BIRD MIGRATION AND NESTING OBSERVATIONS, WESTERN VICTORIA ISLAND, N.W.T. JUNE, 1980

by

Lynne Allen

CANADIAN WILDLIFE SERVICE

YELLOWKNIFE, N.W.T.

June 1982

SUMMARY

In 1979, Polar Gas Ltd. announced that they were considering construction of a gas pipeline from the High Arctic to southern markets. The pipeline would cross western Victoria Island, an area of the Arctic where there was practically no published information on birds. In 1980, the Canadian Wildlife Service initiated a study to obtain preliminary data on spring migrating and nesting birds on western Victoria Island. The study was intended to help identify what further bird studies would be needed if a specific application for a gas pipeline was filed in the future. The project was funded by the Canadian Wildlife Service with logistical support from Polar Continental Shelf Project of Energy, Mines and Resources.

The study consisted of a spring migration watch and a set of aerial surveys for nesting birds. The migration watch was conducted at Cape Lambert in Dolphin and Union Strait from 6 to 9 June 1980 to record the migration of birds through the strait and their use of the nearby polynia. The aerial surveys for nesting birds were conducted from 23 to 29 June on western Victoria Island along the proposed Polar Gas pipeline route and along much of the adjacent coastline, cliffs and river valleys.

About 98% of the birds observed during the migration watch at Dolphin and Union Strait were ducks, most of which were Common Eiders, King Eiders and Oldsquaws. Geese accounted for about 1% of the sightings, while the remaining 1% consisted primarily of loons, jaegers, gulls and terns. The highest count occurred on 10 June, when we observed over 20,000 birds. Approximately 18,400 of these birds were Common Eiders, and nearly all were feeding or resting on the polynia, rather than in flight.

Most of the birds migrating through Dolphin and Union Strait flew parallel to the coast in either a southeasterly or northwesterly direction. Species moving primarily southeast were the Brant, Common Eider, Oldsquaw, Rough-legged Hawk, Short-eared Owl, Pomerine Jaeger and Sabine's Gull. The majority of Whistling Swans and Parasitic Jaegers migrated towards the northwest. Nearly all flocks of migrants in flight, regardless of species, contained less than 10 birds. Where there were sufficient data and a definite trend, the timing of migration for each species was estimated. Early migrants which were more abundant prior to mid-June included geese, jaegers, shorebirds and Short-eared Owls. Late migrants more common after 10 June, were loons, Arctic Terns and King Eiders.

The aerial surveys confirmed the importance of the polynia at Dolphin and Union Strait as a staging area for sea ducks during spring migration (64.8 ducks/km^2). The lead off Cape Baring at the mouth of Prince Albert Sound also harboured a large concentration of staging sea ducks (46.2 ducks/km^2). In addition, the Kagloryuak River mouth and several other stream mouths in Prince Albert Sound had small flocks of staging ducks.

The aerial survey of cliffs between Holman and Minto Inlet indicated that this area is important for nesting Peregrine Falcons and Rough-legged Hawks. Eleven Peregrine Falcons and 46 Rough-legged Hawks were recorded along 385 km of cliffs.

The highest overall density of nesting birds generally occurred in lowland areas where there was continuous vegetative cover and numerous ponds (Fig. 6). More specifically, these were the lowlands adjacent

Dolphin and Union Strait (5.9 birds/km^2), Prince Albert Sound (6.4 birds/km^2) and Richard Collinson Inlet (4.8 birds/km^2), as well as the Kagloryuak River valley (3.8 birds/km^2) and the islands at the mouth of the river (10.0 birds/km^2). The most common species of waterfowl and their preferred nesting habitat were as follows: the Whistling Swan and Canada Goose which nested in relatively high densities wherever there were well-vegetated lowlands on the southern half of western Victoria Island; the Brant and Common Eider which nested on the islands in Dolphin and Union Strait and on the islands at the mouth of the Kagloryuak River; the King Eider which nested on inland lakes throughout western Victoria Island, and particularly in the Kagloryuak River valley; and the Oldsquaw which was most abundant in well-vegetated coastal areas, but also nested in moderate numbers on the inland lakes of Diamond Jenness Peninsula. Several colonies of Arctic Terns, Glaucous Gulls, Thayers/Herring Gulls and Sabine's Gulls were noted as well during the aerial surveys (Fig. 5).

The densities obtained for birds nesting on western Victoria Island were compared to those recorded during a similar study conducted in the Keewatin District in 1976 and 1977 (Allen and Hogg 1978). Generally, western Victoria Island had lower densities of nesting birds than the District of Keewatin. However, Victoria Island had two outstanding features:

- high concentrations of spring staging sea ducks in the polynia at Dolphin and Union Strait and in the lead off Cape Baring, and
- a high density of nesting Peregrine Falcons and Rough-legged Hawks near Minto Inlet and Holman.

ACKNOWLEDGEMENTS

I am most grateful to Vernon Stringer who assisted with the field work and data analysis. I also appreciate the support of Ursula Banasch who participated in the raptor surveys, Kevin McCormick, Maureen Gauthier, and Roger Edwards who provided helpful comments on the report, Susan Popowich who drafted the figures and Andrea Purdy who typed the manuscript. I am especially indebted to Polar Continental Shelf Project for their generous support of the study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

In 1972, a consortium of companies called Polar Gas Ltd. was formed in response to several major discoveries of natural gas in the High Arctic. Five years later Polar Gas filed an application with the Federal Government to construct a pipeline from the High Arctic south to the Trans-Canada pipeline. This application was subsequently withdrawn. In June of 1979, Polar Gas announced that they were considering an alternate route, the "Y" Line, which would transport gas from both the High Arctic and the Mackenzie Delta/Beaufort Sea region. The proposed "Y" Line route would go from Melville Island across McClure Strait, and western Victoria Island, join the mainland near Coppermine, then roughly follow the treeline southeast to Longlac, Ontario. A spur line from the Mackenzie Delta would connect with the pipeline just northeast of Great Bear Lake. Two alternate routes being considered for the mainland portion of the "Y" Line were either a route down the Mackenzie Valley or one east of the Franklin Mountains. Regardless of the final route selection, the northern portion of the pipeline would cross western Victoria Island (Fig. 1).

Due to the lack of published information on the birds of western Victoria Island, the Canadian Wildlife Service initiated a study in 1980 to determine:

(a) the distribution of birds on western Victoria Island during spring migration and the nesting season, and
(b) the importance of the polynia in Dolphin and Union Strait to birds during spring migration.

This is a preliminary study intended to identify some of the more important areas for birds on western Victoria Island during spring migration and the nesting season. If a specific application for a gas pipeline is filed in the future, the results of this study should assist in determining what further studies are needed to ensure that the Migratory Bird resource is adequately protected.

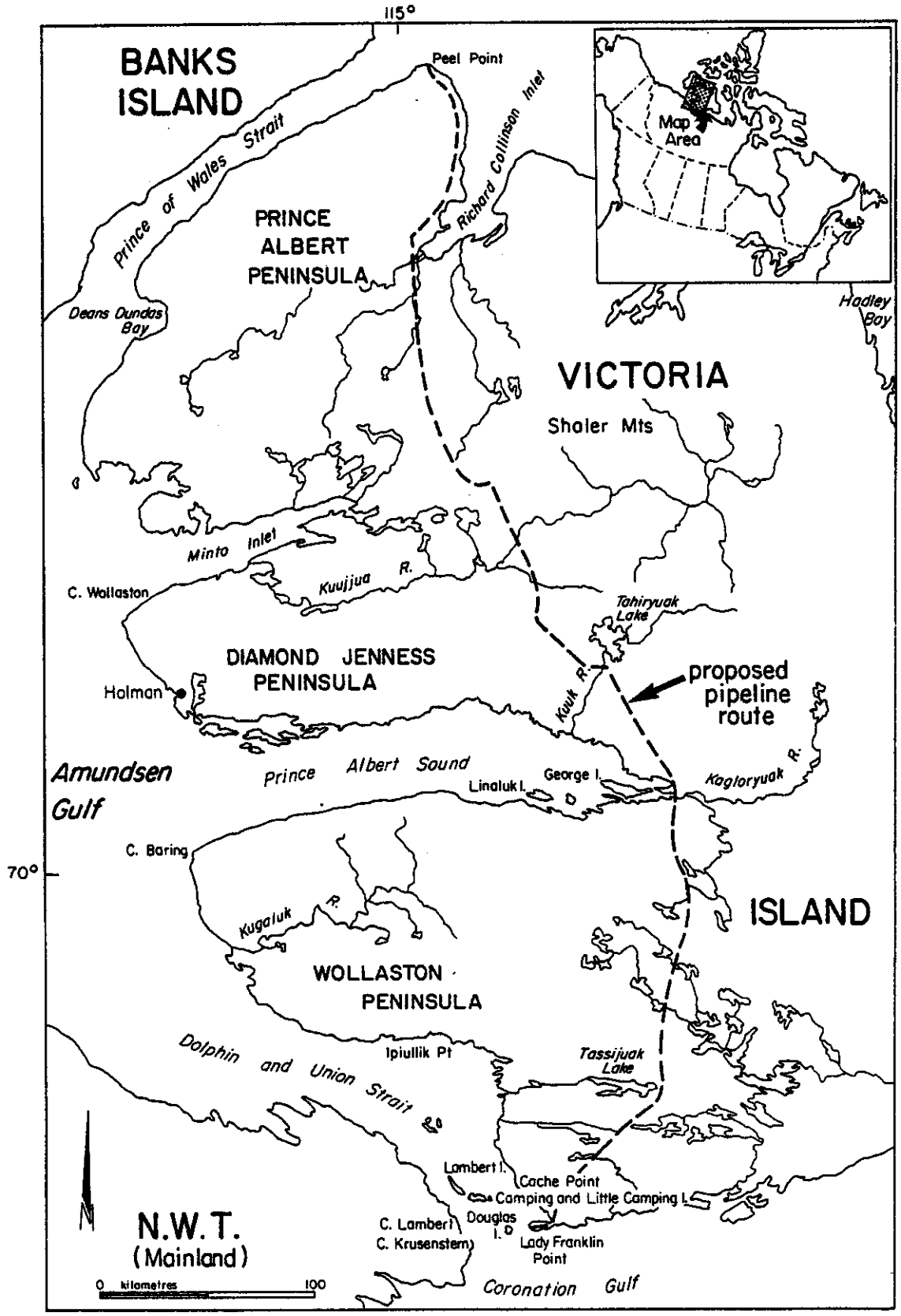

Figure 1. Map of study area.

1.0 LITERATURE REVIEW

There is very little published information on the birds of western Victoria Island. Smith (1973; 1976; 1981) reported bird observations made at Holman while studying the ringed seal. Similarly, Porsild (1951) reported the birds that he saw during a few days of botanical work at the head of Minto Inlet and Prince Albert Sound. Barry's (1960) aerial reconnaissance for waterfowl in the western Arctic in 1960 included Victoria Island. However, the species totals presented in his report were for all of Victoria Island, so that it is impossible to decipher the number of birds found on the western versus the eastern half of the island. Höhn (1954) recorded incidental bird observations made at Holman while on a boat trip from Sachs Harbour to Tuktoyaktuk.

Coincident with this study, Polar Gas contracted LGL Limited to survey for nesting birds in the vicinity of the proposed Polar Gas pipeline on Victoria Island (McLaren and Alliston 1981). In addition, Barry et al. (1981) conducted an aerial survey for seabirds in mid-August of 1980 along the west coast of Victoria Island between Wollaston Peninsula and the north end of Prince of Wales Strait.

2.0 STUDY AREA

Most of western Victoria Island is lowlands with numerous lakes and gently rolling to hilly relief. The landscape is dominated by glacial features, particularly drumlins, eskers and raised beaches (Thorsteinsson and Tozer 1962). The glacial deposits vary in composition from bouldery, stony gravel to fine silt. Although the till is over 100 m thick in some localities, generally it forms a thin layer. Ice scouring in parts of the region has left bedrock outcrops and rubble. Where glacial deposits are

thickest, the terrain is rough with ridge-like and irregular hills over 100 m high. The thickest morrainal belts occur along the northwestern portion of Prince Albert Peninsula, the southern portion of Diamond Jenness Peninsula and central Wollaston Peninsula (Thorsteinsson and Tozer 1962). The coastal lowlands of Richard Collinson Inlet and Prince Albert Sound are areas of recent marine submergence. Clay, silt and sand were deposited in these regions when they were formerly covered by the sea.

The exception to the lowland topography of Victoria Island is a band of tilted beds of Precambrian sedimentary and volcanic rocks which extends southwest from Hadley Bay to Amundsen Gulf. The landscape in this area, known as the Shaler Mountains, is rugged with high plateaux and ridges, steep escarpments, linear valleys, mesas, buttes and cuestas, and summits generally 330 m to 500 m high. Much of Diamond Jenness Peninsula, including Holman and the Kuujjua River valley, lies in this belt of rugged terrain.

Vegetative cover on western Victoria Island varies from areas with virtually no vegetation to areas with continuous cover. Generally, the dry uplands are not as well vegetated as the moist lower slopes and lowlands, and the northern half of the island is more sparsely vegetated than the southern half. The areas with the richest vegetation are the lowlands that extend north of Lady Franklin Point about 100 km, the area bordering the eastern half of Prince Albert Sound, the Kagloryuak River valley and a small area at the head of Minto Inlet. Richard Collinson Inlet also has pockets of well-vegetated lowlands. The poorest vegetative cover is found in the Shaler Mountains and on a sandy area at the head of Richard Collinson Inlet. The major vegetation communities are aven/willow/sedge tundra which is found primarily on the drier uplands,

and grass/sedge which dominates the lowland areas. A more detailed description of the vegetation is presented in McLaren and Alliston (1981).

