

St. Eustatius National Parks Foundation Sea Turtle Conservation Program Annual Report 2010



Photo: Hawksbill hatchling, Zachary Gipson

Jessica Berkel
Sea Turtle Program Coordinator
St. Eustatius National Parks Foundation
Gallows Bay, St. Eustatius
Dutch Caribbean
www.statiapark.org
research@statiapark.org



FOREWORD

The 2010 Sea Turtle nesting season far surpassed anything that the program has experienced in the 9 years of its existence.

There were record numbers of Green Sea Turtle nests including two clutches laid on the main nesting beach that contained rare albino Green Sea Turtle hatchlings.

In previous years there was a definite end to the season in mid-October but the 2010 season saw a Hawksbill nest as late as mid-January. This meant that the next to last nest hatched at the end of March which was after the start of the 2011 season which began in mid-March. The very last nest hatched in April 2011.

This report gives the reader an insight into the program's activities and tries to paint an accurate picture of the 2010 nesting season.

Hoping to have submitted a complete and interesting report,

Respectfully yours,

A handwritten signature in blue ink, appearing to read 'JB', with a vertical line to the left of the letters.

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. In the 2010 season, two Loggerhead nests were excavated confirming for the first time that species' use of Statia's beaches.

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 2010 Sea Turtle Conservation Program.
- Review the accomplishments and deficiencies of the program in 2010.
- Suggest recommendations for the 2011 program.
- Provide a summary of the data from 2010 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 many educational program, 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, and 2008; 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 Manager 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 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: 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



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 only once for the season, in the month of August, did the family call to report tracks on the beach, although in total there were 10 activities noted by researchers 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 rotten and creaky wooden staircase and needless to say having to repeat the process in reverse when finished with data recording on the beach.

Another important observation made during the 2009 nesting season is that due to the lack of stakes and or clear landmarks on Kay Bay several confirmed nests could not be found when the time came for them to be excavated. Because the nests were marked only with GPS coordinates, they proved absolutely impossible to find. This was very unfortunate and disappointing as from the hatchling tracks it could be determined that at least two of the three probable nests had hatched.

To solve this problem, at the start of the 2010 season, the coordinator and intern planted six stakes that run 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 2011 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 twice a week on Kay Bay/Crooks Castle during the hard shell 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



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 2010, 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 2010 nesting season, only 1 Hawksbill track was seen 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 2010 season Lynch Bay was monitored for activities 7 times and tracks leading to a nest were visible on one 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 2010 nesting season, 14 activities were recorded on this beach of which 6 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 good season for Zeelandia beach in 2010 with over 100 recorded activities.

Pre-Season Preparations

The 2010 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 2009 season were repainted and any missing stakes were replaced.

A beach cleanup was done in the middle of March to facilitate walking on the beach at night and to remove as much debris as possible that could hamper any nesting attempts.

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 received training before assisting with beach monitoring.

Other Preparations

At the beginning of the 2010 nesting season, the following activities were performed:

New Turtle Program interns

In mid-February, the position of turtle program intern was advertised internationally through Corallist, Idealist and WorkingAbroad. There was a good response to the offer however 2 volunteers that were already on island expressed an interest in the position and were accepted. In mid-March, Mr. Erik Boman and Ms. Anna Maitz, both from Sweden, were given training by the Program Coordinator.

Protection of Zeelandia beach

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. The concrete turtle was produced as part of the Zeelandia Beach Beautification project. The turtle has a three part function; it 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.

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.



The Program Coordinator and turtle interns had to be creative with the erection of barriers preventing driving on the beach.

Several discarded oil drums were found next to the public dump and were used to block several vehicle access points in order to deter sand miners.

They were buried up to 1/3 of their height and filled with boulders.



The barrels worked as they prevented sand miners from driving on the beach in that area but determined persons could still remove sand by walking onto the beach with buckets. As shown in the picture, large amounts of sand can be removed in this manner.

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

On Sunday, August 18th, a beach rally was held at Zeelandia beach where over 10 off road vehicles drove on the sand along the beach. The vehicles came very close to destroying several nests but luckily they escaped being driven on.



After several incidents involving dogs in the previous seasons, an



Nest partially excavated by a dog.

important preparation for the 2010 season was the erection of a sign at the main beach entrance, warning dog owners to keep a close watch on their dogs. It is impossible to prevent dogs from digging holes on the beach but signage urging persons to investigate exactly 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 2010 nesting season. However nearer the “end” of the season in December, two feral dogs living at the dump were venturing further and further on to the beach prompting the Coordinator to ensure that their tracks were not leading to any nests.

Beach Cleanups 2010



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.

Following is a summary of beach clean ups for the 2010 sea turtle nesting season:

Date	Beach area	Results	Comments
March 19	Zeelandia	20.5 kg	Large engine cover
April 07	Zeelandia	7 kg	
April 16	Zeelandia/Turtle beach	79 kg	Large rope, mesh, boards
May 14	Zeelandia/below dump	61.5 kg	Large rope removed
June 14	Zeelandia	60 kg	School Kids
August 06	Zeelandia	127 kg	
Nov 26	Zeelandia	61.5kg	Big net, Cooler, plastic

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



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 2010 a total of 32 children took part in the

activities of which the sea turtle program section was a part. Twice a week for 6 weeks Summer Club participants took part in turtle 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.



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 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.

Interested persons were called to the beach to witness a nesting female several times during the season but again, exact figures of the amount are not recorded.

As in previous years, an encouraging percentage of nest excavations were done with the assistance of a non-staff member. The actual investigation of the eggs was done by the Turtle Program Coordinator and a watchful eye was kept on the data that was being recorded by the assisting volunteer.

Besides children, the Sea Turtle 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, November 6th, 2010 a hatchling release was done in the early evening and members of the public were encouraged to attend. Hatchling releases are usually publicized using the turtle call list which is comprised of a list of members of



Hatchling Release Jan 22 2011- Photo: Anna Maltz



Written publication of Sea Turtle program activities was minimal.

