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Volume 4. Marine Birds

UNIVERSITY OF ALASKA
ARCTIC ENVIRONMENTAL INFORMATION
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Principal Investigators' Reports
for the Year Ending March 1976

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

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- Volume:
1. Marine Mammals
 2. Marine Birds
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 5. Fish, Plankton, Benthos, Littoral
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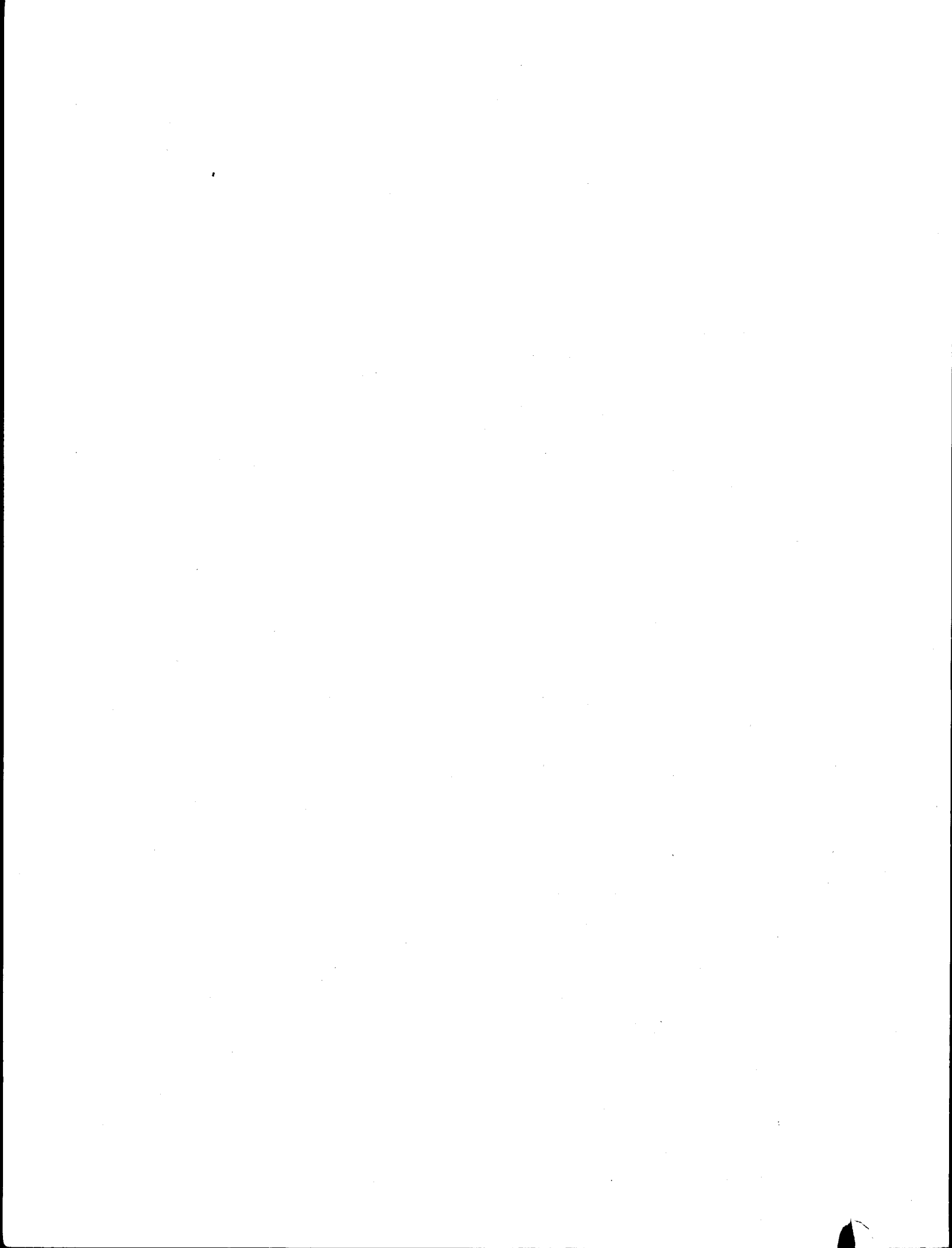
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Environmental Assessment of the Alaskan Continental Shelf

Volume 4. Marine Birds

*Fourth quarter and annual reports for the reporting period ending March 1976,
from Principal Investigators participating in a multi-year program of environmental
assessment related to petroleum development on the Alaskan Continental Shelf.
The program is directed by the National Oceanic and Atmospheric Administration
under the sponsorship of the Bureau of Land Management.*

ENVIRONMENTAL RESEARCH LABORATORIES / Boulder, Colorado / 1976



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SEASONAL DISTRIBUTION AND ABUNDANCE OF MARINE BIRDS:

PART II. AERIAL SURVEYS

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April 1, 1976

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Abstract. Aerial surveys of marine birds were conducted in the Gulf of Alaska, the Pacific Ocean south of the Alaska Peninsula, the Bering Sea, the Chukchi Sea and the Beaufort Sea between 6 March and 9 December 1975 by U.S. Fish and Wildlife Service personnel, contractees and cooperators. Data were drawn from 11 mission reports, one of which summarized unpublished results gathered in 1972 and 1973. In total, 1,420 transects or units of information were collected.

Summaries of bird population data are presented by species, 3-month intervals, and oceanographic region in 23 tables. Quarterly summaries of total bird densities in the Alaskan outer continental shelf regions are presented in 4 maps.

Distributional data from aerial transects are deemed inadequate to measure the potential impacts of OCS leasing on avifauna in most regions during any but the summer months.

INTRODUCTION

This report considers the seasonal density and distribution of marine birds and the identification of critical species and areas with regard to possible effects of oil and gas development. Emphasis is on the pelagic environment and not on species generally confined to littoral habitats. Furthermore, this report does not directly address the distribution of pelagic species when they occupy shoreline habitats during breeding season. With a large enough data base, an evaluation of the use of any geographical area by species can be made. Key areas can then be identified and seasonal patterns of distribution by species will indicate which populations would be adversely impacted by outer continental shelf oil and gas development.

CURRENT STATE OF KNOWLEDGE

There are no published results on aerial surveys of marine birds in Alaskan waters. Unpublished reports and unanalyzed data do exist, and these are cited in Part I, "Shipboard Surveys" (p. 1 and 2) of this annual report.

STUDY AREA

Aerial observations of sea birds have been made within 16 of 32 oceanographic regions identified on Map 1. These oceanographic regions were subjectively delineated by us so as to, in part, encompass sedimentary basins identified by the U.S. Department of the Interior for leasing (Map 2) and, in part, in consideration of political boundaries or oceanographic characteristics. Map 3 shows the aerial transects which were flown in 1975 or will be flown in 1976. Specific locations are reported in the Results section, but in general the boundaries have been the 142° meridian to the east in the Gulf of Alaska, the 52°30'N latitude to the south in Umnak Basin, the 173° meridian to the west in the Bering Sea and the 72°30'N latitude to the north in the Beaufort Sea.

METHODS

Aerial surveys were completed at various intervals in 1975 corresponding to periods when rapid changes of density or species composition in pelagic waters were anticipated and contingent on the availability of aircraft support and the vicissitudes of Alaskan weather conditions. A series of 14 one-day transects was devised to sample bird populations in outer continental shelf lease areas using the ports of Elmendorf, Cold Bay, Nome, Kotzebue, Bethel, King Salmon, and Barrow. Linear transects follow lines of longitude and latitude on whole degrees whenever possible and were selected to maximize the ratio of hours of survey time to total hours of flying time and to sample representative or critical areas.

The aircraft utilized was a Lockheed P2V ("Neptune") equipped with a GNS 500 navigation system (Global Navigation, Inc.) which utilizes the Very Low Frequency (VLF) radio band. This system is capable of locating transects or transect segments within a tenth of an arc minute. All observations were recorded by transect segment encompassing one minute of latitude (1 naut. mi.) for north-south censuses or 5 minutes of longitude (2.8 to 5.6 naut. mi., depending on latitude) for east-west censuses. Supplementary data recorded for each segment included weather, sea state, wind, ceiling, altitude, aircraft speed, presence of fishing vessels, ice conditions, and incidental observations of marine mammals.

Three biologists were utilized simultaneously on aerial surveys. Two sat in the plexiglass observation bubble in the bow and recorded observations to the most specific taxonomic group possible into a cassette recorder. The third monitored the GNS 500 and recorded positions at appropriate intervals. Approximately every 30 minutes the biologists switched seating arrangements to combat aerial hypnosis and to allow one of the three to ease his eyestrain by diverting his attention to the GNS 500.

A 100-m transect width was used. This distance was approximated by using the wing length of the P2V (110 feet) or an inclinometer until the observer gained a feel for the correct transect width. Altitude varied from 100 to 180 feet, depending on flying conditions. Air speed were maintained at 120 knots, thus, ground speed varied with wind direction and velocity. Observability varied somewhat due to overcast, glare and sea state but it is believed that experienced observers minimize these factors and data of reasonably consistent quality is collected.

Synthesis reports for each aircraft survey period were prepared and estimates of pelagic birds/km² within each 10-minute block of latitude and longitude in which censuses were conducted are available. Furthermore, complete transcripts of the tapes, a preliminary mapping of total sea bird densities and surface synoptic weather charts for the periods surveyed are bound into the aerial synthesis reports.

RESULTS

Table 1 is a log of field reports prepared by U.S. Fish and Wildlife personnel, contractees and collaborators covering their shipboard, aerial, and ground surveys during the periods 27 January to 9 December, 1975. Data from field reports 1, 3, 6, 8, 9, 10, 12, 14, 27, 29, and 35 comprise the basis for this report. I should be noted that field report 1 is actually based on data collected in June, 1972 and April, 1973 by the late Larry Haddock.

Table 2 summarizes the distribution of effort for censusing marine birds by the aerial transect method. Furthermore, data are summarized

for each of 16 oceanographic regions, by 3-month periods - March-May, June-August, September-November and December-February (Tables 3-26). Occurrence, percent occurrence, number of birds, and birds/km² are given for each species in each basin by 3-month intervals. Total bird concentrations are mapped by quarter (Maps 4-7).

DISCUSSION

Maps 4-7 illustrate the basic patterns of marine bird distribution in the areas and seasons in which aerial data are available. From March to May birds were most abundant beyond the 1,000-fathom line in the Northwest and Northeast Gulf of Alaska (Map 4). Cook Inlet appears to be comparatively of little importance during this time of year for bird habitat, although extreme caution must be exercised in making such a judgement since we have no data for April or May. Surveys completed in early March 1976 are as yet unanalyzed but will provide information on Umnak Basin, Alaska Peninsula South, Kodiak Basin and Shelikof Strait. We have no information during this period on the Bering Sea, the Chukchi Sea or the Beaufort Sea.

The quarter June-August contains the most extensive aerial information to date (Map 5). Birds generally shifted over the continental shelf from oceanic and continental slope areas where they were found in the March-May quarter. Key areas of bird use include Bristol Bay (short-tailed shearwaters), the Pribilof Islands (murre and other alcids), St. Lawrence Island (murre and small alcids), Little Diomed Island (small alcids and kittiwakes), Cape Lisburne (murre), the Shumagin Islands (small alcids, fork-tailed petrels and kittiwakes), the Semidi Islands (murre and kittiwakes) and the general areas of the Lower Cook Inlet and Northwest Gulf of Alaska (short-tailed shearwaters, kittiwakes, glaucous-winged gulls, murre, fork-tailed petrels and tufted puffins).

Total bird densities for the September-November quarter are presented in Map 6. Key areas during this period appear from these data to be Middleton Island (glaucous-winged gulls, scoters and small alcids), the area from Kayak Island to Cape Suckling (scoters and glaucous-winged gulls), Cape Yakataga to Icy Bay (scoters) and the continental slope south of the Kenai Peninsula (tufted puffin).

Limited data for the December-February quarter (Map 7) suggests that inshore ice-free areas in Bristol Bay may be important winter habitat for oldsquaw. Incompletely analyzed data from a survey on 8 January 1976 will help fill this void by providing information on wintering habitat of scoters, eiders, and oldsquaw in Lower Cook Inlet, Shelikof Strait, Northwest Gulf of Alaska and Kodiak Basin. Furthermore, surveys on 28 and 29 February 1976 of Bristol Bay and St. George Basin have been completed and will identify primary winter habitat of oldsquaw, eiders and scoters in the ice-free areas of Bristol Bay as well as winter range of murre in leads and polynya of the ice pack.

Logistical problems have prevented the gathering of data in several large geographical areas at various times of the year. The weather, especially in the winter, has been a major obstacle. Low ceilings at ports we use and storms with associated winds of greater than 20 knots have curtailed our survey operations in many instances. Either aircraft or aircraft crew were unavailable for some missions because of a variety of reasons including maintenance problems and need for the aircraft by other OCSEAP projects. These difficulties have been mostly resolved by acquisition of another aircraft (Turbo-Goose) having extended over-water flight capability and good forward and lateral visibility.

CONCLUSIONS

The quarter May-August has the best coverage of surveys, but it has little data on bird use in the Kodiak area and none in Umnak Basin (Map 5). Both areas have many important breeding colonies. Ideally, we would have data at 2-week intervals for all outer continental shelf areas over several years time.

Although not presented in this report data on density and distribution of birds in the March-May and September-November quarters in the Kodiak area, the Shumagin Islands, the Semidi Islands, Umnak Basin, and Bristol Bay are available in part from fourth quarter surveys and in part from unpublished U.S. Fish and Wildlife Service data acquired in previous years. Data during winter are generally scarce. Map 4 depicts bird distribution based upon a composite of surveys made on 13, 16 and 26 April 1973 and 6, 8 and 9 March 1975. It is desirable to collect data in May to evaluate bird densities during late spring migration when important staging areas may yet be discovered. Map 6 depicts bird distribution for September-November as based upon 2 days of flying in October 1975. September is an important month for bird migration in Alaska, and additional data during that month are needed from all areas to identify critical bird habitat. Map 7 shows bird distribution and densities for December-February. Clearly data for most regions in winter are deficient but necessary if wintering areas of oldsquaw, eiders, scoters, fulmar, murre and small alcids are to be identified.

In 1975 a total of 1,420 aerial transects were completed compared to 2,663 shipboard transects. Each method has inherent advantages over the other for providing a reliable index of bird populations. Aerial surveys enable large areas to be surveyed and compared over a relatively short time period, and changes in distribution can be analyzed with most variables being held relatively constant. For example, distributional changes in censusing over the continental shelf, the continental slope and pelagic areas beyond the 1,000-fathom line can be emphasized on an aerial survey within a single day. Furthermore, critical habitat or areas in which our knowledge is inadequate can be identified and surveyed as quickly as weather permitted. This is not possible on National Ocean and Atmospheric Administration ships where bird censuses

are conducted on a non-interference basis and regions surveyed tend to be opportunistic. Aerial transects are easily replicated and lend themselves to a monitoring program to detect changes in population indices.

Shipboard censuses have some advantages over aerial surveys. The cost effectiveness of data acquisition is far greater. Shipboard work allows for the gathering of a greater number of environmental parameters such as sea temperature and the presence of food organisms in the surface waters. Furthermore, there is more opportunity to obtain precise identification of birds to species rather than to higher taxonomic groupings as with aerial surveys. There is an apparent tendency for shipboard censuses to obtain higher population estimates than aerial surveys, and the reasons for this have not yet been fully explored although it probably differs according to species. One possibility is that censusing is, in part, a function of time, i.e., shipboard censuses count the numbers of birds which fly through the transect zone, whereas aerial surveys provide a more instantaneous view of birds within the zone surveyed. We believe that aerial and shipboard surveys done concurrently provide powerful tools to understand bird density distribution.

NEEDS FOR FURTHER STUDY

The aerial data to date has provided a solid first step toward understanding marine bird use of Alaskan waters, but it is necessarily a first step. Large parts of the Gulf of Alaska will be surveyed for the first time this spring and fall. Areas which have been surveyed in the summer will be resurveyed in the summer of 1976. The Bering Sea, the Chukchi Sea and the Beaufort Sea will be surveyed in all areas during all seasons in 1976 when open water is present. Transects will be developed and flown in the Chukchi Sea (Map 3) as well as additional transects in the Eastern Central Bering Sea and the Navarin Basin during 1976.

These needed surveys will be made in 1976 to the extent practicable considering funding, aircraft availability and suitable weather.

As time permits, unreported and unanalyzed aerial survey data on seabirds collected by U.S. Fish and Wildlife Service personnel since 1969 will be incorporated in with these currently acquired data.

SUMMARY OF 4TH QUARTER OPERATIONS

P2V surveys in the fourth quarter are summarized in Table 1. A survey in the Kodiak area 8 January 1976 censused winter bird distribution in the Cook Inlet, Shelikof Strait, Northwest Gulf of Alaska and Kodiak Basin over 980 miles of transect lines. Surveys based in Cold Bay were

completed on 28-29 February and 4, 7 and 8 March covering Bristol Bay, St. George Basin, Umnak Basin, Alaska Peninsula South, Kodiak Basin, Shelikof Strait, Northwest Gulf of Alaska and Lower Cook Inlet covering 4,400 miles of transect lines. These data have been transcribed from the tapes and will be analyzed later and put into ADP format.

Table 1. Log of U.S. Fish and Wildlife Service reports covering shipboard, aerial, and land surveys of marine birds, 1972-76.

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Experi- mental
75-001	L. Haddock (summarized by J. Benson)	Grumman Goose	6'72,4'73	NWGOA,KB,NEGOA	184	-	-
75-002	P. Isleib	Oceanographer	1/27-3/4'75	NEGOA,OBC,BCS	132	-	-
75-003	G. Hunt, K. Briggs	P2V	3/6,8,9'75	NEGOA,NWGOA,LCI	112	-	-
75-004	S. Hatch, B. Timson	Surveyor	4/21-6/14'75	NP,PWS,APS,KB, LCI,NEGOA,NWGOA	392	-	-
75-005	I. Warner, J. Guzman	Discoverer	5/9-6/21'75	APS,KB,OA,UMB,BB, OBC,NP,NEGOA,SGB, NWGOA,ECB	69	-	-
75-006	G. Hunt, K. Briggs, E. Bailey	P2V	6/9,11,16'75	LCI,NWGOA, NEGOA,PWS	128	-	-
75-007	M. Dick, I. Warner, R. MacIntosh	(Field Study)	6/17-19'75	Kodiak Island	39	-	-

Table 1 Con't

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Experi- mental
75-008	J. Blankenship, N. Johnson, E. Bailey	P2V	6/18-20'75	HB,NaB,ECB	101	-	-
75-009	J. Bartonek, S. Hatch, B. Timson	P2V	6/26'75	LCI,NWGOA,NEGOA	71	-	-
75-010	J. Bartonek, S. Hatch, B. Timson	P2V	7/2-3'75	BFT	253	-	-
75-011	J. Benson, B. Timson	Surveyor	7/11-31'75	BCS,NP, KB,APS,UMB	90	29	5
75-012	D. Cline, N. Johnson, K. Wohl	P2V	7/15-16'75	LCI,APS, KB,BB, NWGOA	168	-	-
75-013	M. Rauzon, S. Hatch	Glacier	7/16-29'75	SCS,ONC,OO,OW,OBC, KB,APS,SGB,NB,ECB	174	-	-
75-014	J. Bartonek, D. Cline, C. Harrison	P2V	7/31-8/2'75	BB,SGB,LCI, NWGOA	272	-	-

Table 1 Con't

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Experi- mental
75-015	M. Rauzon, J. Ruehle	Discoverer	8/6-9/11'75	NWGOA,KB,NP,APS, BB,SGB,ECB	223	64	-
75-016	K. Henderson, J. Benson, C. Handel	Surveyor	8/7-9/12'75	LCI,NWGOA,NEGOA, KB,PWS,APS, SGB,ECB	91	32	12
75-017	S. Hatch, C. Harrison	(Field Study)	8/11-8/25'75	Unimak Island	-	-	-
75-018	D. Nysewander	Miller Freeman	8/12-9/4'75	BCS,OBC,KB,APS, SGB,ECB,BB	149	63	-
75-019	B. Timson	(Field Study)	8/27-9/12'75	Pt. Barrow	-	-	-
75-020	I. Warner	Silas Bent	9/1-28'75	SEAS,NEGOA,NWGOA,KB, OAPS,APS,UMB	109	77	-
75-021	A. Sowls	Glacier and Burton Island	9/1-30'75	APS,SGB,ECB,SCS, OCS,ONC,TNP,OSK, OAPS,OO,NB,HB	124	1	-
75-022	C. Harrison	Miller Freeman	9/6-29'75	OA,UMB,BB,SGB,SCB	150	21	-
75-023	D. Nysewander	Discoverer	9/13-10/2'75	BB,SGB,NaB, ECB,APS,KB	90	19	2

Table 1 Con't

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Experi- mental
75-024	C. Handel	Surveyor	9/16-22'75	SEAS,NEGOA,KB	45	1	6
75-025	C. Handel, J. Benson	Surveyor	10/1-24'75	KB,SEAS,NWGOA PWS,NEGOA	112	23	12
75-026	M. Rauzon	Miller Freeman	10/2-24'75	SCB,BB,APS,ECB,SGB	110	30	-
75-027	J. Bartonek, C. Harrison, S. Hatch	P2V	10/7'75	LCI,NWGOA,NEGOA	106	-	-
75-028	K. Henderson	Discoverer	10/8-16'75	APS,KB,LCI	27	11	-
75-029	C. Harrison, S. Hatch, E. Bailey	P2V	10/17'75	NWGOA,NEGOA,PWS	71	-	-
75-030	J. Ruehle	Discoverer	10/21-11/10'75	NEGOA,NWGOA,PWS	64	25	-
75-031	K. Henderson	Surveyor	10/28-11/6'75	SEAS,NEGOA,NWGOA,KB, PWS,OGOA,LCI	38	-	-
75-032	S. Hatch	Surveyor	11/8-24'75	OBC,OSK,UMB,APS,KB	60	5	-
75-033	M. Kirchhoff, M. Rauzon	Miller Freeman	11/10-12/3'75	SGB,ECB,BB	106	11	-

Table 1 Con't

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Experi- mental
75-034	D. Hardy, D. Nysewander	Discoverer	11/18-12/6'75	SEAS, NWGOA	-	-	-
75-035	C. Harrison, S. Hatch, J. Ruehle	P2V	12/9'75	BB	13	-	-
76-001	C. Harrison, S. Hatch, E. Bailey	P2V	1/8'76	LCI, KB, NWGOA, SS	Information Not Available		
76-002	G. Sanger, M. Kirchhoff, M. Phillips	Moana Wave	2/15-2/20'76	NWGOA, NEGOA, BCS, SEAS	"	"	"
76-003	J. Hall, K. Wohl	(Field Study)	2/18-2/20'76	Middleton Island	"	"	"
76-004	M. Kirchhoff	Moana Wave	2/20-3/5'76	PWS, NEGOA, NWGOA	"	"	"
76-005	D. Hardy, D. Frazer	Discoverer	2/24-2/27'76	OGO, KB, BCS, OBC	"	"	"
76-006	C. Harrison, S. Hatch, A. Sows	P2V	2/28-3/8'76	BB, SGB, UMB, APS, KB, SS, NWGOA, LCI	"	"	"
76-007	D. Frazer	Discoverer	3/1-3/13'76	KB, NWGOA, NEGOA	"	"	"

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Table 1 Con't

Cruise- Field Report Number	Author- Observer	Vessel- Aircraft	Dates	Location ^{1/}	Survey Units		
					Tran- sect	Sta- tion	Exper- imental
76-008	C. Handel	Surveyor	3/8-3/12'76	(Seattle-Kodiak)	Information Not Available		
76-009	M. Phillips	Moana Wave	3/8-3/26'76	Information Not Available	"	"	"
76-010	G. Sanger, C. Handel, S. Bates, M. Rauzon	Miller Freeman	3/15-3/21'76	(Seattle-Kodiak)	"	"	"
76-011	M. Kirchhoff	Discoverer	3/16-4/3'76	Information Not Available	"	"	"

^{1/}

APS-Alaskan Peninsula South
 BB-Bristol Bay
 BCS-British Columbia Shelf
 BFT-Beaufort Basin
 ECB-Eastern Central Bering Sea
 HB-Hope Basin
 KB-Kodiak Basin
 LCI-Lower Cook Inlet
 NaB-Navarin Basin
 NB-Norton Basin
 NCS-Northern California Shelf

NEGOA-Northeast Gulf of Alaska
 NWGOA-Northwest Gulf of Alaska
 OA-Oceanic Aleutians
 OAPS-Oceanic Alaskan Pen. South
 OBC-Oceanic British Columbia
 OGOA-Oceanic Gulf of Alaska
 ONC-Oceanic Northern California
 OO-Oceanic Oregon
 OS-Oregon Shelf
 OSC-Oceanic Southern California
 OSK-Oceanic South Kodiak

OW-Oceanic Washington
 PWS-Prince William Sound
 SCB-South Central Bering Sea
 SCS-Southern California Shelf
 SEAS-Southeast Alaska Shelf
 SGB-St. George Basin
 SS-Shelikof Strait
 TNP-Transitional North Pacific
 UCI-Upper Cook Inlet
 UMB-Umnak Basin
 WS-Washington Shelf

Table 2. Distribution of effort for censusing marine birds by the aerial transect method, 1975.¹

Region	Region Abbre- viation	Number of Transects													
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Alaskan Peninsula South	APS						50							50	
Bristol Bay	BB						94	49				13		156	
Beaufort Basin	BFT						253							253	
Eastern Central Bering Sea	ECB						11							11	
Hope Basin	HB						41							41	
Kodiak Basin	KB						15	22						37	
Lower Cook Inlet	LCI			5			15	7	14		5			46	
Navarin Basin	NAV						4							4	
Norton Basin	NB						45							45	
Northeast Gulf of Alaska	NEGOA			60	13		93				112			278	
Northwest Gulf of Alaska	NWGOA			42	36		149	12	3		52			294	
Prince William Sound	PWS										4			4	
St. George Basin	SGB							85	63					148	
Shelikof Strait	SS						5	27						32	
Upper Cook Inlet	UCI			4			14	1	2		4			21	
Umnak Basin	UMB													0	
Total			0	0	111	49	0	392	551	131	0	177	0	13	1420

¹ Includes Larry Haddock's June, 1972 and April, 1973 data.

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Table 3 Bird observations on aerial transects, Alaska Peninsula South, June-August, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	30	60	114	1.3	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	12	24	29	0.3	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	9	18	1196	14.1	Steller's Eider				
Leach's Storm Petrel	6	12	10	0.1	Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	2	1	tr.	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 3 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	12	24	58	0.7
Pomarine Jaeger					Unid. Guillemot	3	6	5	0.1
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	4	8	4	tr.	Unid. Large Alcid	6	12	9	0.1
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	9	18	18	0.2	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	26	52	1547	18.2
Black-headed Gull					Horned Puffin	8	16	17	0.2
Bonaparte's Gull					Tufted Puffin	15	30	54	0.6
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	19	38	196	2.3	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 3 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	1	2	1	tr.					
Totals/Average			3259	38.4					

Cruise numbers data are compiled from: 12, 14

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Table 4 Bird observations on aerial transects, Beaufort Basin, June-August, 1975.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/Km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon	12	5	19	0.1	Gadwall				
Unid. Loon	9	4	15	0.1	Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw	29	12	240	1.0
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider	1	0.4	8	tr.
Ashy Storm Petrel					King Eider	2	1	614	2.4
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider	2	1	3	tr.
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	1	0.4	3	tr.
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose	1	0.4	2	tr.	Black Oystercatcher				

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Table 4 Continued.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern	1	0.4	6	tr.
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	0.4	1	tr.	Unid. Murre	3	1	10	tr.
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	6	2	10	tr.	Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull	5	2	8	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull					Xantus' Murrelet				
Slaty-backed Gull	3	1	3	tr.	Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake					Snowy Owl	1	0.4	1	tr.
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 4 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	6	2	12	tr.					
Totals/Average			955	3.8					

Cruise numbers data are compiled from: 10

Table 5 Bird observations on aerial transects, Bristol Bay Basin, June-August, 1975.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon	1	1	1	tr.	Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	1	1	1	tr.	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater	4	3	486	2.6	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	53	37	26468	140.	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	4	3	6	tr.	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter	4	3	158	0.8
Brandt's Cormorant					Surf Scoter	2	1	4	tr.
Pelagic Cormorant					Black Scoter	1	1	2	tr.
Red-faced Cormorant					Unid. Scoter	5	3	27	0.1
Unid. Cormorant	3	2	31	0.2	Unid. Duck				
Whistling Swan	1	1	2	tr.	Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 5 Continued.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	2	1	2	tr.
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	5	3	20	0.1
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	1	2	tr.	Unid. Murre	40	28	455	2.4
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger	9	6	13	0.1	Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	10	7	34	0.2	Unid. Large Alcid	3	2	3	tr.
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	26	18	555	2.9	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	1	1	1	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	20	14	55	0.3
Black-headed Gull					Horned Puffin	1	1	1	tr.
Bonaparte's Gull					Tufted Puffin	5	3	6	tr.
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	52	36	1203	6.4	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 5 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	5	3	9	tr.					
Totals/Average			29545	156.					

Cruise numbers data are compiled from: 12, 14

Table 6 Bird observations on aerial transects, Bristol Bay Basin, December-February, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead	2	15	79	4.4
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon	1	8	1	0.1
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 6 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre				
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull					Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake					Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 6 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/Km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			80	4.4					

Cruise numbers data are compiled from: 35

Table 7 Bird observations on aerial transects, Eastern Central Bering Sea, June-August, 1975.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider	2	18	9	0.5
Ashy Storm Petrel					King Eider	1	9	45	2.5
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider	1	9	10	0.6
Double-crested Cormorant					White-winged Scoter	1	9	40	2.2
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant	1	9	5	0.3	Black Scoter				
Red-faced Cormorant					Unid. Scoter	2	18	17	0.9
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 7 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	2	18	5	0.3
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	2	22	22	1.2
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	1	9	1	0.1	Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull	4	36	107	5.9	Kittlitz's Murrelet				
Glaucous-winged Gull	3	27	7	0.4	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	1	9	3	0.2
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin	1	9	74	4.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake					Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 7 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			345	19.1					

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Cruise numbers data are compiled from: 8

Table 8 Bird observations on aerial transects, Hope Basin, June-August, 1975.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard	1	2	3	tr.
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider	1	2	40	0.5
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	1	2	5	0.1
Unid. Cormorant					Unid. Duck	5	12	18	0.2
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 8 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	2	7	3	tr.
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	27	66	1472	19.8
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	6	15	8	0.1	Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull	2	5	32	0.4	Kittlitz's Murrelet				
Glaucous-winged Gull	2	5	2	tr.	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	3	7	3	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	7	17	427	5.7
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	4	10	132	1.8	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 8 Continued.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Raven	1	2	1	tr.					
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			2148	28.9					

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Cruise numbers data are compiled from: 8

Table 9 Bird observations on aerial transects, Kodiak Basin, June-August, 1972, 1975.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	14	38	40	0.8	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	10	30	73	1.4	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	7	19	10	0.2	Steller's Eider				
Leach's Storm Petrel	2	5	3	0.1	Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	2	5	14	0.3	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	3	7	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 9 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	4	11	15	0.3
Sharp-tailed Sandpiper					Aleutian Tern	1	3	1	tr.
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	9	24	242	4.8
Pomarine Jaeger					Unid. Guillemot	2	5	4	0.1
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	1	3	1	tr.	Unid. Large Alcid	1	3	1	tr.
Skua					Marbled Murrelet				
Glaucous Gull	2	5	6	0.1	Kittlitz's Murrelet				
Glaucous-winged Gull	2	5	7	0.1	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	9	24	35	0.7
Black-headed Gull					Horned Puffin	2	5	5	0.1
Bonaparte's Gull					Tufted Puffin	11	30	55	1.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	20	54	261	5.1	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 9 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			781	15.4					

Cruise numbers data are compiled from: 1, 12

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Table 10 Bird observations on aerial transects, Lower Cook Inlet, March-May, 1975.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	20	22	2.4	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 10 Bird observations on aerial transects, Lower Cook Inlet, March-May, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre				
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	2	40	38	4.1
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	2	40	2	0.2	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	1	20	3	0.3	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 10 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			65	7.1					

Cruise numbers data are compiled from: 3

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Table 11 Bird observations on aerial transects, Lower Cook Inlet, June-August, 1975

Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	15	32	174	2.7	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup	1	2	6	0.1
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater	3	6	5	0.1	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	16	34	982	15.0	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	16	34	93	1.4	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter	1	2	2	tr.
Brandt's Cormorant					Surf Scoter	2	4	62	0.9
Pelagic Cormorant					Black Scoter	2	4	50	0.8
Red-faced Cormorant					Unid. Scoter	1	2	10	0.2
Unid. Cormorant	2	4	7	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 11 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	5	11	46	0.7
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	5	11	93	1.4
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern	1	2	3	tr.
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	2	6	0.1	Unid. Murre	15	32	80	1.2
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	1	2	1	tr.	Unid. Large Alcid	2	4	5	0.1
Skua					Marbled Murrelet				
Glaucous Gull	1	2	2	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull	18	38	195	3.0	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	1	2	1	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull	1	2	1	tr.	Unid. Small Alcid	8	17	31	0.5
Black-headed Gull					Horned Puffin	4	9	7	0.1
Bonaparte's Gull					Tufted Puffin	5	11	10	0.2
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	18	38	319	4.9	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 11 Continued.

Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	2	4	2	tr.					
Totals/Average			2100	32.1					

Cruise numbers data are compiled from: 6, 9, 12, 14

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Table 12 Bird observations on aerial transects, Lower Cook Inlet, September-November, 1975.

Species Name	Occurrence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	X Occurrence	No. Birds	Birds/km ²
Common Loon	1	20	1	0.1	Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	1	20	32	3.5	Oldsquaw	1	20	4	0.4
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 12 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	20	3	0.3	Unid. Murre	3	60	9	1.0
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	2	40	10	1.1
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	4	80	52	5.7	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin	3	60	6	0.7
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	4	80	56	6.1	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 12 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			173	18.8					

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Cruise numbers data are compiled from: 27

Table 13 Bird observations on aerial transects, Navarin Basin, June-August, 1975.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	1	25	1	0.1	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	25	1	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 13. Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull	1	25	1	0.1
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	4	100	110	14.9
Pomarine Jaeger					Unid. Guillemot	2	50	3	0.4
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull	1	25	1	0.1	Kittlitz's Murrelet				
Glaucous-winged Gull					Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	3	75	10	1.4
Black-headed Gull					Horned Puffin	1	25	1	0.1
Bonaparte's Gull					Tufted Puffin	3	75	4	0.5
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	2	50	15	2.0	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 13 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			147	19.9					

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Cruise numbers data are compiled from: 8

Table 14 Bird observations on aerial transects, Northeast Gulf of Alaska, March-May, 1973, 1975.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Loon	1	1	1	tr.	Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	19	24	33	0.3	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	8	10	12	0.1	Oldsquaw	1	1	1	tr.
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	16	20	83	0.7	Steller's Eider				
Leach's Storm Petrel					Common Eider	1	1	2	tr.
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	6	8	13	0.1	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	4	5	12	0.1	Unid. Duck	1	1	2	tr.
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle	1	1	1	tr.
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 14 Continued.

Species Name	Occur- ence	X Occurrence	No. Birds	Birds/ha ²	Species Name	Occur- ence	X Occurrence	No. Birds	Birds/ha ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	29	37	139	1.2
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	1	1	tr.	Unid. Murre	10	13	40	0.3
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	13	16	129	1.1
Skua					Marbled Murrelet				
Glaucous Gull	1	1	1	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull	25	32	80	0.7	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet	1	1	1	tr.
Western Gull					Unid. Murrelet				
Herring Gull	3	4	4	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	21	27	179	1.5
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin	3	4	8	0.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	31	39	439	3.6	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 14 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	13	17	69	0.6					
Totals/Average			1184	9.8					

Cruise numbers data are compiled from: 1, 3

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Table 15 Bird observations an aerial transects, Northeast Gulf of Alaska, June-August, 1975.

Species Name	Occur- ance	X Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ance	X Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross	6	6	9	0.1	Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	38	39	118	0.7	Lesser Scaup				
Pink-footed Shearwater	1	1	1	tr.	Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater	2	2	8	tr.	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	27	28	215	1.3	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	27	28	44	0.3	Steller's Eider				
Leach's Storm Petrel	7	7	12	0.1	Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	1	1	1	tr.	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	1	1	6	tr.
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher	1	1	1	tr.

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Table 15 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	2	2	3	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	11	11	775	4.8
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	6	6	14	0.1
Sharp-tailed Sandpiper					Aleutian Tern	4	4	7	tr.
Unid. Sandpiper					Unid. Tern	7	7	235	1.4
Red Phalarope					Common Murre				
Northern Phalarope	2	2	26	0.2	Thick-billed Murre				
Unid. Phalarope	3	3	21	0.1	Unid. Murre	4	4	10	0.1
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger	2	2	3	tr.	Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	1	1	3	tr.	Unid. Large Alcid	6	6	16	0.1
Skua					Marbled Murrelet				
Glaucous Gull	2	2	2	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull	8	8	41	0.3	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet	1	1	8	tr.
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet	3	3	7	tr.
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	18	19	60	0.4
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin	7	7	13	0.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	21	22	54	0.3	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 15 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/ha ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/ha ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	8	8	23	0.1					
Totals/Average			1738	10.7					

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Cruise numbers data are compiled from: 6, 9

Table 16 Bird observations on aerial transects, Northeast Gulf of Alaska, September-November, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon	1	1	1	tr.	Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe	1	1	1	tr.	American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross	1	1	1	tr.	Redhead				
Laysan Albatross	2	2	2	tr.	Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	70	61	169	1.4	Lesser Scaup				
Pink-footed Shearwater	2	2	2	tr.	Unid. Scaup				
New Zealand Shearwater	1	1	1	tr.	Common Goldeneye				
Sooty Shearwater	7	6	9	0.1	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	8	7	14	0.1	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	49	43	137	1.1	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	2	2	3	tr.	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter	4	4	69	0.6
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter	1	1	1	tr.
Red-faced Cormorant					Unid. Scoter	7	6	245	2.0
Unid. Cormorant	2	2	7	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose	2	2	25	0.2	Bald Eagle	1	1	1	tr.
Black Brant	1	1	1	tr.	Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 16 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	1	1	1	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	4	4	5	tr.
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper	1	1	8	0.1	Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	2	2	3	tr.
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	2	2	2	tr.	Unid. Large Alcid	4	4	9	0.1
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	35	31	128	1.0	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	1	1	8	0.1	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	19	17	47	0.4
Black-headed Gull					Horned Puffin	2	2	3	tr.
Bonaparte's Gull					Tufted Puffin	4	4	10	0.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	20	17	48	0.4	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 16 Continued.

Species Name	Occur- ance	I Occurrence	No. Birds	Birds/m ²	Species Name	Occur- ance	I Occurrence	No. Birds	Birds/m ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	4	4	19	0.2					
Totals/Average			972	7.8					

Cruise numbers data are compiled from: 27, 29

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Table 17 Bird observations on aerial transects, Northwest Gulf of Alaska, March-May, 1973, 1975.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe	1	1	2	tr.	American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	13	10	24	0.2	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater	2	2	2	tr.	Bufflehead				
Unid. Shearwater	19	15	165	1.0	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	21	17	95	0.6	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	6	5	8	tr.	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	3	2	24	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 17 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	1	1	1	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	13	10	42	0.3
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper	1	1	1	tr.	Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	3	2	8	tr.	Unid. Murre	18	14	52	0.3
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	13	10	44	0.3
Skua					Marbled Murrelet				
Glaucous Gull	1	1	2	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull	34	27	153	0.9	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet	5	4	10	0.1
Western Gull					Unid. Murrelet				
Herring Gull	2	2	2	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet	2	2	2	tr.
Mew Gull					Unid. Small Alcid	18	14	83	0.5
Black-headed Gull					Horned Puffin	1	1	3	tr.
Bonaparte's Gull					Tufted Puffin	9	7	58	0.4
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	75	59	1459	9.0	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 17 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	2	2	2	tr.					
Totals/Average			2242	13.8					

Cruise numbers data are compiled from: 1, 3

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Table 18 Bird observations on aerial transects, Northwest Gulf of Alaska, June-August, 1972, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon	1	1	1	tr.	Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross	2	1	4	tr.	Redhead				
Laysan Albatross					Canvasback	1	1	1	tr.
Unid. Albatross					Greater Scaup				
Fulmar	48	29	217	1.0	Lesser Scaup				
Pink-footed Shearwater	2	1	1	tr.	Unid. Scaup				
New Zealand Shearwater	1	1	1	tr.	Common Goldeneye				
Sooty Shearwater	11	7	273	1.3	Barrow's Goldeneye				
Short-tailed Shearwater	4	2	6	tr.	Bufflehead				
Unid. Shearwater	90	55	13911	67.1	Oldsquaw				
Scaled Petrel	11	7	18	0.1	Harlequin Duck				
Fork-tailed Storm Petrel	49	30	676	3.3	Steller's Eider				
Leach's Storm Petrel	6	4	11	0.1	Common Eider	1	1	1	tr.
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	70	43	881	4.3	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter	1	1	25	0.1
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	1	1	tr.	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 18 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	2	1	2	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	16	10	42	0.2
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	4	2	8	0.1
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope	2	1	3	tr.	Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	5	3	10	tr.	Unid. Murre	21	13	143	0.7
Pomarine Jaeger	1	1	1	tr.	Unid. Guillemot	2	16	16	0.1
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	4	2	4	tr.	Unid. Large Alcid	5	3	6	tr.
Skua					Marbled Murrelet				
Glaucous Gull	1	1	1	tr.	Kittlitz's Murrelet				
Glaucous-winged Gull	31	19	207	1.0	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet	1	1	2	tr.
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull	1	1	4	tr.	Unid. Small Alcid	25	15	84	0.4
Black-headed Gull					Horned Puffin	3	2	9	tr.
Bonaparte's Gull					Tufted Puffin	45	27	456	2.2
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	74	45	379	1.8	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

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Table 18 Continued.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	7	4	9	tr.					
Totals/Average			17426	84.1					

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Cruise numbers data are compiled from: 6, 9, 12, 14

Table 19 Bird observations on aerial transects, Northwest Gulf of Alaska, September–November, 1975.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross	1	2	1	tr.	Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	33	62	97	2.0	Lesser Scaup				
Pink-footed Shearwater	1	2	1	tr.	Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater	10	19	12	0.2	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	9	17	38	0.8	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	7	13	12	0.2	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	1	2	4	0.1	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	2	4	14	0.3
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 19 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	1	2	2	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	2	4	10	0.2
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	5	9	14	0.3
Pomarine Jaeger	2	4	3	0.1	Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	18	34	76	1.6
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	15	28	45	0.9	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	1	2	3	0.1	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	13	25	25	0.5
Black-headed Gull					Horned Puffin	1	2	2	tr.
Bonaparte's Gull					Tufted Puffin	15	28	85	1.7
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	21	40	42	0.9	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 19 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	4	8	4	0.1					
Totals/Average			490	10.0					

Cruise numbers data are compiled from: 27, 29

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Table 20 Bird observations on aerial transects, Norton Basin, June-August, 1975.

Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard	1	2	30	0.4
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	1	2	1	tr.	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	1	2	1	tr.	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider	1	2	4	0.1
Ashy Storm Petrel					King Eider	1	2	15	0.2
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider	1	2	3	tr.
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 20 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	5	11	6	0.1
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	30	67	930	11.9
Pomarine Jaeger					Unid. Guillemot	1	2	1	tr.
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	5	11	5	0.1	Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull	4	9	17	0.2	Kittlitz's Murrelet				
Glaucous-winged Gull					Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull	2	4	2	tr.	Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	15	33	83	1.1
Black-headed Gull					Horned Puffin	1	2	3	tr.
Bonaparte's Gull					Tufted Puffin	5	11	11	0.1
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	14	31	69	0.9	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 20 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	1	2	1	tr.					
Totals/Average			1183	15.2					

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73

Cruise numbers data are compiled from: 8

Table 21 Bird observations on aerial transects, Prince William Sound, September-November, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	4	100	25	3.6	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant	1	25	2	0.3	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 21 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/Km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	1	25	1	0.1
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	3	75	62	9.1	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	1	25	2	0.3
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	2	50	3	0.4	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 21 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			74	10.8					

Cruise numbers data are compiled from: 29

70

76

Table 22 Bird observations on aerial transects, Shelikof Strait, June-August, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	8	30	114	3.6	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	3	11	3	0.1	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	11	41	85	2.7	Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter	1	4	2	0.1
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter	1	4	25	0.8
Red-faced Cormorant					Unid. Scoter	1	4	10	0.3
Unid. Cormorant	1	4	3	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

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Table 22 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	6	22	38	1.2
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid	1	4	1	tr.
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	9	33	35	1.1	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	3	11	3	0.1
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin	4	15	6	0.2
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	8	30	108	3.4	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 22 Continued.

Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	1	4	1	tr.					
Totals/Average			434	13.8					

Cruise numbers data are compiled from: 12

73
79

Table 23 Bird observations on aerial transects, St. George Basin, June-August, 1975

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	46	31	121	0.7	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater	1	1	5	tr.	Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	48	33	2404	13.0	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel	11	8	88	0.5	Steller's Eider				
Leach's Storm Petrel	4	3	8	tr.	Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel	1	1	1	tr.	Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	2	1	4	tr.
Unid. Cormorant	5	3	23	0.1	Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

74
80

Table 23 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull	2	1	2	tr.
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope	1	1	3	tr.	Unid. Murre	52	35	1468	8.0
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger	11	8	19	0.1	Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger	6	4	10	0.1	Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	11	8	77	0.4	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid	40	27	121	0.7
Black-headed Gull					Horned Puffin	1	1	1	tr.
Bonaparte's Gull					Tufted Puffin	28	19	158	0.9
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	19	13	34	0.2	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 23 Continued.

Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	I Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird	3	2	4	tr.					
Totals/Average			4551	24.7					

Cruise numbers data are compiled from: 14

76

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Table 24 Bird observations on aerial transects, Upper Cook Inlet, March-May, 1975.

Species Name	Occurrence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	X Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 24 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre				
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull					Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake					Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 24 Continued.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			0	0					

Cruise numbers data are compiled from: 3

79
85

Table 25 Bird observations on aerial transects, Upper Cook Inlet, June-August, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar					Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead				
Unid. Shearwater	1	6	35	1.2	Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider	1	6	1	tr.
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter	1	6	2	0.1
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyr Falcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 25 Continued.

Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	X Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull				
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern	4	22	17	0.6
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre	2	11	57	2.0
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	2	11	123	4.3	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	6	33	235	8.2	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

81

87

Table 25 Continued.

Species Name	Occur- ence	I Occurrence	No. Birds	Birds/Km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/Km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			470	16.4					

Cruise numbers data are compiled from: 6, 9, 12, 14

82

88

Table 26 Bird observations on aerial transects, Upper Cook Inlet, September-November, 1975.

Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	% Occurrence	No. Birds	Birds/km ²
Common Loon					Snow Goose				
Yellow-billed Loon					Unid. Goose				
Arctic Loon					Mallard				
Red-throated Loon					Gadwall				
Unid. Loon					Pintail				
Red-Necked Grebe					Green-winged Teal				
Horned Grebe					American Widgeon				
Western Grebe					Shoveler				
Black-footed Albatross					Redhead				
Laysan Albatross					Canvasback				
Unid. Albatross					Greater Scaup				
Fulmar	1	25	1	0.2	Lesser Scaup				
Pink-footed Shearwater					Unid. Scaup				
New Zealand Shearwater					Common Goldeneye				
Sooty Shearwater					Barrow's Goldeneye				
Short-tailed Shearwater					Bufflehead	1	25	6	1.0
Unid. Shearwater					Oldsquaw				
Scaled Petrel					Harlequin Duck				
Fork-tailed Storm Petrel					Steller's Eider				
Leach's Storm Petrel					Common Eider				
Ashy Storm Petrel					King Eider				
Unid. Storm Petrel					Spectacled Eider				
Brown Pelican					Unid. Eider				
Double-crested Cormorant					White-winged Scoter				
Brandt's Cormorant					Surf Scoter				
Pelagic Cormorant					Black Scoter				
Red-faced Cormorant					Unid. Scoter				
Unid. Cormorant					Unid. Duck				
Whistling Swan					Red-breasted Merganser				
Canada Goose					Bald Eagle				
Black Brant					Gyrfalcon				
Emperor Goose					Peregrine Falcon				
White-fronted Goose					Black Oystercatcher				

Table 26 Continued.

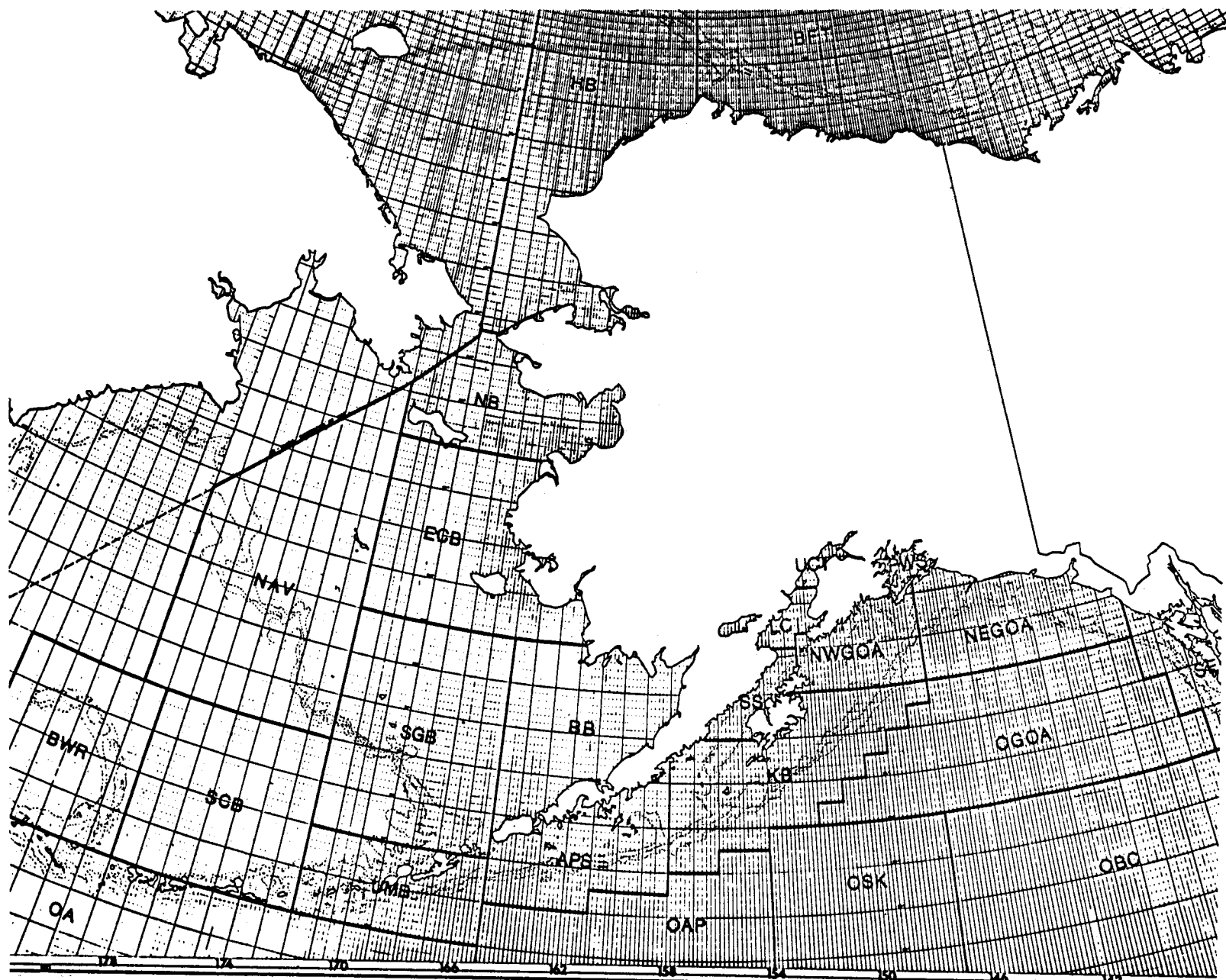
Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²	Species Name	Occur- ence	I Occurrence	No. Birds	Birds/km ²
American Golden Plover					Sabine's Gull				
Unid. Turnstone					Unid. Immature Gull				
Ruddy Turnstone					Unid. Gull	1	25	1	0.2
Black Turnstone					Common Tern				
Whimbrel					Arctic Tern				
Sharp-tailed Sandpiper					Aleutian Tern				
Unid. Sandpiper					Unid. Tern				
Red Phalarope					Common Murre				
Northern Phalarope					Thick-billed Murre				
Unid. Phalarope					Unid. Murre				
Pomarine Jaeger					Unid. Guillemot				
Parasitic Jaeger					Black Guillemot				
Long-tailed jaeger					Pigeon Guillemot				
Unid. Jaeger					Unid. Large Alcid				
Skua					Marbled Murrelet				
Glaucous Gull					Kittlitz's Murrelet				
Glaucous-winged Gull	2	50	4	0.6	Xantus' Murrelet				
Slaty-backed Gull					Ancient Murrelet				
Western Gull					Unid. Murrelet				
Herring Gull					Cassin's Auklet				
Herring/Glaucous-wg. Hyb.					Parakeet Auklet				
Thayer's Gull					Crested Auklet				
California Gull					Least Auklet				
Ring-billed Gull					Rhinoceros Auklet				
Mew Gull					Unid. Small Alcid				
Black-headed Gull					Horned Puffin				
Bonaparte's Gull					Tufted Puffin				
Heermann's Gull					Unid. Puffin				
Ivory Gull					Short-eared Owl				
Unid. Kittiwake	3	75	13	2.1	Snowy Owl				
Black-legged Kittiwake					Tree Swallow				
Red-legged Kittiwake					Black Swallow				
Ross' Gull					Unid. Swallow				

Table 26 Continued.

Species Name	Occurrence	1 Occurrence	No. Birds	Birds/km ²	Species Name	Occurrence	1 Occurrence	No. Birds	Birds/km ²
Common Raven									
Water Pipit									
Bohemian Waxwing									
Orange-crowned Warbler									
Townsend's Warbler									
Wilson's Warbler									
Pine Siskin									
Savannah Sparrow									
White-crowned Sparrow									
Lapland Longspur									
Unid. Passerine									
Unid. Bird									
Totals/Average			18	2.9					

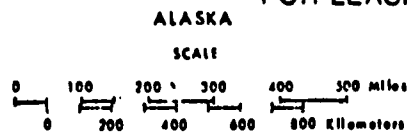
85
91

Cruise numbers data are compiled from: 27

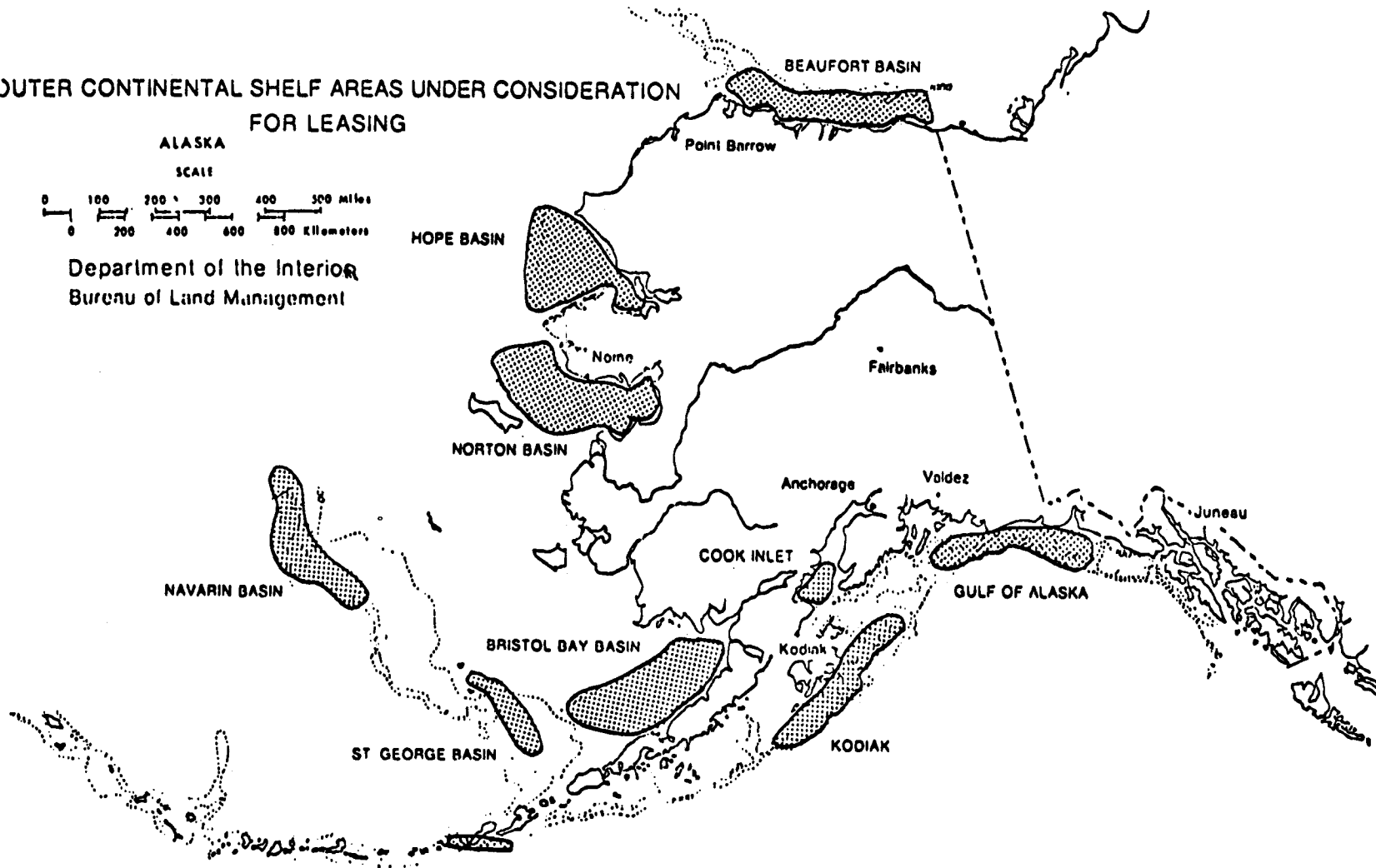


Map 1. Oceanographic regions for which aerial survey data on marine birds are summarized.

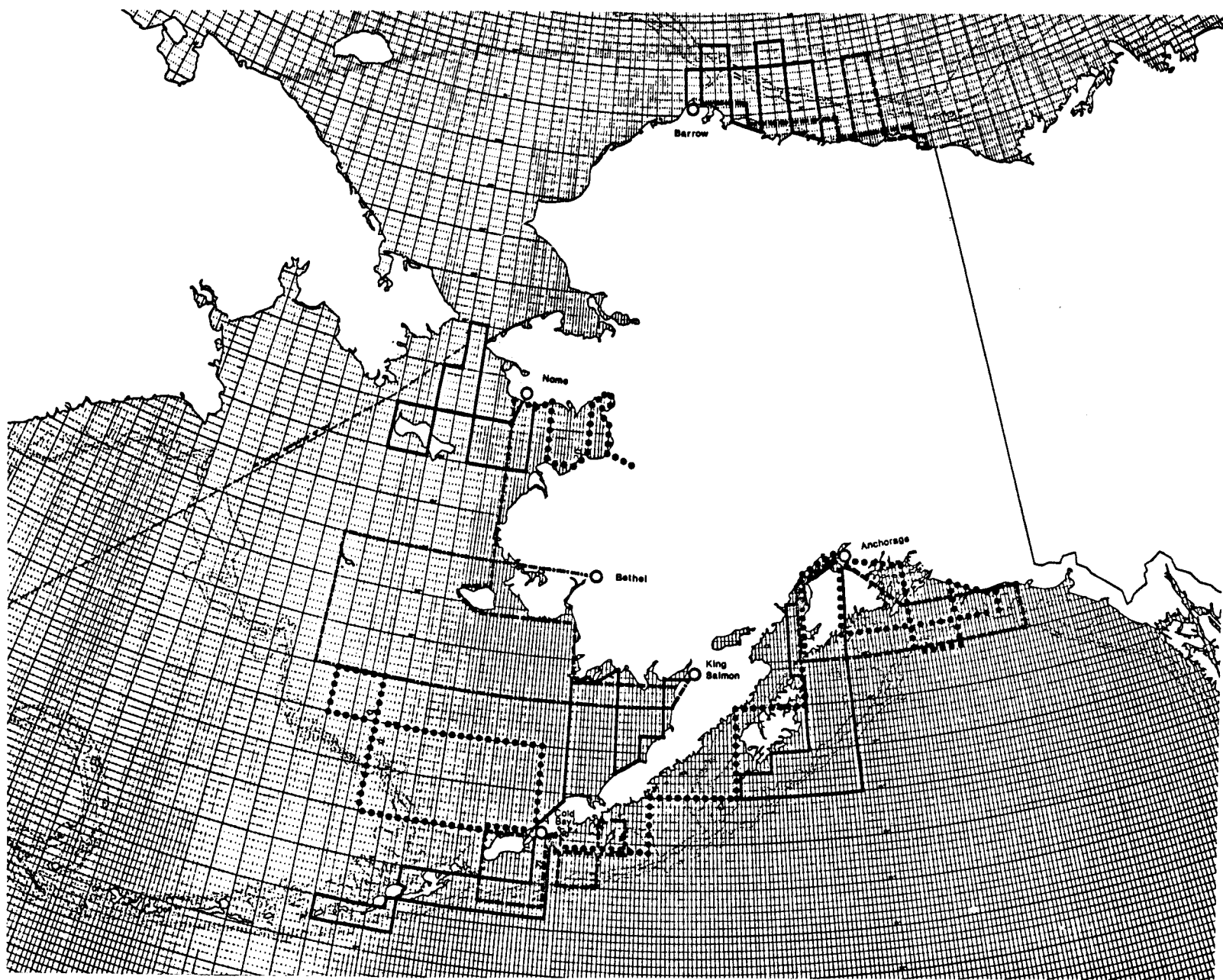
OUTER CONTINENTAL SHELF AREAS UNDER CONSIDERATION
FOR LEASING



Department of the Interior
Bureau of Land Management

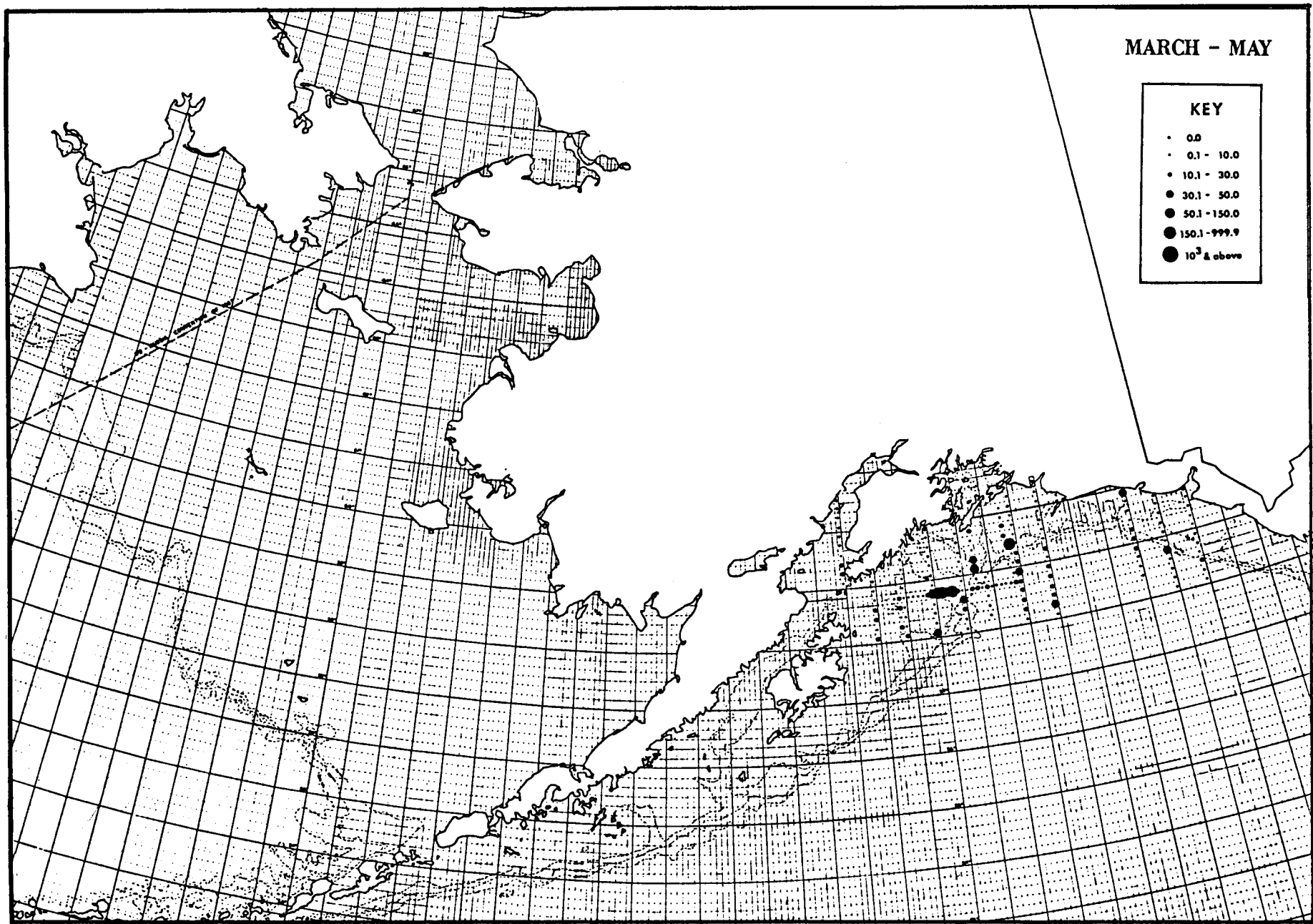


Map 2. Outer continental shelf areas under consideration for leasing (from U.S.D.I. News Release, BLM, November 14, 1974, "BLM announces new tentative OCS lease sale schedule through 1978").

