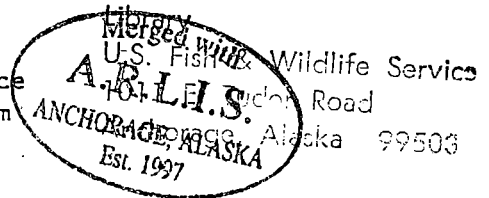


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ABUNDANCE AND DISTRIBUTION OF SEABIRDS IN PRINCE WILLIAM SOUND

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INTRODUCTION

Prince William Sound (PWS) is an extensive embayment in the Gulf of Alaska, 90 km southeast of Anchorage (Figure 1). Through the Sound, oil tankers carry Alaskan North Slope oil which they obtain at the Alaska oil pipeline terminus at Valdez. Because of the increase in tanker traffic and the increasing interest of Federal and State agencies in the management of birds in the area, there have been several recent surveys of the marine birds and mammals of PWS (Dwyer et al, Hogan and Colgate 1980, Islieb and Kessel 1973, Sangster et al 1977, Pitcher and Vania 1973). There have also been a number of short-term studies of the breeding biology of seabirds in and near the sound (Kane and Boyd 1979, Mickelson et al., 1977 & 1978, Nysewander and Knudtson 1977, Oakley and Kuletz 1979, Sangster et al., 1978. Likewise, there is an ongoing study of sea otter ecology at Green Island (A. M. Johnson, pers. comm.).

In addition to possible impact from tanker traffic, there may be further impact on marine birds and mammals in the sound due to increased human activity in the form of recreation, logging, and housing development. Prince William Sound is prime habitat also for Bald Eagles and is reported to have one of the densest concentrations of this species in south central Alaska (J. Hodges, personal communication).

Much of the land around the Sound has been claimed by Native Corporations under provisions of the Alaska Native Claims Settlement Act. Much of the remaining land is managed by the Forest Service. The purpose of this present research was to survey the Native and Forest Service lands to locate all eagle nests and, where possible, to identify each nest tree with a permanent marker. In addition, the Wildlife Operations branch wanted an up-to-date assessment of seabird abundance and distribution in Prince William Sound. Observations on concentrations of sea otters were requested by the Research Division.

DESCRIPTION OF AREA

Prince William Sound extends from approximately $59^{\circ}44'$ to $61^{\circ}14'$ north and $148^{\circ}40'$ to $145^{\circ}45'$ west, and has a diameter of 125 km. The shoreline extends for 2,900 km with another 1,900 km around the islands; much of the shoreline contains many long narrow fjords. The Sound is dotted with islands - 34 major and 150 minor. Water depths range to 870 m and the mean water temperature at Cordova is 6.4° C. Tides are approximately 3.8 m up to a maximum of 5.5 m. Rugged mountains rise from the ocean up to 5500 m and they contain the greatest number of valley glaciers and the largest ice fields of North America (Kessel and Islieb, 1973).

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PWS is surrounded by a Sitka spruce, western-hemlock (Picea sitchensis and Tsuga heterophylla) coastal/subalpine forest typical of the Pacific Northwest coast. It contains tundra, shrub thickets, mature forest, bogs, marshes, deciduous and spruce woodlands, beaches and tidal flats, and rocky shores and reefs (Islieb and Kessel, 1973). Through these habitats, streams flow to the Sound and many of them support good runs of pink (Oncorhynchus gorbuscha) and silver (O. kisutch) salmon.

Annual precipitation in PWS ranges from 158.42 cm in Valdez to 445.21 cm in Whittier. Temperatures generally range from -18° C in winter to 24° C in summer and the mean annual temperatures are approximately 2.1° C to 4.5° C.

METHODS

We surveyed the coast by a 5m skiff, paralleling the shoreline 100 meters from shore along lands claimed by Natives and also along Forest Service and privately owned land. The coastline surveyed is indicated in Figures 2 and 3. Figures 4 and 5 show Native lands and land earmarked for logging in the near future by the U.S. Forest Service.

When we found a Bald Eagle nest we marked its location on a USGS topographic map and filled out a coded card noting specific and general locations, timber type, tree species and other general habitat and location variables and description of the nest. The results of the Bald Eagle survey are found in Hodges et al 1980.

There were two survey teams which divided up the total area to be sampled. Usually each side of a bay was surveyed by one team. Only one team censused seabirds in addition to eagles. The areas of Prince William Sound surveyed by this team are indicated on each map in the report. All tables reflect just the surveys by the seabird team. During the seabird and marine mammal census, we noted total numbers of seabirds and non-seabirds such as ravens, marine mammals and the locations where we found concentrations of birds, feeding flocks or colonies.

SPECIES ACCOUNTS

Birds

The colonial seabirds comprised the majority of birds sighted during the survey. None of them were seen less than 60% of the time, and some were seen every day. Of all birds counted, 88.8% were colonial seabirds, and of them, 92.0% were larids, with the remaining 8% the Marbled Murrelet. Galena Bay, east Hinchinbrook Island and the Port Fidalgo area had the densest population of seabirds. The most abundant species were the larids: the Black-legged Kittiwake was the most abundant (29.3% of all birds sighted) followed by Bonaparte's Gull (19.2%), Mew Gull (13.4%), Arctic Tern (7.5%), and Marbled Murrelet (7.2%) (Table 1). The species most frequently seen during the survey were Glaucous-winged Gulls and Marbled Murrelets which were sighted every day, followed by Arctic Terns (92.3%), Red-breasted Mergansers (84.6%), and Mew Gulls (76.9%). These figures correspond with those from other surveys in PWS (Kessel and Islieb 1973, Dwyer et al.).

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The bays with the highest concentrations of birds were Galena Bay (Figure 17) which had large colonies of Bonaparte's Gulls and Arctic Terns, the east shore of Hinchinbrook Island (Figure 6) which had a large colony of Black-legged Kittiwakes, and the Port Fidalgo area (Figures 14 & 15) which had large colonies of Bonaparte's Gulls and Arctic Terns, and which also, along the outer coast (Figure 13), had many feeding flocks. Bligh and Chenega Islands likewise had high local densities of birds and mammals (Figures 16 to 21). In the other bays and islands there were pockets of high concentrations of birds (Figures 6 to 21) but much of the adjacent surveyed area had few or no seabirds which decreased the mean number of birds sighted per kilometer.

There was no south to north or east to west pattern in densities of seabirds or marine mammals, analysis of variance $p > 0.05$, (Table 3). The mean density of seabirds overall was 25.74 birds/km and that of marine mammals was 0.91 mammals/km. Likewise, there was no correlation in densities between seabirds and marine mammals, seabirds and Bald Eagles, or marine mammals and Bald Eagles, correlation analysis, $p > 0.05$.

LOONS (Gavia spp.)

The majority of the loons were Common Loons (G. immer.) but I have combined them all under one genus for this paper. Loons were most abundant in Sheep Bay (Table 4). Over a third of all loons sighted were found here. In any one day, within specific locations, loons never comprised more than 3% of all birds sighted (Table 5). Overall, they composed less than 1% of the birds observed. They were sighted fairly frequently (69%), (Table 1), but always in low numbers.

DOUBLE-CRESTED CORMORANT (Phalacrocorax auritus)

A Double-crested Cormorant was sighted once on the southeast side of Hinchinbrook Island.

PELAGIC CORMORANT (Phalacrocorax pelagicus)

Cormorants were sighted frequently (62%). They were never abundant, however, and comprised less than 1% of seabirds. On any one day their numbers were never higher than 7%. Their greatest concentration was in Port Gravina.

GREAT BLUE HERON (Ardea herodias)

Great Blue Herons were not abundant (< 1% of all birds) nor were they frequently observed (15% of all days). The majority (88%) occurred along the outer coast to north Sheep Bay in a mixed cottonwood woodland and marsh.

CANADA GOOSE (Branca canadensis)

Canada geese were only found at Columbia Bay near Columbia Glacier. This area appeared to be attractive to many bird species, especially the waterfowl. The geese comprised 12% of the birds in the bay, although overall they made up less than 1% of the numbers.

MALLARD (Anas platyrhynchos)

Mallards were observed on less than one-fourth of the days of the survey. Their total numbers were as low as those of loons and geese ($< 1\%$). Of the numbers sighted, 56% were seen migrating south. The rest were seen at Columbia Bay (31%) and Chenega Island (12%).

PINTAIL (Anas acuta)

Pintails were sparse in PWS being spotted on just 15% of the days. Their numbers were low ($< 1\%$) and most (92%) were seen migrating south at the head of Port Fidalgo. The others were seen in Port Gravina. Their numbers were never more than 3% of all birds sighted in one day.

GOLDENEYE (Bucephala spp.)

Only 7 goldeneyes were seen throughout the survey. They were only seen on 3, or 23%, of all days of the survey; 43% were in Port Gravina with the rest evenly divided between Port Fidalgo and Galena Bay.

HARLEQUIN DUCK (Histrionicus histrionicus)

Harlequin ducks were the most common species of duck. They were usually found in the open, wave-swept areas of the Sound. They were spotted on 62% of the days, yet comprised only 2% of the numbers. They never made up more than 11.5% of all birds seen in one day and the greatest numbers were found at the outer area of Sheep Bay and Port Fidalgo (26% and 28% respectively).

SURF SCOTER (Melanitta perspicillata)

Surf Scoters were about as common as the Harlequin Ducks, comprising 2% total numbers and sighted on 62% of the days. Their greatest numbers occurred at the head of Port Fidalgo and around Bligh Island. Fifty-one unidentified non-White-winged Scoters are included with Surf Scoters.

WHITE-WINGED SCOTER (Melanitta deglandi)

White-winged Scoters were seen on slightly less than one-third of the days (31%). Their relative abundance was very low ($< 1\%$) and they never comprised more than 7% of all birds sighted in a day. They were most abundant along the north and south shores of Hawkins Island (49% and 36% respectively).

RED-BREASTED MERGANSER (Mergus serrator)

Red-breasted Mergansers were quite common and were seen on 85% of the days, although in total numbers their relative population size was low (1%). They were most abundant along the open coast from Redhead to Knowles Head and also in Port Fidalgo. Red-breasted Mergansers never comprised more than 3% of seabirds seen in one day.

BALD EAGLE (Haliaeetus leucocephalus)

We found 322 nests of Bald Eagles during the survey. The total number of adults sighted was 604 and the total number of immatures was 147. There was an average of 0.29 nests per km of coastline with approximately 1.8 times as many nests per km on the east than the west. Twenty-four percent of the eagle nests were active and 85% were in hemlock trees.

BLACK OYSTERCATCHER (Haematopus bachmani)

Black Oystercatchers were seen 46% of all days but only comprised 0.2% of all birds. They were most abundant along the north shore of Hawkins Island (56%) and never comprised more than 5% of birds sighted in a day.

WANDERING TATTLER (Heteroscelus incanus)

Wandering Tattlers were rare ($< 1\%$) and were seen on only 23% of the days. Half of their numbers (2) were at Bligh Island and each was seen on the outer shores of Port Fidalgo and Eshamy Bay.

SURFBIRD (Aphriza virgata)

Surfbirds were uncommon ($< 1\%$) and not frequently seen (15% of all days) and the majority of them (89%) occurred along the open coast from Redhead to Knowles Head.

ROCK SANDPIPER (Calidris ptilocnemis)

Rock Sandpipers were not abundant ($< 1\%$) but were seen on 54% of the days. Their greatest concentration (89%) was at the eastern end of Hawkins Island, Mud Bay to Deep Bay, where they comprised 24% of all birds seen in that location.

NORTHERN PHALAROPE (Lobipes lobatus)

Northern phalaropes comprised 3% of all birds and were sighted on 31% of the days. At the eastern end of Hawkins Island at Deep Bay, we saw a flock of 400 which made the count at that location 70% of all birds sighted. Likewise, this bay contained the greatest concentration of this species (95%) over the entire survey.

GLAUCOUS-WINGED GULL (Larus glaucescens)

Glaucous-winged gulls were ubiquitous and were seen every day of the survey. Their mean densities were high: 3.2 birds/km. Total numbers, 2,066, comprised 12% of all birds sighted during the survey and the numbers sighted per day reached a daily maximum at Sheep Bay, 21% of all birds seen. The overall mean composition within one day was 11%. Glaucous-winged x Herring Gull crosses are combined as Glaucous-winged Gulls.

MEW GULL (Larus canus)

Mew Gulls were the third most abundant species in PWS, comprising 13% of all birds counted. They were sighted on over three-fourths of the days (77%) and in Port Fidalgo in one day, they comprised 30% of all birds seen. This bay also had the maximum number of Mew Gulls sighted during the survey (31%). The mean numbers sighted per day was 11% and the average density was 3.4 birds/km.

BLACK-LEGGED KITTIWAKE (Rissa tridactyla)

Black-legged Kittiwakes were the most abundant species in Prince William Sound. They comprised 29% of all birds and were seen on 69% of the days. Their greatest concentration was at the Porpoise Rocks colony where 2,500 birds nested, which was 51% of all kittiwakes counted. They comprised 94% of all birds seen that day. Because of their high concentration, their mean number per day was 24% and the mean density/km was 7.5 birds.

BONAPARTE'S GULL (Larus philadelphia)

Bonaparte's gulls were the second most abundant species (19% of the birds counted). They were seen on 62% of the days and in any one day their numbers reached a maximum of 64%. Their greatest concentration in numbers was in Galena Bay which harbored a colony of Bonaparte's Gulls. The mean percent numbers sighted per day was 13% and their mean density was 4.9 birds/km.

ARCTIC TERN (Sterna paradisaea)

Arctic Terns were the fifth most abundant species. They were almost as ubiquitous as the Glaucous-winged Gulls and were seen all but one of the days (92%). Their greatest numbers were in Port Fidalgo (27%) where they had several colonies. The mean percent number per day for Arctic Terns was 10% and their maximum for any one day was at Sheep Bay where they comprised 34% of all birds seen. Their mean density was 1.9 birds/km.

PIGEON GUILLEMOT (Cephus columba)

Pigeon Guillemots are one of the non-colonial alcids. They were sparse

($< 1\%$) and their numbers were patchy, and were sighted in less than 50% of all days (46%). Their mean density was 0.1 birds/km and their mean numbers per day were 1%, with a high of 11% of all birds seen on the north side of Hawkins Island. This was the greatest concentration of Pigeon Guillemots during the survey ; 56% of all guillemots sighted were found here.

MARbled MURRELET (Brachyramphus marmoratus)

Marbled Murrelets were as ubiquitous as Glaucous-winged Gulls and were sighted every day of the survey, although they were only the sixth most common species, comprising 7% of all birds seen. Their mean density, 1.8 birds/km, was similar to that of Arctic Terns and their mean relative number per day was 16%. At south Hawkins Island, west from Mud Bay, they composed 63% of all birds observed, although in total numbers of murrelets, their maximum was at Chenega Island.

BELTED KINGFISHER (Megasceryle alcyon)

The Belted Kingfisher was as rare as the Common Snipe, with one individual sighted at the head of Port Fidalgo.

