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REPRODUCTIVE ECOLOGY OF SEABIRDS
AT MIDDLETON ISLAND, ALASKA
14-24 June 1982

TRIP REPORT

by

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This is a summary of the results of the first part of a two part study and the authors should be consulted before use is made of the information in this report

Key Words: Gulf of Alaska, Middleton Island;
Seabirds, Glaucous-winged Gull,
Black-legged Kittiwake, Pelagic
Cormorant, Common Murre, Thick-
billed Murre, Tufted Puffin;
Populations, Reproduction, Phenology;
Monitoring, Assessment.

Marine Bird Management
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National Fishery Research Center

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July 1982

INTRODUCTION

Middleton Island harbors the largest colony of Pelagic Cormorants and Black-legged Kittiwakes in the Gulf of Alaska. The island is situated almost directly in the path of the Alaska Current System about 12 miles shoreward from the 200 m isobath (Figure 1). A major route for oil tankers moving to and from the Port of Valdez lies to the east (upstream) of Middleton Island as do potential oil exploration and development sites. The Federal Aviation Administration supports a station on the island to maintain and operate an air navigation installation (VORTAC). Three people currently work there in one week shifts. The facility includes an airstrip, living quarters, and a road system (Figure 2).

Information on the avifauna of Middleton Island is available in Rausch (1985), O'Farrell and Sheets (1962), Frazer and Howe (1977), Hatch et al. (1979), and Gould and Zabloudil (1981). Hatch et al. provide a great deal of information on the breeding biology and reproductive success of Black-legged Kittiwakes and Pelagic Cormorants as well as population statistics and life history data for Pelagic Cormorants, Glaucous-winged Gulls, Black-legged Kittiwakes, Common and Thick-billed Murres, Rhinoceros Auklets, and Tufted Puffins.

It is obvious from the above brief discussion that Middleton Island is an excellent site for baseline environmental studies in the region. The purpose of the work reported here was thus twofold. First we wanted to assess the current population level and breeding status of Pelagic Cormorants, Black-legged Kittiwakes, Common Murres and Thick-billed Murres, and to compare these with the results of previously conducted studies. Secondly, we wanted to begin a program of monitoring the reproductive efforts of Black-legged Kittiwakes and Pelagic Cormorants. To accomplish this second goal we have continued the monitoring techniques initiated by Gould and Zabloudil (1981).

METHODS

We visited Middleton Island from 14 June to 26 June 1982. During our stay we conducted the following activities.

GENERAL OBSERVATIONS

No special attempt was made to find and identify all bird and mammal species occurring on the island. Notes were kept, however, on the occurrence and reproductive status of all birds observed during other activities (Appendix A).

POPULATION CENSUSES

Counts of Pelagic Cormorant and Black-legged Kittiwake nests were carried out concurrently on 4 days from 17-20 June. Nests were defined as substantial platforms with indications of use in the current breeding season. Counts in all designated census areas (Figure 3) were made from the flats below the cliffs using a 20-45x spotting scope. Counts of all murres, Tufted Puffins, and Glaucous-winged Gulls seen either on the cliffs or flats below the cliffs were made at the same time as the counts

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Figure 1. Location of Middleton Island in the north-central Gulf of Alaska.

