



**Northwest and
Alaska Fisheries
Center**

**National Marine
Fisheries Service**

U.S. DEPARTMENT OF COMMERCE

NWAFRC PROCESSED REPORT 86-02

**Assessment of Net Entanglement
on Northern Sea Lions
in the Aleutian Islands,
25 June—15 July 1985**

February 1986

INTRODUCTION

The breeding range of the northern (Steller) sea lion, Eumetopias jubatus, the most abundant sea lion in the Northern Hemisphere, extends throughout the North Pacific Ocean and Bering Sea with centers of abundance in the Aleutian Islands and Gulf of Alaska. The sea lions are not known to migrate but disperse throughout their range during fall and winter, returning to rookeries to breed and pup during late May to early July. A published review of their distribution and population covering the years 1956-80 showed that overall the world population level had changed little, although marked declines had occurred in the eastern Aleutian Islands and Bering Sea (Braham et al. 1980; Loughlin et al. 1984). Results of an unpublished survey by the National Marine Mammal Laboratory (NMML) in July 1985 indicated that the eastern Aleutian Island sea lion population has continued to decline at a steady rate. The 1985 survey of the eastern Aleutian Islands documented an overall population reduction of 57% from counts made in the mid-1970's by Braham et al. (1980). The 1977 counts showed a 50% decline from counts made in the early 1960's by Kenyon and Rice (1961). In a span of 20 years the number of adult sea lions on eastern Aleutian Island rookeries has declined from about 50,000 animals (1960's) to the 1985 level of about 10,000 adult animals. This represents a rate of decline of about 7% per year, essentially the same rate of decline as that reported for the northern fur seal (Callorhinus ursinus) of the Pribilof Islands (Fowler in press).

We interpret the data to indicate a long-term declining trend in the sea lion population. Data from other areas in their range and from the 1985 aerial survey do not support the hypothesis of a shift in distribution. The reasons for the decline are unknown, but entanglement in debris may be a contributing factor, along with changes in prey availability, disease, direct killing by fishermen, rookery/haul-out disturbance, and perhaps other factors.

There are little or no data on the impact of entanglement on sea lions. The Alaska Department of Game has collected some data on sea lion entanglement in debris in the Gulf of Alaska as part of their on-going research on sea lion biology (Calkins, in press). The purpose of our study was to evaluate the nature and magnitude of entanglement in debris on northern sea lions in the Aleutian Islands. At the end of this report is a chronological summary of each northern sea lion rookery and haul site visited during the study (Appendix I). Also included is a brief summary of research conducted during November 1985 to assess entanglement on pup-of-the-year northern fur seals and northern sea lions in the eastern Aleutian Islands (Appendix II).

Concomitant to our survey to document sea lion entanglement, biologists from the Auke Bay Laboratory, Northwest and Alaska Fisheries Center, National Marine Fisheries Service, conducted beach surveys for litter in areas near sea lion rookeries and haul sites. These data are being prepared by those biologists and will be presented separately.

METHODS

Hypothesis tested: The magnitude of observed entanglement in debris by female and pup-of-the-year northern sea lions is sufficient to cause or contribute to observed declines in the sea lion population. Objective: To determine the nature and magnitude of entanglement of all northern sea lion age groups by sex and age class at each major rookery in the central and eastern Aleutian Islands.

A 30 m commercial fishing vessel, the Polar Sea, was chartered for 21 days to transport the field party of four biologists and to serve as a platform for launching a 4.7 m inflatable motorized raft (Zodiac).^{1/} Each major rookery and haul site from Ugamak Island in the Fox Islands of the eastern Aleutians to Kiska Island in the Rat Islands of the central Aleutians was visited between 25 June and 15 July, 1985 (Figure 1). Weather permitting, we landed at each location by Zodiac to count the number of sea lions present by sex and, when possible, by age class; counted the number of animals present entangled in debris by sex and age class; characterized the debris on the animals; and described the general condition of entangled animals. Age classes were designated as pup, yearling, subadult (2-4 years old for females, 2-7 years old for males), and adult. All data were recorded in notebooks and collected by observation using

^{1/} Reference to trade names does not imply endorsement by the National Marine Fisheries Service.

binoculars. Pups were counted by walking the rookeries to drive adults and subadults into the water. At the same time a separate field party surveyed the beaches for debris.

Pup surveys were accomplished to develop a data base for future research to assess the relative status of the population and determine rates of change. Calculations for the number of replicate pup counts required to assess a change of 20% in the population (our desired detection level) were done using the following formula:

$$n = \frac{4S^2}{L^2} \quad (1)$$

where: n = the number of replicate surveys required,

S = standard deviation and S^2 the variance of the sample or surveyed population, and

L = detection level (of change) as percent of arithmetic mean of sample.

In some instances we were unable to complete the required number of replicate pup surveys as defined by formula (1) for a number of reasons. For instance, near the end of the survey period most of the pups had developed sufficiently to enter the water and swim nearshore once we made our initial counts, eliminating the possibility of a second or third count. Most often we were limited to one or two counts because inclement weather required as brief a stay on the rookery as possible to allow safe egress off the rookery for return to the ship.

We timed our survey to account for the optimal dates to assess adult entanglement and to count pups. The optimal dates to count adults are between mid-June and mid-July when 90% or more of the animals that will haul out are present and the optimal times are between 1000 and 1800 hours (Withrow 1982). Because we were unable to limit our surveys to the time of day when most adult animals would be present (some surveys were completed during early evening hours), our adult counts are not representative of the maximum number of adults present at each location. A more representative count is available from the National Marine Mammal Laboratory which summarizes their 1985 aerial survey of the northern Gulf of Alaska and eastern and central Aleutian Islands.^{2/} The peak in sea lion births is about mid-June and the range is from late May to early July. Thus, the optimal dates to count pups are between about 23-25 June, when most births have occurred, and mid-July, before most pups are old enough to begin entering the water (Withrow 1982; D. Calkins, Alaska Dep. Game, 333 Raspberry Road, Anchorage, AK, pers. commun.).

RESULTS

During the survey 17 rookeries and 15 haul sites were visited on 28 islands (Table 1). In most instances a visit included a landing, but some haul sites with few animals present were surveyed from the Zodiac or Polar Sea. The only rookeries not surveyed were at Cape St. Stephan, Kiska Island, and Column Rocks near Amchitka Island,

^{2/} Available from the senior author.

where inclement weather prevented landing. A survey to assess net entanglement of adult animals on Column Rocks was accomplished from the Zodiac.

