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MARINE TURTLE NESTING ON HUTCHINSON ISLAND, FLORIDA IN 1971

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ABSTRACT

Atlantic loggerhead turtle (*Caretta caretta caretta*) nesting was first noted 7 May, peaked during the first week of July and continued at least through 10 September; 1420 nests were recorded during this period. Forty-four percent (627) of the observed nests occurred during a four-week period ending 10 July. An increasing north to south nesting density necessitated a weighted estimate of the number of loggerhead nests on the island ($N = 3350$). Twenty-eight percent (395) of nests surveyed were destroyed by raccoons. Total egg production was estimated at 402,000.

No linear relationship was discovered between carapace length and width from 164 tagged loggerhead turtles, nor was there a relationship between carapace width and crawl width. Seven turtles were observed to successfully build at least two nests. Time intervals between nestings ranged from 14 to 55 days and appeared to be multiples of 12 to 16 days, supporting the postulation of at least four nestings for two turtles. Distances between nesting crawls of tagged individuals ranged from 0.5 to 13.5 miles.

Twenty-two Atlantic green turtle (*Chelonia mydas mydas*) nests (estimated 8-10 individuals and a total of 2948 eggs) were found only on two distinct sections of beach between 26 June and 30 August 1971. Two of four nesting green turtles were observed nesting a second time 14 days after tagging, 0.5 and 0.8 miles from original tagging sites. Mean width of the 22 green turtle crawls were significantly larger than mean crawl width of 153 tagged loggerhead turtles.

Six leatherback turtle (*Dermochelys coriacea coriacea*) nests were encountered from 17 May to 30 June.

INTRODUCTION

In 1974, Florida Power & Light Company will put into service an 890 megawatt steam generating nuclear power station, located approximately midway between Ft. Pierce and St. Lucie inlets on Hutchinson Island, Florida. Studies now under way will establish baseline data for comparison with changes (if any) effected by plant operation. An initial segment of this comprehensive study, a survey of nesting sea turtle populations on Hutchinson Island directed by the Florida Department of Natural Resources Marine Research Laboratory, was conducted during the summer of 1971.

Caldwell, Carr and Ogren (1959) and Routa (1968) reported that Hutchinson Island beaches were an important nesting area for Atlantic loggerhead turtles, *Caretta caretta caretta* (Linnaeus). Carr and Ingle (1959) were the first to document nesting of the Atlantic green turtle, *Chelonia mydas mydas* (Linnaeus). Caldwell (1959) provided a summary of leatherback turtle, *Dermochelys coriacea coriacea* (Linnaeus) nestings on Hutchinson Island.

Objectives of this study were to estimate total nesting of loggerhead turtles and predation rates upon eggs, and to determine exact numbers of nesting green and leatherback turtles. In addition, a tagging operation was conducted during greatest nesting activity to provide further information on multiple nesting and migration patterns.

METHODS AND MATERIALS

The Hutchinson Island power station (Figure 1) is located 15.8 km (9.0 statute miles) SSE of Ft. Pierce Inlet and 23.5 km (13.4 statute miles) NNW of St. Lucie Inlet, Florida (27°21'N, 80°14'W).

Nine study areas (Figure 2) 0.75 miles long, were selected from all beach types. Area 4 was located to include proposed power plant intake and effluent locations. Areas were chosen to represent various beach conditions, such as slope, height and steepness of dune face, distance from mean high water to dune face, amount and type of background vegetation, and degree of apparent erosion or accretion.

Each nest site was staked, numbered, and dated to maintain accurate records. As raccoon predation occurred, stakes were marked and dated accordingly. Other data recorded at each site included nesting species, crawl width, and nest location. At selected nests, maximum egg diameters were measured with vernier calipers. In addition to the intensive study in the nine selected areas, the southernmost 20 miles of Hutchinson Island were covered in search of green and leatherback turtle nests. Surveys were made daily Monday through Friday (including some weekends during peak nesting periods in June and July) from 3 May through 10 September 1971.

A tagging program was initiated on 24 May and continued through 26 July. Monel self piercing tags (National Band and Tag Co. Style No. 4-1005, Size No. 49) were applied to the posterior proximal margin of the right foreflipper of nesting turtles. Crawl width was determined with a measuring tape, and carapace length (along carapace midline from precentral lamina to notch between postcentral laminae) and width with large calipers of our own design (to insure straight line measurements). A beach buggy was used for transportation throughout this study.

