



St Eustatius Sea Turtle Conservation Programme Annual Report 2008



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List of Acronyms and Abbreviations

AGM.....	ANNUAL GENERAL MEETING
ARGOS	ADVANCED RESEARCH AND GLOBAL OBSERVATION SATELLITE
AVID.....	AMERICAN VETERINARY IDENTIFICATION DEVICES
CCL	CURVED CARAPACE LENGTH
CCL N-T.....	CURVED CARAPACE LENGTH (NOTCH TO TIP)
CCW	CURVED CARAPACE WIDTH
CM	<i>CHELONIA MYDAS</i>
DC	<i>DERMOCHELYS CORIACEA</i>
DCNA	DUTCH CARIBBEAN NATURE ALLIANCE FOUNDATION
EI	<i>ERETMOCHELYS IMBRICATA</i>
GPS	GLOBAL POSITIONING SYSTEM
IUCN	INTERNATIONAL UNION FOR THE CONSERVATION OF NATURE AND NATURAL RESOURCES (WORLD CONSERVATION UNION)
KNAP.....	KLEINE NATUUR PROJECTEN FONDS, NEDERLANDSE ANTILLEN (SMALL NATURE PROJECT FUNDS, NETHERLANDS ANTILLES)
MINA	AFDELING MILIEU EN NATUUR (SECTION OF ENVIRONMENT AND NATURE OF THE MINISTRY OF PUBLIC HEALTH AND SOCIAL DEVELOPMENT)
NACRI	NETHERLANDS ANTILLES CORAL REEF INITIATIVE
NOAA	NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ASSOCIATION
PERS. COMM.	PERSONAL COMMUNICATION
PIT	PASSIVE INTEGRATED TRANSPONDER
STENAPA	ST EUSTATIUS NATIONAL PARKS FOUNDATION
SPA W	SPECIALLY PROTECTED AREAS AND WILDLIFE
USVI	UNITED STATES VIRGIN ISLANDS
UNEP.....	UNITED NATIONS ENVIRONMENT PROGRAMME
WIDECAST	WIDER CARIBBEAN SEA TURTLE CONSERVATION NETWORK
WTT	WORLD TURTLE TRUST, HAWAII

Summary

- The St Eustatius Sea Turtle Conservation Programme was initiated in 2001 due to concerns that the island's sea turtle populations were being threatened due to habitat degradation and destruction. The programme is managed by St Eustatius National Parks Foundation (STENAPA), which is the main environmental non-governmental organization on the island.
- The Sea Turtle Conservation Programme is affiliated to the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and adopts its monitoring and tagging protocols.
- Since monitoring began, three species of sea turtles have been confirmed nesting on the island; leatherback (*Dermochelys coriacea*), green turtle (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*). There was an unconfirmed nesting by a fourth species, the loggerhead (*Caretta caretta*), in 2004.
- Five nesting beaches have been identified; Zeelandia Beach, Turtle Beach, Lynch Bay, Oranje Bay and Kay Bay. Zeelandia Beach is the primary nesting beach, and the only place where all three species nest regularly; the other beaches are used occasionally by green and hawksbill turtles.
- Morning track surveys are carried out on Zeelandia Beach and Turtle Beach throughout the nesting season. The other nesting beaches were monitored weekly. Every track is identified to species; categorised as a false crawl, activity or a nest; all confirmed nests are included in the nest survival and hatching success study.
- In 2008:
 - Morning track surveys were conducted daily from 13 March to 6th November; a total of 238 index beach morning surveys were completed.
 - 20 confirmed leatherback nests (from deposition observation or excavation proof) were recorded from 13th March – 14th June on Zeelandia Beach (stakes 1-17); in addition, four probable lays and two false crawls were recorded.
 - Green turtles were recorded from 26 July until 14th October; 46 Activities were recorded including 1 confirmed nest, 14 probable lays and 31 false crawls.
 - Hawksbill turtles were observed from the 8th of April until 10th of September. A total of nine activities were recorded. Four were potential nests and 5 were tracks only.
- Night patrols are only conducted on our index beach, Zeelandia to Turtle Beach due to limited personnel and minimal nesting on other beaches; patrols run from 9:00pm – 03:30am. Each turtle encountered is identified to species; tagged with external flipper tags and an internal PIT tag (leatherbacks only); standard carapace length and width measurements are taken; nest locations are recorded for inclusion in the nest survival and hatching success study.
- In 2008:
 - Targeted night patrols were conducted from 24th March – 05 October; 74 patrols were completed, totalling 499.5 hours of monitoring.
 - 19 leatherback, 1 hawksbill and 5 green turtles were seen giving a 32% encounter rate.

- Five individual leatherbacks were observed during patrols; all received external flipper tags and 3 received PIT tags. Biopsy samples were taken from these turtles.
 - Leatherback 133713290A, observed on 12th of May was originally tagged by STENAPA in 2002, again in 2004 and received new flipper tags in 2008. Leatherback 023*359*883 also received new flipper tags; this turtle was originally tagged in Trinidad and Tobago 2005.
 - No hard shell species were tagged or observed nesting during the 2008 season.
- Average carapace measurements for female Leatherbacks nesting in 2008:
 - Leatherback: Curved carapace length (CCL) = 156.1 cm; Curved carapace width (CCW) = 115.6 cm.
 - No Greens or Hawksbills were measured for fear of disturbance in 2008.
- All located leatherback nests were included in a study of nest survival and hatching success. During morning track surveys false crawls and probable nests were marked. Close to the expected hatching date the observers recorded signs of hatchling emergence. Two days after hatchling tracks had been recorded the nest was excavated to determine hatching and emerging success.
- In 2008:
 - Only the confirmed leatherback nests were included in this study.
 - All probable hard-shell nests were lost due to storms, swash and flooding.
 - Mean incubation period for leatherbacks was 69 days.
- Excavations were performed on 14 nests; 13 leatherback and the unmarked green nest. Many nests could not be found for excavation purposes.
 - Average egg chamber depth was 77.8 cm for the leatherback and one green nest = 47cm.
 - Mean clutch size for leatherback = 79 yolked + 35.8 yolckless eggs and the green nest = 116 yolked + 0 yolckless eggs.
 - Nine nests hatched or partly hatched out of 13 excavated Leather back nests, 4 were unsuccessful nests.
 - Leatherbacks showed a very low mean hatching success rate at 7.27% of the 13 excavated nests and 41.81% emerging success in 2008.
- Turtle incidents amounted to one injured and four dead turtles in 2008, the highest annual number since commencement of the turtle conservation program.
 - On Sunday, the 23rd of March, an Olive Ridley (*Lepidochelys olivacea*) was found dead entangled in a net at Lynch bay by local citizens of Saint Eustatius. This has been the first confirmed presence of an Olive Ridley turtle in Statian waters.
 - A small green turtle was observed by the Marine Park Manager and turtle intern on the 27th of April at 16:00 when returning from a dive. The injured turtle was seen on the surface just outside of the harbour pier and appeared to be stuck on the surface.
 - On April 28th a small (10-50cm) suspected green turtle was found by Alain Beurgur (Scubaqua) at STENAPA reef during a night dive and was described to be cut in half. The Marine Park Manager and the Turtle intern were informed the next morning and immediately inspected the site. No turtle was found and it is suspected that the carcass had been taken by a shark during the night.

- The Marine Park Manager was alerted on the afternoon of July 6th to the presence of a stranded Hawksbill Turtle just out from the Twelve Guns snorkel site. On arrival Mr. Munson was greeted by Mr. Van Duren and was shown the turtle, which was deceased being severely tangled in green fishing net with no noticeable lacerations or body damage.
 - On the morning of 13th of September 2008, The Marine Park Manager accompanied by a STENAPA volunteer came across a dead Hawksbill at Lynch Beach. Biometrics were taken and the animal showed no obvious cause of death.
- Beach erosion continued on Zeelandia Beach in 2008:
 - Many of the numbered marker stakes were lost due to high tides. Approximately 30 were replaced in March and the beach re-staked.
 - Beach mapping and erosion monitoring continued this year. Data were collected in March, July, September and October.
 - Sand mining compounded the erosion problem at the northern end of Zeelandia Beach. One summons was issued by STENAPA and fine paid by accused sand miner.
 - An estimated 20 tonnes of sand was taken from Zeelandia (at stake 14) from the 24th March to 2nd of November.
 - Beach protection efforts continued with the placement of massive boulders in front of a primary access point for sand miners.
 - Approximately 18 cliff falls were recorded from April to October.
- Various community activities were conducted in 2008:
 - During July 2008, STENAPA conducted its second Summer Club for four sessions each week. A total of forty children aged eight to 13 signed up for the club which included hiking, snorkeling and turtle education activities. STENAPA's Summer Club turtle education program ran from 2 July to 2 August every Tuesday and Thursday.
- Twelve extensive beach clean-ups were conducted on our index beach, Zeelandia during Family Friday volunteer activities. The September cleanup coincided with Ocean Conservancy's International Coastal Cleanup™ Campaign on 20th September. Twelve large garbage sacks of itemized plastic, cans, rope, Styrofoam and a huge fishing net were collected on this particular cleanup. Beach cleanups were carried out by the Marine Park Manager, STENAPA staff and interns, Working Abroad volunteers, local citizens and BroadReach volunteers.
 - A total of 17 trucks full of rubbish bags were removed from the islands' beaches.
 - During EnviroWeek in the week of 16 October the Junior Rangers, led by Parks Ranger Hannah Madden, conducted a cleanup on Lynch beach and Venus Bay. A number of island clean ups were carried out by local children in our education programs: Snorkel club and Junior Rangers.
- The Sea Turtle Conservation Programme was featured in regular articles in the regional press, television and on the local radio. The STENAPA quarterly newsletter included several features about the research activities conducted in 2008. The STENAPA website contains several pages dedicated to the programme. The island videographer Dwight Barran was alerted to the beach on two occasions to video tape a nesting leatherback for local television. Reporters/dive magazine photographers also joined on a few occasions to witness and photograph nesting events.

- The turtle conservation programme continued generating interest from the local population of St. Eustatius. The Marine Park Manager spoke with several interested members of the public who were keen to view the nesting activity of a turtle, nest exhumation or a hatchling release. The turtle phone was filled with a list of interested people to contact when there were possibilities for seeing turtles. This approach was very popular and a grassroots approach of connecting with marine turtles. In 2008 a total of 40 islanders and tourists joined the night patrols. Other interested Stadians were called to the beach when a turtle was nesting.
- Staff participated in several regional and international events in 2008:
The Marine Park Manager, Lee Munson, accompanied by the Office Administrator/Marine Park Assistant, Jessica Berkel attended a Turtle Research and Management techniques Course between October 13th – 18th, on Bonaire. Both Lee and Jessica, together with Manager, Nicole Esteban, attended the WIDECAST Annual General Meeting held on St Kitts from December 18th - 20th.
- In April 2008, STENAPA welcomed its second Marine Turtle Intern, Joseph Roche to St Eustatius. Joe had previous experience working with marine turtles, especially leatherback turtles, in 2006 in Gandoca, Costa Rica. His duties included organizing the turtle aspect of the STENAPA Summer Club, coordinating beach cleanups, beach mapping and managing the data, as well as night patrols, tagging, morning beach surveys and habitat survey dives. Unfortunately Joe terminated his internship half way through the season. His partial replacement was Gerdijanne Leestemaker, our main island turtle volunteer from Holland who has shown a huge commitment and passion for nesting turtles. She has been invaluable to the success of the 2008 nesting program and has assisted in other areas at STENAPA.
- In March 2008, the Zeelandia beautification project continued. The primary objective was to deter vehicles from driving on the beach, stop sand mining and prevent further erosion. A Family Friday was dedicated to replanting of palm trees and yucca plants that succumbed to the warm weather. Only a few of these plants took root and have established themselves at Zeelandia. The information signs placed at Zeelandia were routinely inspected and cleaned. The purpose of these signs is to educate the public about turtles that nest on the beach and remind people not to drive on the beach. In 2008 the prime access point to the beach was blocked by way of huge boulders donated from a nearby construction site. This barrier offers limited protection as other access points still allow sand miners the opportunity to venture on to the beach. Our presence on the nesting beach at night dramatically reduces the instances of sand mining at Zeelandia.
- Surveys for the In-Water Monitoring of Sea Turtle Aggregations in St Eustatius National Marine Park began in January 2008 in order to assess the current status and distribution of foraging turtle aggregations in the surrounding waters of St Eustatius. The foraging population is formed of greens, *Chelonia mydas*, and hawksbills, *Eretmochelys imbricata*. Surveys yielded a total catch per unit effort (CPUE) of 1.17 turtles per hour, with an average CPUE of 0.67 for greens and 0.50 for hawksbills. Greens and hawksbills were found to occupy different areas in different densities, with more greens in the less protected sea grass beds of the harbours and more hawksbills on the reefs of the reserves. Size and gender data indicate a healthy juvenile and sub-adult population for both species. Future monitoring is needed to assess any changes in this population, and active protection of the foraging grounds of these species is essential to their continued existence within the marine park.

- Several recommendations are made for the 2009 season:
 - Continued participation of volunteers, from Working Abroad and the STENAPA intern Programme. Limit beach patrols to 4 additional people.
 - Foster public awareness of the Turtle Programme within the island of St Eustatius and the Netherlands Antilles. Introduce the new intern on the radio along with the 2009 nesting season and activities for interested members of the community.
 - Continue with STENAPA Summer Club and have the Turtle Education activities integrated into a fundamental component.
 - Monitoring of nesting beaches to continue: daily track surveys on all beaches and effective night patrols of the primary nesting beach.
 - Further development of the research programme: Introduce an experimental hatchery in the “SAFE AREA” described in this report and monitor for hatching success.
 - Compare hatching success data with neighbouring islands such as St Kitts.
 - Strongly focus on relocating nests to the hatchery that may be exposed to swash, erosion, cliff fall, sand mining, runoff, and pollution.
 - A proposal to extend the satellite tracking to leatherback turtles for DCNA.
 - Continue with grant proposals that are necessary to finance equipment and activities of this programme.
 - Monitoring of the water table at Zeelandia beach should be a priority in 2009 to determine if the subterranean water levels are causing possible egg failure but more importantly accelerating possible beach erosion.
 - Continue to develop the Zeelandia Beautification Project to include a revamp of the concrete turtle, signage, plantation and possible picnic area for individuals interested in the beauty of Zeelandia Beach.
 - Make additions to the boulder barriers to deter vehicles from venturing on to the beach and organise for them to be painted during summer club.
 - Continue with the beach mapping project and make conclusions from comparisons with previous years.
 - Revitalize the in-water turtle sighting surveys with the local diving centres. This information will help make more informed decisions regarding the in-water monitoring programme.
 - Continue the in-water survey including night surveys and feeding behaviour investigations.
 - Continue with tissue sampling and arrange samples for processing.
 - Improve on nest marking from 2008 with more accurate triangulation, nest marking tape and a protocol that remains continuous throughout the season.
 - Approach NuStar energy and encourage a switch from white to red light for all East facing lights. This is also something to request for the lighting at the buildings that face Zeelandia beach.

Introduction

The St Eustatius National Parks Foundation (STENAPA) established the Sea Turtle Conservation Programme following concerns that the island's sea turtle populations were being threatened by anthropogenic disturbance and destruction of nesting beach habitats through sand mining, joy riding and pollution.

A community outreach campaign was organised in 2001 to begin raising public awareness about sea turtle conservation issues. Subsequent to this initiative, a beach monitoring programme was started in 2002 in affiliation with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). The first year of the programme saw very limited and sporadic monitoring of the primary nesting beach due to a lack of personnel. In 2003 however, regular night patrols were made possible following the introduction of the Working Abroad Programme, which brings groups of international volunteers to assist with projects in the National and Marine Parks. By 2004 the programme had expanded to include daily patrols on several of the island's nesting beaches, with a dedicated vehicle and a full-time project co-ordinator during the nesting season.

Data from the Sea Turtle Conservation Programme have shown that three species of sea turtle regularly nest on St Eustatius; the leatherback (*Dermochelys coriacea*), the green (*Chelonia mydas*) and the hawksbill (*Eretmochelys imbricata*), all of which are classified as either endangered or critically endangered by the IUCN. There has also been an unconfirmed report of nesting by a fourth species, the loggerhead (*Caretta caretta*), which IUCN classes as threatened.

The ultimate objective of the St Eustatius Sea Turtle Conservation Programme is to promote long-term survival of the sea turtle populations on and around the island. This goal is achieved by safeguarding critical sea turtle habitats, conducting research to provide policy and decision makers with current, relevant data on the status of sea turtles in the region, and limiting environmental impacts on nesting beaches and near-shore waters. One of the most important factors to ensure the success of the project is the direct involvement of the local community in the programme to promote a better understanding of the importance of long-term conservation, not just for sea turtles but for other locally threatened species.

The aims of this Annual Report include the following:

- Summarise the activities of the Sea Turtle Conservation Programme conducted in 2008.
- Review the accomplishments and deficiencies of the programme in 2008, and suggest recommendations for 2009.
- Provide a summary of the data from 2008 research initiatives.
- Present information locally, regionally and internationally about the research and monitoring programme on the island.
- Produce a progress report for the Island Government, programme funding organisations, the local community and international volunteers.

Participating organisations

St Eustatius National Parks Foundation (STENAPA)

The Sea Turtle Conservation Programme is co-ordinated by the St Eustatius National Parks Foundation (STENAPA), which is the main non-governmental environmental organization on the island of St Eustatius (known locally as Statia). In 1996 STENAPA was given a legal mandate by the Island Government to administer a new Marine Park and, in 1998, for a new National Park. STENAPA also manages the Miriam C. Schmidt Botanical Garden. The Marine Park surrounds St Eustatius from the high water mark to the 30 metre depth contour. There are two marine reserves within the Marine Park which are designated no-take zones and are in place to protect marine habitats and reduce fishing pressures. The Marine Park staff conduct regular patrols and enforcement, maintains dive, snorkel and yacht moorings and conducts many educational programmes, such as the Snorkel Club and Junior Ranger Clubs. The Marine Park is responsible for many research and monitoring activities including the Sea Turtle Conservation Programme.

STENAPA is a not-for-profit foundation, relying on government subsidies, grants and minimal income from divers, yachts and hikers to conduct its activities. STENAPA has only eight staff and is reliant on volunteers to run projects such as the Sea Turtle Conservation Programme. The organisation is supported by two international volunteer programmes; the STENAPA Internship Programme and the Working Abroad Programme, which are discussed in more detail below.

STENAPA Internship Programme

Since the inception of the Internship Programme in September 2001, over 43 interns from various countries including Great Britain, the USA, Canada, Holland, Belgium, Hungary, Germany and New Zealand have helped accomplish projects at the Botanical Garden, in the Quill National Park and the Marine Park. Interns are responsible for overseeing the daily activities of volunteers from the Working Abroad Programme, in addition to managing and completing individual assignments.

Interns are provided with a small monthly stipend, basic accommodation and the use of a truck during their six-month stay. They are personally responsible however, for all travel costs and living expenses while on the island. The internships allow students and professionals to gain valuable practical experience in their chosen field. Without these dedicated volunteers STENAPA would not be able to conduct many of its projects, since the Foundation could not afford such manpower or expertise.

Working Abroad Programme – Statia Conservation Project

Working Abroad is an international networking service based in the UK that, since it was founded in 1997, has established volunteer projects in over 150 countries worldwide. STENAPA started its collaboration with the Working Abroad Programme in January 2003, and to date a total of 115 volunteers have been recruited via their organisation. Groups of up to eight volunteers stay for two months and assist in the development of the Botanical Garden, conduct maintenance of the National Park trails, and during turtle season, participate in night-time beach patrols. For their stay each volunteer pays approximately US\$1700 towards food, water, lodging, truck hire, fuel and a project expense fee (this does not include international travelling costs or personal living expenses during their stay).

