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Technical Report

BROWARD COUNTY
DEPARTMENT OF
NATURAL RESOURCE
PROTECTION

TECHNICAL REPORT
97-08

SEA TURTLE CONSERVATION REPORT 1997

TECHNICAL REPORT 97 - 08

SEA TURTLE CONSERVATION PROGRAM
BROWARD COUNTY, FLORIDA
1997 REPORT

Submitted by:

Curtis Burney,
Principal Investigator

and

William Margolis,
Project Manager

Nova Southeastern University
Oceanographic Center
8000 North Ocean Drive
Dania, Florida 33004

For the:

BROWARD COUNTY BOARD OF COUNTY COMMISSIONERS
DEPARTMENT OF NATURAL RESOURCE PROTECTION
BIOLOGICAL RESOURCE DIVISION

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ACKNOWLEDGEMENTS

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INTRODUCTION

Since 1978, the Broward County Department of Natural Resource Protection (DNRP) has provided for the conservation of endangered and threatened sea turtle species within its area of responsibility. Broward County is within the normal nesting areas of three species of sea turtles: *Caretta caretta* (the loggerhead sea turtle), *Chelonia mydas* (the green sea turtle) and *Dermochelys coriacea* (the leatherback sea turtle). *C. caretta* is listed as a threatened species, while *C. mydas* and *D. coriacea* are listed as endangered under the U.S. Endangered Species Act, 1973, and Chapter 370, F.S.

Since these statutes strictly forbid any disturbance of sea turtles and their nests, conservation activities involving the relocation of nests from hazardous locations (especially necessary along heavily developed coasts) require permitting by the U.S. Fish and Wildlife Service (USFWS). In Florida, this permit is issued to the Florida Department of Environmental Protection (FDEP), which subsequently issues permits to individuals, universities and local government agencies. This project was administered by the DNRP and conducted by the Nova Southeastern University Oceanographic Center under Marine Turtle Permit #108, issued to the DNRP by the FDEP Institute of Marine Research, St. Petersburg, Florida. The DNRP is especially concerned with any environmental effects of intermittent beach renourishment projects on shorelines and the offshore reefs. As part of this concern, the DNRP has maintained the sea turtle conservation program in non-renourishment years to provide a continuous data base.

Operation of the program is issued based on a review of submitted bids. Nova Southeastern University was awarded the contract to conduct the 1997 program.

In addition to fulfilling statutory requirements, the purposes of the project were:

1) to relocate eggs from nests deposited in sites threatened by natural processes or human activities and thus maximize hatchling recruitment,

2) to accurately survey sea turtle nesting patterns to determine any historical trends and assess natural and anthropogenic factors affecting nesting patterns and densities,

3) to assess the success of sea turtle recruitment and of hatchery operations in terms of nesting success, hatching success and total hatchlings released,

4) to dispose of turtle carcasses, respond to strandings and other emergencies and maintain a hot-line for reporting of turtle incidents, and

5) to inform and educate the public about sea turtles and their conservation.

MATERIALS AND METHODS

Beach Survey

Daily beach surveys commenced at sunrise or 6:00 AM (whichever came first), except at Fort Lauderdale where early beach cleaning required a slightly earlier start. For survey purposes the County was divided as follows:

BEACH	BEACH LENGTH (km)	BOUNDARIES	DEP SURVEY MARKER #
Hillsboro-Deerfield Beach	7.0	Palm Beach Co. line to Hillsboro Inlet	1-24
Pompano Beach	7.7	Hillsboro Inlet to Commercial Blvd.	25-50
Fort Lauderdale	10.6	Commercial Blvd. to Port Everglades Inlet	51-84
John U. Lloyd Park	3.9	Port Everglades Inlet to Dania Beach fence	86-97
Hollywood-Hallandale	9.4	Dania Beach fence to Dade Co. line	98-128

Daily surveys of Hillsboro-Deerfield, Pompano, Fort Lauderdale and Hollywood-Hallandale beaches commenced on March 1, 1997. All surveys continued through September 15th. The beach at John U. Lloyd State Park was patrolled by park personnel who provided the data for that area. Except in Lloyd Park, nest locations were referenced to FDEP beach survey bench marks numbered consecutively from 1 to 128 (N to S). Marker numbers corresponding to each beach area are listed above.

Each nest was initially located relative to the nearest building, street, or other landmark. These locations were later cross referenced to the nearest survey marker.

In John Lloyd Park, four 1 km zones (zone 1 farthest north) were used for recording nest locations, due to the relative lack of beach landmarks. This was also done to provide continuity with the data collected in Lloyd Park during previous years.

Surveyors used four-wheeled all-terrain vehicles which can carry up to five turtle nests per trip in plastic buckets. The usual method was to mark and record nests and false crawls on the first pass along the beach and then dig and transport nests in danger of negative impacts on the return pass. Due to early beach cleaning in Fort Lauderdale, two workers picked up the nests on the first pass. Nests were transferred, at prearranged meeting sites, to a third person who transported them to their destination by car. Nests were often transported to fenced beach hatcheries directly on the all-terrain vehicles. When there were many nests requiring relocation, additional trips were occasionally necessary. After measuring the flipper-to-flipper track width (as an index of turtle size), crawl marks were obliterated to avoid duplication.

Nests in danger of negative impacts were defined as follows:

1) a nest located within 20 feet of the previous evening wrack line,

2) a nest located near a highway or artificially lighted area defined as a beach area where a worker can see his shadow on a clear night,

3) a nest located in an area subject to beach renourishment.

Especially due to definition 2, all of the discovered nests at Pompano, Deerfield Beach, Hollywood-Hallandale, and Fort Lauderdale

beaches were considered to be in danger of negative impact and therefore were relocated to fenced beach hatcheries or to one of two unfenced beach locations at Hillsboro Beach. As in previous years, the main relocation site was designated BH1, located at the Hillsboro Club, immediately north of the Hillsboro Inlet. In order to avoid concentrating all nests at one location, another site designated BH957 was established approximately three quarters of a mile north of BH1. This site was adjacent to the property at 957 A1A. Several other sites to the north of BH957 which were used in previous years, were not used this year due to beach erosion or denial of parking access. Nests in danger of negative impacts that were deposited on Hillsboro Beach were relocated to less hazardous nearby locations on that beach (BH), not necessarily to the hatchery areas listed above.

Nests to be relocated were carefully dug by hand, and transported in buckets containing sand from the natural nest chamber. The depths of the natural egg chambers were measured. The eggs were then transferred to hand-dug artificial egg chambers of similar dimensions, which were lined with sand from the natural nest. Care was taken to maintain the natural orientation of each egg.

Those nests not in danger on Hillsboro Beach and Lloyd Park beaches, were marked and left *in situ*. After hatching, 175 of these nests at Hillsboro Beach were excavated for post emergence examination. At Lloyd Park, 116 *in situ* nests were evaluated by Park personnel and are included in this report. An additional 65 nests from Pompano Beach, Fort Lauderdale and Hollywood-Hallandale beaches were missed during the initial surveys but were discovered on the morning after (or night of) hatching. These nests were also investigated for hatching success and are

included in the totals. Hatching success was defined as the total number of shells minus the number of hatchlings found dead in the nest (DIN), dead piped eggs (PIP), and eggs with visible (VD) or no visible development (NVD). The number of hatchlings found alive in the nest (LIN) were also counted so that the percent of hatchlings naturally emerging from nests could be calculated. All live hatchlings found in nests were released and are included as hatchlings released.

Restraining Hatcheries

As in previous years, early nests were transferred to one of three chain-link fenced hatcheries located at Pompano Beach near Atlantic Blvd., at the South Beach municipal parking lot in Fort Lauderdale, or at North Beach Park in Hollywood. After hatching, all hatchery nests were dug, and counts of spent shells, live hatchlings, dead hatchlings, piped eggs and eggs with arrested or no visible development were made.

Hatchery nests displaying a depression over the egg chamber, indicating eminent hatchling emergence, were covered with a bottomless plastic bucket to retain hatchlings, although the turtles sometimes escaped these enclosures by digging around them. Hatching success was defined as the percentage of relocated eggs resulting in live released turtles, the same as for *in situ* nests. After hatching commenced, the hatcheries were checked twice each night, once between 9:00 PM and midnight and again just prior to 5:00 AM. Hatchlings were released that same night in dark sections of Fort Lauderdale, Hillsboro Beach, Hollywood or Lloyd Park beaches by allowing them to crawl through the intertidal zone into the surf. Hatchlings discovered in the morning in the hatcheries were collected and held indoors in dry Styrofoam boxes in a cool, dark place until that night, when they were released as above.

The Pompano and Fort Lauderdale hatcheries were filled by mid May. After filling the hatcheries, Fort Lauderdale and Pompano nests were relocated to Hillsboro Beach. The fenced hatcheries were again used for nest relocation in mid July, after the first nests hatched. Subsequent nests relocated from Fort Lauderdale and Pompano were taken to Hillsboro Beach. Hatched nests in the hatcheries were completely dug out along with the surrounding sand and replaced with fresh sand. The sand from the old nests was spread outside the hatchery. Fresh sand was obtained from elsewhere on the beach.

An additional 80 nests from Fort Lauderdale and Pompano beaches were transferred to the Dade County Department of Environmental Resources Management (DERM) for use in a beach renourishment study.

Data analysis

The data were compiled, analyzed and plotted primarily with Quattro Pro, version 5 (Borland International Inc.) and Statistica, release 4.2 (StatSoft, Inc.) software for Windows. County-wide yearly nesting densities from 1981 to 1997 for C. *caretta*, *C. mydas*, and *D. coriacea* were plotted and trends were assessed by linear regression and correlation analyses. Seasonal nesting patterns for C. *caretta* and *C. mydas* were plotted for each of the five beaches. Nesting densities were calculated for each beach (nests per km) and the data (except for *D. coriacea*) were compared using 1-way repeated measures analysis of variance (ANOVA) and Newman-Keuls (NK) tests (at the .05 significance level). The total number of nests deposited by each species in the beach segments corresponding to each FDEP survey marker was tabulated and plotted. Total nesting success (nests/total crawls) for each species at each beach was computed and the mean daily nesting successes of C. *caretta*

and *C. mydas* at each beach was compared by repeated measures ANOVA and NK analyses. The total nesting success in each beach segment for each species, was plotted versus its FDEP survey number. The sequential number of each *D. coriacea* nest was plotted versus the Julian date of its deposition, to identify periods of especially concentrated nesting.

The total numbers of eggs for each species which were relocated or left *in situ* at each beach or relocation site were tabulated, as well as the overall hatching successes of relocated and evaluated *in situ* eggs of all species. The overall hatching success of all eggs from relocated and *in situ* nests were plotted from 1981 through 1997. Hatching successes of C. *caretta* and *C. mydas* nests were plotted versus deposition date, and the patterns were analyzed with linear regression and correlation analyses. The mean hatching percentages and proportions of the post-hatching egg categories (LIN, DIN, PIP, VD and NVD) were tabulated from nests of each species deposited or relocated at each of the individual beaches or relocation sites. The hatching success of *in situ* and relocated C. *caretta* nests at Hillsboro Beach were compared by one way ANOVA and NK analyses. The proportions of all post-hatching nest evaluation categories from *in situ* and relocated C. *caretta* nests at Hillsboro Beach were compared using a large-sample hypothesis test of population proportions (percent test) (Weiss and Hassett, 1991).

RESULTS

Figure 1 shows the historical trend in the total number of sea turtle nests deposited in Broward County since 1981. A total of 2288 nests were counted in 1997. This number was slightly above the 1993 count and represents a 18.6 percent decrease from the 1996 record. This was the largest single-year decline since the 25.9 percent drop from 1983 to 1984.