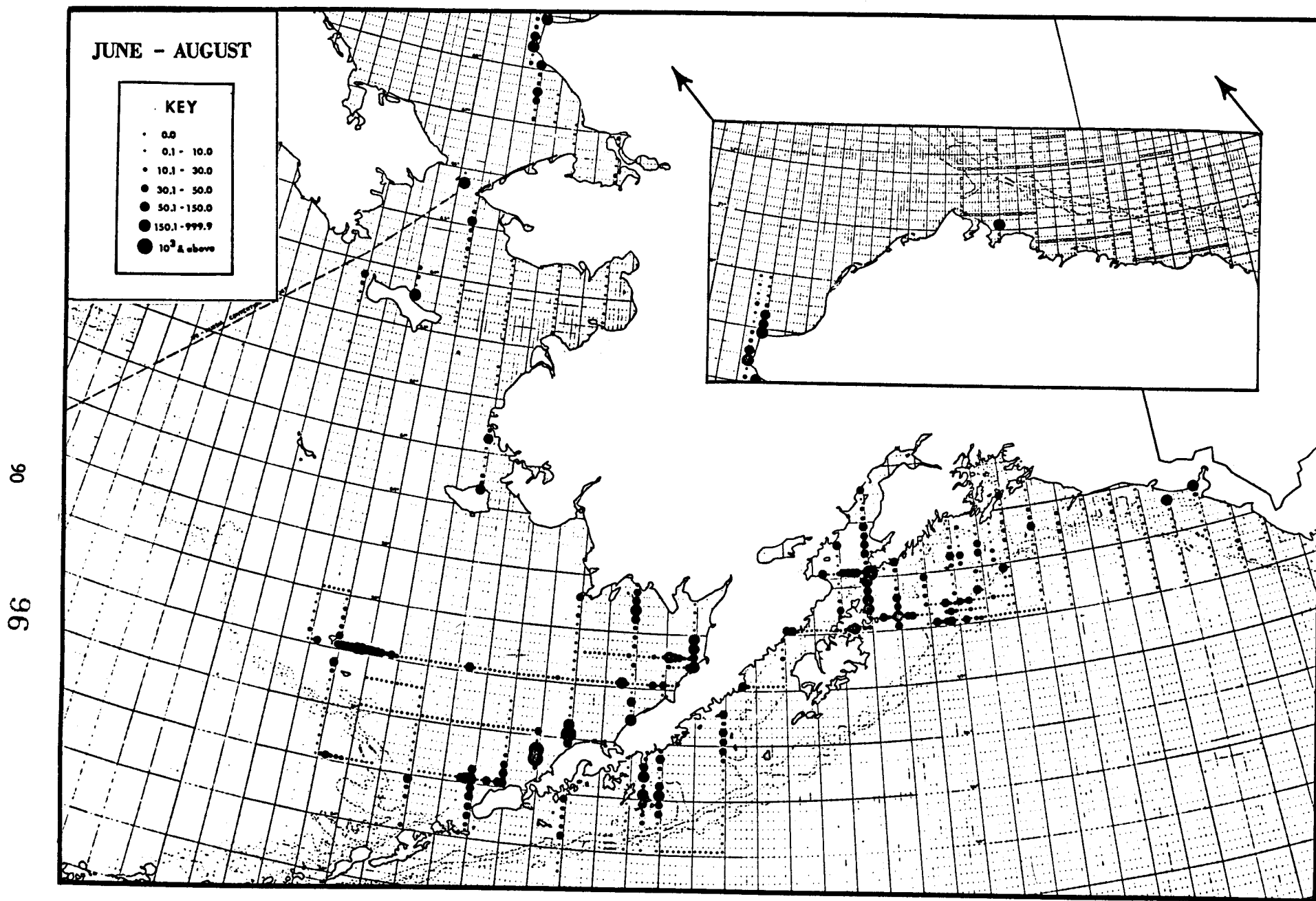


Map 3. Coverage of aerial surveys of marine birds during 1975 and the first quarter of 1976, with transect lines being differentiated by symbols for each day of survey.

69
95

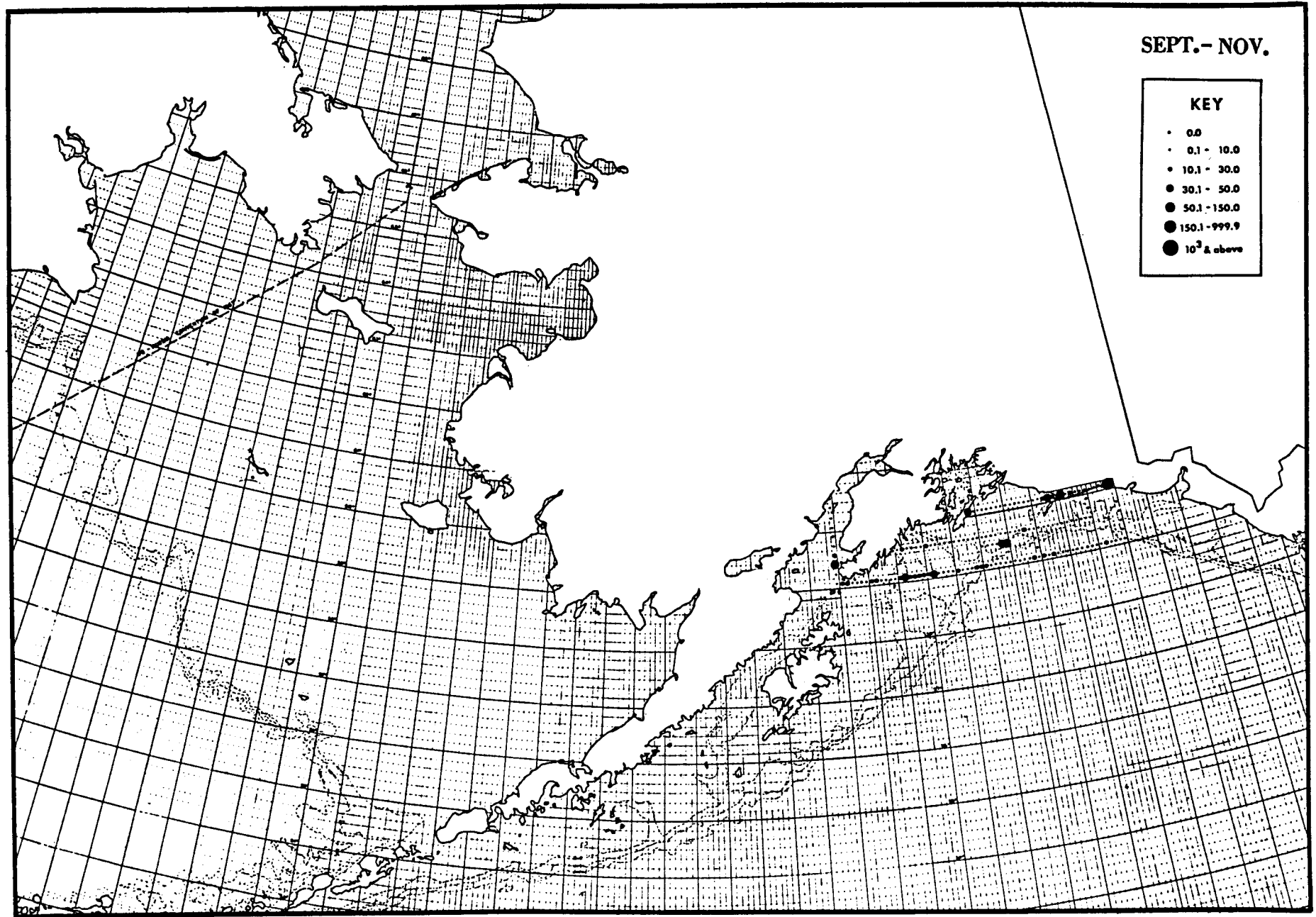


Map 4. Aerial transects showing density of birds per Km², March-May 1972, 1975.

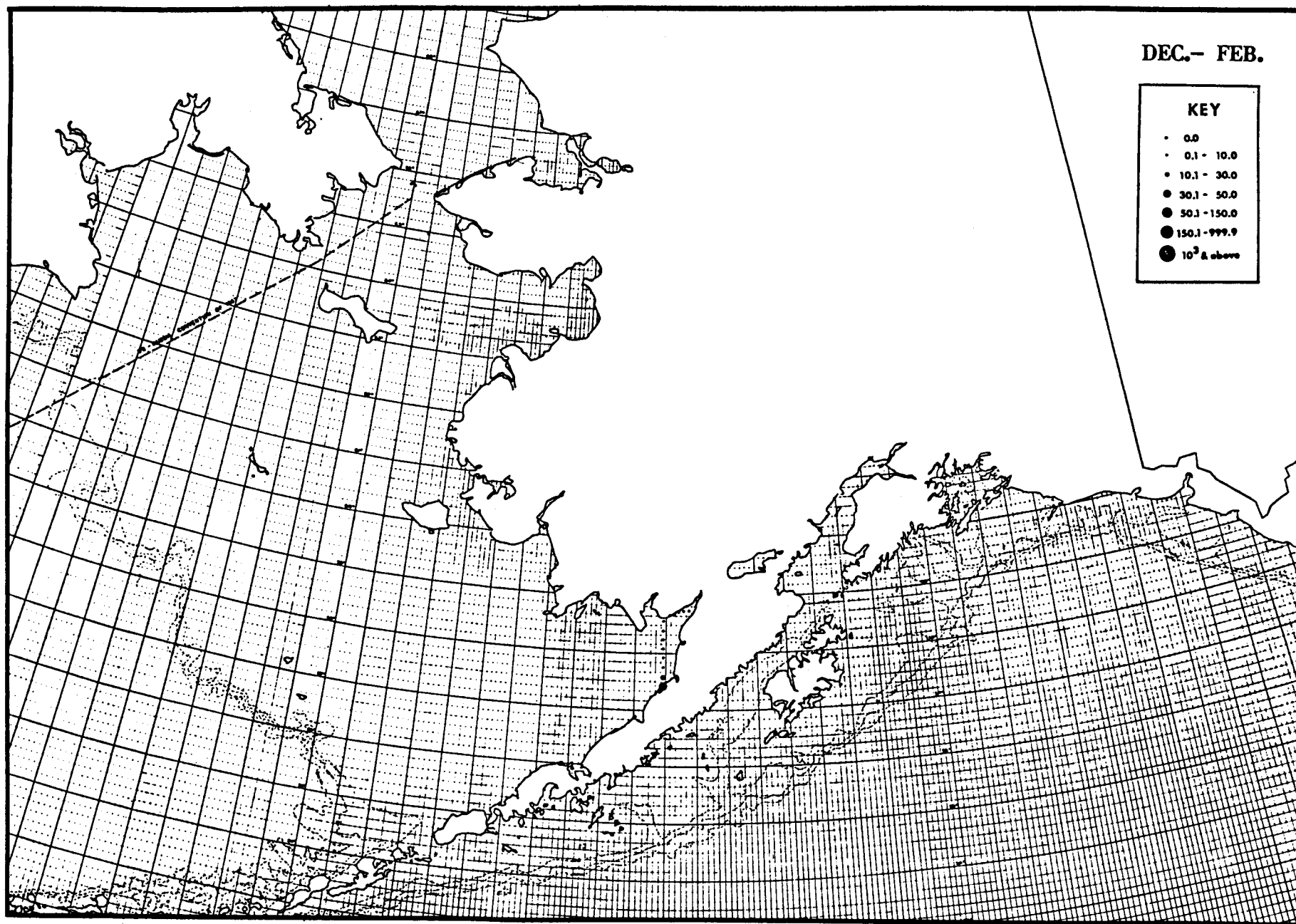


Map 5. Aerial transects showing density of birds per Km², June-August 1973, 1975.

9.7
T6



Map 6. Aerial transects showing density of birds per Km², September-November, 1975.



Map 7. Aerial transects showing density of birds per Km², December-February, 1975.

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PRELIMINARY CATALOG OF SEABIRD COLONIES
AND
PHOTOGRAPHIC MAPPING OF SEABIRD COLONIES

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Abstract. This preliminary catalog identifies 339 seabird colonies lying along the North Pacific coast of Alaska between Cape Fairweather and Unimak Pass. Information is given on location, species composition, population size, and date and source of information. Aerial and ship-board photographs of colonies were taken during 1975 and used to supplement catalog information and aid other OCSEAP investigations. Future efforts in cataloging and photographing colonies are detailed.

INTRODUCTION

The highly conspicuous cliff-nesting seabirds are those most likely to be thought of when seabird colonies are mentioned. Black-legged and red-legged kittiwakes, common and thick-billed murre, glaucous-winged gulls, and any of three species of cormorants are among those birds likely to be encountered at one of the many seabird "cities" along coastal Alaska. Tufted and horned puffins, pigeon and black guillemots are often found in close association with cliff nesters but their nests are less conspicuous. Although the smaller alcids and the storm petrels are abundant in certain Alaskan waters their nesting locations are poorly known, and nests of the marbled and Kittlitz's murrelets are seldom found.

The objectives of the two Research Units covered in this annual report are to catalog seabird colonies, providing information about their location, composition, size, and the amount of land occupied, and to obtain a photographic record of the colonies.

This report contains a preliminary catalog of seabird colonies along the Alaskan coast from Cape Fairweather westward to Unimak Pass and an account of photographic records of colonies made during 1975.

Seabird colonies represent critical habitats that warrant special management consideration by resource planners and developers. While a preliminary catalog, as its name implies, is not a definitive catalog, it nonetheless identifies critical areas, provides a base for which information may be added, upgraded or corrected and identifies deficiencies in the data base.

CURRENT STATE OF KNOWLEDGE

Seabird colonies, their location and species composition, have been reported by many biologists; but there are little published data on the number of birds by species for the Alaskan colonies. Willet was well ahead of his time when he provided estimates of seabird populations nesting on Forrester Island (1915) and St. Lazaria Island (1912). Rausch (1958) estimated the numbers of seabirds on Middleton Island prior to the "Good Friday" earthquake of 1964 which changed appreciably the character of the island and its bird colonies. Bedard (1969) censused and catalogued colonies of least, crested and parakeet auklets on St. Lawrence Island. Fay and Cade (1959) estimated numbers and biomass of all birds on St. Lawrence Island, but information was not well suited for cataloging. Sealy (1973) listed but a few of the many horned puffin colonies within the State that he had censused and as reported in the literature. Tuck (1961) for murre, Fischer (1952) for fulmars, Palmer (1962) for procelliformes and cormorants pinpointed a few of the Alaskan colonies in their world-wide treatment of those groups of birds. Kenyon and Brooks (1960) estimated the size of bird populations on Little Diomed Island. Cade (1952) estimated numbers of

cliff-nesting birds on Sledge Island. Thompson (1967) provided information on birds on Penuk Islands and Northeast Cape of St. Lawrence Island. Swartz (1966) provided the best published assessment of cliff-nesting birds in Alaska with his report about breeding birds at Cape Thompson. Divoky, et al. (1974) presented a catalog of all known breeding records for the black guillemot in Alaska.

While Bent (1919, 1921, 1922), Gabrielson and Lincoln (1959), and Murie (1959) described the location of many seabird colonies within Alaska, they provided little information as to the size and precise location of the colonies.

Regional and state-wide catalogs are even less numerous than the accounts of bird populations at a single colony or group of colonies. Bartonek and Sowl (1972) prepared what is believed to be the first catalog of seabird colonies for a portion of the State. Their catalog summarized published and unpublished information on colonies found along the North Pacific coast from Unimak Pass in Alaska eastward and southward to southern California. LeResche and Hinman (1973) presented the first catalog of seabird colonies for the entire State; but, as with any preliminary effort, some of the larger colonies that were known in the literature as well as those that were identified by Bartonek and Sowl (1972) were omitted from this valuable summary of knowledge about Alaskan wildlife and habitat. In the impact statement on the Alaskan Coastal National Wildlife Refuges which is proposed as part of the Alaska Native Claims Settlement Act legislation are catalogs of colonies found on the western side of the Kenai Peninsula, in the Barren Islands, around Kodiak Island, the coast and islands lying south of the Alaska Peninsula, in the northern Bering Sea, and in the Chukchi Sea.

There are many sources of unpublished information, usually U.S. Fish and Wildlife Service administrative reports, that are being used by us to compile the catalog and will be referenced in the appropriate section. Ongoing and proposed OCSEAP bird studies will begin to contribute importantly to the information on size, composition and value of Alaskan seabird colonies.

STUDY AREA

While contract requirements stipulate information for those regions being considered for oil and gas leasing, the U.S. Fish and Wildlife Service is cataloging all seabird colonies with Alaska as well as the Atlantic, Gulf, and Pacific Coast states. In this report we present a preliminary catalog of colonies located along the North Pacific coast from Cape Fairweather in the east to Unimak Pass in the west.

Subsequent reporting of colonies in coastal areas will generally follow the sequence of proposed leasing schedules, i.e., southern Bering Sea, Beaufort Sea, northern Bering Sea, Chukchi Sea. The Aleutian Islands and southeastern Alaska will be last since they are not included

in the lease schedule (except for the Umnak area which will be included with colonies in the southern Bering Sea.

Aerial photographs of bird colonies in the Pribilof Islands were taken in July 1975. Photographs of colonies along the outer and northern coast of Kodiak Island were taken throughout the summer of 1975. Opportunistic photos of colonies were taken at several localities where U.S. Fish and Wildlife Service personnel aboard OCSEAP vessels were allowed to accompany shore parties.

METHODS

Data for this preliminary catalog were obtained through a review of literature and a synthesis of unpublished reports and data. An open file on each colony is retained in our office (U.S. Fish and Wildlife Service, Office of Biological Services - Coastal Ecosystems, Anchorage, AK) where information will be added, upgraded, or corrected. Photographs or sketches, when available, are included as a part of the open file.

For this summary only information on the size, species composition, and breeding status of the bird populations and the location of the colony are reported. Other information collected, but not reported herein, includes habitat characteristics, land uses, habitation, accessibility, occurrence of mammalian predators or livestock, and other factors which we believe would affect the welfare of the colony or influence the nature of either research or monitoring investigations.

Data are summarized by colony occurrence with the area covered by a standard U.S. Geological Survey 1:250,000-scale topographic map. Figure 1 shows the coverage of the State with those maps, and Table 1 references map name to map number which follows the system used by the U.S. Geological Survey (Orth 1967:4, 5). Open-file reports show colony location on either 1:24,000-scale, 1:63,250-scale, 1:250,000-scale maps, depending upon their availability. Map coverage in this report is shown in Figure 2.

We assigned colonies a 10-digit code for catalog purposes, but only the first 6 digits are used in this report. Digits 1-3 designate the code number for the U.S. Geological Survey maps (Figure 1, Table 1); digits 4-6 are the colony number which is sequentially added for each map as it is acquisitioned; digits 7-8 are for subcolonies; and digits 9-10 are for sample units within either a colony or a subcolony.

Colony numbers and relative size are shown on reductions of the 1:250,000-scale maps and cross-referenced with tabular information on species composition and numbers and source and date of information. Tabular data are segregated by colony occurrence within various oceanographic regions which we subjectively delineated because of sedimentary basins, political boundaries and oceanographic characteristics.

While many persons contributed importantly to the information used in this report, we wish to give particular recognition to the efforts of M. E. "Pete" Isleib for the Northern Gulf of Alaska area, Edgar P. Bailey for the Barren Islands, Vernon Berns for Kodiak Island, and LeRoy W. Sowl, Edgar P. Bailey, and George J. Divoky for coverage of the area lying south of the Alaska Peninsula. Compilation of the information which was available in a variety of forms and formats and final presentation in the tables and figures used in this report was done by Scott A. Hatch and Arthur Sowsls.

RESULTS

Three hundred and thirty-nine seabird colonies from an area along the North Pacific coast of Alaska between Cape Fairweather and Unimak Pass (Figure 2) are cataloged in this report. Place names of the colonies, the source and date of information are listed in Table 2. Tables 3-11 provide data on species composition and numbers for colonies in each oceanographic regions. The location, relative size, and catalog number of colonies are shown in Figures 3-61.

The number of colonies identified in the various oceanographic regions are 22 colonies in the Northwestern Gulf of Alaska (Table 3, Figures 37-41, 54-58), 56 colonies in Prince William Sound (Table 4, Figures 42, 43, 50-55, 57-60); 35 colonies in the Northwestern Gulf of Alaska (Table 5, Figures 35-36, 42-45), no colonies in Upper Cook Inlet (Figures 48-51, 59-61), 6 colonies in Lower Cook Inlet (Table 6, Figures 44-47, 48-49), 57 colonies in Shelikof Strait (Table 7, Figures 26-36), 64 colonies in the Kodiak Basin (Table 8, Figures 20-27), 95 colonies in the Alaska Peninsula South region (Table 9, Figures 5-19), 1 in a portion of the Bristol Bay region (Table 10, Figure 3, 4), and 3 in a portion of the Umnak region (Table 11, Figures 3, 4).

Of the 339 colonies cataloged there were no population estimates for 49 (14 percent) colonies; 46 (14 percent) colonies had from 1 to 100 birds; 94 (28 percent) had from 101 to 1,000 birds; 85 (25 percent) had from 1,001 to 10,000 birds; 51 (15 percent) colonies had from 10,001 to 100,000 birds; and 14 (4 percent) colonies had from 100,000 to nearly 1,000,000 birds. The largest colony reported in this catalog is that on Aghiyak Island (colony number 031 008) where Will Troyer estimated 944,000 birds of three species.

Aerial photographs were taken of bird colonies on cliffs around St. George, St. Paul, Otter and Walrus Islands of the Pribilof Group on July 1974. While resolution was not such that counts of birds were possible, the photographs permit a delineation of the area occupied by the colony. These photos have been sent to Joseph J. Hickey and George L. Hunt, Jr. to aid in their evaluation of bird numbers on these islands.

DISCUSSION

This catalog lists only those colonies known to us through personal experience, personal communications, and unpublished and published reports. We believe that this preliminary catalog is an important beginning to documenting the size and location of Alaskan seabird colonies. Because this catalog lists more colonies ranging between 10,000 and 100,000 birds in size ($n = 51$) than it does those between 1 and 100 birds ($n = 46$), we strongly suspect that a majority of the smaller colonies have been overlooked. This belief is given credence because 28 of 46 (= 61 percent) the colonies ranging in size from 1 and 100 birds and 42 of 94 (= 44 percent) colonies ranging in size between 101 and 1,000 birds were reported within the Prince William Sound-Northeastern Gulf of Alaska-Northwestern Gulf of Alaska where U.S. Fish and Wildlife Service survey efforts have been greatest because of informational requirements associated with the Valdez tanker terminal.

Conspicuous by its absence are data on colonies of storm petrels and small alcids. These birds nest in burrows or talus, and their colonies are not apparent to observers passing by in either boats or aircraft. When considering that fewer than eight nests of Kittlitz's murrelets and possibly only two nests of Marbled murrelets have ever been recorded by ornithologists, it is understandable that they do not contribute importantly to the catalog even though qualitatively and quantitatively they represent important elements of the seabird population within the region treated in this report.

Information varies in quality from colony to colony and usually dependent upon who made the observations and under what circumstances. Accurate counts might be expected where the observer spent several days near a colony during periods when nest attendance was greatest, but counts might be less than that desired when made from an aircraft.

CONCLUSIONS

We believe that the catalog will be one of the most useful products of all OCSEAP studies, since critical habitats that could be impacted by drifting oil or onshore developments will be identified and either avoided or mitigating measures taken.

We recognize that the data in this catalog vary in quality, precision of estimates, and geographical coverage; but nonetheless it provides a base from which information can be added, upgraded or corrected. For some individuals, this preliminary catalog will provide the catalyst to encourage them to systematically collect of colony data, for others it will stimulate them to tell what they know, and thereby show what the "experts" do not know, about Alaskan seabird colonies.

NEEDS FOR FURTHER STUDY

When recognizing the dynamic qualities of the marine bird populations, we realize that the cataloging of Alaskan colonies can never be finalized. There will always be improvements on the quality and quantity of data, especially as census techniques are refined or modified because of our newly gained information on the biology of each species. Until the enigma of the nesting sites of the Kittlitz's and marbled murrelet is solved, the catalog will be missing a significant component.

Because of our activities associated with Research Units #341 and 342; we anticipate a manifold increase in colony information in 1976 for all oceanographic regions included in this catalog. All OCSEAP investigators, especially those working on marine bird studies, will be able to make significant contributions to the base of information.

As previously stated, areas treated in subsequent reports will follow leasing schedules, but eventually the entire State will be included within the catalog.

Photography of colonies will be taken during the breeding season in conjunction with field parties and aerial surveys. Priority will be given to colonies being studied by OCSEAP studies or colonies which are too large to census by conventional means.

SUMMARY OF 4TH QUARTER OPERATIONS

The 4th quarter will provide extensive verification of locations, status, and composition of colonies within the Gulf of Alaska as a result of extensive field studies conducted as part of Research Units 341 and 342. This information will be used to update the present catalog during the 5th quarter and during the 1st quarter FY 77.

Work will continue on identification of colonies in the remainder of Alaska OCS regions for anticipated completion by October 1, 1976.

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Table 1. Numbers and names of U. S. Geological Survey topographic maps, some of which are used in this preliminary catalog of seabird colonies (from Orth 1967).

<i>Map</i>	<i>Name</i>	<i>Map</i>	<i>Name</i>	<i>Map</i>	<i>Name</i>	<i>Map</i>	<i>Name</i>	<i>Map</i>	<i>Name</i>
1	Dixon Entrance	32	Trinity Islands	63	Seward	94	Nome	125	Survey Pass
2	Prince Rupert	33	Kaguyak	64	Cordova	95	Solomon	126	Ambler River
3	Ketchikan	34	Kodiak	65	Bering Glacier	96	Norton Bay	127	Baird Mts.
4	Craig	35	Karluk	66	Mt. St. Elias	97	Nulato	128	Noatak
5	Port Alexander	36	Ugashik	67	McCarthy	98	Ruby	129	Point Hope
6	Petersburg	37	Bristol Bay	68	Valdez	99	Kantishna River	130	De Long Mts.
7	Bradfield Canal	38	Pribilof Islands	69	Anchorage	100	Fairbanks	131	Misheguk Mtn.
8	Sumdum	39	Hagemelster Island	70	Tyonek	101	Big Delta	132	Howard Pass
9	Sitka	40	Nushagak Bay	71	Lime Hills	102	Eagle	133	Killik River
10	Mt. Fairweather	41	Naknek	72	Sleetmute	103	Charley River	134	Chandler Lake
11	Juneau	42	Mt. Katmai	73	Russian Mission	104	Circle	135	Philip Smith Mts.
12	Taku River	43	Afognak	74	Marshall	105	Livengood	136	Arctic
13	Attu	44	Atlin	75	Hooper Bay	106	Tanana	137	Table Mtn.
14	Kiska	45	Skagway	76	Black	107	Melozitna	138	Demarcation Point
15	Rat Islands	46	Yakutat	77	Kwiguk	108	Kateel River	139	Mt. Michelson
16	Gareloi Island	47	Icy Bay	78	Holy Cross	109	Candle	140	Sagavanirktok
17	Adak	48	Middleton Island	79	Iditarod	110	Bendeleben	141	Umiat
18	Atka	49	Blying Sound	80	McGrath	111	Teller	142	Ikpikuk River
19	Sequim	50	Seldovia	81	Talkeetna	112	Shishmaref	143	Lookout Ridge
20	Amukta	51	Iliamna	82	Talkeetna Mts.	113	Kotzebue	144	Utukok River
21	Samalga Island	52	Dillingham	83	Gulkana	114	Selawik	145	Point Lay
22	Umnak	53	Goodnews	84	Nabesna	115	Shungnak	146	Wainwright
23	Unalaska	54	Kuskokwim Bay	85	Tanacross	116	Hughes	147	Meade River
24	Unimak	55	Cape Mendenhall	86	Mt. Hayes	117	Bettles	148	Teshepuk
25	False Pass	56	St. Matthew	87	Healy	118	Beaver	149	Harrison Bay
26	Simeonof Island	57	Nunivak Island	88	Mt. McKinley	119	Fort Yukon	150	Beechey Point
27	Stepovak Bay	58	Baird Inlet	89	Medfra	120	Black River	151	Flaxman Island
28	Port Moller	59	Bethel	90	Ophir	121	Coleen	152	Barter Island
29	Cold Bay	60	Taylor Mts.	91	Unalakleet	122	Christian	153	Barrow
30	Chignik	61	Lake Clark	92	St. Michael	123	Chandalar		
31	Sutwik Island	62	Kenai	93	St. Lawrence	124	Wiseman		

Table 2. Name, colony number, information source and regional location of known seabird colonies from Yakutat to Unimak Pass, Alaska.

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
024 001	Rootok Island	SGB	Sekora	1972
002	Avatanak Island			
003	Akun Island		Lensink	9-30-57
004	Unimak Island	BB	Hatch & Harrison	8-15-75
025 001	Island 38	APS	Sowl	6-19-73
002	Island 83			
003	Palisade Cliff			
004	Sankin Island			
005	High Island			
006	Fawn Island			
007	Let Island			
008	Midun Island			
009	Sozavereka Island			
010	Buyan Rocks			
011	Sushilnoi Island			6-17-73
012	Rose Island			
013	Patton Island			6-19-73
014	Amagat Island			6-18-73
015	Egg Island			
016	Kenmore Head			
017	Sarana Island			6-17-73
018	Hunter Island			
019	Rona Islands			6-19-73
020	Umga Island			
026 001	Bird Island			6-11-73
002	Mountain Point			6-13-73
003	West Saddler Cove			
004	Saddler's Mistake			
005	East Saddler Cove			
006	Saddler Peak			
007	Near Island			
008	Twins			
027 001	South Big Koniuji		Lensink	7-57
002	Unnamed Bay			
003	Yukon Harbor		Sowl	6-13-73
004	Hall Island			6-11-73
005	Koniuji Strait			6-13-73
006	Herendeen Island			6-11-73
007	Atkins Island			
008	Bendel Island			6-13-73
009	Bendel Ranch			
010	Nagai Island			6-10-73
011	Koniuji Point			6-13-73
012	Peninsula Island			
013	Cape Thompson			6-10-73
014	Castle Rock			
015	Bluff Point			6-8-73
016	Kupreonof Point			
017	Fox Cape			

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
027 018	Noon Point	APS	Sowl	6-7-73
019	Leader Island			6-8-73
020	Grub Gulch Islands		Lensink	7-57
021	Spitz Island		Sowl	6-7-73
022	Chaichi Bay			
023	Pinusuk Island			
024	Mitrofanina Island			
025	Brother Islands			
026	Seal Cape			6-6-73
028 001	Iliasik Island			6-16-73
002	Iliasik Passage			
003	Sea Lion Rocks			6-14-73
004	Falmouth Harbor			6-13-73
005	Entrance Island			6-16-73
006	East Dolgoi Entrance			
007	Dolgoi Harbor			
008	Eagle Harbor			6-14-73
009	Clay Island			6-15-73
010	Kennoys Islands			
011	The Pinnacle			
012	Delarof Harbor			6-14-73
013	Halfway Rock Point		Lensink	7-57
014	Wosnesenski Island		Sowl	6-15-73
015	Ulkonoi Island			6-16-73
016	Egg Island			6-15-73
017	Omega Island			
018	Jude Island			
019	The Haystacks			6-10-73
020	Egg Island			6-14-73
021	Andronica West Bay			6-10-73
022	Andronica East Bay			
023	Andronica Islet			
024	Andronica Spires			
025	Andronica Light			
026	Quartz Point			6-9-73
027	Round Island			
028	Dark Cliffs			
029	High Island			
030	Bay Point			6-15-73
031	Flat Island			6-16-73
032	Lump Island			
033	Gull Island			6-9-73
034	Korovin Bay			
035	Henderson Island			
036	Gull Island			6-16-73
037	Ivan Island			
038	Round Island			
039	Karpa Island			6-9-73
040	Guillemot Island			
030 001	Chankliut Island			6-6-73
031 001	South Island	KB	Troyer	5-17-72

continued

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE		
			Investigator ^{2/}	Date	
031 002	Aliksemit Island	KB	Troyer	5-17-72	
003	Chowiet Island				
004	Suklik Island				
005	Kateekuk Island				
006	Kiliktagik Island				
007	Anowik Island				
008	Aghiyuk Island				
009	Aghik Island				
010	Atkulik Island			Sowl	6-5-73
012	Nakchamik Island				
013	Unnamed Island				
014	South Sutwick Island				
015	Volcanic Dike				
016	Foggy Cape				
017	Cape Kumlik				
018	Kumlik Island				6-4-73
019	Garden Island				
020	Hydra Island				
021	Unnamed Island				
022	Ugaiushak Island				
023	Unnamed Island				
024	Central Island				
025	Cape Kuyuyukak				
026	Unnamed Island		Lensink	7-57	
027	Derickson' Island		Sowl	6-4-73	
028	Chiginagak Bay				
029	Navy Island				
032 001	Sundstrom Island		Hatch	5-28-75	
002	Geese Islands		Berns	1972	
033 001	Cape Kiavak		Lensink	1957	
002	Flat Island		Berns	1972	
034 001	Kivak Benchmark		Lensink	1957	
002	Avnulu Creek				
003	John Island		Berns	1972	
004	Sheep Island		Lensink	1957	
005	Cathedral Island				
006	Ghost Rocks				
007	Ladder Island				
008	West Boulder Bay				
009	East Boulder Bay				
010	Gull Point				
011	Alf Island	SS			
012	Carlson Point		Berns	1972	
014	Chiniak Island	KB	Lensink	1957	
015	Middle Island				
016	Svitlak Island				
017	Queer Island				
018	Viesoki Island				
019	Bird Rock	SS			
020	Chief Point				
021	Reef 2	KB	Dick	8-14-75	

continued

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
034 022	Puffin Island	KB	Berns	1972
023	Rock Point	SS	Dick	8-14-75
024	Village Islands			
025	Gull Light		Berns	1972
026	Uganik Passage		Dick	8-14-75
027	Barabara Cove	KB		
028	Barabara Cove Point			
029	Trout Benchmark			
030	Blow Benchmark			
031	Ram Site			
032	Kekur Point			
033	Kizhuyak Point		Lensink	1957
034	Nangolka Point	SS	Berns	1972
035	Nangolka Point Island		Dick	8-14-75
036	Otmeloi Point	KB		
037	Low Island			
038	North Noisy Island	SS		
039	South Noisy Island			
040	Koniuji Island	KB		
041	Bare Island	SS	Lensink	1957
042	Chernof Point	KB	Dick	8-14-75
043	Unnamed Island	SS		
044	Whale Island	KB	Berns	1972
045	Treeless Island		Dick	8-14-75
046	The Triplets		Lensink	1957
047	Middle Bay			
048	Uganik Bay Islets	SS	Dick	8-14-75
035 001	Ayakulik Island		Lensink	1957
002	Gull Island		Berns	1972
003	Portage Bay		Sowl	6-2-73
004	Jute Island			
005	Cape Unalishagvak			
006	Dry Bay			
008	Oil Creek			
009	Klek Benchmark			
010	Cape Aklek			
012	Puale Rocks			
013	Puale Cliff			
014	Alinchak Bay			
015	Portage Creek			
016	Cape Kubugaki			6-1-73
017	Kashvik Bay			
018	Bear Island		Lensink	1957
036 001	Poltava Island		Sowl	6-3-73
002	David Island			
003	Ashiiak Island			
004	Agripina Bay			
005	Cape Kilokak			
006	Imuya Bay			
007	Wide Bay			
008	Slaughter Island			6-2-73

continued

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
036 009	Cape Igvak	SS	Sowl	6-2-73
010	Kanatak Lagoon			
011	Mount Becharof			
012	Kelp Point			
042 001	Mount Pedmar			6-1-73
002	Cape Ilktuitak			
003	Unnamed Island		Lensink	6-57
004	Amalik Bay Islands		Sowl	6-1-73
005	Unnamed Island		Lensink	6-57
006	Geographic Harbor		Sowl	5-31-73
007	Gull Reef			
008	Cape Gull			
009	Kulichkof Island			
010	Aguchik Island			
011	Unnamed Island			
012	Kukak Point Islands			
043 001	South Latax Rock			5-30-73
002	Middle Latax Rock	NWGOA		
003	North Latax Rock			
004	Douglas Reef	SS		
005	Carl Island	NWGOA	Bailey	7-75
006	Sugarloaf Island			
007	Sud Island			
008	Ushagat Island			
009	West Amatuli Island			
010	East Amatuli Island			
011	Nord Island			
046 001	Dry Bay	NEGOA	Patten	1974
002	Situk River		Isleib & Isleib, R.	7-68
003	Yakutat Bay Islands			
004	Cape Enchantment		Shortt	1939
005	Logan Bluffs			
006	Haenke Island		Isleib & Isleib, R.	7-68
048 001	Middleton Island		Isleib, Hall	8-6-74
			Bergman & Vita	
002	Cape St. Elias Pinnacle		Isleib & Hall	7-31-74
003	Kayak Island			
004	Wingham Island			7-30-74
049 001	Chiswell Islands	NWGOA	Sowl	8-71
002	Granite Cape			
003	Granite Island			
004	Harris Bay			
005	Aialik Peninsula			
006	Neck Point		Isleib & Sowl	7-23-72
007	Jeanie Point			
008	Wooded Islands			
009	Nellie Martin River			
010	Resurrection Bay & Cape		Murk, Kessel via Sowl	8-71
			Isleib	5-63
011	Callisto Head		Shaffer	1967
012	Cape Junken		Isleib	5-17-7

continued

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
049 013	Cape Fairfield	NWGOA	Isleib	5-17-73
014	Cape Puget		Isleib & Sowl	7-24-72
015	Point Elington			7-23-72
016	Danger Island		Isleib & Divoky	8-73
017	North Twin Bay		Isleib & Sowl	7-23-72
018	Caines Head		Shaffer	1969
050 001	Gull Island	LCI	Snarski	7-71
002	Perl Island	NWGOA	Sowl	unknown
003	East Chugach Island			
004	Rocky Bay			
005	Port Dick			
006	Gore Point			
007	Gull Island	LCI	ADF&G	
051 001	Nordyke Island		Wohl	
002	Contact Point			
003	Glacier Spit		ADF&G	
062 001	Tuxedni NWR		Snarski	1970-71
063 001	Procession Rocks	NWGOA	Isleib & Sowl	7-24-72
002	Point Pyke			
003	The Needle	PWS		
004	Point Bainbridge	NWGOA		
005	Tiger Glacier	PWS		
006	Montague Island		Isleib & Ray	7-28-72
007	South Icy Bay		Isleib & Sowl	7-24-72
008	Whale Bay			
009	Channel Isle		Isleib & Ray	7-28-72
010	Chenega Glacier		Isleib & Sowl	7-24-72
011	North Icy Bay			
012	South Green Island		Isleib & Ray	
013	Middle Green Island			
014	North Green Island			
015	Knight Island		Isleib & Sowl	7-25-72
016	Bay of Isles		Isleib & Ray	7-31-72
017	Seal Island			
018	Little Smith Island			
019	Smith Island			
020	Eleanor Island			
021	Bass Harbor Island			7-30-72
022	Blackstone Glacier			7-26-72
023	East Point Naked Island			
024	Perry Island			7-28-72
025	West Storey Island			7-30-72
026	East Storey Island			
027	Dutch Group			7-28-72
028	Fool Island			
029	Egg Rocks			
030	Bald Head Chris Island		Isleib	6-69
031	Passage Canal		Isleib & Sowl	7-26-72
032	Esther Rock			
033	Outpost Island		Isleib	7-6-70
034	South Eaglek Bay		Isleib & Ray	7-28-72

continued

Table 2 (continued)

COLONY NO.	COLONY NAME	REGION ^{1/}	INFORMATION SOURCE	
			Investigator ^{2/}	Date
063 035	Granite Point	PWS	Isleib	8-73
036	Mueller Cove		Isleib & Ray	7-30-72
037	Esther Passage			7-75
038	North Eaglek Bay			7-28-72
039	Wells Bay		Isleib	7-7-70
040	Unakwik Inlet		Isleib & Ray	7-30-72
041	Harriman Fiord			7-26-72
064 001	Okalee Spit	NEGOA	Sowl	6-67
002	North Wingham Island		Isleib & Haddock	7-30-74
003	Seal Rocks		Isleib	7-22-72
004	Martin Islands		Isleib & Haddock	7-30-74
005	Cape Hinchinbrook		Isleib	7-22-72
006	Copper River Delta			5 & 6-63
007	Hinchinbrook Island		Isleib & Sowl	7-21-72
008	Porpoise Rocks	PWS		
009	Hook Point	NEGOA		
010	Port Etches	PWS		
011	Point Steel	NEGOA		
012	Boswell Rocks			
013	Pinnacle Rock			
014	Canoe Passage	PWS	Isleib & Ray	8-3-72
015	Gravina Rocks			8-2-72
016	Sheep Bay			8-3-72
017	Hell's Hole			
018	Gull Island			
019	Galena Bay		Isleib & Haddock	8-1-74
020	Point Bentinck	NEGOA	Isleib	5&6-63
068 001	Jack Bay	PWS	Isleib	8-64
002	Shoup Glacier		Isleib & Ray	8-2-72
003	Mineral Creek Islands		Isleib	8-64
004	Shoup Bay			
069 001	Unakwik Reef		Isleib & Ray	7-30-72
002	Jonah Bay			
003	Surprise Glacier			7-26-72
004	Doran Strait			
005	Unakwik Inlet			7-30-72
006	Yale Glacier			7-26-72

^{1/}

NEGOA = Northeastern Gulf of Alaska

NWGOA = Northwestern Gulf of Alaska

PWS = Prince William Sound

LCI = Lower Cook Inlet

SS = Shelikof Strait

KB = Kodiak Basin

APS = Alaska Peninsula South

BB = Bristol Bay

SGB = St. George Basin

Table 2 (continued)

2/

Bailey = Edgar P. Bailey, USFWS
Bergman = Robert D. Bergman, USFWS
Berns = Vernon D. Berns, USFWS
Dick = Matthew H. Dick, USFWS
Divoky = George J. Divoky, USFWS
Haddock = Larry Haddock, USFWS
Hall = George E. (Terry) Hall, USFWS
Harrison = Craig S. Harrison, USFWS
Hatch = Scott A. Hatch, USFWS
Isleib = M.E. (Pete) Isleib, USFWS & commercial fisherman
Isleib, R. = Ruth Isleib, Cordova, Ak.
Kessel = Brina Kessel, University of Alaska
Lensink = Calvin J. Lensink, USFWS
Murk = unidentified
Patten = Samuel M. Patten, Johns Hopkins University
Ray = Tom Ray, USFWS
Sekora = Palmer Sekora, USFWS
Shaffer = Boyd Shaffer, amateur ornithologist
Shortt = Terence M. Shortt. 1939. The summer birds of Yakutat Bay,
Alaska. Contr. Royal Ontario Mus. Zool., 17: 1-30.
Snarski = David J. Snarski, Fairbanks, Ak.
Sowl = Leroy W. Sowl, USFWS
Troyer = Willard A. Troyer, USFWS
Vita = Clair Vita, USFWS
Wohl = Kenton D. Wohl, BLM

Table 3. Summary of data on seabird colonies: Northeastern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		046 001	046 002	046 003	046 004	046 005	046 006
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200				P		
Pelagic Cormorant	0404010500				P	100's	
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	500p	M 500	M 3,000			M 500
Herring Gull	1008010800						
Mew Gull	1008011300		M 100				
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400		M 50p	M 300			
Aleutian Tern	1008070600		P				
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other							
Total		500p	E 700	3,300	?	?	500

P = present p = pairs E = estimated M = minimum

(continued)

Table 3 continued. Summary of data on seabird colonies: Northeastern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		048 001	048 002	048 003	048 004	064 001	064 002
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200		C 16n	C 23n			C 94n
Pelagic Cormorant	0404010500	C 2,774n	C 41n	C 14n			C 49n
Red-faced Cormorant	0404010600		C 59n	C 2n			C 22n
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	E 1,301p	C 110p	E 25p		M 200p	E 95p
Herring Gull	1008010800						
Mew Gull	1008011300	E 6p					
Black-legged Kittiwake	1008030100	C 72,471n	P				C 7,128n
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400					M 100p	
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100	E 5,770p	E 1,230p				E 2,310p
Thick-billed Murre	1010030200	?					P
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100		O				
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			E 4p			
Tufted Puffin	1010140100	E 5,905p	E 3,000p	E 50p	E 5p		E 100p
Other							
Total		E 176,454	E 8,912	E 236	E 10	E 600	E 19,596

F = present C = counted E = estimated M = minimum ? = possibly present (continued)
 O = offshore p = pairs n = nests

Table 3 continued. Summary of data on seabird colonies: Northeastern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		064 003	064 004	064 005	064 006	064 007	064 009
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200			C 30n		C 3n	C 2n
Pelagic Cormorant	0404010500		C 6n	C 32n		C 64n	
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		E 200p	E 100p	E 10,000p	E 25p	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 275n	C 6,710n	C 90n			C 55n
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400				E 1,000p		
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100		E 2,119p				
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		P			E 100p	E 5n
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			E 15p		E 53p	
Tufted Puffin	1010140100		E 1,100p	E 75p		E 1,000p	
Other		E 11 ^a	2p ^b				
Total		E 561	E 20,274	E 684	E 22,000	E 2,490	E 124

P = present C = counted E = estimated p = pairs n = nests

(continued)

^a Brandt's Cormorant ^b Black Oystercatcher

Table 3 continued. Summary of data on seabird colonies: Northeastern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		064 011	064 012	064 013	064 020		
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200	C 2n	C 27n				
Pelagic Cormorant	0404010500		C 41n				
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	C 2p	E 74p		?		
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 52n	C 4,936n	C 700n			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400				?		
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	C 1p	E 5p				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100		E 30p	E 30p			
Other							
Total		E 114	E 10,226	E 1,460	?		

C = counted E = estimated p = pairs
n = nests ? = possibly present, unknown

Table 4. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 003	063 005	063 006	063 007	063 008	063 009
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 380n	C 230n		C 2,350n		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						M 100p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			M 5p		E 40p	M 15p
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						O 1
Horned Puffin	1010130100			M 15p	E 140p	E 35p	
Tufted Puffin	1010140100						M 50p
Other							
Total		E 760	E 460	E 40	E 4,980	E 150	E 330

C = counted E = estimated M = minimum
 O = offshore p = pairs n = nests

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 010	063 011	063 012	063 013	063 014	063 015
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300					M 5p	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 370p	C 550n		C 183n	C 205n	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400					E 20p	M 250p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	E 20p		M 20p		M 5p	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			E 5p			
Tufted Puffin	1010140100			M 10p		M 5p	
Other							
Total		E 780	E 1,100	E 70	E 366	E 480	E 500

C = counted E = estimated M = minimum
 p = pairs n = nests

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 016	063 017	063 018	063 019	063 020	063 021
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 75p	M 20p			E 100p	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 173n				C 277n	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400	M 5p	M 30p				
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		M 30p	M 30p	M 95p		
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100		E 5p	M 80p	M 1p		
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			M 40p	M 60p		
Tufted Puffin	1010140100		M 15p	M 250p	M 550p		M 500p
Other							
Total		E 506	E 200	E 800	E 1,412	E 754	E 1,000

C = counted E = estimated M = minimum

p = pairs n = nests

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 022	063 023	063 024	063 025	063 026	063 027
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 85p					M 175p
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	C 990n					
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						M 450p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	E 70p	M 40p		M 20p	M 25p	M 25p
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100		O 7			M 7p	
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		E 5p	M 10p	E 4p	M 3p	
Tufted Puffin	1010140100		M 45p	E 10p	M 20p	M 40p	E 45p
Other							E 10p ^a
Total		E 2,290	E 180	E 40	E 88	E 150	E 1,410

C = counted

E = estimated

M = minimum

O = offshore

(continued)

p = pairs

n = nests

^a Black Oystercatcher

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 028	063 029	063 030	063 031	063 032	063 033
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			P	E 20p		25p
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100				C 2,780n		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400		M 15p	M 30p			12p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	M 20p			E 20p		P
Ancient Murrelet	1010080100						.
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	8					
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other							
Total		E 48	E 30	E 60	E 5,640	no data	E 74

C = counted E = estimated P = present
M = minimum p = pairs n = nests

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 034	063 035	063 036	063 037	063 038	063 039
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 75p		C 1p			15p
Herring Gull	1008010800						
Mew Gull	1008011300				6n + 17	M 20p	
Black-legged Kittiwake	1008030100	C 33n					
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400			E 80p		M 40p	
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		E 5p				
Tufted Puffin	1010140100		M 10				
Other				C 1p ^a		M 40p ^b	
Total		E 216	E 20	E 164	E 29	E 200	E 30

C = counted E = estimated M = minimum p = pairs

(continued)

n = nests

^a Black Oystercatcher

^b Bonaparte's Gull

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		063 040	063 041	064 008	064 010	064 014	064 015
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	E 5p	E 25p	E 20p			
Herring Gull	1008010800						
Mew Gull	1008011300	M 30p					
Black-legged Kittiwake	1008030100		C 54n	C 975n		C 47n	C 67
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						M 4p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100			E 5p + 1,500nb			
Thick-billed Murre	1010030200			C 1			
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			E 10p			
Tufted Puffin	1010140100			E 570p	E 50p		
Other							1p ^a
Total		E 70	E 158	E 3,081	E 100	E 94	E 77

C = counted E = estimated M = minimum p = pairs
n = nests nb = non-breeders ^a Black Oystercatcher

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		064 016	064 017	064 018	064 019	068 001	068 002
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		M 50p	M 20p			
Herring Gull	1008010800						
Mew Gull	1008011300	P	M 20p			5p	
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400	E 50p	M 50p	M 5p	M 10p	2p	M 20p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other			2p ^a	1p ^a			
Total		E 100	E 244	E 52	E 20	E 14	E 40

E = estimated P = present M = minimum

(continued)

p = pairs ^a Black Oystercatcher

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		068 003	068 004	069 001	069 002	069 003	069 004
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			M 20p	E 500	E 50p	
Herring Gull	1008010800						
New Gull	1008011300						
Black-legged Kittiwake	1008030100		E 195p			C 514n	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400	M 25p		M 50p	E 250		
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other				E 1p ^a			E 30p ^b
Total		E 50	E 390	E 142	750	E 1,128	E 60

C = counted E = estimated M = minimum p = pairs
n = nests ^a Black Oystercatcher ^b Bonaparte's Gull

(continued)

Table 4 continued. Summary of data on seabird colonies: Prince William Sound.

SPECIES	Code No. (88+)	COLONY					
		069 005	069 006				
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		M 2,000p				
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		C 827n				
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400		M 150p				
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other		0 10,000 ^a	E 3p ^b				
Total		10,000	E 5,960				

C = counted E = estimated M = minimum O = offshore p = pairs

n = nests ^a Kittlitz's Murrelet ^b Black Oystercatcher

Table 5. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		043 002*	043 003*	043 005	043 006	043 007	043 008
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100				P	P	
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	250		50	240		200
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600					70	
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	200	P		1,600	500	240
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		P		16	20	100
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100					20	10
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100					1,000	
Horned Puffin	1010130100			40	600	400	250
Tufted Puffin	1010140100			1,000	9,500	1,000	100
Other							
Total		450	?	1,090	11,956	3,010	900

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 5 continued. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		043 009	043 010	043 011	049 001	049 002	049 003
Northern Fulmar	0302020100		20				
Fork-tailed Storm Petrel	0303020100	P	P				
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	870	30	40		500	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	2,300	450	80			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	300	13,000	20,000	2,000	2,000	25,000
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100	10	61,000	30,000			
Thick-billed Murre	1010030200		P				
Pigeon Guillemot	1010050200		50	8			
Ancient Murrelet	1010080100			2			
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	120	360	400			
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	1,300	13,000	40	5,000	100	1,000
Tufted Puffin	1010140100	93,000	95,000	5,000	40,000	200	10,000
Other							
Total		96,910	182,910	55,570	47,000	2,800	36,000

P = present

(continued)

Table 5 continued. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		049 004	049 005	049 006	049 007	049 008	049 009
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100					P	
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	E 200					
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500			300		C 72n	
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	E 500	E 1,000		E 10p	E 50p	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		E 10,000			C 780n	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						M 100p
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100					P	
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200					500p	
Ancient Murrelet	1010080100			P		P	
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100					M 100p	
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100					M 15p	
Horned Puffin	1010130100			E 5p	E 5p	E 300p	
Tufted Puffin	1010140100		E 1,000	E 50p	E 50p	E 7,000p	
Other							
Total		700	12,000	E 410	E 130	E 17,634	E 200

P = present C = counted E = estimated
M = minimum p = pairs n = nests

(continued)

Table 5 continued. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		049 010	049 011	049 012	049 013	049 014	049 015
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100	?					
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						E 240
Double-crested Cormorant	0404010200	P	P				
Pelagic Cormorant	0404010500	P					C 5n
Red-faced Cormorant	0404010600	P					C 75n
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		P	M 30p	M 10p		E 280p
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100	P					170
Thick-billed Murre	1010030200	?					
Pigeon Guillemot	1010050200	P	P	M 10p	M 3p		E 40p
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	?					
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100	?					
Horned Puffin	1010130100	P	P			M 15p	E 100p
Tufted Puffin	1010140100	M 1,000	P	M 30	M 100		E 800p
Other							
Total		M 30,000	M 100	110	126	E 30	E 3,010

P = present ? = possibly present C = counted E = estimated
M = minimum p = pairs n = nests

(continued)

Table 5 continued. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		049 016	049 017	049 018	050 002	050 003	050 004
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000				300	300	
Double-crested Cormorant	0404010200			P			
Pelagic Cormorant	0404010500		C 16n				
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 25		P		1,000	2,500
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		C 25n		5,000		10,000
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400	M 30					
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			P			
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		E 5p				
Tufted Puffin	1010140100		E 400p		P	P	
Other		4 ^a					
Total		59	E 892	M 50	5,300	1,300	12,500

P = present C = counted E = estimated M = minimum

p = pairs n = nests ^a Black Oystercatcher

(continued)

Table 5 continued. Summary of data on seabird colonies: Northwestern Gulf of Alaska.

SPECIES	Code No. (88+)	COLONY					
		050 005	050 006	063 001	063 002	063 004	
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	1,500	P				
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	500			E 500p		
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		1,000				
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200					E 20p	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			E 30p	E 10p	E 100p	
Tufted Puffin	1010140100						
Other							
Total		2,000	1,000	E 60	E 1,020	E 240	

P = present E = estimated p = pairs

Table 6. Summary of data on seabird colonies: Lower Cook Inlet.

SPECIES	Code No. (88+)	COLONY					
		050 001	050 007	051 001	051 002	051 003	062 001
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			P	P	P	
Double-crested Cormorant	0404010200	P					500
Pelagic Cormorant	0404010500	P					E 25
Red-faced Cormorant	0404010600	P					
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	P				P	E 2,000
Herring Gull	1008010800	P					
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	P	P				45,000
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400	P					
Aleutian Tern	1008070600						
Murre	1010030000		P				
Common Murre	1010030100	P					E 25,000
Thick-billed Murre	1010030200	P					
Pigeon Guillemot	1010050200		P				P
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						6
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						2
Horned Puffin	1010130100						E 5,000
Tufted Puffin	1010140100						E 1,000
Other							p ^a , b, c
Total		?	?	?	?	?	E 78,525

P = present E = estimated

^a Kittlitz's Murrelet ^b Marbled Murrelet ^c Black Oystercatcher

Table 7. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		034 011	034 012*	034 019	034 020	034 023	034 024
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000					25	335
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			P			962
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	P			P		25
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						10
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						2,095
Other				P ^a			
Total		?	?	?	?	25	3,427

* = status of site as a breeding colony unconfirmed

(continued)

P = present ^a unidentified puffin

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		034 025	034 026	034 034	034 035	034 038	034 039
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	M 5n	5		40	100	70
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 50	470	M 100	120	1,100	160
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		850		1,500	1,100	100
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100				4		7
Tufted Puffin	1010140100	M 15n	690		1,800	14,000	2,500
Other							
Total		E 90	2,010	100	3,464	16,300	2,837

M = minimum n = nests E = estimated

(continued)

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		034 041	034 043	034 048	035 001*	035 002	035 003*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			P	P		3,000
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	P			P		
Herring Gull	1008010800						
Mew Gull	1008011300					M 100	
Black-legged Kittiwake	1008030100	P	3,500	300			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						?
Tufted Puffin	1010140100		1,200	220			
Other							
Total		?	4,700	520	?	100	3,000

* = status of site as a breeding colony unconfirmed

(continued)

P = present - ? = possibly present M = minimum

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		035 004	035 005	035 006*	035 008	035 009*	035 010
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000				2,000		
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	2,500	2,000	200			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		3,000				
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000		275,000		200,000		
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		2,000			500	4,000
Tufted Puffin	1010140100	15,000					
Other							
Total		17,500	282,000	200	202,000	500	4,000

* - status of site as a breeding colony unconfirmed

(continued)

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		035 012	035 013	035 014	035 015*	035 016*	035 017*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100	?					
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	1,200	1,500			P	250
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	1,000	1,000		500	P	100
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000	200	M 6,000				
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			50			
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	1,500	1,000				
Tufted Puffin	1010140100	M 10,000		500			
Other							
Total		13,900	9,500	550	500	?	350

* = status of site as a breeding colony unconfirmed

(continued)

M = minimum P = present ? = possibly present, unknown

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		035 018*	036 001	036 002	036 003	036 004*	036 005
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	P	500	1,000		100	150
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		1,000	1,000	500	300	150
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		2,000	4,000	5,000	300	
Tufted Puffin	1010140100		5,000	12,000	20,000		1,300
Other							
Total		?	8,500	18,000	25,500	700	1,300

* - status of site as a breeding colony unconfirmed

(continued)

P = present

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		036 006*	036 007*	036 008*	036 009*	036 010*	036 011*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		600				
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	100		1,700	3,000	3,000	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						P
Tufted Puffin	1010140100						
Other							
Total		100	600	1,700	3,000	3,000	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		036 012*	042 001*	042 002	042 003	042 004	042 005
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		50	150	P	800	P
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	50	200	600		500	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200					150	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100			1,000	P	4,000	P
Other							
Total		50	250	1,750	?	5,450	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		042 006	042 007	042 008	042 009*	042 010	042 011*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		75	100			
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	150	100	100	50		100
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			50			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			P			
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100			P			
Other						1n ^a	
Total		150	175	250	50	1n	100

* = status of site as a breeding colony unconfirmed

(continued)

P = present n = nest ^a Bald Eagle

Table 7 continued. Summary of data on seabird colonies: Shelikof Strait.

SPECIES	Code No. (88+)	COLONY					
		042 012*	043 001	043 004*			
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	75					
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	80	500	M 200			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		400				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other							
Total		155	900	200			

* = status of site as a breeding colony unconfirmed

M = minimum

Table 8. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		031 001	031 002	031 003	031 004	031 005	031 006
Northern Fulmar	0302020100	5,000	5,000	30,000	65,000	98,000	65,000
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	30,000	30,000	55,000		1,000	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000	50,000	200,000	435,000	95,000	22,000	
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100				65,000		
Other							
Total		85,000	235,000	520,000	225,000	121,000	65,000

(continued)

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		031 007	031 008	031 009	031 010	031 012*	031 013
Northern Fulmar	0302020100	25,000	38,000	55,000			
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300				3,000	300	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	17,000	245,000	42,000	16,000		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000	52,000	661,000	39,000	33,000		
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200				2,000		
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100				500		500
Tufted Puffin	1010140100	10,000		5,000	2,500		6,000
Other							
Total		104,000	944,000	141,000	57,000	300	6,500

* - status of site as a breeding colony unconfirmed

(continued)

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		031 014*	031 015*	031 016*	031 017	031 018	031 019
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			300			
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	200	700	400			500
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200					P	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100					P	
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100					P	
Tufted Puffin	1010140100				2,000	P	P
Other							
Total		200	700	700	2,000	?	500

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		031 020	031 021	031 022	031 023	031 024	031 025
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						500
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500			600			
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		300	2,500	400		1,400
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			7,000			17,000
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000			13,000			9,000
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		300		3,000		
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100					P	
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		500	14,000	2,000	3,000	
Tufted Puffin	1010140100	4,500	7,000	10,000	5,000	90,000	2,000
Other				300 ^a			
Total		4,500	8,100	57,400	10,400	93,000	29,900

P = present ^a Common Eider

(continued)

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		031 026	031 027*	031 028	031 029	032 001	032 002
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		60		150		P
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			590	300	500	P
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	P					
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		100	2,000	1,200		
Tufted Puffin	1010140100			15,000	3,500	800	
Other							pa
Total		?	160	17,590	5,150	1,300	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present a unidentified puffin

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		033 001	033 002	034 001*	034 002	034 003	034 004
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	P				100	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			P			P
Herring Gull	1008010800						
Mew Gull	1008011300						P
Black-legged Kittiwake	1008030100			P			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100		M 2,000		P		
Other							P ^a
Total		?	2,000	?	?	1,100	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present M = minimum ^a unidentified tern

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		034 005	034 006	034 007	034 008	034 009	034 010
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	P	P				
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	P		P			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	P			P	P	P
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100	P		P			
Other							
Total		?	?	?	?	?	?

P = present

(continued)

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		034 Q14	034 015	034 016	034 017*	034 018	034 021
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						20
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		P			P	30
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	P		P		P	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100	P	P			P	200n
Other							
Total		?	?	?	?	?	E 450

* = status of site as a breeding colony unconfirmed

(continued)

P = present n = nests E = estimated

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		034 022	034 027	034 028	034 029	034 030	034 031
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	30n	15	40			
Double-crested Cormorant	0404010200					15	
Pelagic Cormorant	0404010500						15
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	100n	20				
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			1,300	120		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	P					
Tufted Puffin	1010140100	100n	25				
Other		20n ^a					
Total		E 500	60	1,340	120	15	15

P = present n = nests E = estimated ^a Steller's Eider

(continued)

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		034 032	034 033	034 036	034 037	034 040	034 042*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			2	10	P	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		P	5	10		
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	400	P		50		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100				10		7
Tufted Puffin	1010140100			30	900n	130	
Other			P*				
Total		400	?	37	E 1,880	130	7

* = status of site as a breeding colony unconfirmed

(continued)

P = present E = estimated n = nests * unidentified puffin

Table 8 continued. Summary of data on seabird colonies: Kodiak Basin.

SPECIES	Code No. (88+)	COLONY					
		034 044	034 045	034 046	034 047		
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		400				
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	M 3,000		P			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000			P			
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100		130		P		
Other							
Total		3,000	530	?	?		

P = present M = minimum

Table 9. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		025 001	025 002	025 003*	025 004	025 005	025 006
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600			300	600	2000	
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	100	P	500		300	P
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		12,000				
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000		6,000				
Common Murre	1010030100					300	
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	50	P		100	200	150
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		2,000		1,000	40,000	300
Tufted Puffin	1010140100	2500	10,000		7,000	20,000	2,500
Other							
Total		2650	30,000	800	8,700	62,800	2,950

* = status of the site as a breeding colony unconfirmed

(continued)

P = present

Table 9 cont. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		025 007	025 008	025 009	025 010	025 011	025 012
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600		P				
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	1,000	1,500	300	M 500	600	1,000
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100		3,000				
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000		6,000				
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	P	P	400	100		P
Ancient Murrelet	1010080100		?				
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	P		P			
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Borned Puffin	1010130100	3,000	3,000	10,000	400		
Tufted Puffin	1010140100	10,000	12,000	1,500	4,000	7,000	P
Other							
Total		14,000	25,500	12,200	5,000	7,600	1,000

P = present ? = possibly present M = minimum

(continued)

Table 9 cont. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		025 013	025 014	025 015	025 016	025 017*	025 018*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600	250	200	P	1,000		
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	M 300	12,000	1,400		?	
Herring Gull	1008010800						
New Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	100	400			?	?
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	?	M 1,000				
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	300	50,000	1,500		?	?
Tufted Puffin	1010140100	2,000	40,000	3,000		?	
Other							
Total		2,950	103,600	5,900	1,000	?	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present ? = possibly present M = minimum

Table 9 cont. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		025 019	025 020	026 001	026 002	026 003*	026 004*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			6,000		200	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600		80				
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	1,500	P				2,000
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			43,000			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000			24,000			
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	200	300				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100		P				
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	200	3,000				
Tufted Puffin	1010140100	6,000	22,000	P	8,000		
Other							
Total		7,900	25,380	73,000	8,000	200	2,000

* = status of the site as a breeding colony unconfirmed

(continued)

P = present

Table 9 cont. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		026 005*	026 006*	026 007	026 008	028 001*	028 002*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			40		1,100	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600				2,000		
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	3,000		2,500	500		500
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			6,000	6,500		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000				200		
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			P			
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		500	7,000	2,000		
Tufted Puffin	1010140100			8,000	18,000		
Other							
Total		3,000	500	23,540	29,200	1,100	500

* = status of site as a breeding colony unconfirmed

(continued)

P = present, not counted

Table 9 cont. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 003*	028 004*	028 005*	028 006*	028 007	028 008*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	150	1,400	200	500	250	700
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200				100	100	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100					6,000	
Other							
Total		150	1,400	200	600	6,350	700

* - status of site as a breeding colony unconfirmed

(continued)

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 009*	028 010	028 011	028 012	028 013	028 014
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000				2,000		P
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600			600			1,200
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	1,000	1,200		500		
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	200			55,000	P	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000					P	
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		50		P		200
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100				1,000		
Tufted Puffin	1010140100		500	1,000	6,000		5,400
Other							
Total		1,200	1,750	1,600	64,500	?	6,800

* = status of site as a breeding colony unconfirmed

(continued)

P = present, no estimate

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 015	028 016*	028 017*	028 018	028 019	028 020
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	60					
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	100	500				3,500
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100					22,000	40
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000					30,000	
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200			150	3,000	500	
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100					5,000	1,000
Tufted Puffin	1010140100	500				19,000	8,000
Other							
Total		660	500	150	3,000	76,500	12,540

* = status of site as a breeding colony unconfirmed

(continued)

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 021*	028 022*	028 023*	028 024*	028 025	028 026*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			600		50	400
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100				250		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	30	200				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	200	300		300		
Tufted Puffin	1010140100					6,000	
Other							
Total		230	500	600	550	6,050	400

* = status of site as a breeding colony unconfirmed

(continued)

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 027	028 028	028 029	028 030	028 031	028 032
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	80	1,200				
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600				5,000		
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	2,400	2,400	2,000			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	9,000			13,000		
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000				6,000		
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200				1,000		50
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	4,000		500			
Tufted Puffin	1010140100	4,000		6,000		200	250
Other							
Total		19,480	3,600	8,500	25,000	200	300

(continued)

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 033	028 034*	028 035	028 036*	028 037	028 038
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000					600	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300			300		3,000	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						1,500
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	20	P	20		300	100
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	150	P	200		300	
Tufted Puffin	1010140100	300	P	300	100	300	400
Other							
Total		470	?	820	100	4,500	2,000

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		028 039	028 040*	027 001	027 002*	027 003	027 004
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000		300				50
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	6,000	300				400
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						200
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000	240,000					
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						1,500
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						P
Parakeet Auklet	1010100100						4,000
Crested Auklet	1010110100					10,000	
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	7,000					
Tufted Puffin	1010140100	10,000					2,000
Other				p ^a	p ^b		
Total		263,000	600	?	?	10,000	8,150

* = status of site as a breeding colony unconfirmed

(continued)

P = present ^a unidentified puffin ^b unidentified auklet

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		027 005	027 006	027 007	027 008	027 009*	027 010*
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000				50		
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300		5,000			2,500	
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	3,000		2,500			P
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100		P				
Parakeet Auklet	1010100100	10,000	9,000	M 5,000			
Crested Auklet	1010110100	50,000					
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100	140,000	500	500	P		P
Tufted Puffin	1010140100		9,000	8,000	2,000		
Other							
Total		203,000	23,500	16,000	2,050	2,500	?

* = status of site as a breeding colony unconfirmed

(continued)

P = present M = minimum

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		027 011	027 012	027 013	027 014	027 015	027 016
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000			600		1,700	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						300
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			4,800	6,000		400
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000				8,000		
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200	4,000	2,500				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100	1,000			P		
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100			600	20,000		1,000
Tufted Puffin	1010140100	2,000	35,000	1,200	85,000	3,000	3,500
Other							
Total		7,000	37,500	7,200	119,000	4,700	5,200

P = present

(continued)

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		027 017	027 018	027 019	027 020*	027 021	027 022
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	1,200	100	1,200		2,000	3,000
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100				P	18,000	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000					200,000	
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		100			1,500	
Tufted Puffin	1010140100	4,000	3,000	3,500		12,000	13,000
Other							
Total		5,200	3,200	4,700	?	233,500	16,000

* = status of site as a breeding colony unconfirmed

(continued)

P = present

Table 9 continued. Summary of data on seabird colonies: Alaska Peninsula South.

