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Marine Turtle Nest Screening Program
at Canaveral National Seashore, Florida

CPSU Technical Report 20

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1985 Marine Turtle Nest Screening Program at Canaveral National Seashore, Florida

Richard M. Bryant, National Park Service, Canaveral National Seashore, Titusville, Florida 32780. CPSU Technical Report 20. Univ. Georgia, Athens. 17 pp. February 1986.

Abstract

Canaveral National Seashore averaged 108 marine turtle nests per mile of beach in 1985. The 2,508 included 2,389 loggerhead (*Caretta caretta*) nests (a threatened species) 94 green turtle (*Chelonia mydas*) nests (an endangered species) and 25 nests by species unknown. Raccoons (*Procyon lotor*) depredated 67% of 1,485 unprotected nests, necessitating the ongoing screening program by the National Park Service in 1985. Seasonal turtle workers screened 1,023 of the total 2,508 nests (41%) along the 23.25 miles of Canaveral National Seashore beach. Screening encompassed 939 loggerhead nests (91.9% of total nests screened), 62 green turtle nests (6.0%), and 22 of undetermined species (2.2%).

Storms destroyed 133 screened nests. Raccoons destroyed 51 of the 1,023 screened nests (5%). The remaining 839 nests hatched, and an average of 96.3 hatchlings emerged from each. Thus, the screened nests allowed approximately 80,500 hatchlings to be produced.

Introduction

Recent studies (e.g., McMurtray 1986) conducted at Canaveral National Seashore have shown that sea turtle nesting densities are approximately 100 nests per mile of beach. The vast majority of nests are laid by loggerhead sea turtles (*Caretta caretta*), a threatened species. A small but significant number of nests are deposited by green turtles (*Chelonia mydas*), an endangered species. In addition, there are rare nestings of leatherback (*Dermochelys coriacea*) and hawksback turtles (*Eretmochelys imbricata*). The 23.25 miles of National Seashore beach represents one of the largest undeveloped nesting sites for marine turtles in the United States.

Raccoons (*Procyon lotor*) depredate over 95% of the turtle nests on the Seashore's beaches (McMurtray and Irwin 1983, McMurtray 1986). A 4x4 feet wire screen, placed over the turtle nests, effectively excluded raccoons from reaching the eggs (McMurtray 1986). Since the wire mesh size (2x4 inches) allows turtle hatchlings to escape the nest chamber, screens can remain in place during and after the entire 55- to 60-day incubation period.

In 1984 the National Park Service began a pilot program on the Brevard County section (11.75 miles of shoreline) of the Seashore. Two turtle technicians, working five days per week, placed wire screens over 213 turtle nests. They screened 18.5% of the total number of nests (1,153) laid in the study area. Fifteen (7%) of the screened nests were subsequently depredated by raccoons.

The 1985 turtle management program was expanded to include the entire 23.25-mile length of the Seashore, and to screen nests seven days per week.

Methods

Starting at 4:00 AM, turtle workers patrolled the beach, using 3- and 4-wheeled all-terrain vehicles (ATV). One group of workers began at the south end of the Seashore, while the second team started from the north end. Both groups worked toward the middle of the Seashore, near the Brevard-Volusia County line. Quarter mile grids had previously been established for pinpointing nest sites. During each patrol, any previously unrecorded turtle activity was noted on data sheets. Activities were divided into 3 categories: (1) False crawl; (2) Nest/depredated; (3) Nest/Not depredated. Species, date, grid location and the worker's initials were also entered on data sheets. After these records were made, turtle crawl-tracks were obliterated by driving the ATVs over them. Data collections began on 1 May and lasted until 31 August 1985.

