The National Sea Turtle Tagging and Monitoring Program:

A Report on the 2009 Nesting Season and the launch of the Offshore Component

Prepared by:

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1. Project Summary

The goal of this program is to promote informed decision-making and proactive management to prevent the extinction of sea turtles in Trinidad and Tobago, integrated with the well-being and needs of the human communities with which they interact.

Funding was used to establish:

1) A nesting beach monitoring and survey program, designed to protect marine turtle nesting populations on our beaches and gather information that will inform management decisions.

   Resources were used for equipment acquisition, to enhance patrol coverage and enhance public education of the conservation efforts taking place on the beaches of Trinidad and Tobago.

2) An offshore monitoring program, designed to gather information about the population of resident Green and Hawksbill turtles foraging on the reefs and seagrass beds around Tobago, which will inform management decisions.

   Resources were used for equipment acquisition, to allow regular surveys to be conducted and to enhance public awareness of our foraging turtles and the threats that face them.

2. Project Objectives

The objectives of the national tagging program are:

1. To protect marine turtle nesting populations on our index beaches, and gather information about our population of nesting leatherbacks, hawksbills and greens, that will inform management decisions

2. To gather information about the resident population of hawksbills and greens, foraging on the reefs and sea grass beds around Tobago that will inform management decisions.

3. To develop the capacity of the community organizations to continue the conservation of sea turtles

4. Public Awareness

- Promoting Community Tourism as a tool for conservation of natural ecosystems and species by using the spectacular ecological behaviour of the nesting Leatherback turtles as the principle focus for this activity.
- Safeguarding the nesting habitat of marine turtles and other natural resources from negative human activities through awareness activities.

5. To establish revenue generating capacity for the project.
It should be noted that the NMP is in itself solely a research program, and will never be able to sustain itself through research alone. Income must be generated from other associated activities pursued in the arena of tourism by each of our partner community groups, and some of this used to support the continuation of the NMP which is essential to the continued protection of our sea turtles.

6. Develop Beach Management Plans: Work with the stakeholders (members of the local community, members of turtle conservation groups, hoteliers, utilities in some cases – anyone who uses the beach or has any impact on the beach or its nesting turtles) to produce site-specific plans for Grande Riviere, Matura, Fishing Pond, Turtle Beach and Grafton that will direct the use of the resource, identify responsibilities of stakeholders, highlight research priorities and make recommendations to mitigate threats

Objective 1 : To protect marine turtle nesting populations on our index beaches, and gather information about our population of nesting leatherbacks, hawksbills and greens, that will inform management decisions

(Index beaches – those beaches where patrols are carried out on a nightly basis and tagging is carried out consistently throughout the nesting season: Grande Riviere, Matura, Fishing Pond, Turtle Beach, Grafton, Back Bay)

Actions	Output	Status	Planned Activities
Nightly patrols of Grande Riviere, Matura, Fishing Pond, Turtle Beach, Grafton and Back Bay from 1st May to 30th August 2009	Turtles on these 6 beaches will be highly protected from poachers and other human disturbances on a nightly basis during this period.	Nightly patrols officially began on May 1st for each beach, and ran through to the end of August. Patrols began in April at Matura and in Tobago.	
Conduct tagging and associated data collection at our 6 index beaches, for leatherbacks, hawksbills and greens, throughout the nesting season from 1st May to 30th August 2009	Add data on the reproductive history of individual females to the database. Note that this data can be used to estimate the number of females nesting annually, and the number of nesting females that make up the population, but without the data collected below, this estimate will be a gross underestimate of the true number, since this activity does not capture all nesting events, or all nesting females at Fishing Pond, Matura and especially Grande Riviere.	Tagging and associated data collection began on May 1st across all beaches and ran through to the end of August. Data collection began in April at Matura and in Tobago.	Data analysis is on-going, to use the data collected to estimate population parameters. "Program MARK" will be used to analyse the mark-recapture data.
Conduct morning crawl counts at Matura and Fishing Pond, and night counts of emerging turtles at Grande Riviere, from 1st May to 30th August 2009	When combined with the data collected through tagging, this data will allow for more accurate estimates of the number of females nesting annually, and thus the number of nesting females in the population.	Training in night census was conducted at Grande Riviere on 28th May, to ensure that the GRNTGA is collecting accurate data. 18 members of GRNTGA were impacted. Results of the night census at Grande Riviere are presented in the "Results" section of this document. Morning crawl counts were not conducted at Fishing Pond and only irregularly at Matura.	
Random leatherback nests selected on each of our index beaches for detailed	Will provide an indication of the success of nest and habitat protection efforts.	Training in these methods was conducted for GRNTGA and FPTCG, hosted at Matura by	Now that these groups are familiar with the technique, a protocol

