State of California
The Resources Agency
Department of Fish and Game

SURVEY OF SEABIRD USE OF THE COASTAL ROCKS OF NORTHERN CALIFORNIA FROM CAPE MENDOCINO TO THE OREGON LINE

by

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ABSTRACT

An intense survey was made in 1970 of seabird nesting on coastal rocks from Cape Mendocino to Oregon. Twelve nesting species were identified and an account was made of 43,666 nesting pairs of seabirds on 34 sites.

Five major offshore rocks in Del Norte and Humboldt Counties were intensively studied. The physical and vegetative characteristics of these rocks together with seabird use were well documented. Recommendations included conduct of an annual nesting census of seabirds and provision of adequate protection to seabird rookeries along California's north coast.

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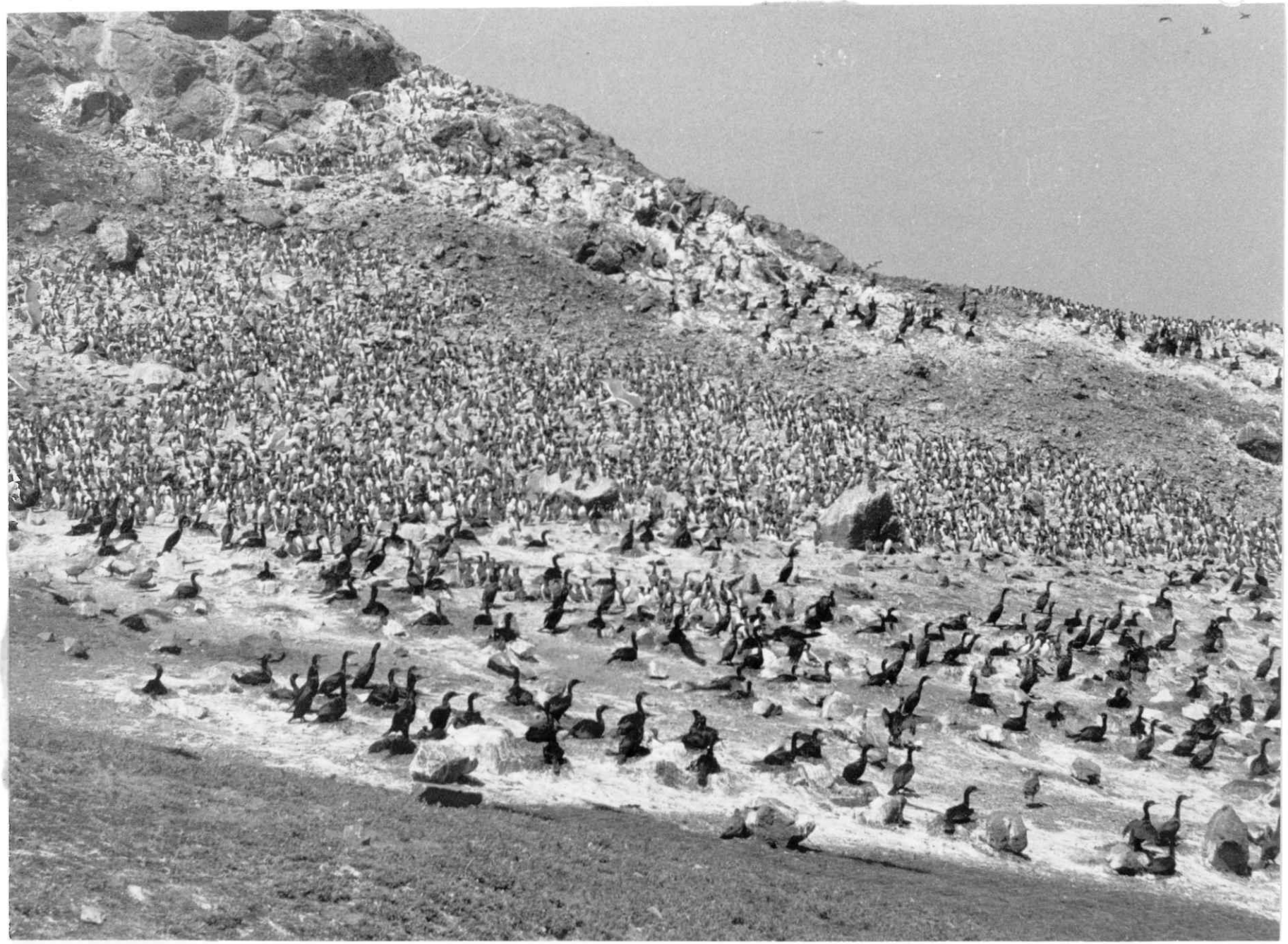


Castle Island, Del Norte County, California. Second only to S. E. Farallon Island in importance as a seabird rookery. Eleven seabird species aggregating 49,500 birds nested here in 1970.

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

INTRODUCTION

This report summarizes the results of the 1970 spring survey of the bird use of the coastal rocks of northern California. The objectives were:

1) To study the ecology of five off-shore rocks that contain major seabird rookeries.

2) To determine the seasonal abundance and occurrence of seabirds using off-shore rocks.

3) To develop and test methods of determining seabird populations with a reporting system for the status of breeding grounds.

METHODS AND STUDY AREA

Based on work done in 1969, major rookeries at Sugarloaf Rock, Flat-iron Rock, and Green Rock in Humboldt County, and Castle Island and Prince Island in Del Norte County were selected for study. Periodic visits were made to each rookery between February 5 and June 20, 1970. The rocks were examined by aerial survey, with a spotting scope from shore, and on-site visits were made by wading at low tide or landing on the rock from a boat. Birds and nests were counted by direct observation.

Eight study areas for determining seasonal abundance and occurrence were established and visited as follows: monthly - Cape Mendocino; weekly - Little River Rock, Luffenholtz Beach, Elk Head, and Patricks Point; bimonthly- False Klamath Cove, Castle Island and Prince Island. At each area all birds within predetermined boundaries were counted from shore with a spotting scope and binoculars. Figure 1A (appended) is a map showing the seabird breeding survey area encompassed in this study; Figures 2A and 3A are seabird survey sites.

ECOLOGY OF FIVE MAJOR ROOKERIES

Sugarloaf Rock

Physical Description

The rock is located 2/3 mile west of Cape Mendocino Light; Township 1 north, Range 3 west, Section 28, Humboldt County, California. The rock is 326 feet high and was formed from undivided cretaceous marine deposits. The rock has very steep sides which are composed mostly of broken rock and scree. Any vegetative litter which accumulates on these slopes is washed away by winter rains. The only soil is found between the rocks. There are numerous caves and cracks around the base. On the northwest face there is a flat shelf 20 feet above the water and about 250 feet long and 75 feet wide. The northwest face is a vertical cliff 250 feet high. The northeast side is a steep 70 degree slope. The largely vertical southwest side has a 30 degree sloping area about 100 foot square near the top. The top consists of a narrow ridge running southeast to north.

The vegetation of the rock is sparse and except for low spreading species, is composed of single plants which are separated from each other by rocky areas. (Figure 1). There are three vegetation types on rock. The Dudleya type covers the entire island from above the salt spray zone (about 75 feet). Besides Dudleya, Plantago and Baeria are found in this type. About 100 feet from the top of the rock and extending down on all sides, a little lower on the north, is a vegetation type dominated by iceplant and also containing Achillea, Spergularia, and Bromus. The wet shady areas on the north slopes near the top are characterized by the Synthris-Poppy type. This mixed herb association includes Orthocarpus, Montia, Synthyris, Ranunculus, Eschscholtzia, Amsinckia, Polypodium, Galium, Erigeron, and Sanicula.

Birds

Table 1 summarizes seabird counts made of Sugarloaf Rock and Figure 2 illustrates their nesting distribution. A species account follows.

Western Gull: Western gulls are found on the rock throughout the year. Nest building was in progress on April 24 and a nest was examined from the northwest corner, on the top, in an area where Synthyris is dominant. The nest was composed of Synthyris 75%, Achillea 5%, Montia 5%, Amsinckia 5%, Baeria 5%, 12 Mesembryanthemum stolons six inches long, trace of Bromus, trace of unknown grass, and trace of Spergularia. On May 6 six nests contained a total of 10 eggs (average 1.6 eggs per nest). On June 6, 59 nests containing 133 eggs and 20 chicks were seen. Four eggs were pipping. On June 20 many young birds had left the nest. One hundred birds were found on the rock.

Double-crested Cormorant: Three nests were recorded from the ledge on the northwest face in 1969. On April 24, 1970, 5 nests averaging 2.8 eggs per nest were seen. Nests were made almost entirely from Mesembryanthemum stolons. On May 6 there were only 4 nests with 11 eggs. On May 22 there were 4 nests with 4 eggs and 4 young. On June 6, of the 4 nests, two had 4 young and two had no eggs. At a different location, 4 nests were under construction and a fifth had 2 eggs. On June 20, there were 14 nests containing 28 eggs and 2 nests with 4 young. One of the young was developed enough to leave the nest when approached.

Brandt's Cormorant: A few roosting birds were seen in April and May, but nest building did not begin until late May. The number of birds increased during May and new arrivals would start building immediately. In 1969 the birds all nested in the middle of the southwest slope, but in 1970 the majority are nesting 200 feet farther east. A few are nesting on the extreme southwest corner. There are a few nests on the southwest slope.

Pelagic Cormorant: Pelagic cormorants arrived in March and the population increased in April. Nest building began in late April. The first eggs were observed on June 6. The average clutch size from nests seen on June 20 was 3.1 eggs per nest. The rock has about 200 pair.

Black Oystercatcher: Neither a nest nor a shell mound has been found, but a pair of birds is resident and may nest on one of the smaller rocks to the south of Sugarloaf.

Pigeon Guillemot: Birds were first seen in early April. The numbers increased through May to an estimated breeding population of 100 pair. Courtship activity was seen in late April and May. One nest with two eggs was seen on June 6.

Table 1 - Resident Seabirds on Sugarloaf Rock

May 1969 - June 1970

Date	Western Gull	Double-crested Cormorant	Brandt's Cormorant	Pelagic Cormorant	Black Oystercatcher	Pigeon Guillemot	Tufted Puffin
May 31 '69	hundreds		hundreds	hundreds		present	
July 31 '69	300	6	100	400	6	75	
Feb. 5 '70	9				3		
Mar. 4 '70	59			13	2		
April 8 '70	15		19	49	2	24	
April 24 '70	300	10		25*	4	37	2
May 6 '70	30	8	11	90	3	57	2
May 22 '70	89	8	47	100	2	39	3
June 6 '70	64	18	60	64	3	97	
June 20 '70	**	32	81	**	1	47*	1

