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REPRODUCTIVE ECOLOGY OF SEABIRDS  
AT MIDDLETON ISLAND, ALASKA  
14 - 26 June 1981

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, Black-legged Kittiwake,  
Pelagic Cormorant, Common Murre,  
Thick-billed Murre, Tufted Puffin;  
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## 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 edge of the continental shelf (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 (1958), O'Farrell and Sheets (1962), Frazer and Howe (1977), and Hatch et al. (1979). The latter study provides 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 possibly also of Pelagic Cormorants and Murres. To accomplish this second goal we had to develop monitoring techniques suitable to conducting only two or three, 1-2 week, visits to the colony per breeding season.

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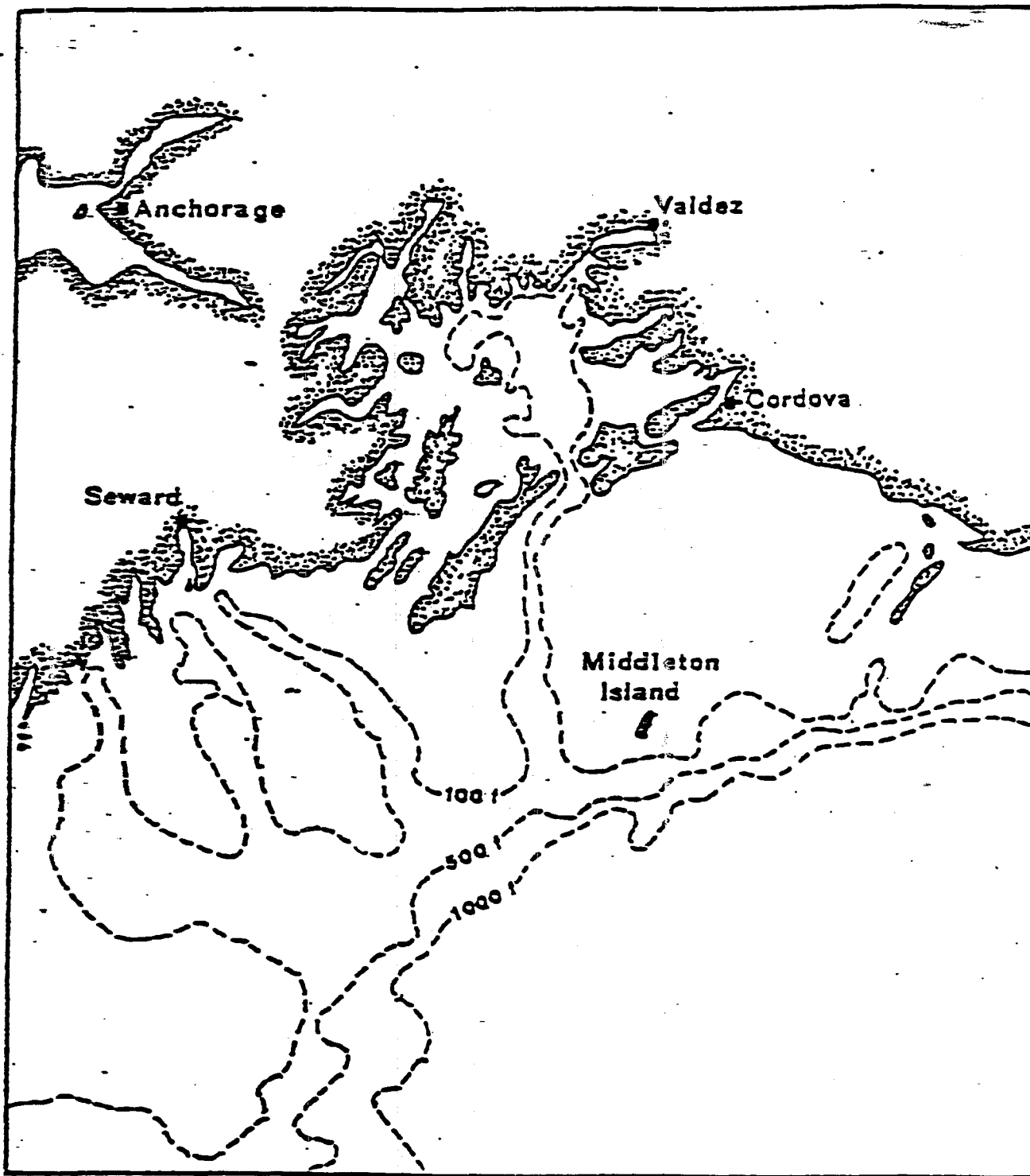


Figure 1. Location of Middleton Island in the north-central Gulf of Alaska.

