

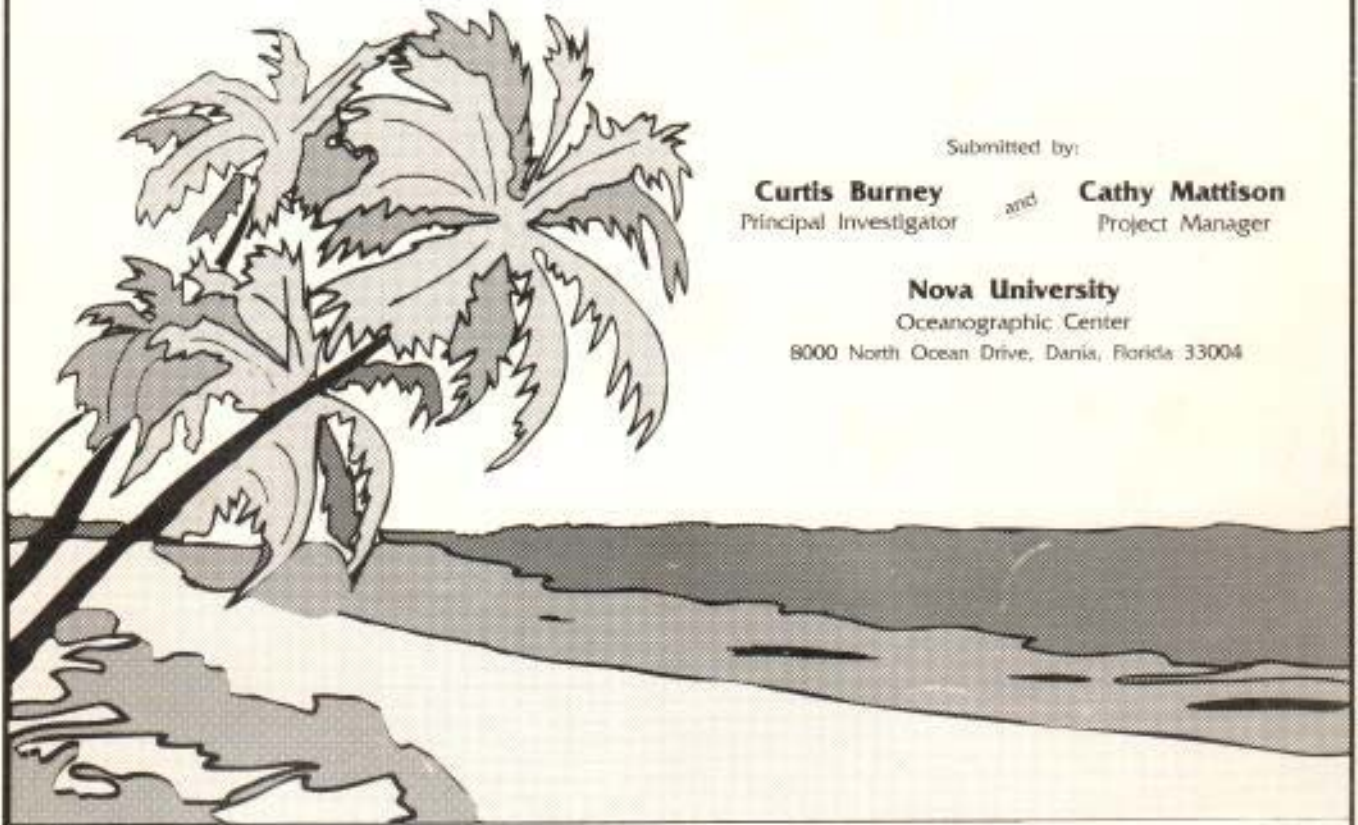
Burney

Technical Report 93-1

Sea Turtle Conservation Program

Broward County, Florida

1992 Report



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Broward County Board of County Commissioners

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Biological Resources Division

Marine Resources Section

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TABLE OF CONTENTS

LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
ACKNOWLEDGEMENTS	v
INTRODUCTION.....	1
MATERIALS AND METHODS.....	3
RESULTS.....	8
DISCUSSION	37
REFERENCES.....	43
APPENDICES	
I. Summary of Hotline Calls	44
II. Summary of Educational Activities.....	45
III. Sea Turtle Summary Report Form.....	46

LIST OF TABLES

Table 1: Total <i>C. caretta</i> nests and nesting densities expressed as nests-per-kilometer for 1992.	12
Table 2: Total <i>C. mydas</i> nests and nesting densities expressed as nests-per-kilometer for 1992.	15
Table 3: Total <i>D. coriacea</i> nests and nesting densities expressed as nests-per-kilometer for 1992.	17
Table 4: Total nests, false crawls and percent nesting success for three sea turtle species in each of five Broward County beach areas during 1992.	21
Table 5: The total number of nests relocated to Hillsboro beach, fenced hatcheries, or left <i>in situ</i>	22
Table 6: Mean hatching success of <i>C. caretta</i> nests relocated to hatcheries and to Hillsboro beach.	28
Table 7: Total egg counts, released hatchlings and overall hatching successes for <i>in situ</i> and relocated nests of <i>C. caretta</i> , <i>C. mydas</i> and <i>D. coriacea</i>	29
Table 8: County wide summary of lost, destroyed and uninvestigated nests for 1992.	30
Table 9: County wide summary of egg counts from lost, destroyed and uninvestigated nests for 1992.	31
Table 10: Contingency table analyses of the effect of beach renourishment on nesting success in John Lloyd State Recreation Area.	33
Table 11: One-way ANOVA analyses of the effect of beach renourishment on hatching success of natural (<i>in situ</i>) <i>C. caretta</i> nests in John Lloyd State Recreation Area in 1992.	34
Table 12: One-way ANOVA analyses of the effect of beach renourishment on hatching success of natural (<i>in situ</i>) <i>C. caretta</i> nests in John Lloyd State Recreation Area in 1992.	34

LIST OF FIGURES

Figure 1: The historical pattern of sea turtle nesting densities in Broward County since full surveys began in 1981	9
Figure 2: Historical nesting patterns for <i>C. caretta</i> , <i>C. mydas</i> and <i>D. coriacea</i> in Broward County, 1981-1992	10
Figure 3: The seasonal pattern of daily <i>C. caretta</i> nest counts in Broward County, 1992.....	11
Figure 4: Comparison of the daily nesting patterns of <i>C. caretta</i> on the five Broward Co. beaches during 1992.	13
Figure 5: The seasonal patterns of daily <i>C. mydas</i> and <i>D. coriacea</i> nest counts in Broward County, 1992.	14
Figure 6: Comparison of the daily nesting patterns of <i>C. mydas</i> and <i>D. coriacea</i> on the five Broward County beaches during 1992.	16
Figure 7: Locations of <i>C. caretta</i> , <i>C. mydas</i> , and <i>D. coriacea</i> nests in Broward Co., 1992, listed by DNR locator number.	19
Figure 8: The horizontal distribution of average <i>C. caretta</i> , <i>C. mydas</i> and <i>D. coriacea</i> nesting success on each beach segment identified by the DNR survey markers.....	20
Figure 9: The mean hatching success of <i>C. caretta</i> , <i>C. mydas</i> and <i>D. coriacea</i> nests during 1992, for each of the beach segments listed by DNR monument numbers.	23
Figure 10: Comparison of the seasonal patterns of <i>C. caretta</i> hatching success in relocated and <i>in situ</i> nests during 1992.	24
Figure 11: Comparison of the seasonal patterns of <i>C. mydas</i> hatching success in relocated and <i>in situ</i> nests during 1992.	26
Figure 12: The historical patterns of yearly hatching success in relocated and <i>in situ</i> (natural) nests since fenced beach hatcheries were first employed in 1981.	27

Figure 13: Yearly comparisons of total sea turtle nest counts and nesting successes in the four zones of John Lloyd State Park.32

Figure 14: Comparison of total nest counts and the nesting success of *C. caretta* and *C. mydas* on Hollywood-Hallandale beaches from 1990-1992.36

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Pompano Beach Maint. Dept. and **Public Works Dept.**

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The Department of Natural Resources, Florida Marine Patrol

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INTRODUCTION

Since 1978, the Broward County Department of Natural Resource Protection (BCDNRP) has provided for the conservation of endangered and threatened sea turtle species within its area of responsibility, according to provisions of permits issued by the U.S. Army Corps of Engineers, the Florida Department of Environmental Regulation and the Florida Department of Natural Resources. Broward County is within the 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 Natural Resources (FDNR), which subsequently issues permits to individuals, universities and government agencies. This project was administered by the BCDNRP and conducted by the Nova University Oceanographic Center under Marine Turtle Permit #129, issued to the BCDNRP by the FDNR Institute of Marine Research, St. Petersburg, Florida. The BCDNRP is especially concerned with any environmental effects of intermittent beach renourishment projects on shorelines and the offshore reefs. As part of this concern, the BCDNRP has maintained the sea turtle conservation program in non-renourishment years to provide a continuous data base.

Operation of the program is competitively bid and a contract award is issued based on a selection committee review of submitted bids through a weighted point factor procedure. Nova University was awarded the contract to conduct the 1992 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 on sea turtles and their conservation.

MATERIALS AND METHODS

Beach Survey

Daily beach surveys commenced at sunrise, except at Fort Lauderdale where early beach cleaning required a slightly earlier start. For survey purposes the county was divided as follows:

<u>BEACH</u>	<u>LENGTH (km)</u>	<u>BOUNDARIES</u>	<u>DNR SURVEY MARKER #</u>
Hillsboro- Deerfield	7.0	Palm Beach Co. line to Hillsboro Inlet	1-24
Pompano	7.7	Hillsboro Inlet to Commercial Blvd.	25-50
Ft.Lauderdale	10.6	Commercial Blvd to Port Everglades Inlet	51-84
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, Pompano, Fort Lauderdale and Hollywood beaches commenced on April 23. The beaches were patrolled through September 15th. Nests were located using DNR survey markers numbered consecutively from 1 to 128 in Broward County. Marker numbers corresponding to each beach area are listed above. Each nest was initially located relative to the nearest building, street, or other land mark. These locations were later cross referenced to the nearest survey marker.

The beach at John U. Lloyd State Recreation Area was surveyed by park personnel, who provided the data for that area. Due to the relative lack of land

marks in the park, four 1 km zones (zone 1 farthest north) were used for recording nest locations. This was also done to provide continuity with the data collected during the previous three years, to assess the effects of a completed beach renourishment project on nesting patterns.

Surveyors used all-terrain vehicles that could carry four to eight turtle nests 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, nests were picked up on the first pass, with help from a second person who transported the eggs by car. When there were many nests requiring relocation, and no road support, 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 mean high water line,
- 2) a nest located in an area with a high level of pedestrian traffic,
- 3) 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,
- 4) a nest located in an area subject to beach renourishment,
- 5) a nest deposited directly in existing, dense vegetation where roots might interfere with successful emergence of the hatchlings.

Especially due to definition 3, 100% of the nests at Pompano, and Fort Lauderdale were considered to be affected and therefore were relocated to hatcheries or dark beach locations on Hillsboro beach. Nests to be relocated were carefully dug by hand, and transported in buckets containing sand from the natural nest chamber.

Chamber depth was measured in order to accurately rebury nests at their original depth. They 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 and Lloyd Park beaches, were marked and left *in situ*. After hatching, 193 of these nests were excavated. Hatching (actual emergence) success for *in situ* nests was defined as the percentage of spent shells (assumed to have yielded live hatchlings) compared to the sum of spent shells, piped eggs, eggs with arrested or no visible development, and hatchlings found dead in the nest.

Hatchery Operations

As in previous years, eggs were relocated to three chain-link fenced hatcheries located (one each) at Pompano beach near Atlantic Blvd., at the South Beach municipal parking lot in Fort Lauderdale, and at North Beach Park in Hollywood. A self-releasing hatchery, located in Lloyd Park, was operated by park personnel. After hatching, all hatchery nests were dug, and counts of spent shells, hatchlings dead in the nest, 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 screen cage or 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. After hatching commenced, the hatcheries were checked each night between 9 PM and midnight. After counting, hatchlings were released that same night in dark sections of Fort Lauderdale, Hillsboro or Lloyd Park beaches by allowing them to crawl through the intertidal zone into the surf. Hatchlings discovered at dawn 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.

Because of the high nesting density early in the season and the high

percentage of relocated nests, the Pompano and Fort Lauderdale hatcheries quickly filled. After June 1, nests from Fort Lauderdale and Pompano were relocated to Hillsboro Beach. Hatched nests in the hatcheries were completely dug out along with the surrounding sand and replaced with fresh sand before new egg chambers were dug. Old sand was spread outside the hatchery. Fresh sand was obtained elsewhere on the beach.

Data analysis

The data was compiled, analyzed and plotted primarily with Quattro Pro. County-wide yearly nesting densities from 1981 to 1992 for *C. caretta*, *C. mydas*, and *D. coriacea* were plotted and trends were assessed by linear regression and correlation analyses. Seasonal nesting patterns of *C. caretta* were plotted for each of the five beaches. Nesting densities were calculated per km for each beach and the data (except for *D. coriacea*) were compared with 1-way analysis of variance (ANOVA) and Student-Newman-Keuls (SNK) tests (at the .05 significance level) (Zar, 1974). The total number of nests deposited by each species in the beach segments corresponding to each DNR 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 ANOVA and SNK analyses. The total nesting success in each beach segment was plotted versus its DNR survey number.

The hatching success of nests deposited at the individual beaches was compared graphically. Overall hatching success of relocated and *in situ* nests of *C. caretta* and *C. mydas* were compared by one-way ANOVA. *C. caretta* hatching success at the hatcheries and the Hillsboro relocation site were compared with ANOVA.

The total number of relocated nests, eggs, lost or destroyed eggs and hatchlings released were tabulated for each beach. An accounting of the lost or

destroyed nests and eggs was tabulated. Loss categories included predation, lost location, Hurricane Andrew, unspecified (for Lloyd Park) and unknown. In addition, the *in situ* nests which were not investigated are listed as not dug. Lost eggs were those from nests left *in situ* or relocated outside a hatchery which should have hatched prior to the hurricane but whose locations were lost due to unauthorized removal of the markers. The fate of these eggs is unknown, but many probably hatched normally. All eggs from nests predated by raccoons, foxes or humans were considered destroyed for hatching success calculations, although many nests were only partially predated and some eggs hatched. Unlike past years, 19 nests were destroyed by poachers. All such instances were immediately reported to the marine patrol and one poacher was apprehended. The unknown loss category includes some nests relocated to Hillsboro Beach which hatched normally but were not further investigated. Hurricane Andrew caused much destruction and loss of data. Although the storm came ashore some 50 miles south of the main relocation site at Hillsboro Beach, most marker stakes were washed away and many nests destroyed. After the storm, the hurricane was listed as the cause for all lost or destroyed nests which were on the beach at that time. No eggs from lost or destroyed nests were included in hatching success calculations.

