Studies of Southeastern Alaska Sea Otter Populations: Distribution, Abundance, Structure, Range Expansion, and Potential Conflicts with Shellfisheries

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Sea otters (Enhydra lutris) were presumably abundant in southeastern Alaska prior to exploitation by Russian and American hunters during the 18th and 19th centuries as it was reported as an important hunting area (Lensink 1962). Kenyon (1969) concluded that otters were essentially eliminated from the area before 1900. Several undocumented reports of sea otters in southeastern from 1940 through 1961 (Kenyon 1969) raised the possibility that a few individuals may have survived although Lensink (1962) did not consider these sightings valid.

Between 1965 and 1969, 402 sea otters were translocated from Amchitka Island (357) and Prince William Sound (45) to six sites in southeastern Alaska from Cape Spencer south (Table 1) by the Alaska Department of Fish and Game (ADF&G) (Burris and McKnight 1973, Jameson et al. 1982). The rational for the transplant was to speed repopulation of historical sea otter habitat distant from areas with major concentrations.

Table 1. Numbers of sea otters translocated to southeastern Alaska (Burris and McKnight 1973).

Release Site	Year	Number of Sea Otters
Khaz Bay	1965	23
Khaz Bay	1966	20
Khaz Bay	1968	92
Khaz Bay	1969	58
Khaz Bay (total)		193
Yakobi Island	1968	30
Biorka Island	1968	48
Barrier Islands	1968	55
Maurelle Islands	1968	51
Cape Spencer	1968	25
Total Released		402

In 1975, personnel from ADF&G and the U.S. Fish and Wildlife Service (USF&WS) conducted a vessel survey of the transplant sites, areas where sea otters had been sighted, and areas which appeared to be good habitat to evaluate the outcome of the transplant. During the survey 477 otters, including 62 pups, were counted at six sites (Schneider 1975) indicating that the the translocation program had probably succeeded in establishing viable sea otter colonies in southeastern Alaska.

In 1983, USF&WS and ADF&G conducted another, similar vessel survey of southeastern Alaska and documented growth for all groups and range expansion of the larger colonies. During this survey 1,124 sea otters, including 129 pups, were counted (Johnson et al. 1983) although coverage was incomplete because of weather and time limitations. Several months later an aerial survey, under nearly ideal weather conditions, was flown along the outer coast north of Sitka and 1,062 otters were seen compared to 698 during the vessel survey indicating that substantial numbers had been previously missed (ADF&G unpublished data).

During March and April of 1986, Simon-Jackson and Hodges (1986) flew aerial surveys from the Necker-Biorka Islands area north to Icy Point. The total number of otters observed (986) was less than that seen during the more limited ADF&G aerial survey in 1983 however significant numbers (229) were counted north of Cape Spencer and along the outer coast of Kruzof Island (106) where they had not been seen during previous surveys.

USF&WS, the agency responsible for sea otter management in Alaska, recognized several important management issues which appeared to be developing in southeastern Alaska (Simon-Jackson and Hodges 1986). These included the likely adverse impacts of sea otters on shellfisheries (with the possible prospect of zonal management of sea otters) and the unregulated harvest of otters by Alaskan natives. USF&WS realized that rational resolution of these issues would require information on the distribution and population status of sea otters in southeastern Alaska as well as information on shellfish resources and harvests in the area. In September 1986, USF&WS contracted with ADF&G to collect and synthesize this information. This report presents information collected during the first year of that contract, primarily abundance and distribution survey data.

METHODS

The ADF&G vessel "Polaris" was used to provide living accommodations and to transport personnel and equipment throughout the study area. Two Boston Whaler skiffs, 16 and 19 feet in length, were used to conduct the actual surveys. Each skiff was manned by an observer-recorder and an observer-skiff operator. Areas surveyed included sites known to contain sea otters from previous surveys and areas adjacent to those sites which contained habitat that appeared suitable for otters. The shorelines of islands and the mainland and offshore rocks and kelp beds were searched from the skiffs. On occasions when otters were seen offshore, transects were run with the skiffs. Binoculars were used as an aid in counting animals. When large numbers

of animals were encountered we attempted to place an observer on a nearby rock or island where counts were made with binoculars or a spotting scope. Most surveys were conducted between about 0800 and 1700 hours when the proportion of animals resting on the surface is normally highest. On occasions when weather conditions were good surveys were extended until 2000. The areas occupied by sea otters and adjoining areas were arbitrarily divided into count areas to facilitate data management and areal coverage during surveys. Data recorded included total number of sea otters, number of dependent pups, locations of sightings, activity of the otters observed, survey conditions, and date and time of sightings. Survey quality was subjectively classified as excellent, good, fair, poor, or bad based on impressions of visibility and thoroughness of coverage. Survey methodology was comparable to the vessel surveys conducted in 1975 and 1983 (Schneider 1975, Johnson et al. 1983).

Surveys were conducted in the Barrier Island, the Maurelle Islands, and the Coronation-Spanish-Kuiu Islands area from 4-14 June 1987 while the outside coast from Palma Bay south to the Necker Islands was surveyed from 8-19 July 1987. Replicate surveys of the Maurelle and Barrier Islands were conducted on 21 and 22 July.

The annual finite rate of increase (r) of sea otter populations was calculated from the relationship $P_2P_1(r)^t$ in which P_1 is the population size at time 1, P_2 is the population size at time 2, and the exponent t is the number of years between time 1 and time 2 (Connolly 1981). For a stable population r=1.0 while for an increasing population r>1.0 and for a decreasing population r<1.0. The finite rate of increase can be expressed as a percentage by subtracting 1 from r and then multiplying by 100. The exponential rate of increase is the natural log of the finite rate of increase (Caughley 1977).

We are now attempting to make arrangements with the Division of Commercial Fisheries (ADF&G)to access their data base of historical shellfisheries harvests for southeastern Alaska. When these data become available they will be summarized by statistical subunit in order to rank areas according to their importance as shellfish producers. We will also attempt to obtain information on subsistence harvests of shellfish in southeastern Alaska from the Subsistence Division (ADF&G). This information along with data on current and postulated sea otter distribution will provide the basis for consideration of zonal management of sea otters in southeastern Alaska.

RESULTS AND DISCUSSION

During the surveys a total (includes the highest count when replicate surveys were conducted) of 3,599 sea otters were counted in five areas of southeastern Alaska (Table 2). These apparently discrete groups of otters were found in the Barrier Islands, the Maurelle Islands, the Coronation-Spanish-Kuiu Islands area, the Necker Islands and the area between Sitka Sound and Icy Point (Figure 1). While all otters north of Sitka Sound essentially comprised a single, continuous group they have been subdivided in Table 2 for ease of presentation and historical comparisons.

Table 2. Historical summary of major sea otter surveys in southeastern Alaska, 1975-1987.

Geographic Area	Total Otters 1987	1986	1983(a)	1983(b)	1975
Barrier Is.	180	NS	NS	81	21
Maurelle Is.	520	NS	NS	159	47
Coronation I.	604	NS	NS	138	65
Necker Is.	47	8	NS	20	4
Sitka Sd.-Cross Sd.	2,099	749	1,062	726	340
Cape Spencer	149	229	NS	0	0
Total	3,599	986	1,062	1,124	477

1987:this survey, 1986:Simon-Jackson and Hodges 1986, 1983(a):ADF&G unpublished data, 1983(b):Johnson et al. 1983, 1975:Schneider 1975

BARRIER ISLANDS: The Barrier Islands area was initially surveyed on 4 and 5 June. The coastline of southern Prince of Wales Island was covered in addition to the Barrier Islands (Figure 2). A total of 147 sea otters was counted, all in the Barrier Islands (Table 3). Counting conditions during this survey were fair to good. Southerly winds to 20 knots made visibility poor on some exposed shorelines. On 25 June, Bob Wood, Game Division area management biologist, flew an aerial survey in a Piper Supercub (PA 18), under excellent conditions, of the coastline of southern Long Island and southeastern Dall Island. He observed a single otter off the coast of Long Island directly west of the Barrier Islands. The areas known to contain otters (count areas 1001-1004) were surveyed again on 22 July when 180 animals were counted. Conditions were better than during the first survey which probably partially accounted for the higher count. Seven more pups were counted during the last survey. These may not have been born during the first survey and contributed to the higher total.