COMMON RAVEN (Corvus corax)

Common Ravens were not abundant (0.2%) and they were only sighted on 39% of all days, with their mean number per day of 1.0%. Their greatest concentration was on the south side of Hawkins Island and their mean density was 0.1 birds/km, and they comprised 0.1% of all birds sighted.

COMMON SNIPE (Capella gallinago)

A Common Snipe was seen only once, in the Redhead to Knowles Head - Port Fidalgo area. Their mean density then was less than 0.1 birds/km, and they comprised less than 0.1% of all birds sighted.

NORTHWESTERN CROW (Corvus caurinus)

Northwestern Crows were not abundant (0.7%) but were seen on 69% of the days of the survey. Their mean density per kilometer of coastline was 0.2 and the mean percent numbers sighted per day were 3% with a maximum relative number in a day of 13% on the south side of Hawkins Island. The greatest numbers of crows were in the Port Fidalgo area where 28% of all crows sighted were found.

MAMMALS

SEA OTTER (Enhydra lutris)

Sea Otters, the most common and abundant marine mammal in PWS (Table 2), were sighted every day and comprised 71% of all mammals. Their mean density was 0.6 otters/km. of coastline and their mean daily abundance was 71% of total marine mammals sighted (Table 7). Their greatest numbers were in Sheep Bay where 35% of all sea otters observed were found (Table 6). They were the most abundant marine mammal in all but two of the areas surveyed.

HARBOR SEAL (Phoca vitulina)

Harbor Seals were the second most abundant marine mammal (24% of total numbers). They were seen on 69% of all the days and their mean density was 0.2 seals per km. Their greatest abundance was likewise in Sheep Bay (29%) of total seals observed and they were the most abundant marine mammal in outer Port Fidalgo (56%) and at the head of Port Fidalgo (88%). Their mean daily abundance was 22%.

KILLER WHALE (Orcinus rectipinna)

Killer Whales were seen in 15% of the days but in numbers comprised only 3% of all marine mammals sighted. Their mean density was 0.2/km and they were only seen on two of the days in the Knowles Head area and near Chenega Island. They never comprised more than 16% of all marine mammals in a day and their mean percent numbers per day were 2%.

DALL PORPOISE (Phocoenoides dalli)

Dall porpoises were only observed once in exposed waters about 3 km off the entrance of Columbia Bay.

HARBOR PORPOISE (Phocoena vomerina)

Harbor Porpoises were seen on 8% of all days but only comprised 0.7% of all marine mammals sighted so their densities were low, 0.1/km. They never comprised more than 1% of all mammals in a day and all were seen in Sheep Bay (50%) and the Port Gravina-Redhead area (50%).

MINKE WHALE (Balaenoptera acutorostrata)

One Minke Whale was seen at Knowles Head beneath a feeding flock of kittiwakes, terns and Glaucous-winged Gulls.

HUMPBACK WHALE (Megaptera novaeangliae)

Humpback Whales were only seen in the Chenega Island area in western Prince William Sound. Their numbers comprised 10% of all marine mammals sighted and their densities were less than 0.1/km.

GEOGRAPHIC VARIATION

The density of seabirds and marine mammals varied widely (Table 8) and there was no significant difference among bays or between east and west sides of the Sound ($p = 0.05$). Seabirds per day ranged from 3.6 birds/km on the north side of Hawkin Island to 128.4 birds/km in Galena Bay. The higher densities of seabirds usually resulted from the presence of colonies in the area. Marine mammals had low densities throughout the Sound, with numbers ranging from zero to 4.2 mammals/km. The high densities of marine mammals were due to feeding or loafing assemblages and their bay-to-bay densities did not correlate with those of seabirds.

SUMMARY

Prince William Sound is an important area for breeding seabirds and marine mammals. Black-legged Kittiwakes, Bonaparte's Gulls, Glaucous-winged Gulls, Arctic Terns and Marbled Murrelets comprised the majority of the 17,384 birds sighted. Sea otters and harbor seals comprised the majority of the marine mammals. The areas with the densest numbers of birds were Galena Bay, Hinchinbrook Island, and the Port Fidalgo area including the outer coastline. Sheep Bay was the most important bay for marine mammals.

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Table 1

Frequencies and numbers of bird species and their
mean densities in Prince William Sound, July and
August 1980.

	FREQUENCY OBSERVED (N=13 DAYS)		NUMBER OBSERVED (N=15,534 BIRDS)		MEAN DENSITIES/KM
	N	%	N	%	
LOON	9	69.2	39	0.2	< 0.1
PELAGIC CORMORANT	8	61.5	113	0.7	0.2
CANADA GOOSE	1	7.7	36	0.2	< 0.1
MALLARD	3	23.1	32	0.2	< 0.1
PINTAIL	2	15.4	26	0.2	< 0.1
GOLDENEYE	3	23.1	7	< 0.1	< 0.1
HARLEQUIN DUCK	8	61.5	298	1.8	0.5
SURF ¹ SCOTER	8	61.5	232	1.4	0.4
WHITE-WINGED SCOTER	4	30.8	33	0.3	< 0.1
RED-BREASTED MERGANSER	11	84.6	198	1.2	0.3
DUCK (UNID.)	2	15.4	10	0.1	< 0.1
GREAT BLUE HERON	2	15.4	8	0.1	< 0.1
BLACK OYSTERCATCHER	6	46.2	27	0.2	< 0.1
WANDERING TATTLER	3	23.1	4	< 0.1	< 0.1
SURFBIRD	2	15.4	9	< 0.1	< 0.1
ROCK SANDPIPER	7	53.9	152	0.9	0.2
NORTHERN PHALAROPE	4	30.8	423	2.6	0.7
PEEP (UNID.)	1	7.7	10	< 0.1	< 0.1
GLAUCOUS- WINGED GULL	13	100.0	2066	12.2	3.2
MEW GULL	10	76.9	2220	13.4	3.4
BLACK-LEGGED KITTIWAKE	9	69.2	4870	29.3	7.5
BONAPARTE'S GULL	8	61.5	3189	19.2	4.9
ARCTIC TERN	12	92.3	1244	7.5	1.9
PIGEON GUILLEMOT	6	46.2	57	0.3	0.1
MARbled MURRELET	13	100.0	1187	7.2	1.3
NORTHWESTERN CROW	9	69.2	113	0.7	0.2
COMMON RAVEN	5	38.5	37	0.2	< 0.1
DOUBLE-CRESTED CORMORANT	1	7.7	1	< 0.1	< 0.1
COMMON SNIFE	1	7.7	1	< 0.1	< 0.1
BELTED KINGFISHER	1	7.7	1	< 0.1	< 0.1

¹Includes 31 unid. Scoters.

Frequency and Numbers of Marine Mammals in Prince William Sound
July and August, 1980

Table 2

SPECIES	Frequency Observed (N = 13)		Numbers Observed (N = 589)		Mean Density/Km
	N	%	N	%	
SEA OTTER	13	100.0	419	71.1	0.6
HARBOR SEAL	9	69.2	142	24.1	0.2
KILLER WHALE	2	15.4	15	2.6	0.1
DALL PORPOISE	1	7.7	4	0.7	0.1
HARBOR PORPOISE	2	15.4	2	0.3	0.1
MINKE WHALE	1	7.7	1	0.2	0.1
HUMPBACK WHALE	1	7.7	6	1.0	0.1

Table 3

Densities of seabirds, marine mammals, and Bald Eagle nests at
specific locations in Prince William Sound, July and August, 1980

	July 28 U. Hawkins Island	July 28 Hinchenbrook Island	July 29 E. Hawkins Island	July 30 N. Hawkins Island	July 31 Sheep Bay	August 1 Redhead to Port Gravina	August 2 Port Fidalgo and E. Olson Bay	August 3 Redhead to Knowles Head and Port Fidalgo
KM CENSUSED	21.1	29.0	24.9	78.5	44.8	77.5	33.9	50.6
BIRDS/KM	8.53	91.62	22.8	3.62	14.73	13.77	57.46	45.63
MAHMALS/KM	0.62	0	1.12	0.06	4.17	1.21	0.53	1.66
EAGLE NETS/KM	0.33	0.24	0.12	0.20	0.40	0.27	0.74	0.34

For Exact censuses, refer to Figures.

	August 4 Head of Port Fidalgo	August 5 Bligh Island	August 6 Galena Lagoon and Bay	August 8 E. Columbia Bay & Coast	August 9 S. Eshamy Bay to N. Granite Bay and Paddy Pt.	August 10 Chenega Island	Total Km	Mean Densities
KM CENSUSED	23.1	79.3	22.4	50.1	37.0	74.0	646.2	
BIRDS/KM	39.83	8.99	128.39	6.27	20.76	18.49		$\bar{x} = 25.74$ SEABIRDS/KM
MAHMALS/KM	0.69	1.13	0.04	0.20	0.16	0.50		$\bar{x} = 0.91$ MAR. HAM/KM
EAGLE NESTS/KM	0.56	0.25	0.31	0.08	0.24	0.28		$\bar{x} = 0.29$ EAGLE NESTS/KM

Table 4

Percent numbers of each species of seabird across all locations,
Prince William Sound, July and August 1970.

Species	July 28 S. Hooking Is.	July 29 R. Birchbrook Is. (Nisqually to Point Barstwick)	July 29 S. Hooking Is. (Mid Bay to Deep Bay)	July 30 S. Hooking Is. (Deep Bay to Hooking Cr.)	July 31 Shoup Bay (Bull A to Head of Bay)	August 1 Bulhead to head of Port Graham	August 2 Port Fidalgo & E. Green Bay	August 3 Bulhead to Knowles Head & N. Port Fidalgo	August 4 Head of Port Fidalgo	August 5 Sligh Island	August 6 Ordnance Island & M. Galena Bay	August 8 E. Columbia Bay & Adjacent Coast	August 9 S. Schumacher Bay to M. Granite Bay to Paddy Island	August 10 Chesapeake Island	TOTAL NUMBER
LUNN	13.88			13.88	14.58	1.92	3.58	0.92		10.32		6.82	6.92		19
PACIFIC CORMORANT	2.78	11.32			1.02	19.02	0.92	0.92		23.02		20.42			113
CANADA GOOSE												100.02			26
HALLARD											16.32	31.32		17.52	22
PINTAIL						7.72			92.22						26
GOLDENEYE						42.92	30.62				20.62				7
HARLEQUIN DUCK			2.42	23.32	15.42	27.92	12.12			11.12	2.72			2.02	296
SURF SCOTER			14.72	0.42	0.92		17.72		22.02 ²	23.32	3.52	17.22			232
WHITE-WINGED SCOTER	16.42		48.32	3.02						12.12					23
RED-BREASTED MERGANSER			7.02	7.12	7.12	5.12	35.42		4.02	6.12	1.02	4.42	5.12	22.72	196
DUCK (UNID.)							70.02		30.02						10
GREY SEAL NEON					87.32			12.32							8
BLACK OSTREACATCHER			33.42				13.32	1.72				7.42	7.42	14.82	27
WANDERING TATTLER							23.02			30.02			25.02		4
SURFRIDER								88.92	11.12						9
ROCK SANDPIPER			88.82	3.32		1.02		0.72			0.72		2.02	0.72	132
MURRES FRASERDOVE			94.42	3.82					1.02				0.72		423
FREY (UNID.)	100.02														10
GLAUCOUS- WINGED GULL		4.92	1.02	6.42	4.02	6.32	14.02	20.42	7.22	3.22	21.72	0.32	1.02	7.72	2044
MEN GULL				1.42	0.52	4.42	17.12	30.62	11.92	3.82	14.72		1.02	10.42	1220
BLACK-LEGGED KITTIWAKE		21.32				1.12	9.72	9.72		4.42	0.92	2.42	0.92	9.22	4870
BONAPARTE'S GULL				0.22	0.32	9.32	8.42	12.42	9.22		50.02		2.22		3189
ARCTIC TERN			0.22	1.92	18.32	9.42	24.82	9.22	7.42	13.82	4.22	0.62	3.42	4.82	1244
PIGEON GUILLERMO			3.32	16.12	12.32					1.82			1.52	22.82	53
HARLEQUIN MURRELET	9.32		0.82	6.32	12.32	9.42	3.82	3.42	1.42	2.32	0.52	5.92	13.12	32.32	4187
NORTHWESTERN CRAB	20.42	2.72			6.22		28.32	11.32	8.92		16.82		0.92	4.42	113
COMMON RAVEN	40.32			2.72				10.82		2.72	13.52			29.72	37
DOUBLE-CRESTED CORCORANT		100.02													1
CARRION EATERS								100.02							1
SALTED PINEAPPLE									100.02						1

¹For exact areas concerned, refer to figures²Bald. Scoters³604 Adult and 147 immature Bald Eagles were also sighted.

Table 5

Percent numbers of seabirds within a specific locations in ¹
 Prince William Sound, July and August 1980.

	July 28 S. Hawkins Island (Mud Bay to Dave)	July 28 S. Hinchin- brook Island (KirryΔ to Pt. Sautinck)	July 29 E. Hawkins Island (Mud Bay to Deep Bay)	July 30 N. Hawkins Island (Deep Bay to Hawkins Circle)	July 31 Sheep Bay (SurfΔ to Head of Bay)	August 1 Redhead to Head of Port Gravina
LOON	2.2%			1.4%	1.5%	0.1%
PELAGIC CORMORANT	1.7%	0.5%			0.3%	4.2%
CANADA GOOSE						
MAILLARD						
PINTAIL						0.2%
GOLDENEYE						0.3%
HARLEQUIN DUCK				3.5%	11.5%	4.3%
SURF SCOTER				12.0%	0.2%	0.2%
WHITE-WINGED SCOTER	6.7%			5.6%	0.2%	
RED-BREASTED MERGANSER				1.4%	2.1%	1.3%
DUCK (UNID.)						
GREAT BLUE HERON					1.1%	
BLACK OYSTERCATCHER				5.3%		
WANDERING TATTLER						
SURFBIRD						
ROCK SANDPIPER			23.8%	2.8%		0.3%
NORTHERN PHALAROPE			70.4%	5.6%		
PEEP (UNID.)	5.6%					
GLAUCOUS- WINGED GULL		5.3%	3.5%	2.8%	21.2%	12.2%
MEW GULL				10.6%	1.7%	13.8%
BLACK-LEGGED KITTIWAKE		94.1%				14.3%
BONAPARTE'S GULL				1.8%	1.7%	27.7%
ARCTIC TERN			0.4%	8.5%	34.4%	1.6%
PIGEON GULLEMOT			0.4%	11.3%	1.1%	
MARbled MURRELET	62.8%	0.1%	1.6%	27.1%	22.1%	10.5%
NORTHWESTERN CROW	12.8%				1.1%	
COMMON RAVEN	8.3%			0.4%		
DOUBLE-CRESTED CORMORANT		0.1%				
COMMON SNIFE						
BELTED KINGFISHER						
TOTAL NUMBER	180	2658	568	284	660	1,067

¹ For exact areas censused, refer to figures.

Table 5 (continued).