Nesting and nesting success patterns in John Lloyd State Recreation Area were plotted and compared to data collected before, during and after a beach renourishment project in 1989. Nesting success and hatching success of *in situ* *C. caretta* were compared graphically and by contingency table analysis in beach zones 3 and 4. Beach zone 3 was renourished during the summer of 1989, while zone 4 was left in its natural condition. Nesting and hatching success from 1990 to 1992 were compared graphically and by ANOVA for Hollywood-Hallandale beach to assess the effects of the 1991 renourishment.

RESULTS

Figure 1 gives the historical trend of total sea turtle nest counts in Broward County. A total of 2360 sea turtle nests were surveyed county-wide in 1992. This exceeded the 1991 count and was second only to the 1990 total of 2385. This is the third consecutive high nesting year. The mean nest count for the last three years (2254) is very significantly greater than the mean count of 1412 from 1981 thru 1989 ($t = 6.0$; $P << .001$). Figure 2 shows the nesting trends for the three species. The trend line for *C. caretta* (Fig 2A) has a strongly positive slope, which is significant at a higher level of confidence than in 1991. *C. mydas* nesting (Fig 2B) showed a strong increase from 1991, and broke the previous record set in 1990, but there is still no significant positive overall trend over the 11 year period. *D. coriacea* again nested at low levels, with no significant historical trends. Figure 3 gives the seasonal pattern of daily *C. caretta* nesting. The pattern is very similar to past years. Table 1 and Figure 4 give the total *C. caretta* nesting densities and seasonal patterns for the five beaches, respectively.

The county-wide seasonal nesting pattern for *C. mydas* is shown in Figure 5. Only 11 *C. mydas* nests were deposited in the county in 1991, but the 1992 pattern is very similar to that of 1990. Table 2 gives the nest counts, nests per km and nests per km per day for *C. mydas*, and Figure 6 illustrates its seasonal nesting patterns at the individual beaches. *C. mydas* nested on all beaches except Hollywood-Hallandale. As in 1990, nesting densities were distinctly higher at Hillsboro than any of the other beaches.

Table 3 and Figure 6 give the distribution of *D. coriacea* nesting. Of a total of 7 nests, 5 were in Hillsboro. One nest was deposited on south Hallandale beach, close to the Dade County line. The data were too few for statistical

COUNTY SEA TURTLE NESTING HISTORY

TOTAL NESTS

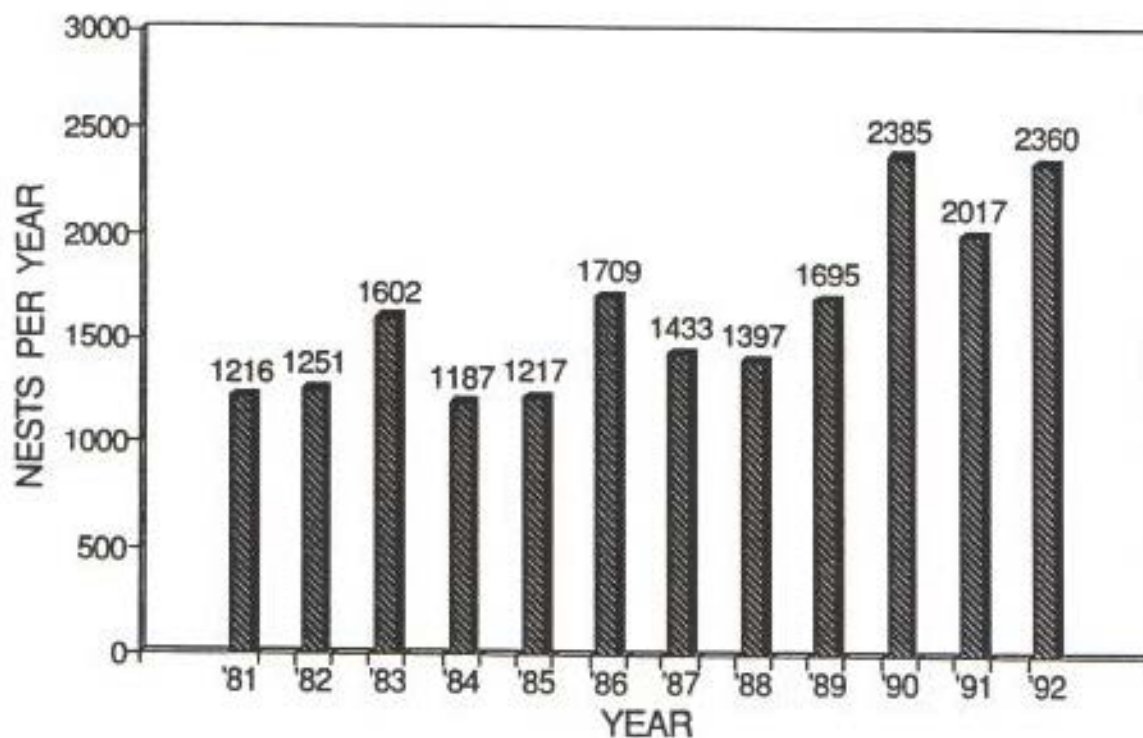
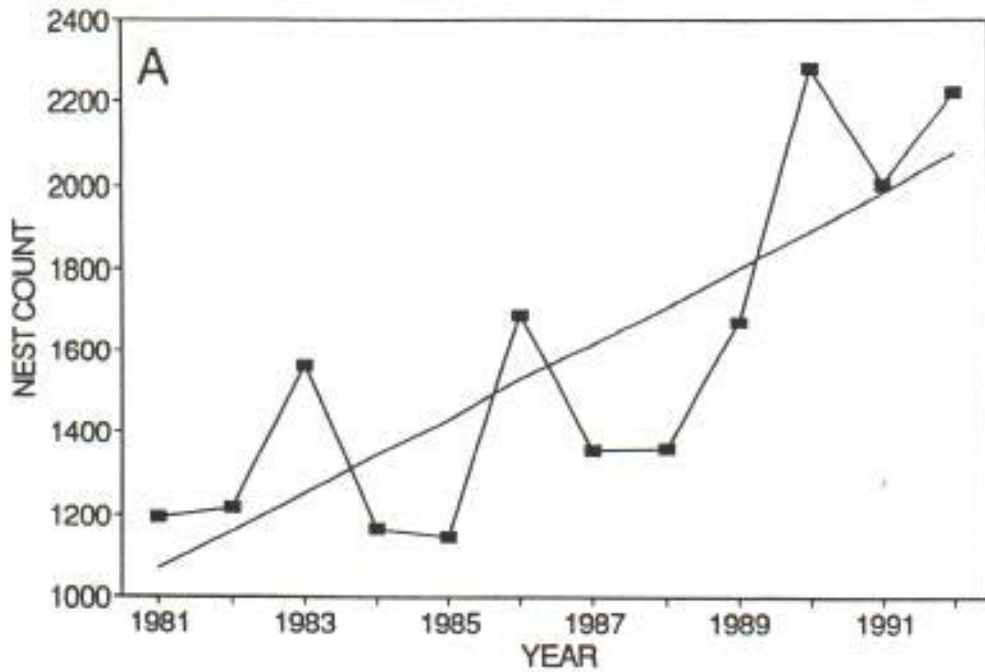


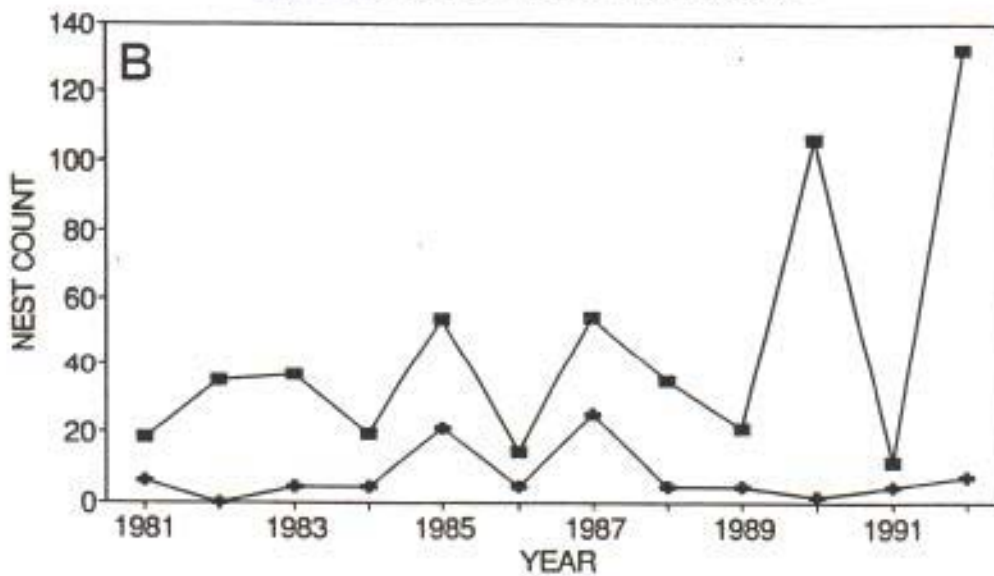
Figure 1: The historical pattern of total sea turtle nesting in Broward Co. since full surveys began in 1981.

TOTAL BROWARD LOGGERHEAD NESTS

$r = .808$ $P < .001$



TOTAL BROWARD NESTS GREENS AND LEATHERBACKS



■ *C. mydas* ◆ *D. coriacea*

Figure 2: Historical nesting patterns for *C. caretta* (A) and *C. mydas* and *D. coriacea* (B) in Broward Co. since 1981.

BROWARD COUNTY LOGGERHEAD NESTS

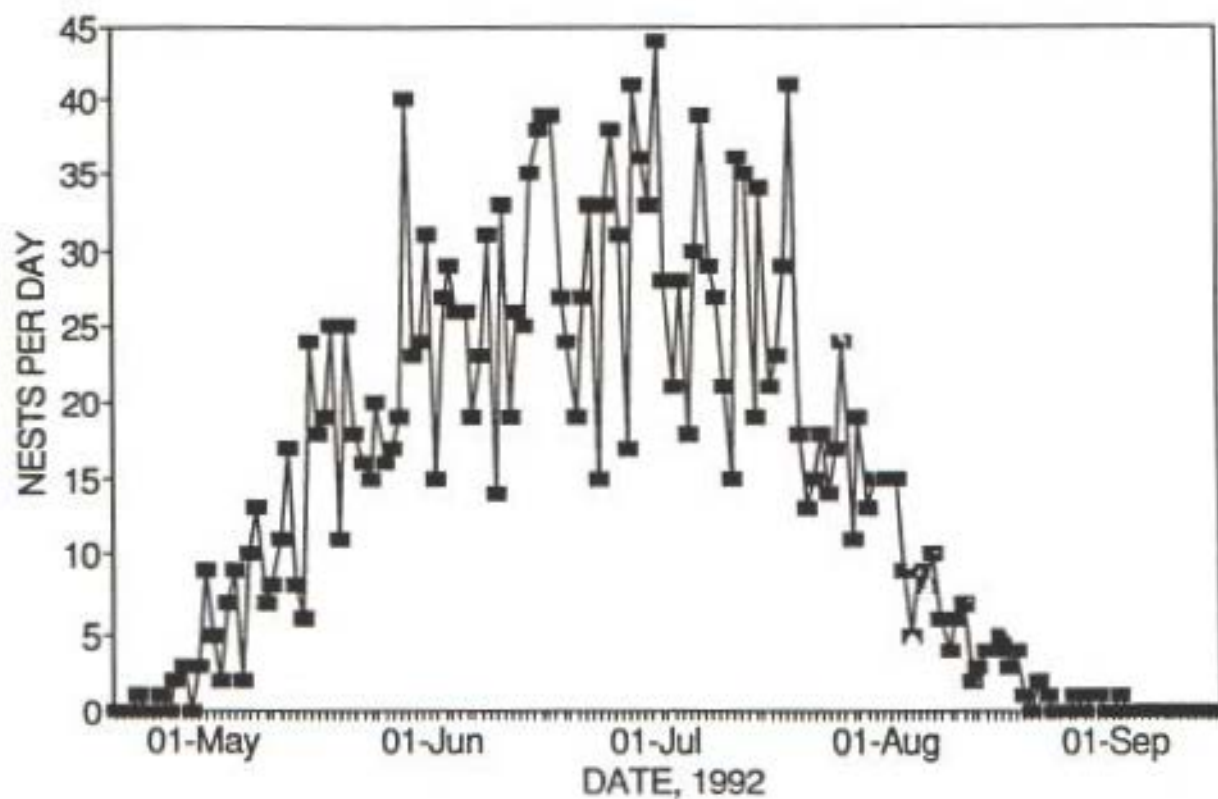


Figure 3: The seasonal pattern of daily *C. caretta* nest counts in Broward Co., 1992.

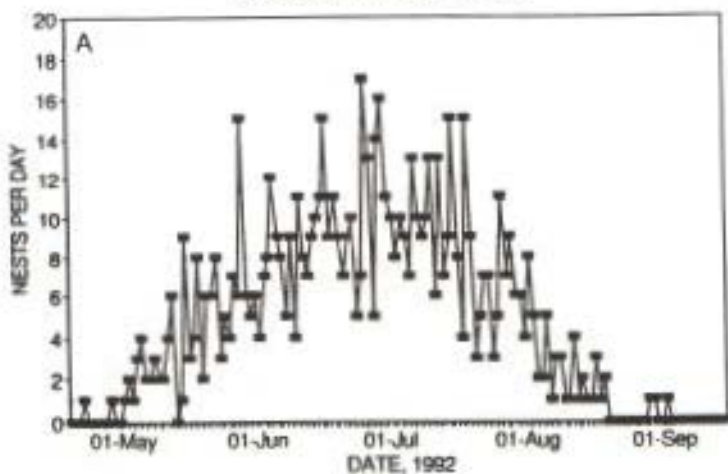
Table 1: Total *C.caretta* nests and nesting densities expressed as nests-per-kilometer for the 1992 season. Vertical lines at the right overlap groups where means were not distinguishable in a SNK test (alpha = .05) of mean daily nesting per km.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	NESTS per km	DAILY MEAN NESTS /km
Hollywood-Hall.	108	9.4	11.5	.077
Ft.Laud.	582	10.6	54.9	.368
Lloyd Park	226	3.9	57.9	.389
Pompano	580	7.7	75.3	.506
Hillsboro	725	7.0	103.6	.695
OVERALL	2221	38.6	57.5	.386