RESULTS AND DISCUSSION

Caretta caretta caretta, Atlantic loggerhead turtle

The first loggerhead nest was found in Area 8 on the night of 7 May. Nesting continued through 10 September and peaked during the first week of July; a total of 1420 nests were surveyed. Forty-four percent (627) of the observed nests occurred during a four-week period ending 10 July (Figure 3).

Generally, with the exception of Area 7, nesting density increased from north to south (Figure 2). In Areas 1, 2, and 3, erosion is pronounced. The flat to moderately sloping beach is narrow, backed by a steep, insurmountable dune face, an intermediate between the "truncate dune" and "ledge section" as defined by Baldwin and Loftin (1959). Nesting turtles encountering such beach either "false crawl" and search for more suitable beach, or nest in the narrow strip of beach between mean high water and the dune face. Our observations suggest that high storm tides destroyed many of these nests. Areas 4, 5, 6, and 8 generally conform to Baldwin and Loftin's (1959) definition of "barren areas." Most nesting occurred on these beach types. Area 7 differs from adjacent areas in two respects: 1) a well-defined dune face is absent along much of its length, 2) background vegetation is low and sparse, or absent in many sections.

No attempt was made to calculate number of nesting loggerheads because of unknown multiple nesting frequency. Total number of loggerhead turtle nests were estimated by plotting nesting density (number of nests per 0.75 miles of beach) of the various survey areas against distance along the beach, and geometrically calculating area under the curve. This method was employed instead of the