The Daily Herald Newspaper Articles 2010

- Wednesday, August 18th - Beach Rally Threatens Zeelandia Turtle Nests-

“STENAPA Update” Newsletter articles 2010

- Newsletter 1/2010 March -2010 Turtle Nesting Season Starts-
- Newsletter 3/2010 September – Busy Nights at the Beach-

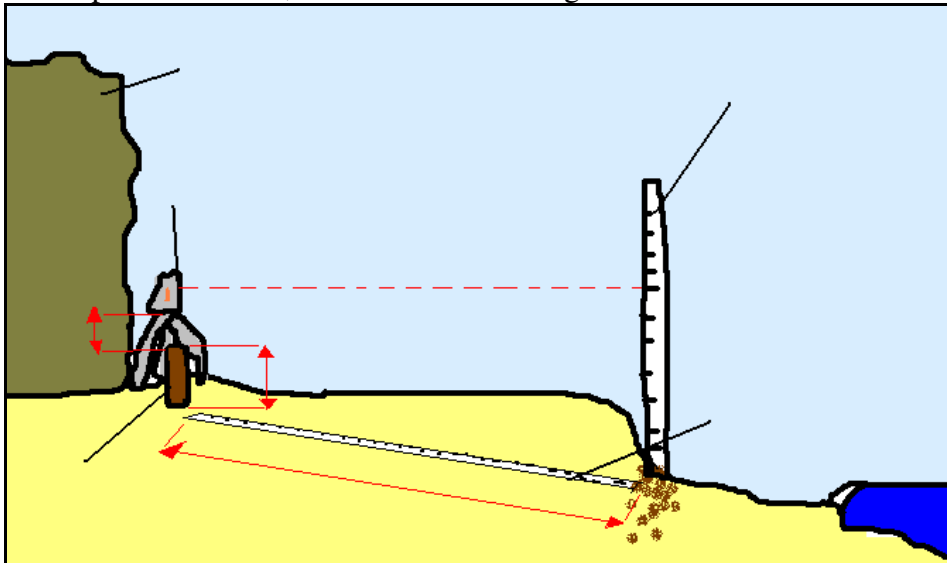
CHANGE Magazine, Volume 6 n° 3 (Magazine published in the Netherlands)

- Saba, St. Eustatius and Bonaire, New Dutch Municipalities –St. Eustatius: A Diamond in the Rough”-

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.



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 month of April 2010 and unfortunately due to time constraints and personnel shortage, the 2 additional beach surveys were not conducted. Hopefully in the 2011 season the program will be able to get back on track with conducting all 3 scheduled beach mapping surveys.

BEACH EROSION



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, #33 to #38, #42 to 51 and stakes #65, 66 and 67, are buried beneath the sand for a period of months. Towards the end of December many of the 70 stakes were 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 #55



Cliff fall stake #58

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 2010 nesting season, there were quite 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.

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 2010 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 15th 2010 up to and including October 10th, 2010 on the primary nesting beach (Zeelandia Beach) and Turtle Beach. After the latter date, daily afternoon patrols and weekend morning patrols were conducted by the Program Coordinator and a member of the public until December 30th. Thereafter patrols were done every other day with a view of monitoring the remaining nests on Zeelandia. 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.

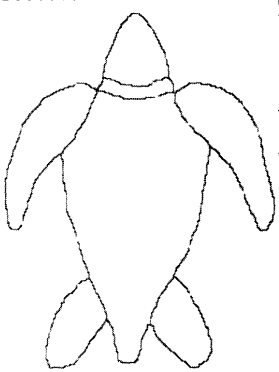
For each track observed the following information is recorded:

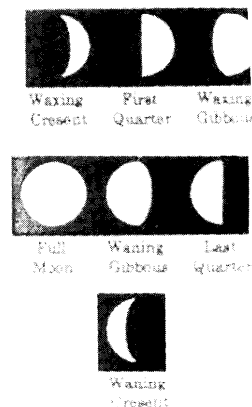
- Observer – Name of observer recording data.
- Date
- Weather – Brief description of weather conditions.
- Moon phase – Based on the previous night's moon; this information is recorded to determine whether there is a relationship between moon phase and emergence.
- Species – If possible to determine 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 30th, 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/
Flipper Tag(R): _____	Digging Egg Chamber/Laying/ Covering/
	Disguising / Leaving / Gone
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 2010 nesting season:

During the entire season a total of 265 morning track surveys were carried out.

Beach	Times surveyed	Activities recorded
Zeelandia Beach	266	17 Tracks, 21 Dry runs, 8 Nests, 3x Hatchling tracks, 2 Unconfirmed nests.
Lynch Beach	07	1 track, 3 nests
Turtle Beach	179	See Zeelandia beach
Oranje Bay	273	2 tracks including 1 nesting attempt
Crooks/Kay Bay	09	10 Tracks, 3 Nests, 4 Unconfirmed
Tumble Down Dick Beach	03	No activity

Turtle beach is included for the results of Zeelandia beach since they are considered as one beach in the database.

This start of this nesting season almost mirrors the last 3 seasons in that the first track was observed on March 15th. The last activity which far exceeded any season was observed on the 31st of January, 2011 which is exactly three and a half months later than the close of the previous season. The 2010 season ended with a Hawksbill making a dry run and a Loggerhead depositing a nest at the far end of Zeelandia beach.

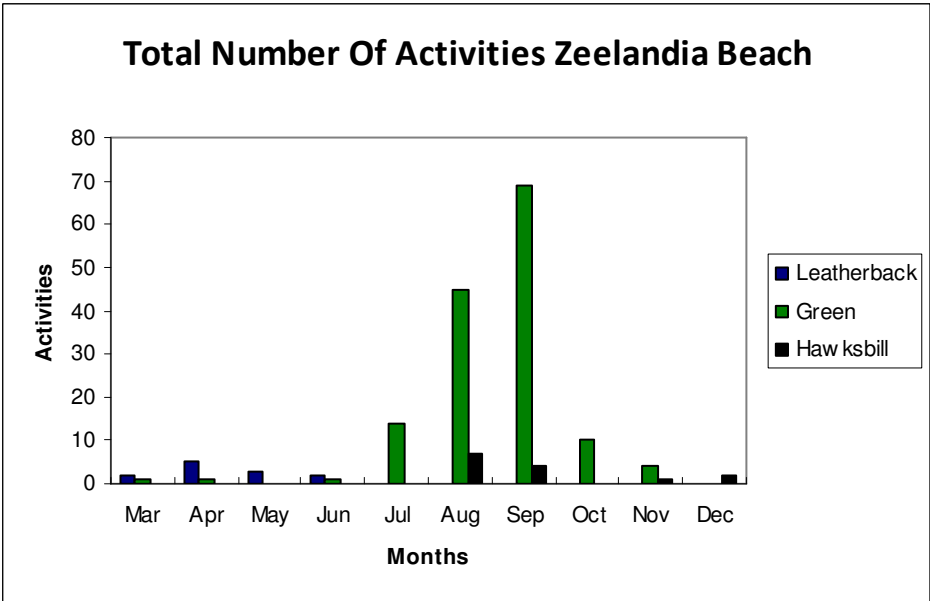
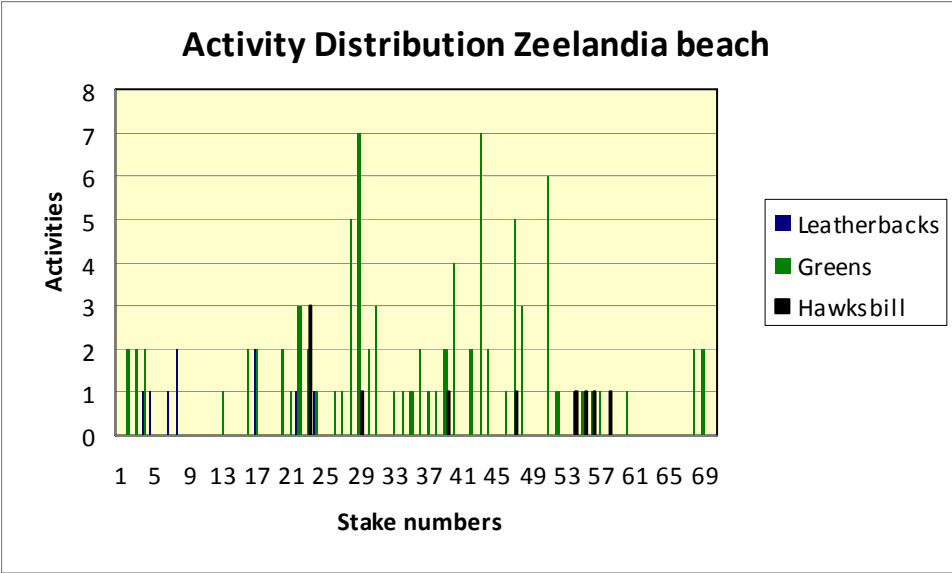
The Leatherback nesting season ran from March 19th to June 2nd 2010. Green turtle activities were recorded from April 25th to November 17th 2010 and the Hawksbills appeared from July 23rd to January 31st.

