

# St. Eustatius National Parks Foundation Sea Turtle Conservation Program Annual Report 2011



**Jessica Berkel**  
**Sea Turtle Program Coordinator**  
**St. Eustatius National Parks Foundation**  
**Gallows Bay, St. Eustatius**  
**Dutch Caribbean**  
[www.statiapark.org](http://www.statiapark.org)  
[research@statiapark.org](mailto:research@statiapark.org)



## FOREWORD

The 2011 Sea Turtle nesting season was very disappointing coming off the back of one of the program's best years in 2010. There was very little nesting activity with regards to the greens and hawksbills and only 1 for the leatherback species.

The program has no explanation for this poor nesting season and can only strive to give a detailed description of all the factors surrounding the nesting beach in 2011 in the hopes that someone with greater knowledge can attribute a reason for it.

This report gives the reader an insight into the program's activities and endeavors to paint an accurate picture of the 2011 nesting season.

Hoping to have submitted a complete and interesting report,

Respectfully yours,

A handwritten signature in blue ink, appearing to read 'Jessica Berkel', written over a light blue horizontal line.

Jessica Berkel  
Sea Turtle Conservation Program Coordinator

# *Introduction*

The St Eustatius National Parks Foundation (STENAPA) established the Sea Turtle Conservation Program 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 organized in 2001 to begin raising public awareness about sea turtle conservation issues. Subsequent to this initiative, a beach monitoring program was started in 2002 in affiliation with the Wider Caribbean Sea Turtle Conservation Network (WIDECAST). The first two years of the program saw very sporadic monitoring of the index beach due to a lack of personnel. In 2003 however, regular night patrols were conducted following the introduction of the Working Abroad Program, which brings groups of international volunteers to assist with projects in the National and Marine Parks. By 2004 the program had expanded to include morning track surveys on several of the island's nesting beaches, with a dedicated vehicle and a full-time project coordinator during the nesting season.

Data from the Sea Turtle Conservation Program 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 was also an unconfirmed 2004 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 Program 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 program 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:

- Summarize the activities of the 2011 Sea Turtle Conservation Program.
- Review the accomplishments and deficiencies of the program in 2011.
- Suggest recommendations for the 2012 program.
- Provide a summary of the data from 2011 research initiatives.
- Present information locally, regionally and internationally about the research and monitoring program on the island.
- Produce a progress report for the Island Government, potential program funding organizations, the local community and international volunteers.

# *Participating organisations*

## *St Eustatius National Parks Foundation (STENAPA)*

The Sea Turtle Conservation Program is coordinated 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, a new terrestrial National Park. STENAPA also manages the Miriam C. Schmidt Botanical Garden. The Statia National Marine Park surrounds St Eustatius from the high water mark to the 30 meter 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. National Marine Park staff conducts regular patrols and enforcement, maintains dive, snorkel and yacht moorings and conducts several educational programs, 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 Program.

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 seven staff and relies on volunteers to assist with conducting field work for projects such as the Sea Turtle Conservation Program. The organization is supported by two international volunteer programs; the STENAPA Assistant Ranger Program and the Working Abroad Program, which are discussed in more detail below.

### *STENAPA Assistant-Ranger Programme*

Since the inception of the Assistant Ranger Program, formerly the Intern Program, in September 2001, over 43 persons 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 Statia National Marine Park. Assistant rangers are responsible for overseeing the daily activities of volunteers from the Working Abroad Program, in addition to managing and completing individual assignments.

Assistant rangers 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 cannot afford the manpower or expertise.

### *Working Abroad Program – 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 Program in January 2003,

and to date more than 200 volunteers have been recruited via their organization. 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 Program is affiliated with 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 organizations within the region, with 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 Program implemented WIDECAST-approved protocols for monitoring and data collection. WIDECAST has assisted the program through donation of tags and purchase of PIT tag applicator. The Sea Turtle Program Coordinator attended the WIDECAST Annual General Meetings in 2004-2006, 2008 and 2011; with funding and logistical assistance provided in part through WIDECAST. In October 2010, Marine Park Manager Jessica Berkel was appointed WIDECAST Country Coordinator after Nicole Esteban returned to the UK.

### ***Dutch Caribbean Nature Alliance (DCNA)***

Founded in 2005, DCNA 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 former Director of STENAPA held the position of chairperson of the DCNA for 2 consecutive terms.

### ***Funding agencies and donors***

To effectively run the Sea Turtle Conservation Program, the Sea Turtle Conservation Project Coordinator allocates approximately 10-20% of their time to raise funds to cover the annual program costs. Fundraising occurs both locally and internationally by soliciting specific organizations, and by donation requests through newsletters and turtle awareness campaigns.

# Study Sites

## St Eustatius

The island of St Eustatius is part of the Netherlands Caribbean which includes Bonaire, 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).

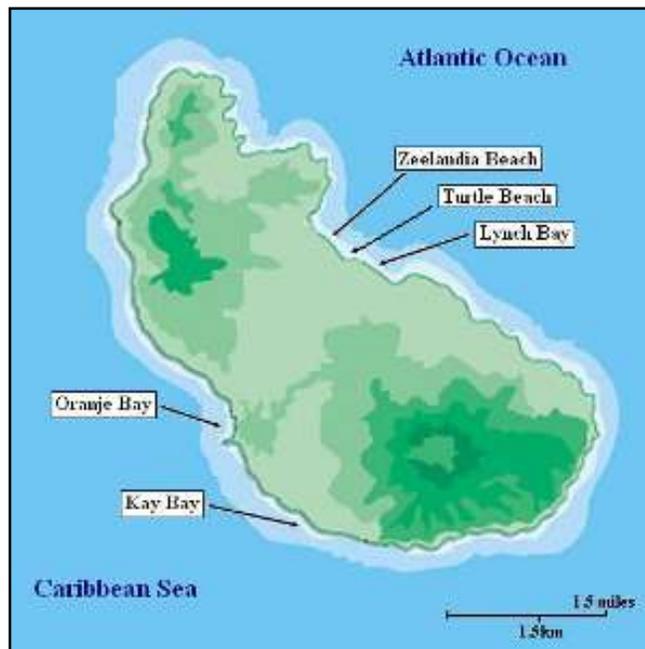
St Eustatius is 21km<sup>2</sup> in size and is dominated by two volcanoes; an extinct volcano comprising the Northern Hills (150 million years old) and a dormant volcano called the Quill in the South, formed 2200 to 3200 years ago. As a result of its volcanic origin, the beaches of St Eustatius all have dark sand.