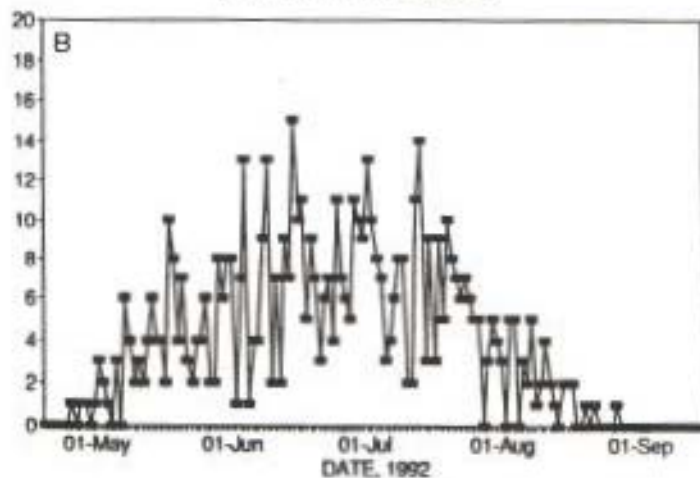
1993 2142

C. caretta nesting
down 3.5% in 1993

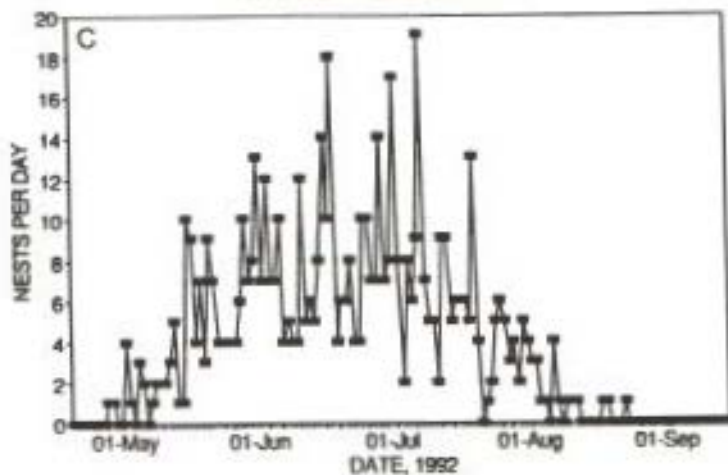
HILLSBORO-DEERFIELD BEACH
LOGGERHEAD NESTS



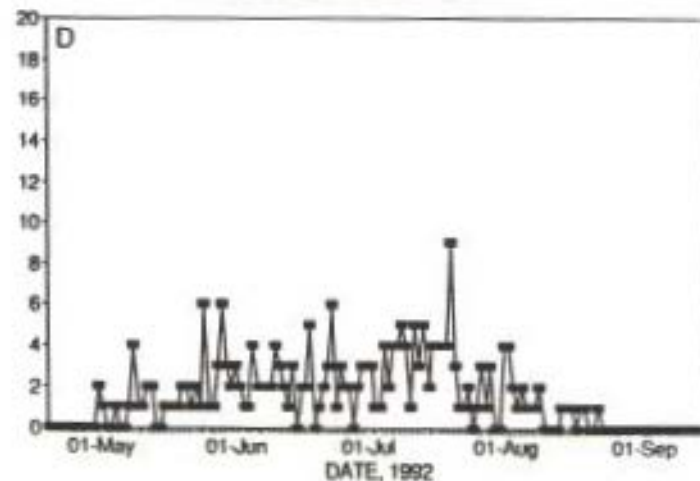
POMPANO BEACH
LOGGERHEAD NESTS



FORT LAUDERDALE BEACH
LOGGERHEAD NESTS



JOHN LLOYD PARK
LOGGERHEAD NESTS



HOLLYWOOD-HALLANDALE BEACH
LOGGERHEAD NESTS

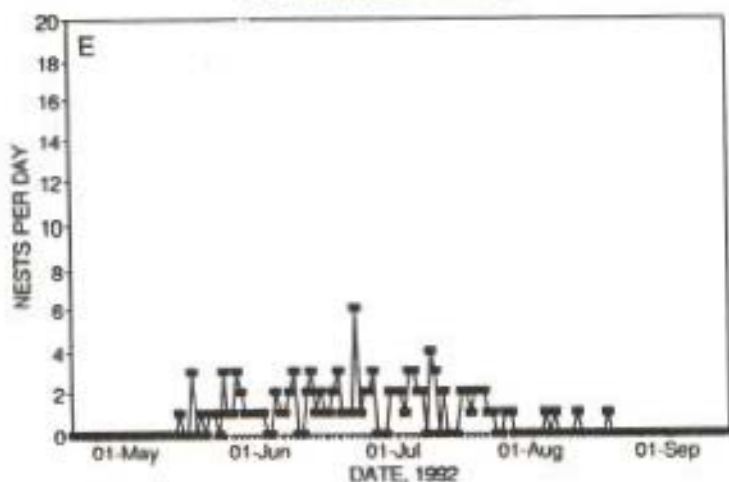


Figure 4: Comparison of the daily nesting patterns of *C. caretta* at the five Broward County beaches during 1992. Hillsboro-Deerfield, A; Pompano, B; Fort Lauderdale, C; John Lloyd State Recreation Area, D; Hollywood-Hallandale, E.

BROWARD COUNTY GREEN AND LEATHERBACK NESTS

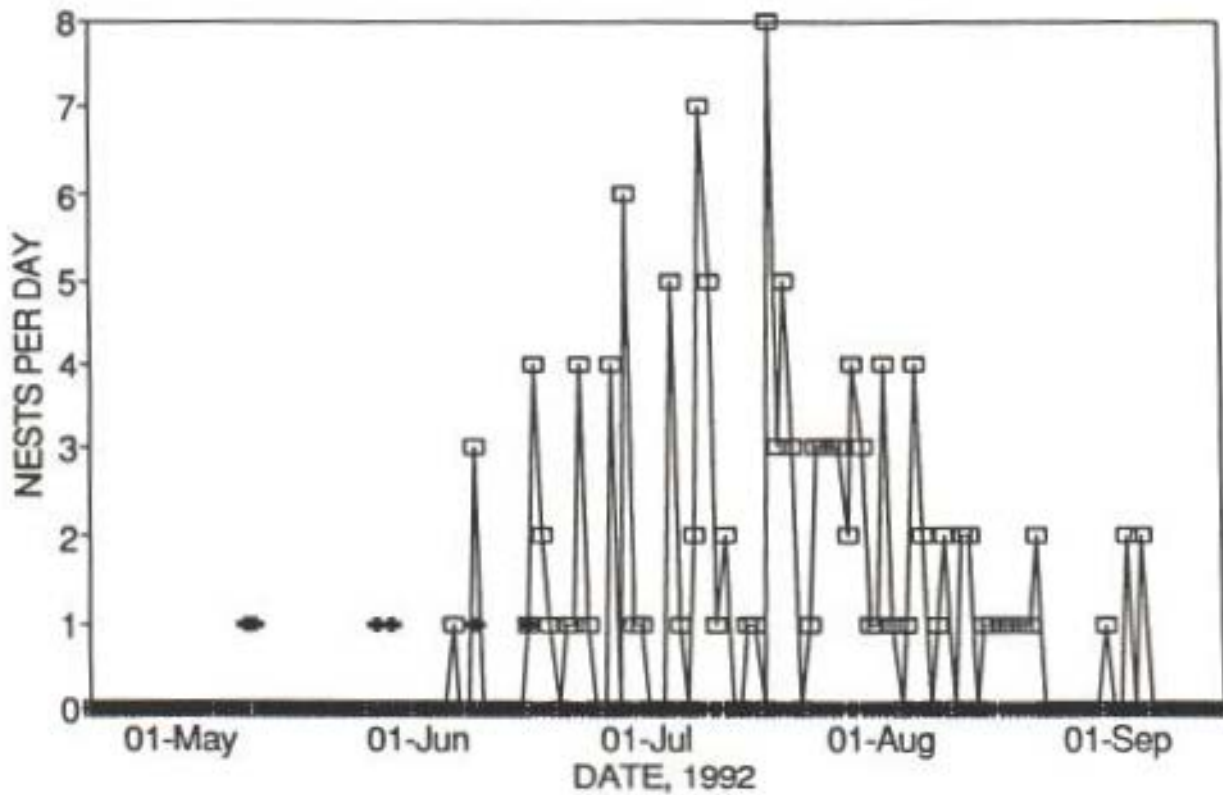


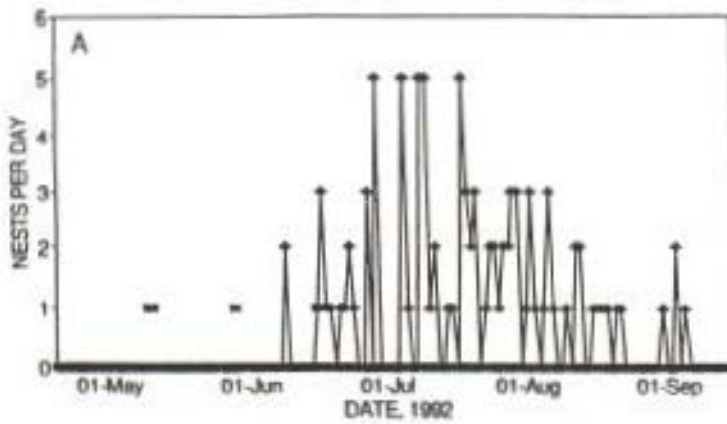
Figure 5: The seasonal patterns of daily *C. mydas* and *D. coriacea* nest counts in Broward Co., 1992.

Table 2: Total *C.mydas* nests and nesting densities expressed as nests-per-kilometer for the 1992 season. Vertical lines at the right overlap groups where means were not distinguishable in a SNK test (alpha = .05) of mean daily nesting per km. Hollywood-Hallandale excluded from the SNK test.

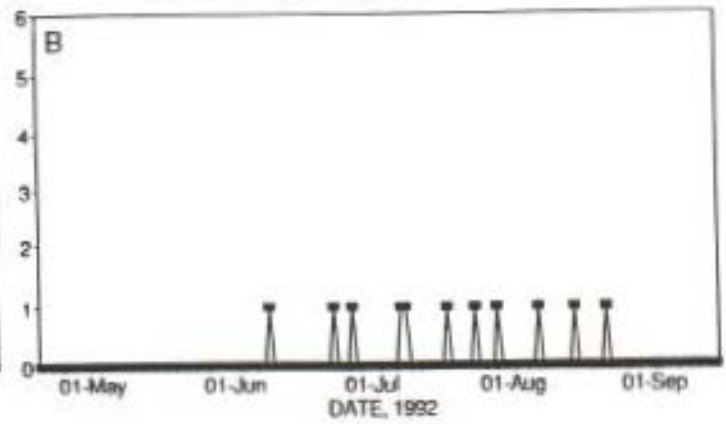
BEACH	TOTAL NESTS	BEACH LENGTH (km)	NESTS per km	DAILY MEAN NESTS / km
Hollywood-Hall	0	9.4	0	.000
Ft. Laud.	9	10.6	0.8	.006
Pompano	11	7.7	1.4	.010
Lloyd Park	16	3.9	4.1	.028
Hillsboro	96	7.0	13.7	.092
OVERALL	132	38.6	3.4	.023

can't do SNK?

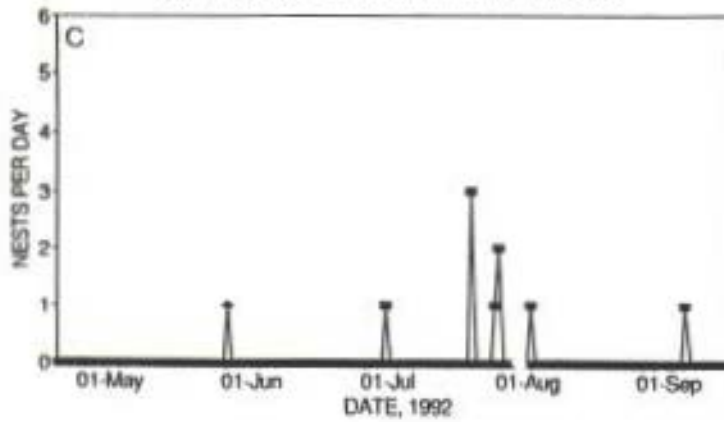
HILLSBORO-DEERFIELD BEACH
GREEN AND LEATHERBACK NESTS



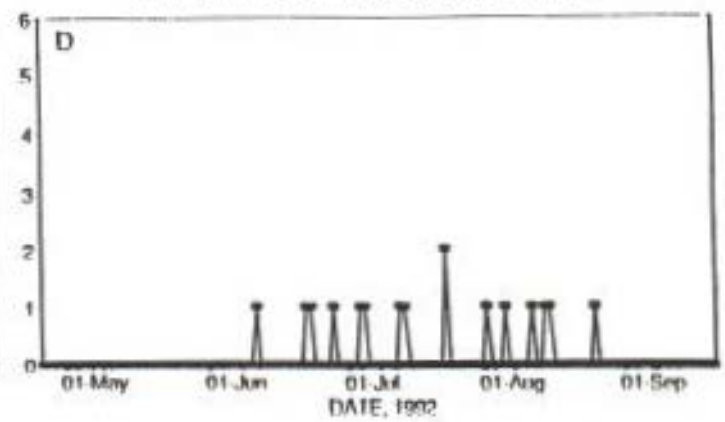
POMPANO BEACH
GREEN AND LEATHERBACK NESTS



FORT LAUDERDALE BEACH
GREEN AND LEATHERBACK NESTS



JOHN LLOYD PARK
GREEN AND LEATHERBACK NESTS



HOLLYWOOD-HALLANDALE BEACH
GREEN AND LEATHERBACK NESTS

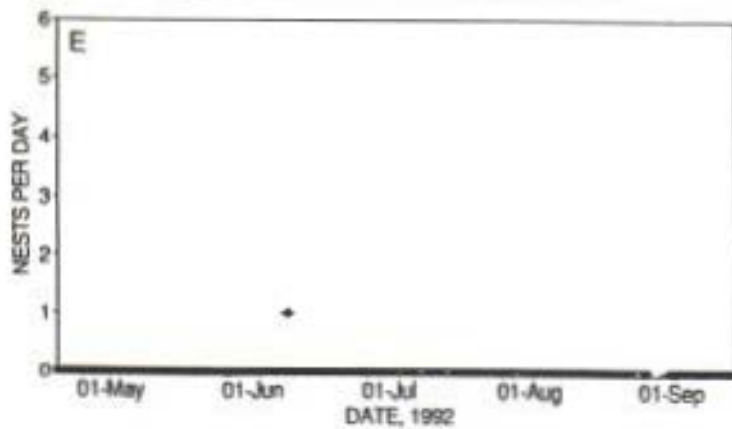


Figure 6: Comparison of the daily nesting patterns of *C. mydas* and *D. coriacea* at the five Broward Co. beaches during 1992. Hillsboro-Deerfield, A; Pompano, B; Fort Lauderdale, C; John Lloyd State Recreation Area, D; Hollywood-Hallandale, E.

—•— *C. mydas* - - - • - - - *D. coriacea*

Table 3: Total *D. coriacea* nests and nesting densities expressed as nests-per-kilometer for the 1992 season. Data were too few for a SNK test of mean daily nesting densities.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	NESTS per km
Pompano	0	7.7	0
Lloyd Park	0	3.9	0
Ft. Laud.	1	10.6	0.09
Hollywood-Hall	1	9.4	0.11
Hillsboro	5	7.7	0.65
OVERALL	7	38.6	0.18

analysis.

Figure 7 shows the horizontal distribution of *C. caretta*, *C. mydas*, and *D. coriacea* nesting. The *C. caretta* and *C. mydas* patterns were very similar to past years and are discussed below.

