A Population Study of Seabirds, Shorebirds, and Waterfowl Associated with Constantine Harbor, Hinchinbrook Island, Prince William Sound, 1978

Nan M. Kane
Diane K. Boyd

U.S. FISH AND WILDLIFE SERVICE
SPECIAL STUDIES
Unpublished Material-For
Use By Permission Only

U. S. Fish and Wildlife Service
Office of Special Studies
1011 East Tudor Road
Anchorage, Alaska 99503

January 1979

List of Figures

List of Tables

INTRODUCTION

Since the completion of the trans-Alaskan Pipeline in the summer of 1977, the Hinchinbrook Entrance to Prince William Sound has become the transport lane for oil tankers enroute to and from the terminal in Valdez (Fig. 1). The possibility of oil spills poses a threat to marine birds and mammals along the route.

U.S. Fish and Wildlife Service biologists established a field camp on Hinchinbrook Island in 1976 to collect baseline data on the marine birds and mammals in the area (Fig. 2). Data collection continued in 1977 and 1978.

Special Studies, USFWS, personnel were in the Hinchinbrook field camp from 9 May, 1978 through 24 August, 1978. Data on breeding populations of tufted puffins (Lunda cirrhata), black-legged kittiwakes (Rissa tridactyla), glaucous-winged gulls (Larus glaucescens), and common murres (Uria aalge) were collected on Porpoise Rocks at the entrance of Port Etches. Bird migration was monitored at three intertidal areas. Marine mammals were counted in Port Etches and Constantine Harbor.

Port Etches, Hinchinbrook Island has been proposed by the U.S. Coast Guard as a containment site for leaking oil tankers. This creates a need for information on birds and mammals in this area that may be affected by oil spillage. Rocky and Zaikof Bays of Montague Island have been suggested as alternative tanker containment sites to Port Etches. Two trips were made to Montague Island to collect data on species and abundance of birds and mammals present in Zaikof and Rocky Bays. This data will be analyzed to determine critical wildlife habitat.

Description of the Study Area

The climate of Prince William Sound is maritime with moderate temperatures, high humidity and frequently overcast skies. Precipitation was frequent although levels were not particularly high. Strong winds were often prevalent.

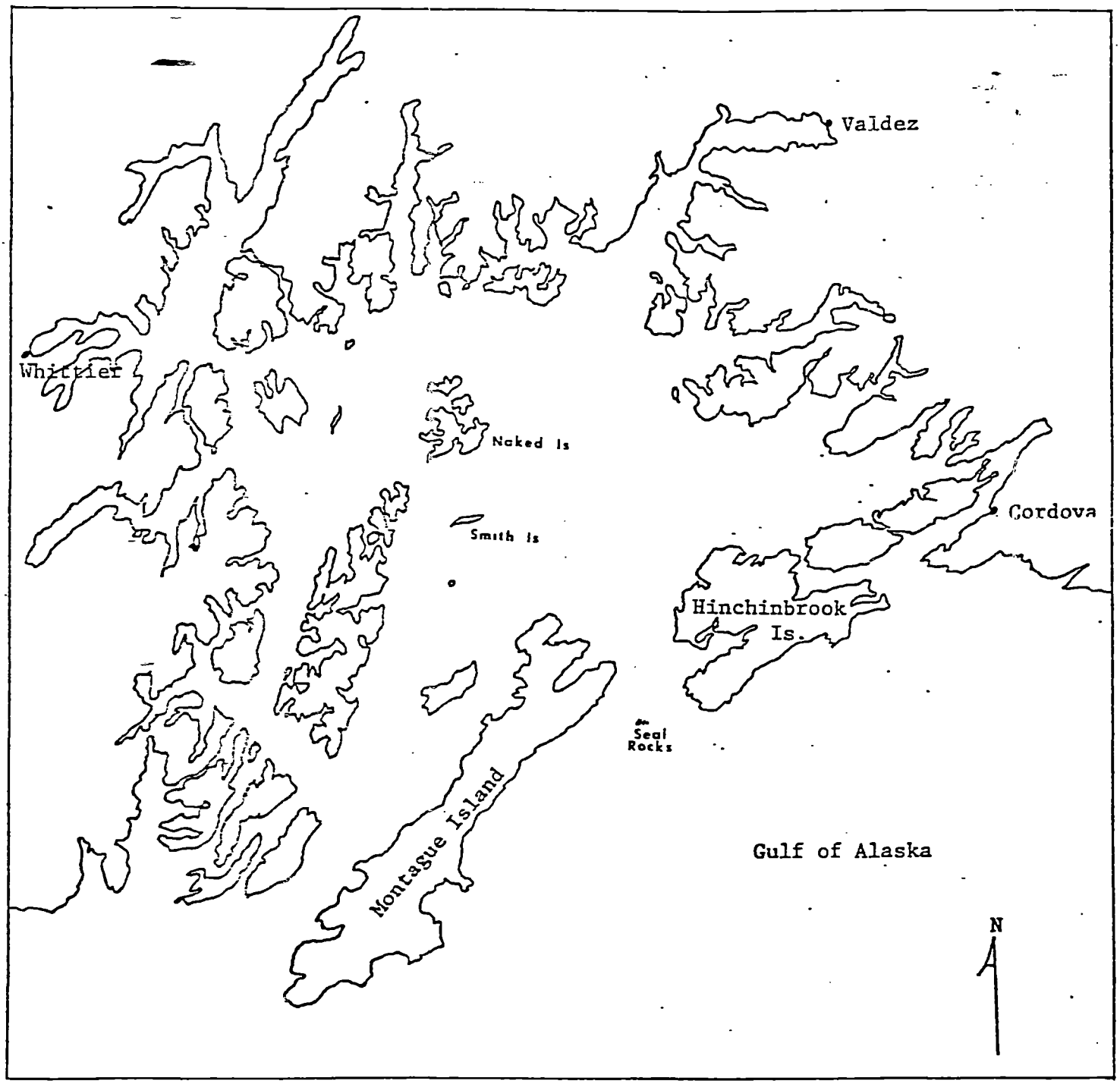


Figure 1. Map of Prince William Sound and vicinity.

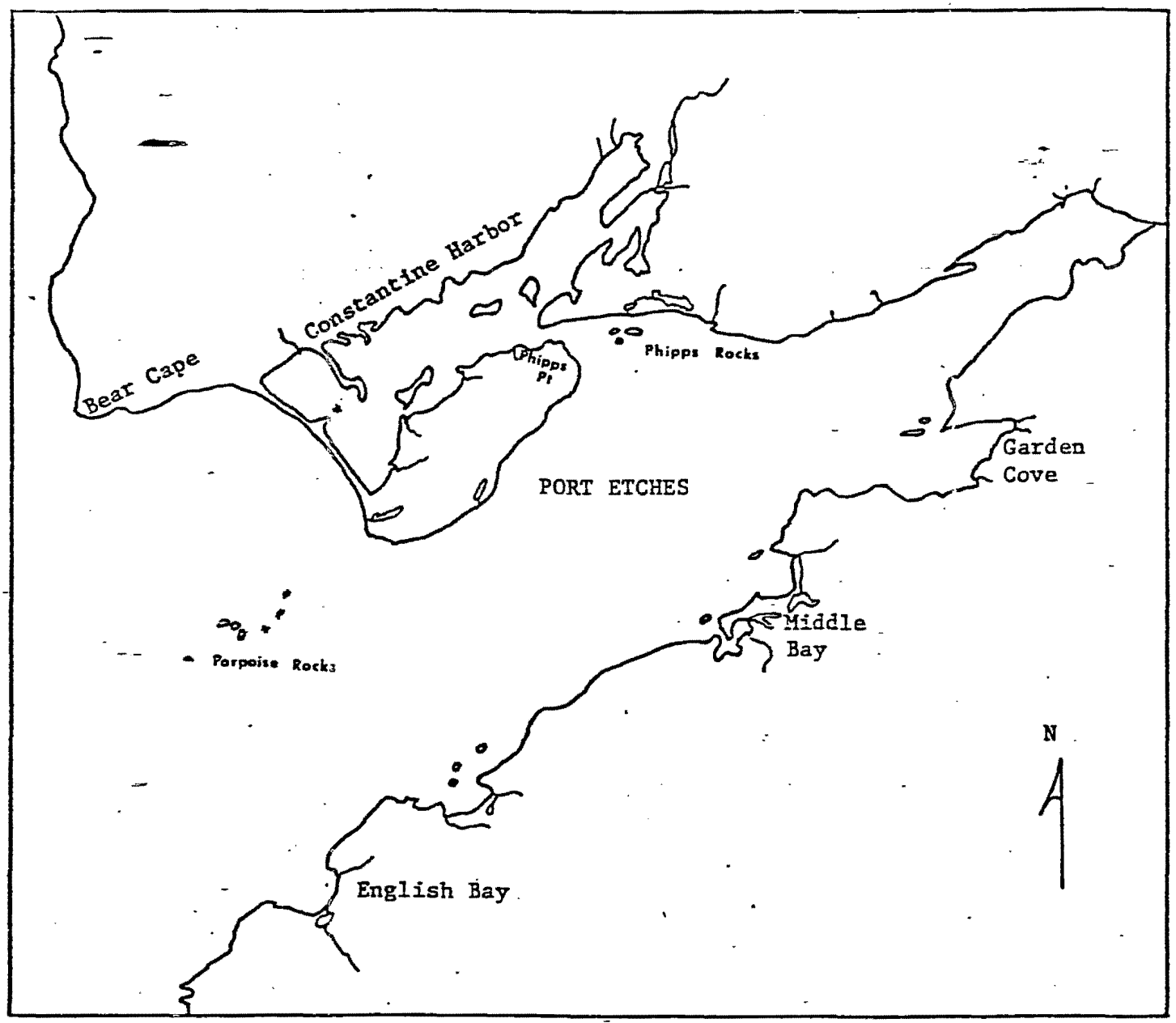
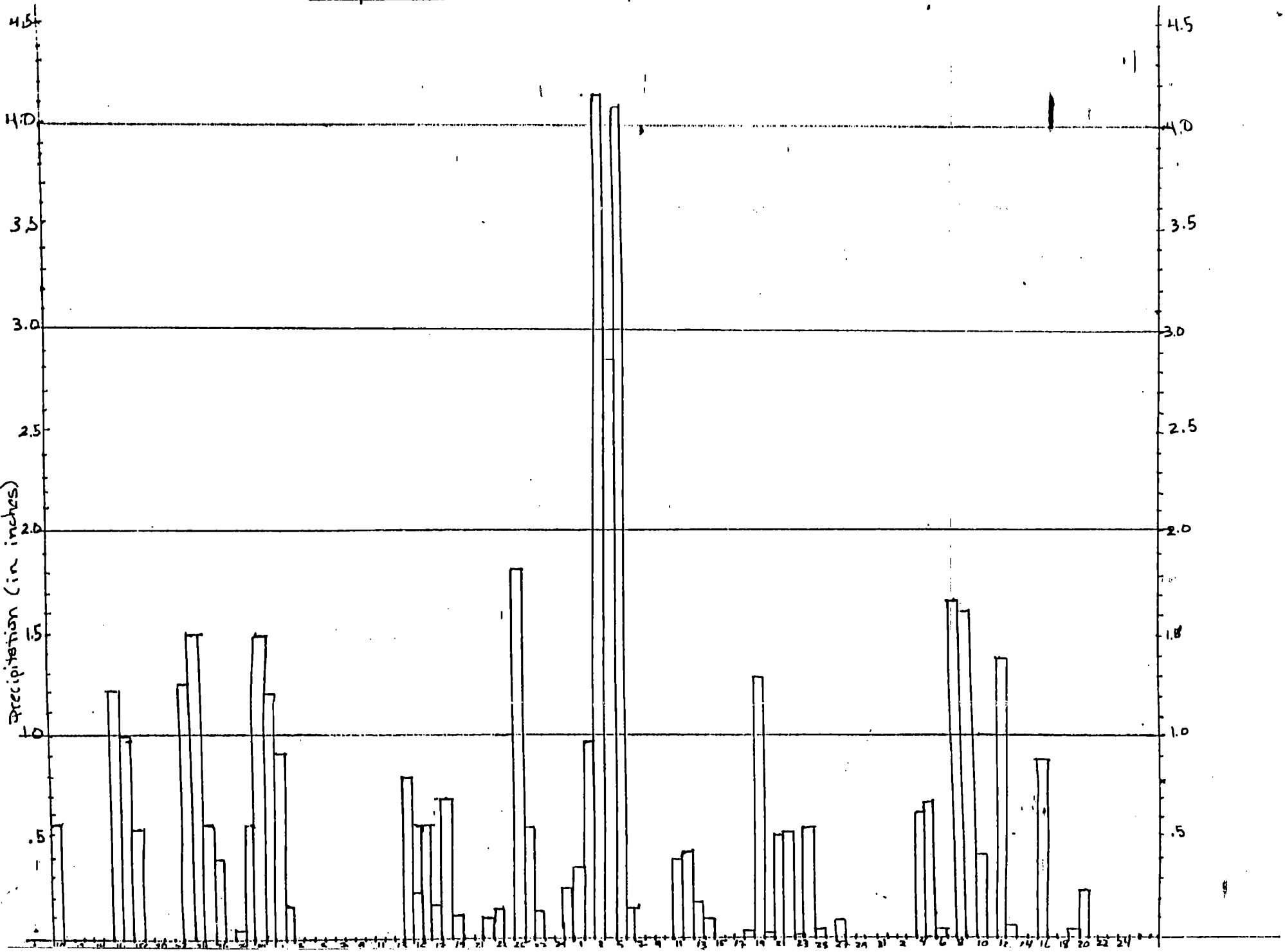