SPECIES	Code No. (88+)	COLONY					
		027 023	027 024	027 025	027 026	030 001	
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000	50	300		2,200	700	
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300	4,000	700	1,500			
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100	500		8,000		500	
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000			0 10,000		3,000	
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200		4,000				
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100		35,000	1,500	P	?	
Tufted Puffin	1010140100	9,000	6,000	45,000	P	?	
Other							
Total		13,550	46,000	66,000	2,200	4,200	

0 = offshore P = present ? = possibly present

Table 10. Summary of data on seabird colonies: Bristol Bay Basin.

SPECIES	Code No. (88+)	COLONY					
		024	004				
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600	50					
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100						
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100						
Other							
Total		50					

Table 11. Summary of data on seabird colonies: St. George Basin.

SPECIES	Code No. (88+)	COLONY					
		024 001	024 002	024 003			
Northern Fulmar	0302020100						
Fork-tailed Storm Petrel	0303020100						
Leach's Storm Petrel	0303020200						
Cormorant	0404000000						
Double-crested Cormorant	0404010200						
Pelagic Cormorant	0404010500						
Red-faced Cormorant	0404010600						
Glaucous Gull	1008010100						
Glaucous-winged Gull	1008010300						
Herring Gull	1008010800						
Mew Gull	1008011300						
Black-legged Kittiwake	1008030100			P			
Red-legged Kittiwake	1008030200						
Sabine's Gull	1008050100						
Arctic Tern	1008070400						
Aleutian Tern	1008070600						
Murre	1010030000						
Common Murre	1010030100						
Thick-billed Murre	1010030200						
Pigeon Guillemot	1010050200						
Ancient Murrelet	1010080100						
Cassin's Auklet	1010090100						
Parakeet Auklet	1010100100						
Crested Auklet	1010110100						
Least Auklet	1010110200						
Whiskered Auklet	1010110300						
Rhinoceros Auklet	1010120100						
Horned Puffin	1010130100						
Tufted Puffin	1010140100	100,000	50,000				
Other							
Total		100,000	50,000	?			

P = present

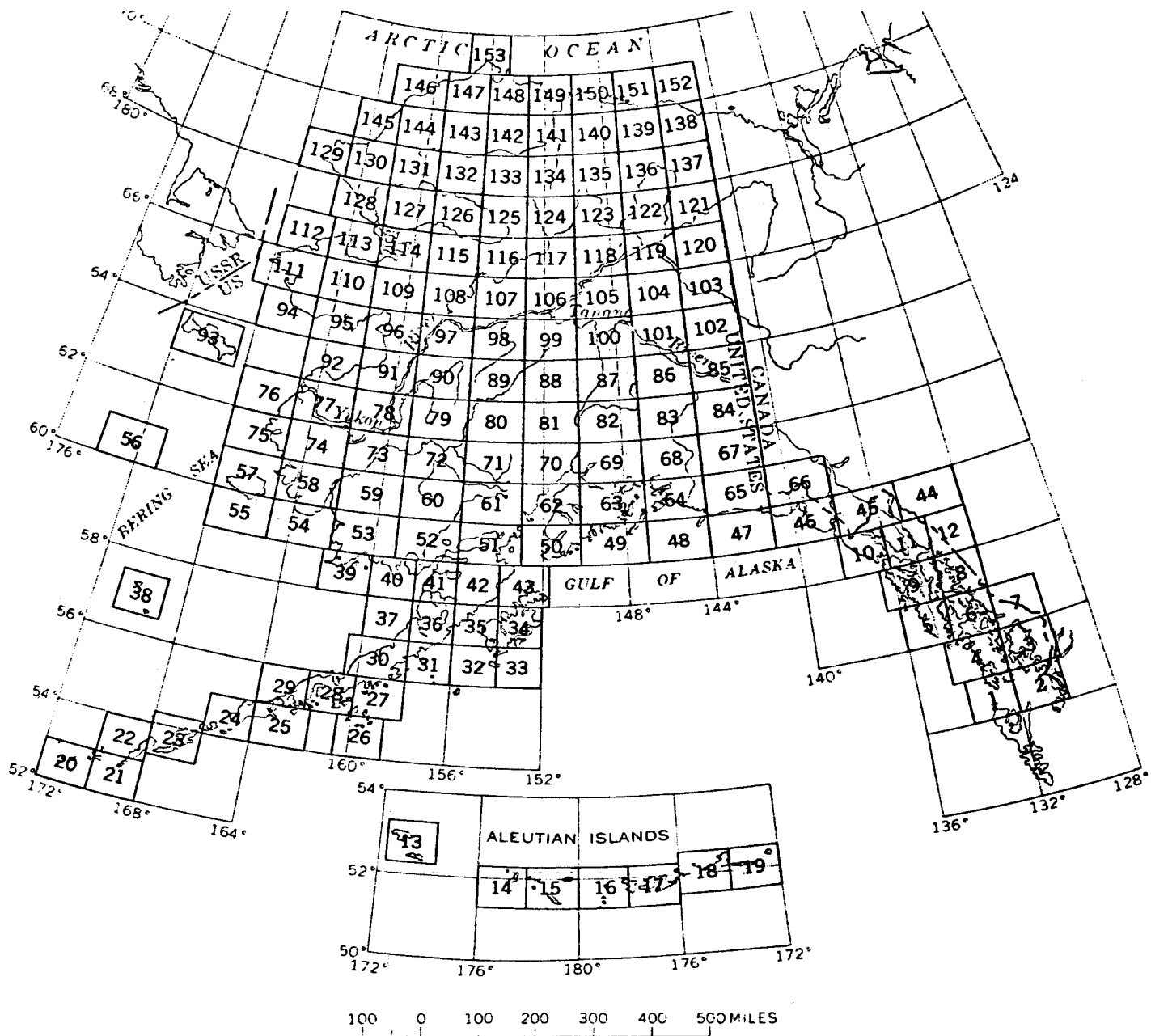


Figure 1. Location of U. S. Geological Survey topographic maps used in this seabird colony catalog and as listed in Table 1 (from Orth 1967).

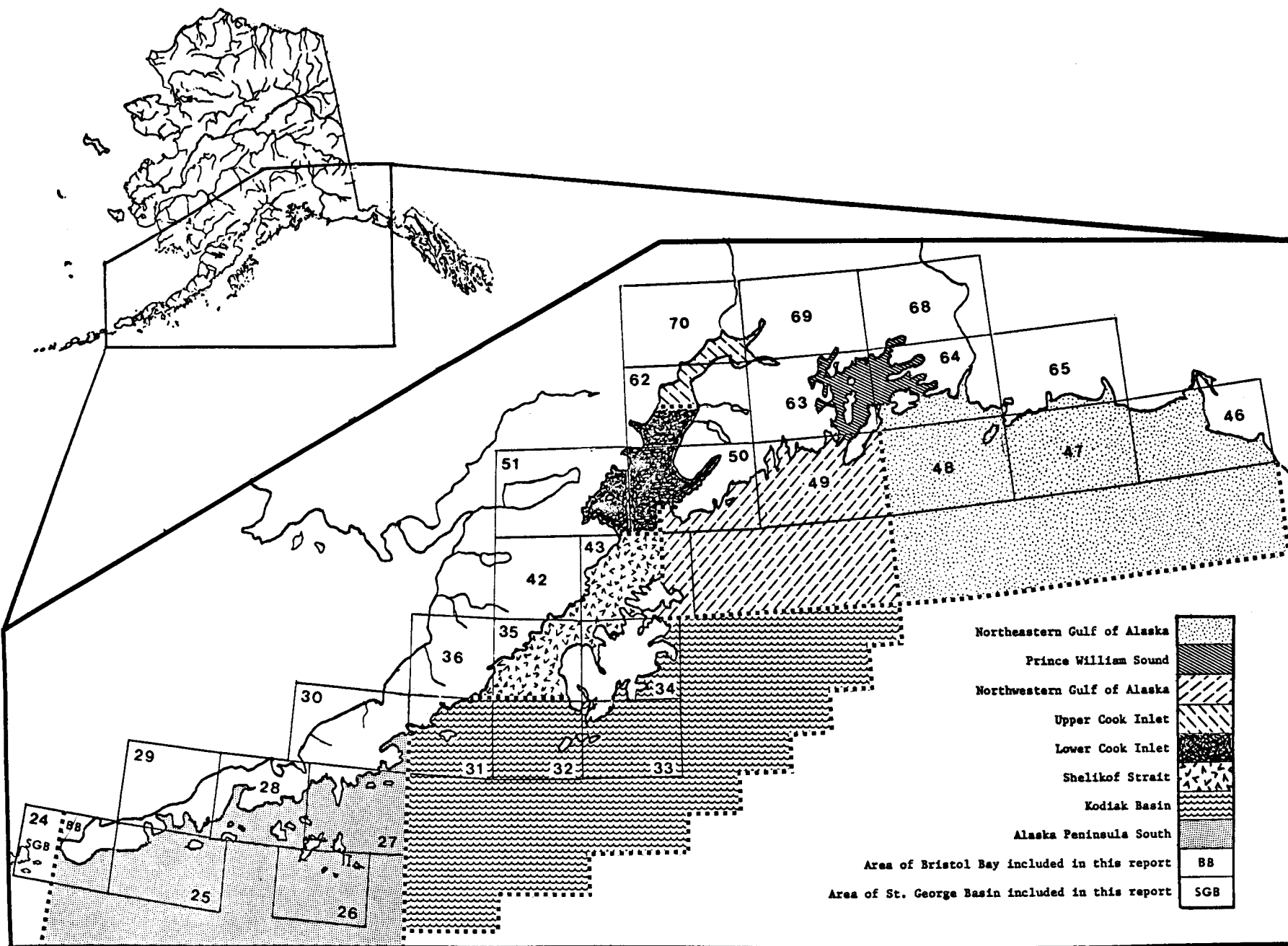


Figure 2. Location and code number of U.S. Geological Survey topographic maps and oceanographic regions reported in this colony catalog.

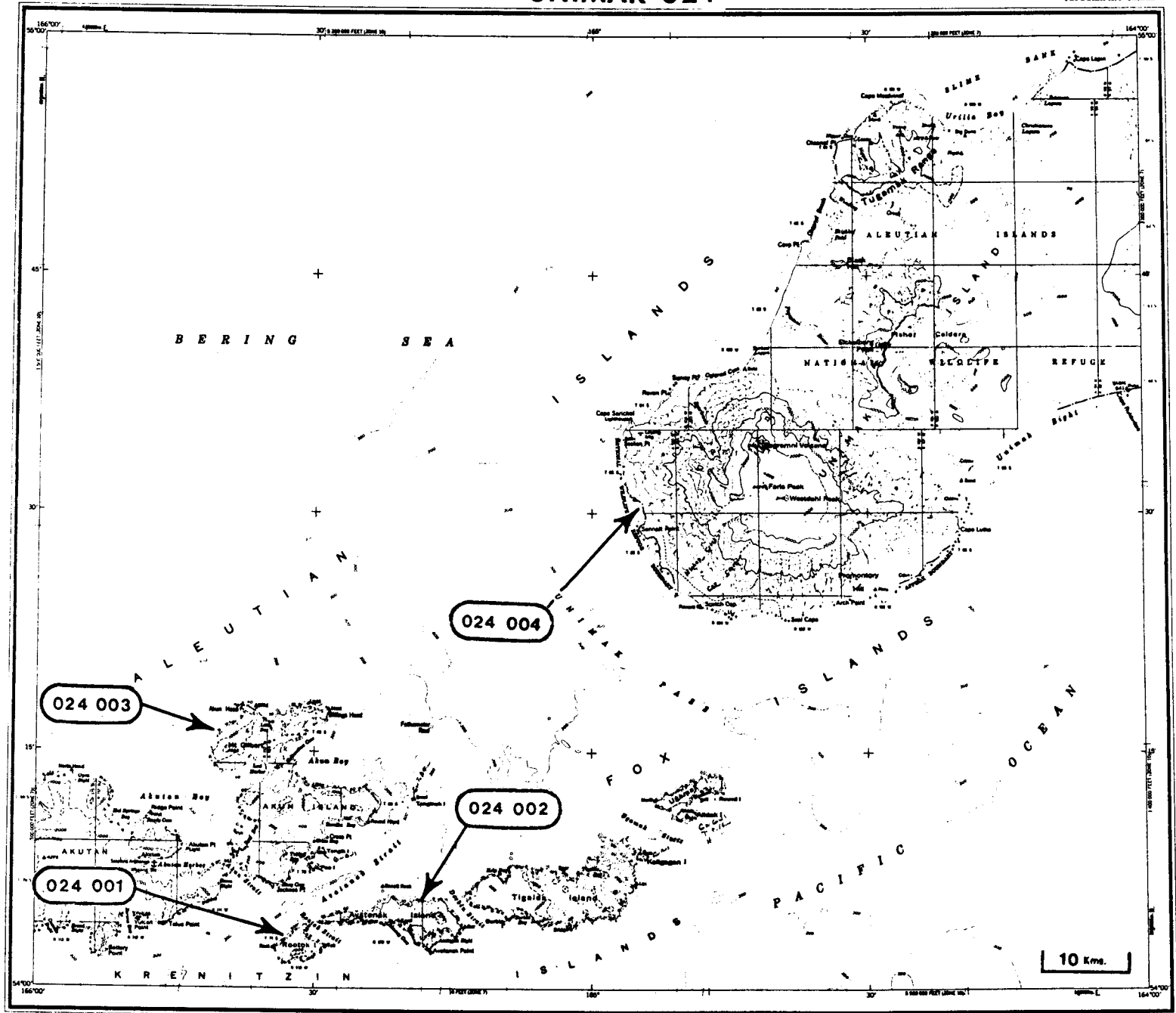


Figure 3. Locations of known seabird colonies in topographic area 024, Unimak.

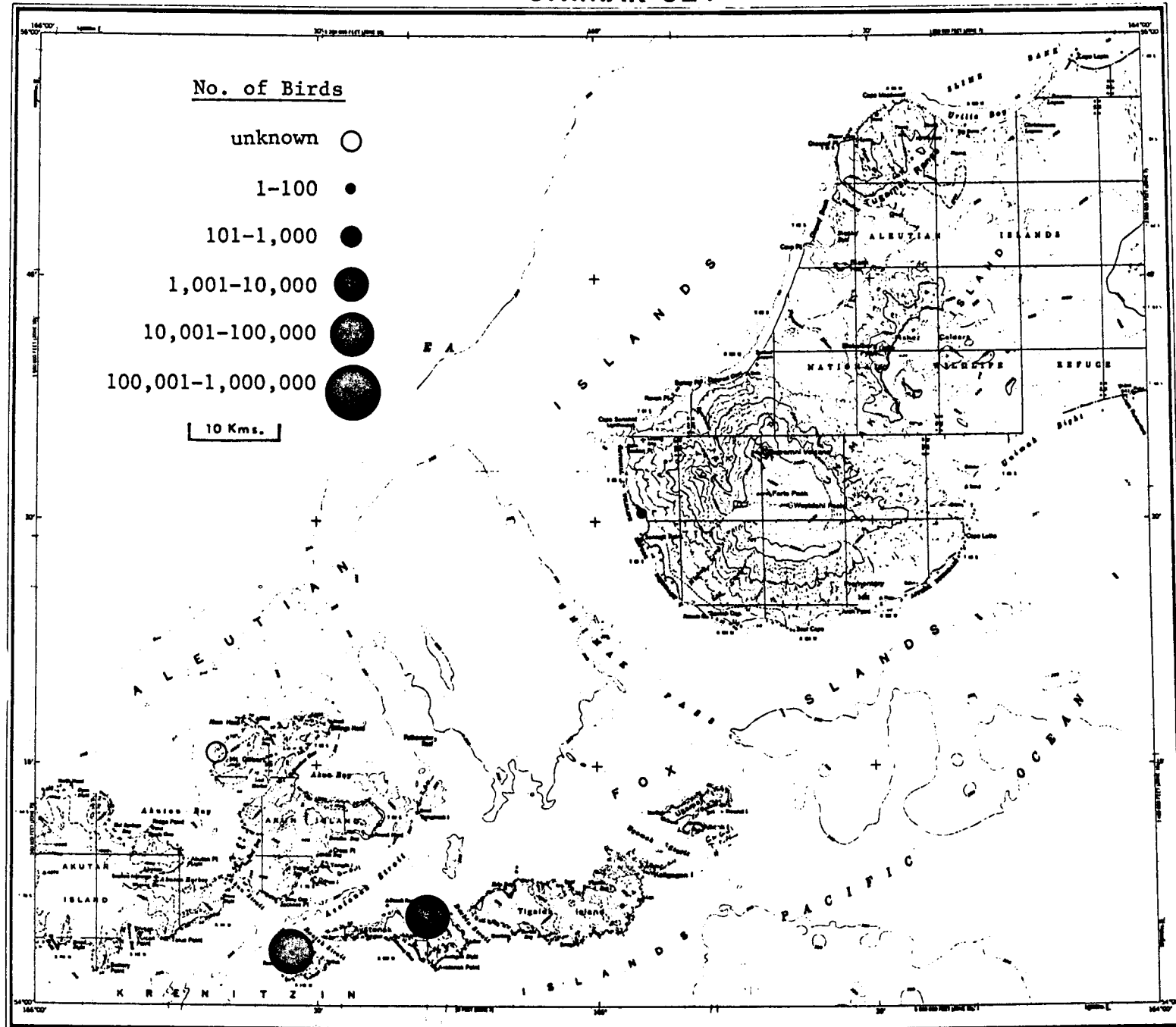


Figure 4. Comparative numbers of seabirds in colonies in topographic area 024, Unimak.

FALSE PASS 025

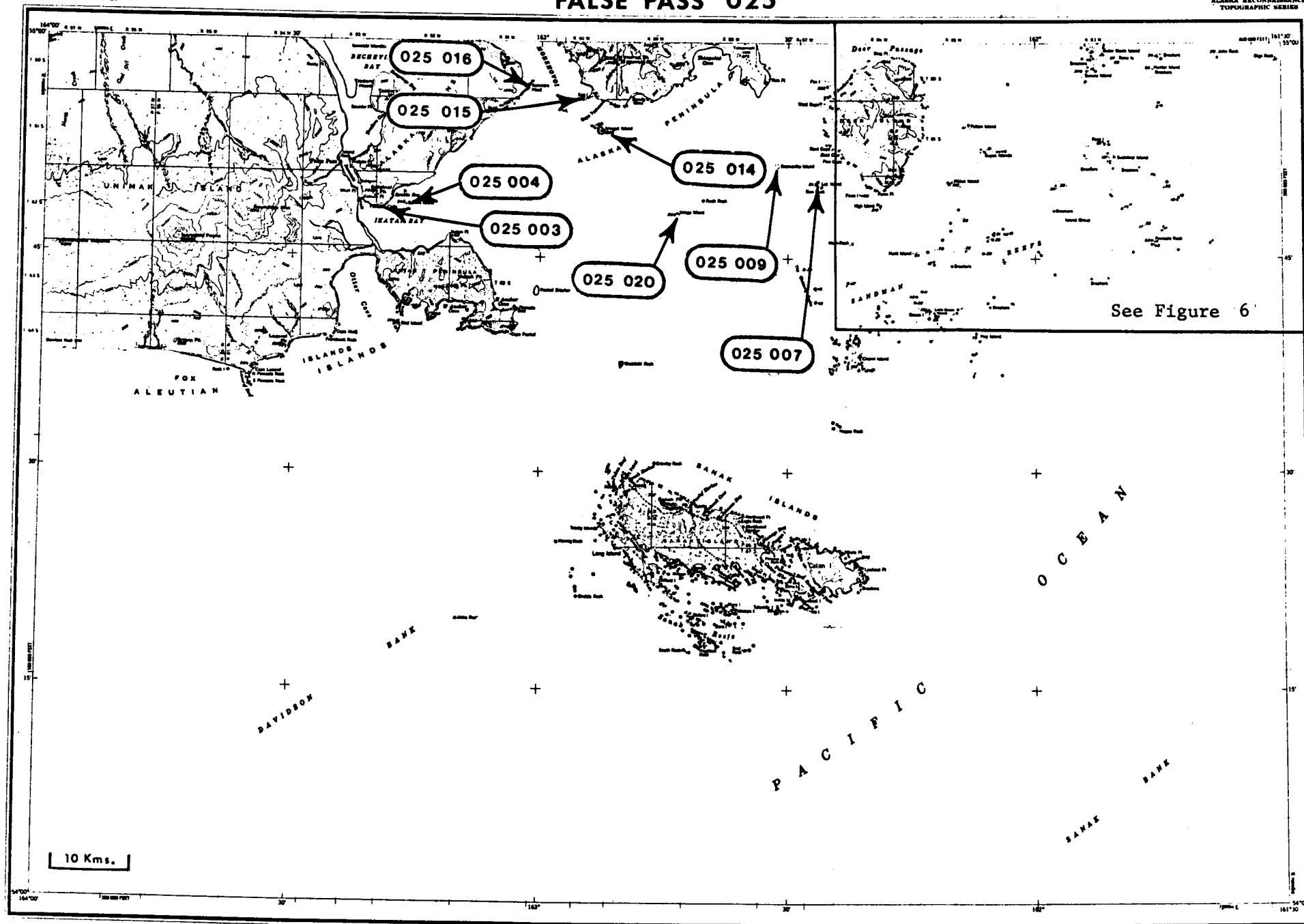


Figure 5. Locations of known seabird colonies in topographic area 025, False Pass.

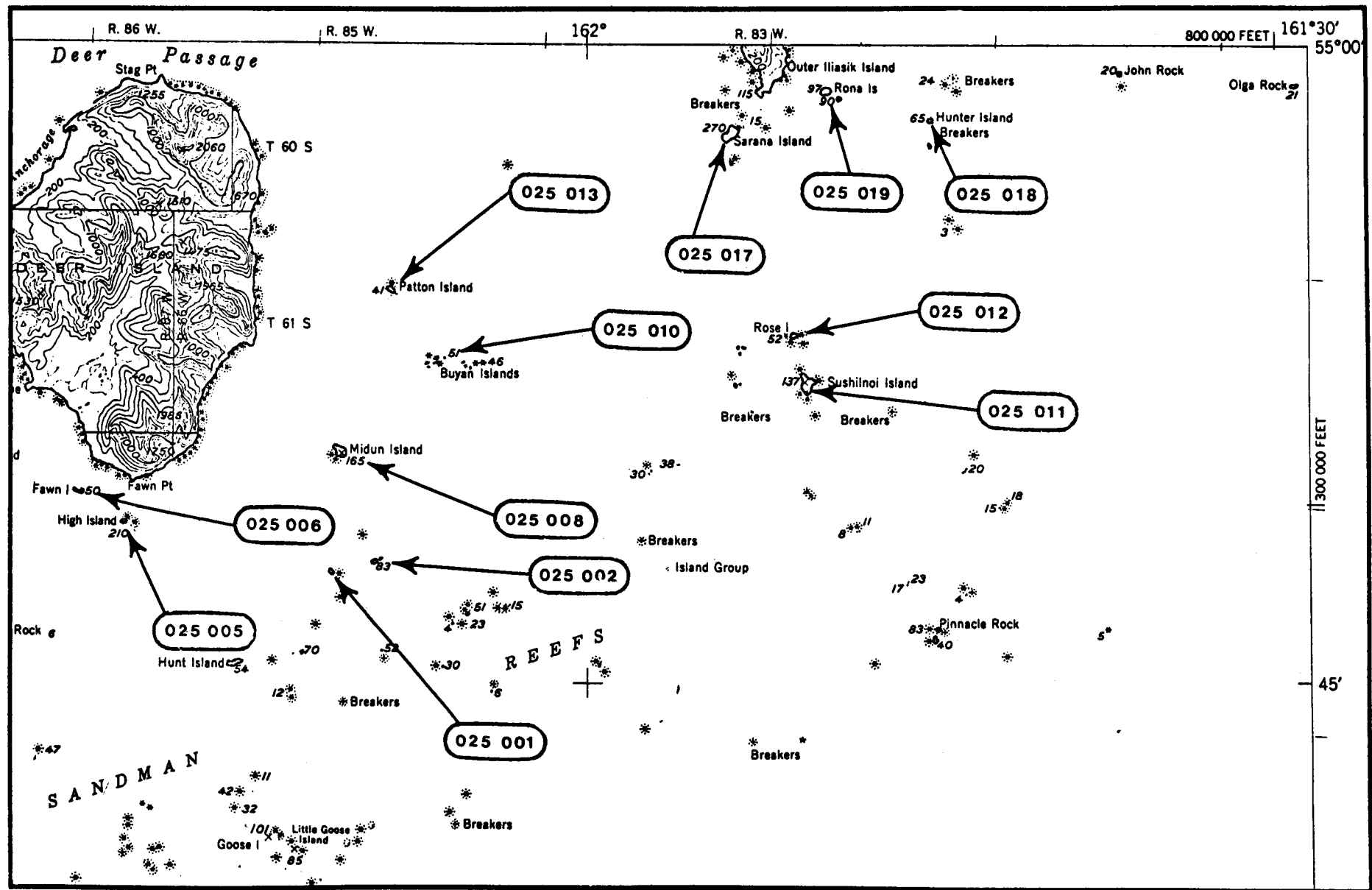


Figure 6. Enlarged section from topographic area 025, False Pass, showing locations of known seabird colonies.

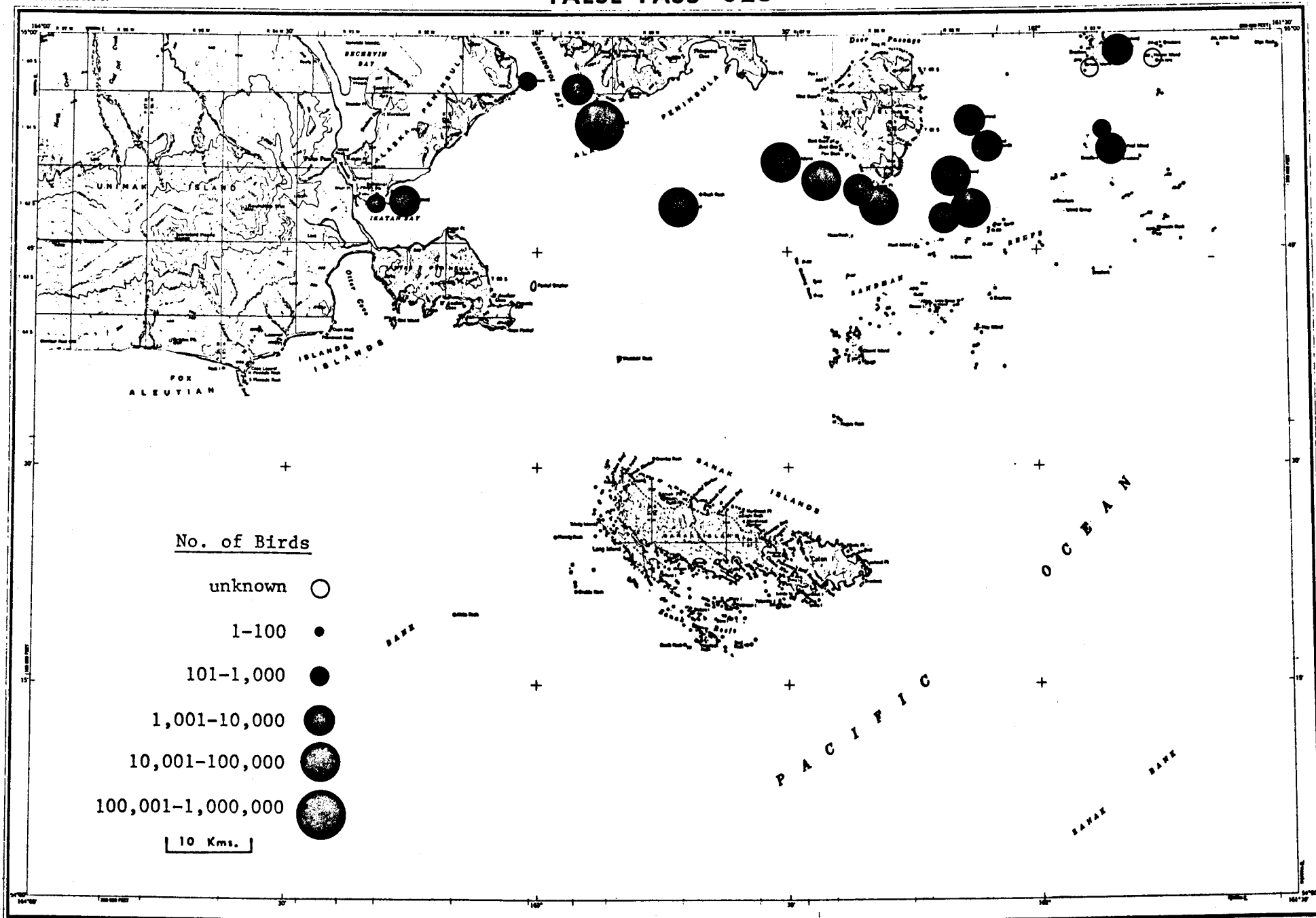


Figure 7. Comparative numbers of seabirds in colonies in topographic area 025, False Pass.

SIMEONOF ISLAND 026

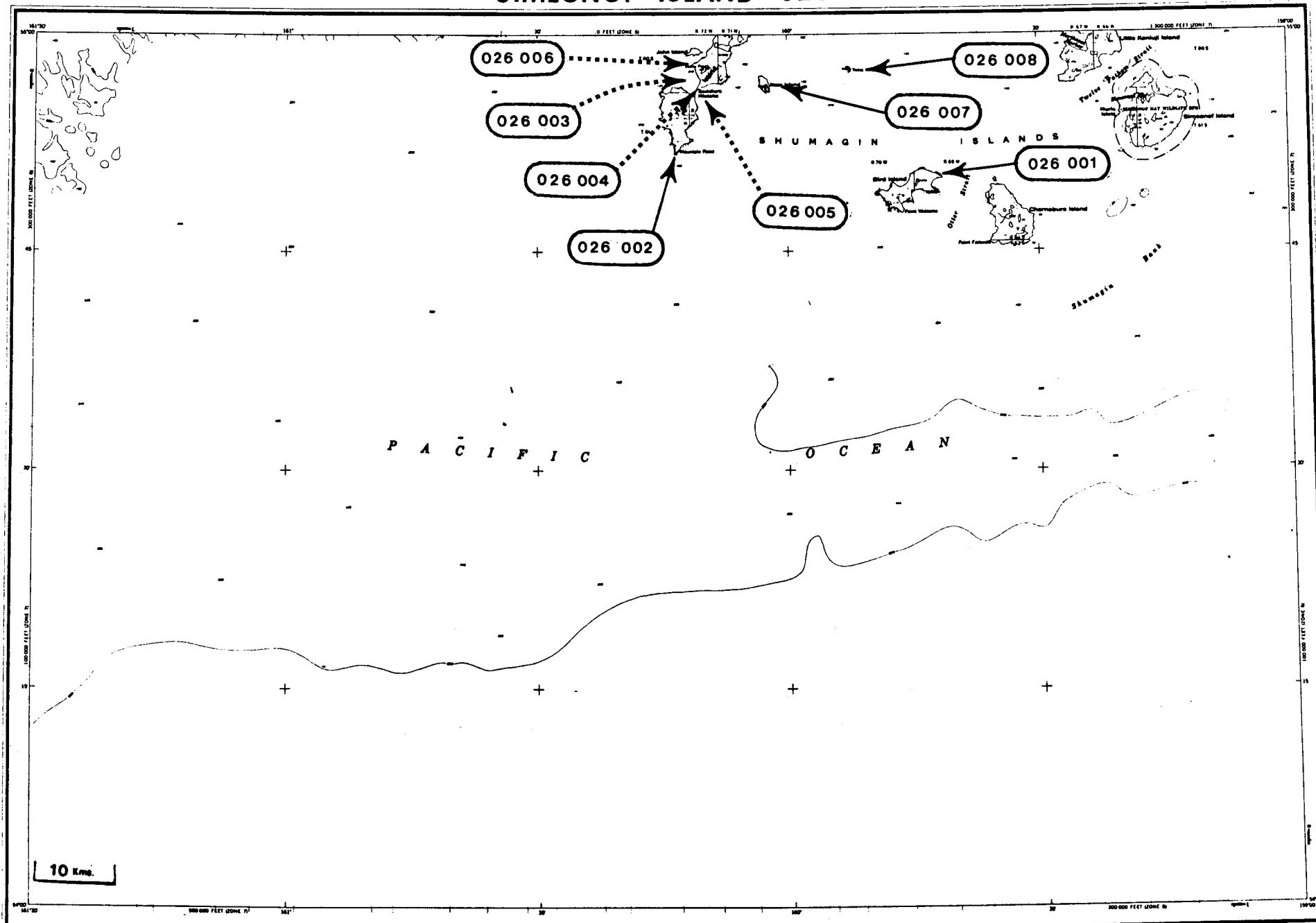


Figure 8. Locations of known seabird colonies in topographic area 026, Simeonof Island. Dashed arrows indicate imprecise colony locations.

86

192

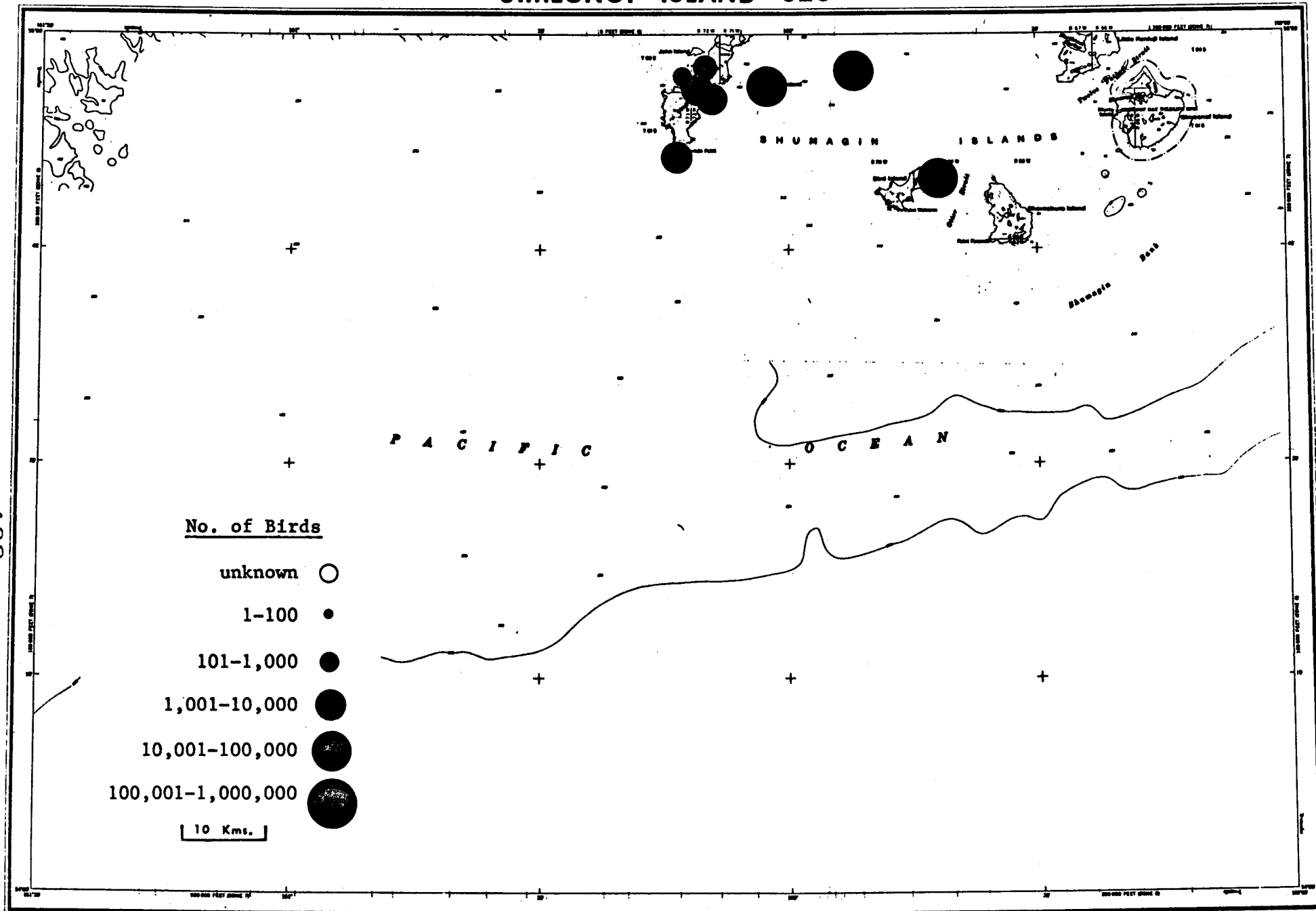


Figure 9. Comparative numbers of seabirds in colonies in topographic area 026, Simeonof Island.

STEPOVAK BAY 027

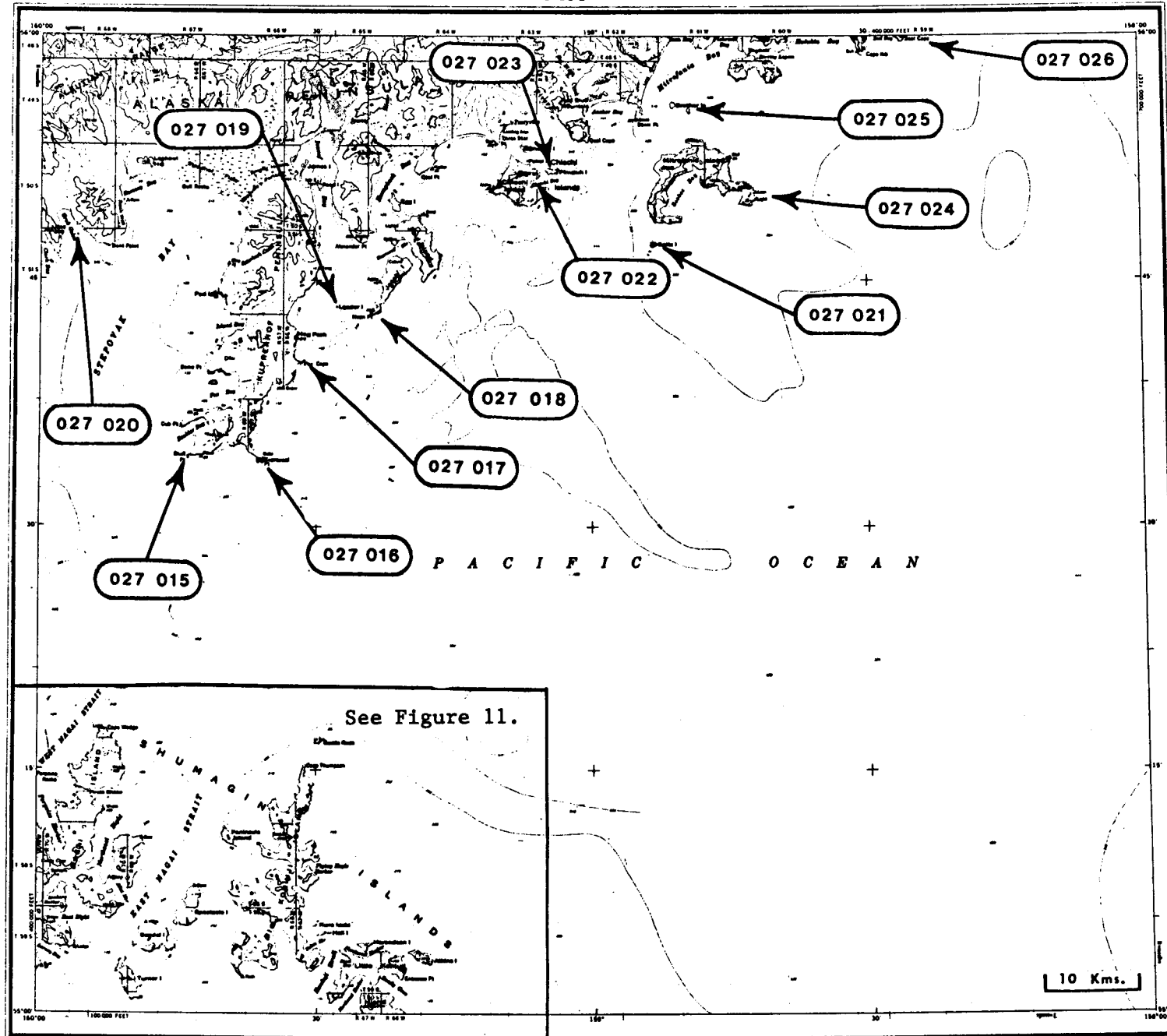


Figure 10. Locations of known seabird colonies in topographic area 027, Stepovak Bay.

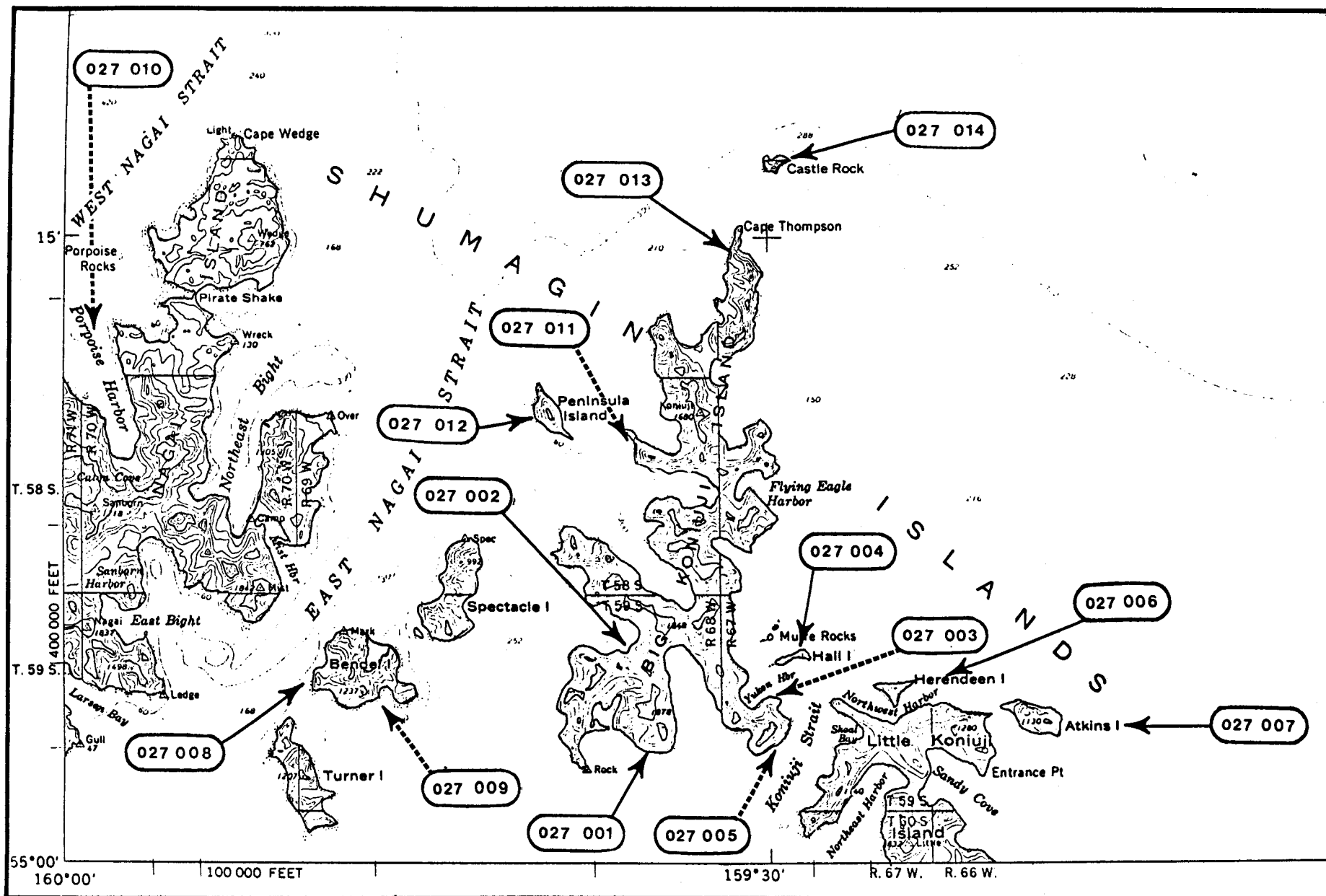


Figure 11. Enlarged section from topographic area 027, Stepovak Bay, showing locations of known seabird colonies. Dashed arrows indicate imprecise colony locations.

STEPOVAK BAY 027

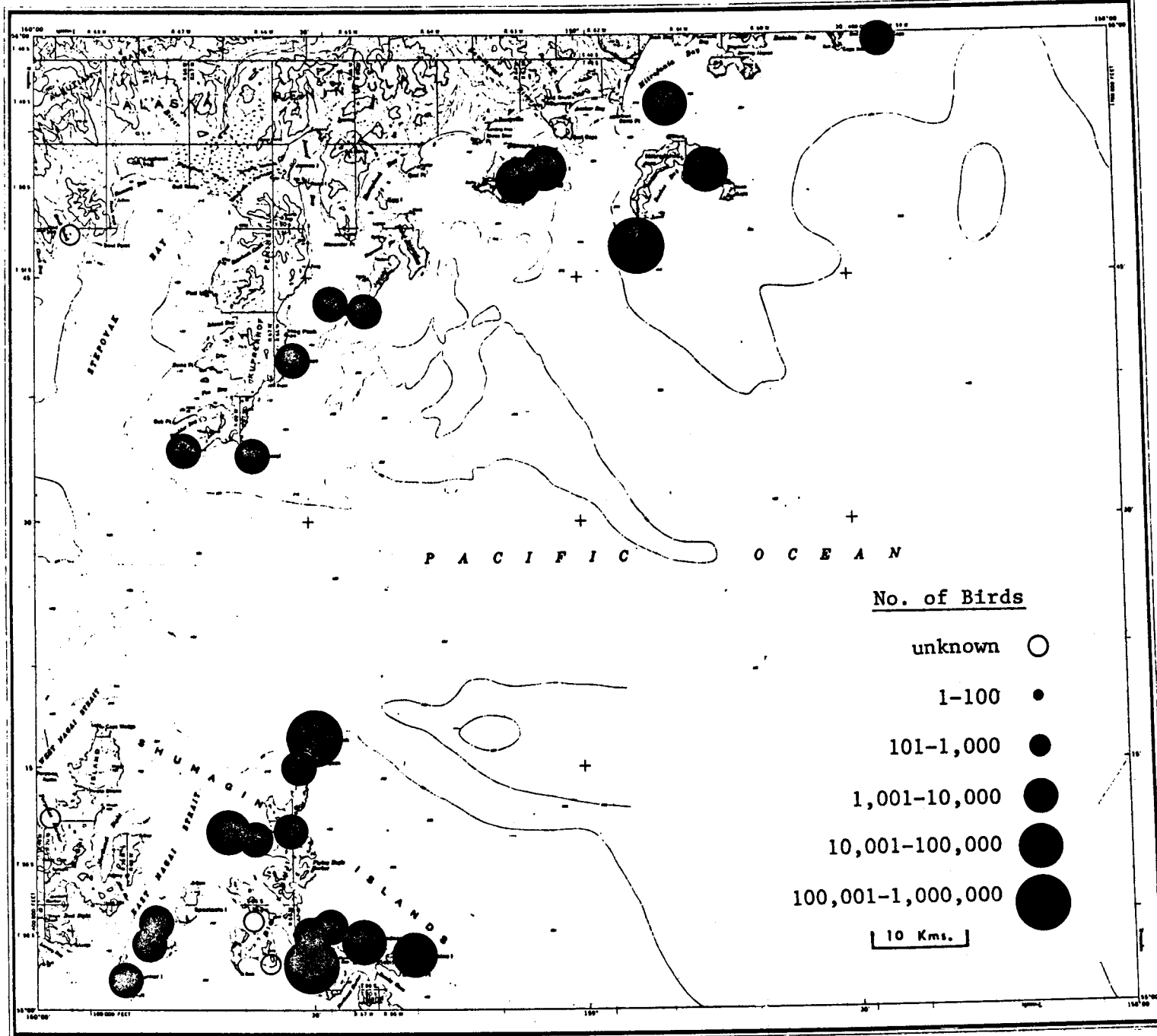


Figure 12. Comparative numbers of seabirds in colonies in topographic area 027, Stepovak Bay.

PORT MOLLER 028

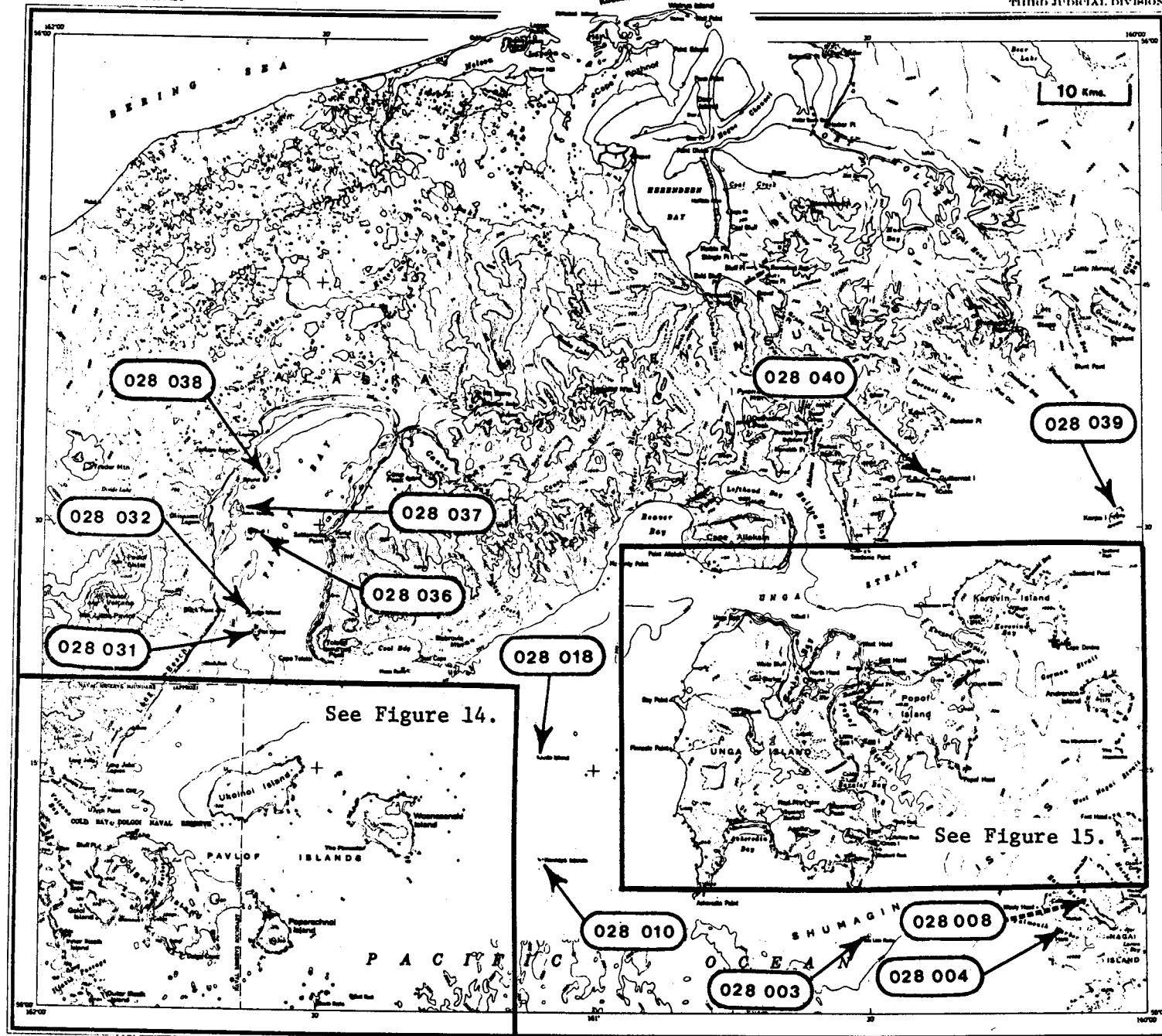


Figure 13. Locations of known seabird colonies in topographic area 028, Port Moller.

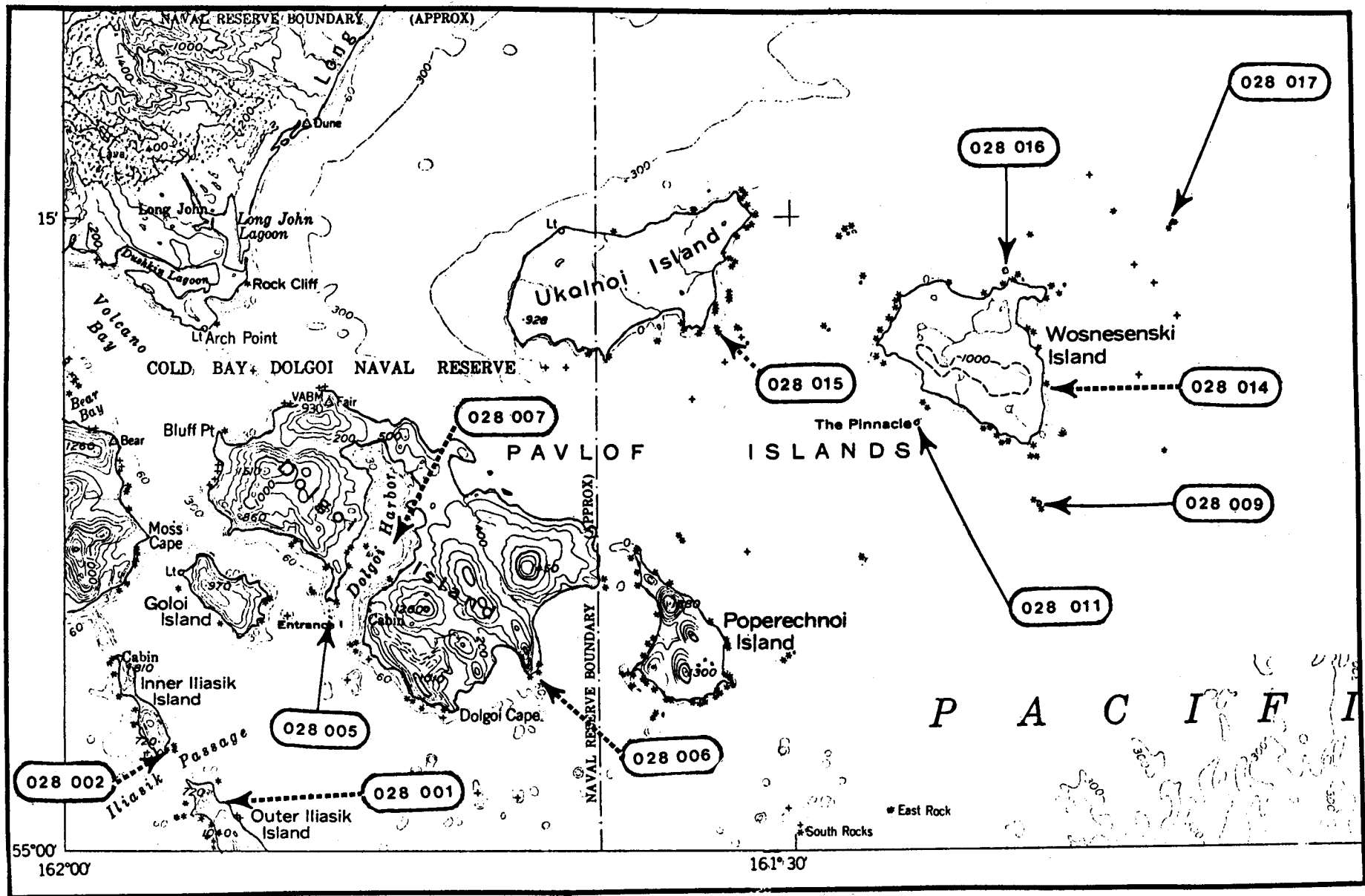


Figure 14. Enlarged section from topographic area 028, Port Moller, showing locations of known seabird colonies. Dashed arrows indicate imprecise colony locations.

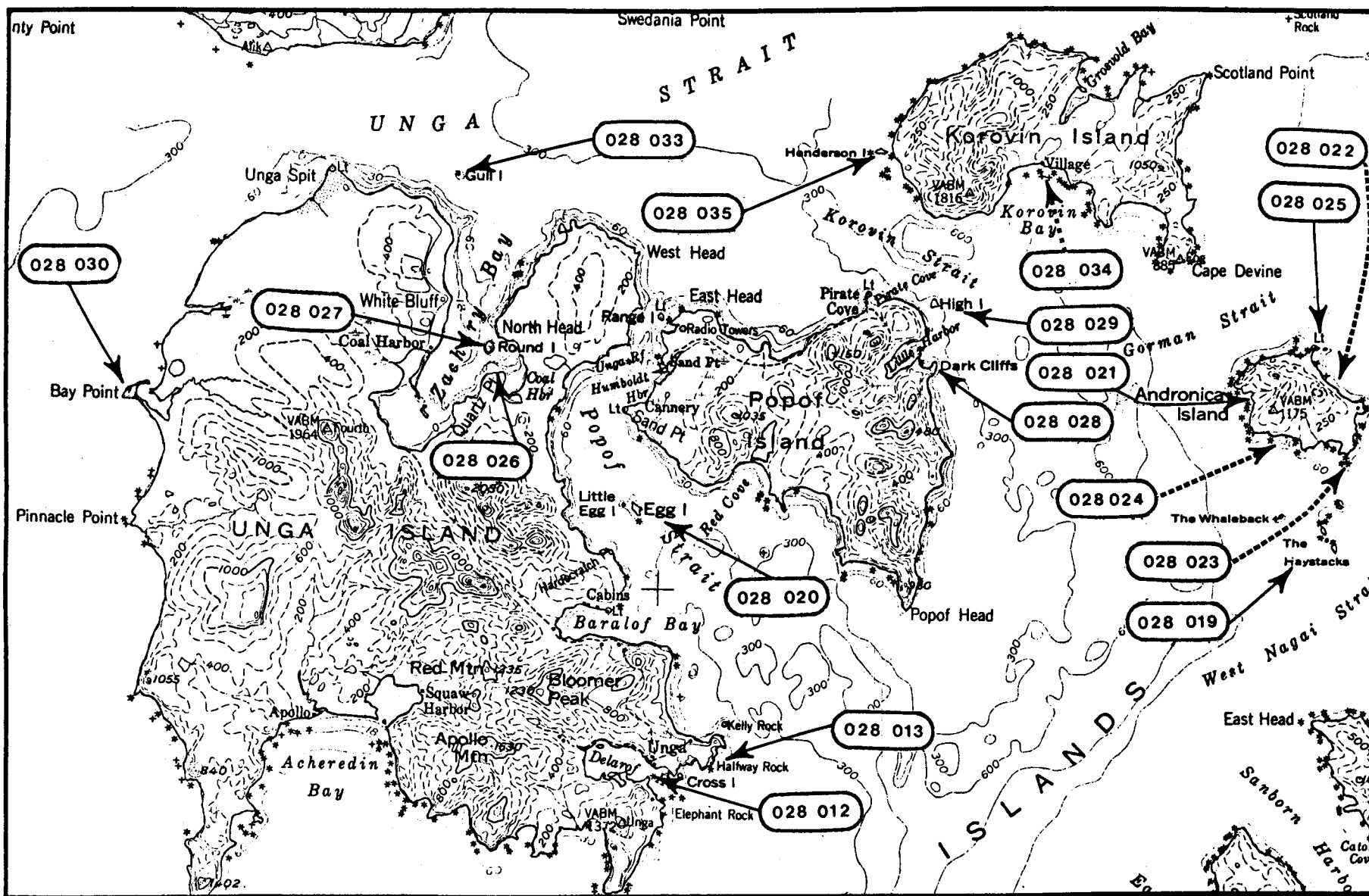


Figure 15. Enlarged section from topographic area 028, Port Moller, showing locations of known seabird colonies. Dashed arrows indicate imprecise colony locations.

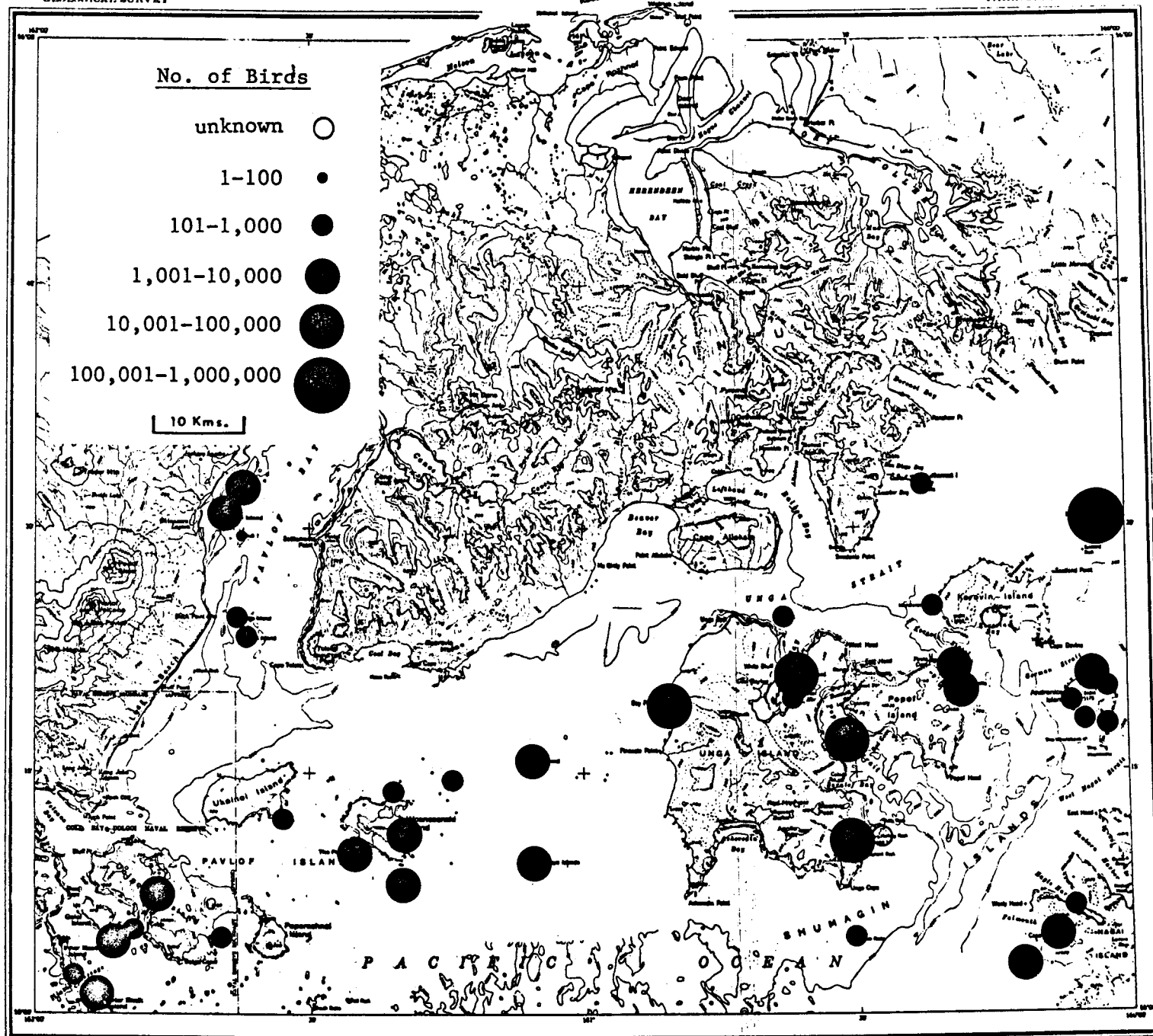
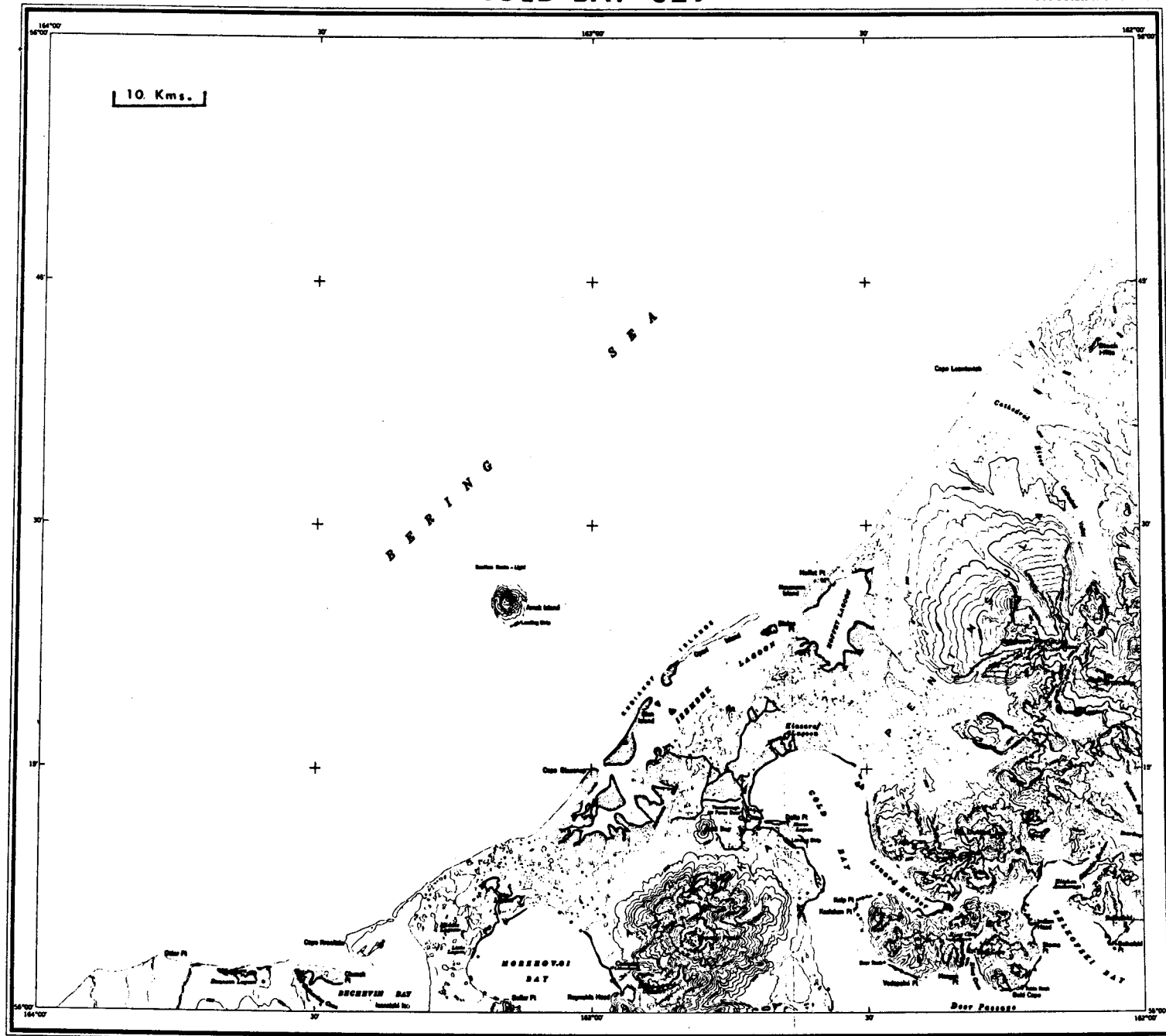


Figure 16. Comparative numbers of seabirds in colonies in topographic area 028, Port Moller.