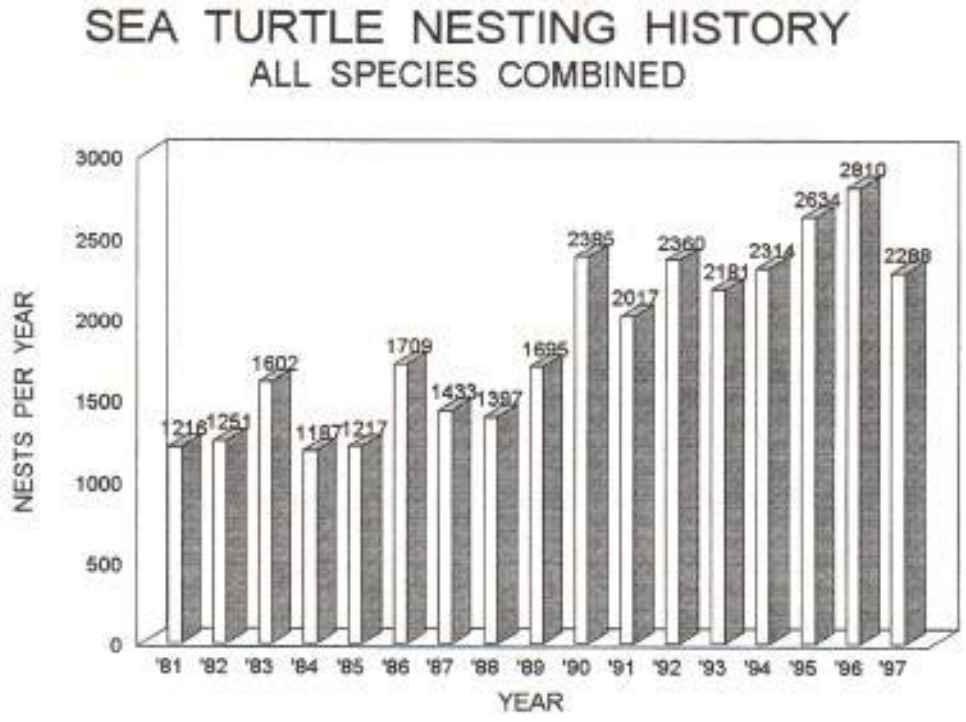


Figure 1: The pattern of total sea turtle nesting in Broward County since full surveys commenced in 1981.

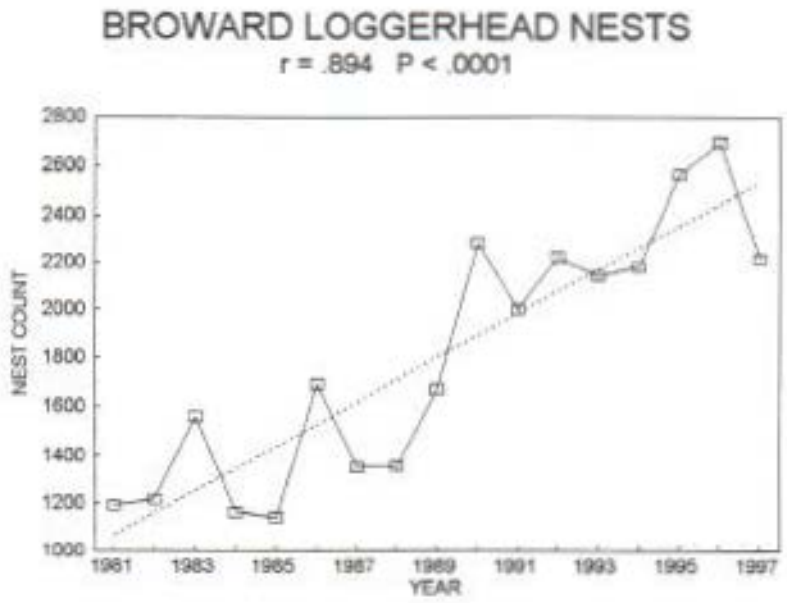
Figure 2 shows the yearly nesting trends of loggerhead, green and leatherback sea turtles. Although the *C. caretta* nest count was lower than in the previous two years, the positive trend line since 1981 is still strongly significant and the correlation coefficient of 0.894 did not differ significantly from its value of 0.907 in 1996. C. *mydas* nesting continued

its alternating high-low pattern, completing the fourth consecutive cycle. This year's count was not statistically different from the mean of the other low-nested years from 1989 through 1995. *D. coriacea* nesting increased dramatically in 1997, exceeding the previous record nest count in 1987 by 68 percent. This year's total exceeded the mean of the previous 16 years by 4.6 standard deviations.

Figure 3 shows the seasonal pattern of daily C. *caretta* nesting. The first *C. caretta* nest was deposited on 18 April and the last was found on 8 September. Table 1 and Figure 4 give the total C. *caretta* nesting densities and seasonal patterns for the five beaches, respectively. A Newman-Keuls test showed significant differences between all the beaches, except between Lloyd Park and Fort Lauderdale.

The County-wide seasonal nesting patterns of *C. mydas* and *D. coriacea* are shown in Figure 5 and for the individual beaches in Figure 6. The first and last *D. coriacea* nests were deposited on 28 February and 19 June. *C. mydas* nests were deposited between 24 May and 10 September. Nesting counts and densities for *C. mydas* are shown in Table 2. Table 3 gives the nesting densities of *D. coriacea* on the five beaches. Hillsboro Beach experienced significantly higher nesting of both *C. mydas* and *D. coriacea* than the other County beaches.

Figure 7 shows the sequence of *D. coreacea* nesting plotted versus Julian date. Vertical sections of the plot indicate more heavily nested time periods. Three such nine-day periods are indicated by the horizontal bars, with the number of nests deposited in each interval. Figure 8 shows the distribution of *C. caretta*, *C. mydas* and *D. coriacea* nesting in each 1000 foot zone of Broward County beach (1 km zones in Lloyd Park) during 1997. The generally low nested areas including the beaches near the



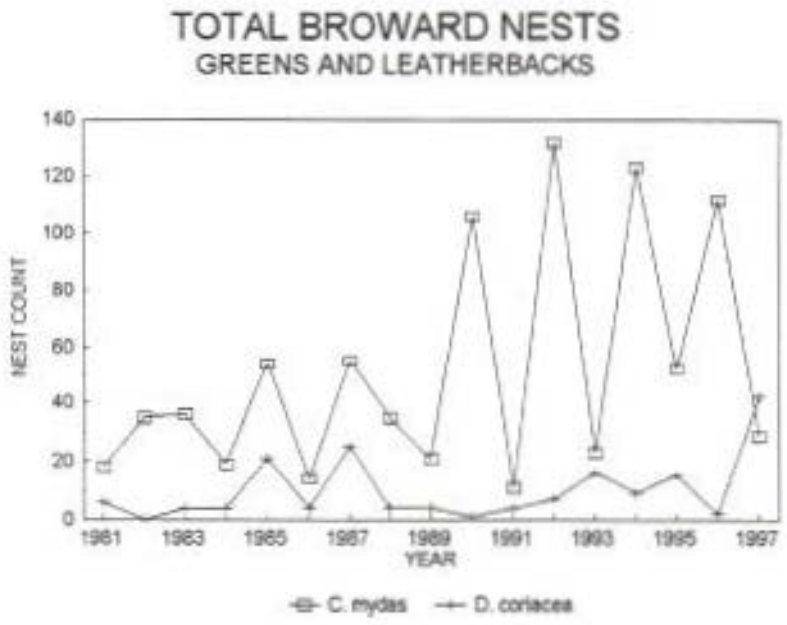


Figure 2: Historical nesting patterns of loggerhead, green and leatherback sea turtles in Broward County since 1981.

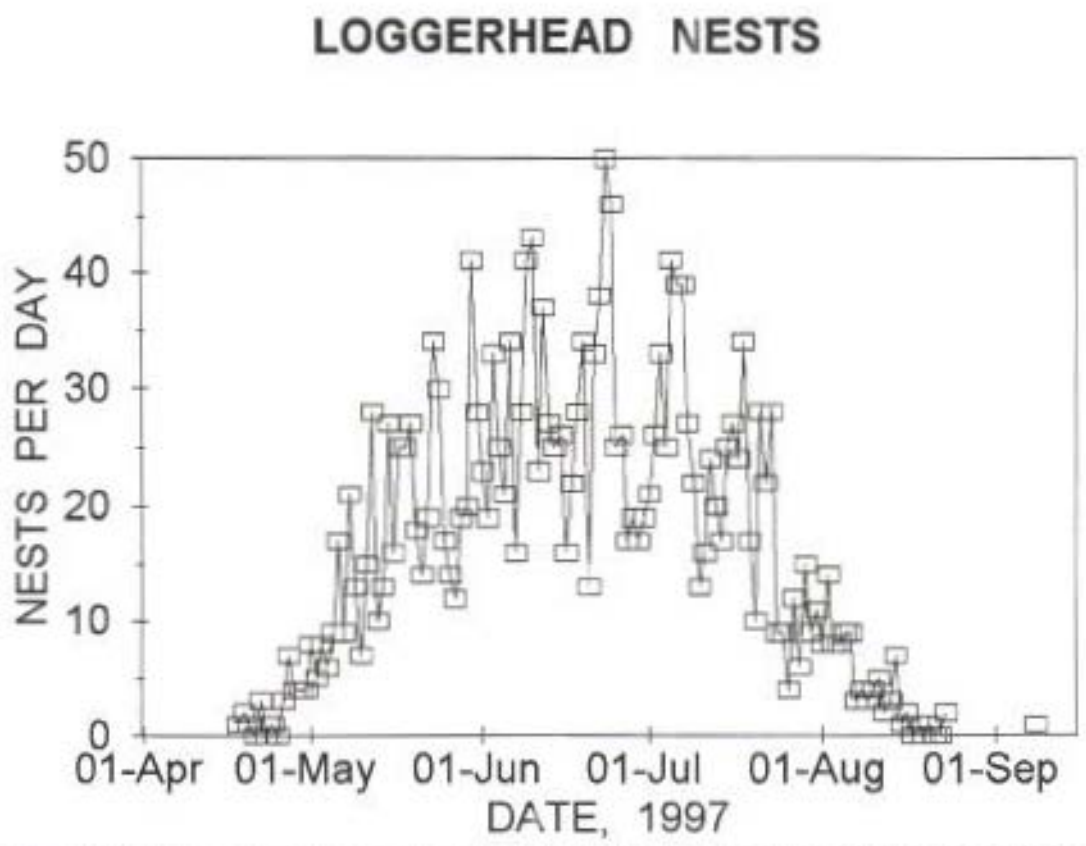


Figure 3: The seasonal pattern of daily loggerhead nesting in Broward County, 1997.

