285 a

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Assessment of Sea Turtle Monitoring Programs in Tampa Bay

Final Report
NEP F- 0508
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ABSTRACT

Four species of sea turtles (*Caretta caretta*, *Chelonia mydas*, *Lepidochelys kempii*, and *Eretmochelys imbricata*) occur in the area encompassed by the Tampa Bay National Estuary Program (TBNEP). All are listed as either endangered or threatened under the Endangered Species Act. Historical records suggest that sea turtles were once abundant in the bay, and were commercially exploited. However, green turtles -- the most commercially valuable species -- were reported to have already become depleted by the end of the 19th century. Current population levels of the various species inhabiting the bay are unknown. Sighting and capture data compiled as part of the current investigation (from aerial and boat surveys, incidental catch, direct sampling) suggest that the bay serves as habitat for several life history stages of sea turtles, including nesting females and foraging juveniles, subadults, and adults. Gulf waters adjacent to Anna Maria Island, Egmont Key, and all of Pinellas County are visited by reproductive male and female loggerheads during the mating and nesting season. The apparent order (decreasing) of abundance of turtles in the bay is: loggerheads, Kemp's ridleys, green turtles, and hawksbills. Loggerheads and Kemp's ridleys have been observed year round; seasonality of green turtles and hawksbills is unknown. Nearly all Gulf-facing sandy beaches in the TBNEP area are used as nesting habitat for marine turtles. Loggerheads are the predominant species, although there are a

few documented nests of green turtles and Kemp's ridleys. Nesting activity recorded on all surveyed beaches within the TBNEP area is summarized for 1982 to 1995. Reconnaissance of sandy beaches within the bay but away from the bay's entrance failed to reveal any nesting activity, although there is one verified record of a loggerhead nest at Northshore Beach in St. Petersburg in 1993. A total of 171 dead or injured marine turtles were documented in the inshore waters of the TBNEP area from 1980 to 1995 through the Sea Turtle Stranding and Salvage Network. Boat collisions, entanglements, and incidental catch are among the mortality factors identified through evaluation of carcass anomalies. Geographic Information System maps have been prepared depicting nesting, stranding, and in-water (live) distributions of marine turtles in the bay.

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INTRODUCTION

Four species of sea turtles (*Caretta caretta, Chelonia mydas, Lepidochelys kempii*, and *Eretmochelys imbricata*) occur in the area encompassed by the Tampa Bay National Estuary Program (TBNEP). All are listed as either threatened or endangered under the Endangered Species Act. Despite their certain occurrence in the bay, there is little information available in the scientific literature that is specific to the bay area. Currently, only two programs--the Statewide Nesting Survey and the Sea Turtle Standing and Salvage Network (STSSN)--include monitoring of turtles in the TBNEP area. Nesting surveys are conducted annually by various governmental and private entities on beaches near the mouth of Tampa Bay (e.g., Anna Maria Island, Egmont Key, Fort DeSoto). These data collection efforts are coordinated by the Florida Marine Research Institute (FMRI), under whose auspices data summaries are produced and distributed to the public and to various government agencies. The FMRI also coordinates the recovery and documentation of sea turtles found stranded in the Tampa Bay area (and throughout the state) through the STSSN. Eighteen states participate in the network, which is coordinated at the federal level by the National Marine Fisheries Service.

Neither the nest monitoring program or the STSSN specifically addresses the distribution, abundance, or status of live turtles that use the bay as habitat. Federal recovery plans for the various species (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1991; 1992) and a report by the National Research Council (1990) on the causes of decline of sea turtles emphasize the need for in-water studies to provide information on these important parameters. In 1994, the FMRI began a pilot study of the distribution and seasonality of marine turtles in the bay. Due to the lack of a dedicated funding source, only limited field effort was possible. This pilot study was continued and expanded under the auspices of the current TBNEP grant, and results of those efforts are reported here.

The goal of the TBNEP study is to evaluate existing monitoring programs for marine turtles in the TBNEP area, and to develop recommendations for future assessment of the status and distribution of these animals. A byproduct of this work is the first synthesis of information about the occurrence of marine turtles in Tampa Bay.

METHODS

An extensive literature search was conducted to find historical and scientific references concerning marine turtles in Tampa Bay. Sources searched included the card catalog and Procite database of the library of FMRI, the Tampa Bay Bibliography produced by NEP, the Pinellas County Public Library System, the University of Florida's Sea Turtle On-Line Bibliography, the ASFA CD-ROM Bibliography (1978-1995), the LUIS computer catalog of the University of South Florida library system, and the University of South Florida regional special collections library (Tampa campus).

Data on nesting activity in the TBNEP area were retrieved from the Statewide Nesting Survey database for the period of 1982-1995. Nesting surveys were conducted by numerous entities, including county parks, state parks, conservation organizations, and private citizens. All parties carrying out the surveys were permitted by the Florida Department of Environmental Protection. Annual summaries submitted to FMRI include the following data: number of kilometers of beach surveyed, survey frequency, dates of the survey, dates of the first and last nest, number of false crawls (unsuccessful nesting attempts), and total number of nests.

Although marine turtles nest primarily on ocean-facing beaches, we were aware of at least one loggerhead nest well inside Tampa Bay (at Northshore Park in St. Petersburg, Figure 1). As part of this project, we decided to explore the possibility that there is other undetected nesting activity within the bay. On eight days in June and July of 1995 (peak nesting season), we reconnoitered 48 sandy beach areas (those with ESI classifications 3 & 4; see Figure 1) for evidence of marine turtle nesting activity (tracks, body pits). Each beach was surveyed one or two times, either on foot or by boat.

Strandings of dead or injured marine turtles along Florida's coastline are monitored by FMRI as part of the STSSN. All records of inshore strandings in the Tampa Bay area (defined herein to be between latitudes 27°22'07" and 28°07'05") for 1980 through 1995 were reviewed. Information recorded on each stranded turtle included: species identification, stranding location, stranding date, size of the turtle, presence/absence of tags, condition of the carcass, and visible carcass anomalies (evidence of entanglement, propeller wounds, fish hooks, etc.).