Wider Caribbean Sea Turtle Conservation Network (WIDECAST)

The St Eustatius Sea Turtle Conservation Programme is affiliated to the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). Founded in 1981, WIDECAST represents the largest network of sea turtle research and conservation projects in the world; with members in over 30 Caribbean states and territories. Affiliation provides access to a collaborative framework of organisations within the region, with a strong emphasis on information exchange, training and active community participation. WIDECAST promotes interaction between different stakeholder groups to ensure effective management and conservation of turtle populations in the Caribbean.

In June 2003, STENAPA Manager Nicole Esteban was appointed WIDECAST Country Coordinator for St Eustatius, following completion of a training course on St Croix (US Virgin Islands). Subsequent to this, the St Eustatius Sea Turtle Conservation Programme implemented WIDECAST-approved protocols for monitoring and data collection. WIDECAST has assisted the programme through donation of tags and purchase of PIT tag applicator. The Sea Turtle Programme Coordinator attended the WIDECAST Annual General Meetings in 2004-2006, and 2008; with funding and logistical assistance provided in part through WIDECAST.

Dutch Caribbean Nature Alliance (DCNA)

The DCNA was founded in 2005, and represents a formal coalition of the six nature conservation management organizations of the Netherlands Antilles and Aruba, with representation from international agencies, central government and financial experts. Their main goals are to safeguard the biodiversity and promote sustainable management of the natural resources of the islands, through the establishment of long-term, sustainable funding sources. The Manager of STENAPA is currently the chairperson of the DCNA.

Funding agencies and donors

To effectively run the Sea Turtle Conservation Programme, the STENAPA Manager and Project Coordinator allocate approximately 10 to 30% of their time to raise funds to cover the annual programme costs. Fundraising occurs both locally and internationally by soliciting specific organisations, and by donation requests through newsletters and turtle awareness campaigns.

Organisations that have contributed (directly or indirectly) to the Sea Turtle Conservation Programme in 2008 are:

- Dutch Caribbean Nature Alliance (DCNA)
- USONA Programme of the Netherlands Antilles
- Wider Caribbean Sea Turtle Conservation Network (WIDECAST), USA
- Working Abroad Programme, UK
- SOL, St Maarten

We also acknowledge those individuals who have contributed to the success of the programme by donating their time or providing financial assistance.

Study Sites

St Eustatius

The island of St Eustatius is part of the Netherlands Antilles that includes Bonaire, Curaçao, St Maarten, Saba and St Eustatius. It lies in the North-eastern Caribbean, and is located in the Windward Islands; lying within the longitude and latitude median of 17°30 North and 62°58 West. The sister islands of Saba and St Maarten stretch out 30km north-west and 63km north, respectively (Figure 1).

St Eustatius is 21km² in size and is dominated by two volcanoes; an extinct volcano comprising the Northern Hills (150 million years old) and a dormant volcano called the Quill in the South, formed 2200 to 3200 years ago. As a result of its volcanic origin, the beaches of St Eustatius all have dark sand.



Figure 1. Map showing location of St Eustatius in the Eastern Caribbean

Sea Turtle Nesting Beaches

Since the initiation of the Sea Turtle Conservation Programme in 2002, nesting activity has been recorded at five beaches on St Eustatius: Zeelandia Beach, Turtle Beach and Lynch Bay on the Atlantic side of the island, and Oranje Bay and Kay Bay on the Caribbean side (Figure 2). There follows a brief description of each of these beaches.



Figure 2. Map showing location of nesting beaches on St Eustatius

Zeelandia Beach



At over 1 km this is the longest beach on St Eustatius and is directly linked to Turtle Beach at its Southern end. It is quite a narrow beach backed by cliffs, except in the northern 200m where there is a relatively sparse border of Sea Grape trees (*Coccoloba uvifera*). In this region there are also the remains of an abandoned hotel behind the beach and the principal public access area. Ground vegetation is not extensive, limited to small patches of Beach Morning Glory (*Ipomoea pes-caprae*) and an unidentified succulent-type plant, which are both grazed by cows that occasionally shelter under the sea grape trees. The beach is very dynamic with considerable sand movement throughout the year. Despite this, the Northern end is the most stable, permanent beach on the island. Erosion is extensive close to the access area, especially following heavy rains. This problem is exacerbated by sand removal in that region. Close to the Southern end of the beach is a large storm water gut which acts as the landfill for the island's household waste. Zeelandia is the primary turtle nesting beach hosting three species of turtle (green, leatherback and hawksbill), and the only place on the island where leatherbacks have been recorded nesting. It is the only beach monitored at night by the Sea Turtle Conservation Programme.

Turtle Beach

This is the second longest beach on the Atlantic side, measuring approximately 400m. It links to Zeelandia Beach at its northern point, and connects to Lynch Bay around a point to the south. It is a steeply sloping bay subject to considerable sand movement, especially during the hurricane season (July – November). It is backed by cliffs and there is virtually no vegetation except for occasional Sea Grape trees on the cliffs. There is a storm water ghaut in the middle of the beach which was formerly used as the land-fill for the island. Although not currently used this ghaut still contains a large amount of refuse



and is open to the beach. Nesting activity to date has been limited to green turtles. Unfortunately, access to this beach at night is often prohibited due to strong surge, and therefore it is patrolled only when conditions permit.

Lynch Bay



This very small, rocky beach is located around the point to the south of Turtle Beach; it is approximately 200m long. There is considerable ground vegetation cover, primarily Beach Morning Glory and is backed by a sloping cliff which provides the only access when tides prohibit movement from Turtle Beach. Unlike many of the other beaches on the island, Lynch Bay is stable due to the adjacent reef barrier that provides a natural shelter and aids sand retention. Green and hawksbill nesting activity has been recorded at this beach, and it was the site of an unconfirmed loggerhead nesting event in 2004 (I. Berkel, Pers. Comm.). Due to access issues, Lynch Bay can only be monitored safely during the day.

Oranje Bay

This is a very dynamic sandy beach on the Caribbean side of the island as it experiences considerable sand movement throughout the year. It stretches for almost 2km and runs into the harbour at its southern end. The beach is bordered by grass and the occasional Coconut Palm (*Cocos nucifera*). In addition to several hotels and shops; there are also ruins of warehouses on the sand and in the near-shore waters along its entire length. Very little nesting of green and hawksbill turtles has been observed, due to the fact that it is not monitored regularly.



Kay Bay



This is a short, rocky bay on the Caribbean side of the island measuring approximately 200m long. It is backed by a high cliff that has no vegetation cover except for a few Sea Grape trees. Green and hawksbill turtles have been recorded nesting on this beach. The only access to Kay Bay is via private residential properties. The owners of one property report any signs of turtle nesting activity to STENAPA as this beach is not monitored on a regular basis.

Methodology

Pre-Season Preparations

The Sea Turtle Conservation Programme 2008 commenced with the following pre-season activities:

Beach Preparation

To prepare the primary nesting beach for patrols, numbered stakes were positioned at 20m intervals along Zeelandia Beach. These stakes are used to mark the location of all nests or false crawls recorded during day or night patrols. Each stake was placed as close as possible to the vegetation or cliff behind the beach. Stakes remaining from the 2007 season were repainted and any that were missing were replaced.

Training of Volunteers

The materials used for teaching volunteers about the Sea Turtle Conservation Programme were reviewed before the first group from Working Abroad arrived in February 2007. Two short presentations were created; the first was a basic introduction to sea turtles, their biology and nesting behaviour; the second focused on beach monitoring protocols and the correct use of the data collection sheets. Every volunteer received training before assisting with beach monitoring.

Other Preparations

At the conclusion of the 2008 nesting season, the following activities were performed:

New Programme Coordinator

In February 2008 the existing Programme Coordinator Arturo Herrera, announced his resignation from the position. His replacement for the 2008 season was Lee Munson the new Marine Park Manager. Arturo returned to St Eustatius to provide adequate cross over training for the Marine Park Manager prior to the 2008 season.

Monitoring and Research Activities

During the 2008 nesting season several different monitoring and research activities were conducted as part of the Sea Turtle Conservation Programme:

Track Surveys

Daily track surveys were conducted on the primary nesting beach (Zeelandia Beach) and Turtle Beach. Surveys of other beaches were performed weekly or when deemed necessary. These surveys provide data on the temporal and spatial utilisation of previously identified turtle nesting beaches throughout the nesting season. For each track observed the following information is recorded (See example of data collection sheet in Appendix 1):

- Observer – Name of observer recording data.
- Date
- Weather – Brief description of environmental conditions.

- Moon phase – Based on the previous night’s moon; this information is recorded to determine whether there is a relationship between moon phase and emergence.
- Species – If possible to determine from the track.
- Track width – Measured as the straight-line distance between the outer flipper edge marks; taken to the nearest millimetre. For each track the width is measured at three random locations and the average used in analyses.
- Track depth – measured as a straight-line distance from the peduncle or cloacae (if turtle is present to the bottom of the nest).
- GPS location – Measured either at the centre of the nest or at the apex of a false crawl track.
- Locale name – Name of the beach.
- Triangulation measurements to two landmarks – Straight-line distance to the two nearest numbered stakes; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track.
- Distance to vegetation – Straight-line distance to the vegetation behind the beach or to the cliff if no vegetation; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track.
- Distance to high tide line – Straight-line distance to the most recent high-tide line; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track.
- Number of unsuccessful nest cavities – If the turtle made more than one attempt at nesting during the same emergence.
- Result of nesting attempt – Recorded as either lay, probable lay, false crawl (when some nesting activity observed) or track only (no nesting activity at all). A lay can only be determined if the eggs are found or in hindsight upon hatching.

All marked nests were monitored daily and their status recorded; any disturbed or destroyed nests were noted. After the data have been recorded a line is drawn in the sand through both tracks to indicate that it has been registered, ensuring that data are not collected twice for the same track. Surveys were conducted as early as possible in the morning to prevent tracks from being disturbed or washed away. For continuity, and to increase the accuracy of data collection, surveys were conducted by the Programme Coordinator, intern or trained personnel.

Beach Patrols

Nightly beach patrols were conducted on Zeelandia Beach and, when sea conditions permitted, Turtle Beach. Data from previous years show very low nesting densities at other beaches, making it an inefficient use of resources to carry out night patrols at these other locations. Each patrol consisted of a minimum of two people; including the Programme Coordinator, sea turtle intern or Marine Park intern. A stretch of beach approximately 1km in length was monitored on Zeelandia Beach (up to 1.6km when Turtle Beach was included) from the cliffs at the northern end to just south of Smith’s Ghaut. Hourly patrols of this section were conducted between 9.00pm - 3.30am.

The primary objective of the beach patrols was to encounter as many nesting turtles as possible. Apply flipper and/or internal tags as appropriate, collect carapace measurements, mark the location of the nest for inclusion in a nesting success survey and relocate any nests laid in suspected erosion zones. For each turtle observed the following data were recorded (See example of data collection sheet in Appendix 1):

- Observer – Name of observer recording data.
- Date – Patrols span two dates but to avoid confusion the first date is used throughout the entire patrol.
- Time – At the moment the turtle is first encountered
- Weather – Brief description of environmental conditions.
- Moon phase – This information is recorded to determine whether there is a relationship between moon phase and nesting emergence.
- Species – If the turtle is not observed the species is determined from the track, where possible.
- Tag information – See detailed description below of data recorded.
- Activity – At the moment the turtle is first encountered. Classed as emerging, searching, body pitting, digging egg chamber, laying, covering, disguising, gone (used if turtle has returned to the sea).
- Carapace Length – See detailed description below of measurements taken for each species.
- Carapace Width - See detailed description below of measurements taken for each species.
- Parasites/Ectobiota – The presence of any parasites on the turtle are recorded, with a brief description of the parasite; its location is indicated on a diagram on the data collection sheet.
- Injuries – Any injury to the turtle is described and the location indicated on a diagram on the data collection sheet.
- Notes – Any additional pertinent information about the turtle or their behaviour is recorded here.
- Track width – This is only recorded if the turtle is not observed during the patrol. Measured as the straight-line distance between the outer flipper edge marks; taken to the nearest millimetre. For each track the width is measured at three random locations and the average used in analyses.
- Track depth – measured as a straight-line distance from the peduncle or cloacae (if turtle is present to the bottom of the nest).
- GPS location – Measured either at the centre of the nest or at the apex of a false crawl track. When possible this is taken while the turtle is laying, when the egg chamber is open and the exact location of the eggs is known.
- Locale name – Name of the beach.
- Triangulation measurements to two landmarks – Straight-line distance to the two nearest numbered stakes; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track. When possible these measurements are made while the turtle is laying so that the exact location of the eggs is known.
- Distance to vegetation – Straight-line distance to the vegetation behind the beach or to the cliff if no vegetation; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track. When possible this measurement is made while the turtle is laying so that the exact location of the eggs is known.
- Number of unsuccessful nest cavities – If the turtle made more than one attempt at nesting during the same emergence.
- Result of nesting attempt – Recorded as either lay (when the turtle was seen laying), probable lay (if the nest site suggests that the turtle laid but no eggs were seen), false crawl (when some disturbed sand observed) or track only (no nesting activity at all, no disturbed sand).
- Relocation data – If the nest is deemed to have been laid in an unsuitable location which is prone to erosion or flooding the eggs are relocated to a more secure section of the beach. The following data are recorded for this new nest site.

- New GPS location – Taken at the centre of the new egg chamber.
- Triangulation measurements to two landmarks – Straight-line distance to the two numbered stakes closest to the new nest location; taken from the centre of the new egg chamber.
- Distance to vegetation – Taken from the centre of the new egg chamber.
- Distance to high tide line – Taken from the centre of the new egg chamber.
- The number of eggs – The total number of eggs; also recorded separately are the number of yolked and yolkless eggs.
- Time eggs laid – The time the turtle began to lay eggs.
- Time eggs reburied – The time the eggs were placed in the new egg chamber.

All data were collected either while the turtle was laying or immediately afterwards when she was covering the nest site. No turtle was touched or approached before she had started to lay.

Once the turtle had returned to the sea, a line was drawn in the sand through both tracks to indicate to the person conducting the track survey the following morning that data had been collected, preventing data repetition for the same track or nest.

Tagging Methods

Flipper Tags

Metal flipper tags (National Band and Tag Company, MONEL Style #49: WC251 – WC350 and INCONEL Style #681: WE1 – WE100) were donated by the Marine Turtle Tagging Centre, Barbados, which is affiliated with WIDECAS. All tag applicators are inspected and cleaned on a routine basis and replaced when they cease to function properly.

Standard tagging methods are used, based on the protocols of the Turtle Monitoring Programme in St Croix, USVI. For leatherbacks, external flipper tags are applied to the centre of the fleshy skin located between the back flipper and the tail (See Figure 3). For hard shell species, tags are applied adjacent to the first large scale on the proximal part of the front flipper (See Figure 4), where the swimming stroke will cause minimal tag movement (Balazs, G. H, 1999). Tags are applied while the turtle is covering her nest, immediately after she has finished laying eggs. This is done so that the turtle is not disturbed prior to laying. Two metal tags are attached to each turtle, both leatherbacks and hard-shelled species; this is to ensure that even if one tag is lost the individual can still be recognised. External flipper tags were only applied by trained personnel, either the Programme Coordinator, turtle intern or a Marine Park intern.

Passive Integrated Transponder (PIT) Tags

PIT tags were purchased by the Sea Turtle Conservation Programme with funding from KNAP Fund, MINA. For leatherbacks only, in addition to the two external flipper tags, one PIT tag is also applied to each individual. A PIT tag is a small microprocessor which transmits a unique identification number when read using a hand-held scanner. While the turtle is laying, a single PIT tag is inserted under the skin in the front shoulder muscle of the turtle using an applicator (See Figure 3). All leatherbacks encountered were scanned for the presence of PIT tags using an AVID scanner before a PIT tag was inserted, to avoid double-tagging individuals. Only the Programme Coordinator and trained staff should apply PIT tags.

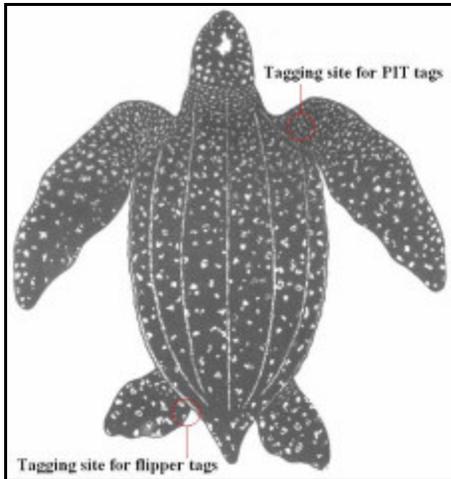


Figure 3. Tagging sites for leatherbacks

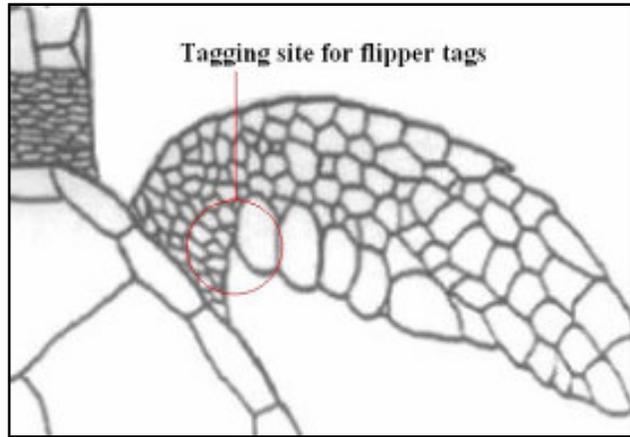


Figure 4. Tagging site for hard shell species

Carapace Measurements

Standard carapace length and width measurements (as of Bolten, 1999) were taken of each nesting turtle encountered, after she had finished laying. Measurements were made using a flexible tape measure. To avoid error, each measurement was taken three times, to the nearest millimetre and the average of these recorded.

Leatherback

Curved carapace length (CCL) was measured from the nuchal notch (the anterior edge of the carapace where it meets the skin) in a straight line to the most posterior tip of the caudal (Figure 5). When the caudal projection is not symmetrical the measurement is made to the longest point (any such irregularity would be noted on the data collection sheet as influencing the measurement). For leatherbacks, measurements are taken just to the right of the central ridge, not along its crest, to avoid errors associated with carapace surface irregularities.

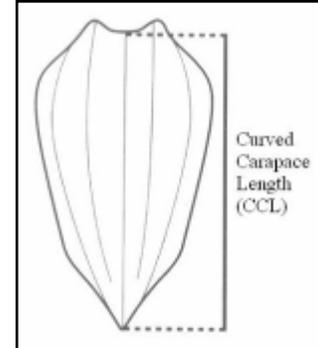


Figure 5. CCL - leatherback

Curved carapace width (CCW) is measured at the widest point, (but there are no standard features delineating the end points) The tape measure passes over the ridges and does not follow their contours.

