2005 Sea Turtle Monitoring Program
The East End Beaches
(Jack's, Isaac's, and East End Bay)
St. Croix, U.S. Virgin Islands

Final Report

WEST INDIES
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INTRODUCTION

Daytime Surveys of all St. Croix Nesting Beaches (1992-1996)

Beginning in July of 1992, annual nesting activity by both hawksbill (*Eretmochelys imbricata*) and green (*Chelonia mydas*) marine turtles was surveyed on the beaches of St. Croix, United Sates Virgin Islands (USVI). Funding for this daytime survey work (1993-1996) was provided by the Division of Fish and Wildlife, USVI Department of Planning and Natural Resources (DPNR) in response to the lack of information on hawksbill and green turtle nesting on St. Croix. Due to an increase in large-scale coastal development on St. Croix, more data were required to ensure that critical nesting habitat was identified and protected. After the first two seasons (1992, 1993) of survey work, 31 beaches were identified as marine turtle nesting areas and targeted for more intensive and consistent monitoring (Mackay, 1994).

Beginning in 1994, daytime foot patrols were conducted on the 31 beaches, and the species and outcome (nest or dry run - eggs were not deposited) of all activities were recorded. Whenever possible, final nest outcome was recorded (hatched, eroded, depredated, poached or unknown) during subsequent patrols. Potential threats to nests success such as artificial lighting, nest compaction (from horses, vehicles, and mechanical beach cleaning), public use (beach umbrellas, lounge chairs, and concentrated foot traffic), and erosion were also recorded and evaluated. These daytime surveys answered our basic questions about where nesting occurred, what species each beach supported, and what threats were present in each beach area. Funding was extended because monitoring over many seasons was required to establish a database, which would allow us to estimate population sizes.

For ease of comparison, we characterized each of the survey beaches according to the total number of recorded marine turtle nests for all species: (1) little or no nesting [0-10 nests], (2) moderate nesting [10-30 nests], and (3) heavy nesting [greater than 30 nests]. Since 1992, the majority of the beaches have been characterized by little or no nesting and in several areas, nesting activity levels have fluctuated over the seasons and were characterized by little or no nesting after some seasons and moderate nesting after others. Only two areas have consistently been characterized by heavy nesting: Sandy Point National Wildlife Refuge (SPNWR) and three, small, pocket beaches on the East End of St. Croix (Jack's Bay, Isaac's Bay, and East End Bay) referred to collectively as the East End Beaches (Mackay 1994, Mackay and Rebholz 1995, 1996, 1997, 1998).

Nighttime Monitoring on Sandy Point NWR and the East End Beaches (1994-2000)

Survey work established that many beaches on St. Croix support marine turtle nesting, but nesting is only concentrated on Sandy Point NWR and the East End Beaches. Areas which support little or moderate nesting are important as a group but difficult for more detailed population study since night monitoring requires a large commitment of funding and personnel. Daytime surveys in these areas were continued each year through 1996

and again in 1998 (Rebholz and Harold 1999). Regular surveys should resume as soon as funding is available through the Department of Planning and Natural Resources. Nighttime monitoring is justified at Sandy Point NWR and the East End Beaches because of the significant levels of marine turtle nesting.

During the 1994 nesting season, additional support was made possible under the U.S, Fish and Wildlife Service (USFWS) and National Park Service (NPS) Interagency Agreement, which allowed for the initiation of night monitoring on both Sandy Point NWR and the East End Beaches. Nesting at Sandy Point NWR proved to be much too diffuse within the refuge for effective coverage without a large number of research personnel. As a result, daytime surveys were carried out at Sandy Point NWR and night monitoring efforts were concentrated on the East End Beaches. Full night coverage (7 nights a week) was not possible but partial night monitoring (2-3 nights a week) allowed us to continue to record all activities and tag 14 hawksbill and 8 green turtles (Mackay and Rebholz, 1995). Night monitoring also revealed how limiting daytime surveys can be. We soon discovered that tracks from nesting activities disappear much faster than previously thought, indicating that daytime surveys were not conducted often enough to be an accurate representation of activity levels. Most importantly, night monitoring allowed us to begin quantifying individual female turtles using these beaches collecting basic biological information on this population.