The total number of adults counted during the study was 15,957 which included at least 2,437 identifiable males; 14,160 pups were also counted. Over 90% of the counted adults were at rookeries, the remaining animals were at haul sites.

During the study only 11 sea lions were seen that showed evidence of entanglement with debris and most of these had signs of entanglement in net or twine; none were entangled in packing bands or other materials (Table 2). The 11 animals represent .07% of the counted adult population. The 11 animals included 6 males, 3 females, and 2 of undetermined sex. The males included three subadults subjectively aged to be about 3-7 years old and three adults which held territories and were probably 8-11 years old. The females were all adults of undetermined age. The two entangled animals of undetermined sex included one yearling and one subadult.

Five of the 11 entangled animals (45%) did not have any foreign material on them but had marks or open wounds of varying degrees which we assumed were indications of past entanglement in debris (Table 2). Six animals (only .04% of the adult population) were seen that actually had netting material on them and these included one female, the two of undetermined sex, one adult male, and two subadult males. Two of the identified materials were single strands of twine (one green, the other grayish) protruding from the neck wounds of two separate animals. The remaining four animals had green trawl net on

the neck or shoulders, or both, which inhibited them to varying degrees depending on the size of net piece or amount of body entangled. The approximate size of net pieces seen on animals ranged from 1x1.5 m to 2x4 m. Three of the animals were mobile but appeared to swim and walk with considerable difficulty; the fourth was not disturbed during our presence and did not move. The six animals with scars or wounds appeared healthy and robust; the one male on Kiska Island was defending a territory containing females.

In addition, two biologists stationed on Ugamak Island reported one adult male with an open neck wound caused by perhaps a band or line and one adult female with a band around the neck. The female's neck was "puckered" near the band. Both animals were robust and appeared healthy.

The distribution of entangled animals in the study plus those not seen by us but reported at Ugamak Island area was

Fox Islands (Ugamak to Samalga)	= 9
Islands of Four Mountains	= 0
Andreanof Islands (Yunaska to Tanaga)	= 1
Delarof Islands (Amatignak to Ilak)	= 0
Rat Islands (Semisopchnoi to Kiska)	= 3

DISCUSSION

Results from the present study do not support the hypothesis that the magnitude of observed entanglement in debris by female northern sea lions is sufficient to cause or contribute to observed declines.

Of 13 animals documented to have evidence of entanglement, only 2 females were identified as entangled in netting material. We interpret these data to indicate that the present level of entanglement in adult female sea lions seen on shore, as documented in this study, is insufficient to conclude a causal contribution to the observed declines.

There was a segment of the sea lion population that was at sea during our survey and not available for counting. An unknown portion of that group may have been entangled in debris, but our visits to the rookeries were too short in duration to assess this unseen group. However, long-term observations at Ugamak Island throughout the breeding season accounted for only two entangled animals (out of a total count of 2,200 adults and 1,694 pups), indicating that the number of entangled adult sea lions that were unobserved was insignificant.

The data are inadequate to address the magnitude or nature of entanglement on pups-of-the year since most pups were too young during the survey to have encountered debris in the water or were away from the rookery. It is possible that the declines are caused by mortality of young animals from post-weaning age to about 3-4 years of age. There was no indication that the 1-4 year old animals had a propensity for becoming entangled, but very few of these animals were seen by us on the rookeries or haul sites. It may be that these animals are unable to swim to shore once entangled and die at sea. It is extremely difficult to assess the level of this mortality; however, it

may be possible to assess the level of entanglement in pups-of-the-year by visiting strategic haul sites and beaches during fall or early winter when these animals are most likely to haul out on nearby beaches to rest after becoming entangled (see Appendix II).

ACKNOWLEDGMENTS

We extend our gratitude to Arnie Haugen, Jeff Oestreich, and Borgy Jorgensen, the captain and crew, respectively, of the Polar Sea for their help in all aspects of the study and for their concern for our safety during difficult situations. It was a pleasure to sail with so competent a crew. We also thank Theodore Merrell and Charles O'Claire for piloting the raft on many surveys and for assistance in other portions of the study. The manuscript was improved by comments from H. Braham and J. Coe.

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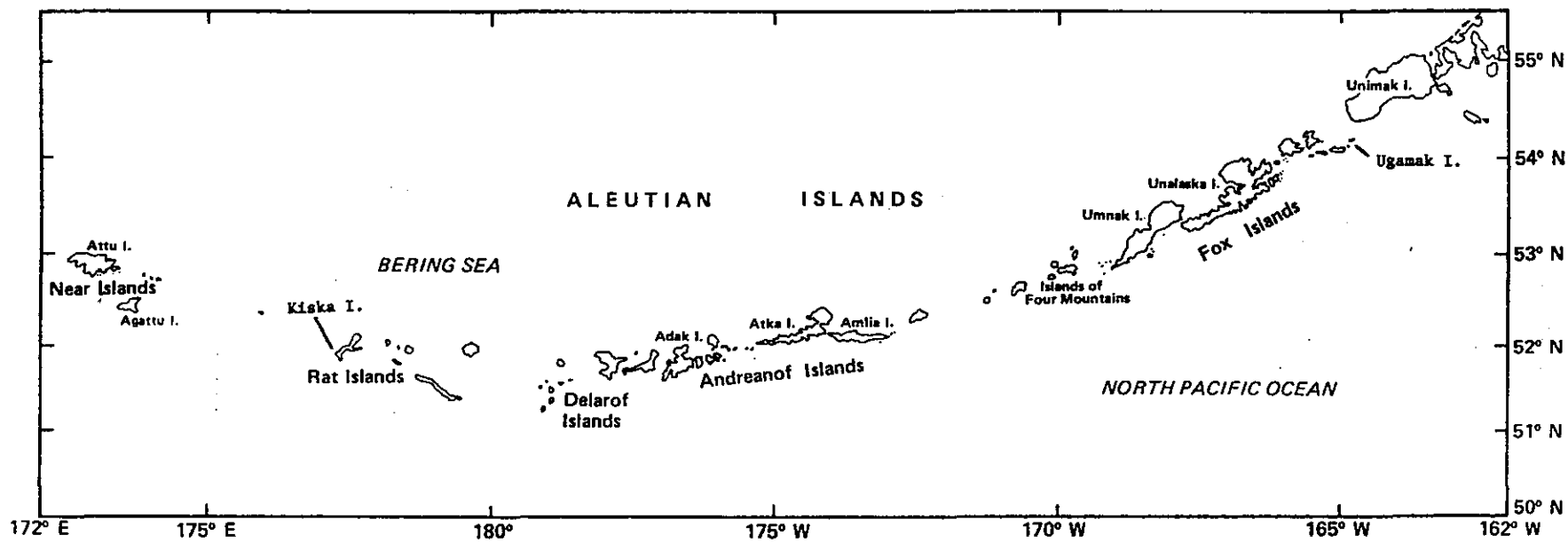


Figure 1. The Aleutian Islands, Alaska.

