

Chapter 7

COASTAL MARINE BIRDS AND MAMMALS

by

Dale R. Herter
LGL Alaska Research Associates, Inc.
505 W. Northern Lights Blvd., Suite 201
Anchorage, AK 99503

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SUMMARY

Small boats were used to survey coastal environments (within 1 km of the shore) not accessible to research ships. Several species or species groups of marine birds and mammals commonly found in the Unimak Pass area are largely restricted to these environments. Most (88 to 99 percent) of the coastline of the Krenitzin Island group (including Unalga and Baby Islands) was censused during the fall, winter, and spring seasons of 1986-1987. Pertinent findings included the following:

- (1) The total number of marine birds in coastal environments remained remarkably constant among seasons, but relative abundances of species varied dramatically among seasons, as follows:
 - Species reaching peak abundance during fall included cormorants, Black Oystercatcher, and Tufted Puffin.
 - Birds reaching peak abundance in winter included Red-necked Grebe, Emperor Goose, most seaducks, Bald Eagle, Mew Gull, Whiskered Auklet, and Horned Puffin.
 - Species reaching peak abundance in spring were Common Eider, Harlequin Duck, Red-breasted Merganser, Glaucous-winged Gull, murre, Pigeon Guillemot, and Ancient Murrelet.
 - Numbers of Horned Grebes, Peregrine Falcons, and Common Ravens were similar during all surveys.
- (2) Thirty-one seabird colonies and 16 active Bald Eagle nests were observed in the study area.
- (3) Steller sea lions were least common during winter, but numbers increased in spring and were highest in fall. At least nine haul-out areas were located. Historical records indicate that regional populations have declined since surveys began in 1957.
- (4) Harbor seals were present on every island surveyed. Haul-out locations were identified during each season. Numbers of animals seen at haul-outs and in the water were highest in spring and lowest in winter. Feeding habitat for harbor seals in the Unimak Pass area appears

limited in area when compared with available feeding habitat in the nearshore zone of the North Aleutian Shelf. This may account for the marked differences in numbers of hauled out animals observed between these two areas--less than 100 animals in the Unimak Pass area vs. thousands in the North Aleutian Shelf area.

- (5) Sea otters were present around all of the islands in the Krenitzin Island group, and densities observed in fall 1986 and spring 1987 exceeded those reported on any previous survey. Six areas were identified that had consistently large numbers of sea otters.

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INTRODUCTION

Several species or species groups of marine birds and mammals commonly found in the Unimak Pass area are largely restricted to coastal environments, generally within 1 km of shore. Pelagic surveys conducted from large research ships are often ineffective in sampling this component of the marine fauna because of the shallow water conditions favored by major faunal aggregations of some of these species (e.g, roosting flocks of birds, hauled-out groups of mammals, and mammal or bird feeding assemblages).

As part of the Unimak Pass study, small boat surveys were conducted to enumerate marine bird and mammal populations using coastal habitats in the Krenitzin Islands, including Unalga and the Baby Islands (Figs. 1 and 2), during each of the three pelagic sampling periods (fall, winter, and spring). In this section of the Unimak Pass report, we describe these coastal surveys and discuss the findings.

CURRENT STATE OF KNOWLEDGE

Coastal-oriented marine bird species or species groups common in the Unimak Pass region include grebes, cormorants, Emperor Goose, seaducks, shorebirds, gulls, and Pigeon Guillemot. Several marine mammal species are also largely restricted to this coastal zone. These include Steller sea lion, harbor seal, and sea otter. A brief discussion of these important species and species groups is presented below.

Grebes

The Horned Grebe is the most common grebe in the Krenitzin Islands area and is the only one discussed here. It breeds across the northern half of North America and in northern Eurasia, and winters in the Pacific from the Aleutian Islands south to Japan and California (AOU 1983). It is primarily a coastal marine species during the non-breeding period, at which time it occurs as scattered individuals or in small flocks in a variety of coastal habitats.

Cormorants

Three species of cormorants--Double-crested, Red-faced, and Pelagic--are common in coastal areas of the Krenitzin Islands. Individuals of these species are present year-round within the area. However, migrations of short distances do take place, particularly by the Pelagic Cormorant, the most northerly-breeding species. This species nests as far north as the central Chukchi Sea coast of Alaska, but retreats southward in fall as sea ice covers its nearshore feeding areas. Small numbers of Red-faced and Double-crested cormorants also nest in areas that are covered in winter by sea ice (e.g.,

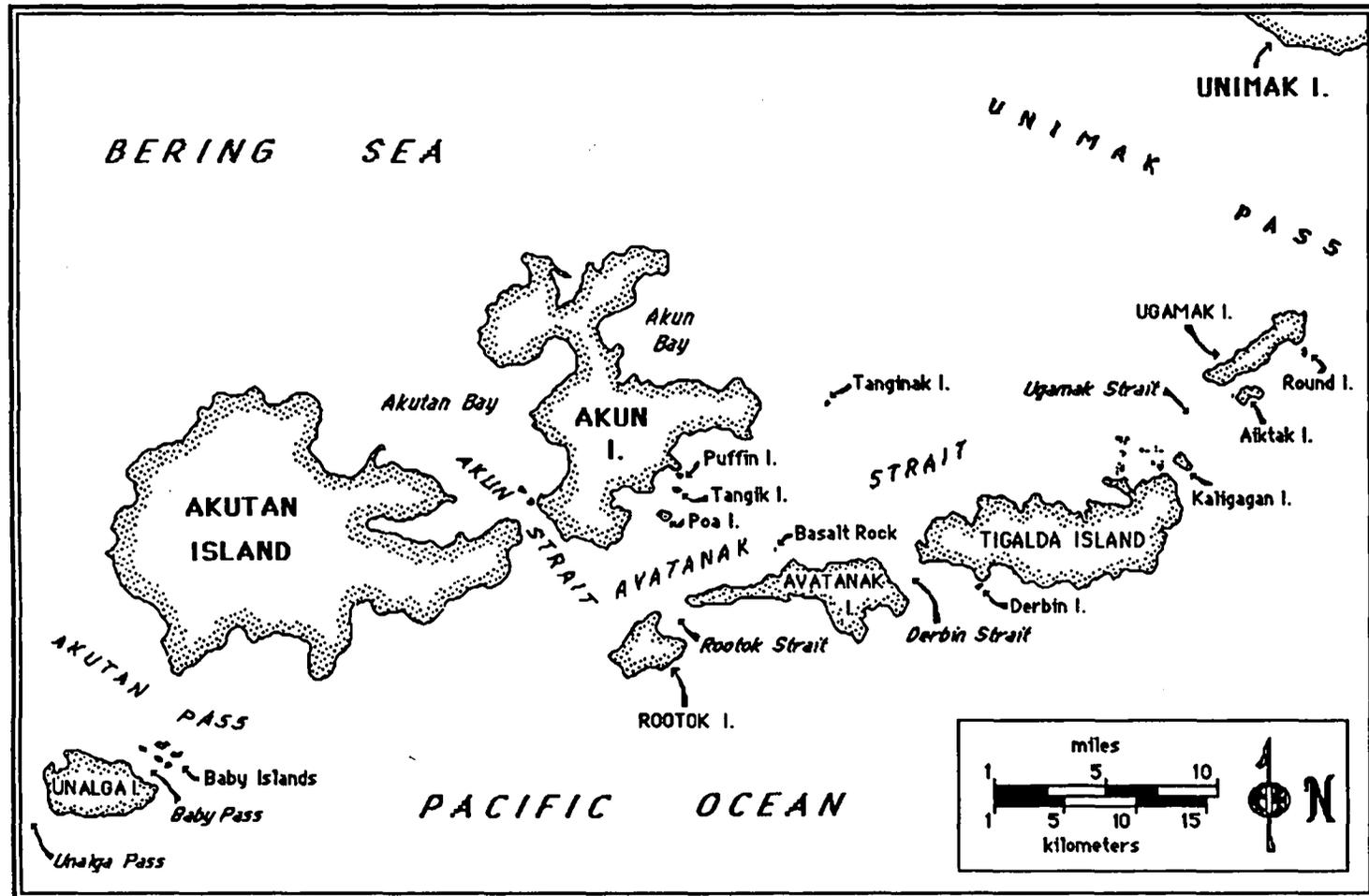


Figure 1. Place names of islands and passes in the Krenitzin Islands and adjacent islands sampled during coastal surveys, Unimak Pass area, Alaska.