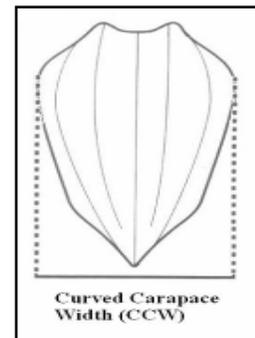
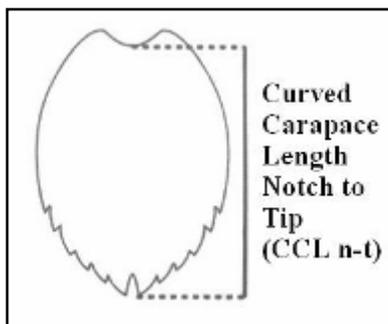


Figure 6. CCW – leatherback

Hard shell species



For green and hawksbill turtles the curved carapace length notch to tip (CCL n-t) was measured. It is measured in a straight line from the anterior point at the mid-line (where the carapace and skin meet) to the posterior tip of the supracaudal scutes (Figure 7). As the supracaudals are often asymmetrical CCL n-t is taken to the longest tip.

Figure 7. CCL –hard shell

Curved carapace width (CCW) is measured in a straight line between the widest points of the carapace (Figure 8). There are no anatomical features marking the end points.

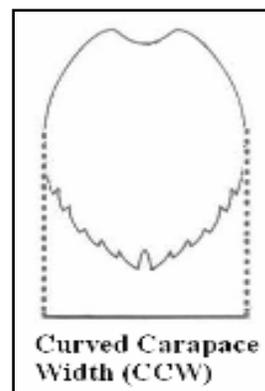


Figure 8. CCW – hard shell

Nest Survival and Hatching Success

All nests recorded were included in a study on nest survival and hatching success. Every day during morning track surveys the status of each marked nest was observed; a record was made if a nest was deemed disturbed, destroyed or washed away. Close to the predicted hatching dates (at around 50 days) the triangulation data were used to mark the site of the egg chamber. To prevent the surveyor having to re-measure the nest each day, a small “V” of sticks was placed on the sand behind the nest site. This area was closely monitored for evidence of hatching; a depression, hatchling tracks or hatchlings. When any signs of hatching were observed the nest was excavated after 48 hours; if no signs of hatching were recorded the nest was excavated after 60 days from the date the eggs were laid. All excavations were conducted by the Programme Coordinator or trained personnel to ensure accuracy of data collection.

If a depression or other sign of hatching was present the excavator carefully dug down at this point until the first egg was encountered; if hatching had not been observed the triangulation data were used to locate the expected site of the egg chamber where digging commenced. Using gloves, the nest contents were carefully removed from the egg chamber and inventoried. The following data were recorded for each excavated nest (See example of data collection sheet in Appendix 1):

- Nest code – Each nest was given a unique identification number.
- Observers – Names of people present during excavation.
- Date – The date the nest was laid; when hatching was observed and the date the excavation was conducted.

- Number of empty shells – Shells corresponding to more than 50% of the egg were counted; representing the number of hatched eggs.
- Number of hatchlings – Hatchlings found in the egg chamber were recorded; dead or alive.
- Number of unhatched eggs – Eggs were opened to search for the presence of embryos and categorised as:
 - No embryo – No obvious embryo present.
 - Embryo – Embryo present; includes all stages of development.
 - Full embryo – Embryo in final stages of development and ready to hatch.
- Number of pipped eggs – Eggs where hatchling had broken the egg shell but failed to hatch; characterised by triangular hole in the shell. Whether hatchling was alive or dead was also recorded.
- Number of predated eggs – If possible the type of predator was noted; often characterised by a circular hole in the shell.
- Number of deformed embryos – Any deformities were recorded such as missing flippers, additional scutes on carapace, albinism or the presence of multiple embryos in a single egg
- Number of yolkless eggs – Small, yolkless eggs were counted separately.
- Notes – Any additional pertinent information was recorded.
- Depth of nest – To the top of the egg chamber (first egg encountered) and the bottom of the egg chamber (after final egg removed); measure to nearest centimetre.

Any hatchlings found alive were released to the sea. When the inventory was complete the nest contents were returned to the egg chamber and reburied.

In-water monitoring of sea turtle aggregations

Surveys were carried out on SCUBA at a number of marked and unmarked sites around the island. GPS coordinates were taken for the start and end points of each survey. For marked dive sites, the start and end points were the same (the location of the buoy) and surveys were carried out along a specified heading, with divers swimming out along one heading and then back along the reciprocal heading about 15 meters away from the original path. For unmarked sites, divers were dropped by boat at one point and swam or drifted in one direction for the complete dive, ending at a different location down current. For surveys of unmarked sites, surface marker buoys were used to allow the boat to follow divers from the surface.

Each survey was carried out with no visual or temporal limit, but dive time was recorded for every survey. Surveys were carried out with 2 observers swimming 5-10 meters apart from one another. Data from every dive, recorded on an underwater slate, included: observers, date, time, weather, sea condition, visibility, and water temperature. For surveys in which turtles were encountered, the following data was recorded for each turtle: species, size, tail length, ectobiota (barnacles, remora, and algae), depth, location (bottom, water column, surface), activity (resting, swimming, foraging), environment (reef, sea grass, wreck), condition (alive, injured, dead), and presence/absence of tags (See Appendix II – Data Sheet). Results were analyzed for catch per unit effort (CPUE), which was calculated by dividing the number of turtles observed (catch) by the cumulative survey time (effort). A spatial analysis was achieved using the GPS coordinates of the surveys—all GPS points were plotted and colour-coded on a map to reveal the spatial distribution of turtles within the marine park.

Beautification and protection of Zeelandia beach

In the last week of January 2008 a life-sized replica Leatherback turtle was built by the Marine Park Rangers Walter “Gadget” Blair and Nadio Spanner. The concrete turtle was produced as part of the Zeelandia Beach Beautification project. The turtle provides a great optical representation of the endangered Leatherback turtle while offering a protective barrier against sand miners wishing to drive on to the beach using that particular access point. It also proves an invaluable tool in training the Working Abroad volunteers and Interns in biometric sampling and nesting protocol.

The implementation of a protective boulder barrier is planned for 2009. It is also planned to continue planting around the main vehicle access points not only to deter sand miners but also to optically enhance the area. This also involves maintaining and cleaning the signs and make necessary replacements.

Education and Media Activities

On June 3rd, 2008 the Marine Turtle Program Coordinator (Marine Park Manager) Lee Munson was invited for a radio interview on the National Parks Foundation radio program “Nature on Statia” to introduce himself and touch on the status of the turtle season. This was a great opportunity to remind the public of the activities of STENAPA, in particular the efforts to reduce the use of plastic bags on the island, invitations to beach cleanups, regulations governing Zeelandia beach and to raise awareness for nesting turtles and hatchlings. Members of the public were encouraged at that time to join STENAPA during these activities to understand a little more about the important nature here on the island.

During the month of July each year, STENAPA has its Summer Club. Children aged 8 to 13 may sign up for the club which includes hiking, snorkeling and turtle education activities. The Summer Club encouraged local children to be more active, while learning more about the plants, animals and marine life that can be found on their island. Summer club is coordinated by STENAPA staff who are assisted by interns and volunteers.

Beach Mapping and Erosion measurements

Zeelandia beach stretching up to Turtle beach is staked out every 20 metres from with posts numbered 1-71. These posts are used to triangulate nests and to describe areas of the beach where tracks are found, or in this case particular sites of erosion. The sand is continually shifting with surging seas and currents. This shift is mapped in turtle nest habitat to identify danger areas on the beach and identify “SAFE” areas that would be best for relocation. The 2008 mapping data is critical in the placement of our experimental hatchery planned for 2009.

Mapping the beach involves making both height and distance measurements. A team of two people measure the distance from the high tide line to each stake using a 90 metre tape. Then using a theodolite mounted on a tripod the height of the stake against the high tide line (sea level) is recorded at every fifth stake. This is best done with one researcher deciding the high tide line (HTL) and the other person reading the theodolite. The researcher on the HTL (marked by highest ocean debris)

stood with an extendable pole, marked in feet and inches. While this was being done the theodolite was placed above the stake (as close as possible as in some places the stake was in the cliff or at an angle making placing the centre of the theodolite base directly above the top of the stake impossible to achieve) and levelled using the adjustable legs on the tripod and the levelling devices on the theodolite head. Once the built in spirit level was set with the bubble in the middle, the lens cap was removed, focussed and a reading at the central cross-hair taken.

The distance between the base of the theodolite and the top of each stake is measured using the plumb line. The distance between the top of each stake and the sand is also measured. By taking these measurements, combining them and then subtracting from the height measurement recorded from the theodolite (which was converted into metres from feet) we achieve the actual height of the beach above sea level (HTL). All data was recorded and logged on a specific data sheet and entered into the computer – averages calculated and recorded.

In 2008 it was decided to include visual support to the numerical data. 6 photos were taken, two up the beach from stake 1, one up one down from stake 51 and two down from stake 71. This data was analysed for the first time by Marine Park Intern Elizabeth Baldwin. Unfortunately the report was not completed. Graphs of sand movement and erosion over the last 3 years have been documented but excluded in this report.

If a significant landslide or cliff fall was encountered during a patrol on any nesting beach, the following data were recorded; the date, time (if known), amount of cliff affected and a description of the damage, including a photograph whenever possible. Areas of sand mining were also recorded and amounts of sand removed estimated.

Community Outreach Events

Raising community awareness of the Sea Turtle Conservation Programme is a fundamental part of the programme. Various activities were arranged during 2008, which are described below:

Beach Clean-Ups

Zeelandia Beach was chosen for Beach Clean-ups as it is the primary turtle nesting beach on the island, and the beach where the majority of the turtle research activities occur. These events were conducted with the aid of staff, interns, volunteers and members of the public. Each clean-up was advertised in advance to encourage participation by the local community. A record was made of the number of participants at each clean-up and the amount and type of rubbish collected. All rubbish was disposed of at the Smith's Gut landfill site. Beach clean ups were also part of the children focussed education programs: snorkel club, Junior Rangers basic (1) and advanced (2).

The annual International Coastal Clean-Up (ICC) event took place in September and provided an excellent campaign to gather members of the public to the beach for a huge clean up. This proved a great platform to raise awareness of sea turtles and how members of the public can reduce littering and help protect these endangered animals.

Media Exposure and Public Presentations

Whenever possible the events of the Sea Turtle Conservation Programme 2008 were publicised in the regional newspaper, STENAPA newsletter, on local radio or via the STENAPA website.

Viewing of nesting turtles and hatchling releases

The approach from 2007 season in generating interest from the local population of St. Eustatius was continued in 2008. The Marine Turtle Program Coordinator spoke with several interested members of the public who were eager to view the nesting activity of a turtle, nest exhumation or a hatchling release. A list of contact numbers was created and termed the “turtle list”. The new approach took on a life of its own and has given a different perspective on turtles on St Eustatius while giving the local community a first hand glimpse of nesting turtles or hatchlings.

Participation in Meetings, Workshops and Symposia

In an effort to broadcast the work of the St Eustatius Sea Turtle Conservation Programme to as wide an audience as possible, the Programme Coordinator tried to attend any relevant meetings, workshops or symposia relating to turtle biology, research or conservation issues. Such gatherings create ideal opportunities to establish regional and international contacts within the sea turtle community; these contacts may provide guidance or support to expand and develop the programme on St Eustatius in the future. The annual WIDECAST meeting is such an example where program coordinators gather from all over the Caribbean to share information on their projects.

Results

Pre-Season Preparations

Beach Preparation

On 18th March, the 2007 Turtle Program coordinator, and Marine Park Manager prepared the numbered beach stakes that were lost after the 2007 season. Thirty-one stakes spanning the entire beach needed replacing. A band of reflective tape was applied to help locate them on the beach at night using a flashlight. Because of the high numbers of missing stakes it was decided that it would be more practical to re-stake the entire beach. The beach was re-staked between the 24th and 25th March by the former and new program coordinators and stakes recalibrated. Over the course of the nesting season only minor losses were recorded due to high tides and beach erosion, these were replaced and if more suitable, rocks were painted to mark the site.

Training of Volunteers

The existing Programme Coordinator conducted the first training session on March 26th. Present were Jessica Berkel, Lee Munson and all interns and Working abroad Volunteers. The training sessions were a combination of in house presentations on sea turtle biology, data collection and safety on the beach followed by a practical session at the beach. The beach session utilized the concrete Leatherback turtle as a dummy for biometrics and a track identification session with triangulation protocol. Each of the three successive groups of Working Abroad volunteers received an identical orientation.

Monitoring and Research Activities

The following is a summary of the data collected during the 2008 monitoring and nesting activities of the Sea Turtle Conservation Programme.

Track Surveys

Daily morning track surveys were conducted from March 13th to November 6th; a total of 238 index beach morning surveys were completed. Zeelandia Beach was always included in the survey; Turtle Beach was included when the conditions allowed, Oranje Bay was surveyed 8 days, Kay Bay 3 days and Lynch Beach was surveyed on 11 occasions during the season. We set up contact with the residents at Kay Bay in order for them to alert the program Coordinator if any tracks were seen on the beach. For the last 30 days surveys were limited to Zeelandia and Turtle Beach as nesting activity had ceased; morning surveys were only conducted to monitor marked nests for hatching activity.

The first track was observed on the 13th of March: a leatherback nest was recorded on Zeelandia Beach. This nest was recorded by Nicole Esteban since no night patrols were being conducted at that time. The last nesting activity was recorded on the 14th of October when a Green turtle left a body pit on Zeelandia Beach.

Three species of turtle were recorded nesting in 2008; leatherback, green and hawksbill. Leatherback nesting occurred from 13 March to 14 May; Green turtle activities (45) were recorded from 26 July until 14 October with only one confirmed nest; 9 hawksbill activities were recorded, 8 April until 10 September. A total of 26 leatherback activities were recorded in 2008, the leatherback nest check list data can be found in Appendix 4. Of these 26 activities, 20 were confirmed nests, 2 were false crawls and 4 were probable nests (Table 1.). For simplicity all probable (unconfirmed) nests and false crawls have been linked as activities and will be described as such throughout this report. It is highly possible that nests were deposited but if we did not observe a turtle laying or find the clutch on excavation then the probable nest has been described as an activity. This classification is more relevant for the hard – shell species where the fate of the nest was very difficult to estimate.

Species	Confirmed Nests	Location of Nests	Number of False Crawls/activities	Location of Activities
Leatherback	20	All Zeelandia Beach	6	Zeelandia North (32) Zeelandia-Turtle beach
Green	1	Kay Bay	45	(7) Kay Bay (1) Bonay Bay (5) Zeelandia
Hawksbill	0		9	(2) Turtle Beach (2) Oranje bay

Table 1. Summary of turtle nesting data collected during track surveys in 2008

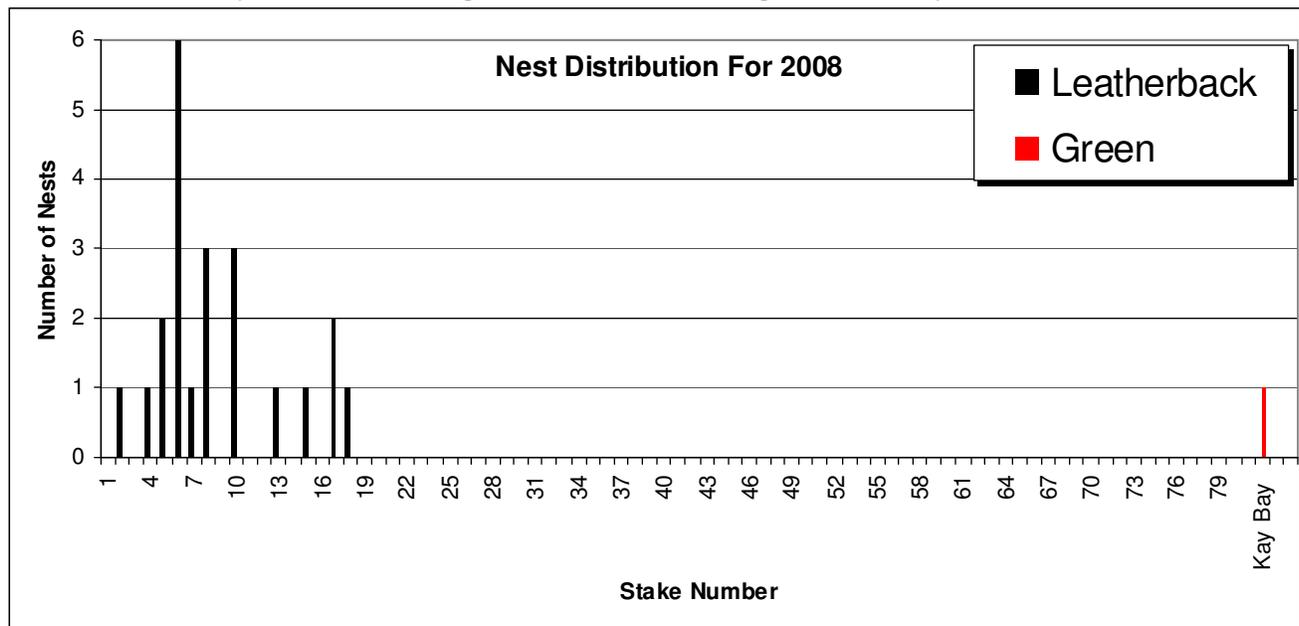


Figure 9. Distribution of nests on St Eustatius Nesting Beaches in 2008

Leatherback nesting activity (confirmed nests, probable and false crawls) occurred exclusively on

Zeelandia Beach between stakes 1 and 17 with the exception of a false crawl at stake 40 (See Figures 9 and 10). In Figure 9, it is interesting to note that stakes 8 to 18 are congruent with the main beach entrances. Furthermore, this area has a high density of light pollution emanating from the oil terminal, and unlike 2007 nesting activities actually occurred here.. Leatherback nesting seemed random across the widest area of Zeelandia North (the area offering most habitat space). This species of sea turtle showed to be the most successful of the nesting species on St Eustatius in 2008. This area of beach is also the most stable throughout the entire season and most accessible from the ocean.