Table 1.--Summary of counts from Aleutian Islands northern sea lion debris survey, 25 June to 15 July 1985.

Island <u>1/</u>	Survey Location	Date	Number of sea lions <u>2/</u>		
			All adults	Adult males	Pups
EASTERN ALEUTIAN ISLANDS					
<u>Fox Islands</u>					
Ugamak	entire	6/24-25	2185	333	1635
Akun	Billingshead	6/25	450	--- <u>3/</u>	60
Akutan	Cape Morgan (E)	6/27	354	65	201
	(M)	6/27	195	24	115
	(W)	7/15	733	>65	814
Bogoslof	entire	7/14	1041	155	1109
Ogchul	entire	7/13	429	>18	172
Adugak	entire	6/28	---	---	844
Samalga	entire		---	225	0
<u>Islands of Four Mountains</u>					
Chuginadak	Concord Pnt.	7/12	---	228	0
CENTRAL ALEUTIAN ISLANDS					
<u>Andreanof Islands</u>					
Yunaska	Lava Flow (E)	6/29	350	27	421
	(W)	"	478	33	605
Amukta	SW Point	7/11	0	0	0
Seguam	Saddleridge	6/30	2739	285	2635

Table 1.--Continued.

Island <u>1/</u>	Survey Location	Date	Number of sea lions <u>2/</u>		
			All adults	Adult males	Pups
Agligadak	entire	7/11	475	>20	>30
Amlia	East Cape N&S	7/11	491	---	0
Tanadak		7/11	did not visit; too foggy		
Sagigik		7/11	did not visit; too foggy		
Atka	Four stacks	7/1	---	230	0
Kasatochi	N side	7/1	940	121	892
Great Sitkin	Swallowhead	7/10	6	did not stop	
Little Tanaga	Tana Point	7/2	did not visit; too rough		
Adak	Cape Yakak	7/2	---	226	0
	Lake Point	7/2	830	178	558
Kanaga	N Cape	7/9	10+	did not stop	
Tanaga	Bumpy Point	7/9	50+	did not stop	
<u>Delarof Islands</u>					
Gramp Rock	entire	7/3	---	---	909
Tag	entire	7/8	252	75	703
Ulak	Hasgox Point	7/8	1986	105	1236

Table 1.--Continued.

Island <u>1/</u>	Location	Date	Number of sea lions <u>2/</u>		
			Adults	Males	Pups
<u>Rat Islands</u>					
Amchitka	East Cape	7/8	---	---	<10
	Column Rocks	7/7	did not land, too rough		
Ayugadak	center island	7/7	648	38	218
	east island	7/7	118	---	111
Kiska	Lief Cove (S)	7/6	526	---	436
	(N)	7/6	688	---	446
	Cape St. Stephan		did not land, too rough		
Totals			15,957		14,160

^{1/} Islands are listed east to west; E, W, N, S, M indicate east, west, north, south, and middle, respectively.

^{2/} Adult and male counts are not valid indicators of the number of animals at each location since many counts were taken during poor visibility, when many were away from the rookery on feeding bouts, or were frightened into the water and not available for counting. Also, in those cases where adult and male counts are listed, the count should read as (so many) adults of which (so many) are males. Pup counts in all cases are the mean of repetitive counts (see Appendix I). Number of repetitive counts varied by rookery.

^{3/} --- indicates no count.

Table 2.--Summary of entangled northern sea lions seen in the Aleutian Islands,
25 June to 15 July 1985.

Island	Date	Sex	Age class ^{1/}	Location on body	Description
Akun	6/25	M	SA	neck	open wound with white strands protruding
		F	A	neck	1x1.5 m green trawl net causing deep, open wound dorsally
		F	A	neck	mark only
Akutan	7/15	M	A	neck	thin mark only
		?	SA	neck and shoulder	green trawl net slowing movement but no obvious wound
Samalga	7/13	M	SA	neck	large mark only
		?	Y	neck and flippers	2x4m gray trawl net inhibiting movement, small open wound dorsally
Yunaska	6/29	F	A	neck	3 scars dorsally
Ayugadak	7/7	M	SA	neck	1x1.5m green trawl net causing open wound dorsally, very lethargic
Kiska	7/6	M	A	neck	thin strand of green net causing deep wound dorsal, animal robust
		M	A	neck	deep, thin, dorsal neck wound, unknown cause

Table 2--Continued.

Island	Date	Sex	Age class ^{1/}	Location on body	Description
Ugamak ^{2/}	6/8	M	A	neck	band or line around neck
	7/3	F	SA	neck	neck puckered, obscuring band (?) around neck

^{1/} A = adult, SA = subadult, Y = yearling.

^{2/} Reported by Ugamak field party.

Summary: 7 males
 4 females
 2 unknown

13 total

Fox Islands (Ugamak to Samalga) = 9

Islands of Four Mountains = 0

Andreanof Islands (Yunaska to Tanaga) = 1

Delarof Islands (Amatignak to Ilak) = 0

Rat Islands (Semisopochnoi to Kiska) = 3

APPENDIX I
 CHRONOLOGICAL SUMMARY OF NORTHERN SEA LION ROOKERIES AND
 HAUL SITES VISITED, ALEUTIAN ISLANDS
 25 JUNE-JULY 15 1985

Location: Billingshead Bight, Akun Island

Status: haul site (small rookery?)

Date and time at site: June 25; 1145-1245

Type of survey: land

Landing site: rocks at northwest end of beach

Substrate: sand/cobblestone with large boulders at extremes

Weather: high broken clouds; light wind

Viewing conditions: excellent

Counts:

Adult: 450

Pups:	Count #1	#2	#3
Dave Withrow	56	61	53
Tom Loughlin (TL)	75	58	--
$\bar{X} = 60.6; s.d. = 8.562$			

Comments: Three animals with debris

1. Adult female with large green trawl net, about 1x1.5m; animal in poor condition, lethargic, with deep open laceration on dorsal aspect of neck.