Morning track surveys continued into the early part of 2011 because some nests had still not hatched and needed to be monitored and maintained. The last confirmed nest was due to hatch mid-March 2011 so although the regular morning patrols ceased on Dec 31st, the Program Coordinator went to the beach sporadically to monitor nests up to February, 2010.

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

Species	Confirmed nest	Unconf. Nest	Crawls/Activities
Leatherback	05	06	04
Green turtle	39	30	65
Hawksbill	06	12	14
Loggerhead	06	00	03

The data above translates into an overall improvement on the previous season which the exception being the amount of Leatherback nests. 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.

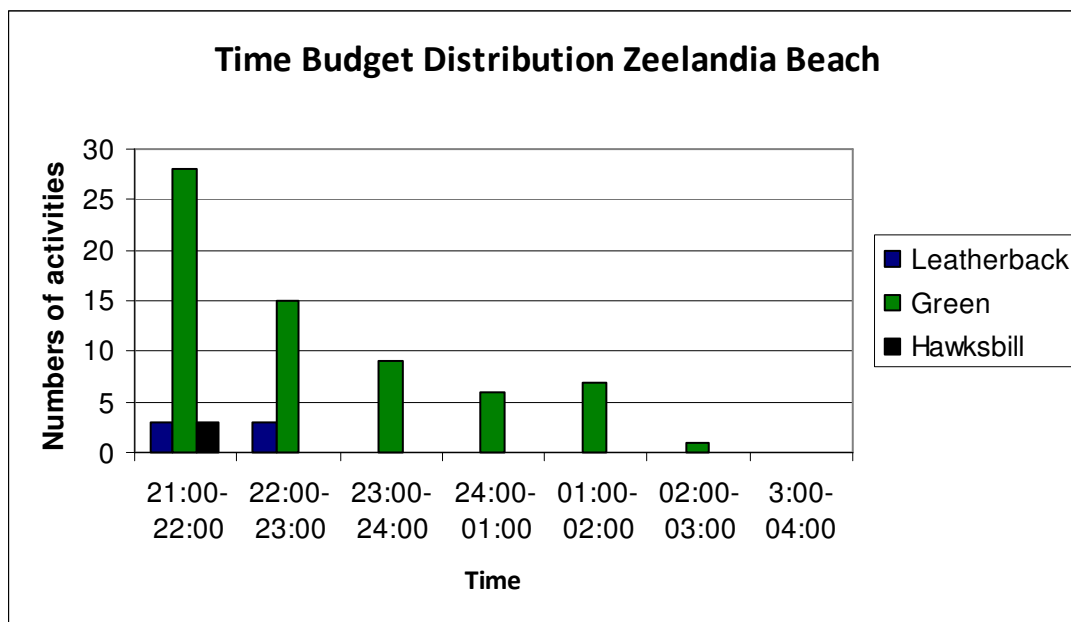
Once the turtle had returned to the sea, a line was drawn in the sand through both tracks or they were erased to indicate to the person conducting the morning track survey that data had been collected, preventing data repetition for the same track or nest.

Results of 2010 Nightly Beach Patrols:

Nightly monitoring of Zeelandia beach began on March 19th, ended on October 12th, and was done on a fairly regular basis. Patrols were only 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 104 nightly patrols during the 2010 season.

The timeframe within which nests were deposited varied with the earliest lay occurring at 21:00 hrs and the latest finishing after 3:00am. This late finisher is not reflected on the graph because she started nesting at 00:46am and due to a missing rear flipper took just over 3 hours to complete the task.

	9-10 pm	10 – 11 pm	11 – 12	12 – 1 am	1 – 2 am	2 – 3 am	3 – 4 am
DC	3	3					
CM	28	15	9	6	7	1	
EI	3						



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.

During the 2010 nesting season, 3 Leatherbacks were encountered. There was almost certainly a 4th Leatherback but it was not seen by the patrol, the nest was found the following morning. 2 Green turtles and possibly 3 Hawksbills were encountered. The Hawksbill count is not certain as there were no tags and no attempt was made to tag the female(s).

ENTER NEST DISTRIBUTION GRAPH HERE

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.

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.

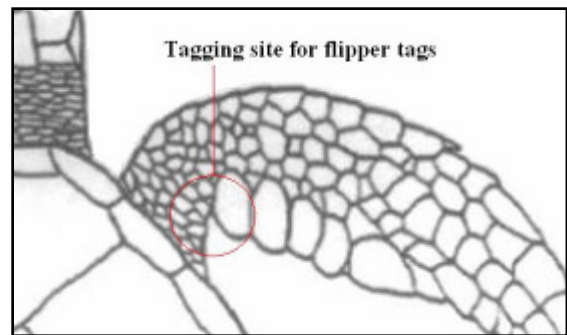
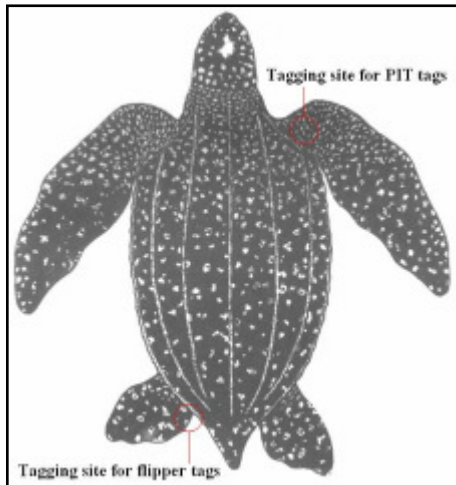


Figure 3: Tagging site Hard shells



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 2009 nesting season as 2 of the 3 female Leatherbacks

Tagging sites for Leatherback

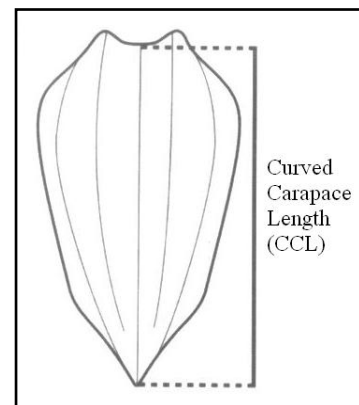
that visited this season had already been PIT tagged and additionally the PIT tag reader malfunctioned in early April and had to be sent to the USA for repairs. The Leatherback (133764653A) was previously recorded on Zeelandia beach in 2005 and the Leatherback (4B12030C2D) was a turtle that had been recorded nesting on the neighboring island of St. Kitts. WC306/WC307 was tagged on Zeelandia beach on April 9th of this season but it could not be determined if she was also carrying a PIT tag as the reader was malfunctioning at the time. The Green turtle (WE11-WE7) was recorded on Zeelandia in 2005.