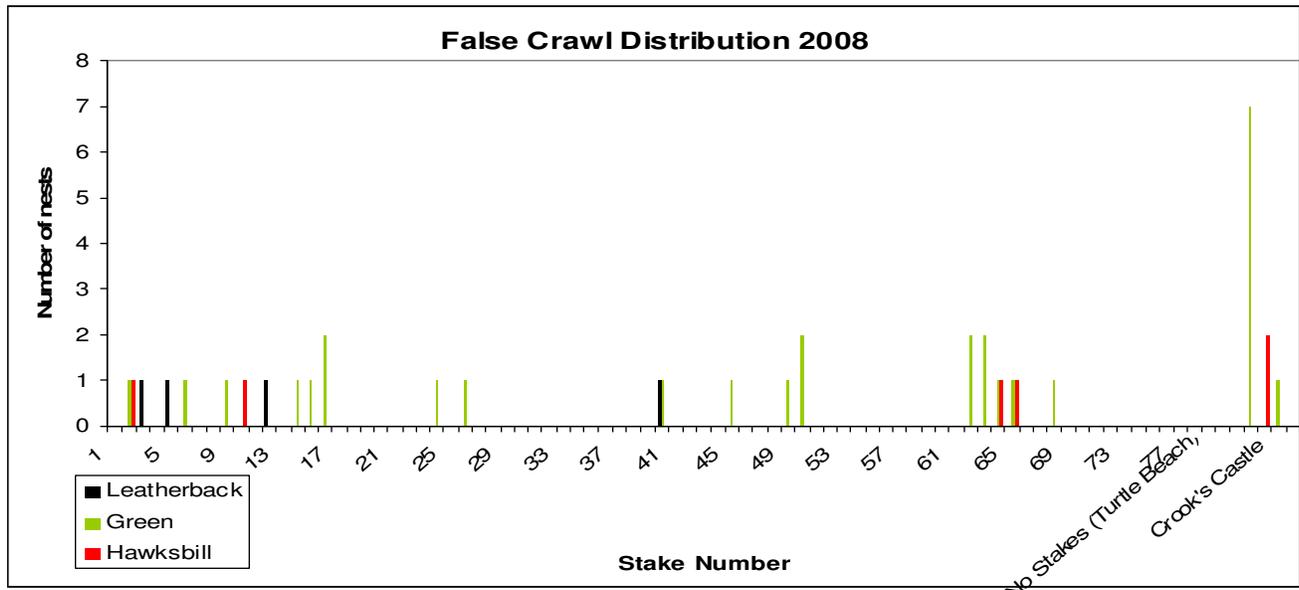


Figure 10. Distribution of false crawls/activities on St Eustatius nesting beaches in 2008

Green turtles showed most activities (45) with many body pits and probable nests observed throughout the season. Position data is only available for 30 of the 46 activities including false crawls, shown in Figure 10. Of these activities, 7 were at Kay Bay, 8 at Zeelandia North, 7 at Turtle beach with the remaining activities scattered over the index beach. It is assumed from the data set that 14 activities were probable lays and 31 were false crawls. The only confirmed green nest occurred at Kay Bay (Figure 9). The species and nest were confirmed only after excavation. Unfortunately due to storms and Hurricane Omar all probable green nests were lost or went undetected during the 2008 season. Patrolling for green turtles and hawksbill turtles was much more labour intensive, showing much variety in nesting preference around the island. Hawksbills showed the lowest nesting activity, just 9 including an estimated four probable lays. Again position data is slightly lacking with only 6 of the 9 activities for Hawksbills documented (Figure 10). Hawksbills and greens seem to access the beach irrespective of the many reef barriers off shore; this is not true of the leatherback that chooses the easy open access beach of Zeelandia South.

Beach night Patrols

In 2008 nightly monitoring of Zeelandia Beach was performed when we expected a turtle (targeted patrols), or when we had a surplus of personnel. This included weekends and in all types of weather. Patrols commenced at 9.00pm and ended around 3.30 am; they were conducted routinely along the entire length of Zeelandia North (stakes 1-25) and to Turtle beach unless rough conditions denied us access along the narrows of Zeelandia central (25-55). Targeted Night patrols were conducted between

24 March and 05 October; patrols ended on this date as no nesting activity had been observed for 20 consecutive days and it was assumed that the season had finished. In total, 74 patrols were conducted with approximately 500 hours of patrol time logged.

Turtles were encountered on 24 of the 74 nights patrolled or on approximately 32% of patrols. Leatherbacks comprised 19 encounters with greens and hawksbills just 5 brief encounters. Of the 19 leatherback encounters 16 resulted in nest observation. The first leatherback was recorded on 13 March, but the first female encountered was on the 23 March. Our first female nested 3 times before the second leatherback (134644547A) arrived on the 3rd of April. The last recorded leatherback was on the 14th of June. No hard shell species were observed nesting at night. The first hawksbill turtle track was recorded by the sea turtle intern on Oranje Bay, during an afternoon survey on the 8th of April but the first observed hawksbill was seen during patrol on the 13 June. The first green activity was recorded on a routine morning track survey on the 26th of July by a previous sea turtle program Coordinator Emma Harrison. The first female green was seen on the beach on four separate occasions during the night of the 6th of August. The last recorded green turtle activity was recorded on a morning patrol on the 14 October.

The times of encountering a turtle at night varied throughout the season. On the 23rd of March, office administrator Jessica Berkel arrived early and noted a leatherback already laying at 21:00. On the 7th of May the sea turtle coordinator accompanied by National Park intern Lindsey Galway encountered a returning Leatherback at 21:10. This turtle had already nested and had been on the beach for at least an hour. Three Leatherback females nested after 02:30 with the latest nest occurring at 02:45 on the 20th of April. This was the latest a turtle was encountered on patrol during the 2008 season. Five leatherback, one hawksbill and five green turtles were encountered during night patrols. On the 6th of August the sea turtle Coordinator accompanied by Marine Park intern Tom Higgins observed the same green turtle on four occasions during the night. It is difficult to estimate the amount of female greens that nested in 2008 because no tags were applied. Looking at the intervals of probable lays (body pits present), variation in nest sites and track width it can be estimated from the activity data that we had a minimum of four female greens.

The average inter-nesting interval for the leatherback was 9.6 days (with a range of 8 – 12 days). Our first female of the season (133663793A) nested 9 times at Zeelandia beach during the 2008 season. 3 of the female leatherbacks skipped a few cycles which could mean that more nests were deposited on neighbouring islands or the eggs had been aborted at sea. On two occasions we had 2 females emerge on the same night. No real nesting habits can be positively determined in 2008 for hard-shells due to the lack of encounters and nesting data.

Visitors were always welcome on night patrols, both tourists and members of the local community. A total of 40 individuals joined researchers in 2008 for a full or partial patrol. These people were mainly tourists, photographers, journalists and some local people. This does not include the public that requested to be called to view a nesting turtle or a release of hatchlings. A list of these viewers was made up and carried on patrol; we kept groups to a maximum of four people with the exception of 16 students from the Caribbean Marine Reserves Programme (part of the Broadreach Programme) that joined for 2 patrols. The island videographer Dwight Barran was also alerted to a nesting female leatherback on two occasions.

Tagging

Of the five individual leatherback females encountered on beach patrols during the 2008 nesting season two were previously tagged. The leatherback turtles that had no tags (PIT or flipper) when first encountered were given two external flipper tags in both rear flippers and a single PIT tag in the right-hand shoulder muscle. No hard shell species received tags in 2008. The previously-tagged turtle (023*359*883) was a returning leatherback that had been tagged in Trinidad and Tobago in 2005. This turtle received two new flipper tags (WC310, WC311) as only one remained on the rear right flipper (YYL624). We also had a returning female that nested here in 2002 and was retagged on the 2nd of June 2004 by STENAPA staff. This turtle (133713290A) nested on the 12th of May and received two new flipper tags (WC347, WC348). A small tissue sample was taken from the rear flipper of each leatherback for future DNA population study analysis.

Carapace Measurements

Standard carapace measurements were taken for each female that was tagged; some individuals were measured more than once, if they were encountered multiple times during the season.

CCL measurements showed a maximum of 7cm of variability between all leatherbacks, with a mean of 154.00cm for the five leatherbacks. CCW varied up to 25cm for all leatherbacks encountered in 2008 suggesting this measurement the most variable; CCW had a mean of 115.3cm across all five females. Note that this report refers to leatherback identification numbers from the PIT tags, rather than flipper tag numbers used as reference in earlier reports.

Turtle Identification Number	Curved Carapace Length¹ (CCL) / cm	Curved Carapace Width¹ (CCW) / cm
133663793A	163.20	121.40
134644547A	151.00	120.00
133922451A	157.00	114.00
133713290A	140.70	104.30
023*359*883	158.00	116.50
Species Mean	154.00	115.3

Table 2. Carapace measurements of all leatherback turtles encountered in 2008.

Nest Survival and Hatching Success

Of the 20 confirmed leatherback nests, 13 were located for inclusion in the nest survival and hatching success study (Appendix 5). The remaining 7 confirmed leatherback nests could not be found and were therefore not excavated. The single excavated green nest at Kay bay was not included in this study. Table 3 provides a summary of the nest survival data obtained from each excavated leatherback nest of 2008; each table details, nest code, turtle identification number, location of the nest, fate of the nest, incubation period in days (if known).

¹ If a turtle was encountered on more than one occasion the average of all measurements taken are shown

Nest Code	Turtle Id Number	Location	Hatched	Incubation / days¹	Date/ Excavated
DC0802	133663793A	Zeelandia	unsuccessful	n/a	12/06/08
DC0804	133663793A	Zeelandia	Hatched	73	6/06/08
DC0805	134644547A	Zeelandia	Hatched	66	7/06/08
DC0808	133922451A	Zeelandia	Hatched	69	23/06/08
DC0811	133922451A	Zeelandia	Unsuccessful	n/a	02/07/08
DC0812	134644547A	Zeelandia	Hatched	72	6/07/08
DC0817	133713290A	Zeelandia	Unsuccessful	n/a	21/07/08
DC0818	133713290A	Zeelandia	Hatched	70	29/07/08
DC0821	023*359*883	Zeelandia	Hatched	n/a	10/08/08
DC0823	133663793A	Zeelandia	Hatched	69	16/08/08
DC0824	133922951A	Zeelandia	Hatched	70	20/08/08
DC0825	023*359*883	Zeelandia	Unsuccessful	66	23/08/08
DC0826	133713290A	Zeelandia	Hatched	n/a	8/7/2008

Table 3. Summary of nest survival data for each marked 2008 leatherback nest.

That (table 3) is raw data, and should be appendicized

The survival of nests varied, but overall was not very high. Of the 13 located and excavated leatherback nests nine hatched or partially hatched (Table 3). The remaining four were completely dead nests and deemed unsuccessful. The remaining 7 confirmed leatherback nests could not be located even after very extensive digging. It is assumed that these nests would have been unsuccessful as no signs of emergence occurred in the immediate area. On the 6th of June 2008 during the excavation of nest DC0804 that hatched the previous night 10 live hatchlings were found in the nest and were released immediately. This nest took 73 days to hatch and only 8 hatchlings escaped the nest, 3 died and 10 were released. This enforces the need to excavate as over half of the live hatchlings in this particular nest were saved by this action. A predicted incubation spreadsheet was made (Appendix 6) and taken to the beach for every patrol containing all nest information and expected hatching dates. Each nest was marked for 60 and 70 days and a close eye kept on the area between these dates. On the 70th day the nest was excavated if no signs of hatching could be seen. For leatherbacks, average incubation period was determined from 8 nests as 69 days. The excavated green nest at Kay Bay could not be determined as no time of nest deposition was recorded.

The depth of nests differed considerably between the three species, with leatherbacks digging deeper nests than either greens or hawksbills; mean depth to bottom of egg chamber was 67.3cm (13 nests) at the time of laying and 77.8cm (5 nests) on excavation for the leatherbacks. The green nest at Kay Bay

¹ "N/A" indicates that the data of incubation was unknown either due to an unknown nesting date or the clutch did not hatch for several reasons described in "Fate of Nest".

measured very shallow at just 47cm. Leatherbacks laid an average of 74 yolked eggs per nest (13 nests) with a range of 46 – 105 eggs, the yolkless eggs amounted to an average of 36 eggs. Mean number of eggs per nest was 115 eggs for leatherbacks, with a range of 81-141 (Table 4). The excavated green nest yielded 116 eggs, none of which were yolkless.

Species	Mean Depth to Bottom/cm	Mean # Eggs / Nest	Mean % Hatching	Mean % Emergence
Leatherback	67.3	115 +60	7.27	41.81

Table 4. Summary of leatherback excavation data from 2008

Leatherbacks showed disturbingly low figures in both hatching and emerging success; hatching success was calculated as the number of hatchlings that made it out of the shell into the egg chamber; emerging success was the number of hatchlings that made it out of the nest. Leatherbacks showed a lower mean success rates from 2007 of 21.16% to just 7.27% hatching success and from 64.58% to just 41.81% emergence in 2008 (Table 4.). The green nest that was layed at Kay Bay, had a hatching success of 22.4% with a high emergence success of 80%. It was noted that this nest had suffered from erosion leaving the chamber dangerously shallow. Being a West facing bay it receives a great deal of sunlight and this had a baking effect on the clutch. Most of the upper level of the clutch showed signs of sun damage with many eggs hard boiled.

When the un-hatched eggs were opened it was found that leatherbacks had a large percentage of eggs with no visible embryo present; these eggs were assumed not to have been fertilised properly or failed to develop. The mean percentage of eggs with no embryo for the 13 excavated Leatherback clutches was 39.1%. The mean percentages of part and full embryo were 14.2% and 7.4% respectively. Several nests contained pipped eggs; an average of 13.5% for leatherback eggs and no eggs showed signs of predation;.Deformed embryos were rare, with just one hatchling from nest DC0811 (133922451A) having a deformed carapace.

Just one Leatherback nest DC0825 (023*359*883) was relocated, due to the likelihood of it being washed away or excavated by sand miners if left in place. This nest was placed between stakes 5-7 high up on the beach in an area thought to be safe. This clutch (119 eggs) yielded just one live hatchling, 72 unfertilised (yolked eggs) and 46 yolkless eggs.

In-water monitoring of sea turtle aggregations

A total of 35 in-water turtle surveys took place in the Statia National Marine Park between January and June 2008. Twenty eight turtles (16 greens and 12 hawksbills) were observed during 23 hours and 59 minutes of dive time, yielding a CPUE of 1.17 within the marine park. CPUE was higher for greens (0.67) than for hawksbills (0.50). CPUE was generally higher outside the reserve (1.25) than inside (1.04), but for hawksbills alone, CPUE was higher within the reserve (0.62) than outside (0.42). For greens alone, CPUE was still higher outside the reserve than inside 0.83 and 0.42, respectively (Figure 1. Appendix 7). CPUE was generally higher on the Caribbean side of the island (1.37) than on the Atlantic (0.7), but for hawksbills alone, CPUE was slightly higher on the Atlantic (0.56) than on the Caribbean side (0.46). CPUE for greens followed the general trend, remaining higher on the Caribbean side (0.89) than on the Atlantic (0.14) (Figure 2. Appendix 7). The majority of green turtles (75%) were between 50 and 100 cm in length, and of the other 25%, 12.5% were 10-50 cm and 12.5%

were over 100 cm. For hawksbills, the size range was more evenly distributed, with 33.3% of observed turtles falling in the 10-50 cm category, 33.3% in the 50-100 cm range, and 33.3% being over 100 cm (Figure 3 Appendix 7). Gender could not be determined for approximately half of the turtles, but of those turtles for which gender could be determined, 87% were female and 13% were male (Figure 4. Appendix 7). The spatial distribution map and coordinates (Figures 5 and 6. Appendix 7) shows more green turtles in the sea grass beds of the harbours and bays on the Caribbean side, in addition to Zeelandia Bay on the Atlantic side, while hawksbills are more spread out over the reefs of the Southern reserve and along the northern Atlantic coast.

Turtle Strandings 2008

On Sunday, the 23rd of March, an Olive Ridley (*Lepidochelys olivacea*) was found dead entangled in a net at Lynch bay by local citizens of Saint Eustatius (Picture 1. Appendix 8). This has been the first confirmed sighting of an Olive Ridley turtle in Statian waters. It appeared that the Olive Ridley died after entanglement in a two meter square drift net. On Monday, the 24th of March, newly arrived Marine Park Manager, Lee Munson, STENAPA employee, Jessica Berkel, and former Turtle Program Coordinator, Arturo Herrera, went to investigate the turtle only to find that someone had taken the shell of the turtle.

A small green turtle was observed by the Marine Park Manager and turtle intern on the 27th of April at 16:00 when returning from a dive. The injured turtle was seen on the surface just outside of the harbour pier and appeared to be stuck on the surface. The top of the carapace was sliced and the left front flipper was missing. While taking a closer look the turtle was able to dive and moved away from the boat. We suspected propeller damage in this instance. On the 28th of April a small (10-50cm) suspected green turtle was found by Alain Bourqui (Scubaqua) at STENAPA reef during a night dive and was described to be cut in half. The turtle was found on the bottom at 18m at the back of the big barge. The Marine Park Manager and the turtle intern were informed the next morning and immediately inspected the site. No turtle was found and it is suspected that the carcass had been taken by a shark during the night. It was strongly suspected that this animal was the one sighted on the previous day and suspected subsequent propeller damage to this turtle.

The Marine Park Manager was contacted on the afternoon of the 6th of July to a stranded Hawksbill turtle just out from the Twelve Guns snorkel site. She was severely tangled in green fishing net with no noticeable lacerations or body damage (Picture 2. Appendix 8). It was strongly suspected that the cause of death was drowning. Her total carapace length measured 75cm with a width of 61cm and a weight of approximately 50kgs. The turtle was recovered using the Marine Park dinghy. This incident highlights the impact of fish net (drifting or while in use) on sea turtles.

On the morning of September 13th, the Marine Park Manager accompanied by a Working Abroad volunteer came across a dead Hawksbill washed up at Lynch Beach (Picture 2. Appendix 8). The animal had an 83cm carapace length and 73cm width. A rough external inspection of the animal was undertaken but no necropsy was performed. The only obvious external injury was at the cloaca, which appeared to have prolapsed (Picture 4. Appendix 8). The animal was taken to Zeelandia for burial and used for Flipper tag training (Picture 5. Appendix 8). The cause of death in this instance is undetermined.

Beach Erosion

Many of the numbered marker stakes were lost during the winter of 2007-2008 due to high tides. Approximately 30 were replaced in March 2008 and the beach re-staked. Stake inventory continued in May and August with the necessary replacements installed. The program extended from just 52 stakes in 2007 to 70 stakes in 2008. This enabled more efficient monitoring of Turtle Beach and the triangulation of activities occurring there. Beach mapping data was collected in March, July, September and October. Data was compared for seasonal changes over the 2008 season.

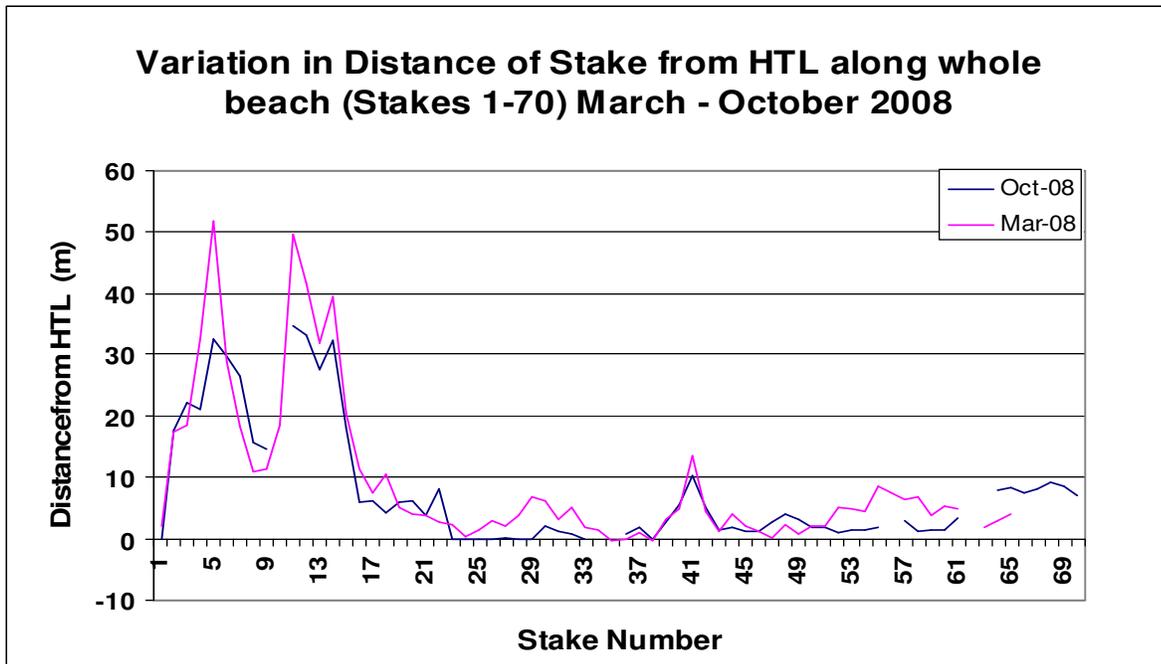
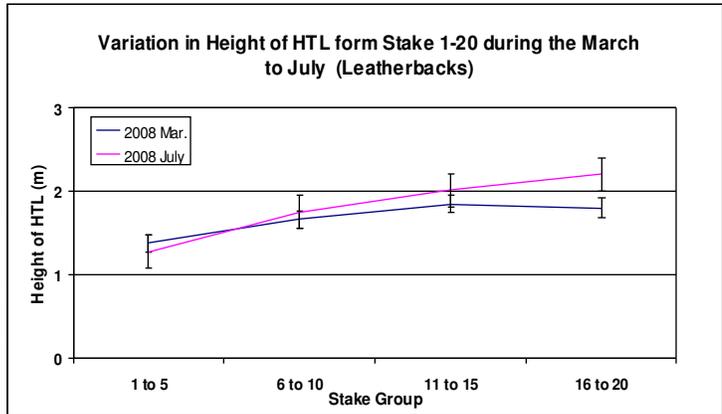


Figure 11. Variation in distance from the stakes to the high tide line from March –October 2008

In 2008 there was a reduction in habitat as the season progressed with practically no viable nesting habitat at Zeelandia from stake 25-55 by late September. The exceptions are high up the beach at Smiths ghaut (stakes 40-44) and high up on Turtle beach (Stake 60-70). The main refuge for turtle nests for 2008 is on the most Northern part of Zeelandia (Stakes 1-20) (Figure 11.). Even this area suffered major changes throughout the season with up to a 20m reduction in beach width from March to October (Figure 11.). The area between stakes 8-15 was subject to flooding during the wet season as was the area between stakes 1-5. Pictures 1 and 2 in Appendix 9 highlight the change at Zeelandia North over the 2008 nesting season.