Figure 2. Map of study area, Hinchinbrook Island, 1978.

Figure 3. Daily Accumulation of Precipitation at Constantine Harbor, 1978



Weather information was collected at the Constantine Harbor field camp from 11 May to 24 August. Temperatures during this time averaged 20°C to a low of 2°C. Total precipitation during the field season amounted to 83.8 cm (33 inches). The maximum amount of precipitation for one 24-hour period was 10.6 cm (4.2 inches) (Fig. 3). Overcast skies were very common and 72.1 percent of the 75 days had a cloud cover of 50 percent or greater.

Prince William Sound is part of the Sitka-spruce-hemlock coastal sub alpine forest of the Pacific coast. The study area included all of the avian habitats described by Isleib and Kessel (1973). Major habitat used by marine birds in the Sound include beaches and tidal flats, rocky shores and reefs and some inshore waters. Migrating shorebirds were found to utilize beaches, tidal flats and inland waters.

METHODS

Censuses

Censusing of the Porpoise Rock colony at Hinchinbrook Entrance followed the recommendations of Nettleship (1976) and Manuwal et al. (1975). Black-legged kittiwake nests and incubating common murres were counted by three observers in a boat. The counts were conducted late in the breeding season (July 26) and many nests of failed breeders that were destroyed or partially destroyed by storm conditions were not considered. The counts of each observer were averaged, and counts were repeated if there was too large a discrepancy between counts.

The number of breeding tufted puffins was estimated by setting up sample plots on Arch Rock (58 m^2) and Table Rock (270 m^2) and extrapolating data to encompass the entire rock surface utilized by puffins for nesting (density of active burrows in sample plot x area of rock top).

Breeding pairs of glaucous-winged gulls were estimated by the number of nests found on Arch and Table Rocks. This yielded a minimum estimate of breeding gulls since no attempt was made to census Beach Rock.

Individual counts were made of the following species: marbled murrelet (Brachyramphus marmoratum), pigeon guillemot (Cepphus columba), horned puffin (Fratercula corniculata), double-crested cormorant (Phalacrocorax auritus), and pelagic cormorant (Phalacrocarax pelagicus). Rafting counts were made of tufted puffins, black-legged kittiwakes, and common murres.

Two 1.5 km transects in different intertidal flats and a 2 km stretch of shoreline in Constantine Harbor were censused weekly in May, July, and August during bird migration (Fig. 4). Surveys were conducted at low tide. The numbers and species of all birds seen in the 50 m wide transect were recorded.

Bald eagle (Haliaeetus leucocephalus) nests were located and mapped, and eagles observed during the summer were noted. The adult to immature bird ratio was recorded.

Marine mammals were censused twice a month in Constantine Harbor and Port Etches from a boat. Two observers counted and recorded all marine mammals seen. Censuses were conducted at low tide when the harbor seals (Phoca vitulina) were hauled out and sea otters (Enhydra lutis) tended to concentrate in large rafts. Pup to adult ratios were recorded.

Two trips were made to Montague Island on 6 June and 29 July to census the marine bird and mammal populations in Zaikof and Rocky Bays (Appendix 2). Transects were conducted 100 m from shore along the entire coasts of Rocky Bay and Zaikof Bay.

Reproductive Phenology and Success

Sample plots were set up to collect data on breeding phenology and success for black-legged kittiwakes and tufted puffins. Common murres and

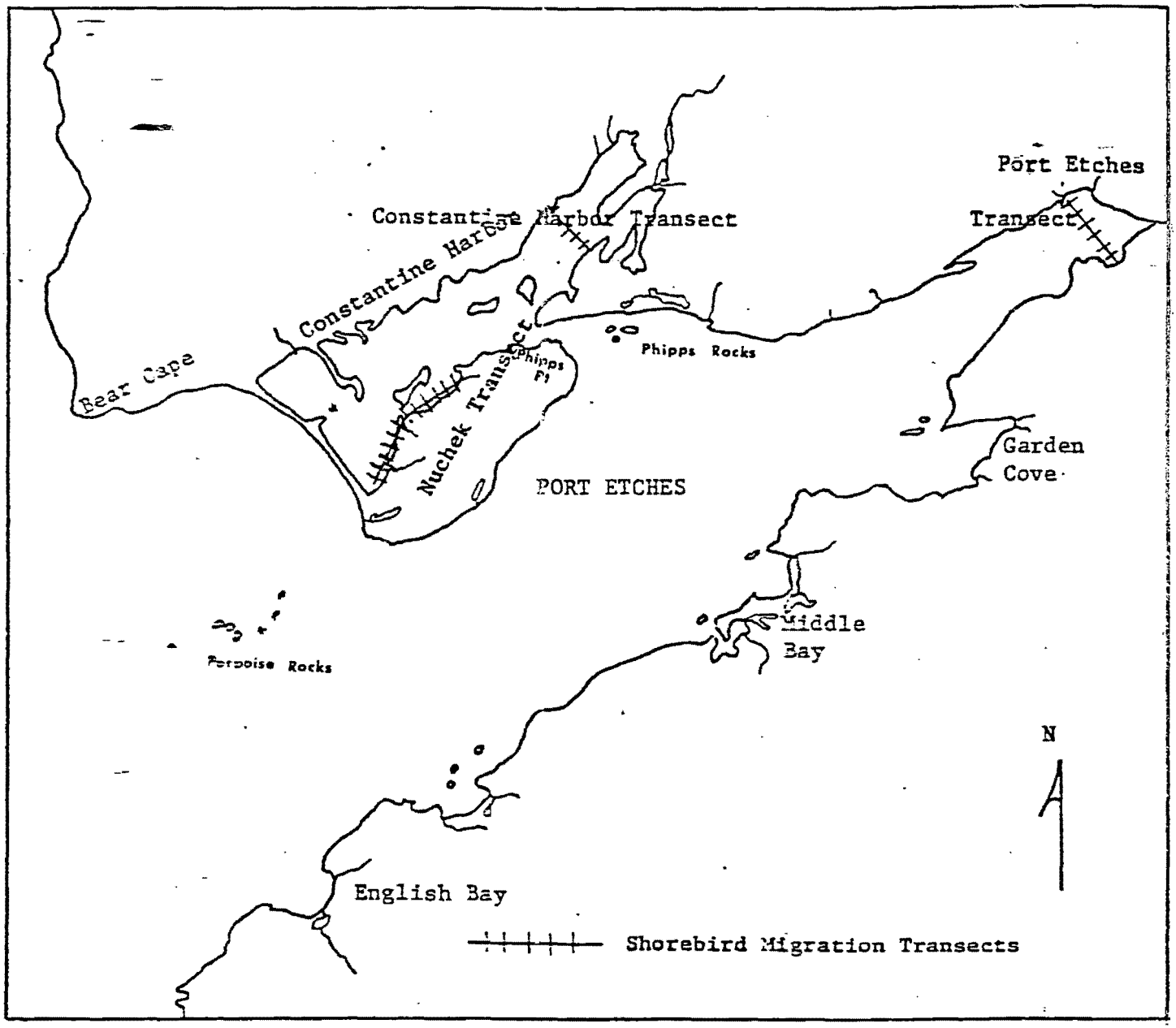


Figure 4. Areas censused for migrating birds, Hinchinbrook Island, 1978.

glaucous-winged gull nests on Arch and Table Rocks were marked and monitored. Arctic tern (Sterna paradisaea), semipalmated plover (Charadrius semipalmatus), black oystercatcher (Haematopus bachmani), and Canada goose (Branta canadensis) nests found in Constantine Harbor and Port Etches were also marked and monitored. Weather permitting, nests were checked at least weekly to determine nest status and breeding success.

Trophic Relationships

Between 8 June and 22 August, digestive tracts were collected from ten species of birds. Birds were collected from Rocky and Zaikof Bays, and from Port Etches and Constantine Harbor. Birds were collected with a 12 guage shotgun. Formalin was injected into the bird's esophagus immediately upon retrieval from the water. The esophagus and stomach of each bird was removed and placed in a 10% formalin solution. Three days post-collection the digestive tracts were transferred from the 10% formalin to a 50% alcohol solution.

In addition to digestive tracts the following parameters were examined: plumage, reproductive condition, parasites, and anatomical measurements. Food samples brought to chicks and chick regurgitation samples were also preserved for later identification.

