roland Bay	10.6		0.2			0.2	2.8	1.2		1.6		3.3				0.2
Lakes	27.0	0.2	0.2				0.5	0.2		0.3			0.3			1.2
Streams	4.1		0.5				10.6		2.1			6.9				2.1
Spring River	15.5	0.2					0.5					0.2				0.2
Cross-country	49.7	0.2		0.1		0.1	0.4	0.5				0.6	0.6		0.1	0.1
Transect 2 km inland	25.0	0.2					0.3						0.1			
Transect 8 km inland	25.0			0.2			0.1	0.2						0.1		
Transect 14 km inland	25.0															
King Point																
Lagoon	4.2															0.6
Lakes	25.5	0.1	0.2				0.6				0.7	3.0	1.0	0.1		0.9
Babbage River	20.0							0.4		0.1		0.9		0.1		
Cross-country	8.7	0.1					0.2				0.1	1.8	0.2		0.2	
Transect 2 km inland	30.0	0.2	0.3				0.3					0.9	0.2	0.3		0.2
Transect 8 km inland	30.0	0.2					0.2	0.2				1.6	0.2			0.1
Phillips Bay																
Shoreline	41.0	0.2	0.1	0.7	0.9	0.1	2.5	0.9	0.2	0.1		0.1	0.2		2.1	1.5
Transects over delta and bay	34.2		0.1	0.1		0.1	3.1	1.5	0.1		0.1		0.5			
Transects SW of bay	26.9						0.1					0.6	0.4			

Appendix E.

Plant species recorded in each of the 13 habitat types encountered on the Yukon Coastal Plain in 1983.

Appendix E. Plant species recorded in each of the 13 habitat types encountered on the Yukon Coastal Plain in 1983.

Species	Habitat type												
	1	2	3	4	5	6	7	8	9	10	11	12	13
BETULACEAE													
Betula spp.									D				
Betula glandulosa		S		D	S	D	D	D	S		D	S	
Betula nana ssp. exilis				S					S			S	
CARYOPHYLLACEAE													
Cerastium Berringianum					S								
Melandrium affine					P								
Stellaria humifusa													P
Stellaria spp.													S
COMPOSITAE													
Petasites sp.									S				
Petasites frigidus												P	
Senecio congestus					P								
CRASSULACEAE													
Rhodiola integrifolia					S								P
CRUCIFERAE													
Cochlearia officinalis spp. arctica					P								
CYPERACEAE						D							
Carex aquatilis ssp. aquatilis				D	D			D				S	
Carex aquatilis ssp. stans				S									
Carex atrofusca				S									
Carex bigelowii												S	
Carex chordorrhiza				D	D			D				S	
Carex glareosa					S								
Carex microchaeta				S	S								
Carex misandra					S								
Carex norvegica				S									
Carex physocarpa				S	S			D					
Carex ramenskii					S								
Carex rariflora				S	P								
Carex rotundata				S									
Carex saxatilis ssp. taxa				S									
Carex subspathacea					S								D
Carex ursina					S								
Carex williamsii				S									
Eriophorum spp.	D	S								D	D		
Eriophorum angustifolium ssp. subarcticum				S	P								
Eriophorum russeolum				S	D				S			S	
Eriophorum vaginatum ssp. vaginatum				D					D	D		D	