94

200

Figure 17. Topographic area 029, Cold Bay. No colony sites have been located on the south side of the Alaska Peninsula in this region.

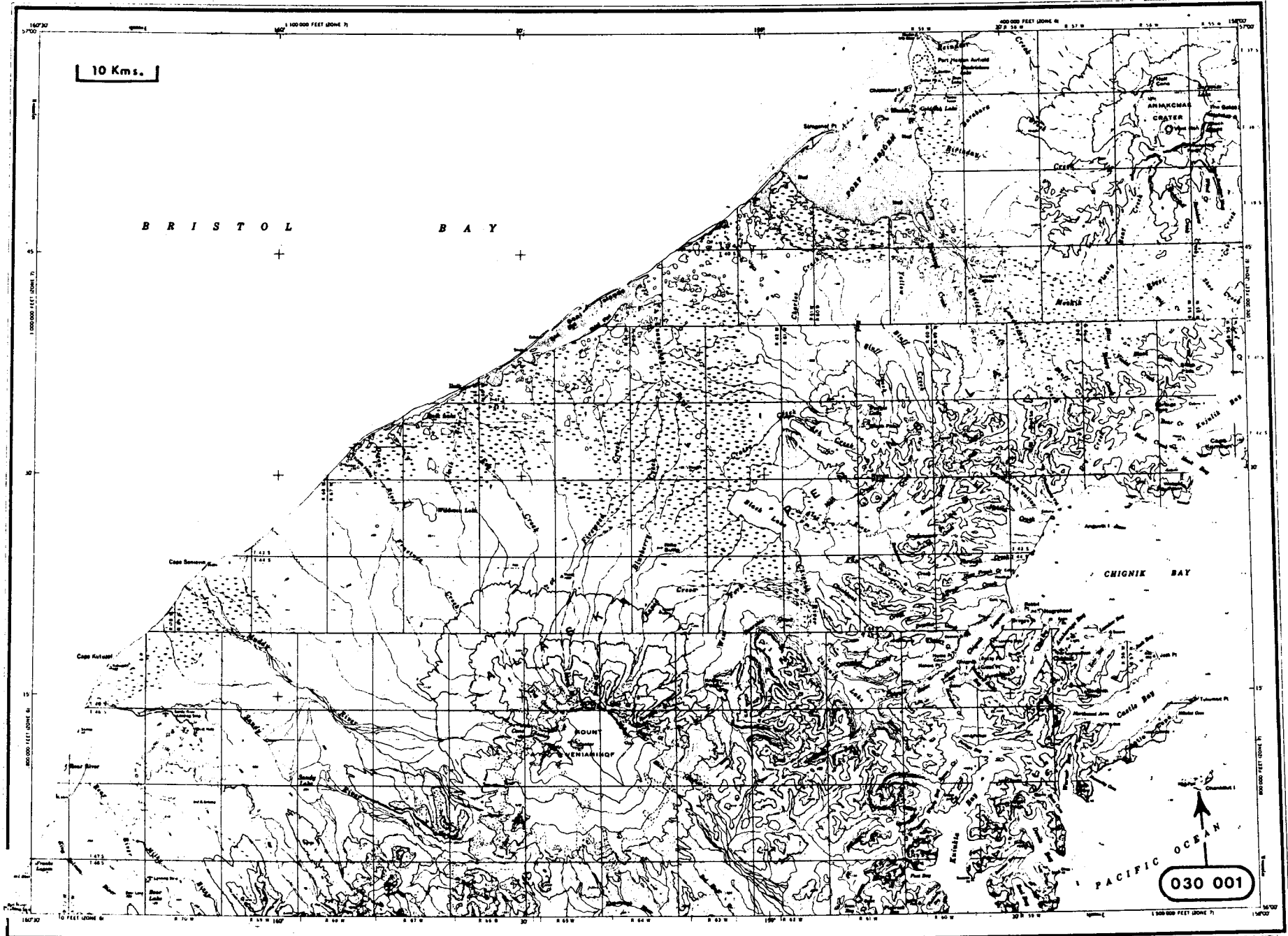


Figure 18. Locations of known seabird colonies in topographic area 030, Chignik.

CHIGNIK 030

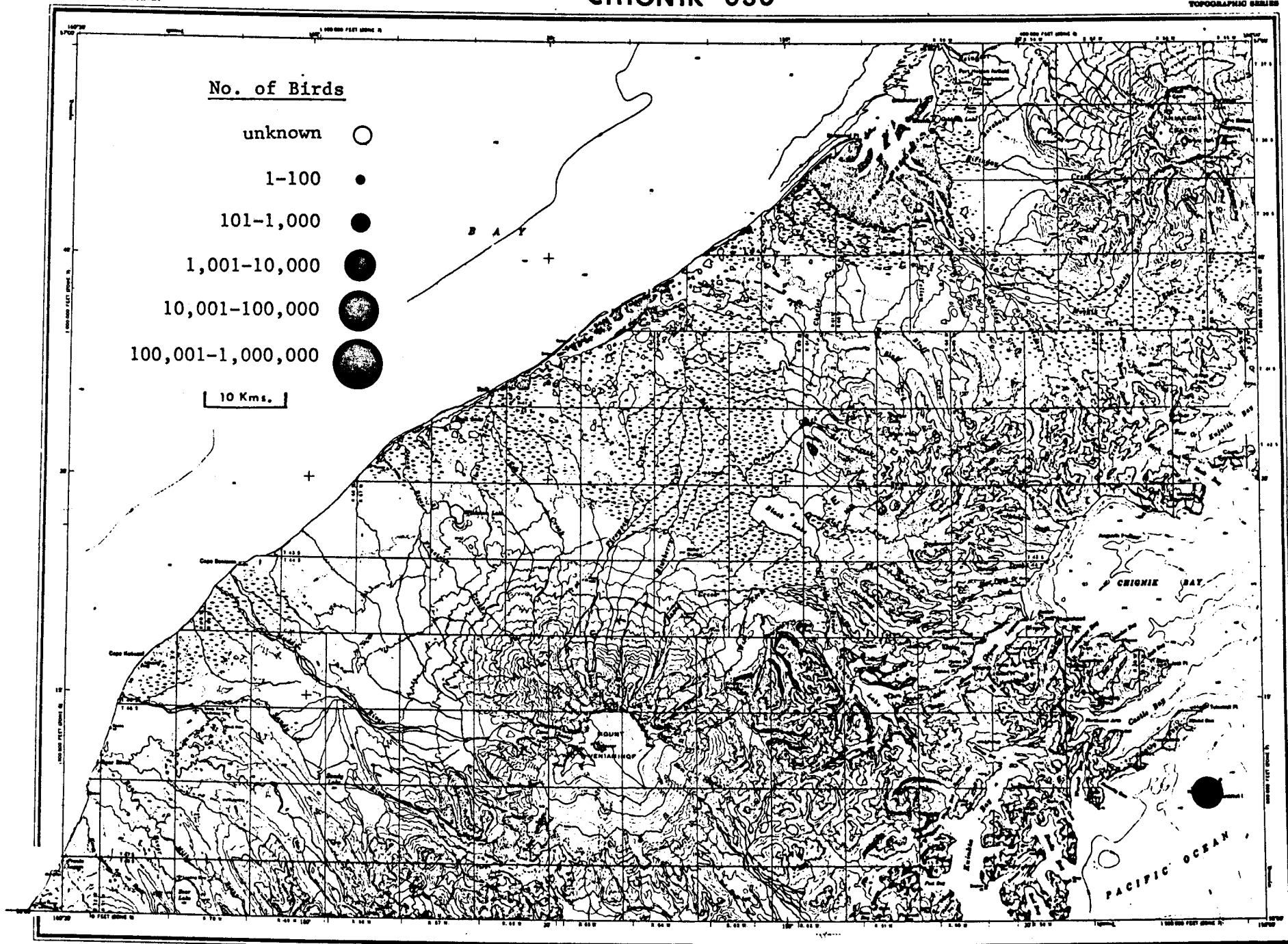


Figure 19. Comparative numbers of seabirds in colonies in topographic area 030, Chignik.

SUTWIK ISLAND 031

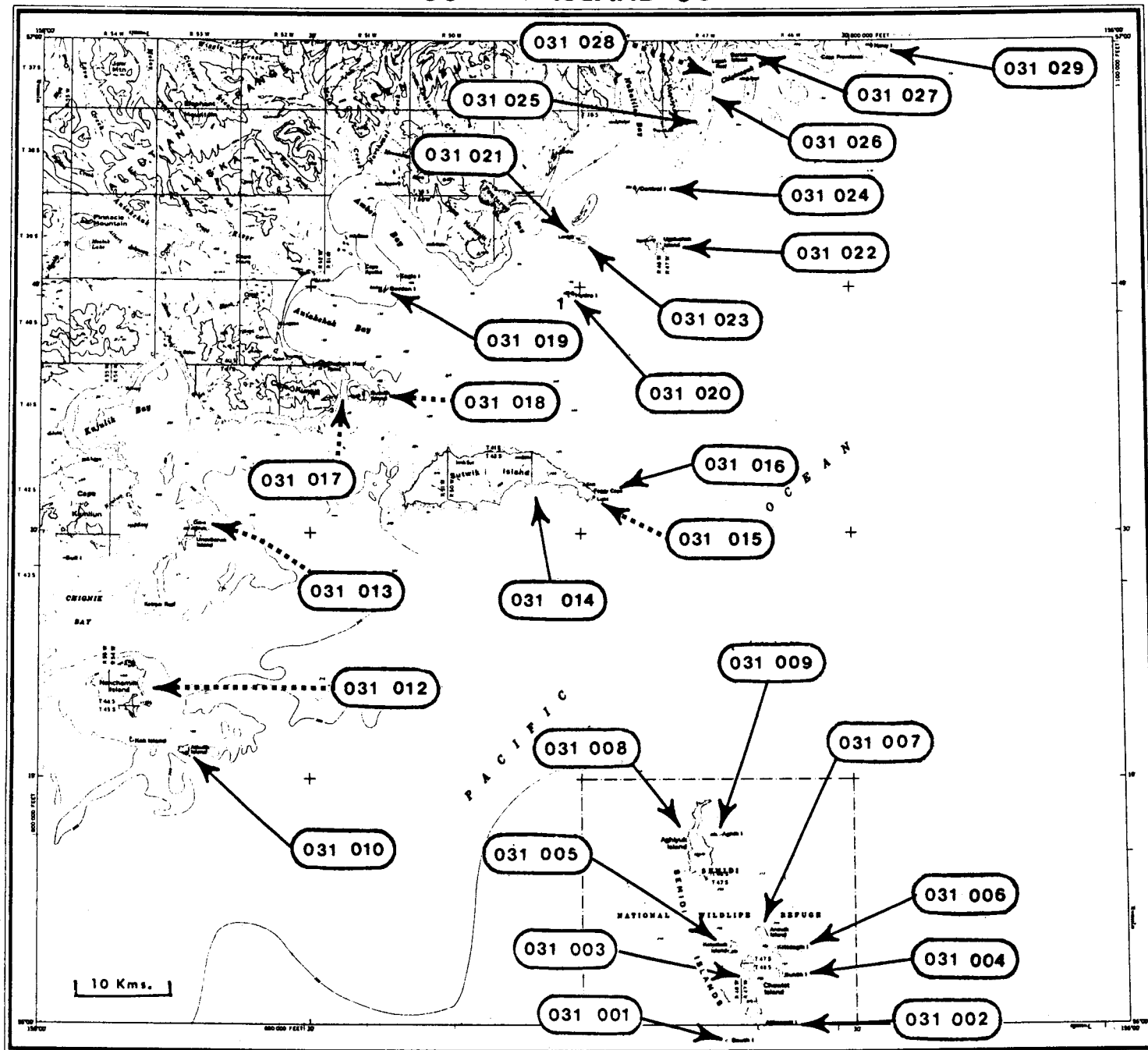
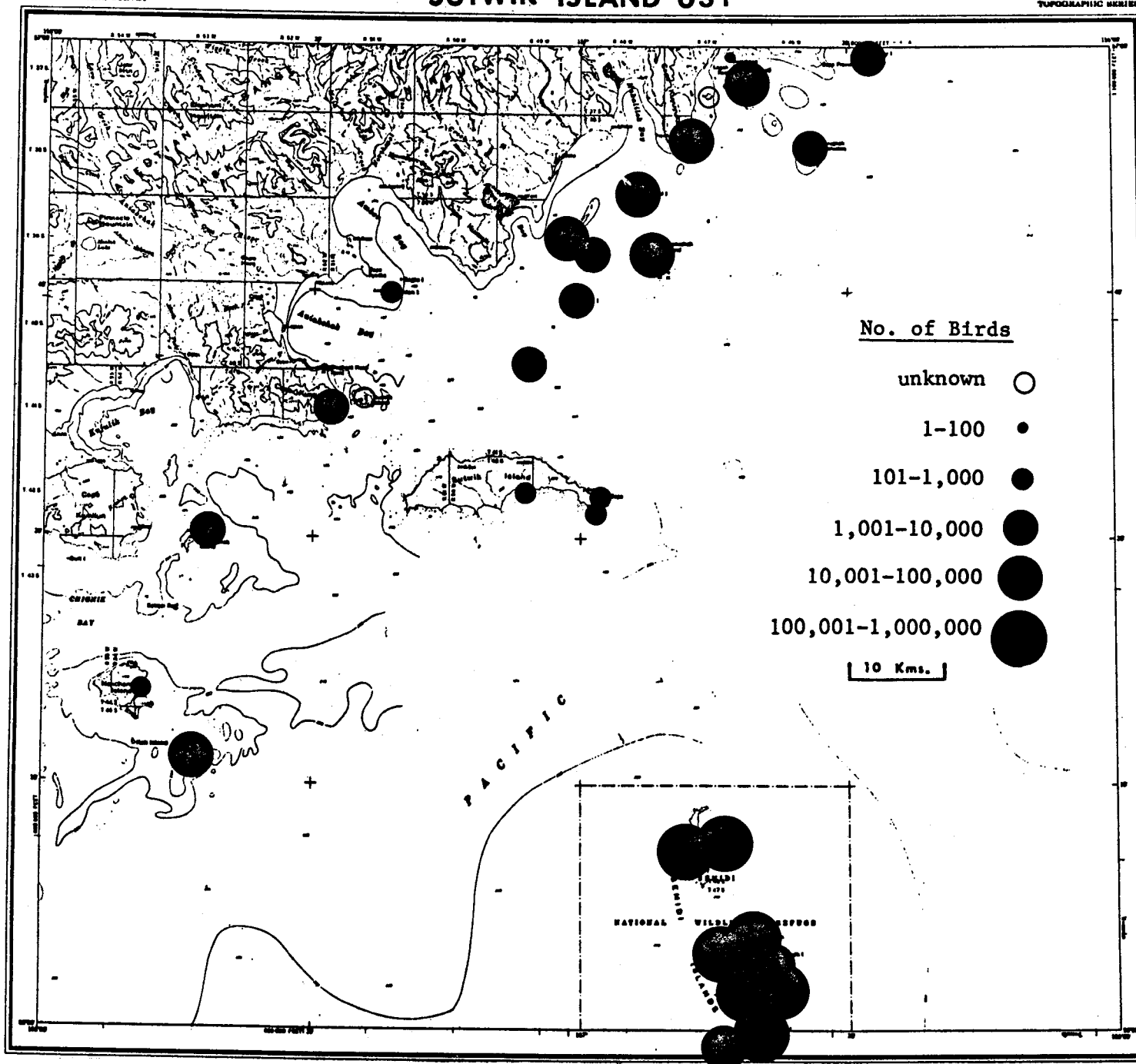


Figure 20. Locations of known seabird colonies in topographic area 031, Sutwick Island. Dashed arrows indicate imprecise colony locations.

SUTWIK ISLAND 031

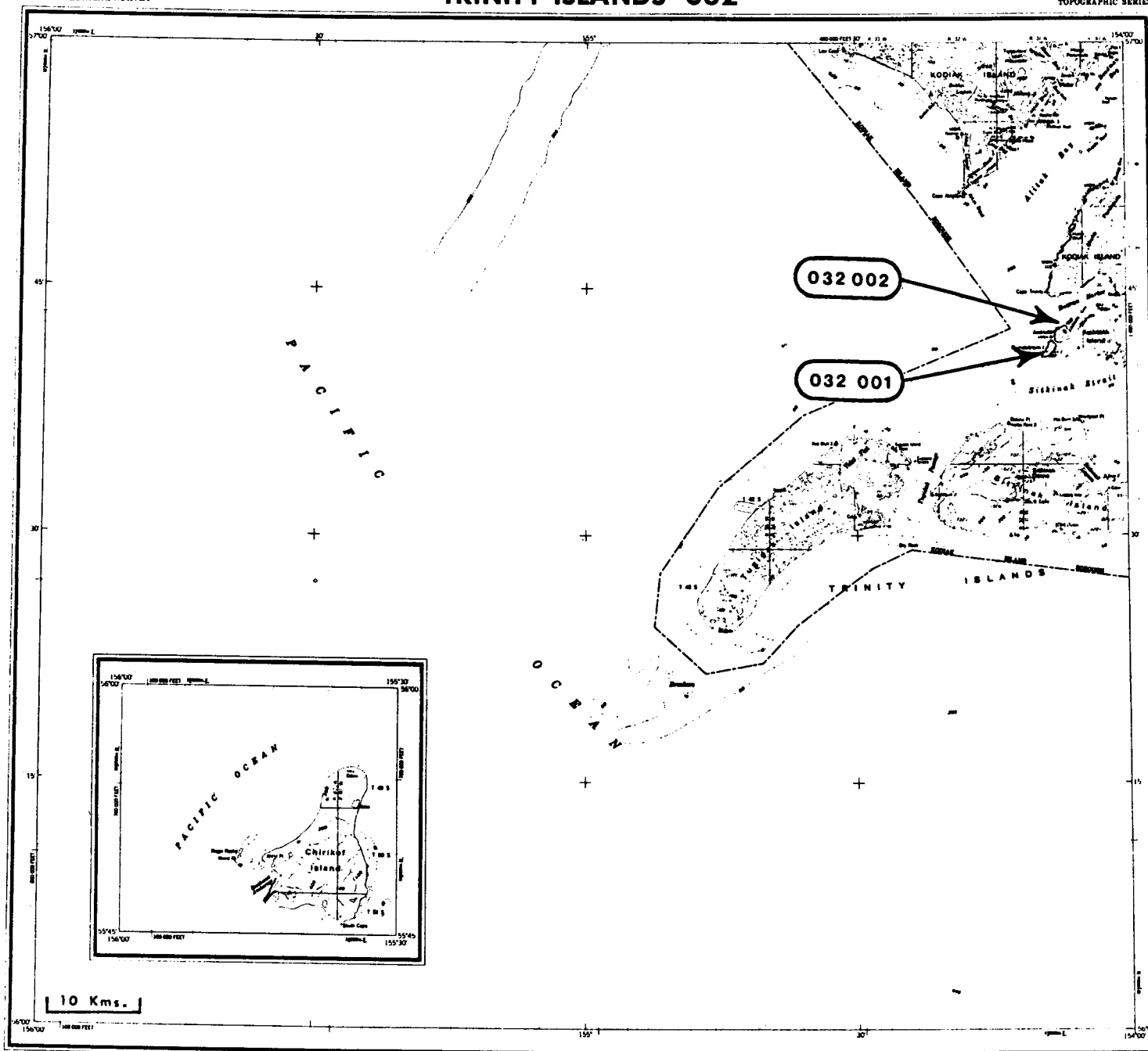


98

204

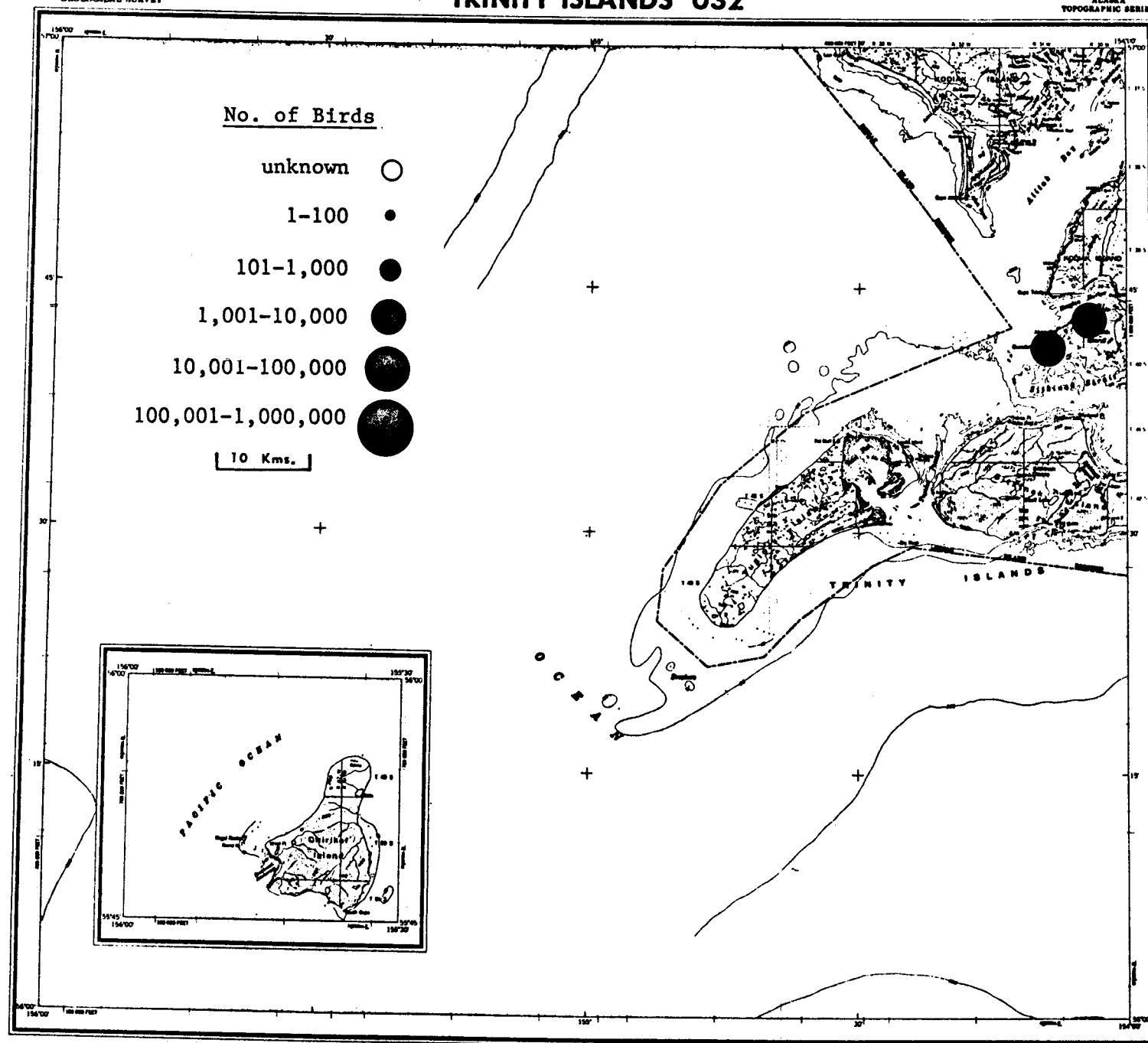
Figure 21. Comparative numbers of seabirds in colonies in topographic area 031, Sutwick Island.

TRINITY ISLANDS 032



69
205

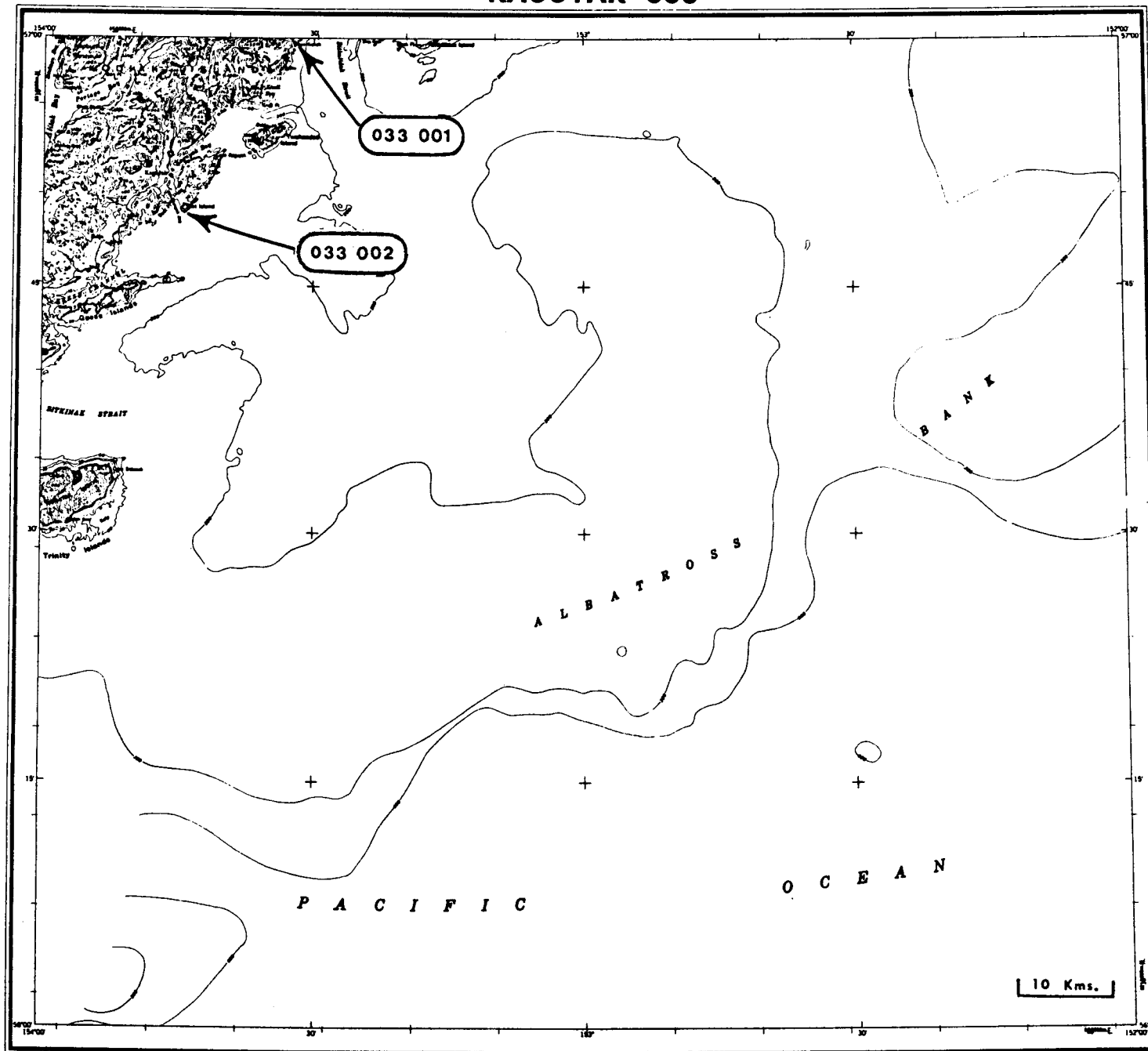
Figure 22. Locations of known seabird colonies in topographic area 032, Trinity Islands.



100

206

Figure 23. Comparative numbers of seabirds in colonies in topographic area 032, Trinity Islands.



101

207

Figure 24. Locations of known seabird colonies in topographic area 033, Kaguyak.

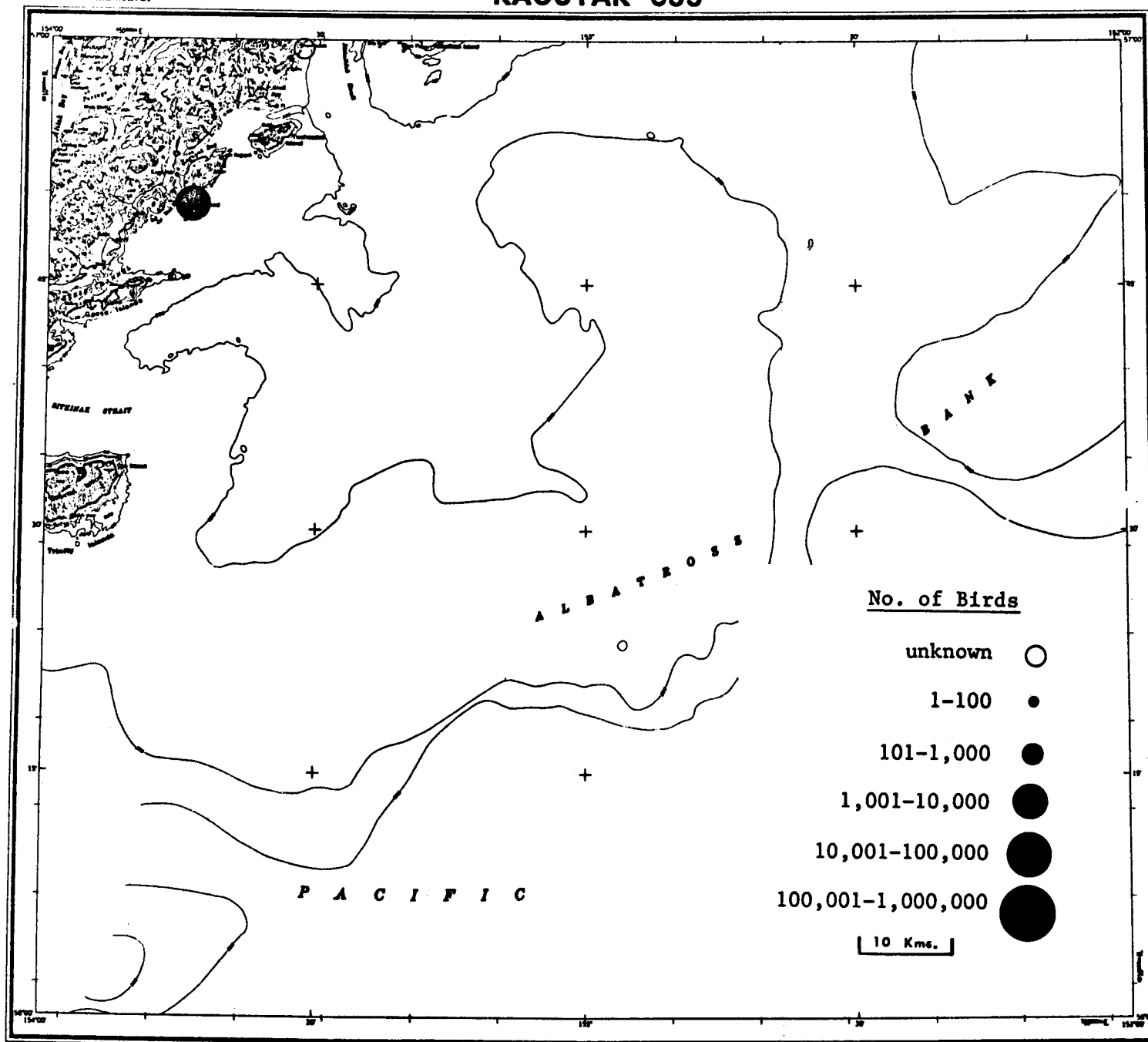


Figure 25. Comparative numbers of seabirds in colonies in topographic area 033, Kaguyak.

KODIAK 034

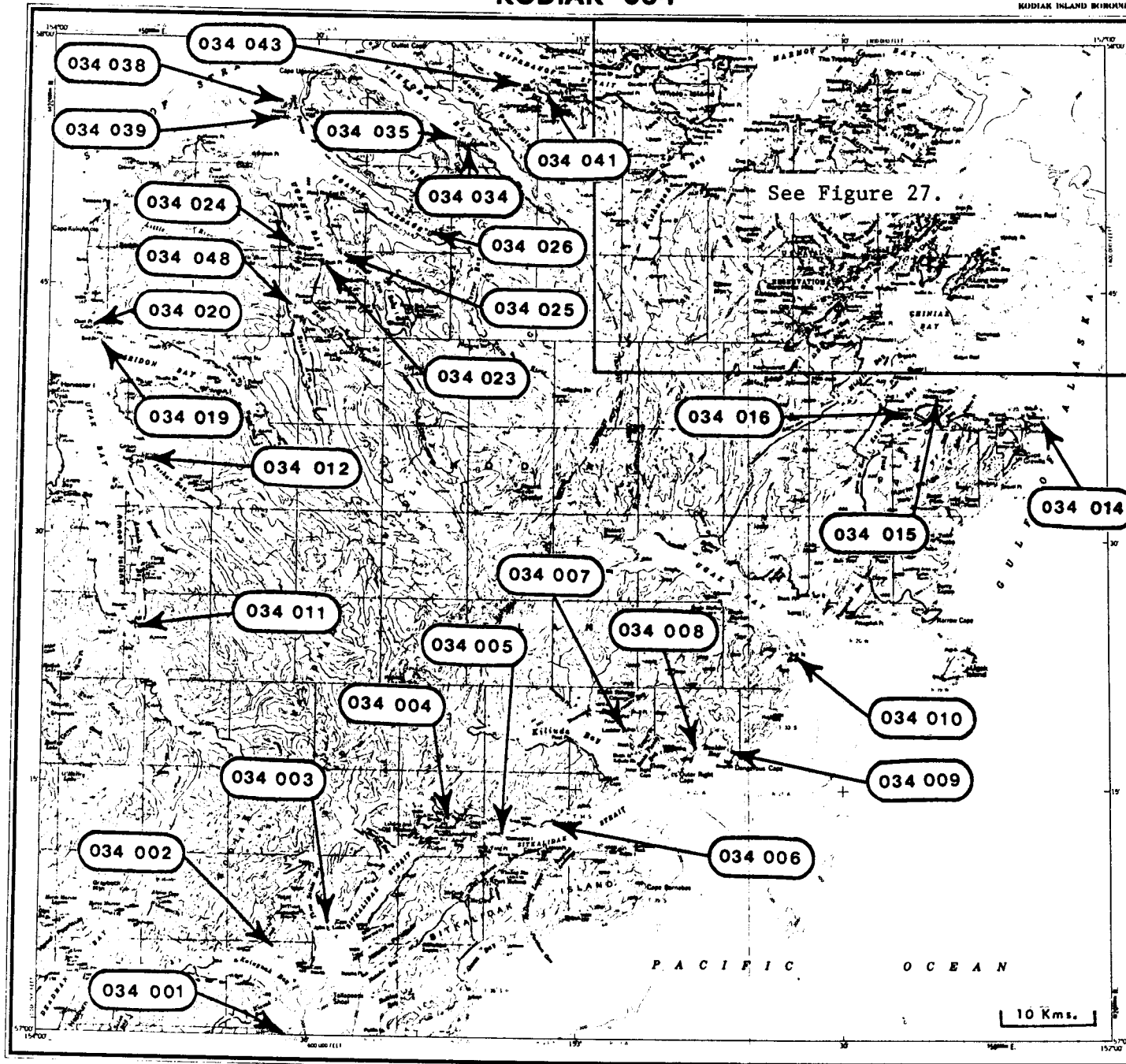


Figure 26. Locations of known seabird colonies in topographic area 034, Kodiak.

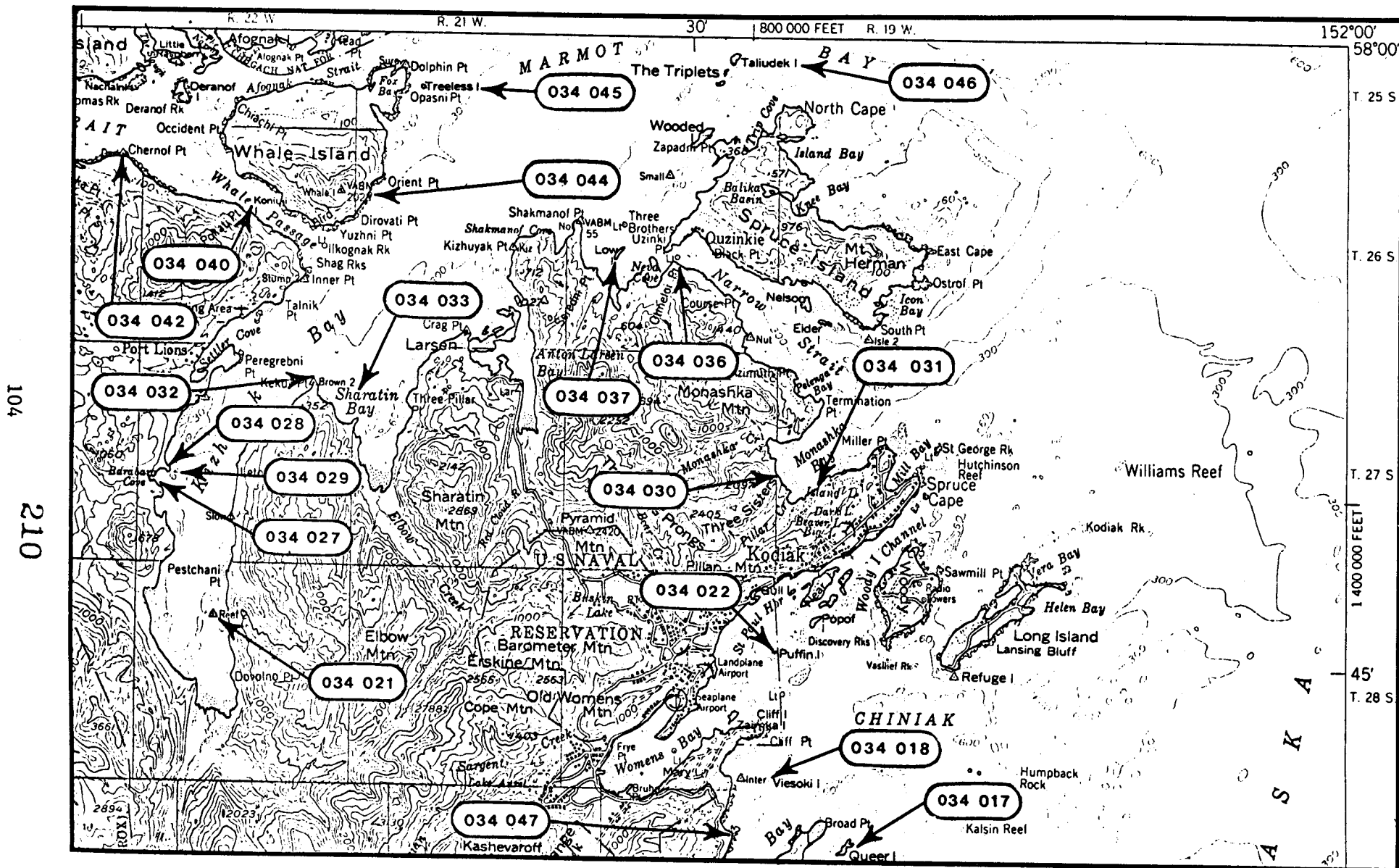


Figure 27. Enlarged section from topographic area 034, Kodiak, showing locations of known seabird colonies. Dashed arrows indicate imprecise colony locations.

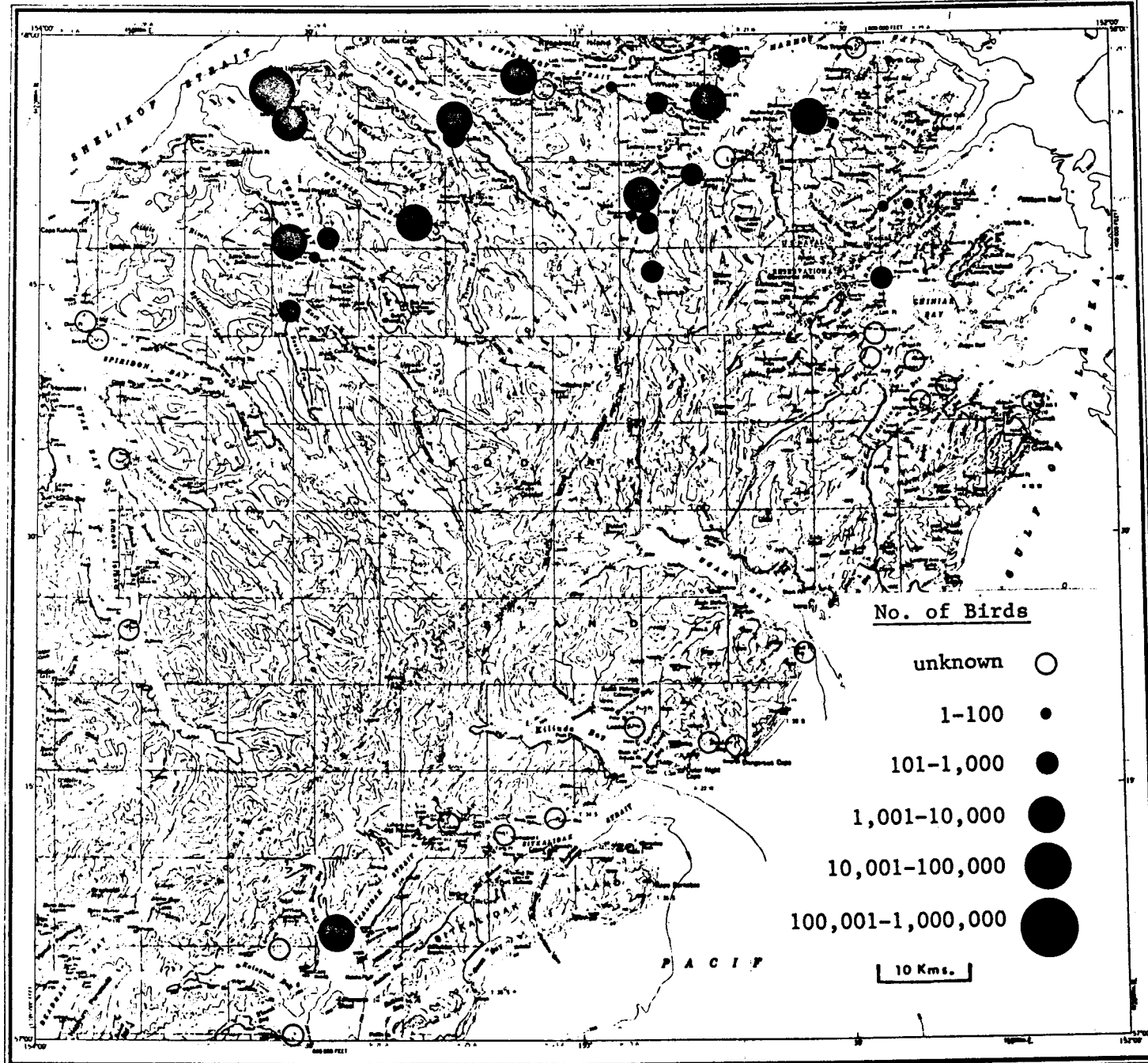


Figure 28. Comparative numbers of seabirds in colonies in topographic area 034, Kodiak.

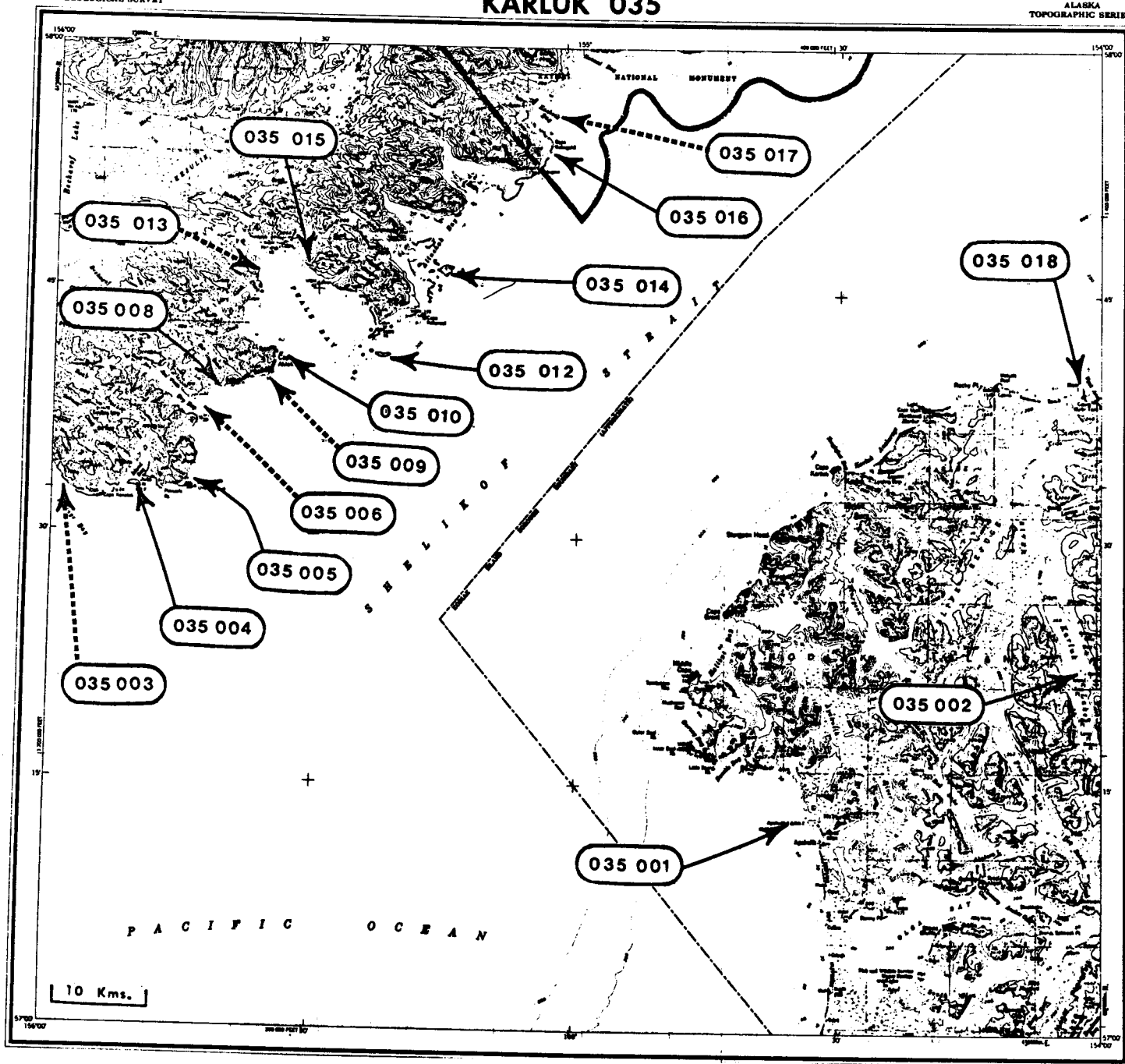
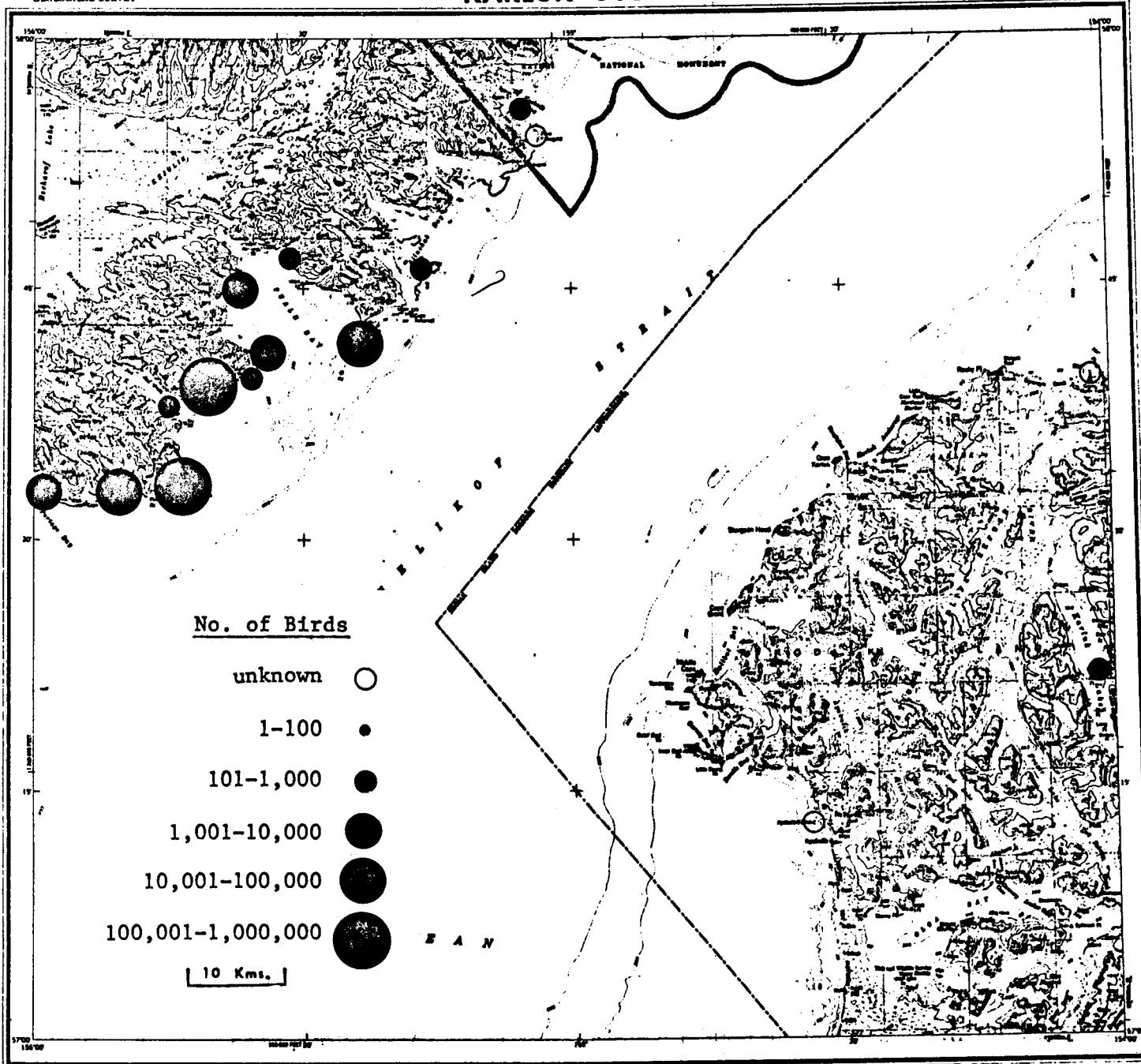


Figure 29. Locations of known seabird colonies in topographic area 035, Karluk. Dashed arrows indicate imprecise colony locations.



107

213

Figure 30. Comparative numbers of seabirds in colonies in topographic area 035, Karluk.

UGASHIK 036

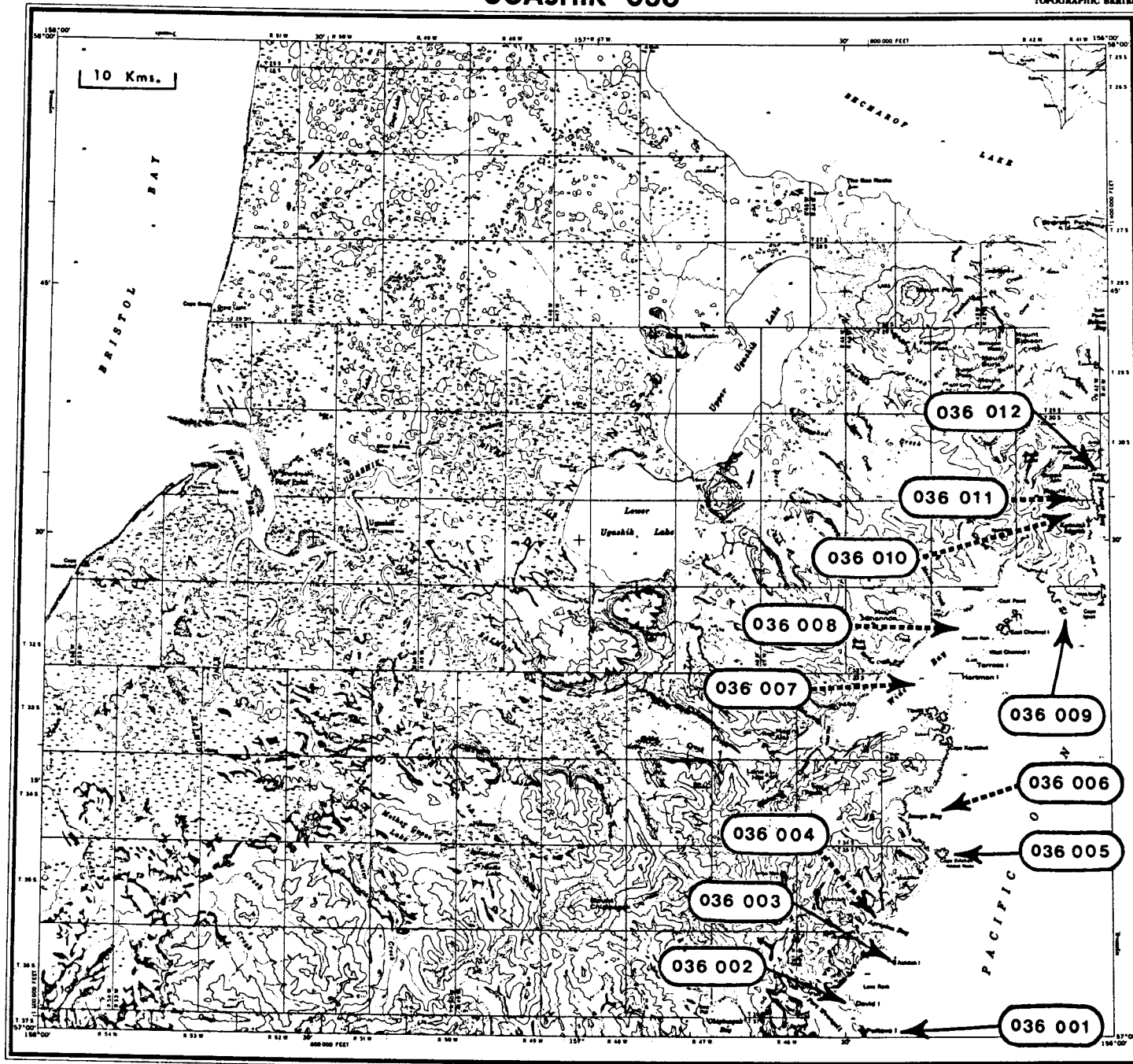
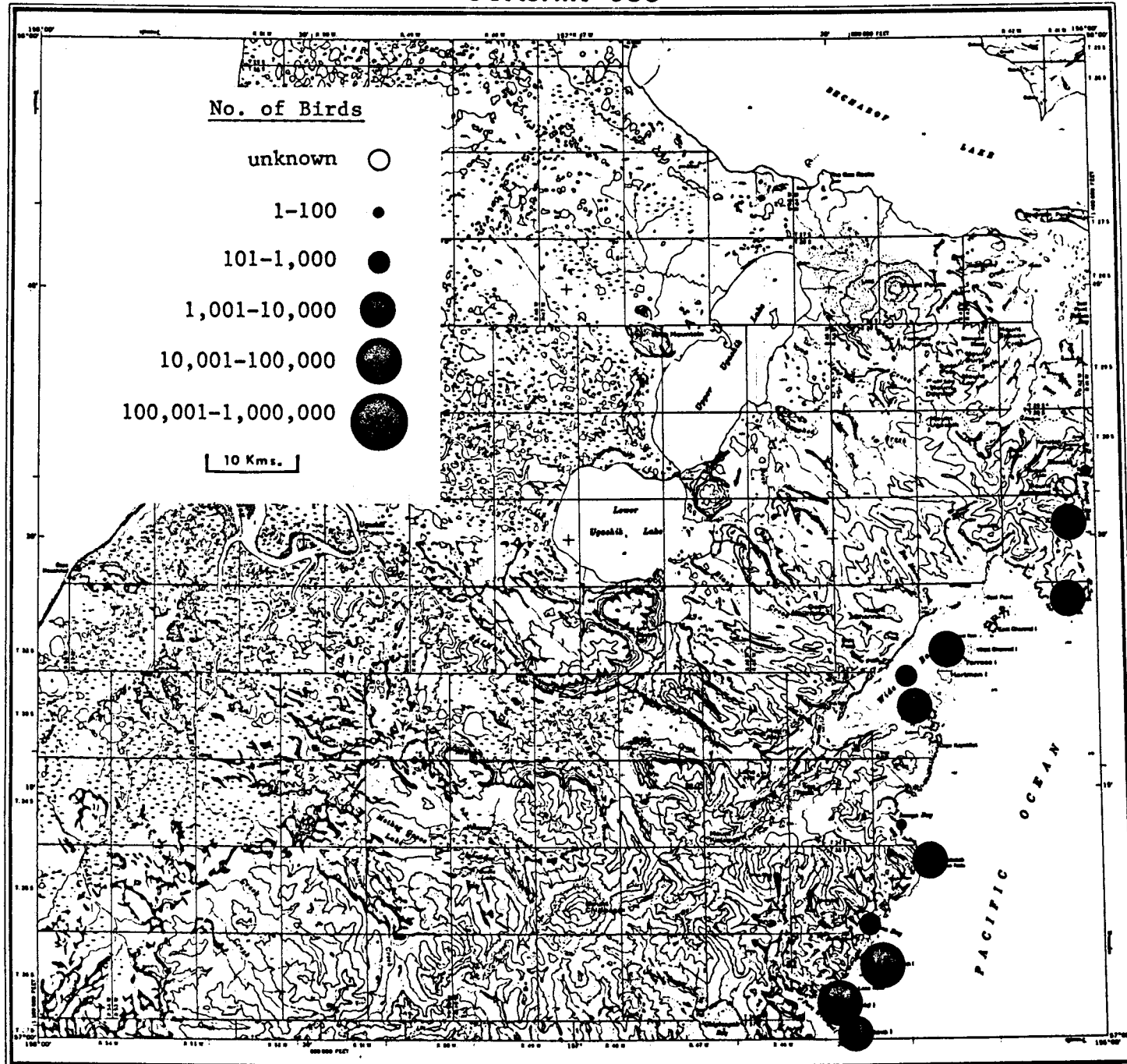


Figure 31. Locations of known seabird colonies in topographic area 036, Ugashik. Dashed arrows indicate imprecise colony locations.



109
215

Figure 32. Comparative numbers of seabirds in colonies in topographic area 036, Ugashik.

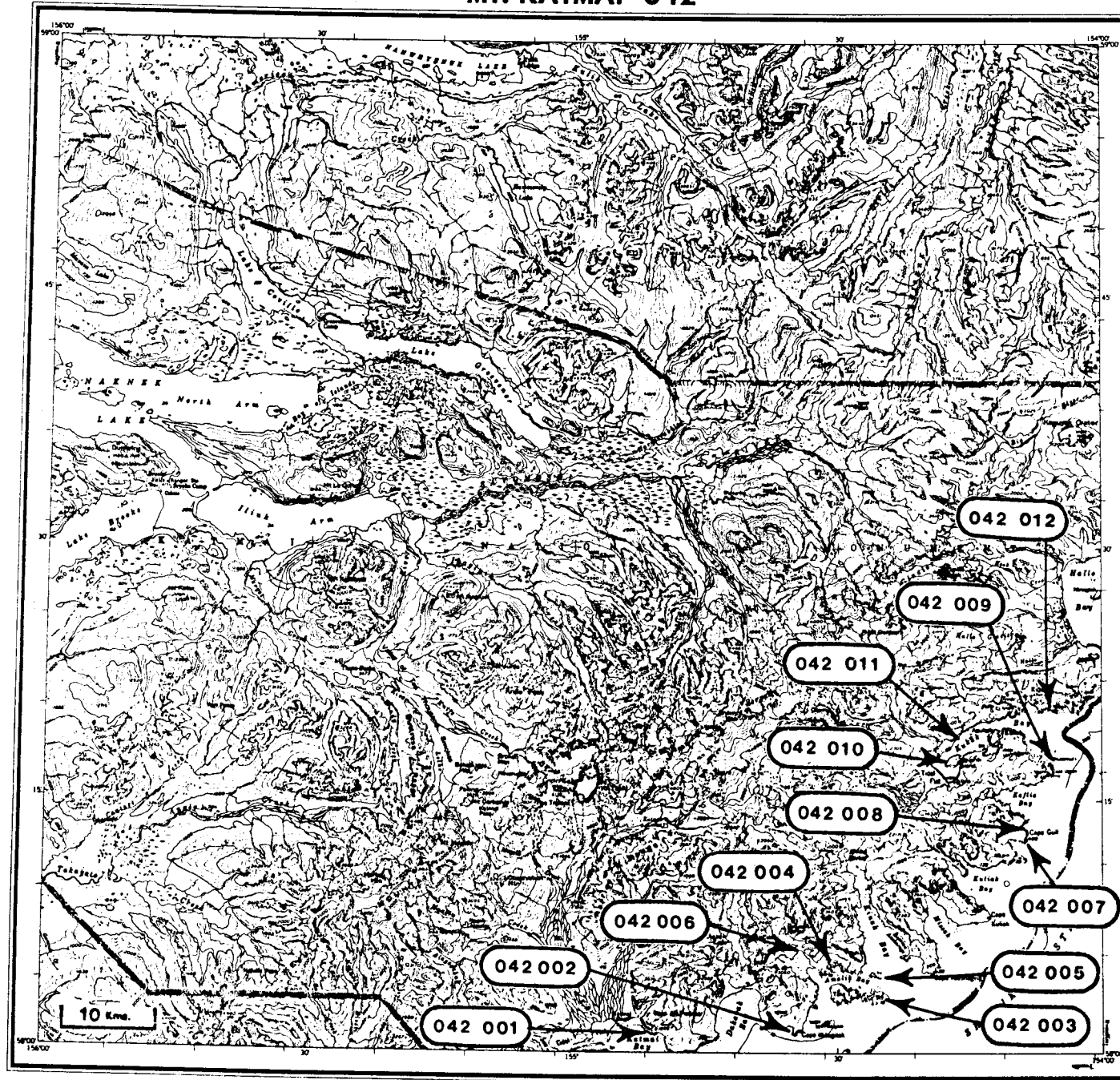
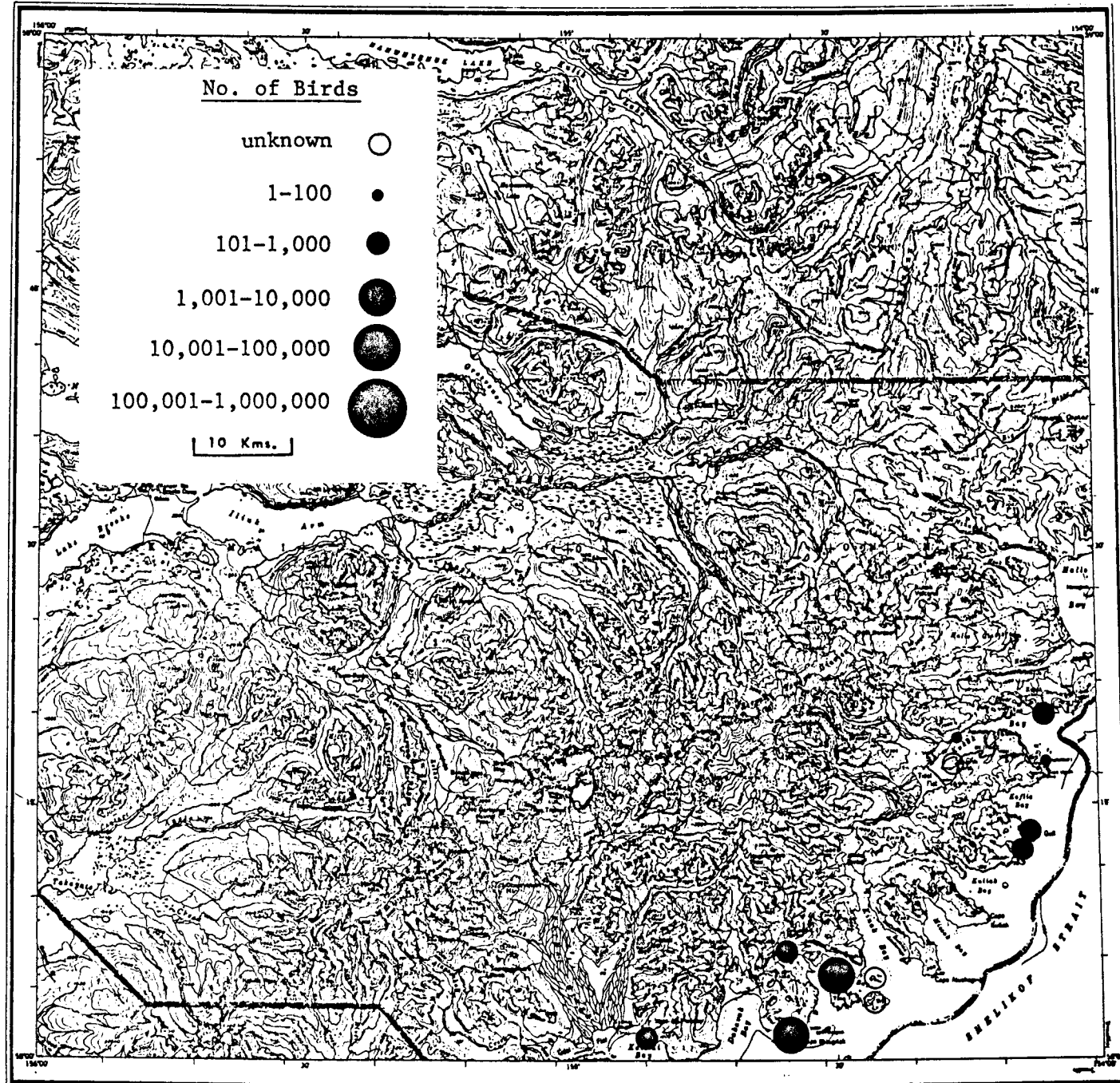


Figure 33. Locations of known seabird colonies in topographic area 042, Mt. Katmai.



III

217

Figure 34. Comparative numbers of seabirds in colonies in topographic area 042, Katmai.

