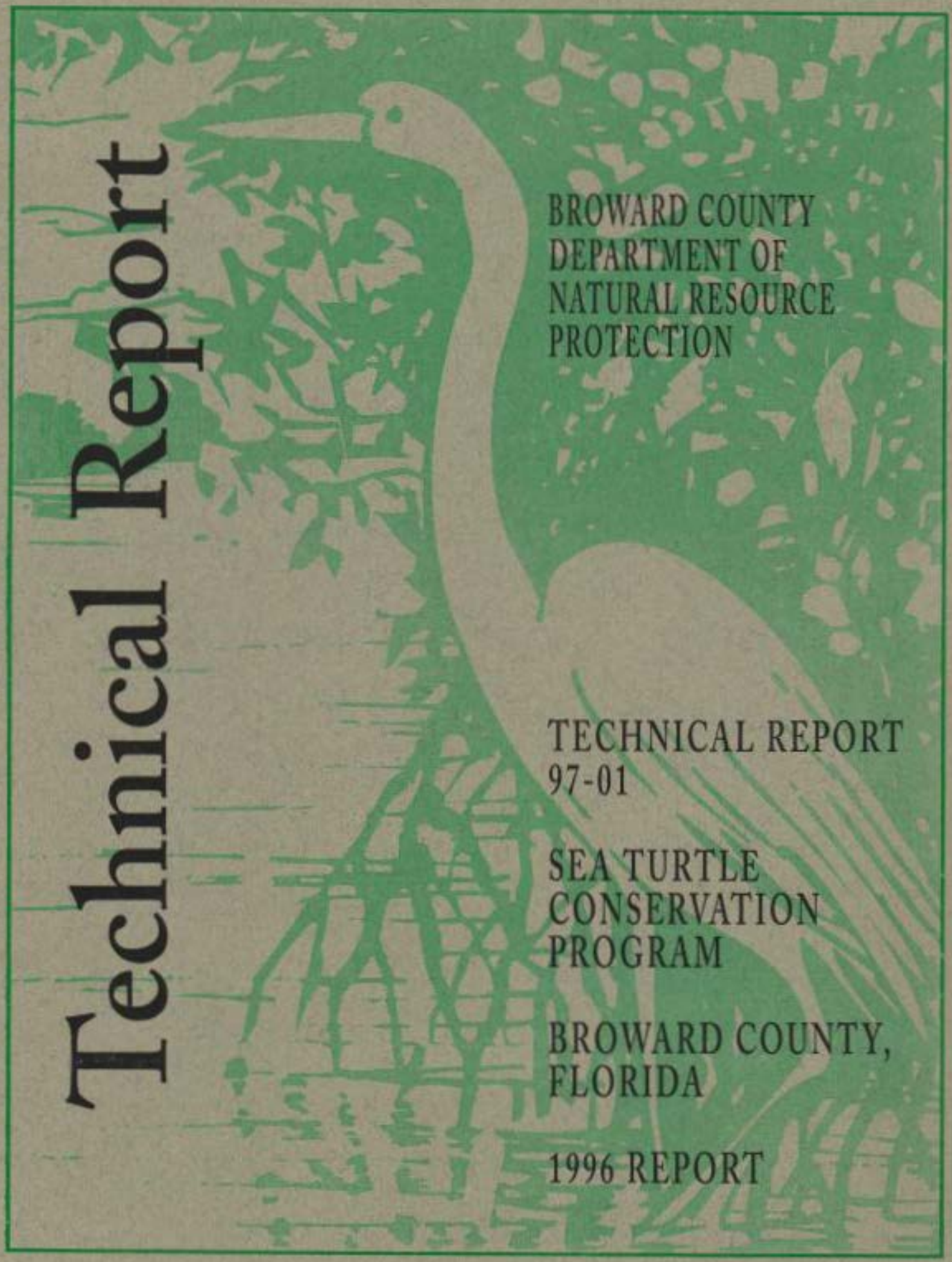
Technical Report

BROWARD COUNTY
DEPARTMENT OF
NATURAL RESOURCE
PROTECTION



TECHNICAL REPORT 97-01

SEA TURTLE CONSERVATION PROGRAM

BROWARD COUNTY, FLORIDA

1996 REPORT

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For the:

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

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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 1996 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, 1996. 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 and 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 six unfenced beach locations at Hillsboro Beach. Two of these open beach hatchery locations had been utilized in previous years. These were designated HB1 located at the Hillsboro Club, immediately north of the Hillsboro Inlet, and HB3 near the Ocean Crest condominiums at 1189 A1A. Last year's site designated HB2 at the Mc Millan property, 1125 A1A, was not used this year. Instead, three hatchery sites were established near 923, 925 and 969 A1A. These locations were designated HB923, HB925, and HB969, respectively. At the peak of the nesting season, the HB923 and HB925 sites enlarged until they effectively merged. The relocation area between these sites was designated HB923/5. Nests deposited in Hillsboro Beach, which were in danger of negative impacts, were relocated to less hazardous nearby locations on that beach (HB), 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, 192 of these nests at Hillsboro Beach were excavated for post emergence examination. At Lloyd Park, 176 *in situ* nests were evaluated by Park

personnel and are included in this report. An additional 34 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.

Hatchery Operations

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.

Because of the high nesting density early in the season and the high percentage of relocated nests, 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 between July 8 and July 11, after the first nests hatched. All subsequent relocated Fort Lauderdale and Pompano nests 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.

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 1996 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 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 1996. 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 2810 nests were counted in 1996, exceeding the previous year's record by 6.7 percent. The mean nest count of 2386 for the last seven years remains very significantly greater than the average of 1412 nests for the first nine years of the project (t test; $t = 8.2$, $p << .0001$). This year also marks the third consecutive yearly increase in total nest counts.

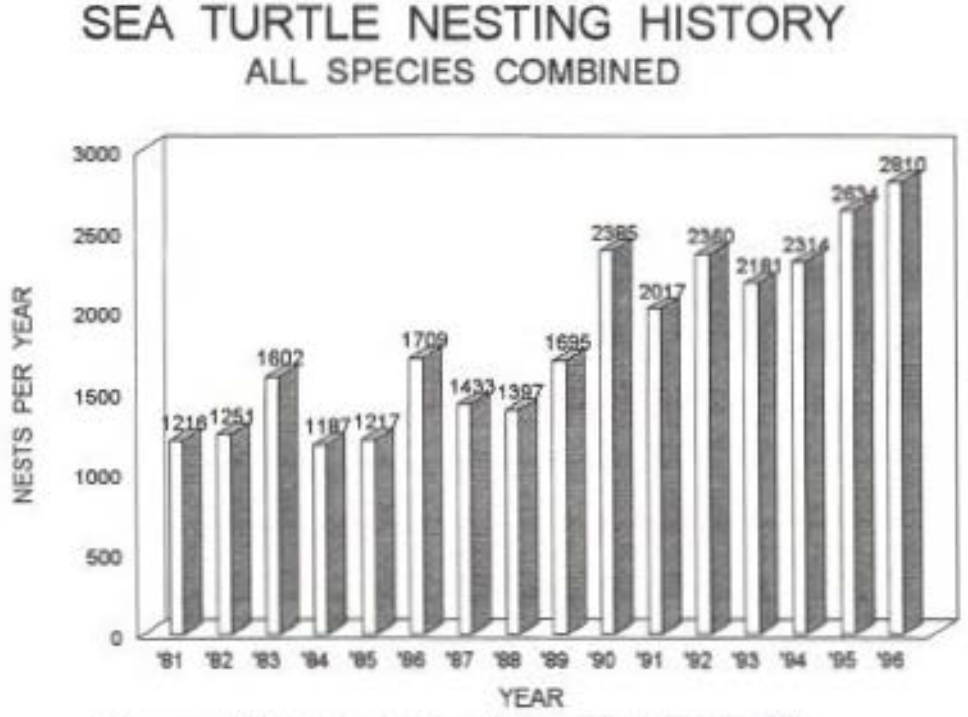
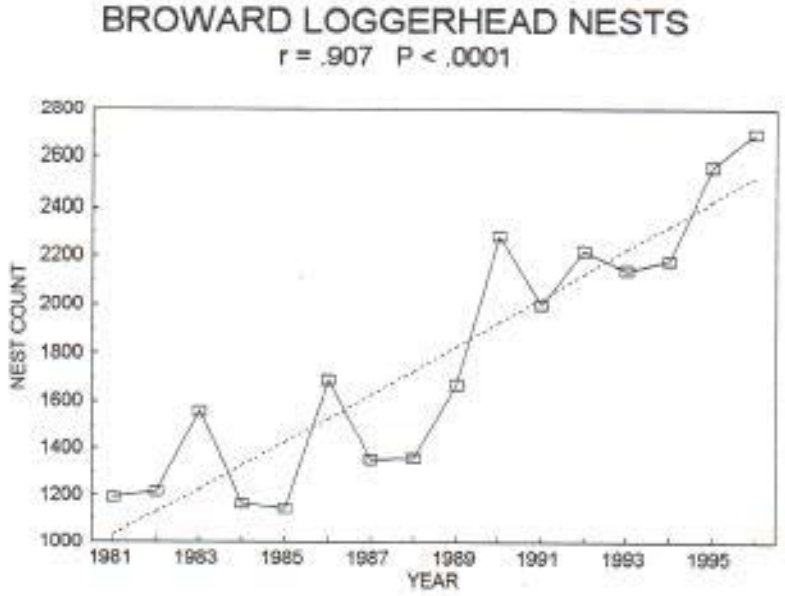


Figure 1: The historical pattern of total sea turtle nesting in Broward County since full surveys commenced in 1981.

