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NO. 304

STATUS OF THE RED-FOOTED BOOBY COLONY
ON LITTLE CAYMAN ISLAND

BY

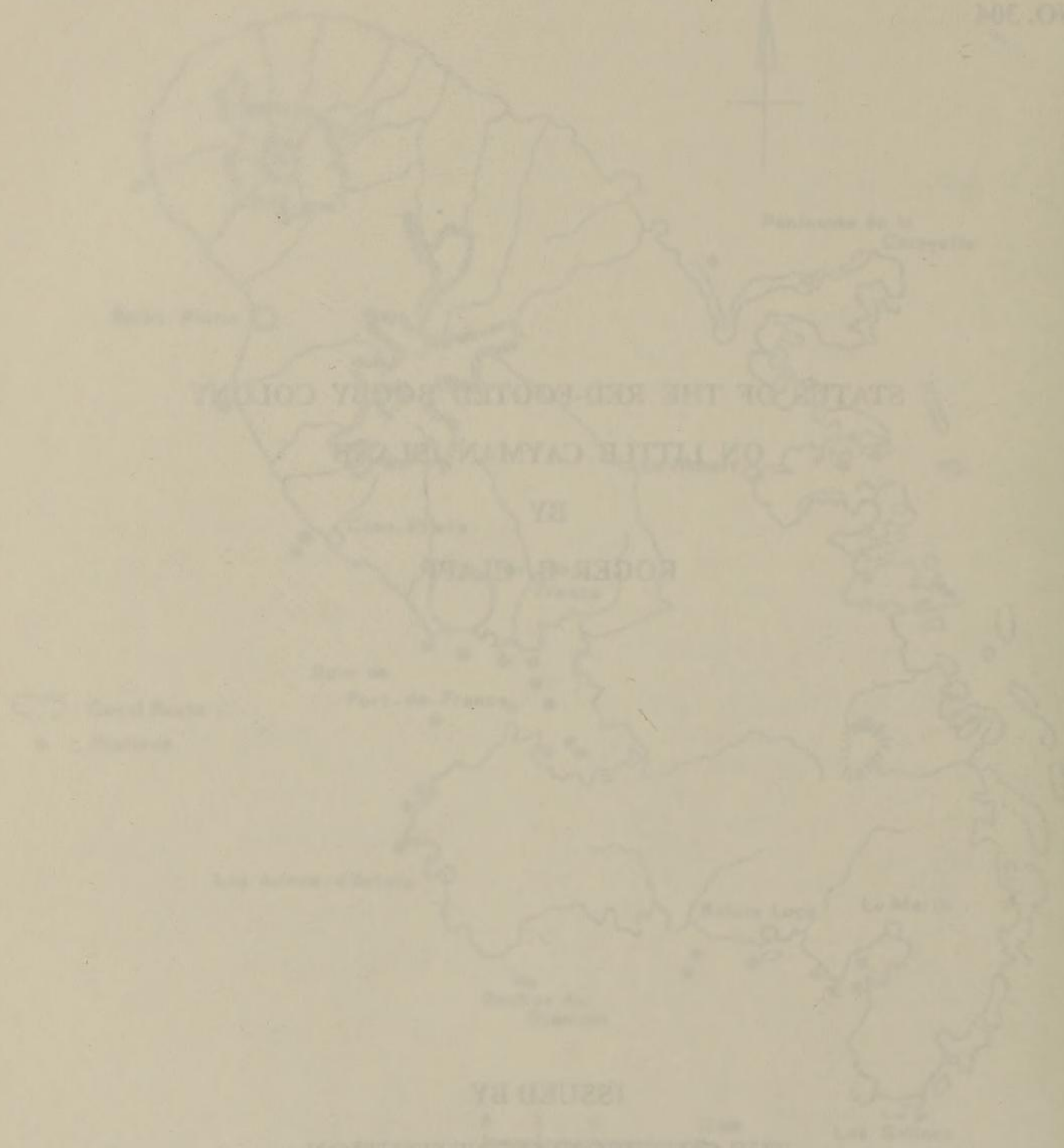
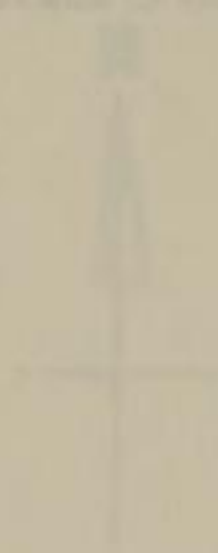
ROGER B. CLAPP

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THE SMITHSONIAN INSTITUTION

WASHINGTON, D.C., U.S.A.

