St. Eustatius National Parks Foundation
Sea Turtle Conservation Program
Annual Report 2009

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

FOREWORD

It was my greatest pleasure to serve as Sea Turtle Conservation Program Coordinator for the 2009 sea turtle nesting season. Although it is hard work, it is very rewarding to know that you have done your part in the conservation of this most endangered species, however small that part may be. Needless to say that it is only with the hard work of volunteers, interns and staff that the program manages to be a success.

Many lessons have been learned this year and bearing them in mind it will be possible to further improve on the successes of the program in the coming years.

This report gives the reader an insight into the program's activities and tries to paint an accurate picture of the 2009 nesting season.

Hoping to have submitted a complete and interesting report,

Respectfully yours,

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 has also been an unconfirmed report of nesting by a fourth species, the loggerhead (*Caretta caretta*), which IUCN classes as threatened.

The ultimate objective of the St Eustatius Sea Turtle Conservation 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 2009 Sea Turtle Conservation Program.
- Review the accomplishments and deficiencies of the program in 2009.
- Suggest recommendations for the 2010 program.
- Provide a summary of the data from 2009 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 six staff and is reliant on volunteers to run projects such as the Sea Turtle Conservation Program. The organization is supported by two international volunteer programs; the STENAPA Internship Program and the Working Abroad Program, which are discussed in more detail below.

STENAPA Internship Programme

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

Interns are provided with a small monthly stipend, basic accommodation and the use of a truck during their six-month stay. They are personally responsible however, for all travel costs and living expenses while on the island. The internships allow students and professionals to gain valuable practical experience in their chosen field. Without these dedicated volunteers STENAPA would not be able to conduct many of its projects, since the Foundation 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 150 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.

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 Manager of STENAPA is currently the chairperson of the DCNA.

Funding agencies and donors

To effectively run the Sea Turtle Conservation Program, the STENAPA Manager and Project Coordinator allocate approximately 10 to 30% 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 Antilles that includes Bonaire, Curaçao, St Maarten, Saba and St Eustatius. It lies in the North-eastern Caribbean, and is located in the Windward Islands; lying within the longitude and latitude median of 17°30 North and 62°58 West. The sister islands of Saba and St Maarten stretch out 30km north-west and 63km north, respectively (Figure 1).

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

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

Sea Turtle Nesting Beaches: Description and activities in 2009

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 has been somewhat neglected over the past seasons as it is not easily accessible and as the bulk of nesting activity occurs on the Atlantic or Eastern side of the island. Also because of the lack of accessibility, the program has often relied on private citizens living nearby to alert us whenever any nesting activity is ascertained.
During the 2009 season however, 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 the entire season.
By using the coastal route, researchers were able to record an additional 9 activities for which no call was received. This was either due to the absence of the volunteer family or the fact that they do not check the beach on a regular basis. This also raises the question of how many activities were missed earlier in the season due to the belief that nesting activity there was being monitored by willing volunteers.

This seriously calls into question the method of relying on untrained and perhaps less dedicated observers for accurately recording activities.

One of the main problems with Kay Bay faced in previous years, getting to the beach, was solved this year 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. 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 were absolutely impossible to find. The extensive digging that was done to locate the nests was to no avail as they were never found.

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, the coordinator and intern planted six stakes that run from the southern most end of the beach northerly towards Crooks Castle. This should enable the position of any future possible lays and confirmed nests to be more accurately marked.

Because of the intervals in which morning patrols were conducted on Kay Bay, when researchers did carry out a patrol, there would be usually three or four different tracks visible. This prompted at least two night patrols on Kay but unfortunately no turtles emerged on those occasions.

From the experiences this year, several recommendations can be put forward for the 2010 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 2-3 times a week on Kay Bay/Crooks Castle during the hard shell season.
3. Conduct several targeted night patrols on Kay Bay/Crooks when no activity expected on the main index beach, Zeelandia, or split the patrol if enough volunteers are available.
4. When there is no stake in the immediate vicinity, researchers should be very diligent in accurately describing the position of the lay/possible lay including measurements and additionally a sketch if necessary.

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 2009, there was minimal sand on this beach due to passing tropical storms and ground sea swells. 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.

During the 2009 nesting season, 1 Green turtle (tracks and a nest cavity only) and 1 Hawksbill turtle (tracks only) visited Oranje Bay. Both turtles were witnessed by members of the public. The Green turtle was seen early in the morning by several persons and it was deduced that the approach of the onlookers on the beach must have scared her off as there was an abandoned 30cm deep nest cavity present. The Hawksbill was witnessed and reported by several persons visiting the Gin House Hotel located somewhat in the middle of the stretch of Oranje Bay. Unfortunately, they reported it the following day and no one working with the program had a chance to observe the turtle.

One other 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.

LYNCH BAY

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

During the 2009 season Lynch Bay was monitored for activities 7 times but no tracks were visible 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.
A member of the public reported seeing a leatherback turtle toward the extreme Northern end of Lynch Bay but he reported it weeks after the fact and naturally no sign of a track

or nesting activity was found when researchers went to examine the area indicated. The person did give a very accurate description of a Leatherback turtle without being prompted, including mentioning that the eyes seem to be sick when he shone the light on the turtle. It is thought he was describing the salt tears that persons familiar with Leatherbacks would recognize.

TURTLE BEACH

This is the second longest beach on the Atlantic side, measuring approximately 400m. It links to Zeelandia Beach at its northern point, and connects to Lynch Bay around a point to the south. It is a steeply sloping bay subject to considerable sand movement, especially during the hurricane season (July – November). It is backed by cliffs and there is virtually no vegetation except for occasional Sea Grape trees on the cliffs. There is a storm water ghaut in the middle of the beach which was formerly used as the land-fill for the island. Although not currently used, this ghaut still contains a large amount of refuse and is open to the beach. 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 2009 nesting season, 11 activities were recorded on this beach of which 7 Green turtle tracks and 4 hawksbill tracks. No nests were seen or found on this beach for this season.

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, 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 three species of turtle (green, leatherback and hawksbill), and the only place on the island where leatherbacks have been recorded nesting. It is the only beach monitored at night by the Sea Turtle Conservation Program except for the fact that Kay Bay was monitored for two nights during the 2009 season. It was a good season for Zeelandia beach in 2009 with over 50 recorded activities for the season.

Pre-Season Preparations

The 2009 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 2008 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 2009. The two existing short presentations were updated in early 2009; 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 2009 nesting season, the following activities were performed:

New Program Coordinator

In February 2009 the existing Programme Coordinator Lee Munson, announced his resignation from the position. His replacement for the 2009 season was Jessica Berkel, the Office Assistant and trainee Marine Park Manager. Lee remained on St Eustatius to provide adequate cross over training for the new Marine Park Manager Mr. Tadzio Bervoets and Ms Jessica Berkel prior to his departure and during the initial months of the 2009 nesting season.

New Turtle Program intern

In mid-February, the position of turtle program intern was advertised internationally through Corallist, Idealist and WorkingAbroad. After a selection process, in March the new Turtle Program intern Mr. Micah Herriot arrived from Canada for a six month

internship with the program. Mr. Herriot had previously done two seasons with the Barbados Turtle program and had experience with night patrols, nest relocations and excavations. However due to issues such as a less than cooperative attitude, unwillingness to follow directions, increasing tensions amongst the other volunteers and interns etc., a warning letter was given to Mr. Herriot whereupon he abruptly quit.