Table 1: Total *C.caretta* nests and nesting densities expressed as nests-per-kilometer for the 1997 season. Vertical lines at the right overlap groups where means were not distinguishable in a Newman-Keuls test (alpha = .05) of mean daily nesting per km.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	Nests per km	MEAN DAILY NESTS/km	
Hollywood	75	9.4	8.0	.044	|
Lloyd Park	181	3.9	46.4	.276	|
Ft. Lauderdale	622	10.6	58.7	.337	|
Hillsboro Beach	565	7.0	80.7	.479	|
Pompano Beach	773	7.7	100.4	.574	|
OVERALL	2216	38.6	57.4		

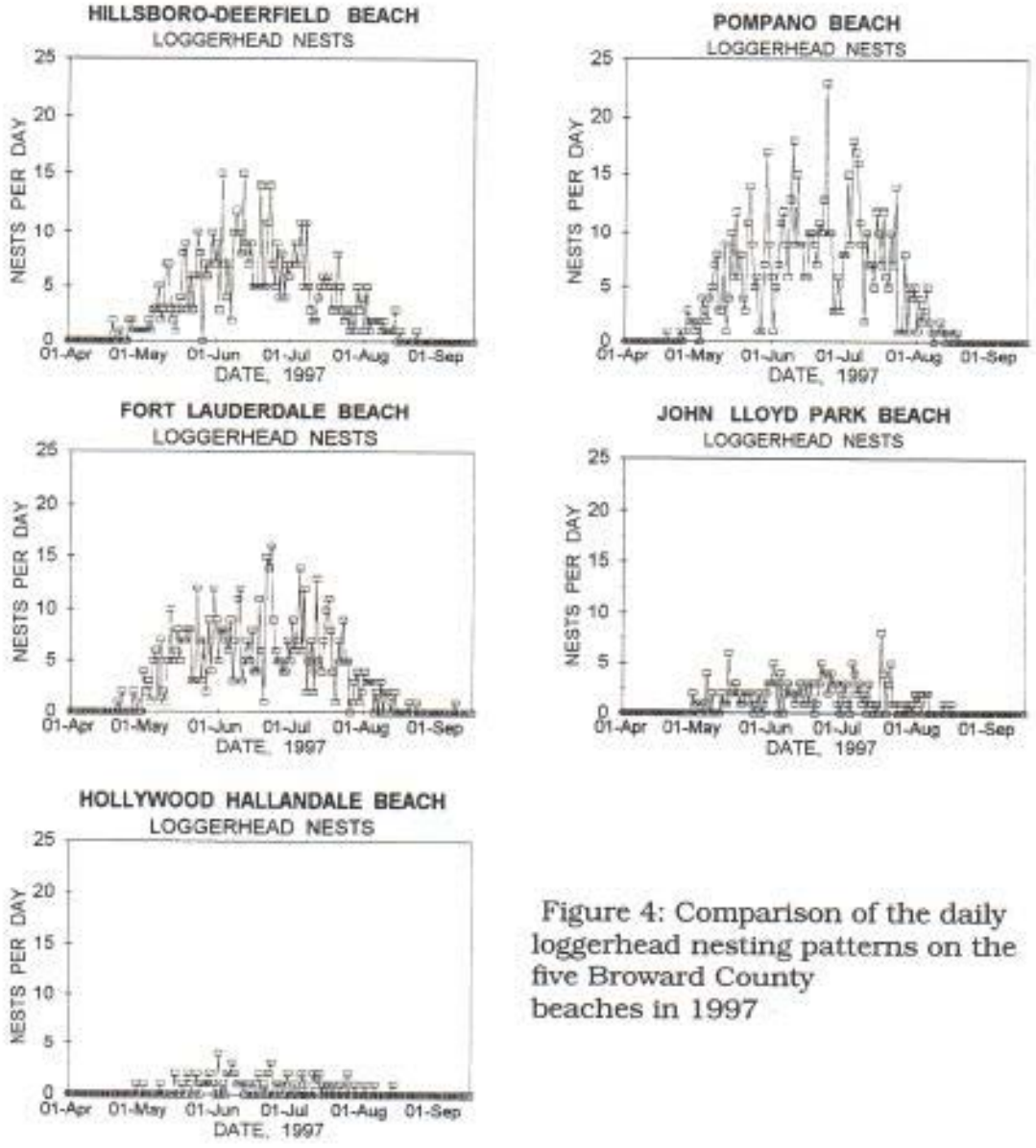


Figure 4: Comparison of the daily loggerhead nesting patterns on the five Broward County beaches in 1997

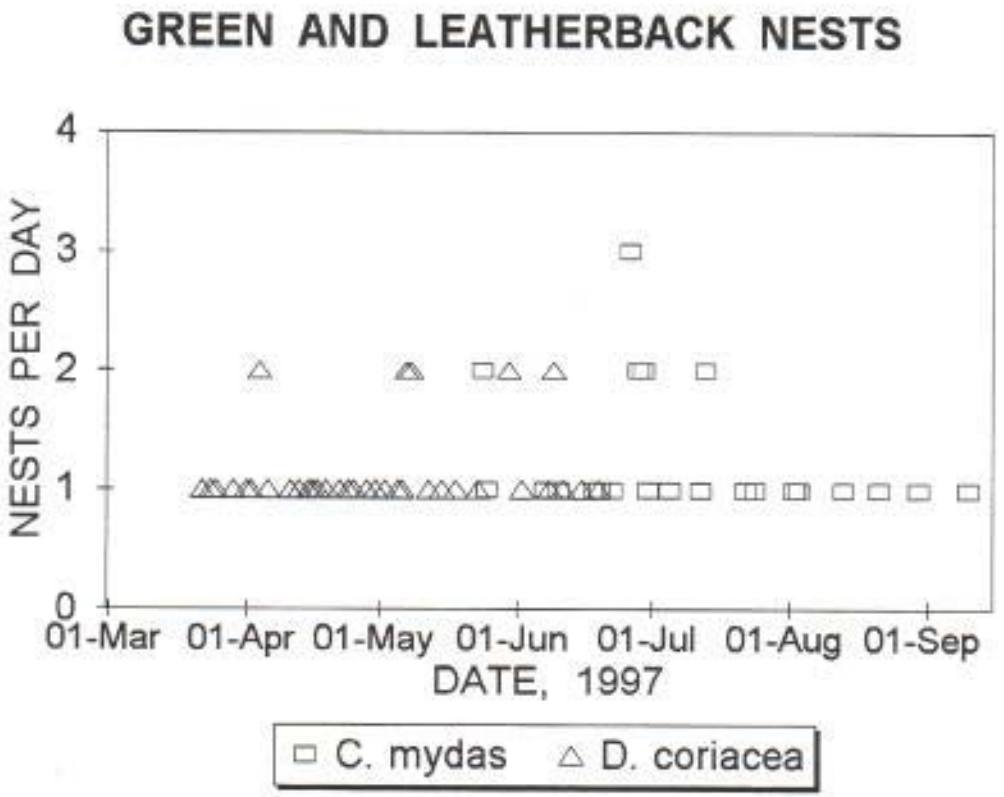


Figure 5: The seasonal pattern of daily green and leatherback nesting in Broward County, 1997

Table 2: Total *C. mydas* nests and nesting densities expressed as nests-per-kilometer for the 1997 season. Vertical lines at the right overlap groups whose means were not distinguishable in a Newman-Keuls test (α =.05) of mean daily nesting per km.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	Nests per km	MEAN DAILY NESTS/km	
Hollywood	0	9.4	0	0	
Pompano Beach	1	7.7	0.13	.0008	|
Ft. Lauderdale	4	10.6	0.38	.0017	|
Lloyd Park	5	3.9	1.28	.0076	|
Hillsboro Beach	19	7.0	2.71	.0161	|
OVERALL	29	38.6	0.75		

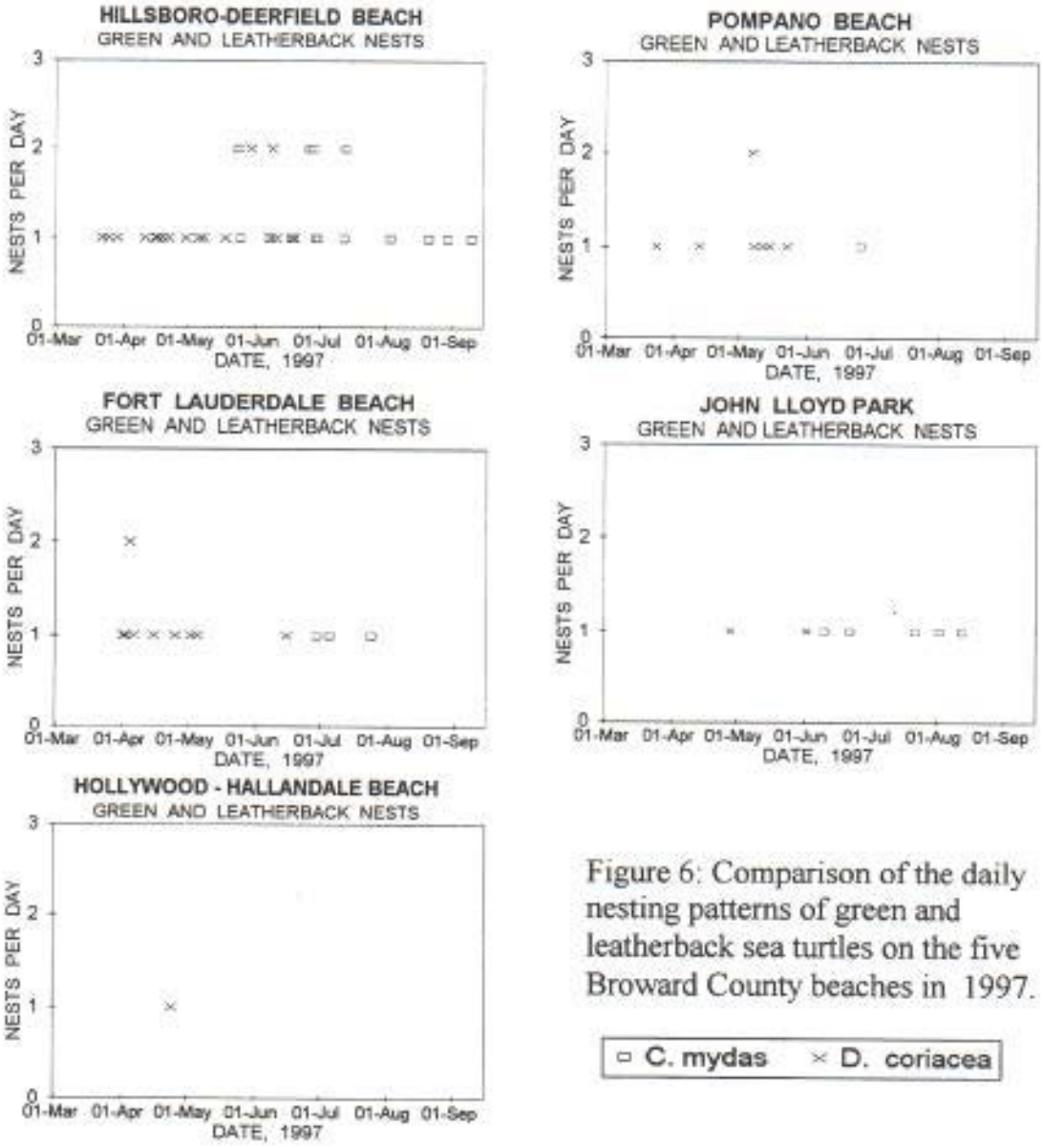


Figure 6: Comparison of the daily nesting patterns of green and leatherback sea turtles on the five Broward County beaches in 1997.

Table 3: Total *D. coriacea* nests and nesting densities expressed as nests-per-kilometer for the 1997 season. Vertical lines at the right overlap groups whose means were not distinguishable in a Newman-Keuls test (α =.05) of mean daily nesting per km.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	Nests per km	MEAN DAILY NESTS/km
Hollywood	1	9.4	0.11	.0005
Lloyd Park	2	3.9	0.51	.0025
Ft. Lauderdale	11	10.6	1.04	.0047
Pompano Beach	8	7.7	1.04	.0052
Hillsboro Beach	20	7.0	2.86	.0144
OVERALL	42	38.6	1.09	

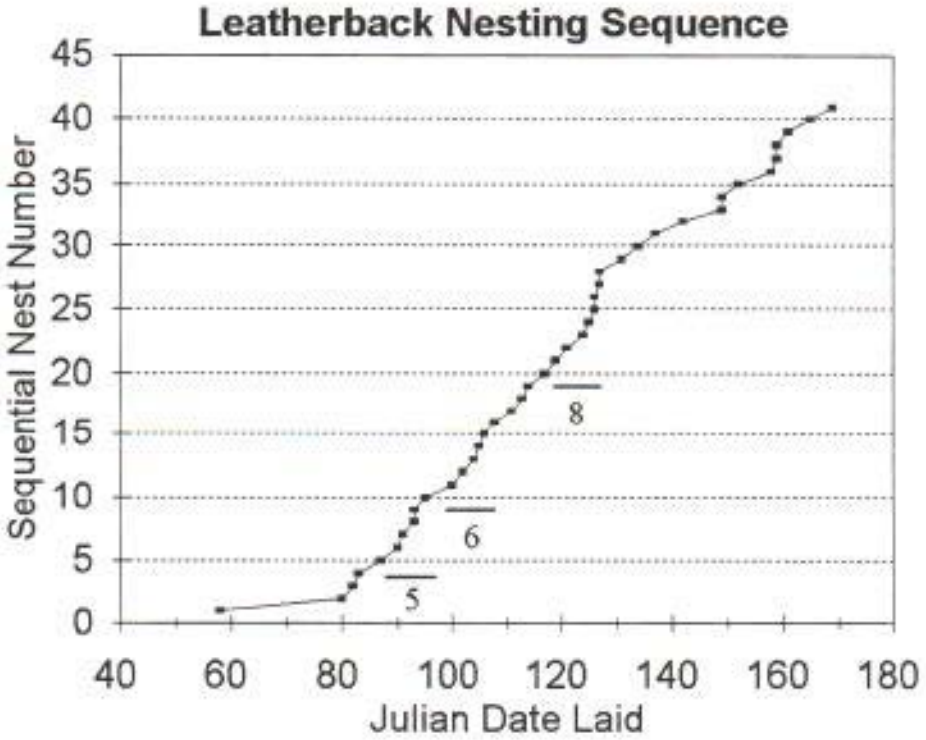


Figure 7: The sequence of leatherback nests plotted against the Julian Date of their deposition. Horizontal solid lines represent nine-day minimum internesting intervals. Numbers below the lines give the number of nests deposited during each interval.