Figure 8 and Table 4 give the county-wide distribution of nesting success for the three species. Low *C. caretta* nesting successes occurred at Hillsboro Inlet (locator # 25) and in Hollywood and Hallandale, which were also areas of low nesting activity. *C. caretta* nesting success was statistically indistinguishable at all county beaches except Hillsboro, where it was distinctly higher (Table 4). *C. mydas* crawled on all county beaches, but failed to nest in Hollywood-Hallandale. With this beach excluded, there were no statistical differences in *C. mydas* nesting success between the other beaches.

Table 5 gives the total numbers of nests for each species that were relocated to Hillsboro beach or fenced hatcheries, as well as the numbers and location of nests left *in situ*. Most nests relocated from Pompano and Fort Lauderdale beaches were taken to Hillsboro, because of hatchery space limitations.

The distribution of mean hatching successes for the three turtle species are shown in Figure 9. Hatching success at Hillsboro beach was lowest for nests deposited at the relocation site (locator #18). Figure 10 compares the hatching success of all relocated and *in situ* *C. caretta* nests. The severe reduction in the density of the data points in Fig 10A at about Julian day 185 (early July) is due to Hurricane Andrew. Except for this truncation, the relocated pattern appears similar to previous findings (Burney and Mattison, 1990), however the relocated nests had a much higher incidence of low or no hatching nests than did the *in situ* nests. This resulted in a very significant (ANOVA, $F=86.2$; $P < .001$) difference between overall hatching success in relocated and *in situ* nests. The comparison of hatching successes of *C. mydas* in relocated and *in situ* nests (Figure 11) produced the same conclusion ($F=23.6$; $P < .001$). Figure

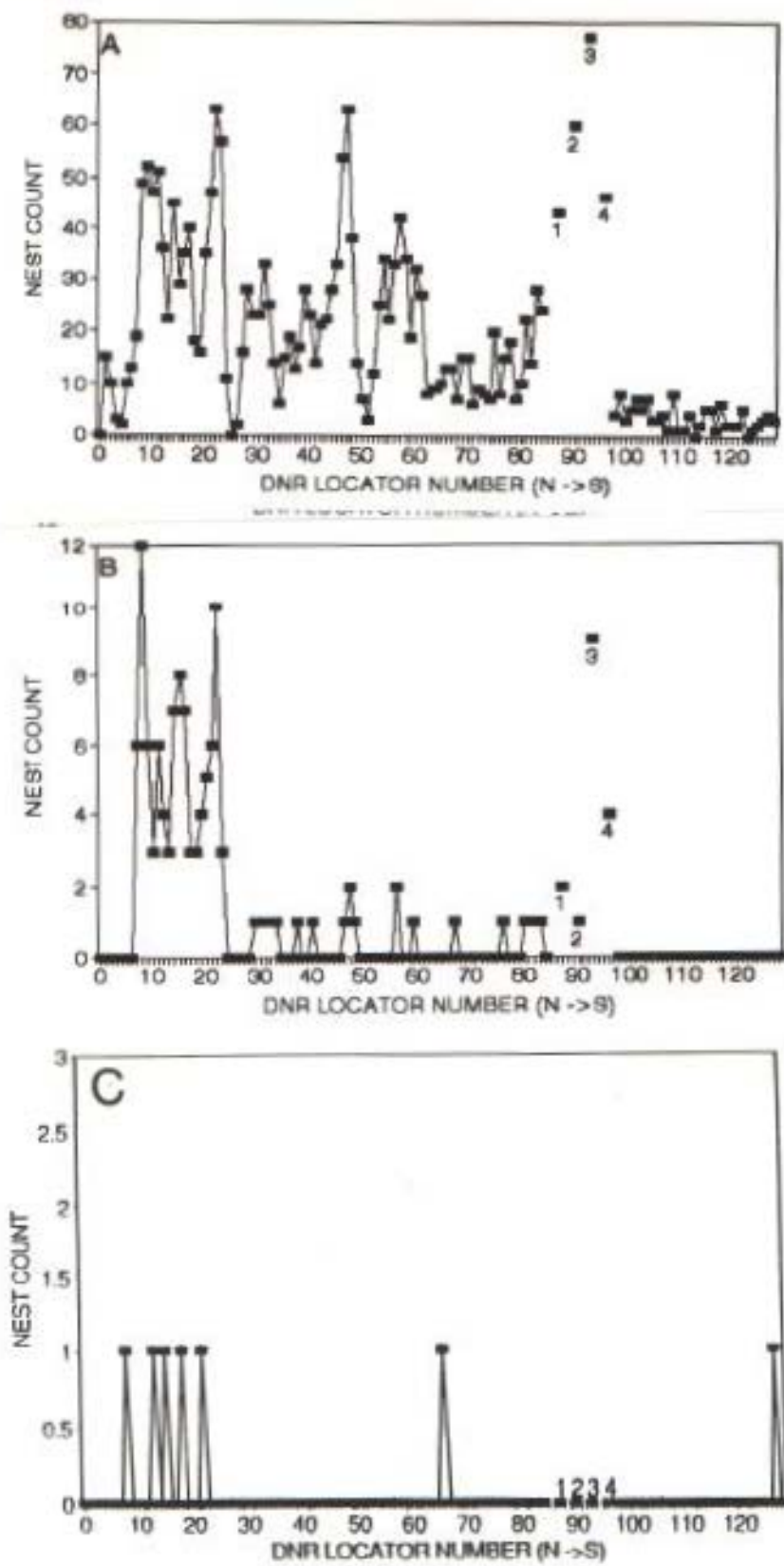


Figure 7: Locations of *C. caretta* (A), *C. mydas* (B), and *D. coriacea* (C) nests in Broward Co., 1992, listed by DNR locator number (or zone number in John Lloyd State Recreation Area).

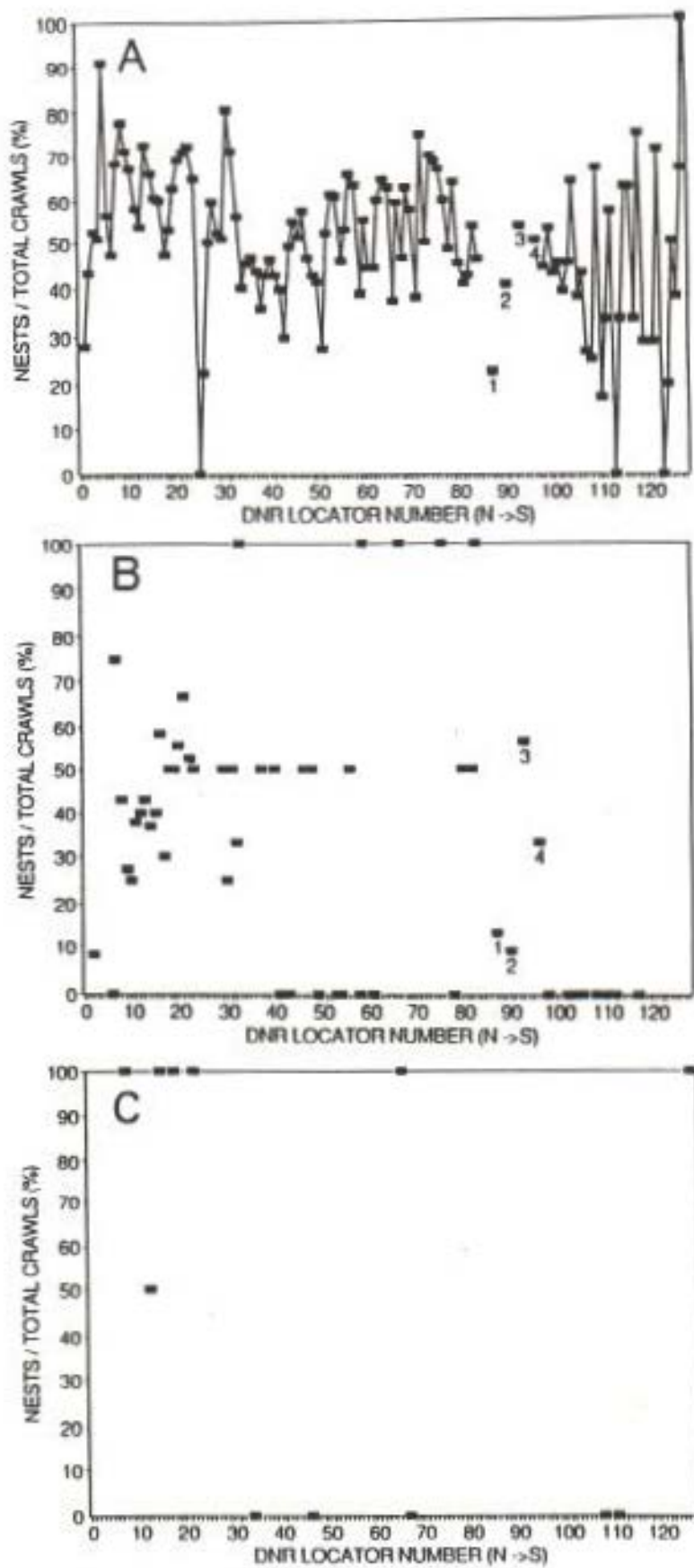


Figure 8: The horizontal distribution of the average 1992 nesting success of *C. caretta* (A), *C. mydas* (B) and *D. coriacea* (C) on each beach segment identified by the DNR survey markers.

Table 4: Total nests, false crawls (FC) and percent nesting success (NS) for three sea turtle species in each of five Broward County beach areas during 1992. Vertical lines for *C. caretta* overlap beaches where mean daily nesting successes were not distinguishable in a SNK test. No significant differences between beaches were found for *C. mydas* with Hollywood-Hallandale removed from the analysis. *D. coriacea* were too few for reliable statistical comparisons.

BEACH	<i>C. caretta</i>			<i>C. mydas</i>			<i>D. coriacea</i>		
	NESTS	FC	NS	NESTS	FC	NS	NESTS	FC	NS
Lloyd Park	226 ₁₂₀	347 ₂₀₅	39.5 ₅₄	16 ₄	38 ₅	29.6 ₆₅	0 ₁	0 ₀	0
Holly-Hall.	108 ₉₇	123 ₉₂	46.8 ₂₃	0 ₀	11 ₀	0 ₋	1 ₁	2 ₀	50.0
Pompano	580 ₄₇₆	608 ₅₈₃	48.8 ₆₇	11 ₀	17 ₀	39.3 ₋	0 ₃	2 ₁	0
Ft. Laud.	582 ₅₅₀	517 ₄₉₀	53.0 ₅₄	9 ₇	11 ₁	45.0 ₆₄	1 ₁	1 ₂	100
Hillsboro	725 ₆₉₉	383 ₃₀₄	65.4 ₅₁	96 ₁₀	128 ₁₃	42.9 ₆₅	5 ₁₀	1 ₁	80.0 ₁₀₀
OVERALL	2221	1978	52.9	132	205	55.7	7	6	50.0
	2102	1967	53.4	25	22	66.0	16	4	

21

1493
lower
46.97
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(1493)
-16.4
5.5
3.6

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1493 1493 1493

1493

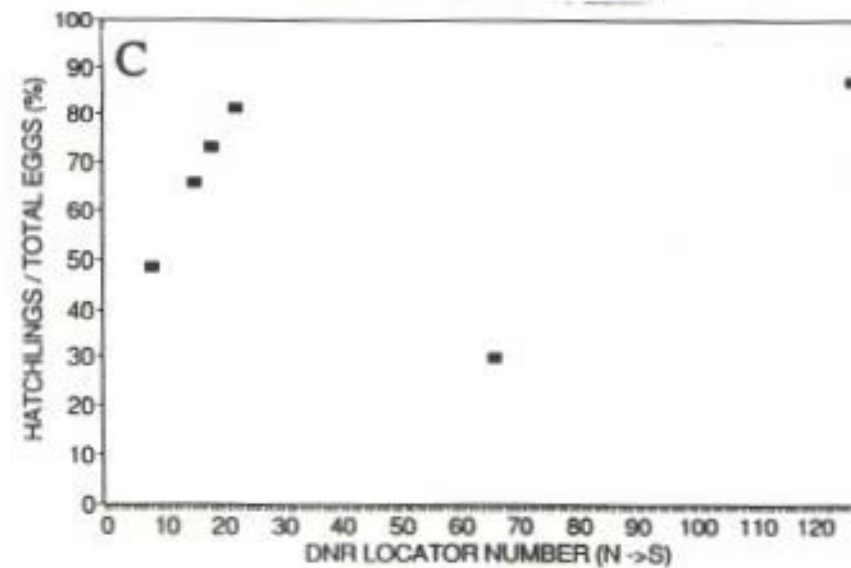
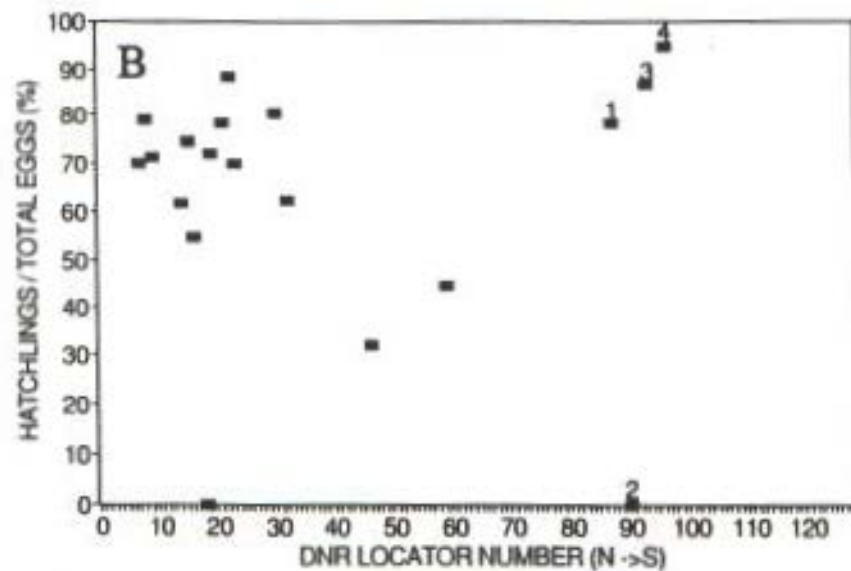
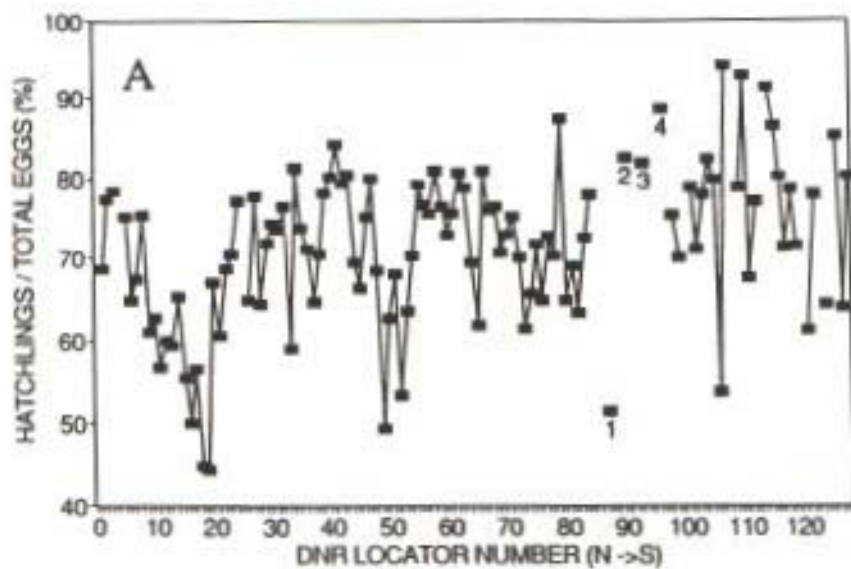
Table 5: Total Number of *C.caretta*, *C. mydas* and *D. coriacea* nests relocated to Hillsboro beach or fenced hatcheries, or left *in situ*.