AUGUST 1987



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Introduction

The Red-footed Booby (Sula sula), a pan-tropical species, is one of the most abundant of tropical pelecaniform birds. Summaries of its status in some areas indicate that the species is undergoing a slow decline. Red-footed Boobies formerly bred at about 16 localities in the western Indian Ocean and at several were noted as "common". Now they are common only at Aldabra Atoll (ca. 6,000-7,000 pairs) and have been extirpated from 12 of the 15 remaining localities (Feare 1978, 1984). In the South Atlantic, they are gone from several breeding areas; now fewer than 100 pairs breed at two colonies (Williams 1984). Red-footed Boobies have declined in Indonesia and remain abundant (1,000-6,000 pairs) only at Manuk in the Banda Sea (de Korte 1984). Caribbean populations also have declined (Halewyn and Norton 1984); the Red-footed Booby colony on Little Cayman Island remains one of the largest (Table 1).

In the tropical Pacific the species is still widespread with populations on the order of 1,000-10,000 pairs each in the Society, Phoenix (Garnett 1984), and Northwestern Hawaiian Islands (Harrison et al. 1984), as well as in Fiji and New Caledonia (Garnett 1984). A population exceeding 10,000 pairs is believed to breed in the Line Islands (Garnett 1984) and about as many are thought to breed on Cocos Island (Nelson 1978). Nelson (1978) suggested that 250,000 pairs breed in the Galapagos Islands -- the home of a large proportion of the species' population. Seabird populations there have been only indifferently surveyed, however, and populations could be smaller.

In 1975, A. W. Diamond (1980) tried to determine the size of the population on Little Cayman but could not determine the size of the breeding population because his survey was made after the birds had bred. I visited Little Cayman from 17 to 27 January 1986 to survey the colony, to estimate the size of the breeding population, and to determine, if possible, whether numbers had changed since Diamond's survey.

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Table 1. Size, location₁ and breeding data for Caribbean Red-footed Booby Colonies

Location	When Data Obtained	Colony Size (Pairs)	Breeding Data	References
Half Moon Cay off Belize	1958	1400	Laying November to April.	Verner 1961
Little Swan Id. off Honduras	1908	?	Many nesting on eastern island on 19 January	Lowe 1909
	1929		Common with variously sized young in April	Fisher and Wetmore 1931
Navassa Island	?	300+		
Little Cayman Island	1986	2600	Mostly downy young in January	This paper
Cabo Norte Puerto Rico	ca. 1975	500-700		A.O.U. 1976
Mona, west of ₂ Puerto Rico	1971	1000-1400	Nests in all stages in Dec.	Raffaele 1973 in Kepler 1978
	1972	1000+	Eggs and naked young in Sept.	Kepler 1978
Monito, 5,6 km NW Mona ₂	1945	6	Nesting in April	Bond 1976, 1977
	1973	800-850	Eggs laid late June - April, in Aug.-Sept.	Kepler 1978

1. Information in this table is largely from Halewyn and Norton (1984) and sources cited therein but includes supplementary details from the literature. Colonies are listed west to east from Belize through the Lesser Antilles and east to west along the northern coast of South America. Other areas where Red-footed Boobies breed or have bred, but for which no adequate information is available include the Pedro Cays off Jamaica, the Albuquerque Cays and Serrana and Serranilla Banks in the southwestern Caribbean.

2. A combined total for these two localities of 1400 pairs is given by Halewyn and Norton (1984).

Table 1 (cont'd). Size, location, and breeding data for Caribbean Red-footed Booby colonies.

Location	When Data Obtained	Colony Size (Pairs)	Breeding Data	References
Desecheo Island off Puerto Rico	1984	150-200	Colony with ca. 2000 birds in June 1912 later reduced by depredating mon- keys	Norton 1984 Wetmore 1918 A.O.U. Conser- vation Comm- ittee 1976
Cayos Geniqui NE of Culebra	1981-82	3-6		Furniss 1983
Frenchcap Cay US Virgin Is. ³	1984	3?		Norton 1985, in litt.
Dutchcap Cay ⁴ US Virgin Is.	1980	ca. 500	Nests and eggs in Dec.	Norton 1981a, in litt.
	1981	ca. 150?	Downy young present 11 June	Norton 1981b
Redonda Island Lesser Antilles	1980's	1000+		Norton in litt.
Grenadines Lesser Antilles		?	Present status unknown, formerly at 2-4 sites.	
St. Giles Islet Tobago	1958-66	100+	"Several hundred" nest. Eggs most frequent Aug.-Apr.	Dinsmore and ffrench 1969
	1973	750		ffrench 1973
Los Testigos Is. off Venezuela	1908 ?	? 100's	Nesting on 1 Jan.	Lowe 1909

3. Breeding confirmed for the first time in September 1984 (Norton 1985). Furniss (1983) indicated that the species nested there previously but Norton (in litt.) states this is in error.

4. The species has also bred on nearby Sula Cay in the early 1980's but may not do so at present (Norton, in litt.)

Table 1 (cont'd). Size, location, and breeding data for Caribbean Red-footed Booby colonies.