Species	Habitat type 1	2	3	4	5	6	7	8	9	10	11	12	13
EMPETRACEAE													
Empetrum nigrum		S		S		S	S		S	S	S	S	
EQUISETACEAE													
Equisetum spp.										P			
ERICACEAE													
Arctostaphylos rubra				P									
Arctostaphylos uva-ursi									P				
Cassiope tetragona	S	S		S	P	S	D	S	D		S	S	
Ledum decumbens	S	S		D	S	S	S	D	S		D	S	
Vaccinium vitis-idaea	S	S		S	S	S	S	S	D	S	D	D	
GRAMINEAE			D				D						
Alopecurus alpinus					S								
Arctagrostis latifolia				S	S			P				S	
Arctagrostis litoralis				P									
Arctophila fulva				S	S								
Calamagrostis deschampsioides				S	S								P
Deschampsia caespitosa													P
Dupontia fisheri				P	S								P
Elymus arenarius ssp. mollis					S								D
Festuca brachyphylla					P								
Hierchloe alpina				S								S	
Hierochloe pauciflora					S								
Poa arctica				S	S							P	
Puccinellia andersonii													S
Puccinellia angustata					S								
Puccinellia phryganoides													P
Trisetum spicatum					S								
HALORAGACEAE													
Hippuris cf. tetraphylla					S								P
Hippuris cf. vulgaris					S								
JUNCACEAE													
Juncus castaneus				P	P								
Juncus triglumis ssp. triglumis				P									
Luzula nivalis												P	
Luzula nivalis var. latifolia					P								
Luzula parviflora				S									
LEGUMINOSAE													
Lupinus arcticus												P	
Oxytropis maydelliana													P

Species	Habitat type 1	2	3	4	5	6	7	8	9	10	11	12	13
LILIACEAE													
Tofieldia pusilla				P									
POLYGONACEAE													
Polygonum viviparum					P				P			P	
Rumex arcticus													P
PRIMULACEAE													
Pyrola spp.				P				P					
RANUNCULACEAE													
Aconitum spp.				P									
Caltha palustris var. palustris					P								
Ranunculus gmelini ssp. gmelini					P								
Ranunculus lapponicus				P					P			P	
Ranunculus pallasii				P	P							P	
ROSACEAE													
Dryas integrifolia		D			P		S		S			S	
Potentilla egedii													D
Potentilla palustris				P	P							P	
Rubus chamaemorus				S	S			S				P	
SALICACEAE													
Salix spp.	D	D	D			S	D	S	D	S	S		
Salix arctica				S	S				S			S	
Salix fuscescens				S							P		
Salix chamissonis				S	S								
Salix lanata ssp. richardsonii				S	P								
Salix ovalifolia var. arctolitoralis													S
Salix ovalifolia var. ovalifolia				S	S								S
Salix planifolia ssp. pulchra				D	D			D				D	
Salix reticulata					S								
SAXIFRAGACEAE													
Chrysosplenium tetrandrum					P								
Saxafraga spp.									P				
Saxifraga cernua					P								
Saxifraga hirculus					P								
SCROPHULARIACEAE													
												P	
Pedicularis labrodorica				P	P								

Species	Habitat type												
	1	2	3	4	5	6	7	8	9	10	11	12	13
VALERIANACEAE													
Valeriana capitata												P	

D Recorded as a dominant species (most common species in habitat: represents a significant portion >25% of the vegetation cover)
S Recorded as a subdominant species (moderately common species representing 5 to 24% of vegetation cover)
P Recorded as present (not dominant or subdominant)

Habitat types:

1 = Tall Shrub *
2 = Heath *
3 = Wet Dwarf Shrub *
4 = Wet Sedge-Patterned Ground
5 = Wet Sedge
6 = Dwarf Shrub-Patterned Ground *
7 = Dwarf Shrub *
8 = Dry sedge *
9 = Graminoid/Dwarf Shrub
10 = Tussocky tundra-Patterned Ground *
11 = Tussocky tundra
12 = Graminoid/Dwarf Shrub-Patterned Ground
13 = Tidal flats

* These habitats were only accessed in the spring; therefore data on vascular plant species is limited

Appendix F.

Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain on 2 and 16 August 1983.

Appendix F1. Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain, 2 August 1983.