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

***Sea Turtle Nesting Beaches: Description and activities in 2010***

Sea Turtle 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/Crooks Castle on the Caribbean side.



**Figure 2. Nesting beaches on St. Eustatius**

## KAY BAY/CROOKS CASTLE



**Figure 3 Kay Bay Beach**

This beach on the Western or Caribbean coast of the island had been somewhat neglected in the past as it is not easily accessible and because the bulk of nesting activity occurs on the Atlantic or Eastern side of the island. Also because of the lack of accessibility, the program had often relied on private citizens living nearby to alert us whenever any nesting activity was ascertained. This relationship was discontinued in 2009 as it proved to be very unreliable. Only once for the season did the family call to report tracks on the beach, although in total there were 10 activities noted by program staff during that season.

One of the main problems with Kay Bay faced in previous years, getting to the beach, was solved in 2009 as it was decided that even though the walk along the coast to the beach was arduous due to the rockiness of the area, it was well worth it to not have the trouble of gaining access to the beach from the White Wall road above the cliff. The latter entailed, requesting permission to walk through two private properties, the many loose guard dogs on the properties requiring the presence of the owners at all times, the long walk down a weathered and creaky wooden staircase and needless to say having to repeat the process in reverse when finished with data recording on the beach.

Due to the lack of stakes and or clear landmarks on Kay Bay over the years, several confirmed nests could not be found when the time came to excavate. Because the nests were marked only with GPS, they proved impossible to find. This was very unfortunate as from the hatchling tracks it could be determined that at least some nests had hatched.

To solve this problem, at the start of the 2010 season, stakes were planted from the southern most end of the beach northerly towards Crooks Castle. This made the position of any possible lays and confirmed nests easier to be accurately marked.

From the experiences this year, several recommendations can be put forward for the 2012 season;

1. Re-stake the beach, if stakes are missing at the start of the season as is done on the index beach.

2. Conduct morning patrols at least once a week on Kay Bay/Crooks Castle during the Green and Hawksbill nesting season.
3. Conduct several targeted night patrols on Kay Bay/Crooks when personnel numbers allow or split the patrol if enough volunteers available.
4. Even when there is no stake present researchers should be very diligent in accurately describing the position of the lay/possible lay including measurements and a detailed sketch.

## ORANJE BAY



**Figure 4** Oranje Bay on the Caribbean coast

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 harbor 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 occurs on this beach due to the passing traffic, street lights and near shore restaurants and terraces. This is most likely a deterrent to females looking for a quiet area to nest.

For most of 2011, there was minimal sand on this beach due to passing tropical storms and ground seas. Besides there being a few longer stretches of sandy areas during the Easter period, sand was present only in small pockets between some standing walls of ruins, in front of a section of beach where the dive shop “DiveStatia” is located and on the small beach next to the City pier.

Another aspect of Oranje Bay is that the shoreline is very minimal and slanted toward the water so that in the morning any tracks that would have been visible on a flatter beach have long been washed away by the high tide surge. In that way, although you can

monitor almost the entire length of the bay very easily, there are usually no tracks visible on this beach.

During the 2011 nesting season there were no tracks recorded on Oranje Bay.

## 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 minimal 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.

During the 2011 season Lynch Bay was monitored for activities 15 times which is up from 7 times the previous year. There were no tracks recorded on any of those occasions. The sand is of a very gritty texture and tracks are not very clearly visible even when viewing them the day after they were made.

## TURTLE BEACH

This is the second longest continuous 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. Unfortunately, access to this beach at night is often prohibited due to strong surge, and therefore it is patrolled only when conditions permit. In the 2011 nesting season, the beach was monitored 183 times. 6 activities were recorded on this beach of which 2 were actual lays.



## 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 a narrow beach backed by cliffs on some stretches, 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 ghaut which acts as the landfill for the island's household waste. Zeelandia is the primary turtle nesting beach hosting four species of turtle (green, leatherback, hawksbill and loggerhead), and the only place on the island where leatherbacks have been recorded nesting. It is the only beach regularly monitored at night by the Sea Turtle Conservation Program because of easy access and the volume of activity. It was a very poor season for Zeelandia beach in 2011 with only 10 recorded activities.

## **Pre-Season Preparations**

The 2011 Sea Turtle Conservation Program began with the following 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 2010 season were repainted and any missing stakes were replaced. As per the previous year's recommendations, the stake number was also painted on the cliff wall to facilitate measurements when the surge has removed both stake and sand in an area.

### **Material Preparation**

The designated turtle bag for nightly patrols and all other equipment for the program were inventoried. Missing materials such as gloves, tape measures etc. were purchased.

### **Training of Volunteers**

The materials used for teaching volunteers about the Sea Turtle Conservation Program were reviewed before the first group from Working Abroad arrived in February 2010. The two existing short presentations were updated in early 2010; the first was a basic introduction to sea turtles, their biology and nesting behavior; the second focused on beach monitoring protocols and the correct use of the data collection sheets. Every volunteer receives training before assisting with beach monitoring.

### **Other Preparations**

At the beginning of the 2011 nesting season, the following activities were performed:

### **Turtle Program intern**

There was no search for an intern for the program in 2011 as a volunteer had already shown an interest in returning to the island to work for the turtle program. The person, Ms. Anna Najbar of Poland, had shown an avid interest in patrolling and in sea turtles while working as a volunteer. The fact that she already had experience and knew how the program was run worked in favour of her selection as the intern for 2011.

## **Protection of Zeelandia beach in 2011**

In January of 2008 a life-sized replica of a Leatherback turtle was built by then Marine Park Ranger Walter “Gadget” Blair and National Park Ranger Nadio Spanner with the help of the turtle program coordinator and intern. The concrete turtle was produced as part of the Zeelandia Beach Beautification project and has a three part function; it provides a great visual 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.

Protection of the beach also involved maintaining and cleaning the sea turtle information signs.

Sand mining continues to be a problem at Zeelandia Beach. Although illegal, people continue to take anywhere from a few buckets of sand to full truck loads.



**Figure 5 Sand miners in broad daylight**



**Figure 6 Replacing the rusted barrel barrier**

The discarded oil drums that were placed in 2010 to block several vehicle access points in order to deter sand miners were completely corroded and had to be replaced. New barrels were buried up to 1/3 of their height and filled with sand and boulders.