In an effort to assess the efficacy of the STSSN in the bay area, we searched for carcasses on the 48 beaches that we surveyed for signs of nesting activity in June and July 1995.

To investigate the distribution and seasonality of live marine turtles in Tampa Bay, we first compiled records of sightings from various sources. We reviewed all manatee aerial survey data collected between October 1987 and March 1996 by FMRI's marine mammal section and Dr. John Reynolds of Eckerd College. These consisted of 103 flights made at monthly or bi-monthly intervals. Turtles were noted opportunistically, with varying degrees of attention, during these flights and their locations were marked on detailed nautical charts. The surveys were conducted in nearshore waters (from the shoreline to about 1.0 km offshore), at an altitude of 600' and an airspeed of 80-85 knots. Further details of survey methodology are given by Reynolds et al. (1991).

Another source of turtle distribution data was aerial surveys flown from July 1995 through March 1996 as part of a study of recreational anglers being conducted by FMRI Fisheries Dependent Monitoring. These surveys were conducted at approximately 500' altitude at 90-110 knots, following a route along the shorelines, boat channels, and bridges of Tampa Bay (and other areas). Each of the zones in the study were flown two or four times during each two-month period. Turtle locations were recorded with a Global Positioning System (GPS).

We also compiled sightings of turtles made by personnel of the National Marine Fisheries Service during aerial surveys for marine mammals along the west Coast of Florida in September and October of 1994, and for red drum in November of 1995. Positions of turtles were recorded with a GPS unit.

Our database of live marine turtles in Tampa Bay also included captures made incidental to research on sharks conducted by Mote Marine Laboratory's Center for Shark Research.

Turtles were captured in monofilament gill nets that were deployed for catching sharks. Turtles were measured, weighed, and tagged before release.

Three records from the STSSN involved healthy, live turtles and were therefore included in the live sighting database. We also included miscellaneous sightings made by FMRI personnel conducting field work in the bay.

In addition to compiling existing records of marine turtles in the bay, FMRI marine turtle staff directly sampled turtles using three approaches: scouting trips designed to spot turtles surfacing to breathe, netting with large-mesh tangle nets, and trawling with shrimp trawls. Scouting trips were conducted in appropriate habitats on nine days in November - March of 1996. The specific areas reconnoitered are shown in Figure 2. Most of these scouting trips were conducted during early morning hours to maximize the opportunity to see turtles surfacing to blow.

On three days (20 October and 20 November 1995, and 6 March 1996), large-mesh tangle nets were deployed in Tampa Bay by FMRI turtle staff in an effort to capture live turtles (Figure 2). Four nets connected end-to-end were set in a linear array extending approximately 300 m. The nets were tended continuously in order to remove captured turtles and bycatch.

We had two separate opportunities to sample for marine turtles in Tampa Bay with shrimp trawls. On May 15-16 and June 12-13 of 1995, we chartered a 55' shrimp boat (the Seaweed IV) that was equipped with two 25' trawls. The nets were not outfitted with Turtle Excluder Devices (TED's). We conducted 30 30-minute paired tows on these four days (Figure 2). Endpoints of the tows were recorded with GPS.

The second trawling opportunity was afforded by the Army Corps of Engineers, USAE Waterways Experiment Station, which carried out an assessment of sea turtle abundance in the Tampa Bay Entrance Channel prior to dredging operations. FMRI marine turtle staff were invited to accompany ACOE researchers on three days of trawling (20-22 February 1996) in the ship channel (Figure 2). The vessel, the Georgia Bulldog, was equipped with two 60-foot trawls constructed from 8-inch mesh (stretch) fitted with mud rollers and floats. The trawls were not equipped with TED's. A total of 29 paired tows, each lasting 15-30 minutes, was made.

Our data collection protocol for net- and trawl-captured turtles was the same and included taking standard measurements, weighing the animal, and tagging it with both plastic and metal tags bearing unique numbers and a return address. Blood samples were collected from the dorsal cervical sinus following the method described by Owens and Ruiz (1978). Serum was collected by centrifugation and frozen for hormone analysis at Texas A&M University. Samples of whole blood were preserved in buffer for DNA sequencing at the University of Florida DNA Sequencing Core. Exact capture sites of turtles were determined with a GPS unit. Turtles were released at the site of capture.

Thirteen Geographic Information System (GIS) coverages of coordinate data obtained from the various sources were generated using ARC/INFO software. Data positions were plotted on a 1:275,000 Tampa Bay Shoreline compatible with the 1:24,000 shoreline adopted by the TBNEP. All associated data have been given topology as attributes linked to geographic coordinates in the GIS database and will be incorporated into the Marine Resources Geographic Information System (MRGIS).

RESULTS AND DISCUSSION

Historical background. Several publications from the early and mid-1800's suggest that loggerhead and green turtles were once numerous in Tampa Bay. The earliest report we found was that of Williams (1837), who wrote that "Fish and turtle are abundant; in the SW part in particular,... The Spanish fishermen keep a schooner here, to carry fish and turtle to Havana. From 15-20 men are constantly employed in curing them and in conveying them away to market." Pizzo (1968) reported that in 1824-1886, "Tampa Bay teemed with fish and turtle," and Sunshine (1880) stated that in Tampa Bay, "(g)reen and loggerhead turtles are taken, and form a lucrative traffic."

Collins and Smith (1893) reported that 10,000 lbs of marine turtles were landed in 1889 in Hillsborough County (which at that time also included Pinellas County); in 1890, 10,244 lbs were landed. It is not known where these turtles were captured, and thus it remains unknown whether any were taken from within Tampa Bay. Turtle eggs were also reported in the fisheries statistics, so it is possible that some of the catch included turtles slaughtered on the nesting beach. Curiously, catch statistics given by these authors for adjacent Manatee County show approximately six times as many pounds of turtles landed as for Pinellas County, yet fewer turtle eggs. Turtles were not identified to species.

