BREEDING SEABIRDS AT GULL ISLAND AND SIXTY-FOOT ROCK DURING 1989

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ABSTRACT

The number of Gull Island pelagic cormorant (Phalacrocorax pelagicus) nests in 1989 was 12.6% higher than the mean number of nests from the previous three years. Red-faced cormorant (P. urile) nests were 15.4% greater than the mean of the three previous years. At Sixty-Foot Rock, we found three pelagic nests for the first time since we began monitoring this colony in 1984. However, they did not produce any young.

Black-legged kittiwake (Rissa tridactyla) nests and numbers declined for only the second time since we began monitoring Gull Island. There was a 16.0% decline in adult birds between 1988 and 1989 at plots 1-8. There was also a 7.8% decline in nests for the same plots. However, 0.50 prefledging chicks/nest were produced. At Sixty-Foot Rock there was a 15.2% decline in adults, but no change in the number of nests between 1988 and 1989. This colony produced only 0.16 prefledging chicks/nest.

At Gull Island, common murres (Uria aalge) declined by 22.3% at plots 1-8 between 1988 and 1989. This was the first year we observed a decline in murres. One oiled murre was collected on June 16 and another apparently oiled murre was observed on June 22. Therefore, oil clearly affected the murres, but we could not determine the extent of this impact. At Sixty-Foot Rock, murres increased by 49.7% over the previous year.

INTRODUCTION

Gull Island and Sixty-Foot Rock became part of the refuge system when the Alaska National Interest Lands Conservation Act created the Alaska Maritime National Wildlife Refuge. However, in 1987 Gull Island was conveyed to the Seldovia Native Association and the refuge does not have jurisdiction over the island.

Both colonies were first surveyed in the late 1970's (Erikson 1976). The study was part of an effort to determine the potential impacts of the sale of outer continental shelf lease tracts in lower Cook Inlet. Since 1984, the Alaska

Maritime Refuge has monitored Gull Island and Sixty-Foot Rock. Results through 1988 are presented in Nishimoto et al. (1987) and Nishimoto and Beringer (1989).

Gull Island and Sixty-Foot Rock are located within 6 km of the Homer Boat Harbor. They are the most accessible seabird colonies to the headquarters of the Alaska Maritime National Wildlife Refuge (Figure 1). Their locations provide a convenient and inexpensive opportunity for the refuge to study seabirds. These studies provide a means of assessing the health of the marine environment in lower Cook Inlet, an area particularly susceptible to disturbance from oil spills and commercial fishing. The colonies also provide an opportunity to observe the impacts of visitors on seabird colonies since Kachemak Bay is heavily used by boaters. Tour boats approach to within 2 m of Gull Island daily during the summer. Sixty-Foot Rock is also visited.

In this project, we monitored the reproductive success of black-legged kittiwakes (Rissa tridactyla) and two species of cormorants. We also estimated populations of pelagic cormorants (Phalacrocorax pelagicus), red-faced cormorants (P. urile), glaucous-winged gulls (Larus glaucescens), common murres (Uria aalge) and pigeon guillemots (Cepphus columba).

STUDY AREA

Kachemak Bay is situated at the southeast entrance of Cook Inlet and is 62 km long and 38 km wide at its mouth. Homer is located near the north-central part of the bay where the Homer Spit extends 7 km southeasterly into the bay. The south side of the bay is much deeper with numerous coves and islands, including Gull Island and Sixty-Foot Rock.

The bay is used by forage fishes such as capelin (Mallotus villosus), walleye pollock (Theragra chalcogramma) and Pacific sand lance (Ammodytes hexapterus). Like most non-commercial species, little is known about their abundance and distribution. However, in the only known feeding ecology study of marine birds in the bay, all three species were of moderate to high