Figure 2 shows the yearly nesting trends of loggerhead, green and leatherback sea turtles. The mean C. *caretta* count for the last two years is significantly greater than the average from 1990 through 1994 (t test; t = 5.45, p = .0028). The overall historical trend in loggerhead nesting remains strongly positive. This year's count continued the positive trend, which was stagnant from 1990 through 1994. *C. mydas* nesting continued the alternate high-low pattern of the last seven years. This year was the third most heavily nested year since 1981, but this year's count was not significantly different than the mean of the three previous high nesting years (t-test; p=0.19). Only two *D. coriacea* nests were deposited this year. This represented a decline from the counts of the last three years, but such fluctuations have occurred previously. Figure 3 shows the seasonal pattern of daily C. *caretta* nesting. 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 *D. coriacea* and *C. mydas* nests were deposited on May 8th and May 31st, respectively, on Hillsboro Beach. The first C. *caretta* nest was deposited on April 23, also at Hillsboro Beach. Nesting counts and densities for *C. mydas* are shown in Table 2. As in past years, Hillsboro Beach and Lloyd Park beaches had the highest nesting densities. Table 3 gives the nesting densities of *D. coriacea* on the five beaches.



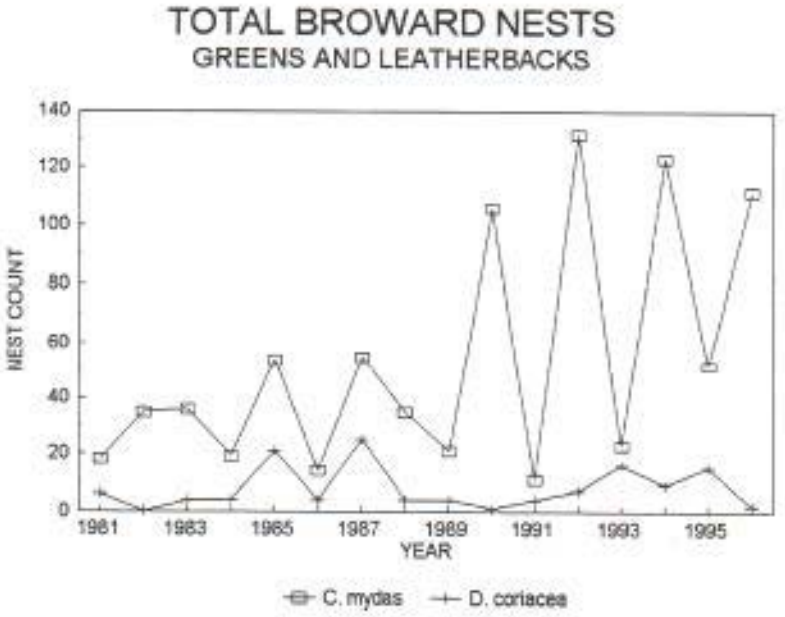


Figure 2: Historical nesting patterns of loggerhead, green and leatherback sea turtles in Broward County since 1981.

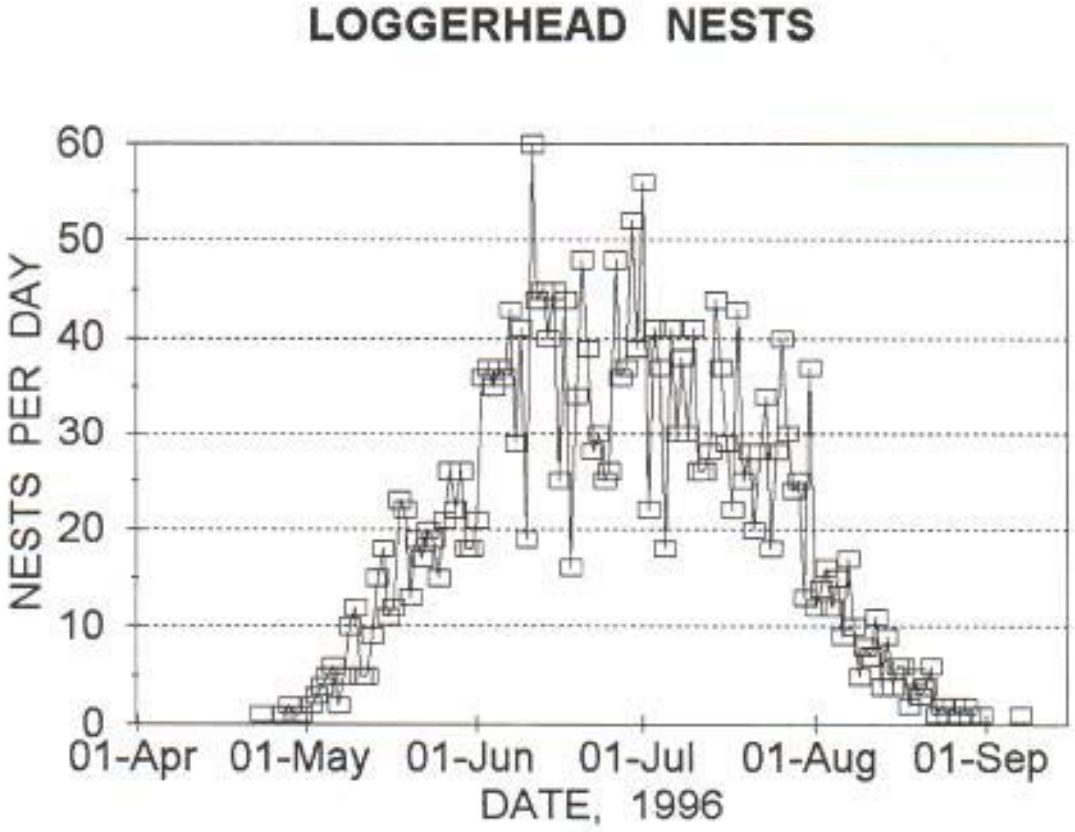


Figure 3: The seasonal pattern of daily loggerhead nesting in Broward County, 1996.

Table 1: Total *C.caretta* nests and nesting densities expressed as nests-per-kilometer for the 1996 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	89	9.4	9.47	.054	|
Lloyd Park	206	3.9	52.82	.314	|
Ft. Lauderdale	652	10.6	61.51	.316	|
Pompano Beach	848	7.7	110.13	.639	|
Hillsboro Beach	901	7.0	128.71	.765	|
OVERALL	2696	38.6	69.84		