AFOGNAK 043

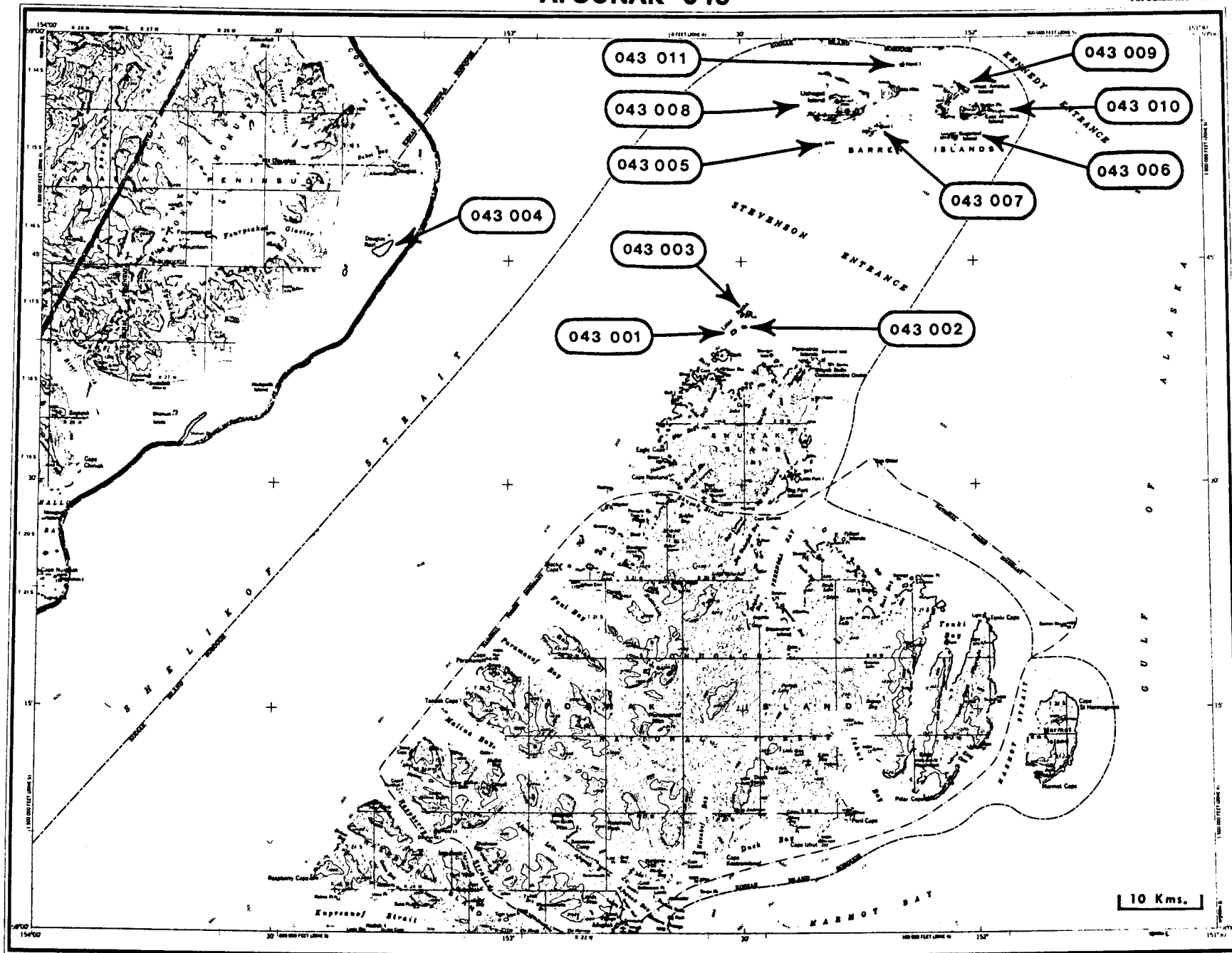
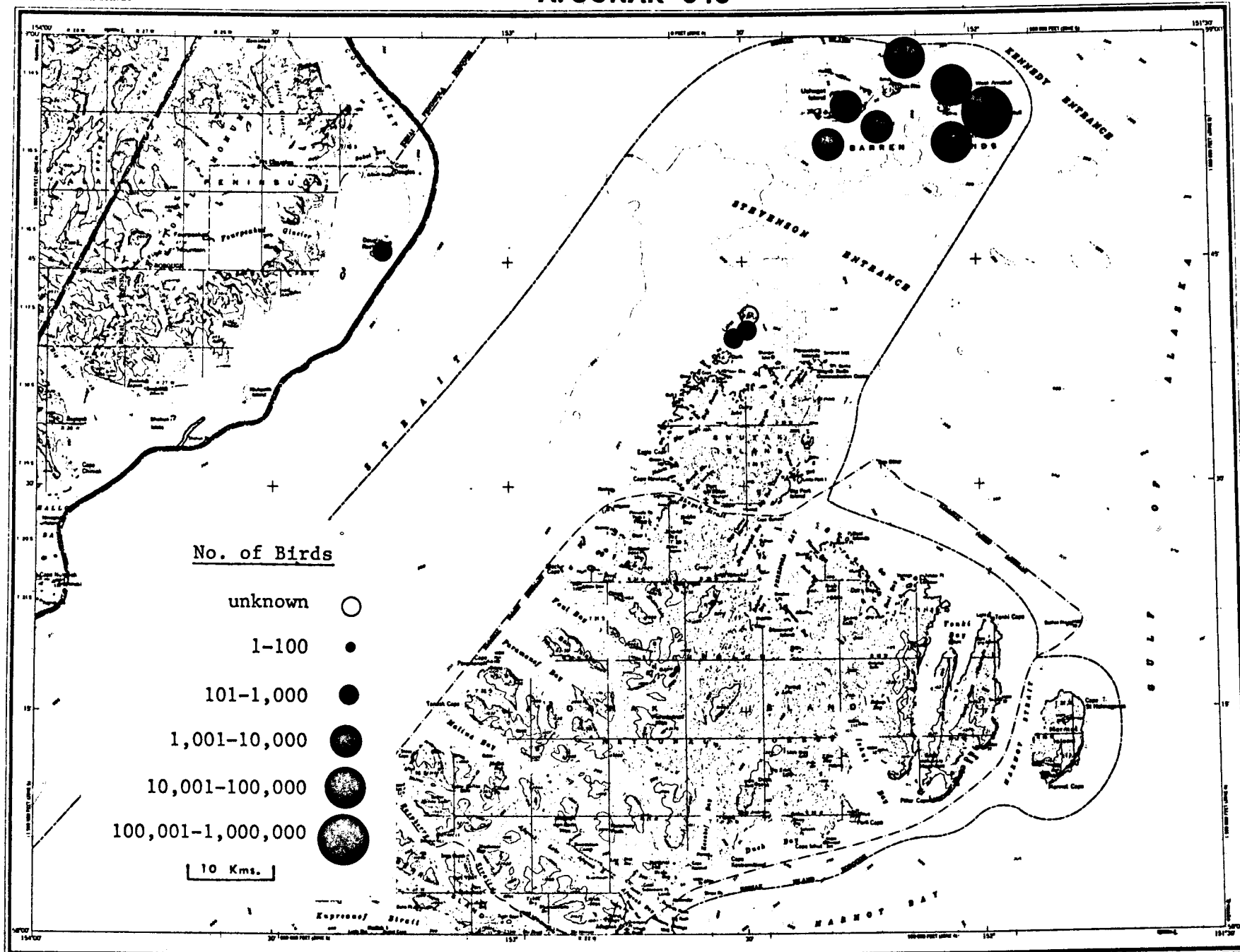


Figure 35. Locations of known seabird colonies in topographic area 043, Afognak.



113

219

Figure 36. Comparative numbers of seabirds in colonies in topographic area 043, Afognak.

YAKUTAT 046

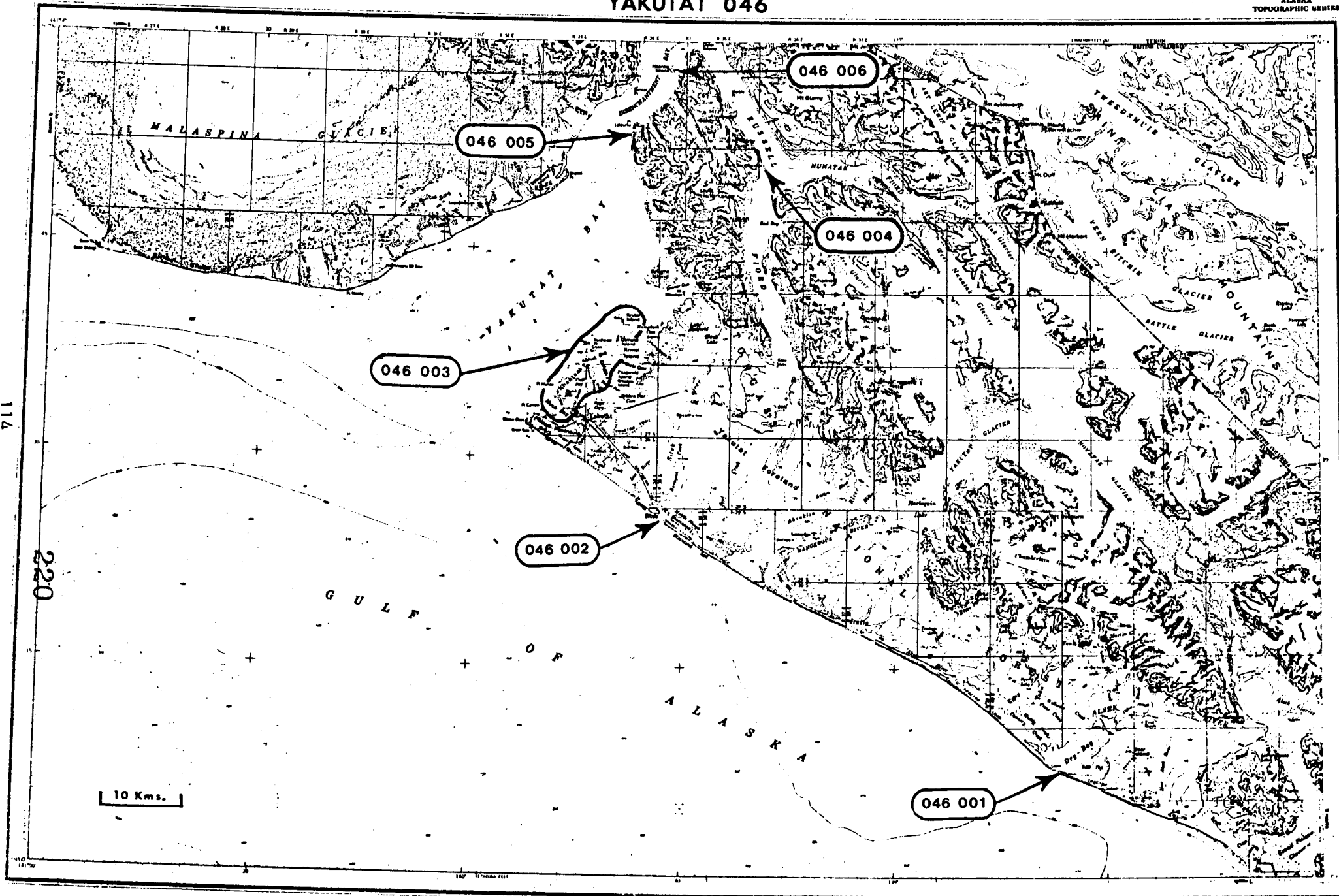


Figure 37. Locations of known seabird colonies in topographic area 046, Yakutat.

YAKUTAT 046

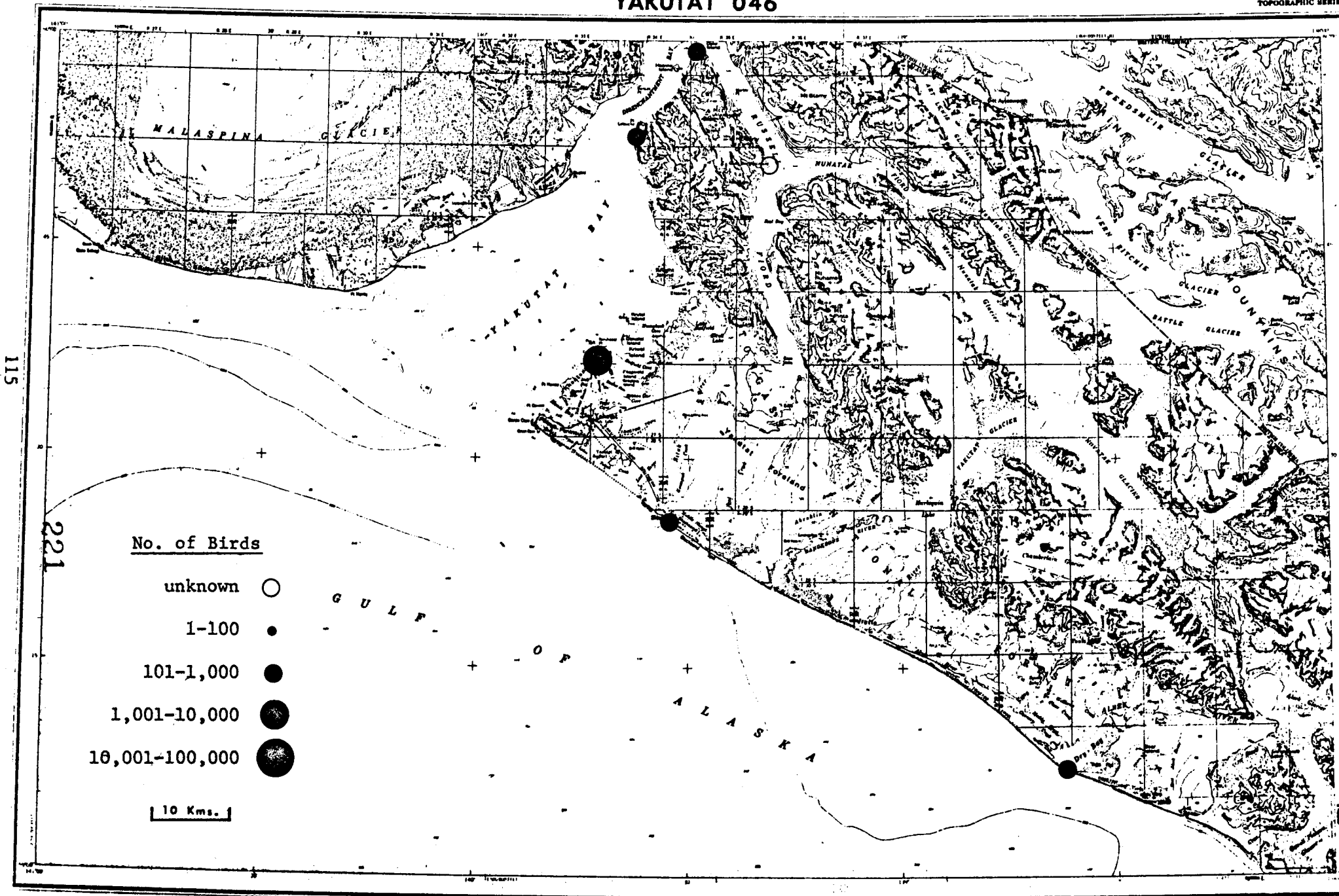


Figure 38. Comparative numbers of seabirds in colonies in topographic area 046, Yakutat.

ICY BAY 047

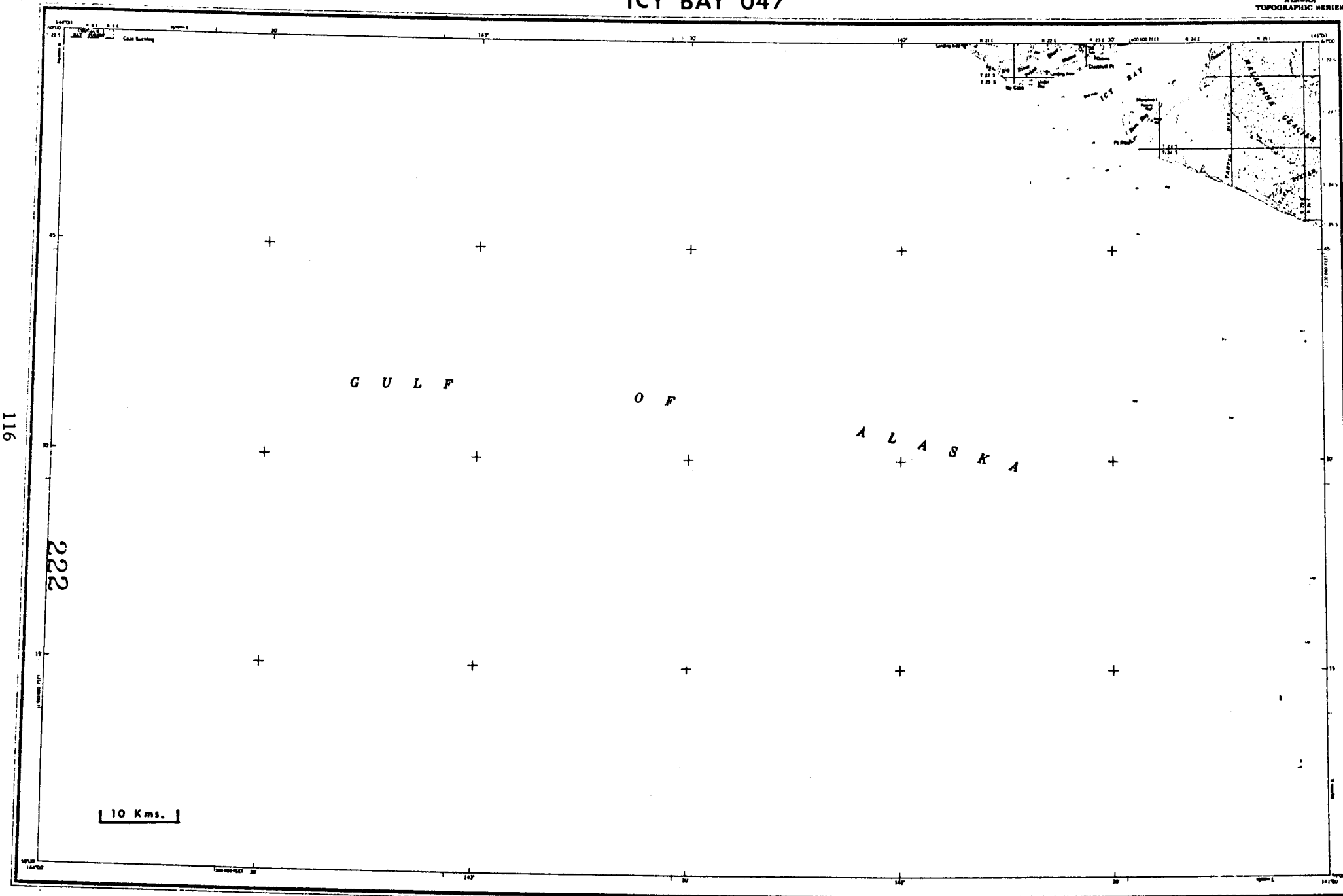


Figure 39. Topographic area 047, Icy Bay. No colony sites have been located in this region.

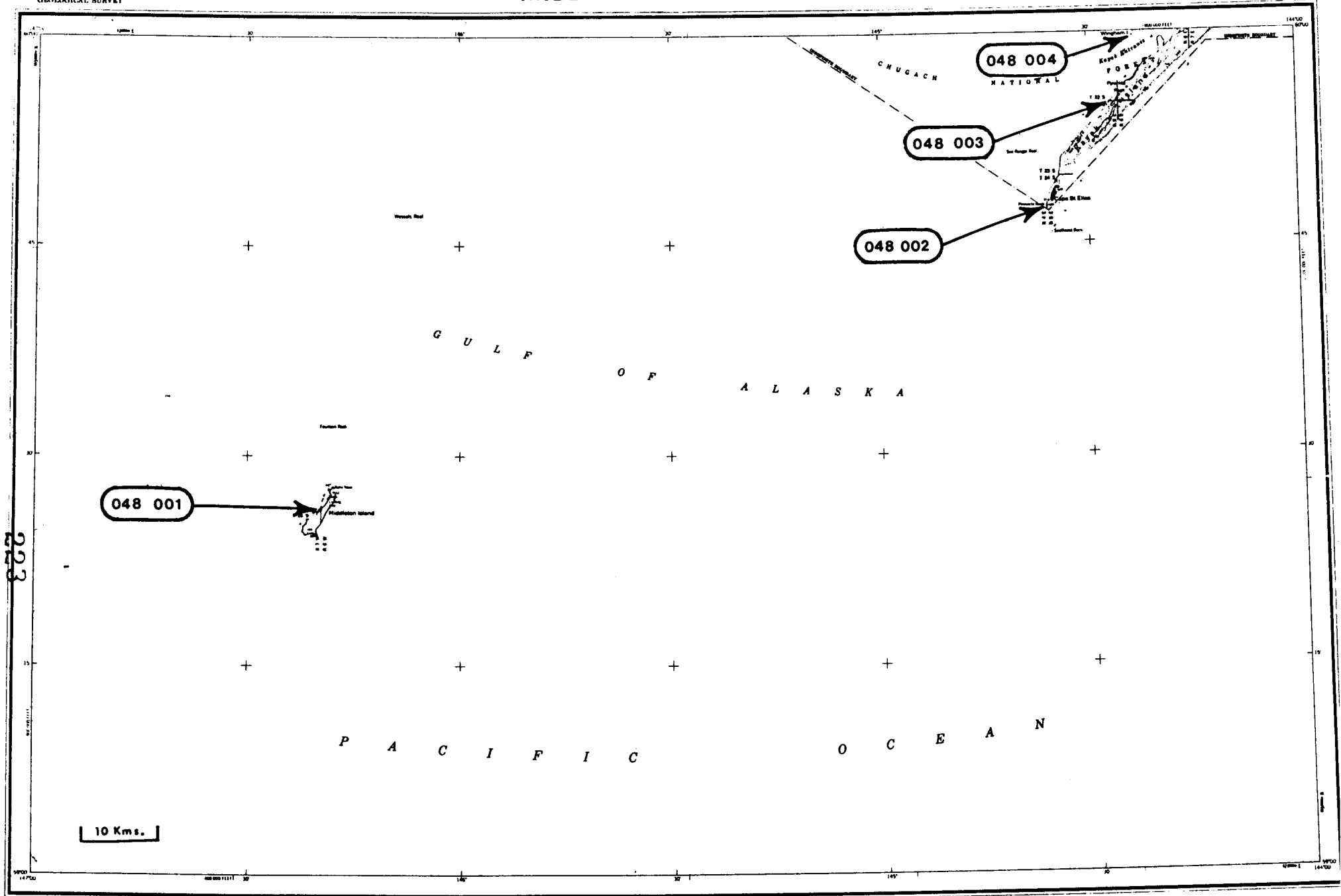


Figure 40. Locations of known seabird colonies in topographic area 048, Middleton Island.

MIDDLETON ISLAND 048

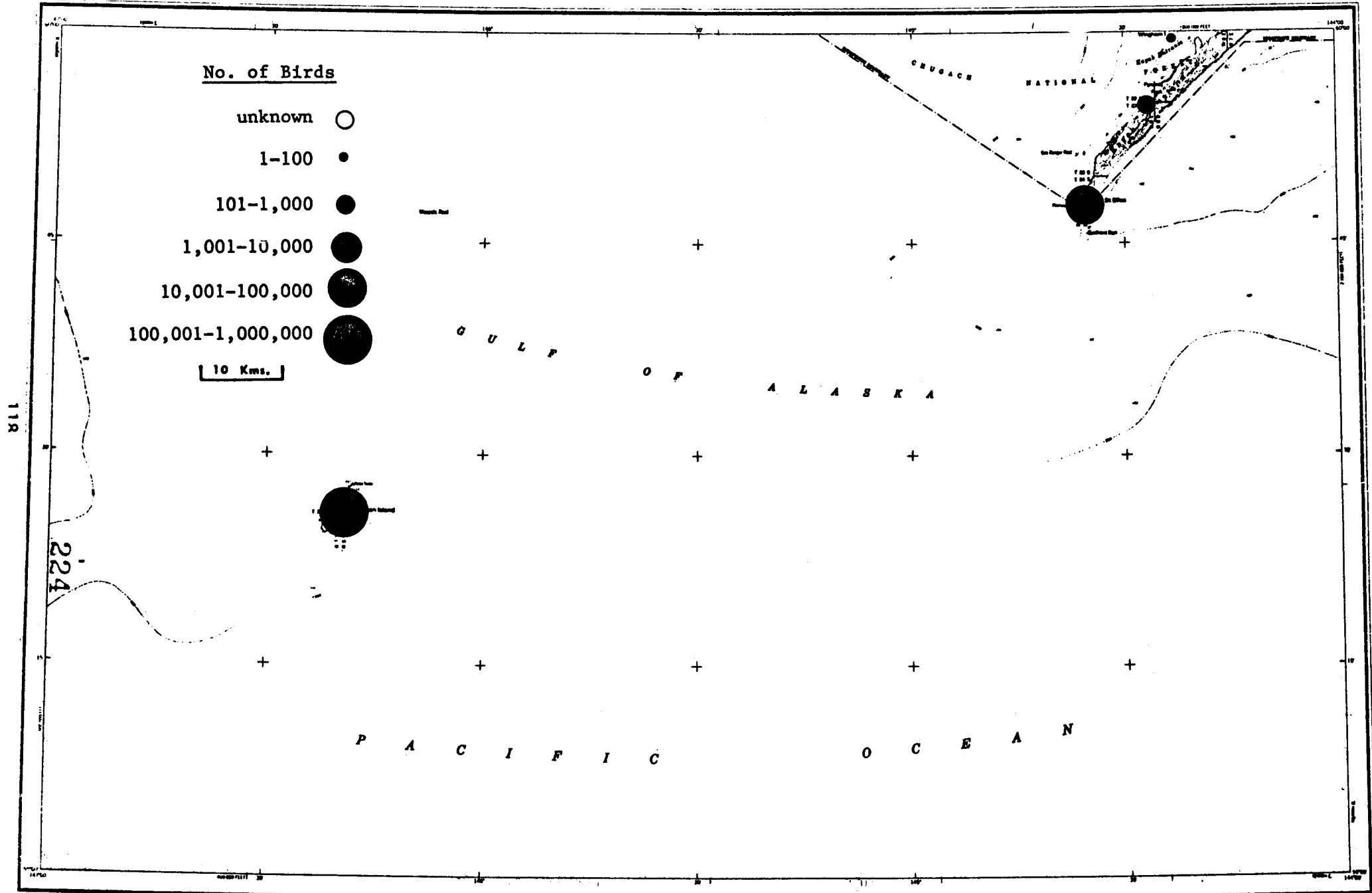


Figure 41. Comparative numbers of seabirds in colonies in topographic area 048, Middleton Island.

BLYING SOUND 049

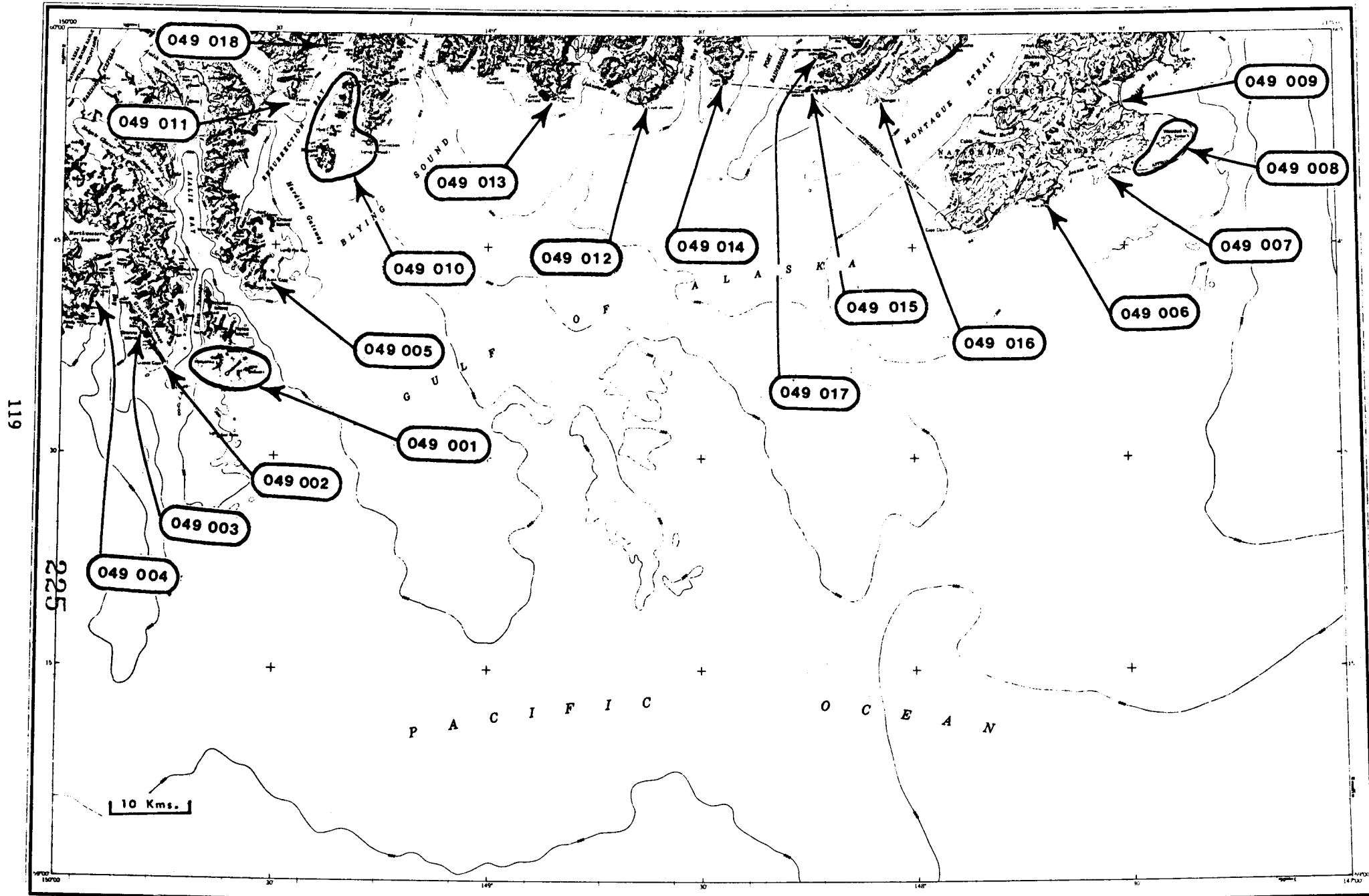


Figure 42. Locations of known seabird colonies in topographic area 049, Blying Sound.

BLYING SOUND 049

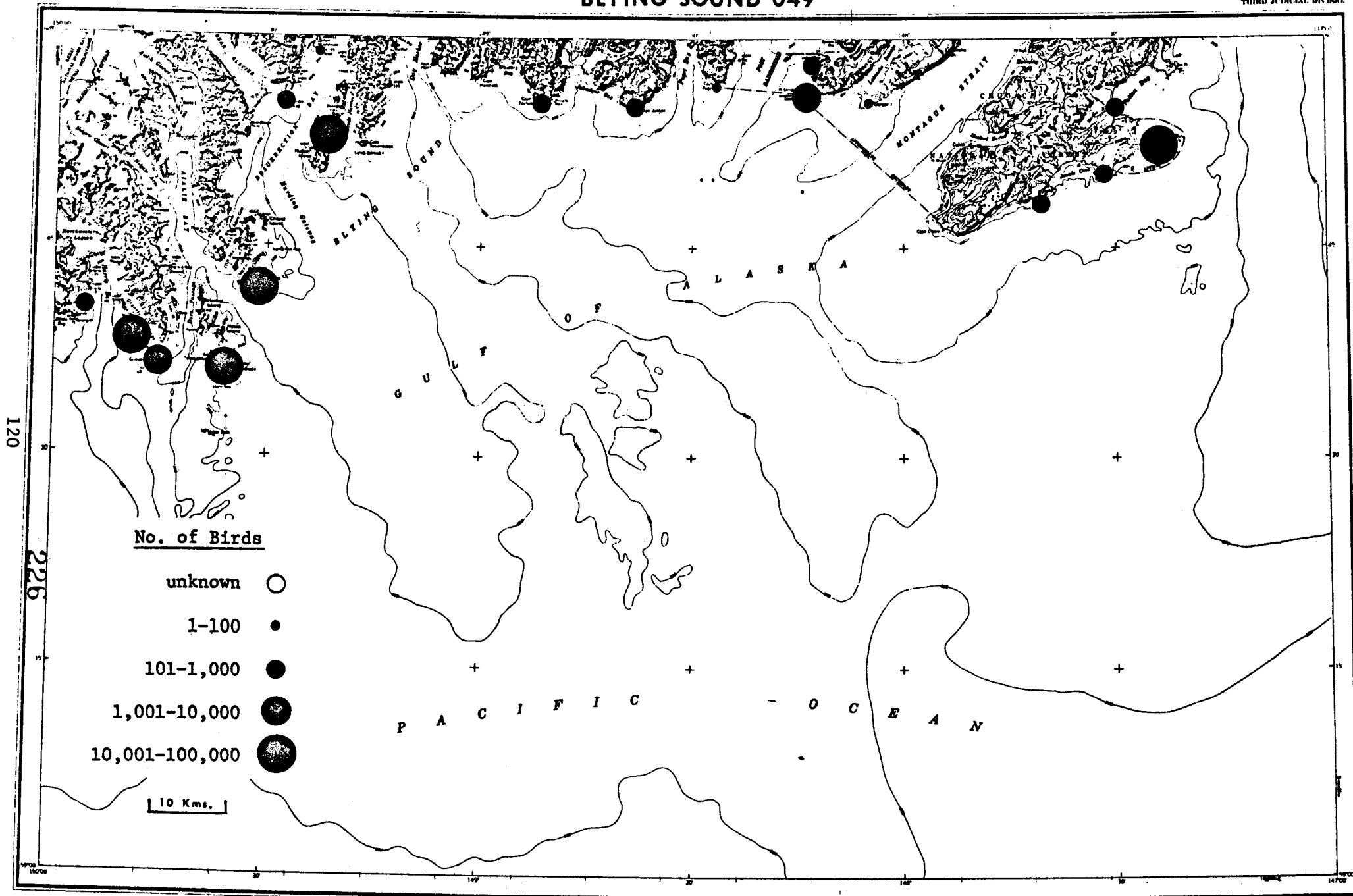
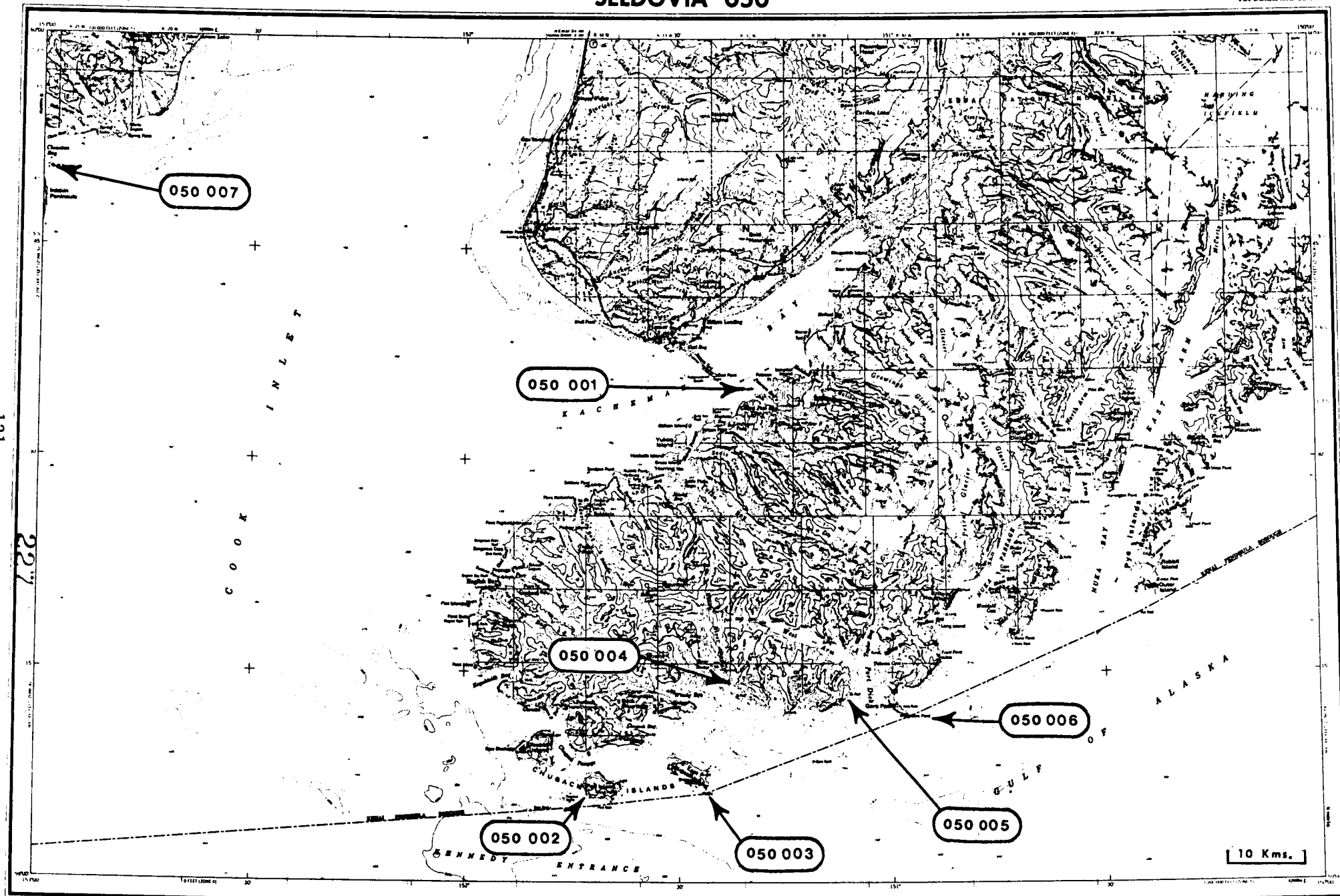


Figure 43. Comparative numbers of seabirds in colonies in topographic area 049, Blying Sound.

SELDOVIA 050



121

Figure 44. Locations of known seabird colonies in topographic area 050, Seldovia.

SELDOVIA 050

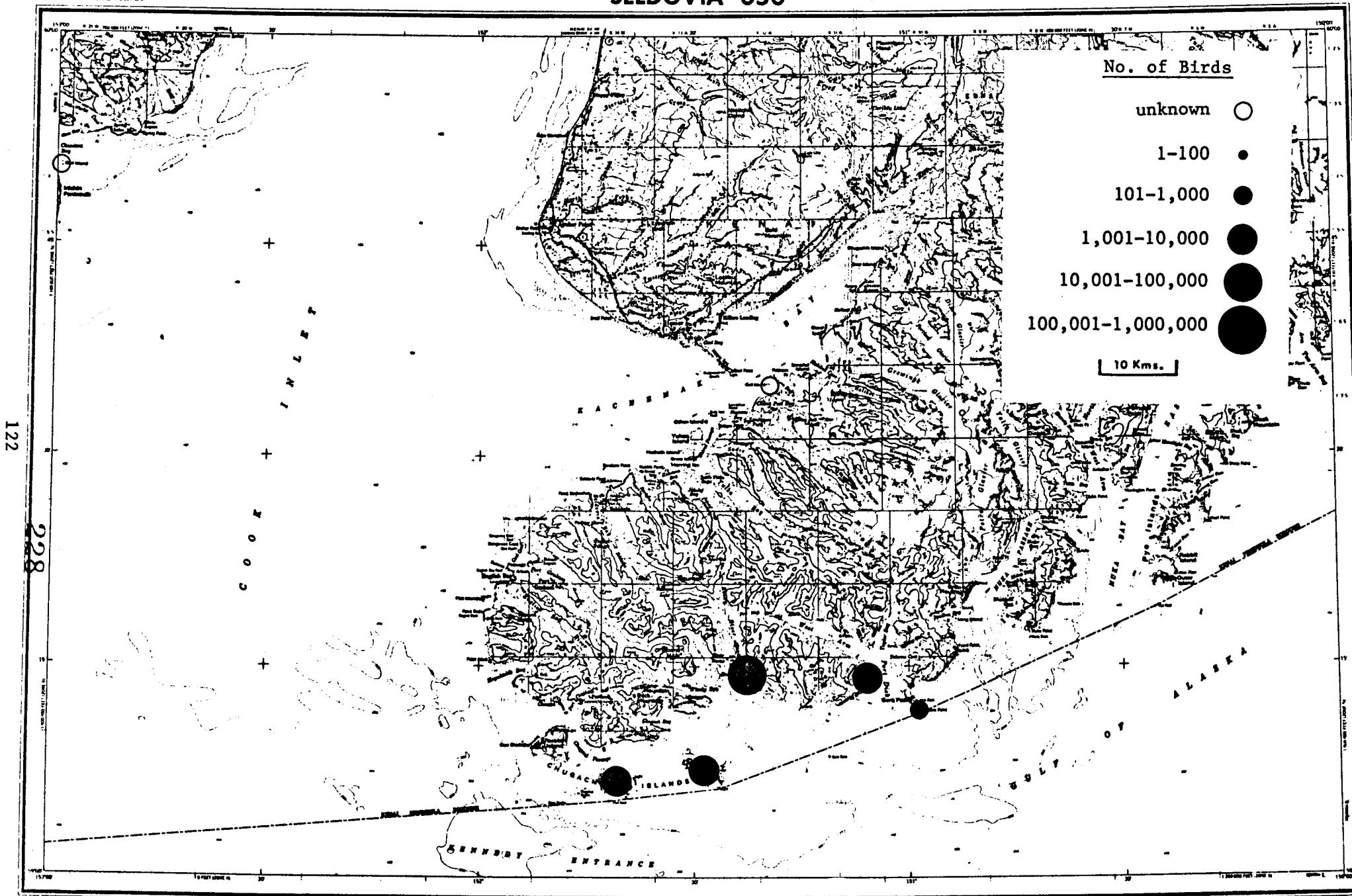
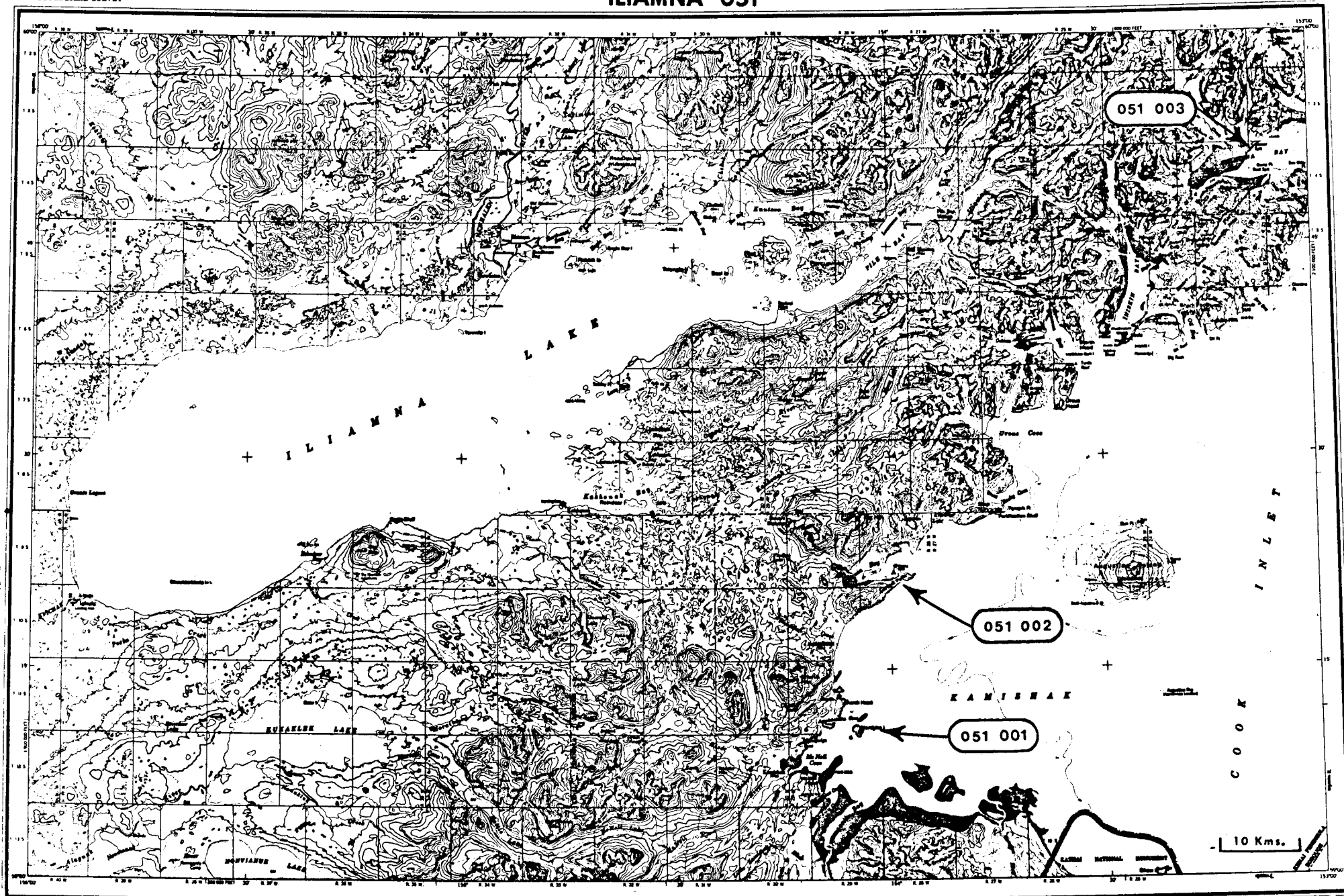


Figure 45. Comparative numbers of seabirds in colonies in topographic area 050, Seldovia.



123

229

Figure 46. Locations of known seabird colonies in topographic area 051, Iliamna.

ILIAMNA 051

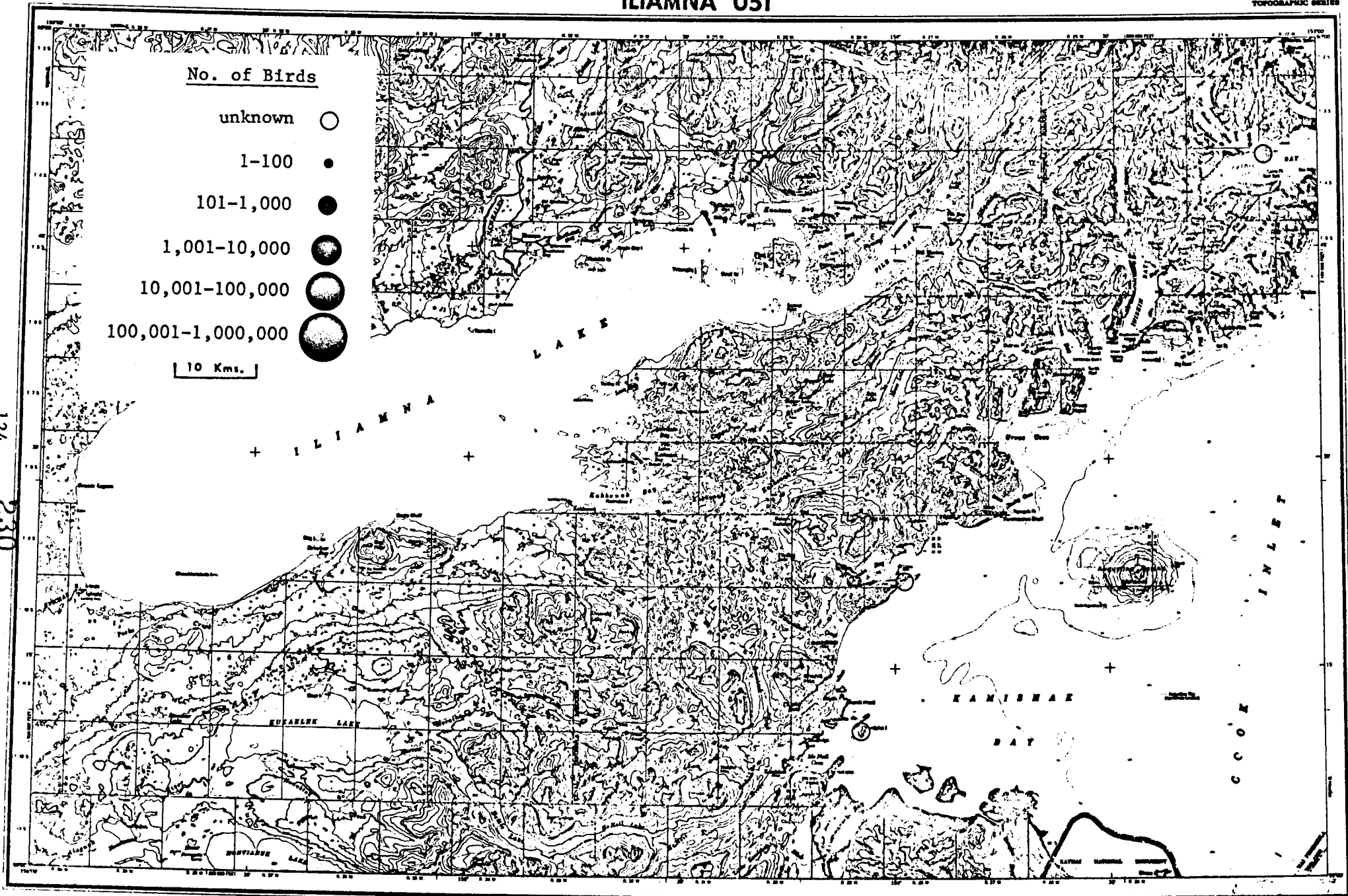
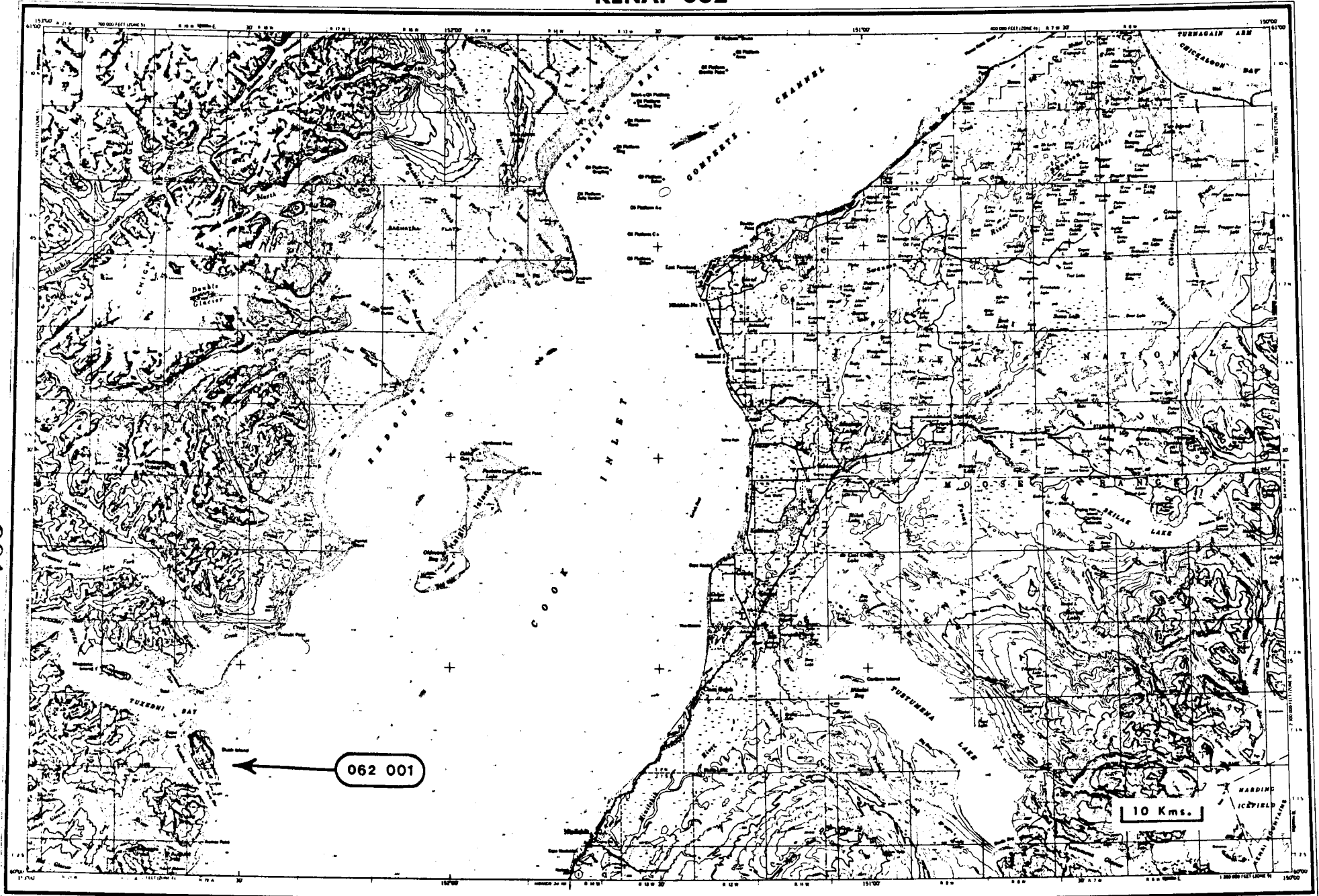


Figure 47. Comparative numbers of seabirds in colonies in topographic area 051, Iliamna.



125
231

Figure 48. Locations of known seabird colonies in topographic area 062, Kenai.

126

232

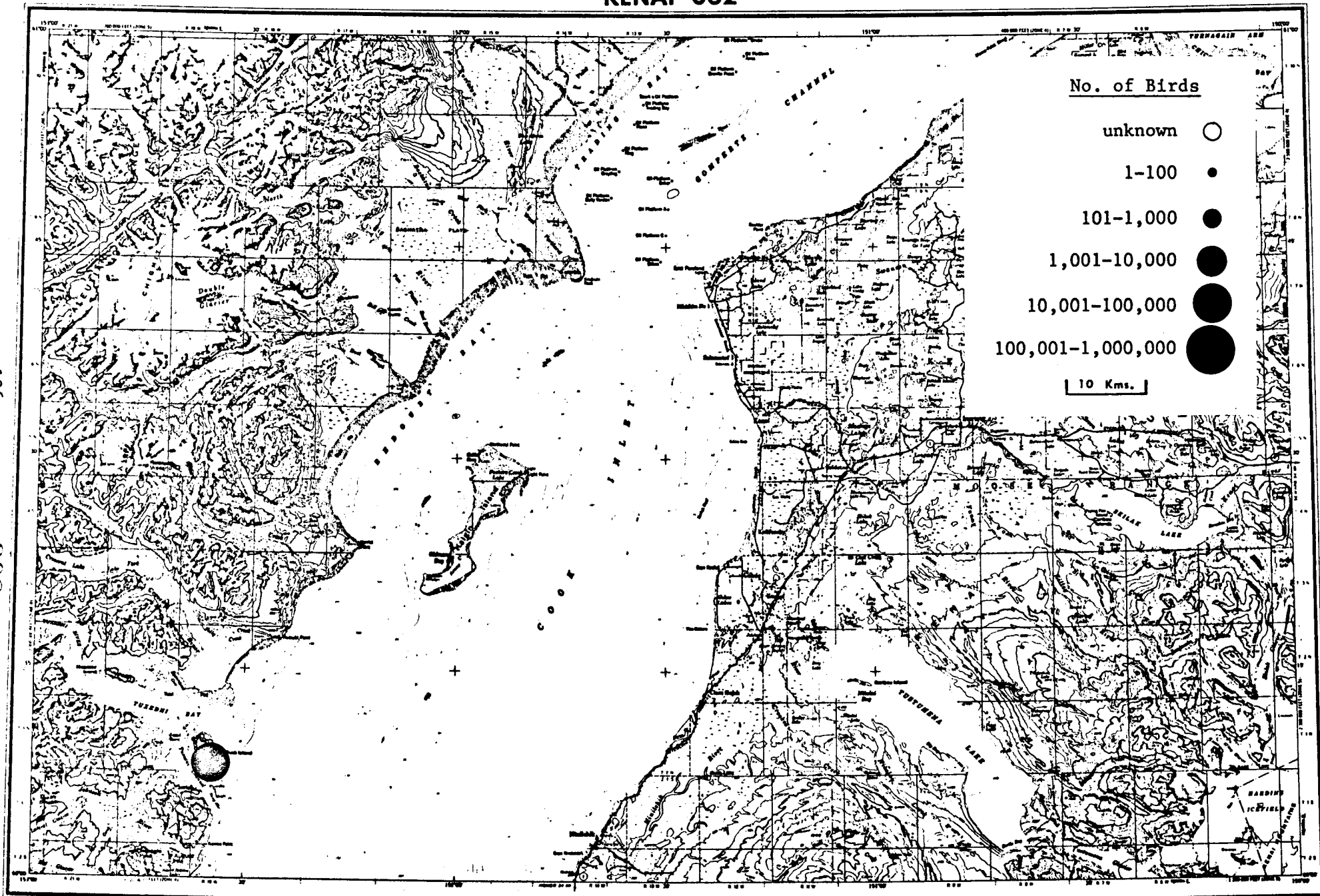


Figure 49. Comparative numbers of seabirds in colonies in topographic area 062, Kenai.

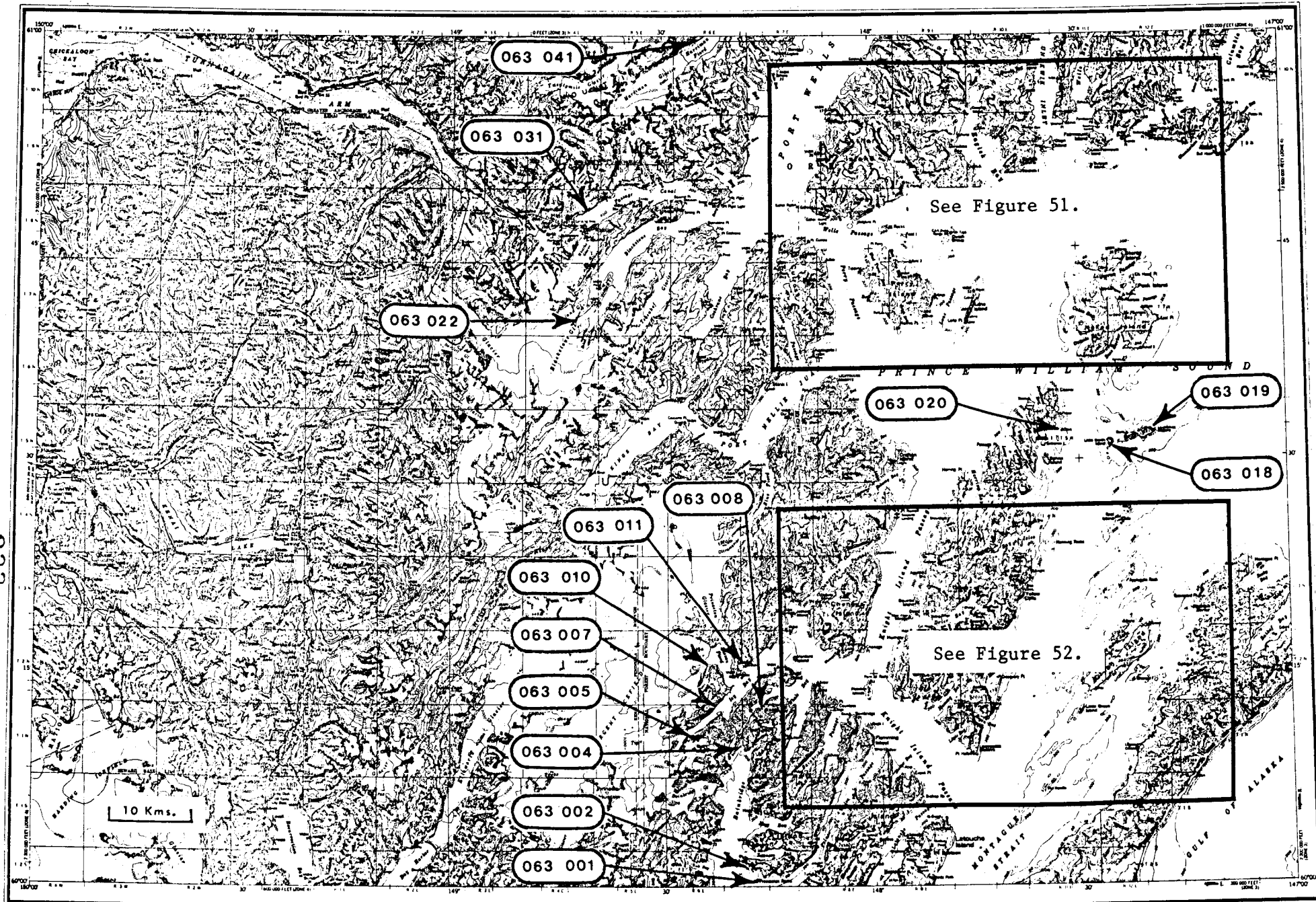


Figure 50. Locations of known seabird colonies in topographic area 063, Seward.

128
234

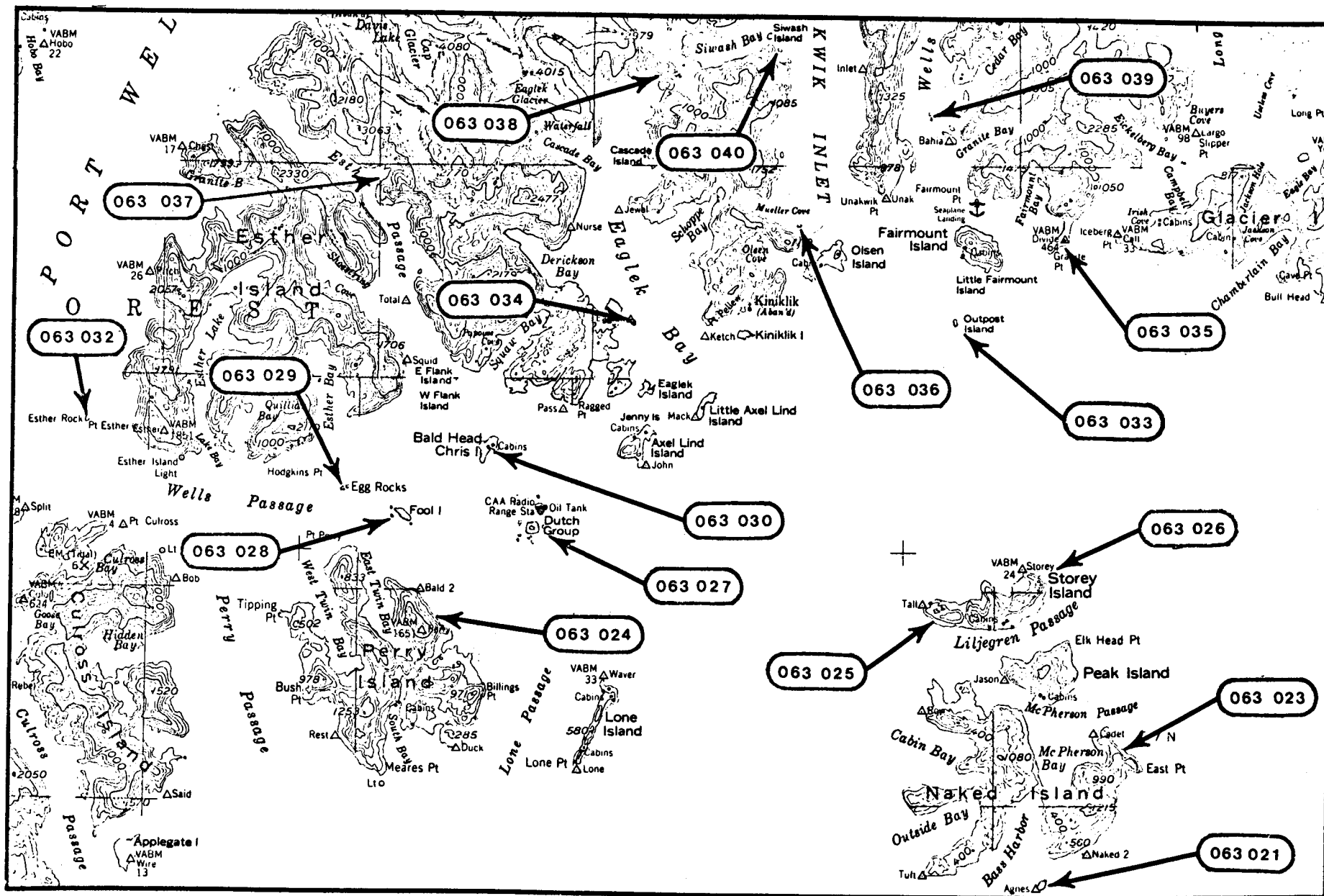


Figure 51. Enlarged section from topographic area 063, Seward, showing locations of known seabird colonies.

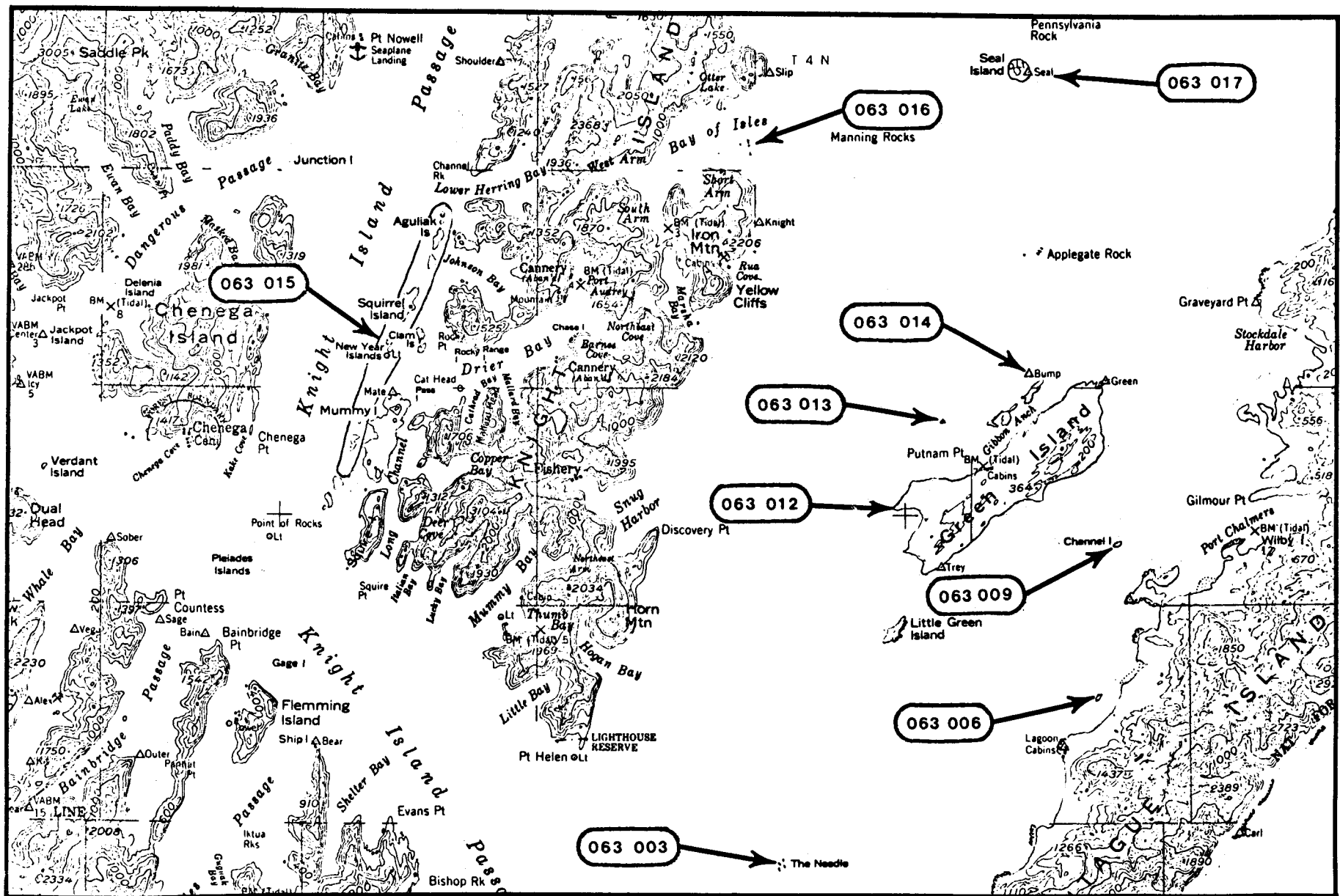


Figure 52. Enlarged section from topographic area 063, Seward, showing locations of known seabird colonies.