After several incidents involving dogs in previous seasons, an important preparation for the 2011 season was the maintenance of the signs at the main entrances, warning dog owners to keep a close watch on their dogs, and the placement of an additional sign. It is impossible to prevent dogs from digging holes on the beach but signage urging persons to investigate what their animals are digging up could prevent a nest from being destroyed completely or hatchlings being hurt or predated upon. There were luckily no incidents involving dogs during the 2011 nesting season.

Persons continue to take advantage of the isolation of the beach to drive on the sand at night. Though there are several signs indicating the harm that this activity can cause to hatchlings both on the sand and in the egg chamber.



**Figure 8 Tire tracks found during morning survey**



**Figure 7 New signs**

Because of lack of funding for the program, simple and cost effective solutions have to be sought to mitigate the problem of driving on the sand. For that reason, the oil barrels are replaced year after year because they are obtained for free, can simply be filled with rocks and sand and are high enough and sturdy enough that vehicles cannot drive over them. The program is still looking for a more permanent solution to the problem.

## Beach Cleanups 2011



As Zeelandia beach is the primary nesting beach, a beach cleanup is performed at the beginning of the sea turtle nesting season and usually once a month during the entire season if it is warranted.

**Figure 9 Monthly Beach clean up on Zeelandia beach**

Following is a summary of beach clean ups for the 2011 sea turtle nesting season:

Date	Coordinator	Nesting season?	Location	Persons	Area (m)	Estimated time (h)	Nr of bags	Total weight (kg)
20-Jan	Jean Pearson	no	Zeelandia	6	1500	1.75	17	105
6-May	Anna Najbar	yes	Zeelandia	4	1000	2.5	7	87.25
23-Jun	Broadreach	yes	Zeelandia	15	1400	2	4	34
8-Jul	Broadreach	yes	Zeelandia	3	1400	2.2	9	81.5
5-Aug	Anna Najbar	yes	Zeelandia	8	1400	2	19	96
9-Sep	Coral Hines	yes	Zeelandia	9	800	2	22	137
18-Nov	Coral Hines	yes	Zeelandia	4	400	2	12	76.5

Many persons expressed an interest in joining the beach clean ups but were unable to as beach cleans are usually carried out on Friday mornings when the majority of the public is at work.

## Education, Community Outreach and Media Exposure



**Figure 10 Summer Club field trip to the nesting beach**

turtles alone, a more comprehensive Marine Park program was put together. Twice a week for 6 weeks Summer Club participants took part in sea turtle and Marine Park related activities in sessions lasting two hours. Some of these activities included, track surveys, nest excavations, nest relocations, presentations with knowledge reviews and sea turtle themed games.

Besides children, the Sea Turtle Conservation Program tries to involve the general public as much as possible in its activities in order to generate interest and support for sea turtles. On Saturday, January 22<sup>nd</sup>, 2011 a hatchling release was done in the early evening and members of the public were encouraged to attend. Due to the low nest numbers for 2011 that release turned out to be the only public event for the 2011 season. Hatchling releases are usually publicized using the turtle call list which is comprised of a list of members of the public who have requested to be called in such an event and also through staff members that spread the word to interested friends and relatives who in turn pass on the information to their friends. The hatchling release saw some 20+ persons witnessing the event. Additionally interested members of the public could join the nightly

The annual STENAPA Summer Club program took place from July to mid-August during the local school summer vacation. The Summer Club is open to all children, locals and visitors alike, between the ages of 8 and 13. In 2011 a change was made to the Turtle Program section of Summer Club. Instead of focusing all 6 weeks on sea



beach patrols after signing a waiver form and receiving instructions from the patrol leader. On several occasions during the season persons would come to the beach and sit at a certain vantage point and look out for turtles. Since it is a public beach, they are allowed to do so, but the patrol at every opportunity explained the need for quiet and the restrictions on using white lights. The night patrol diary does not adequately reflect the amount of times members of the public were on the beach as in most situations they were not actually a part of the patrol.

Written publication of Sea Turtle program activities was minimal.

#### The Daily Herald Newspaper Articles 2011

- Tuesday, March 29th – Turtle nesting season starts on St. Eustatius-
- Wednesday, June 22<sup>nd</sup> – STENAPA announces 2011 Summer Club Program-

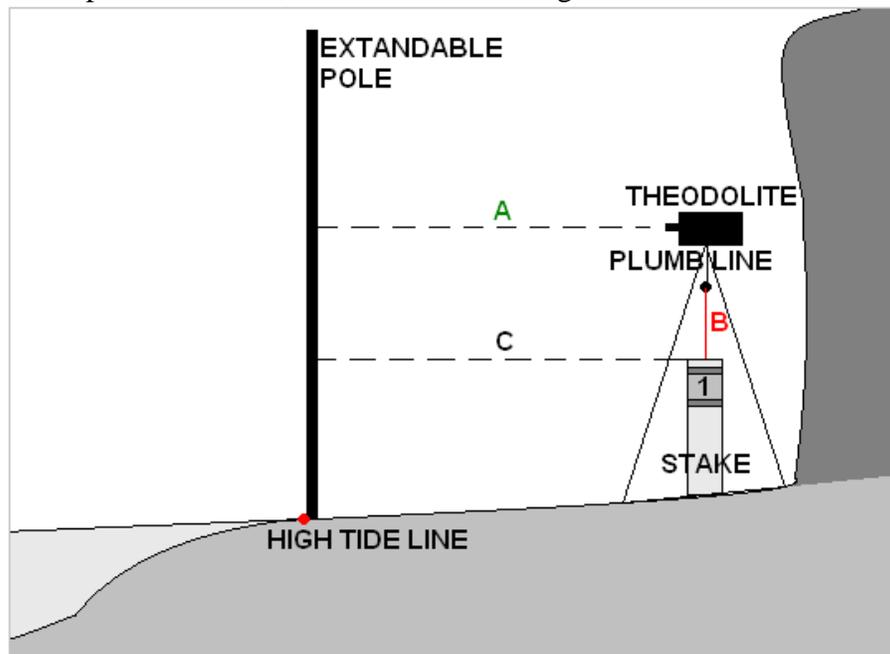
#### “STENAPA Update” Newsletter articles 2011

- Newsletter 1/2011     March - 2011 Turtle Nesting Season Starts-
- Newsletter 3/2011     October - 2011 Busy Nights at the Beach-

## **Beach Mapping and Erosion measurements**

Due to the highly dynamic nature of Zeelandia beach, periodic beach mapping is carried out to measure the shifting of the sand. Using the stakes which are placed for nest triangulation and that are situated 20 meters apart measurements are taken using the following method:

A team of two people measure the distance from the high tide line (HTL) to each stake. 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 HTL and the other person reading the Theodolite. The researcher on the HTL (marked by highest ocean debris) stands with an extendable pole, marked in feet and inches. While this is being done the Theodolite is 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 leveled using the adjustable legs on the tripod and the leveling devices on the Theodolite. Once the built-in spirit level was set with the air bubble in the middle, the lens cap was removed, focused and a reading at the central cross-hair taken.