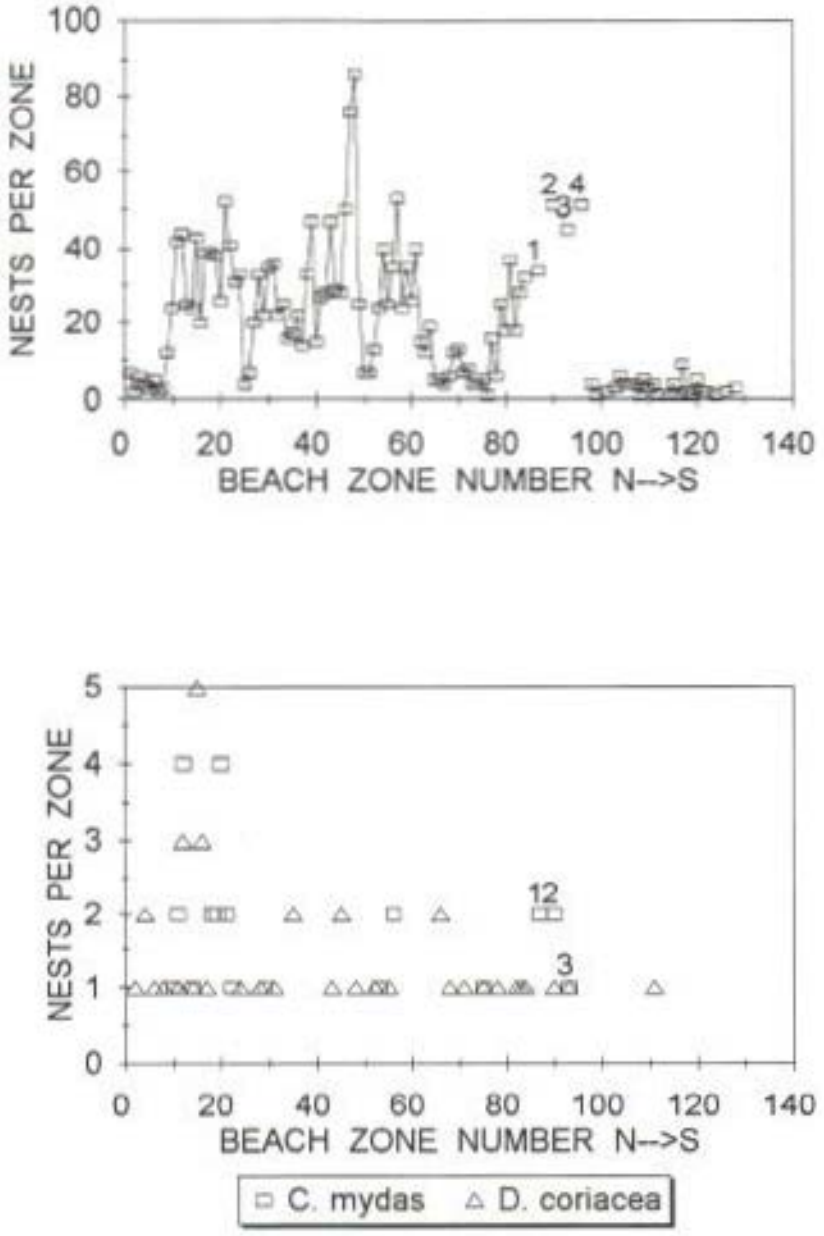


Figure 8: Locations of loggerhead, green and leatherback nests in Broward County, 1997. Numbers 1-4 indicate the four beach zones of John Lloyd Park.

Deerfield Beach pier, the Hillsboro Inlet, the Commercial Boulevard pier, the Fort Lauderdale strip and all of Hollywood and Hallandale have remained recognizable since the project's inception. The highest *C. caretta* nesting activity occurred in zones 47 and 48 in Pompano Beach.

Figure 9 and Table 4 present the County-wide distribution of nesting success for the three species. *C. caretta* nesting success was significantly lower on Hollywood-Hallandale beaches than at the more northerly beaches, which were not statistically different from each other. The nesting success of *C. mydas* and *D. coriacea* were not significantly different on any of the beaches.

Table 5 gives the total number of nests for each species that were relocated to Hillsboro Beach or to fenced hatcheries, as well as the numbers and locations of nests left *in situ*. One incidental *Eretmochelys imbricata* (hawksbill) nested on June 25 in Fort Lauderdale.

Table 6 lists the total number of eggs and emerged hatchlings from evaluated *in situ* and relocated nests. The numbers of predated nests and nests which were unevaluated due to stake removal are also listed. The hatching success of relocated C. *caretta* nests increased by 0.1 percentage point from 1996 while the success of *in situ* nests declined by 1.2 percent. The hatching success of relocated *C. caretta* nests was 7.7 percent lower than for *in situ* nests. *C. mydas*, the hatching success of relocated nests was more than twice that of *in situ* nests, however only 6 *in situ* and 4 relocated nests were evaluated. Sixty percent of relocated *D. coriacea* eggs hatched while *in situ* eggs produced live hatchlings at a rate of 67.7 percent.

Figure 10 illustrates the seasonal patterns of the hatching success of *in situ* and relocated *C. caretta* nests. As observed in past years (except

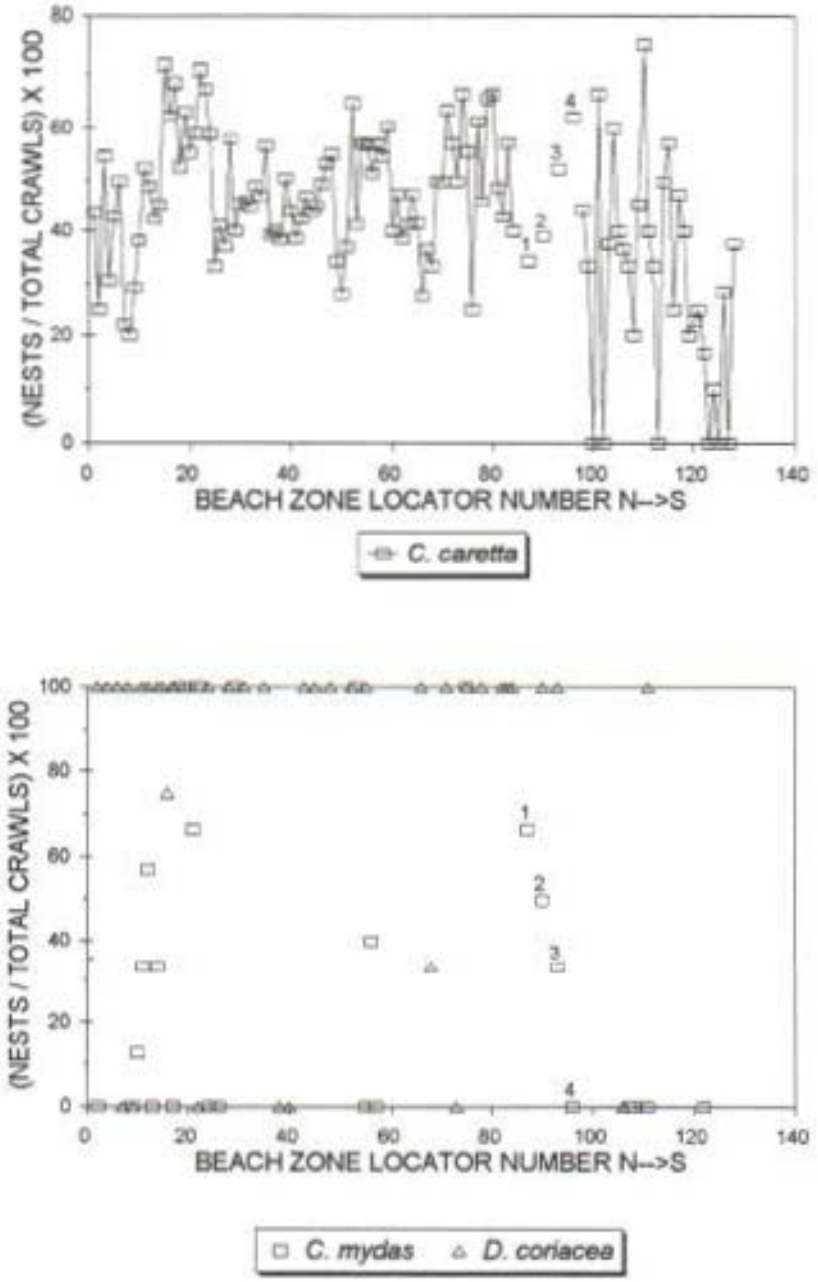


Figure 9: The distribution of the nesting success of loggerhead, green and leatherback turtles across Broward County, 1997. Numbers 1-4 indicate the four beach zones of John Lloyd Park.

Table 4: Total nests, false crawls (FC) and percent nesting success (NS) for three sea turtle species on each of five Broward County beaches during 1997. Vertical lines for C. *caretta* overlap means which were not distinguishable in a Newman-Keuls (N-K) test. ANOVA showed no significant differences in *C. mydas* and *D. coriacea* nesting success.

BEACH	C. *caretta*				*C. mydas*			*D. coriacea*		
	Nests	FC	NS	N-K	Nests	FC	NS	Nests	FC	NS
Hollywood	75	150	33.3	|	0	4	0	1	1	50.0
Lloyd Park	181	217	45.5	|	5	7	41.6	2	0	100
Pompano Beach	773	906	46.0	|	1	1	50.0	8	2	80.0
Ft. Lauderdale	622	622	50.0	|	4	7	36.4	11	3	78.6
Hillsboro Beach	565	487	53.7	|	19	29	39.6	20	4	83.3
OVERALL	2216	2382	48.2		29	48	37.7	40	10	80.0

Table 5: Total Number of *C.caretta*, *C. mydas* and *D. coriacea* nests relocated to Hillsboro beach or fenced hatcheries, or left *in situ*.