Numbers underlined indicate count made by spotting scope from shore

*Represents a partial count

**Bird Counts obscured by fog

FIGURE 1 Vegetation on Sugarloaf Rock

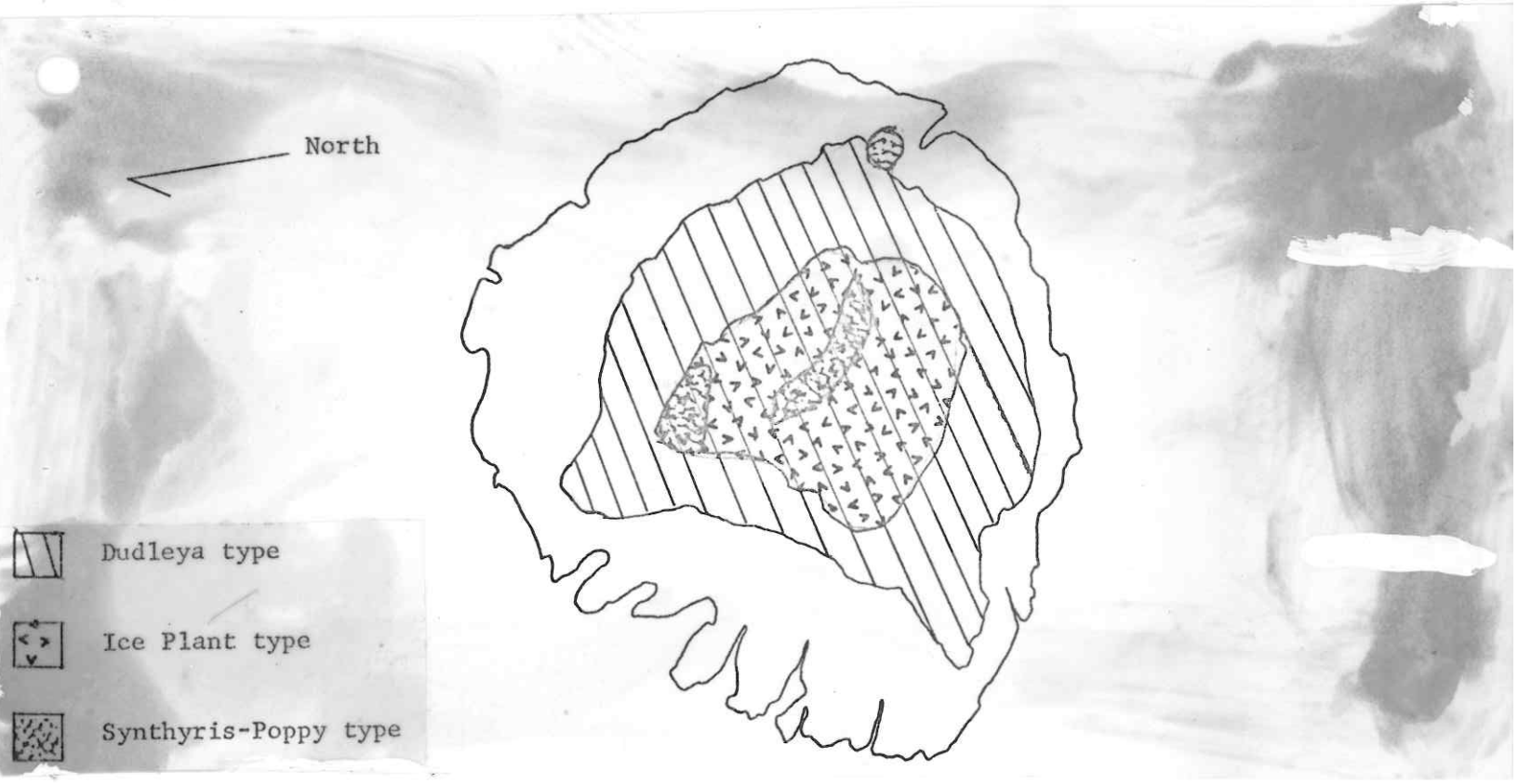
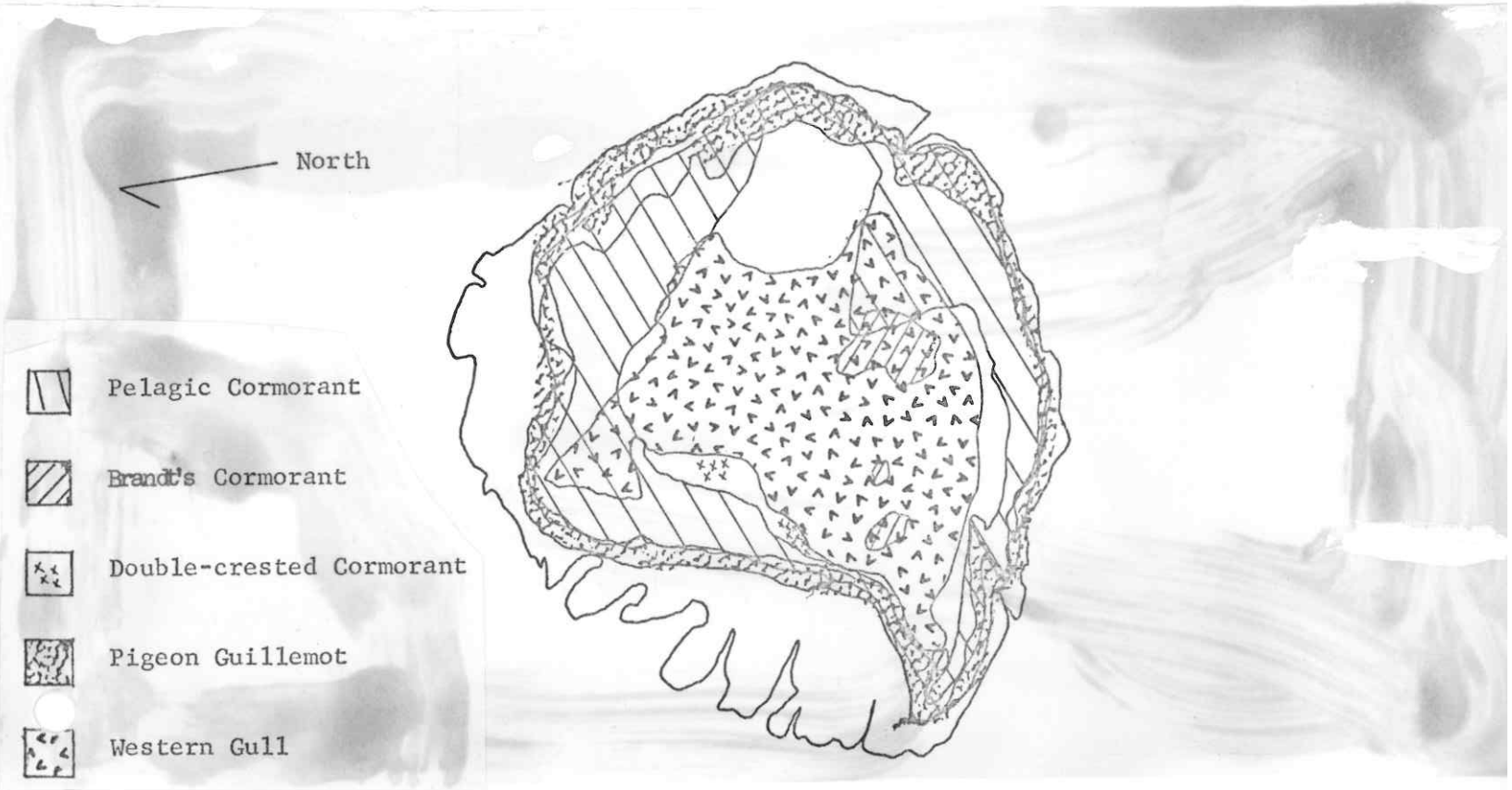


FIGURE 2 Bird Nesting at Sugarloaf Rock



Tufted Puffin: Birds were first seen at the rock on April 24. None were seen in 1969. The nesting site is unknown, but the birds have been seen flying around the northwest corner on the east side. Probably 4 birds are on the rock.

Other birds seen on the rock in 1970:

February 5 - 1 sparrow hawk, 1 water pipit, 2 black turnstones

March 4 - 17 black turnstones

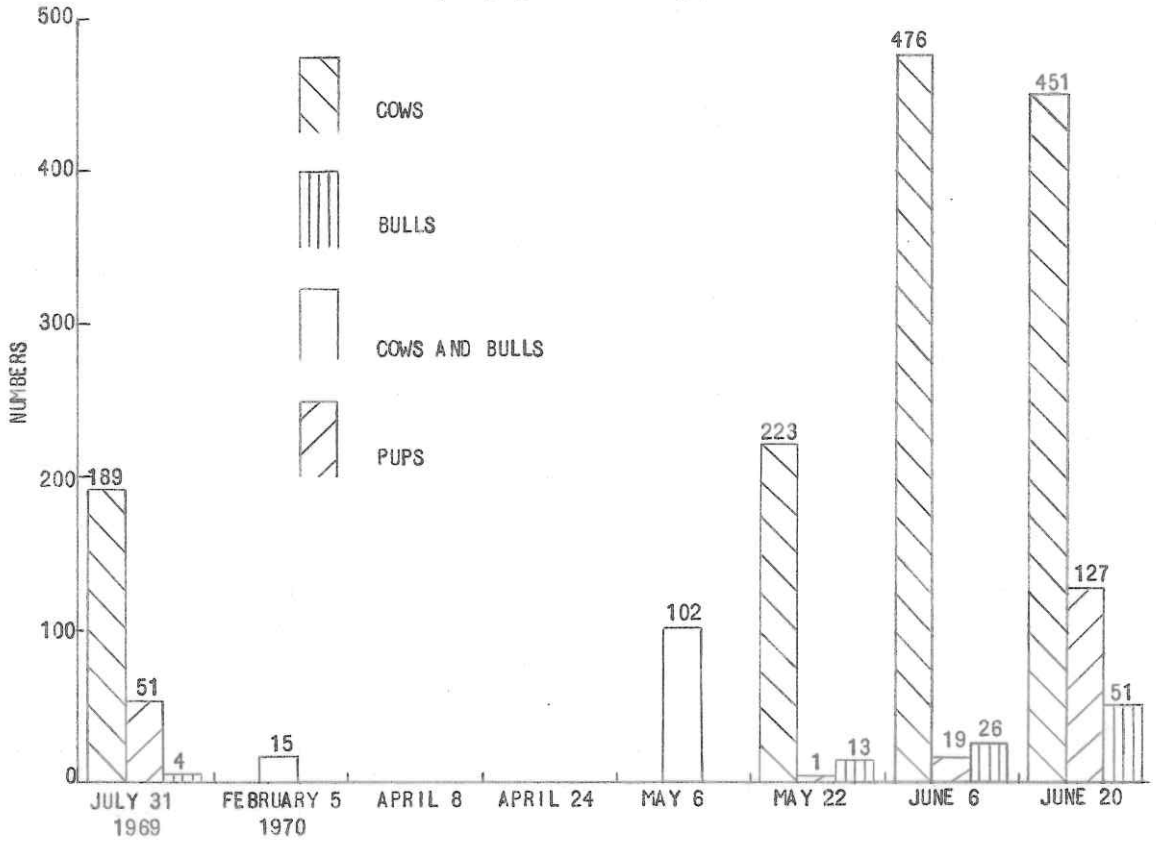
April 24 - 2 mourning doves, 10 surfbirds, 8 black turnstones, 1 wandering tattler.

Mammals

Sugarloaf Rock is an important resting area for male California sea lions during the winter. It is the only known breeding rookery of the Stellar sea lion in Humboldt and Del Norte County. Nursing pups were first seen May 22 and mating was seen on June 20. The colony is formed of harem bulls and females with young. The Stellars arrive in May and the bulls have departed by the end of July. (Figure 3.) Sea lions occupy the flat shelf below the northwest face during the winter.

Figure 3 - Stellar Sea Lion Population at Sugarloaf Rock

July 1969 - June 1970



Flat-iron Rock

Physical Description

The rock is located 3/4 mile northwest of the Trinidad Light, Township 8 north, Range 1 west, Section 22, Humboldt County, California. The rock is of the Franciscan formation from the Mesozoic. The rock is almost divided by a large surge channel which creates a large north wing and a smaller south wing. The north wing is 30 feet high and flat on top. There is an abrupt (hog-back) ridge which rises above the flat along the southern side and runs from east to west. The ridge is about 30 feet wide and 100 feet long. The flat area has a corrugated surface in which there are depressions filled with water and depressions filled with sand. The eastern side has a rise about 20 feet above the flat. The southern wing is more uneven having an L-shaped ridge which runs along the extreme southern side and turns north 50 feet from the eastern edge, and then runs north about 100 feet. This ridge is the highest point on the rock (elevation 72 feet). There is a level platform east of this ridge which runs north to the northern wing. West of the ridge are a series of deep cuts, some of which are filled with water. In the middle of the western part of the southern wing is a deep dry surge channel which is 10 feet long and 20 feet wide. This channel contains numerous small rocks. On the eastern side of the ridge above the flat platform is an area of gravel deposition. This area is 10 feet high, 4 feet thick, and 50 feet long. A rather sandy gravelly soil is tied up in this deposit. The only other soil are sand deposits in depressions on the northern wing, and some depressions of the western and the extreme southern parts of the southern wing.