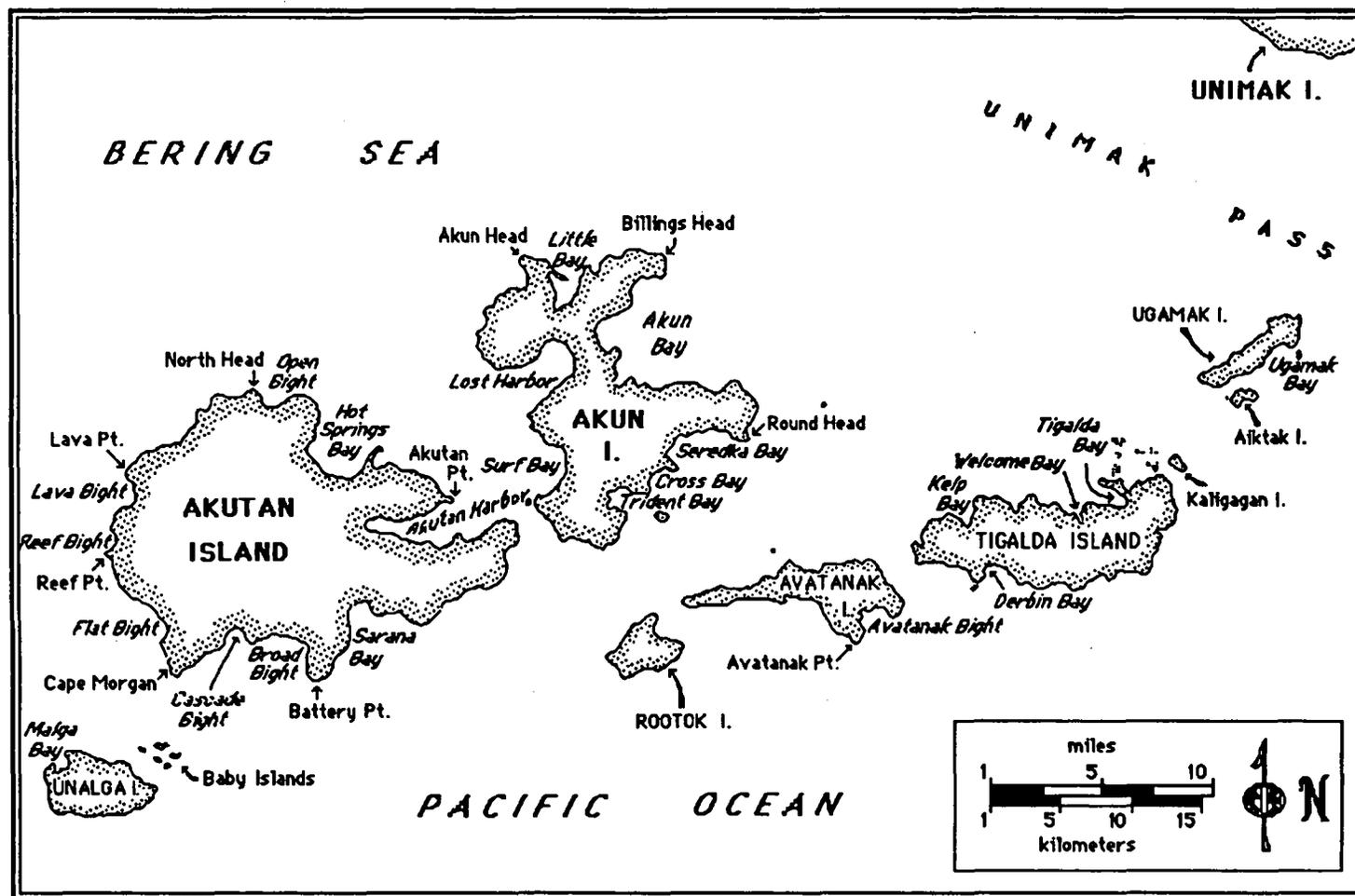


Figure 2. Place names of bays and points in the Krenitzin Islands and adjacent islands sampled during coastal surveys, Unimak Pass area, Alaska.

northern Bristol Bay) and may similarly migrate short distances southward in winter.

Cormorant numbers in the North Aleutian Shelf region adjacent to the Unimak Pass area varied only slightly among seasons in 1985-86 (LGL 1987: Table 6.3). Highest densities were recorded during the non-breeding period (October, January, and March). The North Aleutian Shelf, similarly to Unimak Pass, was not ice-covered in winter.

Emperor Goose

This goose breeds in western Alaska and northeastern Siberia in much the same kind of tundra habitat as other northern geese. However, unlike other geese, it spends the winter in marine habitats of the Aleutian Islands, the Alaska Peninsula, and the Kodiak Archipelago. Its diet in winter is not well known, but is believed to include marine algae and also benthic invertebrates from rocky substrates (Eisenhauer and Kirkpatrick 1977). Emperor Geese may be present in the eastern Aleutians in small numbers at any time of year; however, they are most common there from November through April.

Seaducks

Although the North Aleutian Shelf area immediately to the northeast of Unimak Pass provides good habitat for wintering seaducks (LGL 1987), the Krenitzin Islands appear to have far less suitable habitat. The North Aleutian Shelf is dominated by a broad, shallow nearshore zone with gravel, sand, or mud substrates and several large, shallow lagoon systems. The fine, unconsolidated substrates probably harbor large populations of molluscs (clams, mussels, etc.) and epibenthic crustaceans (primarily amphipods), important food for several species of seaduck (White-winged and Black scoters, and Common, King, and Steller eiders). Nearshore habitats in the Krenitzin Islands are characterized by a narrow band of shallow water with a steep bottom profile, rocky substrates, numerous kelp beds, and relatively few, small lagoons. These characteristics appear to limit the numbers and species of seaducks wintering there.

One of the most abundant species in the eastern Aleutians, and probably in the Krenitzin Islands, is the Harlequin Duck. This seaduck is common in the nearshore zone of these islands where it feeds on gastropod molluscs and other invertebrates commonly found on rocks and kelp fronds (Dzinbal and Jarvis 1984, LGL 1987). Unlike the large flocks typical of scoters and eiders, Harlequin Ducks are found most frequently as isolated individuals, in pairs, or in small flocks.

Shorebirds

The rocky shorelines common in the Krenitzin Islands are poor habitat for most shorebirds. In addition, the Aleutian Islands lie outside of the major migration pathways for shorebirds moving between arctic nesting areas and wintering sites in lower latitudes. Large migrating flocks of shorebirds typical of much of southern coastal Alaska do not regularly reach even the eastern Aleutians. The only species occurring regularly in the Krenitzin Islands--American Black Oystercatcher and Rock Sandpiper--are both permanent residents in rocky shoreline habitats.

Gulls

Two of the most common species of gull in the eastern Aleutians are Glaucous-winged Gull and Black-legged Kittiwake. These species are opportunistic feeders and, although abundant on the coast, can occur far out to sea.

The Glaucous-winged Gull is the most common coastally-oriented large gull species found in the Aleutians. Studies in the western Aleutians indicate these gulls are very opportunistic, feeding primarily on invertebrates, fish, and other seabirds, depending on the availability of prey (Trapp 1979). While largely resident within their range, a certain proportion of local populations may undergo seasonal movements (Butler et al. 1980).

Black-legged Kittiwakes are widely abundant in the Bering Sea, and frequently occur in coastal habitats where they nest on cliffs. Large flocks frequently roost in a variety of shoreline habitats, often with other gulls.

Pigeon Guillemot

The Pigeon Guillemot is by far the most coastally-oriented alcid in the Aleutian Island region. Pigeon Guillemots feed in shallow nearshore waters, and generally occur as isolated individuals or in small flocks (rarely numbering into the hundreds or thousands) along rocky coasts. The Aleutian Islands provide prime habitat for this species, which nests in crevices on cliffs or under beach boulders (Nysewander et al. 1982). Pigeon Guillemots feed primarily on a variety of small fishes caught in kelp beds and other nearshore habitats (Sowls et al. 1978).

Steller Sea Lion

Although Steller sea lions cross large expanses of open water (such as the Gulf of Alaska) on migrations, they are typically found close to shore throughout their North Pacific range. This species breeds in large rookeries, generally on gravel or sand beaches.

Fifty-one rookeries (haul-outs) of this species have been identified throughout its range (Loughlin et al. 1984). Haul-out sites may be on beaches or rocky islands and headlands, frequently near productive feeding areas. Two of these presently occur in the Krenitzin Islands, one on eastern Ugamak Island and one at Cape Morgan, Akutan Island. Other haul-outs are known and have been previously censused in the Krenitzins. A decline in numbers of sea lions in the eastern Aleutian Islands over the last few decades has been documented (Braham et al. 1980, Loughlin et al. 1984).

Harbor Seal

This pinniped is present in coastal Alaska from the central Bering Sea throughout the Aleutian Islands and the Gulf of Alaska. Harbor seals prefer coastal habitats, feeding in shallow waters and hauling out on sand or mud bars, or on rocks and reefs exposed at low tides. The populations in the eastern Aleutian Islands are much smaller than those farther east along the north shore of the Alaska Peninsula (LGL 1987). No large haul-outs are known in the Krenitzin Islands, though several sites consistently used by small numbers of animals were identified in this area by Everitt and Braham (1980) who reported a maximum count of 2,208 harbor seals in the Krenitzin Islands in August 1976.

Sea Otter

Sea otters, though once abundant throughout the Aleutian Islands, were heavily harvested during the 1800s for their fur. By the early 1900's the fur trade had reduced their populations to a few small colonies in the eastern Aleutians, one on the north side of Unimak Island and several smaller groups in the Fox Islands (Schneider 1981). During the following 70 years (up to 1980) sea otter populations increased remarkably in the eastern Aleutian Islands, but some vacant or only partially repopulated habitat remains. All islands in the Krenitzin Islands group contained sea otters by 1976-77, but known breeding concentrations were recognized only in the Tigalda/Ugamak Island area.

METHODS

Habitats used by coastal marine birds and mammals in the eastern Aleutian Islands are probably most efficiently censused by air or small boats, and each method has its advantages and disadvantages. Aerial surveys, although fast and efficient in covering large areas, result in population estimates that are frequently biased because small body size or elusive habits make some species difficult to census from the air. Surveys by small boat can be more time-consuming and are affected to a greater extent by weather, but use of boats can bring observers closer to the animals being censused and allows the observers to stop to count large aggregations. Coastal censuses via

small boat in Sweden have recently been shown to provide results highly correlated with relatively accurate shore-based counts of gulls and waterfowl (Haldin and Ulfvens 1987).

Because of the relative accuracy of boat surveys, and because we had ready access to several types of small boats based aboard the R/V *Miller Freeman*, we conducted small boat coastal surveys. Details of these surveys follow.

During each of the R/V *Miller Freeman* cruises (fall, winter, spring), we deployed one of the three small boats on board to conduct coastal surveys near the Krenitzin Islands. Surveys took 6-8 days to complete and required most of each daylight period (Figs. 3, 4, and 5).