Picture 1. Flooding 22nd September 2008 **Figure 12. Beach changes at Zeelandia North**

Beach mapping data reveals the stability of the northern section of Zeelandia during the leatherback nesting season. This section of beach remained at least 2m above sea level for the duration which was ideal as nests were up to 0.8m below the surface (Figure 12.). When the wet season begins the beach can be flushed out to sea up to 1 meter, particularly between stakes 8-15 (Picture 1.) and 1-5. Clutches deposited in these areas should be relocated immediately.

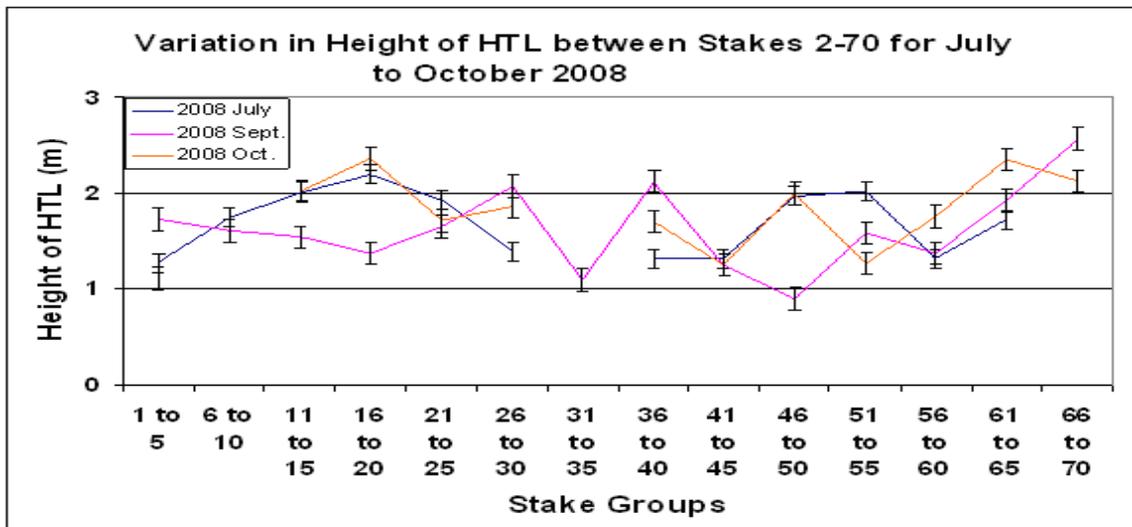


Figure 13. Variation in beach height from stake to high tide mark 2008.

Beach height data was compared for the rest of the index beach from July to October. A mapping session took place in September because intense weather conditions caused a drastic change in the beach. From July to September large quantities of sand are lost to the ocean (Figure 13) Where the July (Blue) and September (Pink) lines cross it is assumed little sand movement occurred and can be deemed as a potentially safe area. The difference of almost 1m of sand height movement is highlighted in the graph between stakes 8-20, 38 and 44-50. This data is critical in highlighting “SAFE AREAS” for the 2009 season for relocation purposes. Turtle Beach seemed to accumulate more sand as the season progressed suggesting that the sand moves in a Southerly direction. During intense storms and hurricanes Turtle Beach was still vulnerable even with 2.5m of sand height above sea level (Figure 13).

Cliff falls



Approximately 18 cliff falls were recorded from April to October. This has a huge effect on nesting as a clutch may become buried and will be unable to hatch. Cliff falls ranged from rubble slides from rain fall to large chunks breaking away from the cliff. On the 16th of July 20 boulders of approximately 1m diameter fell at stake 40. Cliff falls occurred throughout the season with no obvious pattern. Ten falls occurred just north and south of Smith's Gut which made negotiating these areas during night patrols difficult, especially when coupled with strong winds and nightly high tides.

Sand Mining

Sand mining compounds the erosion problem at the northern end of Zeelandia Beach. Despite being an illegal activity it occurred throughout 2008, with one court order issued by STENAPA on the 24th of March. The presence of the turtle patrol on the beach at night dramatically reduces the amount of sand mining. An estimated 20 tonnes of sand had been taken from Zeelandia from the 24th March to 2nd of November 2008. Incidentally there was a nest very close to Stake 14 and a media article was released to highlight this problem. This area should be monitored closely and clutches deposited here should be relocated to the "SAFE AREA".

Zeelandia Beautification-Protection Project

The main objectives of the Zeelandia beautification-protection project are multi-faceted. The primary objective is to deter vehicles from driving on the beach, stop sand mining and prevent further erosion. Beginning in the last week of January, STENAPA staff and interns helped to create a life-sized replica of a leatherback turtle made out of concrete (Picture 5. Appendix 9). The hard-working team was led by Marine Park Rangers Walter "Gadget" Blair and Nadio Spanner. The newly created concrete turtle, along with the existing signs already in place give focal points in different areas of Zeelandia beach while having erosion-preventative plants nearby. The concrete turtle will help enormously with public education and has given rise to future ideas on artistic objects near Zeelandia beach.

In March 2008 a family Friday was dedicated to planting palm trees and yucca plants. Unfortunately this event proved fruitless as most of the plants succumbed to the dry, warm weather and salt spray.

On the first weekend of May 2008 the turtle coordinator arranged for three truck loads of boulders to be placed at the primary entrance point for sand miners. Staff and volunteers successfully placed 9 tonnes of boulders (Picture 6. Appendix 9). The boulders were donated from the construction site near the Botanical garden and were transported by a former STENAPA Ranger.

Community Outreach Events

Summer Club

During July 2008, STENAPA held its second annual Summer Club. Approximately forty children aged eight to 13 signed up for the club which included hiking, gardening, snorkeling and turtle education activities. The Summer Club's turtle education program was held from July 2nd to August 2nd every Wednesday and Thursday and was managed by the sea turtle intern Joe Roche. The Summer Club encouraged local children to be more active, while learning more about some of the plants, animals and marine life that can be found on their island (Picture 1. Appendix 10). The first session involved a PowerPoint presentation on biology, behavior, threats and conservation of Marine Turtles. The second week focused on patrolling the beach, measuring a turtle (using the concrete leatherback) and involved a tagging of a cardboard flipper competition. The third session involved nesting behavior, relocation and identifying turtle tracks. This was emphasized by way of the Ready-Set-Nest game. Students learned how sea turtles nested and details of the hatching process. On the fourth week, students were guided on a snorkel survey to assess the near shore population. The fifth week was allocated for a hatchling release but this had to be switched to a beach clean due to the timing of the nest.

Beach Clean-Ups

Ten beach clean-ups were organised during the 2008 turtle nesting season; every month except for the month of October (due to Hurricane Omar). Seven of these were on 'Family Friday's' which included the participation of Working Abroad volunteers, STENAPA Staff and members of the public. All of these cleanups resulted in the collection of 17 truck loads of rubbish bags removed from the beach. Items of note from these cleanups included a large propane gas bottle, fishing nets, oil barrel, fishing ropes and buoys, as well as several pallets.

In February the Junior Rangers program led by National Parks Ranger Hannah Madden, conducted a huge beach cleanup in Venus bay. A total of 1,649 items were collected, the majority being bottles (531), plastic containers (157), shoes (423) and Styrofoam (888).

On July 25th, BroadReach volunteers, along with STENAPA staff, interns, volunteers and three members of the public joined together in a collaborative effort to clean up Zeelandia Beach.

On the 31st of July the children of Summer Club collected 2 garbage bags of rubbish at Venus bay. During EnviroWeek in the week of October 16th the Junior Rangers, conducted a cleanup on Lynch and Venus Bay. Many island clean ups were carried out by Hannah and local children in our education programs: Snorkel club and Junior Rangers.

On the 20th September 2008, 18 volunteers gathered on Zeelandia Beach to participate in the largest singular most successful worldwide volunteer movement, the Ocean Conservancy's International Coastal Cleanup™ Campaign (Picture 1. Appendix 11). 12 large garbage sacks of itemized plastic, cans, rope, polystyrene and a huge fishing net were collected (Figure 1. Appendix 11). Flyers were distributed in local stores around the island to involve the local community with this cleanup (Figure 2. Appendix 11). The ICC is the single largest one day cleanup event in the USA, and possibly the world. These cleanups occur in 56 countries and over 50 U.S. states and territories. It is hoped that Statia will be able to attract more volunteers for next year and have a larger impact. Local citizens

were encouraged but did not participate much in the 2008 beach cleanups.

Media Exposure

To ensure that the Sea Turtle Conservation Programme reaches as wide an audience as possible, the Programme Coordinator maintained moderate exposure in the press and on local radio programme "Nature on Statia". Press releases were published during 2008 with copies attached in the Appendix. The STENAPA quarterly newsletter included several features including the start of the nesting season, stranded turtles, hatchlings, the ongoing plastic bag campaign and International Coastal Cleanup. (**Error! Reference source not found.**12). Staff were also joined on a few occasions by reporters/dive magazine photographers to witness and photograph a nesting event. The STENAPA website (<http://www.statiapark.org>) has several pages dedicated to the St. Eustatius Turtle Program activities and is updated regularly. The annual reports are also uploaded to the website for public viewing. Other reports, including an in-water population assessment of sea turtle aggregations on St Eustatius conducted in the 2008 season by Marine Park intern Julia Smith provide international exposure for the programme.

In a new phase of media exposure, television was used by STENAPA on local channel 15, a government information service channel. The island videographer Dwight Barran was alerted to the beach on two occasions in 2008 to videotape a nesting leatherback. This footage was used in a documentary about the activities of St Eustatius National Parks. The documentary featured interviews with Nicole Esteban, STENAPA managing director and included activities such as a nesting turtle, hatchlings emerging and beach clean-ups. This local programming resulted in many letters addressed to NuStar Terminals to advise on turtle friendly lighting. Unfortunately, these letters seemed to go unnoticed in 2008 and the marked effects on turtles from the terminal lights continue.

Viewing of Nesting Turtles and Hatchling Releases

In 2008 STENAPA continued generating interest from the local population of St. Eustatius. The Sea Turtle Program coordinator spoke with several interested members of the public who were enthusiastic to view the nesting activity of a turtle, nest exhumation or a hatchling release. The turtle phone was filled with a list of interested people to contact when there were possibilities for seeing turtles. On April 2nd the first opportunity to use this list presented itself allowing STENAPA staff, interns, Working Abroad volunteers, and several members of the public to witness the nesting process of a leatherback turtle. The alerted members of the public were wide ranging from young children to members of the local police force. From this experience, it was decided that future night time nesting viewing be limited to just 4 people to be able to manage them properly and to not disturb the nesting activity. This approach proved a very popular grassroots approach of connecting people with marine turtles and their conservation.

In addition to the alerted viewers mentioned above, 40 islanders and tourists joined the night patrols on different occasions. These guest patrollers were asked to sign a waiver form and were also educated on how to conduct themselves on the beach, safety considerations and what to wear (Figure 1. Appendix 13). In some instances they were involved in our working abroad volunteer presentation prior to the night patrol. These guests included Medical students, dive tourists, reporters and general tourists interested in our program.

Due to the very low hatchling success rate of the 2008 leatherback season only a few local persons along with Working Abroad volunteers, STENAPA staff and interns were able to witness the release

of leatherback hatchlings.

Over 100 members of the public ranging from tourists, STENAPA staff, interns and volunteers, the local police and interested members of the community viewed a hatchling release, a nesting female or both during the 2008 season.

Participation in Meetings and Workshops

The Programme Coordinator/Marine Park Manager, Lee Munson, accompanied by the office administrator/Marine Park Assistant Jessica Berkel attended a Turtle Research and Management techniques Course (Picture 2. Appendix 14) on Bonaire from October 13th – 18th. The course included field sessions to support the classroom presentations and covered many topics from biology and data management to major threats and disease. Dr Robert van Dam was joined by turtle Veterinarian/disease expert Alonso Aguirre, Mabel Nava the Project Director of Sea Turtle Conservation Bonaire (STCB) and volunteers to provide a well rounded course. During the practical sessions expert advice was gained about the issues that the programme faces here on Statia and what approaches can be taken. An experimental hatchery was discussed to address the issue of low hatching success rates and to mark each nest with marked flag tape to aid finding for excavation. As a part of the field sessions turtles from Lac bay were captured and processed, hard shell excavations were performed, a necropsy was witnessed and there was a snorkel expedition where over 50 green turtles were spotted. (Pictures 1 and 3. Appendix 14).

Although there was much to bring to Statia it was decided that an in-water capture and tagging project would not be employed. The delegation from St. Eustatius had already noted that the tagged animals on Bonaire were highly skittish and the saturation of tagged turtles looked extremely artificial compared to the naturalness of Statia. Also, most of our turtles are in the 15-25m depth zone which makes capture much more difficult and dangerous.

Lee Munson, Jessica Berkel and Nicole Esteban attended the WIDECAST Annual General Meeting on St Kitts. This meeting, which lasted from the 18th to the 20th of December, brought together all those in the WIDECAST organization involved in turtle research and conservation to discuss topics that have specific bearing on turtles in the Caribbean. The WIDECAST meeting was an ideal opportunity to forge relationships with other turtle projects, and to establish a valuable network of contacts for future reference. It was interesting to learn about other projects in the region and to learn about the issues they face. On the final day there was an open discussion about many topics and our delegation was able to bring up the issues that are faced here on Statia. It would seem that St. Eustatius has one of the most comprehensive monitoring programs in the region largely because of the ability to monitor very closely our small population. In other areas other programmes can only estimate population numbers through spot monitoring due to very large nesting areas. There was also the chance to broadcast the findings of the St Eustatius Sea Turtle Conservation and Monitoring Programme to interested parties, and to seek guidance about on-going research projects from experienced sea turtle biologists.

No member of staff attended the Annual Symposium on Sea Turtle Biology and Conservation in 2008 which is the largest of these meetings within the field of turtle research. This was due to the fact that the Symposium occurred as the 2007 Turtle Coordinator, Arturo Herrera, was leaving STENAPA, and the new Marine Park Manager, Lee Munson had not yet arrived. As has been the practice since 2004, it is intended that the Coordinator of the St Eustatius programme participate in future years.

Discussion

Pre-Season Preparations

Beach Preparation

The system of marking the primary nesting beach (Zeelandia Beach) with numbered wooden stakes remains the most cost effective method, due to the high probability of losing the markers as a result of high tides and cliff falls outside the nesting season. Stakes are easy to replace or repaint at the start of each season and many get washed up for reuse. Reflective tape is very beneficial and greatly facilitates finding the stakes when measuring nests in the dark. In 2008 it was decided to re-stake the entire beach seeing that over 50% of the stakes were lost. The relocation of stakes must be recorded accurately and documented as such. New GPS measurements should be taken to ensure comparability of subsequent beach mapping data.

Training of Volunteers

A review of the volunteer training materials was undertaken before the arrival of the first group of Working Abroad volunteers in March. All field materials were inventoried for the season, missing equipment purchased and patrol bags were set up. The Programme Coordinator wanted to ensure that everyone involved in night patrol activities was given sufficient training in all aspects of the data collection protocols, both theoretical and practical. It is very important to set out the entire protocol as simply as possible to ensure that staff and interns, who will be assisted by volunteers, will strictly conduct themselves according to protocol to avoid confusion. Safety on the beach was also strictly enforced; the dangers of the sea and falling cliff were highlighted both on the beach and in the classroom. The in-house PowerPoint presentations followed by a practical application exercise at Zeelandia Beach provided the best training in these matters. In 2008 these activities were scheduled on the day after a nesting when possible, to provide the most realistic training. All volunteers showed great excitement and motivation once shown a real track and demonstration with the concrete turtle. The level of training given to all volunteers was adequate for them to be able to collect the required data, as under normal circumstances volunteers were not expected to undertake patrols without the Programme Coordinator or sea turtle intern present. It is suggested that the same training and orientation activities continue in 2009.

New role for sea turtle intern

In 2008 it was decided that more responsibility be given to the sea turtle intern due to the change in staff structure from 2007. The role of sea turtle coordinator was assigned to the new Marine Park Manager Lee Munson. This change in structure meant that the coordinator had only a limited amount of time to spend on the turtle program. It was decided that the coordinator would conduct one patrol a week, with the intern taking the bulk of the patrols. Additional training in tagging methods was provided for the turtle intern who could then perform all the necessary field procedures in the absence of the coordinator. The intern would then guide 4 nightly patrols a week, with the coordinator and other staff and interns patrolling one night each, with the assistance of one volunteer. The intern would also manage data, coordinate the beach mapping project, assist in beach protection and lead presentations and education programs. Unfortunately, due to a variety of factors, the turtle intern left the island half way through the season. Mrs Gerdijanne Leestermaker, a local Dutch woman, was selected and kindly asked to take over from Joe's position. She had learned a great deal while

volunteering and was already assigned the same responsibilities as STENAPA interns. Gerdijanne agreed to take on a partial intern role (no tagging) conducting two night patrols a week and supportive data entry. She proved an invaluable asset in the 2008 program. This change over of the primary researcher had a serious effect on the organisation and fluency of the data set. It is strongly advisable to assign the responsibility of primary researcher to one capable individual in 2009. The issue of trucks continued in 2008 so it was decided that the intern would use the assigned turtle truck for night patrols with the program coordinator using the truck for patrolling and to be on call. It is advisable to carefully select the turtle intern with the above in mind.