Carapace Measurements

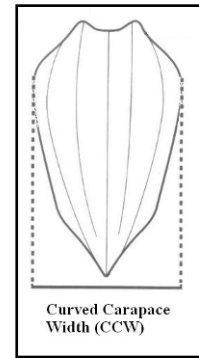
Standard carapace length and width measurements (as of Bolten, 1999) were taken of each nesting turtle encountered, after she had finished laying and at every encounter thereafter when possible. Measurements were made using a flexible tape measure; each measurement was taken once, to the nearest millimeter.

Leatherbacks

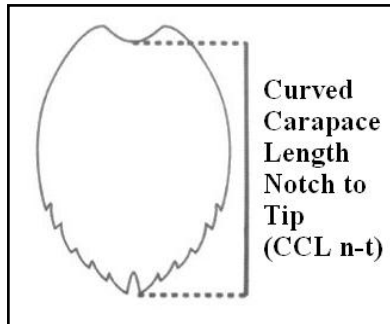
Curved carapace length (CCL) was measured from the nuchal notch (the anterior edge of the carapace where it meets the skin) in a straight line to the most posterior tip of the caudal projection. When the caudal projection is not symmetrical the measurement is made to the longest point (any such irregularity 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.



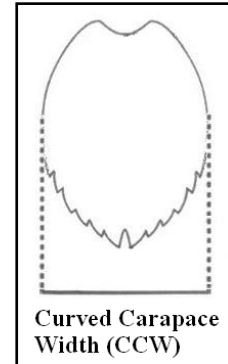
Curved carapace width (CCW) is measured at the widest point, but there are no standard features delineating the end points. The tape measure passes over the ridges and does not follow their contours.



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.


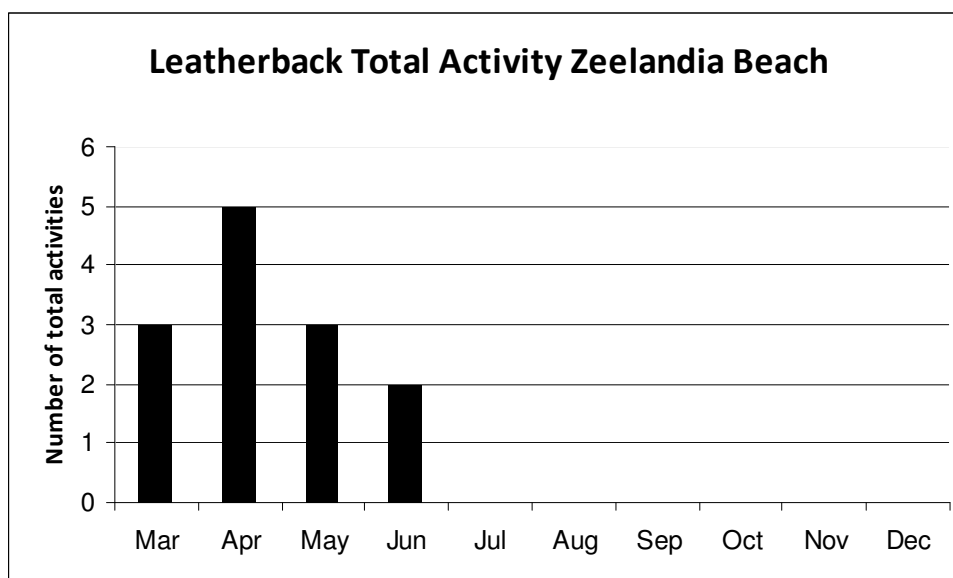
NEST EXCAVATION DATA SHEET	
Nest Code	<input type="text"/>
Observers	<input type="text"/>
Date	<div>- Laid <input type="text"/></div> <div>- Hatched <input type="text"/></div> <div>- Excavated <input type="text"/></div>
Number of Empty Shells (> 50%)	<input type="text"/>
Number of Hatchlings	<div>- Alive <input type="text"/></div> <div>- Dead <input type="text"/></div>
Number of Unhatched Eggs	<div>- No Embryo <input type="text"/></div> <div>- Embryo <input type="text"/></div> <div>- Full Embryo <input type="text"/></div>
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	<div>Depth of Nest</div> <div> <div>Depth to top of egg chamber / cm <input type="text"/></div> <div>  <div>Depth to bottom of egg chamber / cm <input type="text"/></div> </div> </div>

Figure 5: Data sheet used for recording nest excavation information

LEATHERBACK SUMMARY

Nest Survival and Hatching Success

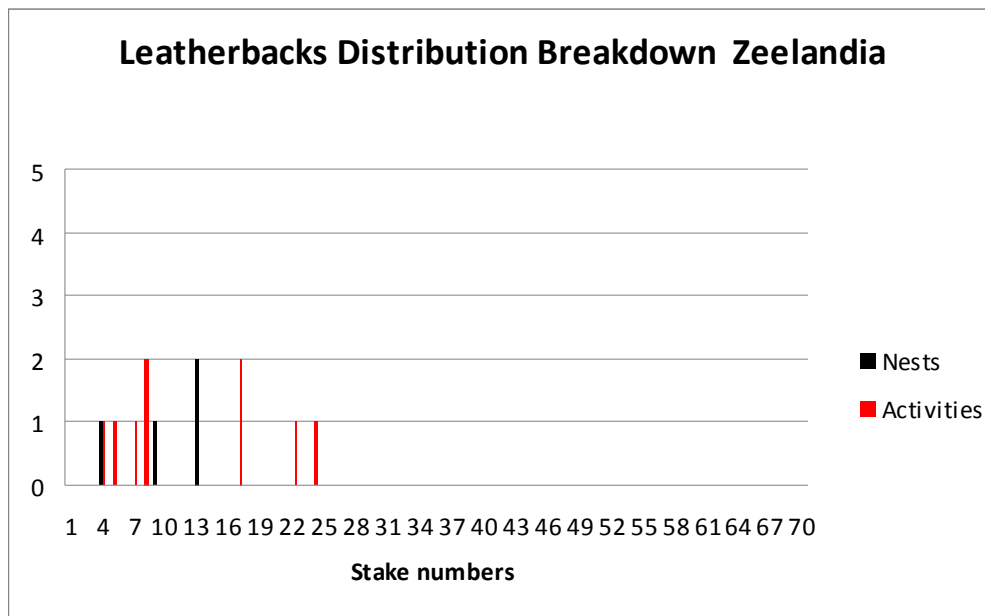
2010 leatherback numbers were very low therefore they are only included here to give an overview of the activities and dates.