	<i>C. caretta</i>	<i>C. mydas</i>	<i>D. coriacea</i>
RELOCATED			
<u>Open Beach</u>			
Hillsboro	1541 ¹⁴⁵⁸	568	16
<u>Hatcheries</u>			
Pompano	73 ⁵⁹	00	11
Ft.Laud.	71 ⁶⁶	10	0
Lloyd Park	50 ⁵	31	0
Hollywood	108 ⁹⁷	00	1
Totals	1843 ¹⁷⁰⁹	609	37
IN SITU			
<u>Open Beach</u>			
Hillsboro	202 ²¹⁸	599	48
Lloyd Park	176 ¹¹⁵	135	01
Totals	378 ⁴³³	724	49
Totals			
	2221 ²¹⁴²	1323	716

SPALL

SPALL

1493 relocated
done

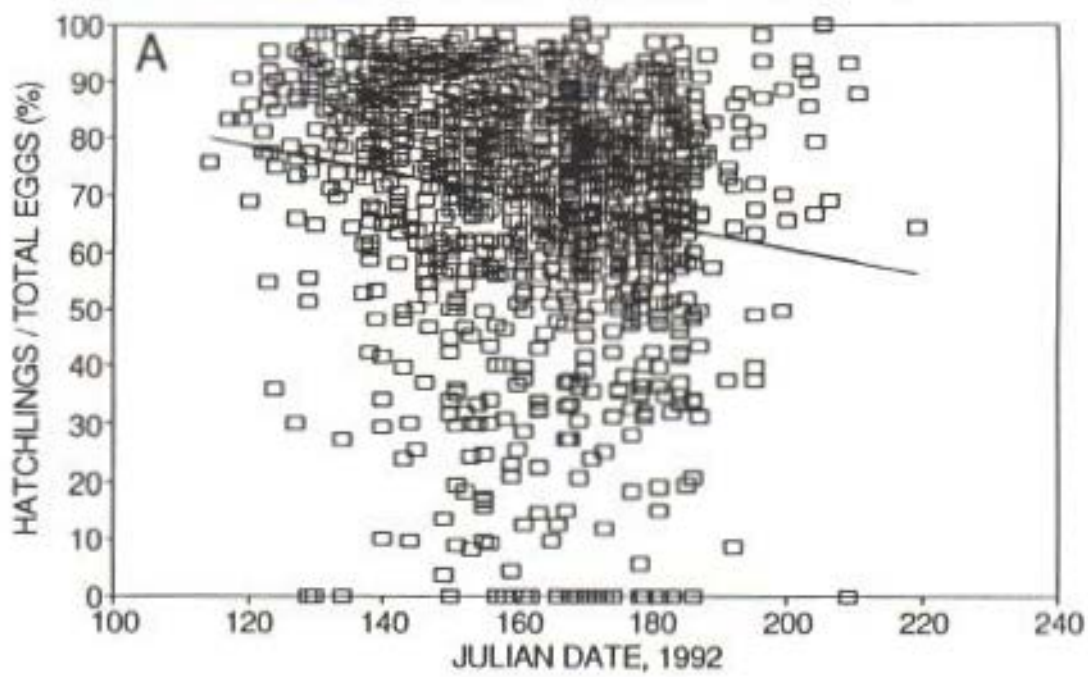


John Lloyd State Park
 1000
 1000
 700

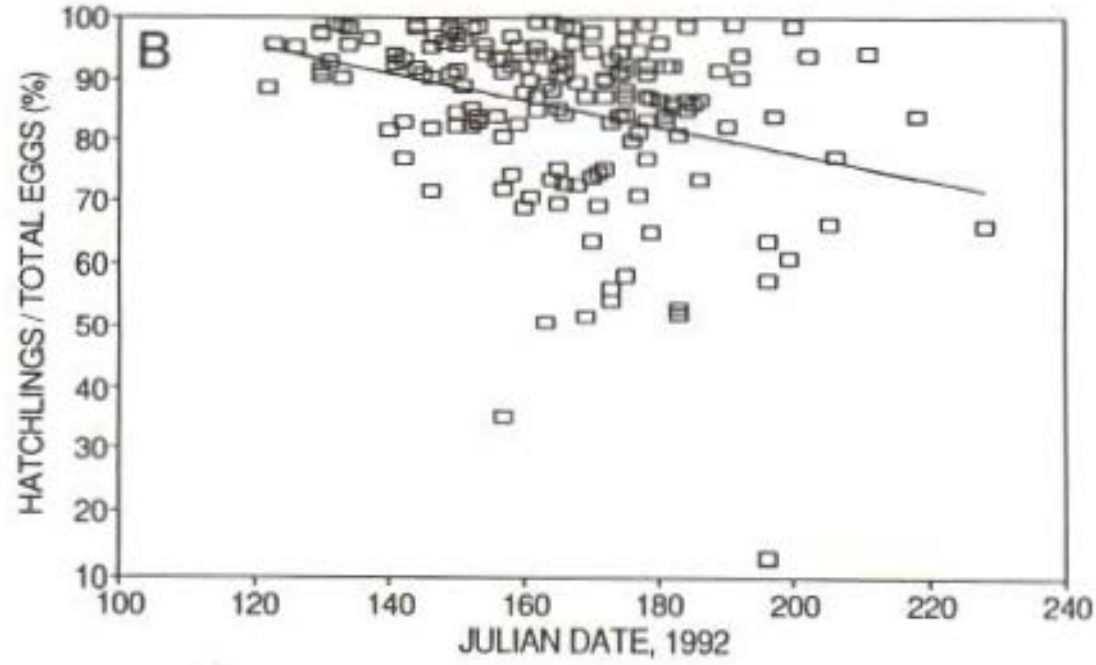
Figure 9: The mean hatching success of *C. caretta* (A), *C. mydas* (B) and *D. coriacea* (C) nests during 1992 in each of the beach segments listed by DNR monument number. Data for the four zones of John Lloyd State Park are labeled with zone numbers.

92

BROWARD COUNTY RELOCATED LOGGERHEAD HATCHING SUCCESS



BROWARD COUNTY IN SITU LOGGERHEAD HATCHING SUCCESS



Download
date from
to HATCHING 1992

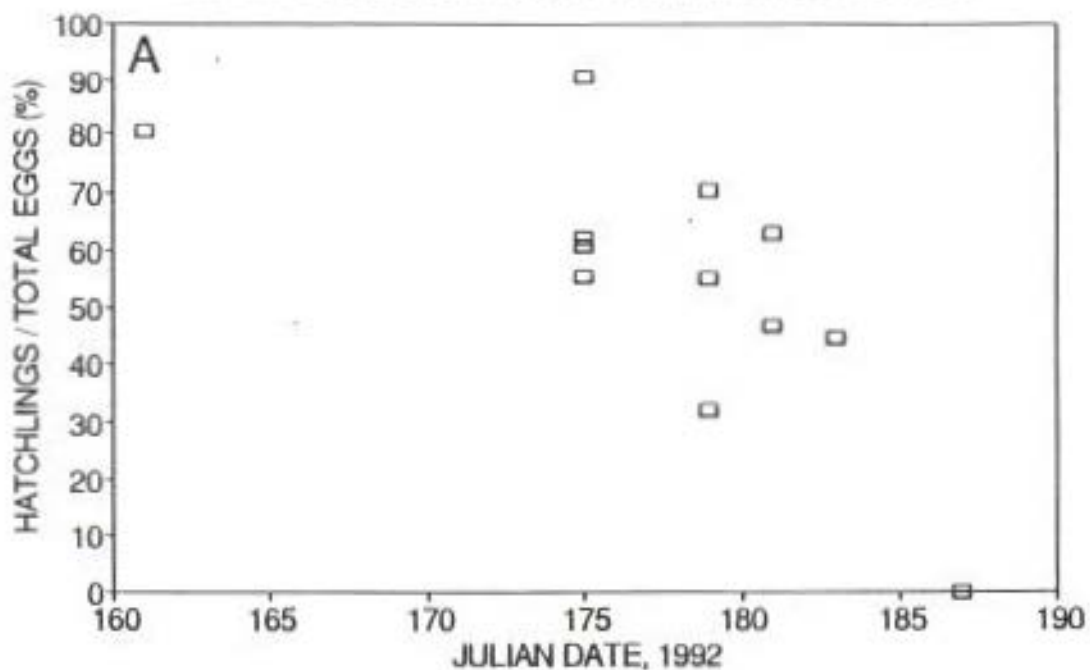
Figure 10: Comparison of the seasonal pattern of *C. caretta* hatching success in relocated (A) and in situ (B) nests during 1992.

12 shows the historical pattern of overall hatching success in relocated and *in situ* nests. Hatching success in relocated nests was not much different from 1991, but the success of *in situ* nests increased dramatically. The possible reasons for the difference in hatching success are discussed in detail below. Table 6 compares mean hatching successes at the relocation sites. Mean hatch percent at Hillsboro was significantly lower than for any other beach except Lloyd Park. The lack of a statistical difference between Hillsboro and Lloyd Park was primarily due to the latter's low nest count, which increased the standard error in its comparisons.

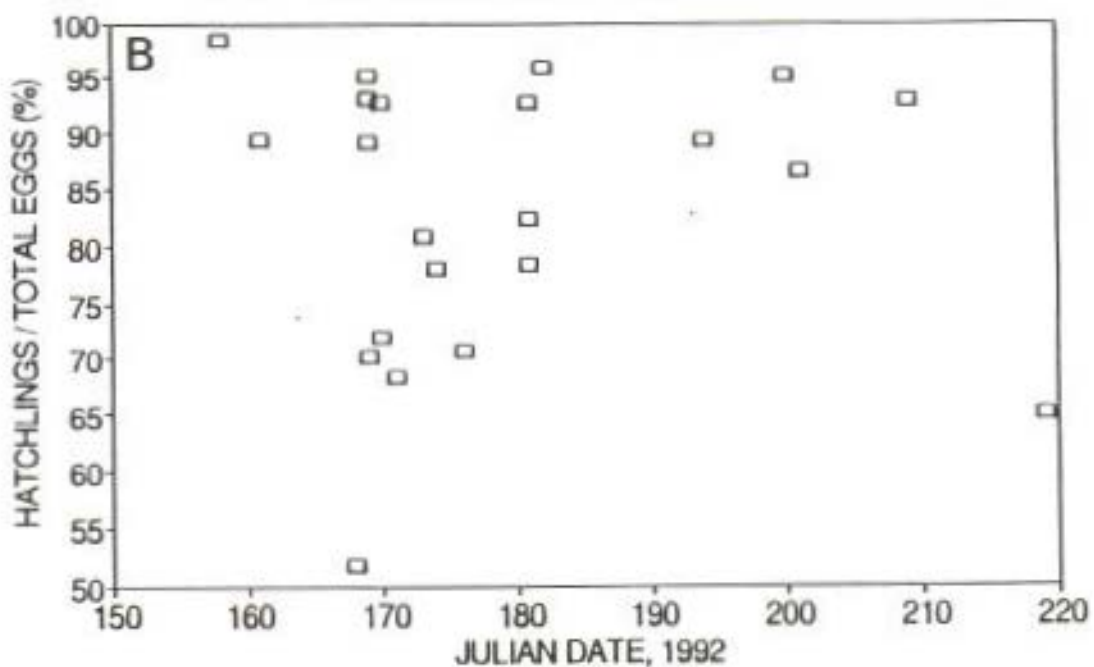
Table 7 gives the number of eggs, released hatchlings and hatching success for relocated and *in situ* nests of each species. In spite of the devastation caused by the hurricane, the total number of released *C. caretta* hatchlings was down only 16 percent from 1991. The reasons for nest and egg loss are given in Tables 8 and 9, respectively. Serious predation in the open relocation area at Hillsboro beach was encountered before the storm. Up to 663 *C. caretta* and 90 *C. mydas* nests (those listed as Hurricane and Lloyd) were destroyed or lost due to the hurricane. Some of the nests and eggs lost at Lloyd Park may have been due to other causes.

Figure 13 compares sea turtle nesting and nesting success at John Lloyd State Park for the years spanning or following a beach renourishment project. Table 10 shows contingency table comparisons of nesting success in zone 3 (renourished in 1989) and zone 4 (not renourished) of the Park over 3 years. In 1990, nesting success was significantly lower in the renourished section. However, in 1991 and 1992 the difference was insignificant. Tables 11 and 12 compare hatching success of *in situ* *C. caretta* and *C. mydas* nests in zones 3 and 4 by ANOVA. For both species, the ANOVA shows no significant differences in hatching success in the renourished and unrenourished zones.

RELOCATED GREEN HATCHING SUCCESS



IN SITU GREEN HATCHING SUCCESS



HATCHING SUCCESS HISTORICAL PATTERN

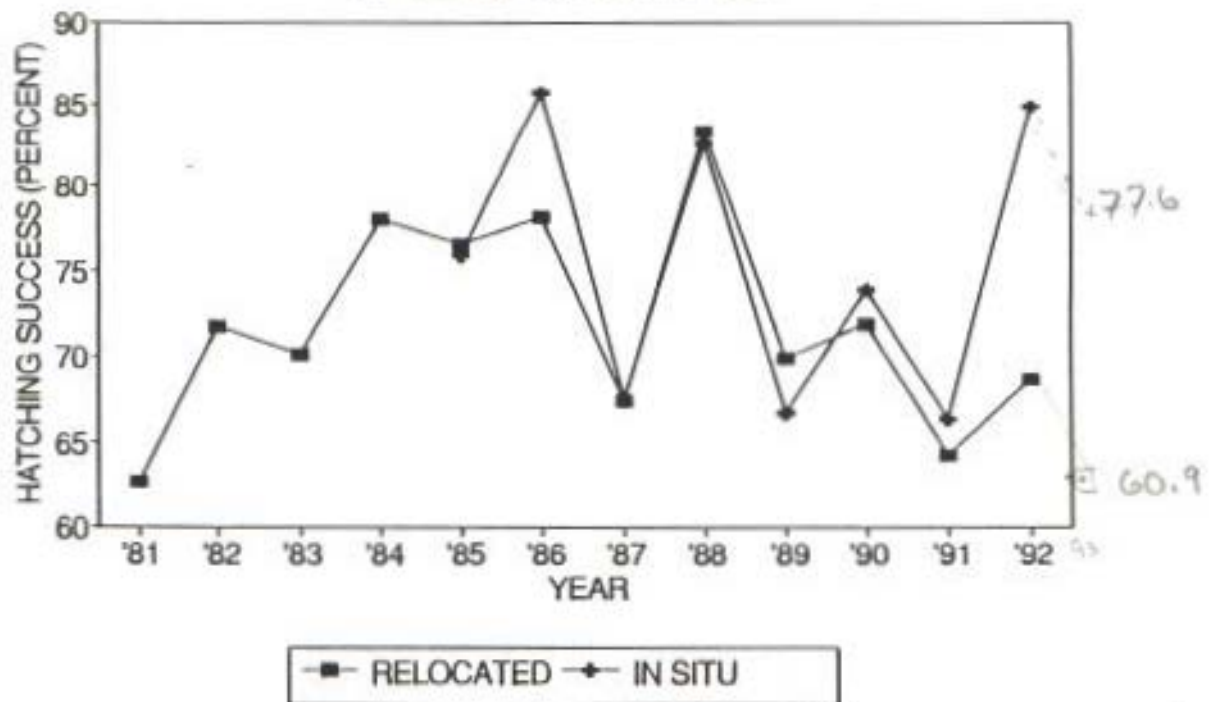


Figure 12: The historical patterns of yearly hatching success in relocated and *in situ* (undisturbed) nests, since fenced beach hatcheries were first employed in 1981.

from

Table 6: Mean hatching successes of *C.caretta* nests relocated to hatcheries or to the open beach relocation site at Hillsboro beach. Vertical lines at the right overlap groups where means were not distinguishable in a SNK test (alpha = .05). Mean hatch percent at Hillsboro was statistically distinct from Pompano, but not significantly different from Lloyd Park. This was due to the small number of nests at Lloyd Park, which increased the standard error in its comparisons.