A search went out on the Coral List server for an immediate replacement and Ms. Elizabeth Sheets of the USA took up the position for the final 2 ½ months of the program. After a brief training period, Ms. Sheets proved to be a great asset to the program. Friendly, eager to help, positive and hardworking were just some of her attributes.

Protection of Zeelandia beach

In January of 2008 a life-sized replica of a Leatherback turtle was built by then Marine Park Ranger Walter "Gadjet" Blair and National Park Ranger Nadio Spanner. The concrete turtle was produced as part of the Zeelandia Beach Beautification project. The turtle had 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. An interim measure to control this was undertaken and involved placing small sections of rebar capped with plastic bottles across potential vehicle access areas to the beach. Unfortunately this was not permanent and those determined to mine the sand simply pulled them out and drove onto the beach. On one occasion a sand miner was spotted by the patrol and the police were called. Fortunately they arrived on time to get the vehicle license plate and promised that they would follow up.

Also on several occasions during the 2009 nesting season, vehicles simply drove around the concrete turtle as if it were not blocking the path down to the beach. The turtle intern tried to solve this by erecting a wall of stones and small boulders on either side of the turtle but to no avail. A more permanent low wall or some other difficult to shift obstruction will have to be erected on that spot. This will have the added bonus of preventing heavy water runoff that is steadily eroding the area around the concrete turtle every time it rains.

Since the planned implementation of a protective boulder barrier was not realized at the beginning of the 2009 nesting season and due to a lack of funding for this year's program, the Program Coordinator and turtle intern had to improvise and be creative with the erection of barriers preventing driving on the beach.

Several discarded oil drums were found next to the public dump and they 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. Some barrels were also later placed on the slope under the sign in the background on the photo. The slope is a very popular access point for vehicles driving on to the beach as can be seen in the photo below.

The barrels worked in that they prevented sand miners from driving on to the beach in that area but naturally determined persons could still mine sand by walking onto the beach with buckets. The barrels were painted later on by the Summer Club kids; a dark color on the sides facing the beach and a bright color on the sides facing any vehicle headed toward the beach.

Protection of the beach also involved maintaining and cleaning the sea turtle information signs. This was done with the help of volunteers from the BroadReach program who were generous enough to donate the paint, brushes, varnish and manpower needed for refurbishing the signs.

Bearing in mind several incidents involving dogs during the 2009 nesting season, an important preparation consideration for next season will be the erection of at least three signs warning dog owners to keep a close watch on their dogs while they are on the beach. A sign can be placed at the three most popular entrances to the beach so that dog owners cannot fail to notice one. It is doubtless impossible to prevent dogs from digging holes on the beach but at least a sign urging

A nest partially excavated by a dog.

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 three such occurrences during this nesting season.

Beach Cleanups 2009

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. Besides the beach cleans on January 30th and February 16th in which in total two truckloads of garbage and debris and one large net were removed from the beach, the actual preseason beach clean was performed on Friday, March 20th, 2009. On that occasion a total of 25 extra large garbage bags were filled.

Following is a summary of beach clean ups for the 2009 sea turtle nesting season:

Date	Beach area	Results	Comments
March 20	Zeelandia/Turtle Beach	25 bags	
April 24	Zeelandia	10 bags	
May 29	Zeelandia	20 bags	incl. 9 members of public
June 17	Zeelandia/below dump	11 bags	Junior Ranger I children
June 29	Zeelandia	04 bags	
July 29	Zeelandia	04 bags	Various large plastic debris
August 28	Zeelandia	06 bags	1 truckload
Sept 04	Zeelandia	10 bags	Int. Coastal Cleanup
Sept 11	Zeelandia	05 bags	
Oct 02	Zeelandia	08 bags	
Nov 23	Zeelandia	10 bags	71 kgs and 1 dead goat

Many persons expressed an interest in joining the beach clean ups but were unable to do as beach cleans are usually carried out on Friday mornings when the majority of the public is at their place of work. As can be seen from the list above only one clean up for the year was attended by members of the public. Two others were attended by children from the BroadReach program that do specific community outreach programs on each island that they visit.

Education, Community Outreach and Media Exposure

Figure 3: Summer Club children learning triangulation.

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 2009 a total of 25 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.

Besides children, the Sea Turtle Program strives to involve the general public as much as possible in its activities in order to generate interest and advocacy for sea turtles. On several occasions hatchling releases were done in the early evenings 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 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 very first hatchling release for the season saw some 50+ 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.

Finally, 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 or trained staff and a watchful eye was kept on the data that was being recorded by the assisting volunteer. Members of the public who were not assisting with the actual excavations did stay around to witness them and ask questions.
At those times Turtle Program staff take the opportunity to answer any questions and provide additional information on sea turtles to keep the plight of the sea turtle and the importance of their conservation in the forefront.

Publication of Sea Turtle program activities was less than it could have been with only 1 article being printed in the regional newspaper at the start of the season. The remaining publicity was done by STENAPA media as can be seen below.

The Daily Herald Newspaper Articles 2009

- Monday, March 23rd -Leatherback turtle arrives early for nesting season-

"STENAPA Update" Newsletter articles 2009

- Newsletter 1/2009 March 2009 -Early Start for Turtle Season-
- Newsletter 2/2009 June 2009 -2009 Sea Turtle nesting season update-
  - Juvenile Hawksbill saved by citizen-
- Newsletter 3/2009 Sept. 2009 -New turtle program intern-

"Nature on Statia" STENAPA monthly radio program

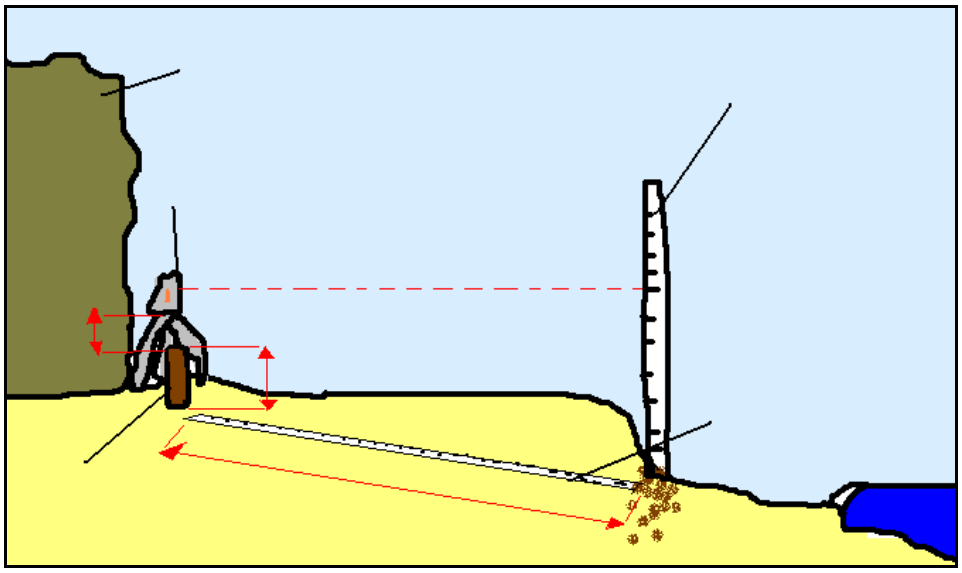
- March 2009 Interview with Micah Herriot, turtle program intern, to discuss the details of the turtle program and his duties therein.

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 are situated 20 meters apart.

Measurements are taken using the method described below.