The vegetation is scattered in small areas with three types. (Figure 4). The Dudleya type occupies both the hogback ridge of the northern wing and the L-shaped ridge of the southern wing. Spergularia is sparse in this type. The Distichlis type grows in sandy areas on the southern wing in a pure stand. On the northern wing it grows in association with Synthyris, Poa, Montia, Rumex and Gotula. Stands of Bromus, Baeria, Erodium, Montia, Poa and Polypogon grow on the gravel deposit. There are remains of Polypodium rhizomes which were alive in 1965 on top of the gravel deposit. Atriplex, Baeria and Rumex grow in the small pothole on the southern edge of the rock.

Birds

Table 2 summarizes seabird counts made of Flat-iron Rock and Figure 5 illustrates their nesting distribution. A species account follows:

Brandt's Cormorant: In 1969 there were 130 nests scattered among the murres on the north wing. A few birds were present on the rock from April until the bulk of the birds arrived in May. About 80 birds started to build nests on the flat platform east of the L-shaped ridge in May. When the rock was visited May 24, 50 nests were under construction, some of which contained one to two eggs. Upon being disturbed, the birds scattered and many eggs were broken. When the rock was next seen May 28 there were 300 cormorants on the north wing and none on the south wing. On June 18 all but 6 nests on the southern wing had been abandoned and the birds had started nest building on the northern slope of the hogback and to the south

Table 2 - Resident Seabirds on Flat-Iron Rock

July 1969 - June 1970

Date	Brandt's Cormorant	Black Oystercatcher	Western Gull	Common Murre	Pigeon Guillemot	Tufted Puffin
Aug. 4 '69*	125	3	120	600	2	0
Feb. 21 '70				1000		
March 6	(2)		47	975		
March 13	(4)		18	1225		
March 20	(5)		8	2100		
April 2				1100		
April 5*	19	3	50	5000	6	
April 10	19		9	1700		
April 17	20		8	1200		
April 22	20		17	1100		
May 7	28		49	2000		
May 14	85		16	1200		
May 21	155	1	27	1500	6	
May 24*		2		2000	6	
May 28	300		38	2300	1	
June 3	300		42	2400	4	1
June 9	210		35	2800		
June 18*	300	2		2500	8	2
June 26	223		68	1600	8	

* Spotting scope counts made from mainland with exceptions noted.

() identification tentative until April 5

FIGURE 4 Vegetation on Flat-iron Rock

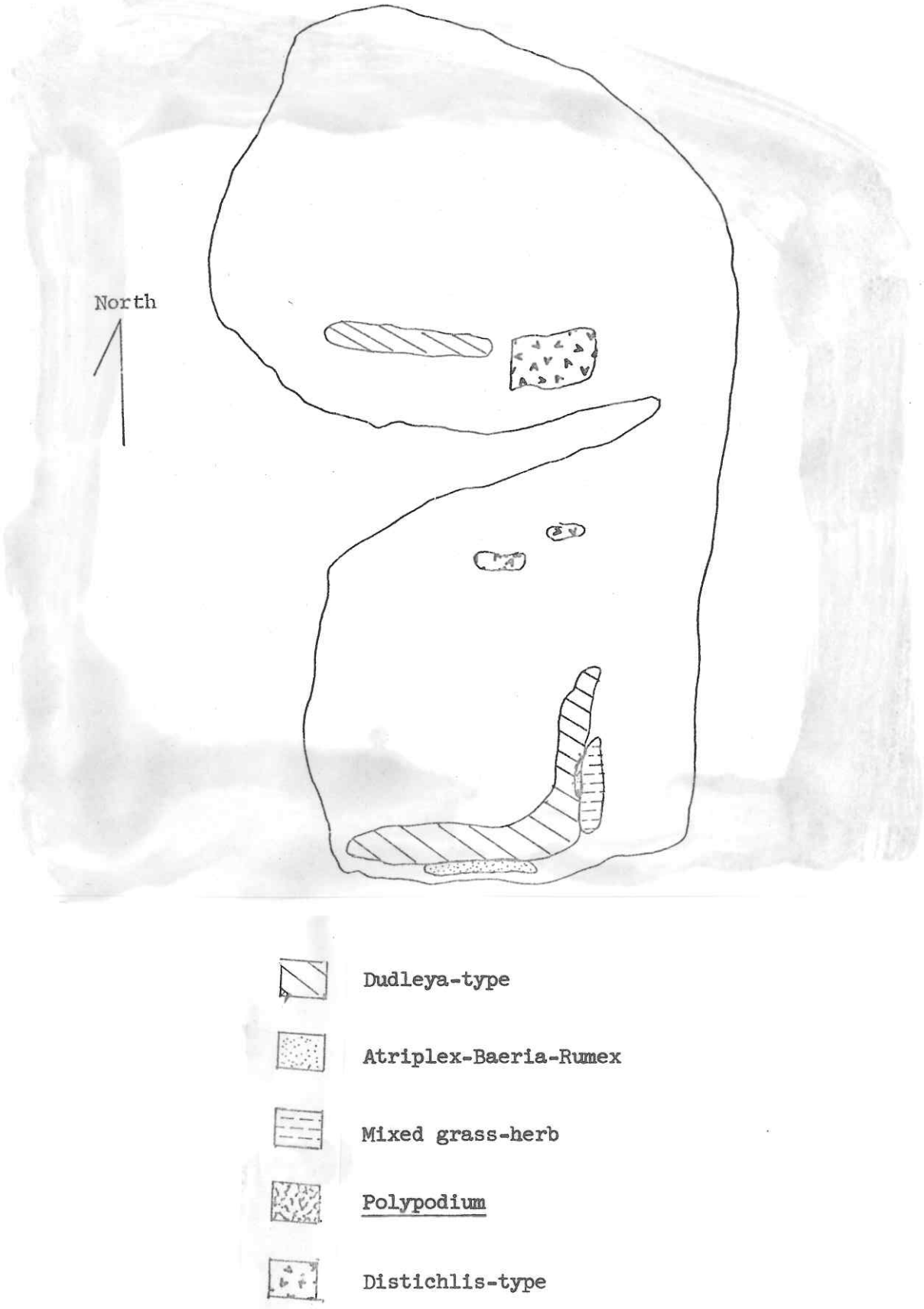
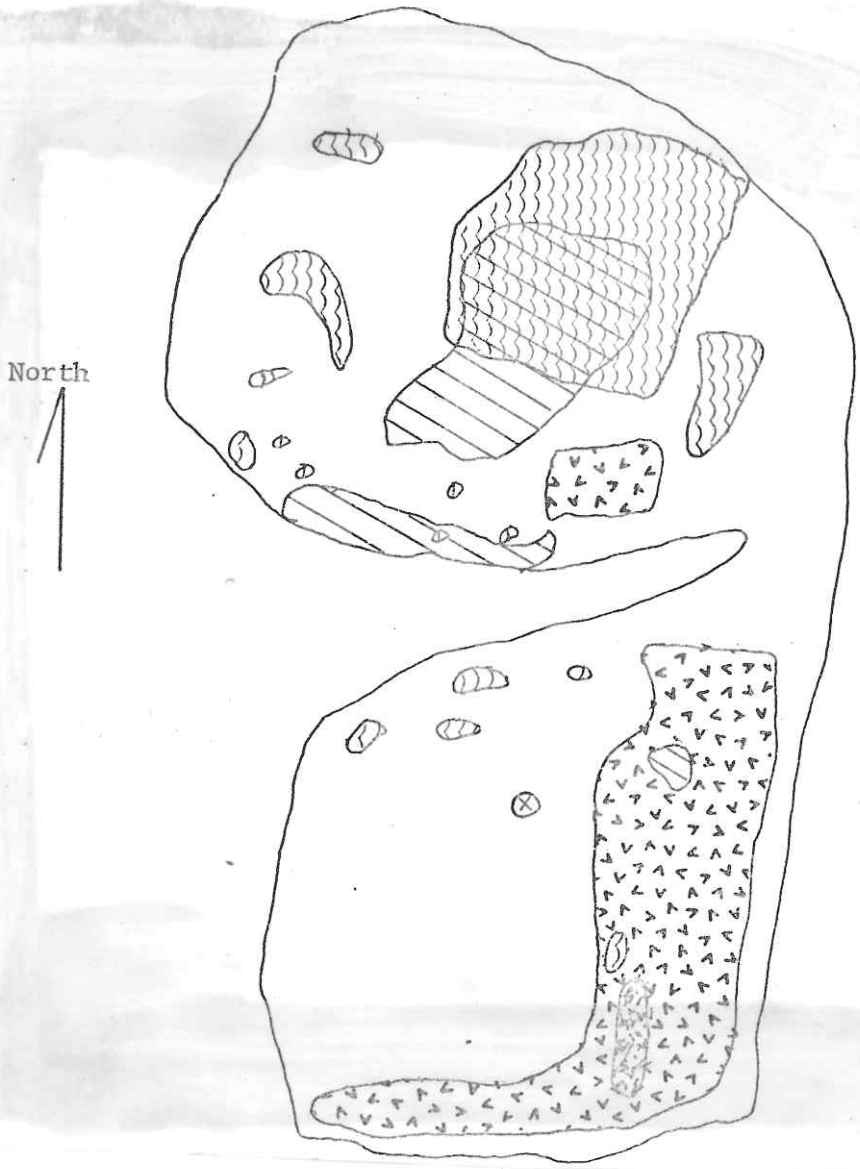


FIGURE 5 Bird Nesting on Flat-iron Rock



of the hogback on the northern wing. There are about 200 pair nesting on the rock.

Black Oystercatcher: One pair nests in the dry surge channel on the south wing. Three eggs were seen in 1969 and 2 eggs were seen in 1970.

Western Gull: Birds are present on the rock throughout the year. There were no nests April 5. By May 24 the first chicks had hatched, and on June 18 both eggs and chicks were present. About 40 pair breed on the rock.

Common Murre: The first landfall at Flat-iron was in early February, but the number was variable until the beginning of April. Courtship and mating were seen April 5. Eggs and a single one-day-old chick were seen May 24. Some birds were still incubating and eggs were seen pipping on June 18. The murres nest mainly on the north wing to the north of the hogback ridge, but scattered pockets of 12 to 100 birds are on the south wing and on the southern part of the north wing. About 2,500 pair breed on the rock.

Pigeon Guillemot: One egg was found August 4, 1969. In April birds were seen during the mornings, but did not remain on the rock throughout the day until the end of May. Two eggs were found in one nest on June 18. There are 4 pairs nesting on the rock.

Tufted Puffin: There was no sign of nesting in 1969. One bird was seen June 3 flying around the rock. On June 18 two birds and one egg were seen. The gravel deposit area has 24 holes which apparently have been evacuated over the years by puffins, but at present there appears to be no more than one pair of puffin on this rock.

Other birds seen on the rock in 1970:

April 5 - 10 black turnstones, 5 surfbirds

Mammals

April 5 - male California sea lions present

May 24 - male California sea lions and Stellars sea lions present.

Green Rock

Physical Description

The rock is located 1-3/4 miles N-NE of the Trinidad Light, Township 8 north, Range 1 west, Section 15, Humboldt County. The rock is of Franciscan formation. It is 108 feet high and is predominately rock except for a gravel deposition cap about 10 feet thick which covers 1/3 of the total area of the rock. The east side of the rock is almost vertical. On the south and west side there is a ledge 10 feet above the sea, then the sides of the rock are vertical for 50 feet. The north side of the rock slopes up from the sea to the top at a 30 degree angle. The gravel cap has steep banks on the southwest and north edges varying from 4 to 10 feet high. There is a pocket of soil in a deep cut on the northern side below the cap. There are three isolated pockets of vegetation on Green Rock (Figure 6). Large growths of Polypodium occur on the east cliffs, and

there is another patch just off the northwest tip in a deep cut where Synthyris and Baeria grow in sandy organic soil. To the west and south of the gravel cap are found scattered plants of Baeria, Rumex, Bromus, Distichlis, Poa and Spergularia.