BEACH	TOTAL NESTS	MEAN HATCH PERCENT
Hillsboro	909 ¹⁴⁸⁸	67.0 59.2
Lloyd Park	31 ⁵	74.9 28.5
Pompano	73 ⁵⁹	73.7 80.5
Hollywood-Hall	92 ⁴⁷	78.4 77.0
Ft. Lauderdale	70 ⁵⁹	81.8 76.6
OVERALL	1175	69.4

do the
10/11

Table 7: Total egg counts, released hatchlings and overall hatching successes for *in situ* and relocated nests of *C.caretta*, *C.mydas* and *D.coriacea*.

Species	NUMBER OF EGGS	EGGS LOST/ DEST.	n*	NUMBER TURTLES RELEASED	HATCH SUCCESS PERCENT
In Situ Nests					
<i>C. caretta</i>	2814 3 19161	N/A	167	15972	83.4 78.1
<i>C. mydas</i>	789 2607	N/A	22 ¹⁴	2161 ⁵⁴³	82.9 68.8
<i>D. coriacea</i>	282 334	N/A	49	232 ¹⁵⁷	69.5 55.7
Total	29214 22102		459 ¹⁹³	18365 ²²⁴⁷⁶	83.1 77.6
Relocated Nests					
<i>C. caretta</i>	187081 200508	25296 57649	1709 1281	99305 96881	67.8 60.2
<i>C. mydas</i>	1105 6779	5146 ¹³²	149	907 ²⁹⁹	55.5 41.0
<i>D. coriacea</i>	722 290	84 0	27	134 ²⁵⁶	65.0
Total	188908 207577	62879	1297	97922	67.7
Overall					
<i>C. caretta</i>	219669	57649	1448	112853	69.7
<i>C. mydas</i>	9386	5146	36	3068	72.3
<i>D. coriacea</i>	624	84	6	366	67.8

* n = The number of nests actually investigated for hatching success percent.

Must include
to include
including
to be
1991

Table 8: County wide summary of lost, destroyed and uninvestigated nests for the 1992 nesting season.

Loss Reason	<i>C. caretta</i>	<i>C. mydas</i>	<i>D. coriacea</i>
Predation ¹	82	5	1
Lost Location ²	15	1	0
Hurricane ³	546	83	0
Lloyd ⁴	87	7	0
Not Dug ⁵	28	0	0
Unknown ⁶	15	0	0
Totals	773	96	1

¹ Nests at least partially predated by foxes or racoons.

² Nests relocated outside of hatcheries which could not be found because of markers were removed (prior to hurricane).

³ Nests destroyed or lost due to Hurricane Andrew. Some of these nests may have hatched.

⁴ Nests from John Lloyd State Park with unreported hatching information and unlisted cause (prior to hurricane).

⁵ Non-relocated nests which probably hatched before the hurricane, but which were not investigated.

⁶ Relocated nests which hatched naturally but were not re-investigated (plus one nest to the Discovery Center).

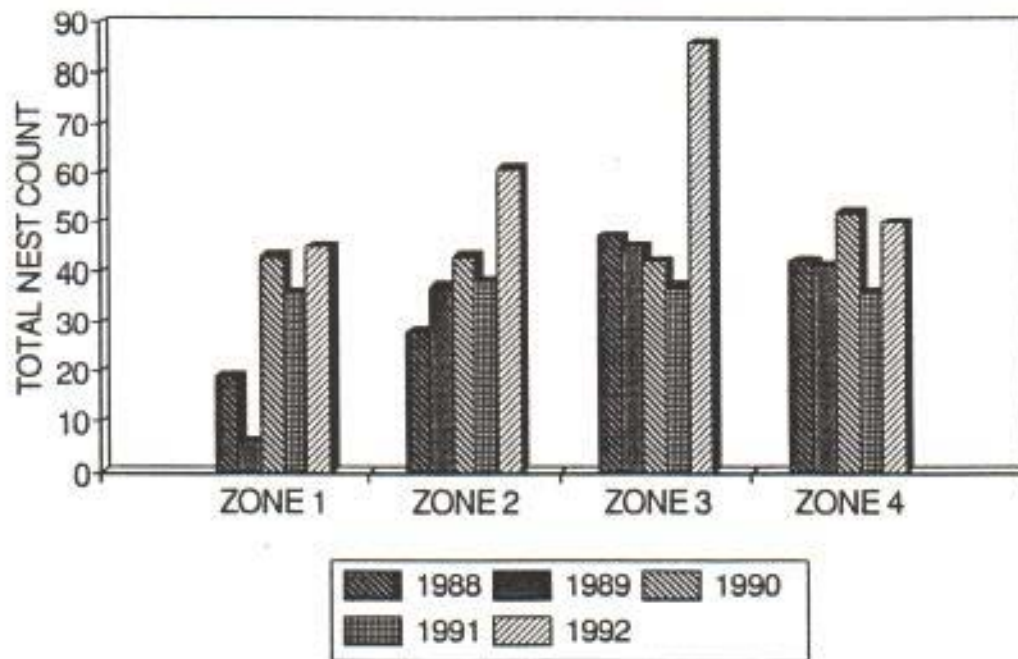
Note: The 19 apparently poached nests were not included in any of the totals in this report, because no eggs were present when surveyed and their existence could not be confirmed.

Table 9: County wide summary of egg counts from lost, destroyed and uninvestigated nests for the 1992 nesting season.

Loss Reason	<i>C. caretta</i>	<i>C. mydas</i>	<i>D. coriacea</i>
Predation	9393	587	84
Lost Location	629	0	0
Hurricane Lloyd	46139	4431	0
	1488	128	0
Totals	57649	5146	84

JOHN LLOYD STATE PARK

TOTAL SEA TURTLE NESTS



SEA TURTLE NESTING SUCCESS

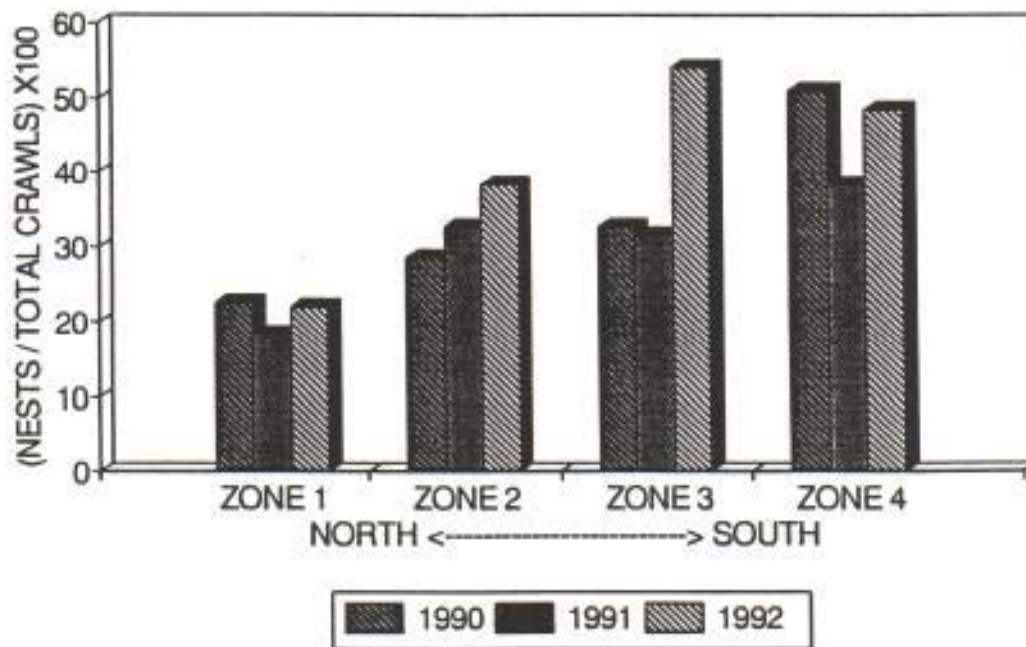


Figure 13: Yearly comparisons of total sea turtle nest counts (A) and nesting successes (B) in the four zones of John Lloyd State Park. Zones 1-3 were renourished in 1989.

Table 10: Contingency table analysis of the effect of beach renourishment on nesting success in John Lloyd State Recreation Area. Zone 3 was renourished in 1989 while Zone 4 was not renourished. The expected frequencies are given in parentheses below the observed frequencies.

1990	Renourished Zone 3	Not Renourished Zone 4	Totals
Nesting Crawls	36 (46.9)	45 (34.1)	81
False Crawls	82 (71.1)	41 (51.9)	123
Totals	118	86	204
Nest Success	30.5%	52.3%	

$X^2 = 9.89$, d.f. = 1, $P < .002$
Nesting success was not independent of beach zone.

1991	Renourished Zone 3	Not Renourished Zone 4	Totals
Nesting Crawls	35 (38.4)	36 (32.6)	71
False Crawls	76 (72.6)	58 (61.4)	134
Totals	111	94	205
Nest Success	31.5%	38.3%	

$X^2 = 1.03$, d.f. = 1, $P = .310$
Nesting success was independent of beach zone.

1992	Renourished Zone 3	Not Renourished Zone 4	Totals
Nesting Crawls	77 (75.2)	46 (47.8)	123
False Crawls	66 (67.8)	45 (43.2)	111
Totals	143	91	234
Nest Success	53.8%	50.5%	

$X^2 = 0.24$, d.f. = 1, $P = .62$
Nesting success was independent of beach zone.

Table 11: Results of a one-way ANOVA analyses of the effect of beach renourishment on hatching success of natural (*in-situ*) *C. caretta* nests deposited in John Lloyd State Recreation Area in 1992. Zone 3 was renourished in 1989 while Zone 4 was not renourished.

SOURCE	DF	SS	MS	F	P
FACTOR	1	178	178	1.35	0.250
ERROR	58	7624	131		
TOTAL	59	7801			

LEVEL	N	HATCH% MEAN	STD
Zone 4	28	91.84	7.63
Zone 3	32	88.39	13.97

Table 12: Results of a one-way ANOVA analyses of the effect of beach renourishment on hatching success of natural (*in-situ*) *C. mydas* nests deposited in John Lloyd State Recreation Area in 1992. Zone 3 was renourished in 1989 while Zone 4 was not renourished.

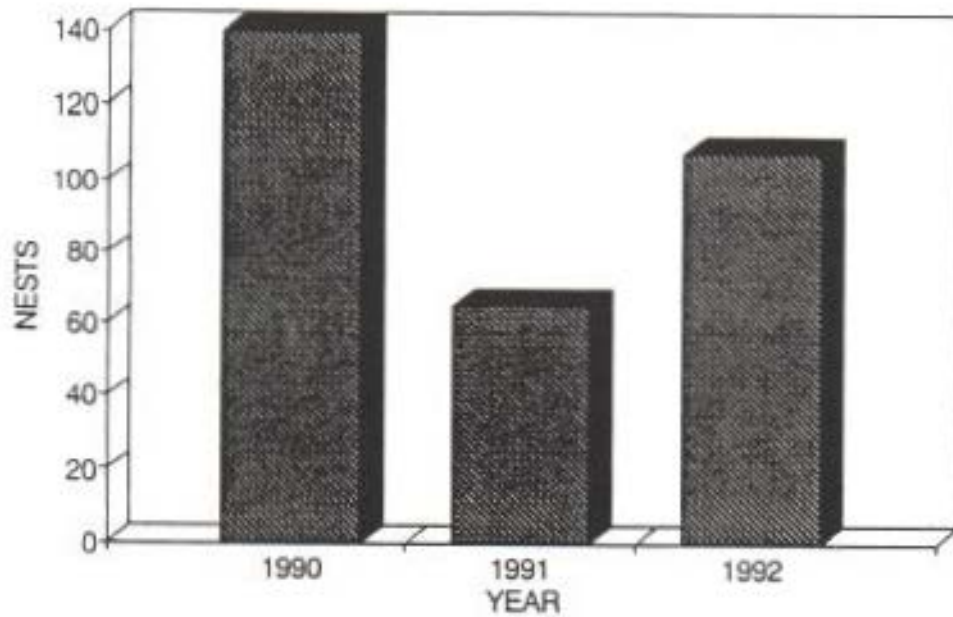
ANOVA Table

SOURCE	DF	SS	MS	F	P
FACTOR	1	111	111	0.86	0.396
ERROR	5	643	129		
TOTAL	6	745			

LEVEL	N	HATCH% MEAN	STD
Zone 4	3	94.57	3.32
Zone 3	4	86.53	14.38

Figure 14 compares *C. caretta* nesting and nesting success on Hollywood-Hallandale beach in the year before, during and after beach renourishment.