130
236

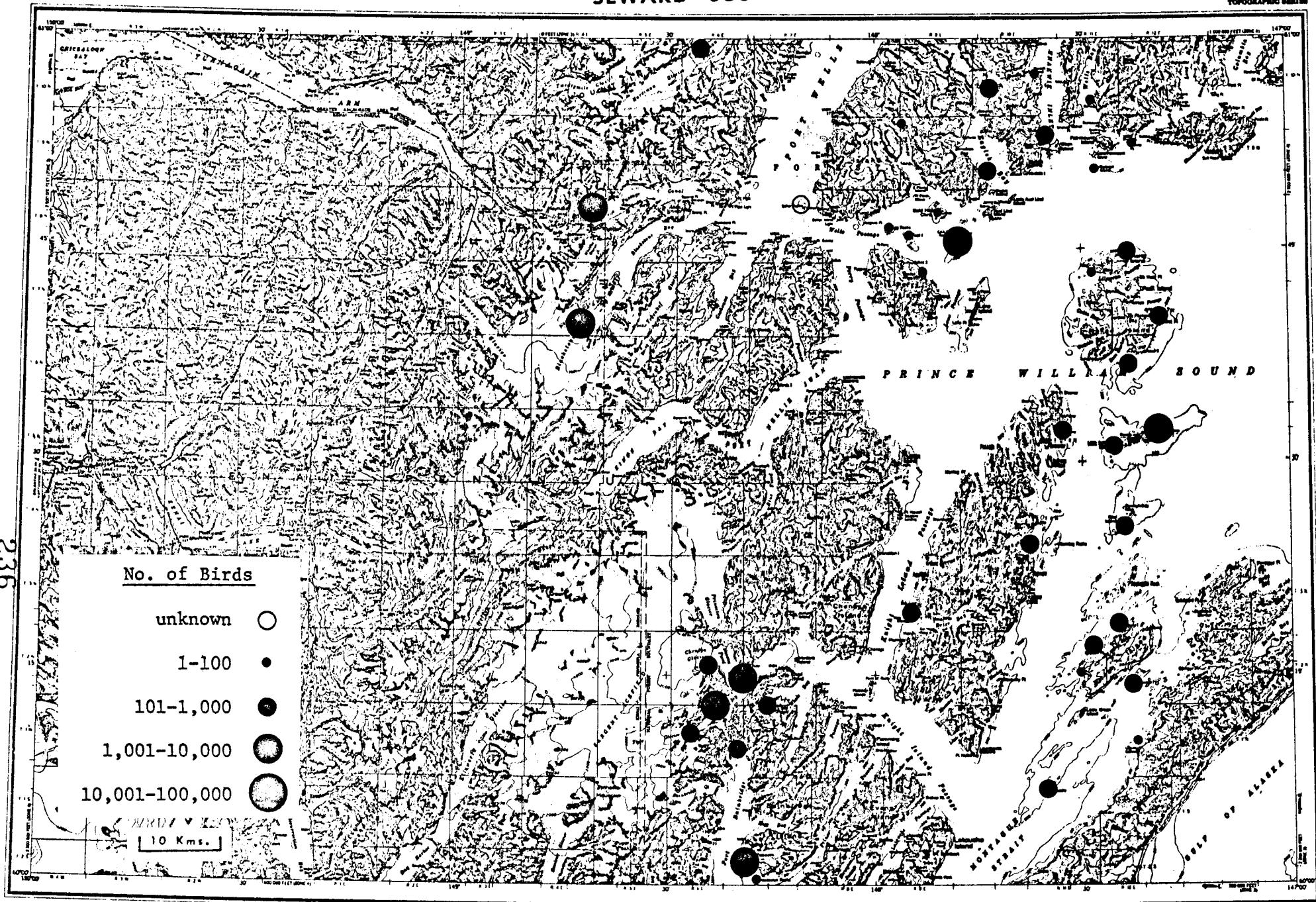


Figure 53. Comparative numbers of seabirds in colonies in topographic area 063, Seward.

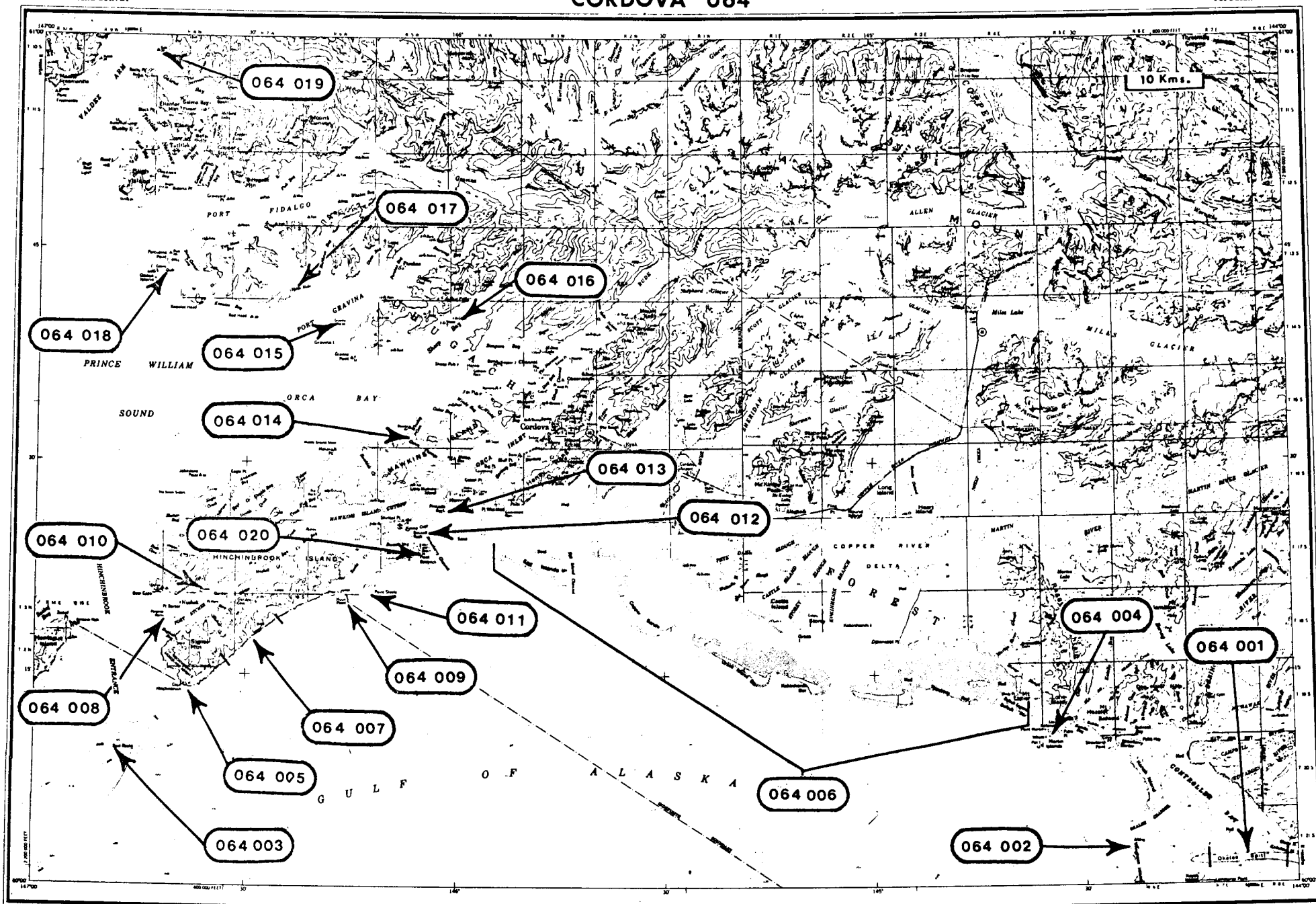


Figure 54. Locations of known seabird colonies in topographic area 064, Cordova.

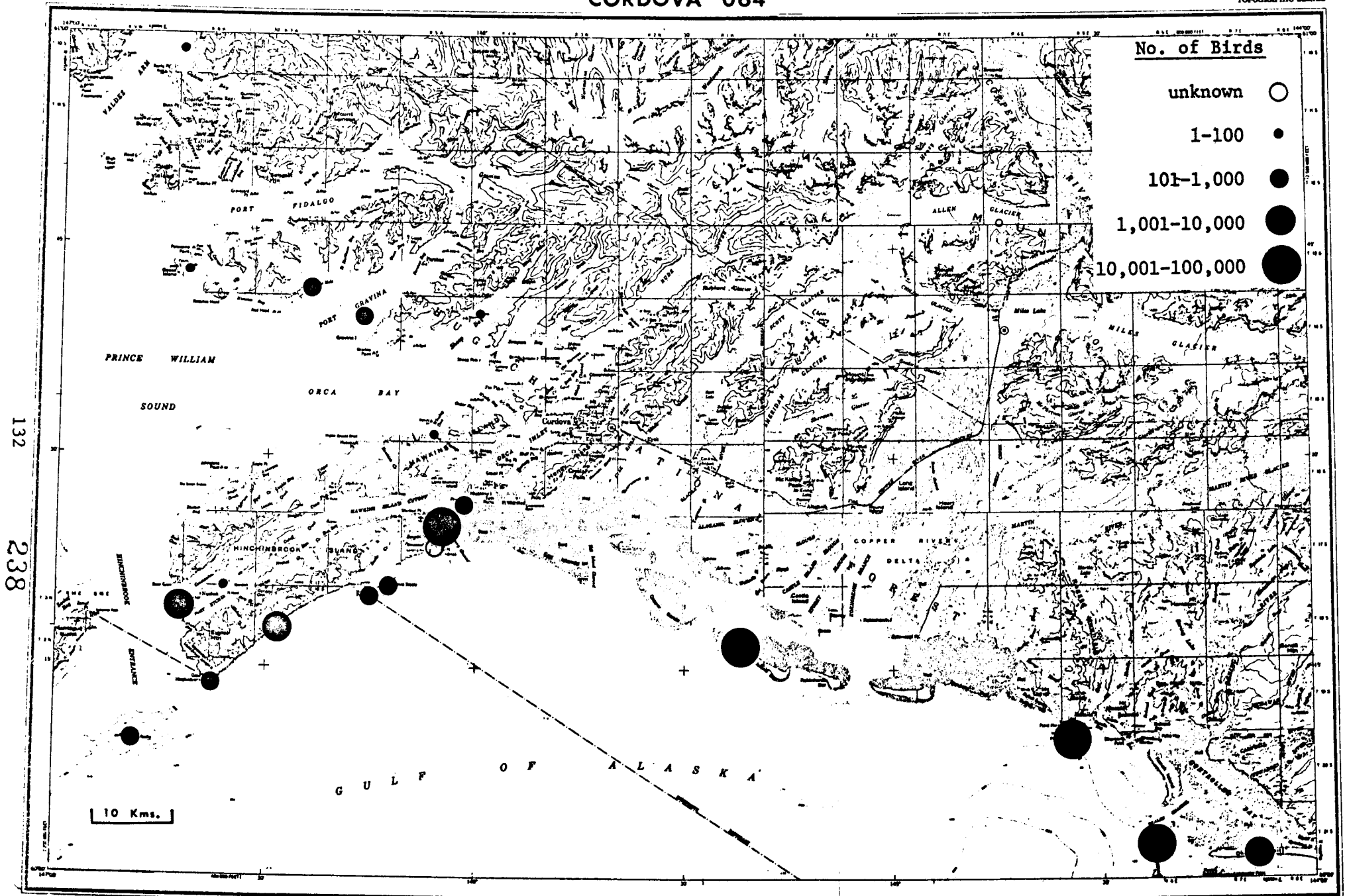


Figure 55. Comparative numbers of seabirds in colonies in topographic area 064, Cordova.

BERING GLACIER 065

133
239



Figure 56. Topographic area 065, Bering Glacier. No colony sites have been located in this region.

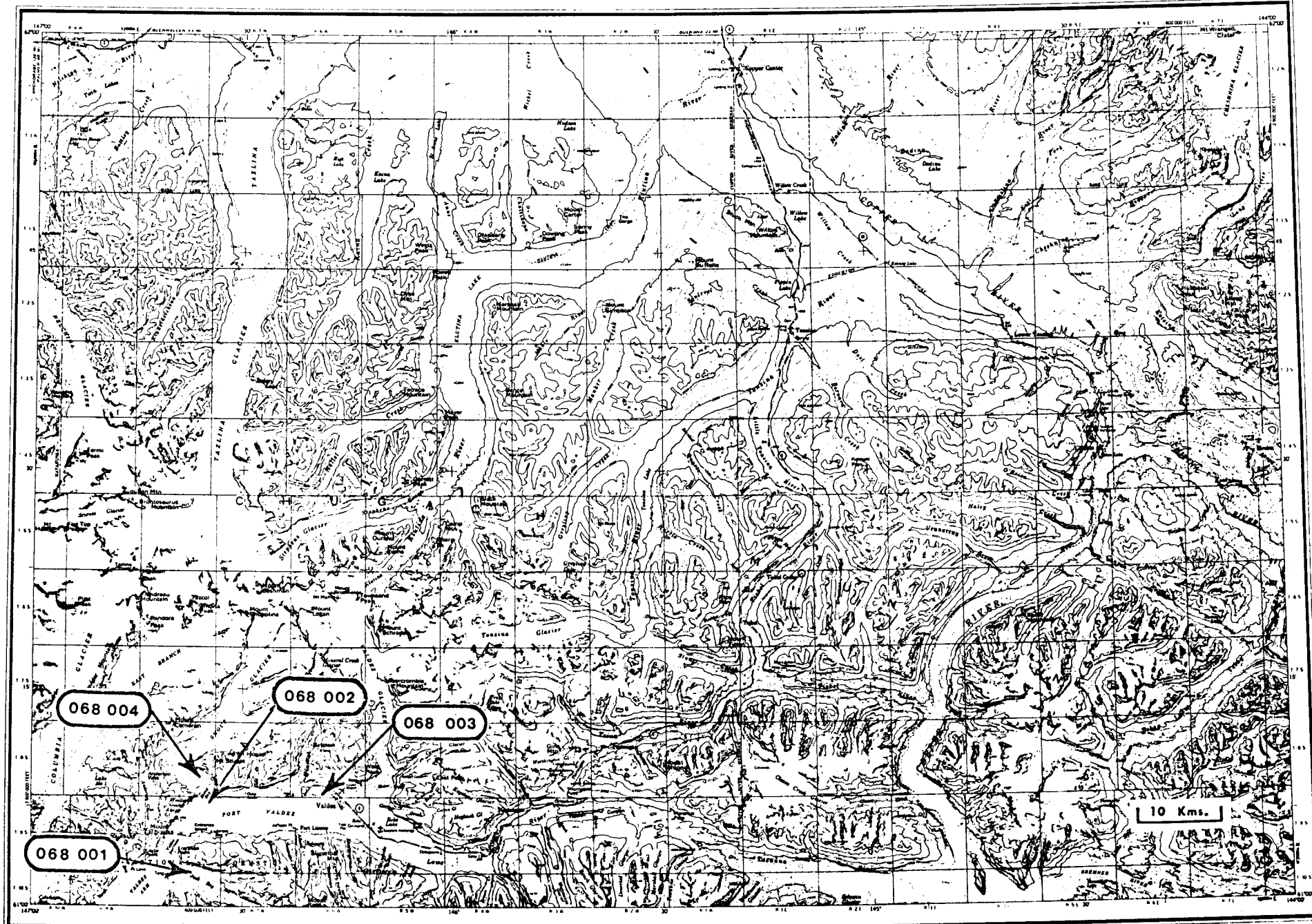


Figure 57. Locations of known seabird colonies in topographic area 068, Valdez.

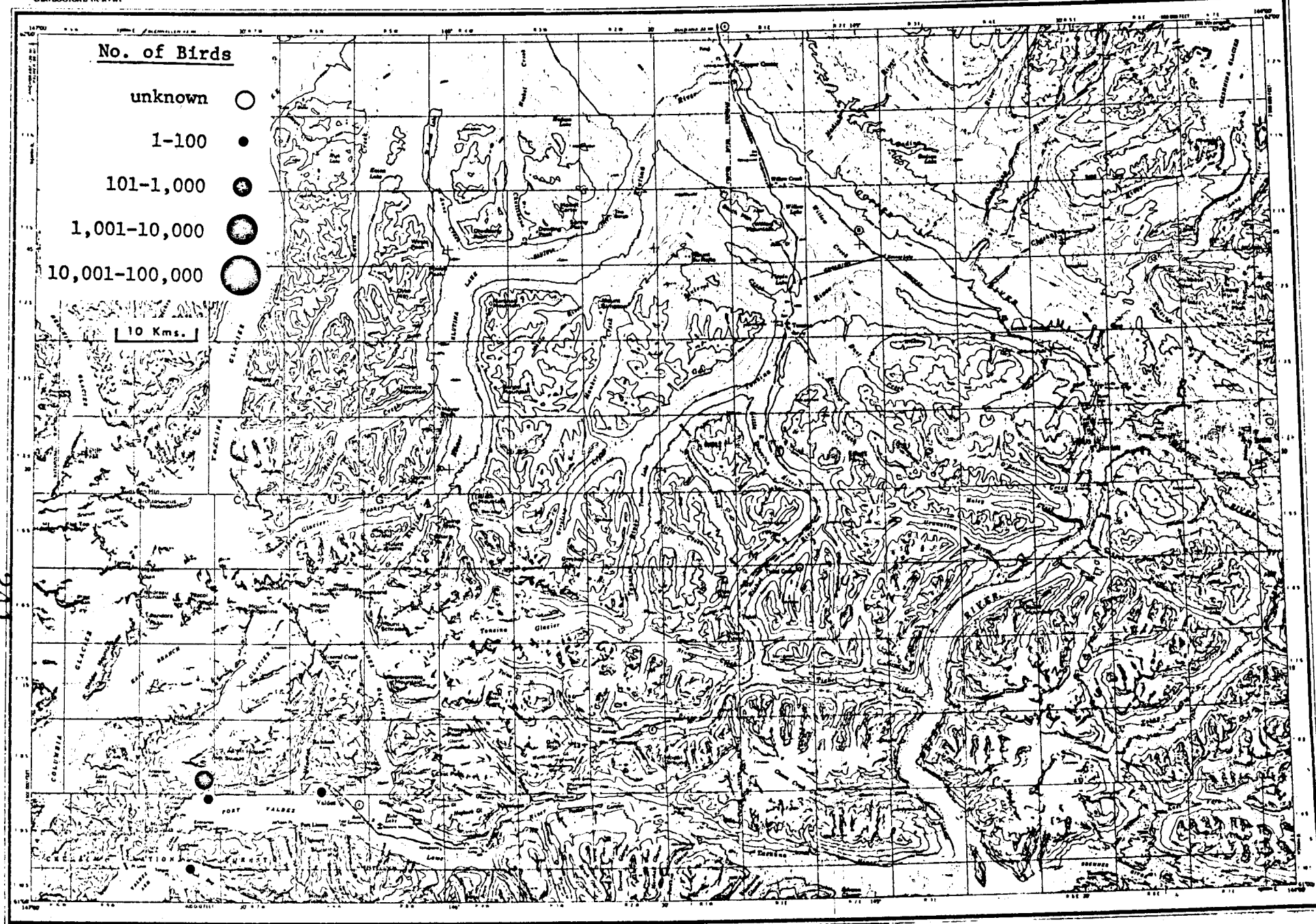
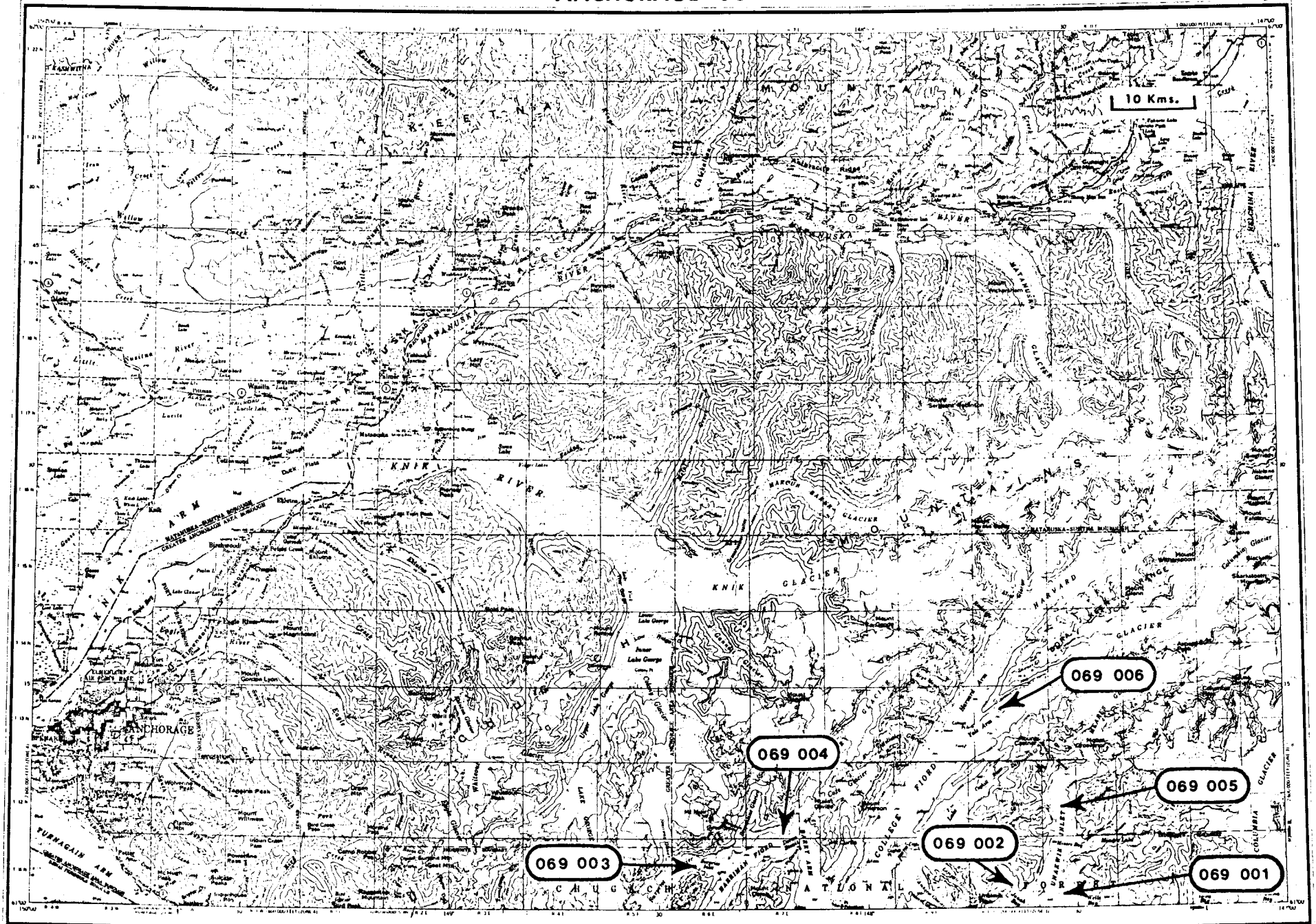


Figure 58. Comparative numbers of seabirds in colonies in topographic area 068, Valdez.



136

242

Figure 59. Locations of known seabird colonies in topographic area 069, Anchorage.

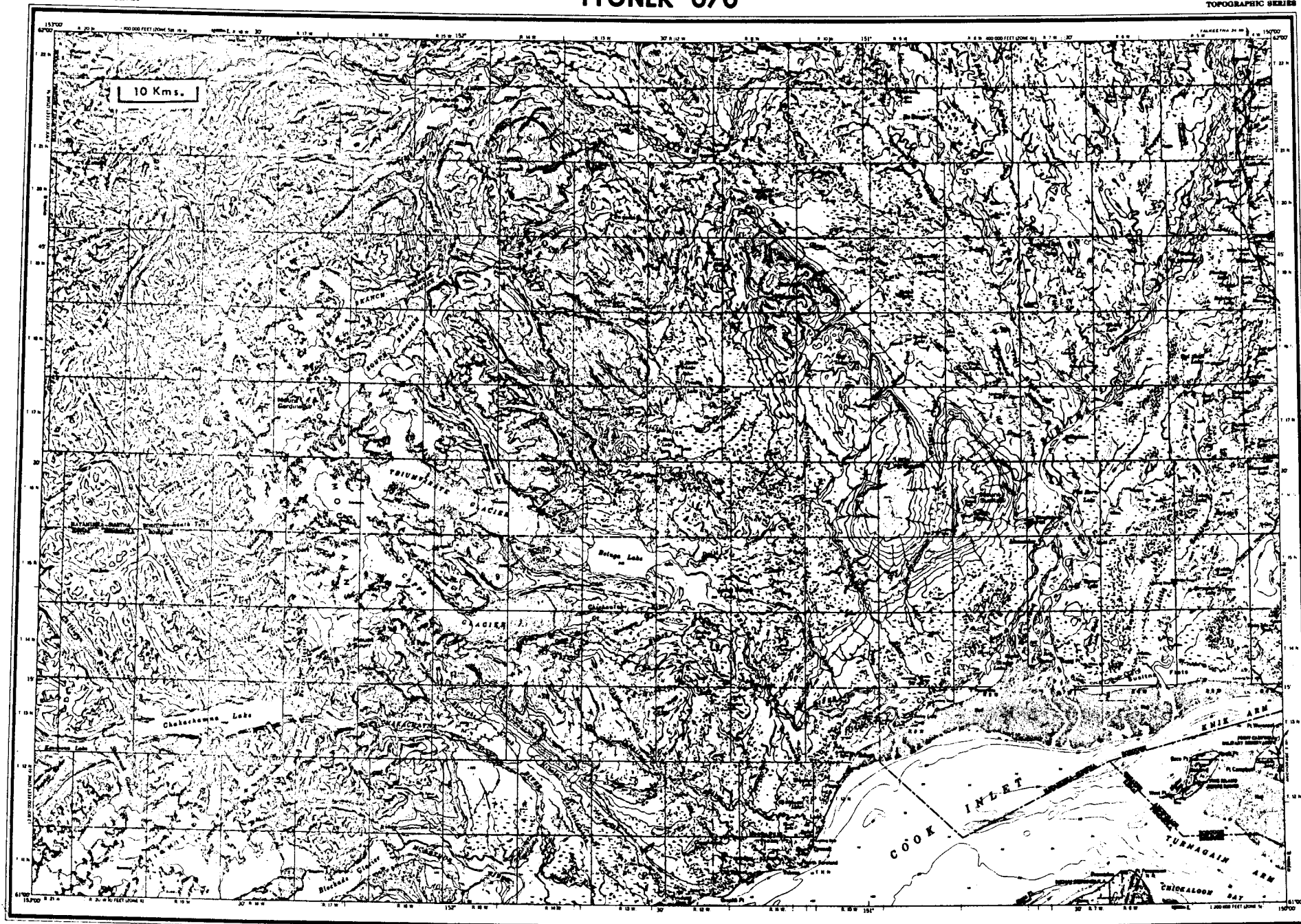


Figure 61. Topographic area 070, Tyonek. No colony sites have been located in this region.

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REVIEW AND ANALYSIS OF LITERATURE AND UNPUBLISHED

DATA ON MARINE BIRDS

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Anchorage, Alaska 99501

April 1, 1976

REVIEW AND ANALYSIS OF LITERATURE AND UNPUBLISHED DATA ON MARINE BIRDS

The objectives of this research unit are to provide an annotated bibliography of Alaskan marine birds and an analysis of the current status of information on marine birds of relevance to evaluating potential impacts from proposed developments of the Outer Continental Shelf (OCS). An additional and unrelated objective was to develop a computer code for North American species which could be used in Environmental Data Service formats for archiving data from the OCS Environmental Assessment Program (OCSEAP). This code was completed and submitted as a report on this research unit in September 1975.

Our working definition of a marine bird includes any species substantially dependent on the marine or estuarine environment for a part of its life cycle. Thus, many species of shorebirds, waterfowl, and raptors are considered in addition to the typical seabirds represented by such groups as alcids, gulls, and tubenoses.

A substantial part of the information on Alaskan marine birds, particularly of distribution, abundance, and migration is unpublished. Because such information is of value to the OCSEAP Program it was desirable that it be included in the review. Such unpublished data, however, is frequently not retrievable; and we have, therefore, listed only such items for which copies could be placed in the Fish and Wildlife Service Library in Anchorage or for which our abstract would provide all pertinent data.

Project Accomplishments

Work during the first three quarters emphasized collection of source documents, particularly of unpublished materials, as publications on Alaskan birds are largely identified in Gabrielson and Lincoln (1969. The Birds of Alaska. Stackpole Co., Harrisburg, PA, and Wildl. Manage. Inst., Washington, D.C.), Bartonek (1974. "Selected bibliography on birds in the Bering Sea and the Arctic Ocean as related to outer continental shelf areas under consideration for leasing." FWS unpubl. admin. rept.), and other bibliographic sources. A brief analysis of information status by topic is provided in annual reports on Research Units 337, 340, 341, 342, and 343.

Projected 4th Quarter Activities

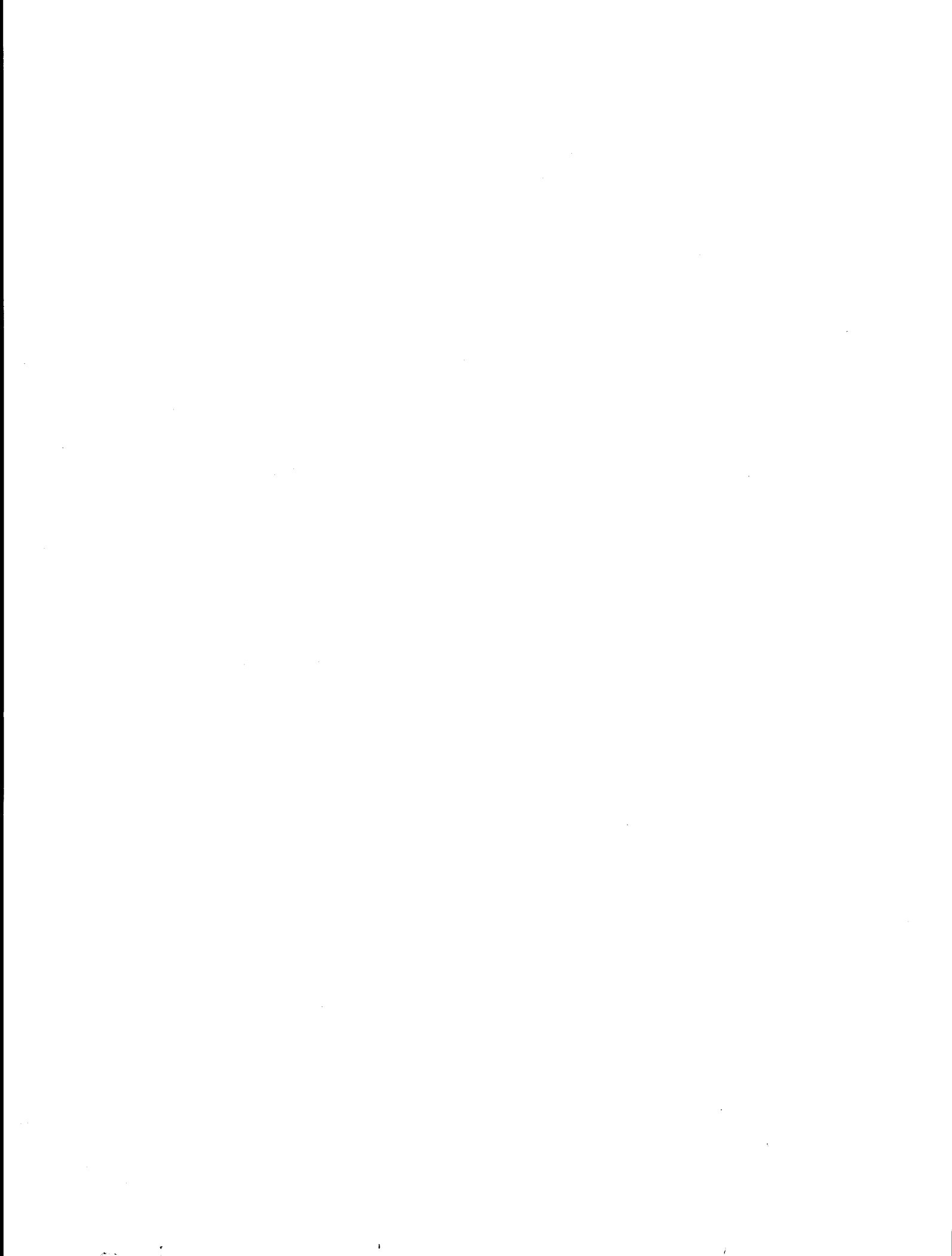
Activity during the 4th quarter will include:

1. Continued collection and examination of source documents,
2. Complete annotation of source documents and preparation of draft bibliography, and

3. Complete draft analysis of information status.

The annotated bibliography will pay particular attention to the character and value of source documents in order to minimize need for examination of irrelevant sources of material by other investigators and impact statement writers. Annotation will include either a summary or an abstract of source documents whichever is most appropriate. Published and unpublished sources will be considered separately with each group including the following sections:

- I. General references and regional avifaunas.
- II. Species and site specific studies.
 - A. Pelagic seabirds.
 - B. Shorebirds.
 - C. Waterfowl.
 - D. Other Birds.
- III. Effects and impact analysis.



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**MIGRATION OF BIRDS IN ALASKAN COASTAL AND MARINE
HABITATS SUBJECT TO INFLUENCE BY OCS DEVELOPMENT**

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Abstract. Published and unpublished reports on migration of birds in coastal waters subject to impacts from outer continental shelf development are summarized and deficiencies noted.

Between 1921 and 1975 there were reported to the Bird Banding Laboratory 20,158 birds that either had been banded in Alaska or had been banded elsewhere but recovered in the State. Except for the more heavily hunted species of waterfowl those birds most likely to be impacted by OCS development were poorly represented among the band report data.

Counts of marine birds in Unimak Pass were made from 12 to 25 August 1975 from various locations on western Unimak Island in an evaluation of sites for visual and radar monitoring of bird migrations. Murres visible within the view of 8-power binoculars were estimated to be surrounding Cape Sarichef at the rates 3,731 and 5,951 birds per hour as determined by two different counting techniques. Indices of abundance for other species are presented.

Radar and visual observations of birds migrating across and through the Bering Strait in late spring 1975 are described in a final report which is included as an appendix.

INTRODUCTION

This report summarizes efforts by U.S. Fish and Wildlife Service personnel, contractees, and collaborators during 1975 to characterize the migration of birds in those Alaskan waters subject to outer continental shelf development. Information is presented on the state of knowledge, long-term information on reported recoveries of banded birds, banding efforts in 1975, radar observations of bird migrations at Cape Prince of Wales, an evaluation of sites on western Unimak Island for observing birds migrating through Unimak Pass, and an existing and future data bases to be incorporated into the analyses for the final report.

The objectives of this research unit are to determine primarily migratory routes and secondarily patterns of seasonal density distribution of marine birds in those coastal and marine habitats of Alaska subject to impacts from outer continental shelf development. There are more than a hundred species of birds regularly frequenting these waters and coastal habitat, and each of those species has one or more populations with their own unique pathways and timing of migration. An understanding of these seasonal movements is necessary for resource managers to develop guidelines and schedule development activities such that adverse impacts do not occur at either critical localities, at critical times, or both. An understanding of affinities between wintering, breeding, summering and migrating populations of birds will permit an evaluation as to the potentially far-reaching effects of adverse impacts that could occur at a specific locality.

CURRENT STATE OF KNOWLEDGE

Gabrielson and Lincoln (1959) summarized the published literature and unpublished reports about Alaska's avifauna in their Birds of Alaska which remains the best single account of the range, habits, foods, and migration of the then 321 species of birds reported as occurring within the State. They reported Alaskan birds as flying down all four of the great North American flyways, i.e., Pacific, Central, Mississippi and Atlantic Flyways; and they additionally described an Arctic, Asiatic, and Pacific Oceanic Routes of migration. Some of their conclusions about migration were drawn from recovery of banded birds; but much of it was conjectural, being based upon their knowledge that a species was known to breed in a certain locality and that the same species (but perhaps not the same population) was known to winter in another locality. Since most ornithological investigations that they summarized were done from land, the migration information for some species of marine birds was either fragmentary, misleading or erroneous.

Dement'ev and Gladkov (1951), Dement'ev et al. (1952, 1951), Palmer (1962), Shuntov (1972), and Bent (1919, 1921, 1922, 1923, 1925, 1926, 1927, 1929) generalize about patterns of migration and delineate the breeding and wintering areas for many species of marine birds found in the Alaskan waters.

Of all Alaskan birds, information on migration is best for those species of waterfowl that are managed for hunting. Intensive and extensive banding efforts provide information on migration routes, survival rates, and harvest patterns. King and Lensink (1971) and Bellrose (1976) summarize such information as it is known for most Alaskan waterfowl. Data on migration has been summarized in greater detail for some of the more coastal and marine species of waterfowl such as the black brant (Hansen and Nelson 1957, Einarsen 1965), Canada geese (Nelson and Hansen 1959, Hansen 1962, Mickelson 1975), white-fronted geese (Lensink 1969), emperor geese (Eisenhauer and Kirkpatrick 1975), greater scaup (King 1973), Steller's eider (Jones 1965), Pacific common eider (Schamel 1974), king eider (Thompson and Person 1963, Johnson 1971), and spectacled eider (Dau 1974). While much is known about migration of some waterfowl species, much is not known about others. For example, the spectacled eider's migration remains an enigma, with their wintering ground not being known to ornithologists even though it may be well known to Siberian fishermen or Eskimos.

Radar has been used to track bird migrations across and through the Bering Strait (Flock 1972) and from various localities along the Arctic Coast (Flock 1973). Accounts of bird migrations, some giving first and last dates of occurrence, have been reported by writers (e.g., Bailey 1948, Fay and Cade 1959, Gabrielson and Lincoln 1959, Williamson et al. 1966) for many coastal regions and will be treated in subsequent reports as appropriate.

STUDY AREA

Contract stipulations limit the study areas to those Alaskan outer continental shelf areas being considered for oil and gas leasing. The U.S. Fish and Wildlife Service will ultimately characterize migration in all coastal regions, but we must place priorities on our regional reporting effort to be in sequence with the leasing schedule.

METHODS

This study is dependent upon observations of bird occurrence or lack of their occurrence at many locations throughout coastal Alaska throughout the year. Data are, in part, acquired through observations made during other research activities, especially Research Unit #342 dealing with population dynamics of marine birds and Research Unit #337 dealing with seasonal distribution and abundance of birds, from other OCSEAP investigators, and from other cooperators who are not affiliated with OCSEAP programs. Published and unpublished information on seasonal occurrence of birds exists and will be incorporated with the currently collected data. Band recovery data on file in the U.S. Fish and Wildlife Service, Migratory Bird Banding Laboratory, Laurel, Maryland, have been received for our analyses.

RESULTS AND DISCUSSION

Information is presented separately on bird band reporting and banding efforts and the assessments of migration at Unimak Pass and in the Bering Strait.

Bird Banding

Reported recoveries of 20,158 birds that were either banded in Alaska or banded elsewhere but recovered in Alaska are summarized in Table 1. This listing represents all recoveries between 1921 and 1975 (except for those in 1975 too late for entry into this tabulation of 21 January 1976), regardless whether the birds were or were not associated with coastal or marine habitats. We will request from the Bird Banding Laboratory summaries of banding effort within Alaska to determine reporting rates for those species of particular interest to the OCSEAP programs.

Only one banded alcid, an unidentified murre, has been reported. It was banded at Cape Thompson on 20 August 1960 and recovered there on 6 May 1961. There have been no reportings of Alaska-breeding procelliformes, although there are 23 reportings of albatrosses. Among the more marine species of gulls, there are only a few reports for the glaucous, glaucous-winged, and herring gulls and none for the kittiwakes, terns and Sabine's gull. Reportings of coastal species of geese are numerous and reflect both the larger banding effort and the higher recovery rate of hunted species. All but 1 of 2,203 reports of banded ruddy turnstones can be attributed to banding efforts by Max C. Thompson on St. George Island from 1964 to 1968.

During 1976, these recovery reports will be analyzed for information on migration, condition of bird at the time of recovery, reason for recovery, longevity, and, where data permit, survival rates.

Possibly two first species records for Alaska are among this list of band reportings. A gray-backed tern (Sterna lunata) that was banded (USFWS 065247488) on 6 February 1965 about 250 miles south of the island of Hawaii was recovered and released alive on St. George Island on 5 August 1967. Only 15 days later, also on St. George Island, a fairy tern (Gygis alba) was captured and released after having been banded (USFWS 065240695) on 20 March 1964 north of New Zealand. Whether these data are truly avifaunal records or mere errors in data transfer will be determined after both banding and recovery reports are inspected.

Band reports and probably banding effort for many of those species of birds of special interest to OCSEAP studies is small. Low reporting rates for sightings away from the banding site should not be a deterrent to a banding effort since much useful information can be acquired about the bird through resightings during subsequent years at the site of banding.

During 1975, 1,828 birds were banded as a part of OCSEAP programs (Table 2). Samuel M. Patten, Jr.'s banding of 1,580 glaucous-winged gulls represented the greatest numeric contribution. Time and energy expended in banding birds can be great, especially in the case of alcids, kittiwakes and some cormorants and waterfowl.

In order to substantially increase the banding program, effort must be concentrated into a brief period when adults are most easily captured or when young are large enough to hold a band but before they fledge. Man-power requirements would be well above those currently available to OCSEAP programs; and, therefore, assistance would be required. Banding programs would be most fruitful in those localities where it seems probable that the studies will extend beyond OCSEAP's duration.

Bird Migration at Unimak Pass

Unimak Pass has been noted by many ornithologists (Gabrielson and Lincoln 1959, Murie 1959, Arnold 1948) to be an area where large numbers of birds can be found during most seasons of the year but particularly during migration. From 11 to 25 August 1975, Craig S. Harrison and Scott A. Hatch, U.S. Fish and Wildlife Service employees, were at the western end of Unimak Island for the purpose of evaluating sites for visual and possible radar monitoring bird migrations. The following account is an abridgement of their field report (USFWS, OBS-CE Field Report 75-017).

Bird Observations

Counts of marine birds in Unimak Pass were made from five onshore sites between Cape Sarichef and Scotch Cap (Figure 1). When possible, counts were made three times daily using a 25-power spotting scope. A counting session consisted of two types of counts made back to back for later evaluation of their respective merits. Using the Type I count the observer panned the entire area from the south shoreline to the north shoreline keeping the horizon at about one-quarter from the top of the circular field of vision through the scope. Birds on the water and in the air were recorded as to species and numbers. To minimize recounting, only birds moving from right to left through the field of view were counted. Appropriate weather data were recorded at the start of each count. Observations were timed, and the approximate size of the visible arc noted. The time needed to complete a count varied from about 6 to 12 minutes but averaged about 9 minutes while the size of the arc ranged from about 120 to 220 degrees. Certainly these differences affect the number of birds seen. Using the Type II count the observer fixes the scope at a similar level with respect to the horizon and counts all birds entering the field of vision for a 5-minute period. In this case birds flying in all directions were counted as well as those resting on the water. The principal difference between these two methods is the representation of different species obtained. Red-faced

cormorants and glaucous-winged gulls are found in large numbers near the shoreline in counts of Type I but are largely excluded from a Type II count. We consider the latter technique to be more standardized and replicable but its results are influenced by the mobility of the birds. It emphasizes rates of movement and may be preferable during peak periods of activity. Both methods underestimate numbers of birds in the area both because one's field of vision is restricted through the scope and because an observer is often unable to count all the birds seen or those resting on the water unseen. Counts of Type I probably averaged about four-fifths of the birds actually present in the area viewed while Type II counts probably averaged closer to nine-tenths of the true number. One individual using a spotting scope and tape recorder could make either type of count.

The maximum distances at which various birds were distinguishable are estimated as follows:

Shearwaters -- 2-3 mi.

Cormorant (unidentified) -- 2.5 mi.

Shorebirds (including phalaropes) -- unidentifiable beyond
0.25 mi., probably
unseen beyond 1 mi.

Jaeger (unidentified) -- 1.5 mi.

Gull (unidentified) -- 2-3 mi.

Kittiwake vs. Glaucous-winged Gull -- 1 mi.

Large alcid (unidentified) -- 2-3 mi.

Murre (unidentified) -- 2 mi. when flying in formation,
otherwise unidentified alcid beyond
1 1/2 mi.

Pigeon Guillemot -- 1 mi. (breeding plumage)

Horned Puffin -- 1 mi.

Tufted Puffin -- 1.5 mi.

The above distances are highly dependent upon weather and lighting conditions. In Unimak Pass a fog bank at 1 or 2 miles is often limiting.

The data for 34 counts of Type I and 33 counts of Type II are summarized in Table 3. Count Totals were indicative of relative abundances of species in the pass in August. Murres were by far the

most abundant species recorded. Shearwaters ranked second as recorded, and probably in actuality; but the data for shearwaters are not good. These birds generally ranged far enough offshore to be at the limits of visibility. Data on other species would have suffered from greater attention to their numbers. In the relatively small numbers in which they appeared to be present and at the distances they maintained from shore our techniques were not adequate for counting shearwaters. Cormorants, and to a lesser extent, glaucous-winged gulls seemed to be local populations and their totals probably include considerable recounting of individuals on different days. In contrast a steady turnover in murre migrating through the pass was apparent. They flew in discrete skeins of 10 or 20 to several hundred, often accompanied by a few tufted puffins. Murres had apparently followed the coastline for some distance. At Cape Sarichef they approached from the northeast and were usually within 1 mile of the shore. At Scotch Cap all birds were found farther out, on the average, and the murres in particular might better have been observed from the shore of Ugamak Island. Both puffins showed more movement in all directions than murres. Pigeon guillemots were found mostly in small groups resting very near shore and appeared to be in molt. Conspicuously absent from our observations were the small alcids. Fewer than 10 individual small alcids of unknown identity were observed during counts. It is felt that this absence was real and not a result of their smaller size and lower visibility.

Column totals in Table 3 do not point to any significant increase in migrating birds between 12 August and 25 August. The data in Table 4 indicate that comparable numbers of birds were observed at the Cape Sarichef and Scotch Cap locations but counts averaged less at the intermediate locations which usually had a more restricted view. Morning and evening counts averaged higher than afternoon counts probably due to greater activity of birds at these times.

An alternative to the techniques used would be to focus on one or two species for a longer length of time. Very good information on murres, for example, could be gotten by an observer at Cape Sarichef which could be correlated with data from radar. Two counts of 0.5 and 1 hour duration of the passage of murres using binoculars from the bluff at Cape Sarichef on 24 and 25 August gave rates of 5,920 and 3,710 murres per hour. These values serve as a check on the other counting techniques as well. When the data in Table 3 for murres at Cape Sarichef are converted to an hourly basis the mean rates are 3,731 and 5,951 murres per hour for Type I and Type II counts respectively. Combining all these values gives a figure of 4,804 murres per hour rounding Cape Sarichef in mid-August. We do not know of the murres' nocturnal activity but, assuming migration at such a rate for 15 hours of daylight, on the order of 72,000 murres were entering the pass from the north and east each day or 1,008,000 over the 2-week period of our observations.

Cape Sarichef might prove to be an excellent vantage point for the observation of migrating marine mammals. The results of this aspect of our observations will be presented elsewhere.

Potential for Radar Monitoring of Migration

It is physically possible to locate a radar at either Cape Sarichef LORAN "C" station or the Scotch Cap lighthouse both operated by the U.S. Coast Guard. Power is available from generators at both sites; and, according to ETC McCasland, the power needs of the radar would not affect station requirements. Either site would afford biologists with comfortable living conditions. Cape Sarichef is manned by approximately 22 men, while Scotch Cap in an unmanned lighthouse which is serviced at least once a month from Cape Sarichef. A White Alice station lies up the hill from the LORAN station where nine civilians are employed; but that operation will probably cease by 1977 or 1978.

Radar equipment could be brought to Cape Sarichef by air and then easily transported to the LORAN station or less easily transported to Scotch Cap by an all-terrain or 4-wheel-drive vehicle along a 20-mile unimproved dirt road.

On the balance, it seems to us that Cape Sarichef would be the preferable site both on the basis of logistical considerations in regard to the ease of transportation of equipment and for operational considerations due to the fact that observations of sea birds were better at Cape Sarichef. Furthermore, Cape Sarichef has the advantage of detailed weather information being collected every 3 hours day and night. This data includes visibility, temperature, barometric readings, wind speed and wind direction. It seems probable that migration through Unimak Pass will be very influenced by weather, especially wind. It would be easy to use a radar site at the edge of a cliff adjacent to the Cape Sarichef facility, close to the power source and living quarters. Photographs were taken of appropriate sites. The cliff is approximately 100 ft. above sea level (the light is exactly 116 ft.) and since it seems practicable to locate on the edge of the cliff, there would be little, if any, shadow.

ETC McCasland suggested that it be determined whether or not the frequencies of the LORAN transmitter interfere with the radar. LORAN transmits at 1.95 mega Hz and with a power output of approximately 1,000,000 watts. It is not line of sight interference and the large power output could be a problem only if the radar was operating at a frequency close to LORAN. We should probably also consider the possibility of interference from harmonics of the LORAN frequency. The White Alice station transmits at 786-936 mega Hz at a power of 300 watts. The site supervisor said that he doubted that there would be interference from their operation. He also suggested that we consider the fact that VHF radios operate at 121.5 mega cycles and 126.2 mega cycles.

Bird Migration in the Bering Strait

The Bering Strait lies at the cross roads of migratory routes for birds flying between Asia and North America and between the Arctic and Pacific Basins. Bailey (1943, 1949) summarized his years of bird observations and collections at Cape Prince of Wales on the Alaskan side of the Strait. Breckenridge and Cline (1967) and Flock (1972) have characterized the migrations of lesser sandhill cranes and snow geese across the Strait.

The U.S. Fish and Wildlife Service funded Warren L. Flock during 1975 to conduct visual and radar observations of birds at the Bering Strait during spring. Although this effort was not a part of the OCSEAP program, the information is germane. We, therefore, have included within this report Warren L. Flock's final report titled "Bird migration at Cape Prince of Wales: radar and visual observations" (Appendix A).

CONCLUSION

Good information exists on migration for some of the more intensively hunted and managed species and populations of waterfowl, but it is relatively scarce or of lesser quality for most other birds of the nearshore and oceanic waters adjacent to the lease areas. OCSEAP provides the first opportunity by which nearly Alaska-wide information on bird migrations along coastal areas can be acquired and, importantly, collected in a systematic manner. Most migrational information has resulted from observations being taken at a single location and then trying to relate movements of birds during one year with the migrational records taken at another locality during another year. While these kinds of records are important to show annual variations in migration, they are less than optimum.

We believe that by winter of 1976, the spring and fall migrational patterns for many of the procelliformes, gulls, terns, alcids, and waterfowl can be characterized for all the outer continental shelf areas. Information on shorebird migration, however, is not likely to be of similar quality since sites of information collection are not as numerous. It is obviously necessary that data be collected well into fall, but the academic requirements of some investigators will terminate data collection at certain sites.

NEEDS FOR FURTHER STUDY

Banding, color marking and telemetering birds will improve our ability to characterize their timing and routes of migration. Cost effectiveness and the state of the art, however, will ultimately dictate the method used on each species.

Migrational information needs to be collected throughout the year from several widely separated locations. Pt. Barrow has attracted ornithologists for decades and, therefore, the migrational information is better for this locality than for perhaps any other location in Alaska. Long-term information of this nature is also available from the Clarence Rhode National Wildlife Refuge on the Yukon Delta and the Izembek National Wildlife Range and will be incorporated into our subsequent reports.

While we will be collecting year-long information on migration at Unimak Pass and intermittent information from other localities in the southern Bering Sea and the northern Gulf of Alaska, we believe concurrent observations should be made from other sites (e.g., Demarcation Bay, Cape Prince of Wales, and Southeastern Alaska) in order to supplement the sometimes limited amount of published information.

SUMMARY OF 4TH QUARTER ACTIVITIES

Data on bird migration will be collected during the fourth quarter at U.S. Fish and Wildlife Service field camps located at Forrester Island, the Copper River Delta, Hinchinbrook Island, Middleton Island, the Wooded Islands, the Barren Islands, Kodiak Island, Semidi Island, Ugauishak Island, Big Koniuji Island, Attu Island, Amchitka Island, Buldir Island, Cape Sarichef, Izembek Lagoon, Nelson Lagoon, Cape Peirce, Kashunuk River, and the Yukon River delta. About half of the field camps are funded through OCSEAP. All data will be systematically collected using common procedures of censusing.

Continuing shipboard and aerial surveys and review of published and published information will contribute to the data base.

Banding of adults will be done through the 4th quarter, but young will not be of sufficient size to be banded until the subsequent quarter.

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ADDENDA:

- Bailey, A. M. 1943. The birds of Cape Prince of Wales, Alaska. Proc. Colorado Mus. Nat. Hist. 18(1):1-113.
- Breckenridge, W. J., and D. Cline. 1967. Sandhill cranes and other birds from Bering Strait, Alaska. Auk 84:277-278.

Table 1. Summary of reportings of birds banded within Alaska and recovered within Alaska and elsewhere and of birds banded other places than in Alaska but recovered within the State as of 21 January 1975.

Species	Years of Reportings	Number Reported	Species	Years of Reportings	Number Reported
Horned grebe	1956-61	37	Lesser scaup	1930-66	2497
Unidentified murre	1960	1	Ring-necked duck	1947-64	5
Pomarine jaeger	1963	1	Common goldeneye	1961-64	7
Glaucous gull	1960-73	3	Unidentified goldeneye	1955-56	93
Glaucous-winged gull	1936-70	78	Barrow's goldeneye	1957-66	528
Herring gull	1940-62	17	Bufflehead	1953-64	101
Mew gull	1956-62	16	Old squaw duck	1961-65	37
Gray-backed tern	1965	1	Steller's eider	1924-68	47
Fairy tern	1964	1	Spectacled eider	1950	1
Black-footed albatross	1940-66	19	Common eider	1940	1
Laysan albatross	1946-63	3	King eider	1940	1
Double-crested cormorant	1952	2	White-winged scoter	1954-61	7
Pelagic cormorant	1964	1	Lesser snow goose	1949-72	198
Common merganser	1962	1	White-fronted goose	1924-73	1875
Red-breasted merganser	1936-37	2	Canada goose	1941-74	3620
Mallard	1928-72	259	Aleutian Canada goose	1974-75	19
Gadwall	1953-57	3	Cackling Canada goose	1924-74	1030
Widgeon	1926-73	1146	Small Canada goose	1959-73	154
Am. green-winged teal	1921-74	186	Unidentified brant	1973	1
Blue-winged teal	1921-74	6	Black brant	1949-74	2917
Shoveler	1939-66	143	Emperor goose	1924-72	23
Pintail	1925-71	1488	Whistling swan	1930-74	98
Redhead	1957-64	19	Trumpeter swan	1957-73	22
Canvasback	1932-66	459	Greater sandhill crane	1954	1
Greater scaup	1932-66	333	Sandhill crane	1967-68	3
Unidentified scaup	1925-64	76	American coot	1934-54	2

(Table continued.)

Table 1. (continued)

Species	Years of Reporting	Number Reported	Species	Years of Reporting	Number Reported
Rock sandpiper	1964-67	5	Northwestern crow	1962-73	3
Baird's sandpiper	1970	1	Rusty blackbird	1967	1
Dunlin	1960-72	13	Gray-crowned rosy finch	1964-69	8
Semi-palmated sandpiper	1968-72	8	Common redpoll	1961-65	9
Western sandpiper	1966-73	3	Pine siskin	1951	1
Bar-tailed godwit	1966	2	Snow bunting	1947-73	25
Solitary sandpiper	1959	1	Lapland longspur	1949-72	29
Spotted sandpiper	1968	1	Savannah sparrow	1956-67	2
Bristle-thighed curlew	1967	1	White-crowned sparrow	1945-65	7
American golden plover	1964-67	4	Gambel's white-crowned sparrow	1942-73	24
Ruddy turnstone	1964-68	2203	Golden-crowned sparrow	1932-65	31
Black turnstone	1959	1	Tree sparrow	1973	1
Goshawk	1956-72	8	Slate-colored junco	1942-73	8
Red-tailed hawk	1960-66	2	Oregon junco	1952-73	9
Rough-legged hawk	1952-71	13	Song sparrow	1950-52	3
Golden eagle	1971	1	Fox sparrow	1935-59	54
Bald eagle	1962	1	Barn swallow	1927	3
Gyrfalcon	1967-72	3	Tree swallow	1965	2
Peregrine falcon	1952-69	6	Bank swallow	1961-64	2
Boreal owl	1959	1	Orange-crowned warbler	1940	1
Great horned owl	1971	1	Yellow warbler	1959-72	5
Snowy owl	1924-60	2	Myrtle warbler	1945-63	3
Yellow-shafted flicker	1950-61	2	Wilson's warbler	1962	1
Black-billed magpie	1962-65	2	Black-capped chickadee	1952-66	6
Steller's jay	1937-73	8	Chestnut-backed chickadee	1951-53	15
Gray jay	1953-70	7			

(Table continued.)

Table 1. (continued)

Species	Years of Reporting	Number Reported	Species	Years of Reporting	Number Reported
Arctic warbler	1965	1			
Gray-cheeked thrush	1971	1			
Swainson's thrush	1959-71	5			
Hermit thrush	1936-57	3			
American robin	1959-73	4			
Varied thrush	1966	1			

Table 2. Summary of bird banding done in association with outer continental shelf bird studies by U.S. Fish and Wildlife Service personnel 1/ and cooperators 2/ in 1975 under Master-Station Permit 20022.

Species	Number Banded
Red-faced cormorant	7
Rock sandpiper	2
Wandering tattler	1
Glaucous-winged gull	1,629
Black-legged kittiwake	44
Sabine's gull	2
Arctic tern	73
Black guillemot	42
Common murre	20
Tufted puffin	1
Water pipit	5
Savannah sparrow	1
Fox Sparrow	1

1/

Scott Hatch, Craig Harrison, George Divoky, Robert Bokelhide, Matthew Dick, Irving Warner

2/

George L. Hunt, Jr., Samuel M. Patten, Jr., William H. Drury

Table 3. Marine birds observed in Unimak Pass from various localities on Unimak Island using two methods of counts, 12-25 August 1975 (Harrison and Hatch, USFWS, OBS-CE Field Report 75-017).

Species	Type of Count	Location, Date, and Hour of Count						
		Cape Sarichef						
		12 Aug			13 Aug			14 Aug
		0900	1400	1745	0850	1435	2010	0840
Shearwater	I	2	2	0	0	1	0	0
	II		2	0	100	1	0	0
Cormorant	I	76	68	102	118	52	66	172
	II		40	70	60	139	30	45
Jaeger	I	0	3	0	0	0	0	1
	II		0	0	0	0	1	0
Gl-winged Gull	I	1	1	3	1	10	1	7
	II		1	0	3	1	1	3
Kittiwake	I	18	13	5	42	38	21	32
	II		40	1	13	7	7	5
Kittiwake or Gl-winged Gull	I	5	0	2	0	2	0	0
	II		0	0	0	0	1	0
Murre	I	434	147	8	1229	630	293	642
	II		103	52	391	154	140	3517
Pigeon Guillemot	I	2	1	0	1	0	21	12
	II		1	0	0	1	0	0
Horned Puffin	I	3	4	0	22	2	5	7
	II		7	5	8	0	8	1
Tufted Puffin	I	112	95	131	73	177	83	200
	II		150	160	0	85	103	118
Horned Puffin or Tufted Puffin	I	16	13	0	0	1	3	2
	II		3	0	109	1	1	5
Other	I	0	0	5	0	0	0	1
	II		0	0	0	0	0	0
Totals	I	669	347	256	1486	913	493	904
	II		347	288	640	391	292	3694

(continued)

Table 3 (continued).

Species	Type of Count	Location, Date, and Hour of Count						
		5 Mile Cabin			Sennet Point		Big Hill Shelter	
		14 Aug	15 Aug	0910	15 Aug	2020	1315	1945
Shearwater	I	50	0	2	0	0	0	0
	II	0	0	0	1	0	0	0
Cormorant	I	95	20	41	30	5	27	3
	II	4	1	8	7	0	6	1
Jaeger	I	0	0	1	0	0	0	0
	II	0	0	0	0	0	0	0
Gl-winged Gull	I	2	7	39	11	15	5	4
	II	0	14	3	1	1	2	10
Kittiwake	I	25	141	42	16	46	28	62
	II	5	20	25	5	9	4	9
Kittiwake or Gl-winged Gull	I	27	0	4	21	1	3	43
	II	0	0	3	0	3	2	7
Murre	I	141	403	393	341	143	4	40
	II	91	285	99	89	85	2	36
Pigeon Guillemot	I	0	0	3	1	0	0	0
	II	0	0	2	0	0	0	0
Horned Puffin	I	17	11	5	6	0	0	0
	II	14	3	5	0	0	1	2
Tufted Puffin	I	49	288	146	22	7	15	9
	II	150	154	150	52	24	11	10
Horned Puffin or Tufted Puffin	I	82	0	15	6	26	0	13
	II	0	0	51	0	23	0	3
Other	I	187	16	6	0	0	15	3
	II	0	0	0	0	0	0	0
Totals	I	675	886	697	454	243	97	177
	II	264	477	346	155	145	28	78

(continued)

Table 3 (continued).

Species	Type of Count	Location, Date, and Hour of Count						
		Big Hill Shelter	Scotch Cap Light Station					
		17 Aug	17 Aug		18 Aug		19 Aug	
		0915	1545	1945	0835	1335	1910	0920
Shearwater	I	0	350	50	200	400	500	50
	II	0	50	0	100	0	60	0
Cormorant	I	29	57	4	36	46	8	19
	II	7	3	1	3	3	2	16
Jaeger	I	0	0	0	0	0	3	0
	II	0	0	0	0	0	1	0
Gl-winged Gull	I	25	13	11	26	77	65	208
	II	4	3	12	1	8	12	15
Kittiwake	I	88	25	37	110	139	35	421
	II	8	22	47	6	55	28	9
Kittiwake or Gl-winged Gull	I	20	10	7	33	105	227	282
	II	5	0	6	1	3	50	11
Murre	I	366	111	59	276	538	932	230
	II	122	41	12	252	135	351	51
Pigeon Guillemot	I	8	1	1	0	0	0	1
	II	0	0	0	0	0	1	0
Horned Puffin	I	8	10	2	11	10	3	5
	II	0	4	3	15	2	1	8
Tufted Puffin	I	176	32	19	44	427	41	12
	II	34	27	9	78	299	57	33
Horned Puffin or Tufted Puffin	I	28	16	0	61	20	75	2
	II	0	30	0	18	16	7	0
Other	I	0	10	0	0	1	11	0
	II	0	0	0	0	0	0	0
Totals	I	748	635	190	797	1783	1900	1230
	II	180	180	90	474	521	570	143

(continued)

Table 3 (continued).

Species	Type of Count	Location, Date, and Hour of Count						
		Scotch Cap Light Station				5 Mile Cabin Cape Sarichef		
		19 Aug 1820	20 Aug 0930	2015	21 Aug 0900	21 Aug 1845	22 Aug 1835	23 Aug 0940
Shearwater	I	0	0	0	0	0	650	0
	II	0	0	200	0	0	100	150
Cormorant	I	13	8	0	14	16	59	138
	II	8	5	0	7	5	38	75
Jaeger	I	0	0	2	0	0	0	0
	II	0	1	0	0	0	0	0
Gl-winged Gull	I	140	64	93	23	2	5	9
	II	14	11	14	11	4	61	3
Kittiwake	I	111	259	47	199	11	2	7
	II	24	195	12	43	27	13	1
Kittiwake or Gl-winged Gull	I	505	56	108	70	39	9	15
	II	25	0	12	5	31	8	0
Murre	I	435	135	528	0	295	1034	185
	II	285	100	266	0	328	569	129
Pigeon Guillemot	I	0	0	0	0	0	20	3
	II	0	1	0	0	0	0	0
Horned Puffin	I	3	6	4	1	9	0	13
	II	3	3	3	0	1	0	1
Tufted Puffin	I	0	43	14	17	21	29	75
	II	14	173	12	87	21	21	46
Horned Puffin or Tufted Puffin	I	6	5	13	0	234	55	6
	II	13	0	2	1	38	57	1
Other	I	1	2	9	0	1	0	0
	II	0	0	0	0	0	0	0
Totals	I	1214	578	818	324	628	1863	451
	II	382	489	521	154	455	867	406

(continued)

Table 3 (continued).

Species	Type of Count	Location, Date, and Hour of Count						Totals
		Cape Sarichef						
		23 Aug		24 Aug		25 Aug		
		1420	2000	1000	1315	1930	0845	
Shearwater	I	0	0	520	1	0	0	2,778
	II	0	0	1138	55	0	8	1,965
Cormorant	I	72	70	67	84	76	42	1,723
	II	10	4	5	19	9	23	610
Jaeger	I	0	0	1	0	0	0	11
	II	0	0	0	0	0	2	5
Gl-winged Gull	I	2	7	19	18	6	37	957
	II	2	0	3	1	0	2	221
Kittiwake	I	0	5	38	42	0	146	2,251
	II	0	1	14	21	6	7	701
Kittiwake or Gl-winged Gull	I	5	1	34	8	0	37	1,679
	II	1	0	2	1	0	7	184
Murre	I	629	729	333	381	980	494	13,518
	II	210	167	230	198	372	433	9,295
Pigeon Guillemot	I	1	30	6	11	12	13	148
	II	0	1	0	1	0	0	8
Horned Puffin	I	0	1	2	6	0	6	183
	II	2	1	11	0	1	6	119
Tufted Puffin	I	14	5	60	13	2	66	2,517
	II	34	1	30	20	37	51	2,251
Horned Puffin or Tufted Puffin	I	0	15	6	15	3	0	738
	II	11	17	1	0	0	0	408
Other	I	0	14	0	1	0	0	283
	II	0	0	0	0	0	0	0
Totals	I	723	877	1086	580	1079	841	26,786
	II	270	192	1434	316	425	539	15,767

Overall Mean Per Type I Count = 788

Overall Mean Per Type II Count = 477

Table 4. Mean totals of marine birds observed in Unimak Pass from the western shore of Unimak Island, 12-25 August 1975 by two methods of counts (Harrison and Hatch, USFWS, OBS-CE Field Report 75-017).