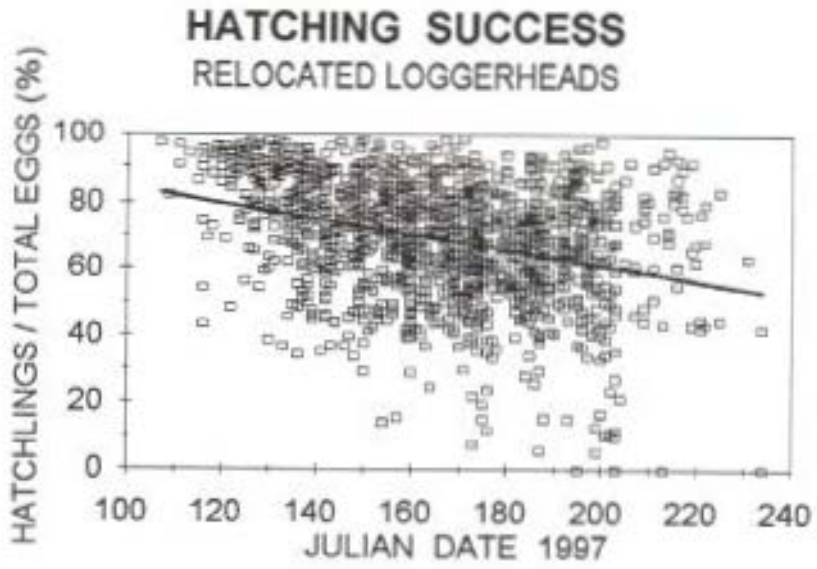
	C. caretta	*C. mydas*	*D. coriacea*	*E. imbricata*
RELOCATED				
Open Beach				
Hillsboro Beach				
BH	248	4	9	0
BH1	792	1	2	1
BH957	265	1	0	0
Lloyd Park				
Screened	2	0	0	0
Unscreened	15	0	0	0
DERM	5	0	0	0
Poached	16	0	0	0
Hatcheries				
Pompano	109	0	4	0
Ft. Lauderdale	36	0	4	0
Hollywood	71	0	1	0
Discovery Center	1	0	0	0
DERM	75	0	0	0
TOTALS	1635	6	20	1
IN SITU				
Hillsboro Beach	317	15	16	0
Pompano Beach	61	1	1	0
Ft. Lauderdale	34	2	3	0
Lloyd Park				
Screened	2	2	1	0
Unscreened	162	3	1	0
Hollywood	5	0	0	0
TOTALS	581	23	22	0
GRAND TOTALS	2216	29	42	1

Table 6: Total egg counts, released hatchlings and overall hatching successes for *in situ* and relocated nests of *C.caretta*, *C.mydas*, *D.coriacea* and *E. imbricata* in 1997.

SPECIES	NUMBER OF EGGS	EVAL. NESTS	HATCHLINGS RELEASED	HATCHING SUCCESS (%)
***In situ* Nests**				
C. caretta	35223	333	26805	76.1
C. mydas	687	6	299	43.5
D. coriacea	1171	17	793	67.7
E. imbricata	0	0	0	0
Total	37081	356	27897	75.2
Relocated Nests				
C. caretta	147101	1346	100686	68.4
C. mydas	431	4	425	98.6
D. coriacea	1514	17	908	60.0
E. imbricata	167	1	89	53.3
Total	149213	1368	102108	68.4
Overall				
C. caretta	182324	1679	127491	69.9
C. mydas	1118	10	724	64.8
D. coriacea	2685	34	1701	63.4
E. imbricata	167	1	89	53.3
TOTAL	186294	1724	130005	69.8

Predated and Unevaluated Nests and Eggs

	Predated Nests	Pred. Eggs	Unevaluated Nests	Unevaluated Eggs
***In Situ* Nests**				
C. caretta	76	-	116	-
C. mydas	0	0	14	-
D. coriacea	3	-	3	-
Relocated				
C. caretta	159	18860	109	11569
C. mydas	2	259	0	0
D. coriacea	2	208	1	114



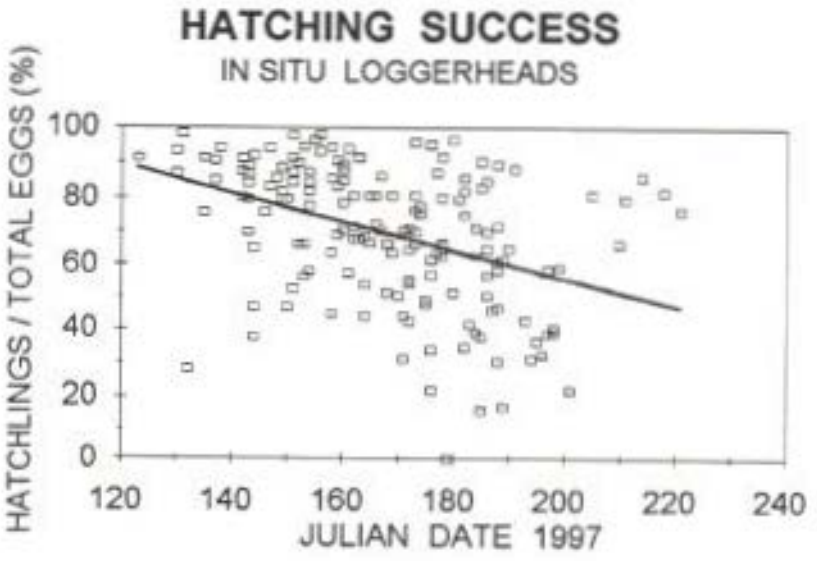


Figure 10: Comparison of seasonal hatching success trends for relocated and *in situ* loggerhead nests during 1997

1994) there was a very significant ($r = -.324$, $p << .0001$) decline in hatching success for relocated *C. caretta* nests over the course of the season. This was also observed for *in situ* nests ($r = -.404$, $p << .0001$). Figure 11 shows the same information for relocated and *in situ D. coriacea* nests. No significant trends are indicated. This was also the case for *C. mydas*. These data were not plotted because of the small number of evaluated nests.

Figure 12 compares the distributions of hatching success frequencies for *in situ* and relocated *C. caretta* nests. As seen in previous years, there were higher proportions of high-success in situ nests (85-100 percent) and the proportion of low-hatching nests (<50%) was not elevated in relocated nests.

Figure 13 shows the historical patterns of the yearly hatching success of all species combined, since 1981. The success of relocated nests showed no change from 1996 but there was a slight decline in the success of *in situ* nests. Table 7 compares emergence success and the percentages of hatchlings and eggs in the post-hatching evaluation categories for relocated and *in situ C. caretta* nests. Tables 8 and 9 give the same results for *C. mydas* and *D. coriacea*, respectively.

Table 10 compares mean *C. caretta* hatching successes for all evaluated nests which were either directly deposited at Hillsboro Beach or were relocated there from other areas of the County. Nests which were relocated to more suitable incubation sites near their original deposition location (BH Relocated) rather than to one of the designated relocation sites (BH1 or BH957) had significantly lower mean hatching success than did nests which were left in situ at Hillsboro Beach or relocated to BH1 or BH957.

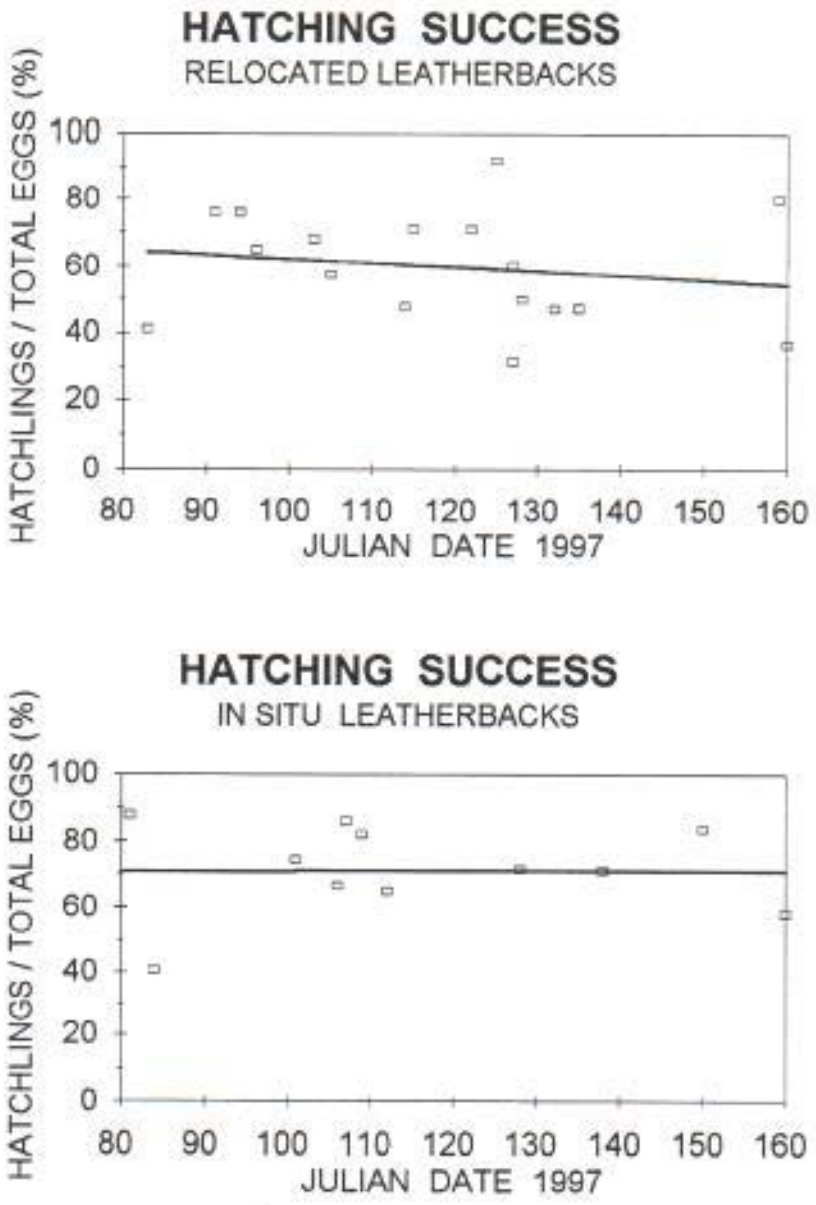


Figure 11: Comparison of seasonal hatching success trends for relocated and *in situ* leatherback sea turtle nests during 1997.

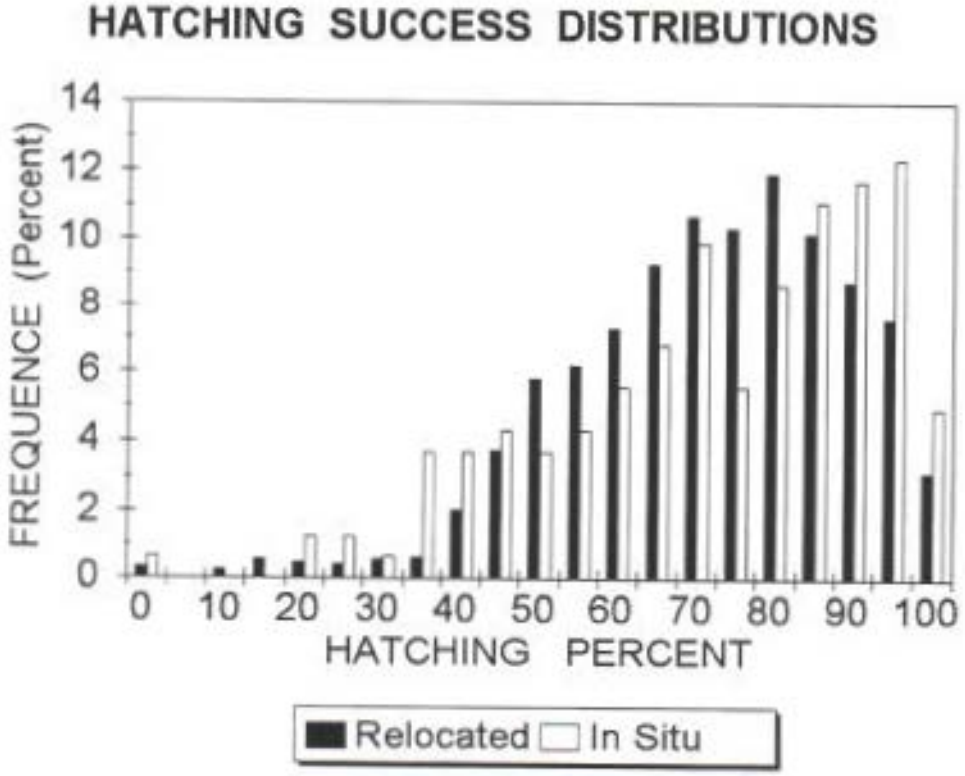


Figure 12: Hatching success frequencies for *in situ* and relocated loggerhead nests, 1997.