Survey segment	Distance surveyed (km)	Density (birds/km^2)									
		Pacific Loon	Red-throated Loon	Canada Goose	Northern Pintail	American Wigeon	Green-winged Teal	Scaup sp.	Old-squaw	Surf Scoter	Red-breasted Merganser
Stokes Point											
Lagoon	9.4	0.3						13.8	25.3		
Roland Bay	10.6	0.7			2.8						
Lakes	27.0	1.1	0.1					1.8	0.3		0.1
Streams	4.1				1.8						
Spring River	15.5										
Cross-country	49.7	0.2	*	1.4	2.0						
Transect 2 km inland	25.0	0.2	0.3					1.0	0.2		
Transect 8 km inland	25.0	0.2	0.2								
Transect 14 km inland	25.0										
King Point											
Lagoon	4.2								10.7		1.8
Lakes	25.5	0.5			0.6			1.7			0.1
Deep Creek	20.0										
Cross-country	8.7		0.3		0.3						
Transect 2 km inland	30.0	0.4	0.8			0.2		1.3	0.1		
Transect 8 km inland	30.0	0.1			0.2	0.4	0.2				
Phillips Bay											
Shoreline	41.0	0.2	1.2		1.3	0.1	0.1		1.1	1.2	
Transects	59.5	0.4	0.1		1.2	0.1			1.3	0.3	

* Refers to densities $\leq$0.05 birds/km^2.

Appendix F2. Density of loon, goose and duck species observed during helicopter surveys along the Yukon Coastal Plain, 16 August 1983.

Survey segment	Distance surveyed (km)	Density (birds/km^2)[I]							
		Pacific Loon	Red-throated Loon	Brant	Northern Pintail	Scaup sp.	Oldsquaw	Surf Scoter	Scoter sp.
Stokes Point lagoon	5.0		2.0	2.0	6.5	1.0	75.0		
Stokes Point to Phillips Bay along coast	21.0	0.4	0.4				1.2	14.5	4.4
King Point lagoon	2.0						52.5		
King Point to Shingle Point along coast	24.0	0.6						4.5	
Shingle Point spit	5.0		2.0						

[I]Birds not identified to species have been excluded from the table.

Appendix G.

Density of loon, goose and duck species observed during fixed-wing aircraft surveys along the Yukon Coastal Plain, 26 August, 1 and 7 September, 1983.

Appendix G1. Density of loon, goose and duck species observed during fixed-wing aircraft surveys along the Yukon Coastal Plain, 26 August 1983.

Site	Distance surveyed (km)	Density (birds/km^2)														
		Pacific Loon	Red-throated Loon	Brant	Snow Goose	Dark Goose	Northern Pintail	Green-winged Teal	Scaup sp.	Common Goldeneye	Eider sp.	Oldsquaw	White-winged Scoter	Surf Scoter	Scoter sp.	Red-breasted Merganser
Survey along coast at 30 m asl																
West Channel to Walking River	62.4	0.1	0.1	1.4	1.4	5.2	1.5									
Escape Reef and Shingle Point spit	11.2															
Shingle Point to Kay Point	45.6	0.1	0.1									0.2		1.9	1.9	
King Point lagoon	4.0											3.8				
Babbage River delta	35.2		0.1			2.1										
Phillips Bay-shoreline	28.0	0.2	0.5	9.4	7.1	0.2	1.7	0.2				0.9				2.2
Phillips Bay-spit at Kay Point	4.0											15.0				
Phillips Bay-offshore	17.6		0.1												7.8	
Spring River and lowlands	9.6		0.5			6.5		0.5								
Spring River to Workboat Passage	25.6		0.7	11.5		0.5								1.2	2.6	
Stokes Point lagoon	9.6			11.7			0.3		79.2		2.6	92.4				
Roland Bay	8.8			2.3		1.7	0.8									
Whale Bay	7.2			74.6	76.4				24.3						6.2	
Workboat Passage	37.6	0.1							2.3	0.1		32.2	0.4	2.6	8.8	0.4
Thetis Bay	15.2															
Nunaluk Spit	60.8	0.3		11.7	25.5		0.2				2.2	1.4	0.3		1.2	1.5
Survey inland 8 km at 150 m agl																
Firth River to Babbage River	44.8															
Babbage River to Blow River	69.6															
West side of Mackenzie Delta	33.6					2.1										0.2

Appendix G2. Density of loon, goose and duck species observed during fixed-wing aircraft surveys along the Yukon Coastal Plain, 1 September 1983.