	August 2 Port Fidalgo & E. Olsen Bay	August 3 Redhead to Knowles Head & N. Port Fidalgo	August 4 Head of Port Fidalgo	August 5 Bligh Island	August 6 Galena Lagoon & Galena Bay	August 7 S. Columbia Bay & Ad- jacent coast	August 9 S. Isahany Bay N. Granite Bay & Coast to Paddy Point	August 10 Chenega Island	Mean Numbers/ Day
GOON	0.12	0.12		0.42		0.62	2.62		0.72
PLASTIC ORMORANT	0.12	0.12		1.72		7.32			1.42
ALADA DOSE						11.52			0.92
ALLARD					6.32	3.22		0.32	0.82
ENTAIL			2.62						0.22
GOLDENEYE	0.12				0.12				0.12
ARLEQUIN UCK	4.12	1.62		4.62	0.32			0.42	2.32
URF COTER		1.82	3.52	7.72	0.32	12.72			3.12
HITE-WINGED COTER				0.62					1.02
ED-BREADED ERGANSE	0.52	3.02	0.92	1.72	0.12	2.92	1.32	3.32	1.42
UCK (UNID.)	0.42		0.32						0.12
REAT BLUE ERON		0.12							0.12
LACK STERCATCHER	0.22	0.12				0.62	0.32	0.32	6.82
ANDERING UTTER	0.12			0.32			0.12		0.12
UNFIRED		0.42	0.12						0.12
UCK MMPER		0.12			0.12		0.42	0.12	2.12
ORIBERY HALABOFF			0.42				0.42		5.92
EP (UNID.)									0.42
LANCIOUS- INGED GULL	15.52	18.42	16.22	9.42	17.02	2.22	2.72	11.62	10.62
EW GULL	19.52	29.52	28.62	11.82	12.92		2.72	16.92	11.42
LACK-LEGGED TTHWAKE	24.32	20.52		31.72	1.62	37.62	57.32	32.82	24.12
UNAPART'S ILL	13.82	17.12	31.92		64.32		9.12		12.92
ICTIC TEEN	17.12	5.02	10.22	24.12	1.82	2.22	5.92	4.42	9.62
KEON ILLENOT				0.12			0.32	1.02	1.12
ARBELED ARFILL	2.32	1.62	2.12	3.82	0.22	19.12	20.22	27.92	15.52
ORTHWESTERN OW	1.52	0.62	1.12		0.72		0.12	0.42	2.62
RRON RAVEN		0.22		0.12	0.22			0.32	1.02
URLE-CRESTED ORMORANT									0.12
RRON SHEEP		0.12							0.12
ILLED ONGFISHER			0.12						0.12
TOTAL NUMBERS	1.948	2.312	920	713	713	2876	314	1.368	16635

Table 6

Percent Numbers of Marine Mammals Across all Locations in Prince William Sound, July and August 1980

	July 28 S. Hawkins Is. (Mud Bay to Dave A.)	July 28 S. Hinchinbrook Is. (Kitty A to Point Bentinck)	July 29 E. Hawkins Is. (Mud Bay to Deep Bay)	July 30 N. Hawkins Is. (Deep Bay to Hawkins Cr.)	July 31 Sheep Bay (Surf A to Head of Bay)	August 1 Redhead to Head of Port Gravina	August 2 Port Fidalgo and E. Olsen Bay
SEA OTTER	2.9%		6.7%	1.0%	34.6%	16.2%	1.9%
HARBOR SEAL				.4%	28.9%	17.6%	7.0%
KILLER WHALE							
DALL PORPOISE							
HARBOR PORPOISE					50%	50%	
HINKE WHALE							
HUMPBACK WHALE							

¹ For exact areas censused, refer to figures.

	August 3 Redhead to Knowles Head & Port Fidalgo	August 4 Head of Port Fidalgo	August 5 Bligh Is.	August 6 Galena Lagoon N. Galena Bay	August 8 E. Columbia Bay & Adja- cent Coast	August 9 S. Eshamy Bay ton. Granite Bay to Paddy Point	August 10 Chenega Island	Total Numbers
SEA OTTER	14.1%	0.5%	15.0%	0.2%	1.4%	1.4%	4.1%	419
HARBOR SEAL	10.6%	9.9%	19.0%				5.6%	142
KILLER WHALE	60.0%						40.0%	15
DALL PORPOISE					100%			4
HARBOR PORPOISE								
HINKE WHALE	100%							1
HUMPBACK WHALE							100%	6

Table 7 Percent Numbers of Marine Mammals Within a Specific Location in Prince William Sound, July and August, 1980¹

SPECIES	July 28 S. Hawkins Island (Mud Bay to Dave Δ)	July 28 S. Hinchinbrook Island (Kitty Δ to Point Bentinck)	July 29 E. Hawkins Island (Deep Bay to Hawkins Creek)	July 30 N. Hawkins Island (Deep Bay to Hawkins Circle)	July 31 Sheep Bay (Surf Δ to Head of Bay)	August 1 Redhead to Head of Port Gravina	August 2 Port Fidalgo and E. Olsen Bay
SEA OTTER	92.3%		100.0%	80.0%	77.5%	72.1%	44.4%
HARBOR SEAL	7.7%			20.0%	21.9%	26.6%	55.6%
KILLER WHALE							
DALL PORPOISE					0.5%		
HARBOR PORPOISE						1.1%	
HINKE WHALE							
HUMPBACK WHALE							
TOTAL	13	0	28	5	187	94	18

¹ For exact areas censused, refer to figures.

SPECIES	August 3 Redhead to Knowles Head & N. Port Fidalgo	August 4 Head of Port Fidalgo	August 5 Bligh Island	August 6 Galena Lagoon N. Galena Bay	August 8 E. Columbia Bay & Adjacent Coast	August 9 S. Eshamy Bay to N. Granite Bay to Paddy Pt.	August 10 Chenega Island	Mean (%) Percent Numbers/Day
SEA OTTER	70.2%	12.5%	70.0%	100.0%	60.0%	100.0%	46.0%	71.2%
HARBOR SEAL	17.9%	87.5%	30.0%				21.6%	22.2%
KILLER WHALE	10.7%						16.2%	2.1%
DALL PORPOISE					40.0%			3.1%
HARBOR PORPOISE								0.1%
HINKE WHALE	1.2%							0.1%
HUMPBACK WHALE							16.2%	1.2%
TOTAL	84	16	90	1	10	6	37	

Table 8

Mean density of seabirds and marine mammals in
each bay and island surveyed.

AREA SURVEYED & DATE	MEAN DENSITY ALL BIRDS	MEAN DENSITY ALL MAMMALS
JULY 28 S. HAWKINS ISLAND	3.5	0.6
JULY 28 E. HINCHINBROOK ISLAND	91.7	0
JULY 29 E. HAWKINS ISLAND	22.8	1.1
JULY 30 N. HAWKINS ISLAND	3.6	0.1
JULY 31 SHEEP BAY	14.7	4.2
AUGUST 1 REDHEAD TO PORT GRAVINA	13.8	1.2
AUGUST 2 PORT FIDALGO & E. OLSEN BAY	57.5	0.5
AUGUST 3 REDHEAD TO KNOWLES HEAD & N. PORT FIDALGO	45.7	1.7
AUGUST 4 HEAD OF PORT FIDALGO	39.8	0.7
AUGUST 5 BLIGH ISLAND	9.0	1.1
AUGUST 6 GALENA LAGOON & N. SIDE GALENA BAY	128.4	0.1
AUGUST 8 E. COLUMBIA BAY & ADJACENT COAST	6.3	0.2
AUGUST 9 S. ESHAM BAY TO N. GRANITE BAY TO PADDY POINT	20.8	0.2
AUGUST 10 CHENECA ISLAND	18.5	0.5

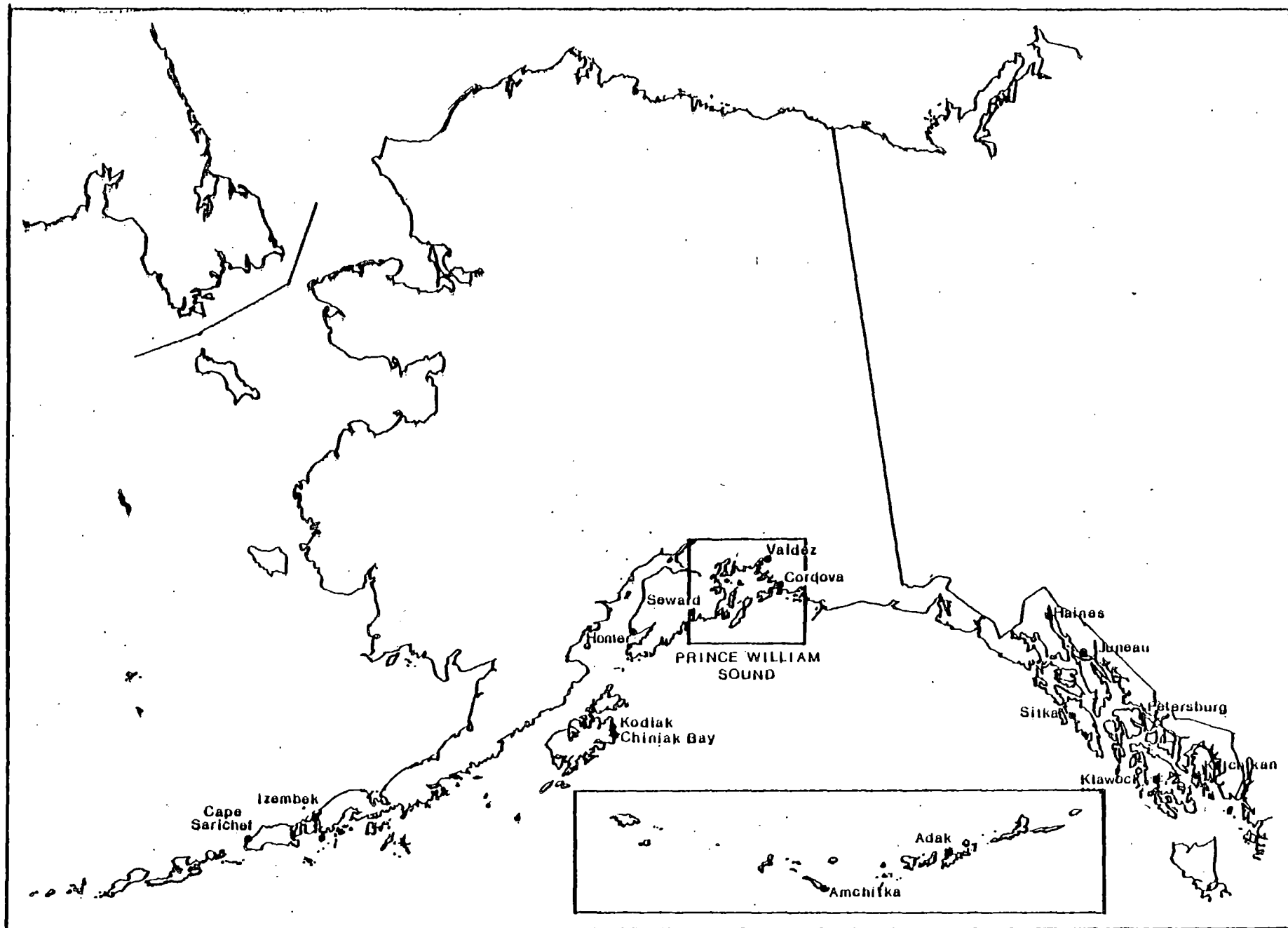


Figure 1. Prince William Sound, Alaska.

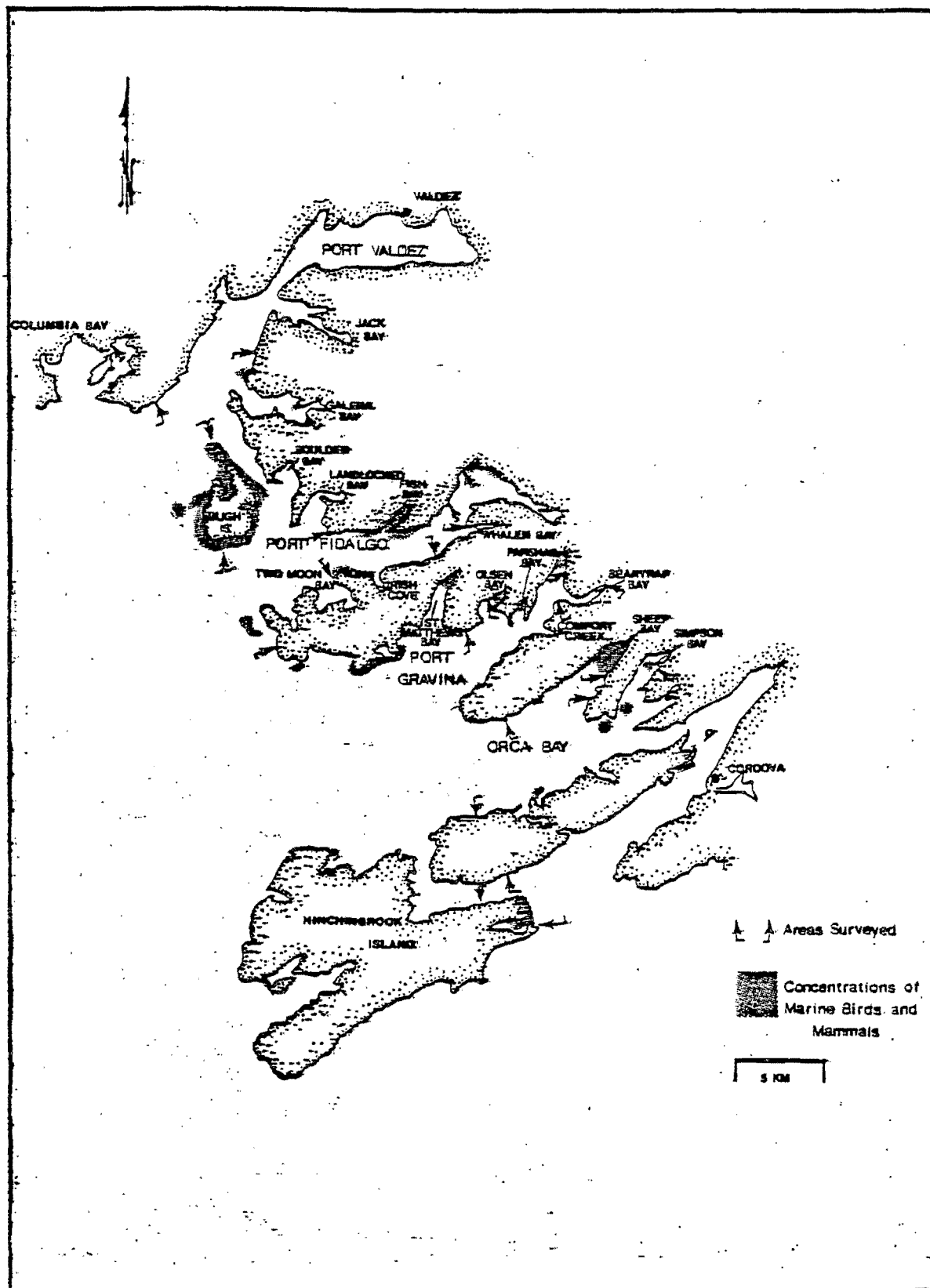


Figure 2. Concentrations of marine birds and mammals in the areas surveyed, eastern Prince William Sound.