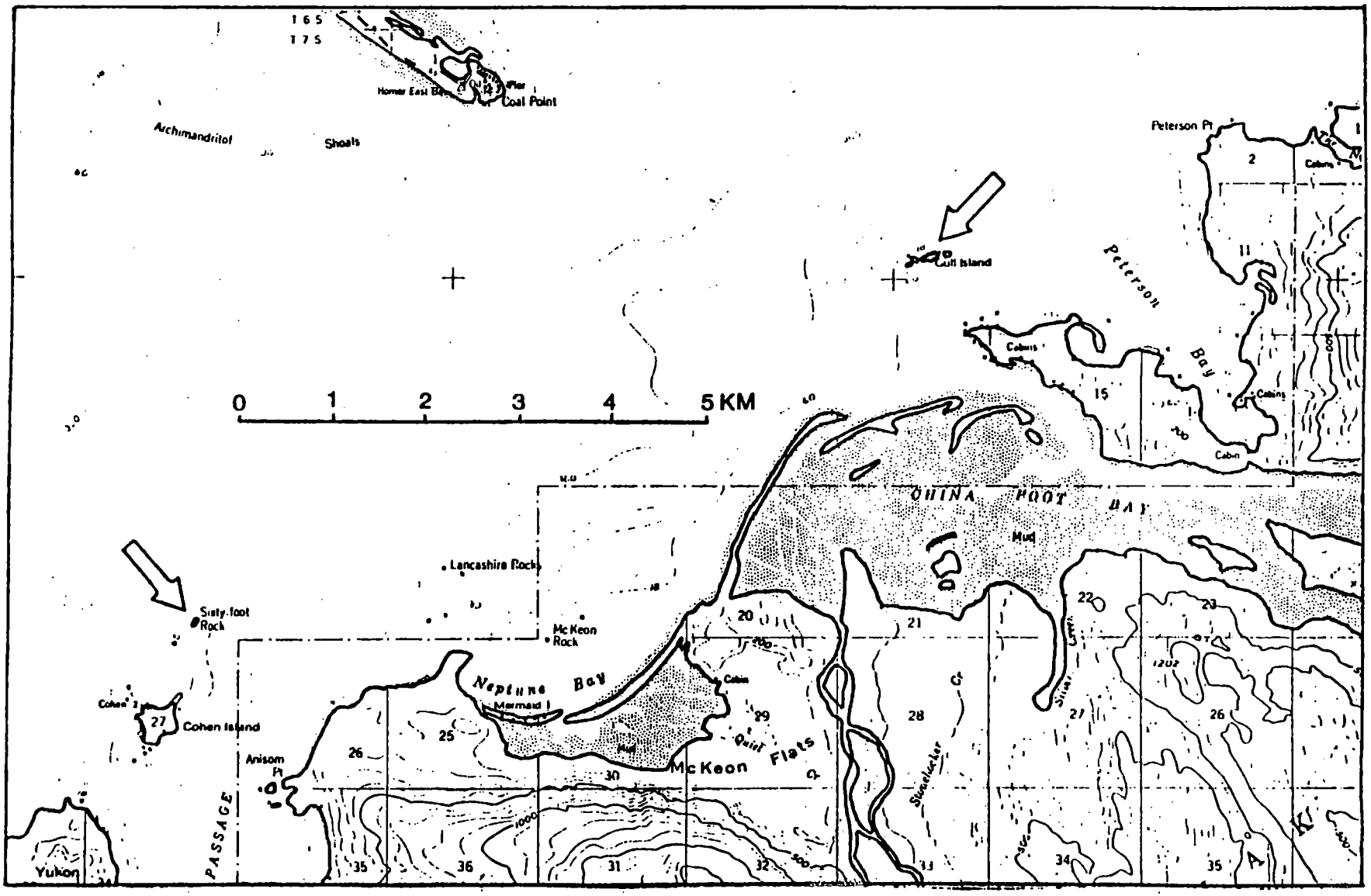

Figure 1. Vicinity map of Gull Island and Sixty-Foot Rock in Kachemak Bay, Alaska.

importance in the winter diets of common murres, pigeon guillemots and marbled murrelets (Sanger and Jones 1982).

The Gull Island colony consists of one vegetated island and three rocky islets (Figure 2). Vegetation covers much of the main island except for a 1 m fringe. Cow parsnip (Heracleum lanatum) and stinging nettle (Urtica sp.) are the dominant vegetation on the main island. Other less common plants include: hemlock parsley (Conioselinum chinense), seawatch angelica (Angelica lucida) and blue joint grass (Calamagrostis canadensis).

The main island and two of the islets, Gorilla and Murre rocks, provide nesting habitat for the following seabirds: pelagic and red-faced cormorants, glaucous-winged gulls, black-legged kittiwakes, common murres, pigeon guillemots, horned puffins (Fratercula corniculata), and tufted puffins (F. cirrhata). Most of the murres breed on Murre Rock and glaucous-winged gulls nest on the main island. The other islet is used by roosting gulls and cormorants. The highest point on the main island is 28 m.

Sixty-Foot Rock is located in outer Kachemak Bay, north of Cohen Island (Figure 3). The rock is about 80 m long and 10 m wide. It is mostly unvegetated with vertical cliffs on all sides. Nesting seabirds at this colony include: glaucous-winged gulls, black-legged kittiwakes, common murres, pigeon guillemots and tufted puffins. In some years, pelagic cormorants also may attempt to breed on the island. Most of the black-legged kittiwakes nest on its east side; glaucous-winged gulls, common murres and tufted puffins, use the top.

METHODS

Gull Island

Pelagic and Red-faced Cormorants

We counted nests over the entire island on June 22, 1989. A count for chicks was attempted on July 28, 1989, but the nestlings were too small to count.