Location	When Data Obtained	Colony Size (Pairs)	Breeding Data	References
Los Hermanos Is. off Venezuela	1908	?	Most abundant booby 8 Jan. Most with small to large downy young	Lowe 1909
La Orchila off Venezuela	1909	100's	Common and nesting 8 Feb. with at least eggs present.	Cory 1909
Los Roques off Venezuela	1980's?	2500	On Las Bubias In the late 1950's nested on Salesqui, Marie Uespen and Las Bubias	Meyer de Schauensee and Phelps 1978, Phelps in litt.
Las Aves Islands off Venezuela		2000		
		1200		Halewyn in litt.
Roncador Cay SW Caribbean	1969	?	"Covered with boobies in May-June but species not given.	Milliman 1969

At present Red-footed Boobies nest on Little Cayman along the north shore of a shallow pond near the southwestern shore of the island. The colony is easily visible from across the lagoon (Figure 1) where the birds may be seen roosting and at their nests in the fringing mangrove (Rhizophora mangle, Laguncularia racemosa). However, the occasionally deep mud and jagged protruding rocks (ironshore) along the lagoon on the south edge of the colony (Figure 2), together with the dense tangles of vegetation, make casual visits difficult. Although most of the nests along the northern edge of the lagoon are in mangrove, the area occupied by fringing mangrove varies considerably (Figure 3). Near transect 3 the mangrove is replaced by a fairly open forest of Cordia sebestena in which the boobies nest. Inland they nest in a variety of woody plants, among them