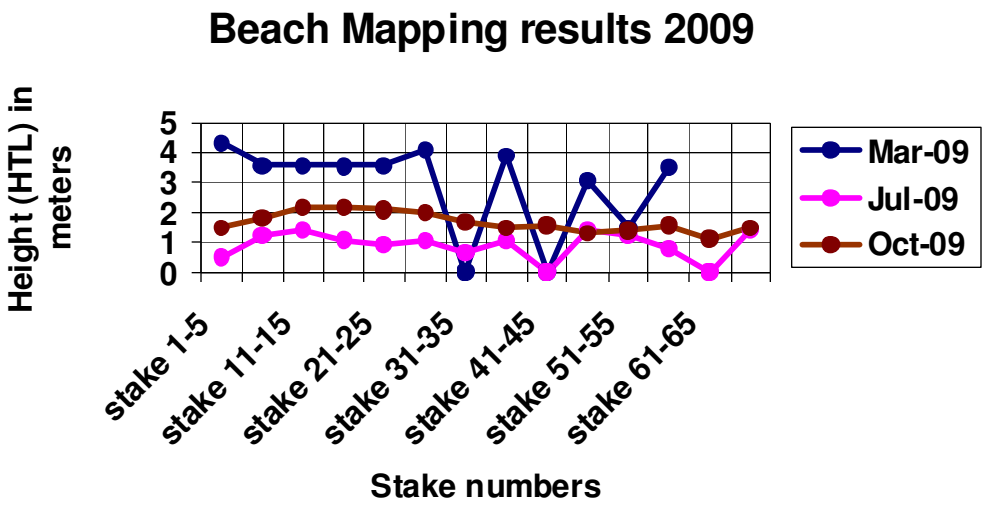
A team of two people measure the distance from the high tide line to each stake. Then using a Theodolite mounted on a tripod the height of the stake against the high tide line (sea level) is recorded at every fifth stake. This is best done with one researcher deciding the high tide line (HTL) and the 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 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 months of March, July and October of 2009.

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.



BEACH EROSION

The 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 some stakes, usually stake #1, #33 to #38 and stakes #65, 66 and 67, are buried beneath the sand for a period of months. This is more clearly portrayed in the beach mapping data graph. For a good percentage of the nesting season there are very little suitable nesting areas on Zeelandia beach. The beach from stake #25 to 51 is usually completely eroded. Patrolling is very difficult as the waves reach the cliff front and one ends up patrolling through the surf to get to Turtle beach. As an example at the end of the season on January 10th, 2010, 27 of the 70 stakes were not in place and of those 27, 8 were found amid the debris that had washed up on the beach over the past week.

CLIFF FALLS

Cliff Fall stake #55

Cliff fall stake #58

During the 2009 nesting season, there were fewer cliff falls than in 2008 in which 18 were recorded. The amount of rock and debris deposited on the beach however was fairly large.

Date	Stake #	Cliff Fall Amount
3-May	20	5m wide
4-May	31	1m wide, small boulders
11-May	30	2m wide
30-Jun	35	19m wide, boulders >1m
17-Jul	24	4x5x1m
18-Oct	55	18mx3mx10cm +/- 2 tons
16-Nov	58	20mx20mx1m

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 up 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 provided the tide did not wash them away. The cliff fall which occurred near stake #58 is in the exact location where the rest stop is made when continuing on to Turtle Beach is impossible. 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 2009 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 14th 2009 up to and including December 6th 2009 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.

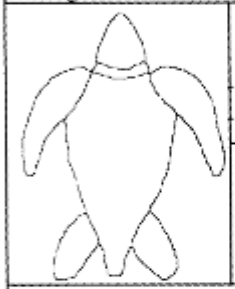
For each track observed the following information is recorded:

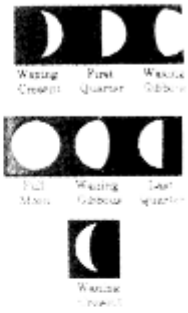
- Observer – Name of observer recording data.
- Date
- Weather – Brief description of weather conditions.
- Moon phase – Based on the previous night's moon; this information is recorded to determine whether there is a relationship between moon phase and emergence.
- Species – If possible to determine 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. 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:

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

Results Morning Track Surveys 2009 nesting season:

During the entire season a total of 554 morning track surveys were carried out.

Beach	Times surveyed	Activities recorded
Zeelandia Beach	262	17 Tracks, 21 Dry runs, 8 Nests, 3x Hatchling tracks, 2 Unconfirmed nests.
Lynch Beach	07	No activity
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.

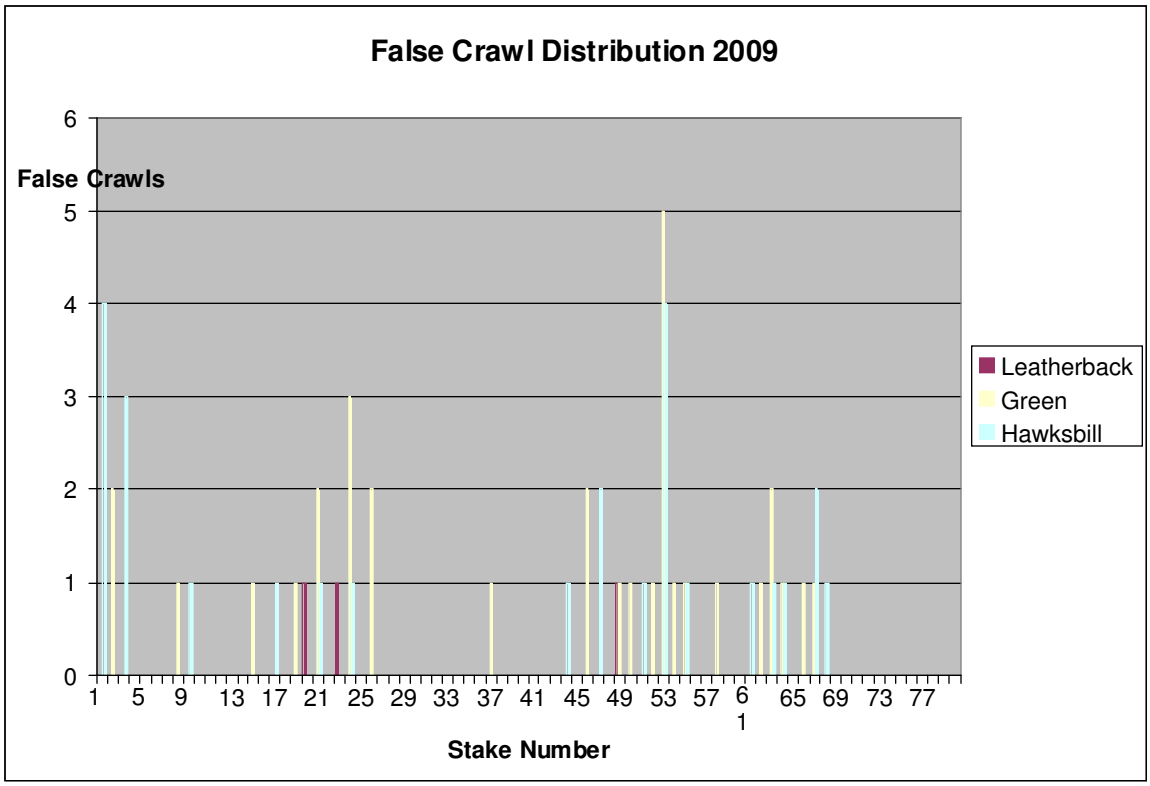
This nesting season almost mirrors the 2008 season in that the first track (and nest) was observed on March 14th 2009, only a day later than the start of the previous season. The last activity was observed on the 14th of November, which is exactly one month later than the close of the previous season. The 2009 season also ended with a large Green leaving a substantial body pit on Turtle Beach. After extensive digging, no eggs could be found.