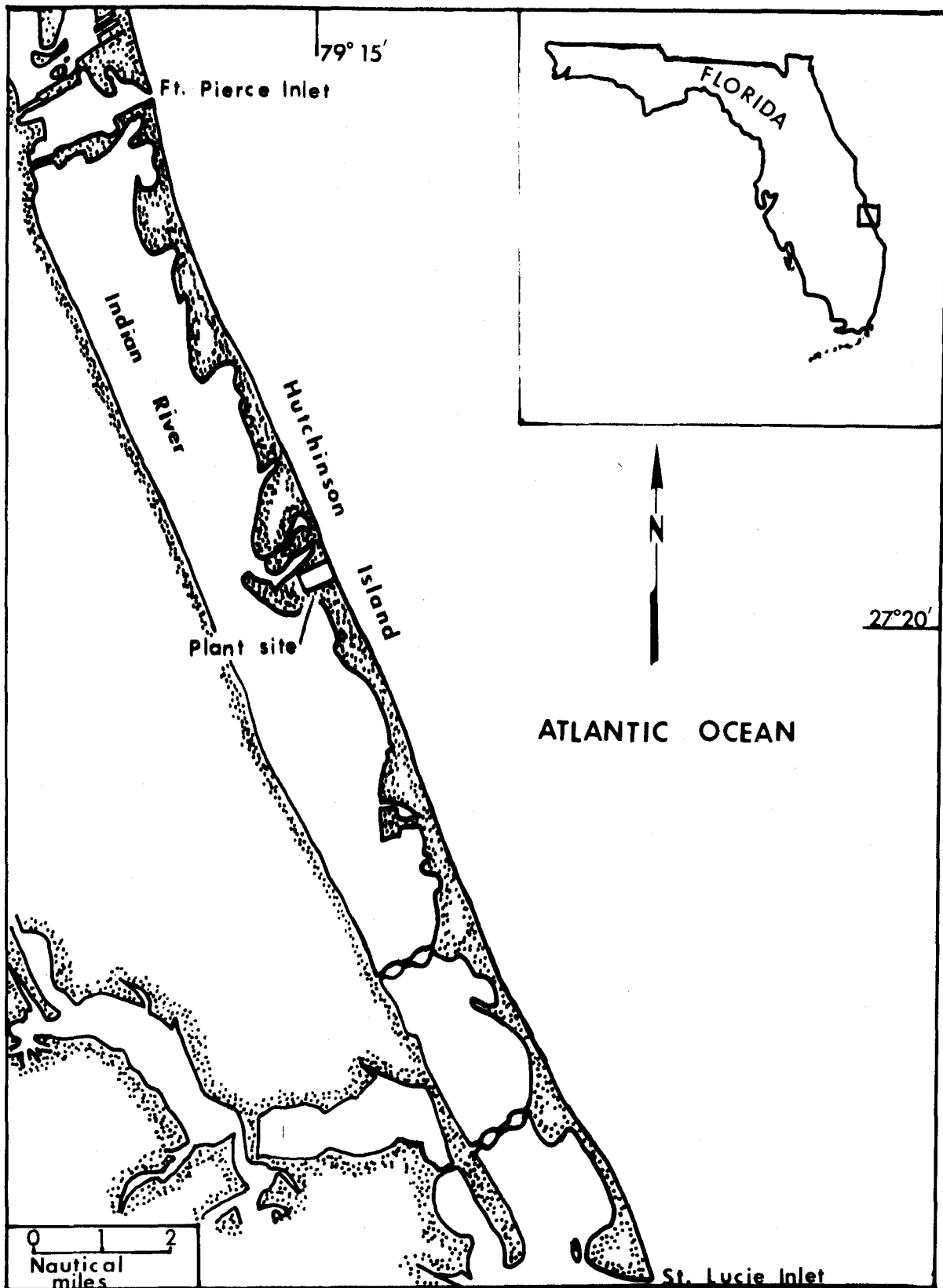


Figure 1. Hutchinson Island, Florida, and vicinity.