Variable	Mean Number of Birds per Count	
	Type I Count	Type II Count
Location		
Cape Sarichef	838	673
Mile 5-Sennet-Big Hill	512	236
Scotch Cap Lighthouse	974	852
Time:		
Morning	818	773
Afternoon	690	275
Evening	817	368

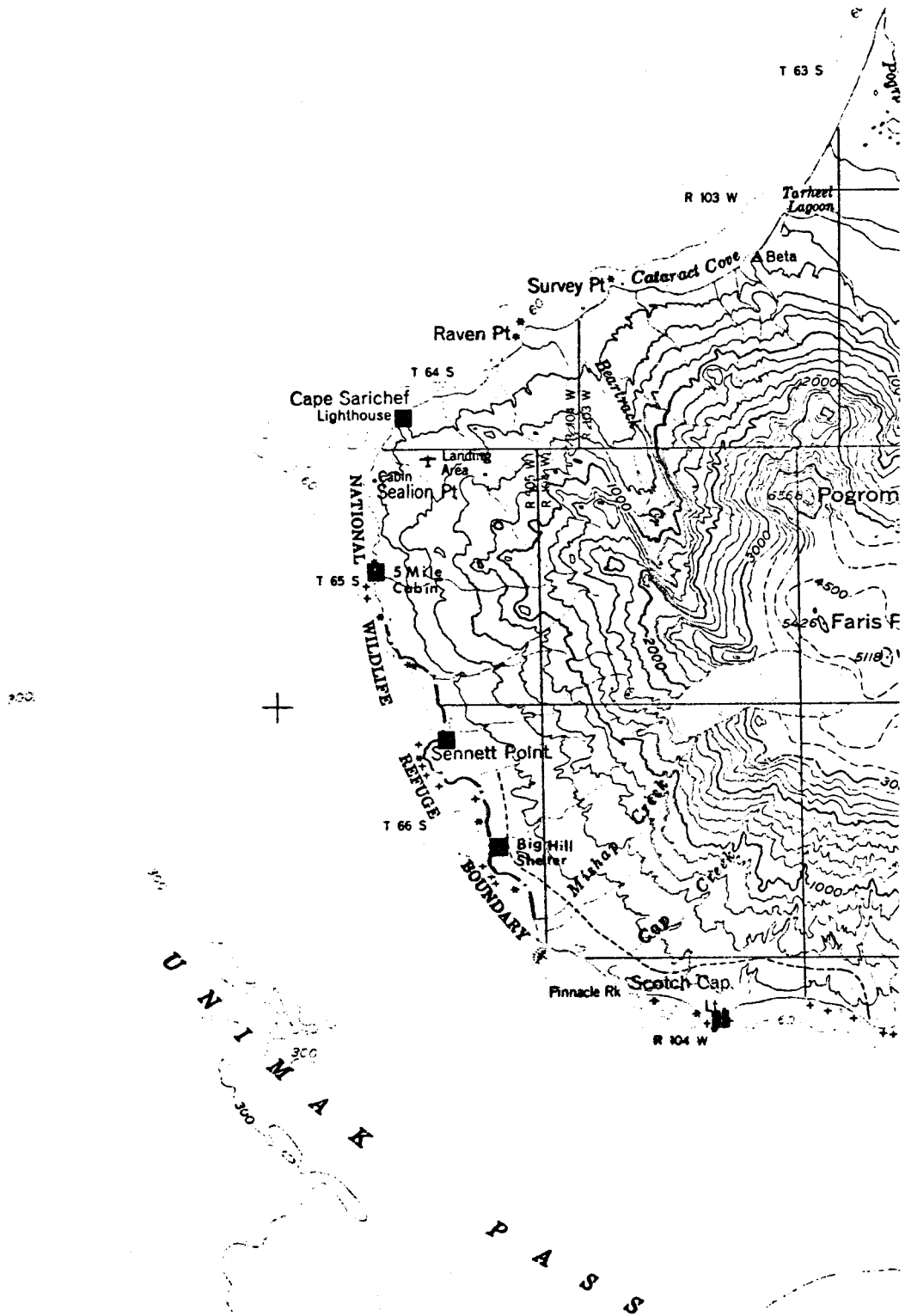


Figure 1. Sites for bird counts, Unimak Pass, August 1975.

APPENDIX A

BIRD MIGRATION AT CAPE PRINCE OF WALES: RADAR AND VISUAL
OBSERVATIONS^{1/}

By Warren L. Flock

University of Colorado, Boulder, Colorado

Abstract: From 14 May to 3 June 1975, radar and visual observations of birds and sea ice were made at Tin City, Alaska and vicinity near the tip of Cape Prince of Wales at the eastern edge of the Bering Strait. The occurrence of consistently above freezing weather and the arrival of shorebirds were delayed by nearly two weeks with respect to 1969. Mostly north-south migration was observed by radar until about 23 May. On that date and later, especially on 26 May, westward movement across and in the vicinity of the Bering Strait was recorded. A westward migration of snow geese (*Chen caerulescens*) was observed visually on 30 May, and some of the westward movement noted by radar on 26 May and at other times could have been snow geese. Considerable northward migration occurred along the edge of the shore-fast ice and, to some extent, on the opposite side of the open-water channel from the mainland as well. Utilization of a location at the very tip of Cape Prince of Wales would allow obtaining additional detailed radar and visual data on birds and sea ice, beyond what the ACW radar on the top of Cape Mountain can supply.

^{1/}

A report submitted to U. S. Fish and Wildlife Service, Office of Biological Services, Coastal Ecosystems, Anchorage, Alaska in fulfillment of contract obligations, July 1975.

THE BERING STRAIT AREA

Physical Features

The location and topography of the Bering Strait area cause it to be of major interest from the viewpoint of bird migration (Bailey 1948). The mainlands of Asia and North America are separated here by as little as 83 km (52 statute miles), and this small distance is favorable to the migration of birds between the two continents. Little Diomedé Island, belonging to the U.S.A., and Big Diomedé Island, only 5 km farther west and belonging to the U.S.S.R., lie about halfway across the Bering Strait which separates the continents. Cape Prince of Wales is at the western tip of the Seward Peninsula of Alaska and at the eastern edge of the Bering Strait. The Cape Prince of Wales area comprises the westernmost land on the mainland of North America, and migrating birds which commonly follow the shore or the edge of the shore-fast ice pass close by the cape on their north-south and east-west migrations.

Because the Bering Strait is the passageway between the Bering Sea to the south and the Chukchi Sea of the Arctic Ocean to the north and all U.S. barge and other sea traffic between the Arctic Ocean and points to the south must pass through it, the extent and condition of sea ice in the strait is of much interest. In May a band of fixed shore-fast ice extends a variable distance from the shoreline. The width of this band is the smallest near the tip of the cape where the depth of the water increases most rapidly in the direction away from the

shoreline. Near Wales and Tin City the shore-fast ice may extend outward a distance of about 1.6 km or more (1 statute mile or more) but the width of the ice is considerably less right at the cape. A channel of open water perhaps 16 km in width may occur beyond the shore-fast ice. The weather in the area is severe. In the spring season it is much colder and windier than at Nome, for example. The wind, generally from the north, is reported to average 25 knots at Wales and 20 knots at Tin City for the entire year (12.9 and 10.3 m sec⁻¹).

The immediate vicinity of Wales and Tin City can be discussed by reference to Fig. 1, formed by joining parts of two topographic maps together. The maps were prepared, however, before the U.S. Air Force installed a surveillance radar system at Tin City. Wales is a small Eskimo Village which is located slightly to the north of the cape. Tin City is located about 8 km to the southeast of Wales on the opposite side of Cape Mountain, elevation 698 m. The main facility of the Tin City Air Force Station (Fig. 2) is located about where "Mill Sites" are indicated on the map. This facility and a small tin mining operation comprise the present Tin City. The 710th ACW Squadron mans the air force station and operates a powerful L-band radar whose transmitter is located on the top of Cape Mountain. (The white transmitter radome shows on the top of Cape Mountain in back of the building in Fig. 2.) The hilltop transmitter location is reached by an aerial tramway, following more or less the route of Paulina Creek. A road, normally usable

only in the summer, also reaches hilltop. The road follows generally the route of the road shown on the map at first, but it turns to the west and passes near "Prospect Areas" and then heads for hilltop. A While Alice communication facility is located near "Prospect Areas," and the road is kept open all year to that location. However, present plans call for abandoning the communication facility in Sept. 1975. The facility includes a rather large, well-constructed building that could be very useful for office, laboratory, and living quarters for scientific groups. No road connects Wales and Tin City and one must fly or walk between the two locations, or use a snowmobile in winter. The "winter trail" on the map is the snowmobile route. Cape Mountain is the highest point of a ridge which extends in a generally northwestward direction from the summit towards the tip of Cape Prince of Wales. The higher portion of the ridge is rather sharp and narrow with precipitous slopes. Peaks or high points having elevations of 592, 503, and 364 m are located along the crest of the ridge. Because of the presence of the ridge, the shoreline and edge of the shore ice are not visible from the top of Cape Mountain throughout an angular range of perhaps 60°. The shoreline is visible to the north, south, and east. To the west of the high point at 364 m the terrain becomes more gentle. An area sloping gradually towards the tip of the cape at elevations between about 150 and 250 m and nearly level over a significant distance in the perpendicular direction is located here. This broad gentle ridge or bench-or table-like

area of gradual slope shows on the map to the right of the words, Cape Prince of Wales. It is a pleasant area, that was free of snow on a visit on 28 May, and provides a view of the sea through an angle of 180° or more (Fig. 3). From the lower end of the area at a height of 150 m it is possible to see the edge of the shore ice itself throughout a large angular range (Fig. 4). The final drop of about 150 m to sea level is abrupt. The village of Wales lies shortly to the north, also down a rather steep slope from the top of the ridge (Fig. 5).

On the north side of Cape Mountain is a rather broad gentle valley, and the best route for walking from Tin City to Wales is through this valley, perhaps along a route somewhat like that shown as a tractor trail on the map. Snow accumulates and stays late in spring on this north slope area, however, and when the snow becomes soft in late spring, walking is extremely difficult.

Bird Movements

Bird movements in the Cape Prince of Wales-Bering Strait area are in more or less east-west or north-south directions. Migrations take place across the Bering Strait and along parallel routes somewhat farther to the south. North-south migrations commonly follow the shoreline or the edge of the ice. Migrations may be at low or high altitudes, high-flying birds overflying the area without closely following any of the topographic features.

The very obvious and conspicuous migration of the Sandhill crane (*Grus canadensis*) is an example of migration across the Bering Strait. The snow goose (*Chen caerulescens*) is another

migrant across the strait. This bird is also very obvious when weather conditions and the flight route permit visual observations, but apparently it passes unnoticed at times because of poor visibility and may also bypass the immediate vicinity of the cape. A number of other species presumably migrate from Alaska to Siberia in the spring and vice versa in the fall, some at a high altitude. In addition, some small passerine birds that winter in Asia, or even farther away, migrate across the Bering Strait from Siberia to Alaska in the spring.

The eiders, especially the king eider (*Somateria spectabilis*) and the common eider (*Somateria mollissima*), are prominent among the migrants which follow generally the edge of the ice on the northward migration in spring past Cape Prince of Wales. Many of the eiders continue on to the northern arctic coasts of Alaska and Canada. A large number of eiders pass by Cape Prince of Wales in early May, but extensive migrations of birds also follow along the edge of the shore-fast ice in late May and early June. Especially on these latter dates, a rather large number of species of waterfowl, alcids, and gulls can be observed to be migrating.

Birds overfly the region in either the north-south or east west direction. Many of the spring high-altitude migrations occur late in spring, in the month of June. The identity of these birds is unknown, but many may be shorebirds.

Incentives for Study

The occurrence of the bird migrations mentioned above and the availability of the ACW radar system at Tin City have provided

an incentive for radar and visual observations of bird migration in the Bering Strait area. Interesting radar records were obtained on previous visits in 1969 and 1970 (Flock 1972).

In addition, a strong immediate incentive in 1975 was provided by the fact that Dr. V.E. Jacobi of the A.N. Severtzov Institute of Evolutionary Animal Morphology and Ecology, USSR Academy of Sciences, Moscow was planning to carry out similar observations in Siberia from 15 May to 31 May 1975. Joint observations by Professor Jacobi and Professor Flock were listed as part of the suggested program for 1975-76 of Project F, Northern Waterfowl, of Problem Area V, Nature and Preserves, of the US/USSR Environmental Agreement, and when it was learned definitely that Dr. Jacobi would be carrying out his part of the joint observational program it became highly desirable that Dr. Jacobi's American counterpart be able to do also. It is appreciated very much that support from the U.S. Fish and Wildlife Service has allowed carrying out this cooperative program.

Another reason for wanting to carry out the program was the desire to visit the area again to select possible radar locations for future bird-sea ice studies. Although the existing ACW radar gives good coverage for high-flying birds and displays the extent of ice and open water regions throughout much of the Bering Strait it is not completely ideal by itself for either bird or sea ice studies. It can not record bird migration along the immediate shoreline and it has rather low resolution for sea ice work. Furthermore it is not under the control of scientific investigators. Thus it was desired to investigate possible locations

for higher-resolution radar systems that would be used solely for scientific investigation and that would hopefully allow recording of both sea ice and bird migration data along the edge of the shore-fast ice in the immediate vicinity of the Cape Prince of Wales. If an additional radar is installed at some time in the future, information from the ACW system as well as the new radar will be of value as the ACW system provides valuable data that a different radar will not provide and vice versa.

PROCEDURE

It was necessary for the one person involved in the program to make both visual and radar observations as well as possible. Visual observations were usually made about 3 times a day, in the morning, early afternoon, and evening, except when the weather appeared to be so bad as to make observations useless. A Beattie-Coleman 35 mm camera accomodating 150-foot reels of film and taking a continuous succession of 5-minute time exposures was intended to be operated throughout the entire stay. However there were a number of interruptions, when training missions were undertaken and when either preventative or remedial maintenance was carried out. A scope in the operations area was also monitored visually and photographed routinely two or three times a day, by use of a Polaroid Camera, and at other times of interest as well.

Two types of visual observations were made. A watch was kept to try to detect migrating flocks in flight, and records were made of what birds were in the area, with special attention to new arrivals. Neither the main building of the Tin City Air

Force Station or its immediate vicinity were very good for observing migrating birds. The best location for this purpose is beyond the tram building from the site, or beyond Paulina Creek. A beautiful sheltered spot overlooking the sea ice is found here. The shortcoming of the location is the fact that the edge of the shore-fast ice tends to be so far away that it is difficult to identify the birds that migrate along the edge of the ice. Binoculars and a spotting scope were utilized in 1975. For determining what birds had arrived and were in the area, walks were made from the main site (near Mill Sites on the map) downslope to the beach and a variable distance to the east along the beach. Shortly below the main site, an area having more vegetation than elsewhere provides food and shelter for birds and was a good location for small passerine birds. The low flat tundra below was also very good after shorebirds arrived. The lagoon showing on the map to the east of Tin City is a good location for birds after it thaws, and the sea itself supports large numbers of phalaropes after the ice goes out but in 1975 the lagoon had not thawed nor had the sea ice gone out by 3 June.

The 150-foot reels of 35 mm film have been studied with the aid of a microfilm viewer. Computer analysis of the data was considered, but it was concluded that after extracting data from the films was completed a computer analysis would add very little. The situation is different in certain other radar studies. In the case of the 1974 data from Pt. Barrow, for example, the data are more extensive because of a longer time duration and a cleaner scope having more well defined echoes. In such a case, computer analysis is more helpful.

THE 1975 SPRING SEASON

Previous visits to Tin City in 1969 and 1970 provide a basis for comparing the weather and bird arrival dates in these years and in 1975. Compared to May, 1969, May 1975 was colder. Table I illustrates the coldness and lateness of the spring season in 1975. The entry "Number of days over 32°F" refers to the number of days on which the official weather station temperature (at the airstrip) was higher than 32°F (0°C) for at least one of the recorded hours. (Weather data were recorded hourly, but weather records were copied for this program at only three hour intervals so some minor discrepancy could occur in figures quoted, depending on whether hourly or three-hourly data were used.)

The lateness of the arrival of warm weather in 1975 had a corresponding effect on bird arrivals. The first small shorebirds were observed to arrive on 12 May in 1970 but not until 24 May in 1975. The shore ice went out on 31 May in 1970 but was still firm on 3 June in 1975. Also the lagoon shown on the map to the east of Tin City harbored many waterfowl in late May - early June, 1969, but was still frozen and lifeless during the corresponding period in 1975.

A short warm, clear spell did occur on 10-12 May, 1975, however, and sandhill cranes migrated through in numbers on these dates in 1975, as in both 1969 and 1970.

At Nome, the figures corresponding to those for 1975, during visit, at Tin City are: Minimum, 19°F on 18 May; Maximum 54°F on 14 May (also 53°F on 28, 29 and 30 May);
Number of days over 32°F, 15.

Table 1
Tin City Temperatures

1969

May minimum: 17°F on 5 May
May maximum: 49°F on 2 May
Number of days
over 32°F: 21

1969

During visit (17 May - 31 May)
Minimum: 29°F on 18, 23, 24, 31 May
Maximum: 49°F on 21 May
Number of days
over 32°F: 14 (out of 14)

1970

During visit (9 May - 17 May)
Minimum: 22°F on 14, 15 May
Maximum: 39° on 15 May
Number of days
over 32°F: 5 (out of 9)

Table 1 (cont'd)

1975

May minimum:	5°F on 1 May
May maximum:	36°F on 11 May
Number of days over 32°F:	2

1975

During Visit	(14 May - 3 June)
Minimum	14°F on 20 May
Maximum	32°F on 20 May
Number of days over 32°F:	0

Weather service temperatures were recorded in °F. To obtain °C subtract 32 and multiply by 0.556, e.g. 49°F = 9.4°C.

OBSERVATIONS OF BIRD MOVEMENTS

Radar Observations

Radar data on bird movements were taken from near local noon on 16 May to the early morning of 3 June but with interruptions. From 16 May to late 24 May the recorded bird movement was slight to moderate and took place mostly in the north-south direction and/or in the area to the east of the radar site. The period from late 24 May to 30 May was generally the most interesting and included moderate and heavy (or conspicuous) movement, with westward migration across the area of the Bering Strait on a number of occasions. Unfortunately there were important interruptions, especially overnight on 28-29 May and over half of 30 May. Movements after 30 May were complex and slight to moderate in extent. The features of the radar record will now be described in greater detail.

1. Echoes from birds moving consistently in a given direction show as streaks on time-exposure photographs. Birds flying about erratically produce echoes but not easily recognizable streaks. A feature of the radar record is that echoes show commonly near the north and south shorelines of the Seward Peninsula but the echoes frequently do not appear as well defined streaks. The radar screen is also characterized by a variable amount of sea and ice clutter. The resulting rather complex and cluttered appearance of the radar scope is illustrated by Fig. 6. It should be noted that, because of the 5-minute time exposure, the video level, and the

short range employed for bird studies, the appearance of the radar scope that the operator sees is quite different from that of the photographs of this report.

2. Migration commonly takes place to the northwest along the south coast of the Seward Peninsula and to the northeast along the north coast in spring. Because the radar scopes are oriented with magnetic north at the top (about 20° from geographic north), the appearance tends to be one of movement to the north in the area north of the site and movement to the west in the area east of the site. Echoes are also observed to move to the southwest, or south along the north coast of the Seward Peninsula. In 1969 some of the latter echoes were observed to continue across to Siberia. A suggestion of this type of movement is shown in Fig. 7. In Fig. 8, however, movement is to the south in both the areas to the north and to the south of the site. An individual photograph has an 180° ambiguity as to direction but examination of several frames allows resolution of the ambiguity. Southward movement was evident on 16, 17, 18, 21, and 22 May.
3. Some significant movement to the north in the area to the east of the radar site took place on 22, 23, and 31 May. An example is shown in Fig. 9 and Fig. 6 shows a more extensive movement of this type.
4. By the morning of 23 May westward movement across the strait was beginning to be evident, as shown by the streaks on the far-left side of Fig. 10. On the morning of 24 May, some

westward movement took place in the area to the north of the site. In the evening of the 24th birds seemed to be funneling towards Cape Prince of Wales from easterly directions and also moving to the west in the area to the south of the western Seward Peninsula. However rather little crossing of the strait was obvious during this period. In the early morning of the 25th, westward movement across the strait again became evident.

5. Although some westward movement across the strait was noted on 23, 24, and 25 May, as stated above, the first truly impressive movement across the strait took place on the afternoon of 26 May. Visibility was poor on this day and the movement was not observed visually. A sequence of photographs illustrating this movement is given in Figs. 11-14. Subsequent crossings of the strait from east to west, though not as obvious on 26 May, were recorded on 27, 29, 30, 31 May and 1 and 2 June.
6. Some extensive movements to the west in the area to the south of the site, near and north of King Island, were observed, especially on the evening of 26 and 27 May. This type of movement is shown in Fig. 15. The bird echoes are not as clean and distinct as in some other cases, as they are contaminated by sea and ice clutter.
7. Individual echoes moving from west to east were observed from time to time but no mass or organized movements in this direction were detected.

8. Although the radar does not provide good coverage of the extensive migration of birds along the shore-fast ice in the immediate vicinity of the cape, it detects such movements when the birds are farther away. An interesting feature is that some birds appear to migrate along the edge of the ice on the opposite side of the open water channel from the Seward Peninsula, as they approach the area of the cape from the south. Figure 16 illustrates northward movement along the far and near sides of the open water channel.
9. On the evening of 23 May, a succession of bird echoes appeared to be rounding East Cape, staying close to the shoreline and traveling to the northwest. Some significant movement to the north, in the area west of the Diomedes and most readily observed in the shadow of the Diomedes, was observed on 29 May.

Visual Observations

Observations made at Nome, while enroute to Tin City and waiting for weather to allow air service to Tin City, are pertinent and will be mentioned briefly. A principal point of interest is that the weather is milder and the season is more advanced in mid May than at Tin City, and consequently birds are present in greater numbers at this time. Robins (*Turdus migratorius*), white-crowned sparrows (*Zonotrichia leucophrys*), and fox sparrows (*Passerella iliaca*) were singing and tree swallows (*Iridoprocne bicolor*) were investigating nesting sites. Small shorebirds were in the area but generally not seen at sufficiently close range to identify. Species that were

identified included the northern phalarope (*Lobipes lobatus*), common snipe (*Capella gallinago*), and whimbrel (*Numenius phaeopus*). Pintails (*Anas acuta*) and a shoveler (*Spatula clypeata*) were in the area, and large flocks of sandhill cranes passed over on 13 and 14 May.

Bird life was limited by comparison at Tin City from 14 May until about 22 May, and characterized by typical arctic species such as the snow bunting (*Plectrophenax nivalis*), lapland longspur (*Calcarius lapponicus*), redpoll (*Acanthis*), glaucous gull (*Larus hyperboreus*), and rock ptarmigan (*Lagopus mutus*). A list of birds observed, arranged in order of the date on which the species were first recorded is included as an appendix. Presumably because of the strong influence of the surrounding arctic waters, the Cape Prince of Wales area appears to be an island of cold in at least somewhat milder surroundings in May. Lack of waterfowl and small shorebirds at Tin City, for example, does not mean that they may not be found a hundred miles or less away. Of the birds mentioned above for Tin City, the only species that would be expected to make conspicuous radar targets was the glaucous gull. The gulls were already at Tin City by 14 May. They appeared to have settled in the area for the season, frequented the shoreline area, and made only rather short flights in any given direction. Most king eiders had probably passed by before 14 May, but flocks of eiders were seen flying along the edge of the shore-fast ice on 18 May. If it had been possible to maintain a constant watch at least occasional flocks of eiders would have presumably been seen during much of the 14-22 May

period. Of some interest during this period, though not from the radar viewpoint, was the occurrence of 5 species of passerine birds which are also found farther to the south, namely the white-crowned sparrow, fox sparrow, slate-colored junco (*Junco hyemalis*) tree sparrow (*Spizella arborea*), and varied thrush (*Ixoreus naevius*).

The first migrant from Asia, the wheatear (*Oenanthe isonanthus*), was seen on 22 May, and migrating sandhill cranes were seen on 22 May. The first shorebird, the western sandpiper (*Ereunetes mauri*) was recorded on 24 May. Previous to this time the ground was essentially completely frozen (except for a warm spell on 10-12 May), and conditions were unfavorable for shorebirds. The official temperature did not rise above 0°C for some time after 24 May either but locally the temperature was surely higher at times and sunshine causes some melting even when the air temperature does not rise above 0°C. Thus shorebirds could find suitable conditions after 24 May. Following the first observation of a shorebird on 24 May, six new shorebird species for Tin City for the year were noted on 25 May.

Altogether four species of passerine birds that migrate to Alaska from Asia were recorded. These were the wheatear, yellow wagtail (*Motacilla flava*), white wagtail (*Motacilla alba*), and bluethroat (*Luscinia svecica*). Of these the wheatear was by far the most abundant. Wheatears seemed to be everywhere on 29 May.

The sandhill crane was a conspicuous large migrant. Although it is believed that the major migration of cranes took place during 10-14 May, flocks of cranes were recorded on 22, 23, 25,

and 26 May. The first snow geese were seen on 27 May. Only three birds were noted. These were first seen heading west near 1300 BST but they turned back and then appeared to pass to the north of Cape Mountain instead of following their original route to the south of the mountain. Snow geese were also seen in small numbers on 30 May (8 in one flock and a single) by this observer between 1200 and 1300. It was later learned, however, that hilltop personnel had seen a major flight of snow geese somewhat earlier or between 1000 and 1100 BST (1200 and 1300, Alaska Daylight Time). The birds were heading west on the south side of Cape Mountain, low over the water in a direction to take them directly across Bering Strait. Two small flocks of snow geese were also reported by site personnel on the following day, 31 May (8 at 0530 and 6 at 1030).

The snow geese noted on 30 May between 1200 and 1300 were observed from the lookpoint shortly west of Paulina Creek during an hour when an attempt was made to count the birds migrating along the edge of the shore-fast ice. An estimate of 2765 migrating birds in 55 flocks was made. Most birds were too far away to identify for sure but a range of sizes were involved. In addition to the snow geese which could be easily distinguished, identification was made of emperor geese (*Phalacrocorax auritus*) and common eider. Pelagic cormorants (*Phalacrocorax pelagicus*) were also observed, but mostly as single birds that appeared to be flying as much in the reverse direction as that of the migrating birds. Presumably the cormorants had already settled in the area and were not migrating. Many of the other migrating

birds were believed to be oldsquaws (*Clangula hyemalis*) and alcids, especially murre. Extensive migration along the edge of the shore-fast ice was reported on the morning of 28 May by site personnel, and it can be presumed that such migration took place in varying degree during most of the time at Tin City.

Reports from other Observers

Site personnel made the important sighting of the snow goose migration on 30 May. Only reports involving white geese with black wing tips were accepted as it became obvious that not all persons knew the difference between geese and cranes. The three radar sites of Kotzebue, Cape Lisburne, and Pt. Lay were requested to be on the alert for bird movements, but few reports were received. It was of interest, however, that a few snow geese were reported from Kotzebue on about 12 May and again on about 31 May. Do some of the migrating snow geese fly past Kotzebue, then along the coast to Point Hope, and then directly to Wrangel Island? White-fronted geese (*Anser albifrons*) were seen in small numbers at Pt. Lay and one large flock was reported on about 27 May.

Eskimo workers at the Tin City tin mine reported that a few emperor and white-fronted geese had passed by before 24 May. Eskimo students returning to Wales from Nome reported seeing 8 whistling swan (*Olor columbianus*) in pairs near Cape York on 31 May. The Munz pilot reported seeing about 16 swan west of Nome on 2 June. Only one pair was in the same area, however, on 3 June. Thus the swan seemed to be migrating at that time.

SEA ICE AND BIRDS

The subjects of sea ice and birds are closely related in the Bering Strait area, especially when radar data are considered. In the spring migration, many birds follow along the edge of the shore-fast ice past Cape Prince of Wales. Gulls, however, commonly frequent the shore itself after their early arrival in the area.

Although radar systems have been most commonly operated for one purpose alone, they are inherently multipurpose systems. Thus, the Air Force and agencies like the Federal Aviation Agency have been primarily interested only in detecting aircraft, but the radars they operate obtain echoes from birds, the sea, sea ice, etc., depending on location. The Tin City ACW radar, in particular, has good coverage of the Bering Strait area, except for the near shoreline near Cape Prince of Wales itself, and provides information on birds, the extent of open water, and the extent and nature of the sea ice. An inherent difficulty in having so much information available, however, is that one type may mask the other and it may not always be possible to separate one type from the other. On the other hand, with experience and effort it is possible to do quite well in analyzing data from the Tin City radar and in separating the various types of echoes.

Visual observations in the vicinity of Cape Prince of Wales, including Tin City, show a variety of birds migrating along the edge of the short-fast ice. The radar, however, shows birds migrating along the edge of the ice on the other side of the open water channel as well. The appearance of the radar screen suggests that some of these birds cross over to the near side in

the vicinity of the cape.

The fact that the Tin City radar provides more than one type of video signal is very helpful in distinguishing the areas of open water, shore-fast ice, and pack ice. The two video types used for this purpose are MTI video and a logarithmic, short-time-constant video which will be referred to as a log video. The MTI video signal emphasizes return from the waves of open water areas and from ice floes moving with the waves. The log video emphasizes return from nearly stationary ice, particularly at the edge of the open water. The characteristics of the two types are illustrated in Figs. 17 and 18.

Because of the close relation between sea ice and birds, ERTS satellite scenes are being ordered, of the Bering Strait area and the regions to the north and south. These will provide further information on the occurrence of open-water channels, shore-fast ice, and pack ice.

DISCUSSION

Observations of 1975

The echoes near the coastline of the Seward Peninsula that do not form well defined streaks are probably mostly due to gulls which are observed to make frequent changes in direction as they fly about, often at moderately high elevations. The observations of birds moving to the south, in cases where they are not actually migrating to the southwest across the strait, suggest that some reverse migration takes place in the spring in the area. Such reverse migration is commonly observed in the spring in other areas such as the Great Plains and consists of a temporary retreat

to the south at times of unfavorable weather. The migration to the north in the area east of Tin City (Fig. 6) is an example of overflight, made without detailed reference to local topographic features.

The radar does not have the capability of identifying bird echoes, and it is not possible to determine for certain which echoes were caused by snow geese. Westward migration across the strait was evident in varying degree from about 23 May on, and any of this movement could have involved snow geese. The conspicuous migration of 26 May could well have been snow geese, as the date is rather late for a major flight of sandhill cranes, especially as major flights of cranes took place in the 10-14 May period. Also it appears that the cranes migrate mostly under conditions of good ground-level visibility, whereas the snow geese do not require such good visibility and 26 May was a very foggy day. The only major flight of snow geese that was observed visually took place on 30 May.

Jacobi (personal communication, 1975) has provided information to the effect that the snow geese follow two different routes in Siberia on the way to Wrangel Island. One route is via East Cape and the other is via Mechigman Bay. The two routes join near Vankarem, and the birds leave the coastline for Wrangel Island near Cape Schmidt where Jacobi was located from 15 to 31 May, 1975. The birds which fly directly across the Bering Strait as on 26 May, or to the north of it, presumably travel via East Cape. The migration noted on 26 and 27 May in the area to the south of the Bering Strait, near King Island, may have involved

birds heading for Mechigman Bay. Some of these birds could have been snow geese. The migration of 30 May appeared to be heading across the Bering Strait. It is possible that the echoes rounding East Cape on 23 May were due to snow geese which had escaped detection until that point.

The radar record suggests that some birds migrate north from the vicinity of King Island on the other side of the open-water channel from Cape Prince of Wales. It appears that some of the birds may cross over in the vicinity of the cape to the near side, although perhaps they stop or are diverted in the area of the strait and it is different birds that are observed to continue north along the edge of the shore-fast ice adjacent to the Seward Peninsula. In any case, an impressive migration takes place along the edge of the shore-fast ice past Cape Prince of Wales.

Preliminary comparison of results by Dr. Jacobi and Dr. Flock indicate that the season was cold and late at both Cape Schmidt and Cape Prince of Wales and that the most extensive movements were observed on both radars on approximately the same dates (26 May and later). More detailed comparisons will be made later. As the two sites are separated by roughly 340 nautical miles (635 km), a particular flight passing Cape Prince of Wales would not reach Cape Schmidt until about 9 hours later.

Radar Characteristics and Siting

The location of the Tin City radar at a high elevation above the sea surface provides coverage of a large area, but a high location tends to cause serious clutter in the form of echoes

from the surroundings. The clutter in such situations is often so severe that the normal (unprocessed) video signals are of little use. MTI (moving-target-identification) circuitry, however, in which signals from one sweep are subtracted from those of the next, helps very much to alleviate the clutter, and MTI video signals were used almost exclusively at Tin City for recording echoes from birds. The subtraction process is commonly referred to as a cancellation process, as it results in signals from stationary objects being cancelled out or eliminated. Echoes from objects having a radial velocity greater than some minimum value, however, are retained.

The adjustment of MTI circuitry to achieve the desired degree of cancellation of undesired signals but to retain high sensitivity for signals of interest can be difficult except perhaps in the case of the latest sophisticated radars. At Tin City, echoes from rough sea ice are apparently more intense and/or more nearly continuous spatially, taking into account the radar resolution, than echoes from open water or the mountainous terrain to the east. As a consequence, if the MTI circuitry is not performing perfectly, a lack of sensitivity for weak targets, such as birds, may develop and the effect may show up first in the areas of sea ice. The result in such a case might be that bird echoes may be quite obvious over the land and open water but less so over the sea ice. There are reasons other than MTI circuit adjustment, of course, for echoes from birds to be more obvious in certain areas of the radar screen than elsewhere. The birds themselves may be flying mostly in one area but not elsewhere. Also in the

case of a widespread movement in a given direction, echoes will be absent from regions where the radial velocity does not exceed a minimum value, in the case that MTI video is employed. A resultant phenomenon is referred to as an MTI wedge; signals will be apparent in certain angular ranges or wedges and absent elsewhere.

For studying bird movements, there is some advantage to having a radar at a low elevation above the surroundings as in the case of the Alaskan DEW radars. Normal video, rather than MTI video, can commonly be used to advantage at DEW sites. A low elevation of the radar, however, does limit the coverage of the radar for distant low-flying birds.

Apart from the matter of MTI-circuit adjustment, the Tin City radar does not cover the near shoreline, or edge of the shore ice, throughout a significant angular range near the tip of Cape Prince of Wales, because the edge of the ice is not visible from the top of Cape Mountain. It was determined, however, that a location at a height of about 150 m at the very tip of Cape Prince of Wales does allow coverage of the edge of the shore ice throughout a large angular range (Fig. 4). This location would be an ideal one in many ways for obtaining high-resolution data on bird movements and sea ice in the region between the cape and the Diomedes and in areas to the north and south. King Island, for example, is within the line of sight to the south (Fig. 3). The location is only about 0.6 km from the south end of the village of Wales, and electrical power could be supplied by a line from the village. The climb from the village is steep (Fig.5),

but in May the slope was covered with snow in such a condition as to facilitate walking up and down. In winter and early spring a snowmobile could probably be used to travel to the site, if a longer route of gradual slope was used. The ridge may tend to blow free of snow even in winter, however, so that a snowmobile could not traverse the entire distance. Moving the building material and radar to the site originally would probably be accomplished best by using a helicopter. Other options would be to construct a road from the village or to rely on snowmobiles alone, the season being chosen accordingly.

Using the site would present no problem to a person in good physical condition in good weather, even without a road or snowmobile. However, living quarters should be constructed for staying several days or more at a time if desired or for use when severe weather made it necessary to stay overnight or longer. The building would have to be well constructed to withstand strong wind. As bird observations would not need to commence before late April, it is only in late April and the first week of May that really cold weather (near -18°C) might be encountered. After the first week in May, the weather is often (if not generally) unpleasant but not dangerous. Precautions would have to be taken in the case of winter use.

Installing the power line, building the site originally, and installing a road, if that option was pursued, would be rather costly and the weather and remoteness of the location are such as to require strong motivation on the part of the individuals involved in manning the facility. On the other hand, the location is beautiful and quite hospitable in good weather, and the proper

type of radar could provide excellent data on birds and sea ice. The ACW radar on Cape Mountain and a high-resolution radar at Cape Prince of Wales itself would have different characteristics and locations and data from the two would complement and supplement each other. A Cape Prince of Wales radar would not be a replacement for the Cape Mountain radar but would provide valuable additional information. The cape location is not as high as the mountain location but would still experience sea and ice clutter, and it would be highly desirable for the cape radar to have doppler or MTI capability so that sea and ice echoes could be inhibited when desired. An unmodified video signal, or one with a logarithmic, short-time-constant characteristic, should also be available to provide sea ice data.

Future Operations Using Present Facilities

The advantages and difficulties of installing an additional radar facility at Cape Prince of Wales have been discussed in the previous paragraphs. It is hoped that sufficient interest will develop to support such an operation.

Confining attention to the use of present facilities, the Kotzebue and Cape Lisburne ACW radar sites should be investigated to obtain data on the extent and nature of bird migration in these areas. The Kotzebue radar is at a relatively low height above the water and should not have such strong clutter as the Tin City radar. Possibly migration between Alaska and Siberia is not restricted to the near vicinity of Bering Strait but takes place also between the Kotzebue-Cape Lisburne area and Siberia as well. The Kotzebue and Cape Lisburne sites could be conveniently

visited on one trip.

Even in the absence of an additional radar facility at Cape Prince of Wales, more emphasis should be placed on visual observations in the immediate vicinity of the Cape, in any future program at Tin City. Carrying out this suggestion requires that at least two persons be assigned to the field program so that one can concentrate on visual observations at the cape while the other gives attention to radar operations. To carry out visual observations at the cape efficiently will require staying at Wales, or better yet in living quarters at the cape itself if they were constructed, for at least several days at a time. Wales and Tin City are only 8 km apart but covering that distance frequently involves delay and/or much physical exertion. At intervals of several days or more, however, the persons involved in a Tin City-Wales program could exchange stations if desired.

CONCLUSION

A significant migration of snow geese was observed visually on 30 May. Westward crossings of the Bering Strait region were recorded by radar from 23 May on, major movements taking place on 26 May. Some, or much, of the westward movement could have involved snow geese.

Extensive migrations of birds follow the edge of the shore-fast ice at Cape Prince of Wales in May and early June, and some migration takes place along the opposite side of the open water channel from the cape.

The Tin City ACW radar on Cape Mountain does a good job of providing information on bird movements and sea ice over a wide region. A suitable high-resolution radar at the very tip of Cape Prince of Wales, south of the village of Wales, could provide more detailed information on bird migration and sea ice in the immediate vicinity of the cape, as well as the area between the cape and Little Diomedé Island and to similar distances to the north and south.

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Appendix

List of Birds for Tin City-Wales Area, by Date of First Observation, 1975

1. snow bunting (<i>Plectrophenax nivalis</i>)	5-14
2. common raven (<i>Corvus corax</i>)	5-14
3. glaucous gull (<i>Larus hyperboreus</i>)	5-14
4. lapland longspur (<i>Calcarius lapponicus</i>)	5-17
5. redpoll (<i>Acanthis</i>)	5-17
6. white-crowned sparrow (<i>Zonotrichia leucophrys</i>)	5-17
7. rock ptarmigan (<i>Lagopus mutus</i>)	5-17
8. fox sparrow (<i>Passerella iliaca</i>)	5-18
9. slate-colored junco (<i>Junco hyemalis</i>)	5-18
10. king eider (<i>Somateria spectabilis</i>)	5-18
11. tree sparrow (<i>Spizella arborea</i>)	5-19
12. varied thrush (<i>Ixoreus naevius</i>)	5-19
13. wheatear (<i>Oenanthe oenanthe</i>)	5-22
14. western sandpiper (<i>Ereunetes mauri</i>)	5-24
15. savannah sparrow (<i>Passerculus sandwichensis</i>)	5-24
16. horned lark (<i>Eremophila alpestris</i>)	5-25
17. common snipe (<i>Capella gallinago</i>)	5-25
18. rock sandpiper (<i>Erolia ptilocnemis</i>)	5-25
19. ruddy turnstone (<i>Arenaria interpres</i>)	5-25
20. semipalmated plover (<i>Charadrius semipalmatus</i>)	5-25
21. American golden plover (<i>Pluvialis dominica</i>)	5-25
22. long-tailed jaeger (<i>Stercorarius longicaudus</i>)	5-25
23. sandhill crane (<i>Grus canadensis</i>)	5-25
24. short-eared owl (<i>Asio flammeus</i>)	5-25

25.	Baird sandpiper (<i>Erolia bairdii</i>)	5-26
26.	bluethroat (<i>Luscinia svecica</i>)	5-26
27.	gray-cheeked thrush (<i>Hylocichla minima</i>)	5-26
28.	gray-crowned rosy finch (<i>Leucosticte tephrocotis</i>)	5-26
29.	golden-crowned sparrow (<i>Zonotrichia atricapilla</i>)	5-26
30.	snow goose (<i>Chen caerulescens</i>)	5-27
31.	knot (<i>Calidris canutus</i>)	5-27
32.	oldsquaw (<i>Clangula hyemalis</i>)	5-28
33.	yellow wagtail (<i>Motacilla flava</i>)	5-29
34.	water pipit (<i>Anthus spinoletta</i>)	5-29
35.	pelagic cormorant (<i>Phalacrocorax pelagicus</i>)	5-30
36.	emperor goose (<i>Philacte canagica</i>)	5-30
37.	common eider (<i>Somateria mollissima</i>)	5-30
38.	red phalarope (<i>Phalaropus fulicarius</i>)	6-1
39.	white wagtail (<i>Motacilla alba</i>)	6-1

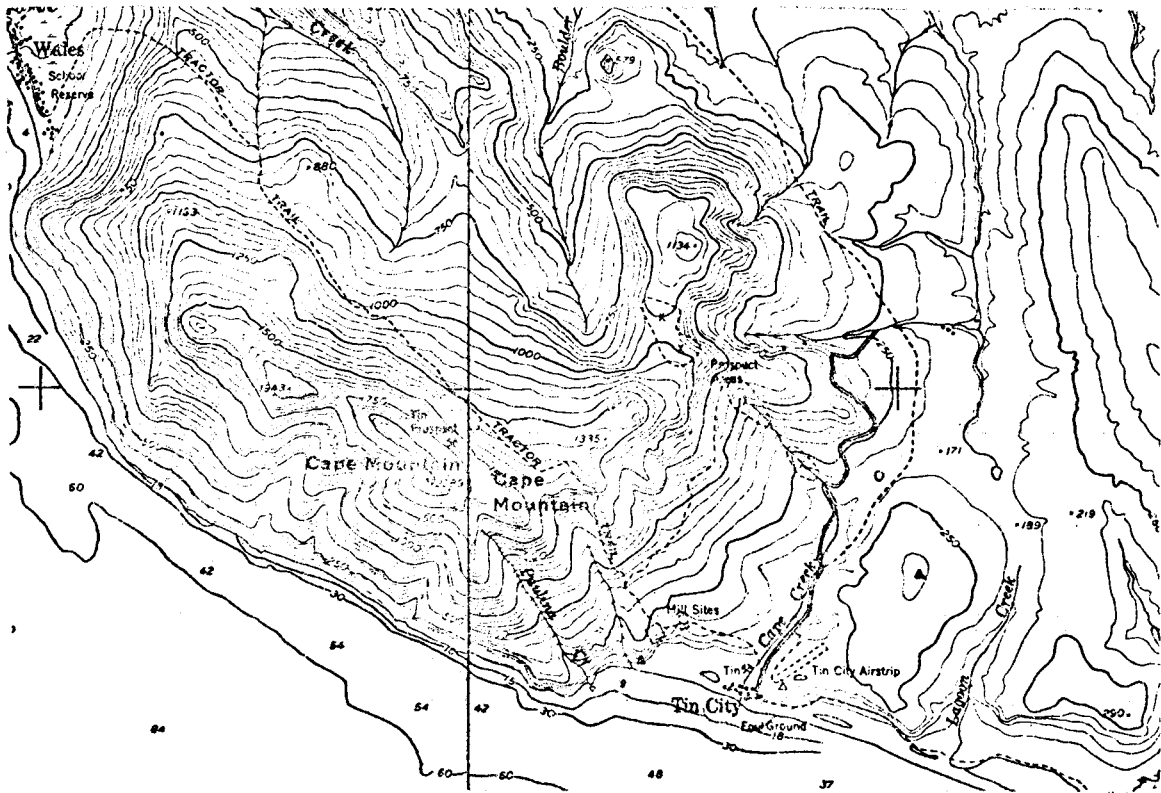


Fig. 1 Map of Cape Prince of Wales area. Elevations are in feet. To obtain elevations in meters multiply elevations in feet by 0.3048.

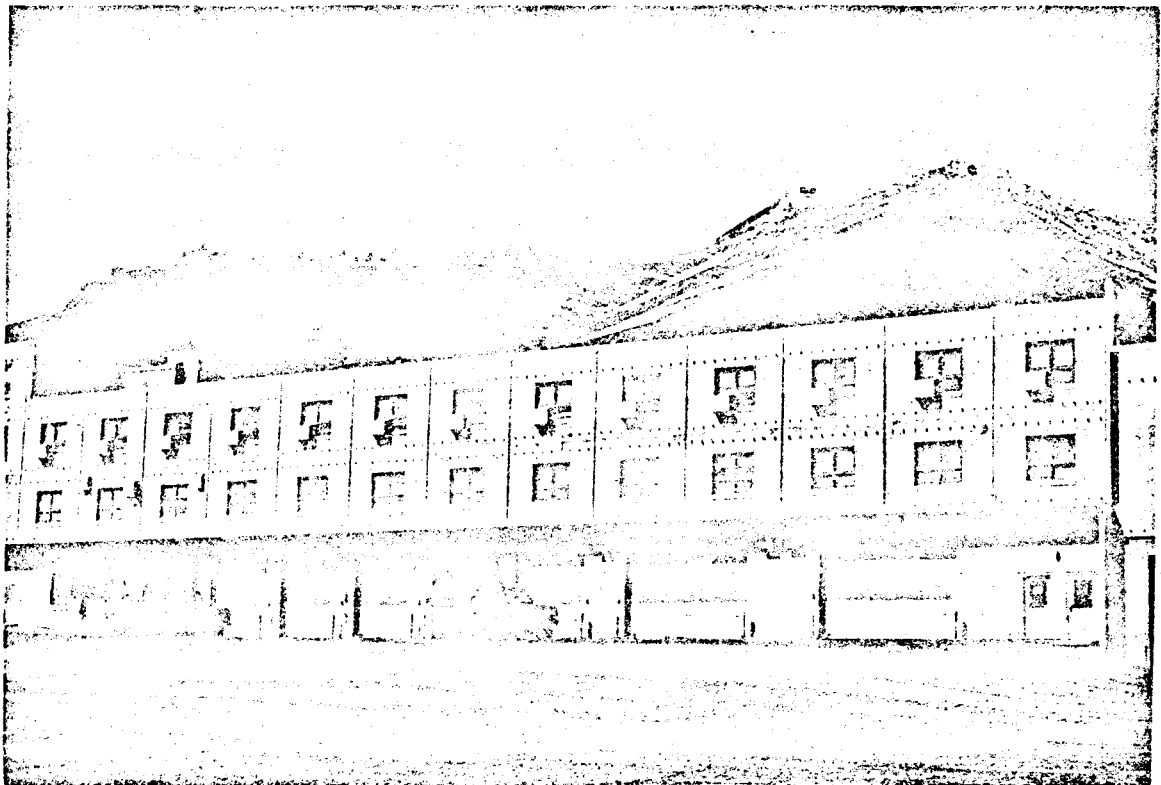


Fig. 2 Tin City Air Force Station headquarters building, with radar transmitter on Cape Mountain in background.



Fig. 3 View looking south towards King Island from near tip of Cape Prince of Wales.



Fig. 4 Shore-fast ice at the tip of Cape Prince of Wales.



Fig. 5 View of ridge on which radar installation is recommended, with village of Wales in foreground.



Fig. 6 Tin City radar screen, MTI video, 31 May 1975, 1130 BST. All radar-screen photographs are 5-minute time exposures, with range circles spaced 10 nmi (18.5 km) apart. The radar screen is oriented with magnetic north up. Times are given in Bering Standard Time (BST) which lags 11 hours behind Universal Time and 2 hours behind Alaska Daylight Time (used at Tin City AFS).

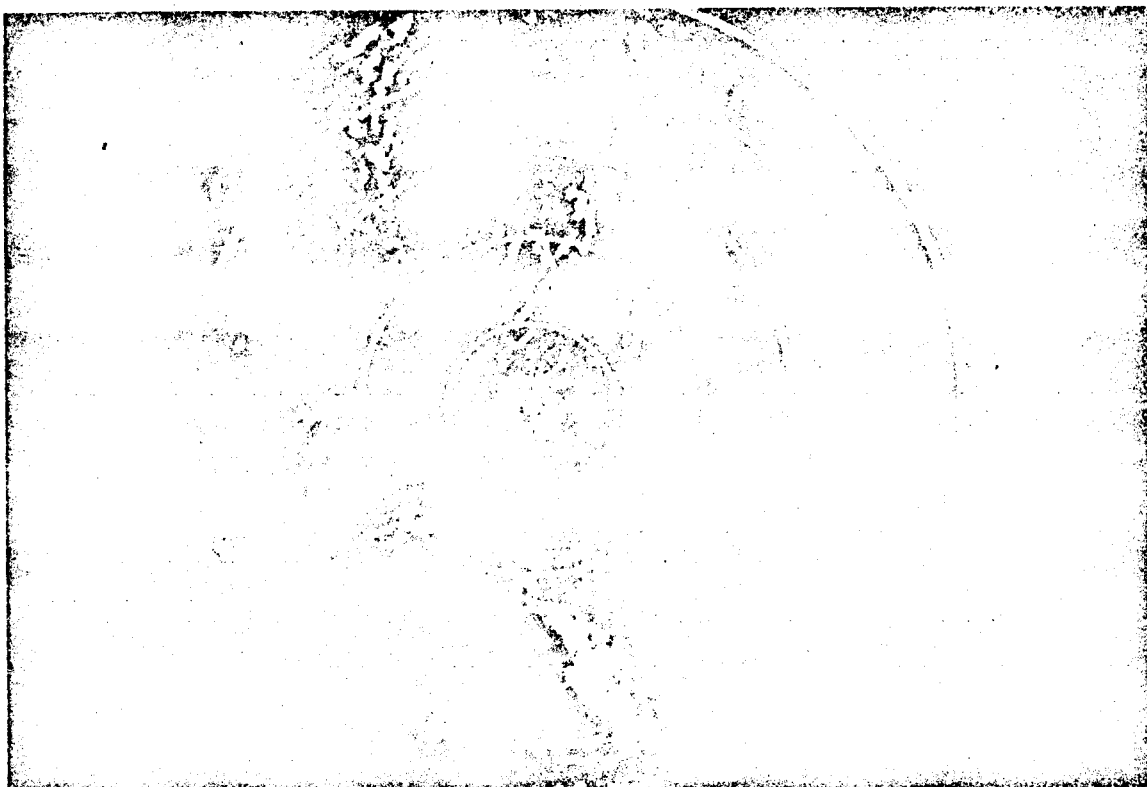


Fig. 7 Tin City radar screen, MTI video, 18 May 1975, 0650 BST.
Birds heading towards about 210°.

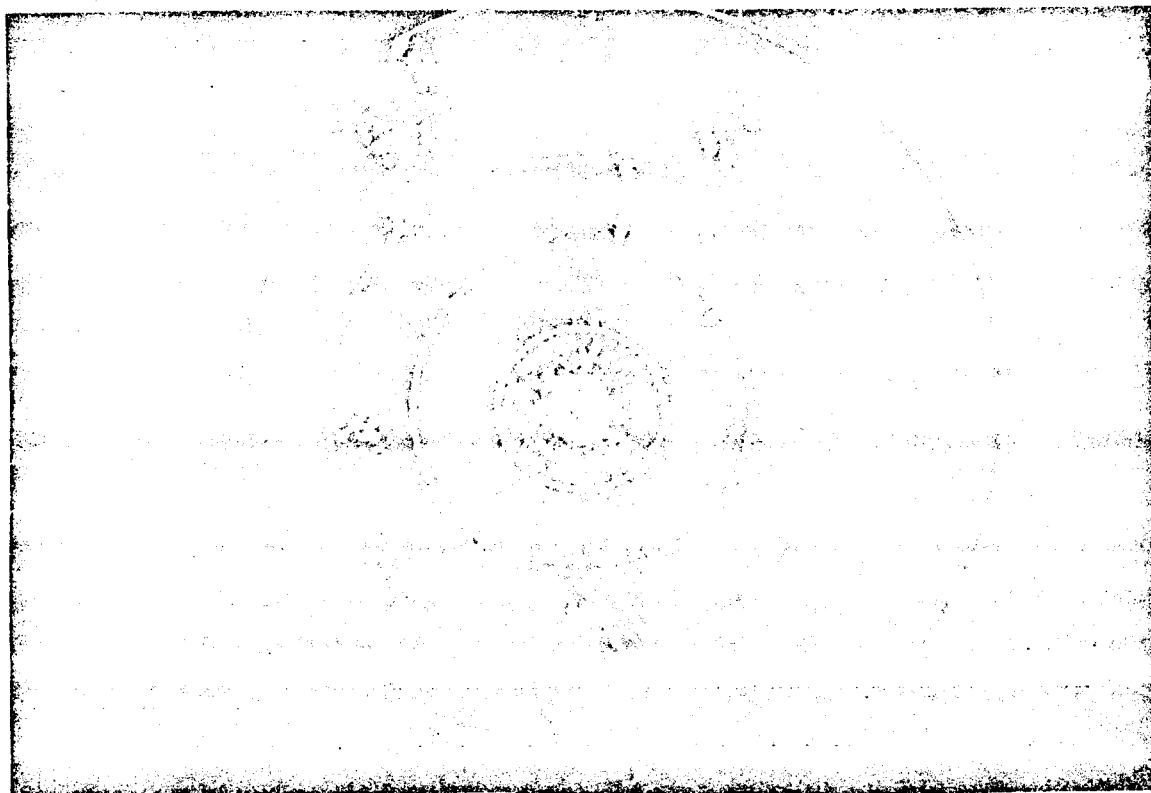


Fig. 8 Tin City radar screen, MTI video, 17 May 1975, 2350 BST.
Birds heading south.

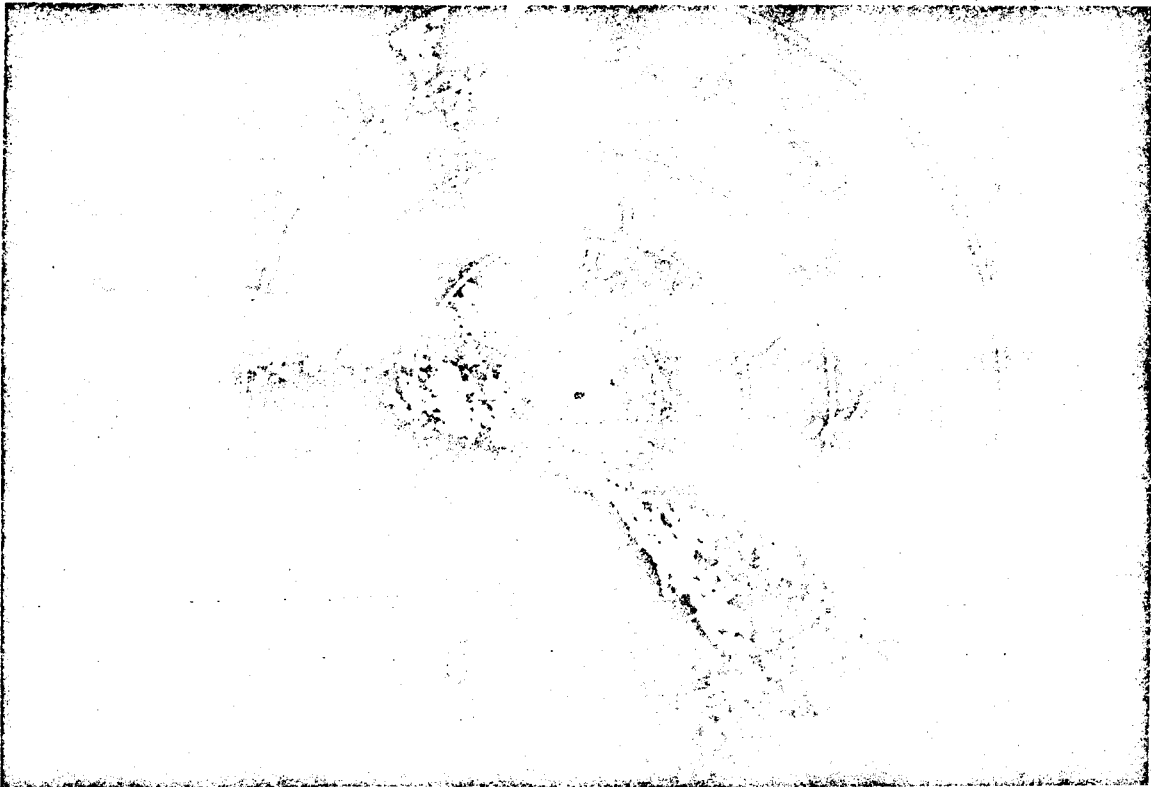


Fig. 9 Tin City radar screen, MTI video, 22 May 1975, 2330 BST.
Birds heading towards the north and northeast.



Fig. 10 Tin City radar screen, MTI video, 23 May 1975, 0615 BST.
Westward movement of birds, including some that are crossing the
Bering Strait.

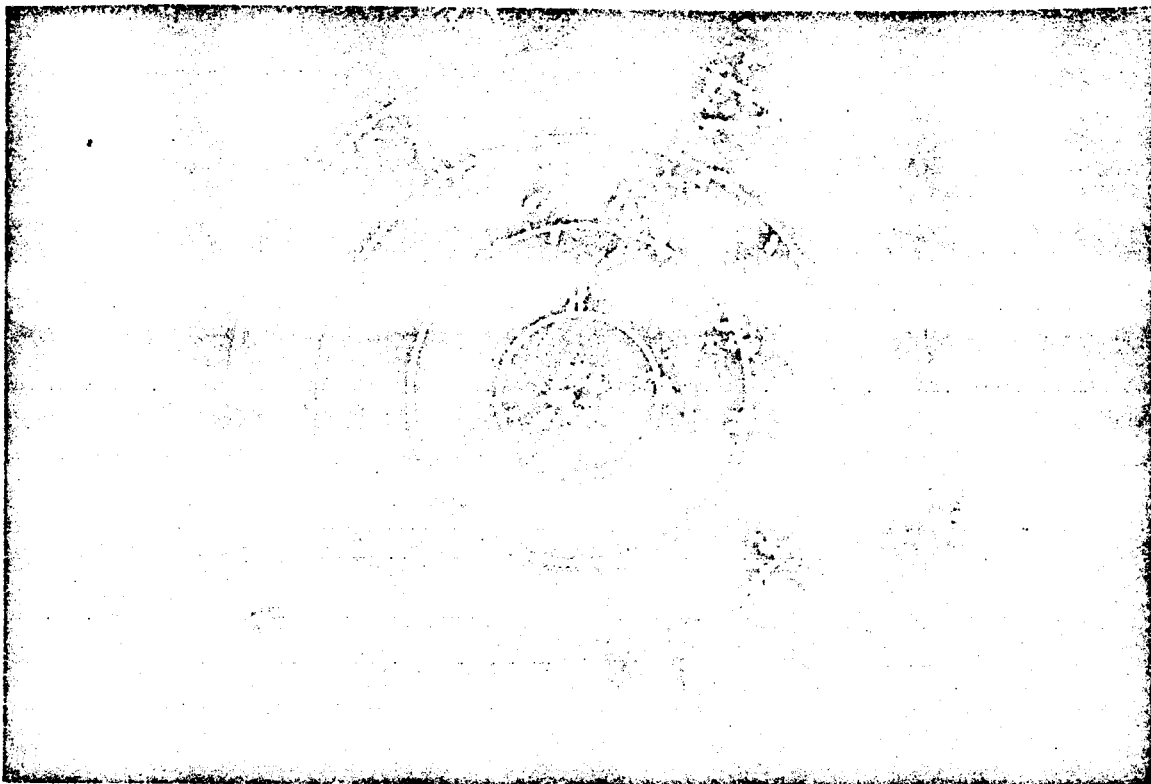


Fig. 11 Tin City radar screen, MTI video, 26 May 1975, 1500 BST.
Beginning of an obvious westward crossing of the Bering Strait.

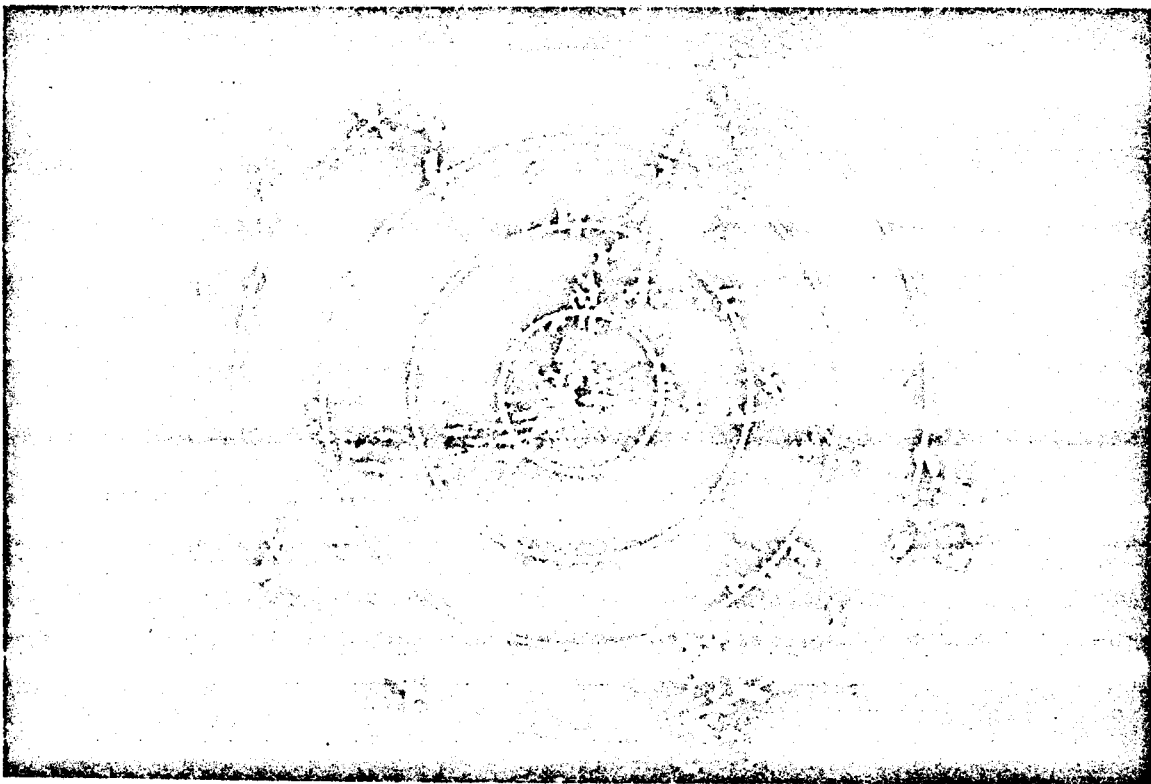


Fig. 12 Tin City radar screen, MTI video, 26 May 1975, 1540 BST.
Westward crossing of Bering Strait.

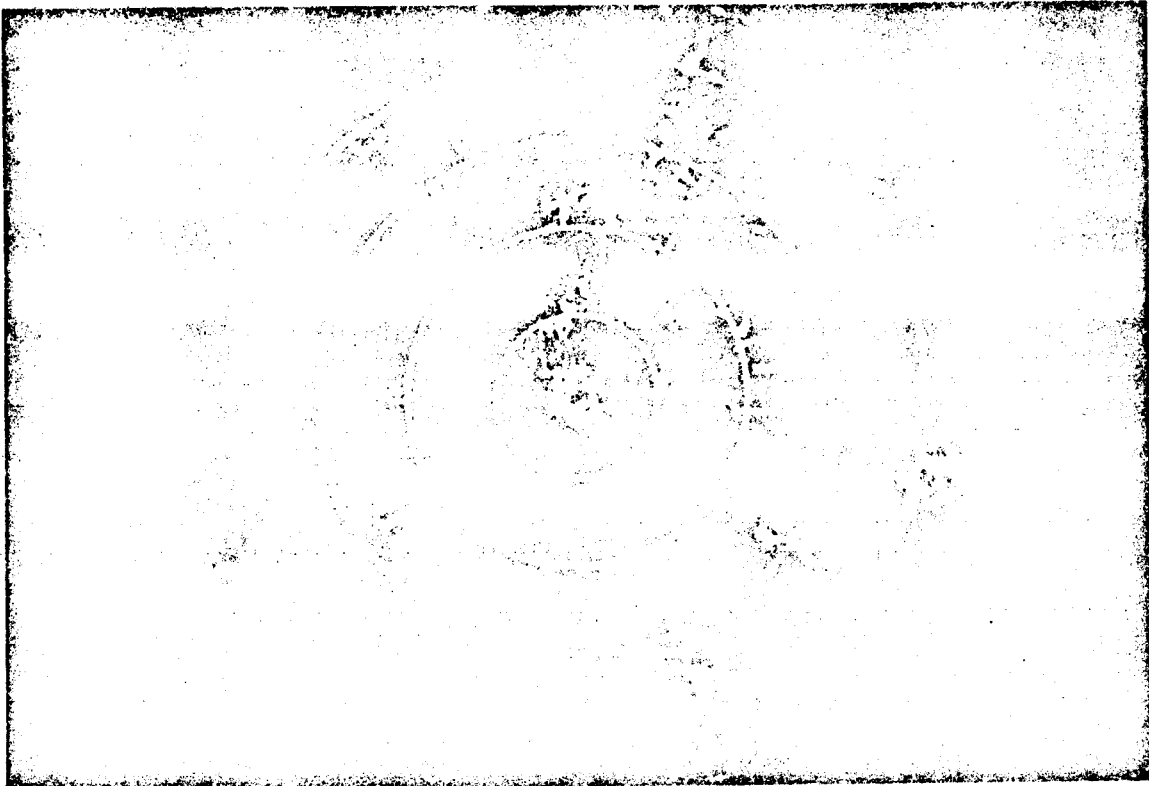


Fig. 13 Tin City radar screen, MTI video, 26 May 1975, 1610 BST.
Westward crossing of Bering Strait, continued.