There were 13 leatherback activities of which 5 were confirmed lays, 5 were probable lays, 2 were dry runs and 1 was track only.

Nest Code	Date	Time	Result	Comment
No Code	15 Mar-10	17:30	Dry Run	
DC1001	17-Mar-10	07:35	Lay	Unhatched
DC1002?	21-Mar-10	8:30	Probable Lay	Could not find
DC1003?	02-Apr-10	21:00	Probable Lay	Could not find
DC1004?	10-Apr-10	9:05	Probable Lay	Could not find
DC1005?	17-Apr-10	9:50	Probable Lay	Could not find
DC1006	19-Apr-10	22:20	Dry Run	
DC1007?	25-Apr-10	12:00	Probable Lay	Could not find
DC1008	03-May-10	10:15	Lay	Unhatched
DC1009	12-May-10	09:00	Lay	Could not find
DC1010	21-May-10	22:15	Lay	WC337
DC1011	01-Jun-10	7:25	Lay	Unhatched
DC1012	02-Jun-10	8:00	Track Only	

As can be seen from the chart above no leatherback hatchlings were encountered during the 2010 season. There were no signs of hatchling tracks in the areas of the probable lays and the lays that could not be found. This has prompted the program to be more aggressive in our conservation efforts for the 2011 season especially where it concerns the leatherback nests.



The graph above, which is a good reflection of activity distribution not only for the 2010 season but for all previous years, shows that leatherbacks very rarely emerge much farther than the wide sandy area on Zeelandia beach between stakes 3 and stakes 16. By utilizing this and previous distribution maps the program can concentrate their monitoring efforts on that area of the beach during leatherback nesting season.

There were 2 re-migrant leatherbacks during the season which were tagged previously by the program.

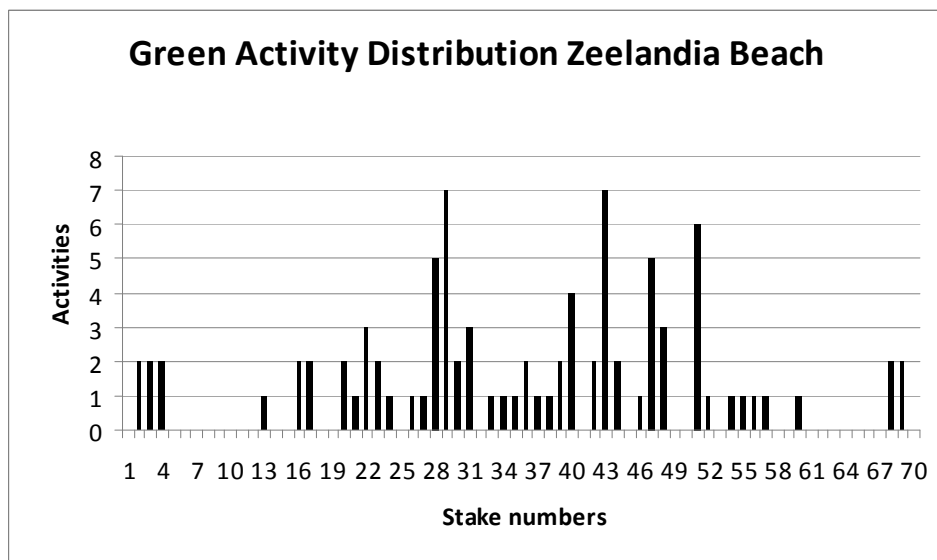
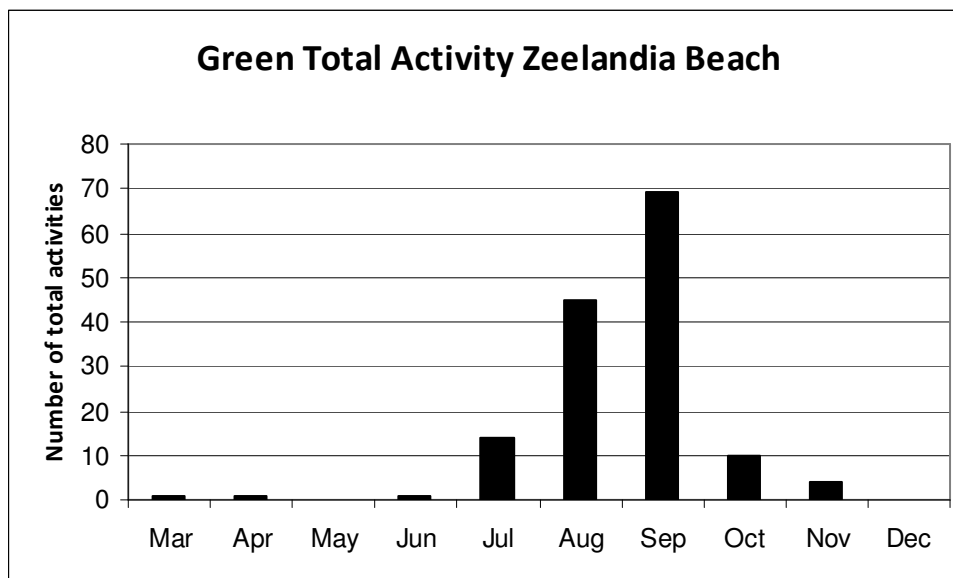
The leatherback WC339 (PIT 133922451A) which had visited in 2008 and then measured CCL 158cm and CCW 106cm, returned to nest this season and was measured this time at CCL 168cm and CCW 119cm. This female was encountered only once in 2010 and deposited a nest on that occasion.

