CAPE LOOKOUT NATIONAL SEASHORE

1999 SEA TURTLE MONITORING

PROGRAM

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INTRODUCTION

The field rangers of Cape Lookout National Seashore (CALO) began monitoring marine turtles in 1976. Baseline data was collected for a portion of South Core Banks during an extensive six-year study from 1978 - 1983. Nesting turtles were tagged and nests marked during nightly patrols. Since 1984 Cape Lookout has continued to monitor turtle activity, document strandings, protect nest sites, relocate endangered nests (1987 being the exception) and protect hatchlings. Cape Lookout continues to be a significant northern nesting beach and supports among the highest number of loggerhead turtle nests in North Carolina. Each year data has been collected, analyzed and presented to management in hopes of better protecting our declining marine turtle population. The 1999 Sea Turtle Report will summarize the 1999 project, consolidate many years of data and make recommendations for management of this federally threatened species. In addition to providing CALO with management data, the information gathered on CALO beaches continues to be an important link for many state, federal and private Atlantic coast sea turtle managers.

COOPERATING AGENCIES

Cape Lookout National Seashore cooperates with numerous agencies, including the North Carolina Wildlife Resources Commission (NCWRC) and the U.S. Fish and Wildlife Service, concerning the protection of sea turtles. The North Carolina Sea Turtle Stranding and Salvage Network (STSSN) Coordinator receives all original stranding reports and weekly nesting activity reports. NCWRC also issues to Cape Lookout National Seashore a Threatened or Endangered Species permit for possession and disposition of marine turtles and relocation of nests.

SITE DESCRIPTION

Cape Lookout National Seashore is located in the central coastal area of North Carolina between Beaufort and Ocracoke Inlets. Barden Inlet and New Drum Inlet divide the park into three islands. The northernmost island, North Core Banks (NCB) is approximately 22 miles long, extending from Ocracoke Inlet to New Drum Inlet. South Core Banks (SCB) extends southward from New Drum Inlet 25 miles to the Cape Lookout bight area. Both NCB and SCB have a northeast to southwest orientation and exhibit a low-profile landscape. The third island, Shackleford Banks (SH) is 9 miles long and has an east-west orientation with a higher dune system and larger areas of vegetation. All three islands are subject to constant and dramatic change by the actions of wind and waves.

METHODS

The Seashore is divided into three study areas; each area corresponds to one of the three islands comprising the Seashore. Student Conservation Association Volunteers (SCAs), interns and NPS staff patrolled NCB and SCB from June 1 to August 15. Patrols were conducted seven days a week and each patrol began early enough so that the island was checked for turtle activity by 12:00 PM. Patrols of Shackleford Banks were conducted an average of twice a week. Once a turtle activity was located, individual data sheets were completed for each nest and dig. Locations of each activity were noted by linear mile markers (See Appendix I, Attachment 2). For detailed information on procedures used in the 1999 Sea Turtle Program refer to Appendix I.

Nest losses to tidal flooding and predation are the primary threats to nesting success at CALO. Nests laid

in the tidal wash zone, primary berm, and back swale are considered in danger of erosion or flooding. These nests were relocated to a higher elevation on the primary dune. The park closed six beach areas, up to one mile in length, to vehicles. Relocated nests were moved into these closures and vehicles were detoured around the backside of the primary dunes. Beach closures eliminated the need to construct and maintain numerous individual barricades. However, individual barricades were erected around those nests that were not relocated and were outside the beach closures. Beach vehicle closures provide a rut-free corridor from the nest site to the ocean thus preventing hatchlings from becoming entrapped in tire ruts and dying from predation or desiccation. Camping and campfires were not permitted in the closures to prevent disturbance of hatchlings by artificial lights.

Nests relocated onto the primary dunes and into beach closures may introduce factors that increase egg and hatchling mortality. Sea oats (*Uniola paniculata*) are dominant on the primary dunes and their roots invade the nest. Hatchlings that emerge from nests located high on the primary dunes are exposed to mainland lights and may travel towards the lights away from the ocean. Records were therefore kept of hatchlings entangled in roots and eggs destroyed by roots in the egg chamber. Hatchling tracks that were observed to go towards the sound away from the ocean were also noted. Finally, relocating nests into a single beach closure increases the risk of a large loss due to storms, pathogens, or predation. Any sign of predation was noted and the approximate numbers of eggs or hatchlings destroyed were recorded. To discourage raccoon predation, wire screens anchored by rebar were placed over all nests on SCB. Wire cages were used on some nests between the lighthouse and Power Squadron Spit, the area with the most problems from raccoons in the past. Some nests on NCB were screened when they passed 50 days of incubation. Nests were monitored for hatching activity through November. Nests were excavated for follow-up data.