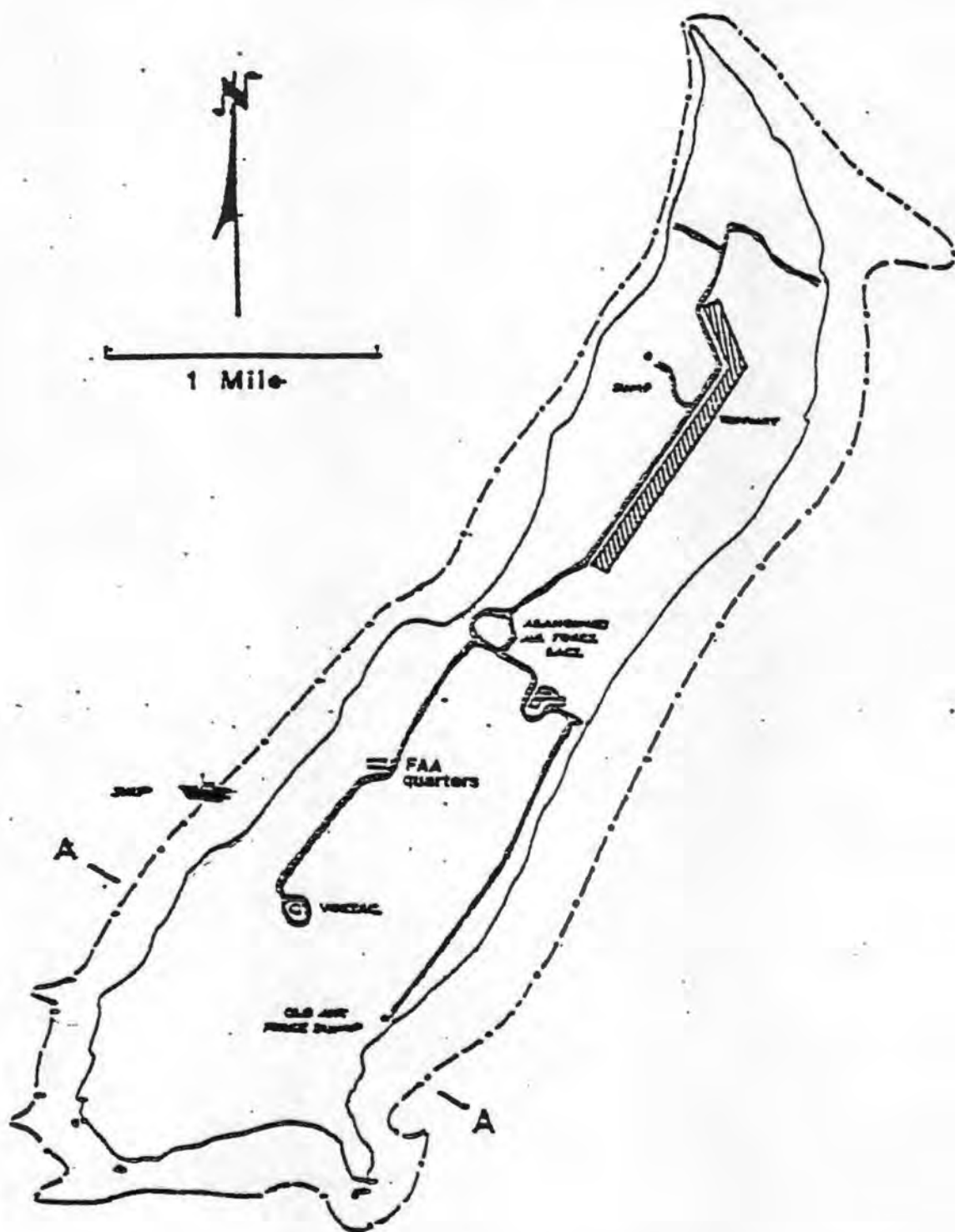


Figure 2. Human constructions on Middleton Island. (Redrawn from Fraser and Howe 1977). Dashed line indicates present shoreline.