Brice (1897) noted that the turtle fishery along Florida's west coast had been considered comparatively important in an investigation made in 1890 by the United States Fish Commission. However, by the time of his study, it was reported that "in the Tampa region the green turtles are nearly all killed off and that it does not now pay to follow the business." One vessel from Tampa and two from Punta Rassa fished for turtles part of the year using a total of 4 nets and caught

9,375 lbs (equivalent to 55 turtles). Most references to the natural resources of the Tampa Bay area and the turtle industry of the Gulf of Mexico after 1900 no longer mention the occurrence of marine turtles in Tampa Bay (Carr, 1969; Ingle and Smith, 1949; Lewis and Courser, 1972; McKay 1924, Rebel, 1974). Parsons (1962) reported that green turtles were trucked from Tampa for the turtle soup industry, but the origin of these turtles is unclear. Limoges (1975) stated that sea turtles are reported in the bay on rare occasions, but are not adversely affected by dredge and fill activities.

Reynolds and Patton (1985) provided the most detailed account of marine turtles in the Tampa Bay area, including comments on nesting activity, research initiatives, and recommendations for future conservation and management action. Most other reports and publications about the bay that mention marine turtles quote this source (Department of Environmental Regulation, 1986; Lewis, 1987; Lewis and Estevez, 1988).

A report on statewide nesting activity of marine turtles by Meylan et al. (1995) includes data for specific beaches within the TBNEP area through 1992 (see below). This reference also discusses the regional and worldwide status of the various marine turtle species that nest in Florida.

Nesting activity. Nearly all ocean-facing (Gulf) sandy beaches in the TBNEP area are used as nesting habitat by marine turtles (Figure 1). All but two nests recorded in this area have been attributed to the loggerhead turtle; a single nest at Ft. DeSoto in 1994 was that of a green turtle, and a nest on Madeira Beach in 1989 was made by a Kemp's ridley (Meylan et al., 1990).

Although the Statewide Nesting Survey database was created in 1979, TBNEP area beaches were not monitored until 1982 (Table 1). From 1982 - 1987, surveys were conducted on

an irregular basis in several areas; in Pinellas County, results for all beaches have been compiled under the single category "County Beaches"; this category includes beaches north of the TBNEP area. The extent of beach covered within each survey zone and the frequency of the surveys have varied from year to year, with increasingly thorough coverage over time. Currently, Mid County Beaches (from the south border of Indian Rocks Beach to Blind Pass) are surveyed by Clearwater Marine Science Center (with funding from Pinellas County); St. Petersburg Beach (Blind Pass to southern end of Pass a Grille Beach) is monitored on a volunteer basis by a private citizen (Mr. Bruno Falkenstein); Ft. DeSoto County Park is monitored by park rangers; Egmont Key is monitored by State Park personnel; and Anna Maria Island is monitored by the Anna Maria Island Turtle Patrol.

Because of variability in survey effort and data collection methods over time, the number of nests presented in Table 1 cannot be used to evaluate long-term trends in the nesting activity of loggerheads in the TBNEP area. Large natural fluctuations in the number of turtles arriving annually at nesting beaches is a common, well-documented phenomenon that also complicates trend evaluation. The relative contribution of loggerhead nests in the TBNEP area to the state total is small: in 1995, nesting in the TBNEP area comprised 0.53% of the state total of 80,557 loggerhead nests. Despite this small quantitative contribution, nesting in the TBNEP area is important from the standpoint of maintaining a wide geographic nesting distribution of the Florida loggerhead population. An extensive range provides the population with resilience in the event of catastrophic events such as hurricanes, and it also helps to preserve genetic diversity within the population. Marine turtle nesting habitat is seriously threatened in Florida and

elsewhere by coastal construction (and its attendant artificial lighting), coastal armoring, and an increasing human presence on the beach (Meylan et al.,1995).

Our reconnaissance of sandy beach areas within Tampa Bay revealed only one previously undocumented nesting site, Passage Key, in the mouth of the bay (Figure 1). Evidence of four emergences (one certain nest) were noted on July 7 and July 24, and attributed to loggerhead turtles on the basis of track characteristics. In August 1995, we were informed by U.S. Fish and Wildlife personnel that the refuge manager on Passage Key (a National Wildlife Refuge) had observed a loggerhead nesting on June 8, 1995. This was apparently the first documented nest on the island, which is only infrequently visited for the purpose of assessing seabird populations.

Shell Key (also called Cabbage Key), south of Pass-a Grille, has been surveyed on an occasional basis by Mr. Falkenstein. It and other sandy keys in the vicinity are known to support low-level nesting by loggerhead turtles. Nesting activity was noted during aerial surveys conducted by DEP during 1989-91 (A. Foley, personal communication).

Strandings. A total of 171 records of dead or injured turtles exist for the inshore waters of the bay area (Table 2, Figure 3). Loggerhead turtles are the species most frequently documented, followed by Kemp's ridleys, green turtles and hawksbills. Reporting efficiency has increased significantly since the network was initiated, partly as a result of increased public awareness. It is important to note that these data reflect only inshore strandings; offshore strandings, which occur on Gulf beaches, are far more numerous. Also, stranding records represent a minimum estimate of mortality because not all dead turtles wash ashore, and some of those that do are either not found or not reported.

Figure 3 depicts locations at which stranded turtles have been found. Although stranding distributions provide some useful information about distributions of live turtles, particularly in inshore waters, it is important to note that dead turtles can be transported considerable distances by tides or currents. Also, turtles that strand in areas frequently visited by people are more likely to be reported.

Figure 4 shows the seasonality of documented strandings of loggerheads, green turtles, and ridleys during 1980-1995. Strandings of loggerheads were most numerous from March through June; green turtle strandings were documented in late fall, winter and spring only. Strandings of Kemp's ridleys appear to be relatively constant year round. The three strandings of hawksbills occurred in March, May, and December.