2. Adult female with mark only; no apparent damage except for thin circular mark around neck. Presume mark was result of net

entanglement. Appeared robust and healthy.

3. Subadult male with deep laceration on dorsal aspect of neck progressing laterad; two strands of gray or whitish net threads protruding ventrally. Appeared robust and healthy.

Location: Ugamak Island

Status: rookery

Date and time at site: 26 June; 0820-1700

Type of survey; land

Landing site: Ugamak Bay, Site A3

Substrate: sand, cobblestone, large boulders

Weather: dense fog and rain

Viewing conditions: poor

Counts: Merrick and Gearin counted 2,185 adults of which 333 were males; also counted 1,635 pups. Counts are for entire island.

Comments: Landing was to capture, tag, and release 96 sea lion pups at site A2; counts are from summaries by two biologists stationed on the island from 27 May-10 July. Two entangled animals were seen by them.

Location: Cape Morgan, Akutan Island (see also 15 July)

Status: rookery

Date and time at site: 27 June; 0940-1200

Type of survey: Zodiac

Landing site: did not land

Substrate: pebbles and sand

Weather: high beach surf, overcast, light to moderate wind

Viewing conditions: excellent

Counts: Counts are for south facing beaches; west facing beach was counted on 15 July

East beach:

Adults: 354 of which 65 were male

Pups:	Count	#1	#2	#3
Pat Gearin (PG)	185	219	221	
TL	175	207	---	
\bar{X}	= 201.4; s.d. = 20.562			

Middle beach:

Adults:	PG	202 of which 24 were males
	TL	189 of which 23 were males
	\bar{X}	= 195.5
Pups:	PG	115
	TL	115
	\bar{X}	= 115

Comments: Large surf and tide rips precluded survey of west beach. No entangled animals seen on south facing beaches but see survey of west beach on 15 July.

Location: Adugak Island, two large rocks on south west side

Status: rookery

Date and time at site: 28 June; 1815-1945

Type of survey: land

Landing site: small coves on north side of each rock

Substrate: large rocks sloping to north and west

Weather: low overcast, light rain, light fog

Viewing conditions: poor to moderate

Counts:

Flat rock:

Pups	Count #1	#2
PG	603	617 14 dead
TL	581	
$\bar{X} = 600.0; s.d. = 18.148$		

Slope rock:

Pups	Count	
PG	244	3 dead
TL	245	
$\bar{X} = 244.5$		

Comments: No evidence of entanglement; virtually no debris on rookery but some floats and odds and ends visible on main island. The fog was very bad and the Polar Sea pulled up to within 50 meters of the northwest side of the rocks to facilitate our going ashore. The Zodiac was not landed but two of us jumped off it onto the steep rocks while a third person drove the boat; the third person waited offshore in the Zodiac until we finished our counts.

Location: Lava Flow, Yunaska Island

Status: rookery

Date and time at site: 29 June; 1020-1415

Type of survey: land

Landing site: east side of lava flow on pebble beach

Substrate: sand/pebbles

Weather: partial sun changing to light fog, moderate wind

Viewing conditions: good

Counts:

East side lava flow to point (sunny and calm):

Adults:	350 of which 27 were males
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Pups:	PG	415	8 dead
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	TL	427
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$\bar{X} = 421.0$

West side lava flow (moderate to heavy fog and calm):

Adults: 478 of which 33 were male

Pups:	Count #1	#2	
PG	632	628	11 dead
TL	586	577	
$\bar{X} = 605.8; s.d. = 28.289$			

Comments: One adult female seen with three thin marks on dorsal aspect of neck that may have been a net scar. Animal was robust and appeared healthy.

Location: Saddleridge Point, Seguam Island

Status: rookery

Date and time at site: 30 June: 1120-1410

Type of survey: land

Landing site: far east end of rookery in sand/cobblestone area near male haul site

Substrate: sand/pebble/cobblestone/boulder

Weather: overcast, light fog, wind to 30 kn.

Viewing conditions: good to excellent

Counts:

Adults: from Polar Sea 0.5 km from shore - 2,360 from Zodiac 200 m from shore - 2,739 of which 285 were males

Pups:	Count #1	#2	
PG	2,921	2,546	53 dead
TL	2,438	-----	
$\bar{X} = 2,635.0; s.d. = 252.502$			

Comments: No evidence of entangled animals.

Location: Four Stacks, Atka Island

Status: haul site

Date and time at site: 1 July; 0730-0835

Type of survey: Zodiac

Landing site: did not land

Substrate: large pillar rocks

Weather: low overcast, light drizzle, calm

Viewing conditions: good

Counts: 230 adults

Comments: male and subadult haul site; no pups seen or heard

Location: Northeast Point, Kasatochi

Status: rookery

Date and time at site: 1 July; 1345-1700

Type of survey: land

Landing site: the eastern section was approached by climbing onto the steep north facing rocks; the western section was approached by landing the Zodiac in the large rock area in the cove to the west then hiking over the small hill

Substrate: sloping rock slabs

Weather: overcast, calm seas, no wind

Viewing conditions: excellent

Counts:

Northeast corner:

Adults: 597 of which 53 were male

Pups: section 1. PG 385

TL 353

$$\bar{X} = 369.0$$

section 2. Count #1 #2

PG 213 220 (11 dead)

TL 186 218

$$\bar{X} = 209.3; \text{ s.d. } = 15.777$$

Middle Cove: 41 bachelor males

Northwest corner:

Adults: 343 of which 27 were male

Pups: PG 294

TL 335

$$\bar{X} = 314.5$$

Comments: None

Location: Cape Yakak, Adak Island

Status: haul site

Date and time at site: 2 July; 1140-1200

Type of survey: Polar Sea

Landing site: did not land

Substrate: large rocks

Weather: overcast, 4-6' seas, 10-15 kn wind

Viewing conditions: good

Counts: Adults only

	Count #1	#2	
PG	226	220	
TL	219	186	(about 30 in water)
$\bar{X} = 212.75; s.d. = 18.099$			

Comments: Polar Sea was able to approach to within 1/8 mile of haul site.