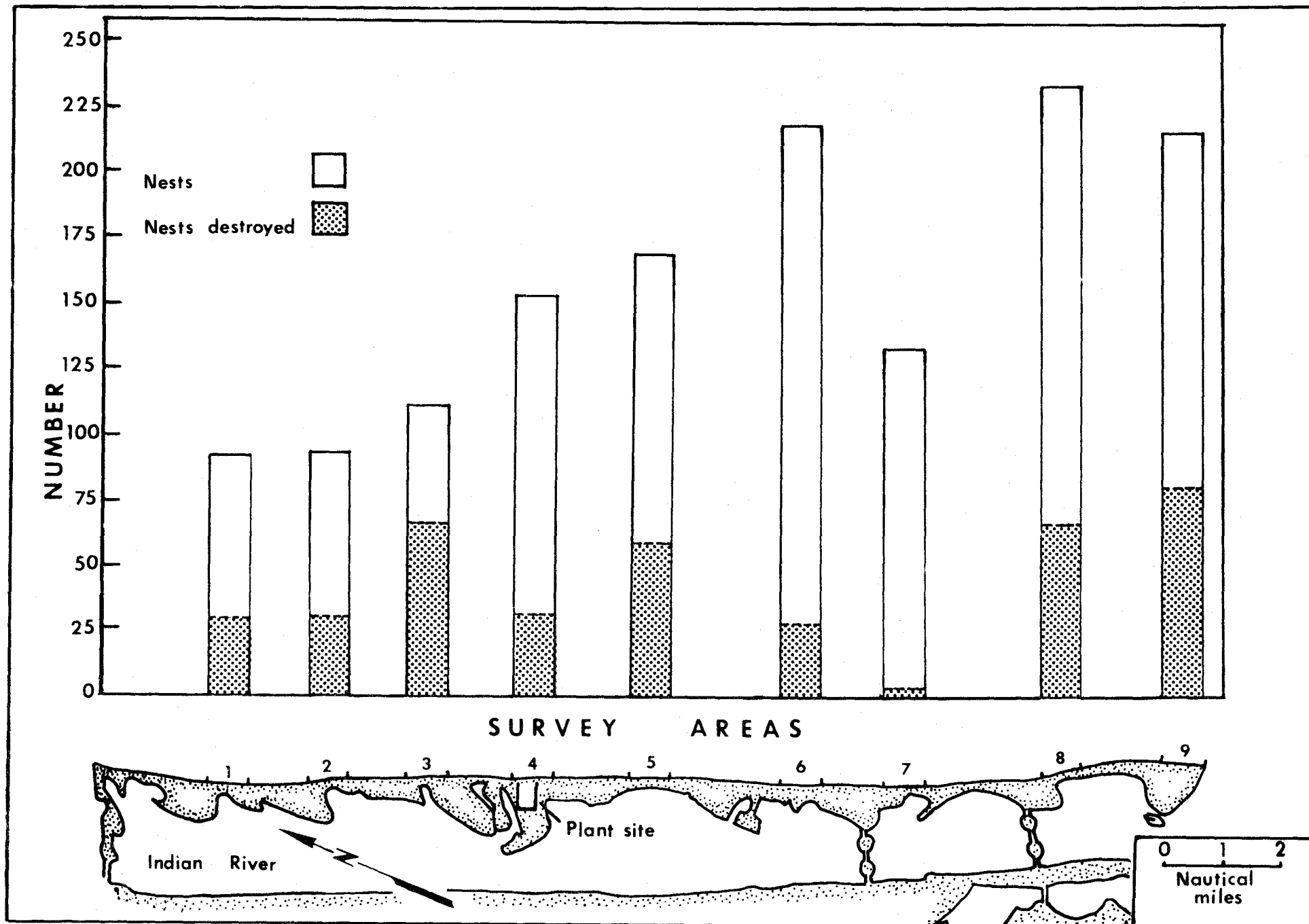


Figure 2. Location of survey areas, number of loggerhead turtle nests, and number of nests destroyed per area by raccoons.

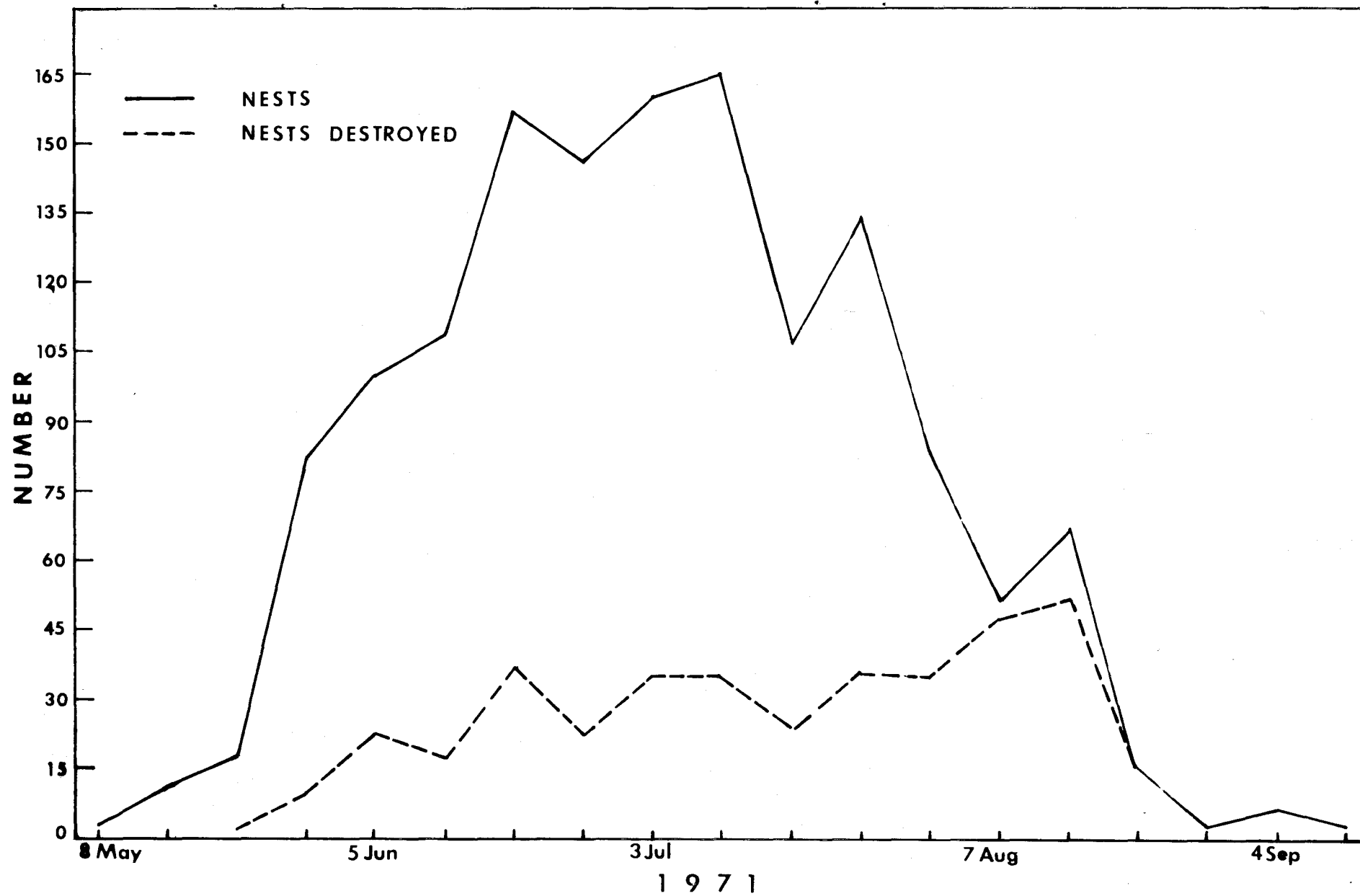


Figure 3. Number of loggerhead turtle nests and number of nests destroyed by raccoons per week.