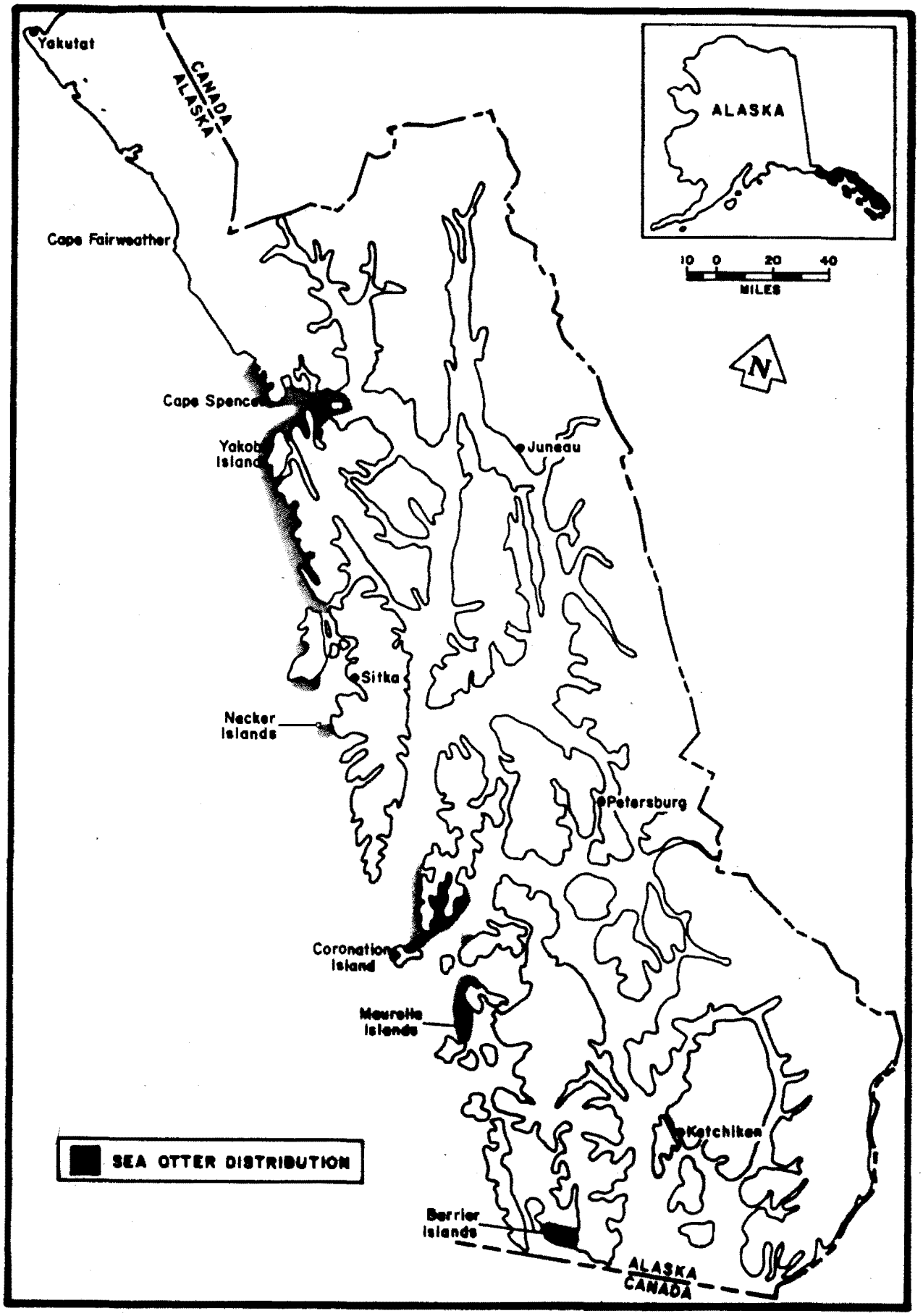

Figure 1. Distribution of sea otters in Southeastern Alaska, June and July 1987.

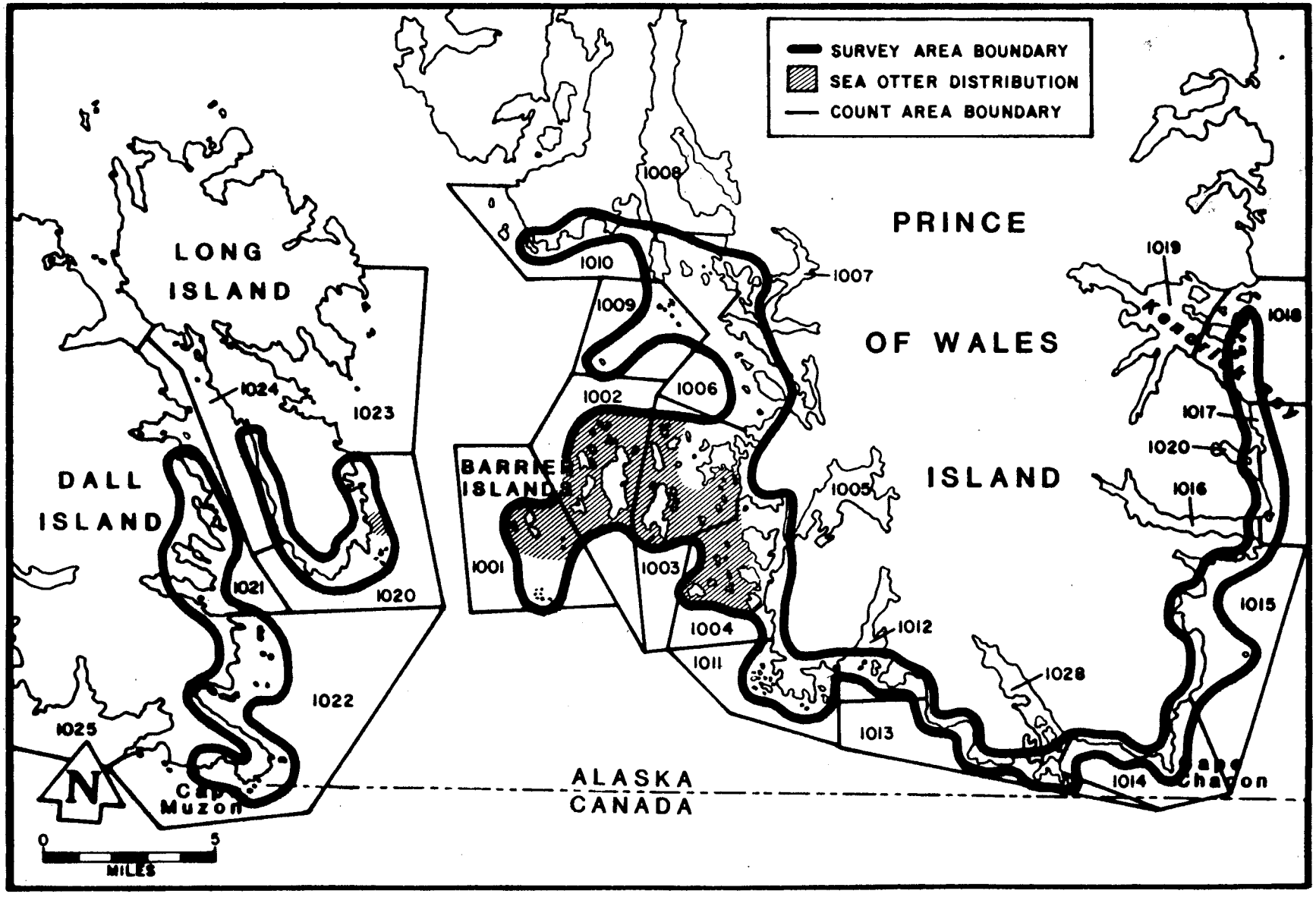

Figure 2. Area surveyed and sea otter distribution near the Barrier Islands in southern Southeast Alaska, June and July 1987.

Table 3. Summary of sea otter surveys conducted in the Barrier Islands area during June and July 1987.

Count Area	Date	Total Otters	Pups	Survey Quality
1001	5 June	9	2	Fair
1002	5 June	109	14	Fair
1003	5 June	7	0	Fair
1004	5 June	22	0	Fair
1006	5 June	0	0	Fair
1008	5 June	0	0	Fair
1009	5 June	0	0	Good
1011	5 June	0	0	Good
1013	4 June	0	0	Fair
1014	4 June	0	0	Fair
1015	4 June	0	0	Good
1017	4 June	0	0	Good
1018	4 June	0	0	Good
Total		147	16	
1020*	25 June	1	0	Exc.
1021*	25 June	0	0	Good
1022*	25 June	0	0	Good
1023*	25 June	0	0	Good
1024*	25 June	0	0	Fair
Total		1	0	
1001	22 July	2	0	Good
1002	22 July	98	18	Good
1003	22 July	7	2	Good
1004	22 July	73	3	Good
1011	22 July	0	0	Fair
Total		180	23	

*aerial survey

Distribution of otters in the Barrier Islands changed between the the two surveys. Movement to the southeast occurred resulting in an substantial increase in the numbers seen in count area 1004 (Table 3). Most females with pups were found in count area 1002 during both surveys. It appeared that much of count area 1004 was a male area and may have only been recently occupied. Few otters were observed in this area in 1983 (Johnson et al. 1983) and numbers seen increased considerably between the two 1987 surveys.

