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Nesting Biology of the Sea Turtles of St. Kitts, West Indies

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Several successful, long-term projects have been underway to assess nesting by sea turtles in the Lesser Antilles, West Indies. Boulon et al. (1996) reported on an ongoing tagging and nesting study of leatherbacks (*Dermochelys coriacea*) on St. Croix that began in 1981. Extensive studies of hawksbills (*Eretmochelys imbricata*) are taking place in St. Croix (Hillis, 1995), Antigua (Richardson et al., 1999), and Barbados (Horrocks and Scott, 1991). Those islands boast relatively large nesting populations, while many of the other islands have fewer turtles nesting, thus attracting less attention from researchers. Meylan (1983) assessed the status of sea turtles on most of the Leeward Islands of the Lesser Antilles, but little has been published concerning the turtles of most of those islands since then.

St. Kitts, in the Leeward Lesser Antilles, is a nesting area for leatherbacks, hawksbills, and green turtles (*Chelonia mydas*). Loggerheads (*Caretta caretta*) are seen infrequently offshore but do not nest on the island (Eckert and Honebrink, 1992). Several studies have attempted to analyze sea turtle nesting on St. Kitts (Meylan, 1983; Wilkins and Meylan, 1984; Wilkins and Barrett, 1987; Eckert and Honebrink, 1992). The potential for commercial development of the southeastern peninsula of the island has led to even more intensive assessment of turtle nesting there (Jackson, 1981; Arendt, 1985; Towle, 1986; d'Arbeau, 1989; Eckert, 1989). Most of the above investigations were brief localized field studies to assess species presence and beach usage. In the WIDECAST Sea Turtle Recovery Action Plan for the island Eckert and Honebrink (1992) stressed the need for longer term, island-wide surveys to elucidate the most important beaches for nesting by the various species.

I surveyed all of the larger sandy beaches of the island over a period of 20 months in 1998–99. The objectives of this study were to: 1) determine the seasonal limits of nesting for each species; 2) ascertain the number of nesting events in each season; 3) identify the most important nesting beaches for each species; 4) elucidate natural and human-imposed threats to nesting; and 5) make recommendations for changes that would facilitate sea turtle survival on St. Kitts. In addition, I recorded some information concerning clutch sizes and hatching success.

Methods

Study Area. — St. Kitts (17°20'N, 62°45'W), situated between St. Eustatius to the north and Nevis to the south, is about 30 km long with a surface area of 168 km^2 (Fig. 1). The main part of the island is connected to the southeastern peninsula by a ribbon of land only 500 m wide at its narrowest. Most of the islanders live around the periphery of the main area, and its center is mountainous with the inactive volcano, Mt. Liamuiga, at the northwestern end. The drier southeastern peninsula is also mountainous, and, although land is for sale there, few people live in the area. The shorelines of the island are mostly steep and rocky, but numerous sandy beaches exist (Fig. 1). Most beaches are 600 m or less in length, but there is a fairly uninterrupted stretch from Hermitage Bay to North Frigate Bay on the east shore that measures about 11 km.

Data Collection. — Nesting data were collected by searching beaches from 24 May 1998 through 31 December 1999. The major indicator of sea turtle nesting activity was the presence of nesting crawls. Eckert and Honebrink (1992) noted that crawl characteristics can sometimes be indicative of the species. Leatherback crawls are about 2.0 m wide and tracks are symmetrical. Green turtles leave a symmetrical crawl about 1.0 m wide, and hawksbill crawls are about 0.7 m wide and are asymmetrical. Using these criteria leatherback crawls were unmistakable, and greens and hawksbills could be distinguished if crawls were recent enough to evaluate. I measured the widths (± 1.0 cm) of all crawls and assessed their symmetry to determine species. Most crawls led to a body pit, and those without pits were considered false crawls or dry runs. In most cases I was unable to pinpoint the nest unless it had been poached or depredated, or until it hatched and hatchlings emerged.

