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SEA TURTLE NESTING AT VIRGIN ISLANDS NATIONAL PARK
AND
BUCK ISLAND REEF NATIONAL MONUMENT
1980 - 1985

By

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INTRODUCTION

To effectively manage sea turtles at Virgin Islands National Park (VIIS) and Buck Island Reef National Monument (BUIS) we need to know, as a minimum, population sizes and reproduction rates. Historically, all three species found in NPS waters, green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermochelys coriacea*) have experienced large-scale exploitation by man that has led to drastic reductions in numbers in the Caribbean (King, 1981; Ross, 1982).

Population censuses are the best method by which the stability of populations can be monitored and dangerous trends detected. The nesting beach is perhaps the only practical place to conduct a census of sea turtles. By conducting daily beach monitoring during the nesting season, the number of yearly arrivals can be estimated. There is mounting evidence that estimation of seasonal nesting totals should be based on data from many seasons due to the tremendous fluctuation in the number of yearly arrivals of nesting turtles observed at rookeries around the world (Meylan, 1981).

Over the long term, censuses can be used to measure the negative effects such as habitat alteration and commercial exploitation, and to evaluate the efficacy of management and conservation practices within VIIS and BUIS. For these reasons VIIS and BUIS initiated a sea turtle nesting project in 1980. Nesting data from the first two seasons, 1980 and 1981, have been published (Small, 1982). In 1983 a Resources Management Directive was signed by the VIIS Superintendent, to ensure that the sea

turtle nesting observations initiated by the Biological Technician in 1980 would be continued each year by the Resource Protection and Visitor Services Division (RP & VS). This report summarizes results for the 1980 - 1985 nesting seasons, in similar format as the first publication, and treats VIIS and BUIS as separate projects.

VIRGIN ISLANDS NATIONAL PARK

OBJECTIVES

The objectives of the project were:

1. Locate and map all sea turtle nesting activities.
2. Determine species nesting, via crawl differentiation, nest habitat and hatchling identification.
3. Control nest predators.
4. Record chronology of nesting.
5. Determine nesting success.

Guidelines were developed to assist the Chief of RP & VS in incorporating these tasks into the present workload of the RP & VS staff. The Biological Technician has conducted yearly seminars, at the beginning of each nesting season, to instruct the rangers in field methods.

METHODS

Beaches within VIIS (Figure 1) were to be surveyed at least twice weekly and all signs of sea turtle nesting activity recorded. Surveys were done by walking the beaches; in addition, weekly surveys were conducted using binoculars from a boat