Surveys were dependent on weather and sea conditions. We were unable to obtain complete coverage in any study period due to rough weather; nonetheless, we surveyed from 88 to 99 percent of the coastline of the Krenitzin Islands (including Unalga and the Baby Islands) during each period. The circumferences of all islands surveyed are given in Table 1. Total distances surveyed in each of the three study periods were: Fall—461 km; Winter—406 km; and Spring—448 km.

Two types of boat were used to conduct coastal surveys; the type used during each survey depended on weather conditions, the tasks to be completed, and the mechanical condition of the boats. We conducted surveys on 14 days (out of 21 survey days) in an 8-m aluminum-hull launch equipped with an inboard V-6 diesel engine and small cabin. The survey party consisted of one observer and three crew members who were responsible for operation of the boat. We conducted the remaining surveys in a 5-m inflatable boat, equipped with a fiberglass hull and 70 hp outboard engine. Surveys using this craft required only the observer and a driver.

The survey format consisted of a belt transect, the width of which extended seaward from the coast approximately 200 m and landward of the coast about 10 m. We counted all birds and mammals observed in this area. Obvious aggregations of birds and mammals farther offshore and on the tundra were also noted, but were recorded as off-transect sightings. The survey boat proceeded at a slow, consistent speed parallel to land at a distance of approximately 100 m. We were forced to vary the boat's distance from shore on numerous occasions due to submerged rocks and dense beds of kelp (*Alaria* sp. and *Nereocystis* sp.), but the area surveyed did not change.

Observations were recorded on a portable tape recorder. Observers noted the species, number of individuals, age and sex (if possible), behavior (e.g., swimming, flying, diving, roosting, hauled-out), and habitat (e.g., type of beach substrate, cliff, offshore rock, kelp bed, open water). Additional

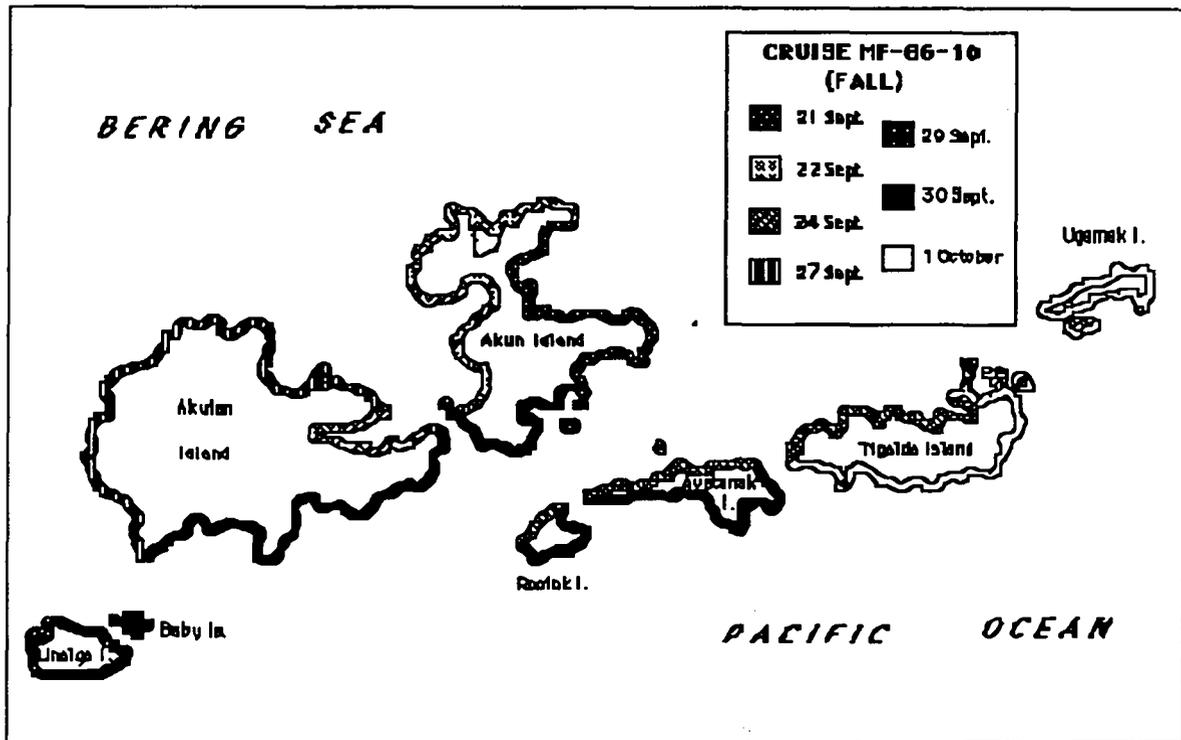


Figure 3. Dates and locations of coastal transects in fall 1986.

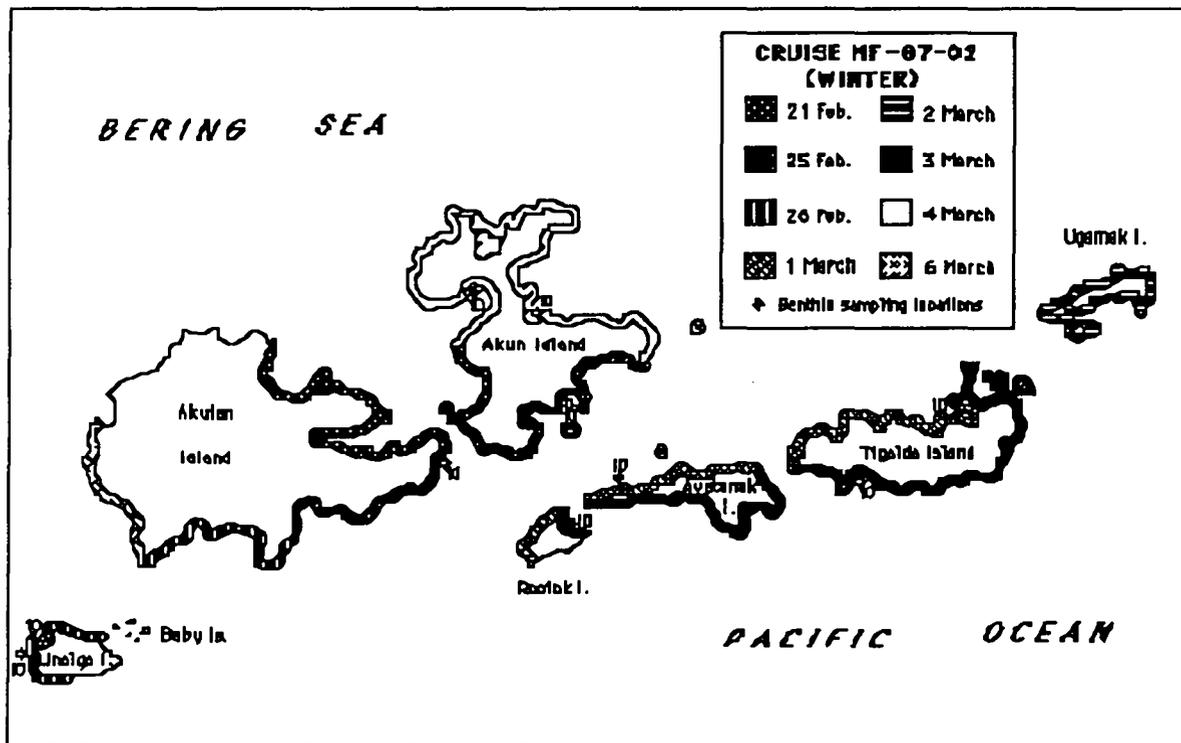


Figure 4. Dates and locations of coastal transects in winter 1987.

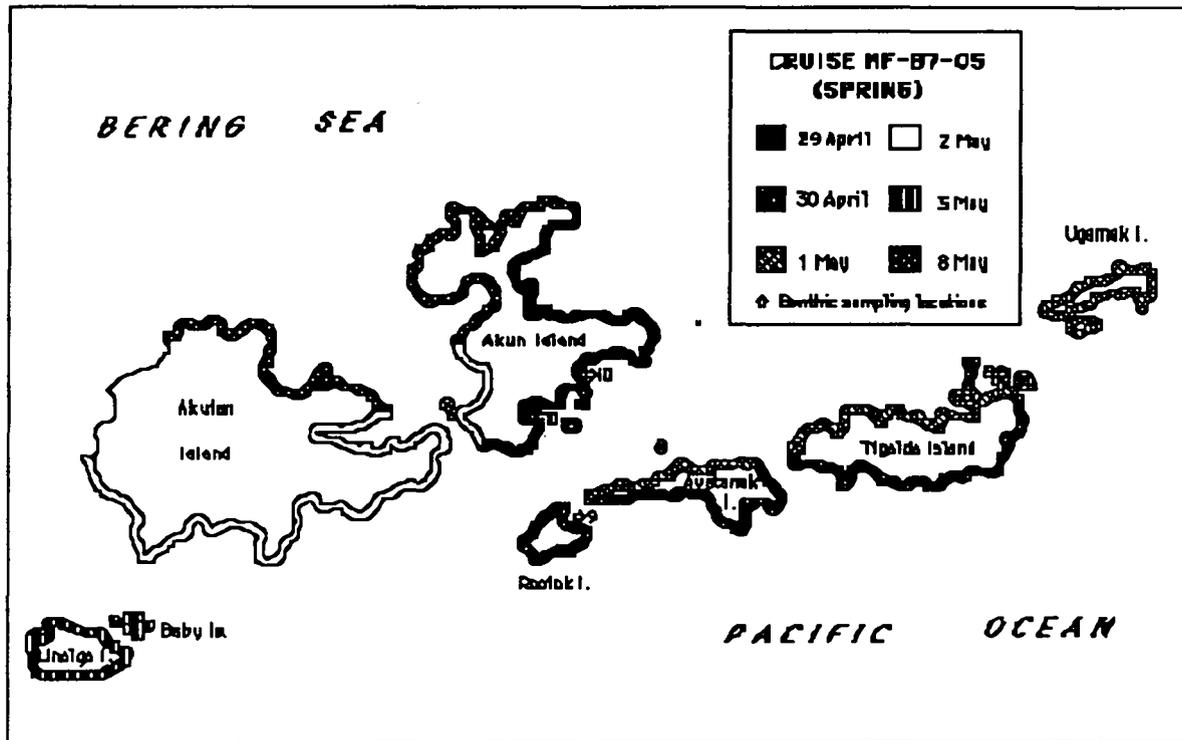


Figure 5. Dates and times of coastal transects in spring 1987.