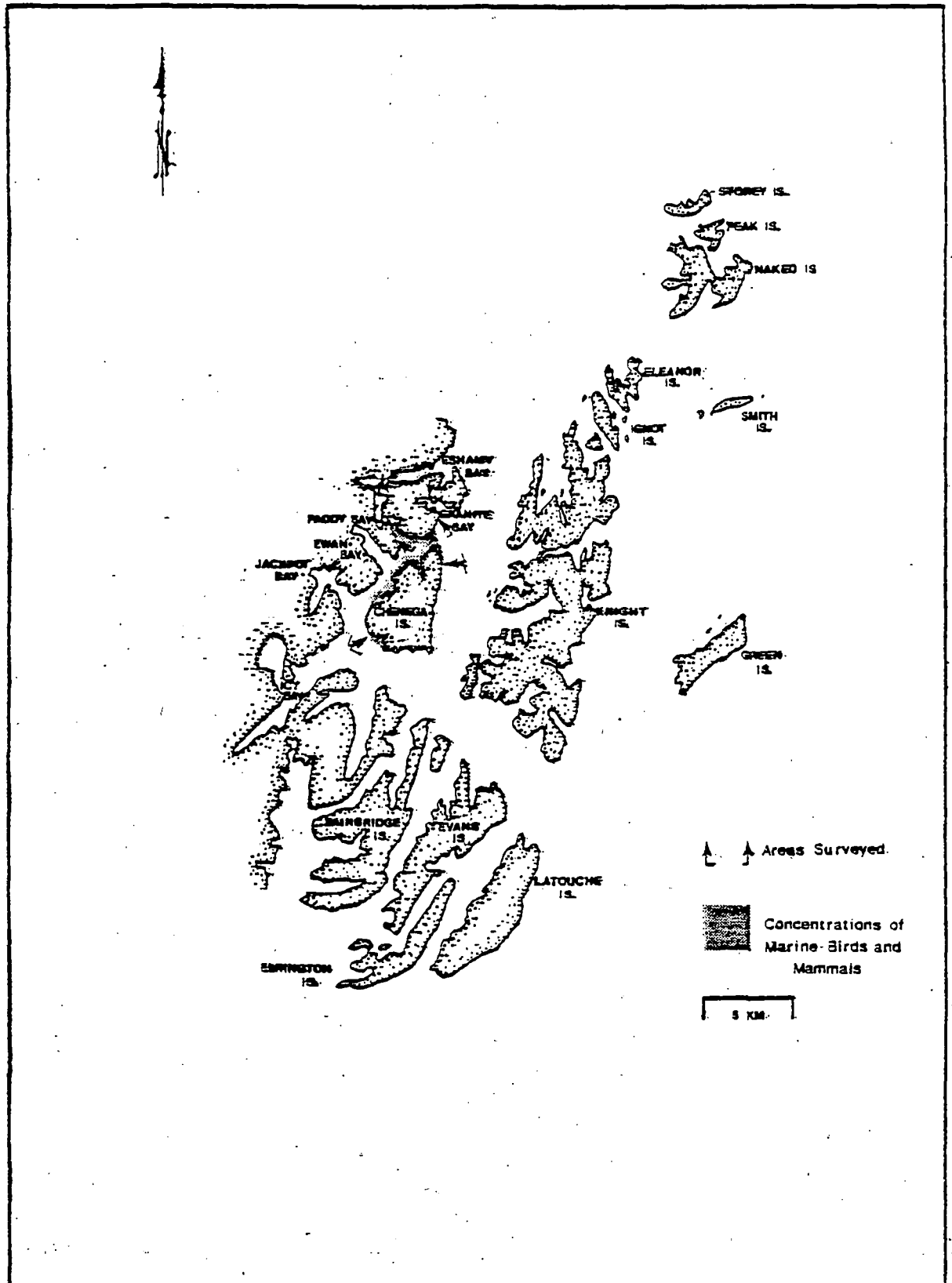


Figure 3. Concentrations of marine birds and mammals in the areas surveyed, western Prince William sound.

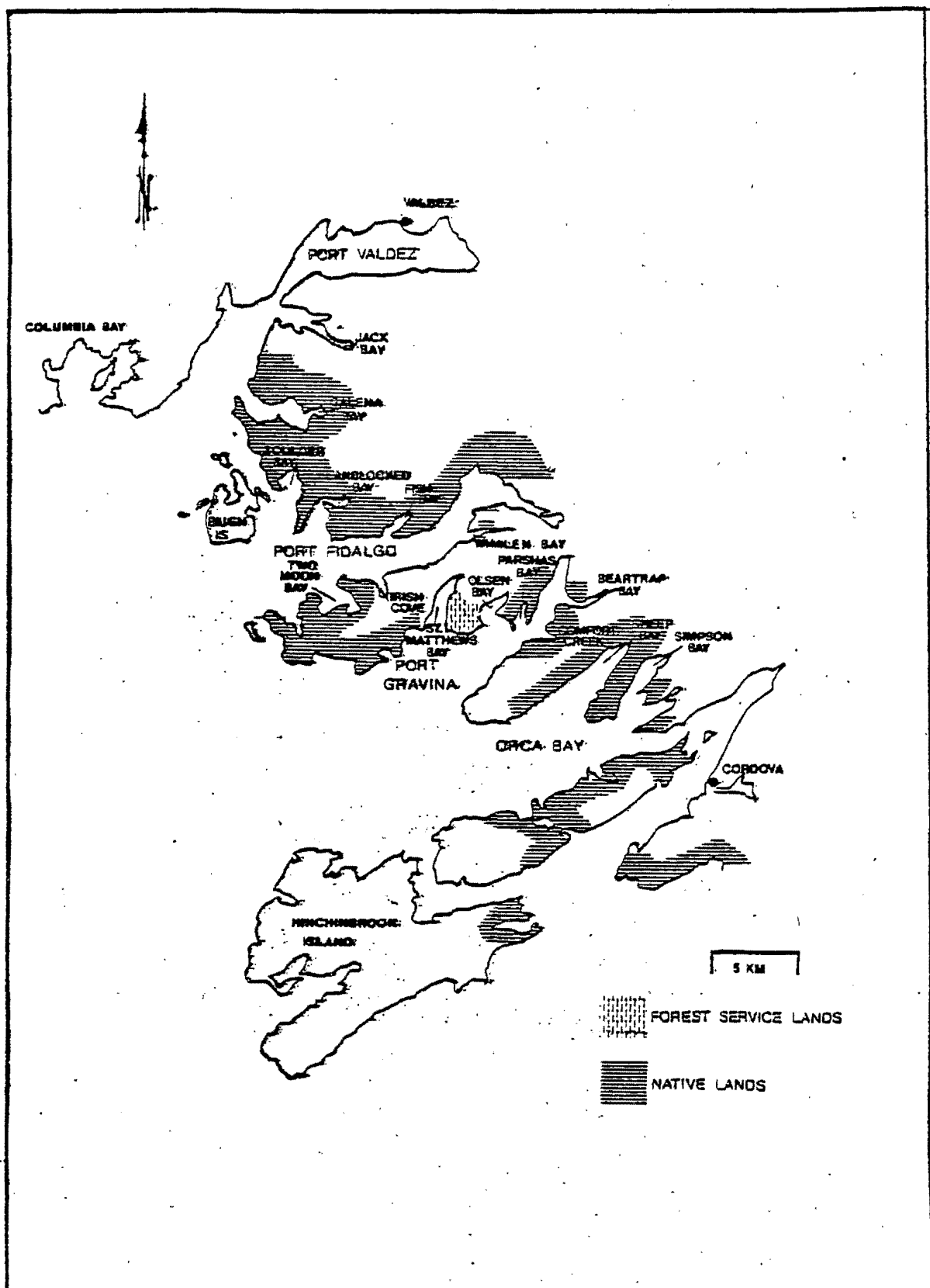


Figure 4. Native-claimed and U.S. Forest Service-lands, western Prince William Sound.

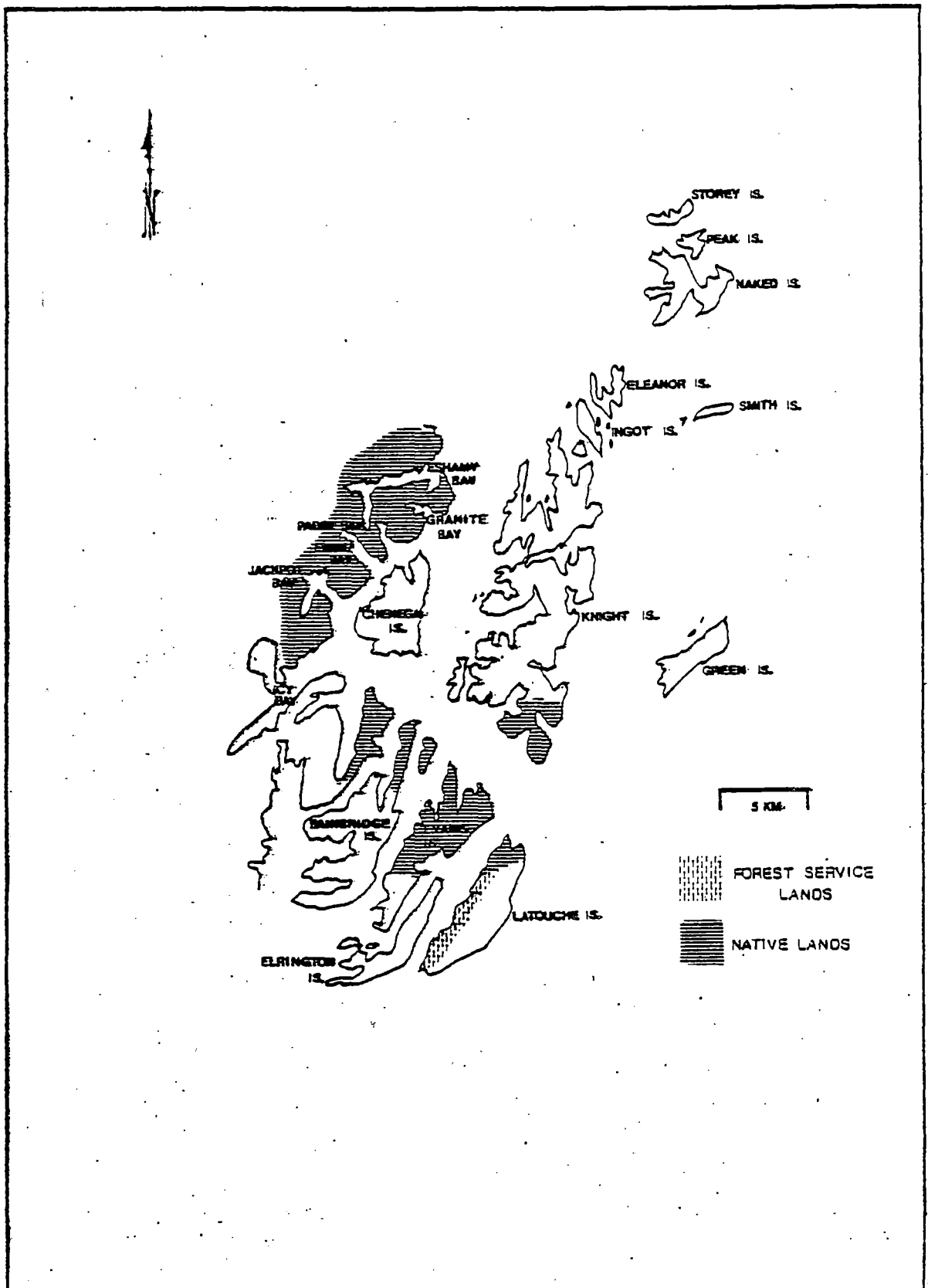


Figure 5. Native claimed and U.S. Forest Service lands, eastern Prince William Sound.

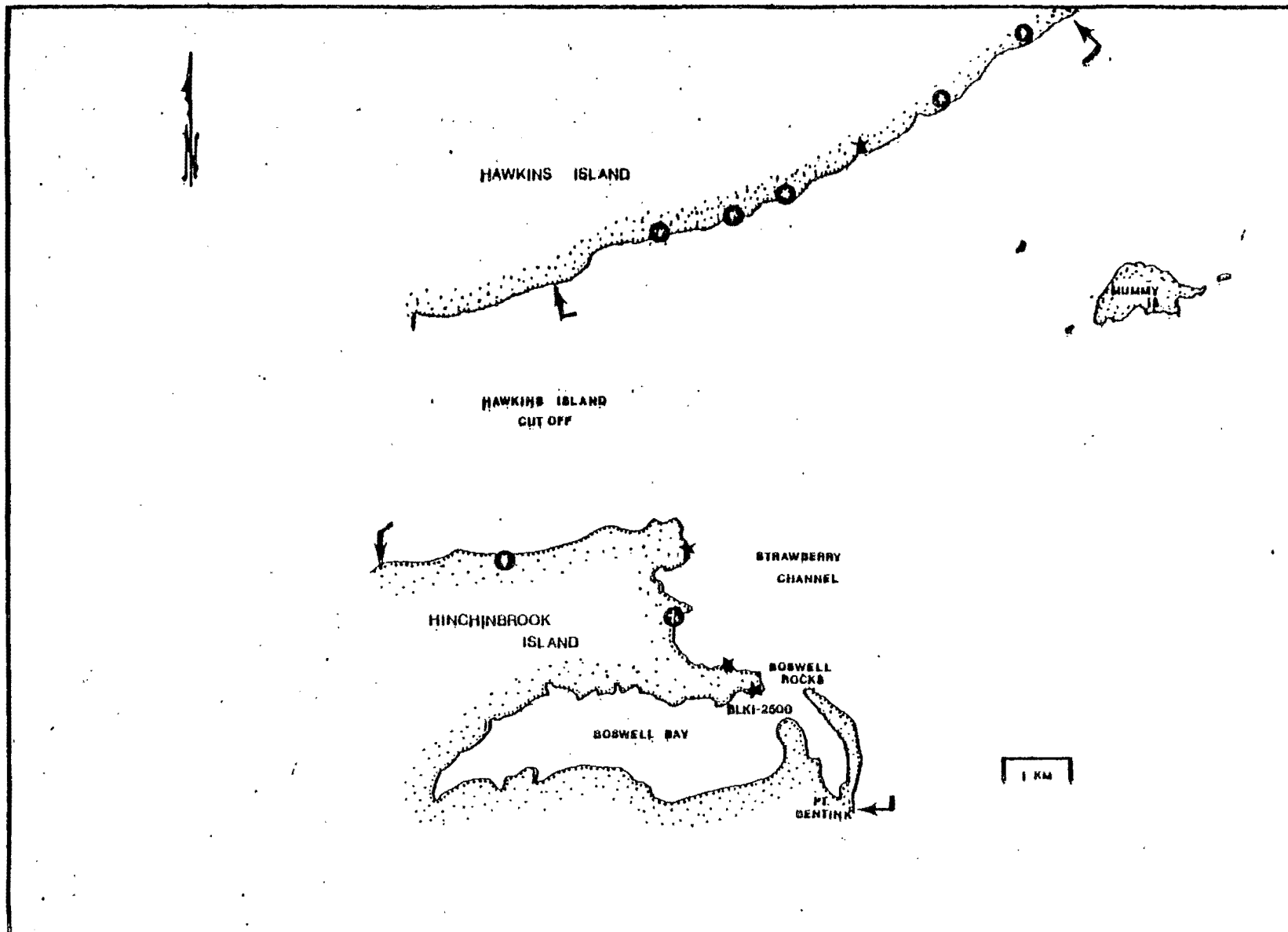


Figure 6. Distribution of Bald Eagle nests and seabirds, S. Hawkins Island (Mud Bay to Daye A) and S. Hinchinbrook Island, Kirtv A to Pt. Bentinck).