The average size of stranded loggerheads, expressed as curved carapace length, was 95.7 cm (N = 60; range 58.4 - 121.9, SD 11.5); green turtles averaged 36.7 cm (N = 15, range 25.7 - 55.6, SD+ 7.94); Kemp's ridleys averaged 44.9 cm (N = 27; range 30.5 - 67.0, SD 8.96). Only two of the three stranded hawksbills were measured; these were 29.5 and 37.0 cm curved carapace length. The size class distributions of stranded turtles are shown in Figure 5. Most of the loggerheads in the graph are presumed to be mature; for green turtles and hawksbills (not shown), only immature animals are represented. Two ridleys with curved carapace lengths greater than 60.0 cm are probably mature; the remainder are immature.

External carcass anomalies (not necessarily causes of death) reported in the stranding records are given in Table 3. These numbers are considered absolute minimum percent occurrences because the lack of remarks on a stranding form does not necessarily indicate the lack of carcass anomalies. It is important to note that the factors causing carcass anomalies may occur

either ante- or post-mortem, and it is not always possible to distinguish between the two. Boat strikes (including propeller wounds and possible boat collision injuries), were the most frequently observed carcass anomaly for loggerheads (25.9%); one ridley and one hawksbill also showed this anomaly. Fibropapillomas, which are large tumors occurring on the soft parts of the turtle, were the most common carcass anomaly on stranded green turtles (58.8%). Flipper trauma (either partial or entire flippers missing) and carapace and body trauma also occurred relatively frequently on loggerheads, ridleys, and green turtles. It is important to note that these types of carcass anomalies are often of uncertain origin and that on loggerheads and ridleys, some were old, healed wounds. Carcass anomalies of certain human origin other than boat strikes included entanglement or ingestion of fishing gear and deliberate mutilation.

Our reconnaissance of sandy beach areas within Tampa Bay revealed no additional marine turtle strandings. We do not interpret this finding as an indication that the stranding network is completely effective. We believe that considerable more effort would need to be expended to determine the network's efficiency. We believe that there is a good possibility that turtles regularly strand and are not reported.

Sightings of live marine turtles in Tampa Bay are depicted in Figure 6. It should be noted that two surveys (the FMRI Recreation Fisheries Aerial Survey and the NMFS aerial surveys) included waters adjacent to the TBNEP area. The majority of sightings were attributable to the FMRI manatee aerial surveys (n=44 turtles) and to the NMFS aerial surveys (n=28). Four ridleys and four green turtles were incidentally netted by Mote Marine laboratory while conducting shark research. Of the three live turtles reported by the STSSN, two were hooked with fishing gear,

and one was trapped in the intake canal of the TECO power plant. Miscellaneous reports include in-water observations made by FMRI staff.

Many of the sightings were ancillary to other studies and the turtles were not identified to species. Interpretation of these data with regard to marine turtle distributions is also complicated by differences in data collection methods (aerial sightings, in-water sightings, and netting), behavioral differences among species (some are more cryptic than others), and the occurrence of smaller size classes in some species (which may cause them to go unnoticed). In addition, marine turtles can remain submerged for long periods of time. Renaud (1995) reported an average submergence time of 89% for ridleys, and Renaud et al. (1995) reported a 91% average submergence time for green turtles.

Areas reconnoitered for marine turtles by FMRI staff are depicted in Figure 2. No turtles were seen on any of the scouting trips made through March. Two turtles were captured as a result of our netting and trawling efforts. One female loggerhead (89.6 cm SCL-notch to notch, >90 kg) was netted on October 20, 1995. One female loggerhead (97.4 cm SCL-notch to notch, 136 kg) was captured while trawling on May 16, 1995. Blood samples were taken from both turtles before they were measured, tagged and released. No turtles were captured during the trawling effort of the Army Corps of Engineers in February 1996.

CONCLUSIONS

Our compilation of data from various sources (stranding records, aerial surveys, incidental captures, etc.) on the occurrence of marine turtles in the TBNEP area suggests that they are common, although perhaps inconspicuous, inhabitants of the bay. Their great mobility and

tendency to remain submerged most of the time contribute to their cryptic nature. Several species are represented, with the following apparent order of abundance: loggerheads, Kemp's ridleys, green turtles and hawksbills. The loggerhead is considered a threatened species; the other three are endangered. During the 1980's, Kemp's ridley was listed as one of the twelve most endangered animals in the world by the International Union for the Conservation of Nature.

Although data on the seasonality of the various species in the bay are limited, it appears that at least the loggerhead and ridley are year round residents; this may eventually prove to be the case for the green turtle, as well. The hawksbill--a more tropical species than the others--appears to be very rare in the bay.

The bay serves as habitat for several life history stages of marine turtles, including foraging adults, foraging juveniles and subadults, and nesting females. The Gulf waters adjacent to Anna Maria Island, Egmont Key and all of Pinellas County can be expected to be visited by both reproductive males and females during the mating and nesting season.

Historical literature suggests that marine turtle populations in the Tampa Bay area were once more robust, but became depleted at the end of the last century. Their current population status remains unknown, but there is no current evidence that densities are high. Although they are all now protected by law from harvesting, it is clear from stranding records that numerous mortality factors are operating. Many are human-related, such as boat collisions, entanglement, and incidental catch. For green turtles, fibropapilloma disease is a major mortality factor. It has been suggested that environmental conditions such as pollution may play a part in the etiology of this disease, but this hypothesis remains unproven. A herpes virus is suspected to be the pathologic agent.

Current monitoring efforts on behalf of marine turtles in the bay area focus primarily on nesting beaches. With the exception of Passage Key and some small islands in the Ft. DeSoto area, nearly all nesting beaches are monitored daily throughout the nesting season. Given the small number of nests believed to be made on the unmonitored areas, and the potential disturbance to seabirds on Passage Key, we would not recommend extending surveys to these areas.