Table 1. Approximate circumferences of the islands and island groups surveyed by small boat.

Island	Circumference (km)
Unalga	30.8
Baby Islands	11.5
Akutan	117.7
Akun (Includes Poa, Tangik, Puffin, and Tanginak Islands, and two islands near Akun Strait)	125.3
Rootok	17.7
Avatanak	43.8
Tigalda (Includes Kaligagan and Derbin Islands and islets northeast of the main island)	85.4
Ugamak (Includes Aiktak and Round Islands)	31.1
Total	463.3

information, coded later onto computer forms, included start and end times, weather and sea conditions, and tidal stage.

To match sighting records geographically among surveys, observations were recorded within 252 subsections (segments) of the coastline. Each segment was approximately 0.5 km in length, and was identified in the field by orienting to recognizable coastal features. We mapped these segments during the first study period and used identical maps during each succeeding survey, recording and coding observations within these segments.

Among-season comparisons of bird and mammal populations were based on sightings from only those coastline segments sampled all three seasons. Segments of coast sampled during only one or two cruises (Fig. 6) were excluded from these comparisons.

RESULTS AND DISCUSSION

Most species of marine birds and mammals utilizing the coastal zone of the Krenitzin Islands varied in abundance among the three seasons of the study (Table 2). Numbers recorded (Table 2) represent minimum estimates of abundance, because some individuals of all species were probably missed during surveys (individuals seen off the transect are not included in Table 2.). Numbers of very small birds (e.g. rock sandpipers, most passerines) are probably appreciably under-represented because of the difficulty in detecting them on shoreline substrates.

Discussions of the major groups of birds and marine mammals encountered during the surveys are presented below.

Marine Birds

Total numbers of birds observed during the Krenitzin Island coastal surveys were remarkably similar among seasons (Table 2). This was not necessarily expected, because seasonal proportions of many species varied dramatically. Species or species groups that peaked in abundant in the fall included cormorants, Black Oystercatcher, and Tufted Puffin. Those reaching peak abundance in winter included Red-necked Grebe, Emperor Goose, most seaducks (except Common Eider, Harlequin Duck, and Red-breasted Merganser), Bald Eagle, Mew Gull, Whiskered Auklet, and Horned Puffin. Those reaching peak abundance in spring included the breeding seaducks, Glaucous-winged Gull, murre, Pigeon Guillemot, and Ancient Murrelet. Only a few species (Horned Grebe, Peregrine Falcon, and Common Raven) were nearly equally abundant during fall, winter, and spring surveys.

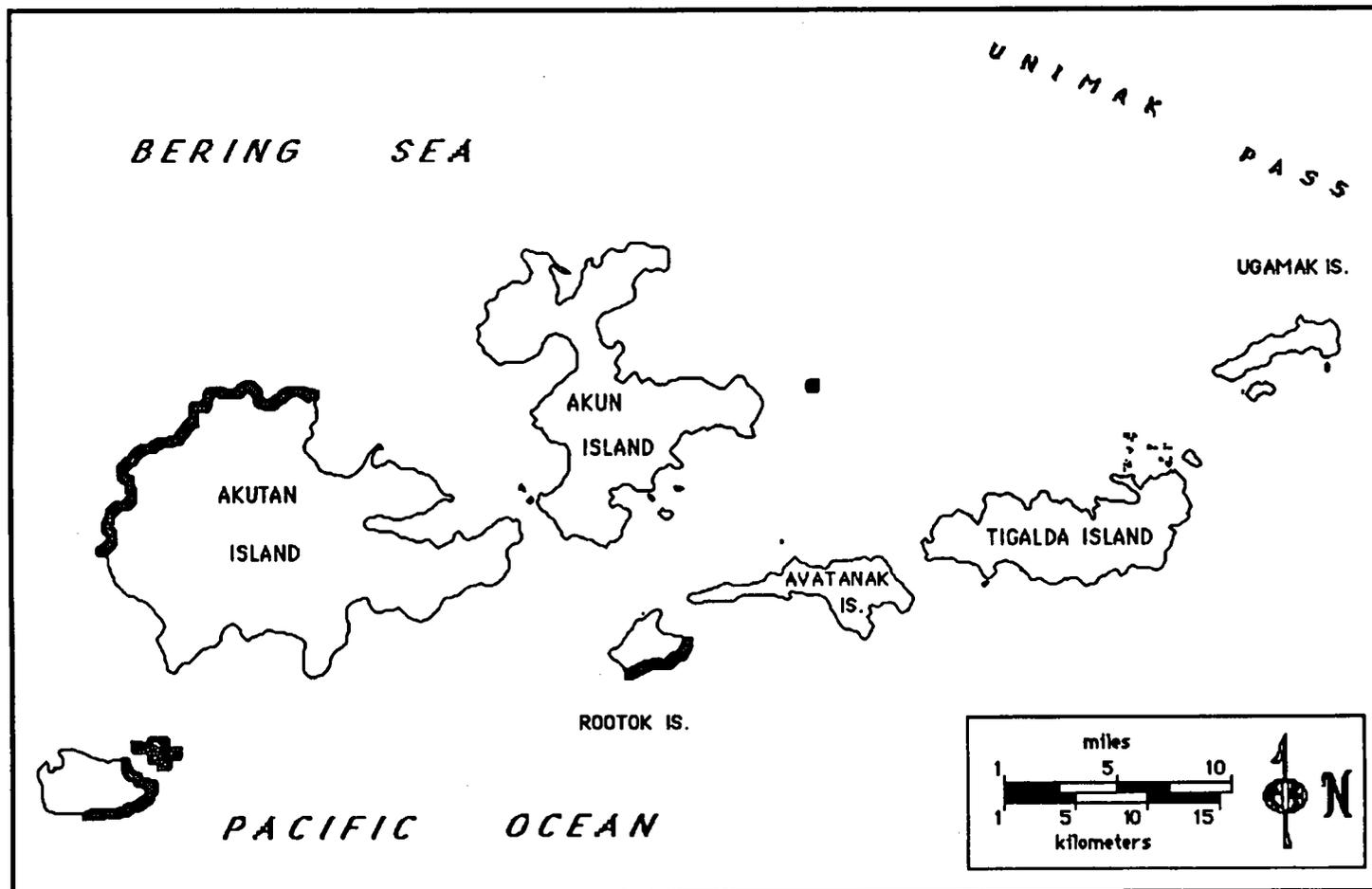


Figure 6. Portions of the coastline of Krenitzin Islands not surveyed on every cruise (shaded). Comparisons of counts between surveys do not include any transect segments in these areas.

Table 2. Numbers of birds and mammals seen within the coastal zone of the Krenitzin Islands (Unalga I. to Ugamak I.) during coastal surveys. Only sightings for those transects sampled during all seasons are included.

Species	Fall	Winter	Spring
Red-throated Loon	1	0	0
Pacific Loon	7	0	0
Common Loon	3	1	0
Yellow-billed Loon	0	0	1
Unidentified Loon	0	7	0
Horned Grebe	31	37	44
Red-necked Grebe	2	15	1
Western Grebe	1	0	0
Double-crested Cormorant	470	313	722
Pelagic Cormorant	160	1310	767
Red-faced Cormorant	838	58	940
Unidentified Cormorant	3121	1128	218
Emperor Goose	444	1457	18
Brant	0	0	1
Canada Goose	0	0	9
Green-winged Teal	63	45	12
Mallard	20	48	8
Northern Pintail	8	0	22
Northern Shoveler	0	0	6
Greater Scaup	0	5	1
Common Eider	39	102	117
King Eider	9	1208	101
Steller's Eider	86	1441	0
Unidentified Eider	7	0	8
Harlequin Duck	3948	3347	6426
Oldsquaw	0	140	4
Black Scoter	64	1385	48
Surf Scoter	0	2	0
White-winged Scoter	90	460	102
Common Goldeneye	0	20	2
Bufflehead	0	137	23
Red-breasted Merganser	14	29	36
Total Non-resident Seaducks	256	4794	288
Bald Eagle	75	232	192
Rough-legged Hawk	0	0	9
Golden Eagle	0	1	0
Peregrine Falcon	6	6	3
Unidentified Ptarmigan	0	0	2
Black Oystercatcher	247	75	165
Rock Sandpiper	18	33	2
Mew Gull	7	105	0
Herring Gull	1	0	0
Glaucous-winged Gull	5641	3136	7951
Black-legged Kittiwake	3251	0	16

Table 2, cont.

Species	Fall	Winter	Spring
Common Murre	35	12	1
Thick-billed Murre	0	3	3
Unidentified Murre	21	70	300
Pigeon Guillemot	173	174	1541
Marbled Murrelet	6	1	0
Ancient Murrelet	0	0	312
Cassin's Auklet	0	1	1
Crested Auklet	0	4	0
Whiskered Auklet	22	6618	923
Rhinoceros Auklet	1	0	0
Tufted Puffin	1263	2	2
Horned Puffin	7	15	3
Common Raven	63	56	66
Winter Wren	0	0	3
Song Sparrow	0	12	27
Snow Bunting	0	53	0
Rosy Finch	0	90	1
Total Birds	20,268	23,397	21,161
Sea Otter	466	322	627
Arctic Fox	1	0	2
Red Fox	2	4	5
Steller's Sea Lion	5248	1361	1419
Harbor Seal	356	187	513
Cattle	0	18	4
European Rabbit	0	0	13
Total Marine Mammals	6090	1874	2936

Loons

Loons were uncommon in the coastal zone of the Krenitzin Islands (Table 2). All four of the common North American species (Red-throated, Pacific, Common, and Yellow-billed) identified on coastal surveys were present in very low numbers. Loons are difficult to identify to species when in winter plumage, and were usually too wary to be approached closely with survey boats. The lack of large numbers on pelagic transects (see Chapter 5: MARINE BIRD ABUNDANCE AND HABITAT USE, this volume) indicates that the Krenitzin Islands/Unimak Pass area is not an important area for loons during the non-breeding period.