RESULTS

The monitoring procedures used at CALO prior to 1990 were significantly different than those used after that year. Records from those years will not be included in this report. 1990 marked the beginning of monitoring procedures following the USFWS Index Nesting Beach program (See Appendix I, Attachment 7).

NESTING RESULTS

The first recorded nesting activity in 1999 was on May 25 and the last on August 27, for a 94 day nesting season. A total of 431 activities were documented of which there were 242 nests, 21 digs, and 168 crawls, (Table 1; see Appendix I for activity definitions).

Table 1. 1999 ACTIVITIES BY STUDY AREA

	North Core Banks	South Core Banks	Shackleford Banks	CALO Total
NESTS	73	148	21	242
DIGS	6	13	2	21
CRAWLS	50	115	3	168

Nest totals for CALO in 1999 surpassed the highest number ever recorded for the park. SCB had a record numbers of nests (Fig. 2). As in past years, SCB had nest sites concentrated in the area south of the lighthouse. The three-mile area between mile markers 42-45 accounted for 40% of the nests on the island. One nest was found on the soundside in the Cape Lookout Bight opposite the rock jetty.

Nesting on NCB and Shackleford Banks was fairly evenly distributed (Fig. 3). No confirmed green turtle nests were found at CALO in 1999. All nests were loggerhead turtle nests.

HATCHING RESULTS

Follow-up of nesting activity involved observing nest and dig sites for signs of hatching, recording relevant data, and excavating the site. By collecting hatch information, often it can be determined if predators, human disturbance or environmental occurrences have adversely affected a nest. Individual nest data for SCB, NCB and SH are given in Appendix II.

Follow-up studies were completed on 79% of the nests. 37 nests were washed away with the numbers of eggs unknown. In five nests the number of eggs and number of hatchlings emerged were both unknown. The last nest was excavated on November 8. The average clutch size was 116 eggs. It took an average of 62 days for nests to incubate. 53% of the eggs produced hatchlings that made it out of the nest (emergence success), the highest for any one nest being 99% and lowest 0%. A total of 23,224 eggs were laid for those nests either excavated or relocated. The number of eggs was unknown for 42 nests. 11,751 of these eggs hatched and hatchlings emerged or were released from the nest (Table 2).

The 1999 nesting season was affected by two hurricanes. Hurricane Dennis washed away 52 nests and Hurricane Floyd washed away seven more nests. 31 other nests failed to hatch due to flooding. Calculating a true emergence success for the year always proves to be difficult. Raccoons may dig into a nest at hatching or after hatching making it impossible to know how many turtles escaped from the nest. A nest may be washed away that wasn't relocated, thus an emergence success of zero is known but the original number of eggs laid is not known. The emergence success reported is for those nests in which the number of eggs laid and the number of emerged turtles is known. The number of nests excavated for the year provides a basis for knowing how many nests the emergence success is based upon (Table

2).

Table 2. SEA TURTLE HATCH SUMMARY 1990-1999

Year	Nests	Relocated	Excavated	Avg. Clutch	Flooded	Avg. Incu	Eggs	Emerged	EMR %
1990	99	68	89	115	1	57	10376	7369	71%
1991	89	56	74	115	6	62	8393	5197	62%
1992	90	39	84	114	4	63	9419	6791	73%
1993	99	54	89	115	9	59	10365	7544	74%
1994	124	98	119	120	3	62	14459	11296	79%
1995	119	66	103	115	38	57	12357	6157	51%
1996	95	69	85	115	16	65	10091	5602	57%
1997	124	92	120	122	3	63	14824	10740	73%
1998	198	117	169	114	39	62	19672	13315	69%
1999	242	123	191	116	90	62	23224	11751	53% *

*does not include 37 nests washed away with unknown egg totals

To provide a more accurate emergence success rate we have calculated an estimated emergence success of 44% in 1999. This figure includes 37 nests that were washed away, but the number of eggs laid were unknown. The average clutch size for the year was given to those nests as the number of eggs laid, allowing them to be calculated into the estimated emergence success.

