



St Eustatius Sea Turtle Conservation Programme Annual Report 2006



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Table of Contents

LIST OF ACRONYMS AND ABBREVIATIONS	7
SUMMARY	8
INTRODUCTION.....	13
PARTICIPATING ORGANISATIONS.....	14
ST EUSTATIUS NATIONAL PARKS FOUNDATION (STENAPA)	14
<i>STENAPA Internship Programme</i>	<i>14</i>
<i>Working Abroad Programme – Statia Conservation Project.....</i>	<i>14</i>
WIDER CARIBBEAN SEA TURTLE CONSERVATION NETWORK (WIDECAST).....	15
DUTCH CARIBBEAN NATURE ALLIANCE (DCNA)	15
FUNDING AGENCIES AND DONORS	15
STUDY SITES	16
ST EUSTATIUS	16
SEA TURTLE NESTING BEACHES	16
<i>Zeelandia Beach.....</i>	<i>17</i>
<i>Turtle Beach.....</i>	<i>17</i>
<i>Lynch Bay.....</i>	<i>18</i>
<i>Oranje Bay.....</i>	<i>18</i>
<i>Kay Bay.....</i>	<i>18</i>
METHODOLOGY	18
PRE-SEASON PREPARATIONS.....	18
<i>Beach Preparation.....</i>	<i>19</i>
<i>Training of Volunteers.....</i>	<i>19</i>
OTHER PREPARATIONS.....	19
<i>Selection of New Programme Co-ordinator.....</i>	<i>19</i>
MONITORING AND RESEARCH ACTIVITIES	19
<i>Track Surveys.....</i>	<i>19</i>
<i>Beach Patrols.....</i>	<i>20</i>
<i>Tagging Methods</i>	<i>22</i>
<i>Carapace Measurements</i>	<i>23</i>
<i>Nest Survival and Hatching Success.....</i>	<i>24</i>

<i>In-water Turtle Sightings</i>	25
<i>Sea Turtle Satellite Tracking Project 2006</i>	26
<i>Beach Erosion</i>	27
COMMUNITY OUTREACH EVENTS	27
<i>School Activities</i>	27
<i>School Vacation Programme</i>	28
<i>Media Exposure and Public Presentations</i>	28
<i>Participation in Meetings, Workshops and Symposia</i>	28
RESULTS	28
PRE-SEASON PREPARATIONS.....	28
<i>Beach Preparation</i>	28
<i>Training of Volunteers</i>	29
<i>Selection of New Programme Co-ordinator</i>	29
MONITORING AND RESEARCH ACTIVITIES	29
<i>Track Surveys</i>	29
<i>Beach Patrols</i>	32
<i>Tagging</i>	34
<i>Carapace Measurements</i>	34
<i>Nest Survival and Hatching Success</i>	35
<i>In-Water Turtle Sightings</i>	40
<i>Turtle Stranding</i>	41
<i>Sea Turtle Satellite Tracking Project 2006</i>	41
<i>Research Activities</i>	42
<i>'Lisa' the Hawksbill turtle</i>	42
<i>'Grace' the Green Turtle</i>	43
<i>Beach Erosion</i>	43
COMMUNITY OUTREACH EVENTS	44
<i>School Activities</i>	44
<i>School Vacation Programme</i>	45
<i>Beach Clean-Ups</i>	45
<i>Media Exposure and Public Presentations</i>	45
<i>Poster & Presentation at Annual International Sea Turtle Symposium</i>	46
<i>Participation in Meetings, Workshops and Symposia</i>	46
<i>Culebra Island in-water monitoring Programme</i>	47
<i>Sea & Learn on Saba</i>	47

<i>Annual Public Meeting of STENAPA</i>	48
<i>WIDECAST Visit</i>	48
DISCUSSION	48
PRE-SEASON PREPARATIONS.....	48
<i>Beach Preparation</i>	48
<i>Training of Volunteers</i>	48
MONITORING AND RESEARCH ACTIVITIES	49
<i>Track Surveys</i>	49
<i>Beach Patrols</i>	50
<i>Tagging Methods</i>	50
<i>Carapace Measurements</i>	51
<i>Nest Survival and Hatching Success</i>	51
<i>In-water Turtle Sightings</i>	52
<i>Sea Turtle Satellite Tracking Project 2006</i>	53
<i>Beach Erosion</i>	53
COMMUNITY OUTREACH EVENTS	56
<i>School Activities</i>	56
<i>Beach Clean-Ups</i>	57
<i>Media Exposure and Public Presentations</i>	57
<i>Participation in Meetings, Workshops and Symposia</i>	58
RECOMMENDATIONS FOR 2007	58
<i>Participation of volunteers</i>	59
<i>Beach patrols</i>	59
<i>Development of the research programme</i>	59
ACKNOWLEDGEMENTS	60
REFERENCES	60
APPENDICES	62
APPENDIX 1	62
<i>Tagging and Nest Location Data</i>	62
<i>Nest Excavation Data</i>	63
APPENDIX 2	64
IN-WATER SIGHTING SHEET.....	64
APPENDIX 3	65
APPENDIX 4	66

<i>Flyer information to inform the community about the Sea Turtle Conservation Programme</i>	66
APPENDIX 5	67
<i>Excavation data for leatherback nests</i>	67
<i>Excavation data for hawksbill nests</i>	67
APPENDIX 5 CONTINUED	68
<i>Excavation data for green turtle nests</i>	68
APPENDIX 6	69
<i>Photos and Satellite information for Lisa, the hawksbill turtle</i>	69
APPENDIX 6 – CONTINUED	70
APPENDIX 7	71
<i>Photos and Satellite tracking for Grace, the green turtle</i>	71
APPENDIX 7 CONTINUED	72
APPENDIX 8	73
<i>2006 Education Outreach/Environmental Education</i>	73
APPENDIX 9	74
<i>Media Articles for the 2006 Year featuring the Sea Turtle Satellite Tracking Project</i>	74
APPENDIX 9 CONTINUED	75
APPENDIX 9 CONTINUED	76
<i>DAILY HERALD ARTICLE OF 11 SEPTEMBER, 2006.</i>	76
APPENDIX 10	77
<i>2006 Media Articles</i>	77
APPENDIX 10 CONTINUED	78
APPENDIX 11	80
<i>Example of flyer advertising monthly cleanup of Zeelandia Beach</i>	80
APPENDIX 12	81
APPENDIX 13	82
APPENDIX 14	83
<i>Sand Mining Policy</i>	83
APPENDIX 14- CONTINUED.....	84
<i>Sand Mining Policy - Continued</i>	84
APPENDIX 14- CONTINUED.....	85
APPENDIX 15	86
<i>STENAPA letter written in opposition to Zeelandia Sand Mining written on 14th September, 2006</i>	86
APPENDIX 15 - CONTINUED.....	87

List of Tables

TABLE 1. SUMMARY OF TURTLE NESTING DATA COLLECTED DURING TRACK SURVEYS IN 2006.....	30
TABLE 2. CARAPACE MEASUREMENTS OF ALL LEATHERBACK TURTLES ENCOUNTERED IN 2006.....	35
TABLE 3. CARAPACE MEASUREMENTS OF ALL GREEN TURTLES ENCOUNTERED IN 2006.....	35
TABLE 4. CARAPACE MEASUREMENTS OF ALL HAWKSBILL TURTLES ENCOUNTERED IN 2006.	35
TABLE 5. SUMMARY OF NEST SURVIVAL DATA FOR EACH MARKED LEATHERBACK NEST.	36
TABLE 6. SUMMARY OF NEST SURVIVAL DATA FOR EACH MARKED NEST OF HARD SHELL SPECIES.....	37
TABLE 7. SUMMARY OF EXCAVATION DATA FROM 2006.....	39

List of Figures

FIGURE 1. MAP SHOWING LOCATION OF ST EUSTATIUS IN THE EASTERN CARIBBEAN.....	16
FIGURE 2. MAP SHOWING LOCATION OF NESTING BEACHES ON ST EUSTATIUS	17
FIGURE 3. TAGGING SITES FOR LEATHERBACKS.....	23
FIGURE 4. TAGGING SITE FOR HARD SHELLS SPECIES.....	25
FIGURE 5. CARAPACE LENGTH - LEATHERBACK	23
FIGURE 6. CARAPACE WIDTH – LEATHERBACK	24
FIGURE 7. CARAPACE LENGTH –HARD SHELL.....	24
FIGURE 8. CARAPACE WIDTH – HARD SHELL	24
FIGURE 10. DISTRIBUTION OF NESTS ON SAINT EUSTATIUS NESTING BEACHES IN 2006	31
FIGURE 11. DISTRIBUTION OF FALSE CRAWLS ON SAINT EUSTATIUS NESTING BEACHES IN 2006	32
FIGURE 12: TEMPORAL DISTRIBUTION ON ZEELANDIA BEACH IN 2006.....	33
FIGURE 13: MEASURING DIAMETER OF OLD SCAR POSSIBLY DUE TO SHARK BITE.	41
FIGURE 14: POSSIBLE BITE ON REAR RIGHT FLIPPER.	41
FIGURE 15. PUPPET SHOW PERFORMED AT LOCAL SCHOOLS	44
FIGURE 16: DR. HARRISON WITH JUVENILE GREEN TURTLE.....	47
FIGURE 17: SAND MINING PERFORMED ON 1 NOVEMBER.....	54
FIGURE 18: RUN-OFF RESULT OF CREATION OF WATER CATCHMENT CREATED BY PUBLIC WORKS	54
FIGURE 19: 30 NOVEMBER 2006 EROSION AND DEGRADATION OF ZEELANDIA BEACH GUT ENTRANCE	55
FIGURE 20: PUBLIC WORKS ATTEMPTING TO SAND MINE ERODED AREA OF ZEELANDIA BEACH.	55

List of Acronyms and Abbreviations

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

Summary

- The St Eustatius Sea Turtle Conservation Programme was initiated in 2001 due to concerns that the island's sea turtle populations were being threatened due to habitat degradation and destruction. The programme is managed by St Eustatius National Parks Foundation (STENAPA), which is the main environmental non-governmental organization on the island.
- The Sea Turtle Conservation Programme is affiliated to the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) and adopts its monitoring and tagging protocols.
- Since monitoring began, three species of sea turtles have been confirmed nesting on the island; leatherback (*Dermochelys coriacea*), green turtle (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*). There was an unconfirmed nesting by a fourth species, the loggerhead (*Caretta caretta*), in 2004.
- Five nesting beaches have been identified; Zeelandia Beach, Turtle Beach, Lynch Bay, Oranje Bay and Kay Bay. Zeelandia Beach is the primary nesting beach, and the only place where all three species nest regularly; the other beaches are used occasionally by green and hawksbill turtles.
- Daily track surveys are carried out on Zeelandia Beach and Turtle Beach throughout the nesting season. Weekly track surveys were carried out on Oranje Bay following the report of a hawksbill track on 1 June. The other nesting beaches were monitored sporadically. Every track is identified to species; categorised as a false crawl or a nest; all nest locations are recorded for inclusion in the nest survival and hatching success study.
- In 2006:
 - Track surveys were conducted daily from 20 March to 24 November; a total of 232 morning surveys were completed.
 - Leatherback nesting activity occurred from 17 March – 14 June; 10 nests and two false crawls were observed; all emergences were on Zeelandia Beach.
 - Green turtles were recorded from 27 May until 18 September; 34 nests and 57 false crawls were encountered; nesting was on Zeelandia Beach, Turtle Beach and Kay Bay.
 - Hawksbill turtles were observed from the 3 June until 19 September. Six nests and two false crawls were recorded; hawksbills used Kay Bay (3 nests), Zeelandia Beach (1 nest) and Oranje Bay (2 nests).
- Night patrols are only conducted on Zeelandia Beach due to limited personnel and minimal nesting on other beaches; patrols run from 9.00pm – 4.00am. Each turtle encountered is identified to species; tagged with external flipper tags and an internal PIT tag (leatherbacks only); standard carapace length and width measurements are taken; nest locations are recorded for inclusion in the nest survival and hatching success study.

- In 2006:
 - Night patrols were conducted from 12 April –06 October; 127 patrols were completed, totalling 812.75 hours of monitoring.
 - One leatherback, three green turtles and one hawksbill turtle were encountered during patrols; all were tagged by the Programme Co-ordinator.
 - One remigrant green turtle returned to nest in the 2006 season. This green turtle was first observed on 19 July.
 - One green turtle and one hawksbill turtle during the night patrol were selected for satellite transmission in 2006. This has been the second consecutive year that the Dutch Caribbean Nature Alliance Satellite Tracking Project has been conducted and successfully accomplished.

- Average carapace measurements for females nesting in 2006:
 - Leatherback: Curved carapace length (CCL) = 158.7 cm; Curved carapace width (CCW) = 114.8cm
 - Green: CCL = 107.0 cm; CCW = 64.9cm
 - Hawksbill: CCL = 85.5 cm; CCW = 75.0 cm.

- All marked nests were included in a study of nest survival and hatching success. During track surveys they are monitored for signs of disturbance or predation; close to the expected hatching date the observers record signs of hatchling emergence. Two days after hatchling tracks have been recorded the nest is excavated to determine hatching and emerging success.

- In 2006:
 - 50 nests were marked: 10 leatherbacks, 34 greens and six hawksbill nests.
 - 21 nests were lost during the incubation period; 15 green nests and six hawksbill nests were presumed to be washed away during high tides in October; one leatherback nest was washed over by the tide for three days causing inundation; All hawksbill nests were presumed to be lost, with one hawksbill nest inundated before being moved on 18 October.
 - Mean incubation period for leatherbacks was 64.3 days, for greens 51.1 days and for hawksbills was indeterminable since none survived.

- Excavations were performed on 20 nests; six leatherbacks, 13 greens and one hawksbill.
 - Average egg chamber depth varied between the three species: leatherback = 68.6 cm, green = 54.4cm and hawksbill = 48.2cm.
 - Mean clutch size for each species: leatherback = 76.2 yolked + 34.2 yolkless eggs; green = 101.2 eggs and hawksbill = 131 eggs.
 - Hatching success was greater for green nests than either hawksbill or leatherback: 51% compared to 0.00 % and 21.1%, respectively.
 - Leatherbacks hatching success improved from the 2005 season, increasing from 3.5% to 21.1% in 2006.
 - All hawksbill nests were lost for the 2006 season. This was due to a culmination of reasons. Mostly because of laying in Oranje Bay and Kay Bay which has a limited area available for nesting and those areas washed away by high tides later on in the

- season. The one nest laid on Zeelandia was inundated for an unknown period of days before being relocated causing nest failure.
- Emerging success was lower for leatherback than greens; 15.3 % compared to 46.4 %, respectively.
 - Very little predation was observed and a few deformed embryos were recorded; one nest had several hatchlings with deformed carapaces; one had an incomplete skull and no eyes present while another green hatchling had two sets of jaws. One green turtle egg contained twin embryos, and 11 albino green turtle hatchling was also found. Ten were found from one nest.
 - Six nests were relocated during the 2006 season; one hawksbill nest, one leatherback nest and four green turtle nests. The hawksbill nest was laid on 7 September but due to the risk of erosion from freshwater run-off from the surrounding cliff, was relocated 19 October. The eggs appeared to have been affected by the run-off.
 - The leatherback nest was immediately relocated whilst being laid. Unfortunately, the eggs were unfertilised.
 - Of the four green turtle nests that were relocated; two hatched, one was washed away and one failed to hatch.
 - In future years the practise of relocating nests laid in erosion zones to safer sections of the beach will continue.
- On 27 September, a dead hawksbill turtle was encountered by the Programme Co-ordinator on Turtle Beach during a morning survey. At the current time, the Co-ordinator was lacking the equipment to perform a proper necropsy, but the turtle was moved and a necropsy was performed later. A rudimentary necropsy to determine the cause of death. Unfortunately no definitive answer as to the cause of death was determined from the necropsy.
 - A satellite tracking project was initiated in 2005 by the Dutch Caribbean Nature Alliance (DCNA) which was continued in 2006. This research was an inter-island collaboration between STENAPA and the Nature Foundation St Maarten. Dr Robert van Dam was the lead biologist, providing expertise and training in satellite telemetry methodology.
 - Two transmitters were successfully deployed on nesting females; one on a green turtle (“Grace”) that nested on Zeelandia on 17 September, the other was a hawksbill (“Lisa”) that nested on Zeelandia on 7 September. The turtles’ names were taken from two competitions that were organised for students for the “Name the Turtle” Competition in 2005.
 - The green turtle initially went off towards St Kitts, but then headed back towards Statia and returned to nest once more (29 September). The night patrol found her after nesting as she was returning to the ocean. They double-checked to make sure the transmitter was properly attached and it was. She then moved in between St Kitts and Nevis in presumably near-shore waters of the island. We suspect that she is in foraging grounds. As early as December, Grace has travelled a total distance of 1700 km.
 - Lisa was the first hawksbill observed nesting on St Eustatius for the 2006 season. The last observed hawksbill was in the 2004 season. She took off from Statia, and headed straight to St Barts. She remained around the uninhabited islands between St Barts and St Maarten for over two weeks before moving to Anguilla for a few days. In late September she started moving again, and travelled to the US Virgin Islands where she

stayed until approximately 7 October. Then the hawksbill started out for open water and appeared to head back towards Anguilla but veered to the uninhabited islands between St Maarten and St Bartholomew again in mid October. Lisa moved just off the southeast point of St Maarten but returned to the uninhabited islands around 10 November where she has been since.

- Beach erosion continued on Zeelandia Beach in 2006:
 - Many of the numbered marker stakes were lost due to high tides. Approximately, twenty were replaced.
 - A new method of beach mapping and erosion was undertaken this year. Data were collected in July and November and compared within the year. 64% of the stakes had recorded a positional change from the cliffs that were less than 50cm from their July positions. Only one stake recorded more than 2m cliff erosion from its July location. Although the data does not suggest extensive cliff erosion, the data points to possible steady erosion. Preliminary data stills needs multiple year analyses before any tangible conclusions can be made.
 - Sand mining compounds the erosion problem at the northern end of Zeelandia Beach. Despite being an illegal activity, it occurred throughout 2006, in the gully and on the beach.
 - In addition to the illegal sand mining, the Executive Council of the Island Government agreed to a one-year policy of sand mining to curb the sand shortage for construction on St Eustatius. This policy started 11 October and will be a temporary solution that will be monitored with certain steps placed to minimise the impact on Zeelandia Beach. None of the preparation steps agreed to have been implemented but the Executive Council has already permitted one sand mining operation to proceed on 1 November.
 - Four major cliff falls and four minor cliff falls were recorded from June to October.
 - Monitoring of erosion will be a priority for 2007. A suggestion for 2007 is to monitor erosion rates and water table to see if there is a correlation.

- Several different community activities were conducted in 2006:
 - A puppet show was organised for local schools and the after school programme to teach about water quality with a turtle, Scout, as the main puppet in the theme.

- Ten beach clean-ups were conducted on Zeelandia Beach. A total of 16 trucks full of rubbish bags were removed, including a partial radiator, water heater, large rope, fishing nets, oil barrel, a plastic barrel, four large batteries and several car batteries. Unfortunately it was difficult to attract support from the local community despite visits to schools to notify classes.

- The Sea Turtle Conservation Programme was featured in regular articles in the local press and on the radio. The STENAPA quarterly newsletter included several features about the research activities conducted in 2006 and the new website contains several pages dedicated to the programme, with a focus on the Sea Turtle Satellite Tracking Project 2006.

- Staff participated in several regional and international meetings in 2006:

- The Programme Co-ordinator, Emma Harrison attended the 26th International Sea Turtle Symposium in Crete, Greece 3 – 8 April, 2006 and the WIDECAST Annual General Meeting.
 - The Programme Co-ordinator travelled to Puerto Rico from 11 – 19 March, to participate in the in-water monitoring programme of juvenile green and hawksbill turtles at foraging sites close to Culebra Island. The purpose was to receive training in a protocol for conducting in-water capture of turtles, possibly implementing the techniques on Culebra Island to the St. Eustatius in-water monitoring programme.
 - On 16 August, STENAPA held its first Annual Public Meeting upstairs at the government guesthouse. At the Annual Public Meeting, Dr Harrison, gave a presentation on the Sea Turtle Conservation Programme.
 - In September, the Programme Co-ordinator was the opening night speaker of the “Sea & Learn on Saba” event. The work of the Sea Turtle Conservation Programme was presented to international biologists, tourists and local residents. The focus of the presentation was satellite tracking and its role in the conservation of Caribbean Sea turtles.
- Several recommendations are made for the 2007 season:
 - Continued participation of volunteers, from Working Abroad and the STENAPA Intern Programme. To extend volunteer participation, and arrange a dedicated Sea Turtle intern(s) for the upcoming 2007 season.
 - Monitoring of nesting beaches to continue: daily track surveys on all beaches and night patrols of the primary nesting beach.
 - Further development of the research programme: expand the focus of the programme by implementing an in-water survey of juvenile turtles and continue the satellite tracking project. There is a proposal to extend the satellite tracking to leatherback turtles for 2007.
 - Monitoring of erosion should also become a priority. In addition, monitor the water table at Zeelandia beach to determine if the subterranean water levels are causing possible egg failure but more importantly accelerating possible beach erosion.
 - As well as the monitoring of erosion, continue to monitor the sand mining approved by the Executive Council of the Island Government and develop alternatives, including instigating a study to assess sustainability of sand mining and impact to the beach nourishment process.
 - Include schoolchildren in carrying out beach cleanups. Arrange a contest to see who can collect the most rubbish and award a prize to the winner of the competition.
 - Integrate The Ocean Conservancy’s International Coastal Cleanup™ Campaign with monthly beach cleanups. The Ocean Conservancy organizes a worldwide annual cleanup on 16 September.
 - Revitalize the in-water turtle sighting surveys with the local diving centres. This information will help make more informed decisions regarding the in-water monitoring programme.

Introduction

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

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

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

The ultimate objective of the St Eustatius Sea Turtle Conservation Programme is to promote the 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 in near-shore waters. One of the most important factors to ensure the success of the project is the direct involvement of the local community in the programme to promote a better understanding of the importance of long-term conservation, not just for sea turtles but for other locally threatened species.

The aims of this Annual Report include the following:

- Summarise the activities of the Sea Turtle Conservation Programme conducted in 2006
- Review the accomplishments and deficiencies of the programme in 2006, and suggest recommendations for 2007
- Provide a summary of the data from 2006 research initiatives
- Present information locally, regionally and internationally about the research and monitoring programme on the island
- Produce a progress report for the Island Government, programme funding organisations, the local community and international volunteers.