The screening of each turtle nest was preceded by locating the nest cavity. Careful probing proved to be essential; in the past, screens were sometimes placed accidentally several feet from the actual nest cavity. Eggs were not handled or counted at the time the nests were located. Instead, the sand over the nest was leveled slightly, then pre-cut 4x4 feet sections of galvanized welded-wire screen were placed over the nest area. Screen corners were held in place by 36-inch sections of #3 rebar, driven into the sand with a hammer. After the screen was in place, it was hidden with a 1- to 2-inch deep cover of sand. A wooden stake with the nest number, species, grid location, date and distance (in feet) to the nest was placed at the edge of the dune. Thereafter, the screened nests were visually checked for predation on a daily basis.

When encountering a depredated nest, workers would count damaged eggs. If less than 15 were broken, workers would remove damaged eggs from the nest site, recover the remaining eggs and screen the nest. These were later revisited to determine how many remaining eggs had hatched.

To evaluate hatch rate in nests that had been partially depredated, turtle workers screened 73 loggerhead and 4 green turtle nests that had been depredated prior to screening. Eighteen of the loggerhead nests were excavated; hatched and unhatched eggs were counted.

Hatching and emergence could be identified, respectively, by a depression in the sand that covered the nest and the actual crawl-tracks of hatchlings. Three days after emergence, the screens were removed, and the nests excavated to determine hatch success. All eggs, shell fragments and hatchlings were counted. Live hatchlings were released.

Results

Nesting

Data collected between 1 May and 31 August revealed that 2,508 nests were laid on the beaches at Canaveral National Seashore. This is an average of 108 nests per mile (68 nests per kilometer), a figure slightly higher than in previous years. Other beaches in Brevard County also experienced higher nesting densities than average (Erhardt, pers. comm.; Provanchia, pers. comm.). Loggerhead turtle nests accounted for 2,389 (95.2%) of the total nests deposited. Green turtles accounted for 94 nests (3.7%). The remaining 25 (1.0%) could not be identified to species. Table 1 summarizes the nesting and crawl data.

Table 1. 1985 Turtle crawl and nest summary, Canaveral National Seashore

Turtle Activity	T U R T L E		S P E C I E S		Total
	<i>Loggerhead</i>	<i>Green Turtle</i>	<i>Undet. species</i>		
<i>False crawl</i>	1,953 (94%)	92 (4%)	39 (2%)		2,084
<i>Nest/Screened</i>					
Depredated Prior To Screening	73 (8%)	4 (5%)	1 (1%)		78
Not Depredated/Screened	866 (92%)	58 (6%)	21 (2%)		945
Total Nests Screened	939	62	22		1,023
<i>Nest/Not Screened</i>					
Depredated/Not Screened	983 (99%)	13 (1%)	1 (0.1%)		997
Not Depredated/Not Screened	467 (96%)	19 (4%)	2 (0.4%)		488
Total Nests Not Screened	1,450	32	2		1,485
Total Nests	2,389	94	25		2,508

Screening

A total of 1,023 nests were screened. This represents 41% of the total nests deposited. Loggerhead nests accounted for 939 (91.8%) of the screened nests. Sixty-two (6.0%) were green turtle nests, and 22 (2.2%) were of an undetermined species.

Of 939 loggerhead nests screened, 73 (7.8%) had been depredated prior to screens being placed over the nests. Likewise, four (6.5%) green turtle nests had been depredated.