I recorded the distance (± 1.0 m) of the body pit from the shoreline and to the line of vegetation. Locations of body pits were marked using a compass reading and accurate distance measurement to a spot in the vegetation to subtly mark the nest using sticks and survey tape with the nest numbers on them. I raked all crawls and pits to obliterate them, so they would not be counted on subsequent visits and would be less obvious to poachers.

On return trips I assessed all marked areas for poaching, depredation, inundation and/or washout, and emergence of hatchlings. I noted potential nest and hatchling predators by their presence or tracks. I also noted when the pits had been run over by vehicles or when other animals walked on them. When emergence occurred I noted hatchling crawls from the nest. Ten days following emergence I excavated the nest and counted hatched and unhatched eggs to determine hatching success and clutch size. I monitored all nest pits for 90 days unless they hatched prior to that.

The study grew and evolved as seasons changed and I learned more about the turtles' movements. Consequently, my beach visitation schedule also changed as I tried to monitor all the beaches regularly, while also responding to seasonal nesting intensities by paying more attention to very active beaches.

North and South Friar's Bay Beaches. — I monitored these two beaches twice weekly at three to four day intervals during the entire project, and this is my most consistent data

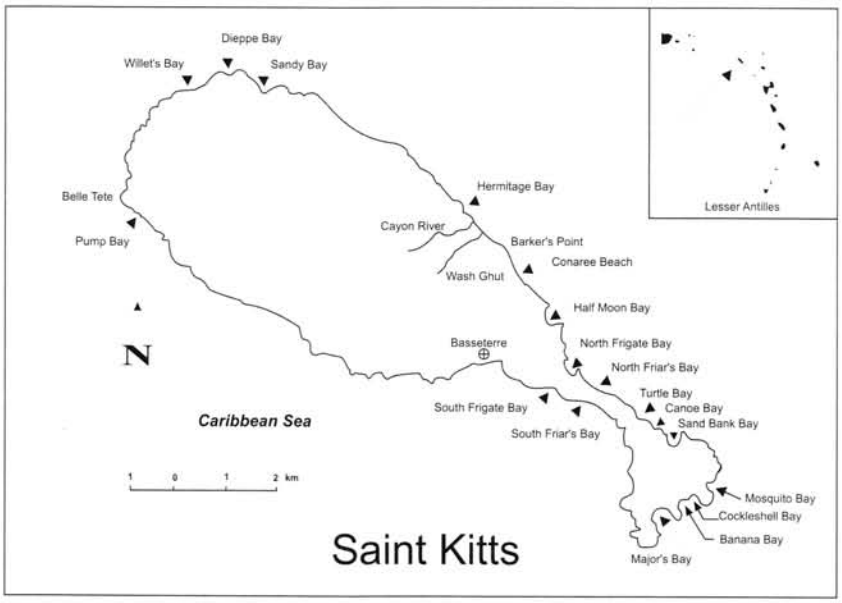

Figure 1. Map of St. Kitts showing sea turtle nesting beaches and other places mentioned in the text. Insert shows relative position in the Lesser Antilles.

set. South Friar's Bay beach is a favored recreational spot for islanders and tourists and for years has been considered as a potential hotel site (K. Orchard, St. Christopher Heritage Society, *pers. comm.*). The extreme surf of North Friar's Bay makes it less attractive for these activities, but the presence of a hotel on South Friar's would impact both beaches. I wanted to add to the information about sea turtle nesting on those beaches before such development takes place. North Friar's Bay here includes a smaller beach immediately to its north that is accessible from North Friar's most of the year.

Sand Bank, Mosquito, Cockleshell, Banana, and Major's Bay Beaches. — Beginning in June 1998 I visited these beaches at least once monthly. By mid-September it was clear that hawksbill nesting was important on most of these, and I increased my monitoring to three or four times monthly until nesting ceased in early December. In July 1999 hawksbill nesting began again, and I monitored those beaches twice weekly through 31 December.