Participating organisations

St Eustatius National Parks Foundation (STENAPA)

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

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

STENAPA Internship Programme

Since the inception of the Internship Programme in September 2001, over 37 interns from various countries including Great Britain, the USA, Canada, Holland, Hungary, Germany and New Zealand have helped accomplish projects at the Botanical Garden, in the Quill National Park, in the Marine Park; they have also assisted with educational programmes in the local schools. Interns are responsible for overseeing the daily activities of volunteers from the Working Abroad Programme, in addition to managing and completing individual assignments.

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

Working Abroad Programme – Statia Conservation Project

Working Abroad is an international networking service based in France that, since it was founded in 1997, has established volunteer projects in over 150 countries worldwide. STENAPA started its collaboration with the Working Abroad Programme in January 2003, and to date a total of 90 volunteers have been recruited via their organisation. On St Eustatius 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 expenses fee (this does not include international travelling costs or personal living expenses during their stay).

Wider Caribbean Sea Turtle Conservation Network (WIDECAST)

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

In June 2003, STENAPA Manager Nicole Esteban was appointed WIDECAST Country Co-ordinator for St Eustatius, following completion of a training course in St Croix (US Virgin Islands). Subsequent to this, the St Eustatius Sea Turtle Conservation Programme implemented WIDECAST-approved protocols for monitoring and data collection. WIDECAST has assisted the programme through donation of tags and purchase of PIT tag applicator. The Sea Turtle Programme Co-ordinator attended the WIDECAST Annual General Meetings in 2004, 2005 and 2006; with funding and logistical assistance provided in part through WIDECAST.

Dutch Caribbean Nature Alliance (DCNA)

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

Funding agencies and donors

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

Organisations that have contributed to the Sea Turtle Conservation Programme in 2006 are:

- Dutch Caribbean Nature Alliance (DCNA)
- Travel Committee of the International Sea Turtle Society
- USONA Programme of the Netherlands Antilles
- Wider Caribbean Sea Turtle Conservation Network (WIDECAST), USA
- World Turtle Trust (WTT), USA
- Working Abroad Programme, France

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

Study Sites

St Eustatius

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

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



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

Sea Turtle Nesting Beaches

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



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

Zeelandia Beach



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

Turtle Beach

This is the second longest beach on the Atlantic side, measuring approximately 400m. It links to Zeelandia Beach at its northern point, and connects to Lynch Bay around a point to the south. It is a steeply sloping bay, which is subject to considerable sand movement especially during the hurricane season (June – 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 gut in the middle of the beach which was formerly used as the land-fill



for the island; although not currently used this gut still contains a large amount of refuse and is open to the beach. Nesting activity to date has been limited to green turtles. Unfortunately access to this beach at night is often prohibited due to the tides, and therefore it is only patrolled during the day except when conditions permit.

Lynch Bay



This very small, rocky beach is located around the point to the south of Turtle Beach; it is approximately 200m long. There is considerable ground vegetation cover, primarily Beach Morning Glory and it 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 also for sand retention. Green and hawksbill nesting activity has been recorded at this beach, and it was the site of an unconfirmed loggerhead nesting event in 2004 (I. Berkel, Pers. Comm.). Due to access issues, Lynch Bay can only be monitored safely during the day.

Oranje Bay

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



Kay Bay



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

Methodology

Pre-Season Preparations

The Sea Turtle Conservation Programme 2006 commenced with the following pre-season activities:

Beach Preparation

To prepare the primary nesting beach for patrols, numbered stakes were positioned at 20m intervals along Zeelandia Beach; these stakes are used to mark the location of all nests or false crawls recorded during day or night patrols. Each stake was placed as close as possible to the vegetation or cliff behind the beach. Some stakes were remaining from the 2005 season, these were repainted; any that were missing were replaced.

Training of Volunteers

The materials used for training volunteers about the Sea Turtle Conservation Programme were reviewed before the first group from Working Abroad arrived in April 2006. Two short presentations were created; the first was a basic introduction to sea turtles, their biology and nesting behaviour; the second focused on beach monitoring protocols and the correct use of the data collection sheets. Every volunteer received training before assisting with beach monitoring.

Other Preparations

At the conclusion of the 2006 nesting season, the following activities were performed:

Selection of New Programme Co-ordinator

In July the existing Programme Co-ordinator, Dr Emma Harrison, announced her resignation from the position; she accepted a new job as the Scientific Director of a turtle conservation organisation based in Costa Rica. She remained in St Eustatius until 1 November to oversee the end of the nesting season, begin the in-water surveys and to train the new Programme Co-ordinator.

The position was advertised locally in the Daily Herald newspaper and on radio, and also on several listservers including NANJI (Netherlands Antilles Coral Reef Initiative), CORAL, seaturtle, in addition to the DCNA (Dutch Caribbean Nature Alliance) list and via the WIDECAST network.

Assistance with UNEP Caribbean Environment Programme and SPAW

In partnership with the UNEP Caribbean Environment Programme, an assessment of the degree to which parties to the Cartagena Convention's Protocol concerning Specially Protected Areas and Wildlife (SPAW) have implemented legislation to enable the Protocol was conducted. STENAPA assisted with writing the text that has executed laws relating to Netherlands Antilles' and Aruba's legislation, specifically St. Eustatius, that deal with SPAW, focussing on sea turtles as a proxy for the several hundred species listed in the Protocol annexes.

Monitoring and Research Activities

During the 2006 nesting season several different monitoring and research activities were conducted as part of the Sea Turtle Conservation Programme:

Track Surveys

Daily track surveys were conducted on the primary nesting beach (Zeelandia Beach) and Turtle Beach; surveys of other beaches were performed periodically when deemed necessary. These

surveys provide data on the temporal and spatial utilisation of previously identified turtle nesting beaches throughout the nesting season. For each track observed the following information is recorded (See example of data collection sheet in Appendix 1):

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

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

Beach Patrols

Nightly beach patrols were conducted on Zeelandia Beach and, when tidal conditions permitted, Turtle Beach; data from previous years show very low nesting densities at other beaches, making it an inefficient use of resources to carry out night patrols at these other locations. Each patrol consisted of a minimum of two people; including either the Programme Co-ordinator or an intern when possible, although occasionally two Working Abroad volunteers conducted a patrol together. A stretch of beach approximately 1km in length was monitored on Zeelandia Beach (up to 1.6km when Turtle Beach was included) from the cliffs at the northern end to just south of Smith's Gut; hourly patrols of this section were conducted between 9.00pm - 4.00am.

The primary objective of the beach patrols was to encounter as many nesting turtles as possible; to tag them with 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 designated erosion zones. For each turtle observed the following data were recorded (See example of data collection sheet in Appendix 1):

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

- Distance to high tide line – Straight-line distance to the most recent high-tide line; taken to the nearest centimetre. Measured either from the centre of the nest or at the apex of a false crawl track. When possible this measurement is made while the turtle is laying so that the exact location of the eggs is known.
- Number of unsuccessful nest cavities – If the turtle made more than one attempt at nesting during the same emergence.
- Result of nesting attempt – Recorded as either lay (when the turtle was seen laying), probable lay (if the nest site suggests that the turtle laid but no eggs were seen), false crawl (when some disturbed sand observed) or track only (no nesting activity at all, no disturbed sand).
- Relocation data – If the nest is deemed to have been laid in an unsuitable location which is prone to erosion or flooding the eggs are relocated to a more secure section of the beach. The following data are recorded for this new nest site.
 - New GPS location – Taken at the centre of the new egg chamber.
 - Triangulation measurements to two landmarks – Straight-line distance to the two numbered stakes closest to the new nest location; taken from the centre of the new egg chamber.
 - Distance to vegetation – Taken from the centre of the new egg chamber.
 - Distance to high tide line – Taken from the centre of the new egg chamber.
 - The number of eggs – The total number of eggs; also recorded separately are the number of yolked and yolkless eggs.
 - Time eggs laid – The time the turtle began to lay eggs.
 - Time eggs reburied – The time the eggs were placed in the new egg chamber.

All data were collected either while the turtle was laying or immediately afterwards, when she was covering the nest site; no turtle was touched before she had started laying.

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

Tagging Methods

Flipper Tags

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

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

individual can still be recognised. External flipper tags were only applied by trained personnel, either the Programme Co-ordinator or a Marine Park intern.

Passive Integrated Transponder (PIT) Tags

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

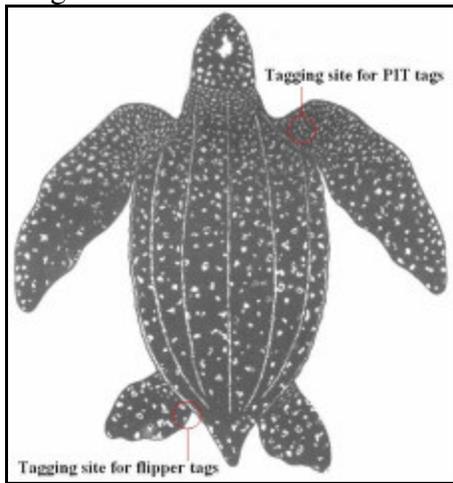


Figure 3. Tagging sites for leatherback species

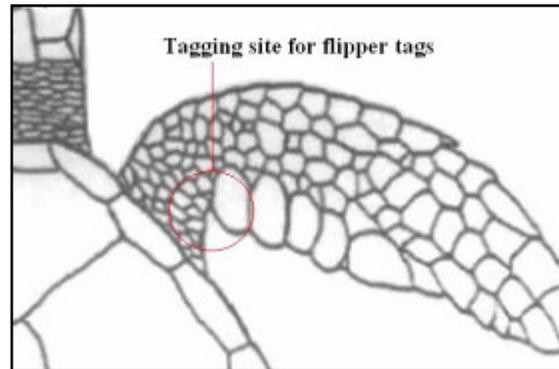


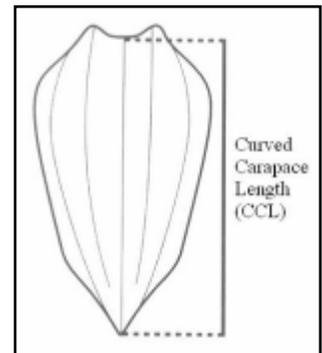
Figure 4. Tagging site for hard shell species

Carapace Measurements

Standard carapace length and width measurements (as of Bolten, 1999) were taken of each nesting turtle encountered, after she had finished laying. Measurements were made using a flexible metal or fibreglass tape measure; each measurement was taken once, to the nearest millimetre.

Leatherback

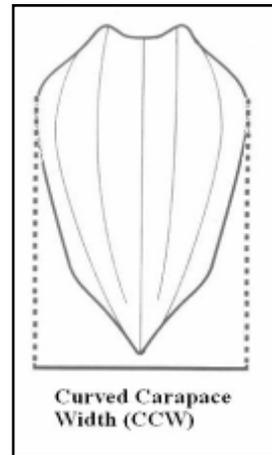
Curved carapace length (CCL) was measured from the nuchal notch (the anterior edge of the carapace where it meets the skin) in a straight line to the most posterior tip of the caudal projection (See **Error! Reference source not found.**). When the caudal projection is not symmetrical the measurement 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. **Figure**



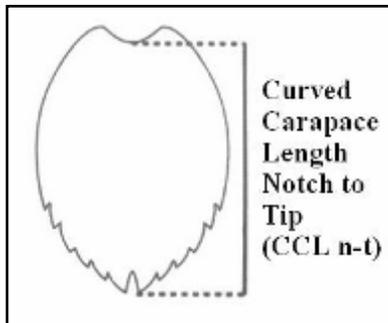
5. Carapace length - leatherback

Curved carapace width (CCW) is measured at the widest point, but there are no standard features delineating the end points (See Figure 6). The tape measure passes over the ridges and does not follow their contours.

Figure 6. Carapace width – leatherback



Hard shell species



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

Figure 7. Carapace length –hard shell

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

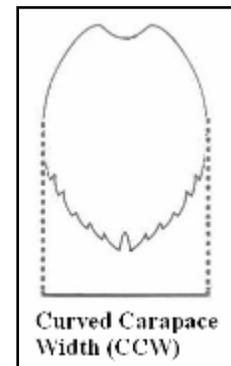


Figure 8. Carapace width – hard shell

Nest Survival and Hatching Success

All nests recorded were included in a study on nest survival and hatching success. Every day during morning track surveys the status of each marked nest was observed; a record was made if a nest was deemed disturbed, destroyed or washed away. Close to the predicted hatching dates (at around 50 days) the triangulation data were used to mark the site of the egg chamber; to prevent the surveyor having to re-measure the nest each day a small “V” of sticks was placed on the sand behind the nest site. This area was closely monitored for evidence of hatching; a depression, hatchling tracks or hatchlings. When any signs of hatching were observed the nest was excavated after 48 hours; if no signs of hatching were recorded the nest was excavated after at least 70 days from the date the eggs were laid. All excavations were conducted by the Programme Coordinator or trained personnel to ensure accuracy of data collection.

If a depression or other sign of hatching was present the excavator carefully dug down at this point until the first egg was encountered; if hatching had not been observed the triangulation data were used to locate the expected site of the egg chamber where digging commenced. Using gloves, the nest contents were carefully removed from the egg chamber and inventoried. The

following data were recorded for each excavated nest (See example of data collection sheet in Appendix 1):

- Nest code – Each nest was given a unique identification number.
- Observers – Names of people present during excavation.
- Date – The date the nest was laid; when hatching was observed and the date the excavation was conducted.
- Number of empty shells – 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 unhatched eggs – Eggs were opened to search for the presence of embryos and categorised as:
 - No embryo – No obvious embryo present.
 - Embryo – Embryo present; includes all stages of development.
 - Full embryo – Embryo in final stages of development and ready to hatch.
- Number of pipped eggs – Eggs where hatchling had broken the egg shell but failed to hatch; characterised by triangular hole in the shell. Whether hatchling was alive or dead was also recorded.
- Number of predated eggs – If possible the type of predator was noted; often characterised by a circular hole in the shell.
- Number of deformed embryos – Any deformities were recorded such as missing flippers, additional scutes on carapace, albinism or the presence of multiple embryos in a single egg
- Number of yolkless eggs – Small, yolkless eggs were counted separately.
- Notes – Any additional pertinent information was recorded.
- Depth of nest – To the top of the egg chamber (first egg encountered) and the bottom of the egg chamber (after final egg removed); measure to nearest centimetre.

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

In-water Turtle Sightings

To obtain information on in-water sightings of turtles, data collection forms were given to the three dive centres on St Eustatius: Dive Statia, Golden Rock Dive Centre and Scubaqua as well as visiting live-aboard dive vessel Caribbean Explorer (See example of data sheet in Appendix 2). The data form was redesigned in October to have a different focus that would coincide with the upcoming habitat mapping and in-water survey programme that will be instated for the upcoming year. The following data were recorded for each sighting:

- Dive Site – Location where turtle was seen.
- Date
- Time – Time of sighting.
- Dive Centre --- Who the dive centre was when the turtle was sighted.
- Dive Master
- Species of turtle – Green, hawksbill, loggerhead or leatherback.
- Size of turtle – Less than 10cm, 10 – 50cm, 50 – 100cm, more than 100cm.
- Did the tail extend more than 15cm past the shell? – Yes, no, don't know.

- Condition of the turtle – Alive, dead, injured. If injury, a description of the injury.
- Distance from the turtle – less than 3 metres, 3-5 metres, 5-10 metres, over 10 metres.
- Visibility – clarity of the water.
- What depth was the turtle seen –metres.
- Where was the turtle – On the surface, in the water column or at the bottom.
- What was the environment – Sand, sea grass, coral reef, rock or other (cave, wreck, etc.).
- What was the turtle doing– Resting, mating, swimming or eating?
- Were tags present – Yes, No or Unsure.
- Any other comments

Originally divers were asked to complete the forms whenever they encountered a turtle while diving. Due to the fact that many people could be completing the form for just one turtle, it was decided to let the Dive Master fill out the form. The Programme Co-ordinator visited the dive centres periodically throughout the 2006 season to collect any completed forms.

Sea Turtle Satellite Tracking Project 2006

In June 2005, funding was confirmed from the DCNA to initiate a multiple-year sea turtle tracking project in the Netherlands Antilles. This project was an inter-island initiative between the DCNA, STENAPA and the Nature Foundation Sint Maarten; led by sea turtle biologist Dr Robert van Dam. The objective was to learn the geographical range of adult female green and hawksbill turtles nesting on St Eustatius and St Maarten, by determining their migratory movements and the location of their feeding grounds. Another important aspect of the project was as a forum to engage local communities in sea turtle conservation issues, by illustrating turtle migratory behaviour from the islands.

Basic Satellite Telemetry

Satellite telemetry involves attaching a small transmitter to the carapace of a turtle; each time the turtle surfaces to breathe, a signal is sent to an ARGOS receiver on-board a polar orbiting NOAA satellite. This signal provides information about the location of the turtle; the signal is classified into one of five location classes depending on its accuracy. This will vary depending on several factors including environmental conditions and relative location of transmitter and satellite. Using satellite transmitters it is possible to follow individuals and gain detailed information about turtle migration and migratory behaviour patterns. By knowing where turtles are going and the routes they use

Figure 9. Satellite transmitter fitted to a turtle carapace



between breeding and feeding areas,

researchers can determine potential threats in all areas frequented by turtles and so focus conservation efforts where most needed.

Satellite transmitters are small and lightweight; the Telonics ST-18 used on St Eustatius measured 12cm by 5cm and weighed approximately 200g. Essentially they are electronic components and a battery housed inside a hard plastic casing, with an external antenna at one end. They are designed to be hydrodynamic and so cause minimal disruption to a turtle's natural swimming and diving behaviours. For hard shell species transmitters lie on a layer of elastomer that cushions between the transmitter and the carapace; it is then secured using layers of fibreglass resin.

The fibreglass creates a protective casing for the transmitter against damage on reefs or other hard surfaces during its time in the ocean. Transmitters will normally last several months until the battery fails, the antenna is broken, or it is dislodged from the carapace.

Education and Media Activities

In 2005 the "Help Out or Sea Turtles Miss Out" programme, teaching the local communities about sea turtle conservation issues, with Education Officer Dominique Vissenburg, was particularly successful. In 2006, the year the focus of the school education programme was waste management and pollution. Each month, the Education Officer visited the four island primary schools and looks at a specific topic related to the main theme; while on St Eustatius she is provided with logistical support from STENAPA staff.

To raise public awareness of the Sea Turtle Conservation Project, different media events were arranged; these included a radio interview in November and December, articles in the local newspaper, the quarterly STENAPA newsletter, features regarding satellite tracking on the STENAPA website, and a poster presented at the 26th International Sea Turtle Symposium. The poster was entitled "A Satellite Tracking Project in the Windward Islands of the Netherlands Antilles".

Beach Erosion

When the numbered stakes were placed along Zeelandia Beach before the start of patrols, the distance from the stake to the cliff or vegetation was recorded to determine the extent of erosion along the monitored section of beach. This estimate of erosion has taken place since 2004.

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.

Community Outreach Events

Raising community awareness of the Sea Turtle Conservation Programme is a fundamental part of the programme. Various activities were arranged during 2006, which are described below:

School Activities

The Education Officer for the Windward Islands of the Netherlands Antilles, Dominique Vissenberg, visits St Eustatius monthly to coordinate the education. The Education Officer

focused on waste management and pollution in 2006. Other activities, such as puppet shows, were organised.

School Vacation Programme

This programme was implemented by the Island Government in 2004: recent high school graduates, who are continuing their studies overseas, are given work placements with local businesses during their summer vacation. STENAPA has participated in this scheme since its inception and accepts at least one student each summer. The student is paid by the Island Government and assists with many of the ongoing programmes including the Sea Turtle Conservation Programme, helping on night patrols, nest excavations and beach clean-ups.

Beach Clean-Ups

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

Media Exposure and Public Presentations

Whenever possible the events of the Sea Turtle Conservation Programme 2006 were publicised in the local newspaper, STENAPA newsletter, on local radio or via the STENAPA website. Public presentations were also given to different groups on the island.

Participation in Meetings, Workshops and Symposia

In an effort to broadcast the work of the St Eustatius Sea Turtle Conservation Programme to as wide an audience as possible, the Programme Co-ordinator tried to attend any relevant meetings, workshops or symposia relating to turtle biology, research or conservation issues. Such gatherings create ideal opportunities to establish regional and international contacts within the sea turtle community; these contacts may provide guidance or support to expand and develop the programme on St Eustatius in the future.

Results

Pre-Season Preparations

Beach Preparation

A total of 65 stakes were prepared by the Programme Co-ordinator; each stake had a number engraved and then painted white. A band of reflective tape was applied to help locate them on the beach at night using a flashlight. Stake 1 was located at the northern limit of Zeelandia Beach and they ended at stake 65, half-way along Turtle Beach; they were positioned by the Programme Co-ordinator and a group of Working Abroad volunteers. Only part of Turtle Beach was marked in April as no leatherback nesting had been observed on that beach in previous years; in August temporary stakes were placed on the remainder of Turtle Beach, when green turtle nesting

activity was recorded. Over the course of the nesting season some of the stakes were lost due to high tides and beach erosion; these were replaced using temporary markers.

Training of Volunteers

The Programme Co-ordinator conducted the first training session on 12 April 2006; present were Working Abroad volunteers and Marine Park staff and interns. Each successive group of Working Abroad volunteers received an identical orientation. In addition to the two theoretical presentations on sea turtle biology and data collection, they received practical training on nest marking methodology and carapace measurements.

All interns also received training in external flipper tagging protocols; it was hoped that they could tag turtles encountered on nights when the Programme Co-ordinator was not leading beach patrols. However, during the monitoring period, all turtles requiring tags were actually observed on patrols led by the Programme Co-ordinator.

Preparations

Selection of New Programme Co-ordinator

In July the Programme Co-ordinator, Emma Harrison, announced her resignation from the position; she accepted a new job as the Scientific Director of another turtle conservation organisation based in Costa Rica. She remained in St Eustatius until the end of October, to oversee the end of the nesting season, begin the in-water surveys and to train the new Programme Co-ordinator.

In September the position was advertised locally in the Daily Herald newspaper and on radio, and internationally via several listservers. Almost 40 applications were received, and a short-list of 13 submitted answers to additional questions prepared by STENAPA Manager Nicole Esteban. From these 13, three were selected for interview by telephone. Their recommendations were submitted to the board of STENAPA and the selected candidate, Arturo Herrera, was informed on 3 October and appointed to start on 26 October; an application for a work permit was submitted to the island authorities prior to arrival on St Eustatius.

Monitoring and Research Activities

The following is a summary of the data collected during the 2006 monitoring and nesting activities of the Sea Turtle Conservation Programme.

Track Surveys

Daily morning track surveys were conducted between 20 March and 23 November; a total of 232 surveys were completed. On 17 days, surveys were not performed either due to inclement weather conditions making surveying dangerous, training or lack of personnel. The Programme Co-ordinator conducted 79% of the track surveys; trained volunteers and interns carried out the surveys in her absence.