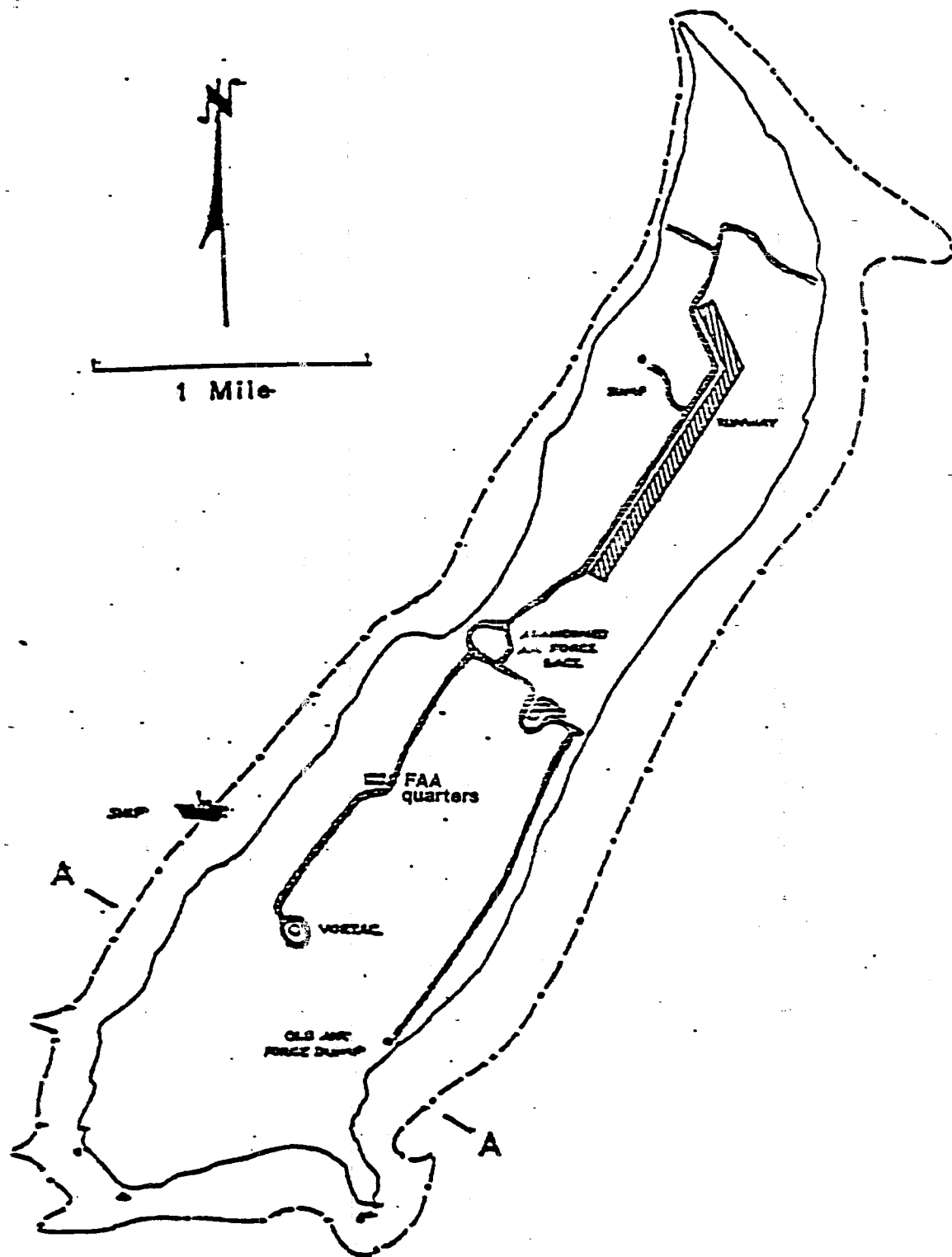


Figure 2. Human constructions on Middleton Island. (Redrawn from Frazer and Howe 1977). Dashed line indicates present shoreline.

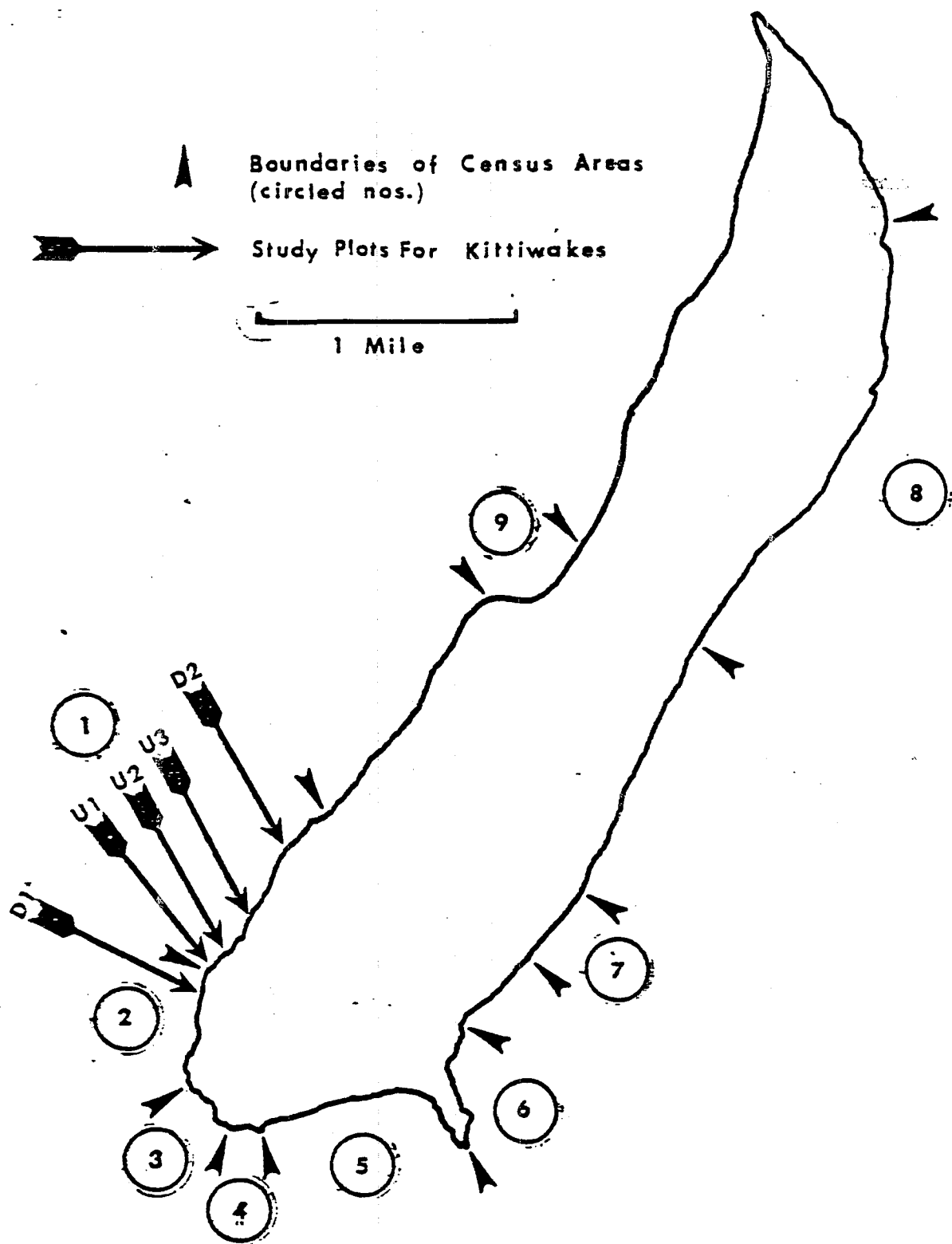


Figure 3. Locations of population census areas and Black-legged Kittiwake study plots (U = undisturbed, D = disturbed).

## METHODS

We visited Middleton Island from 14 June to 26 June 1981. 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 3 days from 21 June to 23 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 and Tufted Puffins seen on the cliffs were made at the same time as the counts of cormorant and kittiwake nests. These techniques are the same as those used by Hatch et al. (1979).

### 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

Three permanent kittiwake plots (U1, U2, and U3) were established (Figure 3), corresponding as closely as possible to the three plots (A, C, and B) used by Hatch et al. in 1978 (Hatch et al. 1979). Plot U1 is on a rocky area devoid of vegetation and situated fairly high on the cliff. We could not find Plot A of Hatch et al., but Plot U1 corresponds fairly closely to it (Appendices B1 and B2). Plot U2 is the same site as Hatch et al. Plot C. This is an area of rocky cliff devoid of vegetation and rather close to the flats below the cliff (Appendices B3 and B4). Plot U3 is located on a gradual, soil-covered slope with dense vegetation around the margins. This is very similar to Hatch et al. Plot B (Appendices B5 and B6). The original Plot B could not be found and we suspect that it has eroded away.