Although the range of this group of sea otters remains almost entirely restricted to the Barrier Islands there has been progressive range expansion. In 1975, otters were found only in the western Barrier Islands (Schneider 1975). By 1983, the range included both the western and central islands (Johnson et al. 1983). In 1987, the entire Barrier Island group was being used although densities in the western islands (count area 1001) had decreased substantially. Otters will likely continue to expand their range, probably initially along the southern Prince of Wales coast, the islands and reefs to the north of the Barrier Islands, and possibly along the southern coastlines of Long and Dall Islands.

The Barriers Island group originated from the translocation of 55 otters there in 1968. Schneider (1975) reported that a few otters were seen the month after release and thereafter a few sightings were made by members of the public through 1974. During the 1975 survey, 21 otters including two pups were seen while in 1983, 81 animals were counted. It appears that for several years after the translocation, group size was below the number actually stocked, probably the result of dispersal and transplant associated mortality. However from 1975 through 1987, this group increased rapidly. The finite rate of increase (r) from 1975-83 was 1.18, from 1983-87 it was 1.22. Overall between 1975 and 1987 r was 1.20.

The Barrier Islands colony has the best potential of any group of otters in southeastern Alaska for studies of population dynamics, population control and geographic containment. The group is distant (about 60 km from the Maurelle Islands) from other sea otter colonies and will likely remain isolated for a number of years. Group size (about 200 animals) is small enough that effective manipulations could be reasonably accomplished.

MAURELLE ISLANDS: The Maurelle Islands area was first surveyed on 7, 8, and 12 June (Figures 3 and 4). The count areas containing nearly all of the otters were completed on the first day; peripheral areas were surveyed on the other two days. During this survey, conditions ranged from good to poor. A large ocean swell reduced the effectiveness of the survey along the outside coastline. The Maurelle Islands area and outside coastline of Heceta Island, where otters had been seen during previous surveys, were covered as well as additional areas to both the north and south. Sea otters counted during this survey totaled 356 (Table 4). Much of the same area, including all locations where otters had been previously seen, was resurveyed on 20 and 21 July when 520 sea otters were counted. Minor problems with sun glare and brisk winds occurred in local areas. The higher count during the second survey was probably the result of

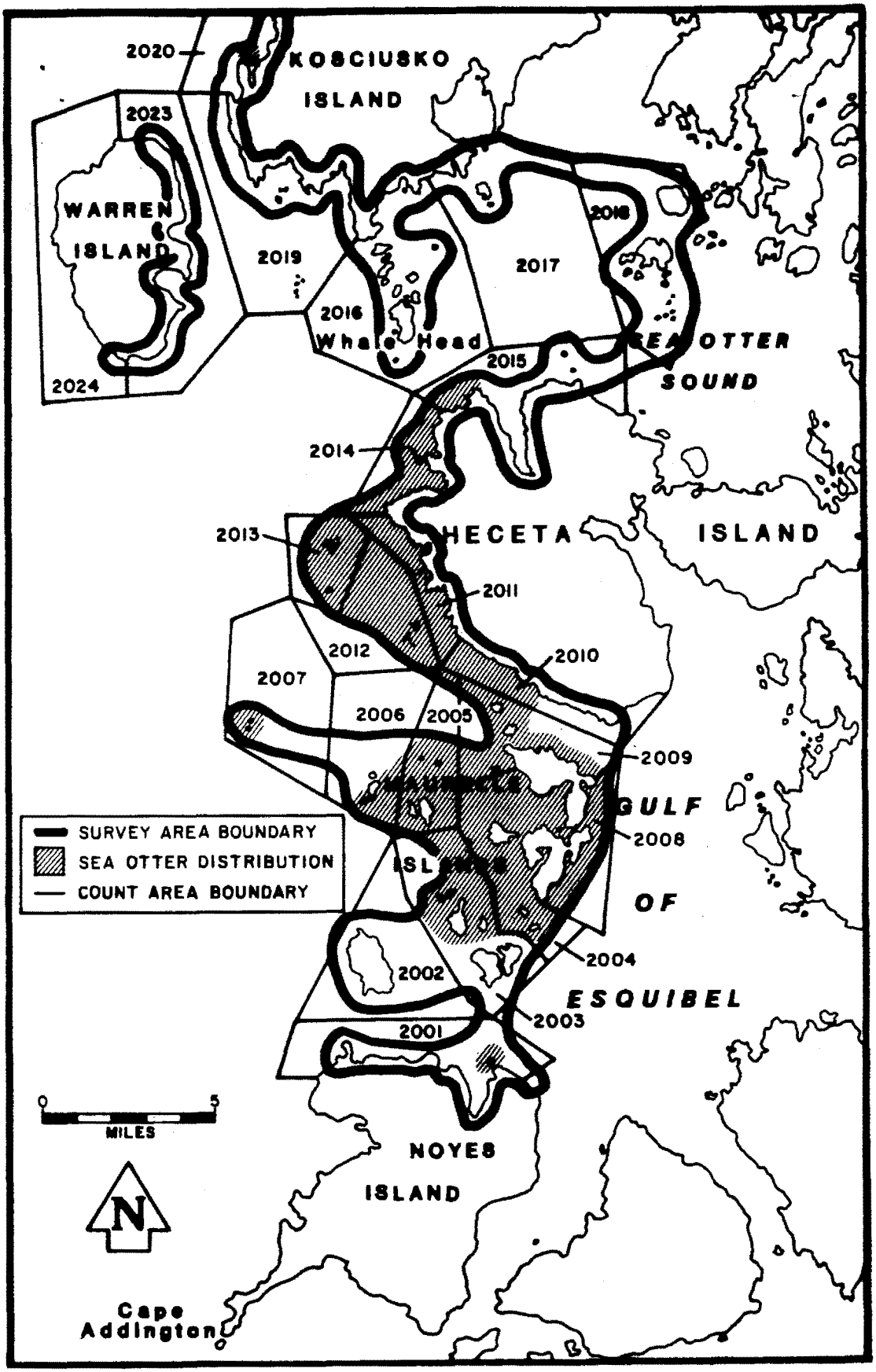

Figure 3. Area surveyed and sea otter distribution in the Maurelle Islands area during June and July 1987.