**Figure 11 The different measurements for beach mapping**

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 meters from feet) we get 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.

Beach mapping took place in the months of April, July and October 2011. A report comparing the data from 2006 up to 2011 is available as a separate document.

## BEACH EROSION



**Beach erosion Stake 30-36**

Loss of the numbered stakes continued throughout the entire season and was particularly a problem during the high surges caused by passing storms. Fortunately the currents at Zeelandia are such that uprooted stakes can more often than not be retrieved as they tend to get washed ashore later on. Due to high sand movement certain stakes, usually stake #1, #42 to 51 are buried beneath the sand for a period of months. Towards the end of December many of the 70 stakes are not in place. For a high percentage of the season there are very few suitable nesting areas on Zeelandia. The beach from stake #28 to 51 is usually completely eroded. Patrolling is difficult as the waves reach the cliff and one has to walk in the surf to get to Turtle beach.

## CLIFF FALLS



**Cliff fall stake #33-#36**

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.

During the 2011 nesting season, there were a number of cliff falls presumably because of the many heavy rain showers that caused significant runoff from the tops of the cliffs. The runoff undermines any cracks in the cliff causing large segments to fall away.

May 28 '11 cliff fall (# 59 - 60)

June 01 '11 cliff fall (# 33 - 34)

June 04 '11 cliff fall (# 22 - 23)

June 11 '11 small cliff fall (# 44 - 45)

July 01 '11 cliff falls (#26-27, #44-45)

July 02 '11 cliff falls (#19-20, #24-25, #49-50)

July 03 '11 cliff fall (#34-36)

July 07 '11 cliff fall - #33-36 (+15 tons)

Sep 13 '11 cliff fall (#38-39)

Nov 26 '11 cliff fall #37 +/- 5 tons (large boulders), #38-#39 – 2 tons (large boulder and dirt) , #39-#40 – 1m<sup>3</sup> (mostly dirt)

Because of the incidences of cliff falls both this season and in previous seasons, when the beach is severely eroded and the patrol will be forced to walk against the cliff, patrols are usually ended in the area of stake #45 near the Smith's Ghaut public dumpsite. It is not worth the danger to patrol further on and any tracks can be hopefully found in the morning if the tide did not wash them away. The hazardous consequences of walking or sitting too near the cliff while on patrol are repeatedly stressed during training of volunteers and interns.

## ***Monitoring and Research Activities***

During the 2011 nesting season several different monitoring and research activities were conducted as part of the Sea Turtle Conservation Program:

### **Morning Track Surveys**

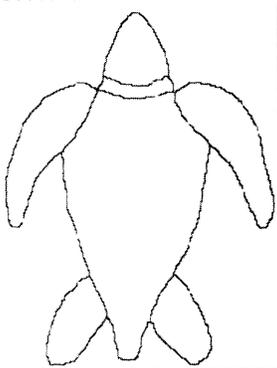
Daily morning track surveys were carried out from March 27<sup>th</sup> 2011 up to and including November 2<sup>nd</sup>, 2011 on the primary nesting beach (Zeelandia Beach) and Turtle Beach. Besides the index beach, only Oranje Bay could be monitored on a daily basis because of its proximity to the National Parks Visitor Center. Surveys of the remaining two beaches, Lynch and Crooks Castle/Kay Bay were performed on an irregular basis.

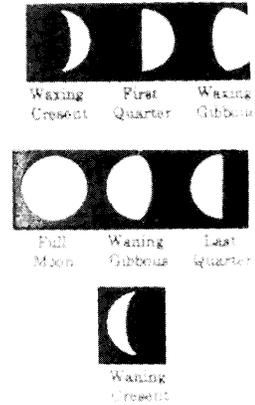
For each track observed the following information is recorded:

- Observer – Name of observer recording data.
- Date
- Weather – Brief description of weather 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 millimeter. For each track the width is measured at three random locations and the average used in analyses.
- 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 centimeter. 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 centimeter. 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 centimeter. 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 nests were monitored daily during morning track surveys; disturbed or destroyed nests were noted. After recording a track it is erased to ensure that data is not collected twice for the same track. During the regular season which ends on Oct 30<sup>th</sup>, 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 Program Coordinator, intern or trained personnel.

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

TURTLE IDENTIFICATION, SIZE AND HEALTH	
Species: _____	PIT Tag: _____
Tagged before: YES/NO	Tag Locale: _____
Flipper Tag(L): _____	Circle Activity: Emerging/ Body Pitting/ Digging Egg Chamber/Laying/ Covering/ Disguising / Leaving / Gone
Flipper Tag(R): _____	
Carapace (L): _____	Carapace (W): _____
Carapace Damage:	
	Parasites/Ectobiota: - - - -
	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: _____	
Locale Name: _____		
Nest Depth: _____	Nest Width: _____	
Highwater (M): _____	Vegetation (M): _____	
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: _____		

Data sheet used for both morning track surveys and nightly beach patrols

## Results Morning and Afternoon Track Surveys 2011 nesting season:

During the entire season a total of 260 morning track surveys were carried out.

Beach	Times surveyed	Activities recorded
Zeelandia Beach	177	6 probable lays, 4 confirmed nests, 4 tracks.
Lynch Beach	15	No activity
Turtle Beach	179	2 probable lays, 3 tracks and 1 dry run
Oranje Bay	149	No activity
Crooks Castle	30	1 track which was a probable lay
Kay Bay	28	No activity
Schotsenhoek Beach	08	No activity

Turtle beach is included for the results of Zeelandia beach since they are considered as one beach in the database. Oranje Bay is surveyed by vehicle every weekday morning and some weekends. When included in the count it brings the morning surveys to a total of 409.

This start of this nesting season came later than the last 3 seasons in that the first track was observed on March 27<sup>th</sup>. The last activity which far exceeded any season was observed on Nov 30<sup>th</sup>, 2011. The nesting season ended with a Hawksbill making a dry run on Turtle Beach.