At each 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 enough above the nests so that the contents of each nest could be seen when the attending bird stood up. This procedure

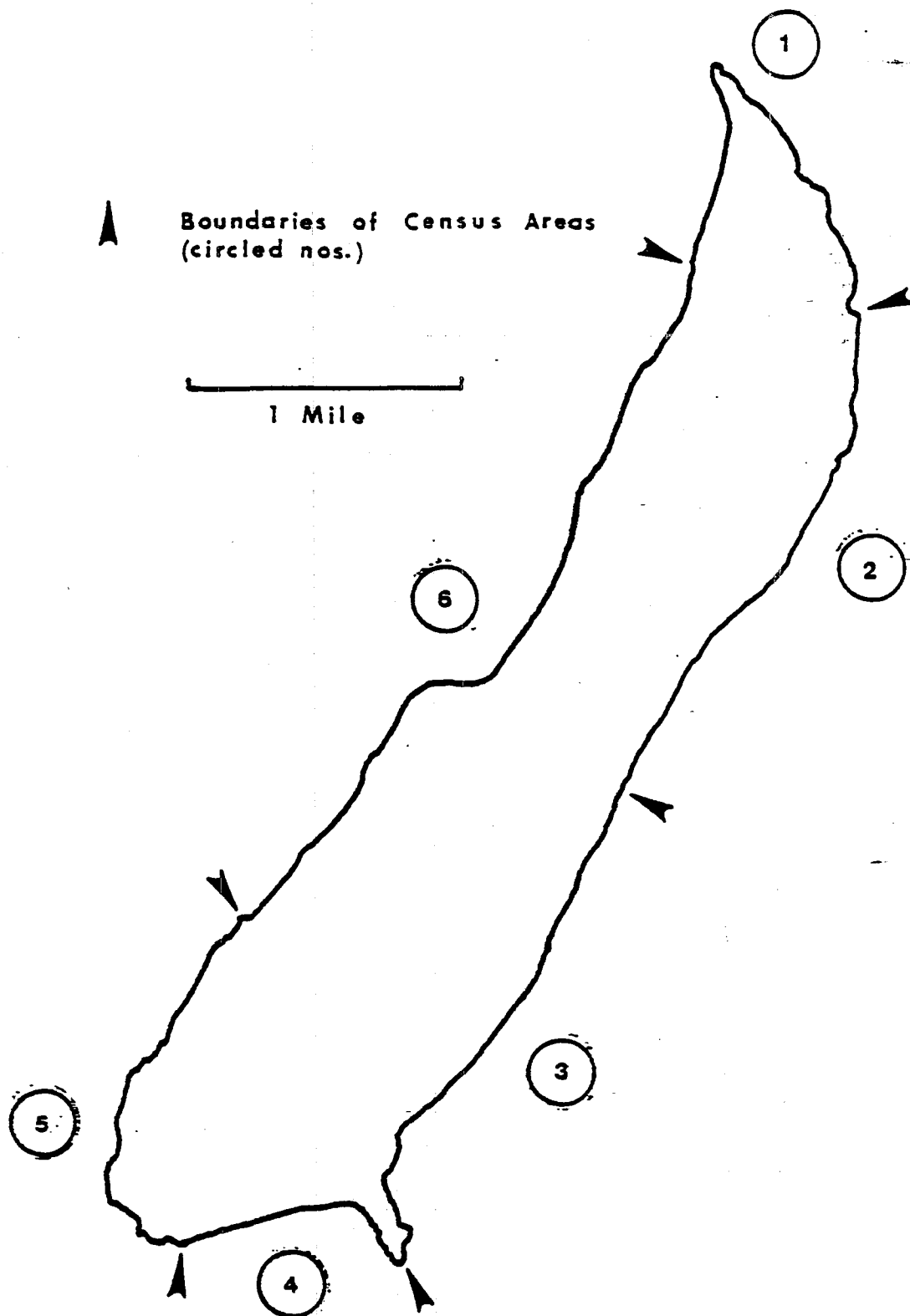


Figure 4. Locations of beached bird and mammal census areas.

## RESULTS

Although the major research effort was directed towards Black-legged Kittiwakes, information on populations, phenology, and productivity were obtained for eight other species of birds including: Pelagic Cormorant, Red-faced Cormorant, Canada Goose, Glaucous-winged Gull, Common Murre, Thick-billed Murre, Rhinoceros Auklet, and Tufted Puffin. Anecdotal information on all other birds observed is presented in Appendix A.

### PELAGIC CORMORANT

#### Population

A grand total of 2,474 active nests of Pelagic Cormorants were counted on the cliffs of Middleton Island (Table 1). This is 133 (6%) more than found by Hatch et al. in 1978, but the difference is well within the limits of possible error in counting. It appears that there has been no significant change in the population of this species on Middleton Island between 1978 and 1981.

#### Phenology

Adult Pelagic Cormorants were flushed from twenty nests on 15 June on the southwest side of the island. Seven of these nests had newly hatched young or pipped eggs indicating that hatching was just starting (Table 2). This commencement date agrees with that found by Hatch et al. in 1978.

#### Productivity

For the 20 nests studied, we found a clutch size of 3.20 with a standard deviation of 0.89 (Table 2). This is slightly higher, but not significantly so, than the 2.84 (SD 0.15) found by Hatch et al. in 1978.

### RED-FACED CORMORANT

One individual was found standing on the edge of a nest on the wrecked ship. This is the same location as that found in 1978 and the bird is more than likely the same individual. No sign of a second bird was found.

### CANADA GOOSE

Two adult Lesser or Dusky Canada Geese with three goslings about two weeks old were found on the southeast side of the island. They may have been just coming down the slope from the top of the island. At least one flock of 11-14 birds was flushed from the flats on the southwest side of the island.

ensures that the breeding performance of kittiwakes is unaffected by human disturbance. Each plot was mapped and 60-62 nests were chosen and marked on a map. The same nests were later marked on black and white photographs of the plots (Appendices B2, B4, and B6). One or both observers then spent one day at each plot observing the nests with a 25-45x telescope. Plots U2 and U3 were watched on 17 June and Plot U1 was watched on 19 June. The contents of each marked nest were observed and recorded (Appendix C). The whole process was repeated 7 days later on Plots U2 and U3, and 5 days later on Plot U1.

Two kittiwake nesting areas on upper cliffs (Figure 3) were chosen as disturbance plots (D1 and D2). Birds were flushed from Plot D1 on 15 June and from Plot D2 on 24 June, and the contents of 200 nests were counted on the former and 151 on the latter. Cormorants were flushed from a section of cliff on 15 June and the contents of 20 nests were counted.

#### BEACHED BIRD AND MAMMAL SURVEYS

We surveyed the entire 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.

Table 1. Populations of seabirds censused in 1976, 1978, and 1981 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	
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	108	82,885	
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
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

Table 2. Contents of nests of Pelagic Cormorants on Middleton Island. 15 June 1981

	<u>Number of Eggs and Young*</u>						<u>Mean Clutch Size</u>
	0	1	2	3	4	5	
Number of Nests	0	1	3	7	9	0	3.20

\* = Three nests contained newly hatched young, two others contained both eggs and newly hatched young, and two more had pipped eggs.