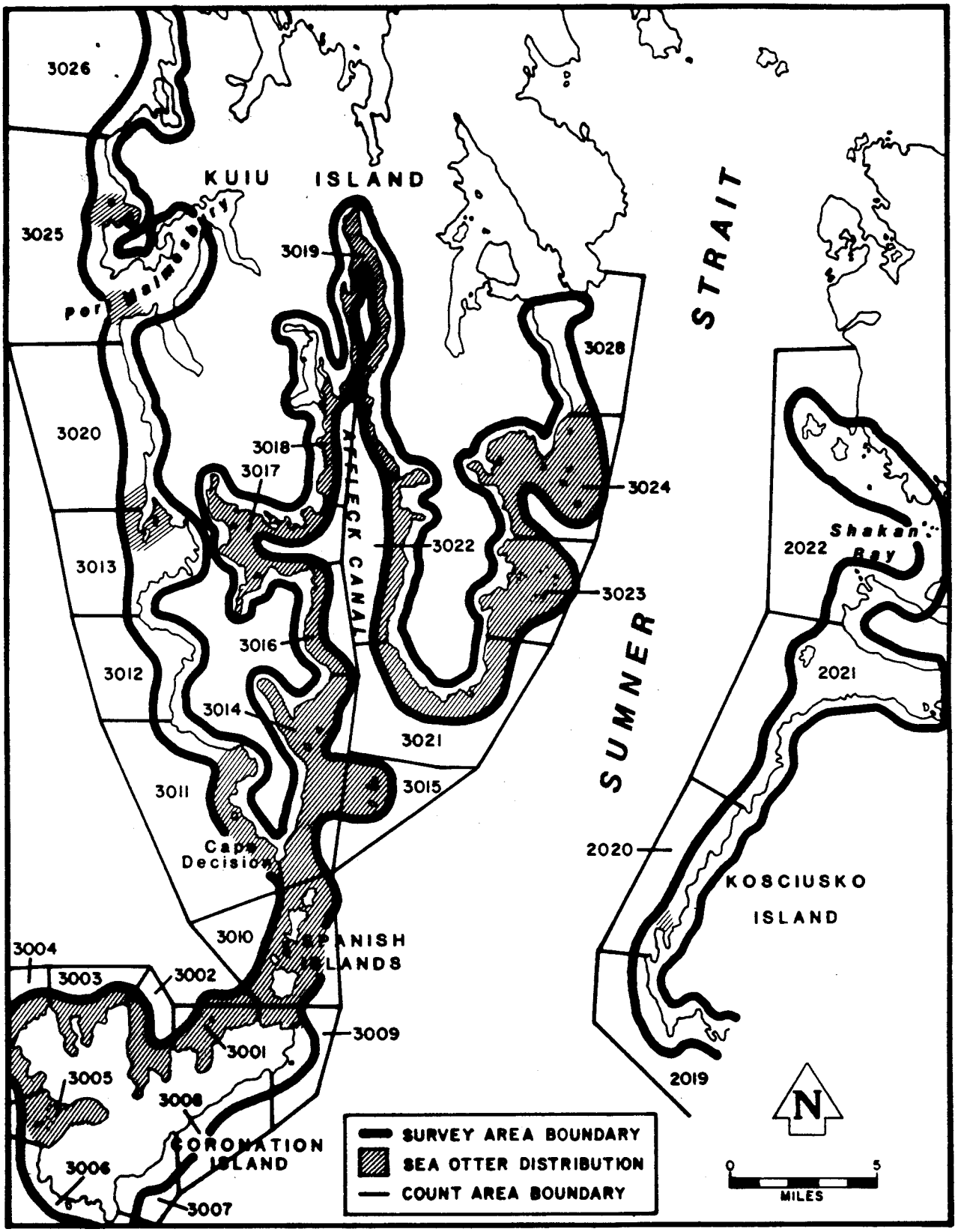

Figure 4. Area surveyed and sea otter distribution in the Coronation–Kuiu Islands area during June 1987.

three factors. Survey conditions during this survey were generally better than during the earlier survey. During the first survey many otters were observed scattered offshore suggesting that some were missed during our shoreline survey. In the second survey most otters appeared to be closely associated with the coastline therefore it was unlikely that many were missed offshore. Also during the second survey, 45 more pups were counted suggesting that a number of pups were born between surveys.

Table 4. Summary of sea otter surveys conducted in the Maurelle Islands area during June and July 1987.

Count	Area	Date	Total Otters	Pups	Survey Quality
2001	7	June	1	0	Fair
2002	7	June	0	0	Poor
2003	7	June	9	0	Exc.
2004	7	June	76	*	Good
2005	7	June	66	0	Good
2006	7	June	16	1	Fair
2007	7	June	0	0	Poor
2008	7	June	0	0	Good
2009	7	June	98	12	Fair
2010	7	June	0	0	Fair
2011	7	June	56	0	Good
2012	7	June	7	0	Good
2013	7	June	10	0	Poor
2014	7	June	15	0	Good
2015	7	June	1	0	Good
2016	8	June	0	0	Fair
2017	8	June	0	0	Poor
2018	8	June	0	0	Poor
2019	8	June	0	0	Fair
2020	8	June	1	0	Exc.
2021	12	June	0	0	Good
2022	12	June	0	0	Good
2023	8	June	0	0	Fair
Total			356	13	
2001	21	July	0	0	Poor
2002	21	July	0	0	Good
2003	21	July	33	4	Good
2004	21	July	106	4	Fair
2005	21	July	29	4	Good
2006	21	July	97	22	Good
2007	21	July	1	0	Good
2008	21	July	2	0	Good
2009	21	July	63	17	Exc.

Table 4. (Continued)

2010	21 July	2	0	Fair
2011	21 July	15	1	Fair
2012	21 July	5	0	Good
2013	21 July	36	6	Good
2014	21 July	131	*	Poor
2015	20 July	0	0	Fair
2016	20 July	0	0	Fair
2017	20 July	0	0	Fair
2018	20 July	0	0	Fair
2019	20 July	0	0	Fair
2020	20 July	0	0	Fair
Total		520	58	

*Unable to classify pups

No striking changes in geographical distribution were noted between the two 1987 surveys although considerable range expansion has occurred since the 1975 and 1983 surveys. In 1975 otters were restricted largely to the Twin and Wood Islands (count areas 2005 and 2006) (Schneider 1975). By 1983 they had occupied areas to the east and north (count areas 2004, 2005 and 2012) (Johnson et al. 1983). In 1987 distribution had been extended to both the north and south (Figure 3). No obvious sexual segregation was noted in 1987 however low proportions of pups in both northern and southern count areas (2014, 2004) suggest that they may be predominately male areas. The Wood Islands-Epsilon Rock area (count area 2006) and the northern Anguilla Island area (count area 2009) had high proportions of females with pups. For the immediate future, range expansion appears most likely to the north as habitat appears to be excellent in portions of Davidson Inlet, Sea Otter Sound and along the southwestern coast of Kosciusko Island.

This colony probably originated from a transplant of 51 animals to the Maurelle Islands in 1968. Estimates of r, based on the 1975, 1983, and 1987 surveys, are: 1975-83, r=1.16; 1983-87, r=1.34; and 1975-87, r=1.22. These estimates suggest that during the 1983 survey substantial numbers (about 60) of animals were probably missed.

CORONATION-SPANISH-KUIU ISLANDS: This area was surveyed on 9, 12, and 14 June (Figure 4) and a total of 604 sea otters were counted (Table 5). Conditions were only fair for much of the counts and stormy weather caused delays in completing the survey. Because visibility may have negatively affected the counts and movement of otters could have occurred during the delays my confidence that the total count approximates population size is not as great as for most other areas. I

do feel that information obtained on distribution was accurate. Count areas 3002, Aats Bay; 3005, Windy Bay; and 3016, southwest Afleck Canal all contained high proportions of females with pups. No distinct male areas were recognized.

Table 5. Summary of sea otter surveys conducted in the Coronation-Spanish-Kuiu Islands area during June 1987.

Count Area	Date	Total Otters	Pups	Survey Quality
3001	9 June	65	10	Exc.
3002	9 June	43	14	Good
3003	9 June	5	0	Exc.
3004	9 June	6	1	Poor
3005	9 June	76	23	Exc.
3006	9 June	0	0	Fair
3007	9 June	0	0	Fair
3008	9 June	0	0	Fair
3009	9 June	0	0	Fair
3010	9 June	92	20	Good
3011	9 June	6	0	Fair
3012	9 June	0	0	Fair
3013	9 June	24	6	Fair
3014	12 June	99	10	Fair
3015	12 June	9	3	Good
3016	12 June	76	22	Fair
3017	12 June	3	0	Fair
3018	12 June	2	0	Good
3019	12 June	10	0	Good
3020	9 June	3	0	Poor
3021	12 June	26	9	Fair
3022	12 June	15	3	Poor
3023	12 June	25	4	Exc.
3024	12 June	15	3	Exc.
3025	14 June	4	0	Good
3026	14 June	0	0	Poor
3027	14 June	0	0	Poor
3028	12 June	0	0	Poor
Total		604	128	

Sea otters were not translocated to this area and likely originated from dispersals from the Maurelle Islands transplant, 25 miles to the southeast, and possibly from the Necker Islands, 70 mile north (Schneider 1975). The first sightings were in 1973 when Commercial Fisheries biologist Alan Davis reported regularly seeing a pod of about 30 animals near the southern Spanish Islands (count area 3010). During the 1975 survey, 65 sea otters were seen in the

southern Spanish Islands and along the northeastern Coronation coastline (Schneider 1975). In 1983, 138 otters were seen throughout the Spanish Islands and along the northern and western Coronation shoreline (Johnson et al. 1983). The Kuiu Island coastline beyond Cape Decision was not surveyed at this time. In 1987, distribution was similar around Coronation and the Spanish Islands (although densities had increased) however sea otters were abundant along the southeastern shoreline of Kuiu Island in Sumner Strait and were found in several locations along the southwestern coast of Kuiu Island in lower Chatham Strait. Future range expansion will probably proceed up the coastlines of Kuiu Island and may cross Sumner Strait to the Shakan Bay area which appears to be good habitat. If this occurs, this colony will undoubtedly merge with the Maurelle group. A drift gillnet fishery for salmon takes place in Sumner Strait off northern Prince of Wales Island. If otters become established in this area, entanglement with resulting mortality of otters will probably occur such as is taking place off the Copper River Delta (Simon-Jackson 1986). Estimates of the finite rate of increase for this colony, based on the 1975, 1983, and 1987 surveys are: 1975-83, r=1.10; 1983-87, r=1.45; 1975-87, r=1.20. These estimates suggest that as many as 100 otters were missed during the 1983 survey, perhaps along the Kuiu Island coast which was not surveyed.