study, including clutch size and hatch success.		Nature Seekers, on the 9th July (Forestry Officers also invited)	should be developed for next season, which will allow each group to obtain representative samples towards estimating hatch and emergence success.
Measure the effect of beach traffic on nest success at Turtle Beach: A control area where beach traffic is restricted must be established, compaction should be measured along with hatch success, and beach traffic levels have to be quantified.	Will provide a useful measure of a suitable carrying capacity of Turtle Beach, so that hatch success is not adversely affected. We may also be able to apply what was learned to other beaches where there is high visitor traffic.	Techniques for measuring sand compaction were tested and found to be insufficient.	We need to evaluate alternative methods to achieve this.
Measure the impact of high density leatherback nesting activity on hatch success of green and hawksbill turtles at Grande Riviere: Record the level of nesting by greens and hawksbills, the hatch success they are achieving, examine the nest site selection by these species and leatherbacks for comparison, and examine how much mortality can be attributed to the high density nesting of leatherbacks.	Will inform the decision of whether or not to pursue manipulative management techniques such as an in situ or ex situ hatchery.	Training in species identification and nest triangulation were conducted on 28th May, to ensure that the GRNTGA is capable of collecting the relevant data. 18 members of GRNTGA were impacted. No green turtles were observed nesting at Grande Riviere this year. A small number of hawksbills were encountered, and their nests were found to be mainly impacted by erosion.	

Objective 2 : To develop the capacity of the community organizations to continue the conservation of sea turtles

The capacity of the community organizations will be enhanced through training and other capacity building actions to continue the conservation of sea turtles.

Actions	Output	Status	Planned Activities
Data Entry Training: Training in Microsoft Access and working with the Access National Database.	2 members each of Grande Riviere, Nature Seekers, Fishing Pond and SOS will be trained in data entry and database use and management.	2 members of GRNTGA and 1 member each of SOSTobago and FPTCG attended training.	
Provision of equipment to Grande Riviere, Nature Seekers, Fishing Pond and SOS.	This equipment is essential to the continuation of patrols, tagging and data collection on our 6 index beaches. Without it, the first objective cannot be achieved.	3000 PIT tags and 6000 Monel flipper tags purchased through WIDECAST	
Institute a micro-project each at Grande Riviere, Matura, Fishing Pond Tobago: each group will be responsible for developing ideas for a research study of interest to their group	Proposals developed by each group	GRNTGA have submitted a proposal for a hatchling collection project and tours Other groups never submitted proposals.	
Facilitate a community awareness workshop each at Grande Riviere, Matura, Fishing Pond, Tobago.	Each group will be responsible for conducting a workshop in their community, to sensitize other members of the community to conservation issues.	Nature Seekers conducted a workshop in Matura, and GRNTGA hosted students from Rio Claro College at Grande Riviere and introduced them to leatherback sea turtles. FPTCG co-hosted a 2 day event at a primary school in Fishing Pond, alongside Forestry Division.	

Objective 3 : To gather information about the resident population of hawksbills and greens, foraging on the reefs and sea grass beds around Tobago that will inform management decisions.