3.0 METHODS

3.1 Migration Watch

On 6 June we established a camp about 10 km north of Cape Lambert (68°36'N, 114°17'W) to observe the birds that use the polynia in Dolphin and Union Strait (Figs. 2 and 3). The method used for the migration watch was similar to that used by Johnson and Richardson (1980) during several migration watches they recently conducted in the Beaufort Sea region. From 6 to 19 June, three 2-hour watches were conducted daily at 09:00 - 11:00, 14:00 - 16:00 and 19:00 - 21:00 hours MDT. Observations were made from a beach ridge about 10 m asl and 300 m from shore. The terrain was gently rolling, so that we were able to make observations in all directions. We estimated that on a clear day we could detect birds at distances as great as 2 km using binoculars and a 15-40x zoom spotting scope. For each bird observation, we recorded the species, number, behaviour (nesting, feeding, resting, flying), and when applicable, flight direction, flight altitude and distance from shore. All information was dictated into a cassette tape recorder and later that day transcribed onto forms.

The birds observed during the migration watch were categorized as either nesting birds, staging migrants or migrants in flight. Nesting status was assigned to birds seen repeatedly in the same spot, often in pairs, and exhibiting behaviour associated with nesting. These birds were not included in the data analysis, but have been listed in Appendix A. Staging migrants were birds resting or feeding on the water, ice or shore,

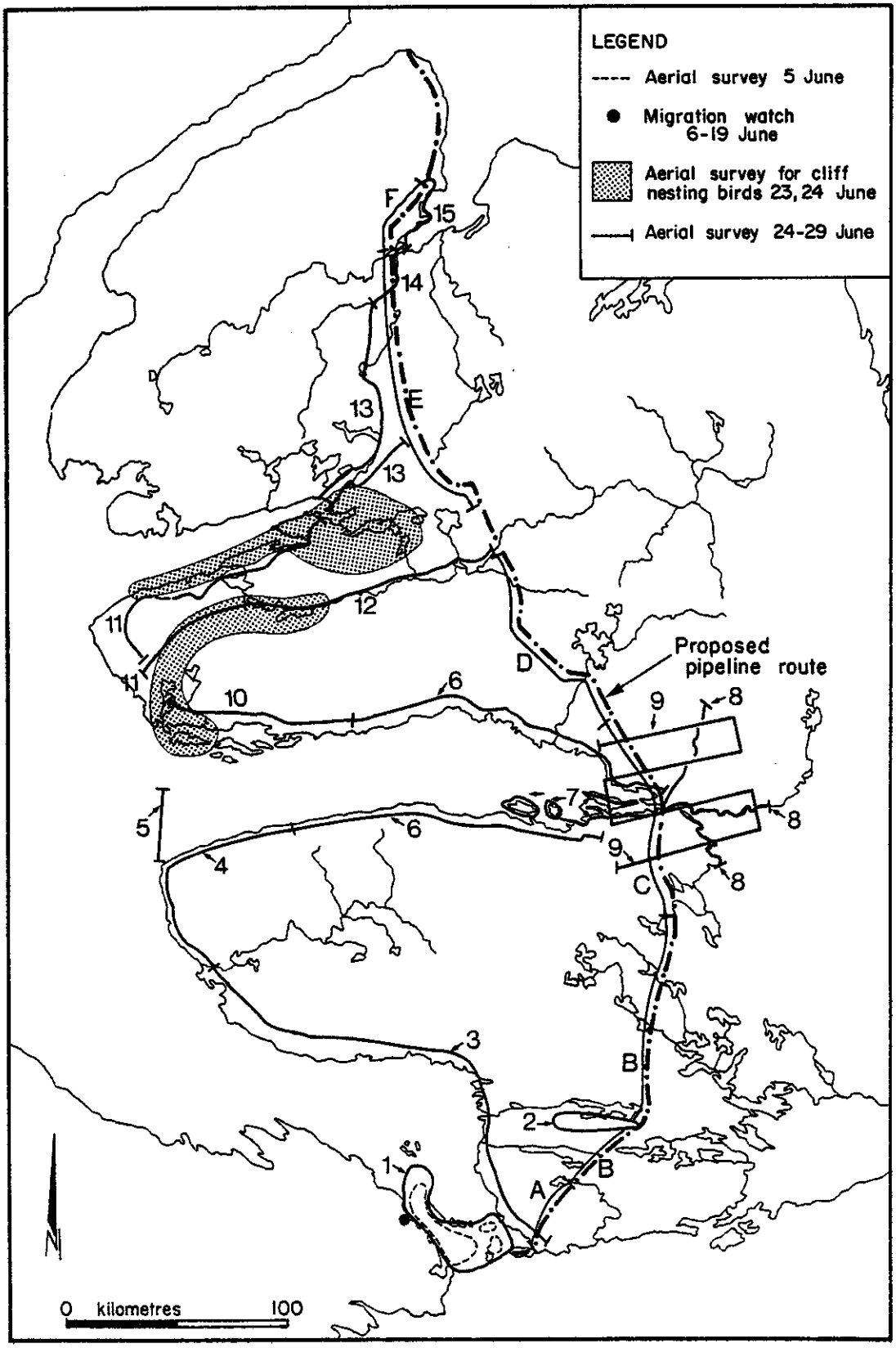

Figure 2. Areas surveyed between 5 and 29 June 1980.

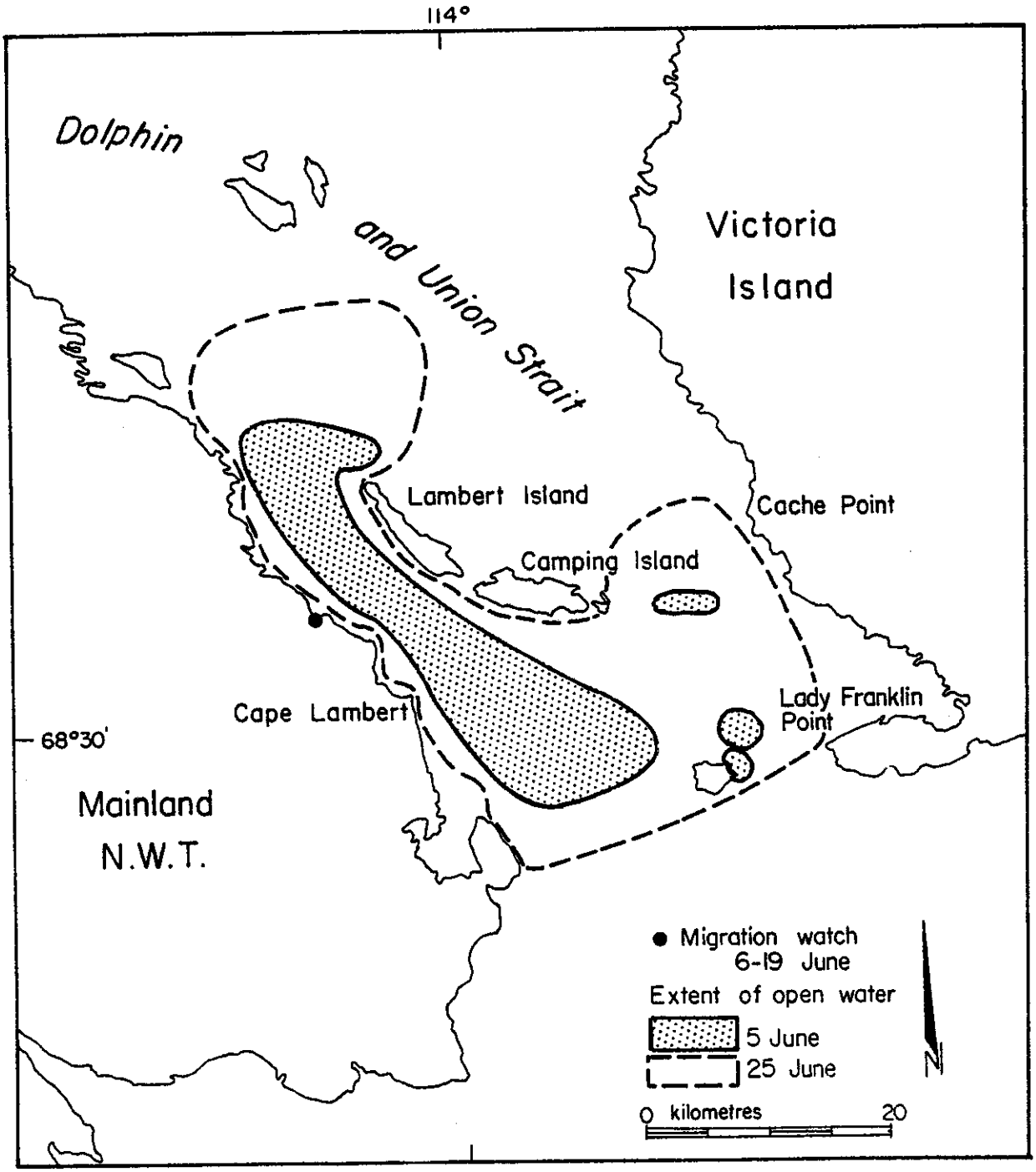

Figure 3. Extent of polynia in Dolphin and Union Strait on 5 and 25 June 1980.

as well as those circling and not flying in any definite direction. For example, Arctic Terns that circled and dived for food just offshore throughout a watch were classed as staging migrants. Birds moving through the area were classified as migrants in flight.

3.2 Aerial Surveys

From 24 to 29 June, we conducted aerial surveys for all bird species along the proposed pipeline route and much of the coastline of western Victoria Island. The Kuujjua River, Kagloryuak River and the polynia at Dolphin and Union Strait were also investigated. All areas were surveyed once, except the polynia which was surveyed on both 5 and 25 June. In addition, on 23 and 24 June a special survey to locate nesting raptors was flown along the cliffs between Minto Inlet and Holman. The flight-lines are shown in Fig. 2.

A Bell 206 Jet Ranger helicopter was used for all surveys. During the search for cliff nesting raptors, we flew along the face of the cliff near the top at about 50 km/h. Each cliff was examined only once. The surveys intended for all bird species were flown at an altitude of 30 to 40 m at about 160 km/h. Surveys along the coast were conducted over the land rather than the sea, because the sea was still frozen, whereas the land was snow-free and most of the coastal ponds were open. The exception was the open water at stream mouths which we surveyed for migrant birds.

During all surveys, one observer sat in the left front seat of the helicopter and the other in the rear right seat. The data were recorded on cassette tape recorder and transcribed onto tables immediately following the survey. All birds detected within 200 m of the helicopter were recorded. Unusual sightings beyond 200 m were also recorded but were identified as "off transect" and not included in the data analysis.

For each bird observation, we recorded the species, number, habitat, and whenever possible the sex, age and general behaviour. The observer in the front seat also briefly described the type and extent of habitat encountered. At the beginning of each flight the date, time of day and weather (temperature, windspeed and direction, cloud cover and precipitation) were noted.

To facilitate locating each bird sighting when analyzing the data, the survey lines were divided into segments approximately 30 km long. At the beginning of each segment both observers recorded the segment number and the time. The time was also noted whenever a bird was sighted. 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.

3.3 Limitations of Study

This study has several limitations which should be considered when interpreting the data. First af all, bird usage of an area varies from one year to the next. Hence, population densities of birds on western Victoria Island may differ considerably from what we found in 1980. For example, sea duck utilization of McKinley Bay on the Tuktoyaktuk Peninsula more than doubled from 5301 in 1980 to 11,876 in 1981 (Scott-Brown et al. 1981). Similarly, a study in the Athabasca Tar Sands area in northern Alberta yielded 41,520 waterfowl one year, but only 18,725 waterfowl the following year on the same waterbodies (Schick and Ambrock 1974). Factors that contribute to such large annual fluctuations in the number of birds using an area include weather conditions, the timing of spring break-up, annual fluctuations in productivity and harvesting, and minor shifts in migratory routes (Schick and Ambrock 1974). Thus for a more accurate assessment of bird populations on western Victoria Isalnd several years of data are required.

Birds frequently use different habitats for each phase of their phenology: migration, nesting, brood-rearing and moulting. This study which covered the area only once in late spring will provide some information on spring staging and nesting areas, but only limited insight into what areas are important to birds that are moulting, rearing young or staging during fall migration. The latter can only be surmised from examining the habitat.

Migration Watch

Because the polynia was a staging area, it was sometimes difficult to decipher local movements, such as feeding and courtship flights, from migrational movements. Similarly, it was sometimes difficult to determine whether a sighting was a bird nesting nearby or migrating.

Estimates of flight altitude and distance from the coast were crude due to the lack of reference points. Making these estimates was especially difficult for observations of birds offshore.

Due to the design of the migration watch, its scope was somewhat limited. No watches were conducted between 21:00 and 9:00 hours MDT, so we have no record of migration through the study area at night. The migration watch occurred at only one site which limited the amount of information that could be obtained on species that migrate on a broad front. Furthermore, birds migrating at high altitudes likely passed undetected.

Aerial Surveys

The advantage of aerial surveys is that a large area can be censused in a short period of time. This is essential when working in such vast and isolated areas as Victoria Island. However, the censusing birds from the air, one only sees a fraction of the total number of birds.

For example, Haddock and Evans (1975) estimated that they detected only 11% of the waterfowl present during surveys by fixed-wing aircraft on the Alaska North Slope. Although more birds are seen when surveying by helicopter, still only a fraction of the birds actually present are detected (Bartels 1973). Thus, the data collected during aerial surveys are merely indices of the number of birds in an area and should not be regarded as absolute numbers of birds. Although the data will not provide total populations, the indices are useful when comparing bird densities from one area to another.