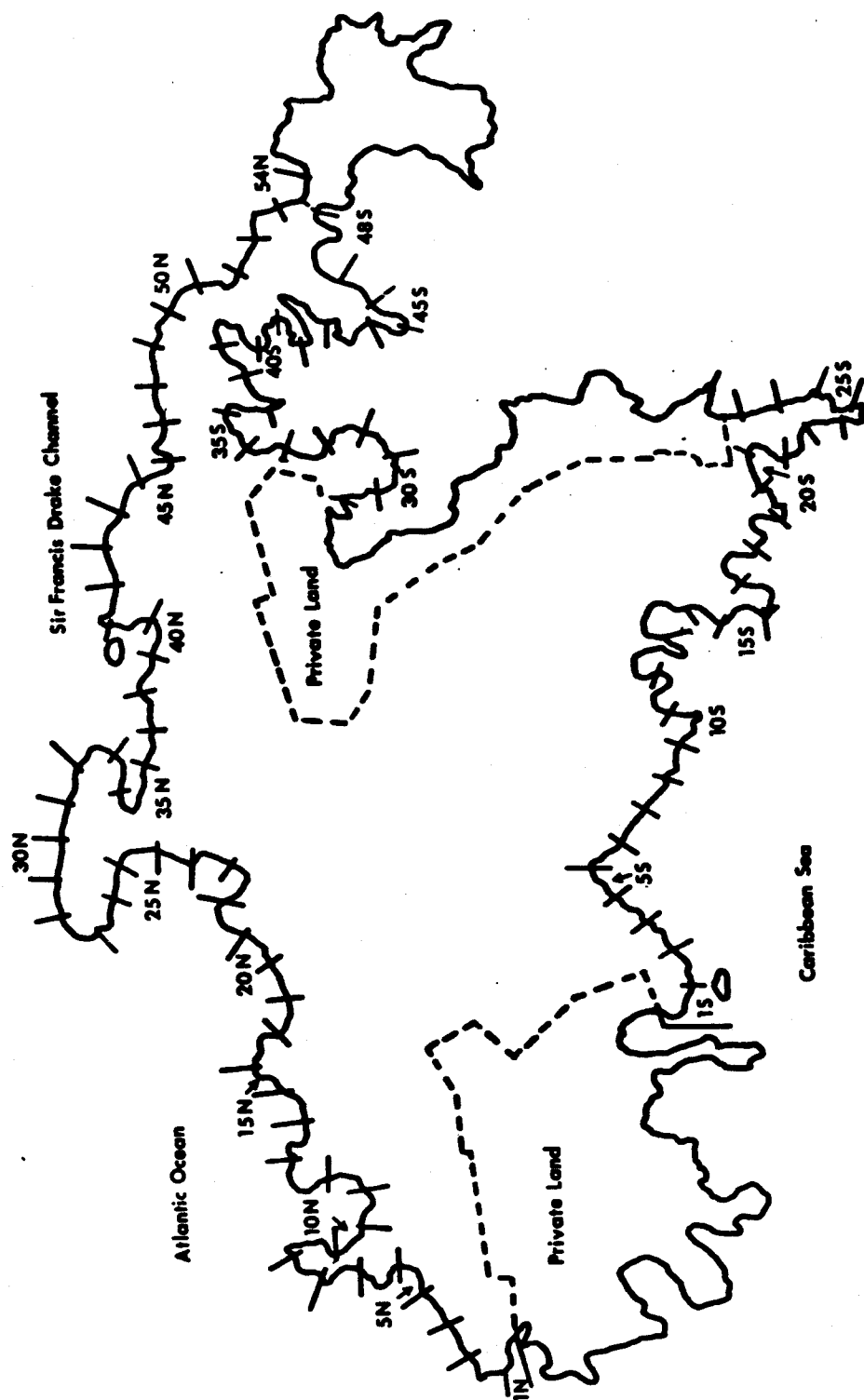


Figure 1. Virgin Islands National Park - Beaches - St. John

Virgin Islands National Park - Beaches

St. John

Key:

3-N=Solomon	23-N=Maho
4-N=Honeymoon	24-N=Francis
5-N=Caneel	41-N=Leinster
6-N=Beach #7	41-Na=Waterlemon Cay
7-N=Scott	45-N=Brown Bay
8-N=Turtle Bay	53-N=Mennebeck
10-N=Caneel Hawksnest	54-N=Haulover
11-N=Hawksnest	
12-N=Gibney Hawksnest	20-S=Salt Pond
13-N=Denis Bay	14-S=Greater Lameshur
14-N=Jumbie	13-S=Greater Lameshur
15-N=Trunk	12-S=Little Lameshur
17-N=Windswept	6-S=Eastern Reef
18-N=Peter Bay	4-S=Genti
19-N=Little Cinnamon	3-S=Western Reef
20-N=Cinnamon	1-2-S=Cocolobo Point

cruising 15 meters offshore.

Primary tasks during the surveys were:

1. Identification of all nesting activity.
2. Detection of nest predation or other nest destruction and placement of protective devices (e.g. mongoose traps) around the nest area.
3. Detection of signs of hatchling emergence.
4. Determination of hatching success, when possible.

For more detailed information on the above methods consult Small, 1982.

RESULTS AND DISCUSSION

Species Nesting All crawls were believed to be hawksbill except for one leatherback crawl at Cinnamon Bay beach in 1984 and four leatherback crawls at Trunk Bay in 1985.

Yearly variation in Nesting Activity. During the period 1980-1985, nesting activity occurred on 20 of the 31 beaches at VIIS (Table 1). Yearly distribution of nesting on VIIS beaches varied considerably from year to year, with just one beach, Cocoloba Point, experiencing nesting every year. Beaches within the same bay (Western keef, Genti and Eastern Reef) all supported nesting in 5 of the 6 years surveyed. Many other beaches (Jumbie, Trunk, Cinnamon, Salt Pond, Little Lameshur) had nesting 3 of the 6 years, while Caneel Hawksnest, Denis, Maho, Francis, and Greater Lameshur all had nesting in only 1 season. Others (Hendrickson, 1981) have found that, for Hawksbills, the probability of new appearances on previously non-utilized nesting beaches is high.