Actions	Output	Status	Planned Activities
An in-water survey of foraging hawksbill and green turtles at Charlotteville, Speyside, Mt. Irvine, Buccoo and Crown Pt, making use of SCUBA and snorkelling, as well as reports from dive operators.	We will gather population data on these 2 species and establish a baseline that can serve for assessing trends over time. We will identify critical foraging habitat that deserves protection.	Two interns were hired and trained in theory and practical techniques. Fieldwork began on August 6th and continued through January 21st. 7 individuals including 3 members of SOS joined us on kayak trips.	
The collection of tissue samples from foraging green and hawksbill turtles for mtDNA analysis.	We will elucidate migration routes and identify which nesting populations our continued harvest will be affecting.	Tissue samples have been collected from 34 hawksbills.	Samples will be sent to Barbados for processing and analysis, which will allow us to describe the genetic make-up of the population, and compare it to other foraging habitats and rookeries in the Caribbean.
Video			

Objective 4 : Public Awareness

- Promoting Community Tourism as a tool for conservation of natural ecosystems and species by using the spectacular ecological behaviour of the nesting Leatherback turtles as the principle focus for this activity.
- Safeguarding the nesting habitat of marine turtles and other natural resources from negative human activities through awareness activities.

Actions	Output	Status	Planned Activities
Conduct a Sensitization programme with ALNG staff	ALNG staff aware of the work of groups and the need to preserve sea turtles. ALNG staff volunteer and join the Adopt a turtle programme	Two (2) ALNG Staff Sensitization events conducted. Point Fortin (6/5/09) Port of Spain (13/5/09) ALNG Staff Field Trip to Grande Riviere to observe nesting (21/5/09) and to Matura to observe hatching (13/8/09)	
Develop Brochures and Posters	2 poster produced one specifically for schools 2 Brochures produced 1 Dive brochure to market the turtles of Tobago and particular dive sites Year 2		
Develop offshore diving turtle tours, in conjunction with the offshore monitoring project.	Guests will be allowed on board the research boat during offshore monitoring, and will learn about the conservation of sea turtles while they observe the monitoring process first hand.	Over 100 recreational divers were guests on the dive boat during fieldwork and were able to participate.	
Produce an educational video	Video distributed to TV stations, and on board Caribbean Airlines flights and aboard the Inter-Island ferry service, will raise awareness.	Raw footage has been collected, Skene Howie has been engaged to produce the video	

Objective 5: To establish revenue generating capacity for the project.

It should be noted that the NMP is in itself solely a research program, and will never be able to sustain itself through research alone. Income must be generated from other associated activities pursued in the arena of tourism by each of our partner community groups, and some of this used to support the continuation of the NMP which is essential to the continued protection of our sea turtles.

Actions	Output	Status	Planned Activities
Each group should enlist talented members of their community to produce handcrafts to be sold as souvenirs to visitors of the nesting beach.	Earnings can be divided between artists, the partner group, and the NMP.	Nature Seekers hosted JoBean Glass at Matura, and have had several persons trained in using recycled glass to create jewellery for sale. (a project in conjunction with WIDECAST)	
Each group should advertise the adopt-a-turtle program and register interested visitors to their beach on suitable forms. At the end of the year the data compiler will be responsible for compiling the packages to be mailed to adopters.	Earnings can be divided between the partner group, and the NMP.	A meeting was held at Matura on 14/5/09, to discuss National Adopt-a-turtle Program, with the CBO's.	Further meetings must still be held to further develop the program

Objective 6 : Beach Management Plans: Work with the stakeholders (members of the local community, members of turtle conservation groups, hoteliers, utilities in some cases – anyone who uses the beach or has any impact on the beach or its nesting turtles) to produce site-specific plans for Grande Riviere, Matura, Fishing Pond, Turtle Beach and Grafton that will direct the use of the resource, identify responsibilities of stakeholders, highlight research priorities and make recommendations to mitigate threats

Status:
A draft plan is currently being developed for Grande Riviere. Stakeholder meetings still need to be held.

Staffing

Grande Riviere
4 taggers per night at $180 per night, for the period 1st May through 30th August
1 Community Coordinator at $2500 per month, for the period 1st May through 30th August

Tobago
4 taggers per night at $180 per night, for the period 1st May through 30th August
1 Community Coordinator at $2500 per month, for the period 1st May through 30th August

Fishing Pond
2 taggers per night at $180 per night, for the period 1st May through 30th August
1 Community Coordinator at $2500 per month, for the period 1st May through 30th August

Matura
2 taggers per night at $180 per night, for the period 1st May through 30th August
1 Community Coordinator at $2500 per month, for the period 1st May through 30th August

Data Compiler
An agreement has been developed with Nature Seekers to be responsible for data entry and management of the database. This agreement is in effect from May 30th to September 15th. A fee of $16000 will be paid to Nature Seekers for this service.