NECKER ISLANDS: Forty-seven sea otters were counted during surveys of this area on 17, 18, and 19 July (Table 6, Figure 5). Conditions were fair to poor because of brisk westerly winds and sun glare and it was likely that some (possibly substantial numbers) animals were missed. The range of this group has not expanded greatly since the 1975 and 1983 surveys although some movement to the southeast of the earlier concentrations has occurred. Previously all otters were seen in count area 4006 and during the 1987 survey about half were found in count area 4007. Substantial areas of unoccupied habitat remain in the Necker-Biorka Islands area therefore it is unlikely that large-scale range expansion will occur within the next several years. Animals from the large group north of Sitka Sound will probably eventually merge with this group, possibly within the next two or three years.

In 1968, 48 sea otters were translocated to Biorka Island. Many of the original animals either died or dispersed as only four otters were seen during the 1975 survey. Since that time the colony has grown rapidly as demonstrated by the rate of increase: 1975-83, r=1.22; 1983-87, r=1.24; 1975-87, r=1.23.

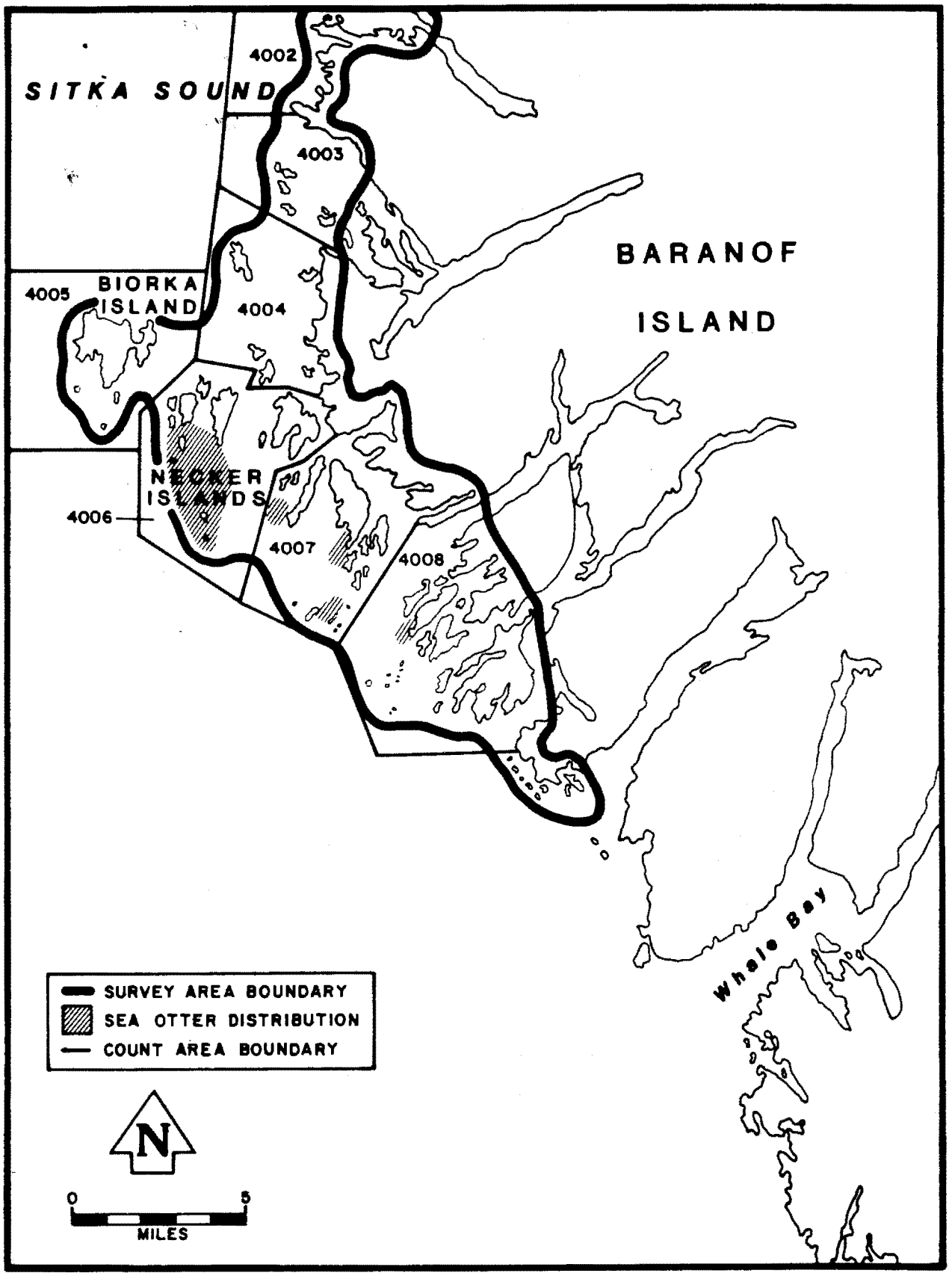

Figure 6. Area surveyed and sea otter distribution in the Necker Islands area during July 1987.

Table 6. Summary of sea otter surveys conducted in the Necker Islands area during July 1987.

Count Area	Date	Total Otters	Pups	Survey Quality
4001	17 July	0	0	Fair
4002	17 July	0	0	Poor
4003	17 July	0	0	Fair
4004	17 July	0	0	Fair
4005	18 July	0	0	Poor
4006	18 July	25	2	Poor
4007	19 July	21	7	Poor
4008	19 July	1	0	Poor
Total		47	9	

NORTH OF SITKA: Surveys conducted between 8 and 19 July indicated that sea otters were essentially continuously distributed along the outside coast from southern Kruzof Island to Astrolabe Point, north of Cape Spencer (Figures 6-9). Areas with the patchiest distribution were the outside of Kruzof Island, portions of the Khaz Peninsula, and Cross Sound. A count of 2,248 otters was obtained for this area (Table 7), which was 62% of the total for all of southeastern Alaska.

In the area from Cape Spencer north to Astrolabe Point (Figure 8), 149 sea otters were seen under good to excellent survey conditions. This was less than the 229 seen by Simon-Jackson and Hodges (1986) during April 1986. Our count may be a substantial underestimate of the total number of animals in the area as numerous sea otters were noted scattered offshore suggesting that our shoreline survey missed animals. Otters were first observed in the Cape Spencer area by National Park Service personnel in 1983 with substantial numbers seen in 1984 (Vequist 1987). Pups were first seen in the area in 1985 (Vequist 1987). Sea otters had extended their distribution about 5 miles to the northwest in the 15 months since Simons-Jackson and Hodges (1986) survey. Nearly all pups seen were in the Cape Spencer-Graves Rocks area (count areas 7001 and 7002) suggesting that otters to the north in areas 7003, 7004, and 7005 were largely males. Range expansion in this area will likely be to the northwest along the coast towards Lituya Bay and Yakutat. Intertidal and shallow subtidal habitats along this coast shift from rocky to sandy and undoubtedly contain a different prey base. This area apparently supported a substantial otter population prior to exploitation as Lensink (1962) reported that Yakutat was a major sea otter trading post and Vequist (1987) stated that numerous otters were harvested in the Lituya Bay area.