The Leatherback nesting season was nonexistent in 2011. Green turtle activities were recorded from July 29<sup>th</sup> to August 4<sup>th</sup> 2011 and the hawksbills appeared from July 29<sup>th</sup> to November 26<sup>th</sup>.

The breakdown of activities per sea turtle species is as follows:

ACTIVITIES	HAWKSBILL	GREEN	LEATHERBACK	UNKNOWN
Track only	5	2	0	0
Probably lay	5	3	1	0
Lay	2	2	0	0
Dry run	0	0	0	1

The figures above translate into a serious decrease compared to the previous season. For leatherbacks there were 6 confirmed nests in 2010, greens had 47 confirmed nest and there were 18 confirmed nests for the Hawksbills in 2010. The amount of morning track surveys conducted this year, 265 is only 27 more than the 238 surveys carried out the previous year.

## **Nightly Beach Patrols**

Nightly beach patrols were conducted on Zeelandia Beach and, when sea conditions permitted, Turtle Beach. Due to the low nesting densities at other beaches, it is an inefficient use of resources to carry out regular patrols at these other locations. Each patrol consisted of a minimum of two people; including the Program Coordinator, sea turtle intern or Marine Park intern. A stretch of beach approximately 1km in length was monitored on Zeelandia Beach (up to 1.4km when Turtle Beach was included). Hourly patrols 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. The data collected when a turtle was observed is identical to that collected on morning track surveys except for the following additional data and considerations:

- 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 weather 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 – Any tags already present are recorded, new tags placed are also recorded on the sheet.
- 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 – Measured from the notch to the tip of the carapace.
- Carapace Width - Measured at the widest point of the carapace.
- 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 behavior
- 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 millimeter. For each track the width is measured at three random locations and the average used in analyses.
- Nest 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 depositing eggs, when the egg chamber is open and the exact location of the eggs are 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 centimeter. 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 depositing eggs 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 centimeter. 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 depositing eggs 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 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 if applicable.
  - Time eggs deposited – 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 deposit her eggs.

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

### Results of 2011 Nightly Beach Patrols:

Nightly monitoring of Zeelandia beach began on March 29<sup>th</sup>, ended on September 3<sup>rd</sup>, and was done on a fairly regular basis. Patrols were cancelled due to impending bad weather (storms/hurricanes), lightning strikes in the Zeelandia area and resorting to targeted patrols because of lack of personnel. In all there were 38 nightly patrols during the 2011 season.

No turtles were encountered during night patrols in 2011.

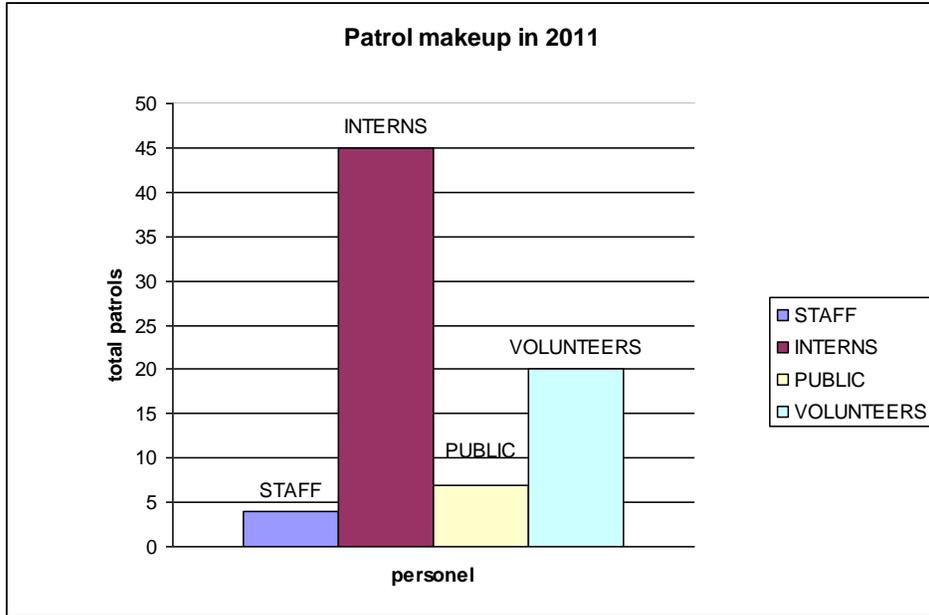


Figure 12 Total patrols in 2011

It is always stressed during training that the patrols are to start promptly at 9pm as it has been shown that turtles can emerge as early as up to an hour before that.

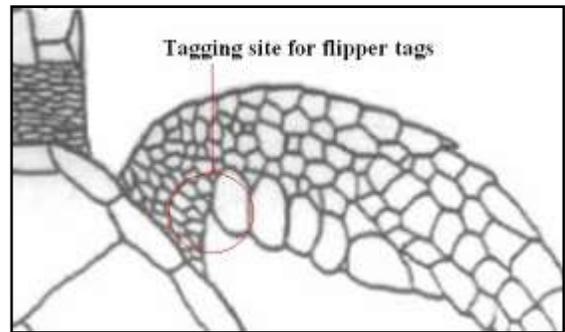
## Tagging Methods

### Flipper Tags



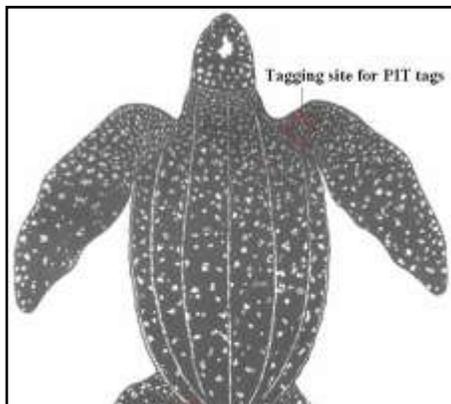
Metal flipper tags (National Band and Tag Company, MONEL Style #49: WC251 – WC350 and INCONEL Style #681: WE1 – WE100) were donated by the Marine Turtle Tagging Centre, Barbados, which is affiliated with WIDECAST. All tag applicators are inspected and cleaned on a routine basis and replaced when they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

Standard tagging methods are used, based on protocols of the Turtle Monitoring Program 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. For hard shell species, tags are applied adjacent to the first large scale on the proximal part of the front flipper 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 to ensure that if one tag is lost the individual can still be recognized.