Interns
2 interns have been engaged at $4000 a month for the period July 25th 2009 to January 25th 2010 to conduct the fieldwork required for the offshore component.

Frontier Divers Ltd.
Frontier Divers Ltd. have been engaged to facilitate the interns to access dive sites of interest on a regular basis for 6 months at a fee of $72450.00

Achievements to Date

Training and Capacity Building

18 members of GRNTGA trained in:

- Species identification
- Census
- Nest triangulation

32 members of Nature Seekers, Grande Riviere Nature Tour Guide Association, Fishing Pond Turtle Conservation Group, Wildlife Section, Forestry Division and EarthWatch volunteers trained in nest excavation, 9th July 2009, hosted by Nature Seekers at Matura, led by Dr. Scott Eckert, Director of Science, WIDECAST

2 members of GRNTGA and one each of SOS Tobago and FPTCG were trained in the use of the database. They became familiar with the capabilities and the limitations of the database, and got practice in entering data as well as exporting data.

Awareness

- ✓ Nature Seekers hosted more than 12000 visitors at Matura over the course of the season, including about 1200 foreign guests.
- ✓ SOS Tobago recorded about 5000 observers on their beaches in Tobago, 60% of whom were foreigners.
- ✓ GRNTGA hosted approximately 17000 local visitors, and 12000 foregin visitors at the Grande Riviere beach.
- ✓ An awareness video is in the process of production.

Data Collection

Nesting beaches

- ✓ Patrols were conducted each night from March 11th to August 31st at Matura, April 1st to August 31st in Tobago, and May 1st to August 31st at Grande Riviere and Fishing Pond.
- ✓ 5,642 leatherback nesting events and 3,757 individual leatherbacks were recorded across all our index beaches in 2009, including 2,913 new turtles, and 844 returning turtles, which had been tagged in previous years.
- ✓ The mean number of times an individual turtle was recorded over the course of the season is 1.47.
- ✓ The peak nesting activity was recorded at the end of May and early June.

- ✓ Between May and August over 13,000 nesting events were recorded at Grande Riviere by night census.
- ✓ Only 12 nesting hawksbill turtles were recorded for the season, including one at Fishing Pond, 3 at Matura, and 8 in Tobago, and no green turtles were recorded.

Offshore Component

- ✓ 98 hawksbills and 35 green turtles have been encountered while SCUBA diving on reefs in 130 dives or 87 hours (rate of 1.1 turtles per hour)
- ✓ 143 greens have been encountered while kayaking at seagrass beds.
- ✓ 34 hawksbills and 4 greens have been captured, tagged and released.
- ✓ Over 100 recreational divers were able to participate.

Nesting Component

Data Analysis

Leatherbacks, the focus of our nesting beach data collection, are known to lay on average 6 clutches of eggs in a season, and return to nest every 2-3 seasons.
While we recorded 3757 individual leatherbacks this season, it should be noted that the average clutch frequency we recorded was just 1.47, with 2675 turtles (71%) only recorded once for the season. This highlights the fact that we are missing a lot of nesting events, and therefore a lot of turtles due to our limited coverage. So the numbers below in Table 1 are certainly underestimates of the true number of turtles and events on our beaches in 2009.
While our coverage is limited, the conditions at our beaches will prohibit ever attaining saturation tagging, where all turtles are encountered each season. These conditions include limited personnel, long stretches of beach, and high density nesting, with large numbers of turtles on the beach at any one time.
While this data should not then be used as a measure of the nesting population as they are, the detailed data we collected can be used to estimate the true nesting population, using Mark-Recapture methodology and statistical software such as "Program MARK".

Using simple probability theory, we can make a very rough estimate of the number of nesting turtles in 2009.

1. Mean 1.47 encounters per turtle that was encountered at all (i.e. excluding individuals nesting but never seen) this year.