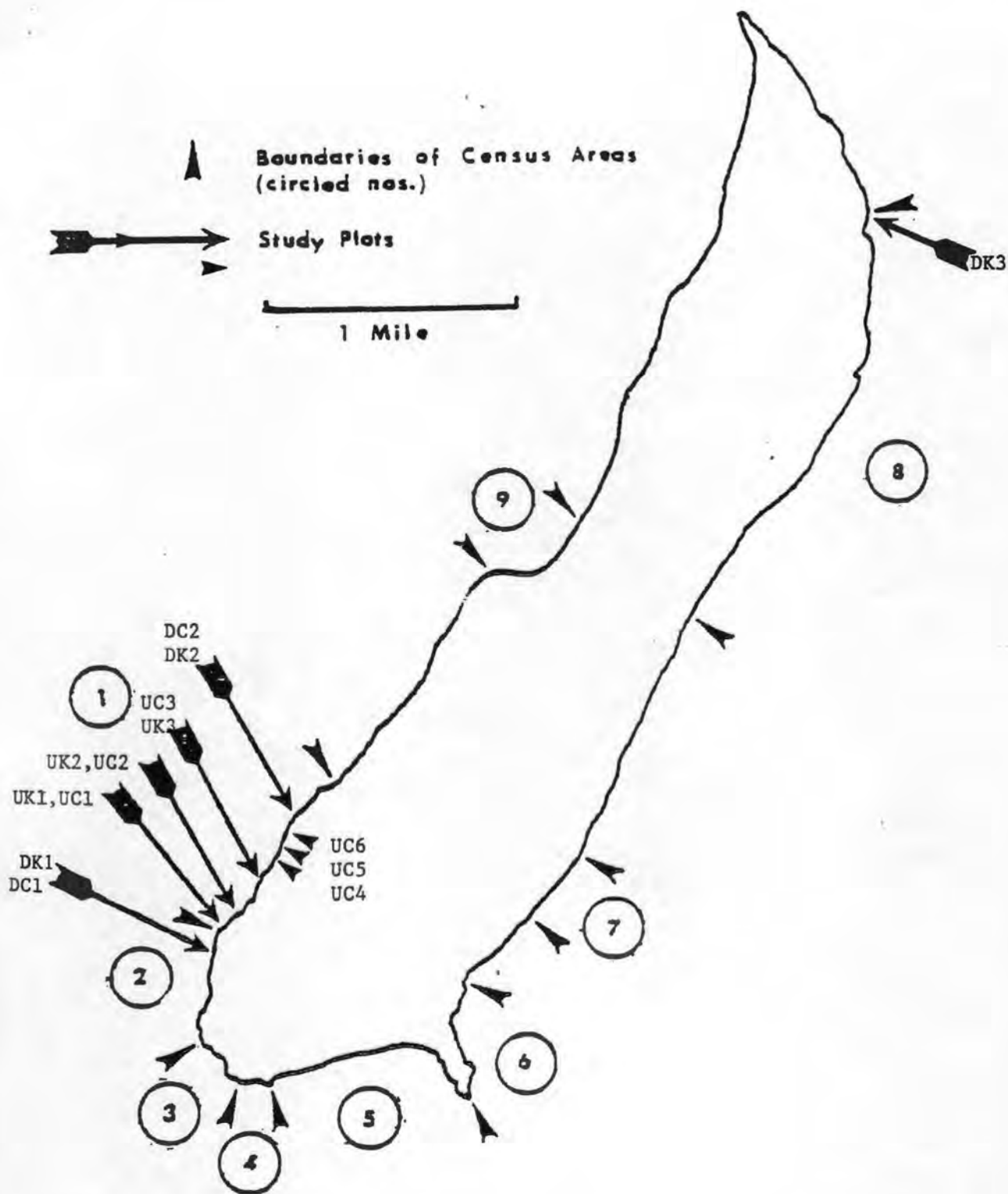


Figure 3. Locations of population census areas and Black-legged Kittiwake (K) and Pelagic Cormorant (C) study plots. U = undisturbed, D = disturbed, 1982.

of cormorant and kittiwake nests. These techniques are the same as those used by Hatch et al. (1979) and Gould and Zabloudil (1981).

BREEDING PHENOLOGY

We recorded the contents of all nests and estimated the age of all young birds observed during our surveys. Except in a few rare instances, we were unable to determine exact laying and hatching dates.

PRODUCTIVITY

We used the three undisturbed (U1-3) permanent kittiwake plots established by Gould and Zabloudil in 1981 (Figure 3), but we relabeled them as UK1-UK3 to avoid confusion with newly established cormorant plots. Plot UK1 is on a rocky area devoid of vegetation and situated fairly high on the cliff. Plot UK2 is an area of rocky cliff devoid of vegetation and rather close to the flats below the cliff. Plot UK3 is on a gradual, soil-covered slope with dense vegetation around the margins.

At each undisturbed plot, an observation station was selected at a point far enough away so that the birds did not flush from their nests when the station was occupied and high enough above the nests so that the contents of each nest could be seen when the attending bird stood up. This procedure assures that the breeding performance of kittiwakes is unaffected by human disturbance. Each plot was mapped and 60-70 nests were chosen and marked on a hand drawn map. The same nests were later marked on black and white photographs of the plots. One observer then spent one day at each plot observing the nests with a 25-45x telescope or 7x binoculars. Plots UK2 and UK3 were watched on 15 June and Plot UK1 was watched on 16 June. The contents of each marked nest were observed and recorded (Appendix B). The whole process was repeated 6 days later.

Three kittiwake areas on mud slopes of the upper cliffs were chosen as disturbance plots (DK1, DK2, and DK3). DK1 and DK2 were the same as used by Gould and Zabloudil (D1-2) in 1981, and DK3 was at the extreme north end of the east side colonies (Figure 3). Birds were flushed from DK1 and DK3 on 15 June and from DK2 on 21 June, and the contents of all nests in sight were counted.

Six undisturbed cormorant plots (UC1-6) were established, all on the western cliffs towards the south end of the island (Figure 3). Most of the nests in these plots are under the overhanging ledge at the top, but those of UC6 are halfway down the cliff on a dirt bulge. A total of 101 occupied nests were mapped (Appendix C). Each was examined from a distance to make sure that an adult was in attendance without scaring the bird from the nest and visible eggs and young were recorded.