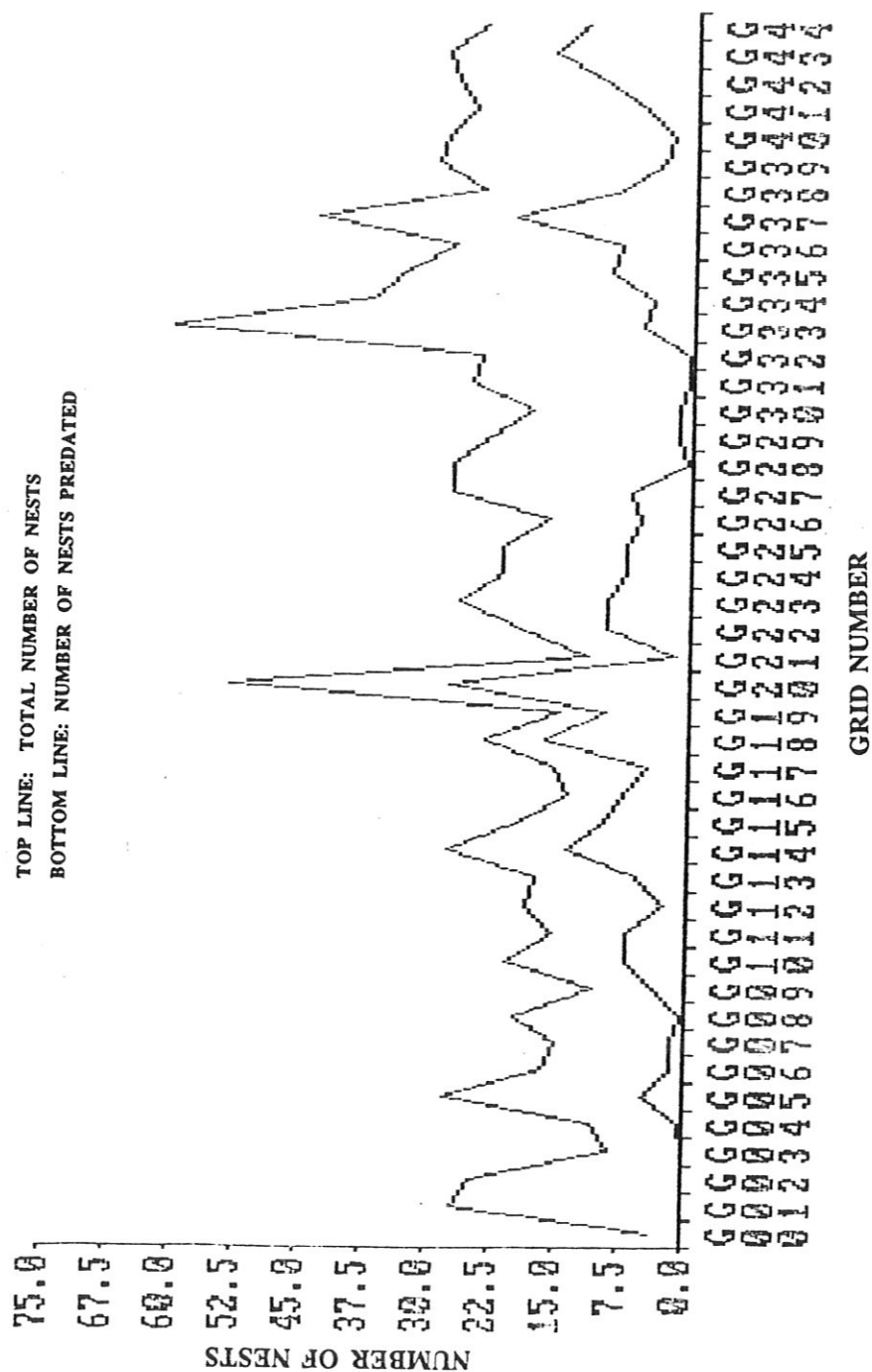
Fifty-one (5.0%) of the screened nests were subsequently depredated by raccoons. In some cases, the eggs were so close to the surface/screen that raccoons were able to reach them through the screens. Forty-one of these nests were so severely disturbed that screens had been removed and the nests abandoned. However, raccoons breached most nests by digging a tunnel, starting from outside the edge of the screen. All tunneling occurred within 48 hours of the initial placement of the screen. Since the majority of successful tunneling occurred within a 1.5-mile radius of Grid 86, it appeared that a small number of raccoons had learned this method. To reduce the possibility of such learned behavior spreading through the population, 13 raccoons were shot within a 1.5-mile radius of Grid Marker 86 between 3-22 June. The incidence of tunneling declined after 22 June over the entire study area.

Figure 1 shows nesting numbers and associated depredation presented by successive quarter-mile grids. It appears (although no statistical analysis was conducted) that depredation percentages are random from one grid to the next. Had depredation rates increased toward the Brevard/Volusia County line (Grid 45) starting at either end (i.e., Grid 00 or Grid 93), it would indicate that travel time of the workers had affected screening success. This trend was not noted, however.