Birds

Table 3 summarizes seabird counts made of Green Rock and Figure 7 illustrates their nesting distribution. A species account follows:

Fork-tailed Petrel: One chick and two incubating birds were seen in holes on June 18. The population is estimated at less than 25 pair.

Brandt's Cormorant: In 1969 there were 60 nests on the northwestern side of the island, and 42 nests on the southeastern part of the cap. Thirty-five nest sites were counted on the southeastern cap in June 1970. Some birds arrived in April and started nest construction. On June 18 no nests were seen on the northwestern part of the rock.

Pelagic Cormorant: Two pair breed on the steep cliffs on the eastern side of the rock.

Black Oystercatcher: On June 18 I was harrassed by three adults in the vicinity of an empty nest. No young were seen.

Western Gull: Birds are resident throughout the year. The main nesting is on the northwest side so that counts made by spotting scope from the southeast side are low. Twenty-two nests were counted June 18 in which all the eggs had hatched. Some gull chicks were found hiding in holes in the gravel cap which had previously been dug by puffins.

Common Murre: The murre colony on Green Rock is the densest congregation of these birds anywhere in Northern California. Almost all the young murres had jumped from the rock by August 4, 1969. The first birds were observed in early February and again in March. Murres cover the entire cap except for an area on the southeastern corner. They also extend north off the cap and on to the rocks. There are two small pockets of murres west of the cap. Mating was seen May 28. On June 18 almost all returning birds had fish in their mouths. The rock has about 10,000 pairs of birds breeding on it.

Pigeon Guillemot: Six birds flew out from Polypodium on the east side on June 18.

Cassin Auklet: Two chicks were seen in holes on June 18. Both birds were determined to be at least 30 days old using criteria by Thoresen (Condor 1964, 66:456-476). There are estimated to be less than 25 pair on the rock.

Tufted Puffin: First birds were seen May 21 when 5 birds were standing outside burrows on the southwest ledge. One egg was seen on June 18.

Other birds seen on the rock during 1970:

June 18 - 5 American goldfinch

Table 3 - Resident Seabirds on Green Rock

August 1969 - June 1970

Date	F-T Petrel	Brandt's Cormorant	Pelagic Cormorant	Black Oystercatcher	Western Gull	Common Murre	Pigeon Guillemot	Cassin Auklet	Tufted Puffin
Jul 16 '69						5,000			
Aug. 4 '69		150			20	40			
Feb. 4 '70						Thousands***			
Feb. 21						1,700			
Feb. 28						0			
March 6					10	75			
March 13					0	3,200			
March 20					3	8,000			
April 2					0	12,000			
April 10		1			10	12,000			
April 17		35			8	6,000			
April 22		21			7	12,000			
May 7		37			9	12,000			
May 12*		49				20,000			
May 21		35			5	12,000			5
May 28		38			7	12,000			
June 3		35			5	12,000			
June 9		29			5	12,000			
June 18**	3		2	3	44		6	2	3
June 26		30			11	12,000	3		3

Spotting counts made from mainland with exceptions noted

*Aerial census

**On-the-site visit

***W. J. Houck (personal communication)

FIGURE 6 Vegetation on Green Rock

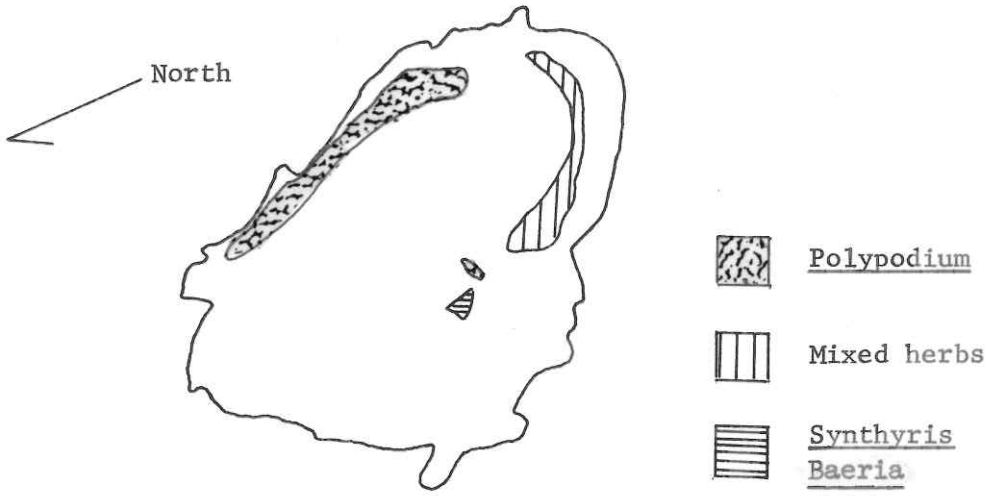
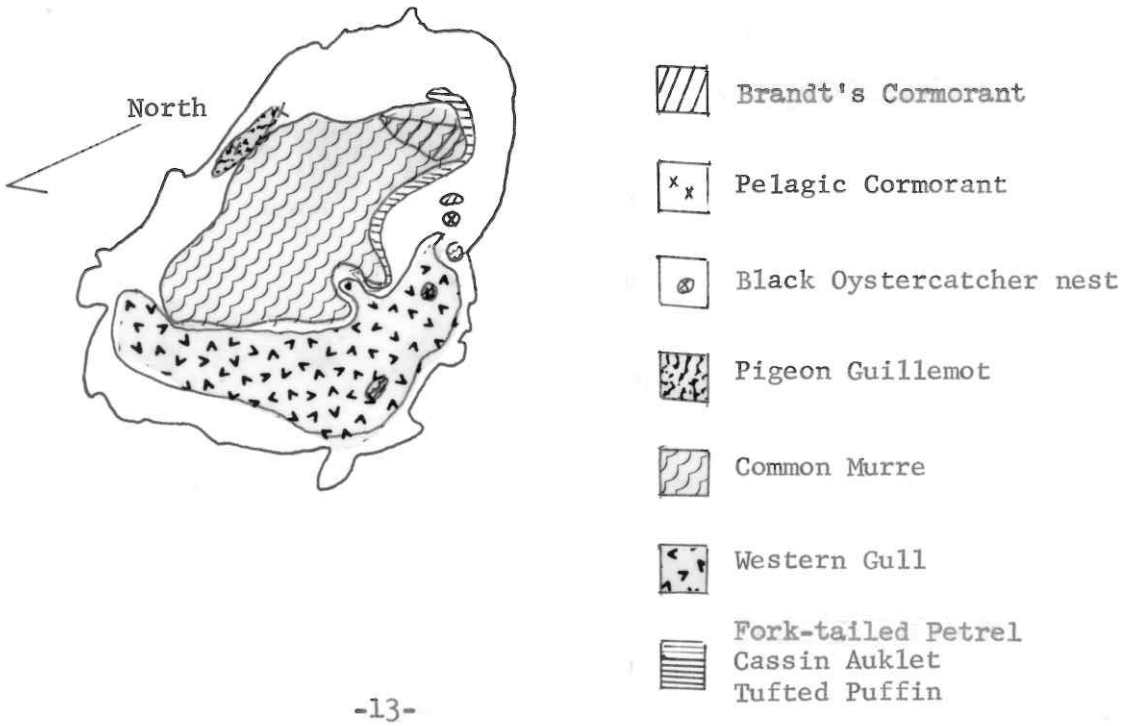


FIGURE 7 Bird Nesting on Green Rock



Mammals

No mammals have been seen on the rock.

Castle Island

Physical Description

The island is located 2-1/2 miles northeast of the old Crescent City lighthouse; Township 16 north, Range 2 west, Section 24, Del Norte County. The rock is of Franciscan formation and is 235 feet high and covers 6.82 acres. The rock has been eroded by the waves and large caves have been formed which undermine overhanging areas in several places. On the east part of the island one of these has collapsed forming a large pit which is 100 feet across and connects to the sea by a cave. To the east of the pit is a sandy beach. The most important feature of the island is a grassy flat 300 feet long and 200 feet wide. Extending from this flat a slope runs up to the highest part of the island 300 feet away. The southwestern, western and northwestern part of the island consist of cliffs 100 to 200 feet high.

The soils of the flat and slope are dark organics at least one foot thick with a yellow subsoil of rock and sand up to 25 feet thick. Most of the topsoil is completely undermined by burrows of birds and it is impossible to walk over the grassy areas without breaking into burrows.

On the large flat area there are two vegetation types (Figure 8). Approximately one third of the area is dominated by a stand of Elymus 24 inches tall. The rest of the area supports stands of a short Poa and Baeria. There are three areas on north facing slopes where Synthryis, Montia and Polypodium are found. On the east edge of the bunch grass stand is a small area occupied by a stand of mixed herbs. Dudleya grows on scattered areas on the rocks.

Birds

Table 4 summarizes seabird counts made on Castle Island and Figure 9 & 10 illustrate their nesting distribution. A species account follows:

Fork-tailed Petrel: Two birds were caught in a mist net at midnight on May 16, 1970. There are probably 50 pair on the island since they have been found in similar areas to be present at the rate of about 2% of the Leach Petrel population (Harris, personal communication).

Leach's Petrel: An incubating adult was seen on July 17, 1969. On May 7, 1970, 18 birds were captured by mist net, 3 of which had brood patches. Sixty-six birds were caught on May 16 in 2 hours. Several thousand were seen flying at midnight. The birds burrow under the bunch grass on the flat and on the sides of the pit (Figure 8). There are about 2,500 pair nesting on the island.

Brandt's Cormorant: The birds nest at five areas in the middle, and one area on the southeastern tip of the island, mixed with murres. There are 770 pair nesting on the island.

Pelagic Cormorant: The birds nest from the pit cave entrance on the south-east side, on the west cliffs, to a deep cut in the middle of the north side. On both May 8 and May 16 nest building and courtship were seen. There are about 50 pairs nesting on the island.

Black Oystercatcher: One nest is located on a rocky pinnacle off the east side of the island.

Western Gull: The birds are present on the island throughout the year but with smaller numbers in the winter. Twenty-six nests were counted in 10,000 square feet of the Baeria-Poa flats on May 16, 1970. The average clutch was 2.4 eggs. The estimated total for the island is 600 nests. Several nests were seen on the sandy beach in areas which were probably inundated during the highest tides.

Common Murre: The first landfall was seen February 7, 1970 when 250 birds were seen on the island. Bird numbers were stable by late April and eggs were seen on May 8 and May 16. The majority of the murres nest on the western half of the island with several thousand nesting on a rocky outcrop on the southeast corner. There are approximately 20,000 pair nesting on the rock.

Pigeon Guillemot: The first birds were seen at sea near the island on March 20, two of the 57 birds seen were still in winter plumage. No eggs were found on May 16, 1970 in an area where eggs had been seen in 1969. About 150 pair nest on the island.

Cassin Auklet: One incubating bird was seen in 1969. In May 1970 birds were digging burrows and many birds were seen in the short grass area at night and two chicks were seen which were 10 and 20 days old. There are about 2,500 pair on the island.

Rhinoceros Auklet: One egg and one young bird were found July 17, 1969. On May 16, 1970 five incubating birds were dug out of burrows and banded. One additional egg was found. The nest day four of these burrows contained unbanded mates incubating eggs. One bird was seen May 16, 1970 at night digging a burrow. The island has a 100 to 150 breeding.

Tufted Puffin: Six birds were seen in July 1969. Eight birds were seen May 1970 and two burrows had eggs. There are about 25 pairs of birds nesting on the island.

Other birds seen on the island in 1969 and 1970:

July 17, 1969 - 1 wandering tattler

February 7, 1970 - 67 Canada geese

February 28 - 155 Canada geese

April 14 - 600 Canada geese

May 8 - 1 black-legged kittiwake, 1 black turnstone, 2 barnswallows, 2 violet green swallows.

May 16 - 1 black turnstone, 2 wandering tattlers, 4 barnswallows, 2 tree swallows.