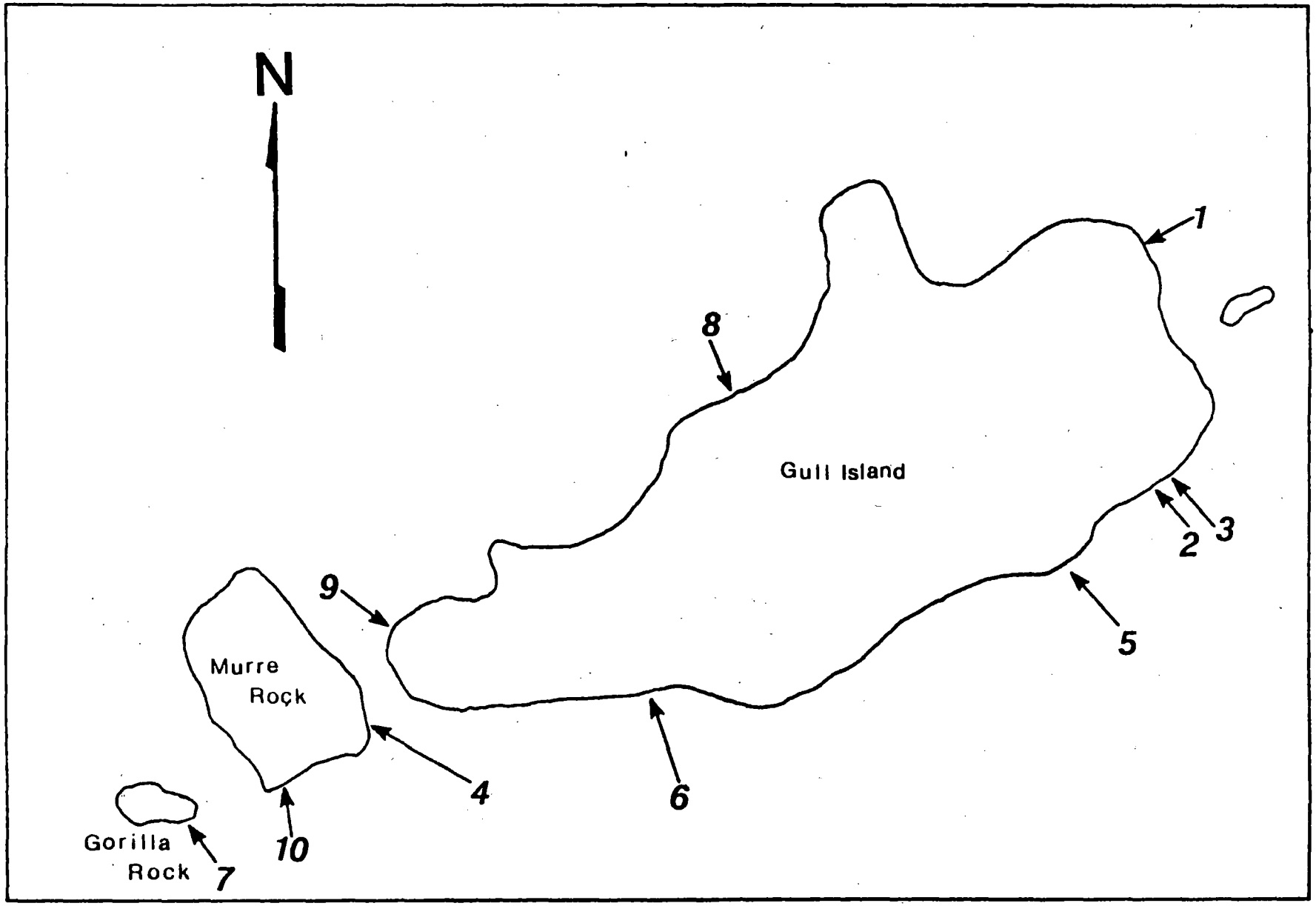

Figure 2. Gull Island complex with locations of kittiwake study plots

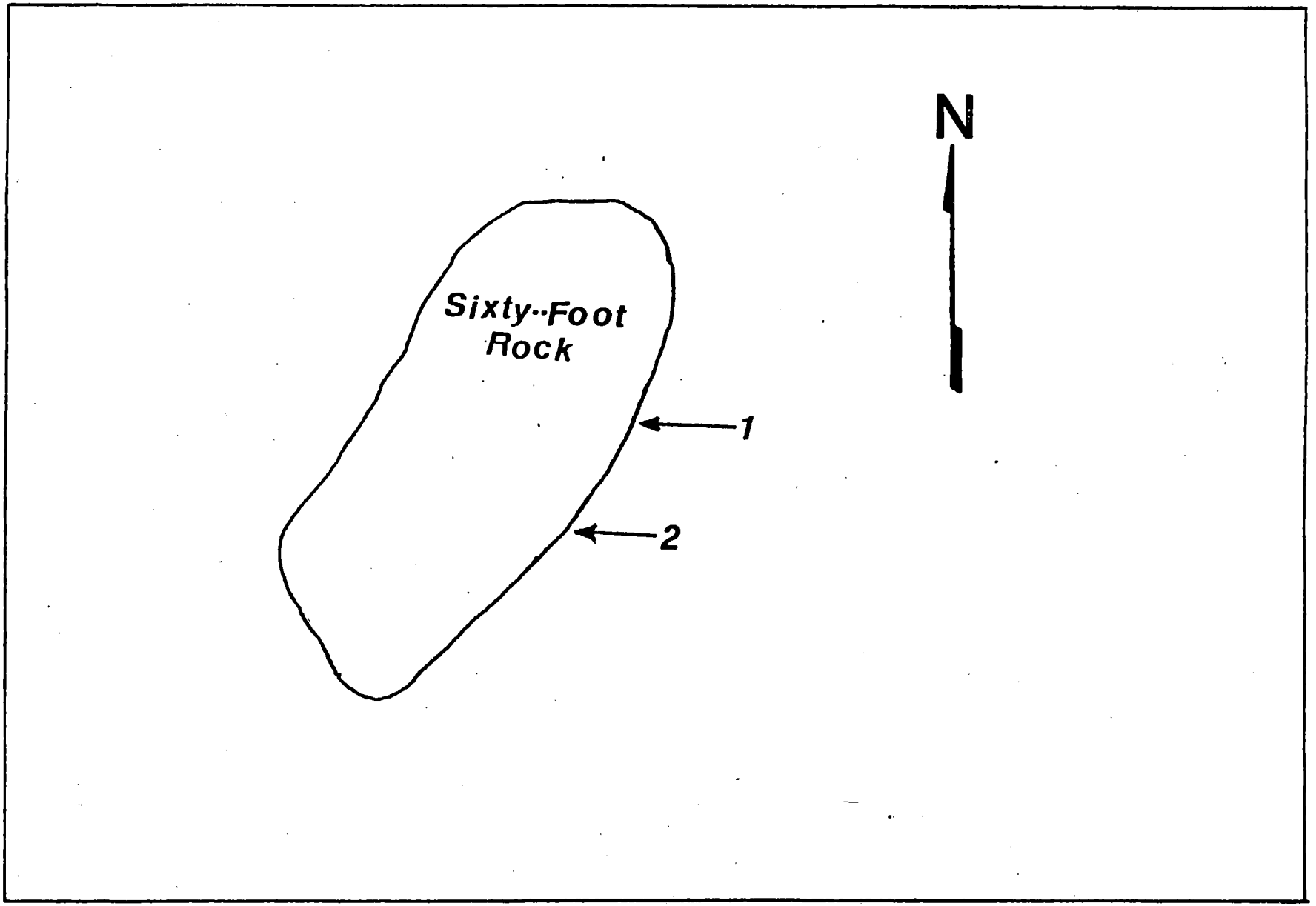

Figure 3. Sixty-Foot Rock with locations of study plots.

We delayed our chick count to August 4, 1989. Nests were defined as platforms where new vegetative material had been added during the breeding season. Counts were made by cliff sections; each section was counted at least twice or until separate counts fell within 5% of each other.

We made one count of cormorant nests within plots in June; adults were counted several times during June and July. Counting procedures followed those for kittiwake plot counts (see below). As with all seabirds, we also looked for birds that may have been oiled by the T/V EXXON Valdez oil spill.

Glaucous-winged Gulls

We counted the number of adult birds on June 20 and 22 by circling the main island on a boat while two members of our field crew were on the island. On the above dates, we also divided most of the main island into 38 three meter wide transects; the first and last transects had unequal widths due to the contour of the island. Transects were marked with numbered wooden stakes placed near the edge of the island. The nest contents of the following transects were counted: 1,2,6,10,14,18,22,26,30,34. Each nest counted was marked with green spray paint. To confirm the accuracy of our counts, transects 2, 10, 22, and 34 were rechecked.