Figure 1 (following two pages). Grid-by-grid summary of number of nests, and number predated for Volusia (first graph) and Brevard (second graph) counties.

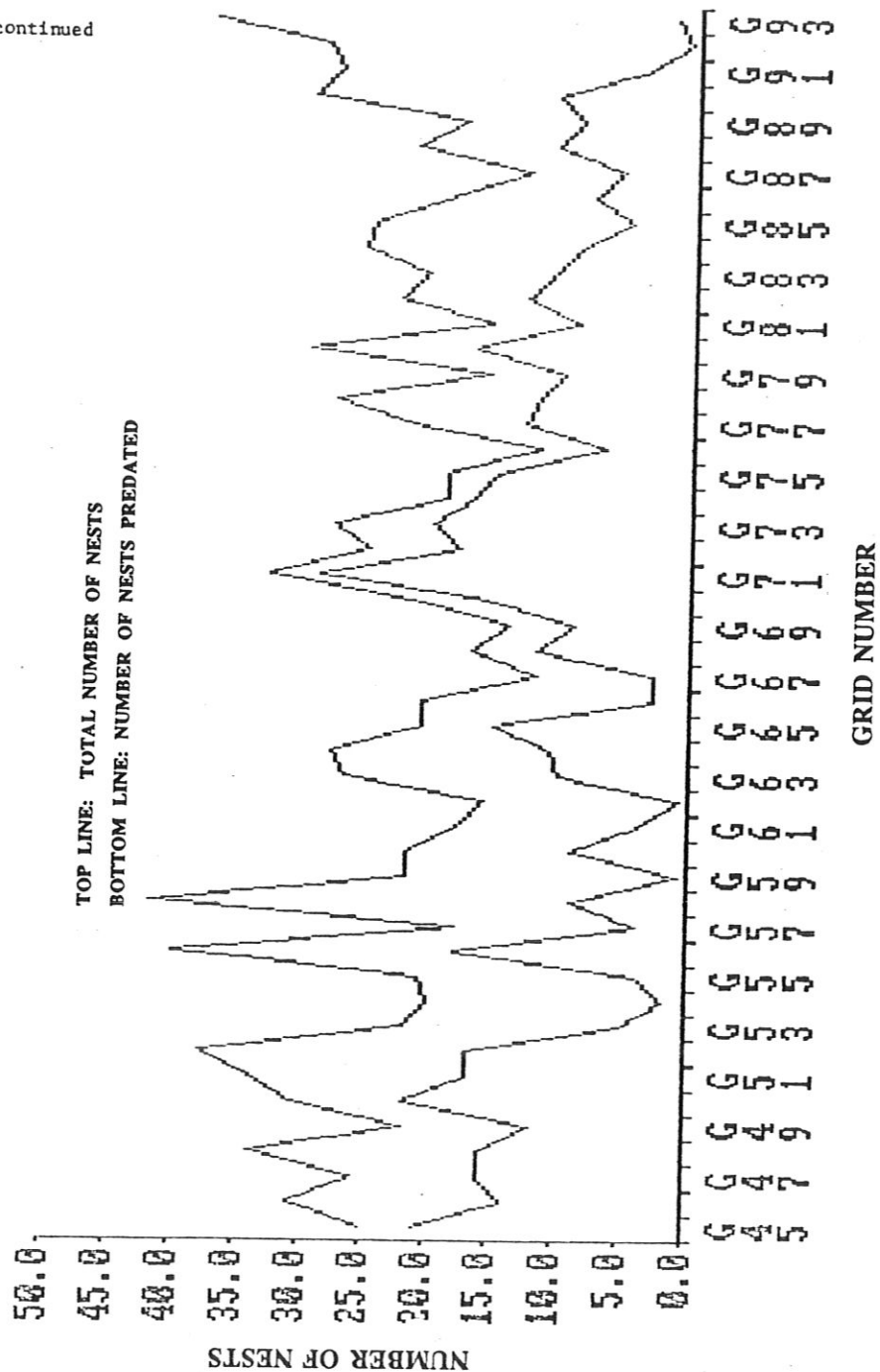
NESTING AND PREDATION OF TURTLE NESTS BY GRID: VOLUSIA COUNTY