#### GLAUCOUS-WINGED GULL

##### Phenology

Twenty-nine nests were found scattered over the south end of the island (Table 3). Approximately one half of these had already hatched eggs. The oldest chick observed was about 5-9 days old indicating that hatching commenced around 6-10 June. These facts are in direct agreement with the breeding phenology found by Hatch et al. in 1978.

##### Productivity

Of the 14 nests which contained only eggs, the average clutch size was 2.71 (SD 0.47). This is very close to the 2.39 (SD 0.32) found by Hatch et al. in 1978.

#### BLACK-LEGGED KITTIWAKE

##### Population

We counted a total of 82,885 kittiwake nests on the cliffs and flats of Middleton Island (Table 1). This is 7,638 (10%) more than counted by Hatch et al. in 1978, and we suspect that it represents a small but real increase in the breeding population.

##### Phenology

Egg laying was in progress when we arrived on Middleton Island, and continued at a slow rate throughout our studies. Thirteen percent of all nests held at least one egg between 15-19 June, and this decreased to nine percent one week later. The number of eggs per nest increased from 1.49

Table 3. Contents of nests of Glaucous-winged Gulls  
on Middleton Island, 14-24 June 1981

Number of Nests	Contents of Nests
4	Empty: no sign of young
4	One chick: ages 2, 2, 3, and 5-9 days
1	One chick plus one cold egg
1	One chick plus one dead chick half out of egg. The live chick was about 2 days old
1	One chick plus one pipped egg
2	Two chicks: ages 1 & 1, and 2 & 2 days
1	Two chicks plus one warm egg
1	Three chicks: ages newly born, 1 day, and 2 days
4	Two warm eggs
9	Three warm eggs
1	Two normal eggs plus one runt egg, all warm

in the first week to 1.67 in the second week. Compared with data obtained by Hatch et al. in 1978, this pattern suggests that kittiwake egg laying was about two weeks later in 1981.

#### Productivity

By 24 June, 91% of all substantial kittiwake nests contained at least one egg, and the average clutch size had increased to 1.83. Considering that egg laying was not yet complete, these figures compare closely with those obtained from good quality sites by Hatch et al. in 1978. Unlike Hatch et al., we found no significant differences between the various sub-colonies that we studied (Table 4) even though we made an effort to use the same or comparable sites.

COMMON MURRE and THICK-BILLED MURRE

#### Population

We counted 5,521 murre on the cliffs of Middleton Island (Table 1).

This is 1,282 (19%) less than found by Hatch et al. in 1978. We feel that this difference is probably more a reflection of colony attendance than of an actual difference in population size.

#### Phenology

A few scattered eggs of both Common and Thick-billed Murres were found on ledges just below the top of the cliffs, and it was apparent that egg laying had yet to reach its peak. This would put the 1981 egg laying perhaps one week behind that found by Hatch et al. in 1978.

#### RHINOCEROS AUKLET

#### Phenology

We dug up one burrow of a Rhinoceros Auklet and found a single egg. The egg contained a feathered embryo about 5 cm long. This would be in agreement with the breeding phenology found by Hatch et al. in 1978.

#### TUFTED PUFFIN

#### Population

We made a general count of adult Tufted Puffins sitting on the cliffs of Middleton and came up with 732 individuals. This is 588 (45% fewer than found by Hatch et al. in 1978. However, we overlooked a number of areas during our count and we suspect that there has not been a significant change in the population between 1978 and 1981.

#### Phenology

We dug up one Tufted Puffin burrow and found an egg with a 1 cm embryo. This would be in agreement with the breeding phenology found by Hatch et al. in 1978.

#### BEACHED BIRDS AND MAMMALS

The results of our beached bird and mammal surveys are presented in Tables 5 and 6. In general, fewer bird species and numbers were found than in past years. This is possibly a reflection of the generally calm and sunny weather which has prevailed in the Middleton Island area this year. The number and kinds of marine mammals found in our surveys was close to that found in previous years (Table 6).

Table 4. Contents of nests of Black-legged Kittiwakes on Middleton Island

	15-19 June 1981							22-24 June 1981						
Colony	Number of Nests Containing				$\bar{X}$ Clutch Size	$\bar{X}$ Eggs/Nest	Number of Nests Containing				$\bar{X}$ Clutch Size	$\bar{X}$ Eggs/Nest		
	0 egg	1 egg	2 egg	3 egg			0 egg	1 egg	2 egg	3 egg				
Disturbed	(%)													
D1	17	65	116	2 700	1.66	1.52	-	-	-	-	-	-		
D2	-	-	-	-	-	-	9	19	121	2	1.88	1.77		
Undisturbed														
U1	8	15	37	0 60	1.71	1.48	6	12	42	0	1.78	1.60		
U2	11	7	43	0 61	1.86	1.52	8	5	48	0	1.90	1.66		
U3	12	14	36	0 62	1.72	1.39	6	19	37	0	1.66	1.50		
Total	48 (100%)	101	232	2 663	1.70	1.49	29	55	248	2	1.83	1.67		

Table 5. Dead birds and mammals found on surveys of  
beaches on Middleton Island. 14-26 June

Species	Survey Area					
	1	2	3	4	5	6
Northern Fulmar	1	0	0	0	0	0
Pelagic Cormorant	0	0	1	0	0	0
Glaucous-winged Gull	0	0	0	1	2	0
Rhinoceros Auklet	0	0	1	0	0	0
Tufted Puffin	0	0	0	0	1	1
Black-legged Kittiwake	1	1	2	1	0	1
Harbor Seal	0	1	0	0	2	0
Steller's Sea Lion	1	0	2	0	0	0

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

	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
Total	1.59	11	0.07	2	27
Survey No. 2					
1976-1978	2.35	10	0.40	3	20
1981	0.25	1	0.25	1	4
Total	2.00	10	0.38	3	24
Survey No. 3					
1976-1978	-	-	-	-	0
1981	1.00	3	0.50	1	4
Total	1.00	3	0.50	1	4
Survey No. 4					
1976-1978	7.43	11	1.29	2	7
1981	1.00	2	0	0	2
Total	6.00	11	1.00	2	9
Survey No. 5					
1976-1978	0.40	2	0.20	1	5
1981	0.60	2	0.40	1	5
Total	0.50	4	0.30	2	10
Survey No. 6					
1976-1978	6.14	10	0.29	1	7
1981	0.40	2	0	0	5
Total	3.75	10	0.17	1	12