Although occasional nesting by marine turtles does occur on sandy beaches well inside the bay (as evidenced by the nest on Northshore Beach in St. Petersburg in 1993), we have no evidence to suggest that this is a common event. Our reconnaisance of these areas revealed no signs of nesting activity.

Monitoring of strandings of marine turtles in the bay has improved dramatically in recent years, but there is no question that marine turtle carcasses sometimes go unreported. We have no way of gauging the extent of this problem. A campaign to inform the public of the importance of reporting sightings of dead turtles would be helpful in this regard. A further enhancement of STSSN activities would be support for professional necropsies of selected carcasses to better investigate mortality factors.

Perhaps the most neglected aspect of sea turtle monitoring in the bay has been that of assessing the distribution, abundance and seasonality of live turtles. We initiated a pilot study of these aspects a few years ago, and we have continued and expanded this work under the auspices of this project. However, our findings remain fragmentary and preliminary. Understanding the biology and ecology of the bay's turtles will take a concerted, long-term effort. The rewards will

be improved management of these species, and a better understanding of the marine ecosystems of which they are a part.

RECOMMENDATIONS

1. Maintain the quality and quantity of existing nesting and foraging habitats of marine turtles in Tampa Bay. Address issues such as artificial lighting, coastal construction, beach armoring, beach nourishment, and human usage, which can negatively impact marine turtles and their habitats.
2. Continue monitoring of nesting activity on bay area beaches.
3. Improve stranding response for marine turtles in the bay through a public awareness campaign. Enhance assessment of mortality factors by providing for professional necropsies of selected carcasses.
4. Promote basic research on the distribution, abundance, seasonality, population structure, habitat usage, growth rates, and migrations of marine turtles.
5. Maintain and update GIS coverages of marine turtle distributions in the bay area; overlay turtle distributions with habitat and other coverages.

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Table 1. Nesting activity of loggerhead turtles (*Caretta caretta*) in the Tampa Bay area (from 27° 22'07" N to 28°07'05" N), 1982-1995. IRR=irregular survey. (Data source: Florida Statewide Nesting Survey database)

Location	Beach length (km)	Year	# Days per week	Survey start date	Survey end date	# of Nests
(Pinellas) County Beaches	--	1982	IRR	--	--	5
	--	1983	IRR	--	--	17
	--	1984	IRR	--	--	19
	--	1985	IRR	--	--	25
	--	1986	IRR	--	--	27
	--	1987	IRR	--	--	50
Mid County Beaches	15.0	1988	7	05/01	10/01	7
	15.0	1989	7	04/11	11/30	35
	15.0	1990	7	04/01	10/31	57
	22.4	1991	7	04/01	10/15	29
	15.0	1992	7	--	--	59
	6.8	1993	7	05/01	10/31	41
	6.8	1994	7	05/01	10/31	33
	6.8	1995	7	05/01	10/31	77
St. Pete Beach	6.4	1988	7	04/01	10/—	7
	9.7	1989	7	04/01	10/31	5
	6.4	1990	7	05/01	10/10	8
	6.5	1991	7	05/01	11/01	19
	6.5	1992	7	04/01	08/15	11
	6.7	1994	7	04/01	10/31	12
	6.4	1995	7	04/15	11/15	29
Ft. DeSoto County Park	8.0	1988	7	05/15	08/10	11
(One green turtle nested in 1994.)	8.8	1989	7	01/01	12/31	8
	8.5	1990	7	01/01	12/31	23
	10.4	1991	7	02/01	12/31	22
	8.9	1992	7	01/01	12/31	15
	9.7	1993	7	02/01	12/31	24
	9.7	1994	7	05/01	10/15	15
	9.7	1995	7	01/01	12/31	50

Table 1 (continued). Nesting activity of loggerhead turtles (*Caretta caretta*) in the Tampa Bay area, 1982-1995. IRR=irregular survey

Location	Beach length (km)	Year	# Days per week	Survey start date	Survey end date	# of Nests
Egmont Key	4.8	1982	3	06/01	10/01	17
	4.8	1984	4	06/01	10/01	6
	4.0	1988	3	–	09/06	11
	6.4	1989	3	05/25	10/01	40
	8.8	1990	7	05/01	07/30	14
	6.4	1991	7	05/01	09/05	16
	6.4	1992	7	05/30	09/07	22
	6.4	1993	7	05/01	09/30	31
	6.4	1994	7	05/01	10/16	31
	6.4	1995	7	04/01	10/10	56
Anna Maria Island	7.4	1982	7	05/07	08/31	21
	8.6	1983	7	05/16	08/13	23
	8.6	1984	7	05/15	08/16	36
	8.8	1985	7	05/18	08/01	23
	9.7	1986	7	05/12	08/15	70
	11.3	1987	7	05/15	08/15	59
	9.7	1988	7	05/13	08/20	25
	9.2	1989	7	05/07	08/21	106
	9.6	1990	7	05/08	08/22	100
	11.2	1991	7	05/04	08/21	96
	11.3	1992	7	05/01	08/25	102
	11.3	1993	7	05/01	09/30	155
	11.3	1994	7	05/10	08/25	136
	11.3	1995	7	05/09	10/10	214

Table 2. Strandings of dead or injured marine turtles in inshore waters of the Tampa Bay area (from 27° 22'07" N to 28°07'05" N), 1980-1995 (Data source: Florida Sea Turtle Stranding and Salvage Network).