Table 3 provides a hatch summary by study area. NCB had an emergence success of 56%, the lowest hatch rate for the island in the last ten years. SCB and SH at 52% and 46% respectively both had lower rates than average.

Table 3. 1999 ACTIVITY SUMMARY BY STUDY AREA

	NCB	SCB	SH	TOTALS
NESTS	73	148	21	242
DIGS	6	13	2	21
CRAWLS	50	115	3	168
RELOCATED	38 (52%)	85 (57%)	0	123
EXCAVATED	54	126	11	191
AV. CLUTCH	113 eggs	118 eggs	108 eggs	116 eggs
EMERGE SUCCESS	56%	52%	46%	53%
AV. INCUBATION	63 days	61 days	60 days	62 days
# FLOODED	30	50	10	90
# PREDATED	5	13	3	21

In 1999 51% of the nests were relocated. Many nests that were relocated would have been lost to flooding had they not been moved. Non-relocated nests, in most cases, were laid on the primary dunes and met the park's criteria for a safe distance above the high tide line. No nests on Shackleford

Banks were relocated this year.

The emergence rate for relocated nests was less than the rate for untreated nests in 1999 (Table 4). However, this does not include 37 non-relocated nests that were washed away without the number of eggs being counted. 31 of 119 nests left in situ were flooded or washed away. 23% of the relocated nests were flooded or washed away.

Table 4. EMERGENCE SUCCESS OF RELOCATED VS. NON-RELOCATED NESTS BY STUDY
AREA IN 1999

RELOCATED	NCB	SCB	SH	CALO Total
Nests	38	85	0	123
Eggs	3,781	9,415	0	13,196
Hatchlings	1,521	4,936	0	6,457
Emergence Rate	40%	52%	N/A	49%
NON-RELOCATED				
Nests	35	63	21	119
Eggs	2,304	5,500	1,188	8,992
Hatchlings	1,866	2,877	551	5,294
Emergence Rate	81%	52%	46%	59% *

*does not include 37 nests washed away with unknown egg totals

Since 1988 emergence success has been similar for relocated and non-relocated nests (Table 5). The presence of good relocation areas has been the key factor in the success of relocated nests. This is dictated by the effects of storms on the beach and dune profiles.

In 1999, five nests were predated by ghost crabs. Ghost crab predation was recorded when eggshells were found on the surface. Raccoon predation was recorded for 16 nests; 8 of the nests had been relocated. On SCB, raccoons dug into 12 nests, despite wire screens. The raccoons reached through the screen to get at the eggs on the top of the nest. Most predation occurred near the time of hatching.

Table 5. 1990-1999 EMERGENCE SUCCESS FOR RELOCATED vs. NON-RELOCATED NESTS

YEAR	PERCENT OF NESTS RELOCATED	EMERGENCE RATE-RELOCATED	EMERGENCE RATE-NON RELOCATED	% OF NESTS EXCAVATED
1990	69	71	77	94
1991	63	57	76	97
1992	43	71	76	97
1993	54	74	73	90
1994	79	80	73	96
1995	55	61	38	86
1996	73	56	64	89
1997	74	69	86	95
1998	59	77	55	85
1999	51	49	59	79
AVERAGES	61	66	65	88

Root invasion destroyed eggs or trapped hatchlings in seven nests. Two nests may have been affected by artificial light. Hatchling tracks and dead hatchlings were found near the backroad. Hatchlings may have been attracted to lights or confused by topography rather than lights. There were no other known instances of human disturbance of nests adversely affecting hatching or hatchlings. Cold temperatures stopped development in five of nests by early November.

DISCUSSION

An objective of the recovery plan for the loggerhead sea turtle is to implement nest protection measures "to ensure (a) greater than 60 percent hatch rate." This should be done using the "least manipulative method ... to avoid interfering with known or unknown biological processes." Tidal flooding continues to be the principal threat to nesting success at CALO. Nest relocation is the primary management tool used to enhance hatching success in the park.

The 1999 Hurricane season led to the lowest turtle hatchling emergent success in the 1990s. Relocation areas that had been used for years successfully were completely washed away by Hurricane Dennis and Hurricane Floyd. Without using an artificial hatchery the turtle nests at CALO will always be in danger from such severe storms.

Nests and hatchlings are effectively protected from vehicles and park visitors through education and beach closures. Predation by raccoons can be limited through the use of screens and cages. These methods have been successful at increasing hatching success with minimal manipulation of natural sea turtle nesting.