# LITERATURE CITED

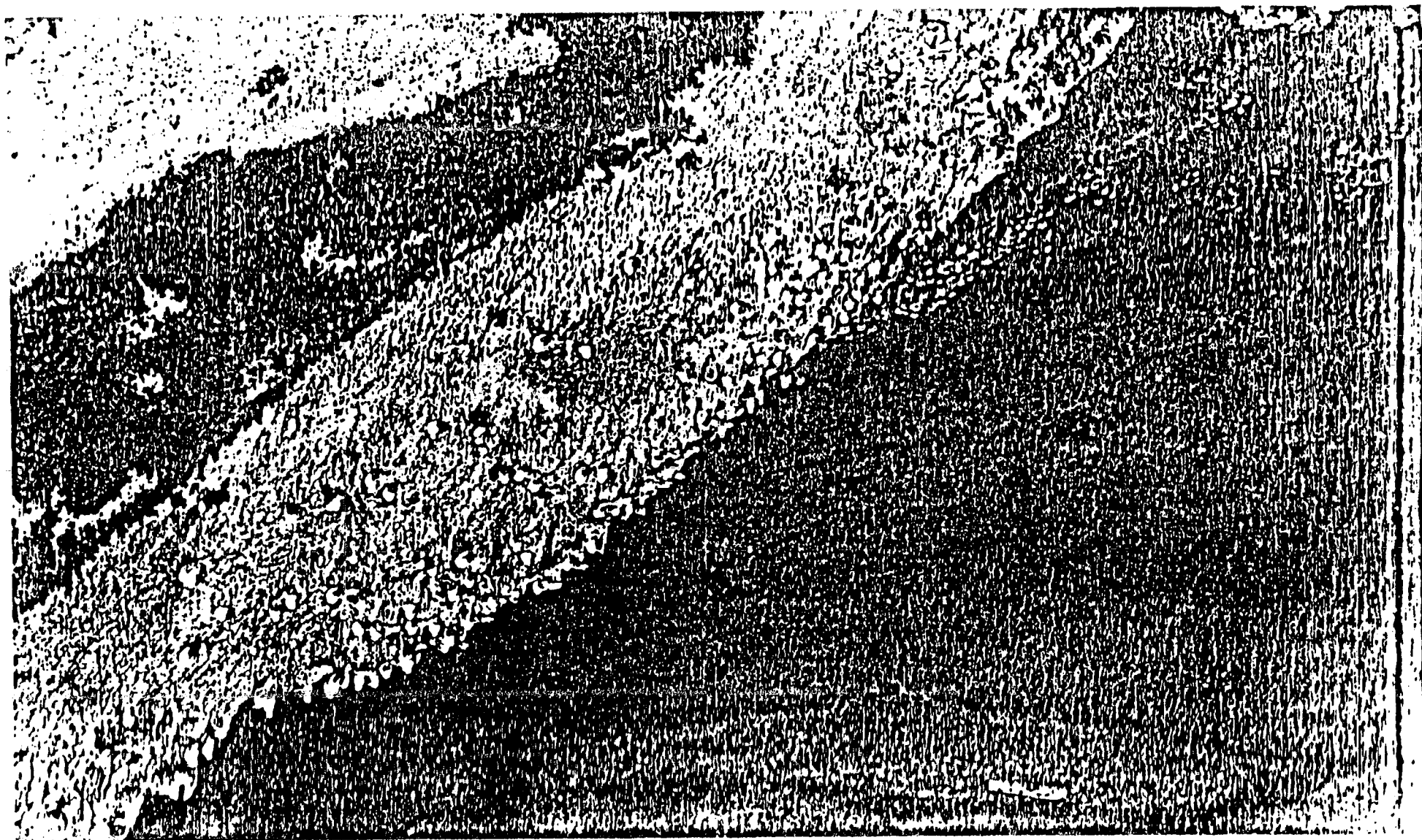
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Appendix A. List of bird species observed on Middleton Island, 14-26 June 1981

Species	Number <sup>a</sup>	Breeding Status
Common Loon	1	Winter plumage
Northern Fulmar	1	Bird found dead on beach
Pelagic Cormorant	Abundant	Nests, eggs, and young
Red-faced Cormorant	1	Single bird on nest
Lesser or Dusky Canada Goose	Flocks of 11, 14	1 pair with 3 small young
Mallard	Uncommon	Young
Gadwall	3	Unknown
Pintail	Common	Young
Green-winged Teal	Uncommon	Unknown
Northern Shoveler	Uncommon	Unknown
American Wigeon	4	Unknown
Greater Scaup	Uncommon	Unknown
White-winged Scoter	2	Doubtful
Black Oystercatcher	12	Territorial pairs
Semipalmated Plover	Abundant	Young
Whimbrel	3	Doubtful
Greater Yellowlegs	4	Doubtful
Wandering Tattler	1	Doubtful
Northern Phalarope	Abundant	Territorial
Common Snipe	Common	Young
Short-billed Dowitcher	5	Doubtful
Western Sandpiper	7+	Doubtful
Least Sandpiper	Abundant	Territorial
Glaucous Gull	1	Doubtful
Glaucous-winged Gull	Common	Nests, eggs, young
Herring Gull	6	Doubtful
Black-legged Kittiwake	Abundant	Nests, eggs
Common Murre	Common	Nests, eggs
Thick-billed Murre	Uncommon	Nests, eggs
Rhinoceros Auklet	Common	Nests, eggs
Tufted Puffin	Common	Nests, eggs
Tree Swallow	Uncommon	Nests
Bank Swallow	Uncommon	Probably
Winter Wren	Uncommon	Territorial
Orange-crowned Warbler	Uncommon	Territorial
Rusty Blackbird	1 female	Doubtful
White-winged Crossbills	3	Doubtful
Savannah Sparrow	Abundant	Young
Lapland Longspur	Abundant	Young

Appendix B.