Zeelandia Beach was always included in the survey; Turtle Beach was surveyed on all but eight days and Lynch Beach was surveyed on 35 occasions during the season. For the last month

surveys were limited to Zeelandia Beach as nesting activity had ceased; morning surveys were only conducted to monitor marked nests for hatching activity.

The first track was observed on 17 March: a leatherback nest was recorded on Zeelandia Beach. This nest was reported by Manager, Nicole Esteban as the Programme Co-ordinator was away from the island and no night patrols were being conducted at that time. The last nesting activity was recorded on 17 September; a green turtle nest laid on Zeelandia Beach.

Three species of turtle were recorded nesting in 2006; leatherback, green and hawksbill. Leatherback nesting occurred between 17 March and 14 June; green turtle nesting activity was recorded from 27 May – 18 September; six hawksbill nests were observed, between 1 June and 19 September.

2006 proved to be the busiest nesting season to date since the inception of the monitoring programme in 2002. Considerable nest activity was observed in 2006 (See Table 1, Figure 10 and Figure 11); a total of 50 nests and 61 false crawls for all three species. Zeelandia Beach was the primary nesting beach with 30 nests in total. Turtle Beach recorded eleven nests, with seven in Kay Bay and two in Oranje Bay.

Table 1. Summary of turtle nesting data collected during track surveys in 2006

Species	Number of Nests	Location of Nests	Number of False Crawls	Location of False Crawls
Leatherback	10	All Zeelandia Beach	2	All Zeelandia Beach
Green	34	19 Zeelandia Beach 11 Turtle Beach 4 Kay Bay	57	38 Zeelandia Beach 18 Turtle Beach 1 Lynch Beach
Hawksbill	6	1 Zeelandia Beach 3 Kay Bay 2 Oranje Bay	2	Oranje Bay

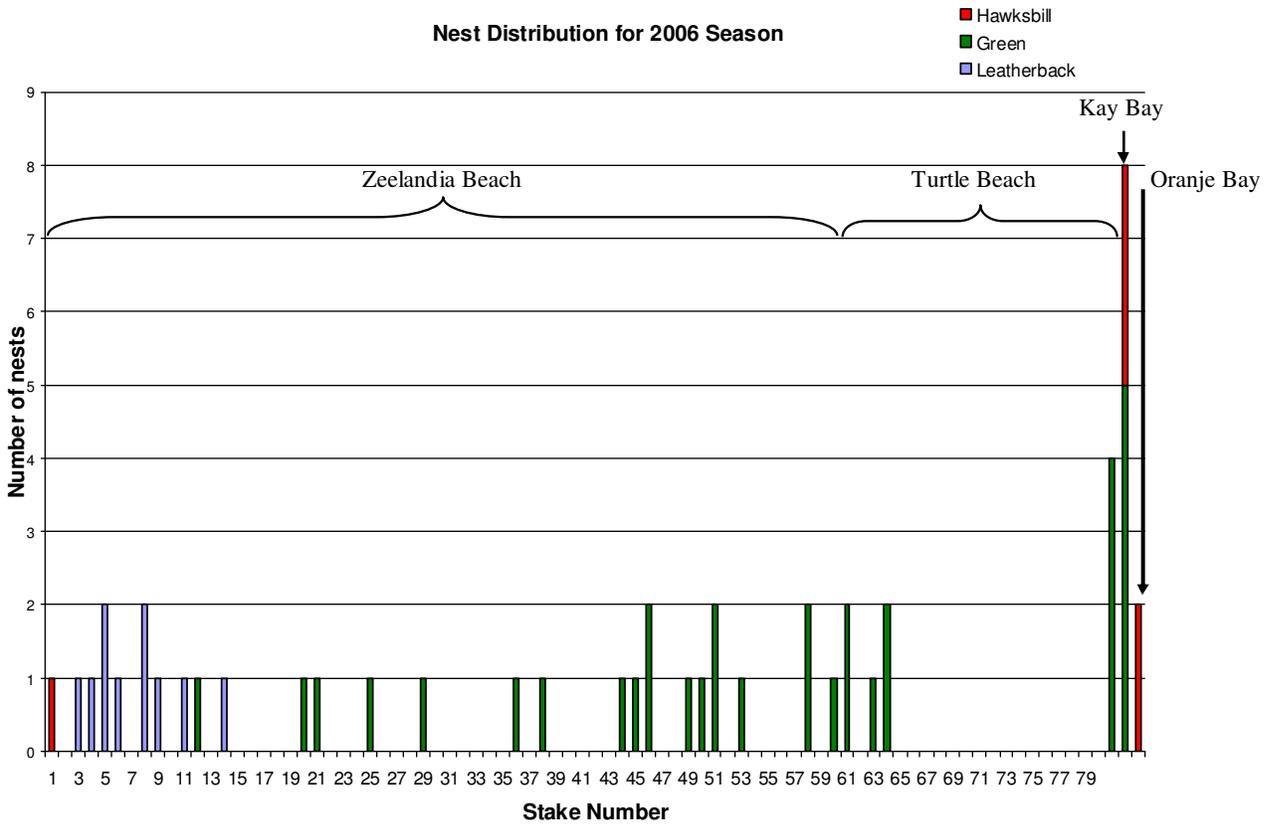


Figure 10. Distribution of nests on Saint Eustatius Nesting Beaches in 2006

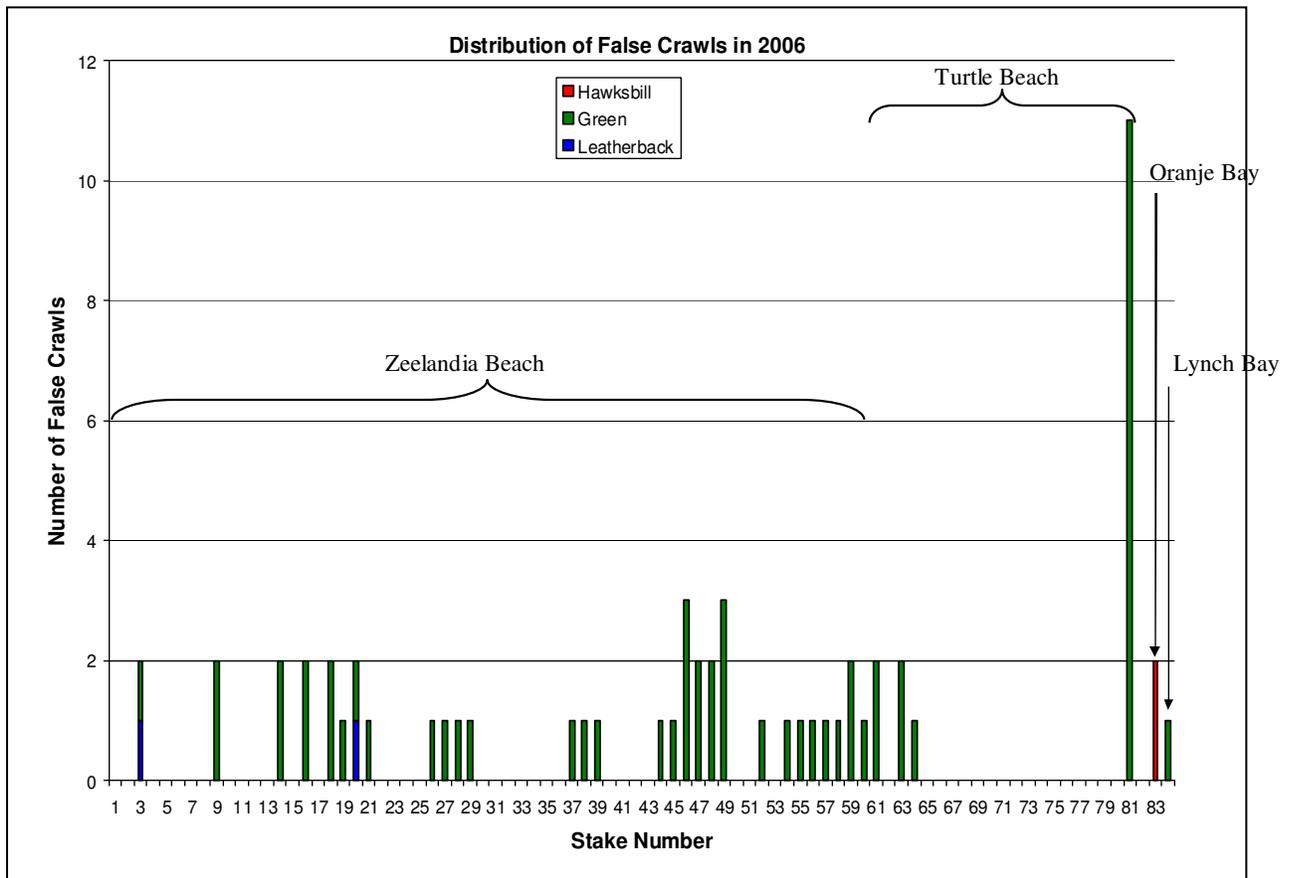


Figure 11. Distribution of false crawls on Saint Eustatius nesting beaches in 2006

All leatherback nesting activity occurred on Zeelandia Beach, and was almost exclusively limited to a 300m stretch at the northern end (See Figures 10 and 11); only one false crawl was recorded south of this area. Green turtles used four nesting beaches for either nesting or false crawl activities; but most emergences were on Zeelandia Beach and Turtle Beach. The rest of the activities were distributed on Kay Bay, with five nests and Lynch Bay with one false crawl. In contrast to leatherbacks, green turtle activity was not as concentrated. There were very few tracks and nests north of marker 11, with activity clustered between markers 43 to 63. Green turtle nests were not found north of marker 11 but were scattered throughout Zeelandia and Turtle Beach, with a moderate concentration found between stake number 44 and stake number 64 (See Figures 10). One false crawl was observed near stake three but most false crawls were recorded south of stake number 10 (See Figure 11). Hawksbill activity was confirmed on three of the nesting beaches; Zeelandia with one nest near marker 1, Kay Bay with three nests, Oranje Bay with two nests and two false crawls. Hawksbills showed no discernible pattern, with truly scattered nesting.

Beach Patrols

In 2006 monitoring of Zeelandia Beach was performed seven nights per week, to include weekends. Patrols commenced at 9.00pm and ended around 4.00 am; they were conducted along the entire length of Zeelandia Beach and occasionally on Turtle Beach, when tidal conditions permitted.

Night patrols were conducted between 12 April and 6 October; patrols ended on this date as no nesting activity had been observed for 20 consecutive days and it was assumed that the season had finished. In total, 127 patrols were conducted with approximately 813 hours of patrol time logged. If insufficient personnel were available patrols were cancelled; on eight nights patrols were cancelled or terminated early due to bad weather causing dangerous conditions on the beach. The Programme Co-ordinator led 37.0 % of patrols, assisted by interns and volunteers; when not on patrol the Programme Co-ordinator was on radio stand-by to assist the team on the beach if necessary.

Turtles were encountered on 21 separate nights; approximately 16.5% of patrols, or an encounter rate of 1 turtle every 6 nights. The first leatherback was recorded on 20 March, but the first female encountered was on 15 April. The last recorded leatherback was on the 14 June; the first green individual observed was on 30 June. The last recorded and observed green turtle was 17 September. Finally, the first hawksbill turtle was recorded by a member of the public on beach 1 June at approximately 9.00 pm with the last recorded hawksbill on 21 September.

The times of encountering a turtle varied throughout the night. The earliest a turtle was encountered was at 6:45am during a morning survey on 26 March. The turtle was a leatherback that was seen by the Programme Coordinator. The turtle was returning to the sea after nesting and had no tags present. Most night encounters were between 8.20pm and 3.20am with peaks between 10.00pm - 11.15pm, 00:10 - 00:30am and 1:00 - 1:15am. The latest a turtle was recorded was 3:20am which was a green false crawl on 25 September.

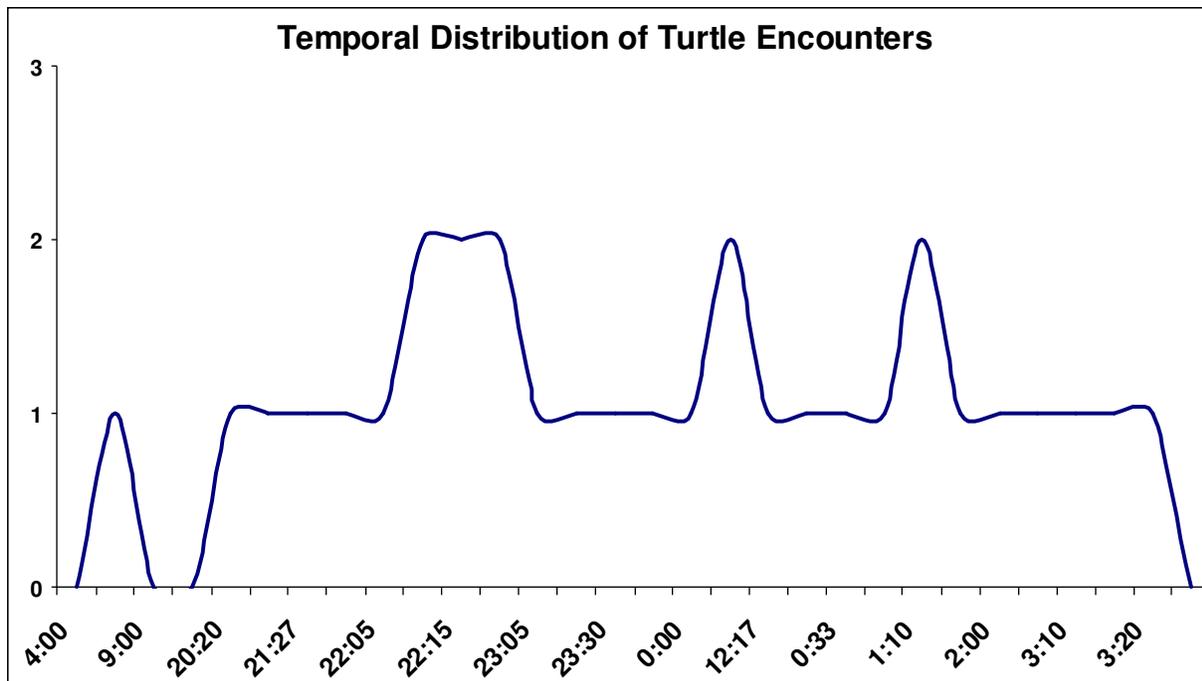


Figure 12: Temporal distribution of turtle encounters during night patrols on Zealandia Beach in 2006

Eight individual females were encountered; one leatherback, six green turtles, and one hawksbill were observed during patrols. One leatherback was seen seven times, all of which were successful nesting attempts; the average inter-nesting interval for the leatherback was 8.3 days (with a range of 8 – 12 days). Of the green turtles, three were observed more than once with one being recorded four times. One laid two nests but not recorded to have any false crawls; one laid a nest and made one known false crawl; another accounted for four false crawls. Unfortunately, with the lack of data, average inter-nesting interval for green and hawksbill turtles could not be calculated from a single individual but collectively the inter-nesting interval for green and hawksbill was 1.5 days (30 June to 20 August) and 18.3 days (1 June to 18 September), respectively.

Visitors were always welcome on night patrols, both tourists and members of the local community. However, very few people joined researchers in 2006; only 24 people in total, comprising two staff members, three medical students, two journalists and 17 interested members of the public. In addition, on two separate nights, a total of 13 students from the Caribbean Marine Reserves Programme (part of the Broadreach Programme) joined patrols. This programme brings groups of high school students from the United States to study how marine reserves are managed and also participate in hands-on field research.

Tagging

Of the seven individual females encountered on beach patrols during the 2006 nesting season (See above) only one had tags from previous years. The leatherback turtle that was encountered had no tags (PIT or back flipper tags) when first encountered and was given two external flipper tags in both rear flippers (Tag numbers WC339 and WC340) and a single PIT tag (133922451A) in the right-hand shoulder muscle. The hawksbill encountered had no tags and was given two external flipper tags (WE34 and WE35). Of the green turtles encountered, one was already tagged and the rest were given new external flipper tags. The previously-tagged turtle was a returning green that had been recorded in 2004 and returned to nest despite an injury to its left rear flipper. The green turtle's external flipper tag was located on the left front flipper (WE19) but was unable to receive another tag on the right front flipper due to time constraints. All tagging of turtles was performed by the Programme Co-ordinator.

Carapace Measurements

Standard carapace measurements were taken for each female that was tagged; some individuals were measured more than once, if they were encountered multiple times during the season. Table 2, Table 3 and Table 4 show the curved carapace length (CCL) and width (CCW) measurements for each leatherback and green turtle encountered, and the mean for each species.

In Table 2, the same leatherback turtle encountered was measured six times; CCL measurements showed 5cm of variability, ranging from 157.2 cm to 162.2cm, with a mean of 158.7cm. Width also varied 2cm for the same female; CCW = 114.0cm – 116.3cm, with a mean of 114.8cm. There was up to 5cm variation in the CCL measurements taken (Range = 157.2cm – 162.2cm), with the CCW measurements differing by two centimetres (Range = 114 cm – 116.3cm).

Table 2. Carapace measurements of all leatherback turtles encountered in 2006.

Turtle Identification Number	Curved Carapace Length¹ (CCL) / cm	Curved Carapace Width¹ (CCW) / cm
WC339	158.7	114.8
Species Mean	158.7	114.8

Table 3. Carapace measurements of all green turtles encountered in 2006.

Turtle Identification Number	Curved Carapace Length¹ (CCL n-t) / cm	Curved Carapace Width¹ (CCW) / cm
WE32	109.3	102.7
WE28	111.0	96.9
WE 30	104.0	96.9
WE36	106.0	100.0
WE19	112.5	
Species Mean	108.6	99.1

Individual green turtles showed much more variation in both carapace length and width than leatherbacks (See Table 3); CCL n-t ranged from 104.0 cm – 112.5 cm, with a mean of 108.6 cm; CCW ranged from 96.9cm – 102.7cm, mean = 99.1.

Table 4. Carapace measurements of all hawksbill turtles encountered in 2006.

Turtle Identification Number	Curved Carapace Length¹ (CCL n-t) / cm	Curved Carapace Width¹ (CCW) / cm
WE34	85.5 ²	75.0 ²
Species Mean	85.5²	75.0²

In Table 4, only one hawksbill turtle was encountered throughout the course of the 2006 season. There were not enough multiple data sets to have repeated measures and determine any variations in CCL and CCW.

Nest Survival and Hatching Success

Twenty nests were marked for inclusion in the nest survival and hatching success study; six leatherbacks, 13 green turtles and a hawksbill. Tables 5 and 6 provide a summary of the nest survival data obtained from each marked nest of 2006; each table details, for leatherbacks and

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

hard shell species respectively, nest code, turtle identification number, location of the nest, fate of the nest, incubation period in days (if known), and whether the nest was excavated or not.

Table 5. Summary of nest survival data for each marked leatherback nest.

Nest Code	Turtle Id Number	Location	Fate of Nest	Incubation / days ¹	Nest Excavated
DC061	WC339	Zeelandia	Partly hatched	66	Yes
DC062	WC339	Zeelandia	Partly hatched	60	Yes
DC063	WC339	Zeelandia	Nest not found ¹	N/A ¹	No
DC064	WC339	Zeelandia	Partly hatched	Unknown	Yes
DC065	WC339	Zeelandia	Partly hatched	67	Yes
DC066	WC339	Zeelandia	Nest not found, markers moved by sand miners	N/A ¹	No
DC067	WC339	Zeelandia	Unhatched/Inundated	N/A ¹	Yes
DC068	WC339	Zeelandia	Nest not found	N/A ¹	No
DC069R	WC339	Zeelandia	Unhatched/Unfertilised	N/A ¹	Yes
DC0610	WC339	Zeelandia	Nest not found	N/A ¹	No

The survival of nests varied in accordance to what nesting beach was utilised, but overall was not very high. For example, on Kay Bay and Oranje Bay, none of the nests emerged because they were washed away. Kay Bay saw eight washed away while Oranje Bay saw two wash away. Four nests were laid on Turtle beach; one nest could not be found when it was time to excavate. One successfully hatched, two partially hatched and one could not be located. On Zeelandia Beach, 36 nests were laid, but only 12 hatched. This left 24 clutches that failed to have hatchlings emerge from them for various reasons. Of the 24 that failed to hatch, 11 were washed away and lost due to erosion before it could be relocated to a safer location. One hawksbill and one green turtle nest was relocated in the middle of the incubation period as high tides posed a serious threat to the survival of the eggs if left *in situ*.

Evidence of hatching was only observed for nine marked nests; six green nests and three leatherback nests. This was either hatching tracks in the sand or hatchlings encountered on the beach, and therefore it was only possible to calculate the incubation period for these nests. For both leatherbacks and greens, incubation period was determined from multiple nests; 64.3 days and 51.1 days, respectively.

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”.

Excavations were conducted on 20 of the 50 marked nests; six leatherback, 13 green and one hawksbill nest. Eleven nests, four leatherback, and seven green, could not be found by researchers when it was time to excavate the nest; on some occasions the nest was marked after the turtle had left the beach, and so only an approximate location of the egg chamber was known. For all of these nests no signs of hatching were observed, thus exacerbating this lack of information about the exact location of the eggs. When trying to excavate each nest, several holes were dug in the vicinity of where the triangulation measurements crossed, to try to locate the egg chamber. Only when this procedure had been performed, and no eggs were encountered, was the attempt abandoned and the nest classified as “Could not find”.

Table 6. Summary of nest survival data for each marked nest of hard shell species.

Nest Code	Turtle Id Number	Location	Fate of Nest	Incubation / days ¹	Nest Excavated
CM061	Unknown ²	Turtle Beach	Hatched	47	Yes
CM062R	WE28	Zeelandia	Hatched	53	Yes
CM063	Unknown ²	Zeelandia	Hatched	51	Yes
CM064	Unknown ²	Kay Bay	Lost ³	N/A ³	No
CM065	Unknown ²	Zeelandia	Unhatched	Unknown ¹	No
CM066	Unknown ²	Kay Bay	Lost ³	N/A ³	No
CM067	Unknown ²	Kay Bay	Unhatched	Unknown ¹	No
CM068	Unknown ²	Turtle Beach	Unhatched	Unknown ¹	No
CM069	Unknown ²	Zeelandia	Hatched	51	Yes
CM0610	Unknown ²	Kay Bay	Lost ³	N/A ³	No
CM0611	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0612	WE30/WE31	Zeelandia	Hatched	48	Yes
CM0613 R	Unknown ²	Zeelandia	Lost ³	Unknown ³	No
CM0614	Unknown ²	Zeelandia	Lost ¹	N/A ¹	No
CM0615	Unknown ²	Zeelandia	Lost ³	Unknown ¹	No

¹ “Unknown” indicates that no signs of hatching were observed or nest could not be found during excavation. Also the hatching date was not known, so it was impossible to calculate an incubation period.