Table 1. Nesting activity in relation to VIIS beaches, 1980-1985

Beaches	1980			1981			1982			1983			1984			1985		
	+	-	?	+	-	?	+	-	?	+	-	?	+	-	?	+	-	?
Henley Cay				1	3								1					
Caneel Hawksnest	2																	
Denis Bay																1		
Jumbie Bay	6	3		3	1								3					
Trunk Bay				7	2					3			4					
Windswept				7	1													
Peter Bay										1	3							
Cinnamon Bay										1					1	3	1	2
Maho Bay				1														
Francis Bay				3	2													
Salt Pond Bay				10	3					10	1	1				3		1
G. Lameshur Bay									1							3		1
Yawzi Point																1		
Grootpan																		1
L. Lameshur	1						3	3								2		
Europa							1	1										2
E. Reef	2			1			4						2		2		2	
Genti		2		3	1					4	1		2					
W. Reef		1		1			11	3		2		1	1					
Cocolobo Point	5	3		12	9		20	9		6	7	4	2	1		2		
Totals:	16	9	0	45	19	0	43	21	0	23	13	9	9	3	2	18	4	5

+ = Successful nesting

- = Aborted crawl

? = Unsure, but suspected nesting

This further emphasizes the need for continual area wide surveillance as a integral part of any management program.

The yearly fluctuation in total numbers of nesting activities within VIIS (range 14 (1984) - 64 (1981 & 1982) may be attributed to the natural fluctuation in the two, three and four year nesting cycle of hawksbills, as has been seen in other populations (Carr and Stancyk, 1975; Diamond, 1976; Gannett, 1977).

Seasonal Period of Nesting. With the addition of leatherback nesting activity in VIIS, the period of nesting begins in March and continues through December. With incubation periods of 60-70 days, the hatching/emergence of nests would continue until March, therefore nesting activity should be considered to be year-round. The peak of nesting continues to be August to November each year for hawksbill sea turtles.

Aborted Nesting Attempts. Hawksbills at VIIS often came ashore and did not successfully excavate a nest chamber and lay their eggs. As part of the beach monitoring program park rangers were to have differentiated aborted nesting attempts from successful nests. Often it is difficult to determine if eggs were deposited during a specific nesting activity, as a hawksbill turtle might disturb many areas during a single crawl. When the activity could not be immediately defined as successful or aborted, rangers were instructed to label the nesting as "unsure". Confirmation of the nesting site was to await the excavation of the nest site after a hatchling emergence had been suspected or 90 days

had elapsed. However, due to personnel shortage, the majority of the nests were never opened. Therefore, from 1983-1985 some nesting activities remained defined as "unsure nesting".

Nest Mortality.

Mongoose Predation. The exotic mongoose, Herpestes auropunctatus is an effective predator on sea turtle eggs and hatchlings on St. John (Small, 1982; Nellis and Small, 1983). Mongoose trapping done on sea turtle nesting beaches did reduce the incidence of mongoose predation. In particular, in 1983, a visiting wildlife biologist did extensive trapping on nesting beaches and the predation level dropped from 15% of all nests in 1982 (7 nests) to 6% in 1983 (2 nests).

As reported in 1980 & 1981 (Small, 1982), mongooses were found to prey on turtle nests during 3 different phases of the nesting cycle: within 1-3 days of egg deposition, at the time of hatching in the nest cavity, and during the emergence of hatchlings as they journeyed to the sea. Therefore, successful mitigation of nest predation does require trapping and removal of mongooses throughout the sea turtle nesting season, including emergence (approximately 60-70 days after nesting). Trapping should be particularly intensive around the nest when hatching and emergence of hatchlings is expected.

Most nest preyed upon at the time of hatching/emergence do not suffer total clutch destruction. Observations of hatchling crawl marks to the sea, and hatched eggshells (not shredded by mongooses) still deep in the nest cavity indicate survival of hatchlings. Most nests preyed upon within 1-3 days of egg depo-

sition are totally destroyed by mongooses. At times, nests are not discovered until predation occurs. For instance, in 1982, 43% of nests which were preyed upon were not even known to exist until the predation was discovered (suspected to be within 1-3 days of egg deposition). Likewise, in 1985 the two nests that were opened by mongoose had not been previously recorded. Again, the need for continual monitoring of all nesting beaches is imperative.

Poaching. During 1980 and 1981 sea turtle egg poaching by humans was not considered to be a major problem at VIIS, as it was at BUIS and St. Croix (Small, 1982). However, during the 1982 season seven nests at Cocoloba Point beach were believed to have been poached. Public access to this beach is not easy by boat or land, subsequently little human activity is normally found there. However, suspicious activities attracted our attention to the possibility of egg poaching; among them were broken eggshells scattered around recently laid nest areas, along with homemade probes and egg collecting bags hidden in the borderline vegetation. The beach is located on a windy SE point, where trails on the beach (both human and animal) are unrecognizable within a few days of occurrence.