Site	Distance surveyed (km)	Density (birds/km^2)																
		Common Loon	Pacific Loon	Red-throated Loon	Brant	Greater White-fronted Goose	Snow Goose	Dark Goose	Northern Pintail	Green-winged Teal	Scaup sp.	Eider sp.	Oldsquaw	White-winged Scoter	Surf Scoter	Scoter sp.	Red-breasted Merganser
Survey along coast at 30 m asl																		
West Channel to Walking River	62.4			0.2	4.3	1.4		31.8	1.8		0.2		0.6				
Escape Reef and Shingle Point spit	11.2			0.9				0.7			1.6						
Shingle Point to Kay Point	45.6		0.2	0.9	0.5		5.8	9.7	1.0				0.8			8.4	0.1
King Point lagoon	4.0	0.6											22.5				
Babbage River delta	35.2				3.9	1.8	35.2	30.2	1.5		0.6		0.1				1.2
Phillips Bay-shoreline	28.0	0.3	0.3	0.3	9.4		0.7	7.5	0.3		3.4		3.2				1.4
Phillips Bay-spit at Kay Point	4.0			2.5									0.6				19.4
Phillips Bay-offshore	17.6		0.3	0.7									0.6				3.3
Spring River and lowlands	9.6			0.5					1.8								
Spring River to Workboat Passage	25.6	1.2	0.4	0.8	4.4	0.5					1.3	1.0	5.0	5.7	2.8	13.9	
Stokes Point lagoon	9.6		0.8	0.5	1.3			19.5			67.4		47.9				2.3
Roland Bay	8.8			0.3		45.2							0.3				
Whale Bay	7.2						5.2		0.7		8.7		12.2				
Workboat Passage	37.6	0.1	0.3					1.3			2.7	1.0	27.2	0.6	0.2	3.7	2.5
Thetis Bay	15.2			0.6								2.8	6.1	1.2	1.6	22.7	1.5
Nunaluk Spit	60.8	*	0.2	0.2	4.7		0.2	6.3	0.9	0.5	1.3	2.2	9.1			*	0.3
Survey inland 8 km at 150 m agl																	
Firth River to Babbage River	44.8						2.7	3.7									
Babbage River to Blow River	69.6					0.2	0.7	3.8									
West side of Mackenzie Delta	33.6							0.5									

* Refers to densities $\leq$ 0.05 birds/km2.

Appendix G3. Density of loon, goose and duck species observed during fixed-wing aircraft surveys along the Yukon Coastal Plain, 7 September 1983.

Site	Distance surveyed (km)	Density (birds/km^2)																		
		Yellow-bellied Loon	Common Loon	Pacific Loon	Red-throated Loon	Brant	Greater White-fronted Goose	Snow Goose	Dark Goose	Northern Pintail	American Wigeon	Green-winged Teal	Scaup sp.	Harlequin Duck	Eider sp.	Oldsquaw	White-winged Scoter	Surf Scoter	Scoter sp.	Red-breasted Merganser
Survey along coast at 30 m asl																				
West Channel to Walking River	62.4			0.1		2.2	2.6	0.3	6.0	0.3	1.2	*	1.0							
Escape Reef and Shingle Point spit	11.2					0.9														
Shingle Point to Kay Point	45.6			0.1	0.2	1.6		15.5	1.1							*	0.3	0.6	0.8	
King Point lagoon	4.0							2.5								9.4				
Babbage River delta	35.2				0.1	1.8	1.5	107.3	18.0	0.8			0.7							
Phillips Bay-shoreline	28.0			0.6		36.4	2.2	27.7	19.7	1.2						0.9				2.7
Phillips Bay-spit at Kay Point	4.0		0.6	2.5												2.5				8.8
Phillips Bay-offshore	17.6	0.3			0.3			3.6							0.1		5.7	0.7	16.3	
Spring River and lowlands	9.6						3.9		5.5											
Spring River to Workboat Passage	25.6					2.9		8.7	3.4				2.6			1.4	0.8	0.7	7.0	0.9
Stokes Point lagoon	9.6		0.8	0.3	0.8			3.1					49.7			27.3				
Roland Bay	8.8				0.9			7.1	9.9	2.0						0.8				2.0
Whale Bay	7.2				0.7								0.7							
Workboat Passage	37.6					2.3		0.3					0.3	0.6		5.2	0.8	0.1		4.0
Thetis Bay	15.2				0.2	1.2		5.6										1.0	0.5	2.0
Nunaluk Spit	60.8			*	*	0.6		2.9	1.4	1.9			0.6		0.9	5.0		0.2	0.6	2.2
Survey inland 8 km at 150 m agl																				
Firth River to Babbage River	44.8							14.8	1.6											
Babbage River to Blow River	69.6							79.6	2.5											
West side of Mackenzie Delta	33.6							4.5												