The Leatherback nesting season ran from March 14th to July 2nd 2009. Green turtle activities were recorded from July 6th to November 14th 2009 and the Hawksbills appeared from July 2nd to November 2nd very much concurrent with the Greens. Morning track surveys continued into December because some nests had still not hatched. The last unconfirmed nest was due to hatch on December 30th so although the regular morning patrols ceased on Dec 6th, the Program Coordinator went to the beach sporadically to check on probable nests up to January 10th, 2010.

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

Species	Confirmed nest	Unconf. Nest	Crawls/Activities
Leatherback	16	01	02
Green turtle	09	03	29
Hawksbill	04	07	24

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 20 confirmed nests in 2008, greens had 1 confirmed nest and there were 0 confirmed nests for the Hawksbills in 2008.



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 2009 Nightly Beach Patrols:

Nightly monitoring of Zeelandia beach began on March 18th, ended on October 5th, 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 156 patrols totaling 777.40 hours. This is a near doubling of the patrols of the previous year in which there were 74 patrols resulting in 500 hours of logged patrol time.

A breakdown of the patrols is as follows:

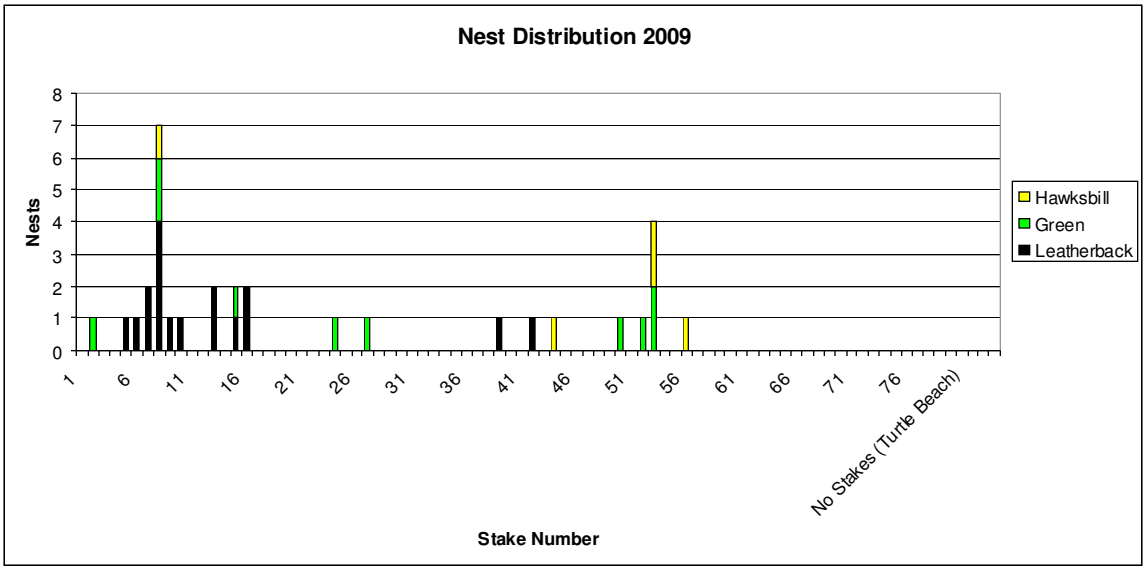
Personnel Patrol	Count	Hours
Program Coordinator (JB)	24	15.38%
Volunteers	125	80.13%
Interns	50	32.05%
Turtle Intern (Beth)	19	12.18%
Turtle Intern (Micah)	49	31.41%
Staff	8	5.13%
BroadReach	3	1.92%
Public	3	1.92%
Med Students	1	0.64%
Observed Turtles	25	16.03%

The timeframe within which nests were deposited varied with the earliest lay occurring at 21:00 hrs and the latest at 2:56am.

9 – 10pm	10 – 11pm	11 – midn.	midn. – 1pm	after 1pm
8 nests	3 nests	2 nests	2 nests	6 nests

The nests that were deposited after 1am occurred closer to the 2pm mark more often than not. The time that the remaining 7 nests were deposited is not known as they were found after the fact or the next morning. It is using data such as this that determines the patrol times. 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 2009 nesting season, 3 Leatherbacks were encountered. There was almost certainly a 4th Leatherback that deposited a nest on May 16th, 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).



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.

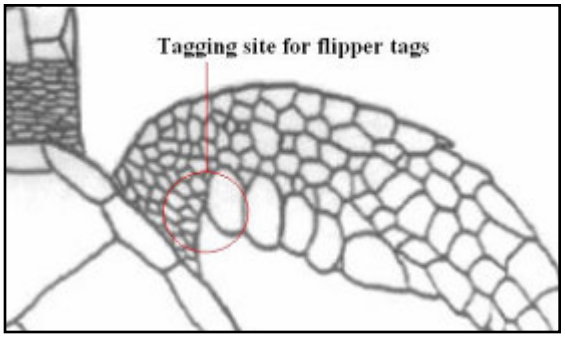
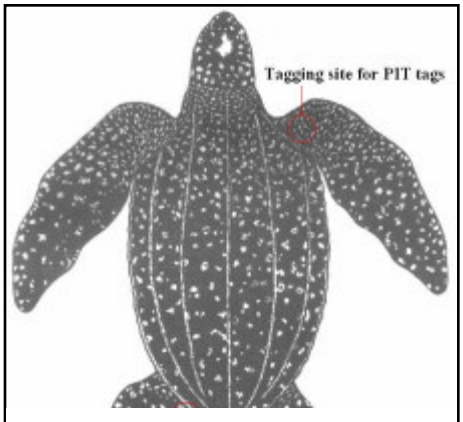


Figure 4: Tagging site Hard shells

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

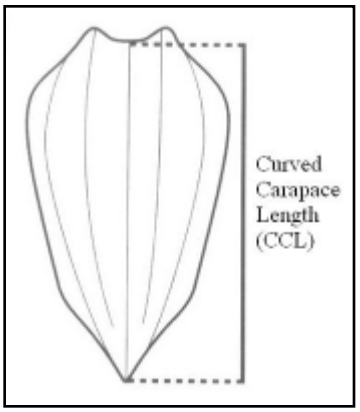
Passive Integrated Transponder (PIT) Tags

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 2009 nesting season as 2 of the 3 female Leatherbacks 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.

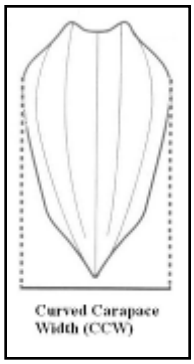
Carapace Measurements

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.



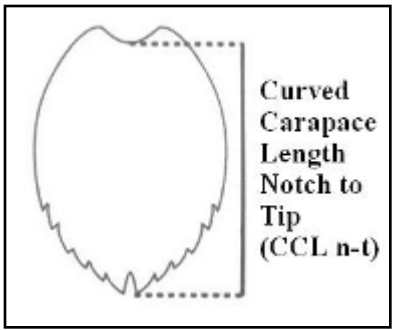
Leatherbacks

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.