The fraction of birds seen during an aerial survey varies with the species, because detectability depends on factors such as size, colour, response to aircraft, tendency to flock and habitat preferences. For example, most Whistling Swans are detected during a survey by helicopter, whereas only about 14% of the shorebirds are seen (Haddock and Evans 1975). One should keep this difference in detectability in mind when comparing the density indices of different species.

4.0 RESULTS AND DISCUSSION

4.1 Timing of Spring Break-up

The timing of spring migration for most bird species is closely linked to the advance of spring. In 1980, from late April through to the last week of May temperatures in northern Canada were warmer than usual causing leads to open in the sea ice early and the snow line to retreat northward more rapidly than normal (Cooch 1980). However, from 28 May to 8 June, below freezing temperatures stopped the advance of spring. Snow melt began again after 8 June, but temperatures remained unseasonably cool until 23 June.

The cold spell at the end of May delayed the melt of ice and snow on western Victoria Island. In the first week of June, several residents of Holman commented that spring was about 2 weeks late. During reconnaissance flights between Minto Inlet, Holman, and Dolphin and Union Strait on 3 and 5 June, we estimated an 80% snow cover, the bare patches being the wind-swept ridges, and saw very little water other than the polynia at Dolphin and Union Strait. By 19 June, the streams, rivers and ponds were open and the larger lakes had open water by shore. By 23 June, the snow cover was less than 5%.

To summarize, despite a warming trend in April and May, the melt proceeded more slowly than normal on western Victoria Island. This likely caused a slight delay in the final stages of migration and nest initiation for the birds in our study area.

4.2 Migration Watch

Ducks accounted for 98% of the migrant birds (both staging and in flight) observed during the migration watch. Geese accounted for about 1% of the migrants and the remaining 1% consisted primarily of loons, jaegers, gulls and terns. The total number of birds of each species seen throughout the migration watch is presented in Table 1. For a more detailed daily account of species numbers, refer to Appendix B.

Most birds travelled parallel to the coast in either a southeasterly or northwesterly direction (Table 1, Fig. 4 and Appendix C). Species that were moving primarily southeast were the Brant (72%), Common Eider (65%), Oldsquaw (78%), Rough-legged Hawk (67%), Short-eared Owl (71%), Pomarine Jaeger (76%), and Sabine's Gull (62%). The majority of Whistling Swans (75%) and Parasitic Jaeger (100%) migrated towards the northwest. The lack of consistancy of direction of travel for species

Table 1. Observations made during a migration watch at Cape Lambert, 6 - 19 June 1980.

Species	Total flying and staging	Migrants in flight only	Max. seen in a single watch[1]	Period of peak numbers[1]	Mean flight altitude[2] (m)	Mean distance from coast (m)[2]		Predominant direction of travel[2] (% of birds)
						Onshore	Offshore	
Yellow-billed Loon	51	(11)	8	10-13 June	18		32	NE (29)
Arctic Loon	26	(13)	4	after 12 June	18			E (31)
Red-throated Loon	2	(1)	1				60	SE (100)
Common Loon	3	(2)	1		2		3	SE (50)
unidentified loon	39	(33)	8		16	19		SE (26)
Whistling Swan	8	(8)	6		18	95		NW (75)
Canada Goose	456	(291)	37	before June 14	11	163		SE (38)
Brant	263	(207)	35	before June 15	10		63	SE (72)
White-fronted Goose	52	(38)	7	16-18 June	8	219		NW (41)
unidentified goose	168	(151)	63		43		75	SE (54)
Common Eider	70 285	(1,294)	18 408	7-13 June	6		48	SE (65)
King Eider	498	(125)	168	after 12 June	5		17	NW (34)
unidentified eider	1,423	(19)	501		2		150	SE (56)
Oldsquaw	5,340	(188)	2,002		11		110	SE (78)
Pintail	162	(140)	24	13-16 June	9	68		SE (49)
Red-breasted Merganser	1	(1)	1		2		3	SW (100)
unidentified duck	4,178	(66)	1,502		12		88	SE (67)
Rough-legged Hawk	10	(3)	4		21	254		SE (67)
Peregrine Falcon	1	(1)	1		3	300		NW (100)
Short-eared Owl	27	(19)	5	before 14 June	11	150		SE (71)
Snowy Owl	1	(1)	1		12	300		SE (100)
unidentified raptor	2	(1)	1		15		300	SE (100)

Table 1. (Continued).

Species	Total flying and staging	Migrants in flight only	Max. seen in a single watch[1]	Period of peak numbers[1]	Mean flight altitude[2] (m)	Mean distance from coast (m)[2] Onshore	Offshore	Predominant direction of travel[2] (% of birds)
Pomarine Jaeger	23	(23)	10	before 15 June	48		97	SE (76)
Parasitic Jaeger	9	(7)	4	before 15 June	8	398		NW (100)
Long-tailed Jaeger	48	(37)	11	before 15 June	14	61		S (28)
unidentified jaeger	44	(21)	9	before 15 June	9	14		SE (67)
Glaucous Gull	209	(75)	51		11		10	SE (39)
Sabine's Gull	61	(29)	24	7-8 June	17		9	SE (62)
Arctic Tern	188	(62)	24	after 10 June	9	58		NW (33)
shorebirds	76	(72)	16	before 9 June	3	564		NW (32)
passerines	41	(33)	20	before 9 June	18			NW (100)

[1]Based on migrants both staging and in flight.
[2]Based on migrants in flight only.

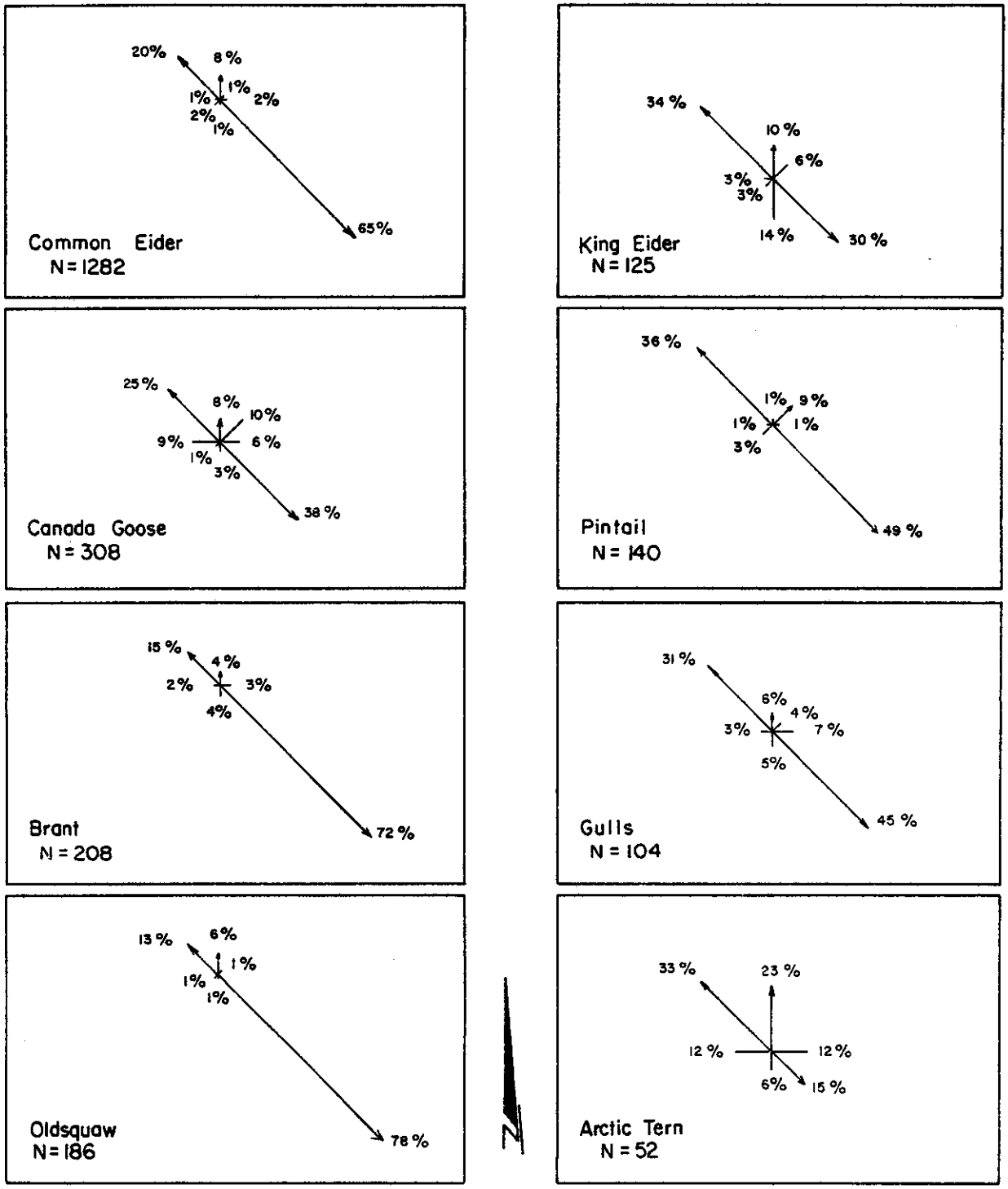

Figure 4. Direction of travel of birds observed during the migration watch at Cape Lambert, 6-19 June 1980.

such as the Yellow-billed Loon, Arctic Loon, Arctic Tern, and Sabine's Gull may have been partly due to the fact that they were at or near their nesting grounds.

Most species including loons, eiders, gulls, Brant, Arctic Terns, Pomarine Jaegers and Parasitic Jaegers migrated within 100 m of the coast (Table 1). The Oldsquaw was generally further offshore, whereas the Canada Goose, White-fronted Goose, Parasitic Jaeger, raptors and shorebirds were usually sighted more than 100 m inland.

Most of the migrants detected were flying below 20 m asl or agl, the exception being the Rough-legged Hawk and Pomarine Jaeger (Table 1). The King and Common eiders both flew low over the water at average altitudes of 5 and 6 m asl respectively. Other migrants which generally flew under 10 m were the White-fronted Goose, Parasitic Jaeger, Arctic Tern and Brant.

Nearly all flocks of migrants in flight, regardless of species, contained less than 10 birds (Table 2). We encountered only 19 flocks with 11 to 20 birds, and another 7 flocks with greater than 20. Species with flocks of more than 20 birds were Brant, Common Eider, King Eider, and Sabine's Gull. The largest flock was 150 Common Eider seen flying southeast about 300 m offshore on 7 June.

Because the migration watch was only two weeks in duration, it was difficult to assess when the peak period of migration occurred for each species. Where there were sufficient data and a definite trend, dates have been estimated (Table 1). Early migrants included Canada Geese, Brant, jaegers, shorebirds, passerines and the Short-eared Owl. Late migrants were the loons, Arctic Tern and King Eider. Common Eider numbers staging in the polynia peaked in the second week of June. The results of

Table 2. Flock sizes of waterfowl in flight.

Species	No. of Flocks	Percentage Distribution of Flock Sizes				
		1	2	3-5	6-10	>10
Canada Goose	174	37	41	19	3	0
Brant	55	22	40	18	13	7
White-fronted Goose	25	24	56	16	4	0
Pintail	35	14	29	26	17	14
Common Eider	355	18	61	12	7	2
King Eider	50	32	52	6	8	2
Oldsquaw	78	32	41	15	9	3

the aerial surveys showed a 10% decline in the number of Common Eiders and an 8% increase in the number of Oldsquaws in the polynia between 5 and 25 June.

A more detailed discussion of the results of the migration watch is given in the following species account.

Loons

The Yellow-billed Loon was the most frequently observed species of loon (Table 1). There were 51 sightings which accounted for 62% of all loon observations. Peak numbers of Yellow-billed Loons occurred from 10 to 13 June (Appendix B). Parmelee et al. (1967) likewise noted that the majority of this species of loon arrived at southeastern Victoria Island by mid-June. Birds in flight were either alone or in pairs, although flocks of up to 8 birds were seen resting and feeding offshore in the polynia. The majority of Yellow-billed Loons were heading across the strait in a northerly direction: NE (29%), N (21%) or NW (14%) (Appendix C). According to Palmer (1962) this species of loon migrates from the west along the arctic coast. From our study, it appears that a substantial number of Yellow-billed Loons stage in the polynia at Dolphin and Union Strait, then head north to Victoria Island. The Yellow-billed Loon is the most abundant species of loon on western Victoria Island (McLaren and Alliston 1981).

Arctic Loons comprised 32% of all loon observations (Table 1). About half were in pairs and most of the others were single birds. The Arctic Loon arrived later than most bird species, for we did not see any until 13 June (Appendix B). The earliest Parmelee et al. (1967) recorded the Arctic Loon at Cambridge Bay was 11 June in 1960 and 1962. The majority of birds we saw were either flying east towards the polynia (31%) or heading inland in a southerly direction (23%). The birds flying inland

may have been looking for nest sites as there were numerous suitable lakes south of camp. Parmelee et al. (1967) reported that Arctic Loons were the most common nesting species on southeastern Victoria Island and that they tended to occupy medium-sized inland lakes.

Three Common Loons were sighted during the migration watch. The mainland coast is probably the northern edge of their breeding range because neither Parmelee et al. (1967) nor McLaren and Alliston (1981) recorded Common Loons on Victoria Island. In addition, we saw 2 Red-throated Loons. This species is an uncommon breeder on southeastern Victoria Island (Parmelee et al. 1967), but nests in moderate numbers along the coast of western Victoria Island (McLaren and Alliston 1981).

Swans

Only 8 Whistling Swans were seen throughout the migration watch: 2 pairs, a group of 3 and a single bird.