Monitoring and Research Activities

Track Surveys

Morning track surveys were completed for Zeelandia Beach every morning throughout the nesting season, as well as weekly checks of the other nesting beaches on the island. They are an effective method for surveying nesting beaches not patrolled at night, to give an indication of spatial distribution of nesting around the island. Similar to previous years, three species of turtle were recorded nesting on St Eustatius; leatherback, green and hawksbill. This method of survey proved the most effective method later in the nesting season as weather conditions and personnel availability denied night patrols to Turtle Beach. Much of the green turtle activity occurred in this area and these morning surveys allowed activities to be documented as this area was often too dangerous to access at night. Two hawksbill activities were noted at Turtle beach, unlike in 2007 where only greens were noted to nest there. In 2008 there was a lot of storm activity and Hurricane Omar which had a significant effect on patrolling the central and Southern stretch of the index beach. This caused huge frustration in monitoring, and evidence that any turtle efforts from stake 25 and beyond would have been lost under these conditions. It is strongly advisable that in 2009 any hard shell nests encountered in this area be relocated. With this in mind, it is proposed that more attention is given to morning track surveys. They should be conducted as early as possible in the day to ensure that all tracks and nests are undisturbed, and carried out as extensively as possible on all identified nesting beaches on the island. They should only be conducted by the Programme Coordinator or trained personnel in their absence, so as to reduce observer bias and minimise data collection errors by untrained observers. Training should be given to the main morning patroller prior to the 2009 hard shell season in locating green and hawksbill clutches from tracks for relocation

Nests and Activities

With exception to the hatched green nest at Kay Bay all confirmed nests (either by visual witness of deposition or successful hatching) were at Zeelandia. In total, nests and activities/false crawls were much higher in all three species in 2008 compared to 2007; 20 confirmed leatherback nests in 2008 compared to just 5 in 2007; One confirmed green nest and 45 recorded activities in 2008, compared to 5 green nests confirmed in 2007. Cross over between the primary researchers allowed for gaps in the data set and it has been assumed that 14 green turtle activities were probable lays and 31 were definite false crawls. Nine hawksbill activities were recorded in 2008 compared to two hawksbill nests in 2007. No nesting trends can be inferred from just a few years of data. Given the long-term life cycle of each of the three species, continued long-term monitoring is essential before any assessments can be made about population trends on the island's nesting beaches. With the implementation of regular surveys throughout the nesting season it will be possible to start between-year comparisons in the future. 2008 was a bumper leatherback season with the highest number of nests over the last four

years. It can also be assumed that we would have had a great green turtle season due to the number of recorded activities. With the arrival of hurricane Omar, strong Easterly winds, and the death of two reproductively sized hawksbill females, the 2008 hard shell season was very disappointing. Relocation of eggs is therefore a critical procedure in promoting the survival and conservation of these species.

As with many locations in the Caribbean, leatherbacks on St Eustatius nest earlier than either of the hard shell species; between March and May, compared to July to November for greens and hawksbills. This allows for hatching to occur before the onset of the hurricane season and a better chance of survival. The first leatherback track was observed on the 13th of March 2008 compared with the 30th March in 2007. It is prudent to have all necessary equipment and a turtle intern in place before the 1st of April and that the intern agrees to a 7 month internship to cover the entire nesting season. The start of the nesting season has occurred around the end of March in most years, and ended with the last green activity on the 14th of October in 2008 compared to almost a month later on the 12th November 2007. A single hawksbill track was observed at Orange Bay on April 8th 2008 but this did not mark the start of the hawksbill nesting season. There was already a hawksbill that had ventured on to Lynch Beach as early as February. With just a few years of data, however, it is difficult to determine a “normal” nesting season for St Eustatius, and so further monitoring is required to create a better evaluation.

No unidentified tracks were recorded in 2008, showing that sufficient training in species track recognition had been received.

Beach Patrols

The 2005 expansion of the night patrol schedule to cover weekends has continued to be successful as several females were encountered on Friday and Saturday nights during the 2008 season. Patrolling should also on occasion include staff of STENAPA so the responsibility is not only held by the coordinator, sea turtle intern, other interns and volunteers. This is especially true during times where the availability of personnel is low.

It is also wise to avoid burn out as highlighted by the 2008 intern, by maintaining a sensible schedule to allow for appropriate rest intervals for the turtle intern. One of the methods to reduce this is to conduct targeted patrols early in the season when it is possible to predict the nesting cycles of the leatherback. It is also advisable to limit the patrol to just one initial walk down the entire length of Zeelandia per night to save energy during the leatherback season and then step up night patrol efforts during green and hawksbill season to include Turtle Beach.

On two occasions, in 2008, a female leatherback was encountered that had already nested when the patrol arrived on the beach. It was still possible to identify each animal before they returned to the sea suggesting that the first patrol covers activity from 20:00. There were three females that nested around 02:30 and one nest occurring past 03:30 that was picked up during the morning track survey. The patrol schedule of one patrol every hour between 21:00 and 3:30, remains effective, and almost guarantees that any turtle nesting during the patrol period will be encountered.

In 2008, there was a three fold increase in visitors to the beach for a partial or full patrol compared with 2007. This brought mixed feelings for the sea turtle intern and the coordinator. On the one hand it is great to educate members of the public to the work of STENAPA and the plight of sea turtles. On the other hand they can become a liability during patrol by affecting nesting (irritating turtles) and

distracting patrollers. Special care must be taken when offering guided patrols to members of the public so as to have no negative effect on nesting turtles. The existing waiver form must be signed by all visitors and a proper briefing given.

Turtle Encounters

Higher number of leatherback females were encountered on night patrols in 2008 than 2007 (5 compared to 3, respectively). Nineteen individual leatherback encounters and 5 brief green and hawksbills viewed amounted to 24 turtle encounters in 2008. This is double that of the 2007 season of just 12 encounters. In 2007, the turtle encounter rate was 10.08% of night patrols whereas in 2008 there was an encounter rate of 32%. This was largely due to the bumper leatherback season but also due to the use of targeted night patrols in the leatherback season. It became obvious during the hard shell season that patrol motivation was greatly reduced due to the low encounter rate. This was largely due to weather conditions denying access beyond stake 25 to Turtle Beach where most of the hard shell activity occurred. The difference in behaviour between hard shell species and the leatherback also became obvious. Hard shells gave the patrol the run around on numerous occasions, with one green turtle emerging four times in one night without laying a single nest. The hard shells seemed very skittish on Statia so the animals were not approached before nesting was attempted and therefore no measurements or tagging was conducted on a hard shell for risk of disturbance. Leatherbacks seemed more decisive in nesting behaviour and, in 2008 it was the most successful species nesting on St Eustatius. On two occasions 2 female leatherbacks emerged on a single night which was good not only for the leatherback but also for morale and education of spectators and patrollers.

Tagging Methods

In 2005 the tagging protocol was changed slightly from 2004; all turtles, irrespective of species, were double tagged with external flipper tags. This practice was used during 2008 and will continue to be used in the foreseeable future, complying with WIDECAST protocols. The reason is to maximise the probability of being able to positively identify the individual if she returned to nest and thus minimising the effect of tag loss. If only one flipper tag is applied, a turtle could be wrongfully categorised as a new recruit if that single tag is lost. Leatherback turtles also had one internal PIT tag inserted, in addition to the two flipper tags. To standardise the protocol, each PIT tag was placed in the right shoulder. Two previously tagged leatherbacks that nested in 2008 could only be positively identified from the PIT tag. One was tagged on Trinidad and Tobago in 2005 and the other a return to Statia from 2004. Both turtles received new flipper tags, even when one tag was present (Trinidadian turtle). These turtles highlight the importance of two flipper tags considering there is often several year nesting intervals and especially the importance of PIT tags. From these two turtles we could also estimate that two flipper tags would last no more than 4-5 years. There is some discrepancy in the data for the flipper tag numbers of the return turtle (133713290A). The left rear flipper has been assigned WC 347 and WC 348 as the right flipper, however, on two occasions the right flipper has been recorded as WC309. Once again, this highlights the benefits of PIT tag use as a reliable ID number, providing a program has the necessary funding to cover tags and a PIT reader. Flipper tagging should be common in practice for 2009 as it allows rapid identification.

Only trained personnel should be allowed to apply tags, either flipper or PIT. This will usually be the Programme Coordinator or a STENAPA intern, preferably the sea turtle intern. The turtle equipment bag should always carry a suitable amount of tagging materials and be completely checked on a daily

basis prior to the patrol. This is the responsibility of the sea turtle intern even if he or she is not on patrol that night.

Tissue Sampling

Tissue samples collected in 2008 were done according to the protocol set forth in Browne. The tissue samples that were collected and preserved in 2008 should be combined with those in 2009 and sent to Barbados for DNA population analysis at the end of the season. The coordinator or intern should be made aware that because of sea turtles being listed on CITES' Appendix I, a proper set of paperwork must be completed before these tissues cross any national borders to be processed. This analysis is very important for assigning a 'fingerprint' to a population from a particular beach or area. It may be the case that our population be part of a larger one composed of neighbouring islands. Collaboration should be part of the 2009 project plan to investigate further these issues and their relevance to our turtle program.

Carapace Measurements

The leatherbacks encountered in 2008 were slightly bigger than those observed in 2007; mean CCL was 1.47m in 2007 compared to 1.54m in 2008 with CCW of 1.15 in 2008 to 1.10m in 2007. Our biggest leatherback (133663793A) had an impressive CCL of 1.63m and a CCW of 1.21m. This animal was the first to arrive and nested 9 times throughout the nesting season. The differences in measurements for this animal were significant with the CCL variation being 7cm, and the difference in CCW is up to 20 cm just for this animal. It is a suggestion that the primary researcher (sea turtle intern) conduct the measuring where possible in 2009 to minimise these differences as these are well above acceptable limits. Once established, a well developed nesting program with reliable data can be analysed in a variety of ways such as for turtle growth rates.

Measurements of leatherback turtles should be taken by two people, as it is difficult for one person to span both the front and rear of the carapace. It can only be stressed that a primary researcher be one of those who conducts these critical measurements throughout the 2009 season. An example of this can be seen in turtle 133713290A, the return from 2004. This turtle had a CCL of 1.44m and CCW of 1.07m in 2004 compared to an average CCL of 1.41m and CCW of 1.04m in 2008. The highest of the 3 measurements made in 2008 were CCL 1.42 and CCW 1.08. This data suggests that the animal had shrunk from 2004 to 2008, however this is highly improbable and it is much more likely a case of observer error this year or previously. Great care must be taken when training volunteers how to take carapace measurements, as this data shows considerable variation in the placement of the tape measure, particularly for CCW.

Nest Survival and Hatching Success

Nest survival was highly disappointing considering all of our efforts over the 2008 season. As such, only leatherbacks were included in this study. Out of the 20 confirmed nests, only 13 could be located for excavation purposes. 7 confirmed nests are assumed to have not hatched and can only be denoted as unsuccessful nests. It is strongly suspected that errors were made in marking the nest. Variations in measuring practice including tightness and placement of the tape, varying wind conditions, dark sandy conditions and distance from the stake can all play a role in accurately marking the nest. This is something which must be addressed for the 2009 season. Enhanced locating practices of confirmed nests and enhanced relocation of vulnerable nests must be employed to prevent the loss of clutches and uncertainty in hatching success. It is suggested that a third measurement to a nearby fixed structure be

made for 2009 with an accurate drawing made on the back of the data sheet. A small piece of flag tape can also be inserted in to the nest, with details marked on it for future reference.

Of the 13 located and excavated leatherback nests, only nine hatched or partially hatched, while the other four were deemed unsuccessful. Leatherbacks demonstrated a worryingly low mean hatching success rate in 2008 from the 2006/2007 season of just 7.27% from 21.1% and 21.6% respectively. A decrease in emerging success was displayed from 64.58% in 2007 to just 41.81% in 2008. With the integration of the 7 lost confirmed nests deemed unsuccessful, the 2008 overall mean hatching success would be an incredibly low 4.72%. This is comparable to the 2005 season of 3.5%.

Many of the excavated eggs were found to be without an embryo, with a low of 60% in one nest and an average figure of 40%. This data could suggest problems in reproduction, fertilisation or development. Twelve of the 13 excavated nests did have at least 2 embryos present suggesting fertilisation of all 12 clutches. No trend in hatching success as the season progressed could be determined.

These disappointingly low success rates must be addressed in the 2009 program. By relocating at least 50% of 2009 nests to the safest possible area of the beach an attempt can be made to reduce the negative influences such as swash, flooding and washed out clutches. An experimental hatchery should be a focus in 2009 to see if any impact can be made on these low success rates. It would also be interesting to collaborate with the St Kitts program to provide insight on the issue of low success rates, and perhaps enhance survivability in the region. Discussions with the manager of St Kitts turtle program suggested success rates of 70% and higher. They also have white and dark sand beaches, which have potential for some interesting comparable data in the future.

Relocation of clutches should be a standard process while on night patrols, with the reliable leatherback as an optimal focus species for a hatching success study. Just one nest was relocated in 2008. It was placed in the "SAFE AREA" between stakes 5-8 just below the vegetation line. Unfortunately, this clutch yielded just one live hatchling and contained 70 eggs with no embryo. This raises the question whether the act of relocating the eggs was to blame; perhaps if the clutch was untouched and left in the sand mining area it may have hatched more successfully. Special care must be taken when relocating a nest to minimize the potentially negative effects of human interference. The best measure to control for this is to have only trained personnel allowed to undertake this procedure.

Although emerging success decreased markedly from the 2007 season, the high number of nests is a promising sign. Our data indicates that numbers are usually low, however the inception of this conservation programme is relatively recent and it will take several more seasons and raw data to make a more accurate assessment of the success of leatherback, green and hawksbill nests in St. Eustatius.

In-water Turtle Sightings

Comparisons of Catch Per Unit Effort (CPUE) in different areas of the marine park illustrate the varying distribution of greens and hawksbills around the island. Hawksbills are most common around the Southern Caribbean and Northern Atlantic reefs, whereas greens are virtually absent from the Atlantic side and reside almost exclusively in the well developed harbours of the island (Oranje Bay, Tumble Down Dick Bay and Jenkins Bay). This distribution pattern is indicative of the different

foraging requirements of the two species. Hawksbills feed mainly on sponges, soft-bodied invertebrates, and other reef-dwelling creatures, whereas greens feed primarily on sea grass such as *Thalassia* spp. (Sybesma 1992). Because the reserves are set up mainly around coral reefs, hawksbills are much more common in those areas than greens, which reside in the less protected sea grass beds of the harbours.

The differing CPUE is reflected on the distribution and topographical maps (Appendix 7), which not only shows the different habitats of greens and hawksbills, but also reveals turtles to be generally more concentrated along the Northern and Western coasts of the island while virtually absent from the entire Southeast coast. The areas where turtles are most common are also the most developed parts of the island, there is virtually no development and very little boat traffic along the South-Eastern coast of the island and no turtles were observed at any of those sites. Foraging aggregations of green turtles around Statia are at a slightly higher risk than hawksbills because they so often reside in busier, less protected parts of the marine park. This was proven at the end of April with the loss of a small green from suspected propeller damage in the harbour.

Catch Per Unit Effort for the two species in the Statia National Marine Park (0.67 for greens and 0.50 for hawksbills) is comparable to CPUE of those species in other marine parks in the Caribbean, but those values are often highly variable for a number of reasons. Surveys targeted at areas already known to be dense foraging grounds will obviously yield a higher CPUE, and in many shallower locations on other islands, in-water capture is carried out as part of the survey, thus altering the methodology as well as the resulting CPUE. In a case study at Kuna Yala, Panama, CPUE for hawksbills was as low as 0.14, compared with other surveys in Dominican Republic and Puerto Rico, which yielded CPUE as high as 3.4 and 4.7, respectively (Diez et al 2002). The CPUE calculated for the turtles in Statia will most likely be more useful for comparing surveys in future years of the same areas using the same methodology rather than between other islands using different survey methodologies.

Size and gender data reflect healthy, stable foraging aggregations around the island. Most foraging green turtles in the marine park are juveniles and sub-adults (less than 1 meter in length), whereas the aggregation of hawksbills include more resident foraging adults and is more evenly distributed among age classes. Because tail length was used to determine gender, only the largest turtles could be properly classified. In the future, a better method for identifying gender in juvenile turtles would be useful to get a better idea of the gender composition of aggregations on Statia. Concentration of juveniles and sub-adults found in the surveys likely indicates a stable future population for both species within the marine park, but should be monitored closely in order to compare data between years. Capture and in-water tagging has been agreed by many researchers as not necessary and an impractical approach for St Eustatius.

Beach Erosion and protection

Erosion continued on Zeelandia Beach in 2008, and analysis from the beach mapping data was done this year. Erosion was exacerbated by several large cliff falls throughout the nesting season (April - October). These are not only extremely hazardous to researchers but also a risk to turtles and nests close to the cliff. Ten of the 18 cliff falls were near the landfill site at Smith's Ghaut. Heavy machinery is regularly used to compress rubbish at the site making it feasible that the vibrations of these machines, in conjunction with heavy rain weakening cliff structure, could cause the cliff to give way. The accumulated boulders from cliff falls also denied access to Turtle Beach on many occasions,

so often no nightly patrol could occur beyond stake 35. This proved very frustrating knowing that green and hawksbill turtles could emerge and go undetected, untagged, and the fate of any nest would remain unknown.

The execution of the Zeelandia Beach Beautification Project should continue in the coming years. A proposed second phase would be to replace plants that have surrendered to the weather on the beach, as such plant species that are resistant to salt blasts and hot temperatures are perhaps better suited to this environment.

Another compounding factor affecting beach erosion in one particular section of Zeelandia Beach is sand mining. Despite laws passed against it in 2001, sand mining still occurs regularly on Statia, as sand remains an essential commodity in local construction. Most sand is taken from behind the beach, in a gully that has been created from storm water run-off. This is close to the main public access at the north end of Zeelandia Beach. Some sand, however, is still being taken directly off the beach in front of stake 14, as it was possible to drive a truck on the sand. Only through improved enforcement of regulations can the situation improve. Several members of STENAPA staff were sworn in as Special Agents of Police in September 2006 after completing a training course in December 2005 and this status gives them authority to issue a summons to people who are in breach of environmental laws on St Eustatius. Hopefully, with additional personnel to assist them, the police will be better able to control these illegal activities. A recommendation for 2009 is to monitor sand mining activities more comprehensively, particularly in months outside the nesting season when it is known that STENAPA personnel are not actively patrolling Zeelandia Beach and mining has been observed to intensify. The STENAPA truck could be parked near the concrete turtle during some night patrols where it is not easily seen to outwit potential violators. This tactic could also be employed for violators joy riding on the nesting beach in our supposed absence. In 2008 an effort was made to combat vehicle access to the main nesting beach by way of a barrier of large boulders. Although a good move towards a solution, it proved not enough as another 3 access points were opened up and used. New ideas should be tested in 2009 in an attempt to keep vehicles off the nesting beach.

In 2008, further detailed investigations were conducted on the extent of beach erosion on the index beach. These studies were complemented by photographic documentation of the beach, which showed major sand deposition and erosion during the year. The findings from these surveys were presented in an unfinished report aimed at comparing rates of beach erosion over the last three years. It is recommended that this report should be finalised in the summer of 2009, along with a complimentary water table survey. We can observe beach depth from the theodolite data but this should be backed up with direct water table sampling. The beach mapping data of 2008, in collaboration with photography, cliff fall documentation, sand mining locations, and beach flushing areas suggests the optimal “SAFE AREA” on the beach for the entire duration of the 2008 season to be between stakes 8 and 10, high on the beach, and situated between the concrete turtle and the signed public access area.