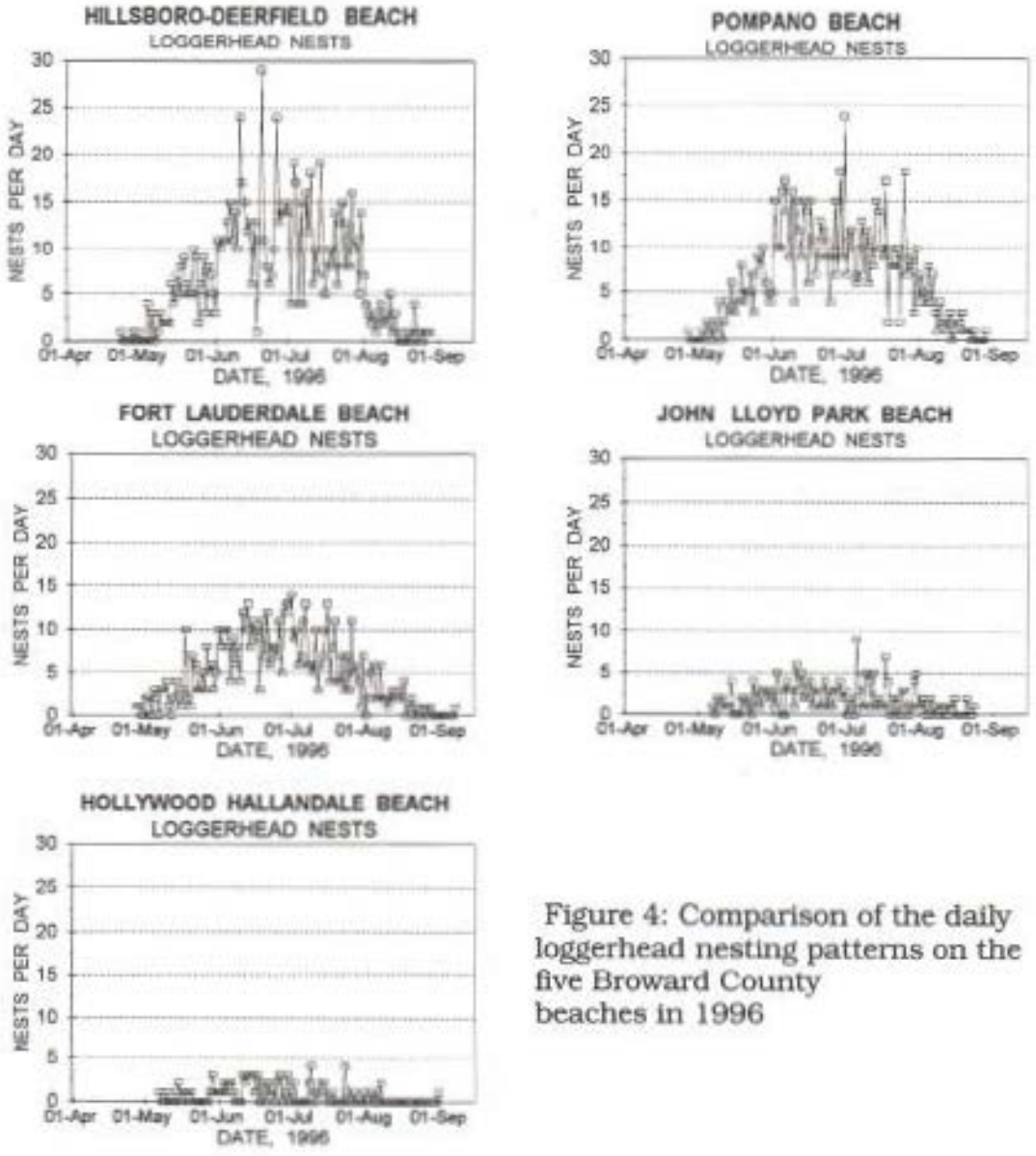


Figure 4: Comparison of the daily loggerhead nesting patterns on the five Broward County beaches in 1996

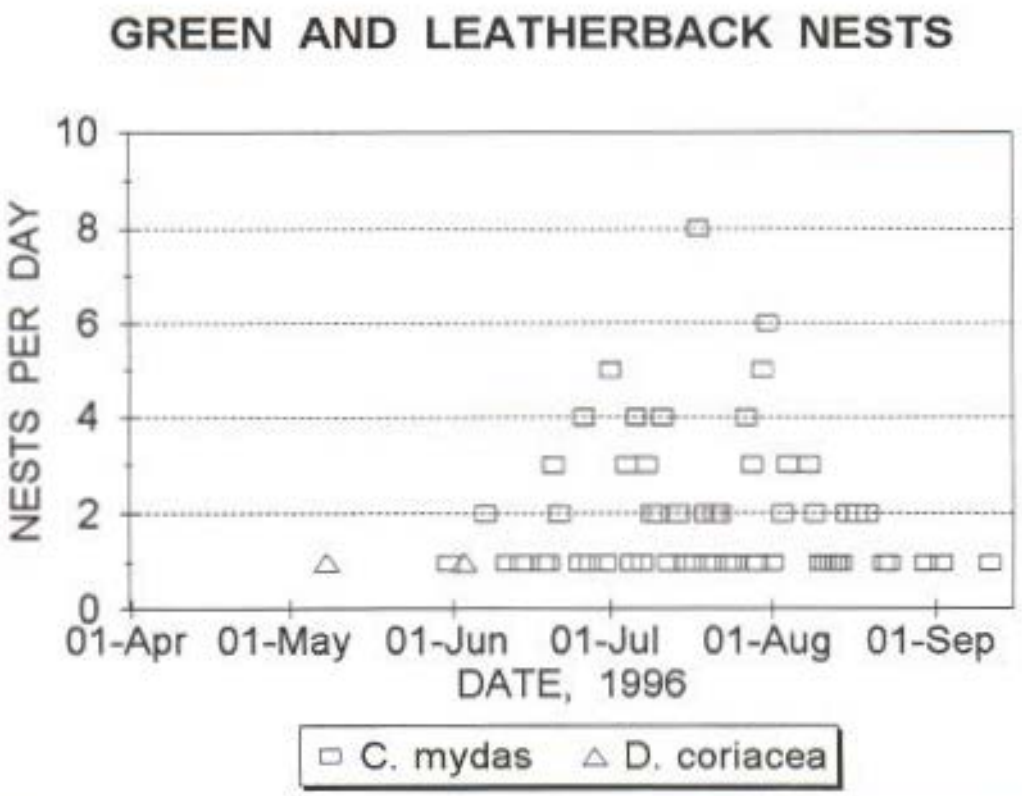


Figure 5: The seasonal pattern of daily green and leatherback nesting in Broward County, 1996

Table 2: Total *C. mydas* nests and nesting densities expressed as nests-per-kilometer for the 1996 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	3	9.4	0.32	.002	|
Ft. Lauderdale	9	10.6	0.85	.005	|
Pompano Beach	10	7.7	1.30	.008	|
Lloyd Park	18	3.9	4.62	.027	|
Hillsboro Beach	72	7.0	10.29	.062	|
OVERALL	112	38.6	2.90		