Grebes

Three species of grebes were found in the coastal zone. The single Western Grebe seen at Akun Bay (and possibly again at Beaver Inlet) represents a casual occurrence only (the second for the Aleutian Islands--Gibson et al. 1987a). A small influx of Red-necked Grebes occurred in winter (Table 2), but likewise were uncommon. The most common grebe was the Horned Grebe.

Horned Grebes appeared as single individuals or in pairs throughout the study area and were found most frequently in kelp beds or protected bays. Numbers observed did not fluctuate greatly among seasons. Because of the relatively small size and secretive nature of Horned Grebes, some individuals undoubtedly went undetected during each survey.

Cormorants

The three cormorant species are difficult to distinguish from each other, and so numbers of "unidentified cormorants" recorded was large (Table 2), particularly in fall and winter. The ability to distinguish species increased from fall to spring as distinctive breeding plumages were attained. Double-crested Cormorants, because of their larger size, were the easiest of the three to identify, and so most of the unidentified cormorants were probably Pelagic and Red-faced.

Cormorants were among the most common of marine birds using the coastal zone of the Krenitzin Islands; only Harlequin Ducks and Glaucous-winged Gulls were consistently present in equal or greater numbers. Largest numbers of cormorants were present in fall, partly because the surveys were conducted in early fall when breeding birds and their young were probably still present in the area.

Three cormorant species breed in the Krenitzin Islands (Sowls et al. 1978). Spring surveys for all cormorants took place during the initial phases of nesting, so that most of the year's breeders were probably present.

The Double-crested Cormorant is at the westernmost limit of its breeding range in the Fox Islands (of which the Krenitzin Islands are the easternmost group). It appeared to be the least common cormorant species in the Krenitzins in spring. In contrast, Nysewander et al. (1982) found it to be slightly more abundant than the Pelagic Cormorant in the entire Fox Islands group.

We found Pelagic Cormorants to be fewer in number than Red-faced Cormorants in the Krenitzin Islands in spring when nesting was underway, as did Nysewander et al. (1982). Pelagic Cormorants appeared to increase in abundance in the fall and to a greater extent in winter (Table 2). The breeding distribution of this species extends well north of the Krenitzin Islands into areas ice-covered during the winter. Considerable numbers may move south into the Unimak Pass area in winter.

The Red-faced Cormorant was probably the most common breeding cormorant in the Krenitzin Islands. Its winter numbers were very low compared with its numbers in spring and fall, and compared with winter numbers of the other species. Causes of winter scarcity are speculative. Cormorants seen in winter in nearby areas away from the coast were usually identified as Red-faced, so lower numbers seen at the coast may have been caused simply by increased pelagic feeding by this species in winter. Alternatively, high concentrations of Red-faced Cormorants seen in the North Aleutian Shelf nearshore zone (northeast of the Unimak Pass area) from October to March (LGL 1987) may represent a partial winter exodus from breeding areas in the eastern Aleutians.

Emperor Goose

As expected, the highest counts of Emperor Geese were obtained during the winter survey. The Krenitzin Islands are within the winter range of this species, and appear to contain winter habitat, although what constitutes important winter habitat has never been well-defined. Locations of wintering flocks (Fig. 7) indicated that Emperor Geese preferred rock ledges and boulder or rock beaches. They occurred in small flocks and were often seen in association with a bright green alga that grows on wave-washed rocks.

Other Geese

Other geese (one Brant and nine Canada Geese) were seen only in spring. As was the case with shorebirds and dabbling ducks, the eastern Aleutians are outside of major flyways and staging areas for these common continental migrants. The Canada Geese we observed flying over Kaligagan Island may have been Aleutian Canada Geese, an endangered subspecies; however, a positive identification was not obtained.

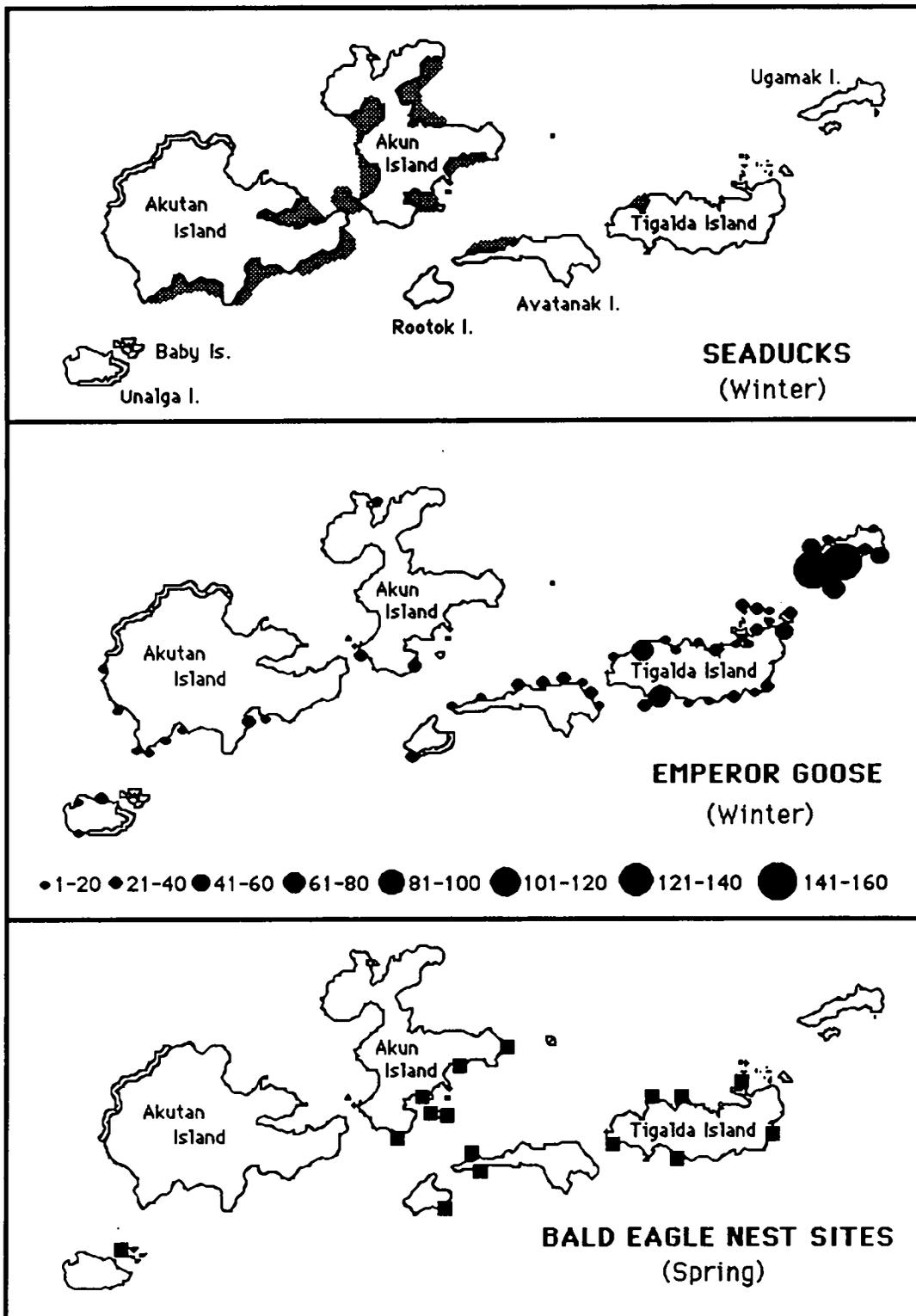


Figure 7. Locations of wintering sea duck concentrations, wintering Emperor Goose sightings, and Bald Eagle nest sites in the Krenitzin Islands. Outlined areas were not surveyed.

Dabbling Ducks

Mallards and Green-winged Teal were observed using coastal habitats at several of the islands surveyed in fall and winter. All of the closely observed teal were of the Aleutian race *Anas crecca nimia*. Both species appeared to prefer lakes and ponds near the coast, but resorted to saltwater habitats if ponds were frozen. These species were least common in spring, possibly because the main movement to inland nesting areas had begun prior to surveys.

Seaducks

Twelve species of seaducks (tribe Mergini) were identified during coastal surveys. Counts were highest during the winter period for all except the locally-breeding species which included Common Eider, Harlequin Duck, and Red-breasted Merganser. Non-resident species included King Eider, Steller's Eider, Oldsquaw, Black Scoter, Surf Scoter, White-winged Scoter, Common Goldeneye, and Bufflehead. These species tended to concentrate in several of the larger bays within the Krenitzin Islands (see Fig. 7). Notable exceptions were King Eiders and White-winged Scoters, which were frequently found in large flocks (100-200 birds) in nearshore waters immediately offshore of headlands, such as north of Unalga Island, southeast of Akutan Island, off the north side of Akun Island, and northeast of Avatanak Island (Fig. 7).

The Harlequin Duck was the most abundant of the resident species; it was one of the most widespread and conspicuous birds in the coastal zone. These birds were typically found as isolated individuals, pairs, or small flocks of under 10 birds. Harlequin Ducks inhabited all major coastal habitats, including kelp beds and open waters adjacent to substrate types ranging from gravel beaches to rock ledges and cliffs.