SAFE AREA, Experimental hatchery

Turtle Beach is subject to complete inundation by waves during strong storms and hurricanes as well as small cliff falls, as such any nests laid in this section of the beach should be relocated. The same is true for central narrow areas of the index beach with added potential for cliff falls. The exception to this area is between stakes 40 and 44, where the ghaat provides an expanse of beach that has potential to host nests but may be subject to flooding from rain run off. The area around stake 14 is frequently

subjected to sand mining influences and the area from 11-15 faces massive wash out from rain in the wet season. This is also true low on the beach from stakes 1-5 where a waterway deposits large quantities of rainwater. Strict efforts should be made to relocate all affected nests to this “SAFE AREA”. This is also a great opportunity to conduct an experimental hatchery to possibly address the issue of low hatching success at our nesting beach. It is advised to provide barriers to the hatchery and mark and date nests on the surface to avoid digging up old nests in such a small area. It has also been observed that limited sand mining has occurred in this proposed area, and this must be seriously addressed in 2009.

Community Outreach Events

School Activities

Schools continued to support the Sea Turtle Conservation Programme during 2008, with some students participating in Junior Rangers, Snorkel Club, beach cleanups and STENAPA Summer Club. There is still opportunity for more students to become actively involved in other aspects of the programme. Principals and teachers were extremely supportive of all involvement with the programme, facilitating the activities whenever possible. Students enjoyed the activities, and appear to be retaining the underlying messages about turtles’ biology, potential threats and the reasons for conservation of the species.

The Junior Rangers learned a vast amount about the life cycles of sea turtles and the threats they face in each stage. Furthermore, they learned they could make a difference in a turtle’s life by not littering in the marine or beach environment, and by reducing possible hazards they face. We hope to encourage children to become more active in environmental issues; both at the present and in the future.

STENAPA hopes that in 2009 there will be further involvement of students in research and monitoring activities. One suggestion is to take small groups of students on partial night patrols whenever possible. This would require careful organisation, planning and supervision, but the impact that would be achieved by having students witness a turtle nesting would be overwhelming. One possibility is to use the Junior Rangers Program as a test for this idea over the course of a weekend. Another possibility is to have students participate in early morning survey patrols to search for emerging nests. The benefit of this would be that it is easier to arrange than a night-time activity and at the same time it affords an opportunity to see another aspect of a turtle’s life cycle.

Hopefully a continued effort to teach about sea turtles will furnish students with a better awareness of the marine environment and a deeper understanding of the need to protect natural resources. It is also hoped that they will appreciate what nature has to offer in general, and how they can be personally involved in conservation initiatives on their own island.

Beach Clean-Ups

Regular monthly clean-ups of Zeelandia Beach were organised by the Marine Park Manager during the 2008 turtle nesting season. Beach cleanups were carried out by the MP Manager, STENAPA staff and interns, Working Abroad volunteers, local citizens and BroadReach volunteers. A total of 17 trucks full of rubbish bags were removed, including a large gas bottle, fishing nets, an oil barrel, fishing ropes and buoys, and several pallets. Local citizens were encouraged but did not participate much in the 2008 beach cleanups. Seven extensive beach clean-ups were conducted on Zeelandia

during Family Friday, a volunteer activity that includes STENAPA Staff. Between 1-2 truck loads of rubbish were gathered on each event and deposited at the landfill at Smith's Ghaut. On the 25th of July, students of the Broad Reach program assisted by collecting 8 garbage bags of rubbish from the islands beaches. On the 31st of July during the summer club program local children gathered 2 garbage bags of rubbish at Venus Bay. During EnviroWeek (16th October), the Junior Rangers, led by National Parks Ranger Hannah Madden, conducted a cleanup on Lynch and Venus Bay. Many island clean-ups were carried out by Hannah and the local children in our education programs; Snorkel club and Junior Rangers.

The September cleanup coincided with Ocean Conservancy's International Coastal Cleanup™ Campaign on 20th September. 12 large garbage sacks of itemized plastic, cans, rope, Styrofoam, and a huge fishing net were collected. Volunteers recorded specific types of marine debris found, which allows The Ocean Conservancy to compile, analyse and track this data year-by-year and make discoveries about the behaviours that cause the debris. Styrofoam was in abundance in most of our beach cleans and continues to be a major polluter on the island as most take away food is sold in containers made from it. The International Coastal Clean-up campaign should continue in 2009 with STENAPA being the local country coordinator. The clean up for October was omitted due to the conditions left by hurricane Omar. One idea for 2009 is to carefully label items of rubbish and deposit them at the dump site. Over time it might be possible to measure the rate at which these items make their way to our index beach once recovered during a beach clean. This could provide crucial evidence and data for supporting a new method of waste management on the island.

To encourage the participation of the local community in the clean-ups in 2009, the Programme Coordinator hopes to improve notification of clean-ups, possibly by publicising events in the local press or announcing them on the radio. The coordinator also plans to approach large employers on the island, such as the oil terminal, to seek their support for such activities, either by donating man-power or resources. In relation to beach clean-up activities, with respect to general waste management on the island, it is vital to try and raise awareness in the community about recycling, and reducing waste as well as promoting reusable materials and best practices.

One troublesome issue on the island is the Smith's Ghaut landfill site, which occupies an area that empties directly onto the beach and subsequently the ocean. It requires immediate and drastic attention because if an alternative solution is not found quickly, it could rapidly become an uncontrollable disaster. STENAPA continues to alert the Island Government to this environmental hazard with regular letters about the landfill.

Other Campaigns

In 2008 the "Ban Plastic Bags" campaign was pushed another step forward with our sea turtle volunteer/intern Gerdijanne Leestermaker distributing STENAPA produced Eco bags to many retail outlets on the island. During the summer of 2008 Gerdijanne encouraged retailers of the island to stock Eco bags on credit and for them to encourage a switch from plastic bags. This movement has had a serious knock-on effect throughout the island. Some positive impacts to date have been retailers banning plastic bags at many outlets, the depletion of the STENAPA stock of Eco bags, as well as a huge island campaign broadcast on Statia TV. This campaign has taken off and the island electricity producer GEBE, has launched a campaign supplying recycled bags. They advertise that by using their reusable bag twice a week for two years, 1664 plastic bags will be saved from use (www.onebagatatime.com). This is obviously a great sign of the movement to a greener Statia.

Three detailed letters were sent to NuStar Terminals by the Marine Park Manager/Sea Turtle Coordinator requesting possible alterations in their lighting practices. The presence of the bright lights have a disorienting effect on nesting sea turtles and their hatchlings at the northern end of Zeelandia Beach. Unfortunately none of these letters were addressed seriously, leaving this battle to be continued in 2009. Light pollution is not limited to the terminal, as other dwellings should be encouraged to change current lighting to reduce impact on the nesting beach.

Funding for the upcoming three years was also applied for by the Marine Park Manager from NFWF. Unfortunately, this application was unsuccessful but very useful for subsequent applications as it is quite time consuming.

Media Exposure and Public Presentations

The Sea Turtle Conservation Programme was featured in regular articles in the local press, television and on the radio in 2008. The STENAPA quarterly newsletter included several features about the research activities conducted in 2008 and the new website contains several pages dedicated to the programme. The island videographer Dwight Barran was alerted to the beach on two occasions to videotape a nesting Leatherback for local television. We were also joined on a few occasions by reporters/dive magazine photographers to witness and photograph nesting events.

It is important for all significant events to be broadcast to the local community to ensure that they remain fully informed about all the work being achieved by the St Eustatius Turtle Programme. In addition, any activities that allow the results of the monitoring and conservation programme to be published locally should be encouraged. These include public talks or presentations with different sectors of the community, such as church groups.

The STENAPA newsletter and website provide an ideal forum to reach international audiences, and inform them about the work of the St Eustatius Turtle Programme. The website in particular is a great medium in which to inform the wider public about the work being done for sea turtle conservation on St Eustatius, as it can be regularly updated with news, research activities and data.

Participation in Meetings, Workshops and Symposia

Participation in local, regional and international events is important for the work of the Sea Turtle Conservation Programme on St Eustatius to be recognised within the wider sea turtle conservation community. This past year we were able to participate in several of these local and regional meetings.

The annual International Sea Turtle Symposium is an ideal forum to exchange information with leading experts in all fields of sea turtle biology and conservation. The WIDECASST meetings traditionally held at the symposium bring together a majority of the current sea turtle projects in the Caribbean. Unfortunately we were not able to send a delegate to this meeting this year as it took place in Australia, and the travel costs were prohibitive. As many of the projects in the region found themselves in a similar situation, a regional meeting was held in St. Kitts which the STENAPA manager, turtle project coordinator and office administrator attended. These meetings facilitated contact with other turtle conservationists and research organisations from the area, and served as a perfect arena in which to develop and maintain regional contacts. The affiliation that the St Eustatius Turtle Programme has with WIDECASST is beneficial as it provides this small island with access to

more established projects who can share their experiences and expertise. It is hoped that the programme coordinator can continue to attend the symposium, and it is anticipated that as the St Eustatius Turtle Programme develops, we will be able to present more of our research findings at this important event.

The current and incoming coordinators participated in Bonaire Sea Turtle's week-long techniques for manager's programme. This course allowed for the acquisition of new skills and information beneficial to the programme. Furthermore, it was an opportunity to disseminate information about our project to researchers working in the region, and important international contacts were made. Upon return from this training course, it was decided that in-water capture of sea turtles would not happen on Statia as we are presented with logistical problems not encountered in Bonaire.

Technical Reports

The publication of technical reports, manuals and articles are a necessary element to the progress and establishment of the sea turtle conservation programme.

A report on the in-water monitoring of sea turtle aggregations in St Eustatius National Marine Park was completed by Marine Park intern Julia Smith in the summer of 2008. The 20 page report can be found in the downloads & links section on the STENAPA website.

A beach erosion and habitat mapping project to analyse the movements of sand over the last 3 years at our index beach was set up for an intern. Unfortunately due to time constraints, this report was left unfinished. Valuable analyses were conducted and have been employed in this report. It would be beneficial that this project be completed in 2009 with data for the last 4 years compared as this information can provide insight to the suitability and stability of our index beach for nesting.

Recommendations for 2009

Several recommendations are proposed for the St Eustatius Turtle Programme in 2009; these suggestions are given following an assessment of the achievements and deficiencies of the project in 2008. Many recommendations have been mentioned previously in the relevant section of the discussion; however, other more personal recommendations are listed below.

It is recommended that a dedicated and experienced Sea Turtle Intern be appointed for 2009 to aid the Programme Coordinator. This intern will be critical to the project and take much responsibility and it is suggested that adequate compromises are made to ensure the intern stays well motivated for the entire season. The loss of the 2008 intern had a massive effect on the program, as the already stretched Marine Park Manager/Turtle Coordinator had to pick up the slack. For the 2009 season it is recommended that the intern focus on the experimental hatchery, water table/beach erosion and mapping project and beach protection/beatification. Data from the hatchery should be analysed for hatching success and compared to data from St Kitts. If the hatchery is successful, this procedure should become standard for the Sea Turtle program. It is important to develop new research projects every year to keep the program developing.

It is suggested that the Marine Park Manager should not be the turtle coordinator in 2009. To manage the Marine Park effectively and run the turtle program to its fullest proved to be too much responsibility. Priorities were given to the Marine Park in 2008 with the turtle program suffering slightly and the report finished in an untimely manner. It is recommended that the data and report be worked on continuously to prevent a backlog of work at the end of the season. It is essential the project has one primary researcher for the entire season who can manage the data throughout. This will assist in avoiding researcher error and standardising the data set. The loss of turtle intern and reduced coordinator involvement exacerbated this problem this season. This had to be addressed with most data re-sorted and filtered by the Marine Park Manager prior to writing this report.

Acknowledgements

The project recognises the continued assistance of STENAPA staff and board members, without whom it could not continue its research and conservation efforts.

The intensive monitoring schedule could not be accomplished without the hard work and dedication of STENAPA interns, international Working Abroad participants and local volunteers.

We received financial assistance during 2008 from the Travel Committee of the International Sea Turtle Society, USONA, Working Abroad and the World Turtle Trust; these awards and donations covered operational expenses and travel costs to participate in international meetings and symposia. .

The project also recognizes Arturo Herrera, previous Sea Turtle Programme Coordinator, for his training of the 2008 coordinator and continuous support throughout the year, as well as review of this report. Jessica Berkel, Micah Herriot and Nicole Esteban also assisted reviewing and editing this report..

For her guidance and continued support of the St Eustatius Turtle Programme in her role as WIDECAST Director, we would also like to thank Dr Karen Eckert.

Special thanks to Dr Jan and Corrie van Duren, for their assistance in monitoring Kay Bay.

Special thanks must also go out to Gerdijanne Leestermaker who spent countless nights and mornings in the field, conducting data entry and supporting the coordinator in the absence of the turtle intern. Her support on the plastic bags campaign should also not go unnoticed or unrecognised.

Thanks to Joseph Roche our second sea turtle intern for his dedication to the leatherback season and many nights patrolling.

Further thanks go to marine park intern Julia Smith for organising survey dives and writing the In-water monitoring of sea turtle aggregations in St Eustatius report. Data from this study is presented in this report.

Final thanks go to Elizabeth Baldwin for her work on the Beach Mapping project, on the beach collecting data, as well as analysing and producing a review of beach profiles to show seasonal change. The data from this project is presented in this report.

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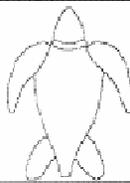
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Appendices

Appendix 1 Data sheets

Tagging and Nest Location Datasheet

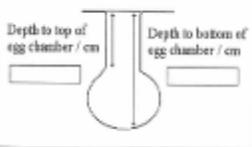
Record Number:	Date:
Observer(s):	Time:
Weather:	Moon Phase:

TURTLE IDENTIFICATION, SIZE AND HEALTH	
Species:	PIT Tag:
Tagged before: YES/NO	Tag Location:
Flipper Tag(L):	Circle Activity: Emerging/ Body Piling/
Flipper Tag(R):	Digging Egg Chamber/Laying/ Covering/
	Blowing/ Excavating/ Crawling
Carapace (L):	Carapace (W):
Carapace Damage:	
	Parasites/Ectoparasites:
	Injuries:
Notes:	
IN ABSENCE OF TURTLE	
Track Width (M):	

NESTING/SIGHTING INFORMATION		
Please Circle One: Relocated/ Natural	Triangulation (M)	
Longitude (W):	Landmark 1:	
Latitude (N):	Landmark 2:	
Locality Name:		
Nest Depth:	Nest Width:	
Highwater (M):	Vegetation (BT):	
Unsuccessful Nest Cavities:		
Result (please circle): Lay / Probably Lay / Dry Run / Track Only		

NEST RELOCATION INFORMATION		
Total Number of Eggs:	Normal:	Yolkless:
Time Laid:	Time Removed:	
Time Reburied:		

Nest Excavation Datasheet

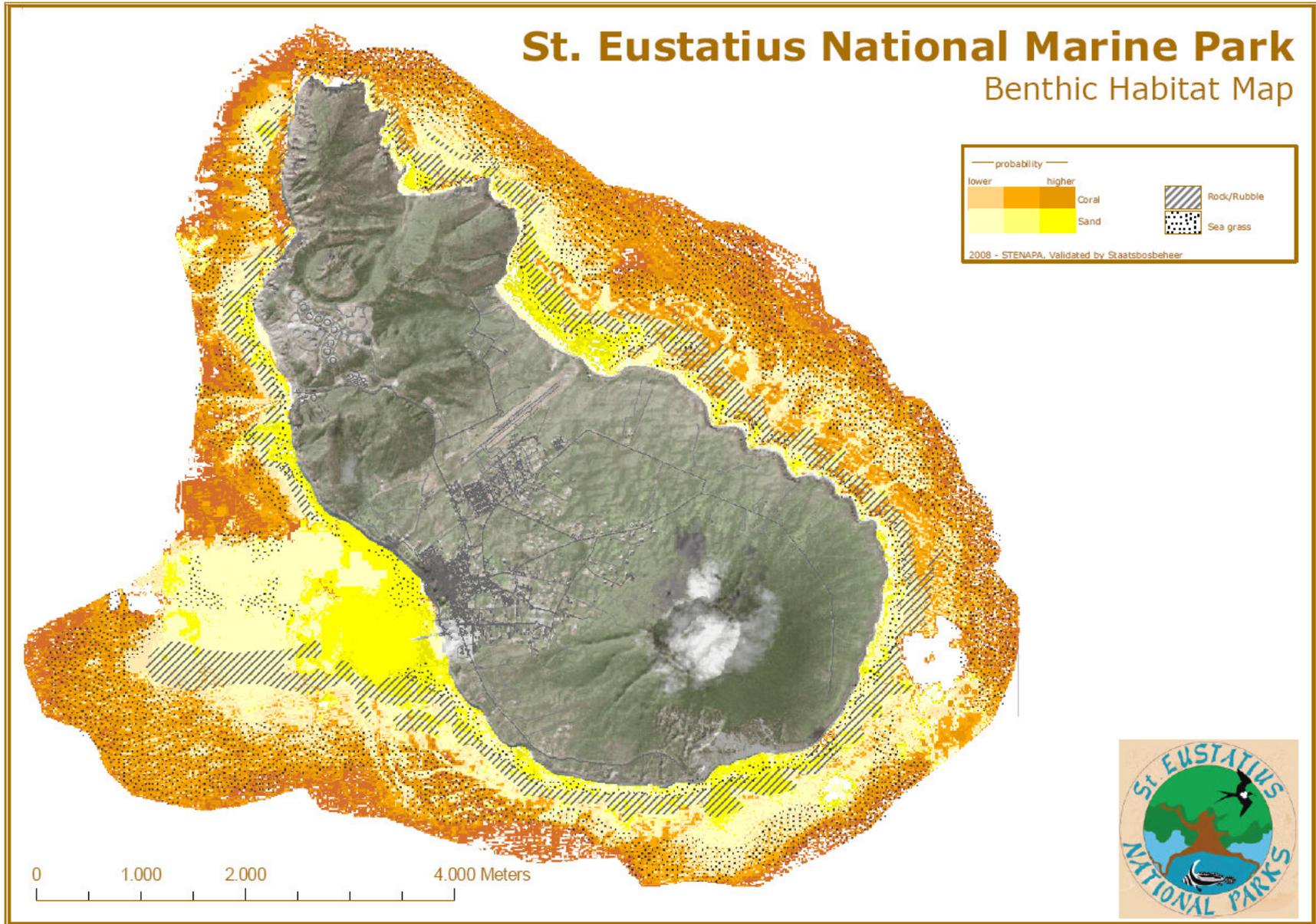
NEST EXCAVATION DATA SHEET	
Nest Code:	
Observers:	
Date:	- Laid - Hatched - Excavated
Number of Empty Shells (> 50%):	
Number of Hatchlings:	- Alive - Dead
Number of Unhatched Eggs:	- No Embryo - Embryo - Full Embryo
Number of Pipped Eggs:	
Number of Depredated Eggs:	
Number of Deformed Embryos:	
Number of Yolkless Eggs:	
Notes:	Depth of Nest 

Appendix 2 In-Water Sighting Sheet employed in 2008

Observer:	Date	Time
Weather Condition:	Sea Condition	
Visibility:	Water Temp:	
Species:	Green	Loggerhead
	Hawksbill	Leatherback
Size:	< 10cm	50 – 100cm
	10 – 50cm	> 100cm
Tail extend >15cm beyond shell?		
Yes	No	
Condition:		
Alive	Injured	Dead
Describe injury:		
Ectobiota :	Remora Barnacles	Algae
Distance from turtle	< 3m	5 – 10m
	3 – 5m	> 10m
Where was the turtle?		
Surface	Bottom	Water column
Depth seen:		
Turtle Activity:		
Resting	Swimming	
Eating	Mating	
Environment:		
Sand	Wreck	
Coral Reef	Sea Grass	
	Other	
Tags present?		
Yes	No	Unsure