Turtle and Canoe Bay Beaches, and an Unnamed Beach South of North Friar's Bay. — These three beaches were difficult to access, and for each the land approach was down steep, thickly vegetated, rocky hillsides. I visited them once monthly beginning in October 1998. The unnamed beach south of North Friar's Bay may be considered by some to be part of North Friar's, but it can be reached from there only a few times a year. Eckert and Honebrink (1992) mentioned an unnamed beach between Turtle and Canoe Bays, but this beach was composed of boulders and little sand and was inappropriate for turtle nesting throughout the current study.

Hermitage Bay to Barker's Point. — This 4 km stretch is known to islanders as "Cayon to Key" referring to nearby villages. Hermitage Bay is actually north of Cayon, and Barker's Point is south of Key. Adjacent to Cayon, the Cayon River crosses the beach, but it is usually dry except during storms. Another large drainage is Wash Ghut further south. I surveyed this beach first on 28 June 1998 and began monthly monitoring that September. By April 1999 frequent leatherback nests led me to survey this area twice, then from May through July I patrolled it weekly.

Beaches at South Frigate, Pump, Willet's, Dieppe, and Sandy Bays, Belle Tete, and Barker's Point to North Frigate Bay. — All these beaches were visited initially in May or June 1998, and monthly patrols began in August for Barker's Point to North Frigate; September for Belle Tete, Dieppe, and Sandy Bays; and October for South Frigate, Pump, and Willet's Bays.The Barker's Point to North Frigate Bay stretch is about 7 km long and includes Conaree Beach and Half Moon Bay.

Results

Leatherbacks. — Mean width of fresh leatherback crawls was 192.4 cm (SD = 16.4, range = 2.3–1.4, n = 98). In 1998 the leatherback nesting season was underway by the time my study began, and I recorded 41 nesting events. Older washed-away crawls that appeared to be from leatherbacks were not measured in 99 other events that year. In 1999 I recorded 137 leatherback nesting events, with the first recorded on 25 March on North Friar's Bay beach, and the last on 18 July on the beach from Hermitage Bay to Barker's Point. In 1999 nesting events peaked in May, with 72.3% of all nesting events occurring in May and June (Table 1). Only one body pit was recorded above the vegetation line, as the open beach was the preferred nesting area. The mean distance from body pit to tide line was 13.0 m (SD = 7.04, range = 0.0–33.4, n = 124); and to the vegetation line was 13.2 m (SD = 10.7, range = -1.0–47.5, n = 125). Seven false crawls were recorded and are not included here as nesting events.

In 1999, most leatherbacks nested on the beach from Hermitage Bay to Barker's Point, where 87 (63.5%) nests were recorded. There were 34 nests recorded at North Friar's Bay beach. Seven nests were recorded on the beach from

Table 1. Number of nesting events, excluding false crawls, by month for sea turtles in St. Kitts. Data for leatherbacks and hawksbills is from 1999, except for one hawksbill event in December 1998. Green turtle data is from 1998 only. No nesting occurred in January or February.

	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
leatherbacks	4	24	53	46	10	0	0	0	0	0
hawksbills	0	0	0	0	11	15	17	17	10	1
green turtles	0	0	0	0	1	2	5	4	0	0

Barker's Point to North Frigate Bay; 5 at Half Moon Bay, and 2 at North Frigate Bay. Five nests were on Majors Bay, and 1 each at Sand Bank, Banana, South Friar's, and Sandy Bays.

About one third (32%) of leatherback nests exhibited signs of poaching or attempted poaching. Turtle eggs are valued for food and aphrodisiacs, and poachers locate them by probing the body pit with a stick. Most poaching occurred from Hermitage Bay to Barker's Point, where 33 of 87 nest pits were affected. One nest discovered near the village of Key had been excavated using a backhoe. Nine of 34 North Friar's pits were also poached.