unweighted ratios of Rounta (1968) since a marked north to south gradient in nesting density occurs along the beach. Total number of loggerhead turtle nests on Hutchinson Island beaches during 1971 was estimated as 3350. Rounta's (1968) estimate of total nesting on Hutchinson Island was 5265 nests. His method assumed no north-south gradient in nesting density, and included at least one green turtle nest, and several unidentified nests.

One hundred sixty-four loggerhead turtles were tagged during a potential nesting emergence. Of these, 26 were tagged before nesting had begun, and these turtles returned immediately to the water without nesting (false crawl). Fourteen tagged turtles were observed returning for further nesting activity (Table 1). Four of these had been tagged on false crawls and were observed nesting at respective intervals of 1 hour, 2 hours, 25 hours, and 42 days after tagging. Caldwell, Carr, and Ogren (1959) and Caldwell (1962) also noted that most turtles interrupted during a nesting emergence will re-emerge to nest within one day. Except for these short intervals, time between emergences ranged from 14 to 55 days. Most intervals appear to be multiples of 12 to 16 days. Accordingly, as many as four nestings after tagging may be postulated for turtles G-445 and G-457 (Table 1). Seven turtles were observed to successfully build at least two nests. However, because of the characteristics of a false crawl (i. e., probable nesting within one day), turtle G-445 almost certainly produced at least three nests. Thus the possibility of four nestings (especially in view of her long emergence interval), is strengthened. Consequently, the six to eight nestings per season suggested by Caldwell (1962) appears excessive.

Distances between crawls of tagged individuals ranged from 0.5 to 13.5 miles and averaged 3.4 miles (Table 1). In addition, three turtles tagged on Jupiter Island by Mr. Frank Lund (University of Florida, Biology Department) were sighted nesting during this study south of Jensen Beach, a minimum of two miles from tagging site(s). These figures indicate much greater distances between successive nests of the same individual than those proposed by Caldwell et al. (1959).

Carapace length of the 164 tagged loggerhead turtles ranged from 77.5 to 106.7 cm (30.5 to 42.0 in.), $\bar{X} = 92.5$ cm (36.4 in.). Carapace width ranged from 60.9 to 91.4 cm (24.0 to 36.0 in.), $\bar{X} = 71.1$ cm (28.0 in.). Crawl width averaged 90.4 cm (35.6 in.). No linear relationship between carapace width and crawl width was found. Likewise, a low coefficient of correlation, 0.57, indicated lack of relationship between the two measurements. Regression of carapace width on carapace length also showed lack of linear relationship and low correlation coefficient, 0.57.

Estimates of clutch size for loggerhead turtles range between 120 and 130 eggs per nest (Carr, 1952; Baldwin and Loftin, 1959; Rounta, 1968; Lebuff and Beatty, 1971). Time did not permit counting of eggs in all loggerhead turtle nests, but counts of selected nests conformed with the above estimates. Assuming an average of 120 eggs per nest, total estimated egg production for loggerhead turtles nesting on Hutchinson Island was 402,000.

Nest predation by raccoons was first noted on 20 May, continued throughout the laying season, and reached a total of 395 nests or 28.0% of nests surveyed. An average of 32 nests per week were destroyed throughout a seven-week period ending 31 July. An unexplained increase to 50 nests per week occurred during the fortnight ending 14 August when nesting activity was diminishing (Figure 3).

Thirty-four percent (111 nests) of predation by raccoons occurred within 48 hours of nesting. Remaining predation, including raiding of hatching nests, was spread throughout the incubation period of about 55 days. Decapitated hatchlings were occasionally found scattered around nest sites.