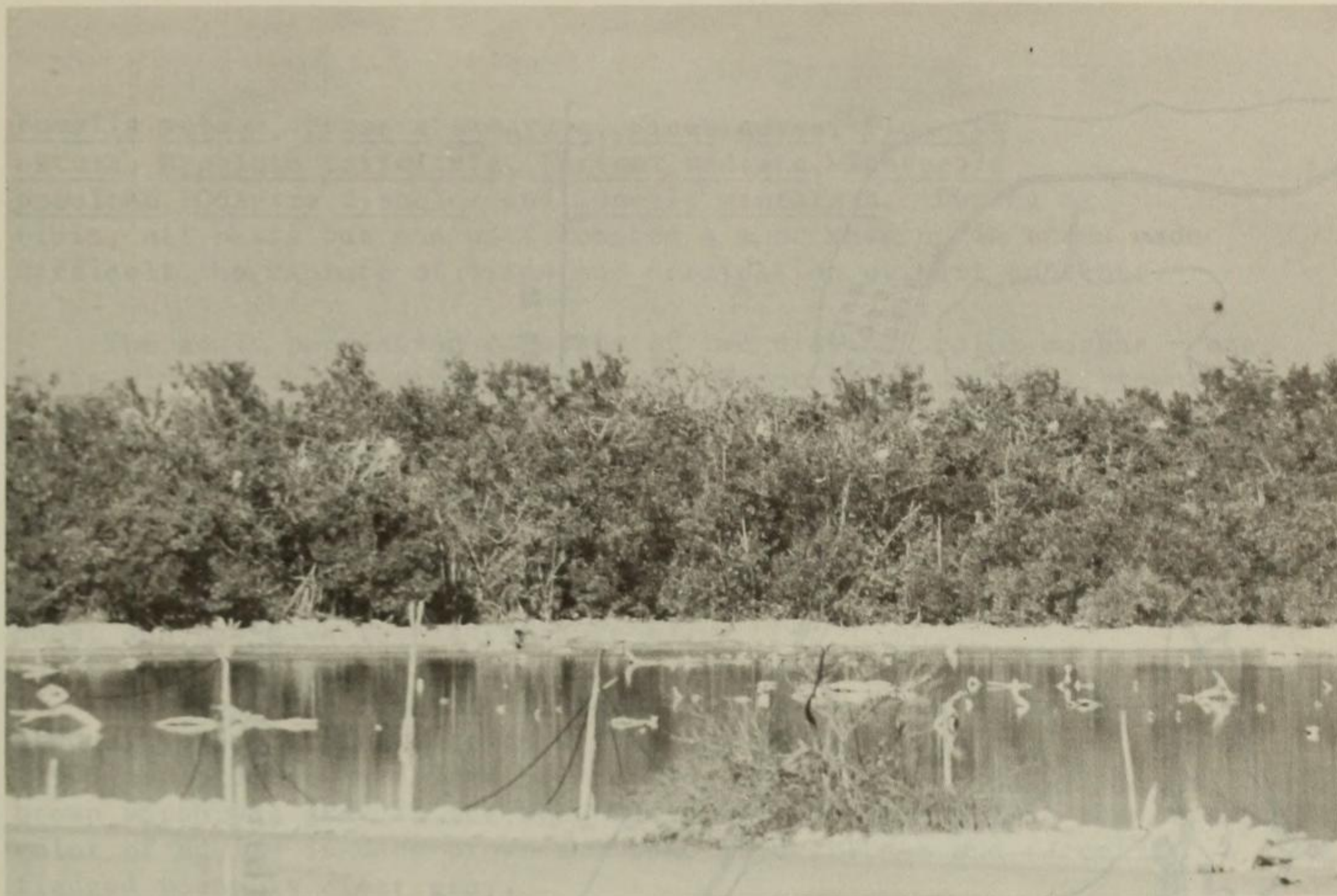


Figure 1. Red-footed Boobies nesting at northeastern edge of lagoon as seen