Thirty-seven nest pits (27%) were inundated at some point during monitoring, and 18 (13%) were washed away completely. Twenty-one pits (15%) were run over by farm tractors or backhoes driven on the beach. One freshly slaughtered female leatherback was found on the beach near the Cayon River in May 1999.

I recorded hatching from 12 nests; 6 in 1998 from 14 June to 5 July, and 6 in 1999 from 5 June through 10 August. Mean clutch size for yolked eggs was 91.1 (SD = 21.1, range = 63–122, $n = 7$), and that for yolkless eggs was 26.1 (SD = 11.7, range = 16–54, $n = 7$). Mean hatching rate for yolked eggs was 22.2% (SD = 16.4, range = 7.1–59.7%), and a mean of 56.7% (SD = 30.0, range = 9.5–86.6%) of yolked eggs developed to very late embryonic stages but failed to hatch.

Hawksbills. — Mean width of hawksbill crawls was 71.1 cm (SD = 6.5, range = 55.0–87.0, $n = 113$). In 1998 I recorded 42 hawksbill nesting events and did not record false crawls. In 1999, with a better idea of which beaches were used by this species and more consistent monitoring, I recorded 70 nestings and 35 false crawls. The nesting season in 1999 was from 2 July through 7 November, but in 1998 the last nesting evidence was recorded as late as 6 December (Table 1). Over both seasons 76 of 90 body pits were in vegetation, and the rest were on the open beach. Twenty-nine were under roots or branches of manchineel trees (*Hippomane mancinella*), 21 at the base of sea grape (*Cocoloba uvifera*), and 15 under acacia shrubs (*Acacia* sp.)

Most hawksbill nesting occurred on the beaches of the southeastern peninsula. Major's Bay had 29 (41.4%), Banana Bay 25 (35.7%), Cockleshell Bay 7, Turtle Bay 5, and Mosquito Bay 3. Elsewhere on the island one nest was found near Wash Ghut, and additional false crawls were recorded on North Friar's Bay and Belle Tete beaches.

Only one nest, located near Wash Ghut, had been poached, but 34 nests were depredated by the introduced Indian mongoose (*Herpestes javanicus*; formerly *auropunctatus*, see Simberloff et al., in press). Of those, 23 (32.9% of total nests) were raided within several days of egg deposition, and 11 (15.7%) were taken at the time of hatching and emergence. Mongooses or their tracks were recorded from every beach on the island, and on Major's, Banana, Cockleshell, and South Friar's Bay beaches they were conspicuously abundant. Other potential nest or hatchling predators that were recorded on all beaches were yellow-crowned night herons (*Nyctanassa violacea*), brown pelicans (*Pelecanus occidentalis*), and ghost crabs (*Ocypode quadrata*).

Twenty-seven nests or pits (38.6%) were inundated at least once, and 14 (20%) more were washed away entirely. Thirteen nests (19%) were trampled by cattle at some point.

I recorded hatching in 11 hawksbill nests; 3 in 1998 from 29 November through 6 December, and 8 in 1999 from 18 September through 6 December. Most hatched nests had been depredated, so recording accurate clutch size was possible for only 3 nests. Mean clutch size was 159.0 (SD = 10.7, range = 147–173), and mean hatching rate was 87.6% (SD = 7.3, range = 77.6–98.3%). Of 477 eggs in those 3 nests 47 (9.9%) were undeveloped and 11 (2.3%) were partly developed.

Green turtles. — Mean width of green turtle crawls was 98.2 cm (SD = 8.8, range = 88.0–117.0, $n = 14$). I recorded 12 nesting events and one false crawl from 6 July through 4 October 1998, and 2 nestings and a false crawl from 4 July through 30 August 1999.

One nest pit was found at Hermitage Bay, another just north of Barker's Point adjacent to the village of Key, 3 each were found on Conaree, Half Moon Bay, and North Frigate Bay beaches, and 2 on North Friar's. One nest was found on the northwestern end of the beach at Basseterre, and another crawl and pit were recorded on the beach at Belle Tete.