Black-legged kittiwakes

We measured nesting attempts by counting nests from eight plots used since 1985 and two others established in 1988. Nests were defined as platforms where vegetative material had been added during the breeding season. The adult population was monitored by counting birds from these same plots. On each count day, plots were counted at least twice or until separate counts fell within 5% of each other. On June 20, 1989, we counted nests and adults at plots 4 and 8. Only nests were counted at plots 2, 3 and 10. On that date, we also looked into nests at the main island to estimate the number of

nests with eggs. We counted the adults at all plots and nests at all plots except plots 4 and 8 on June 22. Adults were again counted on June 27 at all plots. We counted adults at plots 4, 6, 7, and 10 on June 29; on July 2, we counted adults at plots 1, 2, 3, 5, 8, and 9. Thus we made one nest count at each plot and three adult counts at all plots except 4 and 8. Adults at the latter plots were counted four times.

We checked fledging success on August 3, 1989. Productivity data were collected by separately counting nests with one and two chicks. All were counted until our counts of chicks fell within 5% of each other.

Common Murres

On June 20, 1989, we estimated the number of murres at Gull Island from counts of birds on the water between 0718-0845 hours. Few murres were on the colony at that time. Birds were counted by groups of 10's. Unlike previous years, no photos were taken from the light tower on the main island, although murres returned to the colony after 0840 hours. We also counted murres on the plots following the procedure used for adult kittiwakes.

Pigeon Guillemots

We counted pigeon guillemots on the waters around Gull Island on June 20 and 22, 1989. The birds were monitored from about 0700-0720 hours.

Tufted Puffins

We did not estimate the puffin population, but recorded numbers present on our study plots.

Sixty-Foot Rock

Pelagic Cormorants

We counted adults and nests on established plots and cliff sections on June 27, 1989. Only adults were counted on June 28. Counting procedures were similar to those described above. We checked for cormorant chicks on July 28.

Glaucous-winged Gulls

Glaucous-winged gulls were counted following the procedures used for cormorants.

Black-legged Kittiwakes

The entire colony at Sixty-Foot Rock was monitored by dividing the rock into nine cliff sections (including two plots). Nesting attempts were determined from a count on June 27. We counted adult kittiwakes on June 27 and 28. Chicks were counted on July 28.

Common Murres

Murres were counted following procedures used for adult kittiwakes.

Tufted Puffins

Puffins were counted following procedures used for adult kittiwakes.

RESULTS AND DISCUSSION

Gull Island

Cormorants

The number of pelagic cormorant nests in 1989 was 12.6% higher than the mean number of nests from the three previous years (1986-88). There was little difference in nest counts between 1988 and 1989 (Table 1). Red-faced nests in 1989 was 15.4% greater than the mean of the three previous years. However, there was a 87.5% increase in red-faced nests between 1988 and 1989. Unlike 1988, no pelagic cormorant nests were observed along the northwest headlands of China Poot Bay.

Pelagic cormorants produced 0.56 prefledging chicks/nest in 1989 compared to the mean of 0.37 chicks/nest for the three previous years (Table 2). All of the pelagic chicks were produced on the main island (Appendix A). Although there were several red-faced nests, only one chick was produced on Gorilla Rock and four on Murre Rock (two,two-chick nests). Productivity may be underestimated because a clear view of all chicks is sometimes difficult from a boat.

Glaucous-winged Gulls

We made an estimate of 762 adult birds from two counts in late June (Table 1). This compares with 442 birds counted in 1985. We did not count adults during 1986-88. In those years, nests were counted, but it was often difficult to accurately count the nests due to high and dense vegetation. In 1989, we counted nests only from selected index transects (Appendix B). Use of 3 m wide transects proved quite reliable. Among the four transects we rechecked, we missed four nests on one transect and none on the other three. We had intended to count all 3 m transects, but did not have the time. We suggest that all transects be counted at three year intervals. In addition,

Table 1. Comparison of common seabirds at Gull Island and Sixty-Foot Rock, Alaska.

Colony	PECO	RFCO	BLKI	GWGU	COMU	PIGU	TUPU
Gull Island							
1976	222	62	3194	216	3286	12	530
1984	(54)	(4)	(4204)	200	2652	5	(71)
1985	105	14	8202	442	1994	13	8
1986	272(111)	45(14)	--	(286)	--	--	--
1987	296(103)	56(17)	--	(296)	--	42	--
1988	(130)	(8)	--	(527)	5500	27	--
1989	(129)	(15)	--	762	5176	24	--
Sixty-Foot Rock							
1976	0	0	68	64	350	0	52
1984	30	--	(199)	21	234	--	17
1985	28	0	(177)	--	91	--	--
1986	13	0	289(230)	113	99	2(1)	13
1987	9	0	250(106)	86	221	3	5
1988	12	0	414(280)	96	155	--	1
1989	29(3)	0	351(281)	95	232	--	5

PECO=Pelagic cormorant, RFCO=Red-faced cormorant, BLKI=Black-legged kittiwake, GWGU=Glaucous-winged gull, COMU=Common murre, PIGU=Pigeon guillemot, TUPU=Tufted puffin
()=Nests or burrows

Table 2. Reproductive success of cormorants and kittiwakes at Gull Island and Sixty-Foot Rock, Kachemak Bay, Alaska.