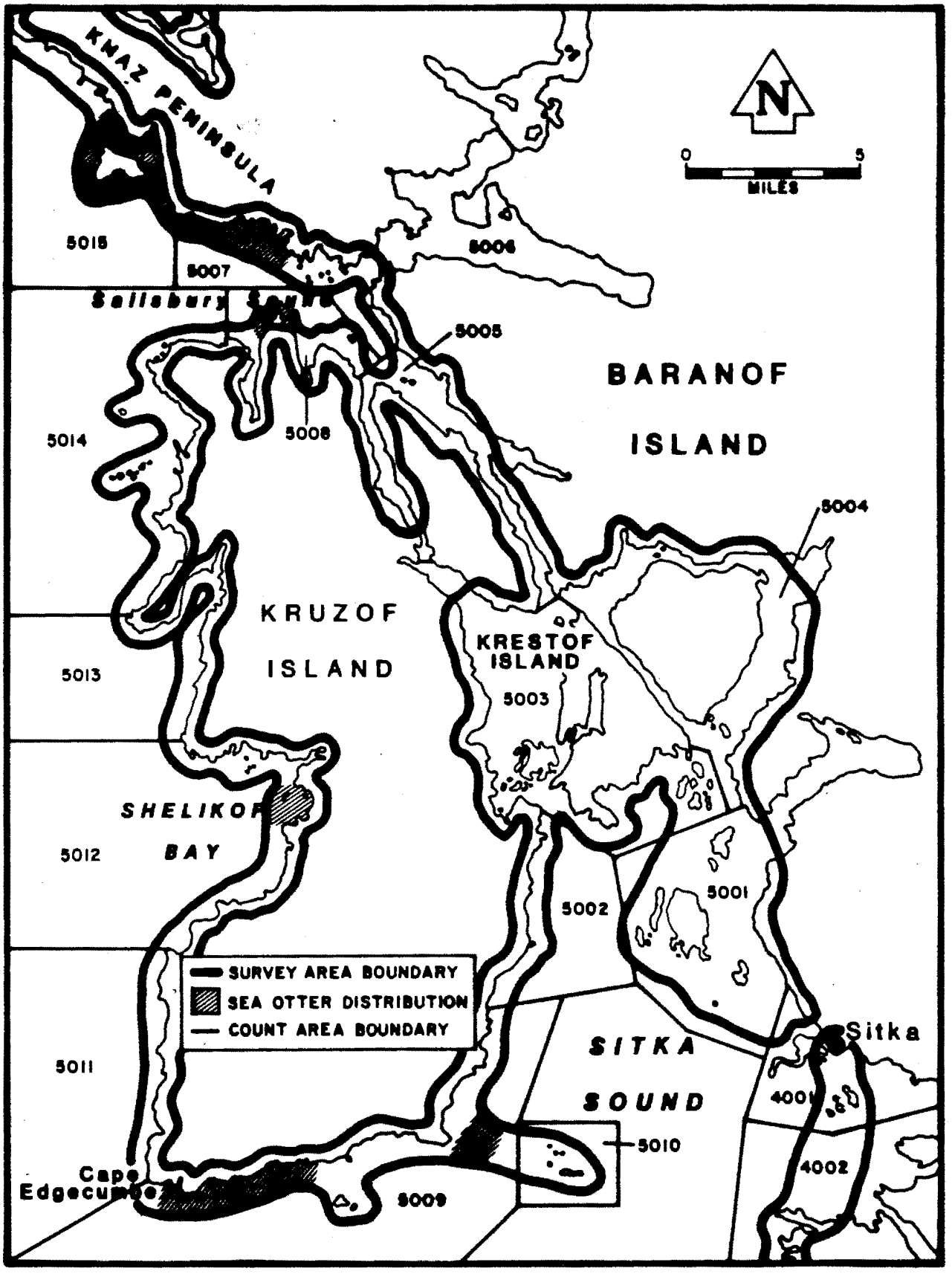

Figure 6. Area surveyed and sea otter distribution in the Kruzof Island area during July 1987.

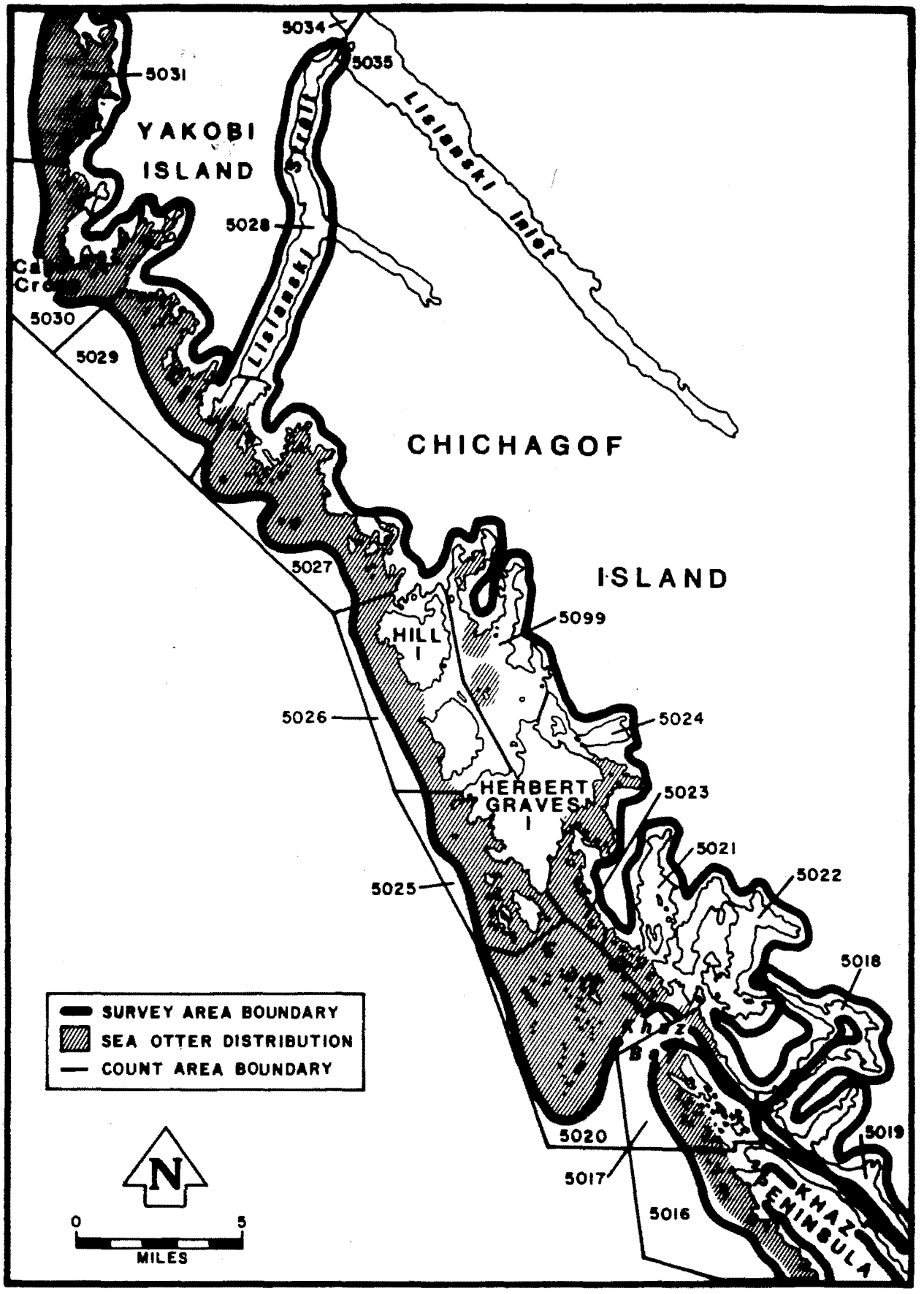

Figure 7. Area surveyed and sea otter distribution in the west Chichagof-Yakobi Islands area during July 1987.