RESULTS AND DISCUSSION

Reproductive Phenology and Success

Data on the breeding biology of tufted puffins, black-legged kittiwakes, glaucous-winged gulls, and common murres nesting at Porpoise Rocks were collected during the summers of 1976, 1977 and 1978. Data were also collected on the breeding biology of arctic terns, Canada geese, black oystercatchers and semipalmated plovers nesting in Constantine Harbor and near Phipps Rocks. A summary of the 1976, 1977 and 1978 breeding population estimates and hatching success for the seabird colonies in the Porpoise Rocks-Constantine Harbor area

is presented in Table 1. The phenology of reproductive activities of the seabirds in the Porpoise Rocks–Constantine Harbor area in 1976 (Nysewander and Knudtson 1977), 1977 (Sangster et al. 1978) and 1978 is presented in Table 2.

Black-legged Kittiwakes

Plots were established on Table Rock and Arch Rock to follow breeding phenology and nesting success of black-legged kittiwakes. Ninety-seven nests on Table Rock and 29 nests on Arch Rock were observed.

On 29 May 250-300 kittiwakes were seen on the ground at the northwestern end of Constantine Harbor picking up bits of weeds and other nesting materials. A continuous stream of kittiwakes were seen flying from Porpoise Rocks to Constantine. Approximately one third of all kittiwakes seen engaging in this activity were immatures. This behavior continued through 3 June when it abruptly stopped.

Egg laying began the first week of June about one week later than last year's initiation date. Laying continued through the month with a peak occurring late in the second week of June. Average clutch size was 1.77 eggs/nest compared to last year's average of 1.98 (Sangster et al. 1978). Overall egg production for the 1978 field season was lower than in 1977. The number of one egg clutches was greater in 1978 (24.6%), than in 1977 (9.5%). The number of three egg clutches was lower (1.6%) in 1978 than in 1977 (7.3%). Clutch size data is presented in Table 3.

By 29 June, high egg losses were noted after an extended period of stormy weather. Ninety percent of the eggs from the Arch Rock plot and 45% of the Table Rock plots were lost. With the exception of five eggs, the remaining eggs from Table Rock were lost by 11 July. The large loss of eggs following stormy periods of weather also was noted during the 1977 field season when Table Rock lost 106 of 141 eggs.

Table 1. Estimates of breeding pairs and comparative hatching success of seabirds at Porpoise Rocks and Constantine Harbor, 1976-1978.

	1976	1977	1978
Black-legged kittiwake			
Breeding pairs	992	1,341	1,046
Number of active nests sampled	210	137	126
Hatching success	1-2%	41%	4.5%
Glaucous-winged gull			
Breeding pairs	60	126	60
Number of active nests sampled	26	67	37
Hatching success	70%	56%	18.5%
Common murre			
Breeding pairs	310-500	750	450
Number of active nests sampled	169	307	67
Hatching success	-	32%	14.9%
Tufted puffin			
Breeding pairs	1,200	1,500	1,300
Number of active nests sampled	78	116	130
Hatching success	61%	27%	38.5%
Arctic tern *			
Breeding pairs	12	60	59
Number of active nests sampled	12	38	54
Hatching success	71%	81%	31-87%*

* See narrative on arctic tern production.

Table 2. Phenology of nesting activites of seabirds in Porpoise Rocks and Constantine Harbor, 1977 and 1978.

Species	First Egg		First Hatching		First Fledging	
	1977	1978	1977	1978	1977	1978
Black-legged kittiwake	25-31 May (estimated)	28 May	26 June	25 June	1 August	11 August
Tufted puffin	3 June	28 May	10 July	11 July	23 August	not observed
Common murre	21 June	29 June	4 August	3 August	21 August	not observed
Glaucous-winged gull	25-31 May (estimated)	28 May	25 June	29 June	3 August	3 August
Arctic tern	14 May	15 May	9 June	12 June	not observed	not observed

Table 3. Clutch size of black-legged kittiwakes found on Arch Rock and Table Rock, 1978.

Clutch size	Arch Rock	Table Rock	Total
	(29)	(97)	
1	10 (34.5%)	21 (21.4%)	31 (24.6%)
2	18 (62.1%)	75 (77.3%)	93 (73.8%)
3	1 (3.4%)	1 (1.0%)	2 (1.6%)

Additional egg loss occurred directly or indirectly due to the continual presence and harassment of eagles, crows and ravens. Two or three eagles were always seen at the colony until mid-July. On one occasion an immature eagle was observed actively pursuing a flock of kittiwakes. Indirect losses occurred whenever an eagle flushed the birds from their nests leaving the eggs vulnerable to predation. The presence of eagles at the colony contrasts with the 1977 season when few eagles were seen at Porpoise Rocks. The information gathered during the 1976 season, however, closely parallels the 1978 observations. During 1976 Nyswander and Knudtson attributed most of their empty kittiwake nests to predation by bald eagles.

In addition to the eagles and the stormy weather, egg loss due to predation by glaucous-winged gulls was also observed. Egg shells from kittiwakes were found near or below gull nests or loafing areas.

Only 10 kittiwake chicks hatched, giving an overall hatching success of 4.5% for Porpoise Rocks. This hatching rate is considerably lower than the 41.1% found during the 1977 season. Of the 10 chicks hatched, only 5 fledged by 22 August giving an overall production rate of 2.2%. Production data for black-legged kittiwakes is presented in Table 4.

Glaucous-winged Gull

A total of 37 glaucous-winged gull nests were found on Porpoise Rocks. Arch Rock had 16 nests compared to 43 in 1977 and 19 in 1976. Table Rock had 21 nests compared to 24 in 1977 and 18 in 1976. Beach Rock was estimated to have about 20-25 nests. Nests were visited one or two times a week throughout the summer.

Egg laying began the last week in May and continued throughout the month. Information on clutch size of nests on Arch Rock and Table Rock is presented in Table 5. Average clutch size was 2.5 eggs per nest.

Table 4. Reproductive success of black-legged kittiwakes on Arch Rock and Table Rock, 1978.

	Arch Rock	Table Rock	Total
Active nests	29	97	126
Eggs laid	49	174	223
Average clutch size	1.69	1.79	1.77
Hatching success	10.2%	2.9%	4.5%
Chicks/breeding pair	.17	.05	.08
Total fledged	0	5	5
Breeding success	0	2.9%	2.2%
Fledglings/breeding pair	0	.05	.04

Table 5. Clutch size of glaucous-winged gulls found on Arch Rock and Table Rock, 1978.

Clutch size	Arch Rock	Table Rock	Total
1	5 (31.25%)	0 (0%)	5 (13.5)
2	5 (31.25%)	4 (19.1%)	9 (24.3)
3	6 (37.50%)	17 (80.9%)	23 (62.2)

The first glaucous-winged gull chicks were found on 29 June. They were estimated to be a day or two old. Hatching continued until 15 July with the peak of hatch occurring between 29 June and 10 July.

Only 16 eggs were known to have hatched chicks with 7 chicks reaching the fledging stage. Mortality was due to unknown factors and it is uncertain whether the loss occurred to eggs or chicks. A total of 17 nests (46%) disappeared between visits on 29 June and 11 July. This period was not only the peak of hatch for glaucous-winged gulls but also a time of severe storms. Gull chicks may have hatched and died from exposure or starvation when parents were unable to forage or feed chicks during the storm. Another possibility is that the appearance of chicks may have triggered predation from other birds. Considering the lack of observations during this time, the hatching success for glaucous-winged gulls may have been higher than the calculated 18.5%.

No glaucous-winged gulls were ever seen eating their own eggs or chicks, an observation mentioned in the 1977 field report. Only two nests were assumed destroyed by eagles. In both cases the plucked and partially devoured body of an adult glaucous-winged gull was found within seven feet of the nest. The adult appeared to have been struck from above while on the nest. Both nests were kicked apart and the eggs scattered. Just how many other gulls or nests were destroyed in this manner is not known.

The first fledgling was seen on 3 August which was the same date as last year. Production data for glaucous-winged gulls is presented in Table 6.

Common Murres

The first murre egg was found on 29 June although laying probably occurred earlier because remains of 10 murre eggs were found near glaucous-winged gull nests on that date. Laying continued for 39 days with the last new egg found on 6 August. A total of 67 eggs were found on Arch and Table Rocks. This

Table 6. Reproductive success of glaucous-winged gulls on Arch and Table Rock, 1978.

	Arch Rock	Table Rock	Total
Active nests	16	21	37
Eggs laid	33	59	92
Average clutch size	2.1	2.8	2.5
Hatching success	39.4%	6.8%	18.5%
Chicks/breeding pair	0.81	0.25	.46
Total fledged	2	5	7
Breeding success	6.1%	8.5%	7.6%
Fledglings/breeding pair	0.12	0.24	0.19

number contrasted sharply with last year's 307 marked eggs. Peak laying occurred about mid July for Table Rock and about a week later for Arch Rock.

Egg losses were high during the first weeks of egg laying and a major cause of egg loss was predation by glaucous-winged gulls. This type of loss was also observed during the 1977 field season. Of the 67 marked eggs, 17 (25.4%) were known losses due to gull predation. At least 8 of the 17 eggs lost were due to observers frightening the incubating murre away, allowing gulls the opportunity for predation. Twenty-six eggs (32.8%) disappeared. Other factors responsible for egg loss include eggs knocked off cliff ledges and eggs laid in cracks or water where they could not be incubated properly.

Eggs were laid in various habitats: 40.3% of the marked eggs were laid in vegetation; 35.8% on sheer cliff faces; 4.5% in rock cavities; 1.5% in vacated kittiwake nests; 13.4% on bare accessible rock and 4.5% on bare dirt. Overall hatching success was 12%. Hatching success for the various habitats was found to vary last year, but sample size was too small in 1978 to draw conclusions.

The first eggs hatched on 3 August on Table Rock with nine additional eggs hatching by 22 August. The 1978 hatching date compares closely with the hatching date of 31 July, 1977.

No chick mortality was observed. Field camp was closed before the fate of eight remaining murre eggs could be determined.

Based on absolute counts of attending murres, Beach Rock appeared to be the most important colony site for breeding murres at Porpoise Rocks. Beach Rock was not climbed during this field season.