Upon extensive digging to determine a possible nesting site we were unable to find a clutch in six activities, even though broken eggshells had been noted at first observation of the nests. In the seventh activity a mongoose had entered a hatching/emerging nest that consisted of just 8-10 eggshells, presumably inadvertently left by poachers when they raided the nest

just after egg deposition. The poachers recovered the nest cavities in all cases, after digging up the eggs.

In 1983 one nest was believed to have been poached at Salt Pond Bay beach. No indication of human poaching was observed in 1984 or 1985. However decreased ranger patrols, in particular on the south side (Reef Bay and Cocoloba Point), may have allowed for poaching to go undetected.

Other turtle poaching incidents during 1980-1985 include an arrest made by National Marine Fisheries Service Law Enforcement Agents in 1982 just outside the NPS south shore boundary. A native St. Johnian was arrested after being observed removing a sea turtle from a preset tangled net and carrying it ashore. Also in 1982, during a routine northshore boat patrol an NPS ranger encountered a British Virgin Island native fishing boat containing a green sea turtle, within park waters. The close vicinity of the home port, Tortola, enabled the fishermen to flee, seeking refuge from NPS jurisdiction. They escaped with the turtle before the ranger could apprehend them.

These incidents all point to the need for more efforts by NPS rangers to work in conjunction with NMFS and V.I. Government Department of Conservation and Cultural Affairs (DCCA) law enforcement officials.

Meteorological Sources of Mortality. Turtle nest habitats at VIIS are narrow strips of sandy land nearly at sea level. These habitats are thus particularly vulnerable to strong sea swells associated with tropical storms during July - November, and northern winter storms November - April.

In 1980, one nest was inundated by sea water and lost during the near passage of Hurricane Allen in August; three nests were inundated and lost during northern sea swells in November. In November, 1981, one nest (almost full term) was lost to a northern storm. In October, 1982, unusually high sea swell activity affected the north shore of St. John, destroying three nests. One nest was exposed, as the beach was pounded by sea swells; it contained 142 hawksbill eggs, all very close to full term. The two other nests were totally washed out to sea, as the beach face was badly eroded. No record was made by NPS rangers of nests lost to inundation during 1983. In November 1984, a Tropical Storm, Klaus, hit the V.I., bringing 12-15 foot seas and causing much erosion on both north and south shore beaches. NPS rangers concluded that all but two nests were lost to inundation (9 total); however, there was no digging done on any of the nests, to further substantiate this assumption. In 1985, no record was made by NPS rangers of any nests lost to sea inundation.

Incubation and Emergence. When the project was turned over to the RS & VP division, under the Resource Management Directive, it was decided that, due to staffing limitations, the emphasis would be placed on locating and protecting the nesting activities. Very little attention was given to digging into emerged nests to determine nesting success. Therefore little data have been generated since 1982, the last year the Biological Technician was involved in the project. Consequently, the following results are from 1982 only.

The combined period of incubation and emergence was accurately recorded for eighteen nests in 1982 to be 63.1 days ($s = 4.0$). This compares to mean incubation-emergence periods of 62.4 days for 1980 and 66.5 days for 1981 (Small, 1982).

The nest depth was the measured distance from the surface of the ground to the bottom of the egg chamber; it ranged from 17.0 to 22.5" ($x = 19.6$, $s = 1.25$, $n = 23$). This compares to a mean of 19.4" during 1980-1981.

Clutch Size and Nesting Success. Clutch size was determined by counting the number of hatched eggs, undeveloped eggs and unhatched eggs with dead embryos. Clutch size was determined for 22 of the 45 nests laid in 1982. Clutch size ranged from 110 to 191 ($x = 152.5$, $s = 20.1$). This was larger than the mean clutch size of 141.6 found in 1980-81 (Small, 1982). The total destruction of 15 nests (7 by poaching, 6 by mongoose predation, 2 from sea swells) prevented a physical count of their contents. In addition, we could not locate, by digging, eight of the areas where we had concluded that a nesting activity had resulted in egg deposition. As experienced in 1980-81, hawksbills often disturb many large areas (up to 10-11) during one crawl, making the actual location of the nest cavity difficult to find. In addition, some beaches are remote; logistical difficulties in surveying them complicated the determination of nesting activities as successful or unsuccessful.

Undeveloped eggs were found in eighteen nests. Their numbers ranged from 1-50 and represented 6.5% of the eggs in those nests. This is up from the 1980-81 figure of 5.9%, primarily due

to one nest having 50 undeveloped eggs (representing 43% of the total clutch).