Harlequin Ducks observed during the fall surveys appeared to be flightless, and birds obviously lacking flight feathers occasionally were observed. Males may have been still flightless by the time of the surveys (molt occurs from July through September), but it is more likely that most of the molters were breeding females, in which molt occurs from August through October (Cramp and Simmons 1977).

Fall and winter abundances of Harlequin Ducks in the Krenitzin Islands were similar, but numbers increased in spring. The Aleutians are known to be an important wintering area for this species (Palmer 1976), and the high numbers in spring may have been caused partly by migrants on their way from the central and western Aleutians to inland breeding areas in northwestern North America.

Common Eiders and Red-breasted Mergansers were present in small numbers throughout the study area. Common Eiders were seen consistently among the Baby Islands; they have been reported to nest there (Nysewander et al. 1982). Mergansers were located consistently along the north shore of Tigalda Island.

Raptors

By far the most abundant raptor present in the coastal zone of the Krenitzin Islands was the Bald Eagle. Highest numbers were counted in winter, and the general influx of birds at this season appeared to last through spring (Table 2). Counts of eagles (and other raptors) were affected by the behavior of the birds. Birds that flushed from perches or that were first observed in the air were easily noted, but some perched birds (particularly those high up on coastal cliffs) may have been missed because the observer's attention was focused on detecting birds on the water and adjacent beaches.

Wintering eagles were attracted to carrion and fish-processing wastes in the Krenitzin Islands. A group of 40 eagles occurred in the vicinity of recently slaughtered cattle on the beaches of Trident Bay, Akun Island, on 25 February 1987. In addition, a concentration of 66 eagles was noted at Lost Harbor, Akun Island, where a fish processing ship was in operation on 4 March.

By the time of the spring survey, many Bald Eagles had initiated nests in the Krenitzin Islands (Fig. 7). Nests were almost invariably placed at or near the tops of sea stacks that were at least somewhat isolated from the mainland of the islands. Again, some nest sites were almost surely missed due to their elevation above the shoreline.

Other raptors observed included Rough-legged Hawk, Golden Eagle, and Peregrine Falcon. Rough-legged Hawks seen in spring were probably local breeders and/or migrants moving to breeding areas farther down the Aleutian chain. Two Golden Eagles (an immature on Avatanak Island on 1 March, 1987, and an adult on Tigalda Island on 3 March) were at the southwestern limit of the species' range in North America (Gibson et al. 1987b). Peregrine Falcons were regularly observed, but many could have been missed if they failed to flush as the survey boat passed. All of the individuals that were observed closely appeared to be of the dark coastal resident race *Falco peregrinus pealei*.

Shorebirds

Only two species of shorebird--Black Oystercatcher and Rock Sandpiper--were observed during the coastal surveys. Oystercatchers usually occurred in small flocks in fall and winter, but by spring had dispersed into isolated (presumably breeding) pairs. Flocks of oystercatchers were most frequently

seen in areas with extensive tidal reefs, such as the south sides of Unalga, Rootok, and Ugamak islands, the east side of Tigalda Island, and along Akun Strait.

Black Oystercatchers were probably more reliably censused than Rock Sandpipers because of their larger size and loud calls. Undoubtedly many more Rock Sandpipers were present than were seen during surveys. They are common winter residents over most of the Aleutians (Gabrielson and Lincoln 1959).

Gulls

Only three species of gull--Mew Gull, Glaucous-winged Gull, and Black-legged Kittiwake--occurred in any numbers in the Krenitzin Islands. Mew Gulls were primarily winter visitors in the area; they appear to reach the southwestern limit of their range in Alaska in the Krenitzin Islands (Gabrielson and Lincoln 1959). Almost all (103 of 105) of the individuals seen in winter were among groups of Glaucous-winged Gulls and Bald Eagles gathered near a floating fish processor anchored in Lost Harbor, Akun Island. All these birds were attracted to the fish offal associated with this processor.

The Glaucous-winged Gull was one of the most abundant species found in the coastal zone of the Krenitzin Islands. The highest count occurred in spring when locally-breeding birds were initiating nests (Fig. 8). The lower numbers seen during winter may have reflected local movement offshore or possibly movement farther south at this time of year. Individuals of this species banded at colonies in coastal British Columbia showed a tendency to disperse southward in autumn (Butler et al. 1980). In the nearby North Aleutian Shelf, Glaucous-winged Gulls declined in abundance in winter and used deeper waters than during the breeding periods (LGL 1987).

As was observed on the adjacent North Aleutian Shelf (LGL 1987), Black-legged Kittiwakes were absent from Unimak Pass during the winter. They were seen again during April-May surveys, and were still common in large roosting flocks along the shore of the Krenitzin Islands in late September-early October.

Alcids

Although a wide variety of alcids was seen on the coastal surveys, these birds were also observed outside of the coastal zone, as confirmed by results of the shipboard transects (see Chapter 5: MARINE BIRD ABUNDANCE AND HABITAT USE, this volume). This tendency to range widely suggests that comparisons of coastal abundances of these species between survey periods must be viewed with caution.

The Pigeon Guillemot preferred shallow coastal waters and so was rarely detected during shipboard transects. Guillemots were seen throughout the study area and were most often observed as scattered individuals, pairs, or small flocks. The large numbers observed in spring probably reflected the return of breeding birds. It is not known where these birds spent the fall and winter.

Other alcid species also showed seasonal peaks in abundance. The high numbers of Tufted Puffins seen on the coastal surveys in fall (Table 2) reflected the presence of breeding birds near colony sites (see Fig. 8). Adults carrying fish into colonies were regularly observed at this season, but insufficient time was spent at each colony to estimate numbers of puffins using the sites.

The relatively high numbers of Whiskered Auklets observed in winter on coastal surveys may reflect only a slight seasonal habitat shift. In winter this species appeared throughout the Krenitzin Islands in small coastal flocks at tide rips and in areas of converging currents near almost all straits and passes. In spring and fall, birds were found in the same straits and passes, but farther from land.

Passerines

The most conspicuous and easily-censused passerine in the Krenitzin Islands was the Common Raven. This resident species was seen in similar densities at all seasons and on all major islands. As was noted for raptors, many individuals that were perched were probably missed unless flushed by the boat. Other passerines were too small to be censused reliably, although the high numbers of several resident species observed in spring probably was caused in part by their greater detectability at this season because of singing by adult males. During the February-March surveys, wintering flocks of Snow Buntings and Rosy Finches were evident against the snow-covered tundra.

Marine Mammals

Steller Sea Lion

Sea lions historically have hauled out at several sites throughout the Krenitzin Islands (Fig. 9), but their numbers in this region appear to have declined since population surveys began in 1957. We occasionally recorded this species on pelagic transects conducted from the R/V *Miller Freeman*, but the majority of sightings were made during the coastal small boat surveys.

Numbers of sea lions observed during the coastal surveys were lowest during winter. Numbers increased slightly in spring and were at their highest

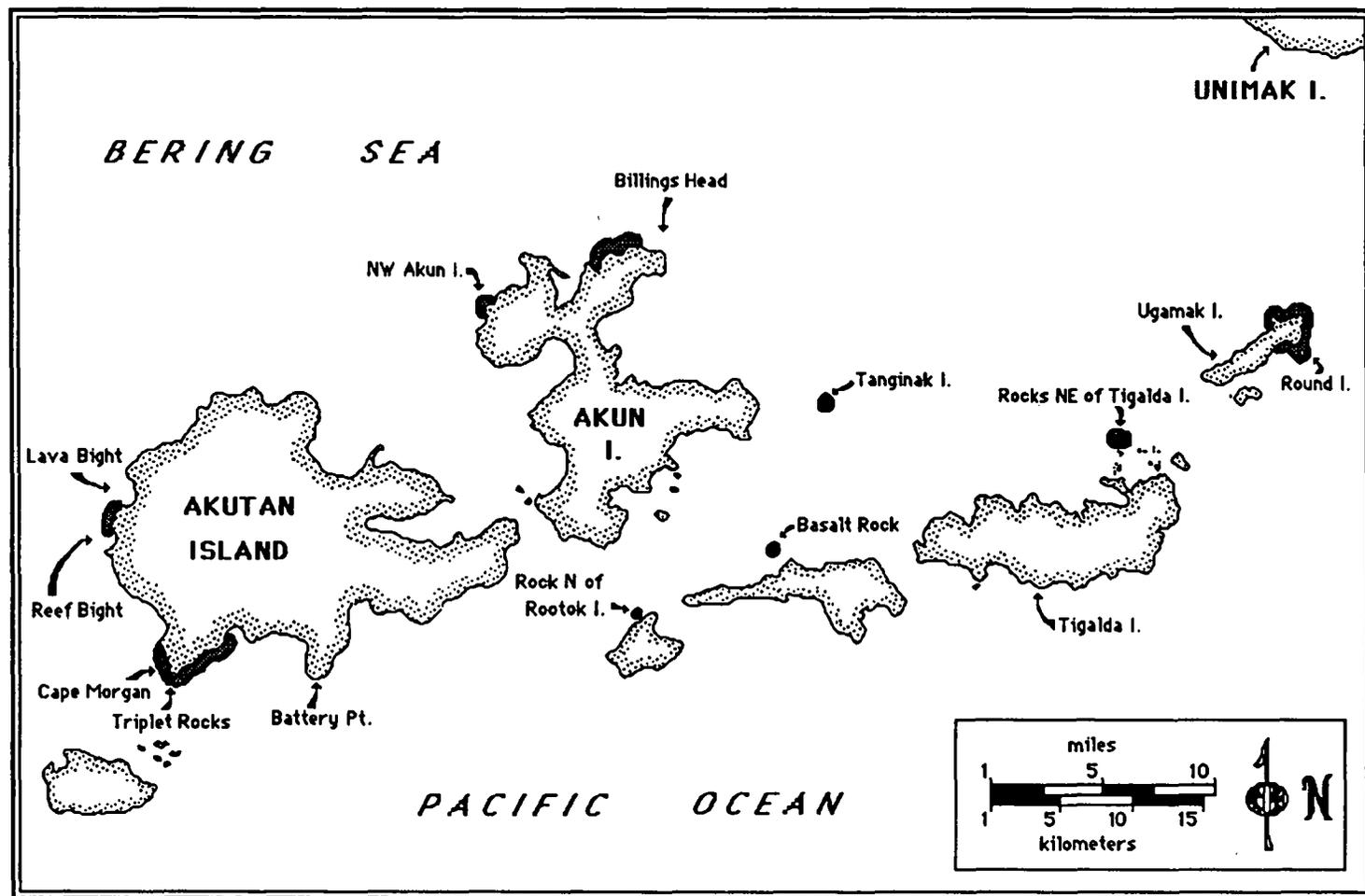


Figure 9. Locations of haulouts of Steller's sea lions in the Krenitzin Islands, Unimak Pass area, Alaska.

levels in fall (see Table 2). In all seasons, most of the sea lions observed were hauled out. A slightly lower percentage of sea lions were seen in the water in fall (5%) than in winter (8%) or spring (9%).