Year	Species					
	Caretta caretta	*Chelonia mydas*	*Lepidochelys kempi*	*Eretmochelys imbricata*	Unknown	Total
1980	0	0	0	0	0	0
1981	1	0	0	0	0	1
1982	3	0	0	0	0	3
1983	3	0	0	0	0	3
1984	2	0	0	0	0	2
1985	3	0	0	0	0	3
1986	11	0	0	0	0	11
1987	9	0	4	0	0	13
1988	11	1	3	0	1	16
1989	21	2	3	1	0	27
1990	14	0	3	0	0	17
1991	8	0	3	0	1	12
1992	7	1	1	0	1	10
1993	6	2	9	0	2	19
1994	5	5	5	0	1	16
1995	4	6	6	2	0	18
Total	108	17	37	3	6	171

Table 3. Percent occurrence of carcass anomalies reported for marine turtles stranded in inshore areas of the Tampa Bay area (from 27° 22'07" N to 28°07'05" N), 1980-1995. (Data source: Sea Turtle Stranding and Salvage Network Database.) Carcass anomaly categories are not mutually exclusive (individual turtles may have exhibited more than one carcass anomaly).

Carcass anomaly	*Caretta caretta* (n=108)	*Chelonia mydas* (n=17)	*Lepidochelys kempii* (n=37)	*Eretmochelys imbricata* (n=3)
Boat strike	25.9	0.0	2.7	33.3
Fishing gear entanglement	0.0	5.9	5.4	33.3
Deliberate mutilation	0.0	0.0	2.7	0.0
Head trauma	4.6	11.8	8.1	0.0
Flipper trauma	14.8	11.8	13.5	0.0
Carapace/body trauma	17.6	5.9	27.0	0.0
Plastron trauma	0.0	0.0	5.4	0.0
Fibropapillomas	0.0	58.8	0.0	0.0
Healed wounds	11.1	0.0	5.4	0.0
Probably cold stunned	0.0	5.9	0.0	0.0
Predation	1.9	0.0	5.4	0.0

Beaches Surveyed for Marine Turtle Nesting Activity in the Tampa Bay area (1982 - 1995)