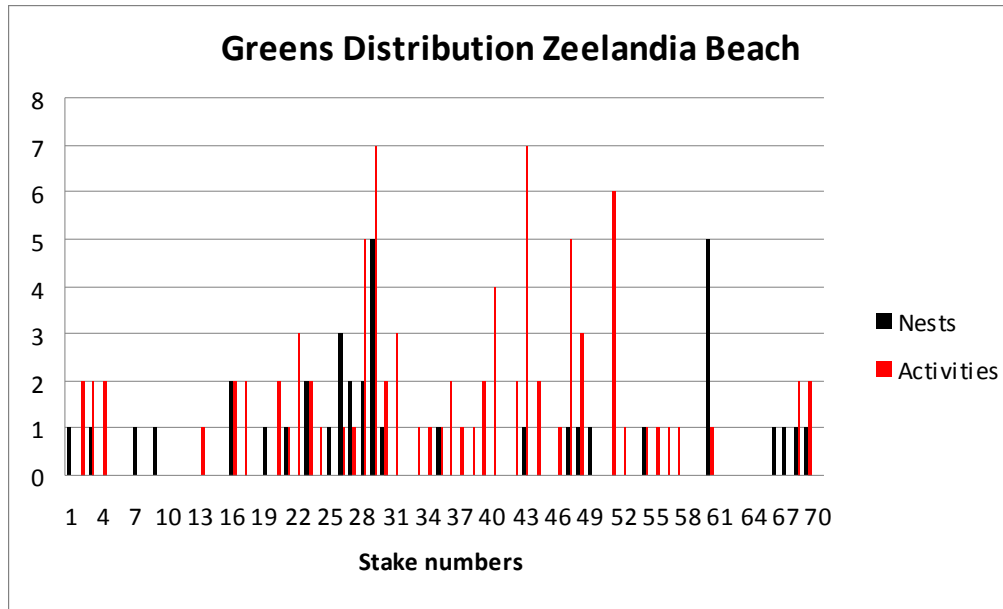
Leatherback WC337/8 (PIT 134614623A) had visited in 2005 with measurements of CCL 147.5cm and CCW 114.6cm and was measured this year at CCL 164cm and CCW 118cm. This female deposited two nests in 2010 as recorded by program researchers. Both females had lost a tag and unfortunately no new ones could be applied because of the position of the female while nesting. Although the tag reader was not working during this season the PIT tag numbers were retrieved from the previous years' data.

GREEN TURTLE SUMMARY

Nest Survival and Hatching Success

All 47 confirmed green turtle nests are included in the nest survival and hatching success study. 36 probable nests were unconfirmed, including two at Kay Bay, and therefore not included. There were 25 dry runs recorded and 44 track only sightings. This brought the total of CM activities to 152 for the 2010 season.





Because of the widely distributed activities of the Green turtle, once the hard shell season starts in late June to 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
CM1013	Unknown	July 26 10	Lay	Hatched	+/- 65 days	Oct 02 10
CM1014	Unknown	July 26 10	Lay	Hatched	Unknown	Oct 23 10
CM1015	WC315 WE57	July 27 10	Lay	Unknown	Unknown	n/a
CM1016	WC304	July 29 10	Lay	Unhatched	n/a	Sept 25 10
CM1019	Unknown	Aug 04 10	Lay	Unhatched	n/a	Oct 19 10
CM1022	Unknown	Aug 05 10	Lay	Hatched	+/- 55 days	Oct 14 10
CM1026	WC258/257	Aug 11 10	Lay	Unknown	n/a	n/a
CM1029	WC302	Aug 12 10	Lay	Unknown	n/a	n/a
CM1037	WE24/25	Aug 14 10	Lay	Hatched	+/- 63 days	Oct 24 10
CM1045	Unknown	Oct 25 10	Lay	Unknown	n/a	n/a
CM1054	Unknown	Aug 21 10	Lay	Unhatched	n/a	Oct 09 10
CM1055	WC253	Aug 21 10	Lay	Unhatched	n/a	Oct 23 10
CM1058	Unknown	Begin of July	Lay	Unhatched	Dug up by other turtle	Oct 09 10
CM1061	WC258	Aug 23 10	Lay	Unhatched	n/a	Nov 06 10

CM1070	Unknown	Sep 02 10	Lay	Hatched	68 days	Nov 17 10
CM1082	WE25	Sep 02 10	Lay	Unhatched	n/a	Nov 27 10
CM1089	Unknown	Sep 04 10	Lay	Hatched	74 days	Nov 28 10
CM1092	Unknown	Sep 08 10	Lay	Hatched	67 days	Nov 14 10
CM10100	Unknown	Sep 11 10	Lay	Hatched	59 days	Nov 09 10
CM10101	Unknown	Sep 11 10	Lay	Unhatched	n/a	Nov 14 10
CM10102	WC315	Sep 11 10	Lay	Unhatched	n/a	n/a
CM10104	Unknown	Sep 13 10	Lay	Unhatched	n/a	Dec 04 10
CM10110	Unknown	Sep 15 10	Lay	Hatched	+/- 65 days	Oct 03 10
CM10112	White Dot	Sep 18 10	Lay	Hatched	+/- 57 days	Nov 21 10
CM10113	Unknown	Sep 19 10	Lay	Hatched	48 days	Nov 06 10
CM10114	Unknown	Sep 19 10	Lay	Hatched	61 days	Nov 19 10
CM10115	Unknown	Sep 20 10	Lay	Hatched	49 days	Nov 09 10
CM10117	Unknown	Sep 21 10	Lay	Hatched	57 days	Nov 19 10
CM10118	Unknown	Sep 21 10	Lay	Unhatched	42 days	Dec 04 10
CM10119	Unknown	Sep 22 10	Lay	Hatched	52 days	Nov 23 10
CM10129	Unknown	Sep 27 10	Lay	Hatched	68 days	Dec 04 10
CM10134	Unknown	Sep 29 10	Lay	Hatched	66 days	Dec 04 10
CM10135	Unknown	Sep 29 10	Lay	Hatched	Unknown	Dec 01 10
CM10138	Unknown	Sep 30 10	Lay	Unhatched	n/a	Dec 08 10
CM10139R	Unknown	Oct 01 10	Lay	Hatched	45 days	Nov 15 10
CM10141aR	Unknown	Oct 14 10	Lay	Hatched	+/- 65 days	Dec 22 10
CM10141	Unknown	Oct 09 10	Lay	Unknown	n/a	n/a
CM10142	Unknown	Oct 22 10	Lay	Hatched	60 days	Dec 22 10
CM10143	Unknown	Oct 23 10	Lay	Unhatched	n/a	n/a
CM10144	Unknown	Oct 23 10	Lay	Unhatched	n/a	n/a
CM10146	Unknown	Oct 24 10	Lay	Hatched	74 days	Jan 05 11
CM10147	Unknown	Nov 06 10	Lay	Hatched	72 days	Jan 22 11
CM10150	Unknown	Nov 17 10	Lay	Hatched	Unknown	Jan 02 10
CM10151	Unknown	Unknown	Lay	Hatched	Unknown	Jan 02 10
CM10UN01	Unknown	Unknown	Lay	Unhatched	Exposed by cliff fall	Oct 09 10
CM10UN02	Unknown	Unknown	Lay	Hatched	Found due to hatchling tracks	Nov 20 10
CM10UN03	Unknown	Unknown	Lay	Hatched	Found then Lost	Nov 23 10

CM10141 and CM10141aR almost share the same nest code because CM10141a was found a month after it was deposited. It was found during a search for another nest and had initially been recorded as a dry run attempt by the female. Since nests had been recorded after it was deposited, it was decided that to avoid the confusion which would result from giving it a higher number than nests deposited after it, it would instead get a letter after the nest code. The nest codes that end with an "R" were those relocated to a safer area.

The survival rate of nests for green turtles was encouraging. As can be seen in the summary above only 12 of the 47 nests were unsuccessful. 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.