Arctic Tern

Four gravel areas were found in which arctic terns nested (Figure 5). Four nests were found on a gravel spit on the north shore of the western end

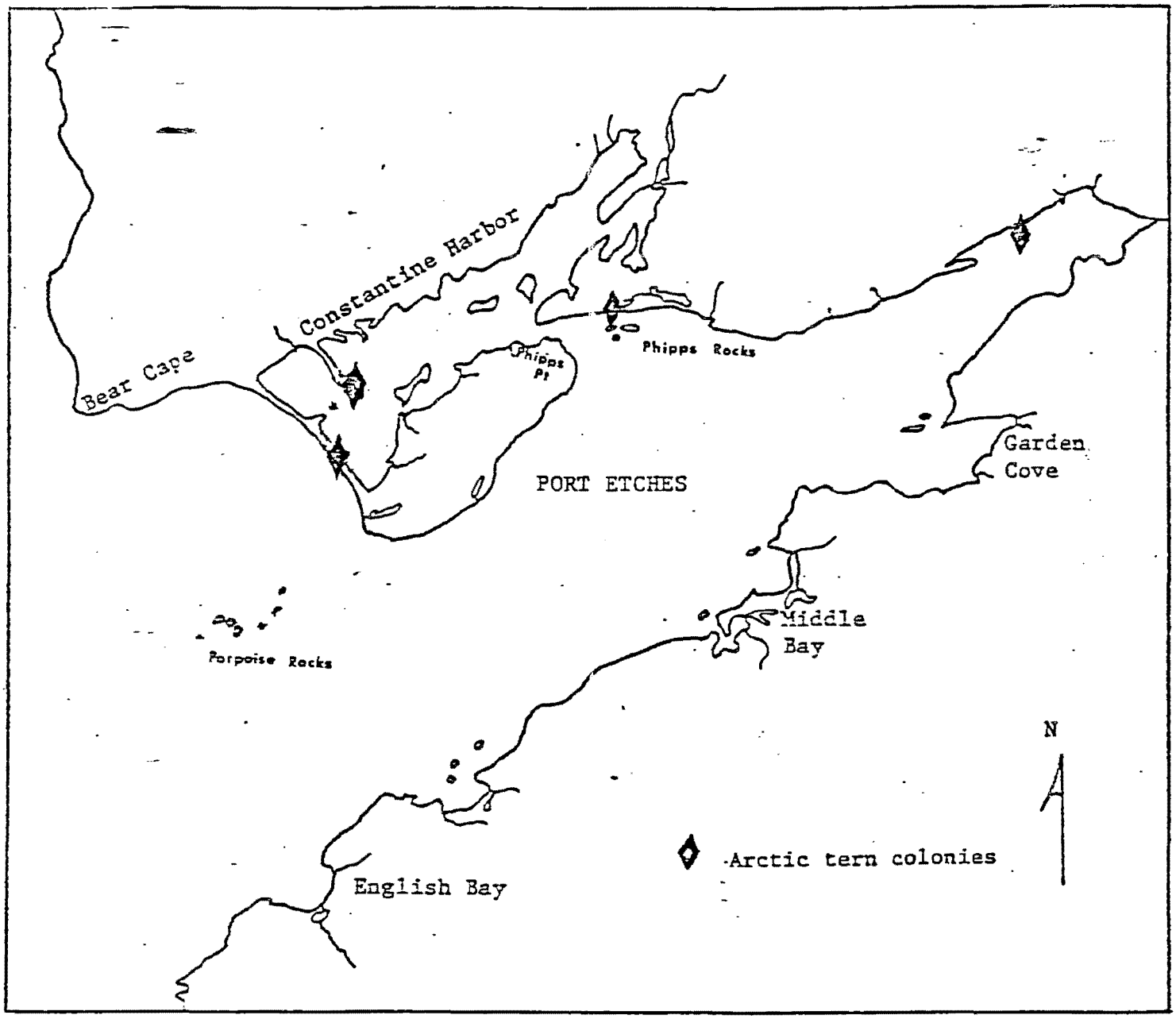


Figure 5. Arctic tern colonies in the study area, 1978.

of Constantine Harbor. One nest of three eggs was found on 12 June. On 17 June an additional two nests containing one egg and one nest containing two eggs were found. Extreme high tides on 18 June covered the spit and washed away all nests. No terns renested in this area.

On a gravel spit adjoining Nuchek, a total of 54 tern nests were found during the summer. Nests were first found on 19 May. Of the total 54 nests found, 9 nests (16.7%) had one egg clutches, 32 nests (59.2%) had two egg clutches, and 13 nests (24.1%) had three egg clutches, yielding an average clutch size of 2.07 eggs.

Of all tern eggs found none were hatched on 6 June, but eight had hatched by 12 June. The incubation period for the arctic tern is 22 days, so by backdating the earliest laying occurred between 15 May and 21 May. Peak hatching occurred between 6 June and 17 June, with 36 nests (66.7%) hatched by 17 June. A second peak of laying occurrred between 24 June and 29 June, with nine new nests found. These may have been renests that included terns from the colony that was destroyed by tides on 18 June.

The fate of 50 eggs was determined: 15 eggs were known not to have hatched and 35 chicks were found shortly after hatch. The fate of the majority of eggs (62) was unknown because of infrequent visits to the colony during hatch. Therefore the hatch rate in 1978 may have been as low as 31.25% or as high as 86.60%. There is not enough data on hatch to determine hatching success or production of young in 1978.

Immature terns were first seen flying with the adults on 18 July, and were commonly seen after that. By mid-August arctic terns were rarely seen in Constantine Harbor.

Tufted Puffins

Transects were established on Arch and Table Rocks to determine breeding chronology and productivity of tufted puffins. The transect on Arch Rock ran

29 m from the northeast edge to the southwest edge across the center of the rock and was 2 m wide, with an area of 58 m^2. Table Rock had three transects running from the north to southwest edges. Each of these transects were 45 m long by 2 m wide giving a total area of 270 m^2. The Arch Rock transect was the same as that used in 1977, however, the Table Rock transects were different and ran not only in a different direction but ran parallel to the cliff edge rather than across the rock. In the Arch Rock transect 21 burrows were active. Active burrow density using 21 burrows in a 58 m^2 transect is 0.36 active burrows per square meter. This density contrasts with the 1977 density of 0.65 active burrows/m^2 and more closely compares to the .39 density found in 1976. The entire upper surface of Arch Rock is 340.6 m^2 (Nyswander and Knudtsen 1977). Using methods of extrapolation the estimate for Arch Rock is 123 active burrows.

On Table Rock active burrow density of 109 burrows in a 270 m^2 area yields 0.40 active burrows/m^2. The entire top surface of Table Rock is 2962.8 m^2 and extrapolation yields an estimate of 1185 active burrows. Care should be taken in comparing the densities and breeding success on Table Rock to those of 1976 and 1977 because 180 m^2 of the 1978 transects paralleled the cliff edges. This is not only considered the best habitat but success rates have been found to be higher the closer a burrow is to the edge (Nettleship 1972).

Each active burrow is assumed to represent one pair of breeding tufted puffins so the total estimate of breeding pairs on Porpoise Rocks is 1308.

Burrows were examined 7-9 times throughout the summer for eggs or chicks. Multiple entrances were noted and a total burrow count made.

The first puffin egg was found on 28 May. Hatching began on 11 July and continued throughout the month.

Of the 130 eggs found in the sample plots, 50 hatched, giving an overall hatching success of 38.5% for Porpoise Rocks. Hatching success for Table Rock transects was 39.4% with 33.3% on Arch Rock.

Known causes of egg mortality were few, the majority of eggs lost disappeared from the burrows. Several eggs were destroyed as a result of caved-in burrows and several eggs were found rotten.

When the field camp closed on 24 August there were 27 chicks remaining from 110 active burrows. Twenty-three chicks disappeared from their burrows before completing a 40 day fledging period resulting in a chick mortality of 46.0%. Breeding success could not be determined because fledging was not observed but the maximum success rate for tufted puffins would be 20.8%.

Semipalmated Plover

Sempalmated plovers were the most common shorebirds in Constantine Harbor. Four nests were found between 21 May and 28 May, with an average clutch size of 3.75. Three of the nests hatched between 28 May and 2 June, and the remaining nest hatched between 2 June and 13 June. Hatching success was 100%. Productivity was 3.75 young/nest. The plovers utilized areas of gravel with sparse vegetation bordering water. On 2 August immature plovers were first seen feeding with the adults in the upper Constantine intertidal flats. Throughout August immature plovers were frequently seen feeding with the adults throughout Constantine Harbor and Port Etches. On 22 July a flock of 25 plovers was seen in the Port Etches tidal flats. Flocks of 12-38 plovers were observed often from late July through late August. The increased flock size may be attributed to birds flocking up previous to fall migration.

Black Oystercatcher

Seven black oystercatcher nests were found in the arctic tern colony on Nuchek spit between 19 May and 27 May. Hatching occurred from 12 June through 24 June. Two additional nests were discovered on a gravel bar 1/4 km northwest of the Nuchek spit. One of these nests hatched between 3 June and 12 June. The other nest was destroyed by high tides on 18 June.

The average clutch size for oystercatcher nests was 2.56. Hatching success 78.3%. Productivity was 2.00 young/nest. On 22 July two downy chicks were seen with a pair of adults at the head of Port Etches. Oystercatchers usually traveled in groups of 2-10 birds. However, on 12 June 24 oystercatchers were gathered on a rocky point in Constantine Harbor, and large concentrations (35 to 145 birds) were seen in June and August. Possibly these were breeding birds that had failed and/or non-breeding birds flocking up.

Canada Goose

An estimated 12 pairs of Canada geese bred in the Nuchek area on Hinchinbrook Island (Fig. 6). The geese nested in broken areas of spruce bordering grassy meadows with ponds. These meadows were utilized as resting areas during incubation. Two pairs of geese nested at the heads of small creeks emptying into the southwest end of Constantine Harbor. On 31 May 20 geese were seen standing together in the meadows behind Nuchek.

On 20 May four goose nests were found bordering the meadows behind Nuchek. On 21 May all eggs were gone with no shells present from nest #1 and the nest was partially destroyed. Two more nests were discovered on 31 May in the same area. The average clutch size was 5.3. On 2 June all eggs from nest #6 were hatching or hatched while nests #2-5 gave no indication of hatching. By 12 June all remaining eggs had hatched with no evidence of predation at the nest sites. With the loss of nest #1 the overall hatching success was 81.3%. Productivity was 4.31 goslings/nest. Backdating an incubation period of 27 days the estimated initiation of incubation was 6 May-16 May.

On 15 June five goslings and two adults were startled from the southwest shore of Constantine Harbor. One adult goose stayed with the goslings while the other adult flew off. Two adult glaucous-winged gulls made several low passes over the goslings, at which the goslings dove under water for protection.