Undisturbed Black-legged Kittiwake Plot U1

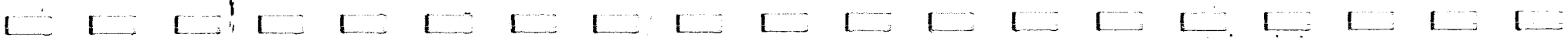
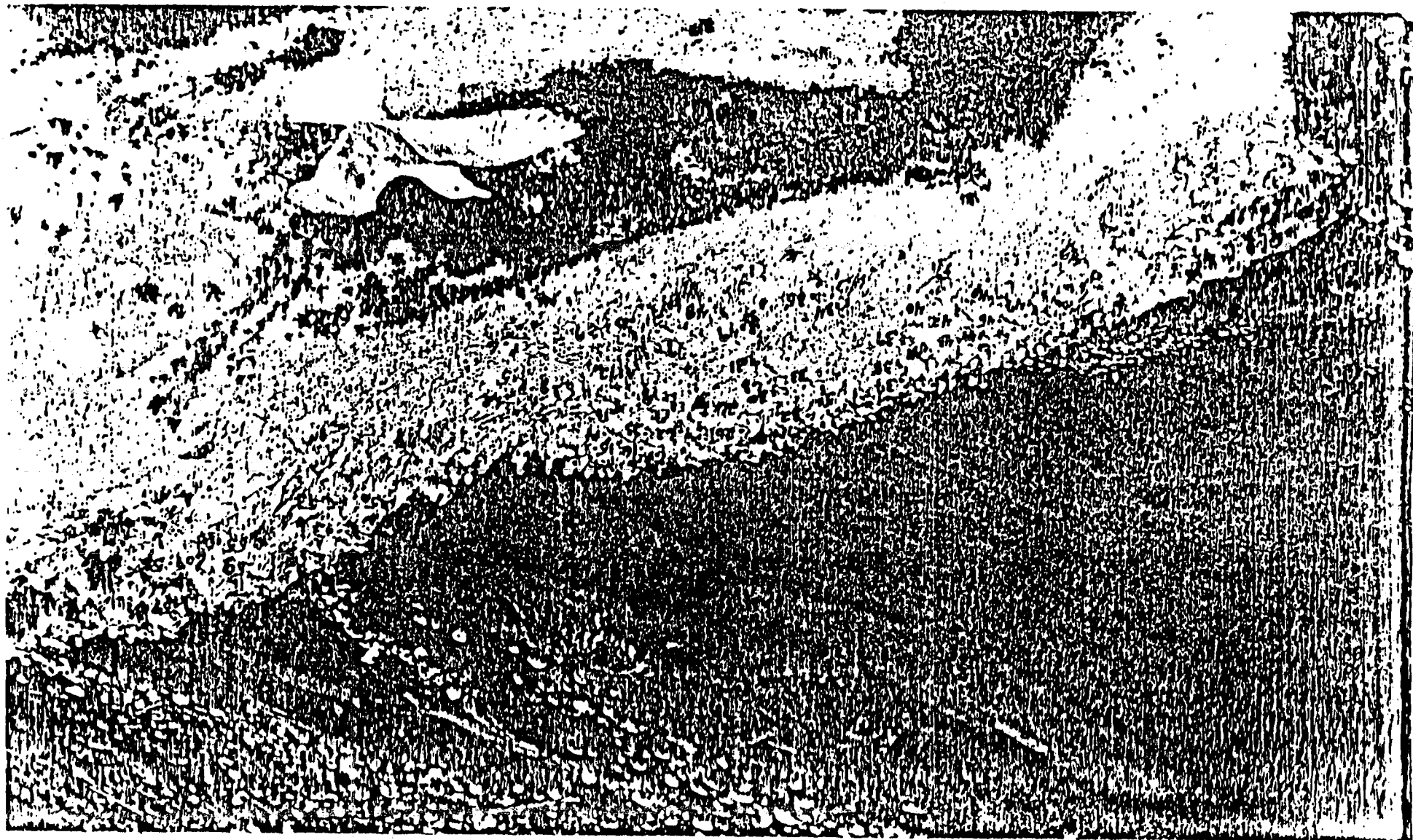


Appendix B2

Undisturbed Black-legged Kittiwake Plot U1

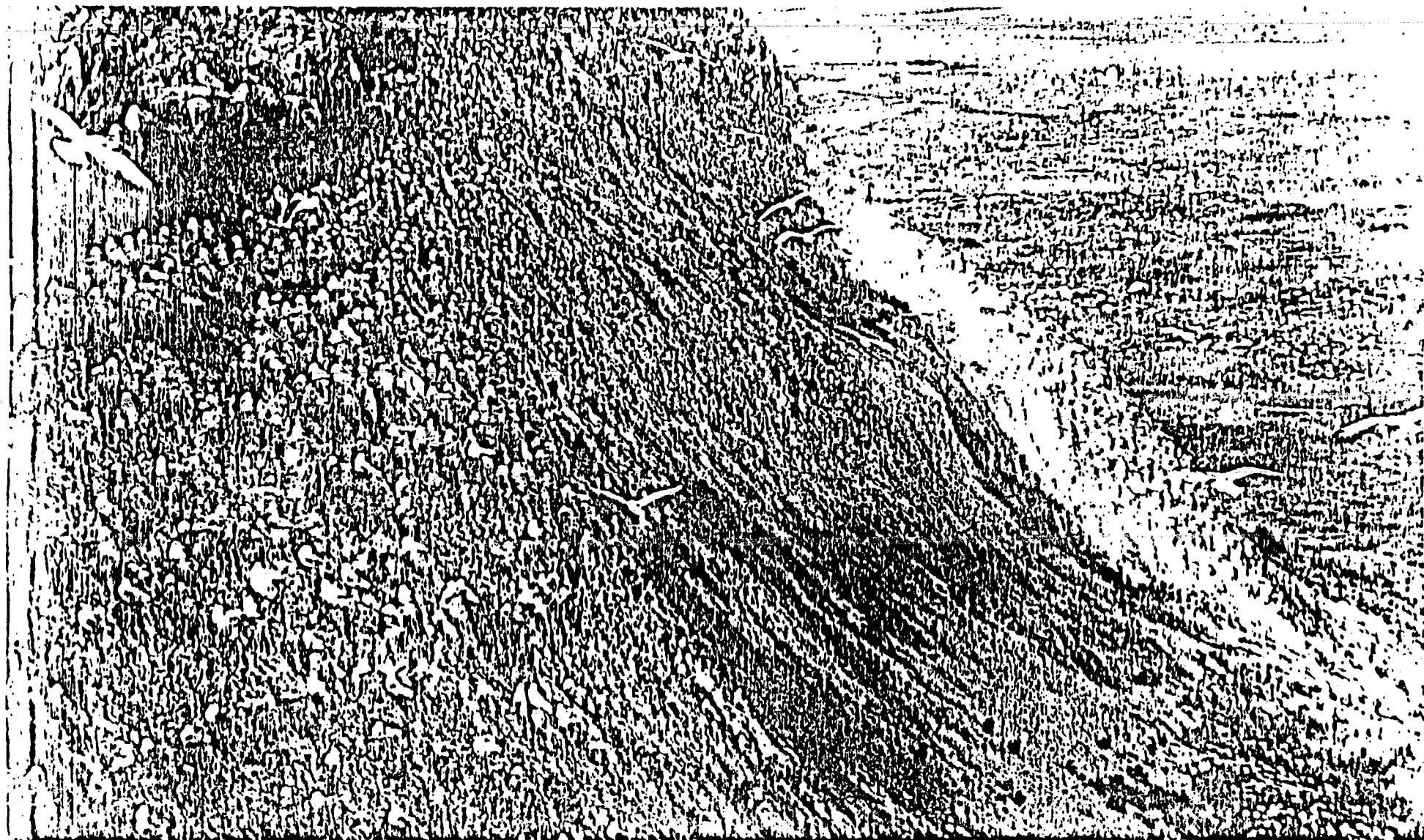
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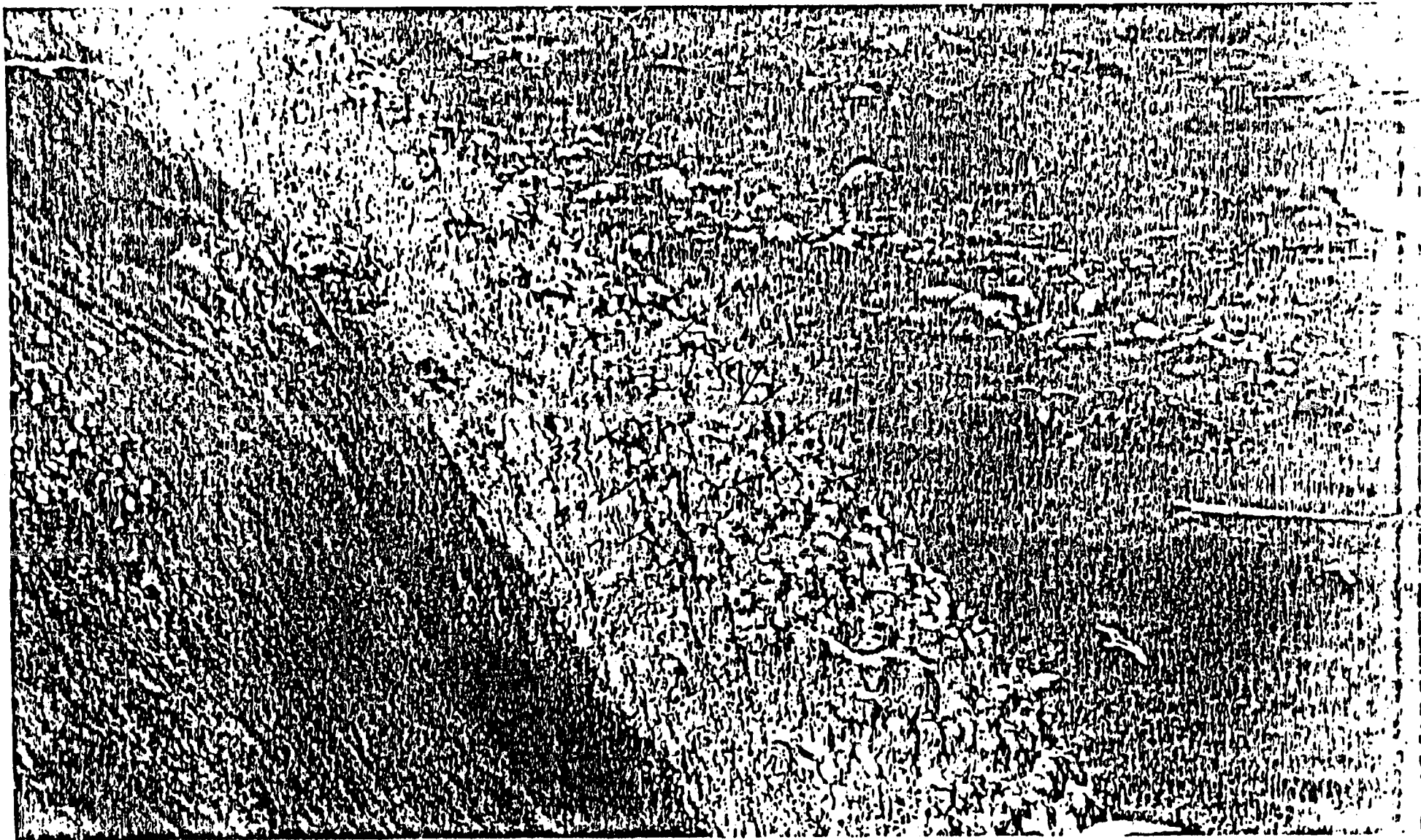
Appendix B3