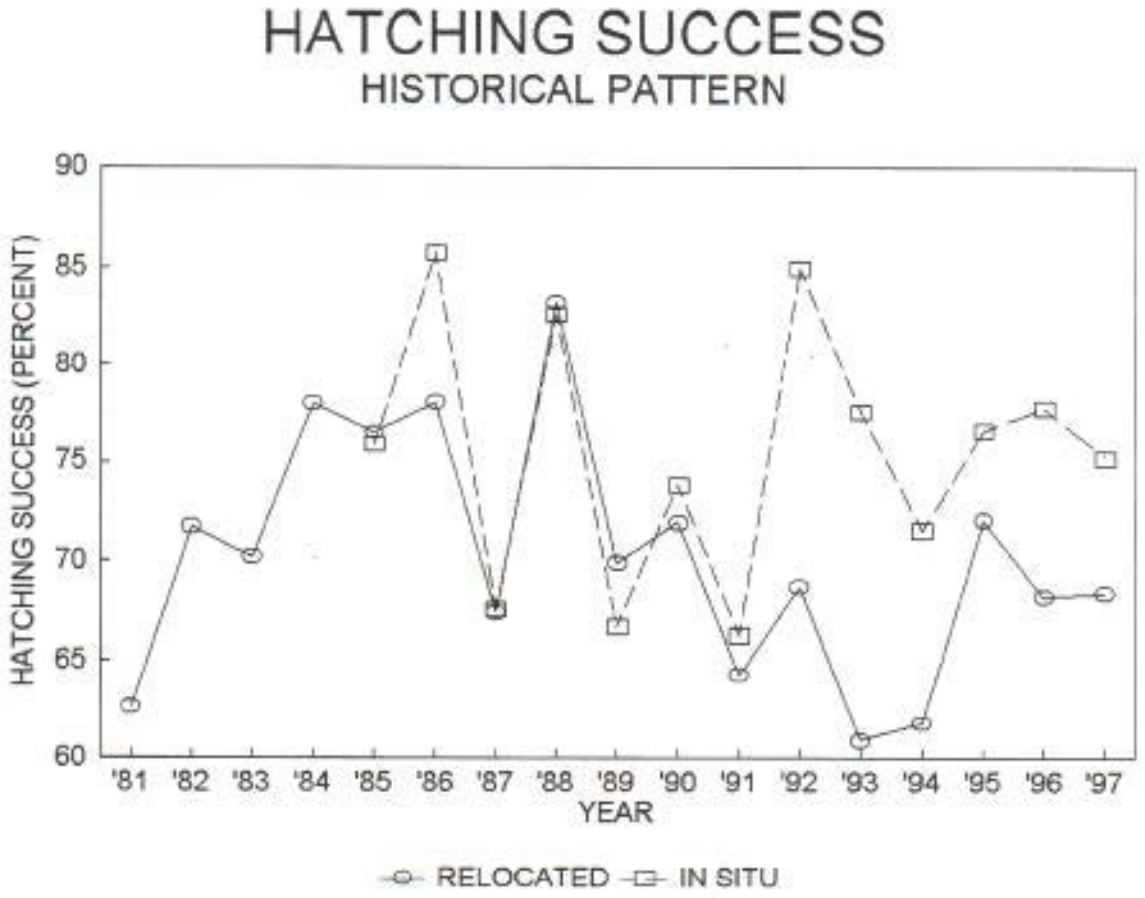


Figure 13: The historical patterns of yearly hatching success for all evaluated *in situ* and relocated sea turtle nests, since 1981.

Table 7: Accounting of the status of all hatched and unhatched eggs in investigated *in situ* and relocated *C. caretta* nests during 1997.

Location	Total Eggs	Emerged Hatchlings (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
***In situ* Nests**							
Hillsboro Beach	16031	65.4	2.6	3.0	13.0	6.0	9.9
Pompano Beach	3871	83.5	3.4	1.2	1.8	2.2	7.8
Ft. Lauderdale	2190	73.0	6.4	4.6	3.7	2.8	9.5
Lloyd Park	12582	81.5	0.9	0.8	1.7	*	15.1
Hollywood	549	76.3	1.8	3.3	0.0	1.1	17.5
Relocated Nests							
Hillsboro Beach							
BH	13143	53.8	5.5	1.9	14.7	9.1	14.8
BH1	82729	58.3	9.4	1.8	14.5	3.7	12.3
BH 957	26085	55.2	10.6	2.6	18.0	3.3	10.3
Pompano Beach	11964	64.2	10.1	1.5	9.2	4.1	11.0
Ft. Lauderdale	4112	80.1	6.6	1.0	4.4	0.3	7.5
Lloyd Park							
Screened	90	87.8	1.1	1.1	1.1	*	8.9
Unscreened	1100	88.0	1.2	1.4	0.4	*	9.1
Hollywood	7878	69.3	9.6	1.6	8.8	1.3	9.3

Hatched Eggs - The percentage of empty shells found in the nest
DIN - Hatchlings found dead in the nest when it was excavated
LIN - Hatchlings found alive in the nest when it was excavated
PIP - Dead hatchlings which only partially emerged from their eggs.
VD - Unhatched eggs with signs of visible embryo development when opened
NVD - Unhatched eggs with no signs of embryo development
* - Unreported category; all unhatched eggs listed as NVD

Table 8: Accounting of the status of all hatched and unhatched eggs in investigated *in situ* and relocated *C. mydas* nests during 1997. Abbreviations as in Table 7.

Location	Total Eggs	Emerged Hatchlings (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
***In situ* Nests**							
Hillsboro Beach	317	51.4	1.9	2.2	21.5	12.6	10.4
Lloyd Park							
Screened	153	61.4	1.3	3.3	0.7	*	33.3
Unscreened	113	53.1	2.7	23.9	1.8	*	18.6
Fort Lauderdale	104	93.3	0	1.0	0	0	5.8
Relocated Nests							
Hillsboro Beach							
BH	190	83.7	3.2	1.1	3.2	0	8.9
BH1	140	33.6	10.7	0	0	12.1	43.6
BH 957	101	33.7	37.6	0	5.9	12.9	9.9

Table 9: Accounting of the status of all hatched and unhatched eggs in investigated *in situ* and relocated *D. coriacea* nests during 1997. Abbreviations as in Table 7.

Location	Total Eggs	Emerged Hatchlings (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
***In Situ* Nests**							
Hillsboro Beach	965	66.0	6.7	2.8	7.5	4.0	19.9
Fort Lauderdale	64	60.9	4.7	0	0	0	34.4
Lloyd Park							
Screened	99	49.5	0	6.1	1.0	0	43.4
Unscreened	43	0	0	0	0	0	100
Relocated Nests							
Hillsboro Beach							
BH	554	57.6	4.3	2.5	11.6	4.0	19.9
BH1	169	47.3	0	3.0	20.1	2.4	27.2
Pompano	308	45.8	5.5	1.6	9.4	8.1	29.5
Fort Lauderdale	393	64.4	7.9	0.3	4.6	0.8	21.4
Hollywood	90	47.8	0	0	6.7	0	45.6

Table 10: Comparison of the mean hatching successes of relocated and *in situ* C. *caretta* nests on Hillsboro Beach. Vertical lines at right overlap means which were not statistically different in a Newman-Keuls test (α=.05).

LOCATION	NESTS EVALUATED	MEAN HATCHING SUCCESS (%)
BH Relocated	119	59.6
BH 957	242	66.7
BH 1	758	68.5
BH *In situ*	158	68.9

DISCUSSION

This year marked the first yearly decline in the total number of sea turtle nests deposited in Broward County since 1993 (Figure 1). This 18.6% single-year decrease was the largest since 1984, when the nest count decreased by 25.9 percent from the previous year.

Such reductions in nest counts may be due to an overall reduction in the size of the sea turtle populations or they may result from a smaller proportion of the female population entering the nesting phase in a given year. Female sea turtles do not usually reproduce every year and the remigration interval can range from 1 to 9 years with reproduction occurring when sufficient fat reserves have accumulated to allow for the completion of vitellogenesis. This accumulation of energy reserves may

require several years (Miller, 1997). A third factor which can cause decreases in nesting densities is year-to-year variations in the average number of clutches deposited per nesting female. Frazer and Richardson (1985) reported that mean yearly *C. caretta* clutch frequencies varied from 4.18 to 2.81 nests/female/year on Little Cumberland Island, GA from 1979 to 1982. Such variations would easily account for the decreased nesting of *C. caretta* in Broward County from 1996 to 1997 (Fig. 2). For example, a change of from 4 to 3.3 nests/female/year between 1996 and 1997 would account for the reduced nest count, without requiring a decrease in the number of nesting females.

C. mydas continued its trend of alternating high and low nesting years (Fig 2). This pattern suggests a nearly synchronized two year nesting interval, with 1997 being a non-nesting year for the bulk of the local nesting population. It seems unlikely that variations in the number of nests deposited per year could explain such drastic nesting fluctuations, and the duration of the alternating pattern suggests that it is not due to random immigration and emigration. Because of the four high-nesting years since 1989, there is a weakly significant positive trend ($r = .4428$; $P = .038$) in *C. mydas* nesting since 1981. The explanation of the dramatic increase in *D. coriacea* nesting in 1997 (Fig. 2) defies speculation without further data. However, Figure 7 indicates that a minimum of 8 *D. coriacea* individuals were nesting in the area. The eight nests deposited between Julian dates 119 and 127 (April 30-May 8) must have been deposited by different individuals, since nine days is the minimum internesting interval for this species (Eckert et. al, 1989; Miller, 1997).

The seasonal pattern of *C. caretta* nesting in Broward County (Figs. 3) again conformed to historical expectations, showing a relatively symmetrical bell-shaped trend with the first nest in late April and the mid season peak in late June. The apparently anomalous pattern of 1994 (Burney and Margolis, 1994), when nesting rapidly increased during the early season and then declined abnormally quickly, showed no signs of reoccurring this year. Seasonal patterns at the individual beaches (Fig. 4) showed no obvious deviations from historical norms.

The rank order of *C. caretta* nesting densities on the five beaches (Table 1) was similar to last year, except that Pompano Beach was more heavily nested than Hillsboro Beach. This was probably due to the eroded condition of the beaches at Hillsboro Beach. Pompano Beach was also more heavily nested than Hillsboro Beach in 1994 and 1995, but this reversed in 1996 (Burney and Margolis, 1994, 1995, 1996).

The seasonal patterns of *C. mydas* nesting (Figure 5-6) were typical of recent low-nesting years (Burney and Margolis, 1993, 1995), with heaviest nesting occurring in June and July. Most *D. coriacea* nests were deposited from mid March to mid June, however the first nest was laid on February 28 and was found the following day when surveys commenced. The beginnings and ends of the nesting seasons for all three sea turtle species were within Florida historical bounds (Meylan, Schroeder and Mosier, 1995), however the first *D. coriacea* nest was quite early.

C. mydas continued to prefer Hillsboro Beach beaches over other areas (Table 2; Figs. 6 and 8), probably because of their seclusion and relative lack of nocturnal illumination. *C. mydas* nested second most heavily in Lloyd Park which may also be favored because of its nocturnal seclusion. However the mean nesting density at Lloyd Park was not

significantly different than for the rest of the County, due to the low overall number of nests. This year, *D. coriacea* nested on all County beaches (Table 3; Fig. 6) but they significantly favored Hillsboro Beach, in spite of the eroded condition at the north end of the Town.

The distribution of *C. caretta* nesting along the Broward County coast (Fig. 8) retains features which have been identifiable since 1981. As in the past, beaches near piers, inlets, the Fort Lauderdale strip and throughout Dania, Hollywood and Hallandale were lightly nested. This pattern and its apparent causes have been discussed (Burney and Mattison, 1992; Mattison, Burney and Fisher, 1993). There have been fluctuations in the relative proportions of nests deposited at Pompano Beach and Hillsboro Beach but the low-nested areas have remained constant. As in past years, the nesting density pattern showed no correlation with the nesting success pattern (Fig. 9) which showed no consistent County-wide trends. This continues to suggest that females primarily select their nesting sites prior to their emergence from the sea and that the factors which influence nesting success (cause false crawls) such as disturbance, unfavorable sand conditions, etc. do not primarily control the nesting distribution throughout the County.