FIGURE 8 Vegetation on Castle Island

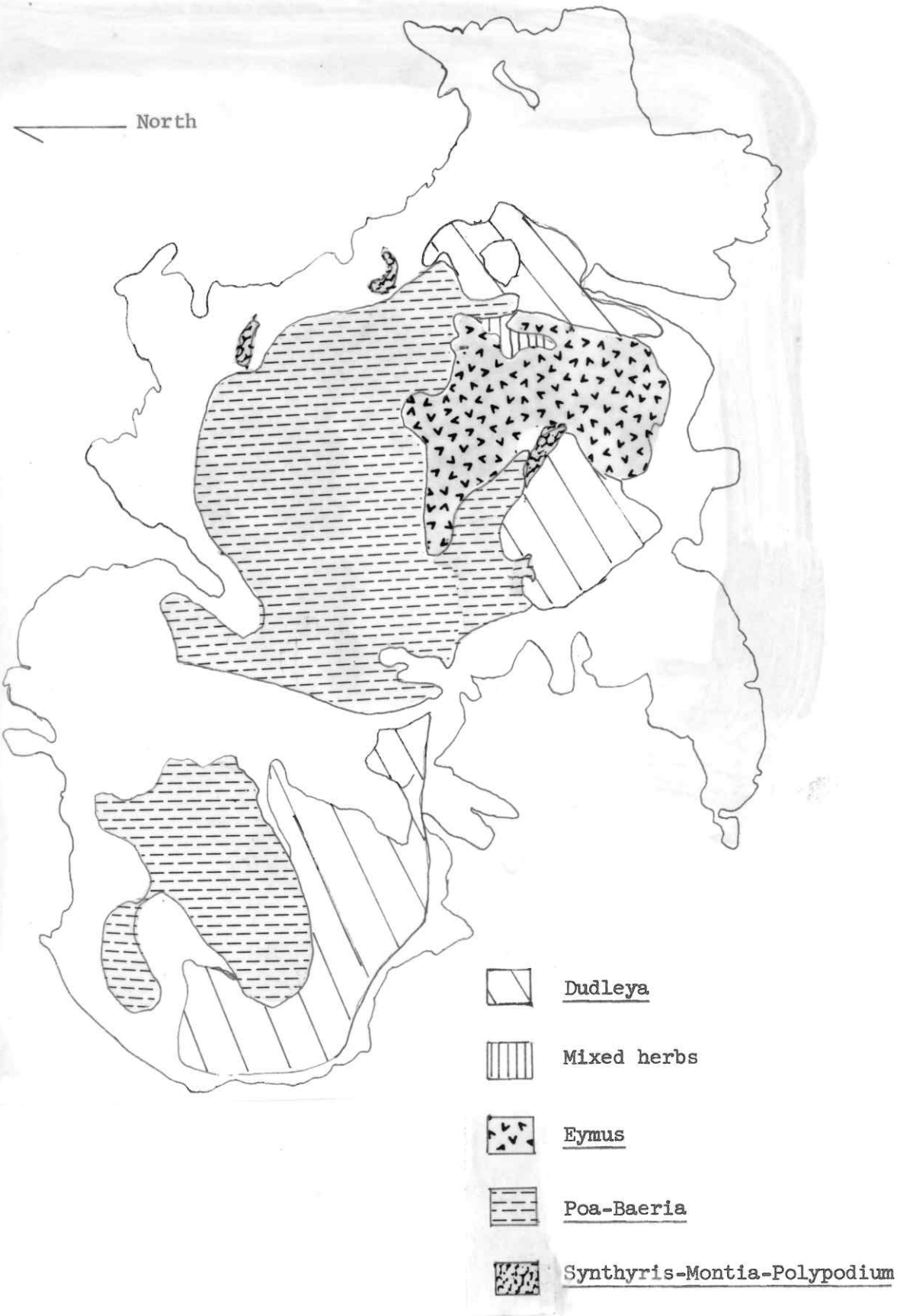


FIGURE 9 Bird Nesting on Castle Island

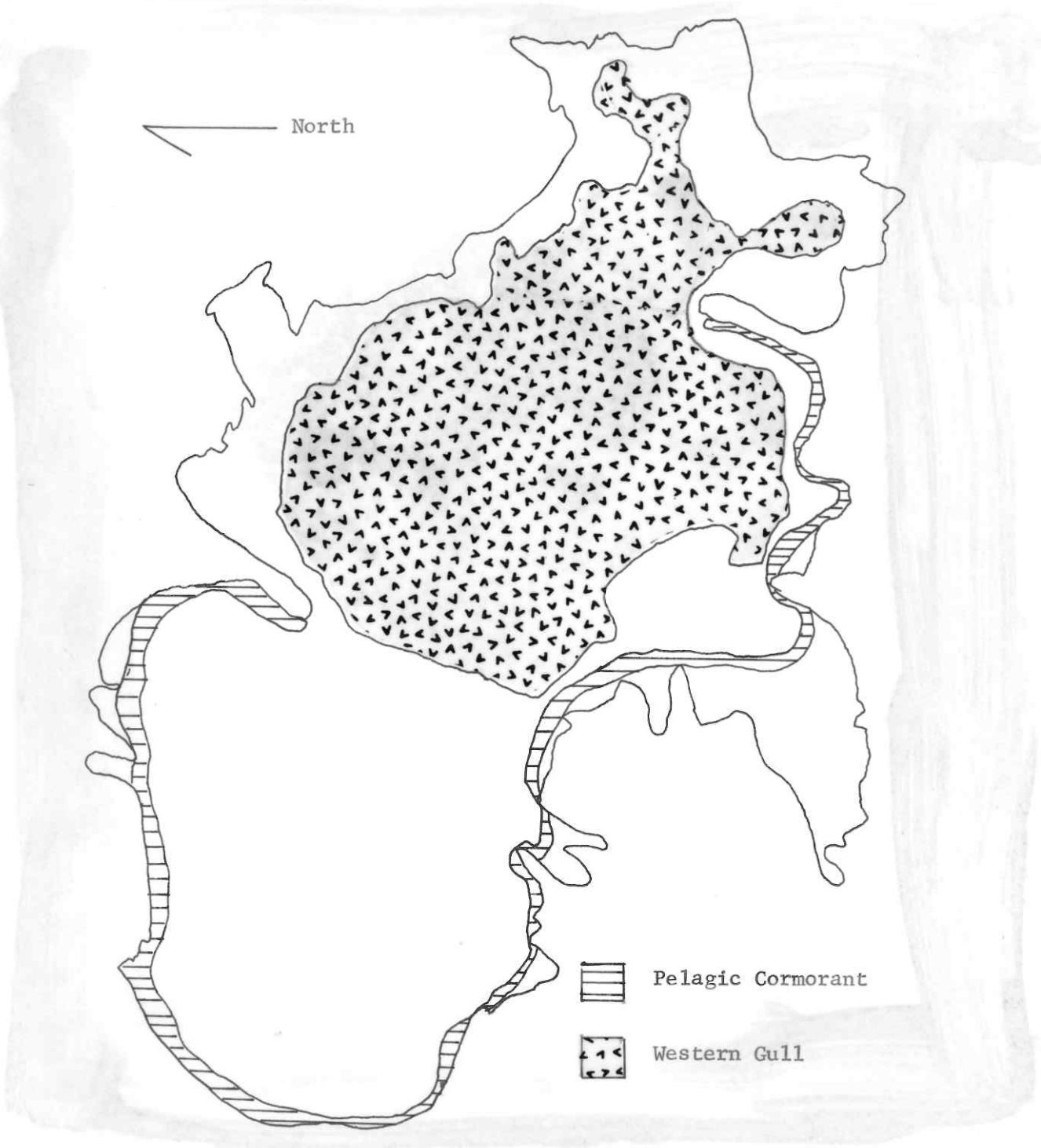


FIGURE 10 Bird Nesting on Castle Island

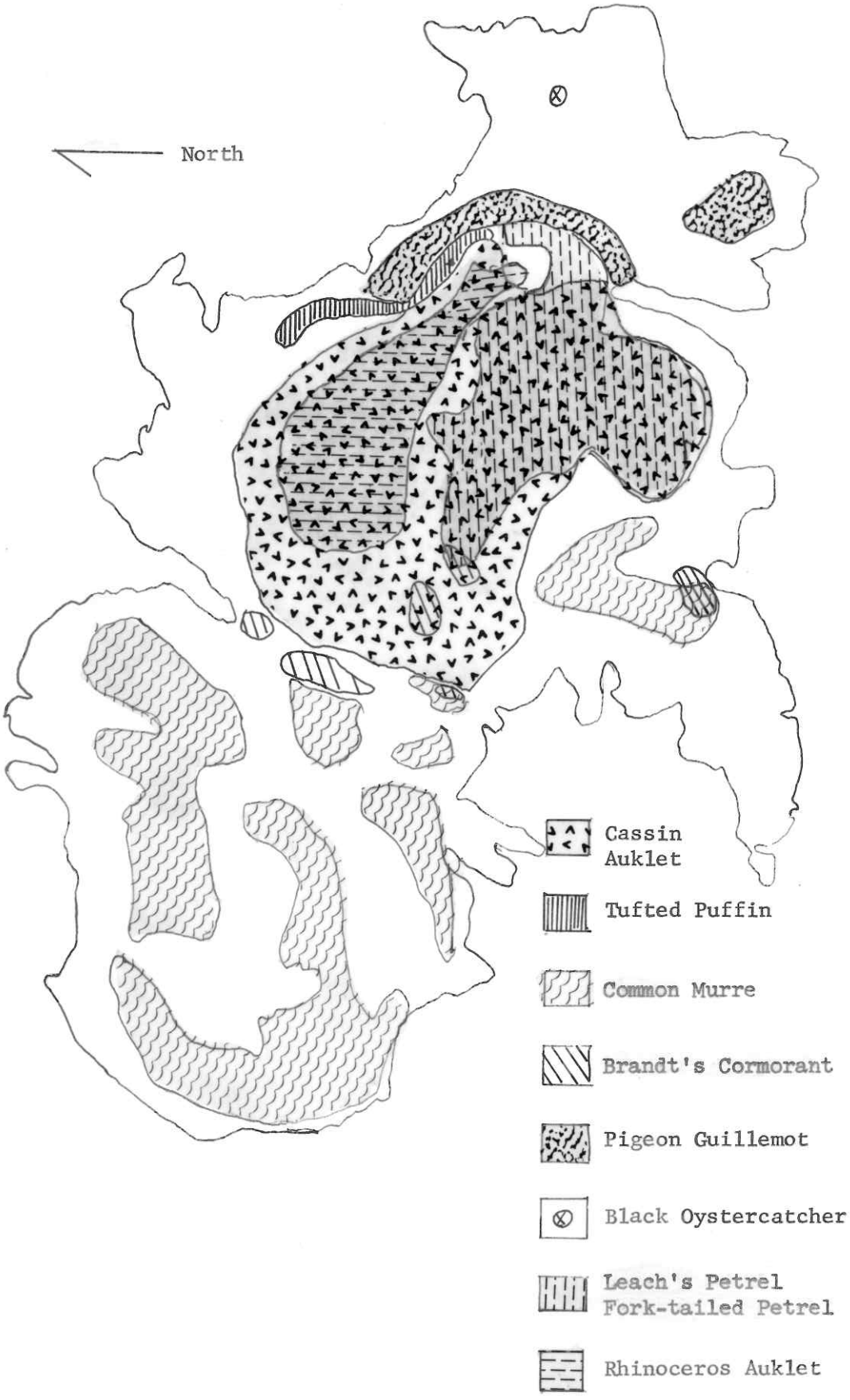


Table 4 - Resident Seabirds on Castle Island

July 1969 - June 1970

Date	F-T Petrel	Leach's Petrel	Brandt's Corm.	Pelagic Corm.	Black Oyster.	West. Gull	Common Murre	Pigeon Guillemot	Cassin Auklet	Rhino. Auklet	Tufted Puffin
July 17 '69*		present			2		10,800	250	present	present	6
Feb. 7 '70			2			250	250				
Feb. 28			0			600	0				
March 7			0			950	0				
March 20			0			600	16,600	57			
April 11			115			700	0				
April 23			75			1200	25,000				3
May 7-8*		thousands	present		1	1200	present				4
May 16-18*	2	thousands	present		6	1200	present	200-300		10	8
June 4			470			1200	32,000	24			7

Counts made by spotting scope unless otherwise noted.