* Refers to densities $\leq$ 0.05 birds/km^2.

Appendix H.

Daily abundance and habitat preferences of birds at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

Appendix H1. Number of birds observed each day during ground surveys at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

	Number of birds												
	August						August				September		
Species	10	11	12	13	14	15	28	29	30	31	1	2	Total
Common Loon												1	1
Pacific Loon	8	7	7	14	8	5	2	8	4	5	8	10	86
Red-throated Loon	10	18	14	21	10	13	10	9	9	6	19	1	140
Loon sp.	16	8	18	18	6	9	33	32	24	31	39	13	247
Tundra Swan							26	2	4	6	2	4	44
Canada Goose										70			70
Brant				4	4	96	9	28	12	592	87	1643	2475
Greater White-fronted Goose							32	63		460	9	5	569
Dark goose							66		8	410	202	60	746
Snow Goose								12				18	30
Mallard				1									1
Northern Pintail	54	47	21	32	23	27	20	16	1	8	7	1	257
American Wigeon			2	13		2							17
Northern Shoveler					2	2							4
Green-winged Teal	1		5	2	5			1			16		30
Unidentified dabbler			8										8
Greater Scaup					4								4
Scaup sp.			5		16	8		20		58	53	42	202
Common Eider	13	12		3		4							32
King Eider		2											2
Oldsquaw	210	253	139	498	239	213	55	79	68	55	80	104	1993
White-winged Scoter	2		2			40							44
Surf Scoter	32	3		11	17	29	6	26	9				133
Scoter sp.	46	2				103	46	30	2			28	257
Red-breasted Merganser									9	9	9		27
Unidentified diver	230		122	7	28	158	22		17		14		598
Unidentified duck	1	31	167	19	27	1	2	20	12	50	158	97	585

Appendix H1. Continued.

Species	Number of birds												
	August						August				September		
	10	11	12	13	14	15	28	29	30	31	1	2	Total
Northern Harrier				1		1	1						3
Rough-legged Hawk			1		1								2
Merlin											1		1
Sandhill Crane												7	7
Lesser Golden-Plover		2		2		3							7
Black-bellied Plover							1	10	4	5	14	2	36
Semipalmated Plover		3											3
Plover sp.										4			4
Spotted Sandpiper								1					1
Lesser Yellowlegs				1									1
Stilt Sandpiper		1											1
Long-billed Dowitcher	2	7	4	12			116	76	16	146	14		393
Ruddy Turnstone	4	6	4	1	2	7						2	26
Pectoral Sandpiper	10	12	1	10	22	52	14	117	4	34	5		281
Dunlin	2	2	1	1	1								7
Sanderling	1	1	1	2	6	8	6	23	5	40	48	23	164
Baird's Sandpiper		1		1	1	5							8
Semipalmated Sandpiper	36	12	2	4	2	10							66
Red-necked Phalarope	130	40	4	98	106	33	7		1				419
Unidentified shorebird	84	29	18	23	15	76	46	223	5	21	57	4	601
Parasitic Jaeger		1	1	2			2	2			1		9
Long-tailed Jaeger	2		1	1									4
Jaeger sp.							1					1	2
Glaucous Gull	8	10	6	6	9	14	29	42	18	21	14	46	223
Arctic Tern	36	49	76	55	80	58				11			365
Black Guillemot				1									1
Short-eared Owl	2	1		1	1	2		1			1		9
Bank Swallow		1											1

Appendix H1. Continued.