These preliminary data elicited an even larger commitment from USFWS during the 1995, 1996 and 1997 nesting seasons. However, once baseline monitoring was completed only partial funding was available for the 1998-2000 seasons and monitoring was less comprehensive compared to the previous seasons. In 1999, The Nature Conservancy (TNC) purchased the 300 acres that make up Jack's and Isaac's Bay. The area adjoins another 300 acres owned by the territorial government and creates a 600-acre protected area including the East End Beaches. In 2001, TNC began funding sea turtle monitoring on the East End Beaches therefore allowing us to resume more complete nighttime monitoring. Additionally, each season, the principal investigators received valuable assistance from two to three interns provided through TNC's internship program.

In 2005 the St. Croix Marine Turtle Conservation Project joined forces with the West Indies Marine Animal Research and Conservation Service (WIMARCS) to manage the East End Project with increased funding from TNC. WIMARCS, a non-governmental organization, is instrumental on St. Croix in the development of sea turtle research, conservation, and education programs. During the 2005 season, WIMARCS hired and directed a principal investigator and two research assistants to conduct nighttime monitoring on the East End Beaches. The St. Croix Marine Turtle Conservation Project continued work on the East End Beaches by assisting WIMARCS with staff training and data collection.

The following report summarizes the results of daytime surveys and night monitoring on the East End Beaches during the 2005 nesting season.

STUDY AREA - EAST END BEACHES

The study area consists of three beaches located along the south coast of St. Croix at the eastern end of the island. This area of the island is characterized by hills having a maximum elevation of 672 feet and steep slopes, some of which are near vertical. Vegetation on these hillsides has been shaped by historical disturbances such as fire, clearing, and grazing. Exotic species such as tan-tan (*Leucaena leucocephala*) and guinea grass (*Panicum maximum*) dominate native, dry-forest species such as cactus, Acacia, and ginger thomas (*Tecoma stans*). Each of the three sites is described as a pocket beach, located at the base of the surrounding hills. Although the beaches are separated from each other by rocky headlands, they form a continuous beach complex.

Jack's Bay Beach

This relatively narrow beach is approximately 1.0 km in length and ranges in width from approximately 3m to 15m. This beach lacks any wave formed berm or other features associated with wave action. Surface water runoff from the surrounding hills creates temporary gullies that cut across the beach and into the sea. Vegetation adjacent to the beach is composed of dense stands of sea grape (*Cocoloba uvifiera*) mixed with thorny scrub. The sand on this beach is typically fine-grained and compact, partially mixed with marine debris and vegetation and covered with dense mats of sandbur grass (*Cenchrus incertus*) and sea purslane (*Sesuvium portulacastrum*).

Isaac's Bay Beach

This beach is approximately 800m in length and ranges in width from 5m to more than 60m. The central portion of the beach contains wind and wave-deposited sand dunes that extend up the slope of the hills behind the beach at an elevation of more than 6m above sea level. Surface water runoff from the surrounding hills has been observed cutting gullies into the beach area. During storms, the low lying area near the east access trail fills with sea water and forms a temporary back swale. Sea grape (*Cocoloba uvifiera*), buttonwood (*Conocarpus erectus*), Acacia, ginger thomas (*Tecoma stans*) and guinea grass (*Panicum maximum*) dominate the vegetation adjacent to this beach. This beach is the only one of the three, which is not affected by artificial light.

East End Bay Beach

This beach is approximately 280m in length and ranges in width from 5m to approximately 30m. This beach receives constant, strong easterly winds creating waves and salt spray. This beach typically receives large amounts of marine debris including wood, other floating materials, and plastics due to the wind and wave action. Vegetation adjacent to this beach consists of sea grape (*Cocoloba uvifiera*), beach vines, and sea purslane (*Sesuvium portulacastrum*) with guinea grass (*Panicum maximum*), cactus, and Acacia covering the surrounding hillsides and ridges. Surface water run-off from the surrounding hillsides floods the area at all three access points to the beach.