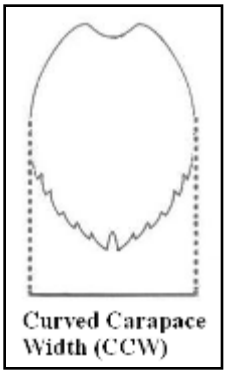


Curved carapace width (CCW) is measured at the widest point, but there are no standard features delineating the end points. The tape measure passes over the ridges and does not follow their contours.

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.

Mean sizes of the nesting females that visited Zeelandia beach in 2009:

Turtle Identification Number	Curved Carapace Length[1] (CCL) / cm	Curved Carapace Width[1] (CCW) / cm
DC - 133764653A	154.00	113.00
DC - 4B12030C2D	147.00	108.00
DC – WC306/WC307	160.00	114.00
CM – WE11/WE7	102.00	95.00
CM – WE13/WC303(new)	112.00	106.00
EI – no tags	76.00	63.00

The measurements above are the average calculated for each female. Taking into consideration the enormous variation in carapace measurements for any particular female nesting in 2008 (up to 7cm), this year the program was determined to be more accurate in their measurements.
The Leatherback 133764653A was measured all 10 times that she was on the beach and the measurements only varied by .075cm for the CCL and .01cm for the CCW.
The Green turtle WE11/WE7 was also measured each of the 5 times that she visited the beach and the differences in measurements there was a maximum of .03cm for the CCL and a maximum of .04cm for the CCW.

The Green Turtle WE11/WE7 had been measured at CCL 101.2cm and CCW 93.8cm when she was recorded on Zeelandia beach in 2005. This shows a growth of .8cm in CCL and 1.2cm in CCW taking into consideration that the measurements are an average taken during the nesting seasons.
The Leatherback 133764653A was measured at CCL 151.2 and CCW 111.4 when she too was recorded last in 2005. This shows a growth of 2.8cm in CCL and 1.6cm in CCW taking into consideration that the measurements are an average taken during the nesting seasons.

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

No comparison could be made with the measurements taken on St. Kitts of the nesting female 4B12030C2D.

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 returned to the egg chamber and reburied.

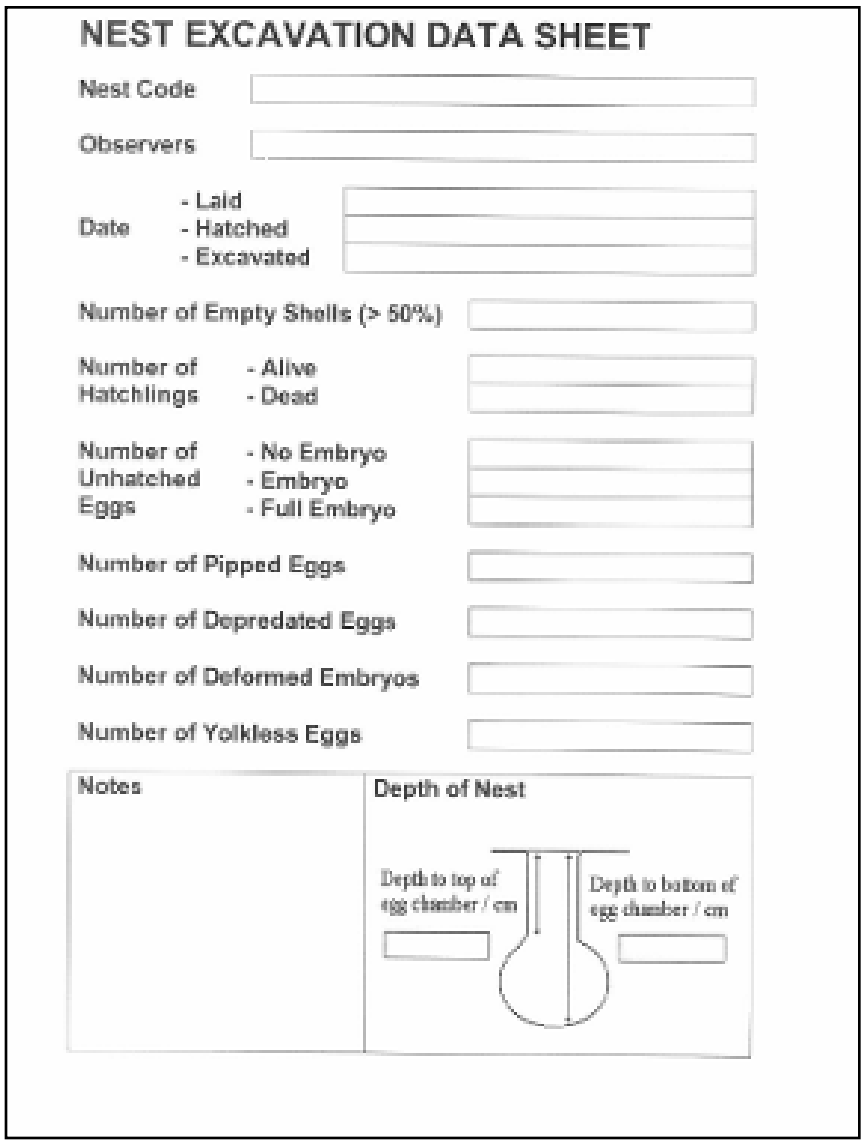


Figure 6: Data sheet used for recording nest excavation information

LEATHERBACK SUMMARY

Nest Survival and Hatching Success

Of the 16 confirmed leatherback nests, 16 were located for inclusion in the nest survival and hatching success study.

Nest Code	Date		Time	Result	Comment
DC0901	17-Mar-09		~3:00	lay	Seen by Marines only
DC0902	27-Mar-09		1:45	lay	
DC0903	7-Apr-09		21:00	lay	
DC0904	9-Apr-09		1:45	lay	
DC0905	16-Apr-09		22:00	lay	
DC0906	25-Apr-09		2:05	lay	
DC0907	3-May-09		1:00	lay	
DC0908	11-May-09		1:35	lay	
DC0909R	13-May-09	?		lay	Not seen
DC0910R	16-May-09	?		lay	Not seen
DC0911	18-May-09		11:59	lay	
DC0912	20-May-09			unconfirmed nest	Not seen
DC0913	27-May-09		0:54	lay	
DC0914	4-Jun-09		0:45	lay	
DC0915	13-Jun-09		1:05	lay	
DC0916	23-Jun-09		2:56	lay	
DC0917	4-Jul-09		10:06	lay	

The Leatherback that deposited the nest on May 16th might possibly be the 4th female of the season apart from 133764653A, 4B12030C2D and WC306/307. A cluster of activity from May 11th to May 20th shows a visit by a nesting female every 2 nights and only the DC0912 nest being unconfirmed. DC0912 has only been included here to demonstrate the high probability of more than 3 females being present during the season. Leatherback 133764653A deposited a total of 9 nests. It is very possible that she also deposited the first nest of the season on March 17th, but no researchers were present on the beach at the time.

The following table provides a summary of the nest survival data obtained from each excavated leatherback nest of 2009; each table details, nest code, turtle identification number, fate of the nest and incubation period in days (if known).
All Leatherback nests were located on Zeelandia beach.