**Figure 13: Tagging site Hard shells**

External flipper tags were only applied by the Program Coordinator and the turtle intern. The 2 Green turtles that nested in 2009 already had flipper tags. The Green (WE13 – WC303new) was missing a flipper tag on the right flipper and a new one was placed by the Program Coordinator. Because of the thickness of the flipper a MONEL tag was used. They are normally used for Leatherbacks but an INCONEL tag was too small by far. The Leatherback WC306/WC307 received two tags after laying her eggs in April. No attempt was made to tag the Hawksbills that were encountered.



**Tagging sites for Leatherback**

### Passive Integrated Transponder (PIT) Tags

The program still has PIT tags which were purchased with funding from KNAP Fund, MINA. For leatherbacks only, in addition to the two external flipper tags, one PIT tag is also applied.

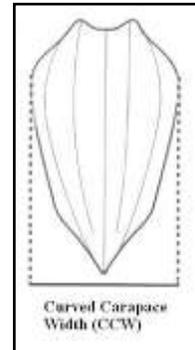
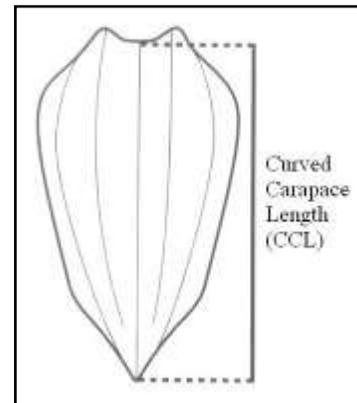
A PIT tag is a small microprocessor which transmits a unique identification number when read using a hand-held scanner. While the turtle is depositing eggs, a single PIT tag is inserted under the skin in the right front shoulder muscle of the turtle using an applicator. All leatherbacks encountered were scanned for the presence of PIT tags using an AVID scanner before a PIT tag was inserted, to avoid double-tagging individuals. Only the Program Coordinator and trained staff should apply PIT tags. None were applied during the 2011 nesting season as there were no nesting females encountered during patrols.

### Carapace Measurements

Standard carapace length and width measurements (as of Bolten, 1999) were taken of each nesting turtle encountered, after she had finished laying and at every encounter thereafter when possible. Measurements were made using a flexible tape measure; each measurement was taken once, to the nearest millimeter.

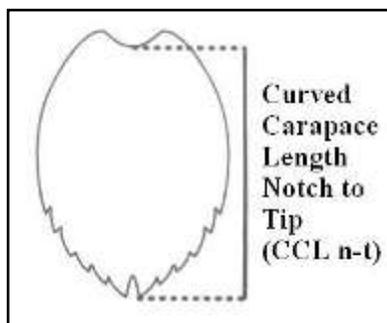
#### Leatherbacks

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 projection. 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). Measurements were taken just to the right of the central ridge, not along its crest, to avoid errors associated with carapace surface irregularities.

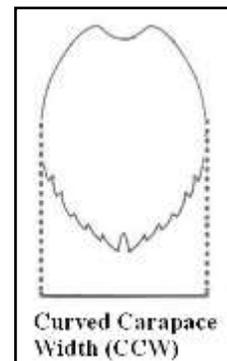


Curved carapace width (CCW) is measured at the widest point, but there are no standard features delineating the end points. The tape measure passes over the ridges and does not follow their contours.

#### 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. Because the supracaudals are often asymmetrical CCL n-t is taken to the longest tip.



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

### *Nest Survival and Hatching Success*

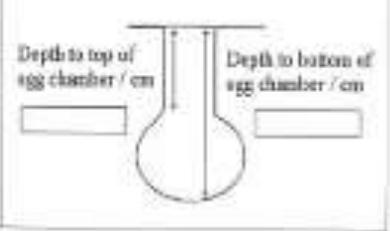
All nests recorded were included in a study on nest survival and hatching success. Nests were monitored during the daily morning track surveys. Close to the predicted hatching dates (approx. 55 days) the triangulation data were used to mark the site of the egg chamber; to prevent the surveyor having to re-measure the nest each day a small “V” of sticks or some other clearly identified mark was placed on the sand behind the nest site. This area was closely monitored for evidence of hatching; a depression, hatchling tracks or hatchlings. After signs of hatching were observed the nest was excavated within 48 hours; if no signs of hatching were recorded the nest was excavated after at least 70 days from the date the eggs were deposited. All excavations were conducted by the Program 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 egg chamber. Using gloves, the nest contents were carefully removed from the egg chamber and inventoried. The following data were recorded for each excavated nest:

- 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 – Only shells corresponding to more than 50% of the egg were counted; representing the number of hatched eggs.
- Number of hatchlings – Any hatchlings found in the egg chamber were recorded; dead or alive.
- Number of un-hatched eggs – Eggs were opened to search for the presence of embryos and categorized 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; characterized 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 characterized 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 centimeter.

Any hatchlings found alive were released to the sea. When the inventory was complete the nest contents were discarded in the surf to prevent bacterial infection of the sand.

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

**Figure 15: Data sheet used for recording nest excavation information**

## LEATHERBACK SUMMARY

### Nest Survival and Hatching Success

2011 leatherback numbers were very low therefore they are only included here as a mention.

There was only one Leatherback activity on Zeelandia beach during the 2011 nesting season. It was a probable lay and indicated the start of the nesting season near the end of March. No hatchling tracks were seen after the incubation period had passed.

The track width of the female averaged 192cm. The activity occurred between stake #6 and stake #7 which is near the concrete turtle entrance.



**Figure 16 Recording 1st track of 2011 season**

<b>Nest Code</b>	<b>Date</b>	<b>Time</b>	<b>Result</b>	<b>Comment</b>
DC1101?	27-Mar-11	12:28	Probable Lay	

One of the leatherback females that originally nested on St. Eustatius, was recorded nesting on Keys Beach in St. Kitts on Wednesday, April 13<sup>th</sup>, 2011.

She was bearing the flipper tag WC 306 on the right flipper. The left flipper tag was missing and the St. Kitts program field team placed WC 10445 on the left. The right tag was also about to come out but as they had met her departing the beach after laying they were only able to get one tag in. She was 162 cm CCL and 122 cm CCW. This was reported by Dr. Kimberly Stewart, the head of the St. Kitts Sea Turtle Conservation Program.

Leatherback WC306/**WC307** (replaced with WC10445) was tagged here in 2009. She was measured at CCL160 and CCW114. As far as we know she only nested once here.