HOLLYWOOD-HALLANDALE BEACH LOGGERHEAD NESTS



LOGGERHEAD NESTING SUCCESS

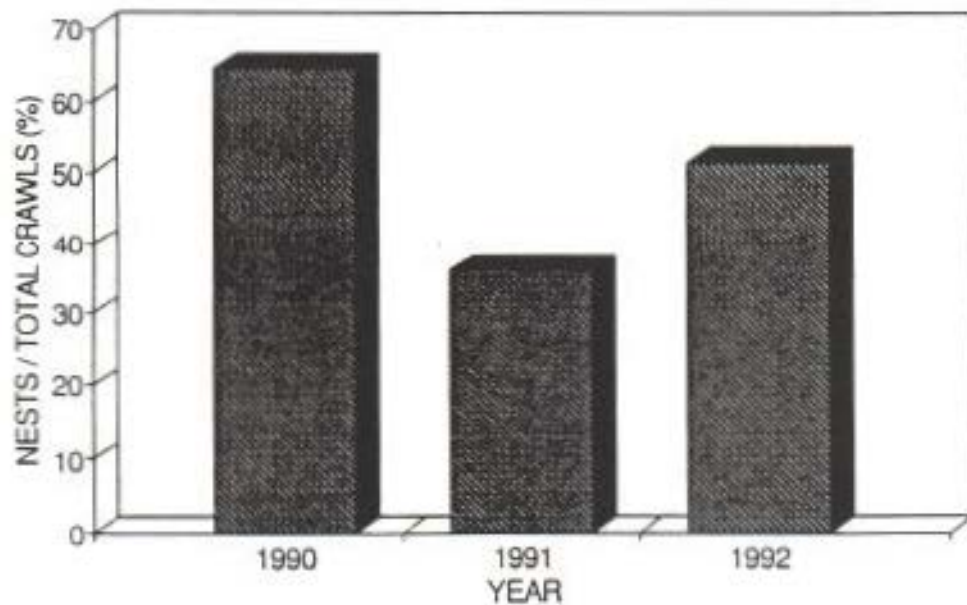


Figure 14: Comparison of total nest counts (A) and the nesting success (B) of *C.caretta* on Hollywood-Hallandale beaches from 1990 to 1992. This section of beach was renourished in 1991.

DISCUSSION

For the last three years the county-wide *C. caretta* nesting density has been significantly higher than the average of the previous 9 years. This consistency and the clearly increasing trend (Fig 2A) suggests a real population increase and enhances last years suggestion (Burney and Mattison, 1991) that the elevated nest counts, beginning in 1990 were not due to a chance coincidence in the turtle's individual nesting patterns (most of the population happening to nest on the same year) or to random augmentation from another location. Whether the reason for the increased nesting is augmentation from first-time nesters (perhaps the fruit of past conservation efforts), augmentation from another population, or increased nesting frequency due to better food availability (Wood and Wood, 1980) is impossible to determine. The fact is that nesting has increased for three consecutive years and such consistency strongly diminishes the probability that random processes are the cause.

The great increase in *C. mydas* nesting from last year (Fig. 2B) is very encouraging. To explain the low nesting in 1991 we speculated (Burney and Mattison, 1991) that since sea turtles usually do not nest every year (Ehrhart, 1981), that the bulk of the population may have nested in 1990, and therefore did not nest in 1991. Their return in 1992 is consistent with a two year nesting interval. Although there has been increased nesting for two of the last three years, consistency is lacking and the indications of a recovery of *C. mydas* is much less clear than for *C. caretta*.

D. coriacea nesting was again low, but present with no trends. This years nests could have been deposited by only 2 or 3 females.

The seasonal *C. caretta* nesting pattern was very similar to previous years, with very close beginning, ending and peak-season dates and smoothed

shape. The hurricane on 24 August had little effect on sea turtle nesting because it occurred so late in the nesting season.

The ranking of *C. caretta* nesting densities on the 5 county beaches (Fig. 4; Table 1; Fig. 7A) was identical to last year, with the highest at Hillsboro, followed by Pompano, Fort Lauderdale and Lloyd Park, and lastly, Hollywood-Hallandale. As in 1991, an SNK test found that all beaches were statistically distinct except for Fort Lauderdale and Lloyd Park which were indistinguishable.

Although more difficult to discern, the seasonal nesting pattern of *C. mydas* (Fig. 5) was similar to 1990, with similar peak season and ending dates but a slightly later start than in 1990 when the first nest was deposited in mid May. Nesting densities (Table 2; Fig. 6; Fig 7B) were much greater on Hillsboro beach, followed by Lloyd Park, Fort Lauderdale, Pompano and Lloyd Park nesting densities were statistically identical. No nests were deposited on Hollywood-Hallandale beach. *C. mydas* obviously prefers darker, less disturbed nesting sites such as Hillsboro and Lloyd Park beaches. However, the proportion of *C. mydas* nests on Pompano and Fort Lauderdale beaches was up slightly from 1990.

The horizontal nesting density distribution for *C. caretta* (Fig. 7A) continues to show great year-to-year similarity. Low nesting again occurred near the Deerfield town pier, the Hillsboro Inlet, the Pompano pier and the Commercial Boulevard pier (locators 3, 25, 34 and 50, respectively), on the section of beach directly adjacent to Highway A1A (locator 63-80) and on the entire Dania-Hollywood-Hallandale beach section (locators 98-128). These features have been seen each year since 1990 when nest location by DNR monuments numbers began (Burney and Mattison, 1990, 1991) and is also evident in survey data collected previously (ie Fletemeyer, 1985). There are also consistently high-nesting zones on developed beaches such as locators 45 and 58.

While it is easy to develop hypotheses to explain low-nesting zones, such as heavy pedestrian traffic, moving lights, piers, inlets, etc. (see Burney and Mattison 1991 for more discussion), reasons for the highly nested regions of Pompano and Fort Lauderdale beaches are more difficult (Mattison, in prep).

Nesting success for *C. caretta* (Fig. 8; Table 4) was significantly higher on Hillsboro Beach and statistically equivalent elsewhere. Lows and highs in the nesting pattern (Figure 7) were not reflected in the nesting success pattern (except at Hillsboro Inlet where there were no nests). This means that the distribution of false crawls and nests are similar. Therefore, the factors affecting nesting distribution actually affect sea turtle emergence (total crawls) rather than nesting success (nests / total crawls). Likewise, there was no statistical county-wide difference in *C. mydas* nesting success when Hollywood-Hallandale (zero nesting success) was removed from the ANOVA.

There was no identifiable county-wide trends in mean hatching success plotted against location of deposition (Fig 9) which might be interpreted as adverse effects of transportation distance (vibration, jostling, etc). Since most nests were relocated, this pattern does not reflect the sand characteristics at the nesting locations. The low hatching success of nests deposited at the main relocation site in Hillsboro (locator #18) is puzzling. It may indicate a decline in the quality of the sand at this site for sea turtle hatching, perhaps due to accumulation of organic matter from past nests. If this speculation was true, it will not be a problem next year because Hurricane Andrew and subsequent wave action efficiently changed the sand at this location.

The highly significant difference in the hatching success of relocated and *in situ* nests (Figs. 10-11) is not due to a drastic reduction in the success of relocated nests from 1991 levels (Fig 12) but to a large increase in the success of *in situ* nests. For example, relocated *C. caretta* hatching success increased slightly from 64.4 to 67.8 percent from 1991 to 1992, while *in situ* success

jumped from 66.0 to 83.4 percent. Between 1990 (last year with significant nesting) and 1992, the success of relocated *C. mydas* changed only from 56.9 to 55.5 percent while *in situ* success increased from 75.7 to 82.9 percent. The comparison was limited mainly to nests deposited before early July, due to the hurricane damage to later nests. Since hatching success declines over the course of the season because of a greater instance of low hatching late-season nests (Burney and Mattison, 1990, 1991), the seasonal average hatching success of both relocated and *in situ* nests would certainly have been lower if not for the hurricane. It is probable that this would have affected the overall success of *in situ* more than relocated nests because the low values would affect the mean of the smaller number of *in situ* nests more than for the larger numbers of relocated nests. This would cause both values to be lower, but closer together.

Still, there was a much higher proportion of low-hatching eggs in the relocated nests than in those left *in situ*. Only 1.1% of the 167 *in situ* *C. caretta* nests had a less than 50 percent hatch rate. Out of 1174 relocated nests, 16.7% had hatching rates less than 50 percent. All but 18 of these low-hatching nests were relocated to Hillsboro beach. However, hatching success was not uniformly bad at the Hillsboro site. Figure 10 shows that the bulk of the relocated nests hatched with rates similar to the *in situ* nests. The slopes of the seasonal trend lines were not significantly different, but the vertical position of the relocated trend line was much lower than for *in situ* nests, caused by the higher proportion of low-hatching nests. Table 6 shows that the *C. caretta* hatching success at Hillsboro was statistically lower than at any of the hatcheries except Lloyd Park's, and this was primarily due to the low number of nests hatched at this hatchery before the storm.

There are several possible reasons for the higher instance of low-hatching nests at the Hillsboro relocation site. Clearly the reason is not due to some

systematic procedural error, because this would have affected all, or most of the nests. It is known that low hatching success results if the sand in hatcheries is not replaced each year, because of organic enrichment and bacterial growth in the sand. It was always assumed that winter wave action would effectively replace the sand at the open Hillsboro site, but this may have not been entirely the case. Workers occasionally reported discovering the remains of a year old nest when digging a new egg chamber. When this happened, the old remains were completely dug out and the hole filled with fresh sand, but it is still possible that eggs were unknowingly placed in chambers near old nest remains and that this affected the hatching success. It is also possible that some nests were adversely affected by transportation.

The first possibility is easily fixed. If open beach relocation must continue, a different beach location can be used each year. The current site was chosen because of easy access. If other sites are used, it will require extra work, but this is possible. A better solution is to expand the size and number of hatcheries throughout the county to handle the increased nesting densities. A hatchery at Hillsboro would be desirable to counter fox predation. This would make mass relocation to Hillsboro unnecessary and would reduce the work load (and expense) of the project. It may also enhance hatching success. Of course, the ultimate solution would be to modify the beach environment so that mass relocation was unnecessary.

The sand from the three-year-old beach renourishment project at John Lloyd State Recreation Area does not seem to be adversely affecting sea turtle nesting. The mean Lloyd Park *C. caretta* nesting densities (per km per day) were not statistically different from Fort Lauderdale beach. It is difficult to compare nest counts between years to look for such effects because the number of nesting turtles is variable, but Figure 13 shows no adverse trends in nesting or nesting success since the project. Nesting in zone 1, nearest the Port Ever-

glades channel, has improved since the project, however nesting success is still low because of the steep eroded beach cliff. This cliff diminishes in size to the south, and nesting success rises.

Comparison of nesting success and the hatching success of *in situ* nests in zones 3 and 4 provide a much better indication of the effects of renourishment because zone 4 was not renourished and serves as a control site. Zone 3 was renourished, and does not have the beach cliff characteristic of the northern zones. Table 10 shows a significant difference in nesting success in the two zones during 1990 (one year after renourishment), but the difference was non-significant for 1991 and 1992. Additionally, there has been a continuous reduction in the degree of difference (seen in the X^2 value) with time. Likewise Tables 11 and 12 show no effect of beach zone on the hatching success of unrelocated *C. caretta* or *C. mydas* nests. We have no evidence that the three-year-old project is adversely affecting sea turtle nesting or hatching.

The more recent renourishment project on Hollywood-Hallandale beaches is more difficult to assess because of the historically low nesting densities. Nesting and nesting success data for the year before, during and after the project (Figure 14) indicate reductions in both parameters during the project but recovery afterwards. One-way ANOVA and SNK analyses showed the 1991 nest count (Fig 14A) to be significantly lower than for the years before and after the project, but nesting in 1990 and 1992 was not significantly different. For nesting success (Fig 14B), all three means were significantly different from each other, indicating a significant decrease during the project. There was significant recovery one year after the project, but nesting success in 1992 was still significantly below the 1990 level. However, *C. caretta* nesting success at Hollywood-Hallandale beach in 1992 was statistically indistinguishable from all county beaches except Hillsboro (Table 4). If there is still a detectable influence of the renourishment project, it is not very large.

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APPENDIX 1: SUMMARY OF SEA TURTLE HOT-LINE, BEEPER & NOVA CALLS

SUBJECT	HOT-LINE	NOVA
EMERGENCES:		
Nesting	32	22
Hatchlings	11 3	9
NEST LOCATIONS	56	18
STRANDINGS	9 8	0
POACHING	44 0	0 4
VOLUNTEERS	112	15
OTHER **	302	77
OVERALL	566	141

** Including calls from the media, residents concerned about land turtles in pools, all-terrain vehicle breakdowns and repairs, and all other unclassified, requests for information, and multi reason calls.

APPENDIX 2: Summary of Educational/Public Information Activities

Flyers were distributed in a timely manner 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.

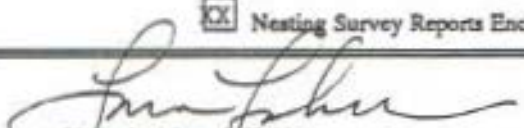
During July through mid August, a weekly sea turtle release and informational seminar was given by the Project Manager at Hollywood North Beach Park. These were well attended.

Hatchlings were also provided for the bi-weekly sea turtle walks held at John Lloyd State Recreation Area, where they were properly released.

FLORIDA DEPARTMENT OF NATURAL RESOURCES
MARINE TURTLE PERMIT RENEWAL REQUEST

1122-01
PERMIT

Instructions: Complete this form by typing all answers and filling each blank. Attach additional sheets if necessary. Indicate N/A if not applicable. Please be sure the form is signed by the principal permit holder and returned no later than December 31. Late renewals will delay issuance of new permits.

1. Principal Permit Holder Information:		
Principal Permit Holder: Louis E. Fisher		Permit #: 129
Organization: Broward County Office of Natural Resource Protection		
Address: 609B SW 1st Avenue Ft. Lauderdale, FL 33301		
County: BROWARD	Day Telephone (include area code): 305 765 4013	Night Telephone (include area code): 305 429 9248
2. Changes in Personnel: The total personnel cannot exceed 25. Indicate NONE if no changes.		
Personnel Additions: Personnel changes are not known at this time		
Personnel Deletions:		
3. Changes in Permit Activities: List all new activities requested and/or deletions of any current activities. Indicate NONE if no changes.		
Activity Additions: none		
Activity Deletions: none		
4. Nesting Survey Area: Please specify by stating county(ies) in which the survey takes place, the beach name(s), and the north and south boundaries of the survey area. Also, please note any exclusions within the survey area (e.g., state parks, national monuments, etc.).		
County(ies): BROWARD		
Beach Name(s): Deerfield Beach, Hillsboro, Pompano, Ft Laud, Hollywood/Hallandale		
Northern Boundary: Border of Palm Beach County and Broward County		
Southern Boundary: Border of Dade County and Broward County		
Exclusions (within N-S boundaries): John U. Lloyd Beach State Recreation Area		
5. Nesting Survey Reports. Permit renewals will not be processed until all nesting survey reports are received. Please check appropriate box.		
<input checked="" type="checkbox"/> Nesting Survey Reports Enclosed		<input type="checkbox"/> Not Applicable
Signature of Principal Permit Holder 		Date 12/11/92

FLORIDA DEPARTMENT OF NATURAL RESOURCES
MARINE TURTLE NESTING SUMMARY QUESTIONNAIRE FOR 1992

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

1. PRINCIPLE PERMIT HOLDER INFORMATION	
Principal Permit Holder: Louis E Fisher	Permit #: 129
Organization: Broward County Office of Natural Resource Protection	
Address: 609-B SW First Ave Fort Lauderdale FL 33301	
County: Broward	
Day Telephone (include area code): 305 765-4013	Night Telephone (include area code): 305 429-9248
Beach Name: Broward County Beaches except John U Lloyd State recreation Area	
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 Beach County/Broward County	
South Survey Boundary: Dade County/Broward County	
Beach Length: 37.4 km / mi (circle unit)	Is beach length ESTIMATED or MEASURED (circle one)
Was this the exact same survey area as your 1991 survey area? (circle one): YES NO	
If NO, please explain the specific differences:	
Start Date of Survey (include month AND day): 4/1/92	
End Date of Survey (include month AND day): 9/15/92	
Time of Day Surveyed: START 0600 AM / PM (circle one); FINISH 1000 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 NOTE	
If VARIABLE, please explain the specific variation and give the total number of days surveyed during the nesting season: Survey was not conducted on August 24, 1992 due to Hurricane Andrew.	
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 1991?: 23	

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, BEACH 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)

If YES, was the screen SELF-RELEASING or RESTRAINING ? (circle one)

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 beach 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)

If you did beach relocate nests, please give reasons: Insufficient hatchery space

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

If YES, was the screen SELF-RELEASING or RESTRAINING ? (circle one)

Did you cover beach 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: To provide for centralized care of relocated nests by region surveyed.