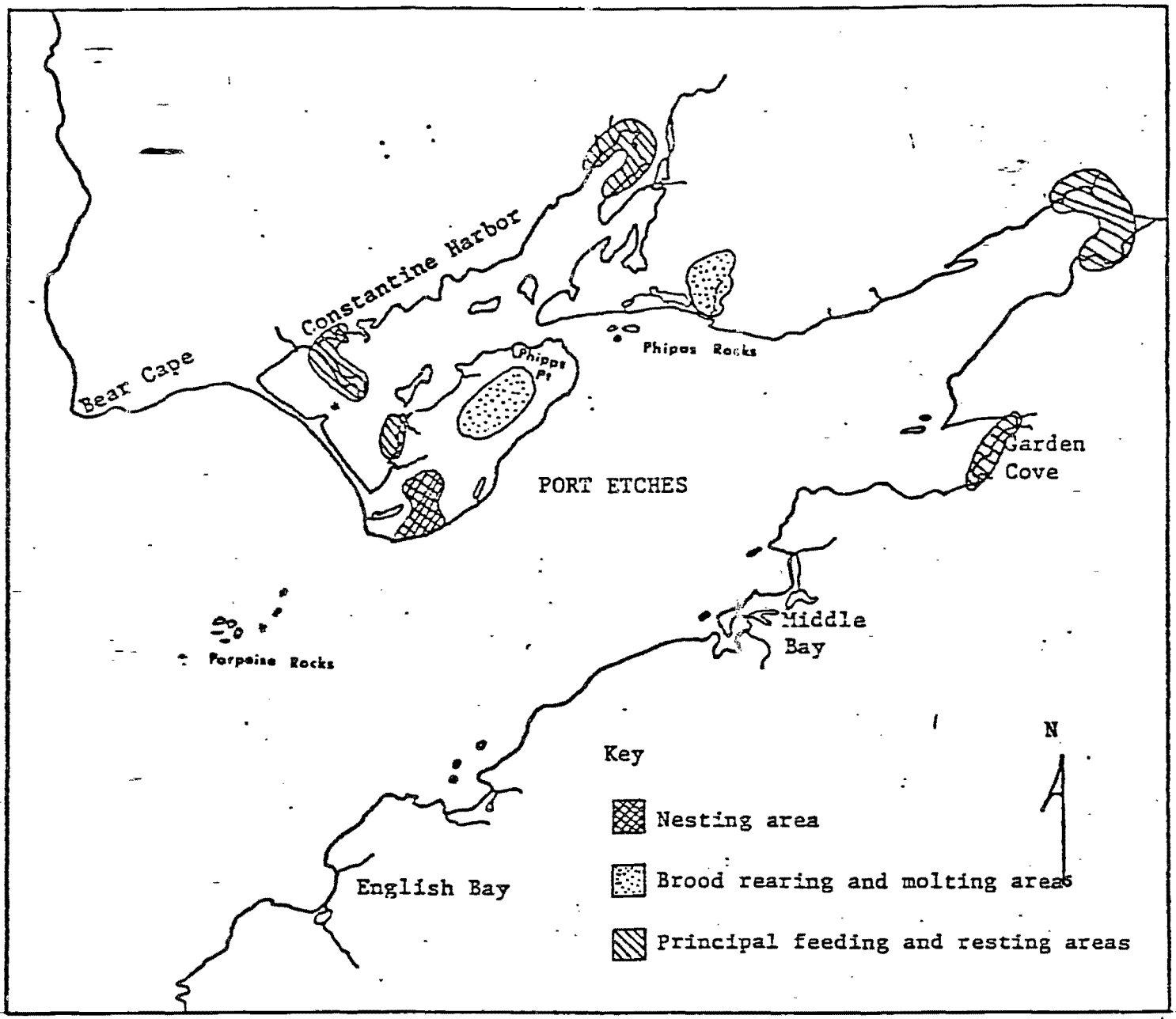


Figure 6. Critical areas of use for the Canada Goose in the Port Etches - Constantine Harbor area.

In 5-6 minutes after the adults parted, the lone adult returned with four more adult geese and they all landed on the water within 6 m of the goslings.

No geese were seen in Constantine Harbor or Port Etches between 5 July and 4 August during their molt. In early August small groups of geese were seen and heard in Constantine Harbor. After 10 August larger concentrations of geese (15-85 birds) were seen frequently in the estuaries at the head of Port Etches and Constantine Harbor. These large concentrations of geese probably consisted of immature and adult birds flocking up for fall migration.

Bald Eagle

Bald eagles were abundant throughout the Port Etches-Constantine Harbor area. Both adult and immature eagles were seen regularly.

In constrast to the observations from the 1977 field season, immature birds were particularly numerous along the shores of Constantine Harbor and on Porpoise Rocks. Twelve to fifteen immatures were observed regularly along with the 9 or 10 pairs of adult eagles in the same area.

A total of seven nests were located, of which, four were thought to be active (Figure 7). One nest was climbed on 21 July and contained two immature eaglets. One was capable of flight. Due to their inaccessability, the other nests were not climbed. Two additional nests were located along the coast north of Bear Cape. An active nest was located at Zaikof Point, Montague Island on 6 June.

The areas immediately below active nests were searched for prey items, however, no carcasses or other remains were found.

Prior to the salmon run in July, two to three eagles were seen regularly on Porpoise Rocks.

Carcasses of tufted puffins, common murres, glaucous-winged gulls and black-legged kittiwakes were found on Porpoise Rocks. The fresh carcasses

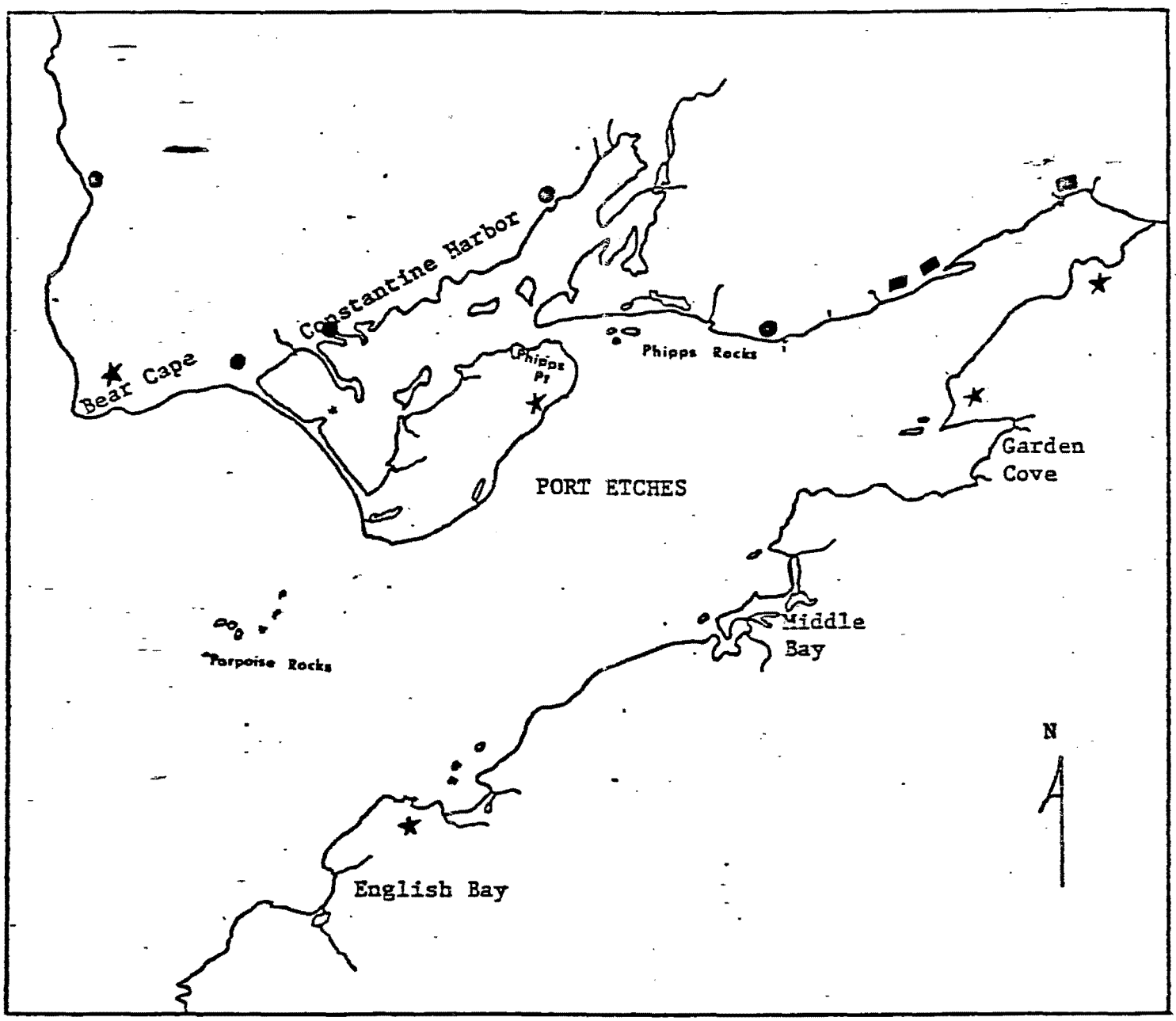


Figure 7. Bald eagle nests in the Port Etches area, Hinchinbrook Island, 1978.

Key

- ● – active nests
- ▬ – inactive nests
- ★ – suspected nests

displayed large blood clotted areas just under the skin, an indication that death was due to a forceful strike. Carcasses were partially plucked and in various stages of being devoured. Just what percentage of carcasses represented actual kills and what percentage were already dead prior to being fed on is not known. Of the 17 carcasses found, 5 were tufted puffins.

Once the salmon run began, eagles were not seen at Porpoise Rocks. The mouths of streams into Port Etches and Constantine Harbor became sites of eagle concentrations throughout the remainder of the summer.

Shorebird Migration

Shorebirds migrated through Constantine Harbor and Port Etches, utilizing intertidal areas for resting and feeding (Figure 4). A summary of bird species and numbers for the three intertidal areas surveyed is presented in Appendix 3. The 2 km stretch of intertidal mudflat and beach extending east of Nuchek, and the two 1.5 km transects surveyed at the northeast end of Port Etches, were similar in habitat. All three consisted of mudflats containing mussels, clams, and various invertebrates that were exposed at low tide.

Shorebird surveys were conducted from 13 May-6 June and from 12 July-19 August. Surveys were not conducted during most of June and early July in both 1.5 km transects because of the absence of shorebirds between spring and fall migrations. Shorebird numbers also decreased during this time in the 2 km transect, although some shorebirds were always seen. Small flocks of western sandpipers (Calidris mauri), least sandpipers (Calidris minutilla) and dowitchers (Limnodromus sp.) sp. began to appear in small flocks in early July in Constantine Harbor and Port Etches. After mid-July flocks appeared more frequently and size of the flocks increased for the remainder of the summer.

Semipalmated plovers, black oystercatchers and greater yellowlegs (Tringa melanoleuca) nested in the area and were the most common birds seen.

The other shorebirds were migrants passing through the area. Dunlins (Calidris alpina) were observed 13-20 May but were not seen again. Least sandpipers and western sandpipers were seen commonly in May, July, and August in all three transects. Nine other species were seen infrequently during the summer on the transects.

Constantine Harbor and Port Etches mudflats were utilized regularly by moderate numbers of birds, but the intertidal mudflats of Constantine Harbor and Port Etches are probably not critical staging areas for any species.

Other Birds in Constantine Harbor-Port Etches

Migrating waterfowl and gulls utilized the shorebird transect areas of open water in Constantine Harbor and Port Etches for staging and feeding. On 14 July mew gulls (Larus canus) first appeared in the study area. Immature and adult mew gulls were observed in the intertidal areas of Constantine Harbor and Port Etches for the remainder of the summer (in groups of 10-50). Adult and immature Bonaparte's gulls (Larus philadelphia) first appeared in the area during the first week of July and remained through the close of the field camp.

Canada geese, common goldeneye (Bucephala clangula), pintails (Anas acuta) and mallards (Anas platyrhynchos) were observed in July and August in the estuary in the northeast end of Constantine Harbor and the northeast end of Port Etches. Surf scoters (Melanitta perspicillata) and white-winged scoters (Melanitta deglandi) rafted together in feeding flocks in Port Etches near Phipps Rocks and in northcentral Constantine Harbor. Flock composition was roughly 25% white-winged scoter and 75% surf scoter and the majority were male birds. Sixty scoters were first seen on 13 May in Constantine Harbor. On 21 May eight black scoters (Melanitta nigra) were observed in Port Etches 1/4 mile from Nuchek. Low numbers of non-breeding scoters utilized Constantine

Harbor and Phipps Rocks for most of the summer. Numbers of scoters increased dramatically in August and the birds shifted their feeding area to the eastern shore of Port Etches (Garden Cove, English Bay). Two to three hundred birds were observed in Port Etches on most boat trips through Port Etches. Molting scoters were observed the end of July and a male surf scoter with complete wing molt was collected on 26 July.