Hatching success, hatchling survival, and overall nesting success for each nest in 1982 was determined in the same manner as in 1980-81 (Small, 1982). Two categories of nests, all nests (including both disturbed and undisturbed) and undisturbed nests only were employed in the calculation of the means for these figures. Mean figures for undisturbed nests in 1982 reflect the reproductive potential of hawksbill sea turtles. Mean figures for hatching success, hatchling survival and overall nesting success for 1982 were 96.6, 99.0, and 90.7% respectively. These figures compare closely to the 1980 figures of 97.6, 98.7 and 90.1% (Small, 1982). The nesting success of all nests (both disturbed and undisturbed) is more of a true indicator of the reproductive success on VIIS nesting habitats. The mean figures for hatching success, hatchling survival, and overall nesting success for 1982 were 65.4, 67.0, and 61.4% respectively. This compares to 69.9, 69.0 and 60.2% in 1980-81 (Small, 1982).

BUCK ISLAND REEF NATIONAL MONUMENT
SEA TURTLE NESTING ACTIVITY 1980-1985

Introduction

Before 1980 there was no systematic program to monitor species and numbers of turtles nesting on Buck Island. Written reports were few and were based on fragmentary records. It was believed that hawksbills, greens and leatherbacks all nested there historically (Seaman and Randall, 1962; NPS 1976-1982; Rainey, 1976; Towle et al., 1978) but it was unknown which, if any species still nested there and in what concentration.

In 1980, BUIS rangers began to participate in the NPS Southeast Region's "Sea Turtle Monitoring Program". Rangers were trained for field identification of turtle crawls and nests; observations were to be made in the course of their other duties. However, due to the NPS staff being short-handed at critical times during the 1980 and 1981 nesting season, the data collection was not a continuous effort. Their preliminary results were published (Small, 1982). Starting in 1983 more emphasis was placed on the sea turtle nesting project, as NPS managers realized the importance of Buck Island as nesting habitat for hawksbill sea turtles. Foot and boat patrols were increased to survey the beach for all sea turtle nesting activities.

This report summarizes the NPS records for sea turtle nesting activity at BUIS from 1980-1985.

OBJECTIVES AND METHODS

Objectives for BUIS sea turtle monitoring program are the same as those listed for VIIS (see above).

The beach at Buck Island is more or less continuous, but shifts according to seasonal winds, waves, and currents. Its length is approximately 1460 meters. In 1980, NPS rangers placed "permanent" wooden stakes at approximately 200m intervals around the island along the beach berm. The markers were used as a reference for locations of nesting activities. By 1982, it was realized that stakes were not needed around the entire eastern half of the island, for the habitat was not suitable for sea turtle nesting. Therefore, a new numbering system was installed whereby the stakes were placed closer together, at 50 m intervals along the sandy stretches of the sw, w, and nw coastline (Figure 2).

Observations of sea turtle nesting activities were made during foot patrols several times a week. Rangers were to make notes on locations of all sea turtle crawls, nests, and incidences of poaching, mongoose predation, sea inundation of nests, erosion of nests, hatching/emergence of hatchlings, and when possible, nesting success figures. As at VIIS, due to staffing limitations, the emphasis was placed on locating and protecting the nesting activities rather than digging into emerged nests to determine nesting success.