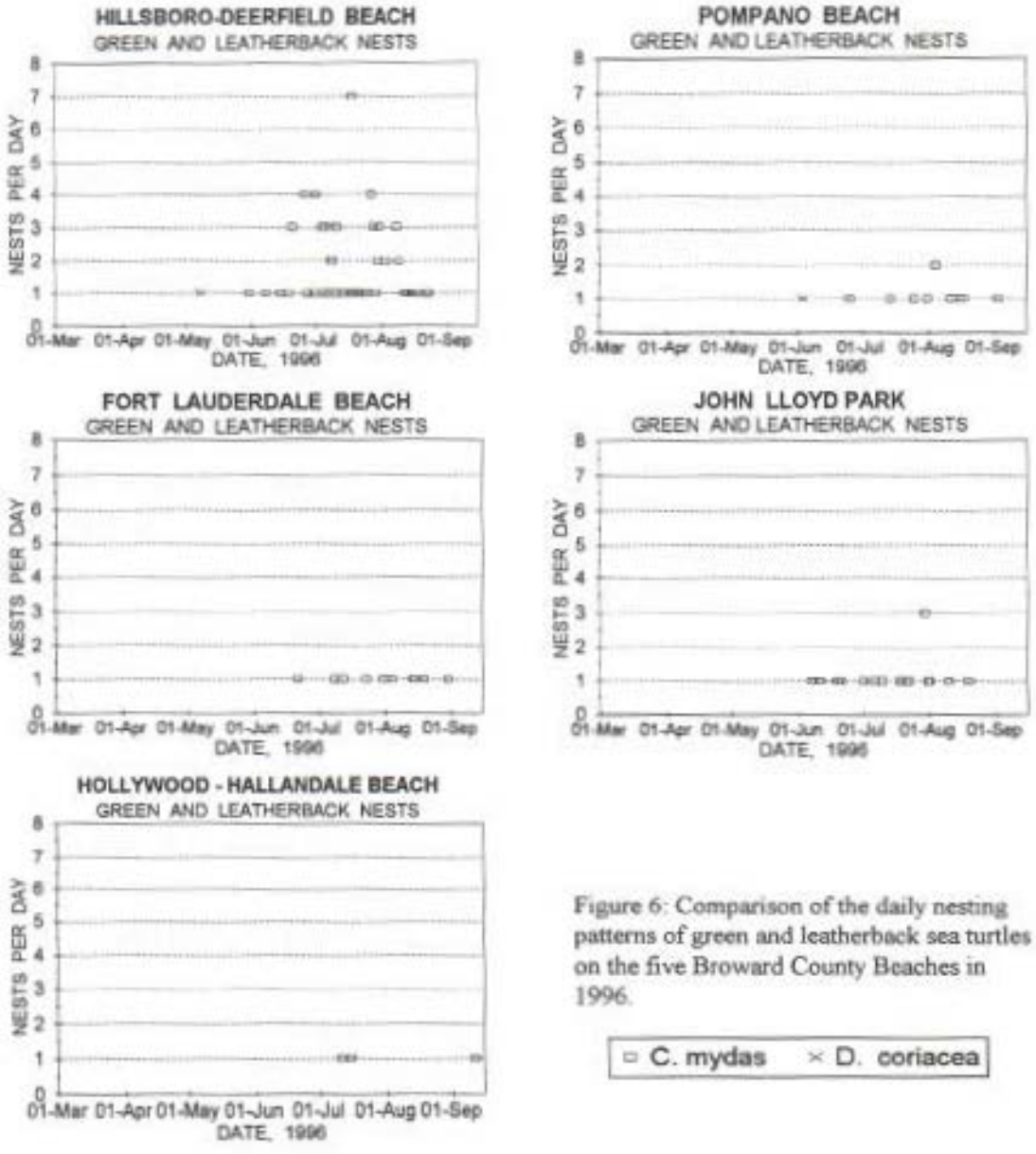


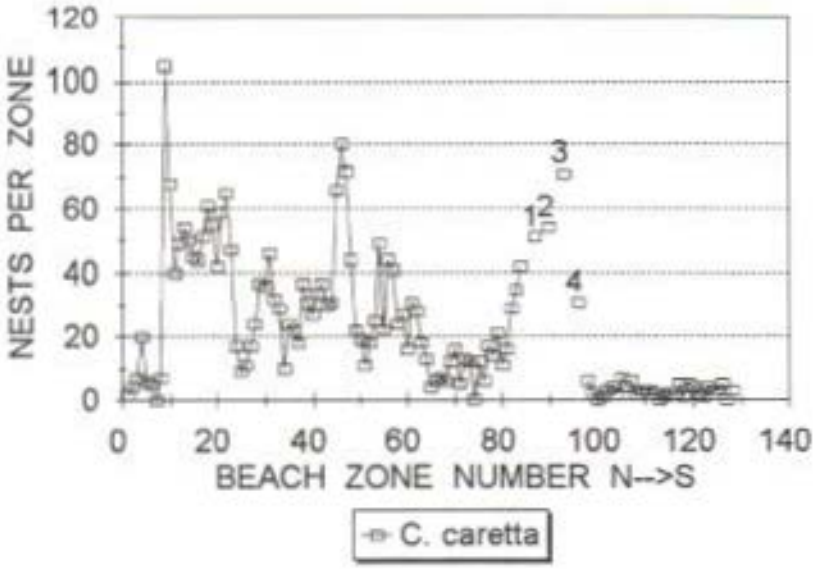
Figure 6: Comparison of the daily nesting patterns of green and leatherback sea turtles on the five Broward County Beaches in 1996.

Table 3: Total *D. coriacea* nests and nesting densities expressed as nests-per-kilometer for the 1996 season. Data were too few for reliable statistical comparison of mean daily nesting densities.

BEACH	TOTAL NESTS	BEACH LENGTH (km)	Nests per km
Hollywood	0	9.4	0
Lloyd Park	0	3.9	0
Ft. Lauderdale	0	10.6	0
Pompano Beach	1	7.7	0.13
Hillsboro Beach	1	7.0	0.14
OVERALL	2	38.6	0.05

Figure 7 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 1996. The general features of this pattern have remained recognizable since the project's inception. This year, there was unusually dense nesting in zone 8 in northern Hillsboro Beach.

Figure 8 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 and Lloyd Park beaches than at the more northerly beaches, which were not statistically different from each other. The nesting success of *C. mydas* was not significantly different throughout the County, and the data for *D. coriacea* was too low for analysis. 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



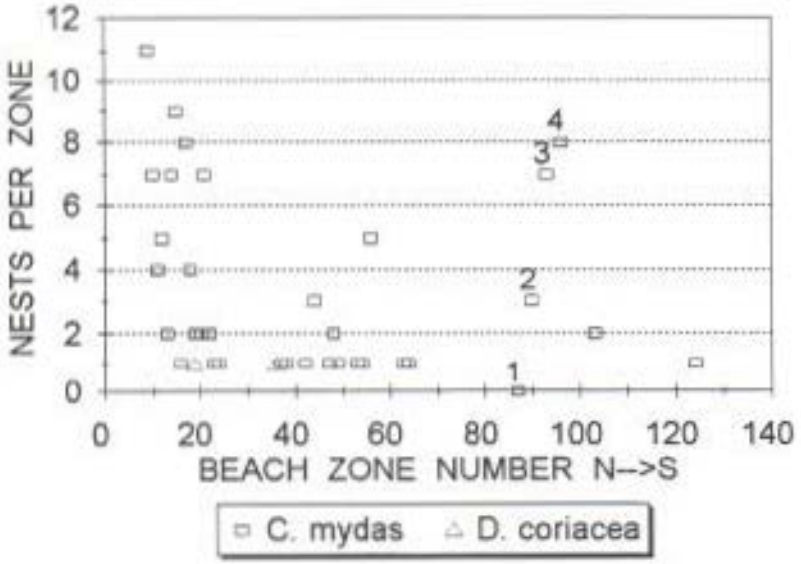
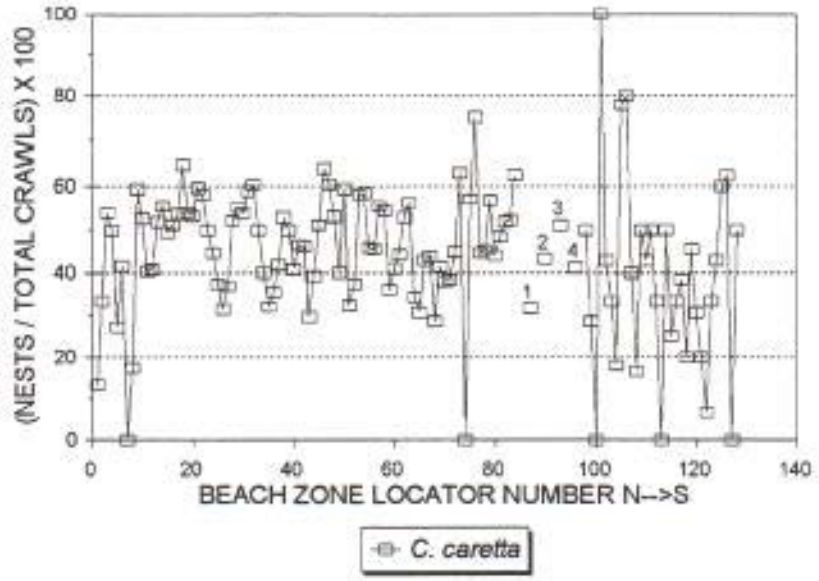


Figure 7: Locations of loggerhead, green and leatherback nests in Broward County, 1996. Numbers 1-4 indicate the four beach zones of John Lloyd Park.



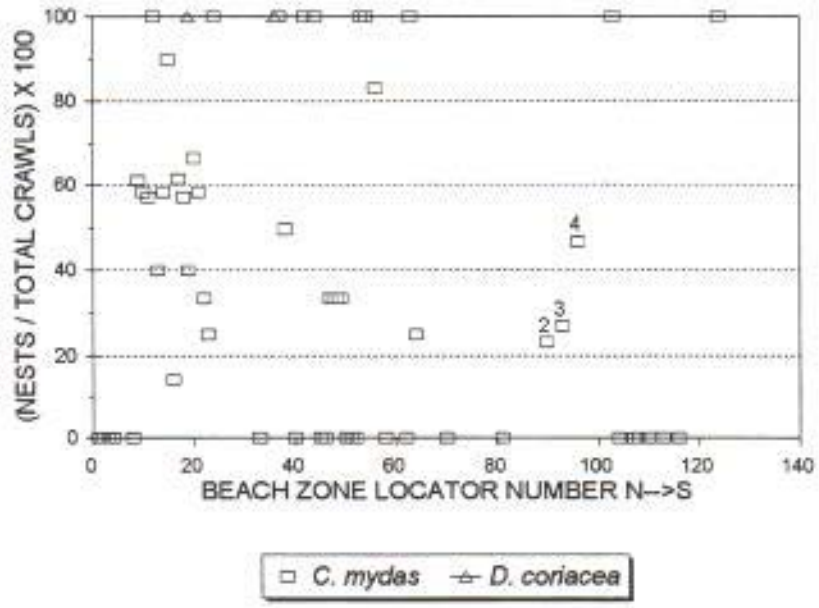


Figure: 8 The distribution of the nesting success of loggerhead, green and leatherback turtles across Broward County, 1996. Numbers 1-4 indicate the four beach zones of John Lloyd Park.

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 1996. 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* nesting success and *D. coriacea* nesting was too sparse for analysis.