285d

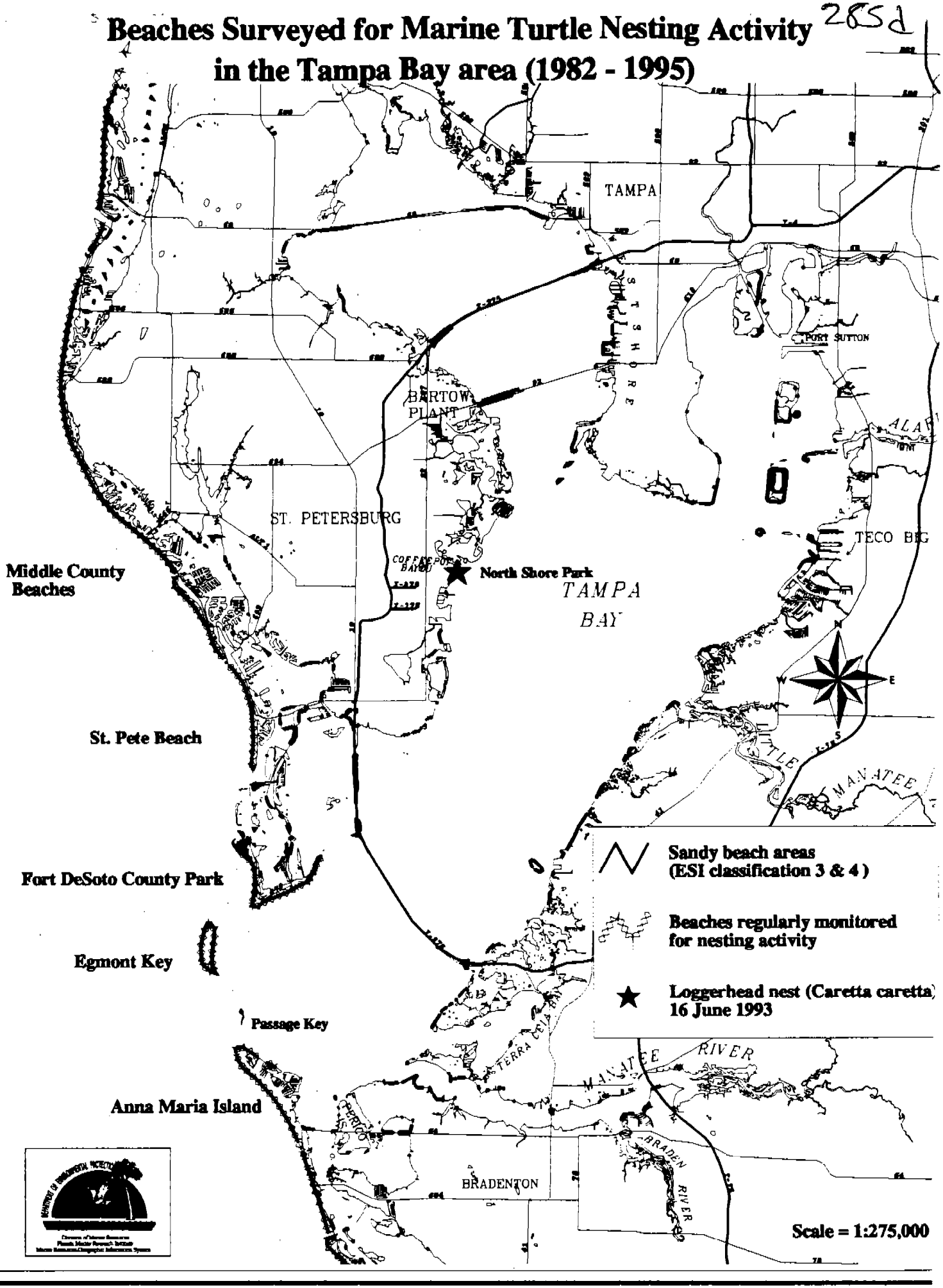

FIGURE 1

Areas Reconnoitered or Sampled for Marine Turtles in Tampa Bay 1995-1996

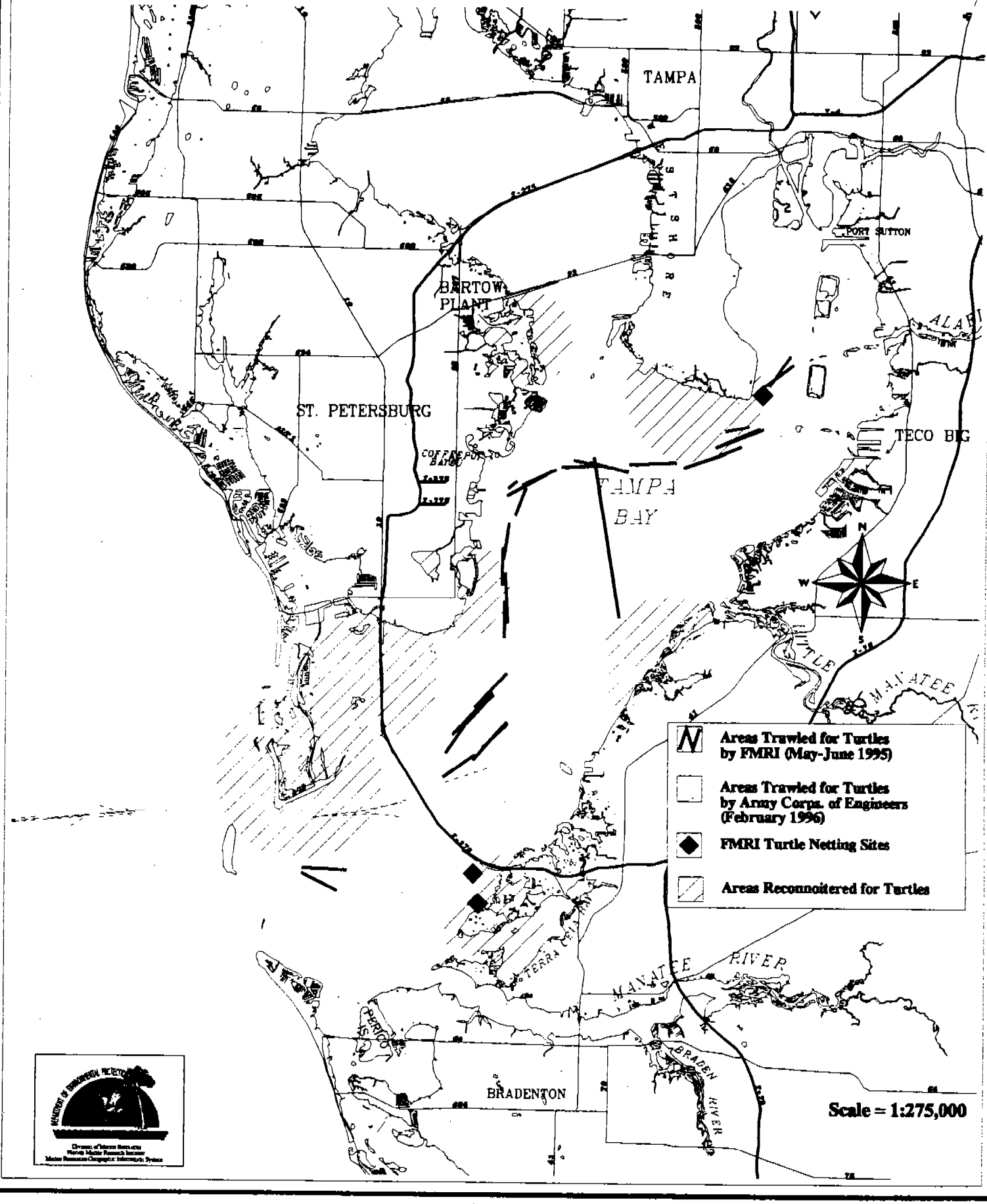

FIGURE 2

Marine Turtle Strandings in the Tampa Bay Area (1980-1995)
(Inshore waters only)
(Source: Florida Sea Turtle Stranding and Salvage Network)