We saw 6 flying along the coast in a northwesterly direction. According to Bellrose (1976), the Whistling Swan flys north from the Peace-Athabasca Delta and nests all along the arctic coast with concentrations nesting at Queen Maud Gulf and the Mackenzie Delta. The Whistling Swan is a relatively early migrant, for example, arriving at Queen Maud Gulf in the first week of June (Ryder 1967). Either most of the Whistling Swans had passed through before the first day of our migration watch, or the swans had dispersed to nesting areas before reaching the coast. The few swans we saw were likely birds scattering locally to breed.

Geese

About 59% of the 771 geese we identified to species were Canada Geese (Table 1). Although active throughout the migration watch, more

Canada were seen prior to 14 June. There were no flocks of more than 10 Canadas and 78% were either single birds or in pairs (Table 2). Most flights were parallel to the coast with 38% going southeast and 25% going northwest (Fig. 4). The geese generally flew low (average of 11 m agl) and from 150 to 200 m inland (Table 1). We first recorded geese incubating eggs on 13 June.

The Canada Goose is an early migrant, arriving on the nesting grounds in the Central Arctic the last week of May (Ellis 1956; Ryder 1971; McEwen 1957; Parmelee et al. 1967). The description by Parmelee et al. (1967) of newly arrived Canada Geese in southeastern Victoria Island was very similar to our observations: "Singles, pairs, and small flocks of three and four birds flew back and forth low above the fast-thawing tundra, often flying out of sight and calling loudly as they went." He concluded that these were local birds. Considering that Canada Geese are early migrants and that most of the geese we saw were in flocks of less than 5 birds, flying low and seemingly back and forth along the coast, the Canada Geese we observed were likely local birds as well.

Palmer (1976) remarked that some of the prebreeders that gather in groups around the periphery of breeding areas prior to moult migration, attempt to duplicate parental activities such as pair formation and nest building. Often they will continue to engage in this activity after the breeders have started to incubate. Some of the flights we observed later in the migration watch may have been such prebreeders.

Brant totalled 263 birds or 34% of the geese identified (Table 1). Although the majority of sightings were either single birds or pairs (62%), 20% were in flocks of more than 5 birds (Table 2). All flocks of more than 10 birds occurred within the first 3 days of the migration watch. Most of the Brant (72%) flew parallel to the coast in a south-

easterly direction at an average of 63 m offshore and 10 m off the water (Fig. 4). Often a flock of 2 to 8 Brant was seen resting by a pool of melt water near the shore in front of the migration watch station.

The fact that most of the Brant were moving along the coast in a southeasterly direction and that all nearby observations appeared to have dark bellies suggests that it is the Pacific Brant which migrates through the Dolphin and Union Strait. This is in agreement with previous studies which indicate that Pacific Brant breed as far east as Pelly Bay (Bellrose 1976; Palmer 1976).

We recorded only 52 White-fronted Geese which accounted for 7% of all geese identified (Table 1). Over half of the sightings were pairs and there were no flocks of more than 10 birds (Table 2). Most birds were travelling parallel to the coast in either a northwesterly (41%) or southeasterly (37%) direction (Appendix C). On the average, the White-fronted Geese flew about 200 m in from shore and 8 m above ground.

The White-fronted Goose is an early migrant, arriving at southeastern Victoria Island in late May (Parmelee et al. 1967) and at Parry River around the first of June (Ryder 1967). According to Palmer (1976), birds that nest along the Arctic coast migrate directly overland from the south. Breeding concentrations are known to occur in the Mackenzie Delta and Queen Maud Gulf, and it is speculated that there is scattered nesting along the mainland adjacent to Dolphin and Union Strait (Palmer 1976). It is unknown whether the geese we saw were local breeders or migrants following the coast to their principal breeding areas. The small flocks and high percentage of pairs we saw is apparently typical for White-fronted Geese reaching their nesting gounds in spring (Johnsgard 1975).

Ducks

Over 90% of all duck observations were of Common Eiders (Table 1). In a single watch on 10 June, we counted over 18 400 Common Eiders resting and feeding on the ice and open water within our view using a 40x power spotted scope. Our total count over the 14-day period of the migration watch was 70 285 birds for an average of 1673 sightings per watch. Peak numbers occurred between 7 and 13 June (Appendix B). Most birds (92%) were staging rather than in flight. Of the birds in flight, 65% were going southeast, and 20% were going northwest (Fig. 4). The majority of flights were low over the water (6 m average) and within 50 m of shore (Table 1). Sixty-one percent of the Common Eiers were in pairs and very few (2%) were in flocks of more than 10 birds (Table 2).

The fact that 65% of the flights were in a southeasterly direction supports previous studies (Johnsgard 1975; Palmer 1976) which state that the Pacific Eider nests as far east as Queen Maud Gulf. According to T. Barry (pers. comm.) the Pacific Eider crosses from the Point Barrow region to southwest Banks Island, and Victoria Island, then likely swings south along the lead at the mouth of Prince Albert Sound and through Dolphin and Union Strait. The data from our aerial survey, as well as from the migration watch support this theory, for during the aerial census on 25 June, we found large concentrations of Common Eiders in two locations: the lead at the mouth of Prince Albert Sound (18.3/km^2) and the polynia on Dolphin and Union Strait (22.7/km^2).

There is a tendency for Common Eiders to travel in small flocks near their breeding grounds. Parmelee et al. (1967) observed that most Common Eiders arriving on southeastern Victoria Island were in pairs and the largest flocks numbered 5. At Cape Dorset, Cooch (1965) noted that

the earliest flocks had from 10 to 17 birds, but as the sex ratio equalized, the later arrivals were in groups of 2 to 4 birds.

The polynia in Dolphin and Union Strait is likely a critical feeding area for Common Eiders prior to nesting. According to Palmer (1976), eider pairs spend a considerable period on sheltered waters upon arrival on their breeding grounds. During this time the females replenish their fat reserves in preparation for egg laying and incubation, a period when they seldom or never leave the nest for food.

The Common Eiders were probably starting to nest in the vicinity of Dolphin and Union Strait by mid-June. We first noticed "scouting forays" on 16 June. According to Palmer (1976) these forays occur for 2 or 3 days before egg laying. McLaren and Alliston (1981) noted that hatching had begun on 15 July at a colony near Lady Franklin Point which would mean egg laying began around 14 June. Parmelee et al. (1967) on the other hand speculated that egg laying on southeastern Victoria Island starts in late June and continues into early July.

Sightings of the King Eider totalled 498 and were more frequent from 13 June onwards (Appendix B). Eighty-four percent were single or in pairs and only 2% were in flocks of greater than 10 (Table 2). Migrant birds flew parallel to the coast with almost equal numbers going in either direction: 34% travelling northwest compared to 30% going southeast (Fig. 4). Flights were generally low over the water (mean of 5 m asl) and an average of 150 m offshore (Table 1).

According to Palmer (1976), the breeding ranges of the King Eiders that winter in the Atlantic versus the Pacific either meet or have a zone of overlap at longitudes 100° to 110° west. Our data would suggest that the zone of overlap extends further west to include Dolphin and Union

Strait, for we observed almost equal numbers of King Eiders travelling southeast as northwest. It is unlikely we were observing the moult migration because according to previous studies, this does not usually occur until late June or early July (Bellrose 1976). However, it is possible that many of the flights we observed were merely local movements (feeding, courtship) by King Eiders staging on the polynia.

The earliest that Parmelee et al. (1967) saw King Eiders on southeastern Victoria Island was on 4 June and the peak period of arrival was mid-June. They also noted that most were in pairs or small flocks of 3 or 4 birds. This concurred with our observations that King Eiders were more abundant after 12 June and generally occurred in small flocks.

The King Eider is the most abundant duck that nests inland on Victoria Island (McLaren and Alliston 1981; Parmelee et al. 1967; this study). Barry (1960) estimated 800 000 nest there. The fact that we saw only 498 King Eiders during the entire migration watch suggests that most of the King Eiders that nest on Victoria Island do not use Dolphin and Union Strait as a spring staging area.

Second in abundance to the Common Eider was the Oldsquaw, which totalled 5340 birds (Table 1). The maximum number seen in a single watch was 2002 birds on 10 June (Appendix B). From 14 to 19 June a total of only 111 Oldsquaw were seen, which indicates that the greatest movement of Oldsquaw through Dolphin and Union Strait occurred in the second week of June. However, the aerial surveys showed an 8% increase in the number of Oldsquaw in the polynia between 5 and 25 June (224 and 1851 Oldsquaw recorded, respectively). This discrepancy may be due to the fact that Oldsquaws normally feed in deeper water than eiders; hence, on most days they were probably beyond our field of view at the migration watch

station. Parmelee et al. (1967) noted that Oldsquaw did not arrive in force near Cambridge Bay until after 12 June in both 1960 and 1962.

About 78% of the birds in flight were travelling southeast which suggests that the Oldsquaws that migrate through Dolphin and Union Strait come from Bering and Pacific waters (Fig. 4). Flights averaged 11 m off the water and 110 offshore (Table 1).

Pintail

A total of 162 Pintails were recorded (Table 1). Most flew parallel to the coast in either direction: 49% going southeast and 36% going northwest (Fig. 4). Flights tended to be low level (9 m agl) and over land near the coast (68 m). Pintails were in larger flocks than other ducks, with 14% in flocks of more than 10 birds and only 39% in pairs or single (Table 2).

Pintails breed all along the arctic mainland coast (Bellrose 1976), and in small numbers on Victoria Island (McLaren and Alliston 1981; Parmelee et al. 1967). The Pintail is one of the first ducks to migrate north in the spring (Bellrose 1976). However, arrival dates available for the Central Arctic are relatively late: 14 and 18 June on southeastern Victoria Island (Parmelee et al. 1967) and 2 and 15 June at Perry River in the Queen Maud Gulf (Ryder 1967). We first saw Pintails on 9 June and maximum numbers occurred 13 to 16 June (Appendix B).

The only other species of waterfowl encountered during the migration watch was the Red-breasted Merganser. One male was sighted by the coast on 19 June. Noteworthy casual observations at the camp included several White-winged Scoters, a pair of Red-breasted Mergansers and a Snow Goose with two Canada Geese.

Raptors

We saw a total of 10 Rough-legged Hawks: 2 pairs during the afternoon watch on 9 June, and 6 sightings of single birds (Table 1). Most of the hawks were travelling in a southeasterly direction inland from the coast an average of 250 m and at an average altitude of 21 m agl. They appeared to be hunting, for they were circling as they drifted by.

It is unknown how many of these observations were migrant birds. There may have been a pair of Rough-legged Hawks nesting nearby, which we were seeing periodically. Rough-legged Hawks nest early in the Arctic. According to Parmelee et al. (1967), egg-laying probably starts near the end of May on southeastern Victoria Island.

We saw 27 Short-eared Owls, including 5 in a single 2-hour watch (Table 1). Seventy-one percent were going southwest along the coast, while most of the others (24%) were following the coast in the other direction (Appendix C). The average flight was about 150 m in from the coast and 11 m above the ground (Table 1). Like the Rough-legged Hawks, the owls circled as they passed, as if hunting.

Again, it is unknown whether some sightings were a pair nesting locally rather than migrant birds. However, the fact that all but one sighting occurred before 14 June suggests that they were migrant birds. According to R. Fyfe (pers. comm.), the Short-eared Owl searches for an adequate food supply prior to nesting. The hunting behaviour we observed may have been this prenesting activity.

The mainland arctic coast is the northern limit of the Short-eared Owl's breeding range, although they may breed in small numbers on Victoria Island (Godfrey 1966; McLaren and Alliston 1981; Parmelee et al. 1967).

Other raptors sighted during the migration watch were a Peregrine Falcon on 6 June and a Snowy Owl on 13 June.

Jaegers

Of the 124 jaegers sighted, 60% were Long-tailed, 29% were Pomarine and 11% were Parasitic (Table 1). Most of the Long-tailed Jaegers occurred prior to 15 June and the maximum seen in a single 2-hour watch was 11 (Appendix B). The direction of travel was variable, although 66% of the sightings were heading either south, southeast or east (Appendix C). A pair of Long-tailed Jaegers had established a nest near the migration watch station prior to our arrival on 6 June. It was usually easy to distinguish this nesting pair from migrant jaegers.

The Pomarine Jaeger migrated at a higher altitude than most birds (mean of 48 m asl). Distance offshore averaged 97 m and predominant direction of travel was southeast (76%) (Table 1).

We saw 9 Parasitic Jaegers. They migrated at an average of 18 m agl and 400 m inland from the coast in a northwesterly direction (100%) (Table 1). The Parasitic Jaeger is the least common of the 3 jaegers on Victoria Island (Parmelee et al. 1967; McLaren and Alliston 1981).

Gulls

We recorded a total of 209 Glaucous Gull observations (Table 1). Several gulls were present at almost every watch, feeding and resting at the ice edge. Gulls in flight tended to follow the coastline with 39% flying southeast and 29% flying northwest (Appendix C). The largest movement of Glaucous Gulls through the study area was a loose flock of about 50 which we observed resting offshore on 9 June (Appendix B).

The Glaucous Gull is an early migrant. At Cambridge Bay, for example, most had arrived by 1 June in both 1960 and 1962 (Parmelee et al. 1967). Thus, some of the birds we saw may have been non-breeders or local nesters that were using the shallow water offshore to feed.

We recorded a total of 61 Sabine's Gulls, 47 of which occurred on 8 June (Appendix B). Flocks varied in size from 1 to 23 birds. Migrant birds flew along the coast at a low level, about two-thirds heading southeast and one-third heading northwest (Appendix C).