BEACH	*C. caretta*				*C. mydas*			*D. coriacea*		
	Nests	FC	NS	N-K	Nests	FC	NS	Nests	FC	NS
Hollywood	89	154	36.6	|	3	6	33.3	0	0	-
Lloyd Park	206	293	41.3	|	18	45	28.6	0	0	-
Ft. Lauderdale	652	715	47.7	|	9	13	40.9	0	0	-
Pompano Beach	848	907	48.3	|	10	16	38.5	1	0	100
Hillsboro Beach	901	868	50.9	|	72	63	53.3	1	0	100
OVERALL	2696	2937	47.9		112	143	43.9	2	0	100

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*
RELOCATED			
Open Beach			
Hillsboro Beach*			
BH	166	6	0
BH1	769	15	1
BH923	34	0	0
BH925	317	2	0
BH923/925	77	1	0
BH969	81	0	0
BH3	79	0	0
Lloyd Park	47	1	0
Hatcheries			
Pompano	62	1	0
Ft. Lauderdale	48	0	0
Hollywood	86	3	0
Discovery Center	1	0	0
TOTALS	1767	29	1
IN SITU			
Hillsboro Beach	735	66	1
Pompano Beach	23	0	0
Ft. Lauderdale	8	0	0
Lloyd Park	159	17	0
Hollywood	3	0	0
TOTALS	928	83	1
GRAND TOTALS	2695	112	2

numbers and locations of nests left *in situ*. 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 declined by 4 percentage points from the 1995 value while the *in situ* C. *caretta* hatching success rate improved by 0.5 percentage points compared to last year. The difference between the hatching rates of *in situ* and relocated C. *caretta* increased from 4.5 percent in 1995 to 9.0 percent in 1996. This was approximately the same difference as in 1994. The success of relocated *C. mydas* nests improved from 55.6 to 64.3 percent from 1995 to 1996, but in the single relocated *D. coriacea* nest, all 91 eggs failed to hatch and showed no visible development. For *in situ* nests, the hatching success of *C. mydas* increased by 8.2 percent. The single *in situ* *D. coriacea* nest showed no signs of hatching and was not investigated for hatching success.

Figure 9 illustrates the seasonal patterns of the hatching success of *in situ* and relocated *C. caretta* nests. As observed in past years (except 1994) there was a slight, but very significant ($r = .211$, $p << .0001$) decline in hatching success for relocated *C. caretta* nests over the course of the season. This was not observed for *in situ* nests, where the slope of the trend line was not significantly less than zero. Figure 10 shows the same information for relocated and *in situ* *C. mydas* nests. Both the relocated and *in situ* nests showed significant increases ($r=.481$, $p=.010$ and $r=.347$, $p=.044$ respectively) in hatching success. This was also observed in 1994, but not in 1995. Figure 11 illustrates the hatching success distributions for *in situ* and relocated

Table 6: Total egg counts, released hatchlings and overall hatching successes for *in situ* and relocated nests of *C.caretta*, *C.mydas* and *D.coriacea* in 1996.

SPECIES	NUMBER OF EGGS	n*	HATCHLINGS RELEASED	HATCHING SUCCESS (%)
***In situ* Nests**				
C. caretta	35549	374	27466	77.3
C. mydas	3195	27	2692	84.3
D. coriacea	0	0	-	-
Total	38744	401	30158	77.8
Relocated Nests				
C. caretta	175206	1624	119630	68.3
C. mydas	2758	23	1774	64.3
D. coriacea	91	1	0	0
Total	178055	1648	121404	68.2
Overall				
C. caretta	210755	1998	147096	69.8
C. mydas	5953	50	4466	74.8
D. coriacea	91	1	0	0
Total	216799	2049	151562	69.9

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

There were 10585 eggs from 87 predated *C. caretta* nests and 271 eggs from 2 predated *C. mydas* nests which were not included in the totals. In addition, there were 5737 eggs from 53 *C. caretta* nests and 428 eggs from 4 *C. mydas* nests which were not evaluated due to marker removal.

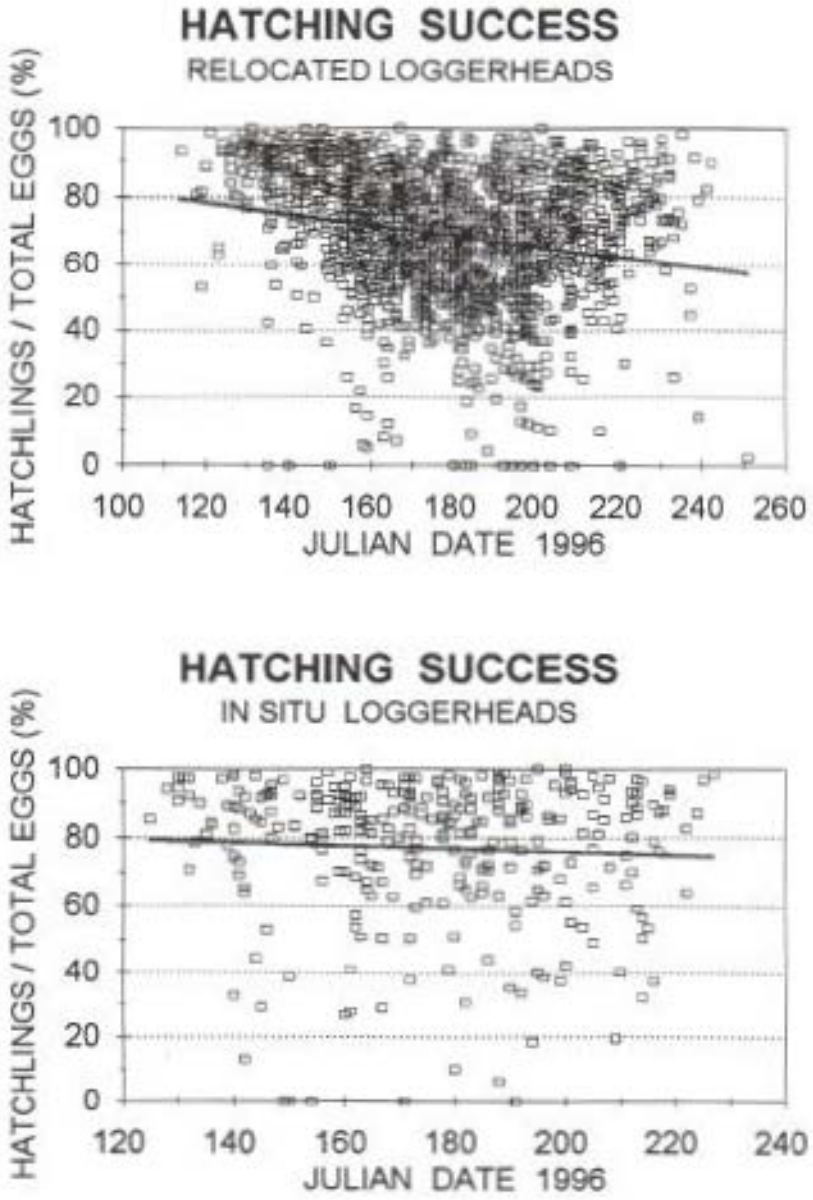


Figure 9: Comparison of seasonal hatching success trends for relocated and *in situ* loggerhead nests during 1996