Trophic Relationships

In 1977 many feeding flocks were observed in Constantine Harbor and Port Etches. However, in 1978 feeding flocks were rarely seen. On 14 August one feeding flock of 270 black-legged kittiwakes was observed 1/4 km west of Porpoise Rocks. Feeding lasted 17 minutes before the flock dispersed. Twice during August a group of kittiwakes was seen feeding in Garden Cove, Port Etches. Feeding in these two smaller groups lasted less than 10 minutes. On 29 July feeding flocks of kittiwakes, glaucous-winged gulls, and small numbers (<5%) of tufted puffins, common murres, and marbled murrelets were observed feeding in both Rocky and Zaikof Bays of Montague Island.

Stomach analysis of collected birds will be presented in a separate report.

Summary of Marine Mammal Observations, 1978

Sea otter

The Port Etches-Constantine Harbor area of Hinchinbrook Island supports a large population of sea otters, and is a valuable pup-rearing area. Throughout the field season the distribution, productivity and size of the sea otter population was recorded as well as those of harbor seals (Phoca vitulina) and Stellar's sea lions (Eumetopias jubatus). Absolute counts of sea otters were made in both Port Etches and Constantine Harbor from a boat. A pup was defined as any small individual seen resting on the chest of a sea otter.

Distribution and activity was influenced by tidal stage, weather and local disturbance. Dense concentrations of otters were generally observed in northwestern Constantine Harbor (Figure 8). Such concentrations were common during low tide and were primarily composed of females with pups. Activity within these large rafts was confined to resting, sleeping and grooming. Sea otters dispersed during high tide and were frequently seen foraging and feeding.

During inclement weather few isolated individuals were seen and large, loosely-formed groups of sea otters were found in areas providing shelter from rough seas, principally Garden Cove and Constantine Harbor.

Population size was determined by combining counts from Port Etches-Constantine Harbor since otters moved freely between the two areas. Total counts ranged from a low of 28 (with 10 pups) in late May to a high of 112 (with 52 pups) in mid-August. This data agrees with the findings of the last two field seasons and supports the statements that: 1) there is a progressive immigration of sea otters into the study area during the summer, and 2) there is a marked increase in the number of pups in the area (Sangster et al. 1978). The increase in pups is either due to immigration, or more likely, is an expression of the pupping peak during the summer months. Peak numbers were observed in August, a month behind that recorded for last year with no noticeable decline in numbers for the month of August.

Sea otters were observed copulating in Constantine Harbor on 18 August. The pair was actively engaged in aquatic mounting for approximately 12-15 minutes with the male clasping the female with forelegs and biting her about the head and face. No other courtship behavior was observed.

Sea otters were observed on five separate occassions hauled out on the shore of Constantine Harbor. Individuals were lying on their sides or back, resting and/or grooming.

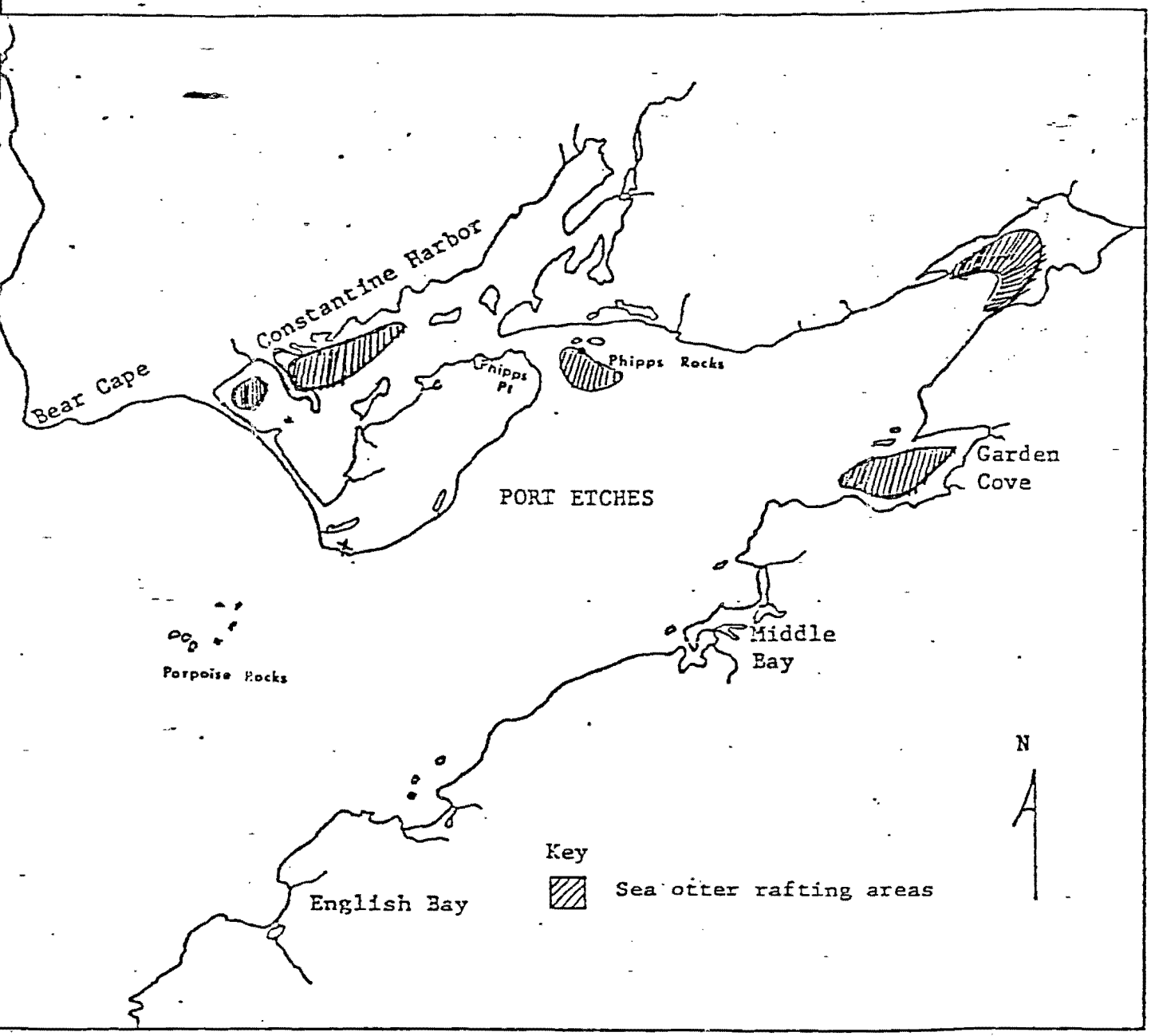


Figure 8. Principal areas for rafting of sea otters in Port Etches and Constantine Harbor.

Feeding behavior was observed periodically throughout the summer. Sea otters were seen and heard crunching unshelled mussels throughout the day and, to a lesser extent, throughout the night. Otters were also observed pulling the soft insides out of larger white bivalves and discarding the shells.

One sea otter which had been shot was found washed ashore in Port Etches on 15 May. The complete carcass of a young otter was found in Constantine Harbor in early June. Cause of death could not be determined due to the extent of decomposition.

Summary of Port Etches-Constantine Harbor
Sea Otter Census, May-August 1978
(Pup numbers in parentheses)

Date	Constantine Harbor	Port Etches	Combined Count
15 May	56 (3)	2 (1)	58 (4)
19 May	42 (18)	13 (0)	55 (18)
25 May--	24 (10)	4 (0)	28 (10)
13 June	37 (10)	2 (0)	39 (10)
22 June	35 (11)	2 (2)	37 (13)
26 June	53	*	53
10 July	63	*	63
23 July--	41 (22)	18 (4)	59 (26)
3 August	41 (6)	37 (11)	78 (17)
6 August	112 (52)	0	112 (52)
13 August	112 (52)	0	112 (52)

* no survey taken

Harbor Seal

Port Etches, Constantine Harbor and Porpoise Rocks were regularly used by seals throughout the field season.

The census area covered all Constantine Harbor and Port Etches from Porpoise Rocks to north of English Bay. The ratio of pups to adults was noted for productivity information and major hauling out areas were delineated (Figure 9).

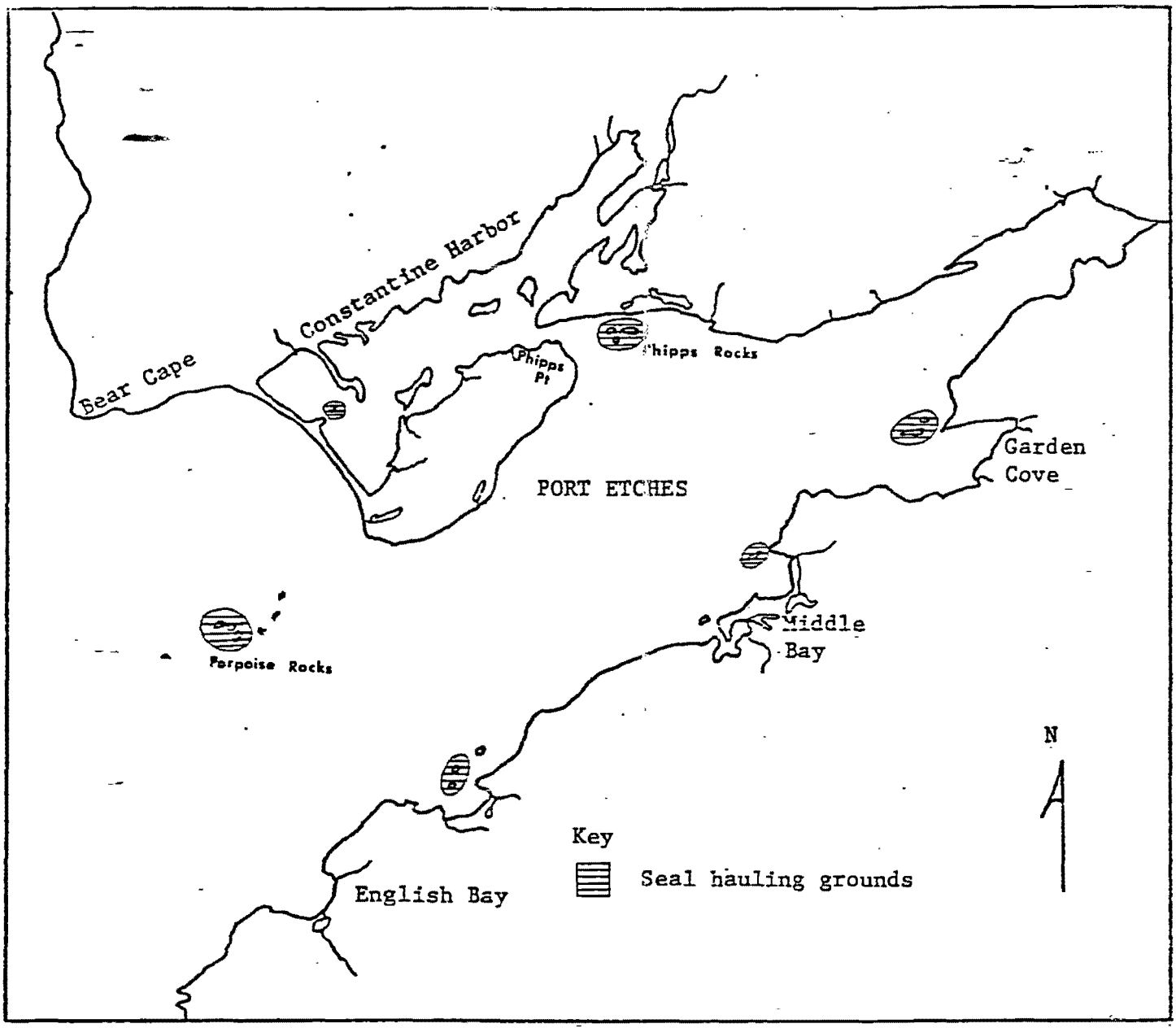


Figure 9. Principal areas of use by the Harbor Seal in the Port Etches - Constantine Harbor area.