The Sabine's Gull is a common nester on southeastern Victoria Island (Parmelee et al. 1967). However, on western Victoria Island, it was found nesting only in the Kagloryuak River valley and at Lady Franklin Point (McLaren and Alliston 1981; this study). Parmelee et al. (1967) noted that in both 1960 and 1962 the Sabine's Gull first arrived on southeastern Victoria Island on 6 June with most arriving by mid-June.

Arctic Tern

The Arctic Tern was not seen until 9 June (Appendix B). Similarly, the earliest Parmelee et al. (1967) saw terns on southeastern Victoria Island was 11 June in both 1960 and 1962. Of the 188 Arctic Tern sightings we recorded, about one-third were terns feeding just offshore. Migrant birds generally flew near the coast (average of 58 m inland) and at a low altitude (mean at 9 m agl) (Table 1). The direction of travel varied, although 56% were heading either north or northwest (Fig. 4). By 19 June, two pairs had established nests near the migration watch station. The Arctic Tern nests throughout the Arctic including Victoria Island (Parmelee et al. 1967; this study).

Shorebirds and Passerines

The species of shorebirds seen migrating were the Ruddy Turnstone, Red Phalarope, Pectoral Sandpiper, American Golden Plover and Semipalmated Plover, all of which nest on Victoria Island (McLaren and Alliston 1981; Parmelee et al. 1967). All flocks had less than 10 birds with the exception of a flock of 16 Semipalmated Plovers and a flock of 11 Pectoral Sandpipers, both of which occurred on 8 June. Flights were generally about 3 m agl and 560 m inland from the coast (Table 1). Other shorebird species noted, but which seemed to be nesting locally rather than migrating, were the Black-bellied Plover, Semipalmated Sandpiper, Buff-breasted Sandpiper, Baird's Sandpiper, Stilt Sandpiper, Northern Phalarope and Least Sandpiper.

We saw very few migrant passerines (total of 41) (Table 1). Flocks all had less than 10 birds with the exception of 12 Lapland Longspurs on 8 June. The only other species that we saw migrating were the Snow Bunting and Savannah Sparrow. All three species nest on Victoria Island; the Lapland Longspur nests in abundance, while the Snow Bunting is uncommon and the Savannah Sparrow is rare (McLaren and Alliston 1981; Parmelee et al. 1967).

There are several possible reasons why we saw so few migrant shorebirds and passerines. The peak period of migration for most of these species may have already occurred by 6 June, which was the first day of the migration watch. Parmelee et al. (1967) reported that Snow Buntings first arrived at Cambridge Bay on 10 May in 1962, while Lapland Longspurs, redspolls and Horned Larks arrived at the end of May, and the majority of shorebird species arrived in the first week in June. Futhermore, many species of passerines and shorebirds migrate at night, at high altitudes

and on a broad front (Richardson 1979; Lack 1973; Gauthreaux 1972). Thus, most of their migratory movements would not be detected by this study.

4.3 Aerial Surveys

The results of the aerial surveys are presented in Tables 3, 4, and 5, and Appendix D.

Loons

Most of the Yellow-billed Loons (18 out of 23) and over half of the other species of loons that we saw were at Dolphin and Union Strait, and amongst the islands at the mouth of the Kagloryuak River (Table 3). It is difficult to tell whether these birds were nesting, non-breeders or late migrants that were staging before moving inland to nest. Migration studies along the Yukon and Alaska coast indicate that migration lasts from about 1 to 30 June and that in some years the peak migration period is as late as 20 June (Richardson and Johnson 1981). Thus, it is quite possible that many of these birds were still migrating when surveyed on 24 and 25 June. However, when McLaren and Alliston (1981) surveyed one to three weeks after us, they also found substantial numbers of Yellow-billed Loons and Arctic Loons at the head of Prince Albert Sound and at Lady Franklin Point. Again, they could not tell whether these were nesting birds or failed nesters and other non-breeding birds.

Unlike the Yellow-billed Loon which was found primarily along the coast, the Arctic Loon was also found on inland lakes (Appendix D). Although we did not positively identify any Red-throated Loons, McLaren and Alliston (1981) reported seeing a number of them, primarily in coastal areas.

Table 3. Densities of birds observed during aerial surveys on western Victoria Island, 24–29 June 1980 (birds/km^2).

Survey Segment[I]	Loons	Swans	Geese	Ducks	Ptarmigan	Cranes	Jaegers	Gulls	Terns	Raptors	Shorebirds	Total
1[II]	0.35	0.02	1.41	64.75			0.01	0.95	1.59		0.02	69.13
2		0.25	0.25	1.05	0.11		0.04	0.69	0.40		0.22	3.00
3	0.04	0.67	1.17	0.91	0.15	0.08	0.12	0.65	0.86	0.02	0.62	5.29
4		0.11	0.52	0.48	0.02			0.09			0.08	1.32
5[II]	0.21		0.14	46.23				0.43				47.01
6	0.12	0.11	0.81	3.78	0.03	0.01	0.30	0.35	0.32	0.02	0.51	6.35
7	0.64	0.04	0.74	6.45	0.09	0.04	0.11	0.91	0.47	0.02	0.45	9.96
8		0.27	0.66	3.32	0.14	0.02	0.46	0.55	0.12	0.09	0.43	6.08
9	0.01	0.18	0.29	1.12	0.10	0.04	0.27	0.19	0.33	0.01	0.34	2.89
10	0.03	0.08	0.34	0.37	0.17			0.20	0.08		0.20	1.50
11	0.15	0.13	0.03	0.49	0.02	0.07	0.03	0.39	0.01	0.03	0.43	1.81
12	0.04	0.13	0.09	0.13		0.04	0.04	0.06			0.08	0.62
13	0.01			1.05	0.04	0.04	0.03	0.13	0.01	0.01	0.20	1.55
14			0.17	1.12				0.09				1.38
15		0.05	1.87	1.87	0.05		0.80	0.05	0.37		0.64	5.89
A	0.19	0.78	4.18	4.57	0.78		0.19	0.29	0.19		0.68	11.38
B	0.04		0.11	0.27	0.38		0.13	0.16		0.02	0.41	1.51
C	0.13	0.05	0.18	0.46	0.20		0.18	0.15	0.13	0.03	0.46	2.01
D				0.73	0.03		0.13	0.03	0.06		0.13	1.30
E		0.06		0.35	0.22			0.02			0.02	0.66
F	0.09	0.09	0.26	0.95			1.21		0.09		0.60	3.28

[I]Reference numbers for survey segments (see Fig. 2).

1. Dolphin and Union Str.
2. S of Tassijuak L.
3. SW coast of Victoria Is.
4. Coast near Cape Baring
5. Lead off Cape Baring
6. Coast of Prince Albert Sd.
7. Islands and mouth of Kagloryuak R.
8. Kagloryuak R. and tributaries
9. Transects in Kagloryuak R. valley
10. Coast east of Holman
11. NW Diamond Jenness Penn.
12. Kuujjua R.
13. NE of Minto Inlet
14. River at Richard Collinson Inlet
15. Coast of Richard Collinson Inlet.

[II]Mostly migrant birds

A–F Proposed pipeline route.

Table 4. Densities of geese observed during aerial surveys on western Victoria Island, 24-29 June 1980

	Survey Segment	Density (birds/km^2)					
		Canada Goose	Brant	White-fronted Goose	Snow Goose	Unidentified goose	All geese
1.	Dolphin and Union Strait[I]	0.40	0.71			0.30	1.41
2.	S of Tassijuak L.	0.11	0.11			0.04	0.25
3.	SW coast of Victoria Is.	1.02	0.02	0.04		0.08	1.17
4.	Coast near Cape Baring	0.32	0.03			0.17	0.52
5.	Lead off Cape Baring[I]		0.14				0.14
6.	Coast of Prince Albert Sd.[II]	0.41	0.18			0.23	0.81
7.	Islands and mouth of Kagloryuak R[II]	0.04	0.53			0.17	0.74
8.	Kagloryuak R. and tributaries	0.30	0.14	0.04		0.18	0.66
9.	Transects in Kagloryuak R. valley	0.15	0.06		0.02	0.06	0.29
10.	Coast east of Holman	0.28	0.03			0.03	0.34
11.	NW Diamond Jenness Penn.			0.01		0.02	0.03
12.	Kuujjua R.	0.09					0.09
13.	NE of Minto Inlet						
14.	River at Richard Collinson Inlet		0.17				0.17
15.	Coast of Richard Collinson Inlet		1.70			.16	1.87
A	Proposed pipeline route	3.85	0.19	0.10			4.18
B	Proposed pipeline route	0.11					0.11
C	Proposed pipeline route	0.10				0.08	0.18
D	Proposed pipeline route						
E	Proposed pipeline route						
F	Proposed pipeline route					0.26	0.26

[I] Mostly migrant birds.
[II] Includes flocks of migrant ducks at river mouths along coastline.

Table 5. Densities of ducks observed during aerial surveys on western Victoria Island, 24-29 June 1980.

	Survey Segment	Density (birds/km^2) Common Eider	King Eider	Eider sp.	Old-squaw	Unidentified duck	All ducks
1.	Dolphin and Union Strait[I]	22.66	6.99	7.29	22.36	5.42	64.75
2.	S of Tassijuak L.		0.69	0.07	0.14	0.14	1.05
3.	SW coast of Victoria Is.	0.31	0.40	0.06	0.09	0.04	0.91
4.	Coast near Cape Baring		0.02			0.46	0.48
5.	Lead off Cape Baring[I]	18.29	0.29	0.29	13.29	14.29	46.23
6.	Coast of Prince Albert Sd.[II]	1.41	0.88	0.32	1.03	0.14	3.78
7.	Islands and mouth of Kagloryuak R[II]	2.37	1.42	0.32	0.34	1.97	6.45
8.	Kagloryuak R. and tributaries	.02	2.63	.23	.29	.16	3.32
9.	Transects in Kagloryuak R. valley	0.09	0.85	0.09	0.07	0.01	1.12
10.	Coast east of Holman	0.06	0.17		0.11	0.03	0.37
11.	NW Diamond Jenness Penn.	0.01	0.20	0.02	0.25		0.49
12.	Kuujjua R.	0.02	0.09		0.02		0.13
13.	NE of Minto Inlet	0.34	0.61			0.10	1.05
14.	River at Richard Collinson Inlet		1.12				1.12
15.	Coast of Richard Collinson Inlet	0.21	1.12			0.53	1.87
A	Proposed pipeline route	0.10	0.48		3.75	0.19	4.57
B	Proposed pipeline route	0.14	0.05	0.02	0.05		0.27
C	Proposed pipeline route	0.15	0.23	0.03	0.05		0.46
D	Proposed pipeline route	0.09	0.44		0.06	0.13	0.73
E	Proposed pipeline route		0.35				0.35
F	Proposed pipeline route	0.52	0.42				0.95

[I] Mostly migrant birds.
[II] Includes flocks of migrant ducks at river mouths along coastline.

Swans

Nesting Whistling Swans were abundant along the southwest coast of Victoria Island (0.7 swans/km^2), south of Tassijuak Lake swans/km^2) and in the Kagloryuak River valley (0.2 swans/km^2) (Table 3). McLaren and Alliston (1981) likewise found high swan densities in the lowlands near Lady Franklin Point (0.6 swans/km^2) and the Kagloryuak River valley (0.6 swans/km^2). Elsewhere moderate numbers were found on the Diamond Jenness Peninsula north of Holman, in the Kuujjua River valley and along the coastal lowlands of Prince Albert Sound (0.1 swans/km^2 to 0.1 swans/km^2). Inland along the pipeline route densities were low.

Geese

The most common species of geese were Canada Geese (63%) and Brant (36%). Nesting Canada Geese were most abundant along the southwest coast (1.0/km^2), especially near Lady Franklin Point (3.8/km^2) (Table 4). They were also scattered in moderate numbers on ponds along the coast of Prince Albert Sound. We saw only 5 Canada Geese in the Kuujjua River valley and none from Minto Inlet northward. McLaren and Alliston (1981) likewise found that densities were fairly high in the south, but declined sharply north of Holman.

We found several Canada Geese nesting on cliffs in old Rough-legged Hawk nests in the Kuujjua River valley and along a tributary of the Kagloryuak River. McLaren and Alliston (1981) reported a colony of about 40 Canada Goose nests on the cliffs bordering the Kuuk River on western Victoria Island.

Most of the Brant we saw were in the polynia at Dolphin and Union Strait (0.7/km^2), amongst the islands at the head of Prince Albert Sound (0.5/km^2) and at Richard Collinson Inlet (1.7/km^2) (Table 4). We

found, as did McLaren and Alliston (1981), that there were very few Brant inland.

We recorded only 8 White-fronted Geese: 5 along the southwest coast of Victoria Island, a pair along the Kagloryuak River and 1 north of Holman (Table 4). The 3 Snow Geese we encountered were in the Kagloryuak River valley.

Ducks

At the time of our surveys some ducks were still migrating, whereas others had begun to nest. It was not always possible to determine whether they were nesting or migrating, particularly the Common Eider which nests in colonies. For the purpose of data analysis, those ducks found offshore in leads, polynias and river mouths were considered migrants, while all other ducks were treated as nesting birds.

The polynia at Dolphin and Union Strait was a major staging area for ducks. When we surveyed the polynia on 5 June, there was very little open water elsewhere on western Victoria Island from Minto Inlet south to Dolphin and Union Strait. The perimeter of the polynia was approximately 142 km and we counted 54.8 ducks/km^2. On 25 June the polynia had increased in size to a perimeter of 207 km and the density of ducks had also increased to 64.8 ducks/km^2 (Fig. 3) (Table 3). The ducks were most numerous between Lady Franklin Point and Cache Point where we estimated 229 ducks/km^2. The other area where we encountered a high concentration of migrant ducks was the lead of open water off Cape Baring in the mouth of Prince Albert Sound where there were 46.2 ducks/km^2 on 25 June. Small flocks of migrants were found in stream mouths in Prince Albert Sound, especially at the Kagloryuak River mouth.