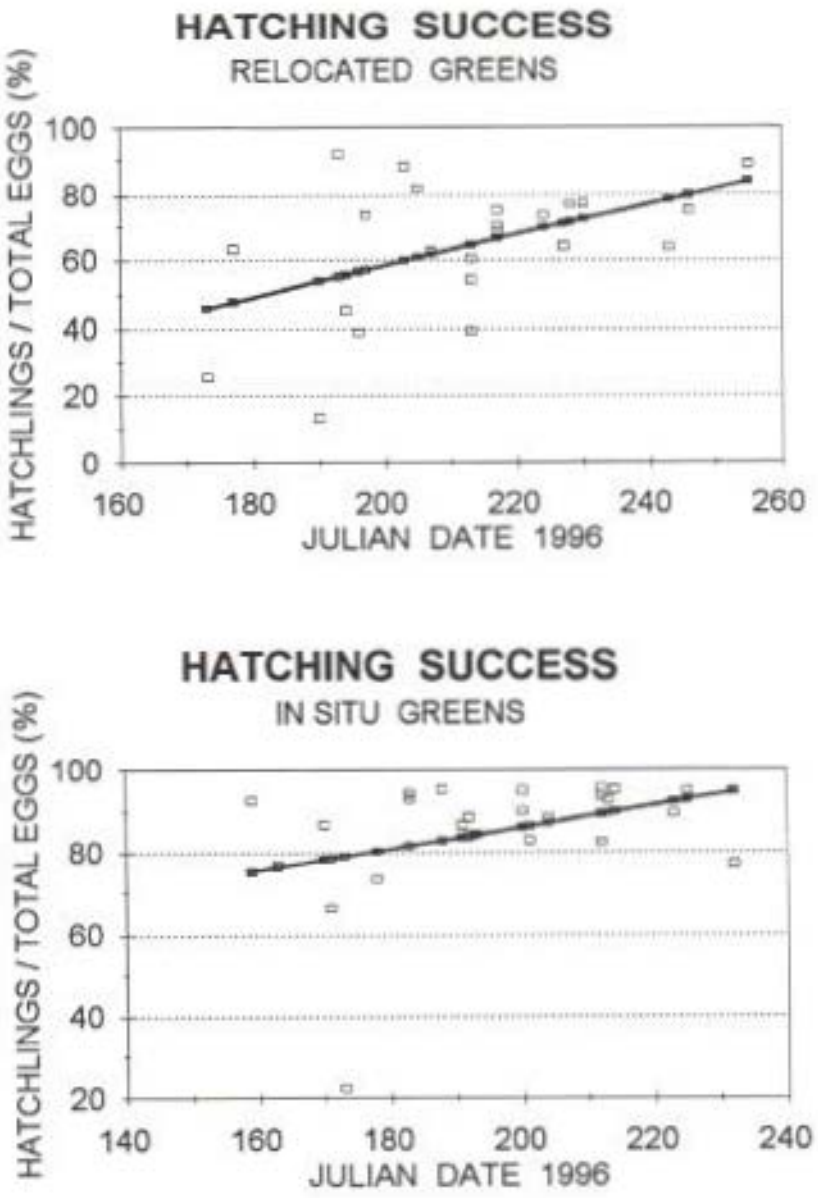


Figure 10: Comparison of seasonal hatching success trends for relocated and *in situ* green sea turtle nests during 1996

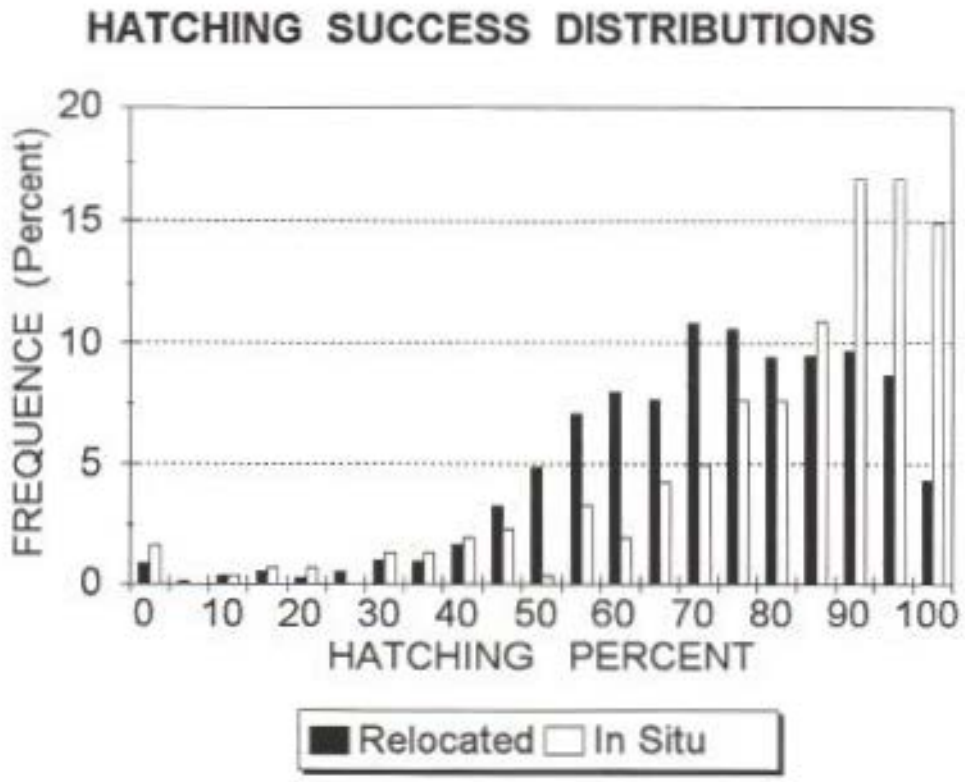


Figure 11: Hatching success frequencies for *in situ* and relocated loggerhead nests, 1996

C. caretta nests. Figure 12 shows the historical patterns of the yearly hatching success of all species combined, since 1981.

Table 7 gives the post-hatching nest evaluation data for all *in situ* and relocated C. *caretta* nests for all beaches. Table 8 and 9 show the same data for *C. mydas* and *D. coriacea*, respectively. Table 10 compares the means of all the individual hatching success rates for all C. *caretta* nests either laid or relocated on Hillsboro Beach. Hatching successes at the new hatchery sites BH923, BH923/5 and BH925 were not statistically different from each other, but were significantly lower than at the older BH1 and BH3 locations as well as for *in situ*

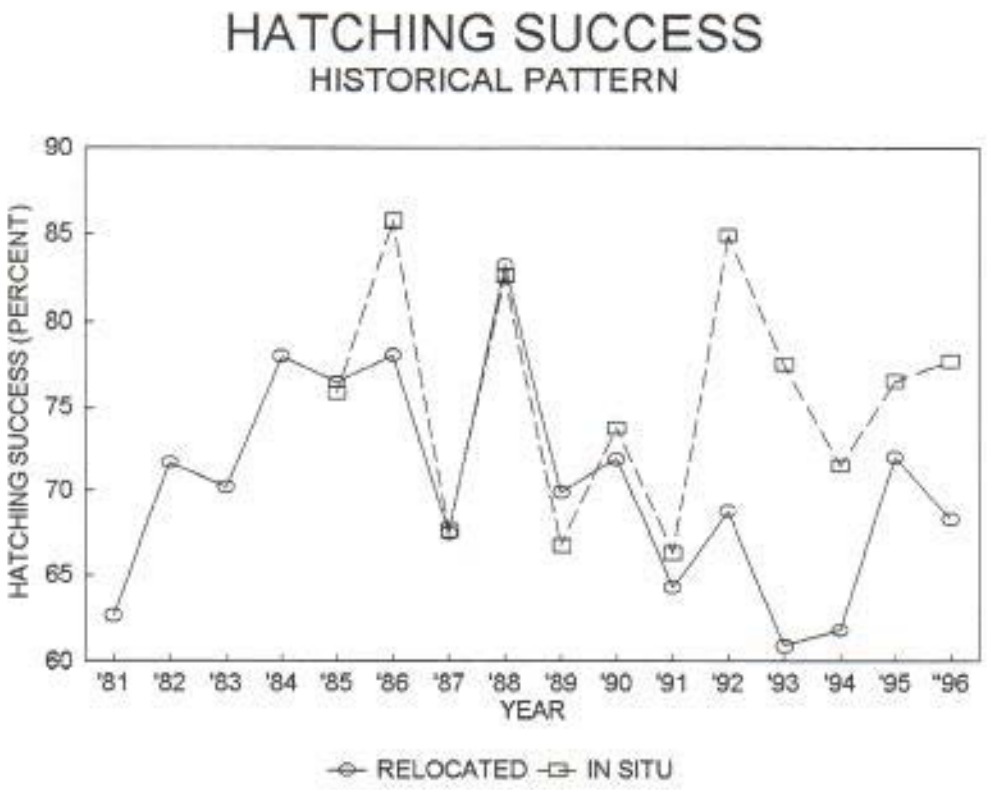


Figure 12: The historical patterns of yearly hatching success for all evaluated *in situ* and relocated sea turtle nests, since 1981.

and relocated nests which incubated on Hillsboro Beach outside the designated hatchery areas.

Hatching success at the main relocation site (BH1) was not statistically different than for *in situ* or non-hatchery relocated nests, while success at the BH3 relocation site was the highest of all the Hillsboro locations.

Table 11 compares hatching success and the post-hatching nest evaluation categories for relocated and *in situ C. caretta* nests at Hillsboro Beach. As in previous years, the difference in the hatching success of relocated nests was significantly lower than for *in situ* nests.

Table 7: Accounting of the status of all hatched and unhatched eggs in investigated *in situ* and relocated *C. caretta* nests during 1996.