Reasons for the differences in observed population levels (i.e., greater numbers in fall than in winter or spring) may be two-fold. Migration of sea lions to areas farther south has been shown to occur during the breeding season (Loughlin et al. 1984), therefore absolute numbers in the Krenitzin Islands may decline annually during winter and early spring. Also, sea lions generally do not re-occupy rookery sites (where they are most easily observed) in spring until late May to June.

Table 3 provides historical maximum counts of all age classes of sea lions at several haul-out locations in the study area, along with data from this study for comparison. Counts in October 1957 at Cape Morgan (including Reef and Lava bights) and Ugamak Island (including Round Island) were both more than an order of magnitude higher than our 1986 counts in late September (Cape Morgan) and early October (Ugamak). Also, counts we made at these two locations were lower by 10 or 12 percent than those made in October 1976. Despite the many factors that can affect the reliability of counts, the data suggest that population levels of sea lions may still be declining, though perhaps not as rapidly as between the mid-1950s and 1970's.

Harbor Seal

Unlike sea lions, harbor seals were present on every island of the Krenitzins. They were most frequently encountered as solitary individuals swimming near the shore. Those hauled out were mostly in small groups (<10 animals) at numerous and seasonally varying locations along the coast. Occasional small congregations occurred near apparently favored haul-out sites, but these rarely involved more than 20 seals. No haul-outs contained more than 100 animals, which contrasts with the North Aleutian Shelf area where thousands of seals have been documented at haul-out sites (LGL 1987). The deep nearshore waters and steep bottom profiles around the Krenitzin Islands provide less feeding habitat for the harbor seal than do the extensive lagoons, bays, and shallow nearshore zone characteristic of the North Aleutian Shelf.

Numbers of animals seen at haul-out sites and in the water were highest in spring and lowest in winter. Aerial surveys by Everitt and Braham (1980) indicated that numbers of hauled out seals generally increased from June to August as the animals underwent molt. The molt period was probably ended by the time of the fall surveys.

Harbor seals in the Krenitzin Islands hauled out on low rocks, reefs, and islets that were generally awash at high tide. Though haul-out locations varied from season to season (Fig. 10), eight areas harbored at least a few seals

Table 3. Observations of Steller's sea lions at haul-out sites in the Krenitzin Islands. Numbers are based on aerial surveys (previous decades summarized by Johnson et al., in prep.; May 1987 data from R. Merrick, Nat. Mar. Fisheries Serv., pers. comm. 1987) or small boats; (1986-87 data in boldface type from this study). Numbers are based on counts taken from photographs or on visual estimates taken in the field, therefore comparisons should be made with caution. Dashes indicate areas not surveyed.

LOCATION/DATE	1950s	1960s	1970s	October 1980s	Sept.- March 1986	Feb.- May 1987	April- May 1987	1987
Akutan Island	7675	15,720	4019	2533				
Cape Morgan					768	37	2¹	0
Reef Bight					293	100	—	253
Lava Bight					0	—	—	311
Battery Point					0	0	0	0
Akun Island	1361							
Billings Head	—	2000	2641	760	1416	429	305	100
NW Akun Is.	—	100	10	—	15	0	1	
Tanginak Island	—	600	470	—	—	52	—	6+
Rocks NE of Tigalda Island	103	750	190	225	33	106	320	117
S side Tigalda Is.	—	10	314	—	0	0	0	25
Basalt Rock					0	0	7	
Ugamak Island	16,002	19,400	5408	3668	2399	430	855	748 ³
Round Island ²					45	10	32	
Rock N of Rootok Island	—	—	118	160	10	75	85	113 ⁴

¹Sea lions were hauled-out on Triplet Rocks

²Included in Ugamak Island counts in previous decades

³Includes counts from Round Island

⁴Sea lions were hauled-out on NW shore of Rootok Island

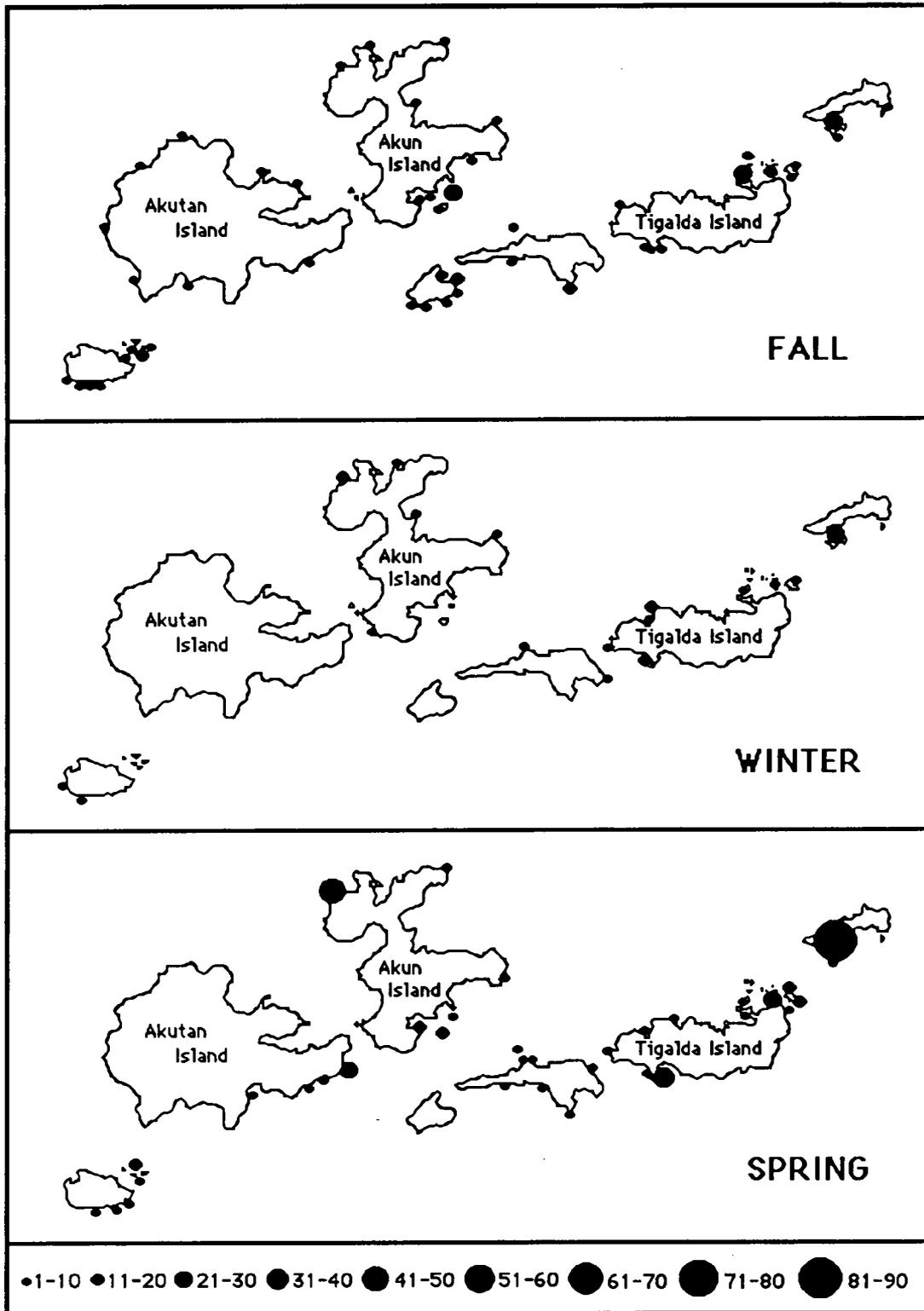


Figure 10. Relative size and locations of harbor seal haulouts observed during each of the coastal surveys in the Krenitzin Islands.

during every season sampled. These areas and highest counts of hauled out animals were:

- (1) Coastal rocks along the shore of the southern half of Unalga Island (highest count—8 in spring).
- (2) Rocks and reefs among the Baby Islands (highest count—28 in fall).
- (3) Rocks on the back side of a sea stack west of Akun Head, Akun Island (highest count—42 in spring).
- (4) Rocks among the offshore islands and along the coast near Trident Bay (highest count—32 in fall; none were seen in winter, but nearby boat trouble in winter probably flushed seals from haul-out sites prior to counts).
- (5) Basalt Rock and rocks along the adjacent coastline of Avatanak Island (highest count—10 in fall).
- (6) Coastal rocks along the shore of Tigalda Island immediately behind Derbin Island (highest count—37 in spring).
- (7) Islets, reefs, and rocks northeast of Tigalda Island, including Kaligagan Island (highest count—61 in spring).
- (8) Rocks adjacent to, but primarily on the north side of, Aiktak Island (highest count—92 in spring).