The Common Eider was the most abundant species (49%), followed by the Oldsquaw (38%) and King Eider (13%) (Appendix D). Other species seen in small numbers were the Pintail, White-winged Scoter and Red-breasted Merganser.

About 63% of the nesting ducks which we saw on western Victoria Island were King Eiders. This species nested by lakes and ponds throughout the interior, but it was most abundant along the Kagloryuak River where we recorded an average density of 2.6 King Eiders/km^2 (Table 5). As McLaren and Alliston (1981) reported, the King Eider was the most common duck species inland along the pipeline route. Similarly, Smith (1973) and Parmelee et al. (1967) saw more King Eiders than any other species inland on Victoria Island.

Common Eiders accounted for 22% of the nesting ducks encountered. Most were by the coast, particularly on the islands at the east end of Prince Albert Sound and along Dolphin and Union Strait (Table 5). Very few were seen inland. During ground surveys, McLaren and Alliston (1981) found a colony of 73 nests on an island at the head of Prince Albert Sound, and another colony of 319 nests near Lady Franklin Point. Nettleship and Smith (1975) reported that Camping Island, Lambert Island and several other smaller islands in Dolphin and Union Strait are important nesting areas for Common Eiders. However, when we surveyed those islands on 25 June, we saw hundreds of birds along the shore by the open water, but no evidence of nesting. Because Common Eiders tend not to flush from the nest, it is difficult to detect them from the air. Thus, they may have been nesting, but we were unable to see them. It is also possible that they had not started to nest at the time of the survey on 25 June. However, hatching dates for the eider colony near Lady Franklin

Point (McLaren and Alliston 1981) and our migration watch indicated that egg laying likely began in mid-June in 1980. Common Eiders may nest on the islands only in certain years, although, Barry and Barry (1982) surveyed the islands from the air on 7 July 1981 and likewise saw no evidence of nesting eiders.

Oldsquaw comprised 14% of the nesting ducks. The highest density occurred in the coastal lowland near Lady Franklin Point (3.8/km^2 or 1.1/km^2 if exclude two large flocks of Oldsquaw that were probably migrant) (Table 5). Moderate numbers of nesting Oldsquaw were also found along the coastal areas of Prince Albert Sound, along the Kagloryuak River and inland on the Diamond Jenness Peninsula. We saw no nesting Oldsquaw north of Minto Inlet, although McLaren and Alliston (1981) reported low densities at Richard Collinson Inlet.

Gulls

Gull species encountered were the Glaucous Gull, Thayer's and/or Herring Gull and Sabine's Gull. Over 80% of the sightings were of Glaucous Gulls (Appendix D). This species was scattered throughout the study area, although densities were lower from Minto Inlet northward. The Glaucous Gull nested primarily on cliffs and on islets in ponds, both solitarily and in colonies. The highest densities of nesting Glaucous Gulls occurred along the coastal lowlands of Dolphin and Union Strait (0.8/km^2) and on the islands at the head of Prince Albert Sound (0.8/km^2). We also found a nesting colony of about 40 Glaucous Gulls on a sea cliff just east of Holman, and another smaller colony of about 8 gulls on one of the islands at the head of Prince Albert Sound (Fig.5).

Thayer's Gulls were far less common than Glaucous Gulls, for we recorded 52 Thayer's Gulls compared to 382 Glaucous Gulls. A few Thayer's

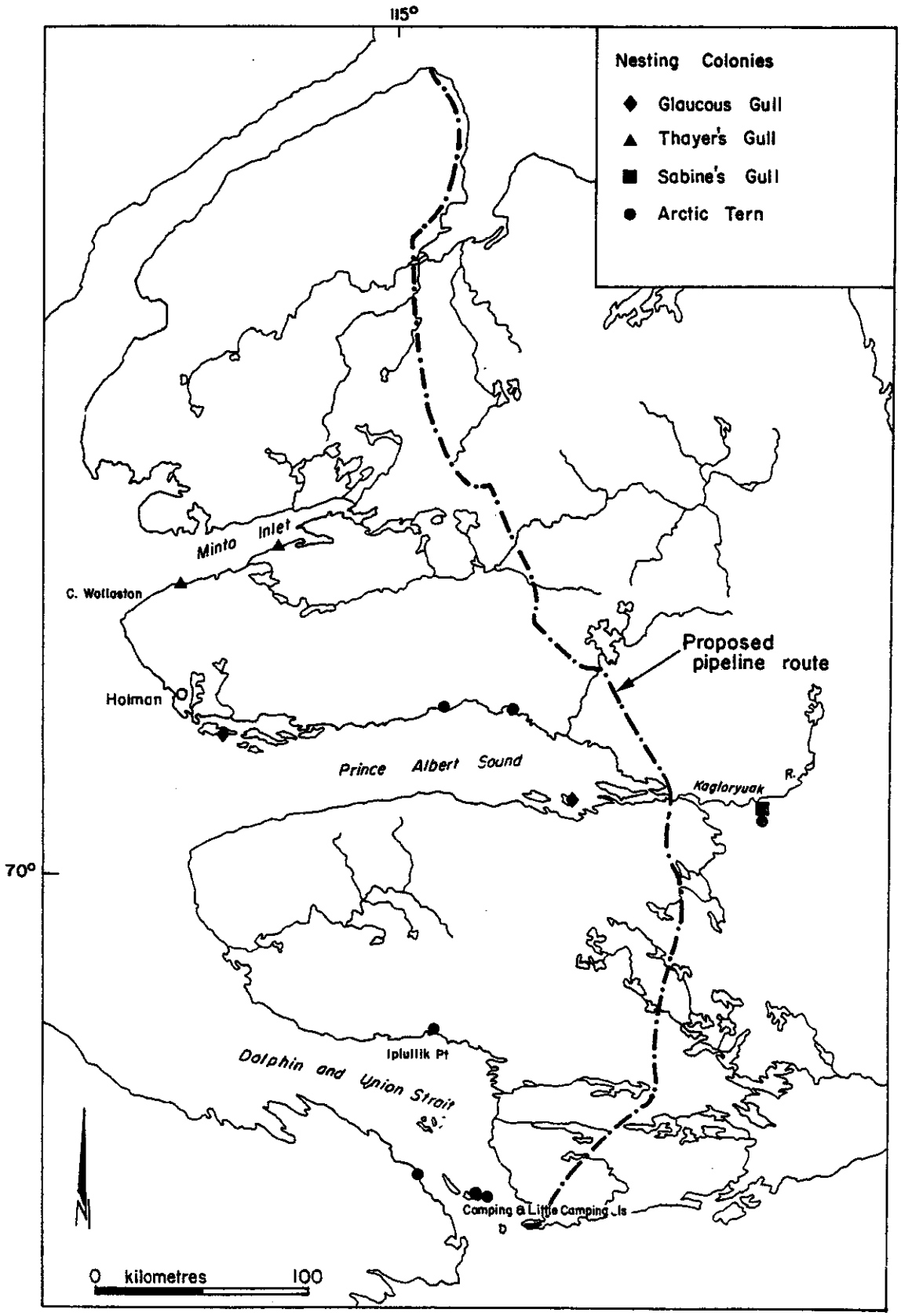

Figure 5. Nesting colonies found during aerial surveys in June 1980.

Gulls were scattered along the coast of Prince Albert Sound and in the Kagloryuak River valley. During the raptor survey at Minto Inlet on 23 June, we found a colony of about 30 Thayer's Gulls nesting on a cliff along the south shore about 10 km east of Cape Wollaston (Fig. 5). Another small colony of at least 4 birds was found east of there on a sea cliff. McLaren and Alliston (1981) reported 4 additional small colonies at Minto Inlet. We recorded 12 Thayer's Gulls singly or in pairs along the coast of Dolphin and Union Strait. However, these birds may have been Herring Gulls as the Strait marks the northern boundary for the Herring Gull (Godfrey 1966).

We saw a total of 32 Sabine's Gulls, including a nesting colony of at least 9 birds. The colony, as well as most of the other sightings were in the Kagloryuak River valley (Fig. 5). Similarly, the majority of Sabine's Gulls that McLaren and Alliston (1981) saw were in the Kagloryuak River valley. Smith (1973) reported no Sabine's Gulls nesting in the Holman area, but the bird is a common nester on southeastern Victoria Island where Barry estimated 700 Sabine's Gulls in Wellington Bay alone during a waterfowl survey in early August 1960 (Parmelee et al. 1967).

Arctic Terns

We observed a total of 351 Arctic Terns, with the highest density occurring along the shoreline adjacent to the polynia in Dolphin and Union Strait (1.6/km^2) (Table 3). The following colonies were noted: 34 terns nesting on Little Camping Island, 16 terns on Camping Island, 40 terns on the mainland at the north end of Lambert Channel, 50 terns near Ipuillik Point on the southeast coast of Victoria Island, 9 and another 10 terns nesting on the north shore of Prince Albert Sound, and about 20 terns nesting in the Kagloryuak River valley (Fig. 5). The Arctic Tern was less

common in the northern half of the study area, although we recorded 8 terns in the coastal lowlands to the west of Richard Collinson Inlet.

Cranes

Low densities of Sandhill Cranes (0.1 cranes/km^2 and 28 in total) were found along the southwest coast of Victoria Island, at the head of Prince Albert Sound, in the Kagloryuak River valley, in the Kuujjua River valley and at the head of Minto Inlet (Table 3). McLaren and Alliston (1981) likewise reported cranes widely scattered in areas adjacent the proposed pipeline route. Their sightings included a pair at Richard Collinson Inlet.

Jaegers

We found 171 jaegers scattered throughout the study area. The highest densities were at Richard Collinson Inlet (0.9/km^2), the Kagloryuak River valley (0.3/km^2) and the coastal lowlands of Prince Albert Sound (0.3/km^2) (Table 3). McLaren and Alliston (1981) reported a similar distribution and noted that although they saw all three species of jaeger (Pomerine, Parasitic and Long-tailed), the Pomerine Jaeger was the most abundant.

Raptors

On 23 June, we surveyed approximately 385 km of cliffs at the head of Minto Inlet and east of Holman in search of nesting raptors (Fig. 2). We saw a total of 11 Peregrine Falcons at 9 sites; at 2 sites there was a bird incubating, at 3 sites the nest was occupied by 1 falcon or a pair and at 4 sites a falcon flushed from the cliff, but its nesting status remained undetermined. In addition, we saw 46 Rough-legged Hawks. During the surveys of 24-29 June, we found another Peregrine Falcon nest attended

by 2 adults south of Minto Inlet. As well, we found 7 Rough-legged Hawks, 4 Snowy Owls, and 3 Short-eared Owls (Appendix D).

In 1980, McLaren and Alliston (1981) also surveyed for raptors in the vicinity of Minto Inlet and the Kuujjua River. We co-ordinated our study with theirs to avoid overlap of cliffs surveyed. During 19 hours of surveys, McLaren and Alliston (1981) saw Peregrine Falcons at 21 sites. Nesting was confirmed at 2 sites, undetermined at 17 sites, and there was no nesting at the remaining 2 sites. In the same area, McLaren and Alliston (1981) found 91 active Rough-legged Hawk nests. Both their study results and ours indicate that the cliffs adjacent to Minto Inlet, in the Kuujjua River valley and east of Holman are important nesting habitat for the Peregrine Falcon and Rough-legged Hawk. The importance of this area is accentuated by the fact that Falco peregrinus tundrius, the subspecies of the Peregrine Falcon that is found on the tundra, is classified as a "threatened" wildlife species in Canada (Committee on the Status of Endangered Wildlife in Canada).

Ptarmigan

We recorded 49 ptarmigan in total. The highest density was in the lowlands at Lady Franklin Point (0.8/km^2) (Table 3). Generally, there were less ptarmigan on the northern half of Victoria Island, although we recorded 0.2 birds/km^2 along the pipeline route north of the Kuujjua River. According to McLaren and Alliston (1981), the Rock Ptarmigan was more abundant and widespread than the Willow Ptarmigan which showed a significant preference for well vegetated tundra.

Shorebirds and Passerine

Because so few of the smaller species of birds are detected during aerial surveys, we did not attempt to survey for passerines. However, we did

record shorebirds and found their densities were highest in the coastal lowlands adjacent Dolphin and Union Strait, Prince Albert Sound and Richard Collinson Inlet (Table 3).

4.4 Summary of Important Areas to Birds

The following discussion of important areas should be regarded as preliminary, because it is based on a single set of aerial surveys and only partial coverage of western Victoria Island. The limitations of the study are described in detail in Section 3.3.

Staging Areas During Spring Migration

The two major staging areas during spring migration were the polynia at Dolphin and Union Strait, and the lead off Cape Baring (Fig. 6). Overall bird densities were 69.1 birds/km^2 and 47.0 birds/km^2 respectively. Of secondary importance were the mouths of rivers and streams, especially the Kagloryuak River mouth. The most abundant species at these staging areas were the Common Eider, King Eider and Oldsquaw which constituted over 90% of the count. Other bird species present in notable numbers were the Yellow-billed Loon, Arctic Loon, Brant, Glaucous Gull and Arctic Tern.