Nest Code	Turtle Id Number	Hatched	Incubation / days[2]	Excavated
DC0901		hatched	62	18-May
DC0902	133764653A	hatched	61	27-May
DC0903	133764653A	hatched	60	7-Jun

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

DC0904	WC306/307	hatched	60	8-Jun
DC0905	133764653A	hatched	60	16-Jun
DC0906	133764653A	unsuccessful	n/a	5-Jul
DC0907	133764653A	hatched	n/a	14-Jul
DC0909R		unsuccessful	n/a	24-Jul
DC0910R		unsuccessful	n/a	27-Jul
DC0911	133764653A	hatched	n/a	1-Aug
DC0912	Unconfirmed	Unconfirmed		
DC0913	133764653A	hatched	n/a	7-Aug
DC0914	133764653A	hatched	n/a	2-Aug
DC0915	133764653A	unsuccessful	n/a	16-Aug
DC0916	4B12030C2D	hatched	67	28-Aug
DC0917	4B12030C2D	unsuccessful	n/a	11-Sep

The survival of nests varied, but overall was not very high. Of the 16 located and excavated leatherback nests 10 hatched or partially hatched while 6 were deemed unsuccessful. The one remaining unconfirmed leatherback nest could not be located even after extensive digging. It is suspected that the nest probably drowned due to its location directly below the cement turtle where runoff causes a large pool of water. A predicted incubation spreadsheet was made and taken to the beach for every patrol containing all nest information and expected hatching dates. Each nest was marked for 60 and 70 days and a close eye kept on the area between these dates. On the 70th day the nest was excavated if no signs of hatching could be seen. For leatherbacks, average incubation period was determined from 16 nests as 62 days.

The mean depth to the bottom of the egg chamber was 75 cm (16 nests) for the leatherbacks with an average of 78 yolked eggs per nest (16 nests), the yolkless eggs amounting to an average of 45 eggs. Mean number of eggs per nest was 123 with a range of 98-143.

Species	**Mean depth to bottom/cm**	**Mean # eggs / nest**	**Mean % hatching**	**Mean % emergence**
Leatherback	75	123	15.62	41.96

Summary of leatherback excavation data from 2009

Hatching success was calculated as the number of hatchlings that made it out of the shell into the egg chamber; emerging success was the number of hatchlings that made it out of the nest. Leatherbacks showed a doubling of the mean success rate from 2008 (7.27%) to a 15.62% hatching success in 2009. Emergence success did not change much as it rose from 41.81% in 2008 to just 41.96% emergences in 2009.

During excavations it was found that leatherbacks had a large percentage of eggs with no visible embryo present. The mean percentage of eggs with no embryo for the 16 excavated Leatherback clutches was 20.06%. The mean percentages of part and full embryo were 24.2% and 14.81% respectively. A few nests contained pipped eggs; an average of 0.13% for leatherback eggs and no eggs showed signs of predation. There was

one deformed hatchling with a severely misshapen carapace. The hatchling had difficulty crawling on the sand, but swam quite easily once it made it to the ocean.

Two Leatherback nests, DC0909R and DC0910R were relocated, due to the likelihood of them being washed away or excavated by sand miners if left in place. These nests were placed between stakes 8-9 high up on the beach in an area thought to be safe. The DC0909R (109 eggs) yielded no live hatchlings, 85 yolked eggs, and 24 yolkless eggs. The DC0910R (98 eggs) clutch also yielded no live hatchlings, 65 yolked eggs, and 33 yolkless eggs.

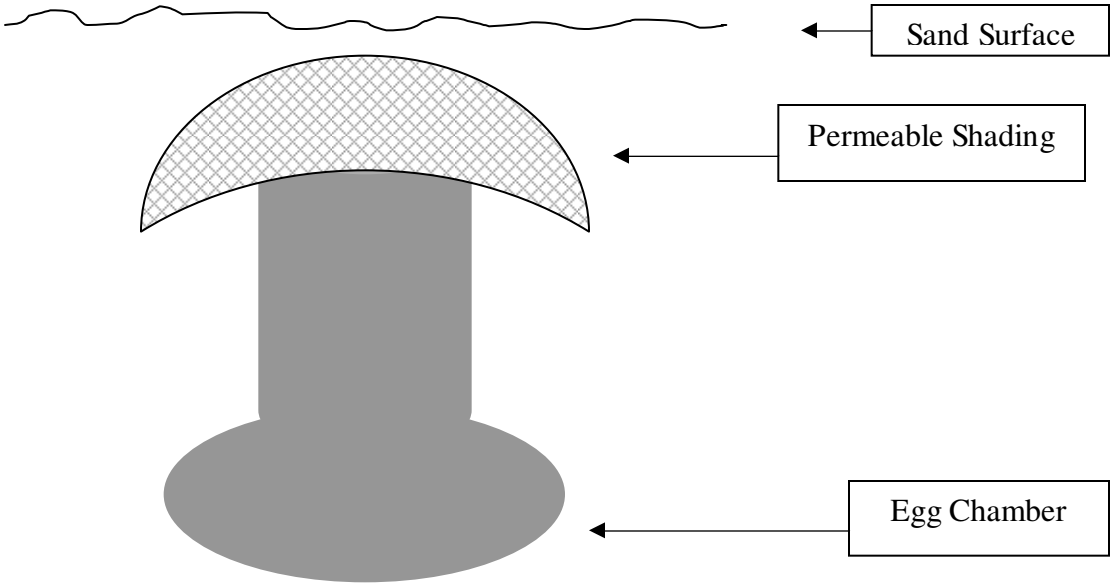
Looking at the data it appears that the first 5 nests, DC0901 to DC0905, laid in March and April and hatching from mid-May in to June were the most successful nests. Thereafter the hatching success took a serious decline as can be seen in the table below. The one exception to this trend was DC0907. One explanation for this decline in hatching success could be that the unusually warm months of summer that were experienced this year caused heat stress in the nest and arrested the development of the embryos. The eggs were clearly fertilized as can be seen from the number of embryos present.

Table 1

Nest Code	Laid	Excavated	# Alive	Dead	# Shells	No Embryo	Embryo	Full Embryo
DC0901	17-Mar	18-May	5	5	62	15	0	7
DC0902	27-Mar	27-May	3	1	45	4	0	6
DC0903	7-Apr	7-Jun	8	3	50	13	0	2
DC0904	9-Apr	8-Jun	14	3	68	2	0	10
DC0905	16-Apr	16-Jun	29	2	32	12		34
DC0906	25-Apr	5-Jul	0	0	0	14	9	50
DC0907	3-May	14-Jul	0	3	31	19	3	27
DC0908	11-May	23-Jul	0	4	4	18	12	40
DC0909R	13-May	24-Jul	0	1	1	32	23	27
DC0910R	16-May	27-Jul	0	0	0	41	18	6
DC0911	18-May	1-Aug	0	0	5	11	46	15
DC0913	27-May	7-Aug	0	1	4	19	60	3
DC0914	4-Jun	2-Aug	2	0	2	32	51	10
DC0915	13-Jun	16-Aug	0	0	0	32	60	0
DC0916	23-Jun	28-Aug	0	1	4	28	36	0
DC0917	4-Jul	11-Sep	0	0	0	29	45	0

For the 2010 nesting season a small experiment should be carried out whereby half of the nest laid from mid-April could be shaded naturally, and half left un-shaded to compare hatching success. Natural shading could be achieved through the use of palm fronds that allow some sun and rain to penetrate to the sand instead of using something like wood that would not allow for natural variation in sand temperatures. Shading could be also be achieved artificially by using shade cloth such as seen in green houses. This might seem like interference but the high percentages of partially cooked eggs found during

excavations leaves the program little choice but to intervene in some way to correct the situation. There could of course be several consequences to the shading such as the location of the nests will be obvious to anyone wishing to poach or destroy them. In that case there could also be a solution sought to disguise the shading. Shading could be the same color of the sand, only slightly raised or covered with a light dusting of sand.