The average incubation period was determined from the 27 nests that hatched with known incubation days to be 60 days.

Species	Mean depth to bottom/cm	Mean # eggs / nest	Mean % hatching	Mean % emergence
Green turtle	68	106	53.26%	54%

Below is a summary of nest content data obtained from excavated green turtle nests of 2010; detailed are nest code and a breakdown of the results of the excavation.
All the nests listed were located on Zeelandia beach.

Nest Code	Laid	Excavated	Alive	Dead	Shells	No Embryo	Embryo	Full Embryo
CM1013	26 July	02 Oct	0	2	45	2	48	0
CM1014	26 July	23 Oct	0	1	1	2	107	0
CM1015	27 July	n/a	?	?	?	?	?	?
CM1016	29 July	25 Sept	0	0	0	3	93	3
CM1019	4 Aug	19 Oct	0	0	0	0	105	16
CM1022	5 Aug	5 Oct	0	0	1	3	81	0
CM1026	11 Aug	n/a	?	?	?	?	?	?
CM1029	12 Aug	n/a	?	?	?	?	?	?
CM1037	15 Aug	24 Oct	1	1	119	0	0	0
CM1045	25 Oct	n/a	?	?	?	?	?	?
CM1054	21 Aug	09 Oct	0	0	0	26	41	0
CM1055	21 Aug	09 Oct	0	0	0	36	130	0
CM1058	22 Aug	09 Oct	3	22	42	18	51	1
CM1061	23 Aug	06 Nov	0	0	0	1	112	0
CM1070	2 Sept	17 Nov	0	0	83	0	24	0
CM1082	2 Sept	27 Nov	0	0	0	2	127	0
CM1089	4 Sept	28 Nov	0	0	59	0	24	0
CM1092	8 Sept	14 Nov	9	0	125	1	5	9
CM10100	11 Sept	09 Nov	3	1	45	0	45	0
CM10101	11 Sept	14 Nov	0	0	0	10	153	0
CM10102	11 Sept	n/a	0	0	0	?	?	?
CM10104	13 Sept	04 Dec	0	0	6	0	124	2
CM10110	15 Sept	03 Oct	0	0	1	10	45	0
CM10112	18 Sept	21 Nov	7	0	106	0	8	0
CM10113	19 Sept	06 Nov	120	0	120	0	0	1
CM10114	19 Sept	04 Dec	0	1	70	0	7	0
CM10115	20 Sept	23 Nov	6	4	137	0	2	1
CM10117	21 Sept	19 Nov	3	8	79	0	0	0
CM10118	21 Sept	04 Dec	0	0	0	0	24	51
CM10119	22 Sept	23 Nov	0	0	97	0	7	0
CM10128	24 Sept	n/a	0	?	0	?	?	?
CM10129	27 Sept	04 Dec	4	1	87	0	8	1
CM10134	29 Sept	04 Dec	13	38	91	0	3	0
CM10135	29 Sept	01 Dec	0	14	39	2	64	2
CM10138	30 Sept	08 Dec	0	0	0	0	89	0
CM10139R	1 Oct	15 Nov	56	7	65	0	0	1
CM10141	9 Oct	n/a	0	0	0	?	?	?

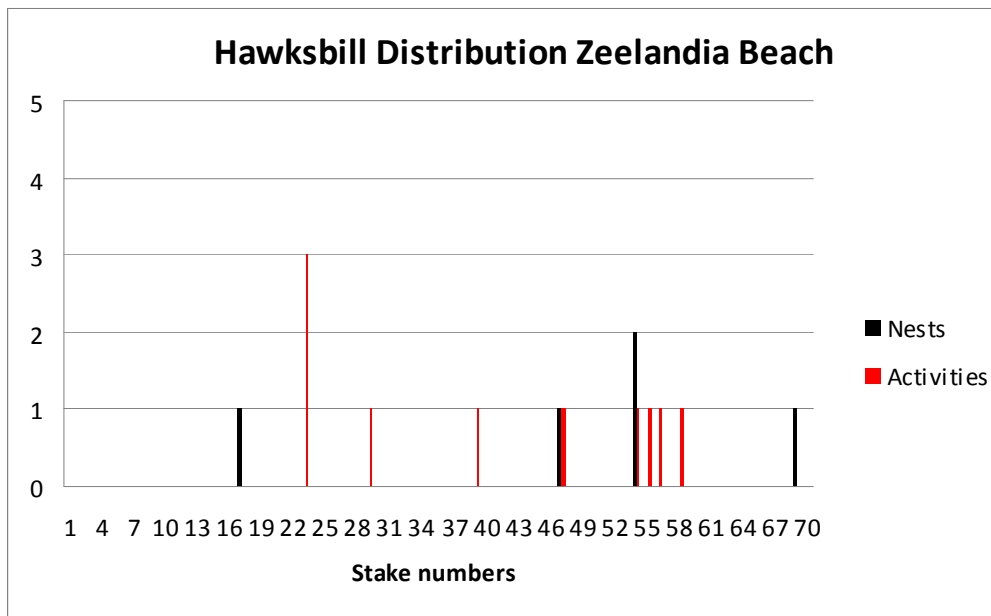
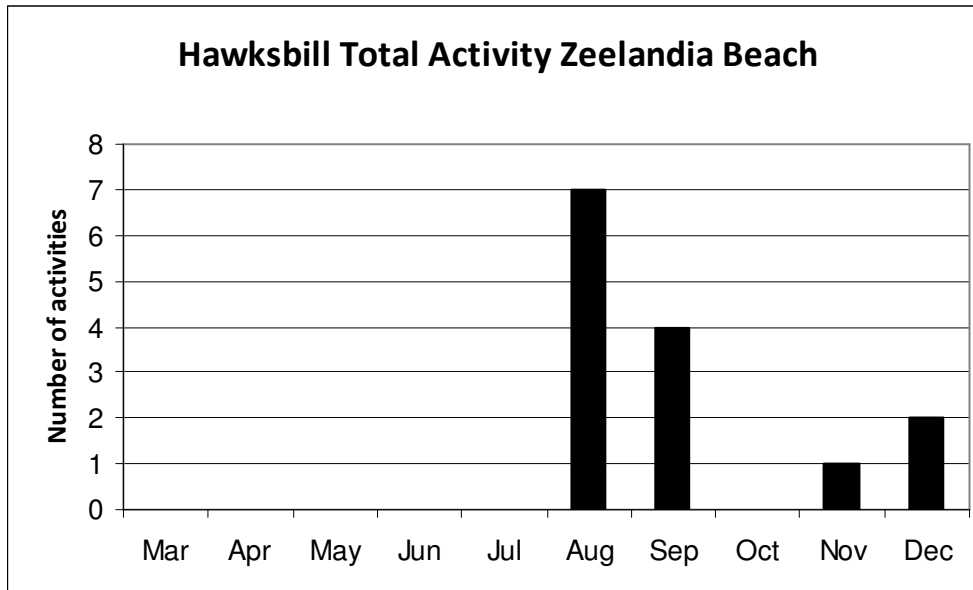
CM10141aR	14 Oct	22 Dec	3	0	65	0	3	0
CM10142	22 Oct	22/30 Dec	52	0	55	0	1	0
CM10143	23 Oct	30 Dec	0	0	0	?	?	?
CM10144	23 Oct	30 Dec	0	0	0	?	?	?
CM10146	24 Oct	05 Jan 11	18	0	101	0	4	1
CM10147	6 Nov	22 Jan 11	9	0	92	2	5	0
CM10150	16 Nov	07 Feb	0	0	0	0	78	22
CM10151	Unknown	2 Jan 11	0	0	89	1	24	0
CM10UN01	Unknown	09 Oct 11	0	0	0	22	22	0
CM10UN02	Unknown	20 Nov 11	1	5	129	0	7	0
CM10UN03	Unknown	23 Nov 11	0	0	6	0	2	1

There were again yolkless eggs encountered during Green nest excavations in 2010.