The major hauling out area was at Porpoise Rocks. Seal numbers at Porpoise Rocks were not recorded during marine mammal surveys but were recorded separately throughout the field season. Additional hauling out areas included Garden Cove, English Bay, Middle Bay and Phipps Rocks.

Combined counts for the Port Etches-Constantine Harbor area increased from a low of 2 adults:0 pups on 15 May to a high of 85 adults:7 pups on 13 August. There appeared to be a slow but steady increase in the number of harbor seals seen, most notably among the Port Etches hauling out areas. Many of these areas didn't receive concentrated use until August.

The first pup of the 1978 season was sighted on Porpoise Rocks in June. No mother-pup pairs were seen after 15 July indicating that weaning had already taken place. No small pups were seen in any of the other hauling out areas except English Bay and Porpoise Rocks.

On 28 May the entire carcass of a newborn pup was found on the intertidal rocks of Porpoise Rocks. One of the eyes was blood-filled, with minor external lesions along the face and neck. Remnants of an umbilical cord, approximately 5-6" long remained. Milk teeth were erupted. The mother was reluctant to leave the pup when approached and remained nearby. The skin and skull were removed and preserved.

On 3 August a large adult harbor seal was observed hauled out at Porpoise Rocks with a large wound on its left side two-thirds of the way down the length of its body. The area was encircled with a bright red ring of blood and was gaping enough to expose the underlying muscle. The wound was approximately 10-11" long and appeared as if slashed open. The individual was not observed again.

Stellar's Sea Lion

Stellar's sea lions were seen infrequently throughout the field season. Unlike last year's observations, they were never observed near Porpoise Rocks nor were any seen hauled out.

Individuals were sighted in Port Etches, near English Bay, around Bear Cape and in Zaikof Bay on Montague Island.

Summary of Stellar Sea Lion Observations, 1978

15 May	Port Etches	1
21 May	Port Etches	1
25 May	Port Etches	1
	Bear Cape	4
3 June	Bear Cape	3
	English Bay	9
28 June	north of Bear Cape	5

Cetaceans recorded during the 1978 field season were primarily observed off Porpoise Rocks and in Port Etches. Additional observations were made during trips to Montague Island.

Dall Porpoise (Phocoenoides dalli)

This porpoise species was the most frequently recorded cetacean. Peak numbers were observed in early June, although sightings occurred throughout the field season. The maximum number observed were 13-14 animals just south of Porpoise Rocks on 3 June.

Summary of Dall Porpoise Sightings, 1978

3 June	Porpoise Rocks - south	13-14
10 June	Porpoise Rocks - south	10-11
13 June	Porpoise Rocks	4
24 June	Porpoise Rocks - south	5-7
28 June	Bear Cape - just north	10
29 July	Porpoise Rocks - south	1
18 August	Port Etches	2

Harbor Porpoise (Phocoena phocoena)

Harbor porpoise were only seen once this field season. On 25 May near Bear Cape, two individuals swam next to the zodiac boat.

Killer Whales (Orcinus orca)

Killer whales were seen only four times during the 1978 field season. One of those observations occurred in Zaikof Bay on Montague Island on 8 and 9 June. Pod sizes ranged from four to nine. This species was observed near Bear Cape once and Porpoise Rocks twice. A calf was present during all four observations.

Humpback Whale (Megaptera novaeangliae)

Humpbacks were sighted only once, on 16 May when four individuals were seen breaching almost entirely out of the water just south of Porpoise Rocks. The display lasted 7-9 minutes.

Minke Whales (Balaenoptera acutorostrata)

Minke whales were seen occasionally throughout the 1978 field season. Identification was based on size and the small curved dorsal fin. Seven minke whales were recorded during five observations. Once outside of Rocky Bay on Montague Island, near edge of feeding flock. Once near Shelter Bay and three times in Port Etches.

CONCLUSION

The low reproductive success of seabirds during the 1978 field season on Hinchinbrook Island paralleled the findings from 1976 and constrasted markedly from the successful season of 1977.

Lowered productivity appears to be the result of a combination of several factors: evidence of a diminished food supply as supported by the lack of feeding flocks throughout the summer; abundant rain and strong winds during the early stages of laying and incubation; and persistant colony harassment by eagles, crows and ravens throughout the first half of summer.

The variability of breeding success of seabirds expressed between the field seasons of 1976, 1977 and 1978 supports the need for continuing studies

in this area to determine the presence of any baseline trends within these species. This information would be nessary to predict and/or possibly alter the direction these populations may go in the future.

Data collected on birds and mammals in Rocky and Zaikof Bays, Montague Island, indicate that these areas are not as critical for wildlife utilization as Port Etches. Port Etches supports a greater abundance and variety of waterfowl, shorebirds, seabirds and marine mammals than either Rocky or Zaikof Bay. It is recommended by the authors to use an area other than Port Etches for tanker containment.

LITERATURE CITED

Isleib, M.C. and B. Kessel. 1973. Birds of the North Gulf Coast-Prince William Sound Region, Alaska. Biol. Papers Univ. Alaska #14. 149 p.

Manuwal, D.A., D. Anderson, G. Knoder, D. Nettleship and S.G. Sealy. 1975. Seabird colony census techniques (preliminary draft). The Pacific Seabird Group. 18 p.

Nettleship, D.N. 1972. Breeding success of the Common Puffin on different habitats at Great Island, Newfoundland. Ecol. Mono. 42:239-268.

Nettleship, D.N. 1976. Census techniques for seabirds of Arctic and Eastern Canada. Can. Wildl. Serv. Occas. Pap. No. 25. 33 p.

Nyswander, D. and P. Knudtson. 1977. The population ecology and migration of seabirds, shorebirds, and waterfowl associated with Constantine Harbor, Hinchinbrook Island, Prince William Sound, 1976. U.S. Fish and Wildlife Service Report, OBS/CE. 71 p.

Sangster, M.E., D.J. Kurhajec and C.T. Benz. 1978. Reproductive ecology of seabirds at Hinchinbrook Island and a census of seabirds at selected sites in Prince William Sound, 1977. U.S. Fish and Wildlife Service Report, Special Studies. 98 p.

Appendix 1

Annoted list of birds observed on/near Hinchinbrook Island
10 May through 24 August, 1978

Gavia immer (Common loon) — A lone immature bird was seen approximately twice a week in May and June.

Gavia arctica (Arctic loon) — Single birds in breeding plumage were observed in Port Etches near Porpoise Rocks once in May and twice in June. Arctic loons were seen on both trips to Zaikof and Rocky Bays of Montague Island. A group of 74 loons in breeding plumage was recorded on 11 June in Port Etches.

Gavia stellata (Red-throated loon) — A single bird was observed on 24 August in Constantine Harbor.

Phalacrocorax auritus (Double-creasted cormorant) — This species was observed at Porpoise Rocks during every visit there.

Phalacrocorax pelagicus (Pelagic cormorant) — These cormorants were observed mixed with double-crested cormorants at Porpoise Rocks.

Branta canadensis (Canada goose) — A common breeder in the boggy meadows of Hinchinbrook. Geese were observed nearly daily in May and June, were conspicuously absent in July during their molt, and reappeared in large numbers in early August.

Anas platyrhynchos (Mallard) — A few mallards were seen weekly at the head of Port Etches and Constantine Harbor in May, July, and August.

Anas acuta (Pintail) — Small flocks of pintails were observed on 15 May and 27 July at the head of Port Etches and Constantine Harbor.

Anas clypeata (Shoveler) — A male and female shoveler were observed in Constantine Harbor on 15 and 16 May.

Aythya marila (Greater scaup) — This species was observed commonly in south Constantine Harbor during May and the first two days of June. None were seen after this time.

Bucephala islandica (Barrow's goldeneye) — This species was observed in Garden Cove and at the heads of Port Etches and Constantine Harbor throughout the field season. Goldeneye were seen twice a week during May, June, the first week of July, and the first two weeks of August.

Histrionicus histrionicus (Harlequin duck) — Harlequin ducks were abundant throughout the field season in Constantine Harbor, Port Etches, Porpoise Rocks, and Rocky and Zaikof Bays of Montague Island.

Somateria mollissima (Common eider) — A lone male was seen in Garden Cove, Port Etches on 18 August.

Clangula hyemalis (Oldsquaw) — Three oldsquaw were observed in Port Etches on 3 June and a pair of oldsquaw was observed on 23 and 24 June.

Melanitta nigra (Black scoter) -- On 28 May a group of eight were observed on the water in Port Etches one-fourth of a mile northeast of Nuchek.

Melanitta deglandi (White-winged scoter) -- This species was abundant throughout the field season, mixing with flocks of surf scoters. White-winged scoters comprised approximately 25% of the mixed scoter flocks. Numbers of both white-winged and surf scoters increased during late July and August.

Melanitta perspicillata (Surf scoter) -- This species was one of the most abundant in Port Etches (excluding Porpoise Rocks). Surf scoters were usually mixed with white-winged scoters.

Mergus merganser (Common merganser) -- This species was observed frequently in Constantine Harbor and infrequently in Port Etches through May, June and July, but was not seen during August. On 17 July a group of 15 young mergansers were seen in Constantine Harbor. On 25 July a group of 11 young mergansers were also seen in Constantine Harbor.

Mergus serrator (Red-breasted merganser) -- This species was observed four times in May, and once each in June, July, and August at the heads of Constantine Harbor and Port Etches.

Accipiter striatus (Sharp-shinned hawk) -- One female was seen on 17 August in Constantine Harbor.

Haliaeetus leucocephalus (Bald eagle) -- This species is abundant throughout Prince William Sound. Four active nests and three inactive nests were found in Port Etches-Constantine Harbor. One active nest was found on Zaikof Point, Montague Island. Immature and adult birds were seen every day of the field season.

Canachites canadensis (Spruce grouse) -- This species was frequently seen in the spruce forests near camp throughout the field season. A hen with seven chicks was seen the last week of July in alder bushes one-half mile north of camp.