FIGURE 1



NESTING AND PREDATION OF TURTLE NESTS BY GRID: BREVARD COUNTY

FIGURE 1, continued



Unscreened Nests

Screening started on 12 May. Screening of loggerhead nests ceased on 20 July. Green turtle nests were screened until 10 August. Prior to the program starting date, and after screening operations had ceased, 467 loggerhead, 19 green and 2 "undetermined species" nests escaped initial depredation. Because these nests were not marked, their outcome is unclear, but many of these 488 nests apparently incurred successful hatching, as evidenced by the large number of hatchling crawl-tracks emanating from them.

Late Season Storms

In mid-September, a low pressure area remained stationary off the coast of Florida. The resulting high winds, coupled with high tides, caused heavy wave action for eight consecutive days. The beach contour and primary sand dunes were subsequently altered.

Two hundred ninety-five screens were in place when the storm began. Inspection of the beach revealed that 188 nests were unaffected and hatched successfully. The screens from these were removed and stored for later use, but 107 screens were lost, either buried by several feet of shifting sand, washed out to sea, or unrecoverable because nest markers had washed away. The fate of the 107 nests could not be determined.

Hatching

Daily visual checks of the screened nests allowed accurate determination of emergence time. Of the 1,023 screened nests, 839 (82.0%) hatched (Table 2).

Table 2. Outcome of screened nests, Canaveral National Seashore

Nest Outcome	Total
Hatched	839
Lost to tides not associated with storms	26
Lost to storm tides/waves	107
Lost to raccoon predation	51
Total nests screened	1,023

Effects of Partial Depredation on Hatching Rate

Jennifer McMurtray (1983) noted that eggs remaining in partially depredated nests show a lower hatching success than eggs in nests untouched by raccoons. The findings from the 18 loggerhead excavated nests that had been screened after depredation are summarized in Table 3. The average number of undisturbed eggs was 89.5, of which 67.6% hatched. Although this is lower than the 81.6% hatching success of screened control nests, it seems much higher than McMurtray's data.

Excavations

To check that the screening procedure was not reducing natural hatching success (other than excluding raccoons), the first 129 loggerhead and 7 green turtle nests to hatch were excavated. Nests were excavated three days after hatchling tracks or depressions in the sand were observed. Of the nests that were screened without prior depredation by raccoons, the average number of loggerhead hatchlings emerging per nest, as determined by the number of hatched eggs, was 96.3. This statistic represents an incubation success of 81.6%, which is comparable to percentages obtained from unscreened loggerhead nests at other Florida locations.

Predators

Raccoons were the only significant turtle egg predators at Canaveral National Seashore. Ghost crabs (*Ocypode quadrata*) were encountered only in turtle nests previously disturbed by raccoons. On the beaches of the

Table 3. Nest excavation results for 1985, Canaveral National Seashore

	<i>Including nests at surf line</i>	<i>Excluding nests at surf line</i>
<i>Loggerhead Turtles</i>		
Non-depredated nests (screened)		
Average number of hatched eggs	96.3	101.1
Average number of unhatched eggs	21.7	12.0
Average number of eggs in clutch	118.0	113.1
Percent hatchling success	81.6%	89.4%
Number of nests excavated	111	99
Depredated nests (screened)		
Average number of hatched eggs	60.5	
Average number of unhatched eggs	29.0	
Average number of eggs in clutch	89.5	
Percent hatchling success	67.6%	
Number of nests excavated	18	
<i>Green Turtles</i>		
Average number of hatched eggs	117.0	
Average number of unhatched eggs	10.5	
Average number of eggs in clutch	127.5	
Percent hatchling success	91.8%	
Number of nests excavated	7	

Kennedy Space Center and Cape Canaveral Air Force Station, areas immediately south of the Seashore, feral swine (*Sus scrofa*) are a major source of turtle nest destruction (Provancha and Provancha, 1985). However, no hogs have been observed at Canaveral National Seashore.