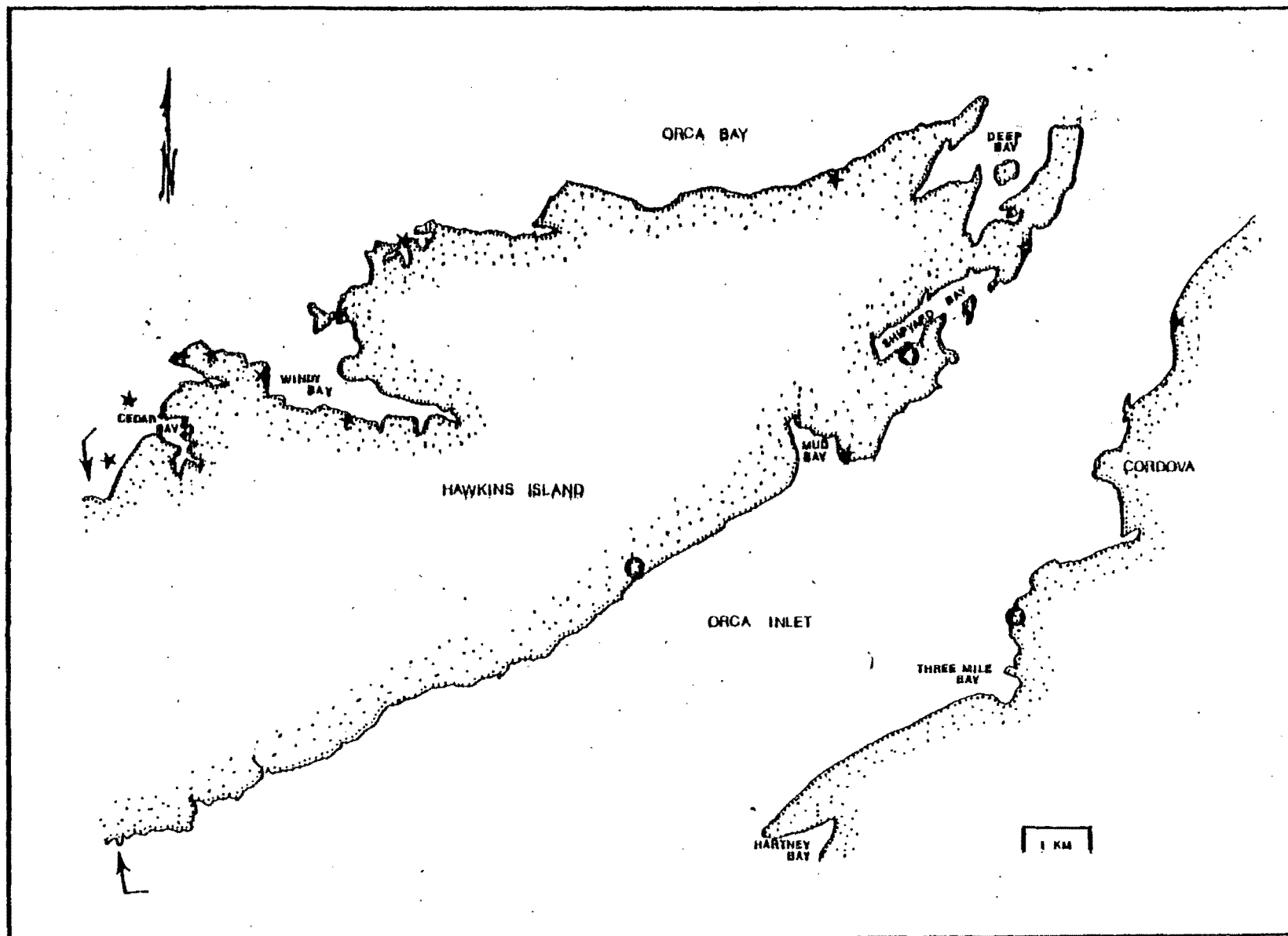


Figure 7. Distribution of Bald Eagle nests, E, Hawkins Island

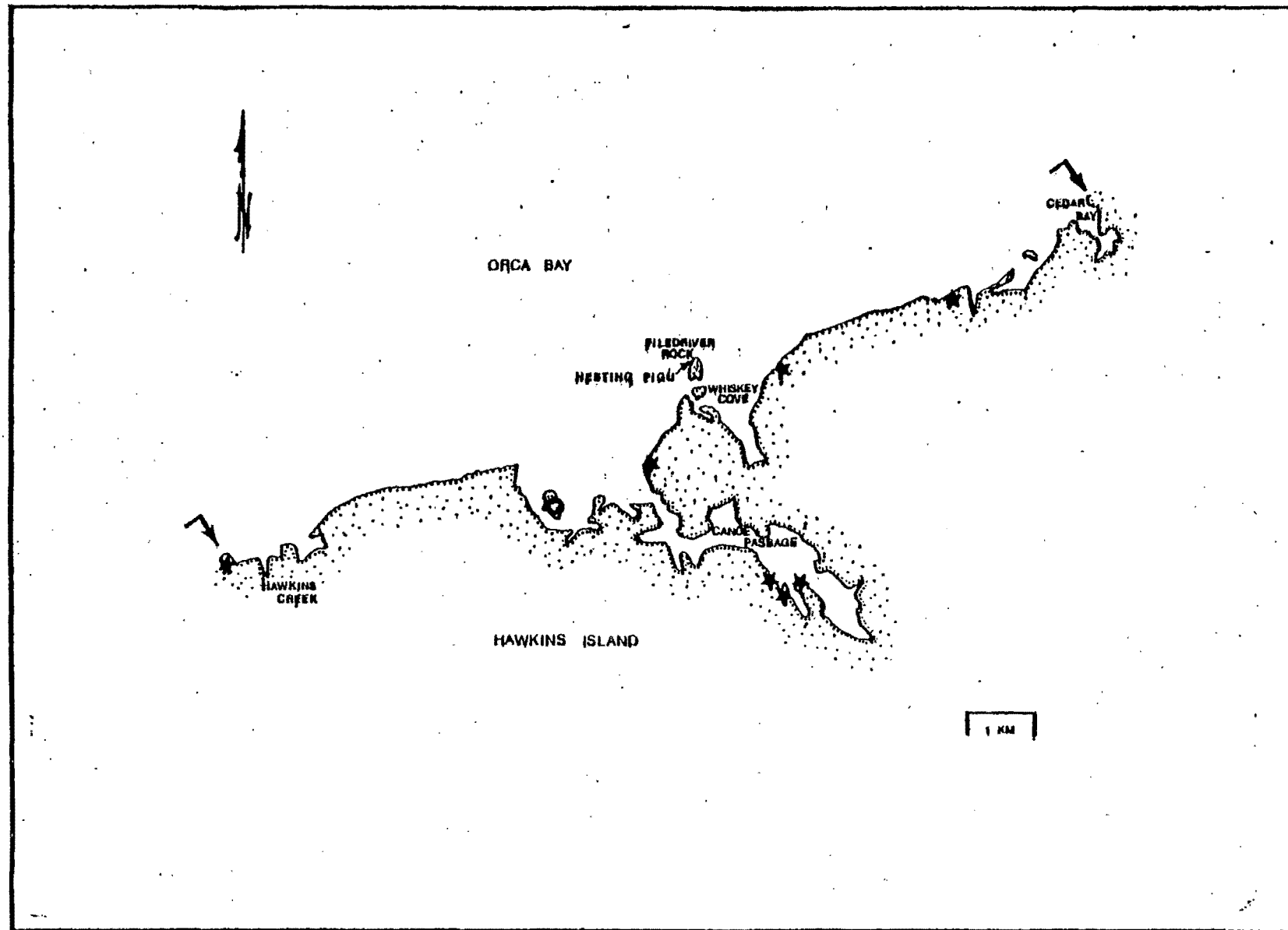


Figure 8, Distribution of Bald Eagle nests and marine birds, N. Hawkins Island,

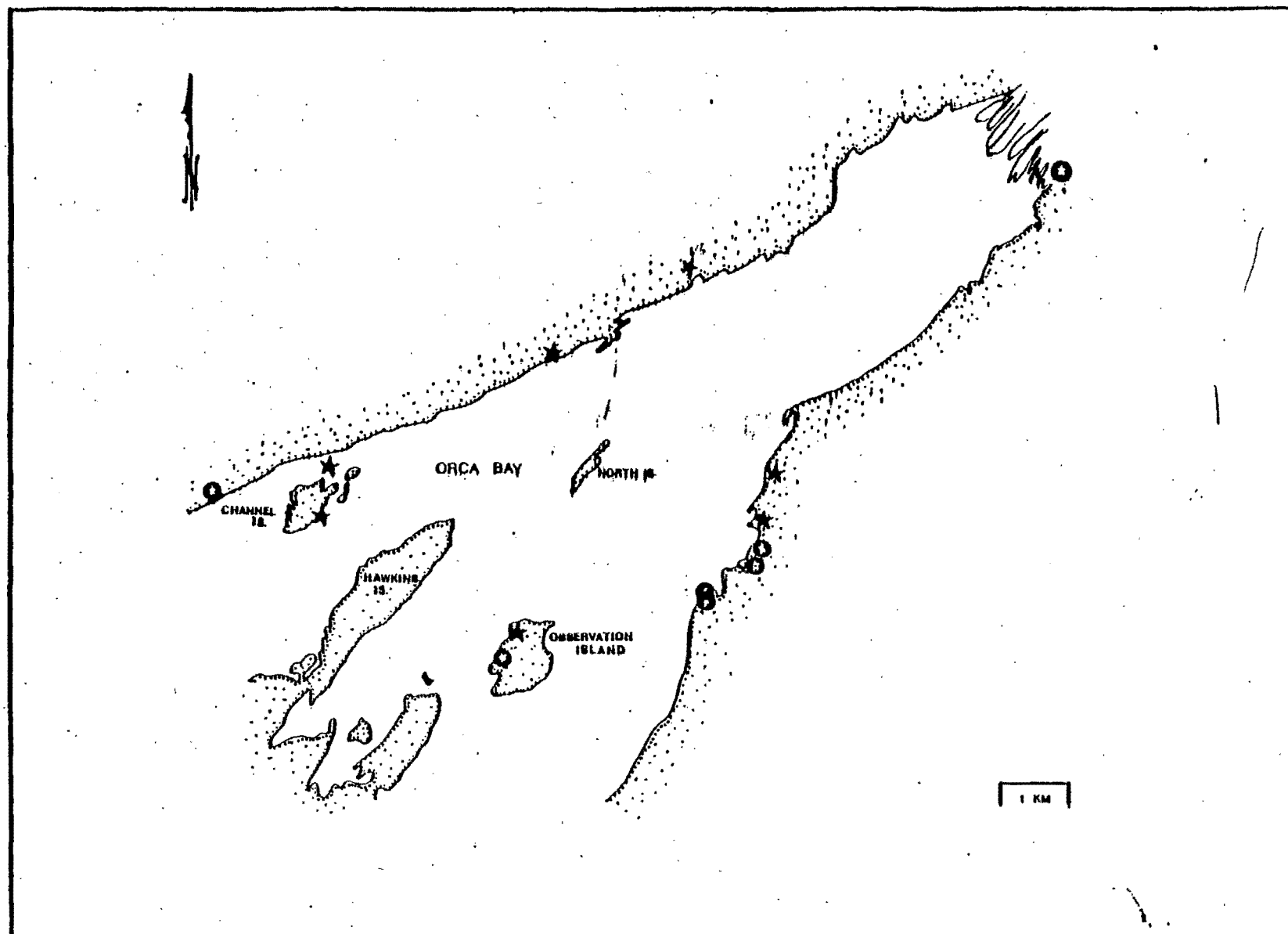


Figure 9. Distribution of Bald Eagle nests, Orca Bay.

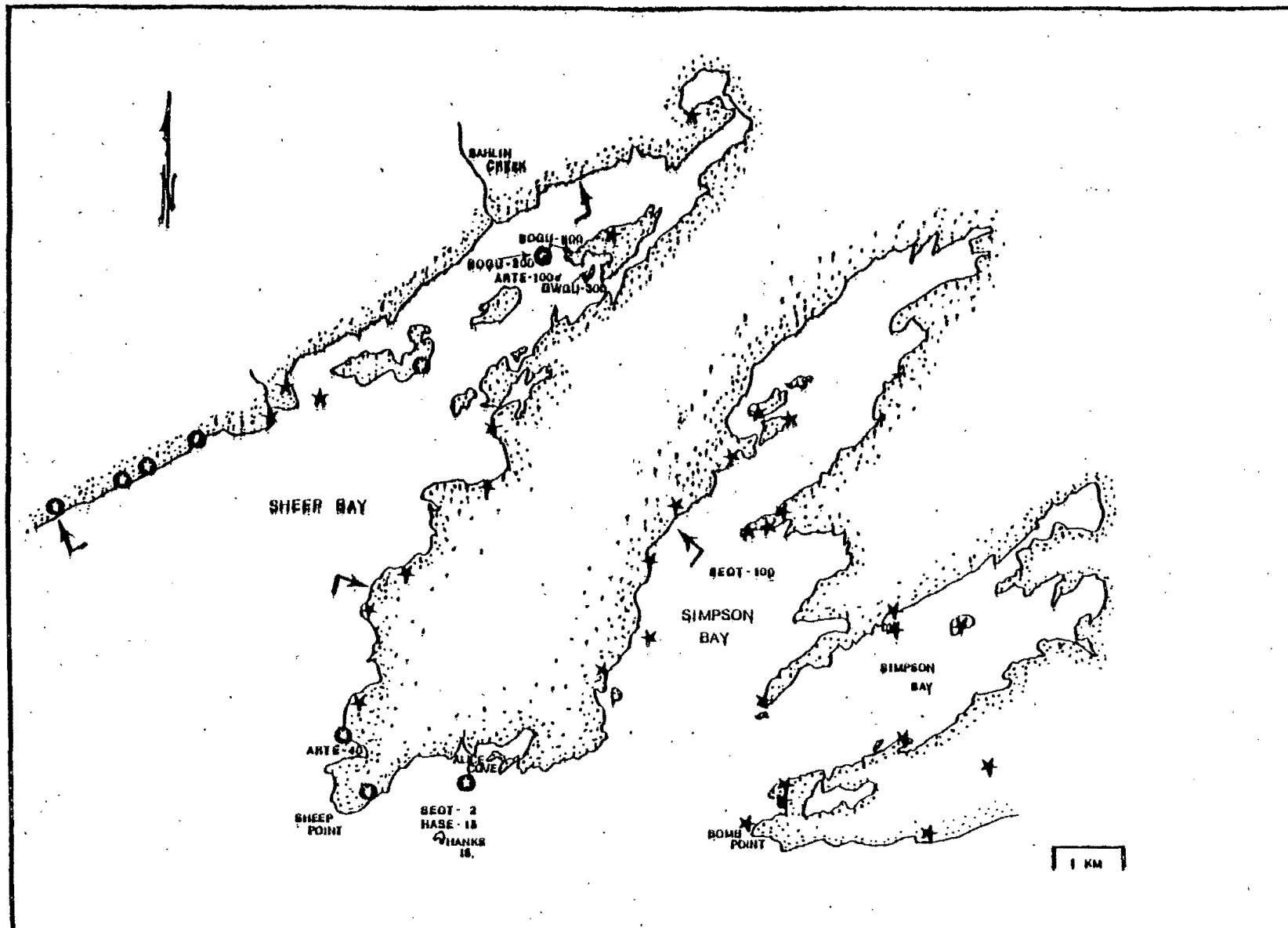


Figure 10, Distribution of Bald Eagle nests and marine birds and mammals, Simpson and Sheep Bays.