Plots	Pelagic Cormorants		Black-legged Kittiwakes	
	Nests	Chick/Nest	Nests	Chick/Nest
G1				
1984	--	--	30	1.13
1985	--	--	33	0.39*
1986	1	2	44	0.80
1987	0	0	24	0.04
1988	1	0	63	0.66
1989	0	1	58	0.81
G2				
1984	--	--	24	0.63
1985	--	--	26	0.38
1986	0	0	48	0.42
1987	0	0	18	0.06
1988	0	0	48	0.81
1989	1	0	45	0.78
G3				
1984	--	--	26	0.58
1985	--	--	31	0.65
1986	0	0	66	0.89
1987	0	0	21	0.29
1988	0	0	78	0.81
1989	0	0	82	0.71
G4				
1984	--	--	--	--
1985	--	--	34	0.26
1986	0	0	40	0.78
1987	0	0	17	0.00
1988	0	0	47	0.49
1989	0	0	38	0.68
G5				
1984	--	--	--	--
1985	--	--	102	0.19
1986	1	0	161	0.67
1987	0	0	94	0.00
1988	1	0	216	0.71
1989	0	0	213	0.42
G6				
1984	--	--	--	--
1985	--	--	148	0.28
1986	11	0.52	208	--
1987	2	0.00	61	0.00
1988	14	0.29	282	0.30
1989	12	0.33	232	0.33

G=Gull Island plots
*=Plots G1 and G4 had 0.86 and 1.28 chicks/nest a week earlier.

Table 2. Continued.

Plots	Pelagic Cormorants Nests	Pelagic Cormorants Chick/Nest	Black-legged Kittiwakes Nests	Black-legged Kittiwakes Chick/Nest
G7				
1984	--	--	--	--
1985	--	--	76	--
1986	2	0	126	--
1987	0	0	45	0.00
1988	0	0	133	0.44
1989	1	0	130	0.42
G8				
1984	--	--	--	--
1985	--	--	54	0.54
1986	5	0.80	76	0.62
1987	13	0.15	20	0.05
1988	5	0.60	82	0.63
1989	2	2.00	77	0.66
G9				
1984	--	--	--	--
1985	--	--	--	--
1986	--	--	--	--
1987	--	--	--	--
1988	1	0.00	44	0.68
1989	0	0.00	41	0.37
G10				
1984	--	--	--	--
1985	--	--	--	--
1986	--	--	--	--
1987	--	--	--	--
1988	0	0.00	78	0.72
1989	0	0.00	69	0.12
Gull Island Plots (pooled data--plots 1-8)				
1984	--	--	+	+
1985	--	--	428	0.33[1]
1986	20	0.65	769	0.69[2]
1987	15	0.13	300	0.03
1988	21	0.33	949	0.63
1989	16	0.56	875	0.50

G=Gull Island plots
+=Only plots G1, G2 and G3 monitored in 1984.
[1]=Does not include reproductive data from plot G7.
[2]=Does not include reproductive data from plots G6 and G7.

Table 2. Continued.

Plots	Pelagic Cormorants Nests	Pelagic Cormorants Chick/Nest	Black-legged Kittiwakes Nests	Black-legged Kittiwakes Chick/Nest
S1				
1984	--	--	--	--
1985	--	--	14	0.21
1986	0	0.00	52	0.62
1987	0	0.00	17	0.00
1988	0	0.00	55	0.78
1989	0	0.00	65	0.02
S2				
1984	--	--	--	--
1985	--	--	21	0.10
1986	0	0.00	23	0.61
1987	0	0.00	14	0.00
1988	0	0.00	27	0.48
1989	2	0.00	25	0.00
Sixty-Foot Rock (entire island)				
1984	--	--	199	--
1985	--	--	177	0.10
1986	0	0.00	230	0.40
1987	0	0.00	106	0.00
1988	0	0.00	280	0.58
1989	3	0.00	281	0.16

S=Sixty-Foot Rock plots

counts of adult birds should be done concurrently with the nest count so a comparison between nest and adult birds could be made.

Black-legged Kittiwakes

Kittiwakes were first observed at Gull Island on March 29, 1989. This is consistent with arrival times of previous years when kittiwakes appeared at Gull Island in March or April. At other Cook Inlet colonies, kittiwakes were first observed in March 1970/71, at Chisik Island (Snarski 1971) and were already present by May 3, 1978, at East Amatuli Island (Manuwal 1980).

On June 20, 1989, we found 85% of the nests on the north side of the main island with at least one egg. On the south side, 95% of the nests had eggs. This agrees with Snarski (1971) who estimated egg laying on Gull Island to occur around early-mid June in 1971.

The increasing trend of kittiwake numbers among the study plots did not occur in 1989. All plots showed a decline except plot 2 (Table 3; Appendix C). There was a 16.0% decline in adult birds between 1988 and 1989 at plots 1-8. There were fewer nests at all plots except plot 3 (Table 3). There was a 7.8% decline in nests between 1988 and 1989 at plots 1-8. The smaller decrease in nests compared to adults is the reverse of our 1987 results, the only previous year when this colony experienced a population decline. In that year, the number of adults at plots 1-8 declined by 26.9% from the previous year, whereas, nests declined by 61.0%. When conditions for breeding are poor, we would expect a greater decline in nests rather than adult birds as was the case in 1987. It is not clear whether the oil spill or boat traffic associated with the spill had an effect on kittiwakes. These results, perhaps, could be better understood after we review other kittiwake studies at study sites affected by the oil spill.

The Gull Island colony continued to be a consistent producer of kittiwakes. All but one plot produced at least 0.33 prefledging chicks/nest (Table 2). However, reproductive success was 0.13 prefledging chicks/nest less than 1988.

Table 3. Counts of adult cormorants, black-legged kittiwakes and common murres at Gull Island and Sixty-Foot Rock.

Plot/Cliff Section	Pelagic Cormorants (mean)	Black-legged Kittiwakes (mean)	Common Murres (mean)
G1			
1984	--	57.0	--
1985	--	61.0	22.0
1986	1.0	69.3	18.2
1987	0.2	46.4	24.8
1988	1.8	82.6	18.8
1989	0.0	68.0	18.0
G2			
1984	--	31.0	--
1985	--	29.0	27.0
1986	0.0	49.3	29.2
1987	0.0	44.3	42.8
1988	0.0	64.6	31.6
1989	0.7	69.3	33.0
G3			
1984	--	57.0	--
1985	--	59.0	0.0
1986	0.0	88.3	19.4
1987	0.0	63.3	35.3
1988	0.0	112.0	43.8
1989	0.3	96.7	60.7
G4			
1984	--	--	--
1985	--	42.0	0.0
1986	0.0	55.5	0.0
1987	1.3	34.5	0.0
1988	0.0	56.0	0.0
1989	0.0	52.5	0.0
G5			
1984	--	--	--
1985	--	155.0	0.0
1986	2.0	213.0	7.0
1987	0.5	163.8	6.3
1988	2.4	266.0	9.6
1989	1.0	219.7	11.7
G6			
1984	--	--	--
1985	--	224.0	0.0
1986	38.0	265.8	25.0
1987	16.8	205.0	39.5
1988	26.0	405.4	29.6
1989	23.7	312.3	37.7

G=Gull Island plots S=Sixty-Foot Rock plots

Table 3. Continued.