Location: Lake Point, Adak Island

Status: rookery

Date and time at site: 2 July; 1218-1350

Type of survey: land

Landing site: steep rock ledges on south side then hike over to rookery

Substrate: large seaward sloping rock slabs with numerous cracks and separations

Weather: overcast, 4-6' seas, 10-20 kn wind

Viewing conditions: good

Counts:

Adults: PG - 797 of which 46 were territorial males
plus 132 bachelor males
TL - 830 of which 49 were territorial males
plus 64 bachelor males

$$\bar{X} = 813.5$$

Pups: PG - 569 (11 dead)

TL - 547

$$\bar{X} = 558.0$$

Comments: No entangled animals seen.

Location: Gramp Rock

Status: rookery

Date and time at site: 3 July; 1030-1140

Type of survey: land

Landing site: difficult landing in small cove on northeast side then
hike over to animals which are on south and west side

Substrate: large, "flat" volcanic rocks with numerous crevices and irregularities and small cobblestone beach on southeast side

Weather: very foggy, 3-4' seas, 5-10 kn wind

Viewing conditions: poor

Counts: No adult count

Pups: PG 893

TL 926

$$\bar{X} = 909.5$$

Comments: No entangled animals seen but poor visibility reduced survey coverage. We were unable to count adults due to fog and as we approached to count pups the adults entered the water before a good count could be made. Also, the pup count is conservative because of the many crevices and valleys on the rookery making it difficult to locate animals. Aleutian terns and two bald eagles were seen nesting on the island.

Location: Lief Cove, Kiska Island

Status: rookery

Date and time at site: 6 July; 1330-1532

Type of survey: land

Landing site: number of landings at each minor rookery; landings were easy on cobblestone and pebble beaches

Substrate: cobblestone and pebble beaches

Weather: overcast with drizzle, 4-8' seas with chop, 15 kn wind

Viewing conditions: good

Counts:

Lief Cove: 41 bachelor males

1st cove north: 67 bachelor males

2nd cove north:

beach #1 (south)

Adults: 500 of which 47 were males

Pups:	Count	#1	#2
	PG	472	489
	TL	344	482

$\bar{X} = 446.75$; s.d. = 68.854

beach #2 (central)

Adults: 188

Pups: too rough to land, no estimate

beach #3 (north)

Adults: 526

Pups:	Count	#1	#2
	PG	447	480
	TL	376	444

$\bar{X} = 436.75$; s.d. = 43.661

Comments: Beach #3 had two territorial males with wounds on their neck, one of which was a very deep laceration of unknown cause. The other male had a deep dorsal laceration with green trawl web strands protruding. Both animals were robust and appeared healthy; both were maintaining territories in good locations. We also saw an adult blue fox on beach #1 with a piece of green trawl net or green band (difficult to determine which) around neck. There was a very large gill net wrapped around the logs south of the stream on beach #1.

Location: Cape St. Stephan, Kiska Island

Status: rookery

Date and time at site: 6 July; 1600-1700

Type of survey: none

Landing site: did not land

Substrate:

Weather:

Viewing conditions:

Counts:

Comments: We did not survey because of high winds and seas compounded by excessive tide rips.

Location: Ayugadak Island

Status: rookery

Date and time at site: 7 July; 1305-1400

Type of survey: land

Landing site: west island - no sea lions; middle island - cove on east side then climbed hill to count from above; east island - rock on northwest corner

Substrate: middle island - sand and pebble beach; east island - low, flat rock slab

Weather: light fog and overcast, calm wind and seas

Viewing conditions: excellent

Counts:

Middle Island

west side - 93 males

east side - 31 males

South side -

Adults: 536 of which 38 were males

Pups: 218

East Island

Adults: 135

Pups:	Count #1	#2	
	PG	107	113 (4 dead)
	TL	---	114
	$\bar{X} = 113.3; s.d. = 3.786$		

Comments: Middle Island had one entangled subadult male in poor physical condition. It had a 1.5x1.5 m piece of green and black trawl net around the neck and body which caused a deep laceration dorsally. The animal was by itself curled up against the cliff west of the rookery.

Location: Column Rocks, Amchitka Island

Status: rookery

Date and time at site: 7 July; 1500-1920

Type of survey: Zodiac

Landing site: did not land

Substrate: two large offshore rocks, one flat, one tall

Weather: moderate fog, 10-15' seas, calm wind

Viewing conditions: poor

Counts: Tall rock - 58 male

Flat rock - 679, no breakdown

Comments: High seas prevented a landing and good counts are difficult from a Zodiac, therefore no pup counts. No entangled animals were seen.

Location: East Cape, Amchitka Island

Status: haul site

Date and time at site: 8 July; 1305-1400

Type of survey: Zodiac

Landing site: did not land

Substrate: small offshore rocks

Weather: partial sun, 3-4' seas, 5 kn wind

Viewing conditions: good

Counts: see comments

Comments: Did not land or get good adult counts because of extensive kelp beds near rocks; however, there were probably over 100 animals and a few pups were heard. No adults were seen on Bering Sea side of mainland and we did not visit the Pacific side because it was too rough.

Location: Hasgox Point, Ulak Island

Status: rookery

Date and time at site: 8 July; 1600-1820

Type of survey: land

Landing site: Two of us were dropped off at the cove on the southwest side of mainland, then we hiked up and counted from the cliff above the rookery. The outer rocks were counted from the Zodiac (too rough to land).

Substrate: large flat rocks sloping to the south with many indentations

Weather: overcast with intermittent fog, 5-10' seas, light wind

Viewing conditions: good to excellent

Counts:

Mainland

Adults: 1,570 of which 105 were males

Pups: 1,059

Outer rock:

Adults: 469

Pups: 177

Comments: Repetitive counts were not needed because of ideal viewing conditions on the mainland and were not possible on the outer rock. No entangled animals were seen but a bail of green net was seen on the beach of a small cove on the west side of the mainland near a male haul site.

Location: Tag Island

Status: rookery

Date and time at site: 8 July; 2100-2230

Type of survey: land

Landing site: Mainland-cove on north side; west rock-dropped off at steep rocks on northeast side in channel separating islets

Substrate: flat irregular rocks with many crevices

Weather: light rain and fog, 6' seas, no wind but dangerous tide rips

Viewing conditions: good

Counts:

Mainland: 46 males

West rock:

Adults: 252 of which 31 were males

Pups: PG 701

TL 705

 $\bar{X} = 703.0$

Comments: No entangled animals seen. There were few females on the rookery and we presume that they were at sea. The rookery was large in area and the territorial males were dispersed throughout. The mainland contained a small pond on which 5 green-wing teals and 2 red phalaropes were seen.

Tanaga, Kanaga, and Great Sitkin Islands were viewed from the ship on 9-10 July but few animals were seen and we did not stop. See Table 1 counts.