Two disturbed cormorant plots (DC1-2) were established adjacent to disturbed kittiwake plots DK1-2 (Figure 3). All of these nests were under the overhang at the top of the cliffs. Birds were flushed from the nests on DC1 and all nest contents were counted. Although most of the birds flushed from DC2 when we were nearby, we did not record the contents of the nests.

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Table 1. Populations of seabirds censused in 1976, 1978, 1981 and 1982 on Middleton Island.

Species	Census Area (Number of Nests or Birds)								Total Nests	Total Birds
	1 & 10	2	3	4	5	6 & 7	8	9		
Pelagic Cormorant										
1976	702	343	85	41	302	110	322	14	1,919	
1978	813	279	125	41	439	184	407	53	2,341	
1981	1,131	339	144	35	330	56	426	13	2,474	
1982	1,210	340	139	25	269	121	414	94	2,612	
Black-legged Kittiwake										
1976	9,294	5,040	1,880	470	8,750	4,521	12,490	14	42,458	
1978	21,352	12,202	6,666	1,101	15,354	7,083	11,469	20	75,247	
1981	23,449	20,615	13,280	3,605	5,257	5,779	10,792	180	82,885	
1982	23,247	12,526	7,256	1,378	14,509	6,459	11,565	256	77,196	
Total Murres										
1976	1,149	4,333	149	0	0	0	220	0		5,851
1978	2,798	3,370	275	0	0	0	360	0		6,803
1981	2,573	2,609	162	0	0	0	177	0		5,521
1982	2,433	3,332	235	0	0	0	161	0		6,161
Tufted Puffin										
1976	195	190	4	20	290	46	110	30		885
1978	330	180	0	15	110	160	470	55		1,320
1981	227	241	11	0	25	134	64	30		732
1982	49	79	10	20	115	84	556	15		924
Glaucous-winged Gull										
1982	239	103	63	12	217	395	498	83		1,610

BEACHED BIRD AND MAMMAL SURVEYS

We surveyed most of the coastline of Middleton Island between high and low tide lines for dead seabirds and marine mammals (Figure 4). Refer to Wohl (1978) for details of these survey techniques.

RESULTS

Although the major research effort was directed towards Black-legged Kittiwakes and Pelagic Cormorants, information on populations, phenology, and productivity were obtained for other species including murres and Glaucous-winged Gulls. Anecdotal information on all other birds observed is presented in Appendix A.

PELAGIC CORMORANT

Population

We counted a total of 2,474 active cormorant nests around the entire island (Table 1). This is a 6% increase over 1981 and may represent a continued slow build up in the population—there was a 22% increase in numbers between 1976 and 1978, and a 6% increase between 1978 and 1981. The areas which showed major increases were colonies 6-8 along the eastern side of the island and the small colony 9 on the mid western cliffs. Colony 5 at the southeast corner of the island showed an 18% drop in numbers.

Phenology

Pelagic Cormorants were found in a variety of stages relative to the breeding cycle. A few birds were still nest building, many had eggs, and many had newly hatched young (Table 2). Several widely separated nests on the island held young judged to be at least in their second week since birth which suggests an initiation of egg laying around the first of May, and a peak near mid-May. This is in agreement with the phenology found by Hatch et al. in 1978, and Gould and Zabloudil in 1981.

Table 2. Contents of nests of Pelagic Cormorants from plot DC1 on Middleton Island, 15 June 1982.

	Number of Eggs and Young*					\bar{X} Eggs/ Nest with eggs	
	1	2	3	4	5		
Number of Nests	0	2	4	9	9	0	3.04