² Turtle not observed and so identity and tagging information was unknown.

³ These nests were not excavated but presumed washed away by the high tides observed in October.

⁴ Nest relocated on 3-Oct-06 as egg with dead hatchling observed on sand during track survey.

⁵ Nest relocated 18-Oct-06 but was lost due to inundation due to run off from cliff

CM0616 R	Unknown ²	Zeelandia	Unhatched	N/A ¹	Yes
CM0617	Unknown ²	Turtle Beach	Lost ³	Unknown ¹	No
CM0618	Unknown ²	Zeelandia	Partly Hatched	50	Yes
CM0619	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0620	Unknown ²	Zeelandia	Partly Hatched	Unknown ⁴	Yes
CM0621	Unknown ²	Kay Bay	Unhatched	Unknown ³	No
CM0622	Unknown ²	Zeelandia	Lost ³	Unknown ¹	No
CM0623	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0624	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0625	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0626	WE30	Zeelandia	Unhatched	N/A ¹	Yes
CM0627	Unknown ²	Turtle Beach	Partly Hatched	50	Yes
CM0628	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0629	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0630	Unknown ²	Zeelandia	Lost ³	N/A ³	No
CM0631	Unknown ²	Zeelandia	Lost ¹	Unknown ¹	No
CM0632	Unknown ²	Turtle Beach	Partly Hatched	38	Yes
CM0633	WE36	Zeelandia	Partly Hatched	63	Yes
CM0634 R	Unknown ²	Zeelandia	Partly Hatched	54	Yes
EI061	Unknown ²	Oranje Bay	Lost ³	N/A ³	No
EI062	Unknown ²	Kay Bay	Lost ³	N/A ³	No
EI063	Unknown ²	Oranje Bay	Lost ³	N/A ³	No
EI064	Unknown ²	Kay Bay	Lost ³	N/A ³	No
EI065R	WE 34	Zeelandia	Unhatched	N/A ⁵	Yes
EI066	Unknown ²	Kay Bay	Lost ³	N/A ³	No

The excavation data from all marked nests are detailed in Appendix 5, with some of the data summarised. The depth of nests differed considerably between the three species, with leatherbacks digging deeper nests than either greens or hawksbills; mean depth to bottom of egg chamber was 68.6cm compared to 68.1cm for greens and 48.2cm for hawksbills. Although leatherbacks dig deeper, it was unusual for green turtles, on average, to lay as deep as

leatherbacks. On average, green turtle nests are 55cm and an average leatherback digs to an average of 60 cm. Leatherbacks laid much fewer yolked eggs per nest than greens or hawksbills; range was 50 – 94 for leatherbacks, 14 – 139 for greens and 139 for hawksbills. Mean number of eggs per nest for each species was 76.2 eggs for leatherbacks, 104.3 for greens and 139 for hawksbills, although the sample size for the Hawksbill species was only n = 1. Leatherback nests excavated contained yolkless eggs (small-sized eggs which have no yolk); No greens or hawksbill nests were observed to contain yolkless eggs (See Appendix 5).

Table 7. Summary of excavation data from 2006

Species	Mean Depth to Bottom/cm	Mean # Eggs / Nest	Mean % Hatching	Mean % Emergence
Leatherback	68.6	76.2 + 34.17 ¹	21.1	15.3
Green	68.1	104.3	51.0	46.4
Hawksbill	48.2	139	0.0	0.0

The three species showed great variability in both hatching and emerging success; hatching success was calculated as the number of hatchlings that made it out of the shell into the egg chamber; emerging success was the number of hatchlings that made it out of the nest. Leatherbacks showed a better hatching and emerging success rate than 2005; 21.1% hatching success compared to only 3.5% in 2005 and 15.3% emerging success in 2006 to just 2.1% in 2005. Two leatherback nests contained only unhatched eggs indicating that no hatchlings survived; four green nests were also completely unhatched. Greens were much more successful than leatherbacks; hatching success was 51.0% and emerging success was 46.4% for the 2006 season. No hawksbill hatchlings managed to successfully complete the incubation period. Five of the nests that were laid in Kay Bay and Oranje Bay were washed away during high tides observed in October. No hatchlings or egg clutches were found during excavations in Kay or Oranje Bay. The hawksbill nest that was laid in Zeelandia beach was inundated by freshwater runoff before being relocated. Unfortunately, during the exhumation of the nest, it seemed that the inundation was sufficient enough to cause failure of that particular egg clutch (EI065R).

During the excavation of a leatherback nest (DC062) a number of dead hatchlings were found in the egg chamber (13 hatchlings), which suggested that they encountered a problem while trying to leave the nest that prevented many of them emerging and going out to the open sea (See Appendix 5). When unhatched eggs were opened it was found that leatherbacks had fewer eggs with no visible embryo present; these eggs were assumed not to have been fertilised properly and no embryo developed. The mean percentage of eggs with no embryo for each species was 46.8% for leatherbacks, 44.9% for greens. One leatherback nest seems to have been an unfertilised clutch (DC069R). 72 of the 74 eggs contained no embryo, while 48 of the eggs were yolkless.

Several nests contained pipped eggs; 18 leatherbacks and 91 greens, with a total of 109 eggs, 39 of which were dead. Very few eggs showed signs of predation; only 3 in total and only from green nests; it was not possible to determine the type of predator. Deformed embryos were rare;

¹ Normal and yolkless eggs calculated separately for leatherbacks.

several hatchlings from nest CM0603 had deformed carapaces; one from nest CM0616R had an incomplete skull and no eyes present while another green hatchling from nest CM0618 contained two jaws but no shell or limb deformities were recorded on this particular hatchling. One green turtle egg contained twin embryos, and a total of eleven albino green turtle hatchling were also found; ten of which came from one nest, CM0620.

Six nests were relocated during 2006, due to the likelihood of it being washed away if left in place; one leatherback, one hawksbill and four green turtles. The leatherback nest was relocated as the eggs were laid into chamber which was filling with water, indicating the female lay below the high tide line. The nest was relocated between stakes eight and nine. No leatherback nests were washed away during the 2006 season. The hawksbill nest was relocated on the 19 October after being laid on 7 September. The reason was that runoff from the nearby cliff after a heavy rain causing erosion. The nest was relocated a few meters away directly in front of Stake 1 which is protected from runoff by a large boulder. Of the green turtle nests that were relocated, two were laid below the high tide line and relocated during that night patrol. One was relocated from marker 45 to marker 39 and the other from marker 46 to 39. In the future any nests laid in this area will be relocated as it appeared to be a section of the beach particularly prone to erosion. The nests were relocated during a night patrol as the eggs were visible in a bank of sand being eroded by waves. The other two green clutches were relocated after the original nesting date. CM0634R was originally recorded as a false crawl on 21 August but eggs were observed on the surface of the sand on 22 September indicating the nest was being washed away. Four eggs were destroyed by the sea and not relocated (marker 36 to marker 39). The other green turtle clutch (CM0613R) was moved ten days after it was laid, 10 August, as the nest was being washed out to sea. This clutch was moved from marker 53 to marker 64.

In-Water Turtle Sightings

In 2006, the in-water turtle monitoring programme was temporarily put on hold. Initially, the in-water surveying was planned to begin in 2006. The reason was due to the upcoming development of in-water survey monitoring techniques being developed for WIDECASST. These protocols should be completed sometime in mid-2007. It was deemed that since these protocols would largely determine how the in-water monitoring would be conducted, the information that was currently being collected could potentially be of minimal value.

In light of these events, however, in-water turtle sightings were still lightly conducted. In late October, a revised form was introduced and distributed to the local dive centres; Dive Statia, ScubaAqua and Golden Rock Dive Centre. The new form included the Dive Master as the primary contact point. The reason for this was that diver might be less experienced in accurately identifying a turtle underwater and so more prone to error. Also, the metric system was used exclusively, which created additional white space and a more readable form. The rest of the basic data (condition of turtle, where it was seen, etc.) remained unchanged. The inclusion of the "Presence of Tags" section was included along with "Other Comments" and the new Sea Turtle Conservation Programme logo was displayed (See Appendix 2).

Turtle Stranding

On 27 September, a dead hawksbill turtle was encountered by the Programme Co-ordinator on Turtle Beach during a morning track survey. Lacking the necessary equipment to perform a necropsy the turtle was moved above the surf line, to ensure that it was not swept away by the tide. Later that day the Programme Co-ordinator, assisted by Marine Park Ranger Walter Blair, returned and performed a rudimentary necropsy to try and determine the cause of death.

Figure 13: Measuring diameter of old scar possibly due to shark bite.

On initial examination it was discovered that the turtle had a large section of its rear carapace (diameter 22cm) and the entire right rear flipper missing. No other obvious signs of injury were observed on the upper side of the turtle, however, when she was flipped over to begin the necropsy several additional signs of damage were found (See Figure 14). A bite was detected



on the plastron, which had a diameter of 23cm, and there was an additional puncture wound in the flesh close to the left rear flipper. These injuries were possibly from a previous shark attack, since they were completely healed. None of the injuries looked serious enough to cause death, and they may have possibly occurred post-mortem. The curved carapace length was 82.3cm and 71.8cm curved carapace width; plastron length was 60.1cm

Figure 14: Possible bite on rear right flipper.



The Programme Co-ordinator was able to conduct a very basic necropsy; all the internal organs were removed and examined; none showed signs of disease or damage. The digestive tract was completely full; there were even undigested pieces of sponge very close to the mouth. This indicates that the turtle was actively feeding up until close to the time of death. The reproductive organs showed her to be female; though the ovaries were undeveloped indicating that she was probably a juvenile or non-breeding adult. Unfortunately no definitive answer as to the cause of death was determined from the necropsy.

Sea Turtle Satellite Tracking Project 2006

The following is a summary of the research activities that were conducted as part of the Sea Turtle Satellite Tracking Project 2006; see also Harrison (2006).

Research Activities

A short training session on the methods for applying the transmitters was given to the Programme Co-ordinator, STENAPA Manager, and researchers in St Maarten in 2005. The preliminary schedule for attachments was organised for the month of September; with an initial plan for three transmitters to be deployed. Two were proposed for St Eustatius, ideally on greens and hawksbills, and one on a hawkbill on St Maarten. Dr van Dam left instructions on equipment to purchase and the design of a wooden holding box that was to be constructed.

'Lisa' the Hawksbill turtle

On the night of 7 September 2006 a hawkbill turtle was encountered on the northern end of Zeelandia beach. The animal was intercepted as it attempted to return to the water after a failed nesting attempt. The hawkbill proceeded to go back up the beach again to eventually nest, laying 143 eggs. The turtle was then held in a plywood box for transmitter application. In addition to flipper tags, a Telonics ST-20 A-1010 transmitter with Argos ID 60725 was attached to the uppermost part of the carapace by the deployment team, led by Dr Emma Harrison, STENAPA's Research Officer. This animal was average size for a hawkbill turtle, measuring 85.5cm curved carapace length. After obtaining a small skin sample for future genetic studies, the turtle was released and returned to the sea at 6.00am on 8 September (See Appendix 6).

As part of a project studying the effects of different beach characteristics on nest success a small data logger was placed in the nest, to monitor the temperature during incubation. This project is being conducted by sea turtle biologist Mario Mota from Mote Marine Laboratory in Florida, USA. He was interested in acquiring data from a black sand beach and approached the Programme Co-ordinator about the possibility of deploying data loggers on St Eustatius

This transmitted hawkbill turtle was named 'Lisa' by one of the winners of an arts and crafts competition held among schoolchildren on St Eustatius by STENAPA. She departed the waters of St Eustatius immediately after nesting on Zeelandia Beach, swimming north towards St Barth's and on to Scrub Island, on the east side of Anguilla. She remained there for several days and, based on the signal strengths received by satellite, may have nested on the ample sandy beach there on the night of 24 September, some 16 days after her nesting on St Eustatius and in accordance to the typical inter-nesting interval exhibited by Caribbean hawksbills. Then she moved westwards through deeper waters, changing southwards onto St. Croix in the U.S. Virgin Islands. 'Lisa' stayed just off the north-western tip of St Croix and again may have nested on the night of 8 October. After this possible nesting, 'Lisa' swam eastwards, again towards Anguilla and St Maarten, eventually settling in waters 20-35 meters deep near the west end of Ile Fourchue, an uninhabited cay located between St Barth's and St Maarten (See Appendix 6). The area appears to be a good foraging ground for adult hawkbill turtles, as another hawkbill turtle was similarly tracked using a satellite transmitter to the same area after nesting in 1998 at Mona Island, Puerto Rico (R. van Dam, unpublished data). As of early December 2006 the turtle remained transmitting from this same location. Although 'Lisa' ended up only 63km straight-line distance from St Eustatius, she swam over 2000km to reach this foraging ground destination after possibly nesting on two different islands.

'Grace' the Green Turtle

On the night of 17 September 2006, a female green turtle was intercepted after it laid 129 eggs on Zeelandia Beach. The turtle was held in a plywood box for application of the Telonics model ST-20 A-1010 transmitter with Argos ID 60724 by a team led by Emma Harrison. The turtle was also flipper tagged and measured 106cm curved midline carapace length, which is an average size for a green turtle in the Caribbean. This turtle was quite a lot larger than the hawksbill female, measuring 106cm in length; however she was much calmer throughout the 2-hour long attachment procedure, making it a lot easier for the team to get the transmitter fitted properly. Fortunately they were able to release her back to the sea just before a huge rain storm began. If it had started raining while they were working with the transmitter, would have severely hampered the entire attachment process. The transmitted animal was released at approximately 2.25am. (See Appendix 7)

Initially she headed around the northern end of St Eustatius before spending several days close to St Kitts. During that period, it looked as if she was heading back towards St Eustatius, to lay another nest. Those assumptions were confirmed on 29 September; the night patrol out on Zeelandia Beach radioed around 10.15 pm to report that 'Grace' had been seen heading back to the sea. They had checked her transmitter and everything appeared to be in good condition. The transmitted green turtle was named 'Grace', short for Graceful, by another winner of the schools' arts and crafts competition. 'Grace' started swimming towards the southeast and along the west coast of the island of St Kitts, maneuvering around to the southeastern point of that island, along the coast facing Nevis. She has since been transmitting from what apparently is her foraging habitat. 'Grace' swam about 60km to reach this location, which appears to contain stretches of relatively shallow seagrass beds and is influenced by some sediment flows from rivers on Nevis. Green turtles are generally herbivores and often associated with such seagrass beds. 'Grace' is the second green turtle tracked from St. Eustatius; 'Miss Shellie' was followed in 2005 to an area just in front of the Zeelandia nesting beach. According to latest calculations, Grace has traveled over 1700km as of early December 2006 with a straight line distance of just 38km (See Appendix 7).

Beach Erosion

Of 52 stakes that had been placed in 2005, approximately 32 still remained at the start of 2006; 20 had been lost, mostly south of Smith's Gut. For the remaining 32 the distance between the stake and the cliff was measured as an indicator of cliff erosion along Zeelandia Beach. Since a new method of beach mapping and erosion was implemented, using data from 2005 beach mapping data would not be applicable. Consequently, figures were compared from information taken July 2006 and figures collected in mid-November 2006. Ten stakes were in exactly the same location as July 2006 suggesting no cliff erosion for that period. Forty-one (64.0%) stakes had a positional change of 50cm or less from their July location; eleven stakes displayed cliff erosion of 50 - 100cm from the July location (11.0%); six (9.8%) recorded over 1m of cliff erosion since the July mapping. Of these six, one (1.6%) was recorded 2m in front of where it had been in July. The mean distance between the stake and the cliff was 0.9m; the range was 0.00 m – 2.00 m. Erosion was concentrated in several areas; from stakes 6 – 14, stakes 23- 27 and between stakes 32 – 38. The first of these areas is close to the public access at the northern end of Zeelandia and the other two are about half-way along the beach, before Smith's Gut. Although the data does not suggest the dramatic cliff erosion there was between 2004 and 2005,

the data does indicate probable steady erosion. Preliminary data still needs multiple year analyses before any tangible conclusions can be made.

During 2006 eight cliff falls were observed on Zeelandia Beach. Four were considered major while the rest were minor cliff falls. Observed evidence shows that the major cliff falls occurred in the early part of the season, two in June, one in July and another in August. Two occurred just north and south of Smith's Gut and each time the fallen boulders covered almost the entire width of the beach. This made negotiating these areas during night patrols difficult, especially when coupled with the nightly tides.

On two occasions the section of cliff which fell was equal or more than 10m in length; the largest (recorded on 18 June) was approximately 15m long. A very large section of the cliff, consisting of boulders and small rocks, was found. During the month of October, four separate falls were recorded, all regarded as minor and ranging between one to three meters. Twice during the season, cliff falls coincided with heavy rains.

Community Outreach Events

School Activities

In September, Dominique Vissenberg, Elsie Riley and several volunteers participated in a puppet show for the new school year's nature conservation educational programme (theme of 'Water'). All Cycle One and Two pupils of the four schools participated (Governor de Graff, Golden Rock School, Seventh Day Adventist School and Terminal School) in the introductory session. During the introductory puppet play, the turtle mascot, Scout, explains his needs and gives examples of different threats he faces in his life. Afterwards, Dominique Vissenberg led a discussion about sea turtles.

In a land-versus-sea turtle race, the children participated and practised how difficult it is to walk on land with flippers. This demonstrated what sea turtles experience when they go to a beach to nest. Also, children held their breath to demonstrate how long turtles can hold their breath in comparison, over five hours.

In later lessons, the water topic will fit in with a pirate theme. The focus goes onto marine life and also the diversity of properties that water has. The major theme is not directly related to turtles; more so the importance of water, marine habitat and coastal vegetation. The central character is Scout, who is a marine turtle. Scout fall under the curse of greed and becomes a pirate sailing under the pirate ship, *Black Turtle*. Each adventure Scout and his pirate crew have introduces a new lesson on water. In the end, Scout breaks the curse of greed and returns to his normal self (see Appendix 8).



Figure 15. Puppet show performed at local schools

School Vacation Programme

This programme was implemented by the Island Government in 2004; recent graduates, who are continuing their studies overseas, are given work placements with local businesses during their summer vacation. In 2006, Ramon Del Rosario participated for the month of July. He participated in a variety of ranger tasks, including several nest exhumations for the Sea Turtle Conservation Programme.

Beach Clean-Ups

Ten beach clean-ups were organised during the 2006 turtle nesting season; every month except for the month of September. Some beach clean-ups were conducted on the weekends to draw assistance from the local community. Unfortunately the response from the local community was disappointing; in the ten clean-ups that were organised, no local volunteers participated. In one case, the Statia Oil Terminal Company promised a joint effort for a beach cleanup, but due to miscommunication none of their personnel ended up taking part. A group of 13 students and staff from the United States, who were working with STENAPA as part of the Broadreach Programme assisted in a beach cleanup on 13 July.

Media Exposure and Public Presentations

To ensure that the Sea Turtle Conservation Programme reaches as wide an audience as possible, the Programme Co-ordinator maintained regular exposure in the press and on local radio. Many press releases were published during 2006. A total of thirteen media articles were submitted and published in the Daily Herald. The topics covered the Programme Co-ordinator travelling to the Sea Turtle Symposium to present a scientific poster, illegal sand mining, the first turtles of the season, a puppet show held in all the primary schools, upcoming vacancy of the Programme Co-ordinator position and updates on the satellite tracking project (See Appendix 9). The St. Eustatius Turtle Programme was also mentioned in an article published on 3 June reporting on sea turtles for World Environment Day. The article focused on turtles on St Maarten, but included information on St. Eustatius.

The satellite tracking project was also featured in a monthly radio interview in late October. The 30 minute radio interview focused on the 2005/6 DCNA Sea Turtle Satellite Tracking Project. The questions pertained to satellite tracking, basic satellite telemetry and results from 2005 and 2006 transmitted turtles.

To maximise the exposure that the St. Eustatius Turtle Programme receives internationally as well as locally, the STENAPA newsletter also featured an articles about turtles in every edition in 2006 (See Appendix 12). This quarterly newsletter is sent electronically to interested parties and ex-volunteers. The STENAPA website (<http://www.statiapark.org>) has several pages dedicated to the St. Eustatius Turtle Programme activities which are updated regularly. Not only do the web pages focus on the Conservation Programme, but the site also has several pages dedicated to the Sea Turtle Satellite Tracking Project in 2006, with links to location maps on <http://www.seaturtle.org>.

Poster & Presentation at Annual International Sea Turtle Symposium

At the 26th Annual International Symposium on Sea Turtle Biology and Conservation in Greece in April, 2006, Ms Vissenberg gave a presentation which gave details on the “Help Out or Sea Turtle Miss Out” programme. The presentation features Scout, the mascot of the environmental education programme. Although the focus was on the community in general, the primary focal point was the island schools, 143 classes in 24 different schools on three islands. The campaign entitled “Help Out Or Sea Turtles Miss Out” was adapted from the “RARE – Promoting Protection through Pride” programme that achieved widespread success in many countries in the Caribbean region. The three aims were to increase pride that these islands (the Winward Islands of Saba, St. Maarten and St. Eustatius) still have sea turtles, to create awareness that they need protection and to identify concrete ways in which the public can help (See Appendix 13). In addition, the Programme Co-ordinator presented a poster entitled “A Satellite Tracking Project in the Windward Islands of the Netherlands Antilles”, which gave information about the satellite tracking study conducted on St Eustatius and St Maarten in 2005 (see Appendix 13). The poster discussed how satellite telemetry has become a common tool for turtle biologists to discover migration pathways between nesting beaches and foraging grounds. The poster highlighted potential threats that may be faced while travelling between reproductive and feeding areas. The poster also demonstrated how projects such as these can increase community awareness by highlighting turtles’ migratory behaviour to engage the public in conservation issues. The poster was seen by an international audience and received very positive feedback, especially regarding the community awareness aspect.

Participation in Meetings, Workshops and Symposia

Annual International Sea Turtle Symposium

As stated previously, the 2005/6 Programme Co-ordinator, Dr Emma Harrison, attended the 26th Annual International Symposium on Sea Turtle Biology and Conservation held on Crete, Greece from 3 April, 2006 to 8 April, 2006. The symposium is usually the only time when the majority of turtle biologists from various parts of the globe come together in one location

In addition to the main symposium activities, the International Sea Turtle Symposium is an opportunity to arrange smaller regional groups for their Annual General Meetings (AGM). These AGMs include regions such as WIDECAST with whom the St Eustatius Turtle Programme is affiliated. These AGMs normally occur a few days before the general symposium commences. As a result of this affiliation, the Research Officer was invited to attend the WIDECAST AGM, which took place the 3 – 4 April, 2006; Dr Emma Harrison represented STENAPA Manager, Nicole Esteban, who is the Country Co-ordinator for WIDECAST but was unable to attend the symposium.