*Represent on-site visit.

Mammals

Mammals seen on the island in 1969 and 1970:

July 17, 1969 - 1 male California sea lion.

May 7, 1970 - 30 male California sea lions.

May 8, - 30 male California sea lions, 2 elephant seals (one with a green tag #119 in its left hind flipper), 1 dead Mus.

May 16, - 4 adult, 3 young harbor seals (one young was 1 day old), 1 elephant seal with green tag #119, 30 male California sea lions, 2 Peromyscus were seen near the middle of the island.

May 17, - 21 harbor seals, 2 elephant seals, 30 male California sea lions.

May 18, - 30 male California sea lions, 2 elephant seals.

Prince Island

Physical Description

The island is located 1/2 mile north of the mouth of Smith River, Township 18 north, Range 1 west, Section 18, Del Norte County. The island is composed of Franciscan formation Mesozoic era rock. It is 87 feet high. Prince Island is basically round in outline, sloping from the water on the east to the highest point which is close to the western edge. A vertical cliff extends along the entire western edge and halfway east on the south side. A small steep rock lies off the west side of the main island. The northwest arm of the island slopes sharply down to the water. There is a surge channel on the west side that forms a cave 100 feet high and 50 feet wide, which almost cuts through the northern arm (Figure 11).

Most of the island is covered by a brown to black topsoil, which is thinnest on the west. Yellow sandy rocky subsoil was seen at eroded areas along the southern edge.

The island is ringed by a belt of Dudleya vegetation type which grows inland from the splash zone on the rocky outcrops. Plantago, Mesembryanthemum, Sedum, Spergularia and Erigeron are found scattered in this area.

A mixed grass-herb vegetation type grows on the west and south side in a belt 20-30 feet wide. (Figure 11). It is composed of: Ranunculus, Iris, Brodiaea, Polygonium, Castilleja, Spergularia, Erigeron, Achillea, Taraxcum, Lupinus, Bromus, Poa and Trifolium. The center of the island supports a dense stand composed of tall shrubs and a few trees as follows:

Polystichum, Abies, Picea, Garrya, Sambucus, Cymopterus, Rubus, Oxalis, Vaccinium, Gaultheria, Baccaris, and Trifolium. Wet areas along the eastern edge of the chaparral support Cryptantha, Cicuta, Geranium, Rumex, Mimulus, Scrophularia, Montia, and Marah. Polypodium grows on the northwest corner on some steep rock cliffs. There is a moist pocket on the northwest corner, where Marah, Scrophularia, and Montia are found.

Birds

Table 5 summarizes seabird counts made on Prince Island and Figure 12 illustrates bird distribution.

Double-crested Cormorant: Nests in all stages of development, from nest construction to young able to walk around, were seen on June 17. The nests were on the wide ledges on the western cliffs and on the top and sides of the southwestern arm and down the sloping northwestern arm in separated pockets. There are about 90 pair breeding on the island.

Brandt's Cormorant: No birds were seen on the rock in 1969. In 1970 a small colony of 34 birds nested within a double-crested cormorant colony on the northwest arm of the island. June 17 there were 17 nests with 10 eggs.

Pelagic Cormorant: These birds nest on the cliffs on the south and west side of the rock. They also nest on the small rock to the west. On June 17, 1970 birds were starting to incubate. One nest had 7 eggs. There are about 40 nests in all.

Black Oystercatcher: Five birds were harassing us on June 17, 1970, but no nest or shell mound was found.

Western Gull: The 1969 figure was high due to numbers of mobbing birds in the air as the young gulls were near fledging at the time counts were made. There were about 50 nests present on June 17, 1970 mainly along the top of the western side where the mixed grass-herb vegetation type grows. Nests were also found on the north side extending down to the splash zone on the northwestern arm.

Pigeon Guillemot: Twenty to thirty were reported in 1969. Fourteen birds were seen on the east side of the island and 14 birds were seen in the water just off the western side between the arms on June 17, 1970. One nest with 2 eggs was found in the cave.

Other birds seen on the island in 1969 and 1970:

July 18, 1969 - 12 black turnstones

January 24, 1970 - 115 black turnstones, 1 wandering tattler

March 7, 1970 - 19 Canada geese, 45 black turnstones, 6 surfbirds

June 17, 1970 - 6 song sparrows, 8 Brewer blackbirds, goose droppings seen on top western side.

Mammals

No mammals have been seen on the rock.

FIGURE 11 Vegetation on Prince Island

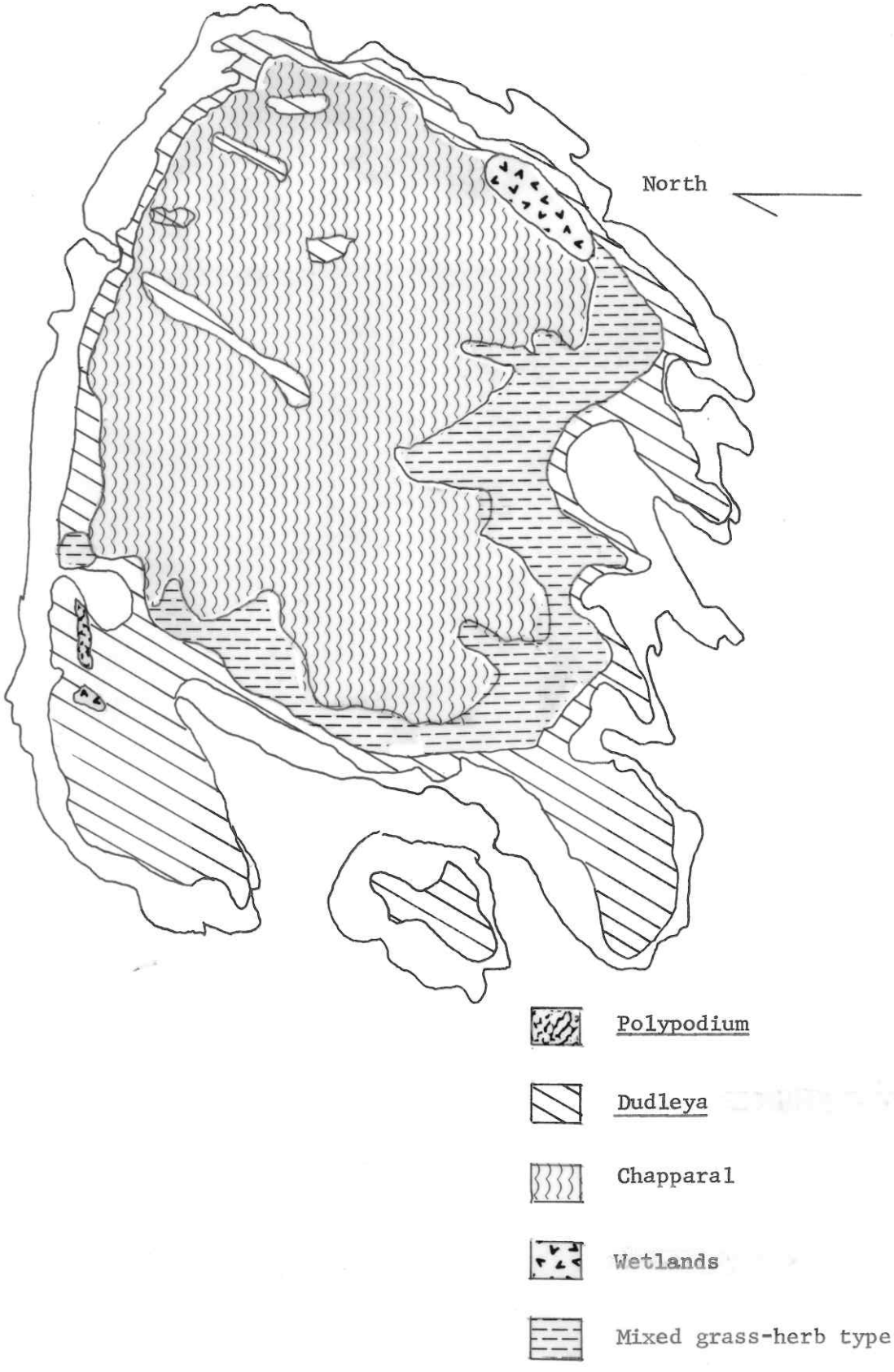


FIGURE 12 Bird Nesting on Prince Island

Table 5 - Resident Seabirds on Prince Island

January 1970 - June 1970

Date	Double-crested Cormorant	Brandt's Cormorant	Pelagic Cormorant	Black Oystercatcher	Western Gull	Pigeon Guillemot
Jan. 24			8		90	
Feb. 7			1		16	
Feb. 28					37	
March 7					32	
March 20	2				34	
April 11					37	
April 23	2		1		69	
May 18			3		33	15
June 4	5		4	1	32	2
June 18*	4	34	5	5	23	28

Count made by spotting scope unless otherwise noted.

*On-site visit.

SEASONAL ABUNDANCE AND OCCURENCE OF SEA BIRDS

The seasonal abundance and occurrence of seabirds along the northwestern California coast has been determined in 3 ways:

(1) systematic counts were made of 8 study areas previously described.

(2) incidental observations made throughout the entire year along the coast.

(3) general surveys of nesting areas made from Cape Mendocino to Oregon in 1969 and during the course of the 1970 work, and are summarized in Table 6.

SPECIES ACCOUNT

Arctic Loon (Gavia arctica): Migrant, seen occasionally resting in protected bays and flying north over open ocean in April.

Red-throated Loon (Gavia stellata): Migrant, seen occasionally resting in protected bays and flying north over open ocean in April.

Western Grebe (Aechmophorus occidentalis): Migrant, occasionally seen throughout winter, large flocks were common in April. Non-breeding flocks were seen in May and June.

Black-footed Albatross (Diomedea nigripes): Migrant, often associated with sooty shearwaters. Occasionally seen in open ocean from April to June.

Pink-footed Shearwater (Puffinus creatopus): Migrant, often associated with sooty shearwaters. Occasionally seen in open ocean from April to June.

Sooty Shearwater (Puffinus griseus): Migrant, abundant in open ocean from April to June and frequently seen from shore.

Fork-tailed Petrel (Oceanodroma furcata): Breeding resident, not as common as Leach's petrel. These birds usually prefer the rocky areas of a rookery and will nest in old puffin holes when suitable soil is lacking. Eggs and chicks were recorded from April to June. Both these petrels are very vulnerable to destruction of their nesting habitat. The soil is very dry during the summer months, and when walked upon will break off and fall off the steep sides of the rock. Most of the rookeries are accessible at low tides and frequently are visited by people. This habitat destruction will soon lead to the birds disappearance unless people are kept off the rocks. The erosion during the winter is greately increased when there have been people on the rookery. Forked-tailed petrels have been recorded breeding from four locations.

Leach's Petrel (Oceanodroma leucorhoa): Breeding resident. Digging activity was seen from March to middle May. Flighting was seen over breeding grounds in May. Heavy gull predation occurred during flighting. Over 200 gull pellets containing petrels were collected in April and May. In June only 20 pellets were collected from the same area. They have been recorded breeding from five locations.