Chelonia mydas mydas, Atlantic green turtle

Carr and Ingle (1959) recorded the first definite observation of nesting emergences of the Atlantic green turtle on the coast of North America. These nestings occurred at Vero Beach, Indian

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Tag No.	Date Tagged (First Emergence) (1971)	FIRST RETURN (Second Emergence)			SECOND RETURN (Third Emergence)			
		Date (1971)	Length of Freedom	Distance from Tagging Site (Miles)	Date (1971)	Length of Freedom After 1st Return	Distance from Tagging Site (Miles)	Distance from 1st Return Site (Miles)
G413	24 May (+)	25 June (+)	32 days	0.50				
G414	24 May (—)	24 May (+)	2 hr	1.50				
G417	25 May (—)	26 May (+)	25 hr	1.60				
G422	25 May (+)	24 June (+)	30 days	2.00				
G424	25 May (+)	25 June (nd)	31 days	(nd)				
G437	26 May (+)	12 July (+)	47 days	13.50				
G440	26 May (+)	25 June (nd)	30 days	(nd)				
G442	26 May (+)	25 June (nd)	30 days	(nd)				
G445	26 May (—)	7 July (+)	42 days	3.50	21 July (+)	14 days	2.00	5.50
G454	1 June (+)	24 June (+)	23 days	3.00				
G457	1 June (+)	26 July (+)	55 days	4.25				
G477	3 June (+)	18 June (—)	15 days	6.50				
G478	18 June (+)	14 July (—)	26 days	2.00	15 July (+)	1 day	2.00	4.00
G510	7 July (—)	7 July (+)	1 hr	0.50	21 July (—)	14 days	1.60	1.10
	+ = nesting — = false crawl nd = no data							

River County, Florida, in July 1957, and on Hutchinson Island, near the House of Refuge Museum, in June 1958. The only other published account of green turtle nesting in North America is that of Rounta (1968) who reported at least one nest on Hutchinson Island.

In our study, green turtle nesting was first observed on 26 June, south of Area 7, and continued at least through 30 August. A false crawl found on 11 September indicates that nesting probably continued beyond this date. Nesting was restricted to the vicinity of Area 5 and to a 4.25 mile section of beach from Area 7 south through Area 8 (Figure 4). Typically, green turtles displayed a high degree of nest site selectivity. With one exception, nest sites were far above mean high water, either at the base or on top of the dune face. Nests were never located on beaches where erosion (northern areas) or accretion (Area 9) was substantial.

A total of 22 green turtle nests were observed. Eighteen nests contained 94 to 180 eggs ($\bar{X}$ = 134) from 41 to 50 mm (1.6 to 1.9 in.) in diameter, $\bar{X}$ = 46 mm (1.8 in.). Approximately 2421 (of an estimated total of 2948) eggs were removed from these nests and relocated to the House of Refuge Museum for hatching, rearing, and release. Two of the remaining four nest locations were obscured by storm tides, and subsequently lost. Hatchlings were removed from the other two nests and taken to the House of Refuge.

Four nesting green turtles were tagged. Two were observed nesting a second time 14 days after tagging, within 0.5 and 0.8 miles of original tagging sites (Table 2).

Carapace length of these four green turtles ranged from 95.3 to 111.8 cm (37.4 to 44.0 in.). $\bar{X}$ = 101.1 cm (39.8 in.), and carapace width ranged from 71.1 to 88.4 cm (28.0 to 34.8 in.). $\bar{X}$ = 78.5 cm (30.9 in.). Crawl width of the four tagged turtles averaged 100.6 cm (39.6 in.) while average crawl width of all green turtles was 104.5 cm (41.2 in.). Mean width of the 22 green turtle crawls was significantly larger (P = .05) than mean crawl width of 153 tagged loggerhead turtles.

TABLE 2. RETURNS OF TAGGED GREEN TURTLES

Tag No.	Date Tagged (First Emergence) (1971)	FIRST RETURN (Second Emergence)		
		Date (1971)	Length of Freedom	Distance from Tagging Site (Miles)
G507	6 July (+)	20 July (+)	14 days	0.8
G508	6 July (+)	20 July (+)	14 days	0.5