METHODS

Study Area Coverage

The East End Beaches are periodically patrolled during the day throughout the year but intensive survey work was carried out from 15 July to 31 December 2005. Nighttime monitoring began on 15 August and ended on 15 November 2005. Nighttime patrols were conducted five nights a week in August, October, and November. Night patrols were conducted seven nights a week during September when peak nesting is usually observed. On two of these nights each week only two of the three beaches were patrolled because staff had to have at least two nights off each week. Beach coverage consisted of periodic daytime monitoring during July, November, and all of December.

Nightly patrols began at 2030 hours and ended at 0400. Research personnel consisted of one field director and two research assistants from WIMARCS. In August, Amy Mackay of the St. Croix Marine Turtle Conservation Project, assisted with patrols while conducting staff training and ensuring consistent data collection.

Data Collection

A data sheet was completed every time a turtle was encountered during nightly patrols. A data sheet was also completed when an activity was discovered but the turtle was missed; in these instances, an attempt was made to determine if the activity had resulted in egg deposition and the species and location were recorded.

If a turtle was observed, data were collected using the following methods.

Nesting

When a turtle was encountered, the date and time as well as the behavior at the time of sighting were recorded. In order to minimize the potential impact on the turtle, no further information was collected until egg deposition began.

If a turtle left the beach before successful egg deposition (dry run), at least one of her tags was read before she entered the water. If the turtle had no inconel flipper tags and no PIT tag she was considered “untagged” and at least one inconel flipper tag was applied as the turtle was leaving the beach.

Nest Location

Beach marker stakes were placed every 20 meters along the vegetation of each of the three beaches. These stakes were made from 2”x 2”x 4’ lumber and provided by The Nature Conservancy. All of the stakes were numbered and each beach was numbered independently of the other beaches.

In the event that a nest was laid behind the stake line, negative measurements were recorded. This system has proven very useful for locating nests after emergence, without leaving any markers indicating the presence of individual nests, except when stakes are lost or removed, as is the case each season. Because this is not a new problem, additionally, a wooden popsicle stick was labeled with the date and the turtle's id number (one of her tag numbers) and placed in the nest to assist with nest confirmation upon excavation.

Tagging

When a previously untagged turtle or one that had lost one of its tags was encountered, tags were applied. Ideally, each turtle left the beach after nesting with two external tags and one internal PIT tag.

An inconel tag (MJ, NNV, PPQ, RRN, XXX, or XXZ prefix) was applied to the posterior edge of one of the two front flippers in the most suitable scale closest to the body (usually the first or the second). Another inconel tag was placed along the interior edge of one of the rear flippers proximal and adjacent to the first large scale. The tags were applied so there was less than 1cm of tag extending beyond the edge of the flipper. Tags were oriented so the tag number was on the dorsal side of the flipper. Whenever possible, each turtle was tagged on the right front flipper and the left rear flipper.

The above methods represent the general placement guidelines. Occasionally, due to behavior, nesting orientation, the presence of scar tissue, or the judgment of the principal investigator, tags were applied differently than described above. Tags, however, were usually oriented to ensure that she was carrying at least one tag on each side of her body (right front and left rear or left front and right rear).

Turtles were also tagged with a Passive Integrated Transponder (PIT) tag (Avid, 12mm). This tag is a small, glass-encased microchip that was injected into the muscle of the front shoulder. It is detected with a portable scanner and a tag-specific nine-digit number is read. The tagging site was treated with Betadine before and after the injection of the PIT tag. Tagging sites were closely examined for signs of infection during subsequent nesting activities.

During prior seasons, PIT tag application and retention were investigated by comparing two tagging sites. As a result, some nesting females have a PIT tag in one of the front flippers, between the scales closest to the body. However, retention in the shoulder muscle was shown to be comparable and stranded animals are often missing flippers but shoulder muscle is much more likely to be intact and available for scanning.

Sampling

In previous seasons, a blood sample was taken from each female for ongoing genetic analysis. Blood was obtained from the dorsal cervical sinus using a sterile syringe (3cc)

with a 21g x 1.5" needle. A small amount of heparin was used to prevent clotting. Blood samples were prepared in lysis buffer shortly after collection. A back-up sample was also prepared and frozen. As with PIT tagging, the sampling area was treated with Betadine before and after blood sampling. Sampling areas were closely examined for signs of infection during subsequent nesting activities. Collection of blood samples took place during egg deposition, and samples were only collected in accordance with issued endangered species permits.