Since the Seashore is open to the public only during daylight hours, human interference with nesting turtles is minimal. Vehicles are not allowed on the beaches of the Seashore. Park visitors did remove several nest screens, but fortunately this did not result in raccoon predation.

Discussion

Nesting

The 2,508 nests laid on Canaveral National Seashore represent a number slightly higher than those of previous studies. The 94 green turtle nests represent the largest number yet recorded for the Seashore. Since individual female turtles nest on a two- or three-year cycle, the above average number of nests may represent a high point on a natural cycle. Alternatively, the absolute number of loggerhead and green turtles may be increasing, reversing the downward trend of the last several decades. Only time and continued monitoring will indicate whether the 1985 nesting represents a cyclic (e.g., see Davis and Whiting 1977) or actual increase in the nesting turtle population.

Whatever the trend, the importance of adequate nesting habitat is of greater concern, since Florida is experiencing rapid population growth along its coastlines. The 23.25 miles of beach at Canaveral National Seashore is one of the longest protected nesting beaches in Florida. Its importance as nesting habitat will increase with continued coastal development.

Screen Loss to Storm Tides

Russell Galipeau (pers. comm.) reported the loss of approximately 50 turtle screens during 1984, due to high waves and storm tides. The additional loss of 107 screens during the 1985 season is evidence of a yearly pattern of loss unless the screen-removal date is changed. Removing all screens by mid-September should prevent such losses. While early removal may increase predation on nests that have not yet hatched, project costs (each screen costs \$4.10 each) and beach litter would be decreased. At the same time, McMurtray (1986) found nests that had screens removed before the end of the incubation period suffered as great a loss to depredation as did unprotected, control nests.

Predation Rates

As noted from Figure 1, travel time of the turtle workers did not seem to affect screening success. Even had workers started setting out screens earlier, e.g., at midnight, depredation rates would doubtfully have been reduced any further. In fact, an earlier starting time might be counterproductive: workers could be repeatedly delayed when waiting for a turtle to finish the nesting process. Also, increased risks to workers accompany longer periods of night operation.

Table 4 summarizes the large disparity in depredation *rates* for Brevard and Volusia counties. The Brevard County site, also referred to as Playalinda Beach (grids 46-93) had a 54% predation rate. In contrast, Volusia County, referred to as Apollo Beach (grids 00-45), experienced only 28% predation. The screening effort was equal (same number of workers beginning at the same hour), and the number of nests laid in both counties were approximately equal (1,399 nests in Brevard versus 1,109 nests in Volusia).

Table 4. Depredation rates of turtle nests by year and location, Canaveral National Seashore.

<i>DEPREDATION RATES</i>		
Year	Playalinda Beach (Brevard Co.)	Apollo Beach (Volusia Co.)
1983	N/A	95%
1984	65%	N/A
1985	54%	28%

SCREENED NESTS SUBSEQUENTLY DEPREDATED BY RACCOONS

Year	Playalinda Beach (Brevard Co.)	Apollo Beach (Volusia Co.)
1984	15	N/A
1985	43	8

Differences in depredation rate may be explained by the differences in the raccoon populations of the two counties. Brevard workers regularly

encountered large numbers of apparently healthy animals (shiny coats, erect ears, alert). Volusia turtle workers reported a greatly reduced number of raccoons, and encountered animals appeared to have dull coats and drooping ears. Park rangers operating in Volusia County have also noted this and they periodically have eliminated raccoons with abnormal behavior (e.g., no fear of humans, aggression toward humans). Tests were negative for rabies, but some sort of bacterial/viral infestations is suggested by the raccoons' behavior and physical appearance.

Acknowledgements

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