Plot/Cliff Section	Pelagic Cormorants (mean)	Black-legged Kittiwakes (mean)	Common Murres (mean)
G7			
1984	--	--	--
1985	--	--	--
1986	2.0	151.5	4.6
1987	1.0	104.5	0.5
1988	0.0	189.2	86.4
1989	1.3	159.3	12.3
G8			
1984	--	--	--
1985	--	--	--
1986	11.5	100.0	3.3
1987	24.4	63.6	9.2
1988	13.0	112.8	17.6
1989	3.0	104.3	11.0
G9			
1984	--	--	--
1985	--	--	--
1986	--	--	--
1987	--	--	--
1988	6.4	61.2	0.4
1989	2.0	52.0	7.3
G10			
1984	--	--	--
1985	--	--	--
1986	--	--	--
1987	--	--	--
1988	0.0	104.4	0.0
1989	0.7	84.7	10.3
Gull Island Plots (pooled data--plots 1-8)			
1984	--	+	--
1985	--	@	@
1986	54.5	992.7	106.7
1987	44.2	725.4	158.4
1988	43.2	1288.6	237.4
1989	30.0	1082.1	184.4

G=Gull Island
+=Only plots G1, G2 and G3 monitored in 1984.
@=Adult counts not made at plots G7 and G8.

Table 3. Continued.

Plot/Cliff Section	Pelagic Cormorants (mean)	Black-legged Kittiwakes (mean)	Common Murres (mean)
S1			
1984	--	--	--
1985	--	--	0.0
1986	0.0	61.4	0.6
1987	0.0	47.8	8.8
1988	0.0	77.6	2.2
1989	3.5	67.5	1.0
S2			
1984	--	--	--
1985	--	--	23.0
1986	0.0	34.4	31.6
1987	0.0	23.3	24.8
1988	0.0	34.8	17.6
1989	8.5	30.0	23.5

Common Murres

Most of the murres use the top of Murre Rock with smaller numbers located on ledges on Gorilla Rock and the main island. In June 1989, we estimated that there were 5,176 murres at Gull Island (Table 1). By comparison, we had an estimate of 5,500 murres in 1988. However, because only a single count was made, this difference could be due to variability in the attendance pattern of murres. We did not make an index count of murres on Murre Rock as was done in the past.

At plots 1-8, murres declined by 22.3% over the 1988 count. This was the first year that we observed a decline in the plots. Some of the birds were clearly affected by the EXXON Valdez oil spill. On June 16, 1989, we collected a dead oiled murre at the colony and observed an apparently oiled murre at the base of plot 6 on June 22. However, little effort was made to study the effects of oil on this colony and, therefore, we could not determine the extent of oil impacts on murres.

Pigeon Guillemots

We estimated that there were 24 guillemots at Gull Island in June 1989 (Table 1). This is probably an under estimate of the population since we did not make our counts during the recommended counting period in early spring.

Tufted Puffins

We did not census the entire colony for puffins, but made counts of adults on our study plots. One or two tufted puffins were occasionally observed at plots 6, 8, and 9.

SIXTY-FOOT ROCK

Pelagic Cormorants

We found three pelagic nests for the first time since we began monitoring this colony in 1984 (Table 1; Appendix C). However, none of the nests produced young. There were also 29 adult birds. This was the second highest count of pelagics since 1984.

Glaucous-winged Gulls

We made an estimate of 95 gulls (Table 1; Appendix C). This is nearly the same number of birds observed during the past three years. A nest count or a method to count adults from land, similar to the method described by Hanssen (1982), would be needed to get a more accurate estimate of the breeding population.

Black-legged Kittiwakes

We had a count of 351 adults and 281 nests in 1989 (Table 1; Appendix C). This represents a 15.2% decline in adults, but no change in nests compared to the 1988 results. The colony generally failed; it produced only 0.16 prefledging chicks/nest (Table 2).

Common Murres

Most of the murres use the top of the rock, but some can be found on ledges on the east side. Our estimate of 232 birds was the second highest count since 1984 when we began monitoring this colony (Table 1; Appendix C). Therefore, there was no obvious impacts to this population as a result of the EXXON Valdez oil spill.

Tufted Puffins

We had an estimate of only five puffins in 1989 (Table 1; Appendix C). However, it is difficult to make conclusions about the population without data on their attendance pattern.

RECOMMENDATIONS

Gull Island

Cormorants

-continue total nest counts.
-count chicks over the entire colony; on enlarged photos identify nests whose nestling numbers cannot be determined on the first count and make additional counts on separate days until an accurate count can be made.

Glaucous-winged Gulls

-count nests within all 3 m wide transects at 3 year intervals; recheck nest counts on at least 5% of the transects.
-count the number of adult birds annually.

Black-legged Kittiwakes

-continue monitoring plots as in the past.
-determine attendance pattern between mid-incubation and early chick rearing period.
-make nest counts of the entire colony every three years beginning in 1990.
-count chicks around the entire colony in the same year as the total nest counts to compare plot data with the overall colony.
-map locations of nest sites.

-establish beached bird transects along the northwest beaches of Kachemak Bay, Homer Spit and Glacier Spit.

Common Murres

-continue monitoring as in previous years.
-map locations of murres.

Pigeon Guillemots

-determine attendance pattern during pre-breeding season.
-estimate breeding population in 1990 and henceforth at three year intervals.

Tufted Puffins

-count burrows every three years.