Location: North cape and south cape, Amlia island

Status: haul site

Date and time at site: 11 July; 1130-1230

Type of survey: Zodiac

Landing site: did not land

Substrate: variety of small nearshore rocks and small beaches

Weather: sunny to moderate fog, strong tide rips, no wind

Viewing conditions: good

Counts: North cape: 379, mostly males; no pups

South cape: 112, mostly males; no pups

Comments: No entangled animals seen

Tanadak and Sagigik Islands were not visited due to heavy fog and tide
rips.

Location: Agligadak Island

Status: rookery

Date and time at site: 11 July; 1230-1300

Type of survey: Zodiac

Landing site: did not land

Substrate: low, irregular rock

Weather: clear to heavy fog, 3-4' seas, calm, heavy tide rips

Viewing conditions: good to poor

Counts:

Adults: 475, of which 20 were males

Pups: about 30

Comments: Just as we were about to land the fog became extremely heavy
and tide rips surrounded the island making a landing unsafe. One
adult female was seen that had a missing left flipper. The limb
appeared to have been bitten off at the knee joint; the wound was
well healed and was probably over a year old. The animal was robust
and appeared in good health. No entangled animals were seen.

Location: Concord Point, Chuginadak

Status: haul site

Date and time at site: 12 July; 1215-1450

Type of survey: Zodiac and ship

Landing site: did not land

Substrate: rocks and boulders

Weather: clear, 3-6' seas, 5 kn wind

Viewing conditions: excellent

Counts: 228 adults, most of which were young males

Comments: No entangled animals seen

Location: Samalga

Status: haul site

Date and time at site: 13 July; 1030-1130

Type of survey: land

Landing site: two landings on low rocks east and in center of haul site.

Substrate: low, flat rocks

Weather: clear to partial sun, 4-7' seas, 5-10 kn wind

Viewing conditions: excellent

Counts: 225 animals mostly subadult males and yearlings; no pups

Comments: Two entangled animals were seen.

1. A subadult male with an extensive scar that circled the neck; no net was visible but there was a shiny black scar (?) on the left quarter of the neck. The animal was robust and looked healthy; it had no apparent problem swimming when spooked into the water.

2. A yearling of undetermined sex was badly entangled in a large gray trawl net about 2x4 m in size. The net encircled the neck and part of left front flipper resulting in a deep dorsal neck laceration. The sea lion swam laboriously and was lethargic when on land.

Location: Ogchul Island

Status: rookery

Date and time at site: 13 July; 1550-1645

Type of survey: land

Landing site: steep rock ledge on southeast side

Substrate: seaward sloping rock ledges

Weather: light rain, high ceiling, calm seas and light wind

Viewing conditions: excellent

Counts:

Area 1

Adults: PG 338 of which 18 were territorial males

C. O'Claire 307

Pups:	Count	#1	#2
PG	158	183	
CO	172	177	

$\bar{X} = 172.5$; s.d. = 10.662

Area 2 93 males

Comments: No entangled animals seen.

Location: Bogoslof Island

Status: rookery

Date and time at site: 14 July; 1005-1645

Type of survey: land

Landing site: cove on east side at north base of cliff

Substrate: mostly sand and pebbles

Weather: clear, no wind, calm seas

Viewing conditions: excellent

Counts:

West cove

Adults: PG 555 of which 25 were males

TL 526 of which 33 were males

$\bar{X} = 540.5$

Pups: Count #1 #2

PG 437 486

TL 398 424

$\bar{X} = 436.25$; s.d. = 36.918

Landing area 80 males

Spit area east #1

Adults: 336

Pups: PG 322 (5 dead)

TL 310

$\bar{X} = 316$

Spit area south

Adults: most had entered the water prior to our arrival

Pups: PG 159 186 (9 dead)

TL 200 178

\bar{X} = 180.75; s.d. = 17.115

Spit area west

Adults: all adults in water but around 150

Pups: PG 171 (2 dead)

TL no count

Comments: No entangled animals were seen. The pups were large and robust; many were old enough to enter the water and swim near shore making it difficult to obtain repetitive counts. We had good views of most adult animals and could assess entanglement while they were on land or in the water even though good counts were not obtained.

Location: Cape Morgan, Akutan Island

Status: rookery

Date and time at site: 15 July; 0955-1110 (see also 27 June)

Type of survey: land

Landing site: north end of rookery on beach

Substrate: sand/gravel beach

Weather: high overcast, calm seas and wind

Viewing conditions: excellent

Counts:

West beach only

South group

Adults: PG 695

TL 772

 $\bar{X} = 733.5$

Pups: Count #1 #2

PG 856 861

TL 774 765

 $\bar{X} = 814$; s.d. = 51.555

Comments: Two entangled animals were seen. One was an adult male, holding a territory, which had a circular scar around the neck. No net was seen. The animal was robust and appeared healthy. The second was a subadult of undetermined sex badly entangled in green trawl net which encompassed the neck and shoulders. It was hauled out with the other animals and crawled into the water when spooked but swimming appeared laborious and it submerged for only short periods. No open wounds were visible. Most of the pups were large and able to swim nearshore and it was extremely hard to get one good pup count; a second count on the north group was not possible because both groups intermixed in the water after the first count. A subadult male elephant seal was sighted hauled out near the male haul site near the north group. It had a green roto tag on the right flipper but the numbers and other identifying marks had worn off.

Appendix I, Table I.--Aleutian Islands northern sea lion survey

25 June-15 July 1985 - List of anchorages.

Date	Location/island	Lat.	Long.	Time
June				
25	Leave Dutch Harbor, begin survey			0600-
25-26	Ugamak Bay, Ugamak	54/12	164/48W	1630-1730
26-27	Avatanak Bay, Avatanak	54/04	165/24	2230-0600
27	Dutch Harbor	53/54	166/31	1440-1953
27	night of the 27th-no anchorage-run all night			
28-29	Applegate Cove, Chuginadak	52/52	169/55	2315-0650
29-30	Finch Cove, Seguam	52/22	172/21	0001-0715
30-1	Uncharted Bay, Atka	51/20	174/21	0030-0520
July				
1-2	Scripps Bay, Little Tanaga	51/51	176/09	2040-0720
2-3	Tanaga Bay, Tanaga	51/44	178/04	1945-0725
3-4	Constantine Hrbr, Amchitka	51/24	179/17E	2243-
4-5	" " "	"	"	-0900
5-6	Kiska Harbor, Kiska	51/58	177/32	0230-0830
6-7	" " "	"	"	2000-0900
7-8	Kirilof Bay, Amchitka	51/50	179/16	0300-0830
8-9	Tanaga Bay, Tanaga	51/44	178/04W	0120-0745

Appendix I, Table 1.--Continued.