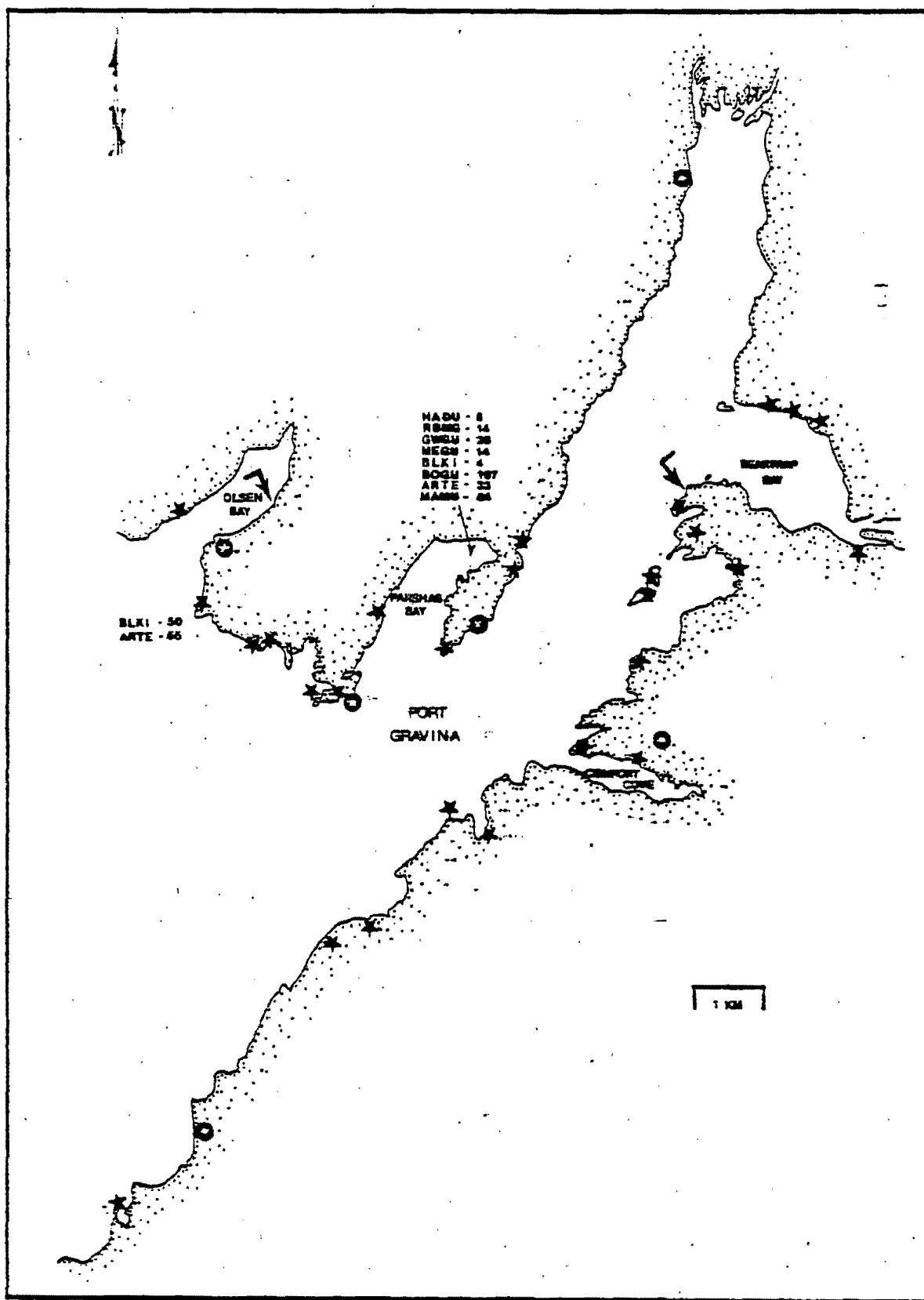


Figure 11. Distribution of Bald eagle nests and marine birds, N. Port Gravina.

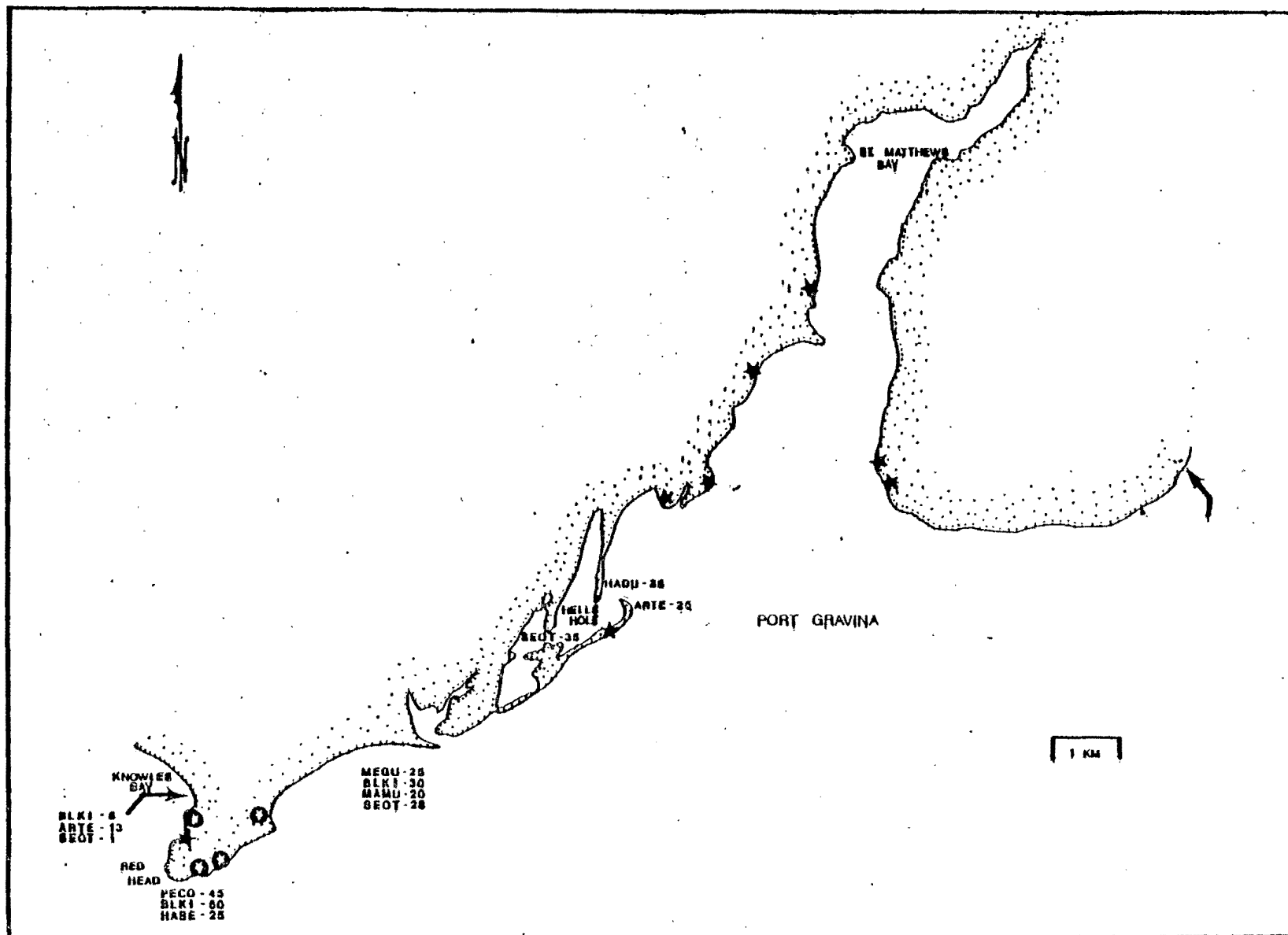


Figure 12. Distribution of Bald Eagle nests and marine birds and mammals, Port Gravina, (Red Head to St. Matthews Bay)

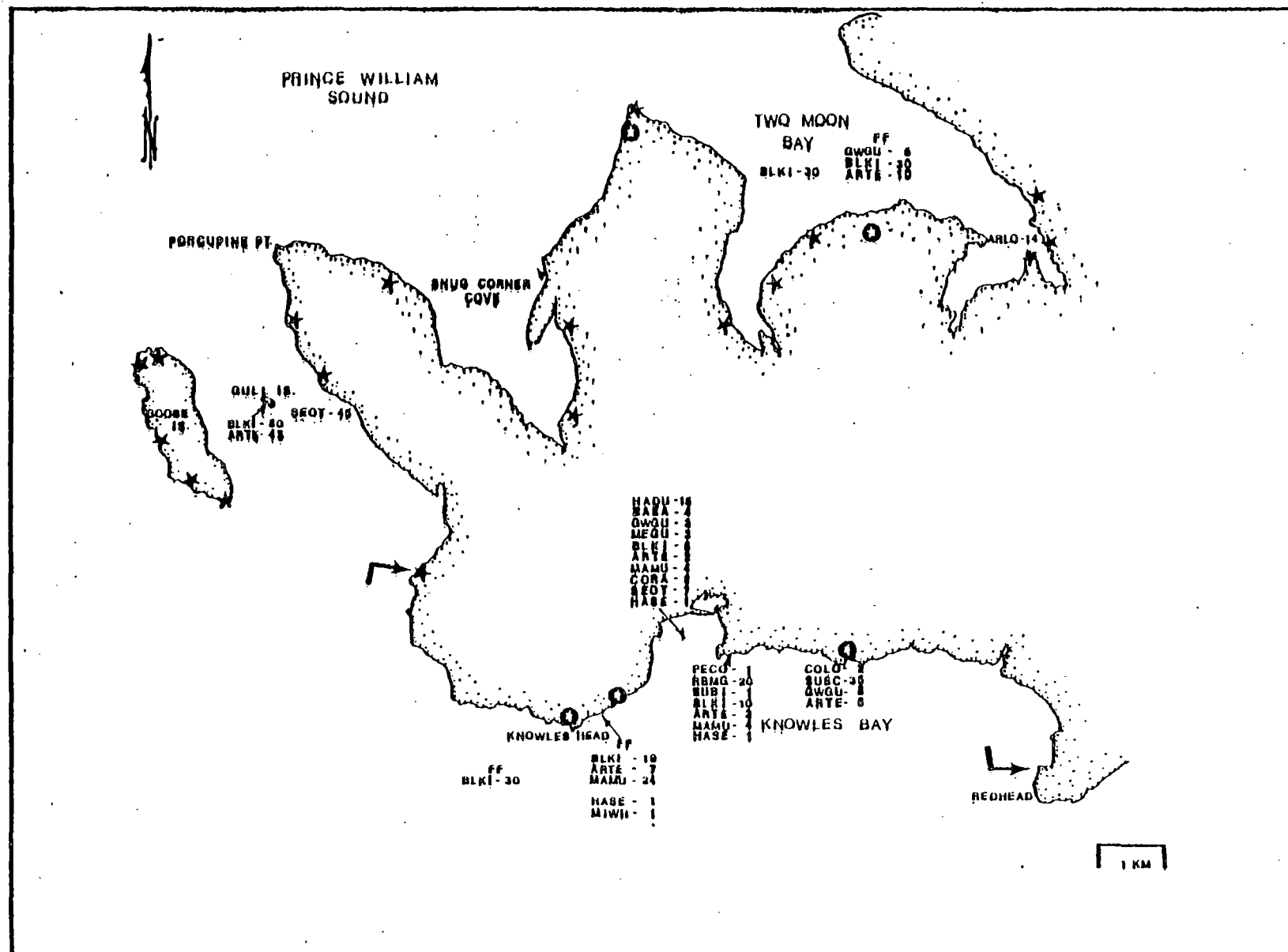


Figure 13, Distribution of Bald Eagle nests and marine birds and mammals, Knowles Head area.