This meeting was very productive for the Research Officer, Dr Harrison, with respect to making contact with other turtle biologists in the Caribbean region. Many regional turtle conservation and monitoring projects were present. Establishing links with neighbouring islands, and other Dutch Caribbean islands, was one of the objectives of her participation at the WIDECAST meeting. Dr Harrison had the opportunity to talk to people from St Kitts, Aruba and Bonaire, in addition to the British Virgin Islands, Cayman Islands and Barbados. These initial meetings will form the foundation for continuing dialogue and collaboration between St Eustatius and these other

projects, many of whom are more established and so can offer guidance and advice to the project as it develops in the future.

Attendance at local, regional and international meetings, symposia and conferences is important for the continuing success of the St Eustatius Turtle Programme. Such gatherings provide a forum in which to broadcast the work being done by STENAPA with regard to turtle conservation on the island, while also facilitating links with other sea turtle researchers that may be beneficial in the future. The Annual Symposium on Sea Turtle Biology and Conservation is obviously the largest of these meetings within the field of turtle research, and so it is important that the Coordinator of the St Eustatius programme be permitted to participate in future years.

Culebra Island in-water monitoring Programme

At the invitation of sea turtle biologists Dr Robert van Dam and Dr Carlos Diez, the Programme Co-ordinator travelled to Puerto Rico the 11 – 19 March, to participate in their in-water monitoring programme of juvenile green and hawksbill turtles at foraging sites close to Culebra Island. The purpose of the visit was to receive training in a protocol for conducting in-water capture of turtles; with the possibility of implementing the technique in St Eustatius.



Figure 16: Dr. Harrison with juvenile Green turtle.

Juvenile turtles were captured using a net placed in shallow water foraging sites. Upon capture the individuals were tagged, measured and weighed before being released at the capture site. A group of veterinarians from the University of Georgia, USA, were also present; they were conducting health assessments of all the turtles caught. They were particularly interested in determining the reasons for the differential incidence of fibropapilloma tumours at the two study sites; one of which had turtles with the tumours, the other showing no cases of the disease.

This was an ideal opportunity for the Programme Co-ordinator to meet other sea turtle biologists working in the region, and establish a network of contacts for future research initiatives as part of the St. Eustatius Turtle Programme. This opportunity would provide ideal training for in-water methodologies, which could be modified for use in St Eustatius.

Sea & Learn on Saba

In October Dr Harrison was the opening night speaker of the “Sea & Learn on Saba” programme. The focus of her presentation was satellite tracking and its role in the conservation of Caribbean Sea turtles. Dr Harrison’s presentation was well attended, by over 80 people and received positive feedback; it is hoped in the future, that participation in “Sea & Learn on Saba” will continue. The exposure may be regional, but the presenters are internationally renown in their respective fields. The awareness of a sea turtle conservation programme will benefit not only St. Eustatius, but the surrounding region as well.

Annual Public Meeting of STENAPA

On 16 August, STENAPA held an Annual Public Meeting upstairs at the government guesthouse. Members of the public were invited to attend, with snacks and refreshments provided. The meeting was the first of its kind and it is hoped that it will become an annual event in the future. It is believed that the community will have a better understanding of the role of STENAPA and the research being conducted by the Turtle Programme; so that hopefully they can become more involved in future activities. This should increase support for upcoming projects that the Turtle Programme may undertake that will incorporate community involvement.

WIDECAST Visit

In October, the WIDECAST Executive Director, Dr Karen Eckert, visited St Eustatius to discuss programme and objectives for in-water monitoring programme. She was shown the habitat of the Marine Park and capture and observations methods were discussed. Scuba surveys were decided to be the most practical method as the waters is too deep for snorkelling. Coincidentally, since the water is too deep, the habitat also deems the use of nets as ineffective. Hand-capture of turtles was discussed and realistically possible but unlikely due to stress to turtle and safety concerns to divers.

Discussion

Pre-Season Preparations

Beach Preparation

The system of marking the primary nesting beach (Zeelandia Beach) with numbered wooden stakes remains the most cost effective method, due to the high probability of losing the markers as a result of high tides outside the nesting season. They are easy to replace or repaint at the start of each season; the reflective tape is very beneficial at night and greatly facilitates finding the stakes when measuring nests in the dark. A recommendation is to extend the markers to include all of Turtle Beach, as several turtles used that beach during the 2006 season and temporary stakes had to be positioned to mark nests.

Training of Volunteers

A review of the volunteer training materials was undertaken before the arrival of the first group of Working Abroad volunteers in April, 2006. The Programme Co-ordinator wanted to ensure that everyone involved in night patrol activities was given sufficient training in all aspects of the data collection protocols, both theoretical and practical. Additional training in tagging methods was provided for interns who were expected to lead patrols when the Programme Co-ordinator was not available. The level of training given to all volunteers was adequate for them to be able to collect the required data, as under normal circumstances they were not expected to undertake patrols without the Programme Co-ordinator or an intern present. It is suggested that the same training and orientation activities continue in 2007.

Monitoring and Research Activities

Track Surveys

In 2006 it was not always possible to conduct track surveys every morning, due to schedule conflicts and lack of personnel; however, surveys were completed for Zeelandia Beach most morning throughout the nesting season. They are an effective method for surveying nesting beaches not patrolled at night, to give an indication of spatial distribution of nesting around the island. Similar to previous years, three species of turtle were recorded nesting on St Eustatius; leatherback, green and hawksbill, no evidence of loggerhead turtles was found. Although there was an unconfirmed sighting in 2004 of a loggerhead turtle, they have not been recorded since then.

As also observed previously, Zeelandia Beach remains the primary nesting beach for all three species, indeed it is the only beach where leatherback nesting was recorded. A sizeable amount of nesting occurred elsewhere on the island; Turtle Beach had 11 nests and 18 false crawls, seven nests were recorded on Kay Bay, two nests were recorded on Oranje Bay and one false crawl on Lynch Beach. Some of these emergences were observed by residents living close to the beach.

In total more nests and false crawls were recorded for all three species in 2006 compared to 2005; 10 leatherback nests in 2006 compared to 16 in 2005; 34 green nests in 2006, 15 in 2005 and six hawksbill nests in 2006 compared to two in 2005. No nesting trends can be inferred from just a few years of data; given the long-term life cycle of each of the three species, continued long-term monitoring is essential before any assessments can be made about population trends on the island's nesting beaches. With the implementation of regular surveys throughout the nesting season it will be possible to start between-year comparisons in the future.

As for many locations in the Caribbean, leatherbacks on St Eustatius nest earlier than either of the hard shell species; between March and June, compared to June to October for greens and hawksbills. In 2006 Leatherbacks and Green turtle species were reported nesting earlier than in 2005; nine days earlier for Green turtles and eleven days earlier for Leatherbacks. For hawksbills, nesting in 2006 started later than 2005; 1 June for 2006 compared to May 27, 2005. Nesting terminated on the 8 October for the 2006 season and the 1 October for 2005. These dates show little variation of the end of the nesting season. The earlier start to the season may be the result of differing environmental conditions between the years; in preceding years, water temperatures in the Caribbean were higher than normal, marked by extensive coral bleaching in the region from August 2005 (Esteban, Kooistra and Caballero, 2005). With just a few years of data, however, it is difficult to determine a "normal" nesting season for St Eustatius, and so further monitoring is required to create a better evaluation.

With this in mind, it is proposed that more attention is given to morning track surveys; they should be conducted as early as possible in the day to ensure that all tracks and nests are undisturbed, and carried out as extensively as possible on all identified nesting beaches on the island. They should only be conducted by the Programme Co-ordinator or trained personnel in their absence, this reduces observer bias in the data and minimises data collection errors by untrained observers. No unidentified tracks were recorded in 2006; all tracks could be identified as a particular species, showing that sufficient training in track recognition had been received.

Beach Patrols

The 2005 expansion of the night patrol schedule to cover weekends has continued to be successful as several females were encountered on Friday and Saturday nights during the 2006 season; four leatherbacks and 12 green turtles. Prior to the 2005 nesting season, these turtles would not have been observed and the data assigned to “unknown” female. Nightly patrols should be continued in future nesting seasons.

A slightly higher number of turtles were encountered on night patrols in 2006 than 2005 (14 compared to eight, respectively). This indicates that more nesting females emerged in 2006. The patrol schedule, of one patrol every hour between 9.00pm and 4.00am, remains feasible, and almost guarantees that any turtle nesting during the patrol period will be encountered. In 2006, the turtle encounter rate was 16.5 % of night patrols, comparable to previous years. An analysis of the hours of peak emergence was conducted to determine if patrols could be shortened; reducing the time observers would need to remain on the beach but without the risk of losing valuable encounters. It was determined, however, that shorter patrols would result in missed turtles (see Figure 12). Another suggestion is to extend the section of beach patrolled at night; although tide conditions often prohibit patrols along Turtle Beach. Whenever possible, particularly during months when green turtles and hawksbills are nesting, patrols should cover Turtle beach in addition to Zeelandia Beach.

Tagging Methods

In 2005, the tagging protocol was changed slightly from 2004; all turtles, irrespective of species, were double tagged with external flipper tags. This practice was used during the 2006 and will continue to be used in the foreseeable future. The reason is to maximise the probability of being able to positively identify the individual if she returned to nest and thus minimising the effect of tag loss. If only one flipper tag is applied, a turtle could be categorised as a new recruit in error if that tag is lost. Leatherback turtles also had one internal PIT tag inserted, in addition to the two flipper tags; to standardise the protocol, each PIT tag was placed in the right shoulder. No previously tagged leatherbacks were encountered, and none of the females showed scars from old tags. Only one green turtle had tags when first encountered; she carried a single flipper tag that had been originally applied on Zeelandia Beach in 2002.

More females were tagged during night patrols in 2005 than in 2006, seven in 2005 compared to six during the 2006 season. All turtles that were encountered had tags when they left the beach during the 2006 season. Furthermore, all turtles that were tagged were double tagged.

As leatherback turtles are often prone to high levels of flipper tag loss it is advisable to continue the double flipper tagging protocol as well as using PIT tags which are less likely to be lost. Green turtles and hawksbills should also have two flipper tags applied, proximal to the last scale on the trailing edge of the front flippers; this tag location causes least drag and hence improved tag retention.

Only trained personnel should be allowed to apply tags, either flipper or PIT; this will usually be the Programme Co-ordinator or a STENAPA intern. The procedure established in 2005 to cover the nights when the Programme Co-ordinator was not scheduled for beach patrol was that she would be on radio stand-by and could join the patrol crew to assist with tagging and data

collection if they encountered a turtle. This worked well for most patrols in 2005 and 2006, but requires careful co-ordination of equipment and radios to ensure that they are fully charged prior to the patrol. It is recommended that this system continue to be implemented in future years, particularly as the Programme Co-ordinator plans to reduce the number of night patrols they conduct in order to focus on other aspects of the monitoring and research programme, such as the daily track surveys and education activities.

Carapace Measurements

The leatherbacks encountered in 2006 was longer than those observed in 2005; mean CCL was 1.48m in 2005 compared to 1.58m in 2006; however, CCW was almost identical both years (1.14m in 2006 and 1.12m in 2005). A similar situation was shown for green turtles; mean CCL n-t in 2006 was 1.07m compared to 1.08m in 2005; mean CCW measurements were 0.98m in 2006 and 1.00m in 2005. Again, no major variance was shown between 2006 and 2005 nesting season. In 2005, no hawksbills were measured so comparisons could not be made.

This difference may be a result of observer bias, or a genuine difference in the size of turtles observed; it will be interesting to compare these results with 2007. There was also some minor confusion by the Programme Co-ordinator as to what CCL measurements had actually been taken in 2004, as the description in the annual report did not correspond to the actual measurements taken; this could account for the quite large differences observed between the two years. Hopefully, this minor problem will be corrected in the future.

Practical training with a real carapace was conducted with volunteers in 2006, to give them an indication of the position of the tape measure on the carapace during measurements. This should be repeated in future seasons to ensure accurate measurements are being taken. For the 2006 season, the decision to convert to fibreglass tape measures for carapace measurements and not the metal tapes that have been used to date was approved. Fibreglass tape measures are more flexible and therefore fit better to the curve of the carapace and give a more accurate measurement. Also, they do not rust as readily and hence are less likely to “stick” during measurements. Hopefully, this will not affect measurements taken in the future, as the previous and current Programme Co-ordinator have considerable experience in carapace measurements and are keen to minimise errors in data collection.

Great care must be taken when training volunteers how to take carapace measurements, as there is scope for considerable variation in the placement of the tape measure, particularly for CCW where there are no clearly defined end-points to measure between. Measurements of leatherback turtles should be taken by two people, as it is impractical for one person to reach the front and rear of the carapace. It is also important to carefully position the tape measure alongside the central ridge, not along the top of it, as these can also greatly effect measurements.

Nest Survival and Hatching Success

Nest survival for all species was mixed throughout the season. As stated previously, no hawksbill nests survived the incubation period. This was due mainly to nest site selection where they were lost due to high tides, but one hawksbill nest on Zeelandia was lost due to inundation of a runoff from the nearby cliff. Twenty-one one nests from green and hawksbill clutches were washed away with exceptionally high tides; 15 and six respectively. In 2005, a green turtle nest was buried under a cliff fall, but in 2006 no cliff falls were culpable in the loss of any nests. No

leatherback nests were known to wash away, but one leatherback nest was washed over by the tide for an unknown number of days and presumed to be the cause of failure of that particular clutch. Hatching and emerging success showed extreme differences between the species; mean hatching success for leatherbacks was 21.1% compared to 51.0% for greens. Emerging success was 46.4% for greens, the highest for all species. Leatherbacks had 15.3% for emerging success. Although the hawksbill figures were unfortunate compared to 2005, leatherbacks demonstrated improved success from the 2005 season of just 3.5% to 21.1% in mean hatching success and an increase in emerging success from 2.1% to 15.3%. Green turtle nests showed a decrease from the previous season, with a hatching success of 76.8% and emerging success of 70.1%, compared to 51.0% and 46.4% in 2006, respectively.

One possible reason that might explain both the lack of success for hawksbill nests, especially when compared to the other species and previous years, is female nest site selection. All but one nest laid by hawksbills was laid either in Oranje Bay or Kay Bay. Both of these bays have very minimal suitable nesting habitat throughout the year and subsequently all nests were washed away by high tides later on in the season. The one nest laid on Zeelandia was inundated for an unknown period of days before being relocated. Although the 2006 season appears to be an anomaly for hawksbills, previous and subsequent seasons will capture an improved understanding of nesting patterns in regards to this species.

Although, leatherbacks improved markedly from the 2005 season, the low percentage of hatching success and emergence is cause for concern. Although the data indicates that the numbers are usually low, the inception of this conservation programme is relatively young and it will take several more seasons and raw data to make a more accurate assessment of the success of leatherback nests in St. Eustatius.

In-water Turtle Sightings

The redesigned forms will hopefully provide important information about the turtles using the near-shore waters around the island; such data collection has, to date, not been incorporated into the monitoring schedule of the Programme.

An important consideration when analysing data from previous years is that they were recorded by untrained observers, thus the opportunity for error in, for example, species identification, could be relatively high. This is the reason for requesting the Dive Master assist in filling out the form. Also, it is easy to overestimate the size of turtles underwater; frequently people will classify a turtle in a size range larger than its actual size.

Despite the minimal amount of data obtained during the 2006 season, the diver sighting surveys will be continued in 2007. It is also hoped to include dive centres on Saba, to gain data from a wider area within the Netherlands Antilles. It will be encouraging to receive support from the dive centres on St Eustatius and the support of the local community for the St. Eustatius Turtle Programme which will always be appreciated.

The raw data does point out that turtle sightings are relatively common in the waters around St Eustatius, and it is these observations that will assist to shape the in-water surveying programme in 2007. Using the data from the diver sighting forms, locations will be considered to conduct regular dive surveys to collect data on species composition, size classes and habitat utilisation.

Sea Turtle Satellite Tracking Project 2006

The implementation of a satellite tracking project in 2005 was a major development for the Sea Turtle Conservation Programme on St Eustatius. The tracking project was just as accomplished in 2006 as it was in 2005. This joint initiative with St Maarten, funded by the DCNA, was planned to not only provide information on the feeding grounds and migratory pathways of turtles that nest in the Netherlands Antilles, but also to engage the local communities on both islands in sea turtle conservation issues.

Three of the five transmitters obtained for the project were not deployed in 2005, and so they were held with the intention of using them during 2006. With the assistance of Dr Robert van Dam, the Programme Co-ordinator re-programmed the remaining transmitters in August, to adjust the settings with the aim of extending the battery life. In preparation for the deployments the Programme Co-ordinator and the Education Officer, Dominique Vissenberg, held a training session in August to practise the attachment procedures.

The plan was to deploy two transmitters on St Eustatius and one on St Maarten, if sufficient evidence of nesting was encountered; the Programme Co-ordinator would assist with the attachment of the transmitter on St Maarten. Using data from the daily track surveys of Zeelandia Beach and Turtle Beach, a diary of turtle emergences was created to try and highlight nights when known turtles were expected to return to the nesting beach. This information helped target nights when turtles were most likely to be encountered during a night patrol. Deployments were scheduled for the beginning of September, to try and avoid the difficulties encountered in 2005 with reduced nesting towards the end of September.

As part of a project studying the effects of different beach characteristics on nest success a small data logger was placed in the nest, to monitor the temperature during incubation. This project is being conducted by sea turtle biologist Mario Mota from Mote Marine Laboratory in Florida, USA. This study required that the number of eggs laid by each female was counted while she was laying; the hawksbill turtle laid 143 eggs, an average clutch size for this species.

Beach Erosion

Erosion continued on Zeelandia Beach in 2006. Since a new method was implemented, it was not practical to compare data between years, so an analysis was done within the year. During the pre-season preparations, the numbered markers that had been lost were replaced and the distance from their 2005 location measured. Compared to 2005, the amounts of lost stakes were less than the beginning of the 2006 season. Also, in 2005 only one-fifth of the stakes were in the same place as the previous year, suggesting no cliff erosion in those sites. Erosion was exacerbated by several large cliff falls in the middle of the nesting season (June – October). Two occurred in June, one in July and August and four in October. These are not only extremely hazardous to researchers (several occurred at night when beach patrols were being undertaken), but also a risk to turtles and nests close to the cliff. Two of the cliff falls was directly in front of the landfill site at Smith's Gut; heavy machinery is used to regularly compress the rubbish at the site, it is feasible that the vibrations of these machines, in conjunction with heavy rain weakening the structure of the cliff, could cause the cliff to give way.

In 2007, further detailed investigations will be conducted on the extent of beach erosion on Zeelandia Beach. The marker stakes are a useful method of rapidly assessing erosion along the cliff base; but it is also proposed to monitor erosion rates at the top of the cliff by placing supplementary stakes at known distances from the cliff edge and recording any changes observed at regular intervals throughout the year. These studies will be complemented by photograph documentation of the beach, showing sand deposition and erosion during the year. The findings from these surveys will be presented in a report that will discuss rates of beach erosion in the last two years; this report should be finalised in the summer of 2007.



Figure 17: Sand mining performed on 1 November

Another compounding factor affecting beach erosion in one particular section of Zeelandia Beach is sand mining. Although illegal since 2001, it still occurs regularly, the sand being used in construction around the island. Most sand is taken from behind the beach, in a gully that has been created from storm water run-off; this is close to the main public access at the north end of Zeelandia Beach. Some sand, however, is still being taken directly off the beach in front of the access area, as it is possible to drive a truck on the sand. On numerous occasions in 2006 the Programme Co-ordinator witnessed people excavating sand, both in the gully and on the beach; she reported each incidence to the STENAPA manager and the police were informed several times; no-one was charged for these offences. The Programme Co-ordinator approached several people who were observed taking sand; she told them that it was a prohibited activity, that it was increasing erosion on the beach and also endangering sea turtle nests in the area. This illegal activity reached a critical point in September at a time when there had been no sand supplies available for purchase on island for several months, and when a rumour was circulated that the Governor had permitted sand mining, within

hours over 10 vehicles were observed on the beach sand mining until the rumour was negated.



Figure 18: Run-off result of creation of water catchment created by Public Works

In 2006, the Executive Council reversed its decision of making sand mining a prohibited activity. The newly-adopted sand mining policy was implemented much to the concerns and opposition raised by STENAPA over beach

dynamics and sustainability (See Appendix 15). This one year policy was introduced to solve the sand shortage for construction. Sand mining is to be done at the behest of the Executive Council

by the Public Works department of St. Eustatius whenever sand is not available for purchase. Construction suppliers have been unable to obtain sand since early 2006 due to regional export embargos and barge size limitations, with negative consequence for economic development. The policy is a temporary solution and proper steps were assured to ensure minimal impact on nature conservation (see Appendix 14). Sand will be excavated from a delineated fenced zone within the gut area of Zeelandia Beach, only above the high tide level (the beach berm) and not extending either side of the entrance of the gut. Only the Public Works Department is authorized to extract sand, in the present of personnel from STENAPA. Also, two sites were excavated in the gut entrance to a five meter depth to prevent erosion. Unfortunately, heavy rains washed out the gut at the beach entrance and created a large pit in early October and, subsequently, all sand and moved earth has been washed out to sea. To further exacerbate this, the Executive Council has been ineffective in completing Phase 1- Preparation - of the Sand Mining Policy (see Appendix 14). To prevent extending this one year policy; it is advisable to develop alternative solutions.



Figure 19: 30 November 2006 erosion and degradation of Zeelandia Beach gut entrance

The beach close to the access point is where the majority of leatherback nests were laid in 2006 (please see Figure 10); their poor success is not surprising considering that this area shows a dramatic loss of sand after heavy rains, caused by the run-off from the gully, and is often also flooded after storms. It is also the site of the majority of sand mining, legal and illegal due to its accessibility. To prevent further beach degradation in this area, and to improve hatching success of nests laid in this zone of the beach, a concerted effort is required to eradicate sand mining both on the beach and in the gully directly behind the sand. Only through improved enforcement of regulations can the situation improve. Several members of STENAPA staff were sworn in as Special Agents of Police in September 2006 after completing a training course in December 2005. This status gives them the authority to charge people in breach of environmental laws on St Eustatius. Hopefully with additional personnel to assist them, the police will be better able to regulate these illegal activities. A recommendation for 2007 is to monitor sand mining activities more comprehensively, especially in months outside the nesting season when it is known that STENAPA personnel are not actively patrolling Zeelandia Beach and mining has been observed

to intensify. An extensive database of information about the frequency of sand mining, and the damage caused, will be gathered and passed on to the relevant authorities to investigate.