* two nests each contained 3 newly hatched young plus one egg

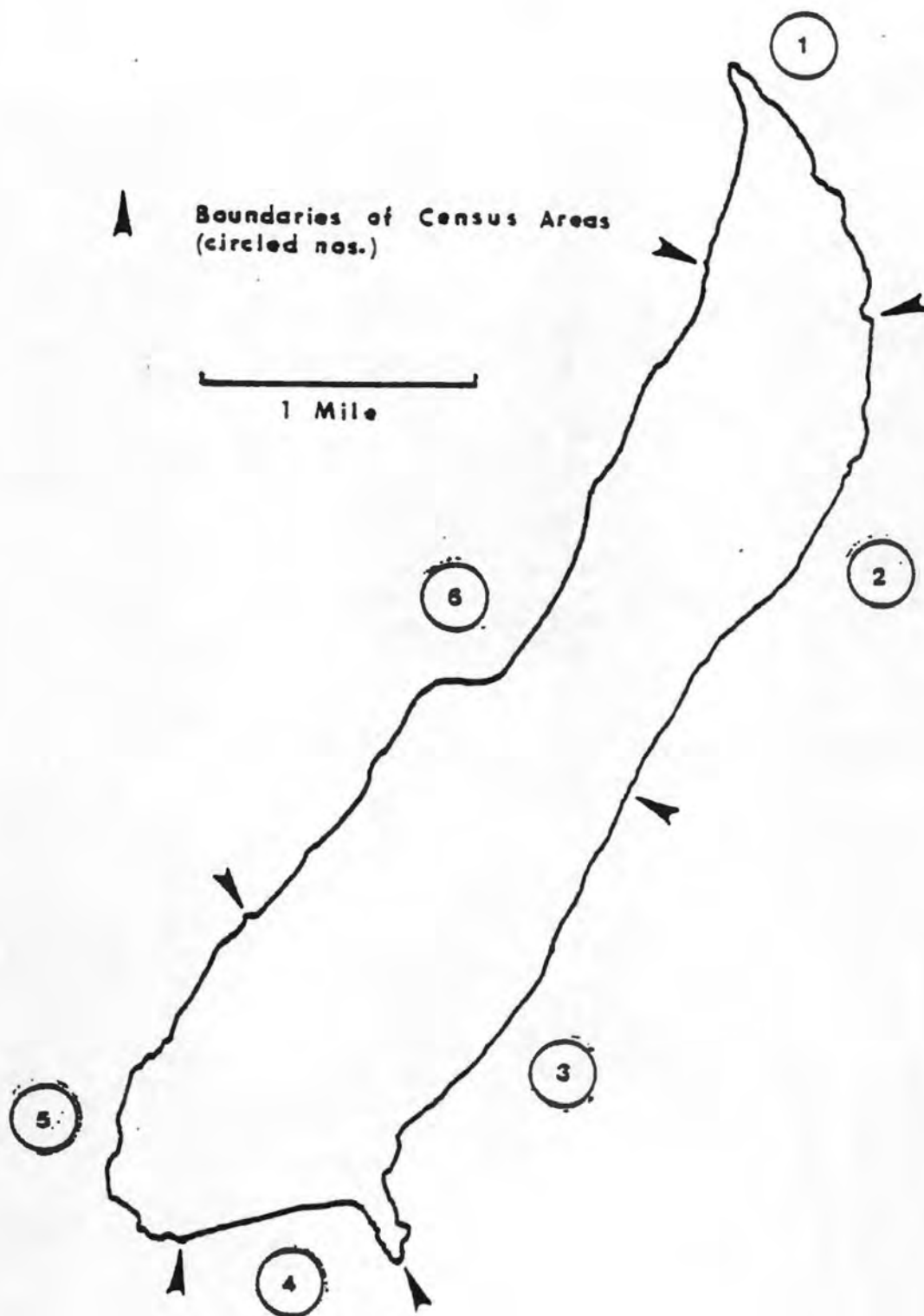


Figure 4. Locations of beached bird and mammal census areas.

Productivity

Birds were flushed from 24 nests in plot DC1 on 15 June (Table 2). Mean clutch size was 3.04. This is half way between the 2.84 found in 1978 and the 3.20 found in 1981.

BLACK OYSTERCATCHER

Population

At least 9-10 pairs still defended territories as late as June 21 in 1982 and five other individual birds were seen at other locations along the beaches (Figure 5). Hence, there were at least 23 birds present on Middleton Island in 1982.

Past studies do not elaborate much about surveys of this species. Frazer and Howe (1977) list only one pair for the island in 1976. Gould and Zabludil (1981) list 3 pairs and a total of 12 birds. Even if past surveys missed some birds, it still appears that Black Oystercatchers are increasing on Middleton Island. This increase probably correlates with the closing of much of the FAA station and the corresponding decrease in human activity. This pattern of reoccupation is similar to that seen on Destruction Island, Washington (Nysewander 1977) and the Farallon Islands, California (Ainley and Lewis 1974).

Phenology

Most pairs appeared to have chicks by the time of our visit, but two nests still had eggs—one of these hatched on June 19-20.

Productivity

Two nests each had three eggs.

GLAUCOUS-WINGED GULL

Population

We counted a total of 1,610 adult Glaucous-winged Gulls on and below the cliffs of the island (Table 1). Largest numbers were found below the densest kittiwake nesting areas. Add to this several hundred adults on the top of the island and we estimate a total of at least 800-1,000 breeding pairs. Whatever the number, there has been a noticeable increase in the gull population since 1978 and even since 1981.

We found two groups of subadult Glaucous-winged Gulls on the island. A group of 28 was on the northwest beach and a group of 42 was on the mideast beach.