Species	Number of birds												
	August						August				September		
	10	11	12	13	14	15	28	29	30	31	1	2	Total
Common Raven			1									1	2
Water Pipit				1									1
Savannah Sparrow	3	1			3		1	1					9
Lapland Longspur	1176	1252	447	587	484	89	112	81	7	472	6	47	4760
Smith's Longspur				1									1
Snow Bunting	4	9	12	4	2	13	13	28	22	10	9	19	145
Unidentified passerine	3				17		23		4		6		53
Total	2126	1823	1090	1458	1141	1081	715	951	265	2524	879	2179	16218

Appendix H2. Number of birds recorded in each type of habitat surveyed at Stokes Point from 10 to 15 August and from 28 August to 2 September 1983.

Species	Number of birds				
	Lowland with ponds	Lagoon	Spit and beach	Ocean	Total
Common Loon				1	1
Pacific Loon	1	6	2	77	86
Red-throated Loon	67	13	1	59	140
Loon sp.	38	22		187	247
Tundra Swan	17	19		8	44
Canada Goose	70				70
Brant	317	74	310	1774	2475
Greater White-fronted Goose	455	34		80	569
Dark goose	335	60	50	301	746
Snow Goose		23		7	30
Mallard		1			1
Northern Pintail	218	29	7	3	257
American Wigeon	9	8			17
Northern Shoveler	4				4
Green-winged Teal	12	12	6		30
Unidentified dabbler	8				8
Greater Scaup		4			4
Scaup sp.	4	191		7	202
Common Eider		20		12	32
King Eider				2	2
Oldsquaw	60	1753	33	147	1993
White-winged Scoter	2			42	44
Surf Scoter		3		130	133
Scoter sp.				257	257
Red-breasted Merganser	27				27
Unidentified diver		448		150	598
Unidentified duck	27	320	1	237	585
Northern Harrier	3				3
Rough-legged Hawk		1	1		2
Merlin		1			1
Sandhill Crane		7			7
Lesser Golden-Plover	3		4		7
Black-bellied Plover	19	11	6		36
Semipalmated Plover	2		1		3
Plover sp.			4		4
Spotted Sandpiper			1		1
Lesser Yellowlegs	1				1
Stilt Sandpiper			1		1
Long-billed Dowitcher	351	26	12	4	393

Appendix H2. Continued.

Species	Number of birds				
	Lowland with ponds	Lagoon	Spit and beach	Ocean	Total
Ruddy Turnstone	4	8	13	1	26
Pectoral Sandpiper	167	44	19	51	281
Dunlin	5		2		7
Sanderling	1	23	102	38	164
Baird's Sandpiper	4		4		8
Semipalmated Sandpiper	36		23	7	66
Red-necked Phalarope	87	73	13	246	419
Unidentified shorebird	103	241	46	211	601
Parasitic Jaeger	2	2	1	4	9
Long-tailed Jaeger	3		1		4
Jaeger sp.		1		1	2
Glaucous Gull	49	40	61	73	223
Arctic Tern	21	2	186	156	365
Black Guillemot				1	1
Short-eared Owl	9				9
Bank Swallow				1	1
Common Raven		2			2
Water Pipit			1		1
Savannah Sparrow	7		2		9
Lapland Longspur	2374	12	2315	59	4760
Smith's Longspur			1		1
Snow Bunting	22	6	117		145
Unidentified passerine	31	17		5	53
Total	4975	3557	3347	4339	16218

Appendix I.