HAWKSBILL SUMMARY

Nest Survival and Hatching Success

All of the 11 confirmed Hawksbill nests were later excavated. 5 activities were recorded as “Track only” and there were 4 “Dry runs”. An additional 13 nests were probable lays and the eggs were never found.



Nest Code	Turtle ID	Date	Result	Nest Fate	Incubation	Excavation

EI1020	None	Aug 28 10	Lay	Hatched	65	Nov 02 10
EI1022	None	Sept 09 10	Lay	Hatched	61	Nov 13 10
EI1025	None	Sept 24 10	Lay	Hatched	60	Dec 01 10
EI1026	None	Nov 13 10	Lay	Hatched	67	Jan 22 10
EI1027UN	None	Unknown	Lay	Hatched	Unknown	Nov 22 10
EI1028	None	Dec 13 10	Lay	Hatched	104	Apr 02 10
EI1029	None	Jan 15 10	Lay	Hatched	91	Apr 23 10
EI1030UN	None	Unknown	Lay	Hatched	Unknown	Feb 04 10
EI1031UN	None	Unknown	Lay	Hatched	Unknown	Feb 04 10
EI1033UN	None	Unknown	Lay	Hatched	Unknown	Dec 26 10
EI1034	None	Jan 31 11	Lay	Unknown	n/a	Feb 05 11

All 10 nests listed above were located on Zeelandia Beach and Lynch Beach. As in previous years, the nests on Kay Bay were impossible to locate although hatchling tracks were seen on several occasions. Also the stakes that were placed on Kay Bay were helpful for some nests but the sand composition is extremely rocky.

Below is a summary of nest content data obtained from excavated hawksbill turtle nests of 2010; detailed are nest code and a breakdown of the results of the excavation.

Nest Code	Incubation Total days	Alive	Dead	Shells	No embryo	Embryo	Full embryo
EI1020	65	0	0	2	4	89	0
EI1022	61	1	3	13	1	145	4
EI1025	60	0	0	142	0	8	0
EI1026	67	28	3	173	0	6	0
EI1027UN	Unknown	37	0	58	3	42	2
EI1028	104	28	6	88	0	8	34
EI1029	91	1	0	127	3	14	1
EI1030UN	Unknown	0	8	94	0	37	1
EI1031UN	Unknown	0	0	139	0	0	0
EI1033UN	Unknown	0	0	146	0	4	0
EI1034	n/a	0	0	0	0	0	0

EI1034 was a very unique nest as it was entirely composed of deformed eggs most of which were attached to a long string. The eggs were extremely fragile and even while trying to remove them from the nest they were tearing in your hand. The nest was therefore filled with yolk and dark brown to black liquid.

Species	Mean depth to bottom/cm	Mean # eggs / nest	Mean % hatching	Mean % emergence
Hawksbill	23.5cm	137	59.10	76.33

INFECTED AND (PARTIALLY) COOKED EGGS

As there were a number of incidences of infected eggs in 2009, one of the recommendations for this year was to make an effort to properly document the occurrence of infected and (partially) cooked eggs from the beginning of the season. Since we were keenly paying attention to it this year it was quickly noted that there was a decrease in the amount of infected eggs seen and also of partially cooked or cooked eggs. It is something 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.

The summary below contains a breakdown of infected and (partially) cooked eggs from all nests excavated during the 2010 season and a breakdown by species and location.

Mean percentage of infected green turtle eggs – 20%

Mean percentage of cooked green turtle eggs – 20%

Mean percentage of infected hawksbill turtle eggs – 17%

Mean percentage of cooked hawksbill turtle eggs – 19%

While there is very little data recorded in the past, the percentages are still a little high for the nesting population that we have locally. Some research has gone into figuring out the reasons why this happens as well as trying to determine if this happens only in particular areas.

The thought is to acquire data loggers for the 2011 season that can measure sand temperatures and moisture in different areas of the beach. With that information we hope to be able to narrow the causes of the

1. Total amount of hatchlings survived in 2010:

- Leatherback – 0
- Green – 1850
- Hawksbill – 962
- Unknown - 61

TURTLE STRANDINGS

There were 4 turtle strandings during the 2010 season. On the 23rd of June, a turtle was reported at the beach behind Smoke Alley called Tumble Down Dick Bay. When the turtle “interns” went to investigate they found a hawksbill turtle that had been dead for at least 2 weeks, probably more. No abrasions to carapace, limbs intact. Turtle was on its back, the carapace length was 93 cm, the carapace width, 61 cm. The turtle was not moved much as its advanced state of decomposition made it difficult to handle. Larvae and flies were present.



The second turtle was reported stranded at Zeelandia beach. It was found in a pool high up on the beach after a particularly violent storm surge. This was a hawksbill turtle that was in its epipelagic phase, 4cm to 20cm. (*Diez and van Dam, 1997*). There were no external injuries visible on the turtle but there were signs of dehydration.



A third specimen was found at Lynch Beach by STENAPA Junior rangers during a beach cleanup. This was a green turtle with measurements of CCL 21cm and CCW 18cm. There was extensive damage to the plastron and it was in an advanced stage of decomposition. Cause of death therefore could not be determined as was the case in all three abovementioned strandings.



On Feb 25th, 2011, a dive master in training from one of the local dive shops came in with a juvenile hawksbill that was found floating in the harbor. There was damage to the right shoulder and it was in a state of severe dehydration. The CCL was 24.8 cm and the CCW was 21 cm. It was checked for tags and there were none found.

Recommendations for the 2011 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.
- Erect signs at the other 2 entrances to the beach urging dog owners to be vigilant when letting their dogs loose on the beach. Warn owners to investigate when their dogs are digging to avoid damage to nests.
- Replace the barrels that block vehicular access to the beach as they were displaced during a late 2010 storm.
- 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 a volunteer resident to do this as was shown during the 2009 season.
- 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 2010 season several nests could not be relocated for excavation due to inaccurate and confusing measurements.
- Initiate the use of 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 the true fate of the nest.
- 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 temperatures 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.