SEA TURTLE NESTING MONITORING REFERENCE STAKES

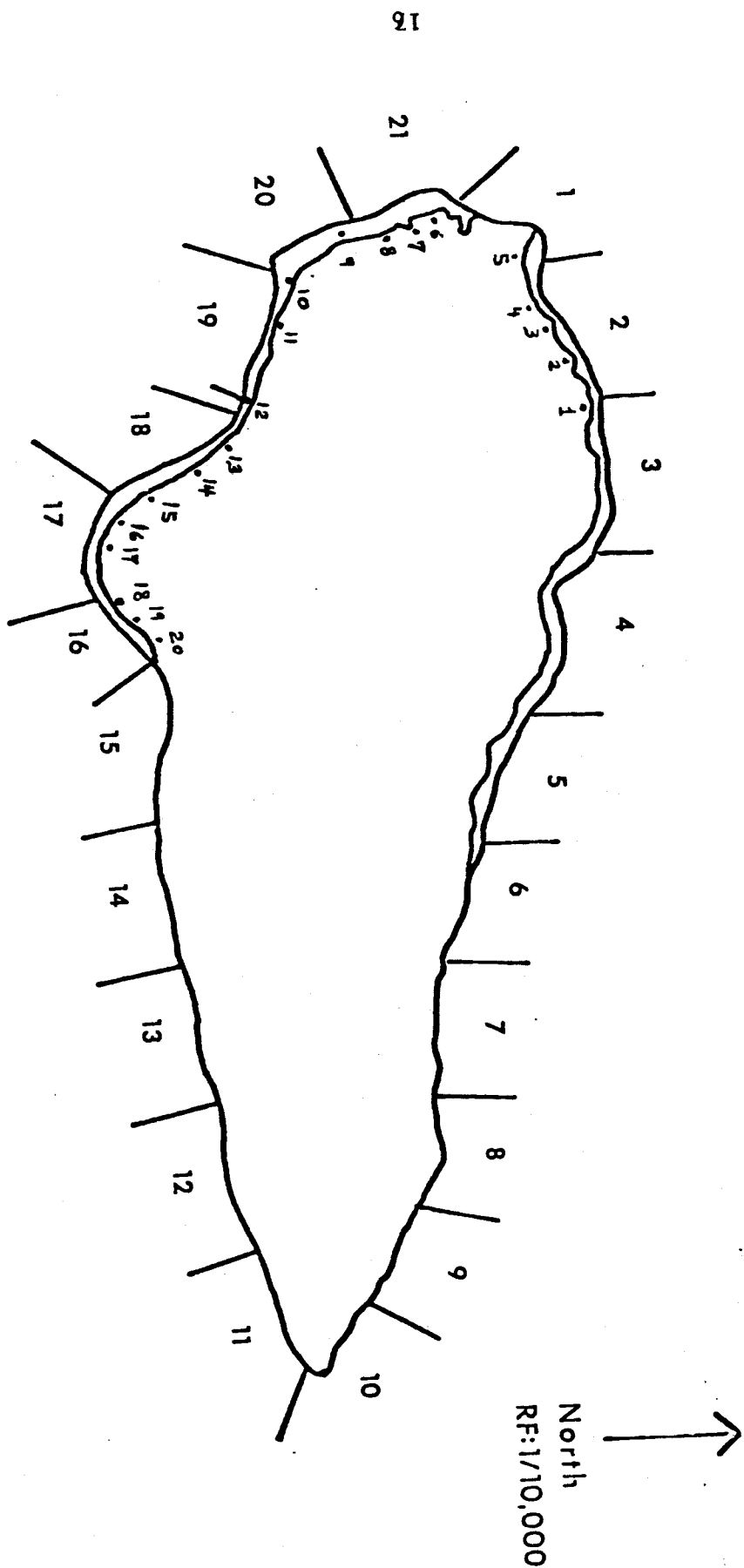


Figure 2. Buck Island Reef National Monument Coastal Segments

Large numbers = numbering system prior to 1982.

Small numbers = numbering system after 1982.

map
insert.

Results

Season of Nesting and Species Nesting. Sea turtle nesting on Buck Island commences in April and continues until late December each year, with nesting reaching a peak from July through October (Table 2).

Recorded crawls in 1980 totaled 62, resulting in 42 nests; 39 crawls were found in 1981, resulting in 35 nests (Small, 1982). In 1982 recorded crawls totaled 77, resulting in 48 known and 8 suspected nests. In 1983, of the 84 nesting activities reported, nests totaled 43 and aborted crawls 41. Leatherback species confirmation was made via hatchling identification in three nests; this confirmed BUIS rangers' belief that leatherbacks still nested on Buck Island. In 1983, it was also believed that three additional leatherback and eight green turtle nesting activities occurred, judging from the size of the crawl and/or body pit. The remainder of nesting activities (63 activities: 21 aborted crawls, 42 nests).

In 1984, 89 crawls were recorded. Five crawls were believed to be leatherback, resulting in 4 nests; 7 nests were laid by green turtles. The majority of the remaining 77 hawksbill crawls were not accurately labeled as nests or aborted crawls. Thirty-seven crawls were recorded as "unsure nests"; 18 were marked as "aborted", and 23 as nests. Due to many discrepancies in the individual logs, no conclusions can be drawn other than 95 crawls were made.

In 1985, 155 crawls were recorded. The records state that 2 leatherback crawls resulted in 1 nest; 7 green crawls resulted in

Table 2. Temporal distribution of sea turtle nesting activity at BUIS, 1980-1985

Year	Number of crawls												Total
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1980				1	1	6	9	14	10	16	3	2	62
1981				0	2	11	7	6	4	2	6	2	39
1982				1	2	7	13	14	18	15	6	1	77
1983				0	2	15	15	11	9	19	6	7	84
1984	1		2	1	10	14	20	25	12	4	0	0	89
1985				2	6	14	23	28	38	19	21	4	155

3 nests and 148 hawksbill crawls resulted in 22 known nests, 46 suspected (unsure) nests and 81 aborted crawls. Again discrepancies in the individual logs, in particular the high number of aborted crawls (81) makes the number of nests suspect.