Figure 20: Public Works attempting to sand mine eroded area of Zeelandia Beach.

In addition to reducing erosion caused by sand mining, some regime to fortify the area behind the disturbed section of beach is also required; the vegetation has been destroyed and so there is little protection for the cliffs, which are eroding at an alarming rate. One proposal is to protect the

remaining vegetation, another idea is to investigate the feasibility of initiating a renourishment scheme; such proposals will need the support of external researchers with specific knowledge and experience. A proposal was sent to Statia Oil Terminal for the possible placement of boulders to protect the existing vegetation and new sea grape plants that could be planted. At present, no plans to proceed have been made. If nothing is done, and the situation continues as at present, then the erosion rates currently observed will result in a drastic loss of suitable nesting habitat along the Atlantic coast of the island, with obvious negative consequences for all the turtle species that utilise that beach, in particular leatherbacks. It is hoped that in 2007, the Executive Council, Oil Terminal and STENAPA can reach an agreement to place boulders to protect the existing and new vegetation that will be planted to curb the erosion.

Community Outreach Events

School Activities

While the schools continued to support the Sea Turtle Conservation Programme during 2006, with the puppet show, vacation activity and satellite tracking projects, there is still scope for further active participation among the students. Principals and teachers were extremely supportive of all involvement with the programme, facilitating the activities whenever possible. The students all enjoyed the activities, and appear to be remembering the underlying messages being given; their knowledge of turtles, their biology, threats and the need to conserve them is vastly improving. Also, the Junior Rangers in October were also involved first-hand; they were given a brief presentation about the life cycle of a leatherback turtle and conservation. They were then taken to Turtle Beach and observed an excavation of a green turtle nest that hatched the night before. In the nest were six hatchlings that had not emerged and the students guarded the hatchlings as they made their way to the sea. Overall, the junior rangers learned a vast amount about the life cycle of a sea turtle and the threats that they face in each stage. Furthermore, they learned that they could make a difference in a turtle's life by not littering in the marine environment or beach and reducing possible hazards they face. By teaching the children, we hope to encourage them to become more active in environmental issues, not only currently but in the future as well.

However, it is hoped that in 2007 there will be further involvement of students in research and monitoring activities. One area that has been suggested is to take small groups of students on night patrols whenever possible; obviously this would require careful organisation, planning and supervision, but the impact that would be achieved by having students witness a turtle nesting would be overwhelming. Another possibility is to have students participate in early morning survey patrols to search for emerging nests; this would be easier to arrange than a night-time activity, affording another opportunity to see an amazing natural phenomena as hatchlings crawl to the sea.

Engaging students in other activities, such as the monthly beach-cleans is also proposed for 2007: this would coincide with another educational programme being planned for schools in 2007, which will teach students about the ecosystems present in different water bodies (freshwater, brackish water, marine water). Following the success of the satellite tracking competitions in 2005 and 2006, it is hoped to establish an inter-school contest to see which school collects the

most rubbish over the year. Perhaps this can be done on World Oceans Day or a short period of time.

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

Beach Clean-Ups

Regular monthly clean-ups of Zeelandia Beach were organised during the 2006 turtle nesting season. The majority of the rubbish collected was plastics, and household waste that had presumably come from the landfill site at Smith's Gut, although large fishing nets and lines were also encountered; these are extremely hazardous to turtles as they can easily become entangled and die.

To encourage the participation of the local community in the clean-ups in 2007, the Programme Co-ordinator is hoping to improve notification of clean-ups, possibly by publicising events in the local press or on the radio. The Co-ordinator also plans to approach large employers on the island, such as the oil terminal, to enquire about their support for such activities, by donating man-power or resources. Additionally, the Programme Co-ordinator plans for participation in the International Coastal Clean-up organised each September by the Ocean Conservancy. This global event highlights marine pollution problems, and would hopefully be a great means of generating local support for the beach clean-ups on the island. Volunteers record specific types of marine debris being found, allowing The Ocean Conservancy to compile, analyse and track this data year-by-year and make discoveries about the behaviours that cause the debris.

In relation to the beach clean-up activities, with respect to waste management on the island in general; it is vital to try to raise awareness in the community about recycling, reducing waste and other associated waste issues. One big problem on the island is the Smith's Gut landfill site; it requires immediate and drastic attention because if an alternative solution is not found quickly it could rapidly become an uncontrollable disaster. STENAPA continues to alert the Island Government to this environmental hazard with regular letters about the landfill.

Media Exposure and Public Presentations

The St Eustatius Turtle Programme received a considerable amount of exposure in the media during 2006. The article of the Programme Co-ordinator and Environmental Education Director heading to Greece for the Sea Turtle Symposium to showcase the "Help out or Sea Turtles Miss Out" Campaign started the exposure on 18 February. In total thirteen articles were published in the Daily Herald featuring humpback whales and leatherbacks off St. Eustatius waters (1 April), illegal sand mining and the research and monitoring activities of 2006; the majority focused on the satellite tracking project. The radio interview with the Programme Co-ordinator in early November also gave good publicity to the programme (see Appendix 10).

It is important for all significant events to be broadcast to the local community, to ensure that they remain fully informed about all the work being achieved as part of the St Eustatius Turtle Programme. In addition, any activities that allow the results of the monitoring and conservation

programme to be published to locally should be encouraged, such as public talks or presentations with different sectors of the community, such as church groups.

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

Participation in Meetings, Workshops and Symposia

Participation in local, regional and international events is important for the work of the Sea Turtle Conservation Programme on St Eustatius to be recognised within the wider sea turtle community.

The Annual International Sea Turtle Symposium is an ideal forum to exchange information with leading experts in all fields of sea turtle biology and conservation; the WIDECASST meetings, held at the same time as this symposium, bring together the majority of the sea turtle projects from the Caribbean. They facilitate contact with other turtle conservation and research organisations from the area, and serve as a perfect arena in which develop and maintain regional contacts. The affiliation that the St Eustatius Turtle Programme has with the WIDECASST network is a beneficial one, as it provides this small island initiative access to more established projects, who can share their experiences with developing programmes such as ours. In future it is hoped that the Programme Co-ordinator can continue to attend the symposium, and it is anticipated that, as the St Eustatius Turtle Programme develops, we will be able to present more of our research findings at this important event.

The Puerto Rico, Isla Culebra workshop in September, was also advantageous to the development of the St Eustatius Turtle Programme. While it is agreed that the population of turtles nesting on the island is very small and that monitoring activities is in its infancy, it is still beneficial to gain knowledge regarding various methods of in-water capture and monitoring. Furthermore, it was another opportunity to disseminate information about the project to researchers working in the region, and important international contacts were made.

The invitation of the Programme Co-ordinator to participate in the Saba “Sea and Learn” programme was also a great occasion to represent STENAPA at a small scale international event, and to share the results of the St Eustatius Turtle Programme with a slightly wider audience, although still within the Netherlands Antilles. Such links with neighbouring islands should be actively encouraged, to facilitate the flow of information within the region. It is hoped that in 2007 exchange trips can be made to neighbouring islands to visit other turtle research programmes, conduct training and share knowledge and experiences between projects.

Recommendations for 2007

Several recommendations are proposed for the St Eustatius Turtle Programme in 2007; these suggestions are given following an assessment of the achievements and deficiencies of the project in 2006. Many of these recommendations have been mentioned previously in the relevant section

of the discussion; however, those that were not, which relate more to the programme in general, are listed below.

Participation of volunteers

Without the continued assistance of volunteers from these two programmes the St Eustatius Turtle Programme could not conduct its intensive research and monitoring activities. It is therefore recommended that for 2007 volunteers continue to participate in all aspects of the project; care should be taken to ensure that all volunteers receive adequate training prior to participating in any research activities. Also, local volunteers should be actively recruited and invited to participate in beach patrols or other project events, thus increasing local involvement in the programme. Furthermore, it is recommended that a dedicated Sea Turtle Intern be appointed for 2007 to aid the Programme Co-ordinator.

Beach patrols

The daily monitoring of the nesting beaches should continue in 2007. The continuation of nightly patrols in 2006 was very successful, and should be maintained providing that sufficient personnel are available to assist the Programme Co-ordinator and STENAPA staff. The inclusion of a dedicated Sea Turtle intern for the nesting season should remedy the personnel situation. As mentioned above, more focus should be placed on morning track surveys, especially on beaches other than Zeelandia Beach, which are not monitored at night.

Early morning patrols during hatchling season were performed in 2006; this is one activity that should be continued indefinitely. It provides increased data on the hatching dates of marked nests, thus enabling the incubation period to be determined more accurately, but it is an ideal means of involving interested members of the public in research activities. In particular, students could be invited to participate in these patrols, which would be logistically much easier to organise than a night-time patrol. Patrols could be organised for days close to the predicted hatching date of a nest, especially if signs of imminent hatching have been witnessed. They also provide an excellent education opportunity; the chance to teach the public about what to do, or not to do, if they observe a turtle nest hatching.

Development of the research programme

In addition to the monitoring activities conducted on the nesting beaches it is hoped to expand the research programme of the St Eustatius Turtle Programme in 2007. To date the focus has been on adult females nesting on the island's beaches; however, it is known that there are juvenile turtles using the in-shore waters within the Marine Park. An in-water survey of these turtles is proposed for 2007 with the groundwork currently being laid out. This in-water monitoring programme will run indefinitely and quantify the data currently being received from divers about turtle sightings in the area. The objectives of this study will be to determine what species of turtle are present; to assign individuals to size classes and hence calculate their approximate age; to investigate habitat use by these turtles and, if possible, study their behaviour in greater detail. Ideally an in-water tagging programme would be hopefully developed to monitor movement of individuals from juvenile feeding grounds to adult foraging areas; this would require extensive training on in-water methods, which would be facilitated by the closer links being developed with other turtle projects in the region. This tagging phase will not be implemented until 2008 at the earliest as in-water surveying guidelines and method becomes more established and familiar. One aspect of the in-

water programme is the benthic mapping of the entire Marine Park. Presently, little is known about the underwater topography of the Marine Park. To do random surveying throughout the Marine Park without determining underwater topography would be an ineffective use of time. Therefore, benthic mapping of the Marine Park will occur before in-water surveying commences. The benthic mapping will determine potential sites where turtles may reside and concentrate efforts of habitats that are known to be foraging or resting areas.

Acknowledgements

The St Eustatius Turtle Programme wishes to acknowledge the contributions made by many organisations and individuals during 2006.

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

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

We received financial assistance during 2006 from the Travel Committee of the International Sea Turtle Society, USONA, Working Abroad and the World Turtle Trust; these awards and donations covered operational expenses and travel costs to participate in international meetings and symposia. Gay and Henk Soetekouw also donated funds towards travel expenses to attend the Sea Turtle Symposium. We also received \$150 from the printing firm Firgos in St Maarten, which covered costs of producing the poster presented in the Sea Turtle Symposium.

For sharing his expertise, and providing training on satellite telemetry methods, we wish to especially thank Dr Robert van Dam, without whom the Sea Turtle Tracking Project 2006 would not have been possible.

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

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

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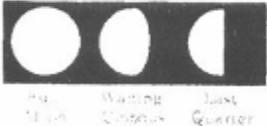
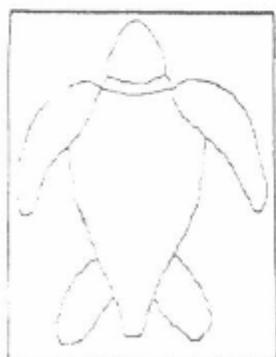
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Appendices

Appendix 1

Examples of data collection sheets updated or created in 2006.

Tagging and Nest Location Data

Record Number <input type="text"/>	<h3>Turtle Identification, Size and Health</h3> <p>Species <input type="text"/></p> <p>Gender <input type="text"/></p> <p>PIT Tag # <input type="text"/></p> <p>PIT Tag Location <input type="text"/></p> <p>Tags Present <input type="text"/></p> <p>Tag #s <input type="text"/> <input type="text"/></p> <p>Tag Locations <input type="text"/> <input type="text"/></p> <p>New Tag #s <input type="text"/> <input type="text"/></p> <p>New Tag Locations <input type="text"/> <input type="text"/></p> <p>Activity <input type="text"/></p> <p>Emerging, Searching, Body pitting, Digging egg chamber, Laying, Covering, Disguising, Leaving, Gone</p> <p>Carapace Length (m) <input type="text"/></p> <p>Carapace Width (m) <input type="text"/></p> <p>Parasites/Ectobiota <input type="text"/></p> <p>Injuries <input type="text"/></p> <p>Notes <input type="text"/></p> <p>In absence of turtle</p> <p>Track width (m) <input type="text"/></p>	<h3>Nesting/Sighting Information</h3> <p>Longitude (W) <input type="text"/></p> <p>Latitude (N) <input type="text"/></p> <p>Locale name <input type="text"/></p> <p>Triangulation</p> <p>Landmark 1 <input type="text"/> <input type="text"/></p> <p>Landmark 2 <input type="text"/> <input type="text"/></p> <p>Highwater (m) <input type="text"/></p> <p>Vegetation (m) <input type="text"/></p> <p>Unsuccessful Nest Cavities <input type="text"/></p> <p>Result <input type="text"/></p> <p>Lay, Probable lay, False crawl, Track only</p>
Observer <input type="text"/>		<h3>Nest Relocation</h3> <p>New Longitude (W) <input type="text"/></p> <p>New Latitude (N) <input type="text"/></p> <p>Triangulation</p> <p>Landmark 1 <input type="text"/> <input type="text"/></p> <p>Landmark 2 <input type="text"/> <input type="text"/></p> <p>Highwater (m) <input type="text"/></p> <p>Vegetation (m) <input type="text"/></p> <p>Number of Eggs <input type="text"/></p> <p>Yolked <input type="text"/></p> <p>Yolkless <input type="text"/></p> <p>Time Laid <input type="text"/></p> <p>Time Required <input type="text"/></p>
Date <input type="text"/>		
Time <input type="text"/>		
Weather <input type="text"/>		
Moon Phase <input type="text"/>		
 <p>Waxing Crescent First Quarter Waxing Gibbous</p>		
 <p>Full Moon Waning Gibbous Last Quarter</p>		
 <p>Waning Crescent</p>		
		

Nest Excavation Data

NEST EXCAVATION DATA SHEET

Nest Code

Observers

Date

- Laid
- Hatched
- Excavated

Number of Empty Shells (> 50%)

Number of Hatchlings

- Alive
- Dead

Number of Unhatched Eggs

- No Embryo
- Embryo
- Full Embryo

Number of Pipped Eggs

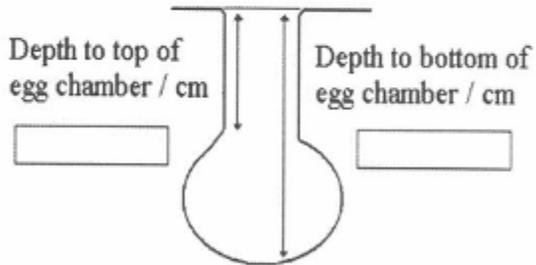
Number of Depredated Eggs

Number of Deformed Embryos

Number of Yolkless Eggs

Notes

Depth of Nest



Appendix 2

In-Water Sighting Sheet

Example of the in-water turtle sighting form given to dive centres in St Eustatius in 2006.



St Eustatius Turtle Programme In-Water Turtle Sighting Form

Sea turtles are endangered throughout the Caribbean. This form is part of a preliminary assessment of their numbers and habitat use within Statia Marine Park. The findings will aid in the implementation of an effective conservation management strategy to ensure their future survival.

Dive Site		Date		Time	
Dive Centre		Dive Master			
Species	Green	<input type="checkbox"/>	Loggerhead	<input type="checkbox"/>	
	Hawksbill	<input type="checkbox"/>	Leatherback	<input type="checkbox"/>	
Size of turtle	< 10cm	<input type="checkbox"/>	50 – 100cm	<input type="checkbox"/>	
	10 – 50cm	<input type="checkbox"/>	> 100cm	<input type="checkbox"/>	
Did the turtle's tail extend more than 15cm beyond the shell?					
Yes <input type="checkbox"/>		No <input type="checkbox"/>		Don't know <input type="checkbox"/>	
Condition of the turtle?					
Alive <input type="checkbox"/>		Injured <input type="checkbox"/>		Dead <input type="checkbox"/>	
If injured, describe injury					
Distance from turtle	< 3m	<input type="checkbox"/>	5 – 10m	<input type="checkbox"/>	
	3 – 5m	<input type="checkbox"/>	> 10m	<input type="checkbox"/>	
Visibility?	Metres				
What depth was the turtle seen at?	Metres				
Where was the turtle?					
At surface <input type="checkbox"/>		On bottom <input type="checkbox"/>		Water column <input type="checkbox"/>	
What was the environment?					
Sand <input type="checkbox"/>	Rocks <input type="checkbox"/>	Reef <input type="checkbox"/>	Sea grass <input type="checkbox"/>	Other <input type="checkbox"/>	
What was the turtle doing?					
Resting <input type="checkbox"/>		Swimming <input type="checkbox"/>		Eating <input type="checkbox"/>	
				Mating <input type="checkbox"/>	
Were tags present? (Metal tags located on front flippers, close to body)					
Yes <input type="checkbox"/>		No <input type="checkbox"/>		Unsure <input type="checkbox"/>	
Other comments:					

Thank you! Please return completed form to your dive master.

For more information please contact the STENAPA office in Gallows Bay
or visit the website at www.statiapark.org

Appendix 3

Updated “Guidelines for Visitors” fact-sheet.



Guidelines for visitors to the St Eustatius Sea Turtle Monitoring Programme at Zeelandia Beach

St Eustatius National and Marine Parks Foundation (STENAPA) started its sea turtle monitoring programme in 2001. In the Netherlands Antilles all sea turtles and their habitats are protected. The Marine Park is part of the Wider Caribbean Sea Turtle Conservation Network and follows WIDECAST protocols to monitor female turtles nesting on Statia. As a visitor and guest of the programme we ask that you please read these guidelines and sign the waiver below, PRIOR to participating in a beach patrol:

- A maximum of 2 guests are allowed on the beach per night because the patrols are conducted for research purposes not as a tour. You need to register at the National Parks office so that researchers know when they have guests accompanying a patrol.
- Patrols are conducted nightly on Zeelandia beach between 9.00pm and 4.00am. You will need to make your own way to and from the beach, as the Marine Park cannot organize transportation. Please arrive by 8.50pm so that the patrol can start promptly at 9.00pm.
- Visitors must remain with the group at all times and follow the advice of the patrol leader.
- NO PHOTOGRAPHY or VIDEO RECORDING is allowed. The Marine Park personnel may take photographs, but only if necessary for research purposes. You are welcome to leave your e-mail with the Marine Park and we will gladly forward pictures of sea turtles to you.
- NO WHITE LIGHT is used on the beach; visitors may only use flashlights that have a red filter attached (Please provide your own filters). Improper use of lights may deter a nesting female or disorientate hatchlings.
- A long-sleeved top and long trousers are suggested clothing, bring an extra layer as it often gets windy on the beach. Shoes, not sandals or bare feet, are recommended, as there are obstacles on the sand that can injure your feet.
- You are advised to bring water, and possibly snacks, for rest periods between patrols. Please note that alcohol is NOT permitted.
- During hatchling season be aware that hatchlings are emerging from nests and you will be asked to walk right behind researchers so that you do not disturb them. Note that hatchlings will only be handled if they are trapped or have flipped over on their back; this will be performed by Marine Park personnel.
- We ask that you closely follow any requests by Marine Park researchers. For instance, you will be asked to stand behind a nesting turtle and there will be no contact with the turtle until after she has finished laying her eggs.
- Anyone who disregards the wishes of Marine Park researchers during a patrol will be asked to leave the beach.

Finally, we would like to thank you in advance for observing these guidelines. Remember, Zeelandia beach hosts a low number of nesting sea turtles and you may not see any turtles while on patrol.

I would like to participate in the beach patrol on the night of _____

I have read and acknowledge these guidelines and will respect these regulations.

Name: _____

Signature: _____

Date: _____

Public awareness turtle watches are neither commercialized (conducted for profit) nor exploited for commercial endeavor. Do not accept reservations made by commercial enterprises that may charge a fee for their services. There is no fee in place to join patrols, however donations are accepted! Thank you. Manager, Statia Marine Park

Appendix 4

Flyer information to inform the community about the Sea Turtle Conservation Programme



STENAPA SEA TURTLE CONSERVATION PROGRAM

EVER SEEN A SEA TURTLE LAYING EGGS?



EVER SEEN BABY TURTLES HATCHING FROM A NEST?



EVER STAYED UP ALL NIGHT WALKING THE BEACH LOOKING FOR TURTLE TRACKS?

IF THE ANSWER TO THESE QUESTIONS IS NO, BUT YOU WANT TO FIND OUT MORE ABOUT SEA TURTLES, WHY NOT COME ALONG AND JOIN US OUT ON PATROL?

VOLUNTEERS ARE ALWAYS WELCOME. JUST COME DOWN TO THE STENAPA OFFICE IN GALLOW'S BAY AND SPEAK TO THE TURTLE CO-ORDINATOR (EMMA), OR CALL HER ON 318-2884 TO FIND OUT MORE ABOUT HOW YOU CAN HELP US CONSERVE STATIA'S TURTLES.

WE LOOK FORWARD TO SEEING YOU SOON!!

Appendix 5

Excavation data for leatherback nests

Nest Code	Hatchlings		Empty Shells	Unhatched Eggs			Pipped Eggs	Yolkless Eggs	Total Eggs	% Hatched	% Emerged	Depth ¹ / cm	
	Alive	Dead		No Embryo	Embryo	Full Embryo						Top	Bottom
DC061	0	1	33	16	0	1	0	20	50	66.0	64.0	60	73
DC062	7	13	32	14	7	3	18	29	74	43.2	16.2	35	50
DC064	0	1	8	16	60	0	0	41	84	9.5	8.3	59	78
DC065	1	3	5	22	67	0	0	29	94	5.3	1.1	54	80
DC067	0	0	2	24	55	0	0	38	81	2.5	2.5	62	N/A
DC069R	0	0	0	72	2	0	0	48	74	0.0	0.0	46	62

Excavation data for hawksbill nests

Nest Code	Hatchlings		Empty Shells	Unhatched Eggs ²			Pipped	Predated	Deformed	Yolkless Eggs	Total Eggs	% Hatched	% Emerged	Depth ¹ /	
	Alive	Dead		NO	E	FE								Top	Bottom
EI065R	0	25	0	106	16	9	0	28	0	0	131	0.0	0.0	30	48.2

¹ Depth from surface of sand to first egg (Top) and bottom of egg chamber.

² NO = No Embryo; E = Embryo; FE = Full Embryo.