from south shore, January 1986

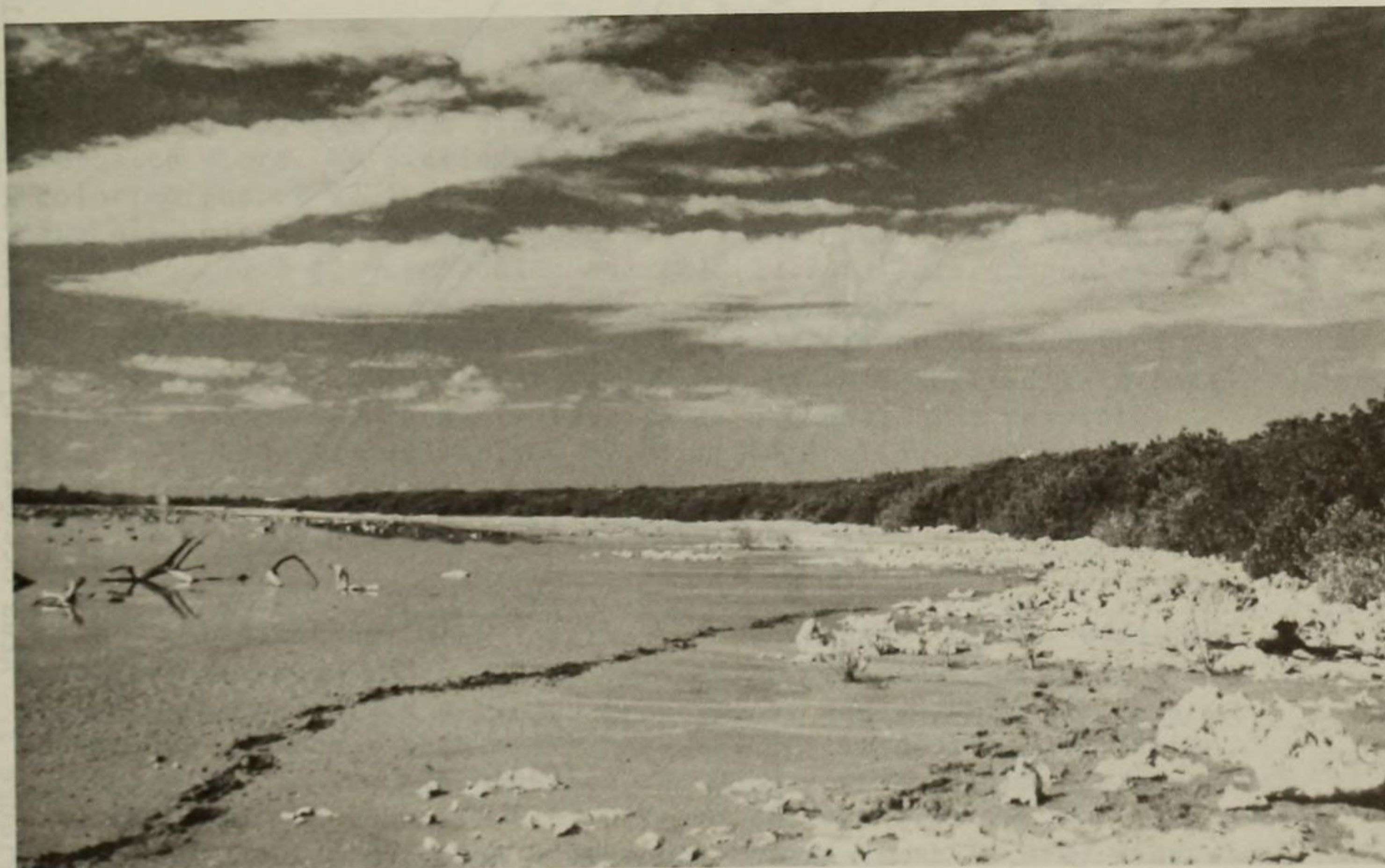
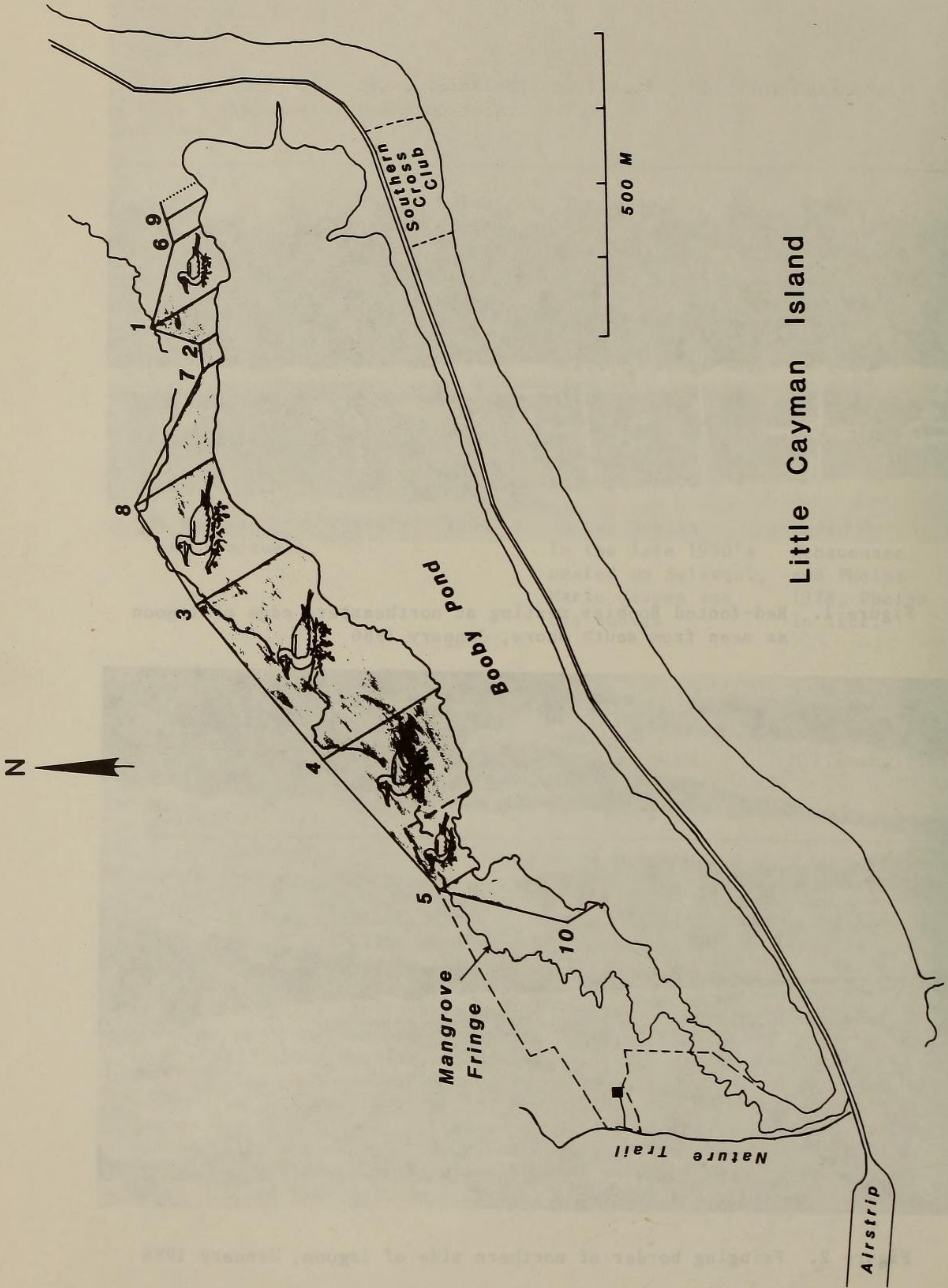