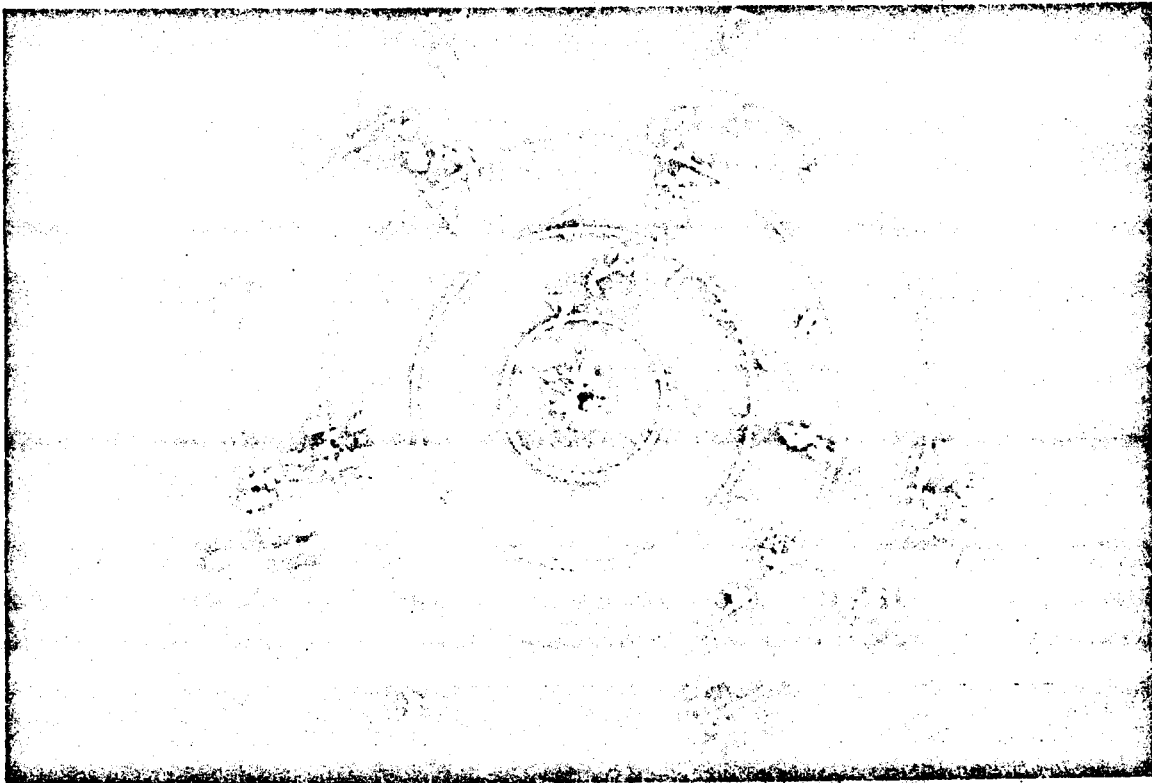


Fig. 14 Tin City radar screen, MTI video, 26 May 1975, 1630 BST.
Westward crossing of Bering Strait, continued.

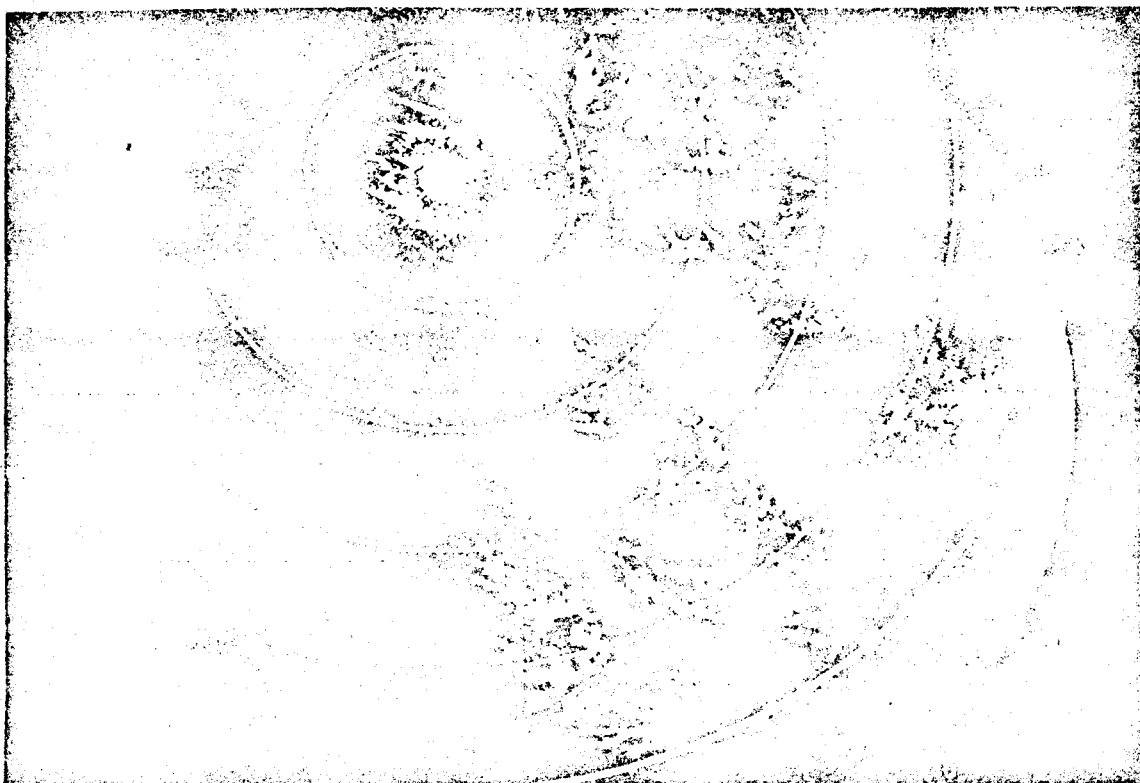


Fig. 15 Tin City radar screen, MTI video, off-centered screen, 26 May 1975, 1855 BST. Westward movement south of Cape Prince of Wales, in area near King Island.

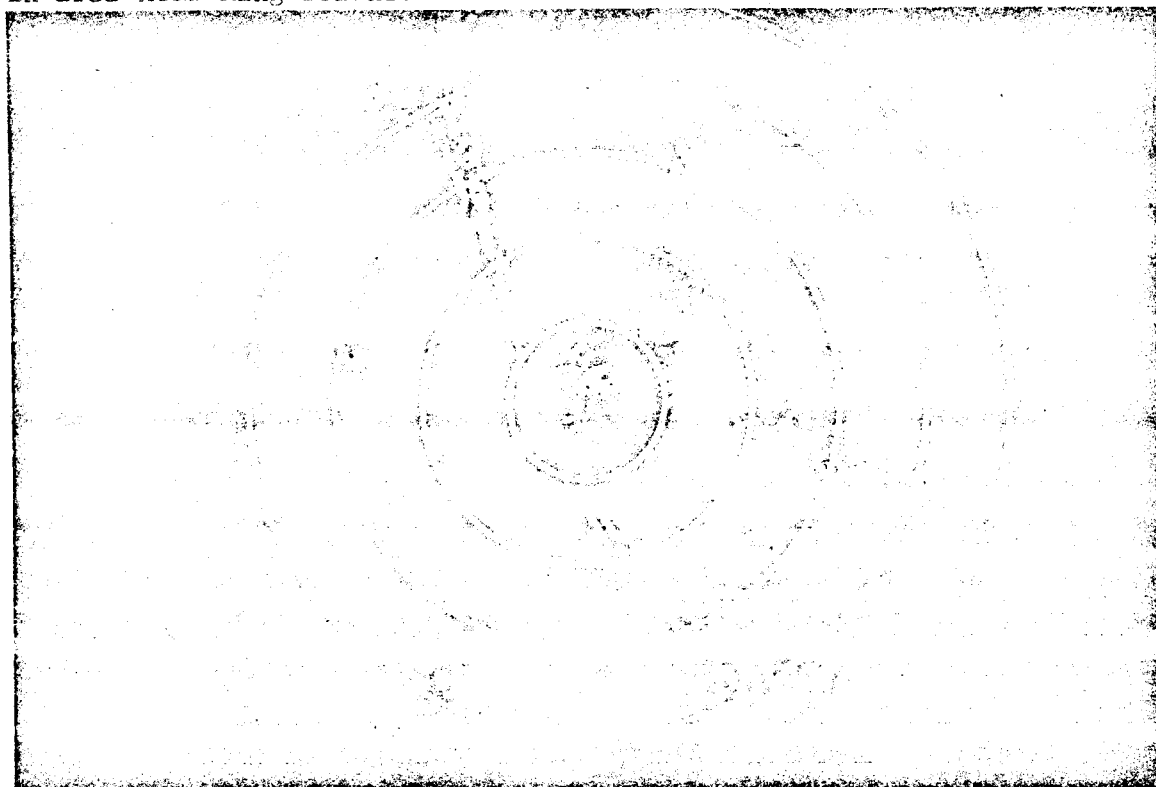


Fig. 16 Tin City radar screen, MHI video, 24 May 1975, 2235 BST. Northward movement along water-ice boundary on opposite side of channel from Cape Prince of Wales.



Fig. 17 Tin City radar screen, MFI video, 21 May 1975, 1105 BST. The open-water channel shows clearly to the south and an area of pack ice appears to the west.

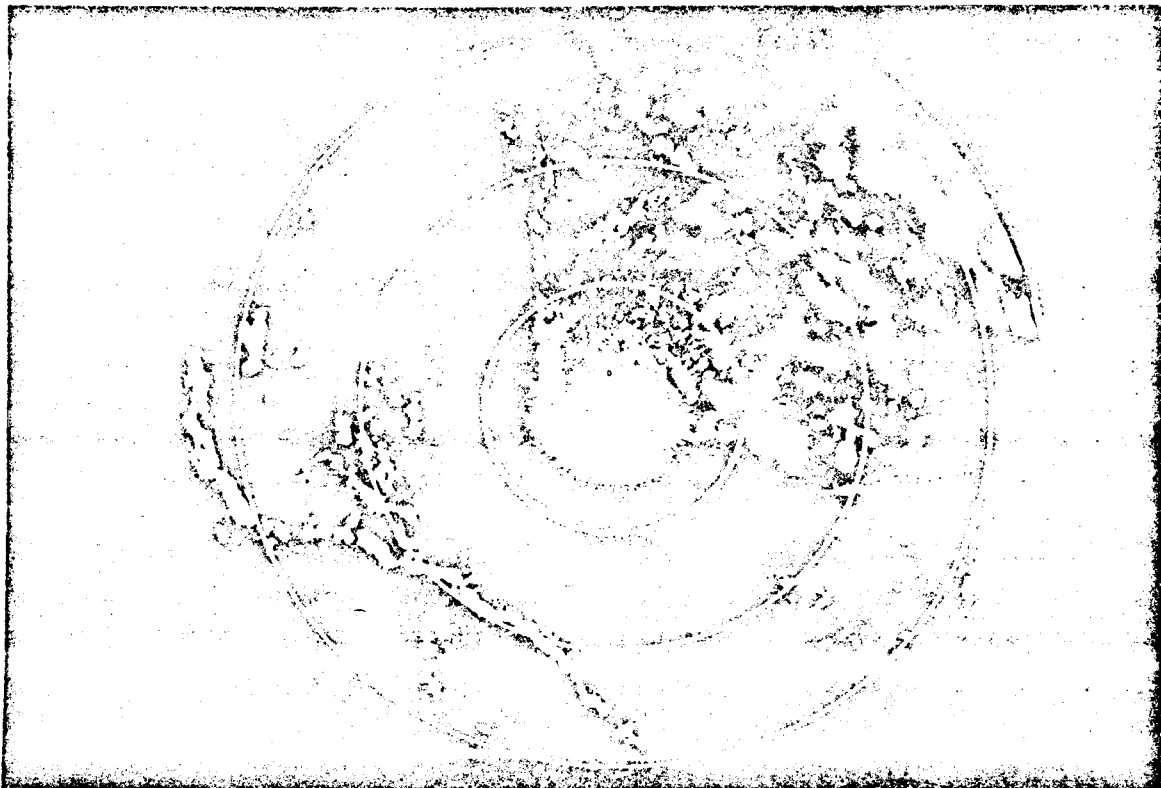
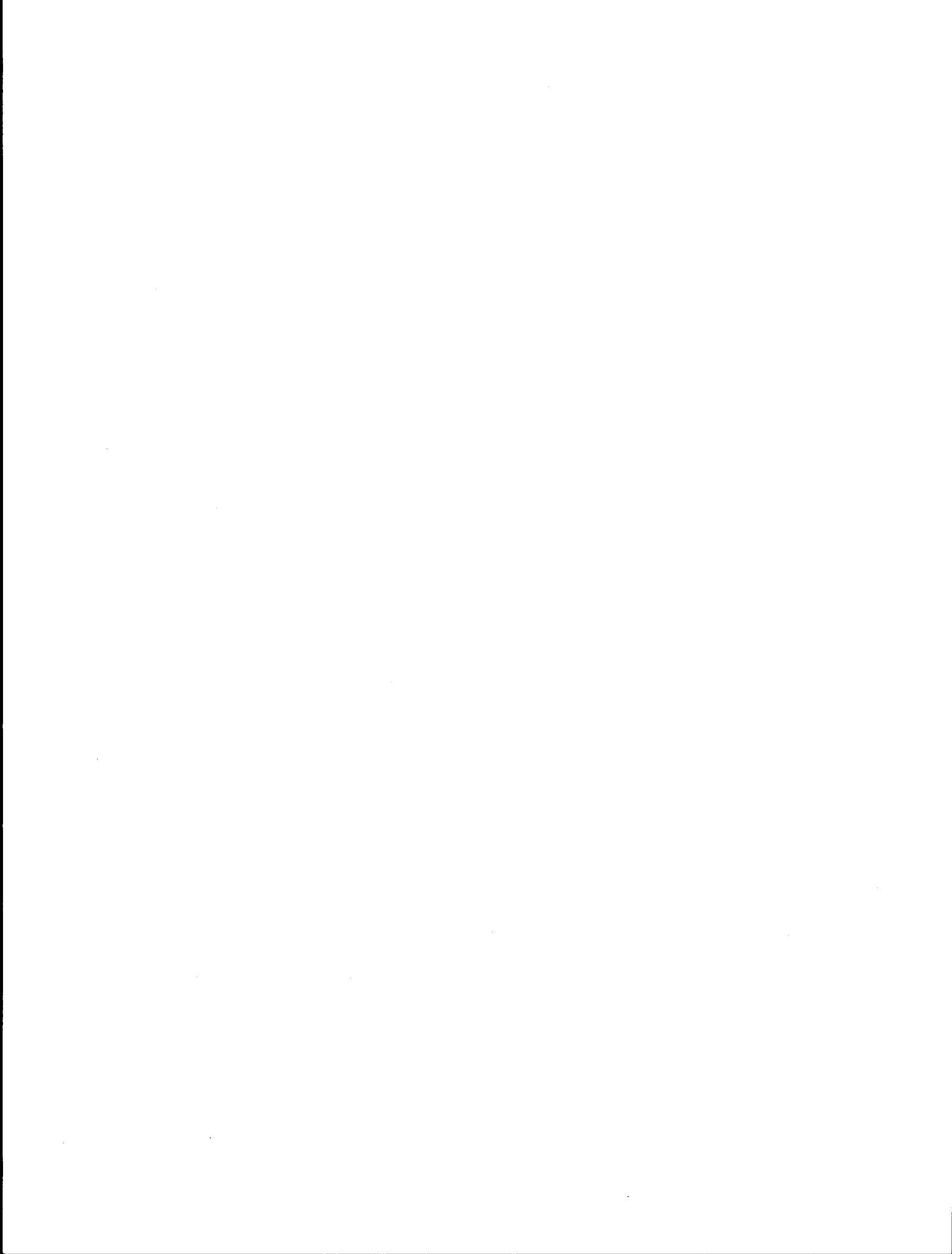


Fig. 18 Tin City radar screen, logarithmic, short-time-constant video, 21 May 1975, 1100 BST. The log video emphasizes boundaries and discontinuities between areas of open water and ice.



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FEEDING ECOLOGY AND TROPHIC RELATIONSHIPS
OF ALASKAN MARINE BIRDS

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Abstract. Two-hundred-twenty-seven marine birds of 32 species were collected by U. S. Fish and Wildlife Service personnel in 1975, or aquired from other sources for birds collected between 1969 and 1974. Thirty-eight percent were from oceanic areas south of the Aleutians and the Alaska Peninsula, 25% were from near the Pribilof Islands and the rest were scattered from the Beaufort Sea to the northern Gulf of Alaska. Northern fulmars, sooty and short-tailed shearwaters, black-legged kittiwakes, thick-billed murres and tufted puffins comprised most of the collection.

Ninety percent of the 83 birds of 14 species whose stomach contents were grossly examined were from oceanic areas. Squid were present in 70% of the stomachs, fish in 35% and nektonic crustacea in 10%. Thick-billed murres appear to selectively eat squid in oceanic areas and a degree of overlap in the occurrence of major prey categories in sooty and short-tailed shearwaters was noted.

These preliminary analyses prohibit meaningful conclusions on the impact of petroleum development on the feeding ecology and trophic relationships of marine birds. Future work will rectify this situation. It will concentrate on observing and collecting feeding birds over the continental shelf, and gathering seasonally and geographically comprehensive feeding data from several breeding colony study sites. Sample analyses will stress determination of prey taxa and size frequencies, essential data for characterizing food web structures and trophic relationships.

INTRODUCTION

Research Unit 341 was designed to help satisfy the objectives of Task A-6, which are to describe the dynamics and trophic relationships of selected species at offshore and coastal study sites. Progress toward this end includes the acquisition of 227 bird specimens or digestive tracts through our 1975 field program, and from other sources, and the gross analyses of the stomach contents from 83 of these. The final report will include detailed analyses of these samples, as well as those anticipated from the 1976 field season.

A major emphasis of this research unit is to describe the food web relationships among marine birds and their ecosystems. The best way of accomplishing this will be to determine as completely as possible the taxonomic identity of prey and their size (length) frequencies. Stomach content weights and indices of fullness will be determined to get an idea of feeding rates, as will frequency of feeding trips of known breeding birds on colonies (and regurgitation volumes whenever possible).

We will focus attention on seven species, which by virtue of their numbers have the greatest ecological impact in pelagic areas of the 40-odd "pure" marine species. They are:

sooty shearwater	black-legged kittiwake
short-tailed shearwater	common murre
northern fulmar	thick-billed murre
tufted puffin	

To provide a broader perspective on the ecological role of the entire bird community, other species will be studied, although not as intensively. Ten species will be given secondary priority. They are:

fork-tailed storm petrel	Cassin's auklet
Leach's storm petrel	marbled murrelet
glaucous-winged gull	ancient murrelet
rhinoceros auklet	least auklet
pelagic cormorant	

We anticipate special situations, e.g., unique situations at our colony study sites, or multi-species feeding flocks at sea, when still other species will be examined.

A second major emphasis of Research Unit 341 is to generalize on seasonal and geographical differences in the feeding ecology and trophic relationships of marine birds. The material reported here was collected in all seasons from widely diverse locations. Collections anticipated for the 1976 field season will add considerably to the diversity of this data base. With data from our various OCSEAP cooperators, we will eventually have an extremely broad data base from which to generalize on the feeding ecology and trophic relationships of birds in most Alaskan marine ecosystems.

Information generated by Research Unit 341 will be critical in defining and assessing impacts of petroleum development to marine birds by providing baseline data on "pre-development" conditions. This will be useful for ascertaining possible alterations in feeding habits or food web structures resulting from petroleum developments.

CURRENT STATE OF KNOWLEDGE

Research Unit 341 addresses and attempts to integrate two separate but strongly related lines of knowledge; first, what, when and how much marine birds eat, and secondly, how these factors are interrelated to each other and to the ecosystem. On both counts, knowledge is scanty at best. The most definitive feeding ecology work on Alaskan marine birds to date (Bedard 1969a) deals with least, crested, and parakeet auklets in the northern Bering Sea. Their overall ecological impact in Alaskan waters is probably relatively small. Similar information on the larger, more numerous, and thus ecologically more important shearwaters and murre is limited to Ogi and Tsujita (1973) who studied the stomach contents from 163 murre and 29 short-tailed shearwaters caught in salmon gillnets in the eastern Bering Sea. These studies are the only ones with detailed information on feeding of marine birds in Alaskan waters. Other studies are available (e.g., Swartz 1966), but they are generally anecdotal only. Except for Bedard's (1969a) study comprehensive information is lacking on prey size preferences which is absolutely essential for determining food web structures and understanding trophic relationships.

Data for the Gulf of Alaska is glaringly absent, although the work of Sealy (1975, 1973) and Bedard (1969a, b) from adjacent areas is useful for inferring certain aspects of bird feeding ecology there. Straty and Haight (in press) and Ainley and Sanger (in press) provide a useful general background for studies on the feeding ecology of marine birds in Alaskan waters, but they have little specific information, and none on trophic relationships per se. Studies from areas outside Alaska (e.g., Ainley in press; Gould 1971; Ashmole and Ashmole 1967) will also be useful.

Important to predicting overall ecological roles of marine birds is a knowledge of overall population levels and their distribution and

abundance. Shuntov (1972), Sanger (1972), and Sanger and King (in press) provided the original impetus to this end; but U.S. Fish and Wildlife Service - OCSEAP Research Unit 337 will provide population estimates with a much broader data base and will therefore be more realistic. Correspondingly refined generalizations on the trophic relationships for the entire marine bird community will be able to be made. Information on food web structures of Alaskan marine ecosystems is largely hypothetical (Sanger 1972, 1974, in press; McAlister, Sanger, and Perez in prep.), but it will provide a basis for a more factual food web and trophic structure into which the marine birds may be fitted.

In its present state of analyses, new data reported here (see below, RESULTS) adds little to our current state of knowledge, but it will be quite useful when analyzed in detail.

STUDY AREA

Marine bird specimens herein reported were collected over a 7-year period from widely diverse areas. About 38% were collected from oceanic areas south of the Aleutians and the Alaska Peninsula, about 25% were collected from near the Pribilof Islands in the eastern Bering Sea, and the remaining 37% were from the Beaufort Sea, through the Bering Sea, and into the Northern Gulf of Alaska. Specimens obtained directly by the U.S. Fish and Wildlife Service were collected in 1975 aboard NOAA vessels operating in most OCSEAP areas.

DATA SOURCES, METHODS

Generally, the bird specimens collected to date for this study were obtained opportunistically during activities of Research Unit 337, or from other agencies.

The agency origins and pertinent other data on the 227 bird specimens or digestive tracts acquired to date are summarized in Table 1. Table 2 lists the species identity and numbers collected by each agency, and summarizes the season and OCS region where collected for the 83 of these specimens with preliminary analyses of stomach contents. Figure 1 indicates the boundaries of the OCS regions referred to in this report.

Birds collected in 1975 by U.S. Fish and Wildlife Service personnel were obtained in OCSEAP areas aboard NOAA vessels, although the most intensive collection (I. Warner) was obtained aboard a cooperating U.S. Navy vessel operating in the Northern Gulf of Alaska. Birds collected by the Marine Mammal Division, National Marine Fisheries Service in 1973 and 1974 were obtained on Northern fur seal research cruises in the vicinity of the Pribilof Islands as part of a study of trophic relationships in the fur seal's ecosystem in the eastern Bering Sea. These specimens were acquired by the U.S. Fish and Wildlife Service

when G. A. Sanger transferred from the former agency in 1975, with the proviso that the Marine Mammal Division be supplied with copies of the subsequent data. Birds collected on various cruises between 1969 and 1971 by the High Seas Salmon Research Program, National Marine Fisheries Service (or its' predecessor, the Bureau of Commercial Fisheries) were caught incidentally in salmon gillnets, mostly south of the Aleutians and the Alaska Peninsula beyond the continental shelf. Under the supervision of Sanger, these specimens were donated to the University of Washington, Burke Memorial Museum, or the University of Kansas, Museum of Natural History, in exchange for their removing and preserving the digestive tracts and returning them to him for feeding habits studies.

Most of the birds collected by the U.S. Fish and Wildlife Service were frozen intact on shipboard, but the digestive tracts were first removed and preserved from those collected aboard the USNS Silas Bent. Specimens from the Marine Mammal Division were collected by shotgun and frozen whole on shipboard, although in 1974 the digestive tracts were first injected with 10% buffered formalin. A few of the birds from the salmon research cruises were collected by shotgun, but the large majority were drowned in the gillnets; all were frozen intact on shipboard.

Digestive tracts were removed from the specimens in the lab, and labeled and preserved in 10% formalin or 50% isopropyl alcohol. Preliminary analysis on 83 of the stomach samples included weighing the preserved, drained contents to the nearest five grams; the presence of major prey categories (squid, fish, and nektonic crustacea) was noted by examination with the naked eye. The final report will include identifications made as completely as possible and length measurements of the prey, or measurements of identifiable remains such as squid beaks, from which original lengths or weights can be extrapolated.

For subsequent discussion in this report, seasons are defined as: winter, December-March; spring, April-May; summer, June-August; and fall, September-November.

RESULTS

Table 3 presents data from gross analyses of stomach contents, listed seasonally by OCS region of collection. Squid was the most prevalent food type, being found in 58 (70%) of the 83 stomachs examined. Fish was next at 35% (29 birds), and nektonic crustacea last at 10% (8 birds). Interestingly, none of the seven specimens from the shelf areas of the St. George and Navarin Basins (1 horned and 6 tufted puffins) contained squid, while virtually all specimens of these species from oceanic areas beyond the shelf (3 horned and 13 tufted puffins) did contain squid.

The frequency of occurrence of the major prey categories and the weight ranges of stomach contents of the 83 specimens of 14 species examined are summarized in Table 4. There are too few examples of most species for generalization, but a comparison of the prey frequency data for the 8 sooty shearwaters, 14 short-tailed shearwaters, 24 thick-billed murrelets and 19 tufted puffins is instructive (Figure 2). Squid are again seen to be important, particularly to thick-billed murrelets; 96% of this species had squid, but less than 10% had fish or crustacean remains. The fact that 25% of each of the other three species contained fish remains, and that most of these specimens were taken in the same general oceanic areas suggests that thick-billed murrelets selectively exclude fish from their diet while in these areas. The data also suggest a degree of diet overlap between sooty and short-tailed shearwaters (thought to be possible competitors). Our subsequent studies will allow us to determine actual diet similarities or differences based on differences in prey taxa or trophic levels.

Other stomach contents included indistinguishable organic matter, parasitic roundworms, plastic particles and gravel. This data will be documented in detail in the final report.

The present stomach content weight data are inconclusive because there is no way of knowing the time period over which the birds had been eating, and it is difficult to account for differing digestion rates of different prey. Over half (59%) of the stomachs had less than 5 g (although only four were empty). Birds may regurgitate most of their stomach contents while drowning in gillnets, but this is not always so. Except for the common murre with 60 g of food in its stomach, which crashed into the vessel at night, the larger weights of foods for all other species were from gillnetted specimens. However, in general, the stomach content data suggests that birds were rarely collected during or shortly after feeding.

DISCUSSION

Squid were shown to be quite prevalent in the samples examined. That squid are important prey of seabirds is generally known (e.g., Ashmole 1971; Ainley and Sanger in press), although this says little about the actual food web and trophic relationships involved. Pertinent to our preliminary findings is that the large majority of birds were collected in areas beyond the continental shelf. While the birds will be expected to feed on the same size or "basic types" of prey in oceanic and shelf areas (Bedard 1969a), different prey species and possibly different trophic levels will be expected to occur in each area. Parsons and LeBrasseur (1970) found different species and different numbers of links in the lower trophic levels of food chains in oceanic and coastal areas of British Columbia. There is no data to tell whether or not this also holds for OCSEAP study areas, but we must be aware of its possibility. This points out the need to know the food web structure of the entire ecosystem before being able to accurately describe how birds fit into it.

The stomach content weight data are generally inconclusive, but the large number of samples with scant weights point out the need to have stomach samples from actively feeding birds. It also shows the need to know diurnal feeding cycles so optimum collection times may be anticipated.

The information generated by Research Unit 341 will be extremely useful in modifying and refining present, simple, hypothetical views of the structure of Alaskan marine ecosystems (i.e., Sanger 1972; Sanger in press; McAlister, Sanger and Perez in prep.). Together with information from other feeding studies (e.g., D. S. Day unpublished; Research Unit 284; NMFS fur seal feeding studies), enough information should be available to begin to realistically describe at least major food web pathways, particularly for the eastern Bering Sea shelf.

CONCLUSIONS

The preliminary nature of the data and its cursory analyses prohibit meaningful conclusions at this time.

NEEDS FOR FURTHER STUDY

Clearly, more stomach content samples are needed from all OCSEAP areas. In particular, seasonal series of samples are needed to characterize the dynamics of trophic relationships. Our field work for 1976 will begin to fulfill these needs. A significant amount of laboratory time will be needed to identify prey and otherwise process the large numbers of food samples anticipated.

SUMMARY OF 4th QUARTER OPERATIONS

Feeding ecology studies will be conducted at sea board NOAA vessels and our charter vessel, and at nine breeding colony study sites. Eight daylight hours per week aboard the NOAA vessels have been allotted for marine bird studies; most of this time will be spent collecting birds. The charter vessel, an 85' crab fishing boat, will be used to collect birds at sea near the breeding colony study sites and in pelagic waters between them. A specific block of time will be spent aboard the charter vessel observing feeding behavior and collecting birds in the extremely important Unimak Pass area. The most intensive work will occur at the colony sites; at regular intervals throughout the field season specimens and regurgitation samples will be collected, and direct observations on parent birds feeding their chicks will be made (after Cody 1973; Pearson 1968). The colony study sites will be located at Cape Pierce and Nelson Lagoon in the Bristol Bay area, and at the west end of Unimak Island, in the Shumagin and Semidi Islands, and on Kodiak and Hinchinbrook Islands.

In addition, cooperators on the Barren Islands in lower Cook Inlet, and on Forrester Island off southeastern Alaska will simultaneously conduct similar studies. Together, these samples will enormously broaden our seasonal and aerial coverage over 1975.

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Table 1. Origin of marine bird specimens available to USFWS, OBS-CE for feeding ecology and trophic relationship studies.

Agency	Vessel, Agency and Cruise Numbers	Dates	Collectors	Present Location of Specimens ^{1/}
U.S. Fish & Wildlife Service, OBS-CE (OBS)	Pacific Marine Center NOAA vessels; cruise numbers various	May-Nov 1975	M. Dick, C. Harrison, S. Hatch, D. Nysewander, M. Rauzon, J. Ruehle, I. Warner	OBS-CE
	USNS <u>Silas Bent</u> U.S. Navy; cruise numbers unknown	1-28 Sept 1975	I. Warner	OBS-CE
National Marine Fisheries Service, Northwest Fisheries Center, Marine Mammal Division (MMD)	M/V <u>Pat San Marie</u> Fur seal research cruise (charter)	Aug-Sept 1974	G. Sanger	OBS-CE or, bird collection, College of Forest Resources, U of Washington (D. Manuwal)
	M/V <u>Mark I</u> , Fur Seal research cruise (charter)	Aug-Sept 1973	C. Fiscus, T. Newby	U.S. National Museum, Wash., D.C

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Table 1 (Continued).

National Marine Fisheries Service, Northwest Fisheries Center, High Seas Salmon Research (NMFS)	R/V <u>George B. Kelez</u> , NMFS, cruises 49, 51, 52	Apr-Jul 1970; Jan-Feb & Apr-May 1971	R. Bakkala, R. Carlson, W. Peterson	Museum of Nat- ural History, U of Kansas (R. M. Mengel)
	R/V <u>Miller Freeman</u> , NMFS, Cruise F69-03	July 1969	G. Sanger	U of Kansas or Burke Museum, U of Washington

1/All digestive tracts at OBS-CE. Anchorage.

Table 2. Marine bird specimens available for trophic relationship studies, summarized by OCS region, season of collection and agency which collected them.

Species	Number of Specimens with preliminary analyses, by OCS region ^{1/} and season ^{2/} (n = 83)						Total Number Collected (n = 227)			Total
	OA	OAP	OSK	UMB	SGB	NAV	Agency ^{3/}			
							OBS	MMD	NMFS	
Laysan Albatross	0-1-0-0								1	1
Northern Fulmar	0-0-2-0						19	2	2	23
Sooty Shearwater	0-2-3-0	0-3-0-0					12		11	23
Short-tail. Shear.	0-5-3-0	0-2-0-0	0-4-0-0				2	3	14	19
Unident. Shear.								3		3
Fork-tail. St. Pet.	0-0-1-0						2	1	1	4
Leach's St. Pet.									4	4
Pelagic Corm.							2			2
Red-faced Corm.								1		1
Pintail								1		1
Harlequin Duck							1	1		2
Northern Phalarope								1		1
Pomarine Jaeger							2	1		3
Glauc.-winged Gull							4	1	1	6
Herring Gull							4			4
Black-leg. Kitti.					0-0-2-0		12	9		21
Red-leg. Kittiwake	0-0-1-0				0-0-1-0			3	1	4
Sabine's Gull								1		1
Arctic Tern								1		1
Common Murre					0-0-2-0		2	4		6
Thick-bill. Murre	0-2-4-0	14-1-0-0		3-0-0-0				6	24	30
Pigeon Guillemot							5			5
Marbled Murrelet							1			1
Kittlitz's Murlt.							2			2
Ancient Murrelet	0-1-0-0							2	2	4
Parakeet Auklet							1			1

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Table 2. (Continued)

Species	Number of Specimens with preliminary analyses, by OCS region ^{1/} and season ^{2/} (n = 83)						Total Number Collected (n = 227)			Total
	OA	OAP	OSK	UMB	SGB	NAV	Agency ^{3/}			
							OBS	MMD	NMFS	
Crested Auklet		0-1-0-0					2	4	1	7
Least Auklet	0-1-0-0							2	1	3
Horned Puffin	0-3-0-0				0-0-0-1			3	3	6
Tufted Puffin	4-0-4-0	3-2-0-0			0-0-3-2	0-0-0-1	5	6	17	28
Rock Sandpiper							5			5
Dunlin							3	2		5
TOTAL	4-15-19-0	17-9-0-0	0-4-0-0	3-0-0-0	0-0-8-3	0-0-0-1	86	58	83	227

^{1/}OCS regions: See Table 3.

^{2/}Seasonal listing: Winter-Spring-Summer-Fall.

^{3/}Agency identification: See Table 1.

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Table 3. Gross analyses of the stomach contents of 83 marine birds collected pelagically in Alaskan waters between 1969 and 1975.

	Collected in				OCS ² / Region	Weight g	Stomach Contents				
	Season ✓						Major Food Type Present				
	W	Sp	Su	F			Fish	Squid	Nektonic Crustacea	Other & Unident.	Empty
<u>Laysan Albatross (n=1)</u>		X			OA	10		X		X	
<u>Northern Fulmar (n=2)</u>			X		OA	40	X	X	X		
			X		OA	10	X	X			
<u>Sooty Shearwater (n=8)</u>		X			OAP	<5				X	
		X			OAP	8			X		
		X			OAP	30	X				
		X			OA	15	X	X			
		X			OA	<5		X		X	
			X		OA	<5		X	X		
			X		OA	<5		X		X	
			X		OA	<5				X	
<u>Sh-tail. Shear. (n=14)</u>		X			OA	5	X	X			
		X			OA	30		X			
		X			OA	<5		X			
		X			OA	<5		X			
		X			OA	<5		X			
		X			OAP	<5	X		X		
		X			OAP	25	X	X			
		X			OSK	5	X	X			
		X			OSK	15				X	
		X			OSK	<5				X	
		X			OSK	10	X				
			X		OA	<5		X			
			X		OA	<5		X			
			X		OA	5		X			

Table 3 (Continued)

	Collected in				OCS ^{2/} Region	Weight g	Stomach Contents				
	Season ^{1/}						Major Food Type Present				
	W	Sp	Su	F			Fish	Squid	Nektonic Crustacea	Other & Unident.	Empty
<u>Fk.-tail. St.Pet(n=1)</u>			X		OA	<5		X			
<u>Bl.-leg. Kitti.(n=2)</u>			X		SGB	<5	X				
			X		SGB	5	X				
<u>Red-leg. Kitti.(n=2)</u>			X		OA	15	X	X			
			X		SGB					X	
<u>Common Murre(n=2)</u>			X		SGB	60	X				
			X		SGB	<5	X				
<u>Thick-bill. Mur.(n=24)</u>	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	30		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	<5		X		X	
	X				OAP	5		X		X	
	X				UMB	<5		X		X	
	X				UMB	10		X		X	
	X				UMB	<5		X		X	

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Table 3 (Continued)

	Collected in				OCS ² Region	Weight g	Stomach Contents				
	Season						Major Food Type Present				
	W	Sp	Su	F			Fish	Squid	Nektonic Crustacea	Other & Unident.	Empty
<u>Thick-bill. Mur.(n=24)</u> <u>(Continued)</u>		X			OA	<5		X		X	
		X			OA	<5		X			
		X			OAP	<5		X			
			X		OA						X
			X		OA	5	X	X			
			X		OA	45	X	X			
			X		OA	5		X	X		
<u>Ancient Murlet.(n=2)</u>		X			OA	<5				X	
			X		OA	<5				X	
<u>Crested Auklet(n=1)</u>		X			OAP	<5				X	
<u>Least Auklet(n=1)</u>		X			OA						X
<u>Horned Puffin(n=4)</u>			X		OA	<5	X	X			
			X		OA	30	X	X			
			X		OA	35	X	X			
				X	SGB	<5	X				
<u>Tufted Puffin(n=19)</u>	X				OA	<5	X	X			
	X				OA	<5		X			
	X				OA	10	X	X			
	X				OA	<5		X			
	X				OAP	<5		X			
	X				OAP	<5		X			
	X				OAP	<5	X	X			

Table 3 (Continued)

	Collected in				OCS ^{2/} Region	Weight g	Stomach Contents				
	Season ^{1/}						Major Food Type Present				
	W	Sp	Su	F			Fish	Squid	Nektonic Crustacea	Other & Unident.	Empty
<u>Tufted Puffin(n=19)</u> (Continued)		X			OAP	<5	X	X			
		X			OAP	10	X	X		X	
			X		SGB						X
			X		SGB	<5	X			X	
			X		SGB	??	X				
			X		OA	<5		X			
			X		OA	<5		X		X	
			X		OA	<5		X			
			X		OA	5		X			
				X	NAV	<5	X				
				X	SGB	??			X		
				X	SGB	??	X		X		

^{1/}W=winter; Sp=spring; Su=summer; F=fall.

^{2/}OCS Regions: OA=Oceanic Aleutians; OAP=Oceanic Alaska Peninsula; OSK=Oceanic South Kodiak; UMB=Umnak Basin; SGB=St. George Basin; NAV=Navarin Basin.

Table 4. Frequency of occurrence of major food items and weight range of stomach contents in 83 marine birds collected pelagically in Alaskan waters between 1969 and 1975.

Species	Number	Prey item present								Weight Range, g.		
		Fish		Squid		Nektonic Crustacea		Other, Unident.				
		#	%	#	%	#	%	#	%			
Laysan Albatross	1			1	100					1	100	10
Northern Fulmar	2	2	100	2	100	1	50					10-40
Sooty Shearwater	8	2	25	4	50	2	25	4	50			<5-30
Short-tail. Shearwater	14	5	36	10	71	1	7	2	14			<5-30
Fork-tail. Storm Petrel	1			1	100							<5
Black-leg. Kittiwake	2	2	100									<5-5
Red-leg. Kittiwake	2	1	50	1	50	1	50					0-15
Common Murre	2	2	100									<5-60
Thick-billed Murre	24	2	8	23	96	1	4	16	67			0-30
Ancient Murrelet	2							2	100			<5-<5
Crested Auklet	1							1	100			<5
Least Auklet	1											0
Horned Puffin	4	4	100	3	75							<5-35
Tufted Puffin	19	9	47	13	68	2	10	3	16			0-10

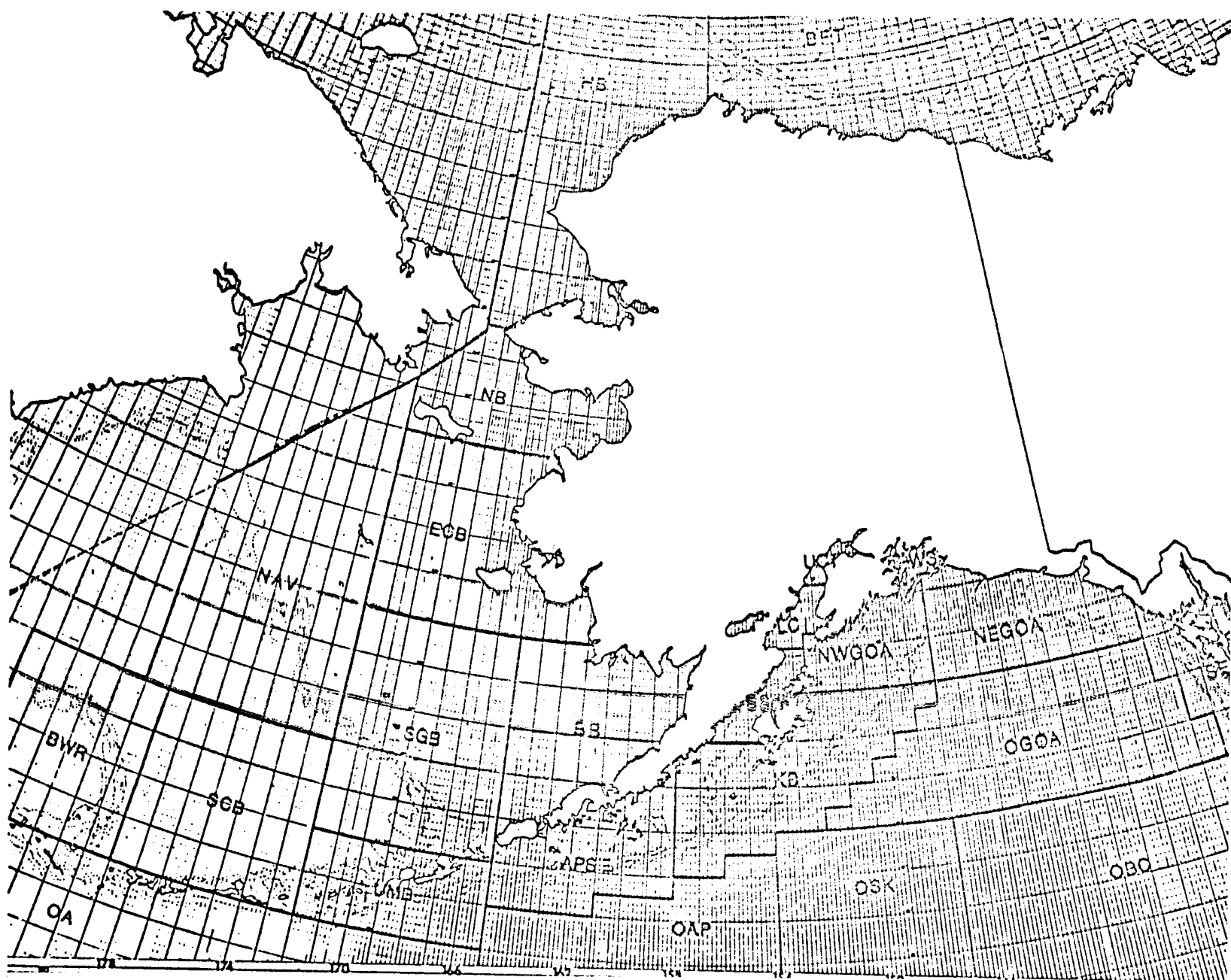


Figure 1. OCS regions for which bird feeding data are summarized.

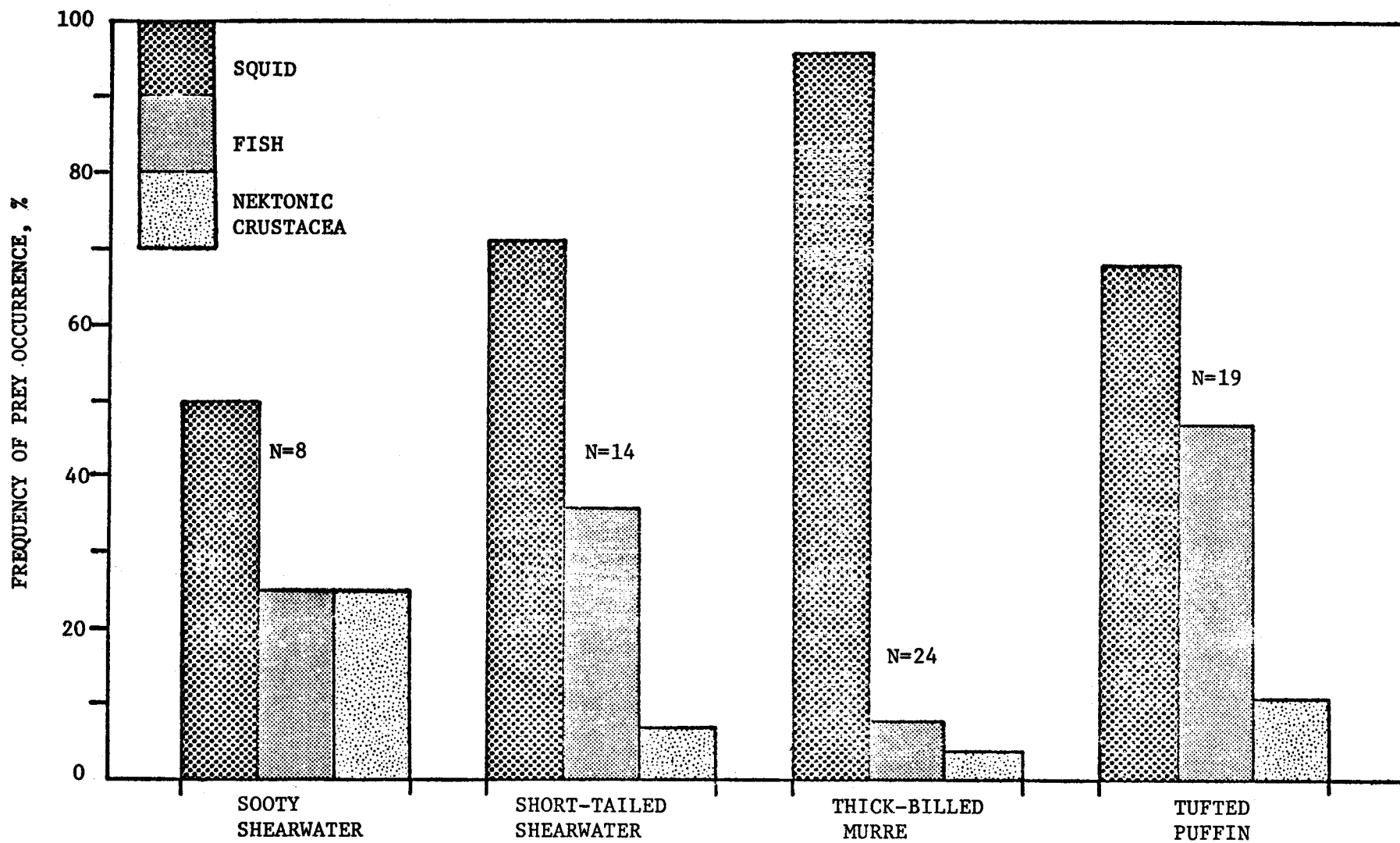


Figure 2. Frequency of occurrence of the three major prey categories in the stomachs of four marine birds from Alaskan waters. Most specimens from beyond the continental shelf; see text.

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POPULATION DYNAMICS OF MARINE BIRDS

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Abstract: The characteristic dynamics of Alaskan marine bird populations are being described from studies conducted at 12 OCSEAP-funded and 6 nonOCSEAP-funded U. S. Fish and Wildlife Service field camps along the North Pacific coast and the southern Bering Sea coast of Alaska. Information on productivity, production, mortality, and chronology of events will be acquired for most of the more representative and abundant species of birds using these localities. The status of existing information is cursorily reviewed and the plans for the 4th quarter are given.

INTRODUCTION

The characteristic dynamics of Alaskan marine bird populations are largely undescribed. This research unit addresses the Alaskan Outer Continental Shelf Energy Assessment Program's (OCSEAP) Task A6 which seeks to remedy that informational deficiency. We will be appraising productivity, production, mortality, and chronology of events for several of the more representative and abundant species of birds over much of their range in Alaska.

Because some species of marine birds are known not to be capable of production until 3 or more years of age, meaningful information on survival and contribution to production of various year classes of some species may not be obtained until from 5 to 10 years after initiation of these studies. However, this long-term requirement does not preclude the collection and evaluation of shorter term information on gross dynamics of populations over larger geographical regions. The enigma surrounding the breeding sites of the marbled and Kittlitz's murrelets typifies some of the problems encountered in doing significant studies of the dynamics of even some of the more numerically important species of birds.

Resource managers require information on the population dynamics of most of the nearly hundred species of birds regularly or occasionally frequenting Alaskan coastal waters and lands subject to impacts from outer continental shelf (OCS) developments. Understanding the critical periods of the breeding cycle when birds, eggs, young, or all are most vulnerable to losses and determining what might be biologically tolerable losses (not necessarily equatable to socially acceptable losses) are important in determining the short-term and long-term consequences of the proposed actions and essential for mitigating losses through control measures.

CURRENT STATE OF KNOWLEDGE

Many of the ornithological studies summarized by Gabrielson and Lincoln (1959) provide information useful in characterizing population dynamics of some species at some specific localities in coastal Alaska. Dates of arrival, nesting, hatching, and fledging were often recorded, but departure dates tended to be missed. The numbers of eggs found in nests collected for museums were dutifully reported, but usually without indication as to whether the clutches were incomplete, complete, or well into incubation, or the number, size, and state of clutches not collected. Examples of natural mortality, unless bizarre or spectacularly large were seldom noted. Much of the early information did not express data in terms of means, ranges, variation or other statistics which permit predictions or allows meaningful comparisons.

Ashmole (1971) and Drury (1975), in review papers, discuss factors regulating population of marine birds; and Drury's treatment is particularly germane to the Alaskan OCS areas since he treated birds of Alaska and other northern latitudes. Bartonek et al. (1971) and Sowl and

Bartonek (1974) describe many man-caused influences that may be or will be limiting bird populations in coastal Alaska. Bailey and Davenport (1972) and Barry (1968), respectively, describe spectacularly large mortalities to common murres in Bristol Bay and king eiders in the Beaufort Sea.

Published information and unpublished information other than that resulting from OCSEAP studies covers either breeding chronology, productivity, natality, mortality, or all, for the following birds of coastal Alaska: double-crested and pelagic cormorants (Matthew Dick personal communications), cackling Canada geese (e.g., Olson 1950, Mickelson 1975), Aleutian Canada geese (G. Vernon Byrd personal communications), dusky Canada geese (Robert Bromley personal communications), black brant (e.g., Jones 1964, 1970; Hansen and Nelson 1957; Olson 1950, 1954), emperor geese (Headley 1967, Eisenhauer and Kirkpatrick 1975), spectacled eiders (Dau 1974, Mickelson 1975), common and king eiders (Schamel 1974), bald eagles (Hensel and Troyer 1964, Sprunt et al. 1973), Peale's peregrine falcons (White et al. 1971), black oystercatchers (Webster 1941), pectoral sandpipers (Pitelka 1959), dunlins (Holmes 1966, 1971), red phalaropes (Douglas Schamel personal communications), glaucous gulls (Swartz 1966, Schamel 1974), black-legged kittiwakes (Swartz 1966, David Snarski personal communications), common and thick-billed murres (Swartz 1966), black guillemots (Divoky et al. 1974), Kittlitz's murrelet (e.g., Bailey 1973), parakeet auklet (Sealy and Bedard 1974), and horned puffins (Swartz 1966, Sealy 1973a, 1973b). Published information on population dynamics for birds in coastal British Columbia with obvious relevance to southeastern Alaska includes that for the glaucous-winged gull (Vermeer 1963), pigeon guillemots (Thorenson and Booth 1958, Drent 1965), and marbled murrelets (Sealy 1974). Important data on the dynamics of bird population were collected at several sites where the entire avifauna was being studied, e.g., at Cape Thompson on the Chukchi Sea coast (Williamson, et al. 1966, Swartz 1966), Point McIntyre on the Beaufort Sea coast (Bergman 1974), the Clarence Rhode National Wildlife Refuge on the Yukon-Kuskokwim delta (Calvin J. Lensink personal communications), the coastal lowlands on the north side of the Seward Peninsula (Thayer 1951), and Ugaiushak Island south of the Alaska Peninsula (George J. Divoky personal communications).

Because little of the information was collected concurrently, generalizations about what might or might not be expected for a species over its range within Alaska should be done with extreme caution and points to the value of the OCSEAP effort being widely spread over many species range and of sufficient duration to measure annual variation in those parameters necessary for safeguarding the bird resource.

STUDY AREA

Intensive study sites for this research unit are located along 1,100 miles of North Pacific coast from Forrester Island in southeastern Alaska to Unimak Pass and from there westward to the end of the Aleutian chain and northward to the Yukon Delta (Figure 1). OCSEAP-funded study sites will be established by us during 1976 at Constantine Harbor in

Hinchinbrook Entrance to Prince William Sound, Wooded Islands off the southern coast of Montague Island, Middleton Island, East Amatuli Island in the Barren Islands, Chowiet Island in the Semidi Islands, Ugaiushak Island and Big Koniuji Island both south of the Alaska Peninsula, Nelson Lagoon, Cape Peirce, and the Yukon Delta. Opportunistic sites will be at Unimak Pass, around Kodiak Island, and possibly on St. Matthew and Hall Islands if access is possible. Studies funded by the U. S. Fish and Wildlife Service, apart from the OCSEAP studies, will be done at Forrester Island in the extreme southwestern Alaska, the Copper River Delta, Valdez Arm of Prince William Sound, Amchitak Island, Buldir Island, Izembek Lagoon and Cold Bay, Kashunuk River on the Yukon-Kuskokwim Delta, and Point McIntyre on the Beaufort Sea coast. Opportunistic studies by the Service, without OCSEAP funding, will be made in southeastern Alaska and along the southern side of the Kenai Peninsula.

METHODS

Information on breeding chronology, natality, mortality, productivity, and production of the dominant species of marine birds will be systematically collected primarily from areas of intensive study and secondarily from areas that are opportunistically visited. An important aspect of this research unit is that data collected over a wide geographic region will be analyzed in addition to the customary site specific analyses.

Study plots within both the intensive and opportunistic study areas will be located and described and photographed so that replicative censuses can be made by anyone at any subsequent time. Breeding success will be measured by following the fate of the clutch, eggs, and young. Mortality rates, causes of mortality, and the longevity of certain species can be measured by analyses of existing banding data (see 1976 Annual Report RU-340), and through additional banding of other species that will be done as part of the OCSEAP studies. Beached bird surveys will be conducted at all sites and will provide indexes to the numbers and kinds of dead or sick birds coming ashore, regardless of the reason, during the predevelopment period. Indexes of population abundance and sex and age composition for populations of marine and land birds will be derived from regularly conducted sea watches at the intensive sites and opportunistic counts at the other sites. Birds that are primarily collected for food analyses will be routinely examined for physiological condition, endo- and ectoparasites, and pathology in order to determine "normal" conditions in the dominant species.

RESULTS AND DISCUSSION

There are no substantial data to report for this period, but good information was collected on production at many locations about Kodiak Island and incidental observations were made at Unimak Pass and at localities where personnel aboard NOAA and USCG vessels were allowed to accompany shore parties ashore. These data are reported in various field and cruise reports (see 1976 Annual Report RU-337, Table 1). Much of the period was spent amassing unpublished data and published reports for synthesis into the final report.

Many study sites are necessary if the avian populations in the areas likely to be impacted by OCS development are to be adequately characterized. Figure 1 illustrates the distribution of study effort by OCSEAP and other programs, and Tables 1 and 2 indicate those species of marine birds that could be studied at those study sites (Note: there is no certainty that the species will be studied).

Numerous sites where concurrent studies are being conducted allows the characterization of both population dynamics and food habits over sizeable portions of many species' ranges. For species such as the glaucous-winged gull, black-legged kittiwake, common murre, and tufted puffin, considerable data will be acquired in each of several sites so as to adequately describe the species' biology while on land. For other species like the pigeon guillemot, common eider, black oystercatcher, and ancient murrelet, any single study site may not acquire sufficient data necessary for the characterization but in aggregate all of the sites could provide adequate data. Seldom before has an opportunity presented itself for regional studies of this nature within the same time period. Continued cooperation among all OCSEAP and nonOCSEAP investigators will be essential to achieving this regional characterization.

CONCLUSIONS

Conclusions will be deferred to subsequent reports.

SUMMARY OF 4TH QUARTER ACTIVITIES

Twelve OCSEAP-funded field camps will be established and operated either full-time or intermittently during the 4th quarter for the purpose of studying population dynamics and food habits of marine birds (Figure 1). A chartered fishing vessel, the Nordic Prince, will resupply most camps in the Gulf of Alaska and provide a platform for studies adjacent to the intensive study areas, collecting specimens for food habits, and making observations on seasonal density distribution (RU-337). An additional eight field camps that are funded by the U. S. Fish and Wildlife Service will be acquiring data that will be incorporated into our data base (Figure 1).

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Table 1. Relative abundance (A = Abundant; C = Common; O = Occasional; U = Uncommon) of birds at sites where ecological investigations of seabird colonies are being conducted by OCSEAP and other programs.

Species	SE Alaska	Southcentral Alaska						SW Alaska	
	Forrester Island	Copper River Delta	Egg Island	Hinchinbrook I.	Wooded Islands	Middleton I.	Barren Islands	Kodiak Island	Semidi Islands
Northern Fulmar							O		A
F-t. Storm Petrel	A				?		A		?
Leach's Storm Petrel	A								?
D-c. Cormorant					C	A			
Pelagic Cormorant	C							A	?
R-f. Cormorant							O		
Canada Goose		A	O						
Black Brant									
Emperor Goose									
Common Eider									
Glaucous Gull									
G-w. Gull	A	A	A	C	C	A	A	A	?
Bl-legged Kittiwake				A	A	A	A	A	A
Red-legged Kittiwake									
Arctic Tern		A	A						
Aleutian Tern									
Common Murre	A			A	?	A	A	A	A
Thick-billed Murre							U		
Black Guillemot									
Pigeon Guillemot	C				A		C	A	?
Marbled Murrelet									
Ancient Murrelet	A				?				
Cassin's Auklet	C								
Parakeet Auklet					C				
Crested Auklet									
Least Auklet									
Rhinoceros Auklet	A				O				
Horned Puffin	C			O	C		A	A	?
Tufted Puffin	A			C	A	A	A	A	A
Waterfowl - general		A							
Shorebirds - general		A							
OCSEAP-funded Study		FWS	Patten	FWS	FWS	FWS	FWS	FWS	FWS
Other-funded Study	FWS					FWS	FWS		

(Table continued).

Table 1. Continued.

Species	SW Alaska		Aleutian Islands			Southeastern Bering Sea				
	Ugaiu- shak I.	Big Kon- iuji I.	Unimak Pass	Amchitka Island	Buldir Island	Izembek Lagoon	Nelson Lagoon	Cape Peirce	St. Geo- rge I.	St. Paul Island
Northern Fulmar					O				A	O
F-t. Storm Petrel	A				A					
Leach's Storm Petrel	C				A					
D-c. Cormorant	C							C		
Pelagic Cormorant	A	?			A			A	A	A
R-f. Cormorant	A	?			A			C	A	A
Canada Goose					A					
Black Brant										
Emperor Goose										
Common Eider					O	O	O	C		
Glaucous Gull										
G-w. Gull	A	A			C	A	A	A		
Bl-legged Kittiwake	A	O			A			A	A	A
Red-legged Kittiwake					A				A	O
Arctic Tern						C	A			
Aleutian Tern							O			
Common Murre	A	A			A			A	A	A
Thick-billed Murre					A				A	A
Black Guillemot										
Pigeon Guillemot	A	A			C			C		
Marbled Murrelet										
Ancient Murrelet		?			A					
Cassin's Auklet		A								
Parakeet Auklet		A							A	
Crested Auklet		A			A				A	C
Least Auklet					A				A	C
Rhinoceros Auklet										
Horned Puffin	A	A			C			A	A	
Tufted Puffin	A	A			A			A	A	A
Waterfowl - general						A	A			
Shorebirds - general						A	A	C		
OCSEAP-funded Study	FWS	FWS	FWS		FWS	FWS	FWS	FWS	Hickey	Hunt
Other-funded Study										

Migration Observations

Opportunistic Studies

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(Table continued).

Table 1. Continued.

Species	Northeastern Bering Sea							
	Kashunuk River	Outer Delta	Mukon Island	Sledge Island	Safety Bluff	Lagoon	King Island	St.Lawrence Island
Northern Fulmar								
F-t. Storm Petrel								
Leach's Storm Petrel								
D-c. Cormorant								
Pelagic Cormorant				C	C		A	A
R-f. Cormorant								
Canada Goose	A	A						
Black Brant	A	?						
Emperor Goose	A	?						
Common Eider								
Glaucous Gull	A	A		C	C		A	A
G-w. Gull	A	A						
Bl-legged Kittiwake				A	A		A	A
Red-legged Kittiwake								
Arctic Tern	A	A		A				
Aleutian Tern								
Common Murre				A	A		A	A
Thick-billed Murre				C	C		A	A
Black Guillemot								
Pigeon Guillemot				C	C		A	A
Marbled Murrelet								
Kittiwake's Murrelet Ancient Murrelet								
Cassin's Auklet								
Parakeet Auklet				C			A	A
Crested Auklet							A	A
Least Auklet							A	A
Whiskered Auklet Rhinceros Auklet								
Horned Puffin				C	C		A	A
Tufted Puffin				O	C		A	A
Waterfowl - general	A	A				C		
Shorebirds - general	A	A				C	A	
OCSEAP-funded Study	FWS	FWS		Drury	Drury	Drury	RFP?	RFP?
Other-funded Study	FWS							

(Table continued)

Table 1. Continued.

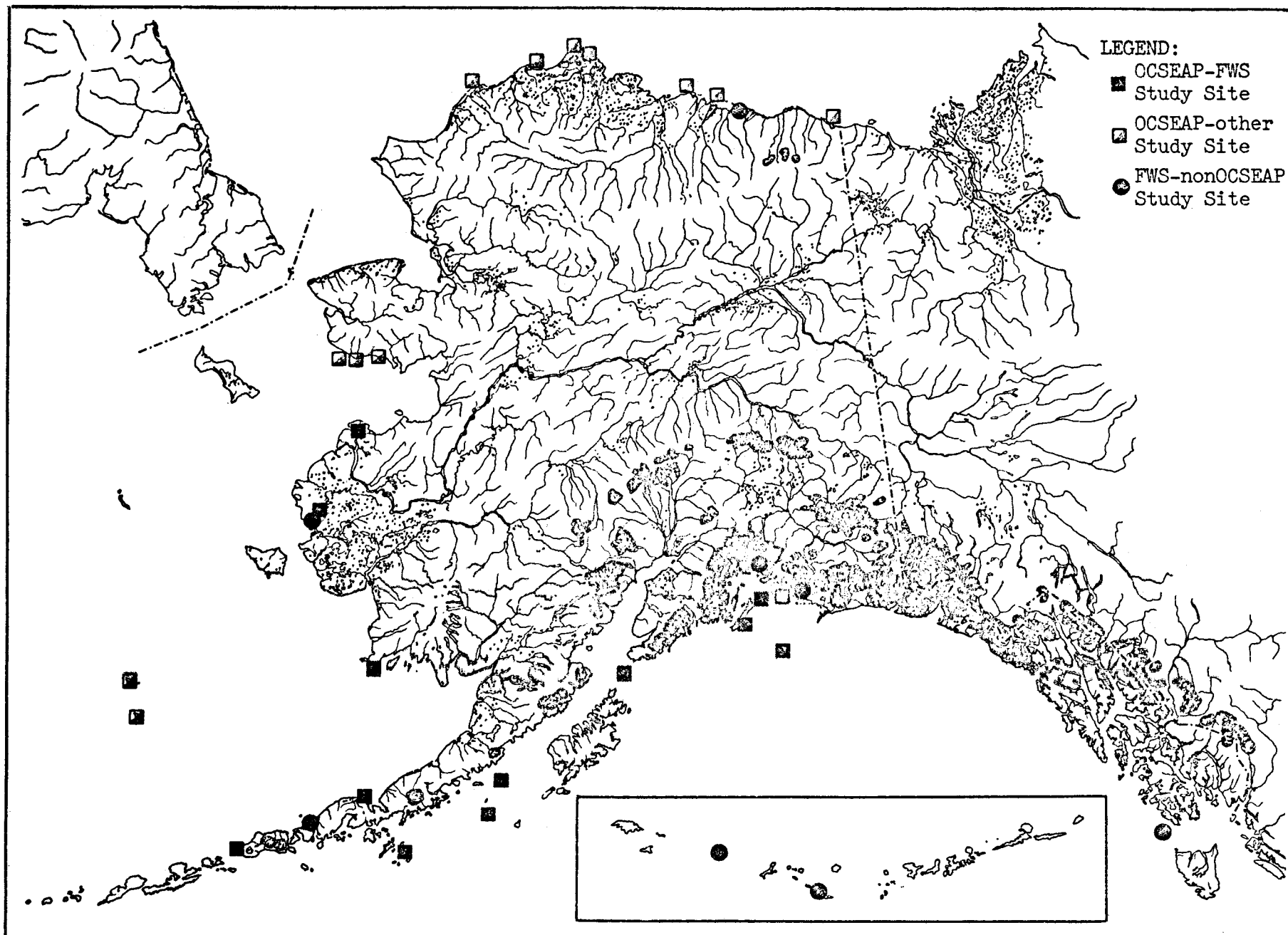
Species	Chukchi Sea			Beaufort Sea			
	N.Seward Peninsula	Cape Thompson	Cape Lisburne	Point Barrow	Cooper Island	Point McEntyre	Barrier Islands
Northern Fulmar							
F-t. Storm Petrel							
Leach's Storm Petrel							
D-c. Cormorant							
Pelagic Cormorant		C	C				
R-f. Cormorant							
Canada Goose	O						
Black Brant	C						O
Emperor Goose	C						
Common Eider	C				O		A
Glaucous Gull	A	A	A		O		A
G-w. Gull							
Bl-legged Kittiwake		A	A				
Red-legged Kittiwake							
Arctic Tern	A				A		A
Aleutian Tern							
Common Murre		A	A				
Thick-billed Murre		A	A				
Black Guillemot		O	O		A		O
Pigeon Guillemot							
Marbled Murrelet							
Rifted Murrelet Ancient Murrelet							
Cassin's Auklet							
Parakeet Auklet							
Crested Auklet							
Least Auklet							
Truskens Auklet Rhinoceros Auklet							
Horned Puffin		A	A				
Tufted Puffin		A	A				
Waterfowl - general	A			C		A	O
Shorebirds - general	A			A		A	O
OCSEAP-funded Study	RFP?	RFP?	RFP?	Connors	ADF&G		ADF&G
Other-funded Study						FWS	

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Table 2. Number of studies of dominant species of birds in coastal Alaska during summer by program and by region, 1975-76.

Species	SE Alaska		Gulf Alaska		Aleutian Is.		Bering Sea		Chukchi Sea		Beaufort Sea	
	OCSEAP	Other	OCSEAP	Other	OCSEAP	Other	OCSEAP	Other	OCSEAP	Other	OCSEAP	Other
Northern Fulmar			2		1		2					
Fork-tailed Storm Petrel	1		2		1							
Leach's Storm Petrel	1		2		1							
Double-crested Cormorant			3				1					
Pelagic Cormorant	1		2		1		5					
Red-faced Cormorant			2		1		3					
Canada Goose					1		1	1				1
Black Brant							1	1			1	1
Emperor Goose							1					
Common Eider							2	1			2	
Glaucous Gull							3	1			2	1
Glaucous-winged Gull	1		8		1		4	1				
Black-legged Kittiwake			8		1		5					
Red-legged Kittiwake					1		2					
Arctic Tern							2	2			2	
Aleutian Tern							1					
Common Murre	1		6		1		5					
Thick-billed Murre					1		4					
Black Guillemot											2	
Pigeon Guillemot	1		5		1		3					
Marbled Murrelet												
Kittlitz's Murrelet												
Ancient Murrelet	1				1							
Cassin's Auklet	1		1									
Parakeet Auklet			2		1		2					
Crested Auklet			1		1		2					
Least Auklet					1		2					
Rhinoceros Auklet	1		1		1							
Horned Puffin	1		6		1		4					
Tufted Puffin	1		8		1		5					
Waterfowl - General							3	2			1	1
Shorebirds - General			1				4	2			2	1



Map 1. Location of sites for studies of birds in coastal habitats by OCSEAP and other programs, 1975-76.