+ = nesting

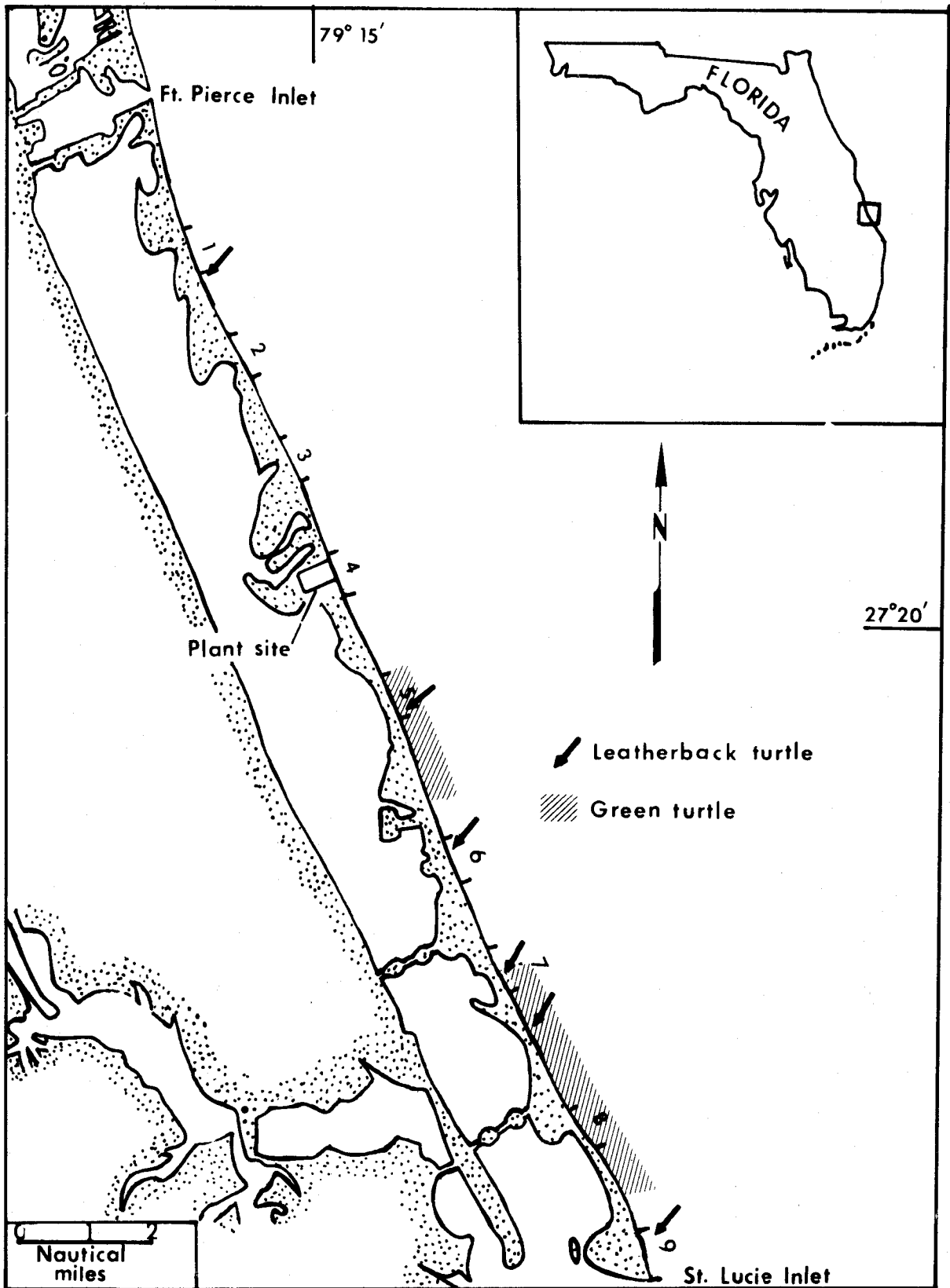


Figure 4. Areas of green turtle nesting and sites of the six leatherback turtle nests.

Estimation of the number of individual green turtles nesting on Hutchinson Island is difficult. Carr (1952) reports that individual green turtles nest three to five times per season, at intervals of about two weeks. This is, in part, substantiated by our observations of multiple nesting. Based on comparison of crawl widths, nest locations, and nesting frequency, approximately eight to ten individuals nested on Hutchinson Island during the summer of 1971.

Dermochelys coriacea coriacea, Atlantic leatherback turtle

Carr (1952) records first observed nesting of a leatherback turtle on the mainland of the United States in over a hundred years. This nesting took place on 6 June 1947 at 10:45 P.M. at Flagler Beach, Florida, approximately 160 miles north of Hutchinson Island. Subsequently, Caldwell (1959) reported a series of nestings in Indian River, Martin and Palm Beach Counties. Yerger (1965) reported nesting of a leatherback turtle near Ft. Walton Beach, Florida, on the Gulf of Mexico.