Figure 2. Fringing border of northern side of lagoon, January 1986



Little Cayman Island

Figure 3. Area occupied by Red-footed Booby colony on Little Cayman Island. Numbers indicate individual transects.

Bumelia retusa, Bursera simaruba, Ficus aurea, Plumeria obtusa, Hypelate trifoliata, Thrinax radiata, Thespesia populnea, Guapira discolor and Canella winterana. During my visit, all nests but one were located 4 m or more up in trees made difficult the capture of birds and dermination of nest contents.

The adult population consists of two distinct color morphs - one white with black wingtips (Figure 4), the other mainly dark brown with a white tail (Figure 5). Some dark birds are more intermediate between plumage morphs than has been reported previously. The dark morph is variable with white extending as little as a few cm up the back and belly to as far as the lower breast and between the wings. Although the wings are usually brown in some birds the secondaries may be patchily white. One bird was white on the underparts well up on the chest and had a white head (Figure 6).

Nestlings and recently fledged young have black bills that gradually become pink with dark tips and finally become blue. Nelson (1978) stated that the iris of breeding adults of the white-tailed brown morph was gray in the West Indies. On Little Cayman the iris color of adults is deep brown and that of nestlings and recently fledged young is clear gray.

In the Caribbean the proportion of dark morphs in the population varies considerably from colony to colony (Table 2), but dark morphs typically compose 80-90% of the breeding population.

The 1975 Survey

From 0800-1000 on 1 August 1975, Diamond counted the number of Red-footed Boobies seen along the southern edge of the lagoon from the opposite shore. He distinguished color and size, when possible, the color morphs of adults, although he did not specify criteria for juvenile birds. His total count was 1,670, and of 613 classified by age, 486 (79.3 %) were adults and 127 (20.7 %) were juveniles.

To this total, Diamond added 2,018, a figure derived from an observed density of 31 birds in 700 m² that was applied to a total colony size of 45,575 m² (= 11.25 a or 4.6 ha). The resulting figure (3,688) was multiplied by 241/124 to allow for the fact that a count throughout the day showed that more birds were present at 0600 than during his survey. This procedure gave him a final estimate of 7,168.

Diamond's total area for the colony is based on the total area of mangrove occupied which was calculated by "tracing the area of the colony from a 1:5,000 map onto graph paper and summing the area covered." This approach would have underestimated the population, because the boobies also nest in the wooded area behind the mangroves. In addition, the total (2,018) Diamond derived from the estimate based on density should not have been added to the count (1,670) made along the edge because the former subsumes the latter. The latter error is