The nesting success of *C. caretta* (Fig. 9; Table 4) was not statistically different on Lloyd Park, Fort Lauderdale, Pompano and Hillsboro beaches, but it was significantly lower at Hollywood. Nesting success at Lloyd Park has been significantly lower than at the more northerly beaches for the previous 4 years (Burney and Margolis, 1993-1996).This has been attributed to the rapid beach erosion in northern Lloyd Park. However, the nesting success of *C. caretta* increased 4.2 percentage points this year, making it statistically indistinguishable from

all beaches except Hollywood-Hallandale. Nesting success on Hollywood-Hallandale beach continued its precipitous decline. There has been a 16.8 percentage point reduction in *C. caretta* nesting success in this area since 1995. There was no statistically significant between-beach differences in the nesting successes of *C. mydas* or *D. coriacea* throughout the County (Table 4).

As for every year since 1991, the percentage of eggs producing live hatchlings (including LIN) was significantly lower for relocated *C. caretta* nests than in nests left *in situ* (Table 6). This was also true for all species combined (Figure 13). Lower hatching success in relocated nests can be caused by less suitable incubation conditions at the relocation sites or the relocation process itself. As in past years, we have analyzed the data in an attempt to better understand the source of the reduced success of relocated nests.

Figure 10 shows a significant downtrend in the hatching success of relocated *C. caretta* as the season progressed. This has been found in all but one (1994) of the past 9 years and may be related to increased incubation temperature or the increased likelihood of seawater inundation due to the higher Fall tides and stormier conditions later in the season. Hatching success also declined significantly in *in situ C. caretta* nests suggesting that the relocation process was not the cause of the aforementioned decline in relocated nests.

The hatching success of *D. coriacea* nests (Fig. 11) declined slightly over the season, but the trend was not statistically significant. There was no detectable trend in the hatching success of *in situ* nests. The same lack of seasonal trends in hatching success were found for *C. mydas*. These were not plotted because of the small number of investigated nests.

Figure 12 shows that the difference in the overall hatching success of relocated and *in situ C. caretta* nests was caused by a higher proportion of relocated nests with intermediate hatching success (ca. 50 to 80 percent) and a higher proportion of high-success (ca 85 to 100 percent) in *in situ* nests. Relocation did not cause increased proportions of lower-hatching nests (≤45 percent). The lower overall hatching success of relocated nests is not due to the total failure of a significant fraction of the nests.

The differences in the success of relocated and *in situ* nests may be partially related to differences in the suitability of the relocation sites and to the relocation process itself. Table 7 shows differences in the proportions of some of the categories of unhatched eggs or unemerged hatchlings. To evaluate these factors more closely we have chosen to focus attention on the comparison of *in situ* and relocated *C. caretta* nests at Hillsboro Beach. This was done to minimize extraneous variables because the restraining hatcheries did not receive nests continuously throughout the season, the Lloyd Park project was not conducted by NSU personnel and the number of *in situ* nests elsewhere in the County was small. Table 10 shows that the mean hatching success [(live hatchlings/total eggs) x 100] was not statistically different at the two mass relocation sites (BH957 and BH1) and for the *in situ* nests. This indicates that the mass relocation process (including road transport) was not inherently destructive to the eggs. Nests relocated to other areas of Hillsboro Beach showed a significantly lower success rate. Most of these nests were grouped together in two unnamed beach sites because most other beach locations were unsuitable due to erosion. Incubation conditions must have been less favorable at one or both of these sites.

Significant differences in the mean success of nests relocated to different sites at Hillsboro Beach have been previously observed (Burney and Margolis, 1996).

Table 7 shows differences in some of the unhatched egg and unemerged hatchling categories between *in situ* and relocated Hillsboro Beach nests. The proportion of LIN hatchlings was significantly lower for in situ nests and for those relocated to unnamed locations of Hillsboro Beach (BH). Because of their more scattered locations, some of these nests were investigated up to one week after hatching, decreasing the probability of discovering live unemerged hatchlings. The greatest difference between Hillsboro *in situ* and relocated (BH) nests was in the VD and NVD categories which were 3.1 and 4.9 percent higher (respectively) in relocated than for *in situ* nests. This difference was not as extreme when comparing Hillsboro *in situ* and BH1 or BH957 nests.

Tables 7 and 8 show differences in hatchling and unhatched egg categories for *C. mydas* and *D. coriacea*. Discussion of these differences for *C. mydas* would be very tenuous due to the small number of evaluated nests. The overall success of relocated *C. mydas* nests was higher than for those left *in situ*. Hatchling and emergence successes for relocated *D. coriacea* nests were slightly (but significantly) lower than for *in situ* nests (Tables 6 and 9). At Hillsboro Beach, the largest difference between *in situ* and relocated (BH, BH1) *D. coriacea* nests was in the PIP category, which was very significantly higher than for *in situ* nests. There was also a much higher proportion of eggs showing no visible development (NVD) in nests relocated to BH1 than in *in situ* Hillsboro Beach nests, but this was not the case for BH nests.

The use of mass egg relocation as a sea turtle management tool is a highly manipulative technique, and should only be employed when less intrusive alternatives would result in direct hatchling mortality. In the absence of factors which mandate that nests in Broward County be relocated, it would be preferable, and much less costly, to leave far more nests in situ. However, until beach front lighting and other conditions hazardous to hatchlings can be reduced or mitigated, nest relocation appears to ensure the greatest chance that hatchlings will survive to begin their ocean odyssey.

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APPENDIX 1: Summary of sea turtle hot-line calls.

SUBJECT	HOT-LINE
EMERGENCIES	
Nesting	2
Hatchlings	17
NEST LOCATIONS	65
STRANDINGS	13
POACHING	6
VOLUNTEERS	22
OTHER	NUMEROUS
OVERALL	> 125

APPENDIX 2: **Summary of Educational/Public Information Activities**

Flyers were distributed along the beach, mostly to people who approached workers with questions and at the night turtle releases at Pompano and Fort Lauderdale, which usually attracted crowds. Flyers were also placed in beach-front business establishments and some were distributed to people touring the Oceanographic Center or requesting information by phone or mail.

Public education talks were conducted on Sunday and Wednesday evenings from August 3 to Sept. 17 at the Anne Kolb Nature Center. These slide show presentations were followed by hatchling releases at Greene St. in Hollywood. Special presentations were conducted at the NSU Oceanographic Center on Sept. 26, for students of Cooper City High School and on Sept. 24 for students of Piper High School. These presentations were followed by hatchling releases in Lloyd Park.

Public talks and slide shows (without hatchling releases) were given for the Floranada Elementary School, Indian Trace Elementary, Deerfield Academy, New River Middle School, Stirling Elementary, McFatter Vocational Technical Center, Chapel Trail Elementary (two talks on separate days), James S. Hunt Elementary and the North Broward Family YMCA.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MARINE TURTLE NESTING SUMMARY QUESTIONNAIRE FOR 1997

Instructions: Please type or print legibly in ink. Please be sure completed form is signed by the principal permit holder. Attach additional sheets if necessary.

1. PRINCIPAL PERMIT HOLDER INFORMATION

Principal Permit Holder: Louis Fisher | Permit #: 108

Organization: Broward County Department of Natural Resource Protection

Address: 218 SW 1 Avenue

Ft. Lauderdale FL 33301

County: Broward

Day Telephone (include area code): 954-519-1255 | Night Telephone (include area code): 954-429-9248

Beach Name: Broward Co Bchs

2. GENERAL SURVEY INFORMATION

Survey Boundary Information: Please describe survey boundaries geographically. Be specific and use known landmarks that can be found on a map (or include a marked map). For example - North Boundary: 1.5 miles south of the Martin/St. Lucie County Line; South Boundary: St. Lucie Inlet.

North Survey Boundary: Palm Bch Co line (excluding John U. Lloyd SPA)

South Survey Boundary: Dade Co line

Beach Length: 38.6 (km) / mi (circle unit) | Is beach length ESTIMATED or (MEASURED) ? (circle one)

Was this the exact same survey area as your 1996 survey area? (circle one): (YES) NO

If NO, please explain the specific differences:

Start Date of Survey (include month AND day): March 1 | End Date of Survey (include month AND day): Sept. 15

Time of Day Surveyed: START 6:00 or dawn (AM) / PM (circle one): FINISH 9:00 (AM) / PM (circle one)

Number of Days Per Week Surveyed: 7 ; If you did not survey seven (7) days per week, describe how nests are counted on the day(s) surveys are resumed:

Was there any variation in the number of days surveyed per week or was the entire beach surveyed the same number of times every week of the nesting season? (circle one): (SAME) VARIABLE

If VARIABLE, please explain the specific variation and give the total number of days surveyed during the nesting season:

Were all non-nesting crawls (false crawls) counted during your survey? (circle one): (YES) NO

How many people were involved in surveying the nesting beach during 1997?: 24

COMPLETE THE BACK OF THIS FORM ALSO

3. NESTING BEACH MANAGEMENT INFORMATION

Please respond to all of the following questions regarding management techniques (SEE ATTACHED NEST SUCCESS REPORTING FORM FOR SPECIFIC DEFINITIONS OF IN SITU NESTS, RELOCATED NESTS, ETC.)

Did you leave nests *in situ*? (circle one): (YES) NO

Did you cover *in situ* nests with flat screen? (circle one): (YES) NO N/A (not applicable) Lloyd Park only

Did you cover *in situ* nests with an above-ground cage (not a hatchery)? (circle one): YES (NO) N/A
If YES, was the cage SELF-RELEASING or RESTRAINING ? (circle one)

Did you relocate nests (not to a hatchery)? (circle one): (YES) NO
If YES, did you relocate nests (INDIVIDUALLY) (e.g., simply moving the nest directly landward of the *in situ* location or otherwise maintaining natural nest spacing) or reburied them in a (GROUP) with other beach relocated nests? (circle one) (BOTH)

If you did relocate nests, please give reasons: 1) Nest located within 20 ft of previous evening wrack line. 2) Nest near a highway or other artificially lighted area.

Did you cover relocated nests with flat screen? (circle one): (YES) NO N/A (not applicable) Lloyd Park only

Did you cover relocated nests with an above-ground cage (not a hatchery)? (circle one): YES (NO) N/A
If YES, was the cage SELF-RELEASING or RESTRAINING ? (circle one)

Did you use a hatchery? (circle one): (YES) NO
If YES, was the hatchery SELF-RELEASING or (RESTRAINING) ? (circle one)

If a hatchery was used, please give reasons: 1) Nest located within 20 feet of previous evening wrack li
2) Nest located near highway or other artificially lighted area.

If a hatchery was used, please give specific location: Pompano Beach at Atlantic Blvd.
Ft. Lauderdale at South Beach Municipal Parking Lot. Hollywood at North Beach Park

If predator control methods other than the screening/caging described above were employed, please describe:

List all non-human predators documented depredating nests in 1996: Fox, Raccoon, Ghost Crab

Were hatchling disorientation events documented during 1997? (circle one): (YES) NO
If YES, have all disorientation reports been submitted to DEP? (circle one): (YES) NO

I certify the above information to be true and accurate to the best of my knowledge.