In 2005, blood samples were not collected but if available, a dead hatchling was salvaged during the excavation of nests laid by known neophytes (turtles first tagged during the 2005 season). These samples were frozen and stored for future analyses.

Morphology

Each turtle was closely examined, usually during tamping or disguising, and all identifying characteristics such as scars from old injuries, barnacles and other ectobiota, tag scars, and other diagnostic markings were recorded on the data sheet.

Standard measurements were taken including the curved carapace length and width. Curved carapace length (CCL) was measured from the nuchal notch to the posterior tip of the carapace along the medial line. Length was recorded to the longest side, if one posterior marginal was longer, and this information was noted on the data sheet as either right or left. An additional carapace length was measured for hawksbills: from the nuchal notch to the notch between the pair of posterior marginal scutes (supracaudals). (Green turtles lack a significant notch and were measured only once.) Curved carapace (CCW) width was measured at the widest point posterior to the front flippers and perpendicular to the medial line.

Turtles were measured every time they were observed nesting.

Nest Excavation

Nests were excavated after hatchling emergence was confirmed by the presence of tracks or after nests were expected to hatch according to the determined incubation period. Nest contents were examined and results were recorded on a hatchling data sheet. All live hatchlings were released and possible causes for poor hatch success were noted. Nest contents were recorded including total numbers of hatched shells, dead hatchlings, pipped and unpipped eggs, embryos, and undeveloped eggs.

RESULTS

Hawksbill Turtles

Seventeen hawksbills were observed nesting on the East End Beaches during the 2005 nesting season. Seven of these individuals were remigrants (tagged during a previous season). One of these remigrants was reported as nesting at Buck Island Reef National Monument during the season. The remaining 10 of the 17 hawksbills observed on the East End Beaches were new turtles (not previously tagged). One of these new turtles was reported as nesting at Buck Island Reef National Monument during the season.

Mean curved carapace length from notch to notch was 82.5 cm (5.3 SD, range 71.0 – 88.5, n = 11) and from notch to tip it was 85.6 cm (5.3 SD, range 76.4 – 90.7, n = 12) and the mean curved carapace width was 76.1 cm (6.0 SD, range 65.3 – 82.3, n = 12).

Green Turtles

Thirty-four green turtles were observed nesting on the East End Beaches during the 2005 season. Nineteen of these turtles were remigrants and 15 were previously untagged. Of the nineteen remigrants, the average remigration interval was 3.4 years with a minimum of one year and a maximum of 11 years.

Mean curved carapace length was 109.1 cm (4.5 SD, range 96.0 – 117.8, n = 81) and the mean curved carapace width was 98.4 cm (5.2 SD, range 83.5 – 110.9, n = 80).

Nests – Hawksbill Turtles

In 2005, 26 hawksbill nests were confirmed (egg deposition was observed or suspected nests were confirmed as hatching) on the East End beaches. The largest number of these nests (12) were laid on Jack's Bay with seven on both Isaac's and East End Bay. Another 11 activities were unobserved but were recorded as probable or suspected nests because of the level of disturbance and the character of the activity. These activities were checked for signs of hatchling emergence with no success.

Thirty-five hawksbill dry runs were also recorded during the 2005 season. Again, the majority of these (22) were recorded on Jack's Bay and five were seen on Isaac's and eight were observed on East End Bay.

Hatching – Hawksbill Turtles

Twenty-four of the 26 hawksbill nests survived to term and emerged. Two nests were depredated on Jack's by the exotic, Javan mongoose (*Herpestes javanicus).*

Of the 24 nests that emerged, 12 were excavated post hatching but only 10 of these provided nest success results. Mean clutch size (determined post hatching) was 127.7 eggs (43.1 SD, range 31 – 167, n = 10). Mean hatch success was 68.5 % (28.8 SD, range 10.9% - 93.3%, n = 10) and mean emergence success was 67.7% (28.6 SD, range 10.9% - 91.4%, n = 10). Using mean emergence success and mean clutch size, we estimate that 2,247 hawksbill hatchlings emerged on the East End Beaches during the 2005 season.