Table 6 - Pairs of Seabirds Breeding From Cape Mendocino to Oregon 1970

	F-T Petrel	Leach's Petrel	D-C Cormorant	Brandt's Cormorant	Pelagic Cormorant	Black Oystercatcher	W. Gull	Common Murre	Pigeon Guillemot	Cassin Auklet	Rhino. Auklet	Tufted Puffin	Total
Pewetole Rock						1							1
Little Pewetole Rock					2								2
Puffin Rock					4	1			6			2	13
Green Rock	(25)			30	2	1	44		3	(25)		(5)	135
Headlands North Elk Head					11								11
Beaver Head					(5)								5
White Rock			12		31		(10)	(600)	5			1	659
Colonial Sea Lion Rock			8		17		12						37
Rock S. Palmer Point							(10)						10
Wedding Rock*									(20)				20
Cormorant Rock					2								2
Redding Rock				40	(5)			(200)					245
White Rk. (Del Norte Co.)				100									100
False Klamath Rock			6	185	(6)		(25)	(5000)					5,222
Castle Island	(50)	(2500)		770	(50)	1	600	20,000	150	(2500)	(150)	25	26,796
Prince Island			(90)	17	(40)		(50)		28				225
Hunter Rocks				150	30	1	15		1				197
Steamboat Rock				150				300					450
Sugarloaf Rock			14	80	200		100		100			2	496
False Cape Rock				400				600					1,000
Old Arcata Wharf			133										133
Little River Rock	(100)	(5000)			2	1	(25)		17				5,145
Off Tepona Point Rock	(5)	150											155
Tepona Point					(5)								5
Button Rock		(50)											50
Split Rock					12		1						13
Cap Rock						1							1
No name Rock					10				1				11
Double Rock					2				10				12
Prisoner Rock		(75)			2								77
Pilot Rock				(80)	(12)		(10)						102
Trinidad Head					(20)				(25)				45
Blank Rock							45						45
Flat-iron Rock				200		1	(40)	(2000)	4			1	2,246

Double-crested Cormorant (Phalacrocorax auritus): Breeding resident. The winter population of this bird is small. Flocks were seen flying north in February, and birds in breeding plumage were seen in early March. Some birds were seen carrying nesting material in March. Eggs were recorded April 24. This bird nests in small groups. All the nests within the group are in the same stage of development. These groups range from 3 to 52 nests. If disturbed, the incubating birds frequently kick out their eggs when they take flight. Egg loss among three nests at Sugarloaf Rock was total after three visits two weeks apart. Double-crested cormorants have been recorded breeding from six locations.

Brandt's Cormorant (Phalacrocorax penicillatus): Breeding migrant. The birds are sparse on the nesting grounds until April, then the numbers build until late May when all birds are building nests. The first eggs were seen in late May. This bird is the latest of the local breeders to arrive and start nesting. If the cormorants are disturbed while nest building in a new locality, they will abandon the site and move. The Castle Island birds, which had returned to old nest sites, were disturbed twice in May for four days at this critical time without affecting the birds except for delaying construction of nests. The birds nesting on the southern wing of Flat-iron Rock were disturbed for only a few hours; however, they abandoned their nest sites and all birds moved near the vicinity of birds which had returned to old nesting sites and were not disturbed by our visit. When cormorants leave their nests unprotected, it will be torn apart by neighboring birds who steal the nesting material and use it in their own nests. After disturbance, many nests are destroyed in this manner. As with double-crested cormorants, there is egg breakage when incubating birds are frightened off their nests. Brandt's cormorants have been recorded breeding from seven locations.

Pelagic Cormorant (Phalacrocorax pelagicus): Breeding resident. Birds in breeding plumage were seen in late February. Courtship and nest building were seen in April and May, and eggs were first seen on June 6. Pelagic cormorants nest on steep cliffs, although in some areas they nest on sloping rocks. They have been recorded breeding from 21 locations.

Canada Goose (Branta canadensis): Resident. This bird is thought to be a breeder. The birds were seen from February to April, but were not recorded since this time. Droppings were evident on Castle and Prince Islands in May and June, but none were fresh.

Black Brant (Branta nigracans): Migrant. Common in bays during spring. These birds were seen in the open ocean only in March.

Harlequin Duck (Histrionicus histrionicus): Migrant, occasional around rocks during winter. Three were seen during January only.

White-wing Scoter (Melanitta deglandi): Migrant. This bird is occasional along the coast from January to April. It is common from May to June.

Surf Scoter (Melanitta perspicillate): This bird is abundant along the coast from January to May.

Common Scoter (Oidemia nigra): Migrant. This bird is occasional during February and March only.

Red-breasted Merganser (Mergus serrator): This bird was only seen in February.

Black Oystercatcher (Haematopus bachmani): Breeding resident. They are quite vociferous when approached any time of the year. This bird prefers to nest on flat gravelly areas. Eggs were seen in May, young in June, and fledglings in August. The birds are territorial and it has been suggested (T. Eley, pers. comm.) that the young of the preceding year stay near the area. They have been recorded breeding from seven locations.

Surfbird (Aphriza virgata): Migrant, common in the intertidal region of rocky areas from January to April. It is usually in the company of black turnstones.

Black Turnstone (Arenaria melanocephala): Migrant. Abundant in the intertidal regions of most rocky areas from January to April.

Spotted Sandpiper (Actitis macularia): Migrant, rare on the coast. Birds were seen in May on the rocks at Cape Mendocino and Trinidad.

Wandering Tattler (Heteroscelus incanum): Migrant. Rare during the winter. Occasional in rocky intertidal April to June.

Rock Sandpiper (Erolia ptilocnemis): Migrant, rare. Birds were seen at Trinidad and in the Castle Island area from the end of February to the middle of March in the company of black turnstones.

Sanderling (Crocethia alba): Migrant, common on sandy beaches during the winter but rare on rocks. Nine seen on rocks near Castle Island in March.

Glaucous-winged Gull (Larus glaucescens): Migrant, occasional January to April.

Western Gull (Larus occidentalis): Abundant all year on both breeding colonies and coastal areas. Courtship and nest building was seen March through April. Eggs were recorded in May and hatching was seen from late May to middle June. Gulls nest mainly in colonies but single nests have been noted. Nests are built by scooping out a hollow and lining it with vegetation. Gulls were not seen to prey on other gull eggs or chicks. Disturbance by man is light to gull rookeries except when the young gulls are near fledging in August. The young then jump from the rock before they can fly. Western Gulls are recorded breeding from 14 localities.

Bonaparte's Gull (Larus philadelphia): Migrant. Large flocks were seen in the open ocean in April and May.

Black-legged Kittiwake (Rissa tridactyla): Migrant, occasional near the coast May to June.

Common Murre (Uria aalge): Breeding migrant. Abundant in open ocean from February to June. Courtship and mating was seen from April to late May. Eggs were seen in early May and fresh eggs were found up to May 18. The first young hatched in late May. By the middle of June almost all birds returning from the sea carried food. Gull predation on murres appears to be a variable habit. On Castle Island eggs exposed to gulls were eaten but on Flat-iron Rock gulls did not bother exposed murre eggs or chicks. When man standing upright approaches murres the birds will flee and frequently the eggs are broken. Sometimes young murres are trapped in splash pools as they try to escape. They are recorded breeding from six localities.

Pigeon Guillemot (Cepphus columba): Breeding migrant. The birds arrived in late March and courtship was seen in late April before the birds permanent landfall. Eggs were first seen in May. This bird nests on the floor of caves, in cracks, and in old puffin holes and has few predators at the nest site. Some birds nest on the mainland in places which are accessible to man. Recorded breeding from 14 localities.

Marbled Murrelet (Brachyramphus marmoratum): Probable breeder and migrant. The bird arrives in April and numbers build until a peak in May. A male and female in breeding condition were collected near Trinidad Bay May 24.

Cassin Auklet (Ptychoramphus aleutica): Breeding migrant. Arrives on the breeding ground in April and May to dig and clean out burrows. Incubating birds were not seen but young chicks were found in May and June. Recorded breeding from two localities.

Rhinoceros Auklet (Cerorphinca monocerata): Breeding migrant. Arrived on breeding ground by late April and eggs were seen in May. Egg near hatching seen May 16. Only recorded from Castle Island.

Tufted Puffin (Lunda cirrhata): Breeding migrant. Arrived in April and eggs were seen in the middle of May through June. Recorded breeding from six localities.

TECHNIQUES

Aerial survey:

The easiest and most accurate method is the aerial census. Photographs are taken with an aerial camera and counts are made from the photographs.

The next best aerial system would be a two person counting census with one person taking pictures with a 35 mm camera and a second person recording information into a tape recorder. The most desirable airplane is a high wing craft with a low stall speed and a window that can be opened to facilitate picture taking. Two passes over a rock at 200 to 300 feet are usually sufficient to cover the area and determine the species. Two or three pictures as the plane does a bank turn 600 feet over the rock are sufficient to estimate overall numbers. These altitudes are for rocks 50 to 100 feet high. For taking photographs either black and white Plux-X or Ektacrome Asa 64 speed can be used. Black and white has advantage for reference

purposes and publication. The color is good for public relations demonstrations, a check on vegetative conditions, and the image can be blown up on a screen and counts can be made without prohibitive cost. The advantages are accurate counts, minimum disturbance and a large area of the coast can be covered in a short time. The disadvantages are: only large birds and those which nest on top of the rock are counted; burrowing species are not seen; and there is no way to check nesting progress other than presence or absence.

Boat survey:

A survey from a boat on most rookeries is impractical. For safety reasons a 30 foot or larger boat is best but due to numerous reefs and rocks around most islands a smaller boat is better. The island is circled and the birds are counted. Photographs can be taken but a telephoto lens is needed. The advantage is that this is the most accurate method for determining species which nest on cliffs. The disadvantages are: the weather affects the survey too often, and when the boat is close to the rock some danger is involved since none of the coastal charts are very accurate when showing reefs and rocks close to shore. If the rock has a flat surface on the top, any birds there will be hidden from view. Burrowing species cannot be counted. Most rocks cannot be completely circled due to reefs, bars etc.

Spotting Scope Survey:

The rock to be surveyed is examined from shore using a 20 power spotting scope and the birds are counted. The advantages are: unlimited time is allowed for observations; the survey can be conducted singly and with no coordinated organization. The disadvantages are: the same as aerial survey with the added hindrance of only one side of the rock being surveyed. Photographs cannot be taken without expensive telephoto equipment.

On Site Survey:

The rookery is visited either by wading at low tide or landing from a boat. The birds and nests are counted and notes are taken of nesting progress and burrow types. The advantages are: accurate counts of nests, records of nesting, burrow counts and occupancy, population structure, plant and bird collections, photographs for public relations and scientific purposes. The disadvantages are: landing on most rookeries is dangerous even in the best weather; before counts can be made birds are leaving the island and neighbors may be joining the residents for mobbing to increase the count; as birds leave their eggs and young unprotected, predators clean out the nests making egg counts erroneous, and are very damaging to the species. Damage may be caused by egg breakage as the parents flee. Many rocks can only be reached by technical rock climbing.

Species to be Censused:

Petrels: There is no practical way to determine the population during a short diurnal visit except by ripping up the island. The best way to determine presence is to mist net islands which have soil with burrows two inches in diameter or are suspected to have petrels by smelling. Petrel smell is unmistakable and is a good indication of presence or absence of the birds. The smell can be detected by a boat downwind from

the rookery. Gull pellets can be examined for the presence of petrel feathers. The best time of the year to do the mist netting is when the birds are flighting and courting over the rookery from March to May. After June there is a minimum of aerial activity. On islands restricted to petrels the population size can be estimated from digging sign in May. But this digging is an index of the total population not the breeding population. Some birds nest in rock crevasses and may not be counted by this method.

Pelagic Cormorant: These cormorants nest on vertical cliffs and the best method is to circle the rock by boat in June counting nests. The nest site is usually obvious since below is a prominent "white-washed" area.

Double-crested Cormorant: The best method to census these birds is on-the-site visits since their habits overlap with those of the Brandt and Pelagic Cormorant and may be confused in aerial photographs. To avoid egg breakage the birds should be censused in early July.

Brandt's Cormorant: The best method is by aerial flights over the rookeries in July when almost all the birds have nests. This bird is the latest nester and are still raising young in August when all the other birds have fledged. Extreme caution must be exercised when visiting Brandt Cormorant rookeries when they are starting to nest in May to June. Any disturbance at this time can cause destruction to the colony.

Black Oystercatcher: Boat, spotting scope or on-the-site visits will detect oystercatchers. Since they are territorial, there is usually only one pair per rock. There is a tendency for the young to remain with the adults or in the area, which could confuse nest counting. The nest of these birds is usually hard to find and it is best to look for concentrations of mussel and limpet shells in August on which the young have been fed.