Two nests on Conaree beach and one at Hermitage Bay showed signs of having been poached. I recorded hatching and emergence of 2 green turtle nests; one starting on 18 November 1998, and another found hatched on 27 October 1999.

Discussion

Leatherbacks. — Based upon 14 seasons of data Boulon et al. (1996) found that from 18–55 individual leatherbacks nested on St. Croix each season, and they calculated that they lay an average of 5.26 nests per season. Applying that figure to the 137 nesting events in 1999 suggests a population of 26 nesting females in St. Kitts for that year. Because I cannot be certain that all the events I recorded resulted in deposited nests, the population estimate could be inflated. The nesting season defined by the 1999 data extends the period beyond

the March–May estimate of Meylan (1983) for St. Kitts, and is similar to other nesting seasons in the Caribbean (Hirth and Ogren, 1987; Leslie et al., 1996). The season is slightly more restrictive than that for St. Croix, but both islands have peak nesting in May (Boulon et al., 1996). Leatherbacks most often nest in the sand between the tide line and vegetation rather than in the vegetation (Whitmore and Dutton, 1985; Hirth and Ogren, 1987; Leslie et al. 1996; Steyermark et al., 1996), and this is also true in St. Kitts.

The beach from Hermitage Bay to Barker's Point had the most nesting events, and the most concentrated nesting occurred from the Cayon River to Wash Ghut, where I recorded a density of 52 events/km/season. North Friar's Bay beach was also preferred with a density of 42.5 events/km. These densities are lower than those for St. Croix (60.6 nests/km, Eckert, 1987) and Puerto Rico (64.1 nests/km, Tucker and Frazier, 1991), but higher than Tortuguero, Costa Rica (15.0 and 36.9 nests/km, Leslie et al., 1996). Previous reports have suggested that beaches at Belle Tete, Sand Bank, South Friar's, and Pump Bays had more leatherback nesting in the past (Meylan, 1983; Wilkins and Meylan, 1984; d'Arbeau, 1989; Eckert and Honebrink, 1992; K. Orchard, *pers. comm.*).

Poaching of leatherback nests has been documented on other Caribbean beaches (Hirth and Ogren, 1987; Leslie et al., 1996), and sometimes as many as 75% of all clutches are taken (Campbell et al., 1996). In St. Kitts, despite a ban on disturbance, removal, purchase, sale, or possession of any turtle eggs (St. Christopher and Nevis Statutory Rules and Orders No. 11, Fisheries Regulations 1995, Part VI - 19), nearly one third of nest pits had been poached or manipulated. The highest concentration of nest poaching incidents occurred from Hermitage Bay to Barker's Point, adjacent to the villages of Cayon and Key, which is also where the slaughtered adult was found. Both these villages have previously been linked to poaching and slaughter of adult turtles (Eckert and Honebrink, 1992). The presence of research personnel on the beach at Tortuguero may have thwarted some poaching (Campbell et al., 1996), and in St. Croix nightly patrols by researchers, the high profile of the sea turtle conservation efforts, and beach status as a National Wildlife Refuge have combined to reduce poaching from nearly 100% prior to 1981 to zero since 1986 (Boulon et al., 1996). The Department of Marine Fisheries in St. Kitts, which would have the responsibility of enforcing anti-poaching regulations, presently does not have sufficient personnel to efficiently protect leatherback nesting (R. Wilkins, *pers. comm.*). St. Croix owes much of its success to night patrols using volunteers from Earthwatch (Boulon et al.,1996). With the nesting peak for St. Kitts defined herein, and because beaches with the highest density nesting are also those with the most poaching, a similar program could be successful there. However, it is important to note that some nest poaching probably occurs during the day, as crawls are easy to see and nest pits can be probed for eggs. Nightly smoothing of crawls and body pits by raking, while not rendering evidence imperceptible, could make poaching much more difficult. National Park status or similar protection for the most important nesting beaches would raise awareness and be beneficial, but for full effect this would need to be accompanied by enforcement of regulations and nightly patrols.