Nesting Areas

Fig. 6 shows where we encountered the highest densities of nesting birds ($\geq$3.0 birds/km^2) during the aerial surveys. Generally, these areas were lowlands with continuous vegetative cover and numerous ponds. The unconsolidated boundaries in Fig. 6 indicate that based on the topography similar bird densities likely occur beyond the area surveyed. A description of the habitat and birds in each of the areas designated as important for nesting birds follows. For those areas which include more

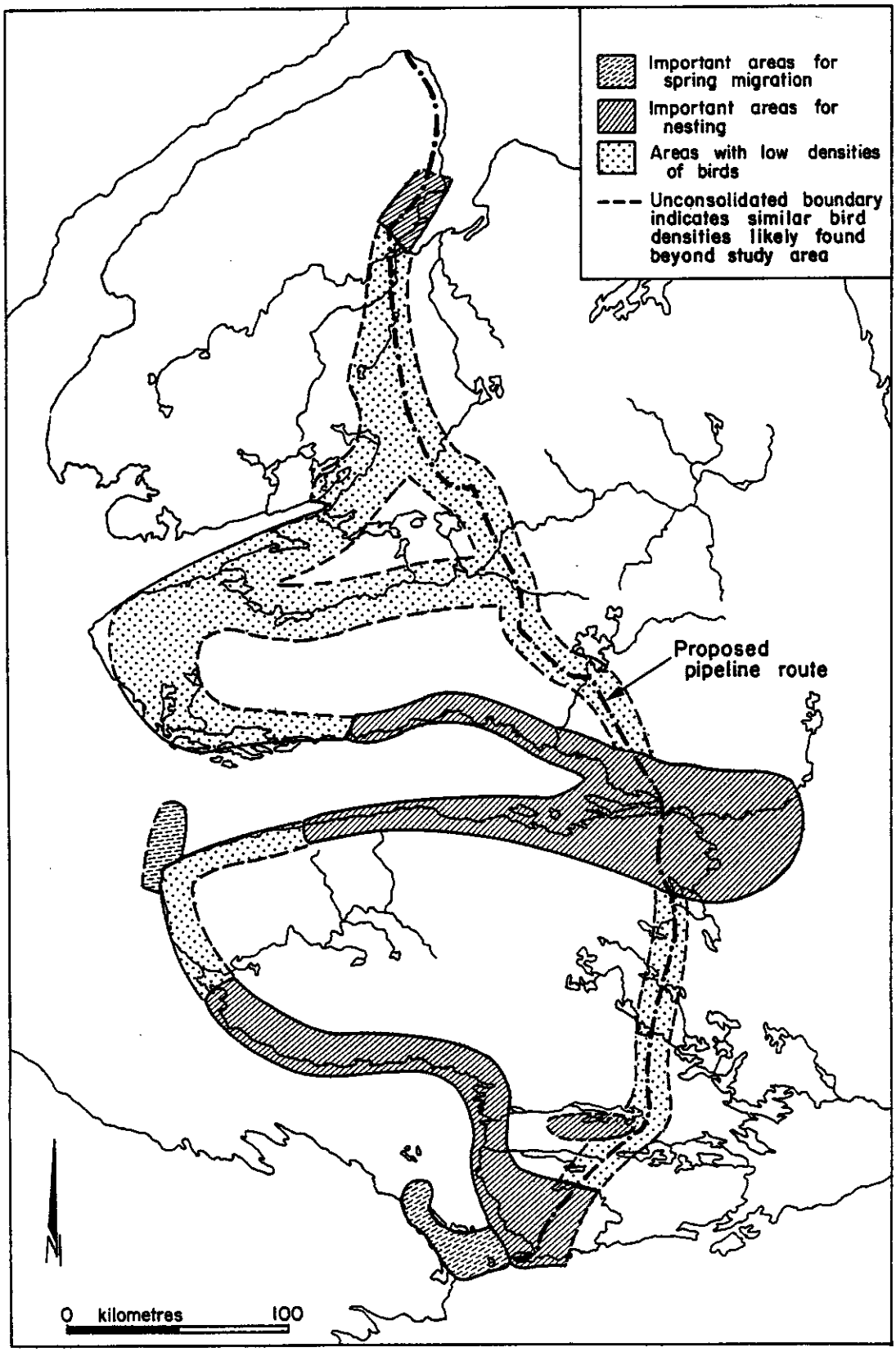

Figure 6. Important areas for spring staging and nesting birds according to aerial surveys conducted 24-29 June 1980.

than one survey segment, the densities presented are weighted averages of the densities given in Table 3 for each survey segment.

Coastal Lowlands of Southwestern Victoria Island (survey segments 3 and A)

This is a flat lowland with numerous shallow ponds which extends about 30 km northward from Lady Franklin Point. The vegetative cover is nearly continuous with extensive tussocky wet sedge meadows and many shallow ponds. Westward along the coast from Lady Franklin Point, the vegetative cover varies from 20 to 90%, with greater cover generally occurring where there are ponds.

The overall density of birds on the coastal lowlands of southwestern Victoria Island was 5.9 birds/km^2. This area had the highest densities of nesting Whistling Swans, Oldsquaws and Canada Geese in the study area (0.7/km^2, 1.1/km^2 and 1.3/km^2 respectively). Other relatively abundant species were the Arctic Tern, Glaucous Gull and ptarmigan.

Coastal lowlands of Prince Albert Sound (survey segment 6)

Prince Albert Sound is bordered by a narrow band of lowlands with an estimated 75% cover of vegetation. Tussocky tundra and wet sedge marshes with shallow ponds predominate. Not far from the coast the land rises gently forming rolling uplands which are drier and more sparsely vegetated with less than 40% cover.

We recorded a bird density of 6.4 birds/km^2 for the coastal lowlands of Prince Albert Sound (Table 3). About one-third of these birds were migrant flocks staging in stream mouths along the coast, so that the density of nesting birds was about 4 birds/km^2. The density of nesting ducks was moderately high at 1.4/km^2 and the King Eider was the most common species (0.8/km^2). A moderate number of Canada Geese as well as

some Brant nested on the coastal ponds for a total of 0.8 geese/km^2. There were also nesting Glaucous Gulls, Arctic Terns and jaegers.

Kagloryuak River Valley (survey segments 8 and 9)

Much of the Kagloryuak River valley is gently rolling to flat and covered with tussocky sedge vegetation. In the lowland areas there are numerous ponds and wet sedge marshes, whereas the hilltops are dry and only partially vegetated.

The overall bird density for the valley was 3.8 birds/km^2. However, the density along the river and its tributaries was considerably higher at 6.1 birds/km^2. The Kagloryuak River had 2.6 King Eiders/km^2 which was the highest density of King Eiders in the study area (Table 5). The density of Whistling Swans was moderate at 0.2/km^2. The valley also had a Sabine's Gull colony and the second highest density of jaegers in the study area.

Mouth of Kagloryuak River and Nearby Islands (survey segment 7)

Although upland areas had less than a 50% vegetative cover, the low lying areas were well vegetated, primarily with wet sedge, and had numerous shallow ponds. Overall vegetative cover was 50% to 80%.

This area had an overall density of 10.0 birds/km^2 and the highest density of ducks in the study area (6.4/km^2) (Table 3). The most abundant species was the Common Eider. A colony of 73 nests on one of the islands was confirmed by McLaren and Alliston (1981). Some of the birds at the mouth of the Kagloryuak River were likely migrant rather than nesting, but the proportion is unknown. Other species nesting on the islands included King Eider, Oldsquaw, Brant and a colony of Glaucous Gulls.

Coastal Lowlands at Richard Collinson Inlet (survey segments 15 and F)

The limited amount of wet, well-vegetated coastal lowlands along the west shore of Richard Collinson Inlet had a density of 4.8 birds/km^2. Brant, King Eider, Arctic Terns, jaegers and shorebirds were the most abundant species.

South of Tassijuak Lake (survey segment 2)

The Tassijuak Lake area is gently rolling with many small lakes. Although the vegetative cover is sparse on ridge tops, in the valleys it is continuous and includes wet sedge meadows.

The overall density of birds for this area was 3.0/km^2 (Table 3). The density for Whistling Swans was relatively high at 0.2/km^2. Other common nesting species were the King Eider, Arctic Tern and Glaucous Gull.

4.5 Comparison with bird densities obtained during a similar study in the Keewatin District

In order to determine the relative importance of western Victoria Island to birds, it is useful to compare the densities found there with those for other areas of the Arctic. This exercise can be misleading, however, because several factors bias the results of a study. These factors include observer skill, type of habitat, survey techniques, method of data analysis, timing of surveys, year to year fluctuations in local populations and weather conditions. The author conducted a study in the Keewatin in 1977 (Allen and Hogg 1978) which should be somewhat comparable to this study. Although different with respect to the year, pilot and time of year (one to two weeks later), the same methods for surveying and data analysis were used, and the author was an observer for both surveys.

Generally, the densities of nesting birds in the prime areas on western Victoria Island were similar to the areas with moderate densities in the Keewatin. The entire southern half of the interior of the Keewatin averaged 6.3 birds/km^2 compared to the most important nesting areas on western Victoria Island which averaged 5.6 birds/km^2. Densities recorded in the prime nesting areas in the Keewatin were considerably higher than those for western Victoria Island. The lakes and rivers in the lowlands south of Spence Bay adjacent to the Rassmussen Basin had an average of 43.6 birds/km^2 during the nesting season. Several major river systems in southern Keewatin also had substantially higher densitites: Thlewiaza River - 10.5, Tha-anne River - 13.0 and Kogtok River - 13.8 birds/km^2 as compared to the Kagloryuak River - 6.1 birds/km^2. The Wager Plateau which extends north of Baker Lake had very low bird densities, similar to those found in the poorly vegetated parts of western Victoria Island.

Although western Victoria Island generally had lower densities of nesting birds than the Keewatin District, it had two outstanding features:

- the concentrations of spring staging sea ducks in the polynia at Dolphin and Union Strait and in the lead off Cape Baring, and
- the high density of nesting Peregrine Falcons and Rough-legged Hawks near Minto Inlet and Holman.

5.0 NEED FOR FURTHER STUDIES

More information about the birds on western Victoria Island is required in order to assess the potential impact of development proposals such as the Polar Gas pipeline.

1) Surveys are needed to determine the distribution of brood-rearing, moulting and fall staging birds on western Victoria Island. To date, only spring-staging and nesting birds have been investigated (this study; McLaren and Alliston 1981), with the exception of Barry (Barry et al. 1981; Barry and Barry 1982) who surveyed parts of the west coast of Victoria Island for nesting and brood-rearing eiders.

2) Surveys are needed to determine the species composition, distribution and habitat preferences of birds on Prince Albert Peninsula and in Richard Collinson Inlet. To date, bird surveys on this part of Victoria Island have been limited to a corridor along the proposed route for the Polar Gas pipeline (this study; McLaren and Alliston 1981) and the eider surveys by Barry along the west coast (Barry et al. 1981; Barry and Barry 1982).

3) Surveys on the ground are needed to obtain more accurate data on nesting birds. Many birds are missed during aerial surveys, particularly the smaller species. The only data available to date are the site specific species accounts by Smith (1973) and Porsild (1951), a ground search for nesting eiders on several of the Investigator Islands by Barry and Barry (1982), and the transect surveys by McLaren and Alliston (1981) at several sites along the proposed route for the Polar Gas pipeline.

4) A ground search of the islands in Dolphin and Union Strait and Prince Albert Sound should be conducted to determine the significance of these islands to nesting Common Eider, Brant,

gulls and terns. McLaren and Alliston (1981), and Barry and Barry (1982) have each done a ground search of some of the islands, but a systematic search of all islands is needed. Of particular interest are Lambert, Camping and the other islands in Dolphin and Union Strait which Nettleship and Smith (1975) identified as important to nesting Common Eiders.

5) Because bird usage of an area fluctuates annually, at least one additional year of surveys for nesting and spring staging birds should be conducted on western Victoria Island.

REFERENCES

Allen D.H. and T.H. Hogg. 1978. Bird studies in the Keewatin District. ESCOM No. A1-27, Can. Wildl. Serv., Edmonton.

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

Barry, T.W. 1960. Waterfowl reconnaissance in the western Arctic. Arctic Cir. 13:51-58.

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

Bartels, R.T. 1973. Bird survey techniques on Alaska's north coast. Unpubl. M. Sc. thesis, Iowa State University, Ames, Iowa.

Bellrose, F.C. 1976. Ducks, geese and swans of North America. Stackpole Books, Harrisburg.

Cooch, F.G. 1965. The breeding biology and management of the northern eider (Somateria mollissima borealis) in the Cape Dorset area, NWT. Can. Wildl. Serv. Manage. Bull. (Ser. 2) 10.

_____. 1980 - fall flight forecast of Arctic and Sub-Arctic geese nesting in Canada. Unpubl. Rep., Can. Wildl. Serv., Ottawa.

Ellis, D.V. 1956. Observations on the Migration, Distribution and Breeding of Birds in the Canadian Arctic During 1954 and 1955. Dansk Orn. Foren. Tidsskr. 50:207-230.

Gauthreaux, S.A. 1972. Behavioral responses of migrating birds to daylight and darkness: a radar and direct visual study. The Wilson Bulletin 84 (2):137-148.

Godfrey, W.E. 1966. The birds of Canada Natl. Mus. Can. Bull. 203. Ottawa.

Haddock, J.L. and C.D. Evans. 1975. Spring bird populations on Alaska's arctic slope. U.S. Fish and Wildl. Serv., Anchorage, Alaska.

Höhn, E.O. 1955. Birds and mammals observed on a cruise in the Amundsen Gulf, NWT, July 29th - August 16th. Can. Field-Nat. 69:41-44.

Johnsgard, P.A. 1975. Waterfowl of North America. Indiana University Press, Bloomington.

Johnson, S.R. and W.J. Richardson. 1980. Beaufort Sea barrier island - lagoon ecological process studies: final report, Simpson Lagoon. Part 3: Birds. N.O.A.A. Arctic Project Office, Univ. of Alaska. Fairbanks.