Sixty-Foot Rock

Cormorants, Black-legged Kittiwakes

-continue monitoring as in previous years.
-map nest sites.

Common Murres

-continue monitoring as in previous years and photograph the colony.
-map locations of adult birds.

Glaucous-winged Gulls

-land on rock and make nest counts at three year intervals.

Pigeon Guillemots

-make colony count in 1990 and henceforth at intervals of every three years.

Tufted Puffins

-land on rock and make burrow counts at three year intervals

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Appendix A. Cormorant counts at Gull Island.

Nesting Atte Form

Island Gull Island Date 6/22/89

Plot/Sect.	Time	Vis.	Wind	PECO (nests)	RFCO (Nests)	DCCO	BLKI	TBMU	COMU	Comments
Main Is.	1240-1415	1	10	125	11					
Murre Rock	"	1	"	3	3					
Gorilla Rock	"	1	"	1	1					

Vis.: 1=excellent (nothing obscured), 2=good (heavy overcast or light mist all birds or nest almost certainly seen) 3=fair (fog or heavy drizzle, observing difficult)

Reproductive Success Form

Island Gull

Breeding Season 1989

Plot	Date	Time	Vis	Wind	Pelagic Cormorants					Kittiwakes				Common Murre
					Ad	0	1c	2c	3c	Ad	0	1c	2c	
Main Is.	7/28/89	1330-1500	3	0	—	—	5	5	0	—	—	—	—	—
Gorilla Rock	"	"	"	0	—	—	+ 1 RFCO chick 0	0	0	—	—	—	—	—
Murre Rock	"	"	"	0	—	—	0	0	0	—	—	—	—	—
Main Is	8/4/89	1000-1138	1	0	—	—	20	15	1					
Gorilla Rock	8/4/89	"	"	0	—	—	+ 1 RFCO chick (1 chick mort) 0	0	0					
Murre Rock	8/4/89	"	"	0	—	—	0	+2 RFCO 0	2 chick Nest (= 4 chicks) 0					

Appendix B. Gull transect counts at Gull Island.

Gull Island Glaucous-winged Gull Nest Counts

Date	Transect No.	0 Egg	1 Egg	2 Egg	3 Egg
06/20/89	1	5	10	22	32
06/20/89	2	3	5	8	18
06/22/89	6	0	2	1	9
06/22/89	10	1	1	4	5
06/22/89	14	1	2	7	2
06/22/89	18	2	5	6	15
06/22/89	22	3	1	7	6
06/22/89	26	5	9	7	5
06/22/89	30	0	5	11	12
06/22/89	34	0	1	0	2

Appendix C. Plot/cliff section counts of seabirds at Gull Island and Sixty-Foot Rock.

ISLAND	DATE	PLOT/SECTION	TIME	VISIBILITY	WIND	PECO-AD	PECO-N	RPCO-AD	RPCO-N	BLKI-AD	BLKI-N	GWGU-AD	COMU-AD	TOPU-AD	PIGU-AD
Gull	06/22/89	P-1	0849	1	5	0	0	0	0	74	58	5	20	0	0
Gull	06/27/89	P-1	1515	1	15	0	0	0	0	66	-------	0	19	0	0
Gull	07/02/89	P-1	1025	1	5	0	0	0	0	64	-------	9	15	0	0
Gull	06/20/89	P-2	---------	1	5	-------	-------	-------	-------	-------	45	-------	-------	-------	-------
Gull	06/22/89	P-2	1301	1	5	1	1	2	1	61	-------	0	36	0	0
Gull	06/27/89	P-2	1421	1	15	0	-------	2	-------	73	-------	0	36	0	0
Gull	07/02/89	P-2	0925	1	5	1	-------	1	-------	74	-------	0	27	0	0
Gull	06/20/89	P-3	1015	1	5	-------	-------	-------	-------	-------	82	-------	-------	-------	-------
Gull	06/22/89	P-3	1308	1	5	0	0	0	0	114	-------	0	81	0	0
Gull	06/27/89	P-3	1430	1	15	0	-------	0	-------	88	-------	0	61	0	0
Gull	07/02/89	P-3	0935	1	5	1	-------	0	-------	88	-------	0	40	0	0
Gull	06/20/89	P-4	0914	1	5	0	0	0	0	54	38	0	0	0	0
Gull	06/22/89	P-4	1126	1	5	0	-------	0	-------	55	-------	0	0	0	0
Gull	06/27/89	P-4	1347	1	15	0	-------	0	-------	56	-------	0	0	0	0
Gull	06/29/89	P-4	0950	1	5	0	-------	0	-------	45	-------	0	0	0	0
Gull	06/22/89	P-5	0913	1	5	0	0	0	0	253	213	1	0	0	0
Gull	06/27/89	P-5	1443	1	15	1	-------	0	-------	196	-------	0	14	0	0
Gull	07/02/89	P-5	0910	1	5	2	-------	0	-------	200	-------	2	21	0	0
Gull	06/22/89	P-6-1	1035	1	5	11	5	0	0	155	113	6	16	0	0
Gull	06/27/89	P-6-1	1351	1	15	11	-------	0	-------	133	-------	2	16	0	0
Gull	06/29/89	P-6-1	1000	1	5	7	-------	0	-------	110	-------	4	13	2	0
Gull	06/22/89	P-6-2	1035	1	5	4	3	0	0	85	35	0	32	0	0
Gull	06/27/89	P-6-2	1351	1	15	6	-------	0	-------	45	-------	0	22	0	0
Gull	06/29/89	P-6-2	1000	1	5	2	-------	0	-------	49	-------	1	10	1	0
Gull	06/22/89	P-6-3	1035	1	5	11	4	0	0	143	85	5	0	0	0
Gull	06/27/89	P-6-3	1351	1	15	10	-------	0	-------	103	-------	1	0	0	0
Gull	06/29/89	P-6-3	1000	1	5	9	-------	0	-------	134	-------	2	4	0	0
Gull	06/22/89	P-7	1148	1	5	2	1	0	0	168	130	0	2	0	0
Gull	06/27/89	P-7	1321	1	15	2	-------	1	-------	170	-------	4	28	0	0
Gull	06/29/89	P-7	0930	1	5	0	-------	0	-------	140	-------	4	7	0	0
Gull	06/20/89	P-8	0938	1	5	1	1	0	0	95	77	8	0	0	0
Gull	06/22/89	P-8	1238	1	5	3	2	0	-------	101	-------	1	0	0	0
Gull	06/27/89	P-8	1523	1	15	4	-------	0	-------	92	-------	0	15	0	0
Gull	07/02/89	P-8	1000	1	5	1	-------	0	-------	129	-------	6	29	2	1
Gull	06/22/89	P-9	1214	1	5	2	0	0	0	58	41	0	2	0	0
Gull	06/27/89	P-9	1536	1	15	2	-------	0	-------	46	-------	0	12	0	0
Gull	07/02/89	P-9	1035	1	5	2	-------	0	-------	52	-------	0	8	3	0
Gull	06/20/89	P-10	1025	1	5	-------	-------	-------	-------	-------	69	-------	-------	-------	-------
Gull	06/22/89	P-10	1141	1	5	0	0	0	0	86	-------	0	7	0	0
Gull	06/27/89	P-10	1332	1	15	1	-------	0	-------	87	-------	0	12	0	0
Gull	06/29/89	P-10	0945	1	5	1	-------	0	-------	81	-------	0	12	0	0