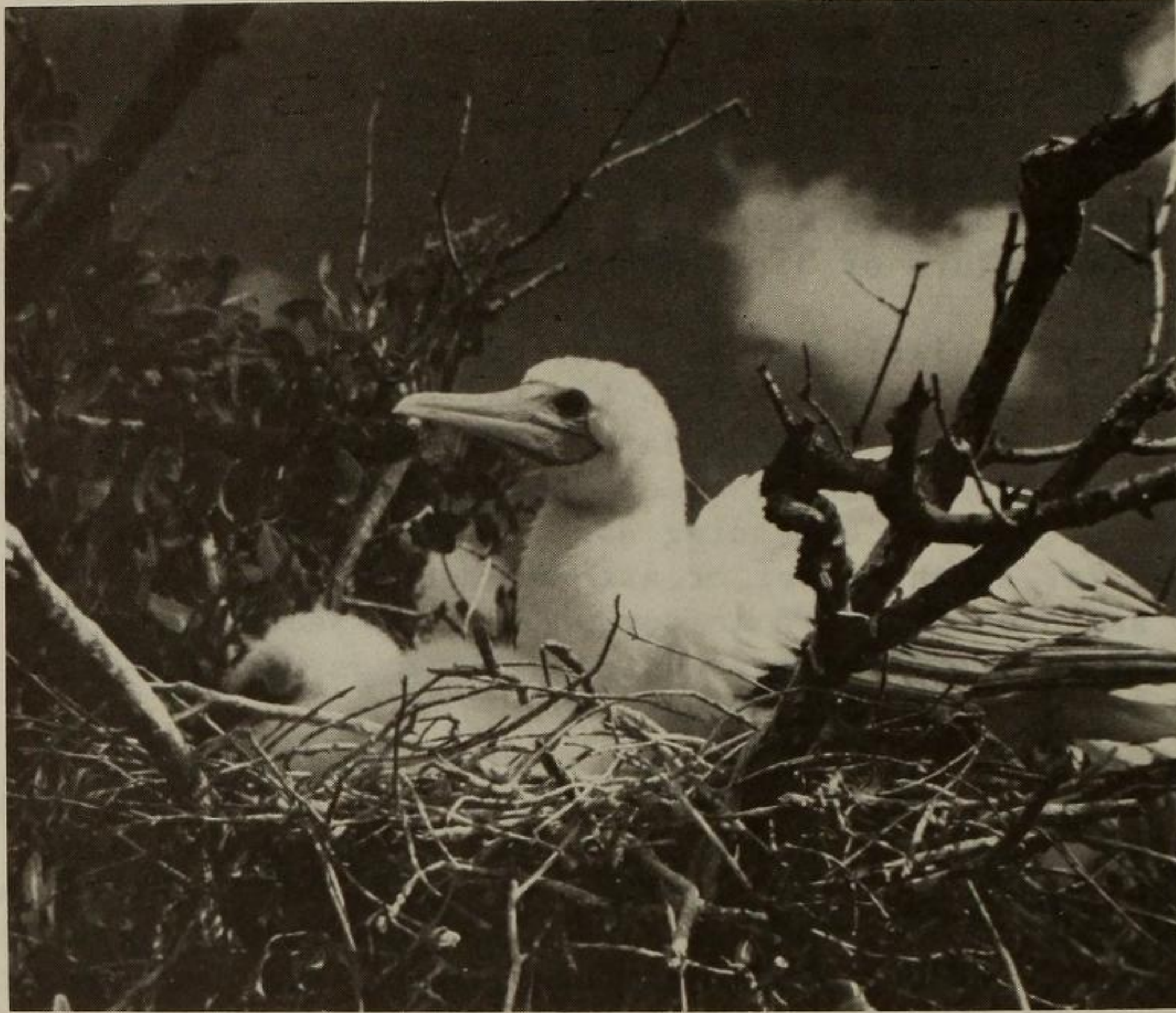


Figure 4. White morph Red-footed Booby at nest, Little Cayman, January 1986



Figure 5. Dark morph Red-footed Booby at nest, Little Cayman, January 1986



Figure 6. Intermediate plumaged morph, Little Cayman, January 1986

Table 2. Proportions of color morphs in adult Red-footed Boobies in different Caribbean colonies.

Colony	When observations made	% dark morph	% light morph	Sample size	References
Monito Island	5 Jun. 1969	78.9	21.1	398	Kepler 1978
Puerto Rico	19 Jun. 1973	81.5	18.5	400	"
Little Cayman ¹	30 July,	89.9	9.1	685	Diamond 1980
	1 Aug. 1975	89.5	10.5	---	"
	20 Jan. 1986	86.5	13.5	288	This paper
	20 Jan. 1986	86.8	13.2	136	"
	21 Jan. 1986	91.1	8.9	271	"
	21-25 Jan. 1986	87.0	13.0	46	"
St. Giles Is. Tobago	1958-66	90	10	--	Dinsmore and French 1969

1) The first figure from Diamond 1980 is derived from counts of birds flying in to roost; the second was estimated from his census. The first figure from the 1986 census is for all adults counted along the north shore, the second for nesting adults, the third for birds flying in to roost and the fourth for nesting birds counted on transects.

almost certainly greater than the former because Diamond's count provided the basis for about 45% of his final estimate and because I found only about 5% of the colony nesting beyond the mangrove fringe. Thus it is likely that Diamond overestimated the number present.

The 1986 Survey

Methods

Because I wished to compare my results with Diamond's, I censused the colony using his methods from 0805 to 0940 on 19 January. I found it difficult to distinguish morph type from across the lagoon and suspect that I included some large downy young with the white-phase adults.

I recensused the colony on 20 January while walking along the north shore of the lagoon from 0800-1015. During this count, I distinguished color phases of the adults, noted whether or not they were on nests, and counted unattended nestlings and young birds. The latter were categorized as immatures (dark-billed, dark plumaged birds that were a few months from fledging) or subadults (birds with pink bills with dark tips and with plumage incorporating part of the adult plumage).

To determine the size of the breeding population I laid out ten transects through the colony at an angle of 310° (roughly perpendicular to the long axis of the lagoon) from 21 to 25 January. The site of eight of these transects was randomly determined. The two other transects (9 and 10) (Figure 3) were made at the east and west ends of the colony to determine the width of the colony at each end. I counted all birds and nests on each 24 ft. wide belt transect. I recorded morph color of adults and numbers of other age groups seen, whether birds were on nests, and, when possible, contents of nests. The location of these transects was recorded on a base map. Results of the transects are presented in Table 3.

On a map, the north edge of the colony was estimated by drawing lines between the ends of the transects (Figure 3). The area between the transects was then calculated. The extent of the colony occurring in the fringing mangroves also was calculated. However, because more of the transects were on the eastern half of the colony where more birds are nesting in mangrove, I suspect that the estimate of the proportion of the colony occurring in mangrove is too high.

Results

My total of 731 on 19 January is less than one-half Diamond's total of 1,670. On 20 January my total for flying birds, the total most comparable with Diamond's figure, was only 296. Doubling the number of nests found (191) and adding immature (6) and subadult (93) birds increases the total to 481, still considerably fewer than when I censused the colony from the opposite shore.

Table 3. Results of Red-footed Booby transects on Little Cayman Island, January 1986¹.