Undisturbed Black-legged Kittiwake Plot U2



Appendix B4

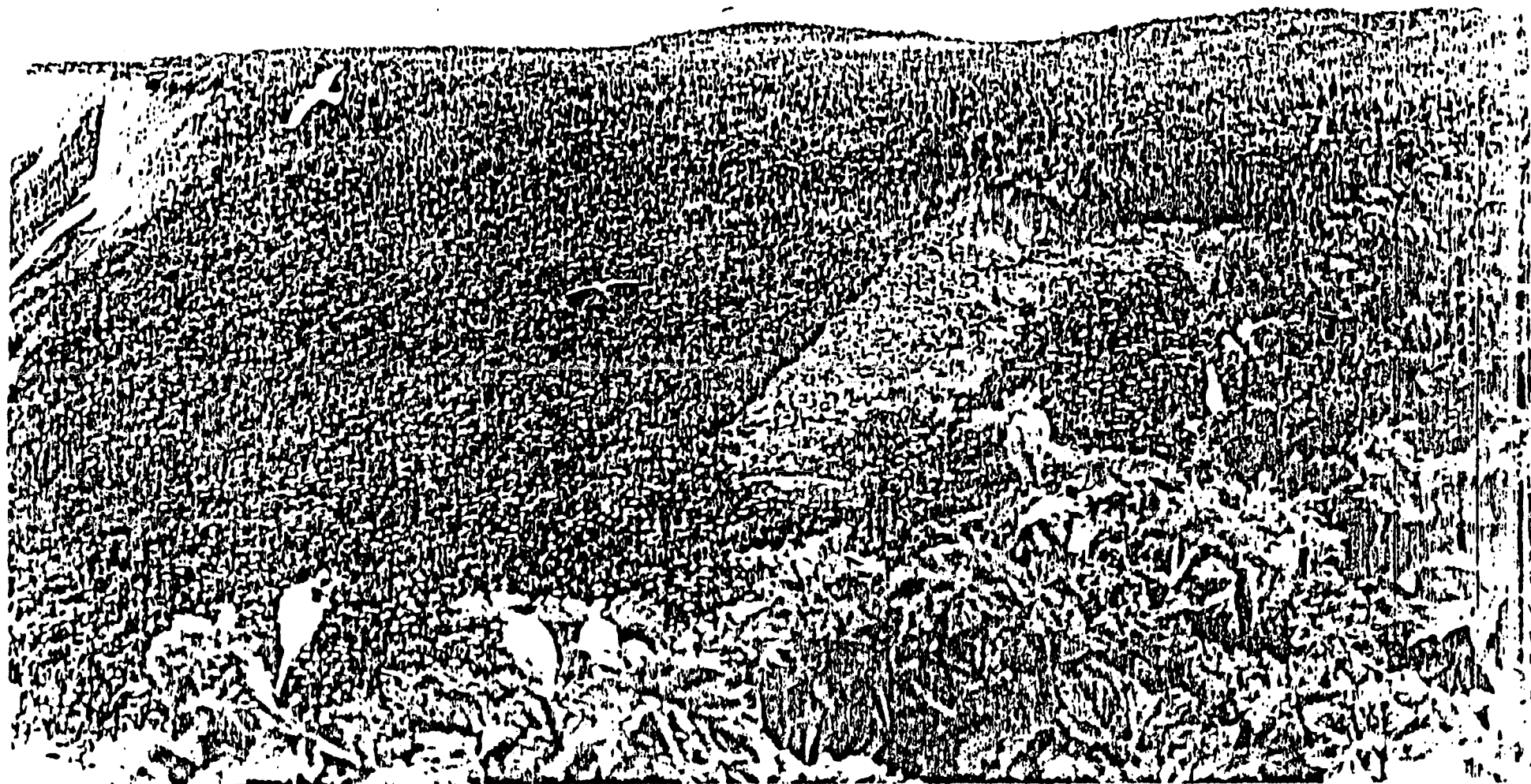
Undisturbed Black-legged Kittiwake Plot U2