Appendix 3

Updated benthic habitat map of St. Eustatius Marine Park



Appendix 4 Nesting data for leatherback nests 2008

Code	Date	Time	PIT Tag #	Left Tag	Right Tag	CCL	CCW	Result
DC0801	13-Mar-2008	7:05						proably lay
DC0802	23-Mar-2008	21:00	133663793A	WC 316	WC 317	160cm	117.5	Lay
DC0804	2-Apr-2008	21:15	133663793A	WC 316	WC 317	167cm	137cm	Lay
DC0805	3-Apr-2008	Morn						lay
DC0806	11-Apr-2008	0:30	133663793A	WC 316	WC 317	165cm	120cm	Lay
DC0807	14-Apr-2008	22:12	134644547A	WC 312	WC 313	151cm	120 cm	Lay
DC0808	14-Apr-2008	23:50	133922451A	WC 340	WC 339	158cm	106cm	lay
DC0810	20-Apr-2008	2:45	133663793A	WC 316	WC 317	162cm	117cm	lay
DC0811	24-Apr-2008	2:30	133922451A	WC 340	WC 339	158cm	116cm	Lay
DC0812	26-Apr-2008	Morn	n/a					Lay
DC0813	29-Apr-2008	01:10	133663793A	WC 316	WC 317	160cm	116cm	Lay
DC0814	2-May-2008	12:25	133922451A	WC 340	WC 339	156cm	113cm	Lay
DC0815	7-May-2008	21:05	133663793A	WC 316	WC 317			Prop lay
DC0816	10-May-08	Morn						Prob lay
DC0817	12-May-08	01:30	133713290A	WC 347	WC 348	139cm	100.0	lay
DC0818	21-May-08	12:39am	133713290A	WC 309	WC 348	141cm	105cm	Lay
DC0819	21-May-08	2:20am	133922451A	WC 340	WC 399	156cm	131cm	Lay
DC0820	30-May-08	11:30						Prob lay
DC0821	06/01/2008	1:55	023*359*883	WC310	WC311/YYL624	157cm	113cm	Lay
DC0822	06/06/2008	Morn						False crawl
DC0823	06/07/2008	13:12	133663793A	WC 316	WC 317	165cm	121cm	Lay
DC0824	06/09/2008	13:12	133922951A	WC340	WC339	157.0	105.0	Lay
DC0825	06/12/2008	9:55	023*359*883	WC314	WC310	159.0	120.0	lay
DC0826	14/6/2008	22:20	133713290A	WC309	WC348	142.0	108.0	Lay

Appendix 5 Excavation data for Leatherback nests 2008

Nest Code	# Hatchlings			# Unhatched Eggs						Total # Eggs			% Emerged Of all eggs
	Alive	Dead	# Shells	No Embryo	Embryo	Full Embryo	Pipped	Deformed	Yolkless		% Hatched	% Emerged	
DC0801	0	0					0	0			#DIV/0!	#DIV/0!	#DIV/0!
DC0802	0	0	108	95	0	0	0	0	13	108	0.00	0.0	0.0
DC0803													
DC0804	10	3	21	5	15	9	37	0	37	103	0.00	38.1	7.8
DC0805	3	0	24	41	4	2	16		25	112	21.43	87.5	18.8
DC0806	0	0	0		0	0	0	0			0.00	0.0	0.0
DC0807	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0808	1	7	10	6	16	24	53	0	32	141	7.09	20.0	1.4
DC0809													
DC0810	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0811	0	0	0	25	46	18	15	1	21	81	0	0	0
DC0812	1	6	14	5	18	16	25	0	29	107	13.08	50.0	6.5
DC0813	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0814	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0815	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0816	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0817	0	0	0	44	17	6	2	0	54	114	0.00	0.0	0.0
DC0818	0	0	4	52	12	3	5	0	57	133	3.01	100.0	3.0
DC0819	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0820	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0821	0	3	27	14	22	7	12	n/a	46	128	21.09	88.9	18.8
DC0822	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
DC0823	0	3	11	70	6	1	0	0	27	118	9.32	72.7	6.8
DC0824	0	1	2	64	9	6	4	0	13	94	2.13	50.0	1.1
DC0825	1	0	1	70	2	0	0	0	46	119	0.84	0.0	0.0
DC0826	0.00	14	22	18	18	4	6	0	65	133	16.54	36.4	6.0

Appendix 6 Leatherback Incubation check list

Code #	Laid	60 Days	70 Days	#1	Dist	#2	Dist	Veg.	N	W	
DC0801	13/03/2008	14-May-08	24-May-08	3	29.13	4	21.5	18.4	062.58.883	17.30.449	
DC0802	23/03/2008	24-May-08	03-Jun-08	5	39.77	6	21.42	26.5	062.58.880	17.30.433	
DC0804	02-Apr-08	01-Jun-08	11-Jun-08	2	5.41	3	15.4	250cm	062.58.892	17.30.471	
DC0805	3-Apr-2008	02-Jun-08	12-Jun-08	6	24.51	7	9.95	50cm	062.58.873	17.30.417	
DC0806	11-Apr-2008	09-Jun-08	19-Jun-08	8	6.5	9	12.1		062.58.855	17.30.423	
DC0807	14-Apr-2008	12-Jun-08	19-Jun-08	6	26.7	5	42.8		062.58.878	17.30.435	
DC0808	14-Apr-2008	12-Jun-08	19-Jun-08	8 front	4	n/a			62.58.862	17.30.414	
DC0810	20-Apr-2008	18-Jun-08	29-Jun-08	5	24.55	6	37.15		062.58.881	17.30.435	
DC0811	24-Apr-2008	22-Jun-08	02-Jul-08	4	26	5	35.7		062.58.880	17.30.436	
DC0812	26-Apr-2008	24-Jun-08	04-Jun-08	6	29.8	4	33.9		062.58.877	17.30.435	
DC0813	29-Apr-2008	27-Jun-08	07-Jul-08	8	4.7	9	16.9		062.58.864	17.30.411	
DC0814	02-May-08	01-Jul-08	11-Jul-08	6	26.3	5	43.9	32.9cm	062.58.875	17.30.435	
DC0815	07-May-08	06-Jul-08	16-Jul-08	6	91in	4	57in		062.58.878	17.30.440	
DC0816	10-May-08	09-Jul-08	16-Jul-08	13	26.4	10	33.58		062.58.840	17.30.378	
DC0817	12-May-08	11-Jul-08	21-Jul-08	18	7.65	19	14	90cm	062.58.780	17.30.330	
DC0818	21-May-08	20-Jul-08	29-Jul-08	15	9.4	last steel bar	12.4		062.58.813	17.30.358	
DC0819	21-May-08	20-Jul-08	29-Jul-08	6	17.7	rusty pipe	7.8		063.58.878	17.30.431	
DC0820	30-May-08	29-Jul-08	08-Aug-08	13	32	12	41.9	41.8	062.58.802	17.30.373	
DC0821	01/06/2008	31-Jul-08	10-Aug-08	17	18.7	16	6.6		062.58.802	17.30.373	
DC0822	06/06/2008	06-Aug-08	16-Aug-08	10	13.4	11	20.5		062.58.845	17.30.399`	
DC0823	07/06/2008	08-Aug-08	18-Aug-08	17	10.2	16	12.5		062.58.780	17.30.341	
DC0824	09/06/2008	10-Aug-08	20-Aug-08	10	19.5	11	44.7	16	062.58.839	17.30.392	
DC0825	12/06/2008	13-Aug-08	23-Aug-08	rust pipe	5.25	7	18		062.58.877	17.30.426	
DC0826	14/06/2008	15-Aug-08	25-Aug-08	10	44.55	13	383.2		062.58.828	17.30.386	

Appendix 7 In-water turtle assessment

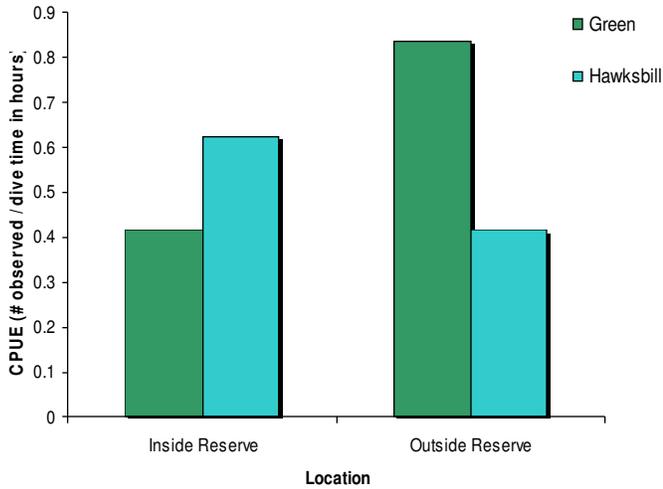


Figure 1: Catch per unit effort (CPUE) of greens and hawksbills comparing sites inside and outside reserve

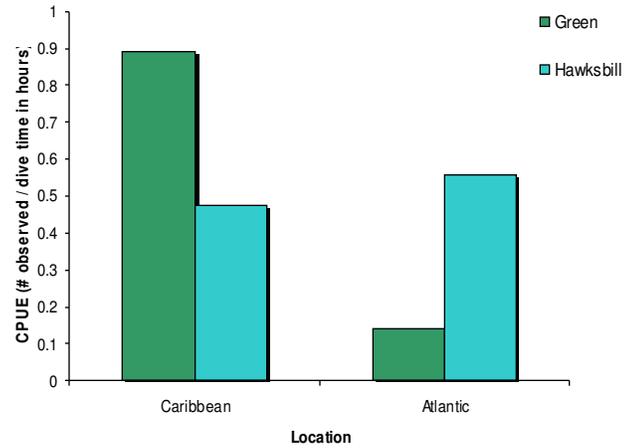


Figure 11: Catch per unit effort (CPUE) of greens and hawksbills comparing sites on the Caribbean and Atlantic sides of the island

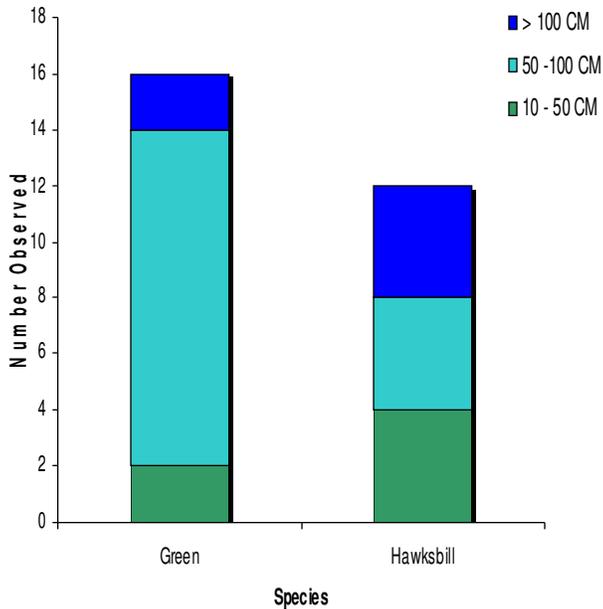


Figure 3: Size ratio of observed turtles in the

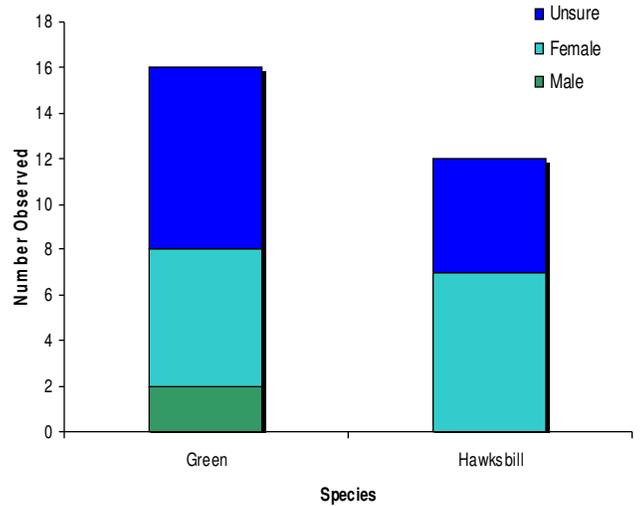


Figure 4: Gender composition of observed turtles in the Statia National Marine Park

In water survey dive coordinates and associated map

Site	GPS N - Start	GPS W - Start	GPS N - End	GPS W - End
Double Wreck	17 ° 28.792'	62 ° 59.641'	heading	N
Crook's Castle	17 ° 28.318'	62 ° 59.254'	heading	SW
Blair's Reef	17 ° 28.227'	62 ° 59.493'	heading	S
STENAPA Reef	17 ° 29.055'	62 ° 59.830'	heading	SE
Chien Tong	17 ° 29.011'	62 ° 59.875'	tour	-
Ledges	17 ° 27.793'	62 ° 59.069'	heading	NE
S. Harbor	17 ° 28.644'	62 ° 59.453'	17 ° 28.862'	62 ° 59.448'
Outer Jenkins Bay	17 ° 30.812'	63 ° 0.114'	heading	N
Venus Bay	17 ° 31.244'	62 ° 58.940'	17 ° 31.331'	62 59.116'
Hangover	17 ° 27.871'	62 ° 59.147'	heading	S
Gibraltar	17 ° 31.509'	63 ° 0.004'	heading	S
S. of Corre Corre	17 ° 28.950'	62 ° 56.742'	17 ° 29.112'	62 ° 56.890'
Barracuda Reef (drift)	17 ° 27.974'	62 ° 59.472'	17 ° 28.088'	62 ° 59.495'
N. Harbor	17 ° 28.890'	62 ° 59.652'	17 ° 29.914'	62 ° 59.617'
Aquarium	17 ° 30.351'	63 ° 0.364'	tour	-
Drop Off West	17 ° 27.673'	62 ° 58.528'	heading	W, SW
Charles Brown	17 ° 27.864'	62 ° 59.648'	tour	-
Twin Sisters (drift)	17 ° 31.016'	63 ° 0.0841'	17 ° 31.556'	62 ° 59.948'
Humps	17 ° 27.809'	62 ° 58.680'	heading	S
S. Zeelandia	17 ° 30.435'	62 ° 58.088'	17 ° 30.486'	62 ° 58.117'
N. Zeelandia	17 ° 30.884'	62 ° 58.656'	17 ° 31.012'	62 ° 58.761'
N. Corre Corre	17 ° 29.257'	62 ° 56.455'	17 ° 29.454'	62 ° 56.615'
English Quarter	17 ° 30.243'	62 ° 57.669'	17 ° 30.340'	62 ° 57.727'
Five Fingers (drift)	17 2 ° 7.898'	62 ° 58.996'	17 ° 27.161'	62 ° 59.321'
The Cave	17 ° 30.662'	62 ° 58.740'	17 ° 30.924'	62 ° 58.802'
W. Whitewall	17 ° 27.733'	62 ° 57.711'	17 ° 27.722'	62 ° 58.009'
Doobie's Crack	17 ° 30.609'	63 ° 0.517'	17 ° 30.675'	63 ° 0.480'
North Man	17 ° 31.5298'	62 ° 59.502'	17 ° 31.608'	62 ° 59.750'
E. Whitewall	17 ° 27.944'	62 ° 57.054'	17 ° 27.888'	62 ° 57.158'
Atlantic	17 ° 29.830'	62 ° 57.181'	17 ° 29.129'	62 ° 57.391'
Zeelandia Bay	17 ° 30.354'	62 ° 58.388'	17 ° 30.480'	62 ° 58.530'
Anchor Point S.	17 ° 27.865'	62 ° 59.200'	heading	E
Blue Bead Hole	17 ° 28.617'	62 ° 59.662'	heading	SE
Triple Wreck	17 ° 28.750'	62 ° 59.660'	heading	SW, tour

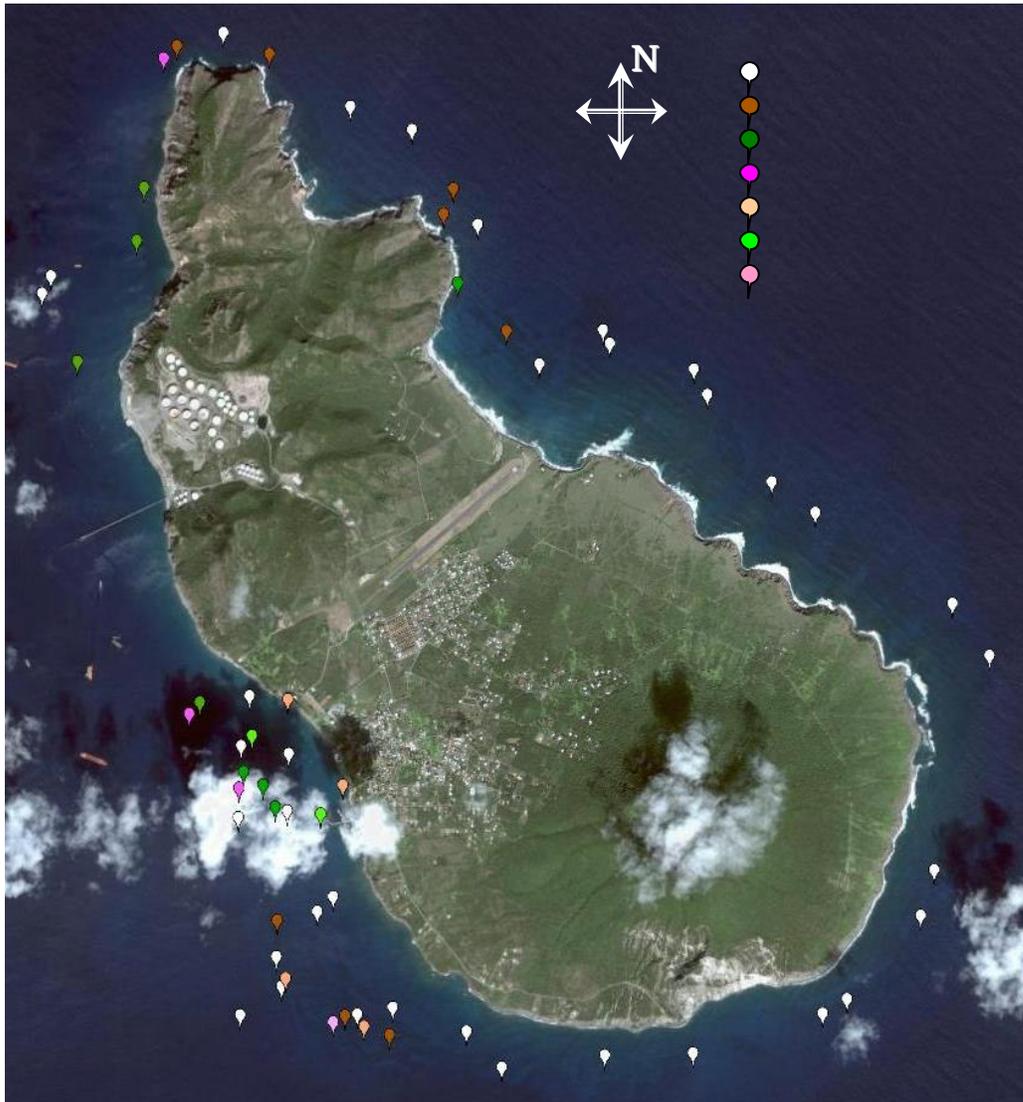


Figure 5: *Map of turtle survey dives completed January - June 2008. In addition to data from the surveys, also included on the map are reported turtle sightings from the local dive centers*