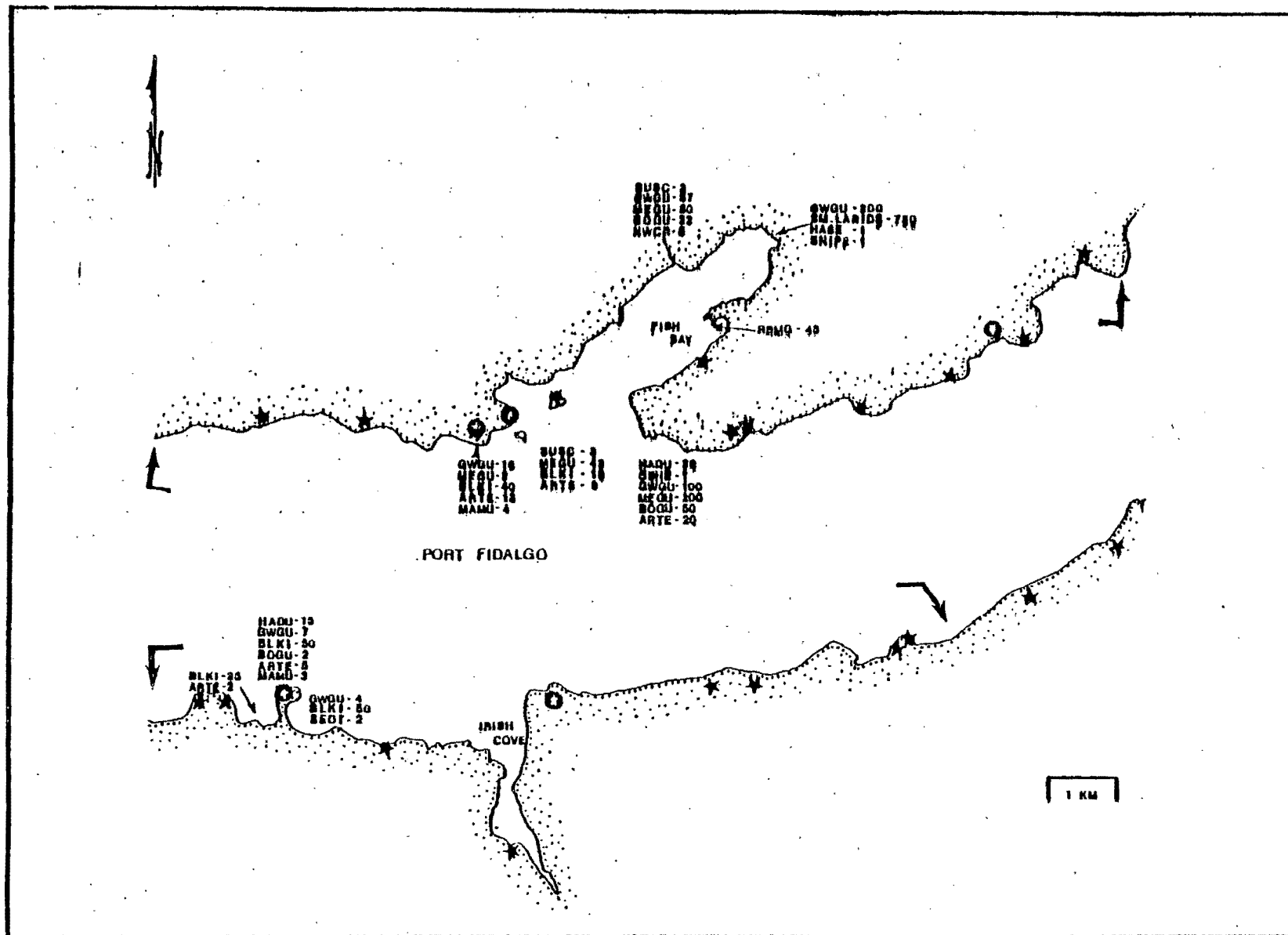


Figure 14. Distribution of Bald Eagle nests and marine birds and mammals, Port Fidalgo,

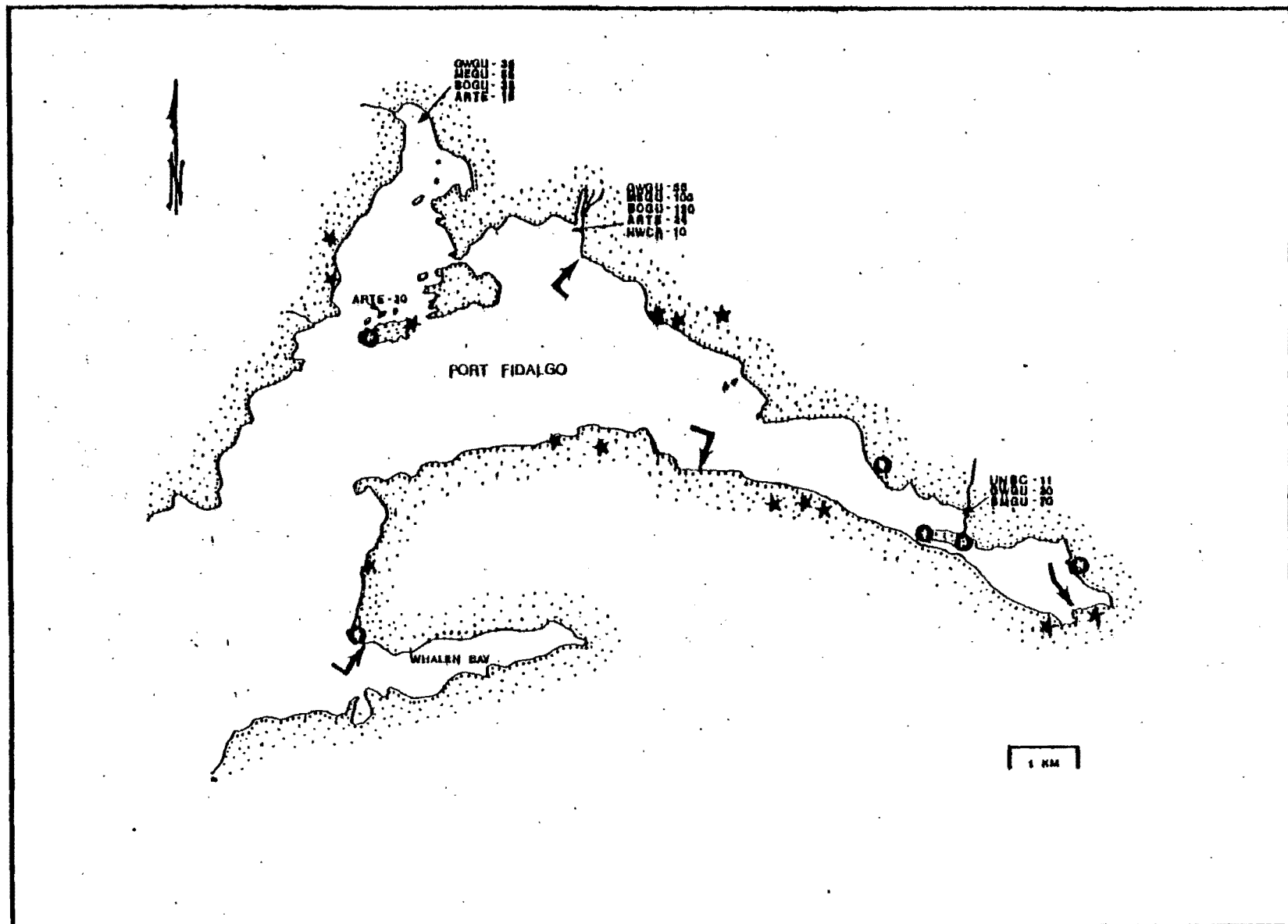


Figure 15. Distribution of Bald Eagle nests and marine birds, head of Port Fidalgo.

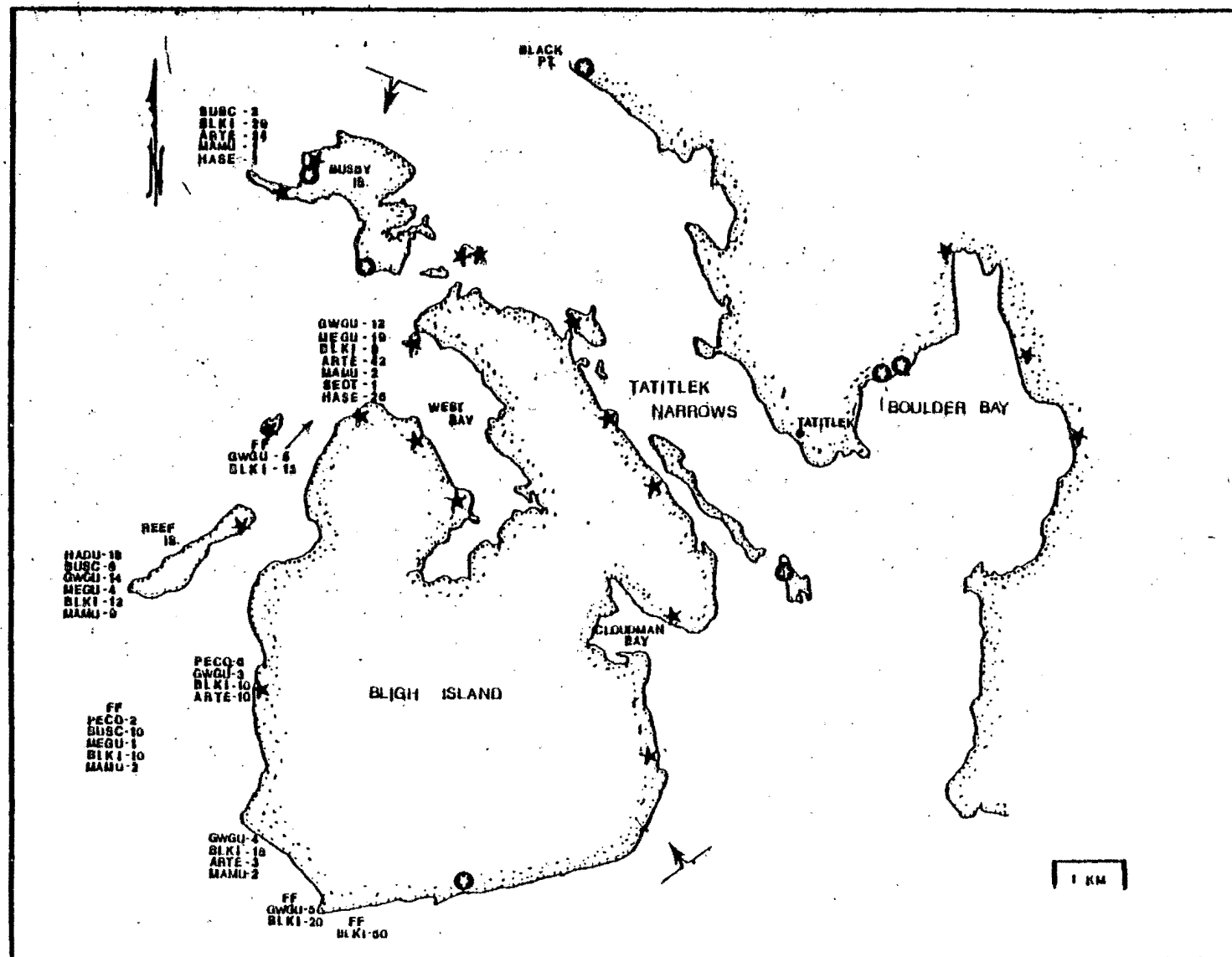


Figure 15. Distribution of Bald Eagle nests and marine birds and mammals, Bligh Island,