Scientific names of birds species cited.

Appendix I. Scientific names of bird species cited.

Common name	Scientific name
Red-throated Loon	Gavia stellata
Pacific Loon	Gavia pacifica
Common Loon	Gavia immer
Yellow-billed Loon	Gavia adamsii
Red-necked Grebe	Podiceps grisegena
Tundra Swan	Cygnus columbianus
Greater White-fronted Goose	Anser albifrons
Snow Goose	Anser caerulescens
Brant	Branta bernicla
Canada Goose	Branta canadensis
Green-winged Teal	Anas crecca
Mallard	Anas platyrhynchos
Northern Pintail	Anas acuta
Northern Shoveler	Anas clypeata
American Wigeon	Anas americana
Greater Scaup	Aythya marila
Lesser Scaup	Aythya affinis
Common Eider	Somateria mollissima
King Eider	Somateria spectabilis
Harlequin Duck	Histrionicus histrionicus
Oldsquaw	Clangula hyemalis
Black Scoter	Melanitta nigra
Surf Scoter	Melanitta perspicillata
White-winged Scoter	Melanitta fusca
Common Goldeneye	Bucephala clangula
Red-breasted Merganser	Mergus serrator
Bald Eagle	Haliaeetus leucocephalus
Norther Harrier	Circus cyaneus
Rough-legged Hawk	Buteo lagopus
Golden Eagle	Aquila chrysaetos
Merlin	Falco columbarius
Gyrfalcon	Falco rusticolus
Willow Ptarmigan	Lagopus lagopus
Rock Ptarmigan	Lagopus mutus
Sandhill Crane	Grus canadensis
Black-bellied Plover	Pluvialis squatarola
Lesser Golden-Plover	Pluvialis dominica
Semipalmated Plover	Charadrius semipalmatus
Lesser Yellowlegs	Tringa flavipes
Spotted Sandpiper	Actitis macularia
Whimbrel	Numenius phaeopus
Hudsonian Godwit	Limosa haemastica
Ruddy Turnstone	Arenaria interpres
Sanderling	Calidris alba

Appendix I. Continued.

Common name	Scientific name
Semipalmated Sandpiper	Calidris pusilla
Baird's Sandpiper	Calidris bairdii
Pectoral Sandpiper	Calidris melanotos
Dunlin	Calidris alpina
Stilt Sandpiper	Calidris himantopus
Long-billed Dowitcher	Limnodromus scolopaceus
Common Snipe	Gallinago gallinago
Red-necked Phalarope	Phalaropus lobatus
Red Phalarope	Phalaropus fulicaria
Pomarine Jaeger	Stercorarius pomarinus
Parasitic Jaeger	Stercorarius parasiticus
Long-tailed Jaeger	Stercorarius longicaudus
Ring-billed Gull	Larus delawarensis
Herring Gull	Larus argentatus
Thayer's Gull	Larus glaucoides thayeri
Glaucous Gull	Larus hyperboreus
Sabines Gull	Xema sabini
Arctic Tern	Sterna paradisaea
Black Guillemot	Cepphus grylle
Snowy Owl	Nyctea scandiaca
Short-eared Owl	Asio flammeus
Horned Lark	Eremophila alpestris
Bank Swallow	Riparia riparia
Cliff Swallow	Hirundo pyrrhonota
Common Raven	Corvus corax
Yellow Wagtail	Motacilla flava
Water Pipit	Anthus spinoletta
Yellow Warbler	Dendroica petechia
American Tree Sparrow	Spizella arborea
Savannah Sparrow	Passerculus sandwichensis
Fox Sparrow	Passerella iliaca
White-crowned Sparrow	Zonotrichia leucophrys
Lapland Longspur	Calcarius lapponicus
Smith's Longspur	Calcarius pictus
Snow Bunting	Plectrophenax nivalis
Common Redpoll	Carduelis flammea
Hoary Redpoll	Carduelis hornemanni