Date	Location/island	Lat.	Long.	Time
July				
9-10	Sand Bay, Great Sitkin	51/59	176/07	2120-0745
10-11	Korovin Bay, Atka	52/14	174/20	1600-0400
11-12	South anchorage, Yunaska	52/35	170/41	2250-0800
12-13	Applegate Cove, Chuginadak	52/52	169/55	1710-0645
13-14	No anchorage, drift 9 km S of Bogoslof			
14-15	Summer Bay, Unalaska	53/55	166/28	2219-0715
15	Return to Dutch Harbor, end survey			-1615

Appendix I, Table 2.--Aleutian Islands northern sea lion survey
 25 June-15 July 1985, List of cetacean
 sightings.

Species and date	Time	Number	Lat.	Long.
Dall's porpoise, <u>Phocoenoides dalli</u>				
June				
29	0936	9-11	52/44	170/32W
29	0941	5-6	52/44	170/34
29	1430	4	52/41	170/36
30	1452	4	52/42	170/31
30	2225	10	52/26	174/02
	"	6-7	"	"
July				
1	1145	6	52/19	175/00
1	1147	5	"	"
1	2017	6-8	51/55	176.08
1	2020	2	"	"
2	1105	4	51/35	176/48
3	1328	4	51/27	178/44
3	1918	3	51/35	179/57E
3	1948	4	51/22	179/54E
5	1004	1	51/24	179/28E

Appendix I, Table 2.--Continued.

Species and date	Time	Number	Lat.	Long.
July				
5	1620	7-8	51/25	179/26E
6	1630	1	51/59	177/18E
8	1925	4-6	51/22	178/48W
9	1905	1	52/03	176/37
10	0826	5	52/03	176/14
Killer whale, <u>Orcinus orca</u>				
July				
8	0930	7	51/23	179/27E
8	1700	3	51/19	179/59W
13	2240	1	53/10	168/13W
Minke whale, <u>Balaenoptera acutorostrata</u>				
June				
30	0720	1	52/24	172/22W
July				
1	2015	2-3	51/55	176/08W

APPENDIX II
ASSESSMENT OF ENTANGLEMENT ON PINNIPEDS IN THE EASTERN
ALEUTIAN ISLANDS, 15-22 NOVEMBER 1985

INTRODUCTION

Continuing declines in both the Pribilof Islands northern fur seal population (Callorhinus ursinus) and northern sea lions (Eumetopias jubatus) from the Aleutian Islands and Gulf of Alaska may be related to mortality of pups-of-the-year and yearlings through entanglement in net fragments and other marine debris. For northern fur seals, the pups are likely to first encounter net fragments during their initial sorties off the islands and, once weaned, during their migration south through the Bering Sea during November and December. If entangled during their migration south, they likely will become burdened by the additional weight and encumbrance of the net and need to haul out onto land to rest. The first land that they will encounter is along the shores of the eastern Aleutian Islands and western Alaska Peninsula.

It seems reasonable, then, to assess the magnitude of entanglement in northern sea lion and northern fur seal pups in the eastern Aleutian Islands during November; they will have grown enough by then to have ventured away from shore to feed and perhaps become entangled. From 15-22 November 1985, a study was conducted to determine the magnitude and nature of entanglement in pup and yearling northern fur seals and northern sea lions on and around the eastern Aleutian Islands.

METHODS

The study was conducted 15-22 November, principally from a Bell Jet Ranger III helicopter (Maritime Helicopters) flown 30-300 m offshore at an altitude of 30-45 m and at 40-70 knots. Altitude and distance offshore increased with increased wind turbulence. No surveys were flown 16-20 November due to inclement weather. All surveys began and ended at Dutch Harbor. A total of 17.1 hours of flight time were completed (6 h prior to the storm and 11.1 h after the storm). On 15 November R. Merrick and P. Gearin surveyed the west end of Tigalda Island on foot and on 21 November they surveyed the south end of Ugamak Island while T. Loughlin conducted surveys in other parts of the study area from the helicopter. On 22 November the helicopter landed on Bogoslof Island allowing for a land survey there. Survey conditions from the helicopter were judged subjectively and ranged from good to excellent, although in rare instances excessive glare reduced the field of view. Areas surveyed included (Figure 2):

1. Unimak Island -- Cape Sarichef to Scotch Cap.
2. Entire coastline of Ugamak, Kaligagan, Avatanak, and Rootok Islands and adjoining rocks and islets.
3. Akun Island -- the point just west of Jackass Point continuing north and east, including Poa and Tanginak Islands, to the northern entrance to Lost Harbor.
4. Akutan Island -- southern point of Open Bight west and south to Battery point and Green Bight.

5. Entire coastline of Unalga Island, Baby Islands, Old Man Rocks, Egg Island, Outer and Inner Signal, all adjoining offshore rocks and pinnacles, and major points on Sedanka Island and eastern Unalaska Island.
6. Unalaska Island -- north side from Priest Rock to Konets Head, south and east to Cape Aiak, including Emerald Island and South Rock.
7. Umnak Island -- entire island, includes Samalga, Adugak, Ogchul and all other islands, islets and offshore rocks, except inside Inanudak Bay and from Thumb Point to Kettle Cape.
8. Entire coastline of Bogoslof Island.

RESULTS

No entangled fur seals were seen during the survey; the only fur seals seen on land were 7 adults (1 male, 6 females) and 5 pups (1 with an "orange" tag on the left front flipper) on Bogoslof Island. No fur seals were seen at sea.

One entangled juvenile sea lion of undetermined sex was seen on land at Billingshead Bight, Akun Island. It had a fragment of green trawl net around the neck. The animal was viewed from the cliff above the haul site but the size of the fragment or extent of entanglement could not be determined. No other entangled sea lions were observed during the study.