Location	Total Eggs	Hatched Eggs (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
***In situ* Nests**							
Hillsboro Beach	18639	73.4	3.3	2.4	6.0	5.7	12.5
Pompano Beach	2416	84.7	5.3	3.4	2.0	2.5	7.3
Ft. Lauderdale	952	81.7	5.9	3.7	2.0	1.8	10.8
Lloyd Park	13202	81.2	0.7	0.7	2.7	*	15.5
Hollywood	340	71.8	.9	6.2	2.6	6.5	12.9
Relocated Nests							
Hillsboro Beach							
BH	9827	73.2	5.7	1.6	7.1	3.7	14.4
BH1	78563	69.1	8.5	1.6	12.7	3.6	12.9
BH 923	3419	62.9	6.9	1.7	22.7	4.2	8.5
BH 925	33399	57.9	9.9	1.2	14.7	6.8	19.3
BH 923/5	8234	58.9	10.8	1.5	16.5	6.0	16.9
BH 969	7847	64.3	14.2	1.6	15.5	7.1	11.6
BH 3	7126	82.9	6.2	1.5	6.7	1.9	7.0
Pompano Beach	6861	68.8	6.0	1.1	4.8	6.5	18.7
Ft. Lauderdale	5595	83.8	2.6	0.6	3.9	0.9	10.8
Lloyd Park	4607	77.9	1.5	1.8	5.9	*	14.5
Hollywood	9728	80.6	4.1	0.7	4.7	1.6	12.2

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 1996. Abbreviations as in Table 7.

Location	Total Eggs	Hatched Eggs (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
***In situ* Nests**							
Hillsboro Beach	1185	87.3	1.8	0.5	1.4	2.6	8.2
Lloyd Park	2010	82.5	1.0	0.9	3.2	*	13.4
Relocated Nests							
Hillsboro Beach							
BH	137	39.4	13.1	1.5	22.6	7.3	29.2
BH1	1666	68.8	10.1	0.6	6.1	3.7	20.8
BH 925	258	42.2	14.3	1.6	15.1	25.2	15.9
BH 923/5	66	25.8	22.7	7.6	56.1	1.5	9.1
Pompano Beach	125	13.6	9.6	0.0	7.2	59.2	20.0
Lloyd Park	142	88.0	7.7	0.0	0.0	*	12.0
Hollywood	364	84.1	4.1	0.0	0.8	0.3	14.8

Table 9: Accounting of the status of all hatched and unhatched eggs in investigated *in situ* and relocated *D. coriacea* nests during 1996. The single *in situ* nest showed no signs of hatching and was not evaluated. Abbreviations as in Table 7.

Location	Total Eggs	Hatched Eggs (%)	LIN (%)	DIN (%)	PIP (%)	VD (%)	NVD (%)
Relocated Nests							
Hillsboro Beach							
BH1	91	0.0	0.0	0.0	0.0	0.0	100

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

LOCATION	NESTS EVALUATED	MEAN HATCHING SUCCESS (%)
BH 925	317	59.3
BH 923/5	76	60.0
BH 923	31	63.2
BH 969	71	65.0
BH 1	734	70.3
BH *In situ*	182	74.1
BH Relocated	88	74.3
BH 3	64	82.4

Table 11: Comparison of hatching success, and all categories of failed eggs from investigated *in situ* and relocated *C. caretta* nests at Hillsboro Beach, using the large-sample hypothesis test of two population proportions (percent test). Percentages in each category are given in parentheses. Abbreviations as in Table 7.

EGGS	*IN SITU* 35549	RELOCATED 175206	Z	p
RELEASED HATCHLINGS	27466 (77.3)	119630 (68.3)	37.2	<<.0001
LIN	904 (2.5)	14256 (8.1)	37.2	<<.0001
DIN	684 (1.9)	2531 (1.4)	6.7	<.0001
PIP	1544 (4.3)	20670 (11.8)	41.7	<<.0001
VD	1164 (3.3)	7438 (4.2)	8.4	<.0001
NVD	4691 (13.2)	24871 (14.2)	4.9	<.0001

This was primarily due to higher proportions of piped eggs in relocated nests. LIN hatchlings were released and are included in the live hatchling total and the hatching percent. The nine percent difference in the percentage of live hatchlings released from *in situ* and relocated nests is small, but very statistically significant.

DISCUSSION

This year marked the second consecutive record number of sea turtle nests recorded in Broward County since 1981, to continue an upward trend which started in 1994 (Figure 1). This continues to suggest that either the female population has increased or that individual loggerheads are nesting more frequently (fewer non-nesting years) or depositing more clutches per female in nesting seasons. The consistently higher nest counts continue to argue against the hypothesis that increased nesting has resulted from a chance coincidental nesting of an unusually large proportion of the female population in the same year. If this were true, there should also be years when an unusually large proportion of the females refrain from nesting. Because at least one non-nesting year usually follows a nesting year for each female (Ehrhart, 1981), such synchronized nesting would cause large variations in nest counts, which has not been observed for *C. caretta*. It is also encouraging that this year's loggerhead count (Figure 2) has continued the upward inclination, which began last year, breaking the unchanging nesting trend of 1990 through 1994.

C. mydas continued its trend of alternating high and low nesting years (Fig 2). Three such cycles have been completed since 1989, and a fourth cycle may have started this year. This pattern is consistent with a synchronized two year nesting interval, with 1989, 1991, 1993 and 1995 being predominately non-nesting years. If 1995 was such a year, it is encouraging that this year's count was the highest of all the low-nested years. This may be a tenuous indication that there has been recruitment to the nesting population, or that the nesting synchrony is breaking. If the trend continues, *C. mydas* nest counts in 1997 would be intermediate between the 1995 and 1996 numbers.

D. coriacea nest counts (Fig. 2) declined from 15 nests in 1995 to only 2 in 1996. Such large percentage fluctuations are not unprecedented in Broward County, and the long-term outlook for *D. coriacea* nesting remains unclear.

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

The rank order of *C. caretta* nesting densities on the five beaches (Table 1) was similar to previous years, except that Hillsboro Beach again assumed its usual position as the most heavily nested region of Broward County. Higher nesting densities in Pompano Beach during 1994 and 1995 were thought to be due to worsening beach erosion at

Hillsboro Beach (Burney and Margolis, 1994; 1995). This hypothesis was apparently erroneous because this year's nesting at Hillsboro Beach increased by 42 percent from 1995, with no obvious improvement in the state of erosion.

The seasonal patterns of *C. mydas* nesting (Figure 5-6) was typical of a high nesting year (Burney and Margolis, 1994, Burney and Mattison, 1992, 1990), with maximum nesting occurring in mid to late July. The first *D. coriacea* nest, deposited on May 8, was quite late when compared to previous years in which nesting has begun in March (Burney and Margolis, 1994). The beginnings and ends of the nesting seasons for all three sea turtle species were within historical limits for Broward County (Meylan, Schroeder and Mosier, 1995). *C. mydas* continued to prefer Hillsboro Beach and Lloyd Park beaches over other areas (Table 2; Figs. 6 and 7), probably because of their seclusion and relative lack of nocturnal illumination. This year, *D. coriacea* nested once at Hillsboro Beach and once at Pompano Beach (Table 3; Fig. 6).

The distribution of *C. caretta* nesting along the Broward County coast (Fig. 7) retains features which have been identifiable since the project's inception. 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). Patterns for 1994 and 1995 differed from past years because of the reduction in nesting densities at Hillsboro Beach (Burney and Margolis, 1994; 1995). This year's pattern is more similar to the historical norm, with higher nesting on Hillsboro Beach (Mattison,

Burney and Fisher, 1993). The cause of the unusually high number of nests deposited in zone 8 on northern Hillsboro Beach is unknown, but this area was very attractive to nesting females and received 75 percent more nests than last year. As seen in past years, the nesting density pattern showed no correlation with the nesting success pattern (Fig. 8). This continues to suggest that the selection of nesting sites is primarily determined prior to the female's 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. 8; Table 4) was not statistically different on Fort Lauderdale, Pompano and Hillsboro beaches, but it was significantly lower at Hollywood and Lloyd Park. This is unlike the pattern of the last three years, when Lloyd Park alone had significantly lower nesting success than the rest of the County. This has been attributed to the rapid beach erosion in northern Lloyd Park due to blockage of longshore sand transport by the Port Everglades inlet and jetty. This year, *C. caretta* nesting success on Hollywood-Hallandale beach declined by a very significant 13.5 percentage points (percent test; $Z=3.22$; $P<.001$), making it statistically indistinguishable from Lloyd Park. This decline, which far exceeded the County-wide 4.5 percentage point reduction in nesting success, indicated that Hollywood-Hallandale beach appeared to be a much less hospitable nesting location than it was last year. This could be due to the worsening erosion on parts of this beach, but erosion is probably not the only factor involved, because the state of erosion at Hillsboro Beach is currently much worse that at Hollywood-Hallandale.

The nesting success of *C. mydas* was not statistically different throughout the County (Table 4). Compared to last year, there was a very large decline in nesting success at Lloyd Park (66.7 to 28.6 percent) and a large increase at Hillsboro Beach (26.0 to 53.3 percent).

