

EARTHWATCH INSTITUTE FIELD REPORT

Project Title: Hawksbill Turtles of Barbados

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HIGHLIGHTS

The primary goal of the Barbados Sea Turtle Project (BSTP) is to bring about the recovery of depleted populations of sea turtles in Barbados through the application of scientifically-sound conservation measures in the field and through environmental education programmes targeted at the public, school children and visitors to the island. Critical components of the Project are the monitoring of turtle abundance on nesting beaches and coral reefs, without which the effectiveness of the conservation activities being implemented on hawksbill population recovery cannot be adequately assessed. Owing to the complexities of the reproductive behaviour of sea turtles, monitoring programmes are only effective if they are conducted for long enough to detect patterns in the population under study. Patrols on index beaches have occurred nightly since 1997, and beach coverage was increased to the present level in 1998. As in previous years, Earthwatch volunteers made a highly significant contribution to the nocturnal beach monitoring of the BSTP in the 2004 nesting season. Three teams were out nightly allowing saturation coverage of our index beach at the Hilton, good coverage of our high density nesting beaches, as well as an immediate response to our 24-hr hotline cell phone. Table 1 summarises the nestings and hatchings involving Earthwatch volunteers.

Barbados is one of only a few sites in the Wider Caribbean collecting information to assess demographic characteristics of hawksbills, trends in population abundance and conducting research to provide information about the migratory behaviour of hawksbills. The information collected is being used to direct national management and conservation efforts, as well as internationally to inform regional conservation and management strategies. Section VIII discusses further the significance of the data collected.

OBJECTIVES

The BSTP is actively involved in conservation efforts to reduce the impact of exploitation and coastal development on sea turtles nesting in Barbados. These include protection of nesting females, relocation of endangered nests, and rescue of disoriented hatchlings, as well public education programmes in hotels and schools, and a pilot study to study the potential for nesting beach ecotourism.

In order to continuously improve on the mitigation techniques used and to inform policy regarding sea turtle management at the national and regional level, research relevant to sea turtle conservation is undertaken. Research topics on hawksbills

include:

(1) investigations of clutch frequency and remigration intervals, nest site fidelity, the recruitment of newly matured females on the nesting beaches, and nest fate,

(2) investigations into the impacts of coastal development on nesting behaviour, nest placement, hatching success, hatchling vigour and early survival rates in the initial swim away from the beach,

(3) the use of satellite telemetry to track migration routes and destinations of adult female and male hawksbills,

(4) the use of GIS and predictions about the extent of sea level rise to assess future nesting beach availability, and

(5) the use of laparoscopy to sex juveniles and learn more about the reproductive history of adult females.

A major component of the BSTP's activities is the nesting beach monitoring programme. One objective of this programme is to answer the question of whether the hawksbill nesting population is declining, has leveled off or is actually increasing. Monitoring programmes are essential in order to assess the efficacy of conservation efforts. Since females can nest at 2-5 year intervals, there may be some years where many females coincide in nesting and some years when few do. Therefore, an increase in numbers in any one year does not necessarily indicate that there is a real sustained population growth. The average inter-nesting interval for hawksbills is 2.5 years. Therefore in order to obtain three data points i.e. the minimum number to detect a trend, monitoring of nesting beaches should continue for at least 8 years. Monitoring programmes require considerable human resources to survey beaches, and the help of Earthwatch volunteers is especially valuable to maintain the beach monitoring programme in Barbados.

METHODS

Conservation and monitoring occur through three principal activities: (1) 24 hour response to public "hotline" (cellular phone) reports of nesting and hatching events of hawksbill turtles, (2) all-night patrol of one index beach and (3) nightly patrols of high density nesting beaches. Whether the nesting or hatching is a public report or is an activity that occurs on an index beach, the same data are collected and standardised forms are completed. All emerging adult female turtles are flipper-tagged (or tags are read), and measured using standard techniques, and their nest locations are marked. The female is then photographed.

Efforts are always made to inform persons making the report about conservation issues affecting sea turtles and to encourage them to monitor and safeguard the nest through to hatching. This educational aspect of BSTP work is considered to be particularly important.

On many occasions, hatching reports are made to the "hotline" because there has been extreme disorientation of hatchlings by coastal lighting during their migration

from the nest to the sea. Earthwatch volunteers assist in collecting disoriented hatchlings, determining the nest location, negotiating with adjacent hotels to temporarily reduce light levels on the beach thereby allowing hatchlings to find the sea, or releasing the hatchlings at an adjacent dark beach stretch. A sub-sample of hatchlings is measured and weighed prior to release. Nests are excavated to allow investigation of levels of egg mortality at different stages of development, and to release trapped hatchlings. All hatching events are recorded, a sub-sample of hatchlings is measured prior to release, and nests are excavated to determine hatching success.

A study to investigate the effect of nest position on hatchling vigour and predation rates in the nearshore environment is nearing completion. One impact of coastal development is that hotel construction is typically adjacent to the widest part of sandy beaches in the center of bays. Beachfront lighting tends to deter females with the result that females tend to nest on the narrow beach edges in the headland areas that are flanked by reefs offshore. The consequence is that newly emerged hatchlings that escape being disoriented by lights may be forced to swim away from the beach close to or over coral reefs rather than swimming over sand. Given the higher biomass characteristic of reef areas compared to sand, this may result in higher levels of predation. Temporarily tethered hatchlings have been followed for distances of about 100m across nearshore fringing reefs and sandy bottom habitats and disorientation and predation rates compared. One worrying finding has been that, even when hatchlings are released on dark stretches of beach, they are still susceptible to being attracted shorewards by lights from adjacent beaches, even from distances offshore.