Phenology

Twenty-six nests were found scattered over the south end of the island. Somewhat over one-third of these had hatched eggs although the oldest chick found was not more than 3 days old suggesting that egg

laying commenced sometime around 11-12 June (Table 3). This is several days later than in 1981 and perhaps two weeks later than in 1978.

Productivity

Of the 17 nests which contained only eggs (Table 3), the average clutch size was 2.59 (S.D. 0.51). This is slightly less than the 2.71 found in 1981 and the 2.89 found in 1978. The decrease in clutch size may be a reflection of the increasing gull population and thus a higher

Table 3. Contents of nests of Glaucous-winged Gulls on Middleton Island, 15-23 June 1982

Number of Nests	Contents of Nests
1	Empty: no sign of young
1	One chick: 3-4 days old
7	Two warm eggs
1	One egg + one newbored chick
3	Two chicks: 2-3 days old
10	Three warm eggs
1	Two chicks + one chick dead in pipped egg
2	Three chicks 2-3 days old

number of first time breeders. Most of the 2 egg clutches were scattered about the flat area above the southeast peninsula where we could not find any 3 egg clutches.

BLACK-LEGGED KITTIWAKE

Population

We counted a total of 77,196 kittiwake nests on the cliffs and flats of Middleton Island (Table 1). This is 7% fewer than found in 1981 but 3% greater than in 1978. Overall, the numbers and distribution of nests were more similar to 1978 than to 1981. Further studies are needed to determine whether 1981 was an unusual year or if the Middleton Island population of Black-legged Kittiwakes now regularly fluctuates between 150,000 and 160,000 breeding birds. It could also be that the 1981 high represented the peak of an expanding population curve.

Phenology

On 15-16 June, 20% of all kittiwake nests were empty. On 22-23 June, this number had decreased to 10% (Table 4). This is similar to the same period of 1981, and represents a laying rate of .06 eggs/nest/day coupled with a loss of .02 eggs/nest/day. Egg laying thus was continuing but at a very slow rate. The higher percentage of empty nests on 15-16 June 1982 compared with 15-19 June 1981, suggests that egg laying was a few

Table 4. Contents of disurbed (D) and undisturbed (U) nests of Black-legged Kittiwakes on Middleton Island 1982.

15-16 June 1982							22-23 June 1982						
	Number of Nests Containing				\bar{X} Eggs/ Nest With eggs	\bar{X} Eggs/ Nest		Number of Nests Containing				\bar{X} Eggs/ Nest With Eggs	\bar{X} Eggs/ Nest
	0 egg	1 egg	2 egg	3 egg				0 egg	1 egg	2 egg	3 egg		
DK1	20	31	62	2	1.69	1.40							
DK2	-	-	-	-	-	-	10	35	121	1		1.78	1.68
DK3	17	17	38	2	1.74	1.38							
Total	37	48	100	4	1.71	1.38	10	35	121	1		1.78	1.68
UK1	11	14	37	0	1.73	1.42	7	8	41	0		1.84	1.64
UK2	23	5	33	1	1.90	1.19	11	7	37	0		1.84	1.47
UK3	4	12	46	0	1.79	1.68	4	12	40	1		1.79	1.67
Total	38	31	116	1	1.80	1.43	22	27	118	1		1.82	1.58

days behind schedule in 1982. Egg counts on 23-24 July, 1982, however, suggest that the 1982 egg laying had caught up with that of 1981 so that termination of egg laying was the same not only in 1982 and 1981 but in 1978 as well. In the last 6 days of egg laying in 1978, 1.5% of the 145 nests studied had clutches initiated in them. In the last 6 days of our stay in 1982, 2.1% of the 157 nests studied had clutches initiated in them.

Productivity

By 22-23 June, the number of eggs per nest with eggs reached 1.82 (Table 4). If this is corrected for known egg loss, the approximate mean clutch size for Black-legged Kittiwakes on Middleton Island in 1982 was 1.88. This is midway between the 1.83 found in 1981 and the 1.94 found in 1978. It is interesting to note that egg loss was not noted at this stage in the breeding cycle of 1981. We could detect little difference between any of the study plots with respect to egg production. Although plot UK2 had a slightly higher percentage of empty nests, it also had a slightly higher mean number of eggs per nest with eggs and a somewhat high rate of egg loss.

COMMON MURRE and THICK-BILLED MURRE

Population

We counted 6,161 murres on the cliffs of Middleton Island (Table 1) which is substantially the same as was found in 1976, 1978, and 1981.