Lagopus mutus (Rock ptarmigan) -- Eighteen birds of this species were observed on top of the mountains on the north side of Constantine Harbor on 23 August.

Haematopus bachmoni (Black oystercatcher) -- A common breeder in the area. This species nested on the gravel beach along the south and southwest end of Constantine Harbor. Large flocks were observed towards the end of July.

Charadrius semipalmatus (Semipalmated plover) -- A common breeder in the area. Larger concentrations of plovers were seen in August.

Numenius phaeopus (Whimbrel) -- This species was observed once in May and July, twice in August, and not seen in July.

Actitis macularia (Spotted sandpiper) -- This species was seen once in May, not at all in June, but seen frequently in July and August. It was usually seen along the southeast shore of Constantine Harbor.

Heteroscelus incamus (Wandering tattler) -- This species was occasionally seen on Porpoise Rocks. In July and August it was often seen at the head of Constantine Harbor.

Tringa melanoleuca (Greater yellowlegs) -- Observed frequently along the muddy shores of Constantine Harbor, at the head of the Harbor and the head of Port Etches.

Tringa flavipes (Lesser yellowlegs) -- This species was observed three times in August at the head of Constantine Harbor.

Limnodromus sp. (Dowitcher) -- On 9 June five dowitchers were observed in Zaikof Bay of Montague Island. Dowitchers were observed at the head of Constantine Harbor on 21 July and 10 August.

Aphriza virgata (Surfbird) -- This species was seen on 14 and 15 May and not seen again until 22 June. Thereafter it was commonly seen on Porpoise Rocks.

Arenaria interpres (Ruddy turnstone) -- This species was observed on 15 and 20 May. No turnstones were seen again until mid-July at which time they were in winter plumage, and difficult to distinguish from black turnstones in winter plumage. All turnstones seen in July and August were identified as turnstone (sp.).

Calidris melanotos (Pectoral sandpiper) -- One pectoral sandpipér was seen on 16 May in Constantine Harbor.

Calidris alpina (Dunlin) -- This species was observed on mudflats in Constantine Harbor 14-20 May and not seen again.

Caldris alba (Sanderling) -- This species was observed on 14 May and 19 August at the heads of Constantine Harbor and Port Etches.

Calidris minutilla (Least sandpiper) -- Commonly seen in May and August in Constantine Harbor.

Calidris mauri (Western sandpiper) -- One of the most common migrants. This species was usually seen with least sandpipers in Constantine Harbor and the head of Port Etches.

Lobipes lobatus (Northern phalarope) -- A lone phalarope was observed feeding at the head of Constantine Harbor on 13 July. Groups of this species were seen feeding in Port Etches on 26 July and in August.

Stercorarius parasiticus (Parasitic jaeger) -- One bird was seen on 11 August flying over the tidal flats at the head of Port Etches.

Larus glaucescens (Glaucous-winged gull) -- This was the most abundant large gull in the area and was observed all through the field season. Many bred on Porpoise Rocks.

Larus canus (Mew gull) -- This species was first observed on 13 July in Constantine Harbor. Thereafter mew gulls were very abundant in Constantine Harbor.

Rissa tridactyla (Black-legged kittiwake) -- This was the most common gull in the area. A large concentration of kittiwakes nested on Porpoise Rocks.

Larus philadelphia (Bonaparte's gull) -- This species was seen twice in mid-June, and was commonly seen in July and August throughout Constantine Harbor and the head of Port Etches. Later in the season many immatures were seen with the adults.

Sterna paradisaea (Arctic tern) -- This species was seen almost daily in Constantine Harbor and Port Etches. A colony of 60 breeding pairs was found on the southwest shore of Constantine Harbor. In August arctic tern numbers decreased drastically as they migrated south.

Sterna aleutica (Aleutian tern) -- Two Aleutian terns were seen on 24 June in Constantine Harbor.

Uria aalge (Common murre) -- This species occurs on Porpoise Rocks where less than 1000 pairs breed. Murres were seen twice in August in Port Etches.

Uria lomvia (Thick-billed murre) -- One was seen on 19 August near Porpoise Rocks.

Cepphus columba (Pigeon guillemot) -- This species was seen commonly throughout the field season in Constantine Harbor and to a lesser extent in Port Etches. A few guillemot pairs probably breed in the talus of Constantine Harbor.

Fratercula corniculata (Horned puffin) -- This species bred on Porpoise Rocks. Twelve was the largest number of horned puffins seen at one time.

Lunda cirrhata (Tufted puffin) -- This was a common breeder at Porpoise Rocks and Phipps Point Rocks.

Brachyramphus marmoratum (Marbled murrelet) -- This species was regularly observed in Constantine Harbor and Port Etches, and probably breeds in the area.

Bubo virginianus (Great horned owl) -- None were seen but one was heard on 5 June and 17 June from field camp.

Cypseloides niger (Black swift) -- One was observed on 15 May flying over the head of Port Etches.

Selasphorus rufus (Rufous hummingbird) -- Often seen in camp in May, and less commonly in July. This species was seen on Montague Island (Zaikof Bay) in June.

Megaceryle alcyon (Belted kingfisher) -- Seen nearly daily in camp throughout the field season. There probably was a nest located near camp, although one wasn't found.

Dendrocopos villosus (Hairy woodpecker) -- One was seen on 16 June in the woods along Constantine Harbor. One was also seen on 6 June in the woods along Zaikof Bay of Montague Island.

Sridoprocne bicolor (Tree swallow) -- This swallow was often seen in the meadows behind Nuchek and is believed to nest there.

Cyanocitta stelleri (Stellar's jay) -- This species was common in the forested areas of Hinchinbrook, and was often seen in camp.

Pica pica (Black-billed magpie) -- Seen on 26 May and 30 May in the meadows behind Nuchek.

Corvus corax (Common raven) -- This species was observed in small numbers throughout the field season. One pair nested in the meadows behind Nuchek.

Corvus caurinus (Northwestern crow) -- Seen regularly at the heads of Constantine Harbor and Port Etches. Large flocks of crows were observed in mid-to-late August in Constantine Harbor.

Parus atricapillus (Black-capped chickadee) -- This species was frequently heard in the spruce forests on Hinchinbrook.

Cinclus mexicanus (Dipper) -- A lone dipper was observed on 4 and 6 August along a stream in the northwest woods of Constantine Harbor.

Certhia familiaris (Brown creeper) -- One was observed on the side of a tree in the deep woods on the western side of Constantine Harbor.

Troglodytes troglodytes (Winter wren) -- Two were observed on 6 August in the woods on the west side of Constantine Harbor. One was seen on 15 May in the woods near camp.

Turdus migratorius (Robin) -- A lone robin was noted in the brush near Nuchek on 24 July and 11 August.

Ixoreus naevius (Varied thrush) -- One was observed in the woods on the northwest side of Constantine Harbor on 23 August.

Catharus guttatus (Hermit thrush) -- This was the most abundant passerine breeding in the area and was seen throughout the field season. Two immature hermit thrushes were startled from the alders bordering Constantine Harbor in mid-July.

Bombycilla garrulus (Bohemian waxwing) -- This species was observed in the meadows behind Nuchek and probably nests there.

Dendroica petechia (Yellow warbler) -- This species was commonly seen in June, but not July or August.

Dendroica coronata (Yellow-rumped warbler) -- This species was observed throughout the field season and probably breeds in the spruce forests on Hinchinbrook.

Wilsonia pusilla (Wilson's warbler) -- One male was observed on 12 July in the spruce trees bordering Constantine Harbor.

Loxin leucoptera (White-winged crossbill) -- This species was observed weekly in July and August.

Zonotrichia atricapilla (Golden-crowned sparrow) -- One was observed on 15 May in Constantine Harbor.

Passerella idiaca (Fox sparrow) -- The dark phase of this species nested in the tall grass of Porpoise Rocks, and was seen there on every trip to the Rocks.

Melospiza melodia (Song sparrow) -- Low numbers of this species were observed in May, June, and July in the alders and bordering woods of Constantine Harbor.

Appendix 2

Birds and mammals observed on Montague Island

Species	7 June Zaikof Bay	8 June Rocky Bay	29 July Zaikof Bay	29 July Rocky Bay
White-winged scoter	22		12	9
Whimbrel	5			
Harlequin duck	137		19	1
Double-crested cormorant	2	4	6	
Canada goose	25			
Pigeon guillemot	7	2	5	6
Marbled murrelet	6	4	32 adults	74 adults
			2 immatures	5 immatures
Glaucous-winged gull	20 adults	3	24 adults	40 adults
	5 immatures		23 immatures	2 immatures
Arctic tern	Many		12	5
Bald eagle	6 adult		1 adult	1 immature
	2 immatures			
Black-legged kittiwake	22 adult	40	21	
	88 immatures			
Black oystercatchers	6			
Arctic loon	1			6
Common loon	2			
Common murre	20		4	1
Tufted puffins			5	40
Mew gull				1
Surf scoter			2	
Raven	2		1	
Northwestern crow	7			
Hermit thrush	2			
Rufous hummingbird	1			
Land otter			1	
Sea otter	1 + 1 pup		23 + 7 pups	
Harbor seal	11		2	1
Stellar's sea lion	2			
Killer whale	6			
Minke whale				1

Appendix 3

Results of shorebird migration counts

Nuchek 2 km shorebird transect

Species	13 May	14 May	15 May	16 May	18 May	20 May	23 May	25 May	2 June	9 June	12 June	20 June	12 July	17 July	24 July	27 July	1 Aug.	7 Aug.	15* Aug.
Semipalmated plover		6	16	8	24	12	11	11	6	7	5	5	5	7	5	6	2		
Black oystercatcher		1	1	5	2		3	1				1	2			2			
Least sandpiper			37	9	13	7							21			16			
Western Sandpiper			4	25	25	14		4								23	15		
Dunlin	22		1	9	16	4													
Greater yellowlegs					1	2									3				
Sanderling					12	1													
Turnstone sp.			16																
Spotted sandpiper					1										2		1	1	
Semipalmated sandpiper								4											
Whimbrel								1	1										

* On 15 August no shorebirds were seen

Port Etches 1.5 km shorebird transect

Species	15 May	31 May	6 June*	14 July	22 July	30 July	11 Aug.	19 Aug.
Semipalmated sandpiper	12	9					1	7
Black oystercatcher		2			8	2		
Least sandpiper	6					27	9	74
Western sandpiper	60			800		121	490	2
Dunlin							1	
Greater yellowlegs						1		
Sanderling								
Wandering tattler	3			1			1	1

* No shorebirds seen on 6 June

Constantine Harbor 1.5 km shorebird transect

Species	14 May	26 May*	13 July	21 July	27 July	2 Aug.	10 Aug.	17 Aug.
Semipalmated plover	22			2		29	36	
Black oystercatcher	4							
Least sandpiper			88	50	17	65	22	64
Western sandpiper	15			75	12	344	189	
Greater yellowlegs							4	1
Lesser yellowlegs							5	2
Sanderling	8							
Turnstone sp. (immature)			7	12	1		3	
Dowitchers sp.				11				
Surfbird	210							
Northern phalarope			1					

* No shorebirds seen on 26 May