Date	Transect		DP	DP/		WP	WP/		SDY	MDY	Sub	Imm.	Prs	Prs/ Acre	
	Jan. No.	Len. (ft)		Area (ft ²)	DY		N	DY							N
21	1	310	3720	-	1	-	-	2	-	-	-	1	-	3	35.1
21	2	80	960	4	-	2	-	1	1	-	-	-	-	4	181.5
22	3	455	5460	4	6	3	1	-	-	1	3	-	-	13	103.7
23	4	542	6504	2	6	5	-	1	-	1	3	-	6	16	107.2
23	5	143	1716	-	-	2	-	-	-	-	-	-	-	2	50.8
23	6	123	1476	-	-	1	1	-	-	-	4	-	-	5	147.6
23	7	100	1200	-	1	-	-	-	-	-	-	-	-	1	36.3
24	8	372	4464	-	4	3	-	-	-	1	4	-	-	12	117.0
		2125	25500	10	18	16	2	4	1	3	14	1	6	56	95.67
24	9	193	2316	-	1	1	-	1	-	-	-	-	-	3	56.4
25	10	136	1632	1	2	-	-	-	-	-	1	-	-	3	80.0
				11	21	17	2	5	1	3	15	1	6	62	

1. DP = dark plumage morph, WP = white plumage morph, N = nests, contents unknown, DY = downy young, Imm. = immatures, young birds with all dark bills and dark tail-feathers, Sub. = subadults = older young with pink bills with dark tips and often possessing much white in the plumage or tail. Transect 4 also contained a male Magnificent Frigatebird (*Fregata magnificens*) on an egg as well as an immature (white-headed) frigatebird.

I calculated that the present area of the colony is 23.37 acres (9.46 ha), a little more than twice the area reported by Diamond (1980). I also calculated that 5.4% of the colony (1.25 a or 0.51 ha) lies north of the fringe of mangrove. Using a density of 95.7 pairs per acre (231 pairs/ha) derived from eight random transects, I estimate a breeding population of about 2,618 pairs.

The total number using the colony is greater, as this figure does not allow for immatures and non-breeding adults. The proportion of immatures seen on the transects (12.5%) was very similar to the proportion (12.7%, n: 312) of immatures seen flying in to roost 1150-1800 on 21 January. These figures are considerably less than the proportion of immatures (24.3%) that Diamond (1980) calculated were present

in August 1975. It is likely that the difference only reflects differences in the stage of breeding between the two visits.

Using 12.5% for the proportion of immatures present, I estimate a total population of flying birds of not less than 5,985. The true figure is certainly somewhat higher, as I could not estimate the number of non-breeding adults in the colony. If dependent young are included, the number present was probably as great as 7,500 to 8,000 individuals.

Because of the several problems with Diamond's estimate, there seems little basis for determining change in numbers between 1975 and 1986. Nevertheless, if the boobies occupied the same area in 1975 as they do today, it is likely that the total population is about the same today. In any case it appears that the Red-footed Booby colony on Little Cayman is healthy with no evidence of a significant decline.

Threats to the colony

During my ten-day visit to Little Cayman, I found no evidence of human interference with the colony but P. E. Bradley (pers. comm.) stated that eggs are sometimes taken. Similar exploitation is believed to have been a primary cause of the species' decline in the Indian Ocean (Feare 1978, 1984) and is also considered a serious threat in the Caribbean (Halewyn and Norton 1984). On the evening of 21 January as I counted Red-footed Boobies coming in to roost over the western end of the airstrip, I heard repeated shots from the vicinity of the village nearby. None of the flying birds fell but several suddenly dived and were obviously attempting to evade danger. Several birds seen flying over the colony had jagged holes in their flight feathers suggesting that they had been shot. Mike Emmanuel (pers. comm.) told me that perhaps as many as 20 heavily oiled birds were once captured per year during fishing trips off the west end of the colony. Few of these birds survived. The extent to which oiling, eggng and disturbance have affected the colony on Little Cayman is not known.

Recommendations

This colony is probably the largest in the Caribbean and, as such, important for potential recolonization of other areas. Much of the area where the colony is located, i.e., that portion in mangroves, is a sanctuary as it is considered a wetland of international importance by the International Union for the Conservation of Nature and Natural Resources. The extent of the colony outside this area is imperfectly known, and a more detailed assessment (perhaps an aerial survey) of the area occupied would be valuable information.

Several approaches may be taken to preserve the colony once its present perimeter is accurately determined. Areas of the colony on private lands should be purchased, these areas to include a buffer zone on which boobies do not breed but where they may do so in the

future. The colony should be fenced along its northern border to protect it from casual visitors and poachers. The status and significance of the area already set aside as a preserve should be marked with signs. Presently no information is provided for the casual visitor.

Red-footed Boobies nesting on islands in the central Pacific quickly become accustomed to the presence of humans and may be approached without disturbance to their nesting activities. The Little Cayman birds took little notice of my activities in the colony; occasional roosting birds flushed with considerable disturbance. Judicious and monitored visits to the colony by bird-watchers and nature enthusiasts would produce support for its preservation and could also provide a small source of revenue for the Cayman Islands.

Much remains to be learned about the population structure of the colony on Little Cayman, including annual and seasonal variation in numbers. The proportion of the population formed by transient roosting birds from other Caribbean colonies, the extent of post-breeding dispersal by birds from Little Cayman, and the extent of movement between colonies are also not yet known. An extensive banding program should be initiated to gather such information.

Acknowledgments

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