Phenology

Egg laying was in progress for both species during the ten days we spent on Middleton Island. We accidentally flushed 15 Common Murres from a cliff ledge on 16 June and exposed 5 eggs.

TUFTED PUFFIN

Population

We made a general count of adult Tufted Puffins sitting on the cliffs of Middleton Island and found 924 individuals scattered around the south, east and west cliffs (Table 1).

BEACHED BIRDS AND MAMMALS

The results of our beached bird and mammal surveys are presented in Tables 5 and 6. We found more than twice as many marine bird species and three times as many individuals as in 1981 even though we did not complete census area number 3. The number of marine mammals found was about the same in both years.

Table 5. Dead birds and mammals found on surveys of beaches on Middleton Island. 15-23 June 1982.

Species	Survey Area					
	1	2	3	4	5	6
Northern Fulmar	0	0	-	0	0	0
Pelagic Cormorant	1	0	-	1	0	0
Short-tailed Shearwater	1	3	-	1	0	0
Goose	0	0	-	0	1	0
Mallard	1	1	-	1	0	1
Green-winged Teal	0	0	-	0	0	1
Greater Scaup	0	0	-	0	1	0
White-winged Scoter	0	0	-	0	1	0
Glaucous Gull	0	1	-	0	0	0
Glaucous-winged Gull	1	1	-	1	0	1
Black-legged Kittiwake	0	3	-	4	5	1
Unidentified Murre	0	0	-	0	1	1
Common Murre	1	1	-	0	0	0
Tufted Puffin	0	0	-	0	3	0
Unidentified Bird	0	0	-	1	0	0
Harbor Seal	0	2	-	2	0	0
Steller's Sea Lion	0	0	-	1	0	0

Table 6. Comparison of results of beached bird and mammal surveys, Middleton Island: May-August 1976-1978, June 1981, and June 1982.

	No. Birds/Km	No. Bird Species	No. Mammals/Km	No. Mammal Species	Km of Surveys
Survey No. 1					
1976-1978	1.71	11	0.04	1	24
1981	0.67	2	0.33	1	3
1982	1.67	5	0.00	0	3
Survey No. 2					
1976-1978	2.35	10	0.40	3	20
1981	0.25	1	0.25	1	4
1982	2.50	6	0.50	1	4
Survey No. 3					
1976-1978	-	-	-	-	-
1981	1.00	3	0.50	1	4
1982	-	-	-	-	-
Survey No. 4					
1976-1978	7.43	11	1.29	2	7
1981	1.00	2	0	0	2
1982	4.50	5	1.50	2	2
Survey No. 5					
1976-1978	0.40	2	0.20	1	5
1981	0.60	2	0.40	1	5
1982	2.40	6	0.00	0	5
Survey No. 6					
1976-1978	6.14	10	0.29	1	7
1981	0.40	2	0	0	5
1982	1.67	5	0	0	3

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APPENDIX A. List of bird species observed on Middleton Island, 15-24 June 1982

Species	Number	Breeding Status
Pelagic Cormorant	Abundant	Nests, eggs, and young
Lesser or Dusky Canada Goose	6	One territorial pair
Mallard	Uncommon	
Pintail	Common	1 nest w/ 8 eggs, young
Gadwall	2	
Green-winged Teal	15+	courtship
Northern Shoveler	5	
Greater Scaup	15+	
Black Oystercatcher	23	9-10 pairs, 2 nests
Semipalmated Plover	Abundant	eggs and young
Greater Yellowlegs	1	
Whimbrel	7	
Black-bellied Plover	2	
Wandering tattler	1	
Black Turnstone	1	
Northern Phalarope	Common	young
Common Snipe	Common	
Dowitcher	3	
Least Sandpiper	Common	nest w/ 3 eggs, young
Glaucous-winged Gull	Common	nests, eggs, young
Herring Gull	2	
Black-legged Kittiwake	Abundant	nests, eggs, young
Common Murre	Common	eggs
Thick-billed Murre	Uncommon	eggs
Rhinoceros Auklets	500	rafting off western cliffs
Tufted Puffin	Common	
Tree Swallow	10-14	nests
Bank Swallow	14-15	nests
Warbler (Orange-crowned?)	1	
Fox Sparrow	common	territorial
Savannah Sparrow	Abundant	fledglings
Lapland Longspur	Common	fledglings