Nests – Green Turtles

In 2005, 115 green nests were confirmed (egg deposition was observed or suspected nests were confirmed as hatching) on the East End beaches. The largest number of these nests (55) were laid on Isaac's, 50 on East End Bay, and ten on Jack's Bay. Another 40 activities were unobserved but were recorded as probable or suspected nests because of the level of disturbance and the character of the activity. These activities were checked for signs of hatchling emergence with no success.

One hundred and seventy dry runs were also recorded during the 2005 season. The majority of these (70) were recorded on East End Bay, 58 were seen on Isaac's, and 42 were observed on Jack's Bay.

Since night monitoring was not carried out every night, some activities were recorded as probable nests but then confirmed post hatching. Thus, we are confident that the number of nests (115) laid on the East End Beaches during the 2005 season is a realistic estimate. Furthermore, we are also confident that every green turtle nesting on the East End Beaches during the monitoring period was observed at least once and in most cases, multiple times. If we take the total number of nests and divide it by the number of turtles nesting throughout the season we find a simple clutch frequency of 3.4 (range 1-7).

Hatching – Green Turtles

One hundred and nine of the 115 green nests survived to term and emerged. Six nests were depredated by mongoose, four on Isaac's and one on both East End and Jack's Bay. Of the 109 nests that were recorded as emerging, 81 of these were excavated post hatching and 73 provided hatching and emergence success data.

Mean clutch size (determined post hatching) was 112 eggs (20.4 SD, range 54 – 157, n = 73). Mean hatch success was 79.4% (19.2 SD, range 0.00% - 100%, n = 73) and mean emergence success was 78.3% (18.9 SD, range 0.00% - 100%, n = 73). Using mean emergence success and mean clutch size, we estimate that 10,088 green hatchlings emerged on the East End Beaches during the 2005 season.

DISCUSSION

Hawksbill Turtles

During the 2005 nesting season, as in past seasons, individual hawksbills were often observed only once and occasionally two or three times. The season was once again characterized by low overall hawksbill numbers when compared to years prior to 2001. Again, the high number of new turtles and the low number of remigrants is a trend which warrants further investigation. In previous seasons, hawksbills that were only observed once and did not nest successfully were tagged with a single inconel flipper tag. Because external tag retention is not as reliable as PIT tagging, we cannot conclusively say that the 10 newly tagged animals in 2005 were new migrants because they may have lost an inconel tag applied during a previous nesting season. Tag scarring, unfortunately, is not a reliable method of determining whether a turtle was previously tagged because lost tags do not always leave scars. During the 2005 season, every effort was made to tag hawksbills with two inconel tags and a PIT tag; however, PIT tagging was only possible when the female successfully nested. Females that did not nest were given two flipper tags to reduce the chance of her returning in subsequent seasons without a flipper tag.

From our data, we have characterized hawksbill nesting as sporadic but beach coverage has not always been complete. Coverage during the past five seasons was thorough enough to show that nesting is truly sporadic and that incomplete nesting records were not due to incomplete coverage. This supports our idea that hawksbill nesting on the east end of St. Croix, and perhaps the entire island, is diffuse in nature, and the monitoring of the East End Beaches is only providing information on a small portion of overall hawksbill activity. Continued monitoring like that of the past four seasons will give us more complete information about the number of hawksbills nesting on the East End Beaches.

Predation by mongoose continues to pose a significant threat to hawksbill nests on the East End Beaches.

Green Turtles

The 2005 season was characterized by lower numbers of nesting. However, after reviewing individual records, it is unlikely that the lower nesting numbers in 2005 represent a population decrease. Instead, the lower numbers are a product of the cyclical nature of sea turtle populations. The significant number (19) of remigrants is encouraging and the increase in activity on Isaac's Bay continues to highlight the importance of the East End Beaches as protected areas.

MANAGEMENT RECOMMENDATIONS

Poaching is no longer a major problem on the East End Beaches but it could become a problem again if nests are not monitored during both daytime and nighttime patrols. We recommend continued monitoring to deter poaching on the East End Beaches. Increased communication with the Department of Planning and Natural Resources Environmental Enforcement Division is also encouraged.