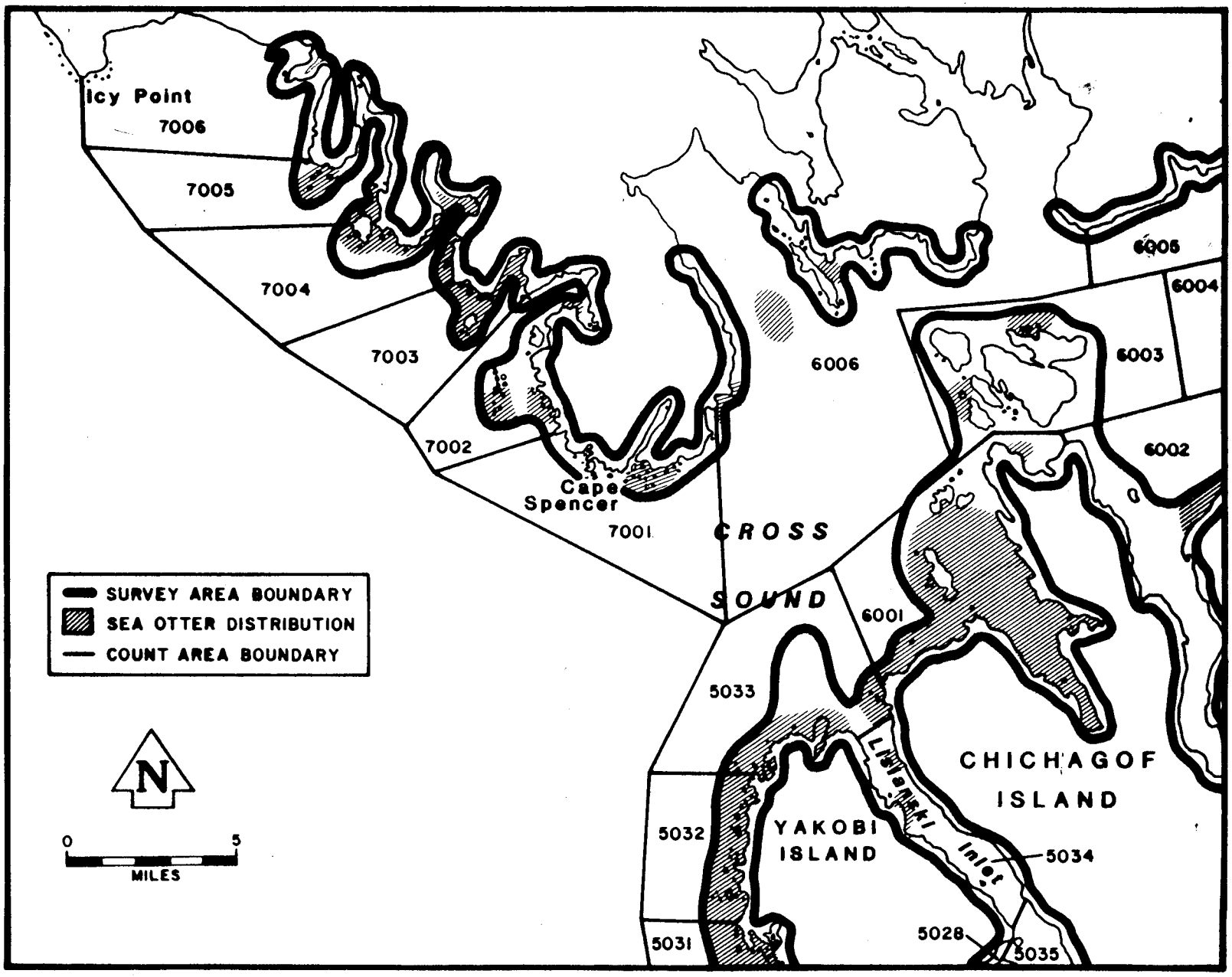

Figure 8. Area surveyed and sea otter distribution in the Cross Sound–Cape Spencer area during July 1987.

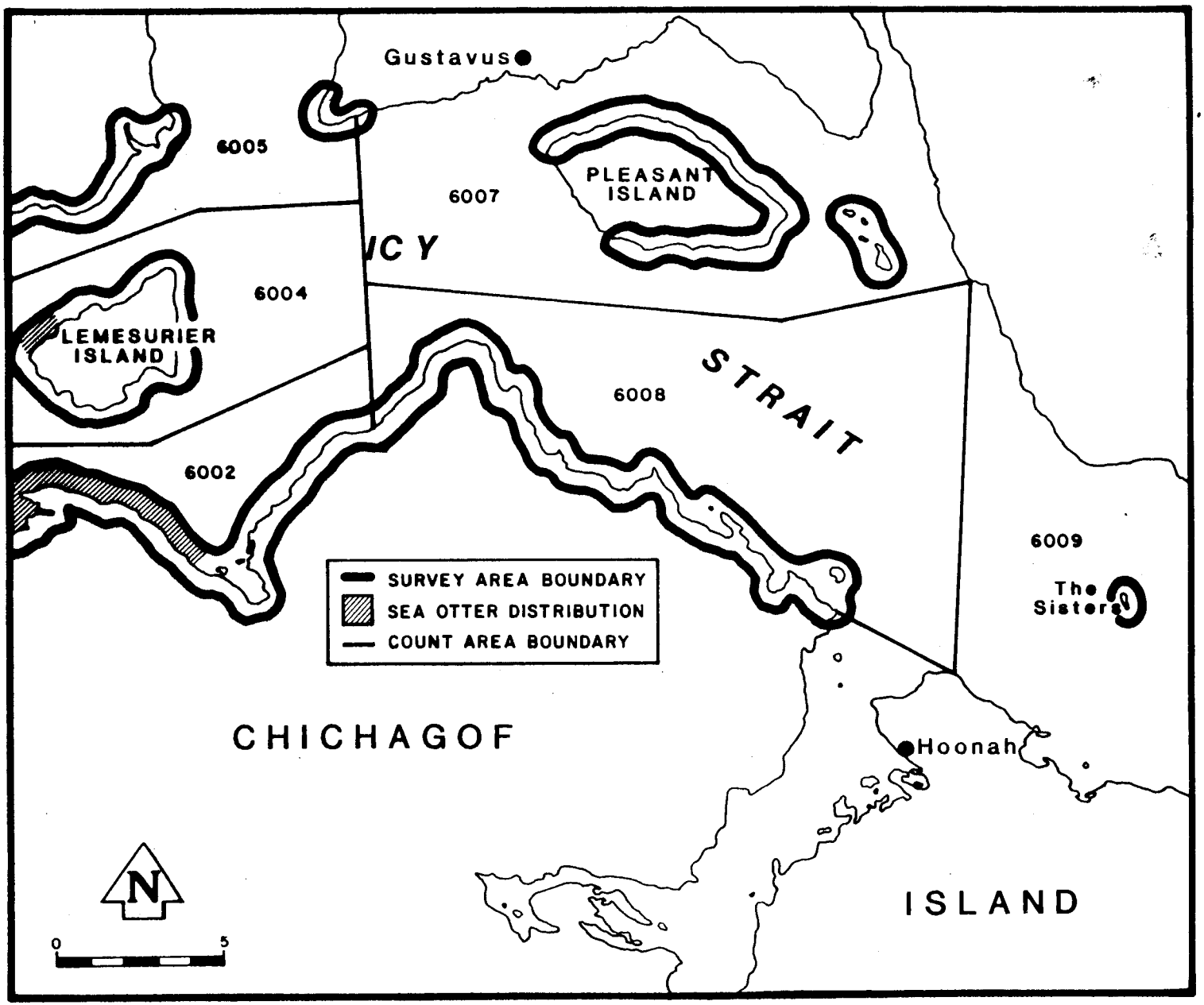

Figure 9. Area surveyed and sea otter distribution in the Icy Strait area during July 1987.

Table 7. Summary of sea otter surveys conducted along the outer coast of southeastern Alaska north of Sitka during July 1987.

Count Area	Date	Total Otters	Pups	Quality
	Kruzof-Chichagof-Yakobi Islands			
5001	17 July	0	0	Good
5002	16 July	0	0	Good
5003	16 July	0	0	Good
5004	15 July	0	0	Good
5005	15 July	0	0	Good
5007	15 July	33	6	Good
5008	15 July	3	0	Fair
5009	16 July	161	0	Fair
5010	16 July	0	0	Good
5011*	19 July	0	0	Bad
5012*	19 July	16	?	Bad
5013*	19 July	0	0	Bad
5014*	19 July	0	0	Bad
5015	15 July	30	10	Fair
5016	15 July	78	*	Good
5017	15 July	109	37	Fair
5018	13 July	1	0	Fair
5019	13 July	0	0	Fair
5020	12 July	620	*	Exc.
5021	13 July	3	0	Poor
5022	13 July	0	0	Poor
5023	13 July	38	*	Poor
5024	13 July	2	0	Fair
5025	12 July	90	25	Exc.
5026	12 July	77	22	Good
5027	12 July	180	27	Exc.
5028	10 July	0	0	Good
5029	10 July	92	15	Good
5030	10 July	57	12	Good
5031	10 July	112	21	Good
5032	10 July	30	8	Good
5033	10 July	84	16	Exc.
5034	10 July	2	0	Fair
5035	10 July	0	0	Poor
5099	13 July	4	0	Fair
Subtotal		1,822	199	

Table 7. (Continued)

		Cross Sound-Icy Strait		
6001	11 July	192	22	Good
6002	11 July	75	9	Good
6003	9 July	2	0	Good
6004	11 July	1	0	Exc.
6005	11 July	0	0	Good
6006	9 July	7	0	Good
6007	8 July	0	0	Poor
6008	8 July	0	0	Poor
Subtotal		277	31	
		Cape Spencer North		
7001	9 July	30	4	Good
7002	9 July	36	9	Exc.
7003	9 July	53	1	Good
7004	9 July	28	1	Good
7005	9 July	2	0	Exc.
7006	9 July	0	0	Fair
Subtotal		149	15	
Total North Sitka		2,248	245	

*Unable to classify pups

A total of 277 sea otters were counted under good conditions in the Cross Sound-Icy Strait area with major concentrations in the Port Althorp and Idaho Inlet-Mud Bay areas (count areas 6001 and 6002) (Figures 8 and 9). No obvious instances of sexual segregation were noticed. Johnson et al. (1983) first found otters along the northern tip of Yakobi Island and along the northeastern Chichagof coast in 1983 while in 1986 Simon-Jackson and Hodges (1986) found numerous otters in the Port Althorp area. Vequist (1987) reported small groups of 10-12 at Pt. Carolus and Pt. Gustavus, areas which were surveyed but where no otters were seen. These animals obviously originated from the long-established Surge Bay group and gave rise to the Cape Spencer colony. It will be important to monitor range expansion of this group as it is unclear to what degree sea otters will colonize the inside waters of southeastern Alaska and this has important implications for future sea otter/shellfish interactions, particularly in regard to dungeness crabs. Kenyon (1969) found no record that sea otters ever occurred in the inland waters of southeastern Alaska and assumed that they were distributed only along the outer coast. Sea otter bones were reported as prevalent in middens at native village sites near Angoon located in the inside waters of Chatham Strait (Vequist 1987 citing de Laguna 1960). This does not necessarily mean that otters

occurred in that area but raises that possibility. Sea otters are well established throughout the inside waters of Prince William Sound, a somewhat comparable situation to southeastern Alaska.