Western Gull: The most accurate method of counting gulls is to visit the rookery no later than the middle of May or the first week of June. Most of the birds should have completed their clutches by then and the young have not yet hatched. After the young hatch, they have a tendency to scatter and are hard to find. On rocks with both western gulls and Brandt's cormorants, the gulls should not be counted by this method.

Common Murre: Aerial censuses conducted in late May and through June are best. After July some of the birds start to leave the rock. Earlier counts probably will not include all the birds. Also by counting in June, most of the young have hatched and one parent is usually fishing so the ratio of nests per bird on the rock is close to one to one.

Pigeon Guillemot: The boat census is the best way since the birds leave the rock when people approach. They will not be picked up by aerial methods since they are hole nesters. The eggs do not hatch until July so a census in early June will give the total number of adults since both adults stay nearby when incubating.

Tufted Puffin: When the island is approached, the birds take flight from their holes and circle the intruder. Boat is probably the best method during early June when both parents are by the nest. Numbers would indicate the total of adults.

Auklets: Both Cassin and rhinoceros auklets are nocturnal burrowers. The only way to determine presence is by an on-the-site visit. Visits in April and May will give an indication of the numbers of birds digging burrows. Burrow size varies, three inches in diameter for Cassin auklet and five inches in diameter for rhinoceros auklet. Cassin auklets will sometimes burrow in old rhinoceros auklet burrows. Digging into the burrows to check on the birds is destructive to the island and often the burrows are more than six feet long.

CONCLUSION

A list of the known seabird rookeries in Humboldt and Del Norte counties and the approximate number of pairs of birds occupying the rocks with a map showing the locality of the rocks is provided. The number of seabirds breeding on the north coast counties is greater than for the rest of the state of California as noted from previous report. (Wildlife Management Branch Administrative Report 71-3).

The rookeries on which these birds breed are unprotected, unmanaged and in danger. The major rookeries, with more than 100 pair of breeding birds, are listed below and comments are made about their status.

Sugarloaf Rock is accessible from the shore at any tide below -0.5 but access to the headlands is owned by Joseph Russ and he does not at present allow the public to trespass. The sides of the rock are steep so the top can only be gained by technical rock climbing. It is impossible to circumnavigate the rock to get at the Stellar sea lion colony.

False Cape Rocks are isolated and inaccessible and are never visited.

Old Arcata Wharf in Humboldt Bay is accessible by boat at any time, and now with the new boat basin at Arcata, the pilings will be even more accessible. This area is not included within the proposed Federal Wildlife Refuge. Several years ago all the nests were destroyed by vandalism (S. Harris, personal communication).

Little River Rock is accessible from shore at any tide lower than -0.5 and the access to the headlands is owned by the state in part of the Luffenholtz beach fishing access. Once at the base of the rock, the cave leading to the top is the route taken by most people. If this cave were sealed, almost all people could be kept off the rock.

Tepona Point Rock is accessible at any low tide across a surge channel, but is rarely visited. By blasting the surge channel could be deepened to make access impossible.

Prisoner Rock is in Trinidad Bay and is visited frequently by picnickers. A dog has dug up some of the petrel burrows. It would be impossible to keep people off this rock.

Pilot, Blank, Flat-iron and Green Rocks off Trinidad are all accessible only by boat and vary from impossible to climb to easy access. Due to their nearness to a boat basin, and the numbers of breeding seabirds, these rocks should be placed off limits to the public.

White Rock can only be visited by boat, but is in shallow water and is too steep to climb.

Redding Rock is safe from harassment due to its distance from shore (7 mi.) and steep sides.

False Klamath Rock is inaccessible from shore and too shallow to be reached by boat.

Castle Island is accessible by boat in most weather and is occasionally visited by boaters. The greatest danger to Castle Island is that it is in private ownership. Because of this the future of the rock is uncertain. The rock is owned by G. E. Kibbe of Portland, Oregon.

Prince Island is accessible by wading at tides lower than -2.0 which is a rare occurrence. The island is owned as community property by the Smith River Indian tribe.

Hunter Rocks are inaccessible and never visited.

The areas in need of immediate protection are: Little River Rock, Pilot, Flat-iron, Green Rock and Castle Island.

It is strongly recommended that research on the seabirds be continued to follow the 1970 breeding season to completion. It is also recommended that the natural history of these birds be studied with emphasis on food habits, food supply and population dynamics.

APPENDICES

FIGURE 1A North Coast Survey Areas

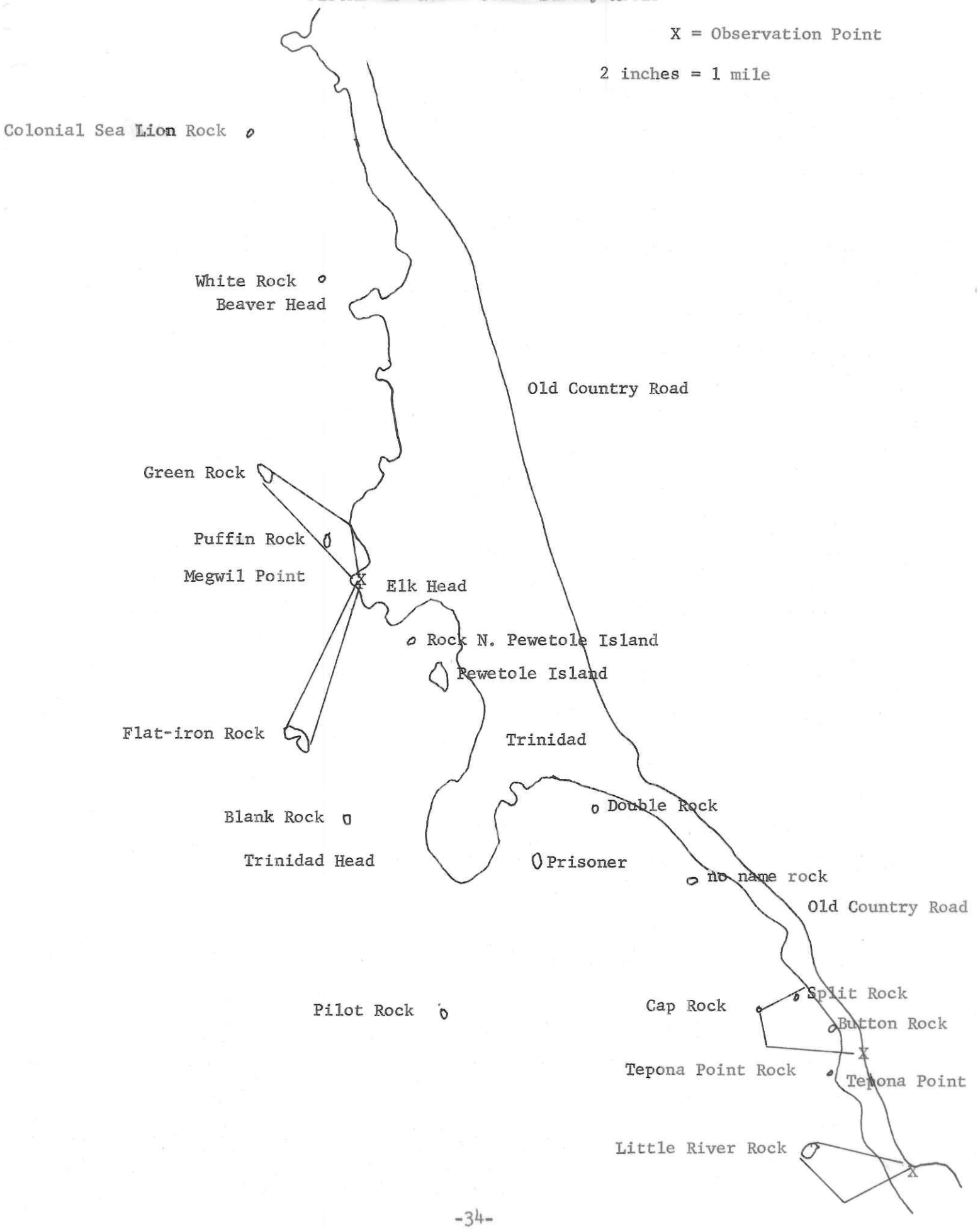
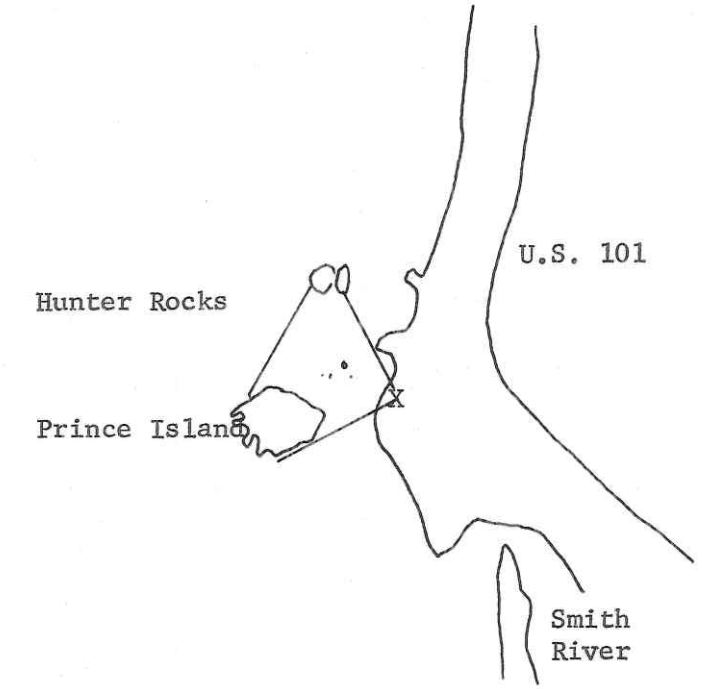


FIGURE 2A Survey Sites

X = Observation Point 2 inches = 1 mile



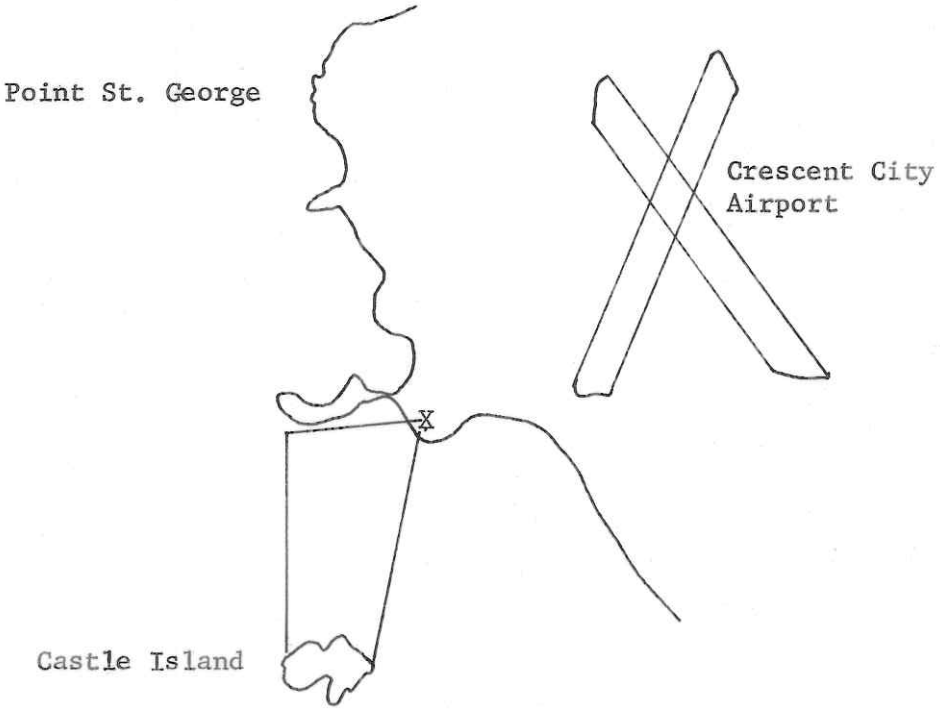


FIGURE 3A Survey Sites