Signature of Principal Permit Holder

12-1-97
Date

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NESTING SURVEY REPORTING FORM FOR 1997

Principal Permit Holder: Lalls Fisher			Permit Number: 108
Beach Name: Brevard Co Bchs			
	C. caretta (Loggerhead)	*C. mydas* (Green Turtle)	*D. coriacea* (Leatherback)
Total # of Nests	2216*	29	42
Total # of Non-Nesting Emergences (False Crawls)	2382	48	10
Date (month **and** day) of First Documented Nest	18 April	24 May	28 Feb.
Date (month **and** day) of Last Documented Nest	08 Sept.	10 Sept.	19 June
***In situ* Nest Data:** *In situ* nests are those left where the turtle deposited the clutch. *In situ* nests may be left without additional protection, screened with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages. Record the number of nests by category and species. For each species, rows a + b + c + d should equal the total # of nests left *in situ*. Please check to make sure this is the case.			
Total # of Nests Left *in situ* (a + b + c + d)	581	23	22
(a) # of *in situ* Nests without Additional Protection	579	21	21
(b) # of *in situ* Nests with Self-Releasing Flat Screen	2	2	1
(c) # of *in situ* Nests with Self-Releasing Cage	0	0	0
(d) # of *in situ* Nests with Restraining Cage	0	0	0
Relocated Nest Data: Relocated nests are those where the clutch is removed from its original site of deposition and reburied at another site. These nests may be relocated to individual sites or as a group to a hatchery (a permanent or semi-permanent fenced or caged area where many nests are re-buried as a group). As with *in situ* nests, relocated nests may be left without additional protection, covered with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages. Hatcheries may be self-releasing (hatchlings escape unaided) or restraining (hatchlings cannot escape unaided). Record the number of nests by category and species. For each species, rows a + b + c + d + e + f should equal the total # of relocated nests. Please check to make sure this is the case.			
Total # of Relocated Nests (a + b + c + d + e + f)	1619*	6	20
(a) # of Relocated Nests without Additional Protection	1325*	6	11
(b) # of Relocated Nests with Self-Releasing Flat Screen	2	0	0
(c) # of Relocated Nests with Self-Releasing Cage	0	0	0
(d) # of Relocated Nests with Restraining Cage	0	0	0
(e) # of Relocated to Self-Releasing Hatchery	0	0	0
(f) # of Relocated to Restraining Hatchery	292	0	9

DEP/OMR/FMRI: Revised 4/97 (NESTSUMM.FRM)

* Includes 16 poached nests

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - NEST SUCCESS REPORTING FORM FOR 1997
SPECIES: *Caretta caretta* (Loggerhead)

PRINCIPAL PERMIT HOLDER: Lalis Fisher				BEACH NAME: Brevard Co Bchs							PERMIT NUMBER:	
	TOTAL # OF NESTS	# OF NESTS MARKED TO EVALUATE	# OF MARKED NESTS DEPREDATED	# OF NESTS ACTUALLY EVALUATED	# OF EGGS IN EVALUATED NESTS	# OF HATCHLINGS EMERGED	# OF LIVE HATCHLINGS IN NEST	# OF DEAD HATCHLINGS IN NEST	# OF PIPPED LIVE	# OF PIPPED DEAD	# OF UNHATCHED EGGS	# OF DEPREDATED EGGS
IN SITU/NO ADDITIONAL PROTECTION	579	579	76	333	35223	25992	813	746		2454	5218	-
IN SITU/FLAT SCREEN	2	2	2	0								
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	1325	1325	159	1135	141917	70657	11291	2417		18580	20112	18860
RELOCATED/FLAT SCREEN (NOT IN A HATCHERY)	2	2	0	1	90	79	1	1		1	8	-
RELOCATED/RESTRAINING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF-RELEASING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF-RELEASING HATCHERY												
RELOCATED/RESTRAINING HATCHERY	292	297	0	290	23954	16426	2232	351		1971	2974	0
OTHER (EXPLAIN) *	**	-	-	-	1561	1454					107	
DEP USE ONLY												

DEFINITION OF TERMS:

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RELOCATED: CLUTCH WAS RELOCATED FROM THE ORIGINAL SITE OF DEPOSITION
SELF-RELEASING: A SCREEN, CAGE, OR HATCHERY THROUGH WHICH HATCHLINGS ESCAPE UNAIDED
RESTRAINING: A SCREEN, CAGE, OR HATCHERY THAT DOES NOT ALLOW HATCHLINGS TO ESCAPE UNAIDED
HATCHERY: A FENCED OR CAGED AREA WHERE MANY NESTS ARE REBURIED
PIPPED: HATCHLING BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL, NOT A HATCHED EGG

ADDITIONAL INFORMATION FOR SOME COLUMN HEADINGS:

OF MARKED NESTS DEPREDATED: COUNT ONLY THOSE DEPREDATED BY NON-HUMAN PREDATORS
OF EGGS IN EVALUATED NESTS: DIRECT COUNT IN RELOCATED NESTS, COUNT EGGSHELLS OF IN SITU NESTS
OF HATCHLINGS EMERGED: COUNT ONLY THOSE EMERGED UNAIDED (PRIOR TO NEST EVALUATION)
OF UNHATCHED EGGS: COUNT ONLY WHOLE, UNPIPPED EGGS
OF DEPREDATED EGGS: IT IS IMPORTANT TO INCLUDE DATA FROM AS MANY NESTS THAT WERE ORIGINALLY MARKED FOR NEST SUCCESS EVALUATIONS AS POSSIBLE, EVEN IF A MARKED NEST IS PARTIALLY OR COMPLETELY DEPREDATED. IF A REASONABLY ACCURATE COUNT OF DEPREDATED EGGS CAN BE MADE (FROM FRESHLY DEPREDATED NESTS ONLY), PLEASE INCLUDE THAT DATA IN THIS NEST SUCCESS REPORTING FORM.

IMPORTANT: THE # OF HATCHLINGS EMERGED + # OF LIVE HATCHLINGS IN NEST + # OF DEAD HATCHLINGS IN NEST + # OF PIPPED LIVE + # OF PIPPED DEAD + # OF UNHATCHED EGGS + # OF DEPREDATED EGGS SHOULD EQUAL THE # OF EGGS IN EVALUATED NESTS. PLEASE CHECK TO MAKE SURE THIS IS THE CASE.

* Eggs hatched in DERM incubator
** Eggs removed from 80 nests listed as Relocated/Restraining Hatchery above

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - NEST SUCCESS REPORTING FORM FOR 1997
SPECIES: *Chelonia mydas* (Green Turtle)

PRINCIPAL PERMIT HOLDER: Louis Fisher | BEACH NAME: Broward Co Bchs | PERMIT NUMBER:

	TOTAL # OF NESTS	# OF NESTS MARKED TO EVALUATE	# OF MARKED NESTS DEPREDATED	# OF NESTS ACTUALLY EVALUATED	# OF EGGS IN EVALUATED NESTS	# OF HATCHLINGS EMERGED	# OF LIVE HATCHLINGS IN NEST	# OF DEAD HATCHLINGS IN NEST	# OF PIPPED LIVE	# OF PIPPED DEAD	# OF UNHATCHED EGGS	# OF DEPREDATED EGGS
IN SITU/NO ADDITIONAL PROTECTION	21	21	2	5	534	320	9	35		70	100	–
IN SITU/FLAT SCREEN	2	2	1	1	153	94	2	5		1	51	–
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	6	6	2	4	690	240	59	2		12	118	259
RELOCATED/FLAT SCREEN (NOT IN A HATCHERY)												
RELOCATED/RESTRAINING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF-RELEASING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF RELEASING HATCHERY												
RELOCATED/RESTRAINING HATCHERY	0											
OTHER (EXPLAIN)												
DEP USE ONLY												

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HATCHERY: A FENCED OR CAGED AREA WHERE MANY NESTS ARE REBURIED
PIPPED: HATCHLING BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL, NOT A HATCHED EGG

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - NEST SUCCESS REPORTING FORM FOR 1997
SPECIES: *Dermochelys coriacea* (Leatherback)

PRINCIPAL PERMIT HOLDER: Lalis Fisher | BEACH NAME: Broward Co Bchs | PERMIT NUMBER: 195

	TOTAL # OF NESTS	# OF NESTS MARKED TO EVALUATE	# OF MARKED NESTS DEPREDATED	# OF NESTS ACTUALLY EVALUATED	# OF EGGS IN EVALUATED NESTS	# OF HATCHLINGS EMERGED	# OF LIVE HATCHLINGS IN NEST	# OF DEAD HATCHLINGS IN NEST	# OF PIPPED LIVE	# OF PIPPED DEAD	# OF UNHATCHED EGGS	# OF DEPREDATED EGGS
IN SITU/NO ADDITIONAL PROTECTION	21	21	2	16	1072	676	68	27		72	229	-
IN SITU/FLAT SCREEN	1	1	1	1	99	49	0	6		1	43	-
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	11	11	2	8	931	399	24	19		98	183	208
RELOCATED/FLAT SCREEN (NOT IN A HATCHERY)												
RELOCATED/RESTRAINING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF-RELEASING CAGE (NOT IN A HATCHERY)												
RELOCATED/SELF-RELEASING HATCHERY												
RELOCATED/RESTRAINING HATCHERY	9	9	0	9	791	437	48	6		53	247	-
OTHER (EXPLAIN)												
DEP USE ONLY												

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1. TITLE AND SUBTITLE TECHNICAL REPORT 97 - 08 SEA TURTLE CONSERVATION PROGRAM BROWARD COUNTY, FLORIDA. 1997 REPORT.	2. REPORT DATE January, 1998
3. CONTRIBUTORS Dr. Curtis Burney and Mr. William Margolis	4. PERFORMING ORGANIZATION REPORT NO. Technical Report 97-08
5. RESPONSIBLE DEPARTMENT AND DIVISION Nova Southeastern University Oceanographic Center 8000 North Ocean Drive Dania, Florida 33004	6. STRATEGIC ASSESSMENT PROGRAM ELEMENT NO. 7. CONTRACT/GRANT NO.
8. SPONSORING AGENCY NAME AND ADDRESS Broward County Department of Natural Resource Protection Biological Resources Division 218 S.W. 1st Avenue Ft. Lauderdale, Florida 33301	9. TYPE OF REPORT AND PERIOD COVERED Technical - Research
10. SUPPLEMENTARY NOTES	

11. ABSTRACT

Since 1978, the Broward County Department of Natural Resource Protection has provided for the conservation of endangered and threatened sea turtles that nest on the beaches of Broward county. Four species of sea turtle nest on Broward County beaches between March 1st and October 31st each year. The most numerous is the loggerhead (*Caretta caretta*) sea turtle, presently listed as threatened in Florida. Three endangered species nest here, the green sea turtle (*Chelonia mydas*), the leatherback (*Dermochelys coriacea*), and the hawksbill (*Eretmochelys imbricata*). The Program is conducted to contribute to the statewide initiative that insures that sea turtle species can continue in the Florida region with the maximum survivability possible. The program surveys the entire coastline of the County, daily, to determine the number of nests deposited, the number of non-nesting emergences, and to compare results with previous years surveys to determine short-term and long-term trends. The surveyors relocate nests from beach areas where hatchlings are threatened by natural or anthropogenic interference to safer beach areas thus maximizing hatchling survival and recruitment.

The 1997 survey revealed 2288 nests county wide. The distribution among the species was as follows: 2216 were loggerhead, 29 were green, 42 were leatherback, and one nest was confirmed as hawksbill. This result is the first yearly decline in surveyed nests since 1993. The reduction may be due to natural fluctuations in the active nesting population or, at least here in Broward County, due to a severe and significant reduction nesting habitat at the Town of Hillsboro Beach where the northern third of the beach has eroded away. 59.8% of the surveyed nests were relocated to safer beaches or to enclosed hatcheries. Long-term nesting trends, seasonal nesting patterns, nesting success patterns, hatching success percentages, and hatching success percentages among relocated nests were evaluated and compared among survey years. A discussion is presented concerning the use of egg relocation as a long-term sea turtle management tool. The technique is a highly manipulative alternative that should only be employed when other less intrusive alternatives would result in hatchling mortality. However, until beachfront lighting and other conditions hazardous to hatchling sea turtles can be mitigated or reduced, nest relocation appears to ensure the greatest chance that hatchlings will survive.

12. KEY WORDS

Sea Turtles, Hatchling Sea Turtles, Conservation of Sea Turtles

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Department of Natural Resource Protection
Biological Resources Division
218 S.W. 1st Avenue ● Fort Lauderdale 33301
(954) 519-1230 ● Fax (954) 519-1412

Broward County Board of County Commissioners
Norman Abramowitz ● Scott I. Cowan
Suzanne N. Gunzburger ● Ilene Lieberman
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