ISLAND	DATE	PLOT/SECTION	TIME	VISIBILITY	WIND	PECO-AD	PECO-M	RPCO-AD	RPCO-M	BLEI-AD	BLEI-M	GNGO-AD	CONO-AD	TUPO-AD	PIGO-AD
Sixty-Foot	06/27/89	S-1	1056	1	0	4	0	0	0	24	17	8	0	0	0
Sixty-Foot	06/28/89	S-1	1015	1	5	6	____	0	____	35	____	12	5	0	0
Sixty-Foot	06/27/89	P-1	1119	1	0	3	1	0	0	68	65	11	12	2	0
Sixty-Foot	06/28/89	P-1	1018	1	5	4	____	0	____	67	____	14	8	0	0
Sixty-Foot	06/27/89	S-2	1141	1	0	0	0	0	0	30	26	9	108	0	0
Sixty-Foot	06/28/89	S-2	1025	1	5	2	____	0	____	24	____	4	102	0	0
Sixty-Foot	06/27/89	P-2	1154	1	10	6	2	0	0	30	25	6	17	2	0
Sixty-Foot	06/28/89	P-2	1035	1	5	11	____	0	____	30	____	5	30	2	0
Sixty-Foot	06/27/89	S-3	1203	1	10	0	0	0	0	102	78	8	0	0	0
Sixty-Foot	06/28/89	S-3	1040	1	5	2	____	0	____	89	____	10	0	0	0
Sixty-Foot	06/27/89	S-4	1231	1	10	0	0	0	0	15	13	11	0	0	0
Sixty-Foot	06/28/89	S-4	1048	1	5	0	____	0	____	25	____	4	0	0	0
Sixty-Foot	06/27/89	S-5	1238	1	10	0	0	0	0	6	4	2	0	1	0
Sixty-Foot	06/28/89	S-5	1050	1	5	0	____	0	____	8	____	11	0	0	2
Sixty-Foot	06/27/89	S-6	1242	1	10	8	0	0	0	27	26	9	3	2	0
Sixty-Foot	06/28/89	S-6	1055	1	5	1	____	0	____	32	____	7	1	0	0
Sixty-Foot	06/27/89	S-7	1251	1	10	4	0	0	0	45	27	24	75	0	0
Sixty-Foot	06/28/89	S-7	1100	1	5	6	____	0	____	45	____	34	103	0	0

REPRODUCTIVE SUCCESS

Island	Date	Plot/Section	Time	Visibility	Wind	Pelagic Cormorants			Red-Faced Cormorants			Kittiwakes	
						1c	2c	3c	1c	2c	3c	1c	2c
Gull	08/03/89	P-1	1637	1	10	1	0	0	0	0	0	23	12
Gull	08/03/89	P-2	1439	1	0	0	0	0	0	0	0	17	9
Gull	08/03/89	P-3	1455	1	0	0	0	0	0	0	0	28	15
Gull	08/03/89	P-4	1529	1	0	0	0	0	0	0	0	18	4
Gull	08/03/89	P-5	1433	1	0	0	0	0	0	0	0	59	15
Gull	08/03/89	P-6-1	1514	1	0	1	0	0	0	0	0	36	10
Gull	08/03/89	P-6-2	1519	1	0	0	0	0	0	0	0	3	0
Gull	08/03/89	P-6-3	1524	1	0	1	1	0	0	0	0	11	3
Totals Plot 6						2	1	0	0	0	0	50	13
Gull	08/03/89	P-7	1551	1	0	0	0	0	0	0	0	34	10
Gull	08/03/89	P-8	1623	1	10	0	2	0	0	0	0	25	13
Gull	08/03/89	P-9	1614	1	10	0	0	0	0	0	0	11	2
Gull	08/03/89	P-10	1602	1	10	0	0	0	0	0	0	8	0
Sixty-Foot	07/28/89	S-1	1258	2	0	0	0	0	0	0	0	3	0
Sixty-Foot	07/28/89	P-1	1301	2	0	0	0	0	0	0	0	4	0
Sixty-Foot	07/28/89	S-2	1303	2	0	0	0	0	0	0	0	0	0
Sixty-Foot	07/28/89	P-2	1305	2	0	0	0	0	0	0	0	0	0
Sixty-Foot	07/28/89	S-3	1308	2	0	0	0	0	0	0	0	4	1
Sixty-Foot	07/28/89	S-4	1317	2	0	0	0	0	0	0	0	0	0
Sixty-Foot	07/28/89	S-5	1319	2	0	0	0	0	0	0	0	1	0
Sixty-Foot	07/28/89	S-6	1324	2	0	0	0	0	0	0	0	14	4
Sixty-Foot	07/28/89	S-7	1329	2	0	0	0	0	0	0	0	8	1