As for every year since 1991, the percentage of eggs producing live hatchlings (including LIN) was significantly lower for relocated *C. caretta* and *C. mydas* nests than in nests left *in situ* (Table 6). This was also true for all species combined (Figure 12). 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 9 shows a slight, but significant reduction in the hatching success of relocated *C. caretta* as the season progressed. This has been found in all but one (1994) of the past 8 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. The lack of a significant decline in the hatching success of *in situ* nests this year (Figure 9) suggests against temperature or other large-scale environmental factors as the cause of the reduced success of relocated nests, but does not rule out differences in nest inundation, because *in situ* nests were those which were deposited higher on the beach. The fact that the hatching success of *C. mydas* nests increased significantly over the season (Figure 10) in both relocated and *in situ* nests suggests that the relocation process was not the cause of the decline in *C. caretta* hatching success,

because both species were relocated by the same group of workers using the same technique.

Figure 11 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. 45 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 low-hatching nests (≤40 percent).

The differences in hatching success of relocated and *in situ* nests may be partially related to differences in the suitability of the relocation sites. Table 7 shows differences in hatching success at the various locations. The new relocation sites (BH923-BH969) were especially low, with higher proportions of dead piped eggs. This can be seen, to a lesser extent for *C. mydas* relocated to BH925 and BH923/5 (Table 8), except that the number of eggs is much lower.

To further evaluate the hypothesis that differences in hatching success were primarily caused by differences in the suitability of the relocation sites, a separate analysis limited to Hillsboro Beach was performed, because nests were relocated to all the various Hillsboro Beach locations by the same group of workers. Table 10 shows that hatching success at sites BH923, BH923/5, BH925 and BH969 was statistically equivalent and lower than the other Hillsboro Beach areas, although there was some statistical overlap between site BH969 and the other locations, except BH3. Hatchery locations BH923 and BH925 were located on adjacent properties, spanning a distance of only about 100 yards, with site BH923/5 between. The statistically indistinguishable hatching successes from these sites suggests that

they were less suitable for the incubation of sea turtle nests. Hatching success at the main relocation site (BH1) which has been used since 1989, was not statistically different than for *in situ* nests (BH-*In Situ*) or those relocated to other areas of Hillsboro Beach (BH-Relocated). Hatching success at BH3 was higher and statistically distinct from all other areas, but it received nests for only one week in early May. Early season nests have characteristically higher hatching success rates which can be seen in Figure 9. The lack of a significant difference in hatching success between *in situ* nests and those relocated to BH1 or non hatchery areas of Hillsboro beach suggests that the lower hatching success at BH923-925 was site specific and did not result from the relocation process itself.

Comparison of hatching success and the proportions of the post-hatching nest evaluation categories (Table 11) for all *in situ* and relocated nests at Hillsboro Beach shows very significant differences in all categories. The percentage of dead piped eggs (PIP) was the most significant category contributing to the difference in the percentage of live hatchlings. This was also the case in 1995 (Burney and Margolis, 1995). Table 7 shows that the percent piped was higher at the new relocations sites (BH923 through BH969) than at the other Hillsboro Beach areas, and far higher than for *in situ* nests. It appears that the factors responsible for the higher proportion of piped eggs in relocated nests may also be site specific (for the same reasons presented above) however, there was no obvious differences in the beach characteristics which might account for this effect. There was also an extremely significant difference in the proportion of live-in-nest (LIN) hatchlings in relocated and *in situ* nests. Although these hatchlings are included

in the released hatchling totals and do not contribute to the lower hatching or released hatchling percentages in relocated nests, relocation does seem to increase the number of hatchlings which do not naturally escape the nests. For Hillsboro Beach nests, this effect does not appear to be as site specific as for piped eggs (Table 7). Sites BH925, BH923/5 and BH969 has significantly higher percent LIN than BH1, but BH923 was lower. Differences in the other egg categories, although statistically significant, were small.

The use of mass egg relocation as a sea turtle management tool is far from a perfect conservation technique. Such an invasive procedure employed on such a large scale may inherently result in slightly reduced hatching success. There is also speculation that relocated hatchlings may experience reduced survivability after they enter the sea. Clearly, it would be preferable, and much less costly, to leave far more nests *in situ*, but we are forced to relocate most nests primarily to avoid hatchling take due to misorientation by coastal artificial lighting.

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

SUBJECT	HOT-LINE	NOVA
EMERGENCIES		
Nesting	3	0
Hatchlings	28	0
NEST LOCATIONS	56	3
STRANDINGS	31	2
POACHING	4	0
VOLUNTEERS	12	10
OTHER	NUMEROUS	NUMEROUS
OVERALL	> 134	> 15

** 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 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 each Sunday evening from July 7 to Sept. 1 and Wednesdays from August 19-28 at the Anne Kolb Nature Center. These slide show presentations were followed by hatchling releases at Greene St. Hollywood. Special presentations were conducted at the NSU Oceanographic Center on Sept. 28, for students of Cooper City High School and on Oct. 4 for students of Hillsboro Christian Academy. These presentations were followed by hatchling releases in Lloyd Park.

Public talks and slide shows (without hatchling releases) were given for the Sheridan Hills Elementary School (twice), Dania Elementary School, the Fort Lauderdale Beach Rotary Club, the Dania Beach Rotary Club, the Wilton Manors Business Association, the Hallandale Beach Rotary Club, Broward Community College (twice), the West Lake Park summer camp program and the Anne Kolb Nature Center's Brown Bag Lunch Series.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MARINE TURTLE NESTING SUMMARY QUESTIONNAIRE FOR 1996

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 County

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

South Survey Boundary: DADE CO LINE

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

Was this the exact same survey area as your 1994 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 1995?: 24 (1996)

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)

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 feet of previous evening wrack line. 2) Nest locate near a highway or other artificially lighted area.

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

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 line.

2) Nest located near a highway or other artifically lighted area.

If a hatchery was used, please give specific location: Pompano Beach at Atlantic Boulevard. 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 1995:

Fox, raccoon, ghost crab.

Were hatchling disorientation events documented during 1995? (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] 12/6/96

Signature of Principal Permit Holder — Date

DEP/DMR/FMRI 33 TOE; Revised 10/95 (NESTSUR.DUC)

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
NESTING SURVEY REPORTING FORM FOR 1996

Principal Permit Holder: LOUIS FISHER			Permit Number: 108
Beach Name: BROWARD CO BCNS			
	C. caretta (Loggerhead)	*C. mydas* (Green Turtle)	*D. coriacea* (Leatherback)
Total # of Nests	2696	112	2
Total # of Non-Nesting Emergences (False Crawls)	2937	143	0
Date (month and day) of First Documented Nest	4/23	5/31	5/8
Date (month and day) of Last Documented Nest	9/7	9/11	6/3
***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)			
(a) # of *in situ* Nests without Additional Protection	929	83	1
(b) # of *in situ* Nests with Self-Releasing Flat Screen	0	0	0
(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)			
(a) # of Relocated Nests without Additional Protection	1570	25	1
(b) # of Relocated Nests with Self-Releasing Flat Screen	0	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	197	4	0

DEP/OMR/FMRI, Revised 10/95 (NESTSUMM.FRM)

FLO... DEPA... ENT O... IRON... AL PR... CTION ... T SU... S REI ... NG F ... OR 1 ...

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	83	83	7	27	3195	2651	41	24		81	398	
IN SITU/FLAT SCREEN												
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	25	25	2	19	2540	1202	249	21		208	589	271
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	4	4	0	4	489	296	27	0		12	154	0
OTHER (EXPLAIN)												
DEP USE ONLY												

DEFINITION OF TERMS:

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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

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.
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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.

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FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION - NEST SUCCESS REPORTING FORM FOR 1996
SPECIES: *Caretta caretta* (Loggerhead)

PRINCIPAL PERMIT HOLDER: LOUIS FISHER				BEACH NAME: BRUNARD ST								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	928	928	55	374	35549	26562	904	684	0	1514	5855	
IN SITU/FLAT SCREEN												
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	1570	1570	87	1428	153022	89084	13294	2355	0	19662	28627	10585
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	197	197	0	196	22184	16290	962	176	0	1008	3748	0
OTHER (EXPLAIN) Poach	1	0	1	0	0							
DEP USE ONLY												

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SPECIES: *Dermochelys coriacea* (Leatherback)

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	1	1	0	0								
IN SITU/FLAT SCREEN												
IN SITU/RESTRAINING CAGE												
IN SITU/SELF-RELEASING CAGE												
RELOCATED/NO ADDITIONAL PROTECTION	1	1	0	1	91	0	0	0	0	0	91	0
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)												
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