Appendix 5 Continued

Excavation data for green turtle nests

Nest Code	Hatchlings		Empty Shells	Unhatched Eggs ¹			Pipped	Predated	Deformed	Yolkless Eggs	Total Eggs	% Hatched	% Emerged	Depth ² /	
	Alive	Dead		NO	E	FE								Top	Bottom
CM061	12	1	103	3	1	3	2	0	0	0	112	92.0	80.4	53	67
CM062R	0	0	94	3	5	0	11	1	0	0	114	82.5	82.5	48	59
CM063	11	5	85	14	11	0	11	0	0	0	121	70.2	57.0	56	72
CM069	0	2	123	1	2	0	3	0	0	0	129	95.3	93.8	51	62
CM0612	0	0	67	17	21	0	0	0	0	0	105	63.8	63.8	65	80
CM0616R	0	0	1	8	2	0	1	2	1	0	14	0.0	0.0	N/A	N/A
CM0618	2	5	17	7	98	2	3	0	1	0	127	13.4	7.9	47	68
CM0620	0	7	1	27	17	0	25	0	1	0	70	0.0	0.0	N/A	N/A
CM0627	6	1	27	39	16	18	4	0	1	0	104	26.0	19.2	50	69
CM0632	6	0	36	42	33	3	2	0	2	0	116	31.0	25.9	66	74
CM0634R	1	0	35	23	16	0	27	0	0	0	101	34.7	33.7	53	68
CM0633	2	0	2	110	18	9	2	0	0	0	139	1.4	0.0	54.5	62.4

¹ NO = No Embryo; E = Embryo; FE = Full Embryo.

² Depth from surface of sand to first egg (Top) and bottom of egg chamber.

Appendix 6

Photos and Satellite information for Lisa, the hawksbill turtle

Photographs of the attachment of a satellite transmitter to a hawksbill turtle on 7-8 September 2006. Dr Emma Harrison, Programme Coordinator, in the holding box with 'Lisa' during the application of the transmitter satellite.

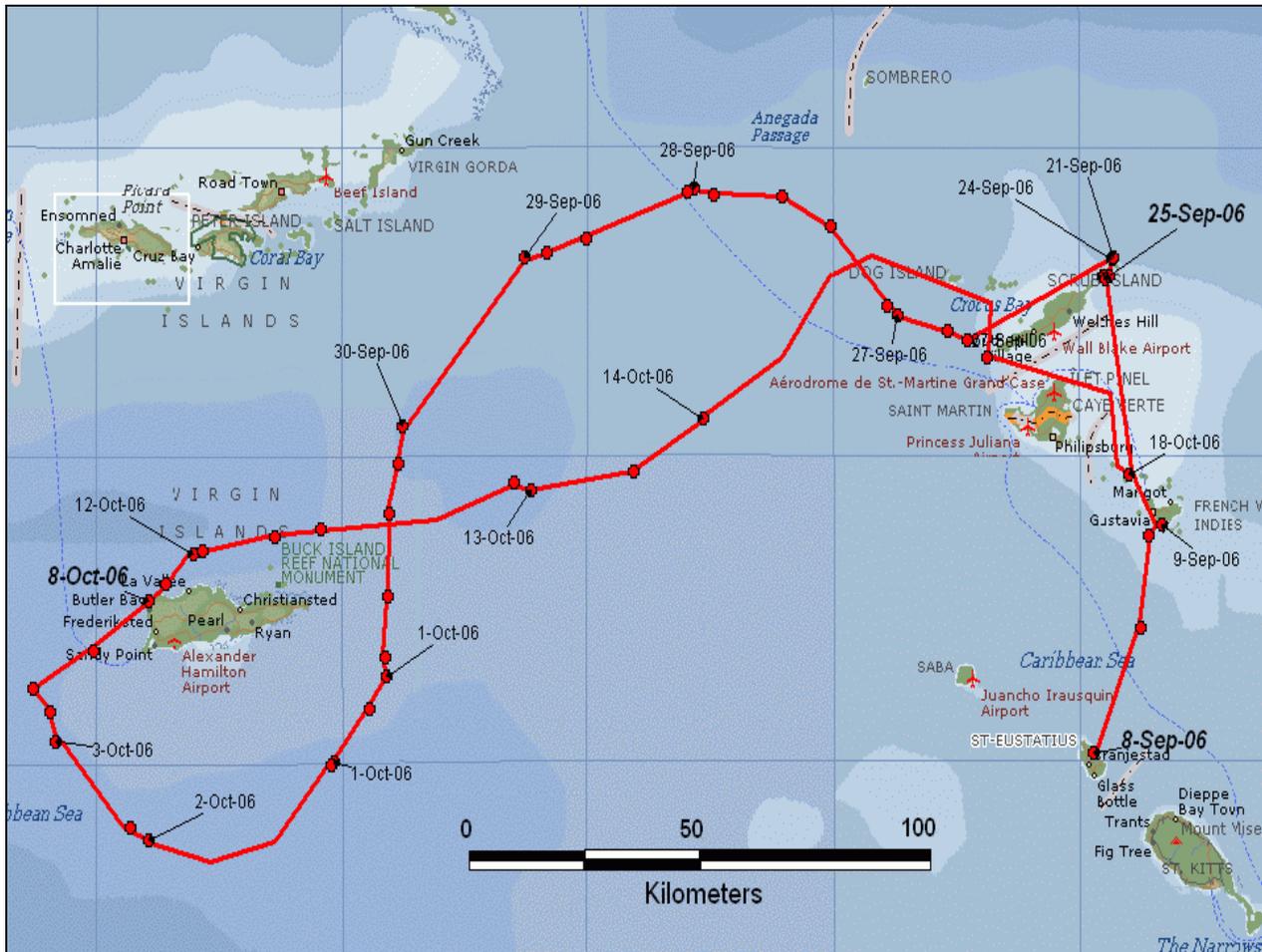


Release of Lisa in the early hours of 8 September, 2006. Shortly after this photo, she headed immediately to the sea.



Appendix 6 – Continued

Map showing some of the location points received from the hawksbill turtle “Lisa” from St Eustatius; points show the route taken by the hawksbill after her release from Zeelandia Beach. Map produced by Dr Robert van Dam.



Appendix 7

Photos and Satellite tracking for Grace, the green turtle

Photographs of the green turtle “Grace” attached with a transmitter on 18 September, 2006.

Grace being cleaned before the application of the transmitter satellite



Grace being released



Appendix 7 Continued

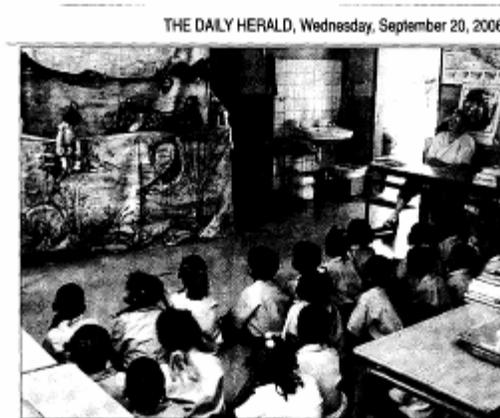
Map of the migration route of green turtle “Grace” from Zeelandia nesting beach. Map produced by Dr Robert van Dam.



Appendix 8

2006 Education Outreach/Environmental Education

News article featuring the puppet show performed by Dominique Vissenburg and STENAPA members on the environmental education topic of marine life.



THE DAILY HERALD, Wednesday, September 20, 2006

Cycle One children at Golden Rock School watch intently as puppets representing a tourist, a fisherman, and the sailing turtle Scout discuss threats facing sea turtles.

Puppet show introduces children to marine life

ST. EUSTATIUS—The St. Eustatius National Parks Foundation (Stenapa), the Saba Conservation Foundation (SCF), and Nature Foundation St. Maarten are "diving" into the water for this year's project of the nature conservation educational programme for this school year.

This programme, which is funded by the Prins Bernhard Culture Fund, was introduced to children in St. Maarten by travelling puppet show.

The project will run from now until next July, with the goal of stimulating student interest in marine life.

All Cycle One and two pupils of the four St. Maarten primary schools participated in the introductory session. On Thursday, the show will be given at Saba's Sacred Heart School. Schools on St. Maarten have received the outline of the programme and have been invited to sign up

for as long as they can. While most students can hold their breath for about a minute, a sea turtle at rest can stay underwater for over five hours.

In later lessons, the water topic is fitted into a pirate theme. The programme focuses on marine life and the different characteristics of water. In addition, a broader picture of the water cycle will be discussed.

The major awareness goals are that students will learn about the importance of water, the marine habitat, and coastal vegetation. This awareness should lead to understanding of what occurs in the ocean and to having more respect for underwater ecosystems.

In the meantime, Scout falls under the curse of greed, and becomes the

wicked captain of the pirate ship Black Turtle. He and his crew sail out to find a hidden treasure. Each of their adventures during this journey is the introduction to a new lesson on water. Topics include scary underwater life, different eating habits of underwater creatures, the water cycle, and mangroves.

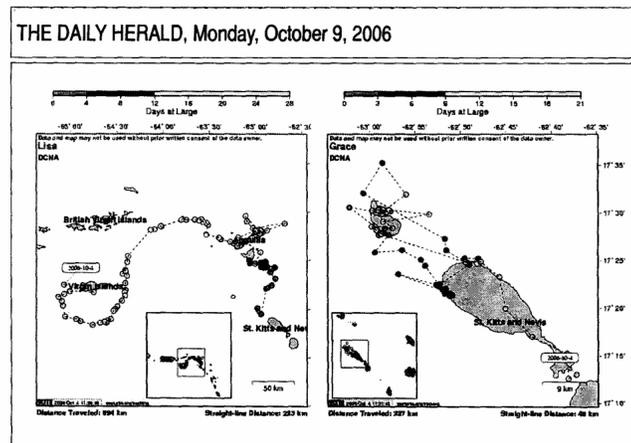
The programme ends with discussion of the physical characteristics of water, such as flotation and surface tension. In the end, Scout is freed from the curse and returns to the sea as his former, friendly self.

St. Maarten schools interested in participating should contact the Nature Foundation at 542-0267 or e-mail Vissenburg at dominique@naturefoundation-stm.org.

Appendix 9

Media Articles for the 2006 Year featuring the Sea Turtle Satellite Tracking Project

Daily Herald article of 9 October, 2006



Tracks showing the travels of hawksbill turtle Lisa (left) and green turtle Grace (right).

Two turtles tagged in Stacia complete nesting for 2006

ST. EUSTATIUS—The two sea turtles nicknamed Lisa and Grace, which were fitted with satellite transmitters by STENAPA, the St. Eustatius National Parks Foundation, in September, appear to have finished nesting for 2006.

Information from their transmitters indicates that they are heading in opposite directions on their migrations to foraging grounds.

The small hawksbill turtle, Lisa, has travelled the furthest. She first visited St. Barths, St. Maarten and Anguilla. She is currently close to St. Croix in the U.S. Virgin Islands on a journey that has taken her more than 220 km (straight-line

distance) from St. Eustatius. Whether this is her final destination or simply another stop along the way remains to be seen.

Grace, the green turtle, hasn't gone nearly so far. She has swum only about 50 km straight-line distance from the release site. Initially, she headed around the northern end of Stacia before spending several days close to St. Kitts. Last week, it looked as if she was heading back towards Stacia and Turtle Project personnel wondered if she would return to the beach to make another nest.

Their assumptions were confirmed on Friday, September 29. The night pa-

trol on Zeelandia Beach radioed around 10:15pm that they had just seen Grace heading back to the sea! They had checked her transmitter and everything appeared to be in good condition. Since then, she has moved south again and as the map indicates, her latest signal places her in the channel between St. Kitts and Nevis.

It is unlikely that she will remain in that location, but where she may go remains uncertain.

Both turtles can be followed on-line via a link from the STENAPA Website, www.statiapark.org.

Appendix 9 Continued

Daily Herald article of 11 September, 2006.



Hawkbill turtle Lisa returning to the sea with her newly installed transmitter.

Turtle nests on Statia, fitted with transmitter

ST. EUSTATIUS—A small hawkbill turtle made a nest on Zeelandia Beach and was fitted with a satellite transmitter by staff and volunteers of the St. Eustatius National Parks Foundation (Stenapa) before being allowed to return to the sea at daybreak on Friday.

The activity is part of the Sea Turtle Conservation and Monitoring Programme, which is funded by the Dutch Caribbean Nature Alliance (DCNA).

The turtle, a member of the critically endangered hawkbill species, was only 85 centimetres in length, which is small for a mature female of this species.

She laid 143 eggs and her nest will be carefully watched over the next two months to make sure it is not disturbed before the hatchlings emerge.

Once she had finished nesting, she was restrained in a wooden box (to prevent injury to herself and the Stenapa crew) while the team carefully cleaned her carapace (shell) and then attached the transmitter using a fibreglass resin. This device will allow the team to track her movements over the next few months, as she travels from Statia to her foraging grounds somewhere in the Caribbean.

The turtle has been named "Lisa" by Erisa Hassell, a student in grade 4 at Governor de Graaff School. Erisa was a winner in an arts-and-crafts competition held during the

last school year.

The Stenapa team was tired but elated after spending most of the night working with Lisa. Probably Lisa felt the same way. During the time she was restrained – for about two and a half hours – Lisa was closely monitored to make sure she was not uncomfortable as the resin set. She was also tagged with small metal identifying tags in her front flippers, so that she can be recognized when she returns to nest again.

In addition, a small skin sample was taken from her neck. This will be analyzed and data will be included in a genetic study of Caribbean hawkbills.

The sea turtle project began in 2005, when two turtles were outfitted with

transmitters and tracked.

A green turtle from Statia, Miss Shellie, remained in the vicinity of the island, while the hawkbill tagged in St. Maarten travelled to the Virgin Islands.

Data from the project are used to provide information about migration routes and to identify the threats turtles face while migrating.

Lisa's transmitter should begin sending information immediately and it will then be possible to track her movements online via a link from the Stenapa Website www.statiapark.org. Further information about the tracking project and other turtle research activities is available at the Stenapa headquarters at Gallows Bay.

Appendix 10

2006 Media Articles

Copy of newspaper articles from the Daily Herald which features some of the topics covered during the 2006 year.

2 APRIL 1, 2006 WEEKE

Leatherback turtles and humpback whales return to St Eustatius



Emma Harrison

Two endangered marine creatures recently returned to St Eustatius: the leatherback turtle (Dermochelys coriacea) and the humpback whale (Megaptera novaeangliae). Leatherback turtles come to nest on Eustatius Beach every spring; the first tracks of this year were observed on 17 March, and it is presumed that the turtle nested the night of 17 March, 12 days earlier than the first nest recorded in 2005. The huge leatherback turtle, which can reach about two metres in length and weigh over 1000kg, will have migrated from her feeding grounds many thousands of kilometres away from St Eustatius. She will return to nest several more times over the next few months, and hopefully will be seen by St. Eustatius Marine Park staff during their nightly patrols of the beach.

As in previous years, the leatherback chose to lay her eggs at the northern end of Eustatius Beach, where roosters said these additional human tracks hindered their chances of survival.

The second endangered animal to visit the waters off St Eustatius was a humpback whale that was spotted by beach-goers in Crooked Bay on Saturday, 18 March. This is the third report of these magnificent mammals from St Eustatius in the last few weeks. A National Park Ranger spotted two whales from the Botanical Garden last week, and the week before divers on-board a boat in the bay got a close-up view of whales in the bay. These majestic whales can reach up to 16 metres in length, and weigh between 25 and 30 tonnes. They are renowned for their appearance for breaching activities and their complex songs.

Like the leatherback turtle, humpback whales also undertake extensive migrations each year. They are breeding here at the top of the bay, and hopefully they will provide people with another opportunity to view them before they too head north to feed. In fact, this year we will have to wait until next year to view them once again return to our waters.

For more information, visit the National Parks' office at Galloway Bay or phone (03) 18-2884. Apply in writing with copies of certificates to Nicole Esteban. Deadline: September 15th, 2006.

S.T.E.N.A.P.A., National Parks Office, Galloway Bay, St. Eustatius, Netherlands Antilles. (599) 318-2884 (phone/fax) semp@goldenrocknet.com (E-mail)

THE DAILY HERALD, Thursday, September 7, 2006



VACANCY

There is a vacancy for:

One Coordinator of the Sea Turtle Program on St. Eustatius

at St. Eustatius National Parks Foundation (S.T.E.N.A.P.A.). This job position has been funded by: USONA.

Qualifications:

- Applicant must be a Science Graduate.

Skills:

- Patrolling, tagging and measuring sea turtles.
- Nest inventory, relocation and monitoring.
- Computer literacy and a valid driver's license.
- Physically able to work outdoors and work 3 nights/week.

For more information, visit the National Parks' office at Galloway Bay or phone (03) 18-2884. Apply in writing with copies of certificates to Nicole Esteban. Deadline: September 15th, 2006.

S.T.E.N.A.P.A., National Parks Office, Galloway Bay, St. Eustatius, Netherlands Antilles. (599) 318-2884 (phone/fax) semp@goldenrocknet.com (E-mail)

Daily Herald, 28 October 2006

Islands



Turtle Programme Coordinator Emma Harrison explains hatching development to the Junior Rangers.

Junior Rangers learn about conservation of sea turtles

ST. EUSTATIUS—Students currently enrolled in the St. Eustatius National Parks Foundation (Stenapa) Junior Rangers Programme learned this week about sea turtles, their nesting procedures, and the threats to their lives.

The programme is for children aged ten years and up, and introduces a variety of different topics based in the Marine Park, the Quill National Park and the Botanical Garden.

By teaching the children about nature conservation and the varied role of a park ranger, Stenapa hopes the children will be encouraged to become more active in environmental issues. It is also possible that some day a few of them may become future Stenapa rangers.

As part of the 9-month programme that runs throughout the school year, the junior rangers were given a short presentation about the life of a leatherback turtle, and the difficulties these turtles face as they grow from hatchlings to adults. They took a quiz to test their turtle knowledge, and completed a word-search puzzle.

Afterwards, the students were taken on a field trip to Turtle Beach by programme organiser Hannah Madden. There they assisted turtle programme coordinator Emma Harrison to perform an excavation of a green turtle nest that had hatched the previous night. They found six hatchlings that hadn't emerged from the nest, and were able to guard these small turtles from predators as they crawled down the beach to the sea.

The group of six students was called by the unique opportunity to see hatchlings, but they also learned that most of the hatchlings will not survive to adulthood due to natural predators and man-made hazards. But the children learned that everyone can help to make a difference for turtles and the marine environment in general by following a few simple guidelines, such as not dropping litter at the beach or in the water.

Anyone wanting more information about the Junior Ranger Programme is invited to visit the new Stenapa Visitor's Centre in Galloway

Appendix 10 Continued

Copy of newspaper articles from the Daily Herald which features some of the topics covered during the 2006 year.

THE DAILY HERALD, Wednesday, May 24, 2006



Sand mining activity on Zeelandia Beach

Illegal sand mining on Zeelandia Beach

ST. EUSTATIUS—The problem of illegal sand mining on Zeelandia Beach has increased significantly in the last few days with the use of a large backhoe to excavate sand from the beach.

The backhoe was observed last week and when St. Eustatius National Parks Foundation (Stenapa) personnel later investigated the area it was found that a considerable amount of sand had been excavated.

Not only is the removal of sand from the beach illegal, with offenders subject to a fine of NAf. 5,000, it also has two very negative consequences. The area where this sand was taken from is located at the base of a stand of sea grape trees that grow behind the beach. Removal of sand close to these trees disturbs their roots, causing them to die. At present these trees are helping to stabilise the bank, but if they disappear there will be nothing to prevent it from eroding, thus adding to the erosion of the beach dunes and to the occurring beach degradation.

Zeelandia Beach also is the primary sea turtle nesting beach on Statia. Sand mining activities pose several threats to turtle nests. The eggs can be physically destroyed by miners, machinery can compact the sand on top of the nest preventing hatchlings from leaving the nest chamber successfully. The loss of sand could also lead to a decrease in the amount of suitable nesting areas on the beach.

This latest excavation site was over 35 metres in front of the notice marking the "no sand mining" zone, and just 25 metres away from a leatherback nest that was laid recently, posing a potential hazard to the eggs of this critically endangered species.

With fewer leatherback turtles observed this year than at the same time last year, it is vital that each nest is protected, giving the hatchlings the greatest chance of survival and thus ensuring that future generations of Statians will be able to enjoy the sight of leatherbacks returning to nest on Zeelandia Beach.

Anyone observing illegal sand mining activities on the beach is encouraged to report the incident to the police. For further information about sea turtles or the Stenapa beach monitoring programme one can contact the National Parks office in Gallows Bay.

THE DAILY HERALD, Saturday, February 18, 2006 www.lhnews.com

Local sea turtle project to be showcased in Greece



features "Scout" the mascot. The Dutch Caribbean Nature Alliance (DCNA) implemented this project for Saba, St. Eustatius and St. Maarten with the aim of raising awareness about sea turtles.

Although the focus was on the community in general, the primary focus was in the island schools. 163 classes in 24 different schools on the three islands were involved in this programme. There was considerable positive feedback from all three island communities and a great deal of encouragement to continue this successful sea turtle conservation and environmental education projects in general, Vissenberg said.

Harrison will give information on the Sea Turtle Satellite Tracking Project, initiated last year by DCNA. Two adult female turtles were fitted with satellite transmitters to allow researchers to observe their migratory behaviour.

This project was an inter-island collaboration between Stenapa and Nature Foundation St. Maarten and was the first tracking study to be carried out in the Windward Islands. In addition to the biological research, it incorporated an extensive education and outreach campaign in the local communities.

More information on this symposium that is being held in the Mediterranean area for the first time can be found at www.seaturtle.org.

Both researchers are still acquiring funds to finance their trip. People willing to offer financial support can contact Nature Foundation at 542-0207 or STENAPA in St. Eustatius at 318-2884.

Research on sea turtle conservation in the Windward Islands achieved in 2004 and the preservation of sea turtles still living and nesting here will be highlighted at the gathering. Beside this, the symposium is an opportunity for them to learn from other turtle projects in the Caribbean and worldwide, and to further develop the turtle conservation projects in St. Maarten and St. Eustatius.

Vissenberg will represent the "Help Out" educational outreach project that

Appendix 10 Continued

Copy of newspaper articles from the Daily Herald which features some of the topics covered during the 2006 year.

12 JUNE 3, 2006
WEEKENDER

Sea Turtles on St. Maarten

Although each World Environment Day has its own theme, it is always a day to evaluate the local state of our environment and to consider seriously the actions which each of us must take for preserving it and our local species. In our case it is a day to call attention to the local endangered species of sea turtles.

While they have survived major changes and witnessed the evolution and extinction of many other life forms, now it is they themselves that are threatened. Some 500 years ago the number of sea turtles living in the ocean could be counted in the millions. Today only a few hundred thousand remain. People have gone far in exploring and polluting the seas and in coastal development. Therefore sea turtles need protection.