It appears that in spite of the yearly seminars conducted by the VIIS Biological Technician, and the on-going communication between VIIS and BUIS during the nesting season, that errors in recording nesting data are prevalent. More attention needs to be placed on accurately filling out the individual sea turtle nesting logs.

Nest Habitats. During the 6 year period, nesting was recorded in all coastal beach segments. Of particular concern is beach segments No. 1-5 (Figure 2). This area has been heavily eroded in recent years, and sections of it are now a dense tangle of tree roots exposed on a 1-1.5m high soil face. Since 1983, over half of the crawls in these areas have been reported as aborted crawls. Notes on the ranger's individual logs for these aborted crawls indicate two primary causes: 1) the inability of the turtle to climb up the eroded beach face to reach the flat wooded area, and 2) upon reaching the heavily wooded area, hitting tree roots and rocks during the excavation of a nest cavity. Should this trend continue we could expect to see a total loss of nesting activities in this area in a matter of just a few years. Loss of nesting habitat on Buck Island is critical since the beach is just 1460 m long, and the nesting is dense, as indicated from the 6 years of NPS logs.

Nest Productivity. Of the 42 known nests in 1980, records were

Nest Productivity. Of the 42 known nests in 1980, records were such that no conclusions could be drawn about the outcome of 13 nests (31%). Nineteen nests (45%) were known to have hatched successfully; nine clutches (21%) were taken by predators and one nest (2%) was taken by poachers.

In 1981 there were 35 nests recorded; of these the outcome of 28 (79%) was not documented. Seven (19%) were believed to have been taken by predators and one nest (2%) was poached.

In 1982 there were 48 nests recorded; of these 26 nests (54%) were preyed upon by mongoose; at least 14 nests (29%) were poached by man; and 4 nests (9%) were lost to sea swell action. In at least one instance it appeared that a nest had been poached, not all the eggs were taken, and subsequently it was preyed upon by mongoose. Just five nests (10%) were known to have hatched successfully. Of those five, one nest had been preyed upon by mongoose within 2 days of being laid; not all eggs were consumed, the nest was recovered and the remaining eggs hatched successfully 2 months later. Another nest was found to be eroding as the hatchlings were emerging, due to rough sea swells.

In 1983 there were 43 nests recorded; of these 10 nests (24%) were lost to erosion from sea swell activity; 6 nests (14%) were preyed upon by mongoose; and at least 3 nests (7%) were poached by man. Just 4 nests (9%) were known to have hatched successfully. Records were such that no conclusions could be drawn about the outcome of the remaining 18 nests (42%).

In 1984 there were 33 nests recorded; an additional 36 crawls were labeled as "unsure nesting". Unfortunately, none of

the nesting activities were rechecked for incidences of hatching, predation, poaching, destructions from sea swells etc. Therefore conclusions on nest productivity cannot be made for the 1984 season.

In 1985, there were 22 nests recorded; an additional 46 nests were labeled as "suspected nests". The high number of aborted crawls (87) is suspect, for, as in 1984, many nesting areas were not relocated at a later date to check for outcome of nesting. Of the 22 recorded nests, nine (41%) were destroyed by mongoose; seven (32%) were lost to erosional forces and six (27%) were believed to have hatched/emerged successfully. None of the 46 nests labeled "suspect" were checked for later activity to determine their outcome.

Predation. The exotic mongoose Herpestes auropunctatus continues to be the primary threat to sea turtle nesting at Buck Island. Each year mongooses destroy anywhere from 14-55% of all nests laid. Realizing the severity of the problem, NPS managers contacted the US Fish & Wildlife Service in 1983. A joint project was initiated in 1984 to eradicate all mongoose from Buck Island. The project was believed to have been successfully completed in 1984; however NPS rangers reported seeing mongoose on the island in 1985. Unfortunately, incomplete records were kept for sea turtle nesting activities in 1984 and therefore, the incidence of mongoose predation that year is unknown. By 1985, the recorded incidence of mongoose predation was back up to previous levels of 41% of known nests.

Continued trapping of the remaining mongooses at Buck Island has now been undertaken by BUIS rangers. Trapping of mongooses from turtle nesting beaches has been proven to reduce predation on St. John (Small, 1982). The eradication efforts in 1984 were thought to have been successful; however, no follow-up trapping was done to verify this, although called for in the original NPS/US F&W contract.