Because of the low hatching success of leatherback eggs, in 2011 the Sea Turtle conservation program, in collaboration with former Stenapa manager Ms. Nicole Esteban and IMARES a research facility connected to the University of Wageningen in the Netherlands, initiated a research project to address the problem.

## GREEN TURTLE SUMMARY

### Nest Survival and Hatching Success

As was indicative of this season there were only 5 activities recorded for Green sea turtles in 2011; 2 lays and 3 probable lays.

Because of the widely distributed activities of the Green turtle, once the hard shell season starts in late July, the entire beach must be patrolled each evening. Because the length of the beach is 1.4km, and because hard shells are harder to target than leatherbacks, this part of the season is very taxing for the night patrol. For that reason the program focuses mostly on targeting of leatherbacks at the beginning of the season, in order to conserve manpower and prevent burnout before the nesting season ends.

The table below provides a summary of the nest survival data obtained from each green turtle nest of 2010; each table details, nest code, turtle identification number, fate of the nest and incubation period in days (if known). All the confirmed nests in question were located on Zeelandia beach.

Nest Code	Turtle ID	Date	Result	Nest Fate	Incubation Days	Excavated
CM1103?	Unknown	July 29 11	Probable Lay	Unknown	Unknown	-
CM1104?	Unknown	July 29 11	Probable Lay	Unknown	Unknown	-
CM1105R	Unknown	Aug 02 11	Lay	Hatched	53	Sept 24 11
CM1106?	Unknown	Aug 02 11	Probable Lay	Unknown	Unknown	-
CM1107	Unknown	Aug 04 11	Lay	Hatched	60	Oct 03 11

Nests whose fate was unknown were either washed away during storm surges or could not be relocated for excavation, even after extensive digging, due to inexact measurements on the data sheets.

Below is the nest content data obtained from excavated green turtle nests of 2011.

The nests listed were located on Zeelandia beach.

Nest Code	Laid	Excavated	Alive	Dead	Shells	No Embryo	Embryo	Full Embryo
CM1103?	July 29 11	-	?	?	?	?	?	?
CM1104?	July 29 11	-	?	?	?	?	?	?
CM1105R	Aug 02 11	Sept 24 11	1	5	70	1	11	7
CM1106?	Aug 02 11	-	?	?	?	?	?	?
CM1107	Aug 04 11	Oct 03 11	0	0	90	0	39	0

There was again a yolkless egg encountered during Green nest excavations in 2010.

Species	Mean depth to bottom/cm	Mean # eggs / nest	Mean % hatching	Mean % emergence
Green turtle	69.5	110	74%	47.5%

## HAWKSBILL SUMMARY

### Nest Survival and Hatching Success

As with the two other species of sea turtle, Hawksbill numbers were extremely low. There were 12 hawksbill activities, making it the most active of the species in 2011. Those activities were 2 lays, 5 probable lays and 5 track only.

Nest Code	Turtle ID	Date	Result	Nest Fate	Incubation	Excavation
EI1101?	None	29-Jul-11	Probable Lay	Unknown	Unknown	n/a
EI1102?	None	29-Jul-11	Probable Lay	Unknown	Unknown	n/a
EI1103	None	16-Oct-11	Lay	Rock Fall	Unknown	n/a
EI1105?	None	17-Oct-11	Probable Lay	Unknown	Unknown	n/a
EI1106?	None	17-Oct-11	Probable Lay	Unknown	Unknown	n/a
EI1110	None	30-Oct-11	Lay	Hatched	70	Jan 15 12
EI1111	None	20-Nov-11	Probable Lay	Unknown	Unknown	n/a

All but one of the nests listed above were located on Zeelandia Beach. The other was located on Crooks Castle beach.

Below is a summary of nest content data obtained from the sole excavated hawksbill nest of 2011; detailed are nest code and a breakdown of the results of the excavation. Nest EI1103, although confirmed, was buried under a rock fall near the end of the incubation period. Due to the mass of the fallen rocks and dirt, the egg chamber could not be relocated even after extensive digging

Nest Code	Incubation Total days	Alive	Dead	Shells	No embryo	Embryo	Full embryo
EI1110	70	138	0	138	1	16	0

Two hawksbill nests were found during the morning surveys that were either nests that were overlooked in 2010 or that could not be relocated due to extensive sand movement. One nest was found near stake 44, 2 meters to the South and 2 meters from the cliff. 11 whole eggs and 3 shells were found partially buried in the sand but there could be no excavation as the nest was now so close to the sea that waves were washing over the area. On September 15<sup>th</sup> during a morning survey another nest was found exposed by waves and excavated.

Nest Code	Incubation Total days	Alive	Dead	Shells	Pipped dead	Embryo	predated
EI10??	Unknown	0	0	90	3	39	1

The 39 eggs with embryo were very dehydrated and difficult to open. Top of the nest was at 41cm and the bottom was at 55cm.

## **INFECTED AND (PARTIALLY) COOKED EGGS**

As the program has been doing since 2009, in 2011 we continued to properly document the occurrence of infected and (partially) cooked eggs throughout the season. It is data that the program will continue to record in the future as in some years there is a considerable amount of nests lost due to the two factors of bacterial infection and excessively high sand temperatures. With the predicted increase in temperatures the program will be in a position to best determine from combined years' data what mitigating measures can be taken to address the problem.

Only 3 nests of the 2011 season were excavated so there is very little indication of what the actual occurrence of infected and cooked eggs were during this season. None of the probable lays could be confirmed and excavated.

Of the 1 hawksbill nest excavated, there were a total of 156 eggs of which 15 were infected by bacteria and 15 eggs were partially cooked. That calculates to 0.1% respectively.

2 green nests were excavated, CM1105R with a total of 102 eggs of which none were infected but 7 eggs were partially cooked (.07%) and CM1107 with a total of 119 eggs of which none were infected and 3 (.03%) were partially cooked.

Some research has gone into determining the reasons for this as well as trying to determine if this happens only in particular areas. The thought was to acquire data loggers for the season that can measure sand temperatures and moisture in different areas of the beach.

### **Temperature monitoring of Green turtle (*Chelonia mydas*) nests, Zeelandia Beach, in 2011**

Statia National Marine Park started work with Professor Graeme Hays and Nicole Esteban from Swansea University in 2011 to understand more about factors affecting turtle hatching success. The annual hatching success rate of turtle nests laid on Zeelandia Beach has been extremely variable since turtle monitoring commenced in 2002. For example, of the 12 Green Turtle (*Chelonia mydas*) nests monitored for hatching success in 2006, the average hatching rate was 51% (46.4% emergence), with variability from 1.4% hatching rate (0.0% emergence) through to 92% hatching rate (80.4% emergence). Factors affecting hatching success include natural predation, anthropogenic disturbance of nests, inundation by water and extreme temperatures.