Mean clutch size of yolked eggs was higher in St. Kitts than in other Caribbean populations; conversely, mean number of yolkless eggs was lower (Hirth and Ogren, 1987; Boulon et al., 1996; Leslie et al., 1996), but since data are present from only 7 nests, this may not be significant. Leatherback hatching rates are usually near 70% (Hirth and Ogren, 1987; Boulon et al., 1996; Leslie et al., 1996), and the extremely low mean rate (22.2%) in St. Kitts deserves more attention. Further, the high percentage of unhatched eggs developed to nearly full-term (56.4%) in this study is much higher than the 10% reported by Hirth and Ogren (1987) or 2.9% by Eckert and Eckert (1990). It has been shown that drowning of eggs of some sea turtle species is a result of inundation by high tides or runoff from rainfall (Kraemer and Bell, 1980). Increased salinity caused by seawater inundation can impair metabolism and also lead to embryo death (Bustard and Greenham, 1968). Because leatherbacks often place their nests closer to the tide line than other species, they should be more vulnerable to such perturbations (Whitmore and Dutton, 1985). However, because most of the eggs in the St. Kitts study died late in development, any inundation would have had to have occurred late as well, and this was not the case.

Hawksbills. — There is geographic variation in the number of nests deposited seasonally by individual hawksbills (Meylan, 1999), but on two islands near St. Kitts the average is about 5 (Hillis, 1995; Richardson et al., 1999). Applying this to the 70 nesting events in 1999, I estimate that 14 hawksbills nested in St. Kitts that year, which is half the number estimated to nest at Jumby Bay, Antigua (Richardson et al., 1999). Hawksbill crawls are often faint and subject to destruction by wind, waves, or trampling. This, coupled with the fact that beaches were not monitored daily, may have caused me to miss some nesting events, so the estimate could be low.

Wilkins and Meylan (1984) reported that hawksbills nested during all months of the year in St. Kitts, but mostly from May–October. I recorded no nesting evidence before July, and nesting occurred into November in both years and December in 1998. The 1999 season might have been longer but for Hurricane Lenny (17–19 November), after which I found no new nests. Dobbs et al. (1999) noted the propensity of hawksbills to nest during the rainy season, and St. Kitts rainfall was highest from August through November.

Current regulations in St. Kitts allow turtle fishing from 1 October through 28 February (St. Christopher and Nevis Statutory Rules and Orders No. 11, Fisheries Regulations 1995, Part VI - 19). This protects nesting leatherbacks, but it does not cover the entire hawksbill nesting season (nor the green turtle season). Clearly, it would be preferable to ban turtle-fishing entirely, but in lieu of that, the closed season should be extended to mid-December if the intent is to protect all nesting turtles. Further, the regulations ban the

taking of "undersized" turtles, which are defined by weight for each species. The intent of this appears to be to allow some harvest while assuring the continued existence of the population by conserving this age group. However, with animals such as sea turtles, which require many years and face many perils before reaching reproductive maturity, it is the mature adults that are most important to the population (Eckert and Eckert, 1990).

Eighty-four percent of hawksbill nests in St. Kitts were under trees or shrubs, which is similar to that found in other studies (Limpus, 1980; Dobbs et al., 1999; Moncada et al., 1999). Horrocks and Scott (1991) found that soil at vegetated sites was less compacted, making it easier for hatchlings to escape the nest. On 14 September 1998 I found that vegetation from about half of the 500 m beach at Banana Bay had been cleared from the shoreline back about 100 m to a ridge. Much of this had been a thick stand of manchineel trees, and hawksbills had been nesting there. On subsequent visits I found crawls that led into the cleared area and wandered. Several nests were deposited in this area after clearing, but much of the soil had become very dried and compacted and was inappropriate for nesting. Such beach clearing is prohibited by The National Conservation and Environment Protection Act of 1987 (Part VI, 26c), but no known correctional action was taken in this case.