A very low cost solution suggested to the Program Coordinator by Edith and Richard van der Wal of Turtugaruba is a light covering of white sand which will naturally reflect the heat of the sun. White sand is available for sale on the island and the program will utilize this method in the next season to see if it will make a difference in hatching success.

GREEN TURTLE SUMMARY

Nest Survival and Hatching Success

All 9 confirmed green turtle nests are included in the nest survival and hatching success study. 3 probable nests were unconfirmed and therefore not included.

Nest Code	Date	Time	Result	Comment
CM0901R	19-July-10	21:44	Lay	
CM0902R	28-Jul-10	22:06	Lay	
CM0903R	08-Aug-10	21:30	Lay	
CM0904R	22-Aug-10	23:45	Lay	
CM0908	26-Aug-10	21:20	Lay	
CM0908A	14-Sep-10	22:30	Lay	Nest found by chance
CM0909R	20-Sep-10	21:35	Lay	
CM0910	25-Sep-10	21:45	Lay	
CM0911	08-Oct-10	MP	Lay	MP = morning patrol

CM0908 and CM0908A almost share the same nest code because CM0908A 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 table below provides a summary of the nest survival data obtained from each excavated green turtle nest of 2009; each table details, nest code, turtle identification number, fate of the nest and incubation period in days (if known).
All the nests in question were located on Zeelandia beach.

Nest Code	Turtle ID	Nest Fate	Incubation	Excavated
CM0901R	WE11/WE7	Hatched	71	September 29
CM0902R	??????????	Unsuccessful	64	September 30
CM0903R	WE13/WC303	Unsuccessful	62	October 09
CM0904R	WE11/WE7	Hatched	63	October 23
CM0908	??????????	Hatched	53	October 18
CM0908A	??????????	Hatched	59	November 12
CM0909R	WE11/WE7	Hatched	58	November 17
CM0910	??????????	Hatched	54	November 18
CM0911	??????????	Hatched	59	December 12

The survival rate of nests for green turtles was encouraging. As can be seen in the summary above only two nests were unsuccessful. The average incubation period was determined from the 9 nests to be 60.3 days. The nest codes that end with an "R" were those relocated and although some did hatch, in three instances only a few eggs out of the entire nest had hatched.
CM0901R and CM0904R only had 2 shells in the nest when excavated, CM0909R had only 4 shells in the nest and CM0911 had only 5.

Species	Mean depth to bottom/cm	Mean # eggs / nest	Mean % hatching	Mean % emergence
Green turtle	61	128	29.06	72.05

The table below provides a summary of the nest survival data obtained from each excavated green turtle nest of 2009; each table details, nest code, turtle identification number and a breakdown of the results of the inspection of the individual eggs.
All the nests in question were located on Zeelandia beach.

Nest Code	Laid	Excavated	Alive	Dead	Shells	No Embryo	Embryo	Full Embryo
CM0901R	19-July	29 Sep	0	0	2	13	97	2
CM0902R	28-Jul	30 Sep	0	0	0	7	101	9
CM0903R	08-Aug	09 Oct	0	0	0	115	34	0
CM0904R	22-Aug	23 Oct	0	0	2	53	54	0
CM0908	26-Aug	18 Oct	3	1	80	14	27	1
CM0908A	14-Sep	12 Nov	0	16	116	2	9	12
CM0909R	20-Sep	17 Nov	0	0	4	28	73	0
CM0910	25-Sep	18 Nov	8	8	125	4	15	0
CM0911	08-Oct	12 Dec	1	0	5	83	15	0

One particular note of interest is the presence of two yolkless eggs in a nest deposited by a green turtle and recorded as CM0904R. This nest was excavated on Oct 23rd by the Turtle program coordinator assisted by the Marine Park manager. The two yolkless eggs measured 2.8cm and 8cm. The appearance of the contents of the eggs was the same as those seen in a yolkless leatherback egg, a crystal clear gelatinous substance.

The overall hatching success of the Green turtle nests is what actually fuelled the discussion of whether or not a hatchery should be utilized. The success rates of the nests left in situ are considerably higher than those that were relocated to the safe area.
The poor result of the relocated nest is not due to the actual move as one can see from the embryo count. Development did take place but was arrested at various stages of the life of the embryo. Again, heat stress death of the embryos is suspected as well as the

infection by bacteria. A fairly disturbing percentage of the Green turtle eggs were infected by some type of bacteria. The insides of the eggs were bright "neon" pink mixed with red and green. The program lacked the resources to test for the particular bacteria in question. Also this data was only recorded in the latter part of the season is therefore incomplete.
An effort will be made in the following season to properly document this phenomenon.

HAWKSBILL SUMMARY

Nest Survival and Hatching Success

Of the 4 confirmed Hawksbill nests only 2 were excavated. The hatching success of the 2 other confirmed nests are undetermined as only the evidence of hatchling tracks was seen and no nest excavation could be performed as the egg chamber was never relocated even after extensive digging. Those 2 are included in the summary below. An additional 7 nests were probable lays and the eggs were never found.

Nest Code	Turtle ID	Nest Fate	Incubation	Excavated
EI0901R	No tags	Unsuccessful	n/a	yes
EI0902	No tags	Hatched	+/- 66	no
EI0903	?????	Hatched	n/a	no
EI0910R	No tags	Unsuccessful	n/a	yes

The Hawksbill is only being briefly included here as the results for the season are less than encouraging. Although there were numerous activities in particular on Crooks/Kay Bay, no live hatchlings were seen by the researchers. The two nests that were excavated did not yield any live hatchlings as the majority of the eggs were either partially or completely cooked by the high temperature of the sand in the area where they were relocated. The nests on Kay Bay were impossible to locate although hatchling tracks were seen on two occasions.

EXPERIMENTAL RELOCATION SITE

Based on circumstances and experiences during the 2008 season, it was strongly recommended that an experimental relocation site be employed in 2009.
Because of the dynamics of Zeelandia beach and to try and improve nest hatch success rates, the suggested hatchery was put into place.

Beach profile monitoring has been carried out with a degree of regularity and from this an appropriate site to relocate to was determined. The predicted best site from that analysis lies in the area at the top of the beach between the information entrance and the concrete turtle entrance, just below a stand of sea grape that stabilize the area at the back of the beach. Thus in 2008, the area deemed to be safe was located between stakes 8 and 10 because that area was the least affected by runoff, storm surge and experienced only minimal sand mining in the immediate area.

With or without storms, Zeelandia beach has historically shown itself to be very dynamic with the majority of the length of the beach lacking areas suitable for nesting. Previous years of nesting have encountered hatch success rates as low as 7.3%. The nesting season runs from mid-March to October and the predominant threats to the survival of the nests laid here is tidal inundation. As all species are threatened to some degree it is felt that increasing the nest success has the potential to boost the nesting population in the future.

The recommendation last year based on 2008 experiences was that nests should be relocated when they are laid too near the sea (within the high tide line), too close to the cliff edge (falling rocks), or near artificial light. Also nests laid south of stake 15 should be relocated to the experimental hatchery as that stretch of beach is susceptible to flooding during hurricane season. As well as nests that have been laid near areas of rainfall runoff or where pools can be created by large swells (i.e. the area in front of the sand bar) should be relocated.