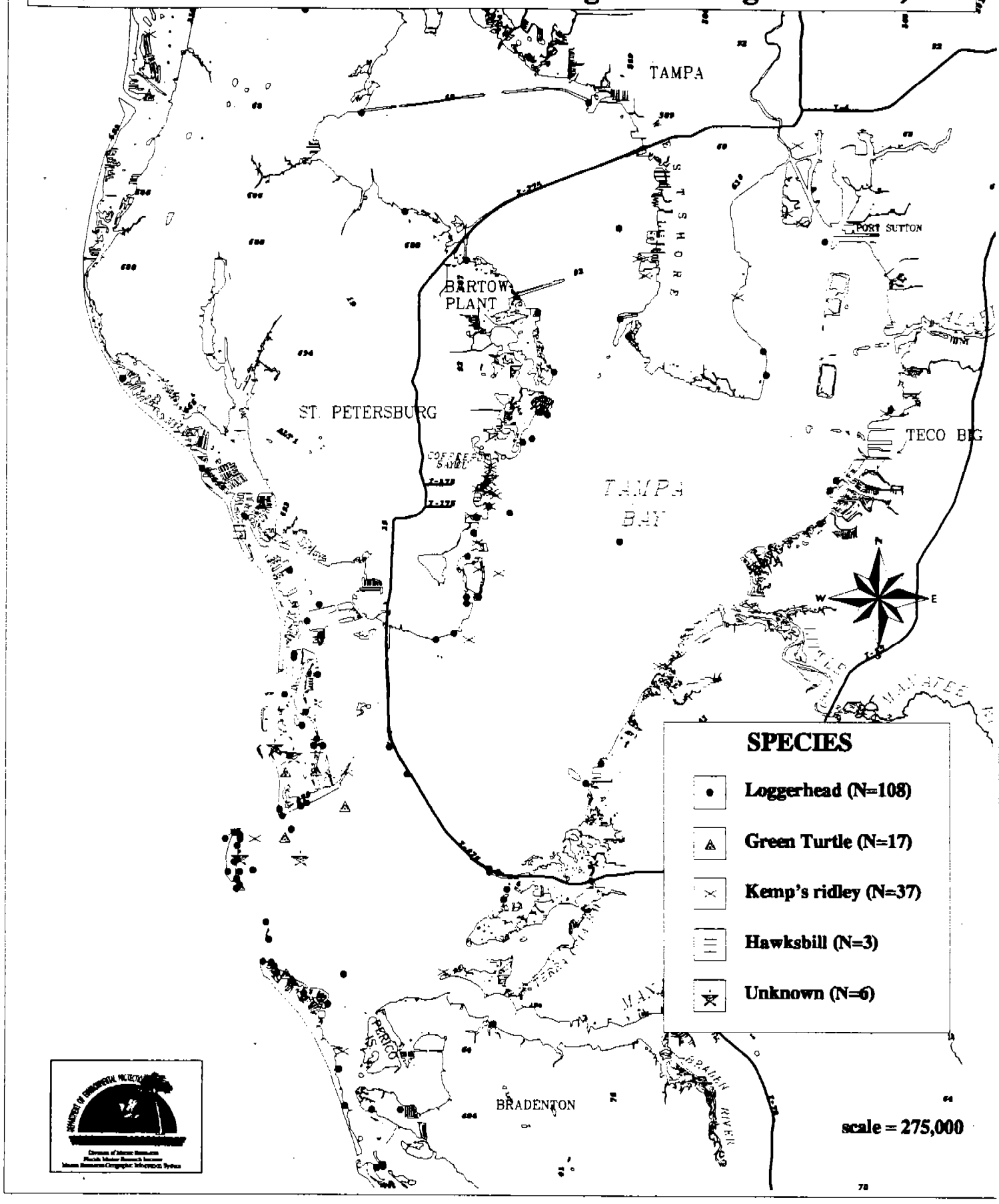

FIGURE 3

Sightings of Live Marine Turtles in the Tampa Bay Area (1986- March 1996)

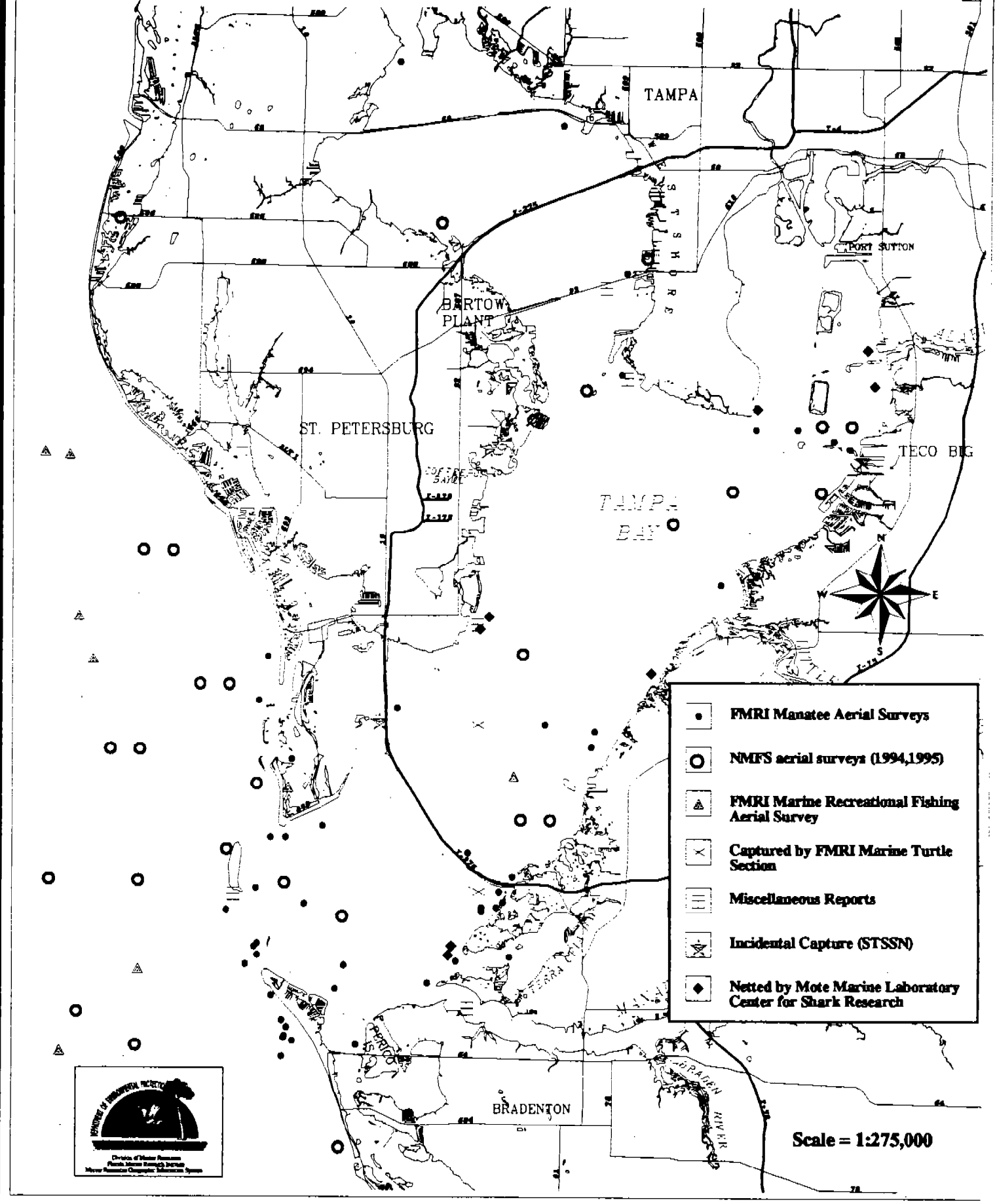

FIGURE 6