Meylan (1983) noted the importance of the beaches of the southeastern peninsula for hawksbill nesting, and d'Arbeau (1989) found most hawksbill nests on the beaches of Major's and South Friar's Bays. In the current study Major's and Banana Bay beaches, which were sites of over 77% of hawksbill nesting, are each about 500 m long and had nesting densities of 58 and 50 nests/km, respectively. As the most important hawksbill beaches on the island, they are in serious need of protection. Major's Bay currently is used as a permanent mooring site for several large barges used to repair the deep water port in Basseterre Bay.

The beach at Belle Tete is mined legally for sand to be used for construction. This beach has also hosted nesting by leatherbacks in the past (Caldwell and Rathjen, 1968; Meylan, 1983), and green turtles (this study). Eckert and Honebrink (1992) discussed sand mining on St. Kitts and its potential long term impacts on beaches, and they recommended in their Recovery Action Plan for the island that sand mining be banned entirely.

In 1999 nearly half the hawksbill nests recorded were predated at various stages of development by mongooses. McDonald Dutton et al. (1998) reduced mongoose predation on leatherback nests in St. Croix by early season trapping over several years, and this may be an effective tactic on some of the small hawksbill nesting beaches in St. Kitts. It may be particularly effective on Major's Bay where 50% of nest depredations occurred. However, unless predator populations are removed entirely, which may be impractical on St. Kitts, they will repopulate and need to be retrapped in subsequent seasons.

Hawksbills nested in vegetation and chose beaches with relatively calm surfs and tides, so nest inundations and washouts were usually due to storms. Hurricanes Jose (20 October 1999) and Lenny (17–19 November 1999) both caused some inundations, and Lenny washed away 7 nests. Richardson et al. (1999) noted that past hurricanes had affected hawksbill emergence in Antigua and stressed the need to preserve beach vegetation that can sometimes insulate nests from such occurrences.

Much of the southern end of the southeastern peninsula, including Major's, Banana, Cockleshell, Mosquito, and Sand Bank Bay beaches, is open range for cattle. The cattle use the beaches daily, perhaps because they afford unobstructed movement. This situation has continued for at least a decade (d'Arbeau, 1989). Their tracks are deep in the soft sand, and because hawksbill nests are relatively shallow (mean = 32.6 cm) it is possible that sand compaction or egg damage could occur. The cattle are not owned by the land owners of the area, and it would seem there would be many beneficial reasons, in addition to protecting turtle nests, to restrict the open range policy. Their grazing alters the natural vegetation, their tracks and droppings leave beaches unsightly, and their presence can be threatening to tourists.

Green Turtles. — Wilkins and Meylan (1984) indicated that green turtle nesting occurred from May to October in St. Kitts, but my limited data suggest a more abbreviated season. Both Wilkins and Meylan (1984) and d"Arbeau (1989) found green turtle nesting on most beaches of the southeastern peninsula, but I found only two nests there despite fairly rigorous monitoring. Most of the current nests were on beaches of the eastern shoreline. Green turtles typically choose nesting sites close to but not within dense vegetation (Whitmore and Dutton, 1985; Spotila et al., 1987), and just over half of the nest pits in this study were at the edge of vegetation.

The quest to accommodate an expanding tourist industry recently produced a major obstacle to green turtle nesting on North Frigate Bay, where over 20% of the nests in this study were located. As part of an expansion project the local resort, Jack Tar Village, built a seawall that extends several hundred meters along the high tide line of this beach. Other permanent seawalls also exist on part of Half Moon Bay, where both green turtles and leatherbacks have nested, and on Mosquito Bay. These seawalls limit sea turtle access to nesting areas. Though the National Conservation and Environmental Protection Act of 1987 (Part VI) clearly states that all beaches are public domain and that alterations to dunes, vegetation, or public access are prohibited, these regulations do not always appear to be enforced, which could set a dangerous precedent that would usurp both wildlife and human residents' rights in the future.

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