U2

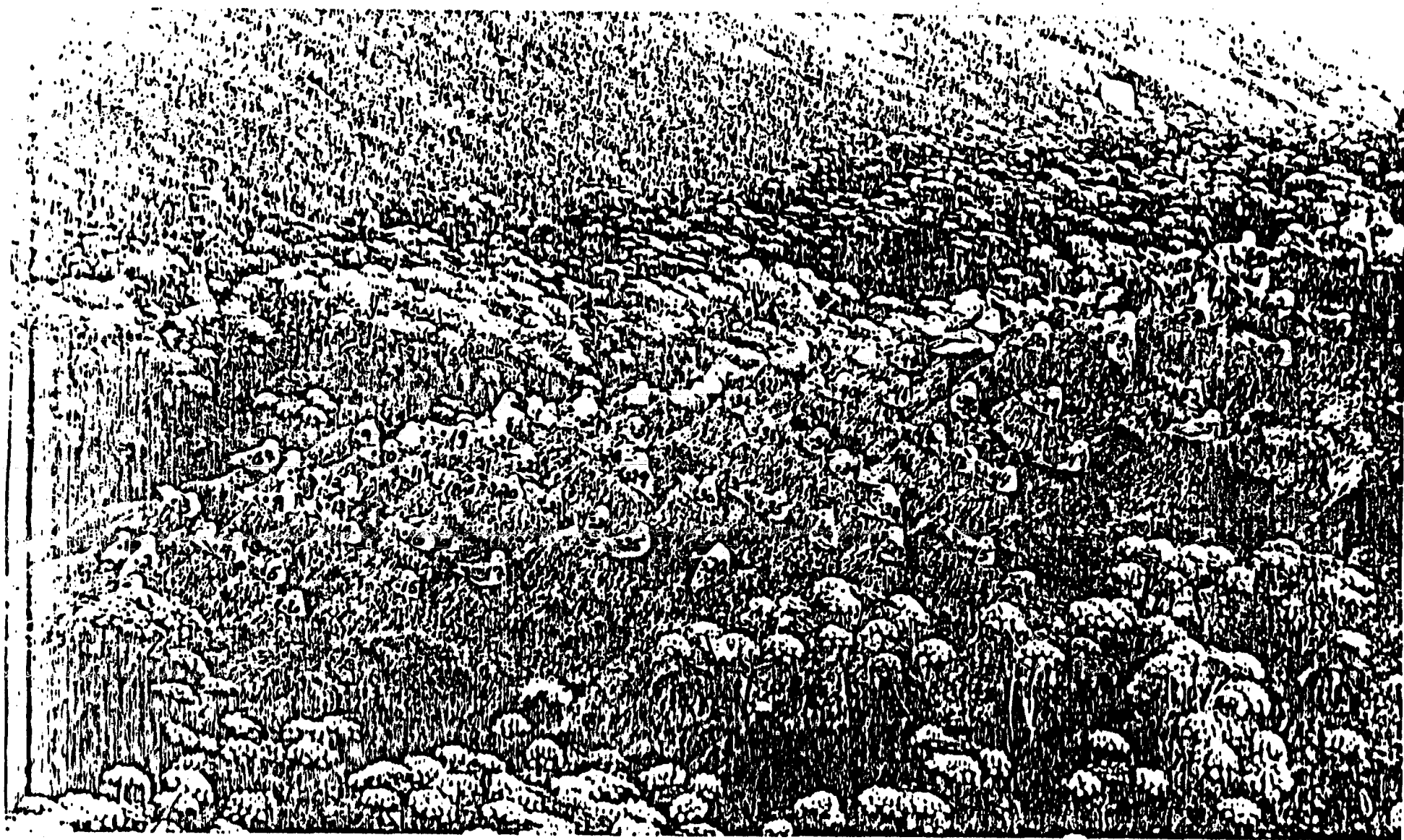
Appendix B5

Undisturbed Black-legged Kittiwake Plot U3



Appendix B6

Undisturbed Black-legged Kittiwake Plot U3



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Appendix C. Number of eggs in marked nests of  
Black-legged Kittiwakes

Nest Number	Colony U2		Colony U1	Colony U3
	17 June	24 June	24 June	24 June
1	2	2	0	1
2	2	2	2	0
3	2	2	0	2
4	2	2	0	1
5	1	2	2	2
6	0	1	0	2
7	0	2	0	2
8	2	2	2	2
9	2	2	?	2
10	2	2	2	2
11	2	2	1	1
12	2	2	2	2
13	2	2	2	2
14	2	2	1	1
15	1	2	2	2
16	1	2	?	1
17	0	0	2	1
18	0	0	2	1
19	2	2	2	1
20	2	2	2	2
21	2	2	2	2
22	0	0	2	1
23	2	2	2	2
24	-	-	1	2
25	1	1	2	0
26	2	2	2	0
27	2	2	2	2
28	2	2	2	2
29	2	2	2	2
30	2	2	1	2
31	0	0	2	1
32	0	0	2	1
33	2	2	2	2
34	2	2	2	2
35	2	2	?	1
36	2	2	2	2
37	2	2	2	1
38	0	0	2	2
39	2	2	2	2
40	2	2	1	2

Appendix C. Continued

Nest Number	Colony U2		Colony U1	Colony U3
	17 June	24 June	24 June	24 June
41	2	2	2	2
42	2	2	1	2
43	0	0	2	2
44	2	2	2	2
45	2	2	?	1
46	0	2	2	1
47	2	2	2	0
48	2	2	2	2
49	2	2	0	2
50	2	2	2	?
51	2	2	2	0
52	2	2	2	1
53	2	2	2	0
54	2	2	2	2
55	2	2	2	2
56	1	1	1	2
57	2	2	1	?
58	2	2	1	1
59	0	0	1	1
60	2	2	2	?
61	1	1	1	?
62	1	1	2	2
63	-	-	1	2
64	-	-	2	2
65	-	-	-	2
66	-	-	-	1
67	-	-	-	0



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