There was considerable seasonal variability in haul-out locations and in numbers of seals present (Fig. 10). This variability was particularly noticeable with regard to seal use of Rootok Island and southeast Akutan Island, and to the wide fluctuations at some haul-outs, such as northwest Akun Island and on islets northeast of Tigalda Island. Harbor seals were not seen at haul-out sites of sea lions when sea lions were present.

Sea Otter

Sea otters were present in inshore waters around all of the Krenitzin Islands, including Unalga and the Baby Islands. Numbers observed were highest in the spring and lowest in winter (see Table 2). Sea otters typically were found as isolated individuals or small groups scattered throughout the study area.

Certain areas in the Krenitzin Islands either consistently hosted higher numbers of sea otters at all seasons or contained relatively high concentrations during a given survey period. A concentration area was

defined as any area of coastline less than 1 km in length that contained at least 10 sea otters; such areas shifted somewhat among seasons (Fig. 11). Despite seasonal differences, six general areas consistently held relatively large numbers of sea otters:

- (1) North shore of Tigalda Island (from Kelp Bay eastward to Kaligagan Island).
- (2) North and east shores of Avatanak Island.
- (3) Poa and Tangik islands (at times extending to Trident, Cross, and Seredka Bays).
- (4) Akun Bay.
- (5) North shore of Akun Island including Little Bay.
- (6) Akun Strait and/or Akutan Harbor.

Concentrations of sea otters were present within all of these areas during all seasons, from fall to spring. Most of these areas are typified by waters well protected from heavy surf, large swells, or strong currents. Notable exceptions include the north shore of Akun Island (exposed to heavy swells and surf) and Akun Strait (having strong currents), but well-protected embayments used by sea otters occur close to both of these areas (Little Bay and Akutan Harbor, respectively). Sea otters appear to prefer calm bays and other protected waters throughout their range (Kenyon 1969), although they are common and occur far offshore in the unprotected nearshore waters of the North Aleutian Shelf (LGL 1987).

We found apparently higher densities of sea otters in the Krenitzin Islands in fall 1986 and spring 1987 than had been reported on any previous survey since 1957 (Table 4). Although survey methods and island coverage varied greatly among past surveys, and between past surveys and ours, it appears that sea otter populations have increased on all islands, with the exception of Tigalda Island and probably Rootok Island. The breeding concentration reported by Schneider (1981) on Tigalda Island, as well as populations on nearby Unalaska and Unimak islands, represent the most likely sources of sea otters that have colonized the remaining islands in the Krenitzin Group.

It is interesting that Akun Island, which previously contained few sea otters even as late as 1977, consistently had the largest populations in the Krenitzin Islands during our surveys. The populations on Tigalda and Rootok islands may not have changed greatly since 1965 (Table 4), although Brueggeman et al. (1988) found greater numbers on Rootok during an aerial survey in July 1986 than were recorded on our surveys. Surveys of sea otters may yield highly variable estimates even when numbers are stable, due to the

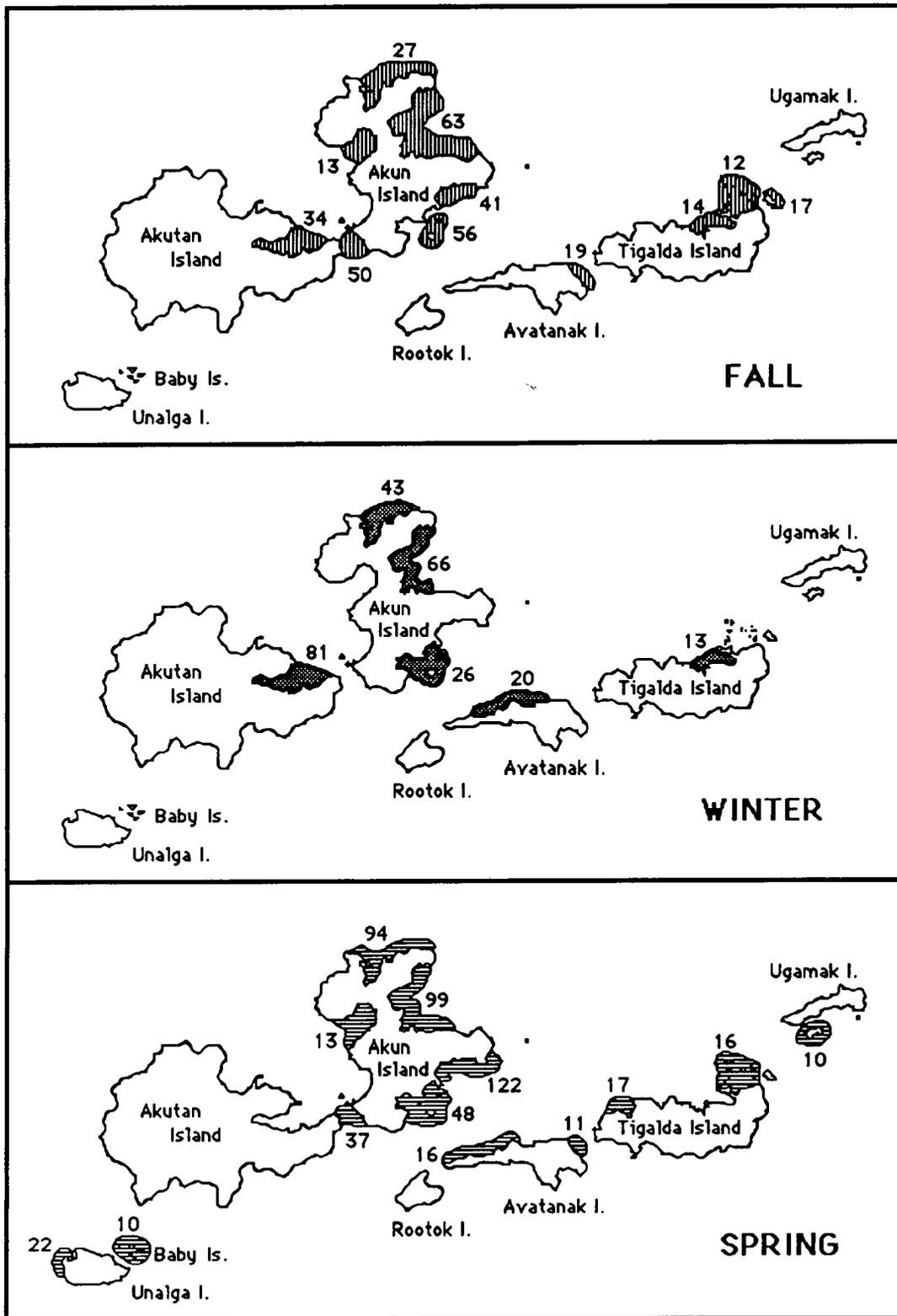


Figure 11. Concentration areas of sea otters in the Krenitzin Islands.

Table 4. Summary of significant sea otter sighting in the Krenitzin Islands, 1957 to present. Data for 1957-1977 are from Schneider (1981) and represent several USFWS aerial surveys by C. Lensink and K. Kenyon (1957-1969; specific reports not listed), and aerial surveys for ADF&G by K. Schneider (1976) and P. Arneson (data gathered during bird studies, 1976-77). Data for July 1986 are from aerial surveys by Brueggeman et al. (in prep.). Data for September 1986 to May 1987 (boldface type) are from small boat surveys done for this study. Dashes indicate islands or island groups not surveyed. Asterisks (*) denote partial surveys.

Island or Island Group	1957	1960	1962	1965	1969	June 1975	Aug. 1975	1976-77	July 1986	Sept.- Oct. 1986	Feb.- March 1987	Apr.- May 1987
Ugamak/Aiktak	—	0	0	0	0	0	5	1	—	13	3	15
Tigalda/Kaligagan	5	11	3	32	49	59	73	53	0*	58	40	51
Avatanak	—	0	—	2	0	0	4	1	—	36	21	33
Rootok	—	0	—	0	2	0	1	4	15	6	2*	1
Akun	—	0	—	—	3	0	3	1	226	230 ¹	159 ¹	431 ¹
Akutan	—	0	—	0	1	0	2	17	146*	125	98*	75*
Unalga	—	0	—	0	0	0	0	1	7	18	1*	48

¹ Includes Tangik, Poa, and Puffin Islands, and islands near Akun Strait but excludes Tanginak Island.

frequent diving rates of this species (Estes and Palmisano 1974) and their inconspicuousness when hauled out and stationary on boulders or rocky beaches.

RECOMMENDED FURTHER RESEARCH

No major concentrations of marine birds were detected during coastal surveys. The steep gradient of coastal waters and lack of protected lagoons in the Krenitzin Islands result in a paucity of habitats for large numbers of coastal birds, especially ducks and shorebirds. Neighboring areas, especially the North Aleutian Shelf to the east and perhaps Samalga Island to the west, support much higher concentrations of these birds. Given these findings, additional coastal surveys for marine birds in this area are probably a low priority. The major informational need is for summer surveys. Although few waterfowl or shorebirds would be expected during the summer, breeding seabirds might be more plentiful at this time. In particular, information on the distribution of and habitat use by Whiskered Auklets might be supplemented by summer work (e.g. in July).

In contrast to the few birds they support, the Krenitzin Islands support relatively large numbers of several marine mammal species. Some species have recently exhibited rather marked changes in abundance. In particular, numbers of Steller sea lions are decreasing, but sea otters are on the increase. Data from summer surveys would be useful to complete a seasonal profile for this area. In addition, because of the dynamic nature of the sea lion and sea otter populations, additional repeat surveys, perhaps at three-year intervals, seem warranted.

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