In order to assess the sand temperature variation throughout the Green Turtle nesting (and incubation) season in 2011, and interpret results to assess whether temperatures are affecting hatching success, six calibrated temperature data loggers (TDL) were buried on 25 July 2011 in nesting locations on Zeelandia Beach and Turtle Beach. TDLs were buried at 48.8cm depth, the average depth recorded for Green Turtle nests in St Eustatius (STENAPA dataset 2005-2010). Four of the TDLs were left in a permanent position and two were relocated to record temperatures at different depths to take into account nest depth variability. Unfortunately two of the TDLs were lost in October due to beach

erosion during heavy ground seas. The remaining four TDLs were excavated and returned to Swansea University on 23 January 2012 at the end of the incubation period. Preliminary results from the TDLs have shown that temperatures in the nests reach 34.5°C on both beaches in the month of September. Maximum temperatures do not dip below 29°C until late November or early December. As would be expected, temperatures fluctuate considerably on a diurnal and seasonal basis, reaching a peak in August and September and a minimum in January at the end of the survey period. There are a number of unexplained spikes whereby the temperature drops by up to 5°C (both on Zeelandia Beach and on Turtle Beach), either in a matter of an hour or over a period of several days. This needs further investigation and comparison with tidal charts and rainfall, and weather records from the airport have been requested.

In marine turtles, sex is determined by temperature in the middle third of incubation with female offspring produced at higher temperatures and males at lower temperatures within a thermal tolerance range of 25–35°C (Ackerman, 1997). For all species and populations so far examined, the pivotal temperature marking the switch from predominantly male to predominantly female offspring has been close to 29°C (Ackerman, 1997). Results from this short survey period suggest that turtle hatchlings on Zeelandia and Turtle Beach will be therefore predominantly female. Additionally, nests on both beaches were at the upper level of thermal tolerance in August and September 2011. Closer examination of the data will bring more understanding of sex determination and potential hatching success during the nesting season. In order to gain a fuller understanding of implications of sand temperature, the survey period will be extended in 2012 to a full 12 month period, from February 2012 to February 2013. Results and conclusions will hopefully assist the Marine Park with a more focused strategy towards nest relocation to increase future hatching success.

Nicole Esteban, March 2012

### **References**

Ackerman RA (1997) The nest environment and embryonic development of sea turtles. In: *The Biology of Sea Turtles* (eds Lutz PL, Musick JA), pp. 83–106. CRC Press, Boca Raton.

Herrera A and Harrison E (2007) St Eustatius sea turtle conservation program: Annual Report 2006. STENAPA, 2007. [www.statiapark.org](http://www.statiapark.org)

### **TURTLE STRANDINGS**

There were no turtle strandings reported during the 2011 season.



**Figure 17 Temperature data logger**

1. Total amount of hatchlings survived in 2011:
  - Leatherback – 0
  - Green – minimum 131 – maximum unknown
  - Hawksbill – minimum 138 – maximum unknown
  - Unknown - 0

## Recommendations for the 2012 nesting season

### PREPARATIONS & CONSIDERATIONS:

- Provide adequate training for the turtle program interns and volunteers. Emphasize the need to fill in all data fields on the forms.
- Regardless of training given to program assistants, Program Coordinator should be present at initial tagging events.
- Program coordinator is responsible for excavations and relocations unless confident that assistant can carry them out in their absence.
- Service the truck that is dedicated to the program as it should be in ready condition to use when on call.
- Re-stake the beach. Stakes also need to be repainted. Check Kay Bay for re-staking as well.
- In addition to replacing and repainting missing stakes, the stake number must be painted on to the cliff face as it is inevitable that stakes will be removed by storm surge.
- Maintain the signs placed at the entrances to the beach urging dog owners to be vigilant when letting their dogs loose. Warn owners to investigate when their dogs are digging to avoid damage to nests.
- Find a more permanent solution to the barrels that block vehicular access to the beach as they corrode very quickly and are displaced during Atlantic storms.
- Publicize the start of the season via all available media with a reminder that Zeelandia is a protected sea turtle habitat and all that implies.
- Notify the police and public prosecutor of the start of the season and the anticipation of their cooperation in the event of violations.

### COMMUNITY AWARENESS

- Revitalize Summer Club activities as many children are repeat participants and find themselves involved in the same activities every year.
- Organize at least one evening presentation on sea turtles and the Program for the general public. If well attended, repeat.
- Dedicate at least two radio programs to sea turtles if there are no other pressing topics to be discussed.
- Update and utilize the list of persons wishing to view a nesting turtle, hatchling release or accompany the patrols.

- Publicize any notable events occurring during the season in the regional newspaper.
- Highlight the turtle program on the local television stations along with current footage.

#### ACTIVITIES:

- Continue with the beach beautification project as planting trees can also help to minimize runoff on the beach.
- Step up morning patrols on Kay Bay and Lynch beach to at least twice a week during Green and Hawksbill season. It is not good practice to rely on area residents to report tracks on the beach.
- Continue to lobby the company NuStar Energy NV to reduce the bright lighting on their storage tanks facing the beach.
- Continue to work on a light pollution solution to the buildings along the cliff.
- As much as possible try to leave nests in situ. Only in extreme situations should a nest be relocated.
- Relocation should be done to a site that is at least partially shaded during the day.
- Discard all remains from excavations into the surf instead of reburying them on the beach to avoid bacterial contamination of the sand.
- Take more accurate measurements when triangulating a nest location including the distance to the cliff face if applicable. During the 2011 season several nests could not be relocated for excavation due to inaccurate and confusing measurements.
- Use the t-shape lint system to easier relocate the nest chamber as using only the one lint straight down makes it hard to find the nest irrespective of the measurements given.
- Twice a month check Tumble Down Dick beach to the North of Smoke Alley
- Every confirmed nest should be excavated and the eggs examined to determine hatching success.
- Beach mapping should be carried out as and when it was done in previous years to have a more long term view of sand movement and erosion on Zeelandia beach.
- Data Loggers have been acquired with the help of the previous Manager and should be utilized to get a more accurate picture of sand temperature and moisture on the index beach.
- Utilize the new and improved data entry fields on the computer. Nothing has been changed but it has been simplified for easier analysis at the end of the season.