STRANDINGS

Collecting information from stranded turtles is also an important phase of the CALO Marine Turtle Program. Research has indicated that Loggerhead population stability is much more sensitive to change in the large juvenile stage (subadult) than in earlier stages. The key to improving the outlook for this population lies in reducing mortality in the later stages, particularly large juveniles. Some potential nesting turtles are drowned in shrimp trawls, fatally wounded by boat propellers, or ensnared in nets and line, in and around the shores of Cape Lookout. 94 dead strandings occurred at CALO in 1999. All strandings were reported to the Sea Turtle Project Coordinator for North Carolina. Species found were 36 loggerheads, 41 green turtles, 15 Kemp's Ridleys and 2 leatherbacks. The month of December had the greatest number of reported strandings (Table 6).

Carcass anomalies that may have contributed to the death of the turtle were recorded on each stranding report. Six turtles were missing part or all of a flipper, six were missing heads, 13 had carapace damage, two had skull damage and two were found with prop scars. The remaining turtles showed no apparent cause of death. All turtles were scanned for P.I.T. tags. PIT tag # 411F146D2E was found in a green turtle. 16 turtles were salvaged whole for the NC State Coordinator. Parts of 12 other turtles were salvaged for NMFS researchers.

Table 6. 1999 SEA TURTLE STRANDINGS AT CAPE LOOKOUT NATIONAL SEASHORE

	NCB	SCB	SH	OTHER	TOTAL
January	4	1	1		6
February	1	6	0		7
March	4	2	0		6
April	2	6	0		8
May	0	2	4		6
June	1	3	8		12
July	0	0	0		0
August	0	2	0	1	3
September	0	0	1		1
October	3	5	0		8
November	5	5	0		10
December	1	25	0		26
Total for 1999	21	58	14	1	94

The peak in strandings occurred in December when 25 dead turtles were found in the Cape Lookout Bight. SCB had more strandings than any previous year (Table 6). The number of strandings in 1999 was the highest total ever recorded at CALO (Table 7). The average yearly total for 1990- 1998 was 52 turtle strandings. 56 of the strandings occurred on the soundside of the islands, the remainder on the ocean beach. More Kemp's Ridley and green turtles stranded at CALO in 1999 than in any previous year (Table 8).

Table 7. CALO SEA TURTLE STRANDINGS 1990 – 1999

YEAR	NCB	SCB	SHACK	OTHER	TOTAL
1990	11	18	14		43
1991	8	8	4		20
1992	18	16	10	1	45
1993	18	12	10	3	43
1994	22	27	12	1	62
1995	11	23	9		43
1996	29	33	29		91
1997	21	18	17	1	57
1998	20	21	20	2	63
1999	21	58	14	1	94

Table 8. CALO TURTLE STRANDINGS BY SPECIES 1990-1999

YEAR	LOGGERHEAD	GREEN	KEMP'S RIDLEY	LEATHERBACK	UNKNOWN
1990	33	7	1	2	0
1991	16	2	1	0	1
1992	30	13	1	1	0
1993	29	6	5	2	1
1994	30	24	5	2	1
1995	27	7	6	1	2
1996	63	21	4	3	0
1997	49	1	7	0	0
1998	43	8	12	0	0
1999	36	41	15	2	0

MANAGEMENT

RECOMMENDA

TIONS

1. CALO should continue to use the US Fish and Wildlife's standards for conducting turtle patrols and continue the current relocation standards and procedures, these appear to be very successful.

2. Screens should continue to be used on SCB to prevent raccoon predation. Nests in the area south of the lighthouse should be protected with wire cages starting 50 days after the nest was laid. All nests on NCB and Shackleford Banks should be protected by a screen 50 days after the nest was laid.

3. All park staff and volunteers involved with turtle monitoring should be given complete training in current monitoring procedures.

4. Educational efforts should be directed toward park visitors to prevent inadvertent disturbance to nesting females, eggs, and hatchlings. This should include posted signs, site bulletins and interpretive programs. Updates on the turtle nesting season should be provided to commercial tour operators, i.e. Muletrain, Corolla Outback Ltd.

APPENDIX I

1999 SEA TURTLE PROGRAM PROCEDURES

Contact NPS- CALO for complete appendices

APPENDIX II

1999 NEST DATA

Contact NPS-

CALO for

complete

appendices