Poaching. From 1980 - 1983, nest poaching by humans was reported to be the second major threat to BUIS sea turtles. After a particularly severe year in 1982, (14-16 known nests poached) NPS rangers started conducting random early morning patrols to Buck Island in an attempt to thwart poachers. However, since record keeping was so haphazard in 1984 the effectiveness of these early morning patrols is not known. No poaching was reported in 1985.

It should be noted that in some cases poached nests were carefully recovered; at other times not all eggs were taken and mongoose subsequently entered the nest, making it appear to have only been preyed upon. But a close inspection of eggshells (often < 10 remained) often revealed the correct sequence of events - poaching, then predation. And still in other cases, the poachers blatantly left the holes open, with cracked eggshells lying around the rim, and stick probes left on the site.

Presently, the only means to deter poachers is to continue the patrols, in hope of apprehending them. Public education about Endangered Species is the only long-term solution, beginning in the elementary school system.

MANAGEMENT IMPLICATION AND RECOMMENDATIONS

A management consideration might be the cost analysis of an effective mongoose trapping/protection program for what might be considered by some to be a relatively small population of nesting sea turtles. However, the hawksbill is probably the least studied species of all sea turtles in the world (Hughes, 1981), due to their dispersed nesting habits on isolated beaches. Historically, hawksbill turtles have been exploited for thousands of years as one culture after another coveted the horny scutes of their shells for making tortoise shell jewelry (King, 1981). During the 1930's and 40's hawksbills were given a temporary reprieve, especially in the Caribbean, as plastics replaced many of the uses of tortoise shell (op cit.). However, in the 1950's renewed interest in luxury items, jewelry, and art objects put hawksbill populations under heavy exploitation pressure. To the present day, the tortoise shell remains a much sought after commodity, resulting in the severe depletion of hawksbills in unprotected areas.

From 1978 through 1980 the Caribbean Conservation Corporation, under contract with the NMFS started a comprehensive survey in the Western Atlantic to assess population levels and identify critical habitats of the six species of sea turtles which occur there: green (Chelonia mydas), hawksbill (Eretmochelys imbricata), leatherback (Dermochelys coriacea), loggerhead (Caretta caretta), Kemp's Ridley (Lepidochelys kempi), and olive ridley (Lepidochelys olivacea). Data accumulated from standardized interviews and from aerial, shore and shore-water surveys pro-

vided for the first time an understanding of population levels throughout the geographic range of sea turtle species that occur in the Western Atlantic (Carr et al, 1982). Their findings were sobering; very few protected marine areas exist for sea turtles throughout the entire Western Atlantic/Caribbean. Of these few, areas where the level of law enforcement is adequate to protect the sea turtles are scarce, due to limited manpower and money. In particular, the hawksbill has been heavily exploited throughout the majority of the Greater and Lesser Antilles. In most areas nesting females and their eggs are taken wherever they are encountered, and consumed. The tourist trade in shell, stuffed turtles, and jewelry is lucrative; boxes of stuffed juvenile hawksbill turtles were seen in souvenir shops throughout the Western Atlantic. The outlook for the success of any conservation effort to change the prevailing attitude is unknown.

The application of this information by NPS Managers to the population of sea turtles at VIIS and BUIS should be reflected in the continuation of the monitoring and protection program. The vital importance of our nesting populations to the survival of the species will be seen as the depleted, over-exploited populations of our neighboring regions become more evident. The sea turtle nesting project initiated in 1980 has become a Resource Management Directive, under the Resource Protection and Visitor Services Division at VIIS. Efforts should be made to continue the monitoring and protection of all sea turtle nests. The importance of rigid enforcement of Endangered Species laws cannot be overemphasized.

In particular, the importance of Buck Island beaches as nesting habitat for three species of sea turtles cannot be overstated. On its 1460 meters of beach it has more nesting activity than on all 31 beaches in VIIS on St. John.

Efforts have been made to document the occurrence of nesting activities at Buck Island, and to identify threats to the nesting success. However, unless further efforts are directed toward mitigating these threats (mongoose predation, poaching and erosion) Buck Island will eventually lose its nesting habitat entirely. Buck Island Reef National Monument will have failed in its legal establishment as a protected area for Federally endangered species. This potentially serious situation demands immediate and continual attention by VIIS/BUIS management.

I think that the few early patrols that we have done effectively deter most poaching now.

Also, we haven't experienced one mongoose predation incident this year.

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