In-water surveys of hawksbill turtles are undertaken during the daytime SCUBA dives, two or three times per week. Untagged animals are hand-caught and brought on board a dive boat for processing. All animals are measured and tagged. Animals are also painted with large numbers on the carapace to allow their subsequent identification without need for recapture. Dive operators and their SCUBA clientele participate in this aspect of the Project by reporting sighting locations of marked animals on forms provided to them. This year, the in-water monitoring protocol was expanded to include the taking of blood and laparoscopy to allow the sexing of juveniles. This is an important step forward in our efforts to understand sex-related patterns in growth rates and dispersal patterns of juvenile turtles. Most EW volunteers had an opportunity to participate in the in-water study in 2004.

RESULTS AND DISCUSSION

We are pleased to report that we recorded more nesting turtles and tagged more new nesting turtles in 2004, than in any previous year apart from 2003. Of a total of 2,655 activities recorded during the period that Earthwatch volunteers were working on the beaches, 1,544 resulted in the successful laying of eggs. A total of 210 previously unrecorded adult females were tagged for the first time. Given that this is the eighth year of index beach monitoring, we are increasingly confident that this is a population in the early stages of recovery.

We continue to record relatively low rates of remigration, not just islandwide where our coverage is insufficient to record all turtles nesting, but also on our intensively surveyed index beach. Since hawksbills are reported to breed at 2-3 year intervals, we had expected to see a substantial number of remigrants from 2001 (3 year interval nesters) and 2002 (2 year interval nesters). These are years in which we were

tagging relatively large numbers of animals. Of 56 tagged turtles recorded nesting in 2001 on the index beach, 29 were seen again in 2003, and 9 this year, representing 67.9% of the cohort of turtles tagged in 2001 appearing within the average remigration interval for this species. This rate of remigration over the 2-3 year remigration interval is very similar to that recorded for turtles tagged in 2000 (66.7%). In 2002, we recorded 80 tagged females nesting on the index beach. Of these, 33 were recorded nesting on a two-year cycle and re-nested this year (41.3%). This 2-yr remigration rate was markedly lower than that seen for 2001 turtles nesting in 2003 (55.4%).

One common explanation of the relatively low levels of remigration being recorded is that tag loss is occurring but is not being detected, such that a number of the untagged females appearing each year are really remigrants (rather than new recruits) that are not being identified as such because they have lost their tags. However, the experience of staff working with the project in detecting tag scars makes such an explanation unlikely. A second explanation is that mortality of adult females may still be significant on the foraging grounds where animals reside between nesting seasons. We know from our satellite telemetry work that females nesting in Barbados forage in the waters of other Caribbean countries that have legal sea turtle fisheries, and we do have flipper tags from females tagged whilst nesting in Barbados that have been returned from neighbouring islands. A third explanation for the apparent low numbers of remigrants might be that females are not as faithful to their natal nesting beaches as the current paradigm suggests. We currently have no evidence of any adult female tagged in Barbados being seen on any other country's beaches in the region. However, we are recording a small but significant percentage of the females nesting on the index beach also nesting on another beach, either within one season or between seasons. Interestingly, of four untagged nesting females that were laproscoped at the index beach this year, two showed indications that they had bred in previous seasons. This means either that they had nested previously at the index beach but had not been observed despite our beach coverage, that they nested at the index beach but on long remigration intervals, or, perhaps most intriguingly, that the tendency to move between nesting beaches is actually not such a rare event as we had previously thought. Whether coastal development is interfering with nest site fidelity is currently under investigation.

Presentations/representation at meetings and conferences:

- 2003 Horrocks, J.A. Sea Turtle Recovery. National Conservation Commission (NCC) Training Workshop on Park and Beach Management in a Tourist Destination. (Barbados 23 July 2003).
- 2004 Krueger, B.H., Beggs, J.A. and Horrocks, J.A. Distribution and abundance of hawksbill sea turtles (*Eretmochelys imbricata*) on the western bank reef of Barbados, West Indies. 24th Symposium on Sea Turtle Biology and Conservation. San Jose, Costa Rica, (22-29th February 2004).
- 2004 Leighton, P.A., Horrocks, J.A., Krueger, B.H., Beggs, J.A., Perez, D., and Kramer, D.L. Predation by the small Indian mongoose (*Herpestes javanicus*) on hawksbill sea turtle nests in Barbados, West Indies. 24th Symposium on Sea Turtle Biology and Conservation. San Jose, Costa Rica, (22-29th February 2004).
- 2004 Harewood, A. and Horrocks, J.A. The impacts of beach development on hatchling survival in hawksbill turtles (*Eretmochelys imbricata*). 24th Symposium on Sea Turtle Biology and Conservation. San Jose, Costa Rica, (22-29th February 2004).

Publications

2004 Luke, K., Horrocks, J., Leroux, R and P. Dutton. Origins of green turtle feeding aggregations around Barbados, West Indies. *Marine Biology* 144:799-805.

OTHER ACCOMPLISHMENTS AND BENEFITS

Dr. Horrocks was honoured to receive a 2004 Pew Marine Conservation Fellowship and a 2003 Environmental Citizenship Award from the Barbados Environmental Youth Programme.

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