A total of 1,822 sea otters were counted along the outer coasts of Yakobi, Chichagof and Kruzof Islands (Figures 6,7 and 8). The largest concentration was in the outer Khaz Bay area (count area 5020) where about 1/3 of the total (620) was seen. Although no composition data were obtained there it was obvious that many females with pups were in the Outer Rocks area. Survey conditions were generally very good from Khaz Bay north while they were fair to bad south of Khaz Bay. The only area of obvious sexual segregation was at the southern limits of this group along southern Kruzof Island (count area 5009) where no pups were seen out of 161 sea otters. This group of otters will probably spread throughout Sitka Sound, eventually merge with the Necker Islands group, and then colonize the outside coast of Baranof Island.

This large, continuous group of otters, extending from north of Cape Spencer to southern Kruzof Island, originated from transplants between 1965 and 1969 of 193 animals to Khaz Bay, 30 to southern Yakobi Island, and 25 to Cape Spencer. Initially, two colonies developed; one at Khaz Bay (count area 5020) and another at Surge Bay (count area 5031). During the 1975 survey, these groups remained localized and totaled 340 animals (Schneider 1975). By 1983, both distribution and abundance had increased substantially with total numbers probably exceeding 1,200 and with a range extending from Cross Sound to the Khaz Peninsula (Johnson et al. 1983, ADF&G unpublished data). Annual finite rate of increase for this group, based on the 1975 count of 340 and the 1987 count of 2,248, was 1.17. This rate of increase was slightly less than found in the other groups which averaged 1.21 during the same period. The difference may be accounted for by a harvest of unknown magnitude directed at this group under the native exemption clause of the Marine Mammal Protection Act.

Dependent pups, obviously associated with a female, were recorded separately from older animals in an attempt to evaluate productivity of the different groups. It was difficult to classify pups when large pods were encountered, particularly if the animals had been disturbed and were moving. I deleted all sightings where it was impossible to classify pups in calculating pup percentages. Percentages of pups ranged between 13% and 21% with an average of 17% (Table 8). The proportion of pups was lower in both 1975 when pups comprised 13% (X^2=4.31, P<0.05) of the otters counted (Schneider 1975) and in 1983 when pups were 11% (X^2=17.48, P<0.001) of the total (Johnson et al. 1983). These surveys were conducted one to two months earlier than

the 1987 counts so the results are not directly comparable. The progression of pupping in southeastern Alaska is not known however it is likely similar to the Aleutian Islands and Prince William Sound where births occur during all months of the year but peak during April, May and June (Garshelis 1983, Schneider 1972). This probably explains the higher proportion of pups in the 1987 survey. Observed pup percentages are not a good indicator of annual productivity as pups born early in the year may be fairly large and not classified as pups and some pups will likely be born after the sampling period. However, samples taken during similar time periods may have comparative value between areas and over time.

Table 8. Percentages of pups counted during southeastern Alaska sea otter surveys, June and July 1987.

Area	Adjusted Total*	No. Pups	%Pups
Barrier Islands	180	23	13
Maurelle Islands	390	58	15
Coronation Island	604	128	21
Necker Islands	47	9	19
North Sitka	1,554	248	16
Total	2,775	466	17

*Adjusted total it the total number of sea otters counted minus those sighting for which it was not possible to classify pups.

The surveys which have been conducted of these transplanted populations provide an opportunity to secure estimates of the rates of population growth from areas in which resources are not limiting. These measures of intrinsic rate of increase, or r_m, (Caughley 1977) are useful for predicting population growth following transplants or expansion into unoccupied habitat and in evaluating impacts of proposed harvest schemes. It appeared that it took a number of years for the southeastern Alaska populations to become established after the translocations. During the 1975 survey only slightly more sea otters were counted that were introduced into the area during the late 1960's. Schneider (1975) proposed that this was the result of transplant associated mortality, dispersal out of the area, and low productivity because of the sex and age structure of the translocated animals. Since 1975, these populations have grown at a rapid rate (Table 9) with an overall annual finite rate of increase between 1975 and 1987 of 1.18. Few data on rates of increase of sea otter populations are available. Lensink (1962) stated that sea otter populations could grow at an annual rate of 10-15%. The California sea otter population grew at about 4-5% a year between 1914 and

the mid-1970's (Riedman 1987). Estes (1981) stated that many small population that had recently expanded into new habitat in Alaska grew at the rate of 10-16% per year. It appears that the southeastern Alaska populations have grown over the past 12 years at a rate that exceeds those previously reported.

Table 9. Annual finite rates of increase for sea otter colonies in southeastern Alaska.

Area	1975-83	1983-87	1975-87
Barrier Islands	1.18	1.22	1.20
Maurelle Islands	1.16	1.34	1.22
Coronation Island	1.10	1.45	1.20
Necker Islands	1.22	1.24	1.23
North Sitka	-	-	1.17
All Areas	-	-	1.18

RECOMMENDATIONS

1. The Kruzof Island-Sitka Sound-Necker Islands area should be resurveyed during the summer of 1988. Poor survey conditions, primarily brisk onshore winds and sun glare, reduced the effectiveness of the 1987 surveys in these areas. Southern Kruzof Island was the southern limit of distribution for the large group of sea otters north of Sitka. These otters can be expected to move into Sitka Sound in the near future and eventually merge with the Necker Islands colony. This is an important subsistence shellfishery area for Sitka residents and conflicts are expected to develop after sea otters become abundant therefore progression of colonization should be monitored.

2. The Barrier Islands colony, because of its size and isolation, provides an excellent opportunity for intensive studies of population dynamics, population manipulation, and geographic containment. If USF&WS has intentions of conducting such research, then the area should be resurveyed during 1988 in order to more completely document population growth prior to experimental manipulation.

3. Although historical shellfishery harvests for southeastern Alaska have not yet been reviewed, it is apparent that the dungeness crab fishery is one of the most important commercial and subsistence fisheries (Doerr and Sigman 1986). Between 1960 and 1986 the average annual commercial harvest has been about 1.5 million pounds. This fishery, as well as major dungeness crab concentrations,

occurs nearly exclusively within the inside waters of southeastern Alaska. Currently most sea otters occur along the outside coast although some animals were found in the Cross Sound-Icy Strait area and in Sumner and lower Chatham Straits. As it is unclear to what extent sea otters will eventually utilize the inside waters of southeastern Alaska and because of important fishery conflict implications, surveys should be conducted during the summer of 1988 to monitor colonization of these inside water sites.

4. The impacts of sea otter predation on dungeness crab populations have not been well documented. Strong circumstantial evidence indicated that otters dramatically reduced the abundance of dungeness crabs, particularly large crabs, in the Orca Inlet area near Cordova (Garshelis et al. 1986, Donaldson 1986). Some residents of Elfin Cove, in northern southeastern Alaska, claim that otters have greatly reduced dungeness crab abundance in nearby Port Althorp. Because dungeness crabs are a valuable shellfish resource in southeastern Alaska it is important to determine what impacts predation by sea otters has on crab populations. As sea otters continue to expand their range in southeastern Alaska they will move into bays containing dungeness crab concentrations. The opportunity exists to obtain indicies of crab abundance, through test fishing, prior to arrival of otters and then after otters have become established. It also would be possible to sample bays which otters had not reached as controls to evaluate fluctuations in crab numbers independent of sea otter predation. These data would be invaluable for considerations of zonal management in southeastern Alaska.

5. The Gulf of Alaska coast between Cape Suckling and Icy Point is the largest section of uninhabited or underpopulated habitat remaining in Alaska. This area according to historical sea otter skin trade records (Lensink 1962, Vequist 1987), once contained large sea otter numbers. Only small numbers of otters have been seen along this coast in recent years; Calkins and Schneider (1985) estimated that 100 animals occurred in the area. This is another important dungeness crab fishing area also with an average annual harvest of 1.5 million pounds (Doerr and Sigman 1986). It is expected that this coastline will eventually be naturally repopulated from expanding populations to both the north and south. This section of coast has never been thoroughly surveyed; available records are from opportunistic sightings and local surveys. A comprehensive survey of this area should be conducted within the next few years.

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