One of the seven known species of sea turtles, at least so far are commonly found around the Windward Islands, the Leatherback turtle, the Hawksbill turtle, the Green turtle and the Loggerhead turtle. Six species are extinct, species that lived as the world's oceans for more than 150 million years. They are adapted to their environment.

A streamlined light shell and long flippers help move them gracefully through the water. They live their entire lives in the oceans, except for the females who travel 10,000 miles or more to lay their eggs on the same beach where they once hatched themselves. All turtles, e.g. lizard, snake etc, reproduce by laying eggs.

In our part of the Caribbean, peak nesting occurs from April through November. This is the only time that female sea turtles come ashore and they return to the same area they once hatched themselves. They dig a hole in the beach, deposit the eggs, cover them with sand and then leave the eggs alone to hatch.

used to be the major nesting site on the Dutch part of the island, but due to its recent development, it is uncertain if that beach can sustain its former turtle abundance.

On Saba, sea turtles nest on Cove Bay, On St. Eustatius they nest mainly on Zeehoofd Beach, Lynds Beach, Cooks Castle, Key Bay and Ouwesland Bay. It is important to realize that sea turtles are dependent on our recreational beaches for their survival. Their nesting success depends on how turtle-friendly these beaches remain and it influences the number of sea

the Nature Foundation St. Maarten has initiated several projects and documented more than 200 sea turtle nests since 1999. They found out that the Leatherback turtle, which was not known to live here, actually visits the island quite often. St. Eustatius National Parks Foundation (STENAPA) has been regularly monitoring their beach since 2002. In 2004, there were since 60 nesting events recorded and over 140 hatchlings released from released nests. Since 2005 STENAPA employs a full time staff member dedicated to sea turtle




Research a support for turtle, Green Bay

local nature organizations here in the Netherlands Antilles. Internationally, they are protected in various ways by the CITES Convention, the UNEP SPAW, and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC).

According to Dutch laws, in the Windward Islands, you may not take, kill or have a sea turtle or any part of a sea turtle in your possession. It is also illegal to damage or destroy sea turtle nests or to take sea turtle eggs (or hatchlings) from their nests. These laws and all the research

done on the island, enhance the survival chances of our sea turtles. But everyone must know the national state of sea turtles by thinking about the following:

Coastal development, lights, noise, beach dining and general harassment chase sea turtles away. Be sure that sea turtles find their way to the beach, don't take them ashore or pollute, and reduce mobile lights on the beach. When people seek to relax, recreation and sea turtle protection can go hand in hand.

Message from the UN Secretary-General on World Environment Day 5 June 2006

The theme of this year's observance of World Environment Day, "Our Shared Responsibility", reminds us all, in the International Year of Drought and Desertification, of the importance of caring for the world's vast areas of arid and semi-arid land. Drylands are found in all regions, cover more than 40 per cent of the Earth and are home to nearly 2 billion people — one-third of the

problem is particularly acute in sub-Saharan Africa and South Asia, where degraded lands are making extreme poverty and hunger, and is jeopardizing efforts to ensure environmental sustainability. These goals, which the world's governments have pledged to achieve by 2015, are essential components of a broader commitment to achieve a more secure future for humankind.



Appendix 11

Example of flyer advertising monthly cleanup of Zeelandia Beach

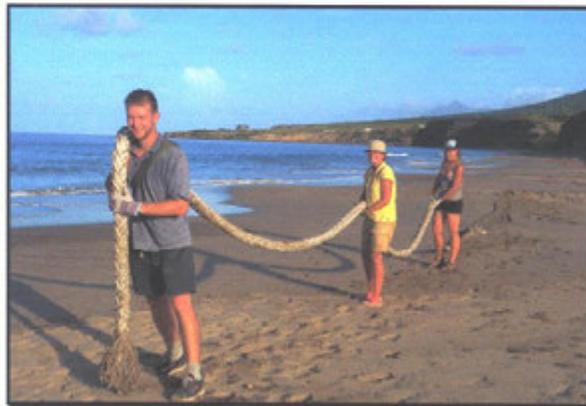


VOLUNTEERS NEEDED!!

The turtles may be almost ready to leave Statia, but they aren't the only reason to keep our beaches clean.

We want people to enjoy the beach too!

We've planned another clean-up, but, we need **YOUR** help to make the beach a nicer place to visit.



Please come along and lend a hand!

When: **Wednesday 19th October**

What time: **3.00pm**

Where to meet: **Zeelandia Beach car park**

What to bring: **Garbage bags and gloves**

Appendix 12

Copy of the April 2006 STENAPA Newsletter featuring an article about the Sea Turtle Satellite Tracking Project.

St Eustatius: National and Marine Parks and Botanical Gardens

October 2006
▶ Newsletter 3/2006

STENAPA Update

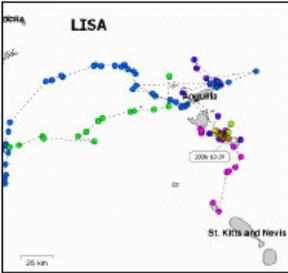


Sea Turtle Satellite Tracking Project – Update

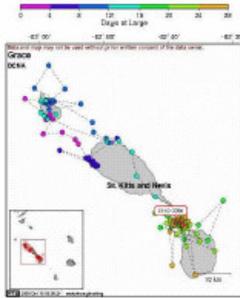


The two sea turtles which were fitted with satellite transmitters in September appear to have finished nesting for 2006 and are heading in opposite directions on their migrations to their foraging grounds. The small hawksbill has travelled the furthest; she visited St Barts first, then Anguilla, on a journey that has taken her more than 220km straight-line distance from Statia. She was close to St Croix, in the US Virgin Islands and has returned to St Barts; whether this is her final destination, we will have to wait and see!

and laid 143 eggs. Once she had finished nesting she was held in a wooden box while her carapace (shell) was cleaned and the transmitter was attached using fiberglass resin. She was released after about 2½ hours when the resin had set; during that time she was closely monitored to make sure she didn't feel any heat that is generated as the fiberglass dries. Just prior to her release she was tagged with small metal tags in each of her front flippers; these help to identify her when she returns to nest again. In addition a small skin sample was taken from her neck which will be included in a genetic study of Caribbean hawksbills.



The turtle was named "Lisa" by Evan Hassell, Class 4 of the Governor de Graaf School, one of the winners of an art and craft competition held by STENAPA last year. She measured just 85cm



A second satellite transmitter was attached to an endangered green turtle, which nested on 17 September at Zeelandia Beach. Just like "Lisa", this female nested successfully before researchers fixed the small tracking device to her carapace; she laid 129

ping-pong-ball sized eggs. This turtle was quite a lot larger than the hawksbill female, measuring 106cm in length. She was much calmer throughout the 2-hour long procedure, making it a lot easier for the team to fit the transmitter properly. The turtle was named "Grace" by Naomi Smith, age 11, who was another winner of the art and craft competition.

Grace has only swum about 50km straight-line distance from the release site. Initially she headed around the northern end of Statia before spending several days close to St Kitts. On Friday 29 September, the night patrol on Zeelandia Beach reported they had seen Grace heading back to the sea. They checked her transmitter and everything appeared in good condition. Since then she has moved south again, and the latest signal placed her between St Kitts and Nevis. It is unlikely she will remain in that location, but where she may go from there remains a mystery.



Inside this Publication

Sea Turtle Satellite Tracking Project	1
Annual Public Meeting	2
Educational activities	3
Report on fish populations	4

Special points of Interest:

Plant Sale Still on at the STENAPA office. Don't miss out!

Reptile Book Copies have been distributed to school classes. Youth organizations wanting a copy may contact us

Botanical Garden Guided tours available for school or church groups

Eco-bags How often do you use yours? See below



Appendix 13

Dominique Vissenburg and Dr Emma Harrison with the "Help Out or Sea Turtles Miss Out" materials before leaving for Crete, Greece.



Poster Presented by Dr Harrison at the 2006 International Sea Turtle Symposium in Crete, Greece.

A Satellite Tracking Project in the Windward Islands of the Netherlands Antilles

Emma Harrison¹, Dominique Vissenburg² and Robert van Dam³
¹St. Eustatius National Parks Foundation, Gallesweg, St. Eustatius, Netherlands Antilles
²Nature Foundation St. Maarten, Philipsweg, St. Maarten, Netherlands Antilles
³Chetivana Inc, PO Box 90207018, San Juan, Puerto Rico 00902

Abstract
 Satellite tracking has become an essential tool for sea turtle conservation and monitoring projects. Residents can identify the recreational habits and habitat utilization of turtles in addition to monitoring their migration patterns in great detail. However, sharing data by online webcams, cell phones, and other devices can be identified, allowing conservation efforts to be focused on critical habitats. To reduce potential use of land, we will use satellite tracking to monitor migration patterns by highlighting specific migration behaviors that public can be actively engaged in conservation activities.

Introduction
 With the rise of satellite tracking, the St. Eustatius Tracking Project (STEP) was initiated by the Dutch Caribbean Nature Alliance (DCNA) on the islands of St. Eustatius and St. Maarten, Netherlands Antilles.

Participating Organizations
 Initiated in 2005, the DCNA represents a formal coalition of the nature conservation management organizations of the Netherlands Antilles and Aruba. Its objective is to safeguard the biodiversity and promote the sustainable management of the natural resources of the islands of the Dutch Caribbean through the establishment of long-term plans.

DCNA
 The project was an excellent collaboration between the St. Eustatius National Parks Foundation (STEN-APF) and the Nature Foundation St. Maarten (NFSM). STEN-APF and the Nature Foundation are both governmental organizations that manage the natural areas on each island.

DCNA coordinates the St. Eustatius Sea Turtle Conservation Programme
 The project was an excellent collaboration between the St. Eustatius National Parks Foundation (STEN-APF) and the Nature Foundation St. Maarten (NFSM). STEN-APF and the Nature Foundation are both governmental organizations that manage the natural areas on each island.

Study Sites
 St. Eustatius and St. Maarten are part of the Netherlands Antilles, which also includes Sint. Christopher, Curacao, and Saba (see Figure 1). The islands lie in the North-western Caribbean, with land areas of just 21 km² and 55 km², respectively.

Leatherback (Dermochelys coriacea) green (Chelonia mydas) and hawksbill (Eretmochelys imbricata) turtles
 are the most common species of sea turtles on both islands, with very low and no commercial impact of a leatherback (Chelonia coriacea) nesting on St. Eustatius in 2004.

Methods
 Following preliminary visits to both islands by Dr. Robert van Dam in July 2005, the initial project design was finalized in August 2005. Since then, the project has been implemented on both islands, as an order of beach-to-beach. Practical training in the application methodology was provided and followed by 20-30 NBSM personnel to be utilized using the "National and Island" management plans, specific management.

Results
 The project was implemented on 20 September, 2005, the first occasion that had been successful nesting in 2005. The second occasion that had been successful nesting in 2005. The second occasion that had been successful nesting in 2005. The second occasion that had been successful nesting in 2005.

Conclusion
 The project was implemented on 20 September, 2005, the first occasion that had been successful nesting in 2005. The second occasion that had been successful nesting in 2005. The second occasion that had been successful nesting in 2005.

Figure 1: Map showing location of St. Eustatius and St. Maarten.

Figure 2: Map showing location of St. Eustatius and St. Maarten.

Figure 3: Map showing location of St. Eustatius and St. Maarten.

Figure 4: Map showing location of St. Eustatius and St. Maarten.

Figure 5: Map showing location of St. Eustatius and St. Maarten.

Figure 6: Map showing location of St. Eustatius and St. Maarten.

Figure 7: Map showing location of St. Eustatius and St. Maarten.

Figure 8: Map showing location of St. Eustatius and St. Maarten.

Figure 9: Map showing location of St. Eustatius and St. Maarten.

Figure 10: Map showing location of St. Eustatius and St. Maarten.

Appendix 14

Sand Mining Policy

POLICY - TO PROVIDE SAND FOR PLASTERING WALLS

Introduction

1. This one year policy will be introduced to solve a shortage of sand for construction on St Eustatius. Construction suppliers have been unable to obtain sand since early 2006 due to regional export embargos and barge size limitations, with negative consequence for economic development.
2. With consideration for nature conservation and, in particular, protection of habitat and nesting turtle populations on Zeelandia Beach, and after taking legal advice, this policy is a temporary solution for the construction crisis, and steps will be taken during the process of sand excavation to limit impact on nature conservation. Sand will be excavated by DROB from a delineated fenced zone within the gut area of Zeelandia Beach, only above the high tide level (the beach berm) and not extending either side of the entrance of the gut.
3. As soon as sand is imported to St Eustatius, all excavation and sales of sand mixture by DROB will be stopped. Re-excavation of sand and subsequent sale due to further shortage of sand will require the permission of the Executive Council.
4. Beach sand excavated from Zeelandia Beach will be available for sale by DROB for plastering walls only at a 2:1 mix ratio (2 washmole: 1 beach sand) based on calculations of plastering needed using plans submitted to DROB for building permits. No sand mix will be sold without a building permit. Excavation of sand and sale is only permitted to be conducted by DROB. All material needed for construction activities other than plastering walls should only be washmole that is to be purchased from existing concrete suppliers and contractors. All plastering sand needed for large construction projects (other than personal dwelling homes) should be imported by the contractor.
5. The Phase 1 (preparation) procedures set out in this policy will be set in place so that sale of sand (only for plastering walls) starts on Wednesday 11 October, 2006. The initial preparation of the excavation area will take place before then.
6. Beach sand is to be sold just higher than market price of imported sand (fl.87/cub.yd at present and increasing in line with the market) in order to ensure incentive exists to import sand.
7. Income from the beach sand proportion sold in mixture is to be placed in a special account to provide financing for future solutions to the problem of sand supply.
8. Excavation of sand from Zeelandia Beach is only a temporary solution to aid the sand supply crisis. The Executive Council will investigate ways to find a permanent solution to the problem, possibly with an Environmental Assessment that will include consideration of impact of sand excavation from Zeelandia Beach, alternative sources of local sand (e.g. dredging), alternative supply channels, economic sources of locally or regionally available sand (e.g. local purchase from Saba and crushing to finer grade, dredging) or manufacture of sand locally (e.g. glass crushing).

PHASE 1 PREPARATION

1. Close beach access: the two entry points to the beach are to be closed for vehicle entry other than DROB vehicles. Initially to be done by DROB with wire fence and wooden gate, then – for longer term duration – to be done with net fence as wire won't last due to salt blast. See map for indicated area.
Actions:

Obtain fence poles and wire from LVV	RC
Put up fencing and (4'x4' - 4m width) gate	DROB
Source nylon net (1.5" mesh, H 4', L 200')	STENAPA
Nylon net purchase (after ExCo agreement)	STENAPA
Put up nylon net	DROB

Appendix 14- Continued

Sand Mining Policy - Continued

2. Fence area where sand will be extracted: exact area to be decided between DROB and STENAPA based on meeting in next week. Fencing is to be done by DROB with wire fence and – for longer term duration – to be done with net fence. This fence will be removed whenever imported sand is available.

Actions: Obtain fence poles and wire from LVV RC
Put up fencing DROB

3. Prepare water catchment upstream to prevent beach erosion due to storm water. Two catchments to be excavated in open area of about 5m depth – one in front of each of the minor guts (see map). The front side of the accessible catchment to be fenced to prevent vehicle entry. The sides of the catchments to be planted with sea grapes to stabilize.

Actions: Excavate two catchments to 5m depth DROB
Put up fencing behind catchment DROB
Propagate and plant out sea grape trees STENAPA

PHASE 2 PROCEDURE TO PURCHASE SAND/WASHMOLE MIXTURE

4. If someone needs sand/washmole mixture for plastering walls they should:
- a. Come to DROB to request mixture.
 - b. DROB will calculate quantity required based on plans in building permit.
 - c. DROB will fill in the standard rental/sale form for the purchaser.
 - d. Purchaser takes form to Receivers Office to purchase.
 - e. Purchaser returns to DROB with receipt and arranges for delivery.
 - f. DROB to deliver on Wednesday and Friday each week to construction site.

Actions: Notify STENAPA of excavation day before excavation of sand at beach (Wed&Fri am)
Sand/washmole mixed on DROB premises (for the moment washmole to be purchased from CBT until system in place for excavation - DROB would need additional equipment)

Developed by: Winston Tearr (DROB)

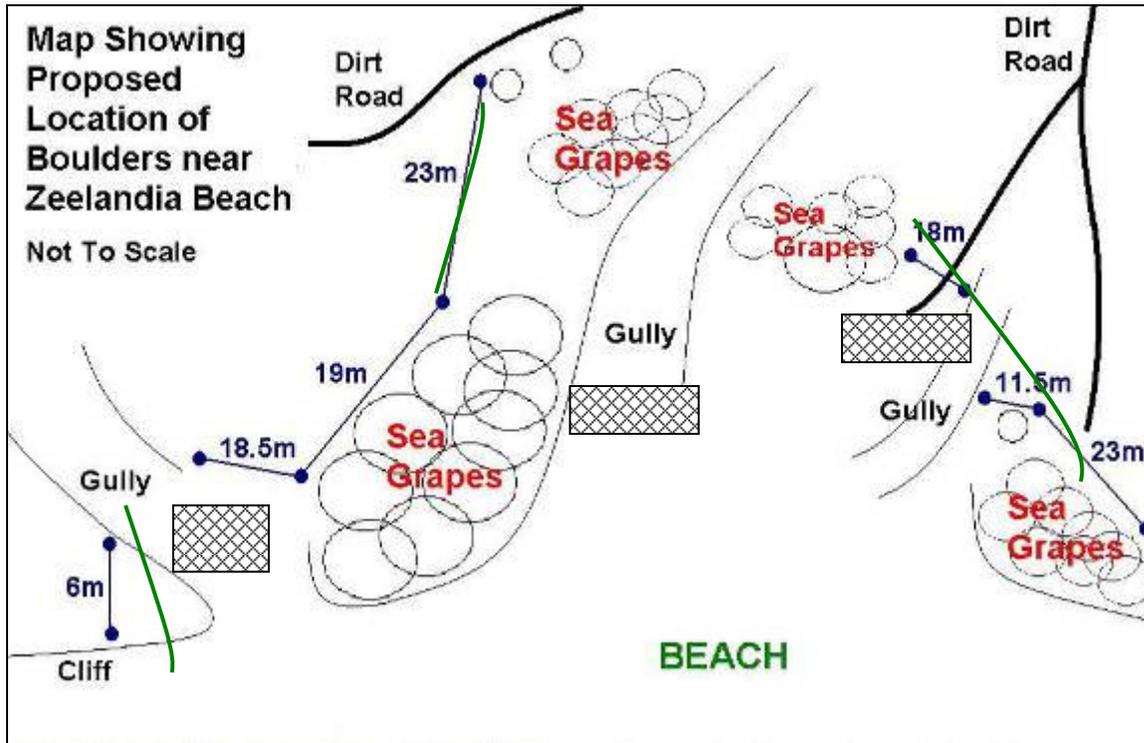
Audrey Sandries (Finance)

Rudy Courtar (Assistant Commissioner Hooker)

Nicole Esteban (STENAPA)

Date: 4 October 2006

Appendix 14- Continued



KEY

Green line – fencing to prevent access to the beach

Shaded area – catchment basin for water run off

Note: this diagram was prepared for a request by STENAPA to Statia Terminal for boulders to be placed around sea grape trees so ignore blue lines.

Appendix 15

STENAPA letter written in opposition to Zeelandia Sand Mining written on 14th September, 2006



14th September, 2006

Executive Council
Government Guesthouse
Oranjestad
St Eustatius, N.A.

Dear Council Members,

Re. SANDMINING ON ZEELANDIA BEACH

As the Co-ordinator of the St Eustatius Sea Turtle Conservation and Monitoring Programme, managed by the St Eustatius National Parks Foundation, I feel obliged to comment on the proposal by the Executive Council to commence sand mining activities on Zeelandia Beach.

While this beach might not be frequently used by people, and hence viewed as of little value to the island, it is, however, very important to the three species of endangered and critically endangered turtles (green, leatherback and hawksbill) that visit it each year to lay their eggs. Indeed, it is the primary nesting site for sea turtles on St Eustatius.

The use of this beach by sea turtles was one of the reasons why the Executive Council awarded it protected status in 2001, in accordance with National Laws. Further to that, it is covered under the SPAW (Specially Protected Areas of Wildlife) Protocol, and the Inter-American Convention on Sea Turtles; the Netherlands Antilles are signatories on both these international agreements which are referred to in the National Nature Ordinance that was adopted in 2000. This ordinance prohibits the disturbance of sea turtle nesting areas, and prevents destruction of nesting habitats to protect future generations of sea turtles.

I am aware that the Executive Council finds itself in a very difficult situation; without sand for construction on the island, and under considerable pressure to alleviate this problem. However, I believe that there are other solutions that could be investigated further before resorting to sand mining on Zeelandia Beach. In a letter to the Executive Council dated 12th September, 2006, the President of STENAPA Irving Brown, and STENAPA Manager Nicole Esteban outlined these alternatives. With this letter I wish to add my support to these other options and reconfirm the view held by STENAPA in opposition to the proposed sand mining activities in this area.

STENAPA, National Parks Office, Gallows Bay, St Eustatius, Netherlands Antilles
+599 318 2884 (phone/fax); (email); (web)

Appendix 15 - Continued



If further evidence of the importance of this beach to sea turtles is required, I would like to draw your attention to an article that appeared in the Daily Herald on 12th September, 2006. STENAPA is currently undertaking a satellite tracking project of nesting sea turtles; attaching transmitters to individuals that allow their movements to be tracked to aid in the knowledge of their migratory behaviour and improve conservation efforts in foraging and nesting areas. On 7th September, 2006 a critically endangered hawksbill turtle was fitted with a transmitter; she was the first female of this species that has been observed nesting on the island since 2004. This turtle chose to nest at the northern end of Zeelandia Beach, less than 250m away from the area that has been suggested for sand mining.

It is not only sea turtles that will be affected by the degradation of Zeelandia Beach, the entire island will suffer the long term consequences of beach erosion, and extensive sand mining will undoubtedly increase the erosion that is already obvious on this beach.

With STENAPA staff and volunteers working so hard patrolling Zeelandia Beach every morning and night to gain a greater understanding of these magnificent creatures that are repeatedly suffering as a result of human interference, I see it as a huge disappointment that the Executive Council appears to have so little regard for the natural resources of St Eustatius to permit sand mining in this area.

I would like the opportunity to discuss this issue with you further, and I look forward to your response.

Sincerely,

Dr Emma Harrison
Research Office and Co-ordinator of the St Eustatius Sea Turtle Conservation and Monitoring Programme
St Eustatius National Parks Foundation

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