Nests laid in the wide sandy areas between Stake 3 and 8 and between stakes 10 and 15 are susceptible to being compacted by the illegal activity of driving on the beach.

The Experimental Relocation Site Project has encountered several problems that need to be addressed for the 2010 nesting season. The most immediate issue is temperature of the nests. Some clutches that were relocated to the "safe area" were excavated after 70 days and found to be partially "boiled" by the intense heat of the sun on that area of the beach. Late into the 2009 season, new nests were buried at a deeper depth than they were originally found. However, this unfortunately did not alleviate the problem. Some alternatives to this issue could be to shade the hatchery or, a more intense solution would be to switch to an incubation system.

The percentage of eggs that were partially cooked (boiled) or completely cooked(boiled) was also only documented during the latter half of the nesting season. Although the data is incomplete a few examples are noted below to show the extent of the problem.

Nest Code	Total eggs	Partially cooked/Cooked	Percentage
CM0903R	149	65	43.6%
CM0904R	113	105	92.9%
CM0909R	106	56	52.8%
EI0910R	159	151	95.0%

CM0908 which was left in its original location close to the cliff had 12 partially cooked eggs out of a total of 122 eggs which works out to around 1% of the total. This can be explained by reason that the cliff shaded the nest during the afternoon hours. This illustrates perhaps that the idea of partially shading the new nest location may help since it did not totally eliminate the problem but did drastically reduce it.
A greater effort will be made in the 2010 nesting season to document incidents of cooked and infected eggs.

From nest CM0903 and onwards, all relocated nests were dug deeper than the nesting female had dug them originally and these nests still were not deep enough for the area where they were placed.

Subsequent research showed that results from studies conducted in Guatemala, Candelaria, Hawaii, and Las Lisas had similar issues with high sand temperature destroying nests due to a hot and sunny climate, medium to dark sand colored beaches, and low rainfall. The study concluded that high sand temperatures resulted in low hatchling success in natural and artificial nests. Hatcheries with no shades had a 0% success rate, where hatcheries that were shaded had an increased success rate (Higginson and Vasquez 1989). Therefore, their solution was to build a shaded hatchery out of fencing and palm tree roof. This could be an experimental solution for the 2010 season. If no progress is seen, a change to an artificial incubation system could be the next step towards a solution.

The predicted best site for the hatchery should also be revaluated for the 2010 season because that area has now shown to be subject to flooding. The parking area and slope below the cement turtle are subject to heavy rain run-off that can form a pool of water near the hatchery.

The hatchery experienced a near miss during the passing of Tropical Storm Ana. An inspection of the hatchery area after the storm had passed showed that the storm surge had come to within 50cm of the relocated nests. Subsequent storms of the season did not pass as near to the island as Ana did or create much of a storm surge and as such did not threaten the hatchery. The island was not heavily affected by the 2009 hurricane season, but caution should be taken in this area for larger storms and hurricanes.

A discussion was held as to whether or not the program should consider discontinuing with the hatchery system of conservation in 2010 citing the high number of "cooked" eggs and the hatching success rate of near 0%. One argument for the hatchery could be that since the nest was in an area that would be inundated anyway, no harm can come from moving the eggs to a safer area. However, the future hatchery if any should be much better prepared than it was this year. In 2009, the program simply began to relocate nests that were laid in erosion zones to the advised/recommended hatchery area.

The following steps should have been employed:

- Prepare the sand in the area to be used: sift for roots, stones or anything that can impede the development of the eggs and the escape of the hatchlings from the nest.
- Erect a simple wooden frame over which a "roof" of Coconut Palm fronds can be placed. This allows natural sunlight and rainwater to filter through and they can easily be adjusted during the hottest months.
- Erect a sandbag wall to hold back any potential surge waters or minimize any damage resulting thereof.

Higginson, Jane and Vasquez, Frabcisci. Hatchery Design and Production of Female Hatchlings. Marine Turtle Newsletter 44: 7-12, 1989.

Two incidents during the 2009 nesting season gave an argument for and against relocating nests that are laid in "danger zones". In the first instance a Green nest laid near stake #55 was relocated to the hatchery. As can be seen from the image on the right, only weeks later a large cliff fall completely obliterated the area where the nest was originally. Had this nest not been moved then the 2 tons or so of rubble would have made it impossible for hatchlings to eventually emerge from the nest.

In another incident, a Green nest was deposited near stake #24. This nest was very near the high water mark and in fact had been subjected to tidal surges on a number of occasions. However after the summer results of nest excavations in the hatchery it was decided by the Program Coordinator to leave the nest in situ. The result of that nest, CM0910, even though it was constantly being subjected to seawater, was a hatching success rate of 87%. As already discussed, had it been moved to the hatchery the success rate would probably have been 0.00% as all the other nests that were relocated there.

It is results such as those of CM0910 that argue for as much as possible leaving the nests where they are laid originally. And as you can in the recommendations for the 2010 season this is exactly what the Program intends to do.

TURTLE STRANDINGS

Fortunately there was no stranding during this nesting season. The only incident that the program dealt with was the rescue of a juvenile sea turtle. In a perfect example of the positive results of community outreach, the program received a call from a private citizen who stated that there was a turtle in her office and asked if we could come retrieve it. The Program Coordinator and the Marine Park manager investigated the call and were very surprised to see a juvenile hawksbill in a bucket. The story of how the turtle came to be in that situation was rather vague but the program was very happy to have received the call and retrieve the turtle. After hydrating the turtle in some fresh water, it was released into the water at Gallows Bay. It swam off with very powerful strokes and seemed like it would be just fine.

Recommendations for the 2010 sea turtle nesting season

PREPARATIONS:

- Provide adequate training for the turtle program interns and volunteers.
- 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 as up to 27 stakes were missing at the end of the 2009 season. Repaint any faded stake numbers. Check Kay Bay for re-staking.
- Erect signs urging dog owners to be vigilant when letting their dogs loose on the beach. Warn them to investigate when their dogs are digging in one particular spot to avoid damage to turtle nests.
- Place additional barrels to block vehicular access to the beach.
- Publicize the start of the season through all available media with a reminder of the fact 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 the Summer Club activities as many children are repeat participants and find themselves involved in the same activities every year.
- Organize at least two evening presentation sessions on sea turtles and the Program for the general public.
- Dedicate at least two radio programs to sea turtles if there are no other pressing topics to be discussed.
- Update and actually utilize the list of persons wishing to view a nesting turtle or join in 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 with erosion and lessen runoff on the beach.
- Step up morning patrols on Kay Bay beach to at least 3x a week during Green and Hawksbill season. If personnel shortage an issue then at the least once a week. It is not good practice to rely on a volunteer resident to do this as was shown in the 2009 season.
- Continue to lobby the company NuStar Energy NV to reduce the bright lighting on their 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.
- Utilize the white sand suggestion of keeping the nests a little cooler.

- Relocation should be done to a site that is at least partially shaded during the day.
- Every confirmed nest should be excavated and the eggs examined to determine the true fate of the nest.
- Remains from excavated nests should no longer be reburied in the empty nest cavity but thrown into the surf as in other programs. The available nesting space on Zeelandia beach is not large enough to justify reburying which only encourages bacteria growth. Also the late nesting of hard shell species does not allow for complete decomposition of the remains before the start of the next nesting season.
- Beach mapping should continue as in previous years to have a more long term picture of sand movement on the index beach.
- Actively seek funding for materials and equipment in order for the Program to continue to function successfully