If a hatchery was used, please give specific location: Three locations: 1) North Beach Park in Hollywood, 2) South Beach in Fort Lauderdale and 3) Atlantic Boulevard and beach in Pompano Beach.

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

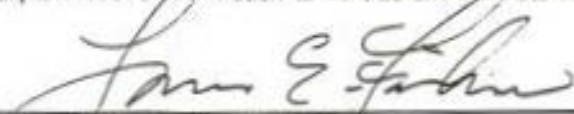
n/a

List all non-human predators documented depreddating nests in 1992: Foxes, racoons, etc.

Were hatchling disorientation events documented during 1992? (circle one): YES NO

If YES, have all disorientation reports been submitted to DNR? (circle one): YES NO

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


Signature of Principle Permit Holder

12/9/92
Date

FLORIDA DEPARTMENT OF NATURAL RESOURCES
NESTING SURVEY REPORTING FORM FOR 1992

Principle Permit Holder: Louis E. Fisher		Permit Number: 129	
Beach Name: Broward County except John U. Lloyd State Recreation Area			
	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)
Total # of Nests	1995	116	7
Total # of Non-Nesting Emergences (False Crawls)	1631	167	6
Date (month and day) of First Documented Nest	April 23	Jun 9	Apr 15
Date (month and day) of Last Documented Nest	Sept 2	Sept 5	Jun 16
<i>In situ</i> Nest Data: <i>In situ</i> nests are those left where the turtle deposited the clutch. <i>In situ</i> nests may be left without additional protection, screened with self-releasing or restraining flat screens, or covered with self-releasing or restraining above-ground cages. Record the number of nests by category and species.			
Total # of Nests Left <i>in situ</i>	202	59	4
# of <i>in situ</i> Nests without Additional Protection	202	59	4
# of <i>in situ</i> Nests with Self-Releasing Screen	0	0	0
# of <i>in situ</i> Nests with Restraining Screen	0	0	0
# of <i>in situ</i> Nests with Self-Releasing Cage	0	0	0
# of <i>in situ</i> Nests with Restraining Cage	0	0	0
Beach Relocated Nest Data: Beach relocated nests are those removed and reburied at a place on the beach (not in a fenced hatchery) other than where the turtle deposited the clutch. As with <i>in situ</i> nests, beach relocated nests may be left without additional protection, covered with self-releasing or restraining flat screens, or covered with self-releasing or restraining above-ground cages. Record the number of nests by category and species.			
Total # of Beach Relocated Nests	1540	56	1
# Beach Relocated without Additional Protection	1540	56	1
# Beach Relocated with Self-Releasing Screen	0	0	0
# Beach Relocated with Restraining Screen	0	0	0
# Beach Relocated with Self-Releasing Cage	0	0	0
# Beach Relocated with Restraining Cage	0	0	0
Hatchery Data: Hatcheries are permanent or semi-permanent fenced/caged areas where nests are re-buried. Hatcheries are either self-releasing (hatchlings escape on their own) or restraining (hatchlings cannot escape without human intervention).			
Total # of Nests in Self-Releasing Hatchery	0	0	0
Total # of Nests in Restraining Hatchery	253	1	2

FLORIDA DEPARTMENT OF NATURAL RESOURCES - NEST SUCCESS REPORTING FORM FOR 1992
SPECIES: Caretta caretta (LOGGERHEAD)

PRINCIPLE PERMIT HOLDER:	Levi Fisher	BEACH NAME: Broward County										PERMIT NUMBER: tp 129
	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	VD/NVD # OF UNHATCHED EGGS	DNR USE ONLY
IN-SITU UNPROTECTED	202			167	19,161	15,172		192		509	308/740	
IN-SITU SCREENED												
IN-SITU CAGED												
BEACH RELOCATED (UNPROTECTED)	1,540			911	67,701	47,234		1,409	3,270	6,271	3315/10262	
BEACH RELOCATED (SCREENED)												
BEACH RELOCATED (CAGED)												
SELF-RELEASING HATCHERY	253			238	25,898	14,950		497		1,462	1126/2617	
RESTRAINING HATCHERY				107	10,582	7,376		197		385	714/1910	
OTHER (EXPLAIN SEE ROWS)												
DNR USE ONLY												

EXPLANATION OF ROW CATEGORIES:

IN-SITU UNPROTECTED: NATURAL NEST LEFT WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED)
 IN-SITU SCREENED: IN-SITU NEST COVERED WITH A SELF-RELEASING FLAT SCREEN
 IN-SITU CAGED: IN-SITU NEST COVERED WITH AN ABOVE-GROUND INDIVIDUAL CAGE
 BEACH RELOCATED (UNPROTECTED): NEST REMOVED AND REBURIED AT A PLACE ON THE BEACH OTHER THAN WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED AND NOT IN A FENCED/CAGED HATCHERY)
 BEACH RELOCATED (SCREENED): BEACH RELOCATED NEST COVERED WITH A SELF-RELEASING FLAT SCREEN
 BEACH RELOCATED (CAGED): BEACH RELOCATED NEST COVERED WITH AN ABOVE-GROUND INDIVIDUAL CAGE
 SELF-RELEASING HATCHERY: PERMANENT OR SEMI-PERMANENT FENCED/CAGED AREA WHERE MANY NESTS ARE REBURIED, HATCHLINGS ESCAPE ON THEIR OWN
 RESTRAINING HATCHERY: PERMANENT OR SEMI-PERMANENT FENCED/CAGED AREA WHERE MANY NESTS ARE REBURIED, HATCHLINGS CANNOT ESCAPE WITHOUT HUMAN INTERVENTION

NOTE: in unhatched eggs column VD = visible development

NVD = no visible development
 OTHER: these are nests in restraining hatchery that hatched after 24 August 1993

EXPLANATION OF COLUMN HEADINGS:

TOTAL # OF NESTS: TOTAL NUMBER OF NESTS FOR EACH CATEGORY
 # OF NESTS MARKED TO EVALUATE: NESTS WHICH WERE MARKED TO TRACK THEIR FATE AND EVALUATE NEST SUCCESS
 # OF MARKED NESTS DEPREDATED: NUMBER OF MARKED NESTS DEPREDATED BY NON-HUMAN PREDATORS
 # OF NESTS ACTUALLY EVALUATED: NESTS IN WHICH NEST SUCCESS WAS EVALUATED
 # OF EGGS IN EVALUATED NESTS: TOTAL NUMBER OF EGGS IN EVALUATED NESTS (THIS MAY BE AN ESTIMATE DUE TO HATCHED EGG COUNTS)
 # OF HATCHLINGS EMERGED: NUMBER OF HATCHLINGS THAT EMERGED FROM THE NEST ON THEIR OWN, BEFORE THE NEST WAS EXCAVATED FOR EVALUATION
 # OF LIVE HATCHLINGS IN NEST: NUMBER OF LIVE HATCHLINGS FOUND IN THE NEST UPON EXCAVATION OF THE NEST FOR EVALUATION
 # OF DEAD HATCHLINGS IN NEST: NUMBER OF DEAD HATCHLINGS FOUND IN THE NEST UPON EXCAVATION OF THE NEST FOR EVALUATION
 # OF PIPPED LIVE: NUMBER OF LIVE HATCHLINGS FOUND PIPPED (BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL) UPON EXCAVATION OF THE NEST FOR EVALUATION
 # OF PIPPED DEAD: NUMBER OF DEAD HATCHLINGS FOUND PIPPED (BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL) UPON EXCAVATION OF THE NEST FOR EVALUATION
 # OF UNHATCHED EGGS: NUMBER OF UNHATCHED EGGS FOUND UPON EXCAVATION OF THE NEST FOR EVALUATION

FLORIDA DEPARTMENT OF NATURAL RESOURCES - NEST SUCCESS REPORTING FORM FOR 1992
SPECIES: *Chelonia mydas* (GREEN TURTLE)

PRINCIPLE PERMIT HOLDER: Lou Fisher			BEACH NAME: Broward County								PERMIT NUMBER: 129	
	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	VD/WVD # OF UNHATCHED EGGS	DNR USE ONLY
IN-SITU (UNPROTECTED)	59			22	2,607	2,161		22		62	50/206	
IN-SITU (SCREENED)												
IN-SITU (CAGED)												
BEACH RELOCATED (UNPROTECTED)	56			10	1,011	617		29		95	81/347	
BEACH RELOCATED (SCREENED)												
BEACH RELOCATED (CAGED)												
SELF-RELEASING HATCHERY												
RESTRAINING HATCHERY	2			2	233	138		17		23	5/50	
OTHER (EXPLAIN)												
DNR USE ONLY												

EXPLANATION OF ROW CATEGORIES:

IN-SITU (UNPROTECTED): NATURAL NEST LEFT WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED)

IN-SITU (SCREENED): IN-SITU NEST COVERED WITH A SELF-RELEASING FLAT SCREEN

IN-SITU (CAGED): IN-SITU NEST COVERED WITH AN ABOVE-GROUND INDIVIDUAL CAGE

BEACH RELOCATED (UNPROTECTED): NEST REMOVED AND REBURIED AT A PLACE ON THE BEACH OTHER THAN WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED AND NOT IN A FENCED/CAGED HATCHERY)

BEACH RELOCATED (SCREENED): BEACH RELOCATED NEST COVERED WITH A SELF-RELEASING FLAT SCREEN

BEACH RELOCATED (CAGED): BEACH RELOCATED NEST COVERED WITH AN ABOVE-GROUND INDIVIDUAL CAGE

SELF-RELEASING HATCHERY: PERMANENT OR SEMI-PERMANENT FENCED/CAGED AREA WHERE MANY NESTS ARE REBURIED, HATCHLINGS ESCAPE ON THEIR OWN

RESTRAINING HATCHERY: PERMANENT OR SEMI-PERMANENT FENCED/CAGED AREA WHERE MANY NESTS ARE REBURIED, HATCHLINGS CANNOT ESCAPE WITHOUT HUMAN INTERVENTION

EXPLANATION OF COLUMN HEADINGS:

TOTAL # OF NESTS: TOTAL NUMBER OF NESTS FOR EACH CATEGORY

OF NESTS MARKED TO EVALUATE: NESTS WHICH WERE MARKED TO TRACK THEIR FATE AND EVALUATE NEST SUCCESS

OF MARKED NESTS DEPREDATED: NUMBER OF MARKED NESTS DEPREDATED BY NON-HUMAN PREDATORS

OF NEST ACTUALLY EVALUATED: NESTS IN WHICH NEST SUCCESS WAS EVALUATED

OF EGGS IN EVALUATED NESTS: TOTAL NUMBER OF EGGS IN EVALUATED NESTS (THIS MAY BE AN ESTIMATE DUE TO HATCHED EGG COUNTS)

OF HATCHLINGS EMERGED: NUMBER OF HATCHLINGS THAT EMERGED FROM THE NEST ON THEIR OWN, BEFORE THE NEST WAS EXCAVATED FOR EVALUATION

OF LIVE HATCHLINGS IN NEST: NUMBER OF LIVE HATCHLINGS FOUND IN THE NEST UPON EXCAVATION OF THE NEST FOR EVALUATION

OF DEAD HATCHLINGS IN NEST: NUMBER OF DEAD HATCHLINGS FOUND IN THE NEST UPON EXCAVATION OF THE NEST FOR EVALUATION

OF PIPPED LIVE: NUMBER OF LIVE HATCHLINGS FOUND PIPPED (BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL) UPON EXCAVATION OF THE NEST FOR EVALUATION

OF PIPPED DEAD: NUMBER OF DEAD HATCHLINGS FOUND PIPPED (BROKEN THROUGH EGGSHELL BUT NOT COMPLETELY FREE OF EGGSHELL) UPON EXCAVATION OF THE NEST FOR EVALUATION

OF UNHATCHED EGGS: NUMBER OF UNHATCHED EGGS FOUND UPON EXCAVATION OF THE NEST FOR EVALUATION

FLORIDA DEPARTMENT OF NATURAL RESOURCES - NEST SUCCESS REPORTING FORM FOR 1992
SPECIES: *Dermochelys coriacea* (LEATHERBACK)

PRINCIPLE PERMIT HOLDER: <u>Lon Fishbe</u>			BEACH NAME: <u>Broward County</u>								PERMIT NUMBER: <u>129</u>	
	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	VD/WVD # OF UNHATCHED EGGS	DNR USE ONLY
IN-SITU (UNPROTECTED)	4	4		4	334	232		18		12	8/64	
IN-SITU (SCREENED)												
IN-SITU (CAGED)												
BEACH RELOCATED (UNPROTECTED)	1			1	84	0		0		0	0/84	
BEACH RELOCATED (SCREENED)												
BEACH RELOCATED (CAGED)												
SELF-RELEASING HATCHERY												
RESTRAINING HATCHERY	2			2	206	134		4		11	26/31	
OTHER (EXPLAIN)												
DNR USE ONLY												

EXPLANATION OF ROW CATEGORIES:

IN-SITU (UNPROTECTED): NATURAL NEST LEFT WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED)
 IN-SITU (SCREENED): IN-SITU NEST COVERED WITH A SELF-RELEASING FLAT SCREEN
 IN-SITU (CAGED): IN-SITU NEST COVERED WITH AN ABOVE-GROUND INDIVIDUAL CAGE
 BEACH RELOCATED (UNPROTECTED): NEST REMOVED AND REBURIED AT A PLACE ON THE BEACH OTHER THAN WHERE TURTLE DEPOSITED THE CLUTCH (NOT SCREENED OR CAGED AND NOT IN A FENCED/CAGED HATCHERY)
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 # OF UNHATCHED EGGS: NUMBER OF UNHATCHED EGGS FOUND UPON EXCAVATION OF THE NEST FOR EVALUATION



**Department of
Natural Resource Protection
Biological Resources Division
Marine Resources Section**

609-B, S.W. 1st Avenue,
Fort Lauderdale, FL 33301

Broward County Board of County Commissioners

Scott I. Cowan • Suzanne N. Gunzburger
John P. Hart • Lori Nance Parrish
Sylvia Poitier • John E. Rodstrom, Jr.
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about the Sea Turtle Conservation Program.

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