APPENDIX B

CONTENTS OF NESTS OF BLACK-LEGGED KITTIWAKES ON UNDISTURBED STUDY PLOTS

Nest Number	COLONY UK1		COLONY UK2		COLONY UK3	
	<u>Number of Eggs</u>		<u>Number of Eggs</u>		<u>Number of Eggs</u>	
	<u>15 June</u>	<u>21 June</u>	<u>15 June</u>	<u>21 June</u>	<u>15 June</u>	<u>22 June</u>
1	1	1	0	1	2	1
2	2	2	-*	2	2	2
3	2	2	2	-	+	2
4	2	2	-	2	2	2
5	2	2	-	-	2	2
6	2	1	1	2	2	2
7	2	-	1	2	2	2
8	0	1	0	2	2	-
9	2	2	2	2	2	2
10	2	2	-	-	1	2
11	2	2	2	-	2	2
12	2	2	0	0	2	2
13	2	-	0	0	2	2
14	2	-	2	-	1	1
15	1	0	0	0	2	2
16	0	1	2	-	2	2
17	2	2	-	2	2	2
18	2	2	2	2	+	-
19	0	0	2	2	-	-
20	0	0	2	1	2	1
21	1	0	2	-	1	-
22	1	1	2	2	2	1
23	0	2	2	2	2	2
24	1	2	2	1	1	1
25	0	0	0	2	1	2
26	1	2	2	-	2	2
27	1	0	0	0	2	2
28	2	2	3	-	2	2
29	0	2	0	2	2	2
30	0	2	2	2	2	1
31	2	2	2	2	2	2
32	1	2	2	-	2	-
33	2	2	2	-	2	1
34	2	-	2	-	1	1
35	0	2	0	2	+	+
36	1	2	2	2	1	2
37	1	2	0	0	2	0
38	-	1	0	0	2	2
39	1	2	0	0	2	2
40	2	2	2	2	2	2
41	0	0	2	2	2	2
42	2	2	0	2	0	0

Nest Number	Colony UK1		Colony UK2		Colony UK3	
	<u>Number of Eggs</u>		<u>Number of Eggs</u>		<u>Number of Eggs</u>	
	<u>15 June</u>	<u>21 June</u>	<u>15 June</u>	<u>21 June</u>	<u>15 June</u>	<u>21 June</u>
43	2	-	0	2	2	1
44	-	2	2	-	2	2
45	2	2	2	2	2	-
46	1	2	2	2	2	2
47	2	2	1	1	2	-
48	2	2	-	2	2	-
49	2	2	1	2	2	2
50	2	2	2	2	1	1
51	2	2	2	2	-	2
52	1	-	0	2	2	2
53	2	-	0	0	2	2
54	2	2	0	1	2	2
55	2	2	2	-	2	2
56	2	2	-	1	2	-
57	2	2	2	2	2	2
58	2	2	2	2	0	2
59	1	1	0	0	1	0
60	2	2	0	2	2	3
61	2	-	2	-	2	2
62	0	1	0	2	2	-
63	2	2	0	0	-	1
64	2	2	2	-	1	1
65			0	0	0	0
66			0	2	1	2
67			-	2	1	-
68			1	1	0	2
69			2	2	-	2
70			2	-		
71			2	2		
72			2	2		

- contents of nest not observed

+ eggs in nest but number unknown

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APPENDIX C

Pelagic Cormorant Study Plots
Middleton Island
14-23 June 1982

- UC : (11 Total Nests). 7 nests from observation post used on UK1 plus 4 more nests from opposite side of ravine (from UK1 observation site) to the west and south of where Pat sat.
- UC2: (39 Total Nests). Seen from UK2 observation post.
- UC3: (6 Total Nests). Seen above and to the right of UK3 observation post.
- UC4: (15 Total Nests). 13 of 15 contained chicks; 2 of these had pretty old chicks (probably in their 2nd week); located at white fiberglass pole with white rag looking south just past stream.
- UC5: (10 Total Nests). Looking north from a position 10-12 paces north of the above white fiberglass pole. The cormorant nests chosen are on the middle (perpendicular to our line of sight) cliff face just under the cliff edge.
- UC6: (20 Total Nests). You view by stepping 2-3 paces west of a wooden pole with white flag. Unlike most other cormorant nests that are up on the cliff edge, these are halfway down the cliff on a dirt bulge like UK2.
- DC1a: (24 Total Nests). These were checked for eggs when we did the DK1 plot.
- DC1b: (11 Total Nests). Immediately to the south of DC1a along the cliff top edge habitat. When we return, Pat Gould and I will double check to see if any of these are included in the DC1a plot.
- DC2: (9 Total Nests). These are seen from rebar marking DK2 plot. You look to the south and choose the nine outer nests going from west of the small murre colony to the corner of the cliff where it bends out of sight.