Estimates of the number of animals present were made at the time of the survey from the helicopter (or from land for Ugamak Island and Bogoslof Island). The estimated number of northern sea lions seen was 3,847 (seven pups tagged at Ugamak Island on June 26, 1985, were observed at Ugamak Island). For comparison, approximately 10,000 sea lions were counted in this area during June 1985. Three dead sea lion pups were seen at Bogoslof Island; cause of death was not determined. We also saw about 1,197 harbor seals (Phoca vitulina) and 197 sea otters (Enhydra lutris); no entangled harbor seals or sea otters were seen. Eight gray whales (Eschrichtius robustus) were seen near Unimak Pass moving in a southerly direction. The remains of an unidentified beaked whale, probably a female, were seen on the beach on the southwest end of Umnak Island. No specimens were collected.

DISCUSSION

The lack of sightings of entangled pup-of-the-year fur seals may be because 1) there were none to observe, 2) there were entangled animals but they did not haul out onto the shores of the eastern Aleutian Islands during our survey, 3) the entangled animals died before they were able to haul out, 4) there were entangled fur seals hauled out onto the beaches of the eastern Aleutian Islands but we did not see them, or 5) the entangled animals died ashore and were scavenged by foxes and eagles before we could observe them. However, no seal remains were observed in fox dens, net fragments on the beach, or other likely locations.

Because of the results of research on the Pribilof Islands during 1985, we know for certain that pup-of-the-year fur seals become entangled in net fragments and other debris, thereby eliminating option 1. In regard to 2, the lack of sightings of entangled fur seals and sea lions may have been related to the weather. On 15 November we surveyed parts of the Krenitzen Islands but had to stop because of darkness. That evening the wind increased to about 40 knots and blew steadily with gusts to 100 knots with rain for the next five days. We flew on the sixth day and found that most of the exposed beaches were "washed" clean of debris and that the water level was so high that many of the haul-out beaches were not accessible for the animals to haul out; many sea lions were forced to haul out onto the few exposed rocks and islets. It is therefore possible that many animals were still at sea during our survey and not available for counting. The opposite could also be argued. That is, the severity of the storm would have caused excessive metabolic costs on entangled animals forcing them to go to shore to rest. This is reasonable in the case of sea lions which need to expend energy to remain on the water surface and would go to shore to reduce their metabolic costs. However, fur seals are able to float and expend very little energy to remain on the surface and would not necessarily gain any advantage by swimming to shore to rest after the storm. Complicating this argument are observations in years past by Aleuts residing at Nikolski of entangled fur seals on Umnak Island. However, we talked to a few people at Nikolski during refueling of the helicopter on 22 November

and they had seen but 7-8 fur seals all year (none entangled in debris); they usually see "many" at this time of year.

Option 3 is possible but we have no way to gauge the level of mortality since no entangled corpses were found. Option 4 is also possible but unlikely. We had no difficulty observing individual harbor seals and sea otters during the survey and in most cases were flying low and slowly enough to observe animals on land and in the water near shore. We believe that if significant numbers of entangled fur seals were on or near land during our surveys, we would have seen them.

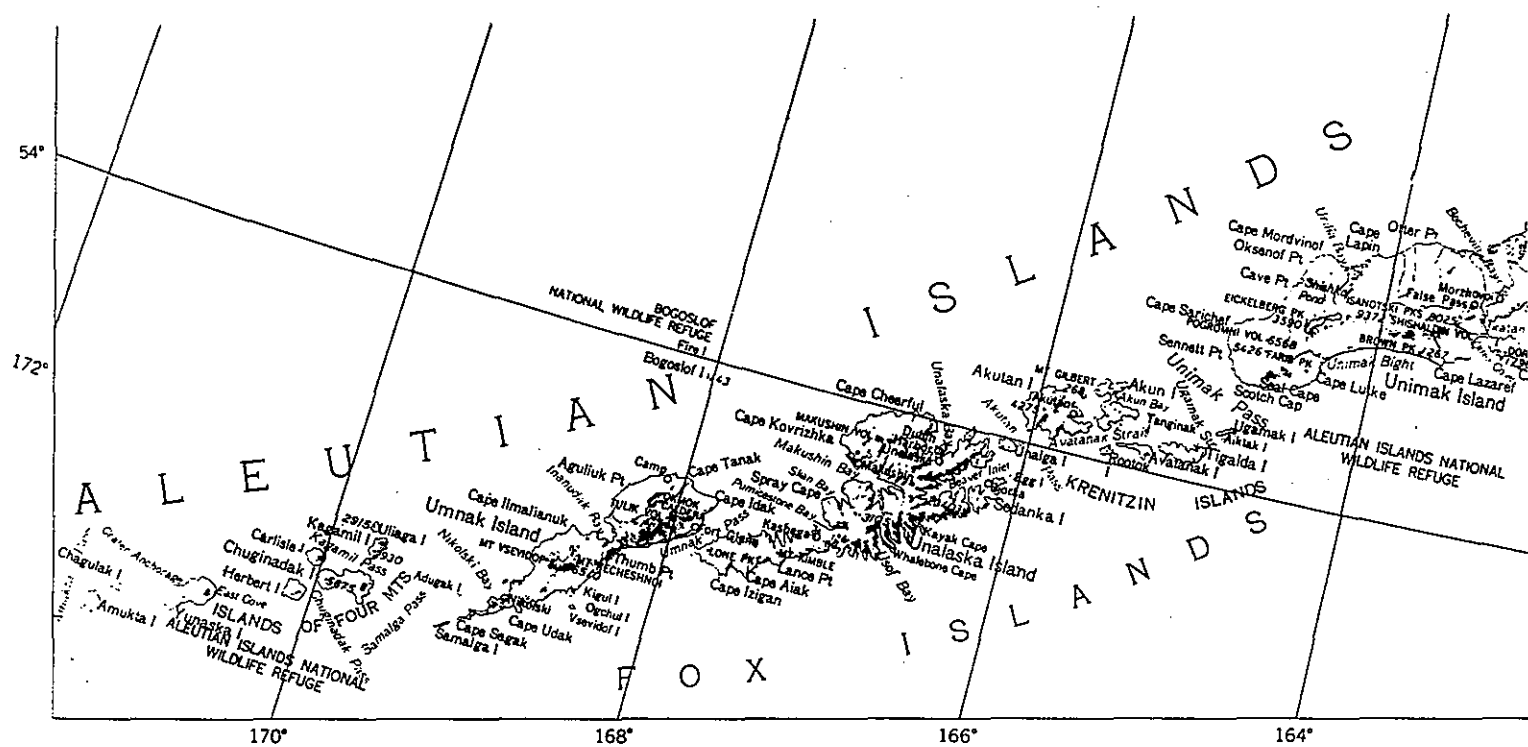


Fig. 2. Map of the eastern Aleutian Islands