Six leatherback turtle nests were encountered during our survey, the first on 17 May and the last on 30 June. They were not concentrated in any particular section of the island (Figure 4). Nests were tentatively identified by the exceedingly wide crawl width (122 to 213 cm, $\bar{X}$ = 173 cm; 48 to 84 in., $\bar{X}$ = 68 in.) and characteristic nest type. Identity was confirmed by removal and hatching of eggs, characteristic egg size, or observation of hatchlings. All nests were located well above mean high water at the base of the dune face. The six crawl widths varied sufficiently to suggest that there was no multiple nesting.

Two nests were excavated and aliquots of eggs measured. Eggs ranged in diameter from 49 to 63 mm (1.9 to 2.5 in.), and many misshapen and undersized eggs were found. Egg diameter range generally conformed with those compiled by Pritchard (1971).

Although nesting of the Atlantic hawksbill turtle, *Eretmochelys imbricata imbricata*, has been reported from the lower Florida east coast (Carr, Hirth and Ogren, 1966), no verification of nesting of this or any other species on Hutchinson Island was obtained during this study.

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LITERATURE CITED

- BALDWIN, W. P., JR. and J. P. LOFTIN, JR.
1959. The loggerhead turtles of Cape Romain, South Carolina. Previously unpublished manuscript abridged and annotated by David K. Caldwell, without the authors. In D. K. Caldwell and A. Carr [coordinators], The Atlantic loggerhead sea turtle *Caretta caretta caretta* (L.), in America. Bull. Fla. State Mus., Biol. Sci., 4(10): 319-348.
- CALDWELL, D. K.
1959. On the status of the Atlantic leatherback turtle, *Dermochelys coriacea coriacea*, as a visitor to Florida nesting beaches, with natural history notes. Q. J. Fla. Acad. Sci., 21(3): 285-291.
- CALDWELL, D. K.
1962. Comments on the nesting behavior of Atlantic loggerhead sea turtles, based primarily on tagging returns. Q. J. Fla. Acad. Sci., 25(4): 287-302.

- CALDWELL, D.K., F. H. BERRY, A. CARR, and R. A. RAGOTZKIE
 1959. Multiple and group nesting by the Atlantic loggerhead turtle. *In* D. K. Caldwell and A. Carr [coordinators], The Atlantic loggerhead sea turtle, *Caretta caretta caretta* (L.), in America. Bull. Fla. State Mus., Biol. Sci., 4(10): 309-318.
- CALDWELL, D. K., A. CARR, and L. OGREN
 1959. Nesting and migration of the Atlantic loggerhead turtle. *In* D. K. Caldwell and A. Carr [coordinators], The Atlantic loggerhead sea turtle *Caretta caretta caretta* (L.), in America. Bull. Fla. State Mus., Biol. Sci., 4(10): 319-348.
- CARR, A.
 1952. Handbook of Turtles. Comstock Publ. Associates, Cornell University Press, Ithaca, N. Y. 542 p.
- CARR, A., H. HIRTH, and L. OGREN
 1966. The ecology and migration of sea turtles, 6. The hawksbill turtle in the Caribbean. Am. Mus. Novit. No. 2248. 29 p.
- CARR, A. and R. M. INGLE
 1959. The green turtle (*Chelonia mydas*) in Florida. Bull. Mar. Sci. Gulf Carib., 9(3): 315-320.
- LEBUFF, C. R. and R. W. BEATTY
 1971. Some aspects of the loggerhead turtle *Caretta caretta caretta* (Linne), on the Gulf Coast of Florida. Herpetologica, 27(2): 153-156.
- PRITCHARD, P. C. H.
 1971. The leatherback or leathery turtle, *Dermochelys coriacea*. Int. Union Conserv. Nat. Nat. Resourc., Morges, Switzerland. IUCN Monograph No. 1. 39 p.
- ROTA, R. A.
 1968. Sea turtle nest survey of Hutchinson Island, Florida. Q. J. Fla. Acad. Sci., 30(4): 287-294.
- YERGER, R. W.
 1965. The leatherback turtle on the Gulf coast of Florida. Copeia 1965, No. 3: 365-366.