Predation by both mongoose and dogs continues to threaten turtle nests laid on the East End Beaches (especially Jack's). We recommend two to three days of mongoose trapping in early July along with continued nest monitoring to eliminate mongoose predation. Early season trapping of mongoose in 2005 lowered predation on Jack's but unlike past seasons, mongoose predation was observed on Isaac's Bay. Increased visitation to these areas has increased the availability of food and allowed the establishment of larger numbers of mongoose. Thus, trapping efforts must be expanded to include all three beach areas.

Predation by dogs can be reduced or eliminated by trapping feral animals and monitoring public use. We believe the majority of depredated nests are being dug by Grapetree homeowners' dogs that are allowed to run free during the day. Explaining the damage their unsupervised animals are doing to endangered species and the legal penalties such negligence can incur may fix this problem. We recommend that the area continue to be clearly posted as a sea turtle nesting beach and dogs be leashed on the beach (as required by V.I. Code). Regular patrols by TNC staff or volunteers may be necessary to advise the public of posted regulations.

Public use can potentially threaten sea turtles and their nests on the East End Beaches. Driving on the beach compacts nests, crushes emerging hatchlings, destroys beach vegetation and contributes to beach erosion. Campers can interfere with nesting animals and campfires can disorient hatchlings or destroy nests. The moving and clearing of vegetation as well as other beach features can also impact nests and nesting habitat. Camping without proper facilities also contributes to increased trash problems and attracts mongoose and feral dogs and cats. We recommend continued restriction of vehicle access to the beaches and that camping be prohibited from at least July to December.

Since the 2003 season, the TNC properties have been clearly posted and vehicular access has been eliminated. A trail system and signage has increased public awareness and public use issues are rare.

ADDITIONAL WORK

In 2005, increased funding allowed us to perform day patrols at Halfpenny and Manchenil nesting beaches. Historically, hawksbill, green, and leatherback turtles have been reported to nest on these two beaches.

A patrol of these beaches was performed on average every 3 days from August 1st through November 1st. A single pass of the beach was performed in each day patrol. A data sheet was completed for every turtle activity encountered. Based upon experience, activities were identified by species and it was determined whether or not egg deposition occurred. The location of the activity was recorded using a handheld GPS unit.

In 2005, day patrols identified 47 activities from August 1st through November 1st.

Hawksbill Turtles

During this patrol period, ten Hawksbill activities were identified. Eight occurred on Halfpenny and the other two on Manchenil. Of these ten activities, 6 of them were suspected to have egg deposition (4 on Halfpenny and 2 on Manchenil). Four dry runs were also identified on Halfpenny.

Green Turtles

During this patrol period, 36 Green activities were identified. Eleven occurred on Halfpenny and the other 25 on Manchenil. Of these 36 activities, 22 of them were suspected to have egg deposition (9 on Halfpenny and 13 on Manchenil). Sixteen dry runs (2 on Halfpenny and 14 on Manchenil) were also identified.

Leatherback Turtles

During this patrol period a single leatherback activity was identified. This was an unusual occurrence as it occurred very late in the St. Croix leatherback season. It was suspected that egg deposition occurred.

Discussion / Recommendations

Forty seven sea turtle activities on these two beaches represent approximately 2.4% of the total sea turtle activity identified on St. Croix in 2005. WIMARCS also conducted day patrols on these two beaches from April 15th through August 1st. These patrols identified an additional 40 activities (5 Hawksbill, 7 Green, 20 Leatherback). These two patrol programs identified 87 activities, representing 4.4% of all sea turtle activity on St. Croix in 2005.

Based upon these activities and knowledge of previous patrols, further investigation seems warranted. We recommend using the calendar-intercept method of night patrols on Manchenil and Halfpenny in the future. This method is based on the fact that we

know approximately when a turtle will return to nest. For example, green turtles on St. Croix will nest, on average, every 10.5 days. Once a green activity is identified during day patrols, a night patrol on the 10^{th} and 11^{th} day could be performed to intercept and identify the individual. This would provide valuable information regarding the identity of females nesting on these beaches and determine if these turtles are the same females nesting elsewhere on island, or if it is a unique nesting population. Nest excavations and night patrols would provide vital information on this nesting population and increase our understanding of beach use and hatchling production by turtles around the island.

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