Lack, D. 1963. Migration across the southern North Sea studied by radar. Part V. Ibis 105:461-492.

McEwen, E.H. 1957. Birds observed at Bathurst Inlet, NWT. Can. Field-Nat. 71:109-115.

McLaren, M.A. and W.G. Alliston. 1981. Summer bird populations on western Victoria Island, NWT, July 1980. Unpubl. Rep. to Polar Gas Limited, Toronto.

Nettleship, D.N. and P.A. Smith. 1975. Ecological sites in northern Canada. Canadian Committee for the International Biological Program Conservation. Terrestrial - Panel 9.

Palmer, R.S. 1962. Handbook of North American Birds. Vol. 1. Yale Univ. Press., New Haven.

_____. 1976. Handbook of North American Birds. Vol. 2. Parts 1 and 2. Yale Univ. Press., New Haven.

Parmelee, D.F., H.A. Stephens and R.H. Schmidt. 1967. The birds of southeastern Victoria Island and adjacent small islands. Natl. Mus. Can. Bull. No. 222., Ottawa.

Porsild, A.E. 1951. Bird notes from Banks and Victoria Islands. Can. Field-Nat. 65:40-42.

Richardson, W.J. 1979. Southeastward shorebird migration over Nova Scotia and New Brunswick in autumn: a radar study. Can. J. Zool. 57(1): 107-124.

_____ and S.R. Johnson. 1981. Waterfowl migration near the Yukon and Alaskan coast of the Beaufort Sea: 1. Timing, routes and numbers in spring. Arctic 34(2): 108-121.

Ryder, J.P. 1967. The breeding biology of Ross' Goose in the Perry River region, NWT. Can. Wildl. Serv. Rep. Ser. 3, Ottawa.

_____. 1971. Spring bird phenology at Karrak Lake, NWT. Can. Field-Nat. 85:181-183.

Schick, C.D. and K.R. Ambrock. 1974. Waterfowl investigations in the Athabasca Tar Sands area. Unpubl. Rep., Can. Wildl. Serv., Edmonton.

Scott-Brown, M., L. Allen and N. Roe. 1981. 1981 Waterbird surveys, McKinley Bay, NWT. Unpubl. Rep., Can. Wildl. Serv., Yellowknife.

Smith, T.G. 1973. The birds of the Holman Region, western Victoria Island. Can. Field-Nat. 87:35-42.

_____. 1976. A White Pelican and a Gannet near Holman, Victoria Island, NWT. Can. Field-Nat. 90:474.

Smith, T.G. 1981. Sharp-shinned Hawk, Accipiter striatus on Victoria Island, NWT. Can. Field-Nat. 95:366.

Thorsteinsson, R. and E.T. Tozer. 1962. Banks, Victoria and Stefansson Islands, Arctic Archipelago. Memoir 330., Geol. Surv. Can., Ottawa.

Appendix A. Bird species observed during a migration watch near Cape Lambert, 6-19 June 1980.

Common Name	Scientific Name
Common Loon	*Gavia immer*
Yellow-billed Loon	*Gavia adamsii*
Arctic Loon	*Gavia arctica*
Red-throated Loon	*Gavia stellata*
Whistling Swan	*Olor columbianus*
* Canada Goose	*Branta canadensis*
* Brant	*Branta bernicla nigricans*
White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
* Pintail	*Anas acuta*
* Common Eider	*Somateria mollissima*
King Eider	*Somateria spectabilis*
Oldsquaw	*Clangula hyemalis*
White-winged Scoter	*Melanitta deglandi*
Red-breasted Merganser	*Mergus serrator*
* Rough-legged Hawk	*Buteo lagopus*
Peregrine Falcon	*Falco peregrinus*
* Rock Ptarmigan	*Lagopus mutus*
* Semipalmated Plover	*Charadrius alexandrinus*
* American Golden Plover	*Pluvialis dominica*
* Black-bellied Plover	*Pluvialis squatarola*
Ruddy Turnstone	*Arenaria interpres*
* Pectoral Sandpiper	*Calidris melanotos*
* Baird's Sandpiper	*Calidris bairdii*
Semipalmated Sandpiper	*Calidris pusilla*
* Stilt Sandpiper	*Micropalama himantopus*
* Least Sandpiper	*Calidris minutilla*
* Buff-breasted Sandpiper	*Tryngites subruficollis*
* Red Phalarope	*Phalaropus fulicarius*
Northern Phalarope	*Lobipes lobatus*
Pomarine Jaeger	*Stercorarius pomarinus*
Parasitic Jaeger	*Stercorarius parasiticus*
* Long-tailed Jaeger	*Stercorarius longicaudus*
* Glaucous Gull	*Larus hyperboreus*
Herring/Thayer's Gull	*Larus thayeri*
Sabine's Gull	*Xema sabini*
* Arctic Tern	*Sterna paradisaea*
Snowy Owl	*Nyctea scandiaca*
* Short-eared Owl	*Asio flammeus*
* Horned Lark	*Eremophila alpestris*
* Common Raven	*Corvus brachyrhynchos*
Savannah Sparrow	*Passerculus sandwichensis*
* Lapland Longspur	*Calcarius lapponicus*
* Snow Bunting	*Plectrophenax nivalis*

*Suspected nesting nearby based on behavior, repeated sightings in the same spot and often the presence of a pair.

Appendix B

Number of migrant birds observed daily during a migration watch conducted near Cape Lambert, 6-19 June 1980

Table B1. Number of migrant birds, both staging and in flight, observed daily during a migration watch conducted near Cape Lambert, 6-19 June 1980. Numbers presented are a sum of the observations from all three of the 2-hour watches conducted daily.

Species	Day in June													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Yellow-billed Loon	1	1	5	1	10	10	4	8			3	1	2	5
Arctic Loon								5	1	4	4	2	8	2
Red-throated Loon					1			1						
Common Loon								1				1	1	
unidentified loon							1	6	3	10	7		8	4
Whistling Swan			1		1						6			
Canada Goose	39	25	19	55	42	74	44	34	9	17	44	12	36	6
Brant	30	35	37	7	12	6	8	58	26	14	9	12	4	5
White-fronted Goose	2	3	2	2	5	4	4			2	14	1	12	
unidentified goose	29	71	27	5	12	4	5	5	7	1			2	
Common Eider	189	4944	1114	4304	36223	6337	7007	5213	864	838	949	444	1229	631
King Eider				2	2		17	175	12	13	53	36	63	125
unidentified eider											384	1021	12	6
Oldsquaw			106	5	3953	779	16	370	23	5	21	24	29	9
Pintail				2				40	33	14	48	7	9	9
Red-breasted Merganser														1
unidentified duck	22		2		24	2	13	1502	2		3	6	1372	1230
Rough-legged Hawk			1	5		1			1		1	1		
Peregrine Falcon	1													
Short-eared Owl	8	1	1	2	2		3	9				1		
Snowy Owl								1						
unidentified raptor				1				1						
Pomarine Jaeger			2				5	12			4			
Parasitic Jaeger								4	2	2		1		
Long-tailed Jaeger	5	1	2	12	9	9	2	1	5			1		1
unidentified jaeger	13	17		4				4	1	2	1		2	

Table B1. (Continued)

Species	Day in June													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Semipalmated Plover			16											
American Golden Plover	5													
unidentified plover												4		
Ruddy Turnstone					1									
Pectoral Sandpiper			11											
Red Phalarope										1				
unidentified shorebirds		8	6				9	2			16			
Savanah Sparrow			1											
Lapland Longspur			12											
Snow Bunting				5										
unidentified passerine	3		20											

Table B2. Number of migrant birds that were observed in flight during the migration watch near Cape Lambert, 6-19 June 1980. Numbers presented are a sum of the observations from all three of the 2-hour watches conducted daily.

Species	Day in June													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Yellow-billed Loon	1	1				2	3	1						3
Arctic Loon								3	1	4	4		1	
Red-throated Loon								1						
Common Loon												1	1	
unidentified loon							1	5	3	10	4		6	4
Whistling Swan			1		1						6			
Canada Goose	31	15	8	33	32	41	30	13	9	11	34	8	22	4
Brant	30	35	37	3	2	2	7	49	11	10		12	4	5
White-fronted Goose	2	3	2	2	3	2				2	10		12	
unidentified goose	29	71	19	5	10	2		5	7	1			2	
Common Eider	22	235	37	39	63	63	107	189	158	66	76	92	45	102
King Eider							17	8	12	9	37	14	17	11
unidentified eider											2	1	12	4
Oldsquaw				5	11	33	10	31	15	5	16	24	29	9
Pintail				2				40	22	14	46	7		9
Red-breasted Merganser														1
unidentified duck	10		2		24	2	13	2	2		3	6	2	
Rough-legged Hawk				2					1					
Peregrine Falcon	1													
Short-eared Owl	4			2	2		2	9						
Snowy Owl								1						
unidentified raptor								1						

Table B2. (Continued)

Species	Day in June													
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Pomarine Jaeger			2				5	12			4			
Parasitic Jaeger								4	2	1				
Long-tailed Jaeger	4	1	1	11	9	7		1	1			1		1
unidentified jaeger	3	12		1				4			1			
Glaucous Gull	12	6	14	2	2	2	3	4	2		8	16	1	3
Sabine's Gull		10	18					1						
Arctic Tern						7	20		12	1	11	2		9
Semipalmated Plover			16											
American Golden Plover	5													
unidentified plover														
Ruddy Turnstone					1									
Pectoral Sandpiper			11											
Red Phalarope										1				
unidentified shorebirds		8	6				9				15			
Savanah Sparrow			1											
Lapland Longspur			12											
Snow Bunting														
unidentified passerine			20											

Appendix C. Direction of travel of birds observed during a migration watch near Cape Lambert, 6-19 June 1980.

Species	NW	N	NE	E	SE	S	SW	W	Sample Size (No. of Birds)
Yellow-billed Loon	14	21	29	7	7	14		7	N=14
Arctic Loon	15	8	8	31		23		15	B=13
unidentified loon	16	23	10	3	26	10	3	10	N=31
Whistling Swan	75	13						13	N=8
Canada Goose	25	8	10	6	38	3	1	9	N=308
Brant	15	4		3	72	4		2	N=208
White-fronted Goose	41				37		10	12	N=41
unidentified goose	5	10	10	12	54			8	N=156
Common Eider	20	8	1	2	65	1	2	1	N=1282
King Eider	34	10	6		30	14	3	3	N=125
Oldsquaw	13	6	1		78	1	1		N=186
Pintail	36	1	9	1	49		3	1	N=140
Rough-legged Hawk	17	17			67				N=6
Short-eared Owl	24				71			6	N=17
Pomarine Jaeger			5	19	76				N=21
Parasitic Jaeger	100								N=7
Long-tailed Jaeger	6	6	6	19	19	28	6	11	N=36
unidentified jaeger	14	10			67	5		5	N=21
Glaucous Gull	29	8	4	9	39	7		4	N=75
Sabines's Gull	34		3		62				N=29
Arctic Tern	33	23		12	15	6		12	N=52
shorebirds	32	15	6		21	6		18	N=68
passerines	100								N=32

Appendix D. Bird species, number and distribution during aerial surveys on western Victoria Island, 24-29 June 1980. Refer to Figure 2 for location of survey segments.

Species	Survey Segment																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A	B	C	D	E	F
Yellow-billed Loon	12					2	6			1	1	1									
Arctic Loon	8				2	3	6				2	1				2	2				1
unidentified loon	9		4		1	9	18		1		10		1					5		3	
Whistling Swan	2	7	60	7		13	2	15	25	3	11	7			1	8		2			1
Canada Goose	33	3	91	21		47	2	17	20	10		5				40	6	4			
Brant	59	3	2	2	2	20	25	8	8	1				2	32	2					
White-fronted Goose			4					2			1					1					
Snow Goose									3												
unidentified goose	25	1	7	11		26	8	10	8	1	2				3			3			3
Common Eider	1876		28		256	161	112	1	12	2	1	1	24		4	1	8	6	3		6
King Eider	579	19	36	1	4	100	67	147	115	6	17	5	43	13	21	5	3	9	14	18	5
unidentified eider	604	2	5		4	37	15	13	12		2						1	1			
Oldsquaw	1851	4	8		185	117	16	16	10	4	22	1				39	3	2	2		
other species	33																				
unidentified duck	416	4	4	30	200	16	93	9	2	1			7		10	2			4		
Rough-legged Hawk						2		1	1				1				1	1			
Peregrine Falcon											2										
Short-eared Owl			2								1										
Snowy Owl								4													
ptarmigan		3	13	1		3	4	8	13	6	2		3		1	8	21	8	1	11	
Sandhill Crane			7			1	2	1	6		6	2	3								
Pomarine Jaeger						1											1				
Long-tailed Jaeger		1	4			4	1		3		1	2	1		1			1			
unidentified jaeger	1		7			29	4	26	34		2		1		14	2	6	6	4		14
Glaucous Gull	70	17	49	6	6	38	36	17	13	7	34	3	9	1	1	3	9	6		1	
Thayer's Gull	9		3			2	1	1	1										1		
Sabine's Gull		2					6	12	12												
unidentified gull			6					1													
Arctic Tern	132	11	77			36	22	7	44	3	1		1		7	2		5	2		1
shorebirds	2	6	55	5		58	21	24	46	7	37	4	14		12	7	23	18	4	1	7
distance surveyed (km)	206.9	69.2	222.9	162.7	35.1	285.4	117.5	140.1	337.9	88.5	215.7	132.7	176.1	29.0	46.7	25.7	139.2	98.1	78.8	127.9	29.0