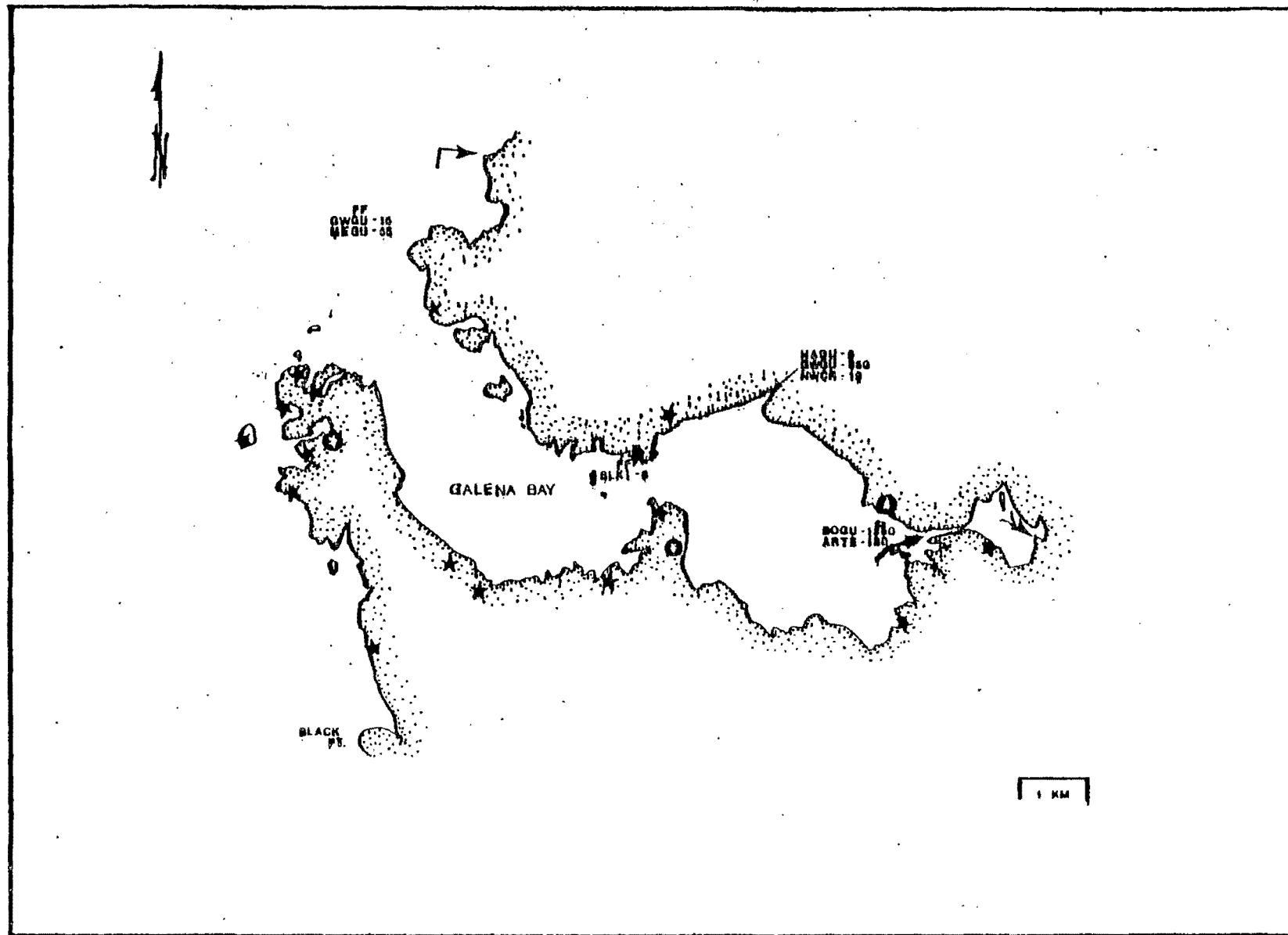


Figure 17, Distribution of Bald Eagle nests and marine birds , Galena Bay,

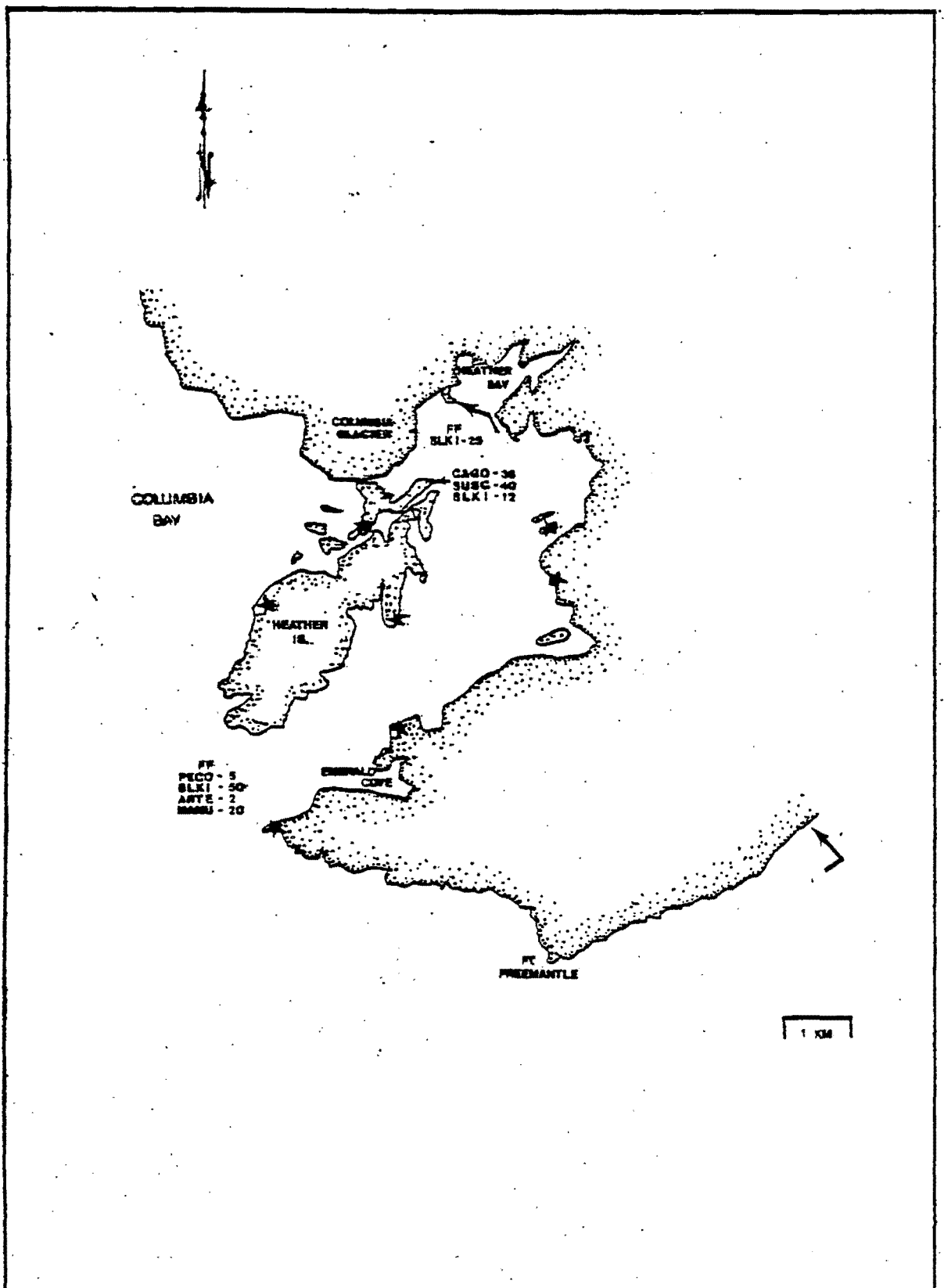


Figure 18. Distribution of Bald Eagle nests and marine birds and mammals, Columbia Bay.

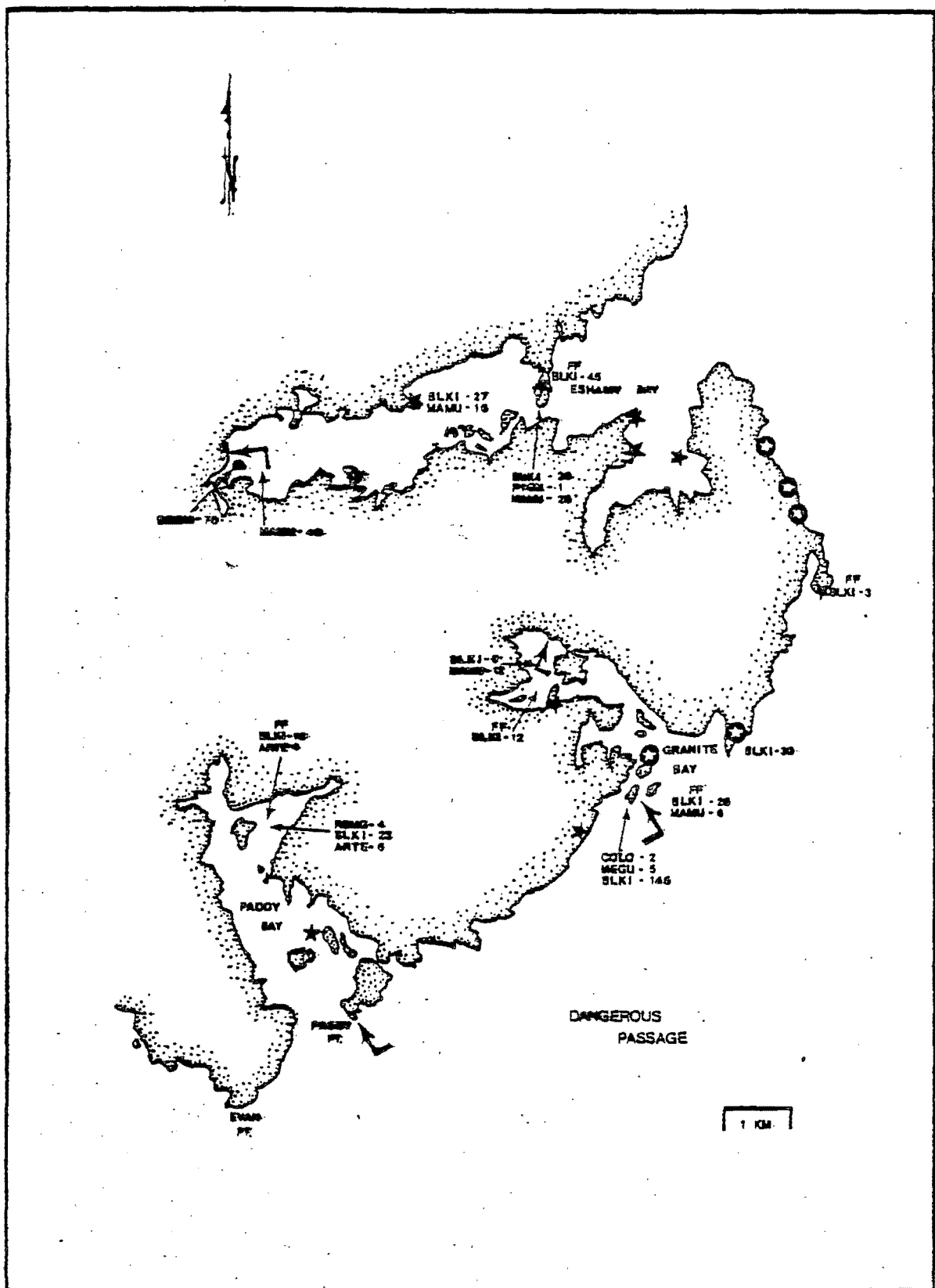


Figure 19. Distribution of Bald Eagle nests and marine birds, S, Eshamy Bay to N. Granite Bay to Paddy Point.

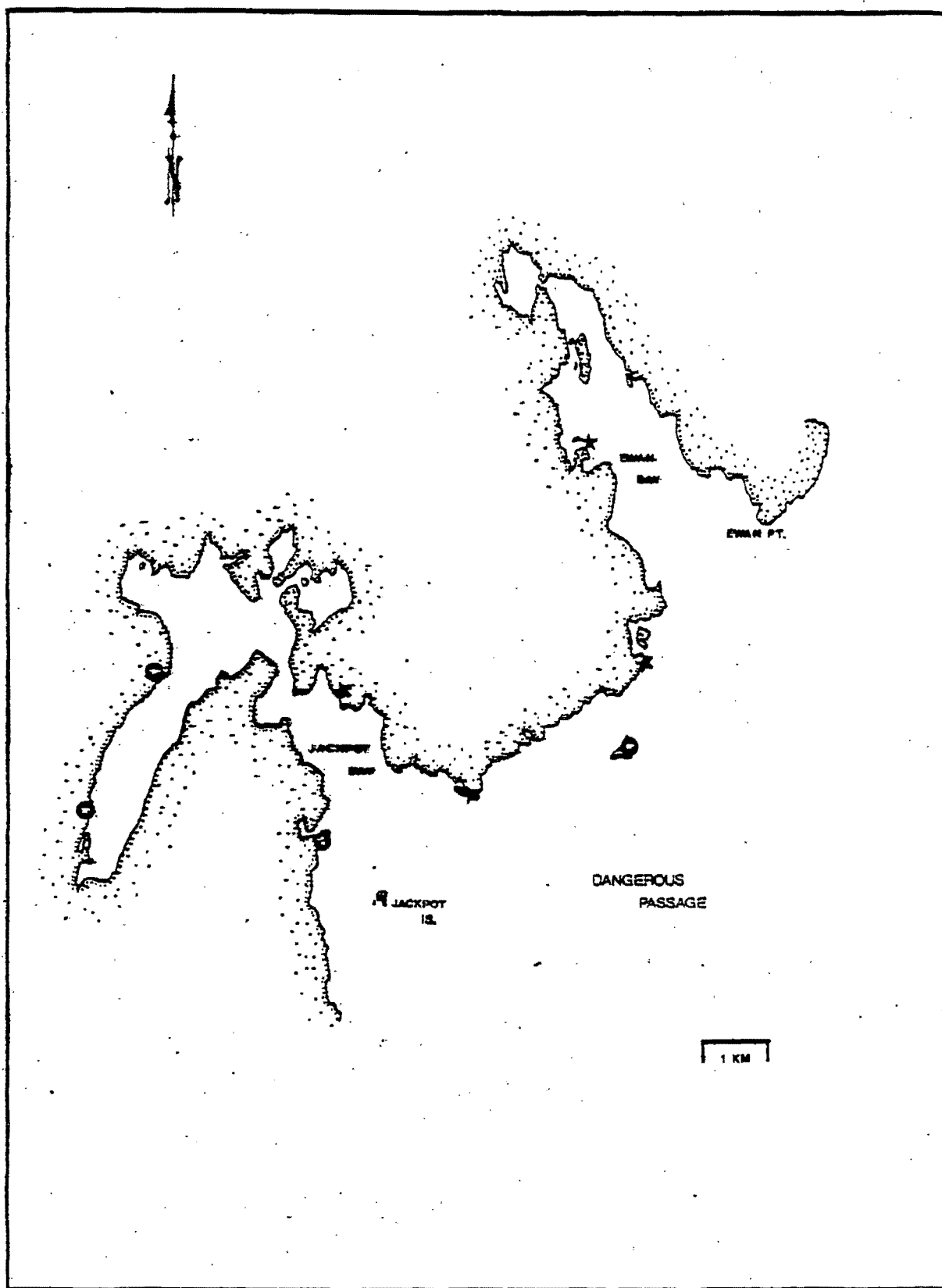


Figure 20. Distribution of Bald Eagle nests, Ewan and Jackpot Bays.

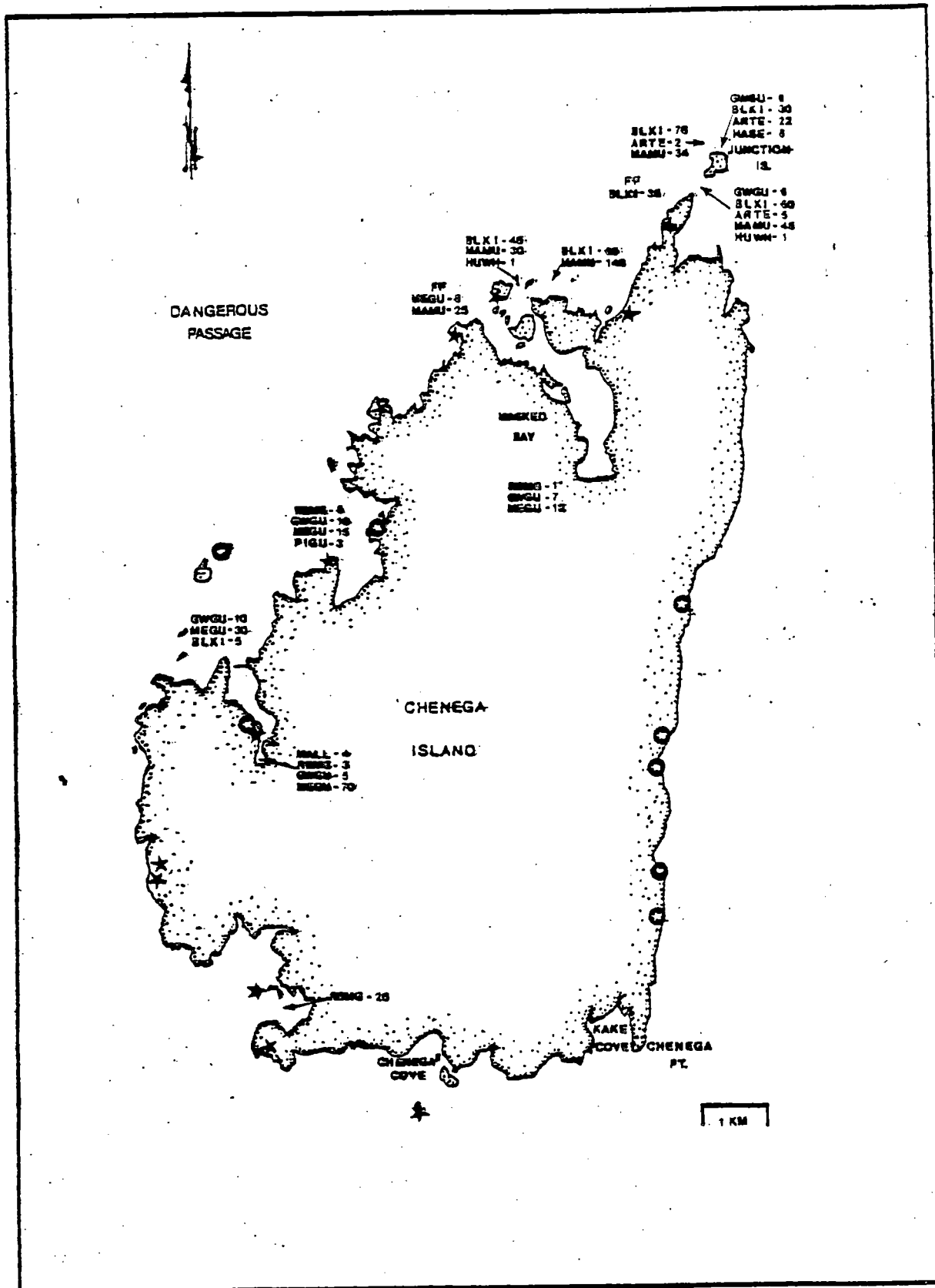


Figure 21. Distribution of Bald Eagle nests and marine birds and mammals, Chenega Island.