2. True mean number of visits per year is 6.

3. So turtles encountered were recaptured 0.47 times this year, although they actually made a further 5.0 visits.

4. So chance of returning turtle being encountered was 0.47/5.0 = 0.094.

5. And chance of returning turtle being missed was 1-0.094 = 0.906.

6. Assume that turtles never encountered had the same chance of being observed per visit.

7. So chance of a turtle being missed on all 5 visits this year is 0.906 to the power 5, = 0.61.

8. And chance of turtle being encountered on at least one visit this year = 1.0-0.61 = 0.39.

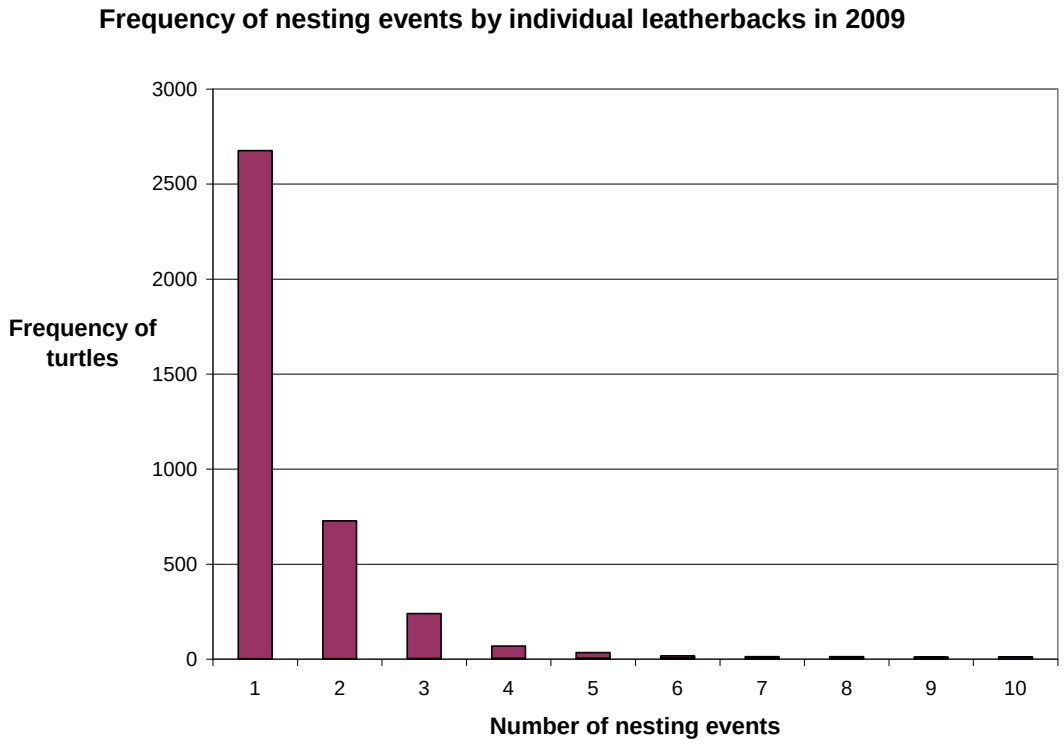
9. So total population nesting this year = 3757/0.39 = **approximately 9633 females**.

Table 1. Total Leatherback Nesting Events and Individual Turtles Recorded by Tagging at all Beaches

	Grande Riviere (1.2km)	Matura (8.8km)	Fishing Pond (10.0km)	Tobago (3.2km)	Total (23.2km)
Nesting Events	2176	2100#	761	381	5530#
Number of turtles	1410	1754	706	116	3757
Average clutch frequency *	1.54	1.20	1.08	3.28	1.47

* Clutch frequency = the number of clutches we recorded for each turtle
# Excluding 112 events by turtles that were not tagged and thus not identified as individuals

Fig. 1.



Nesting Activity Through the Season

Survey effort began for most projects in May, when funding came through for patrollers salaries. However, Nature Seekers were able to begin patrols in the middle of March, and SOS Tobago began in April.
Forestry Division never committed funding towards patrollers this year, so the only financial support for each of the groups came through our program.

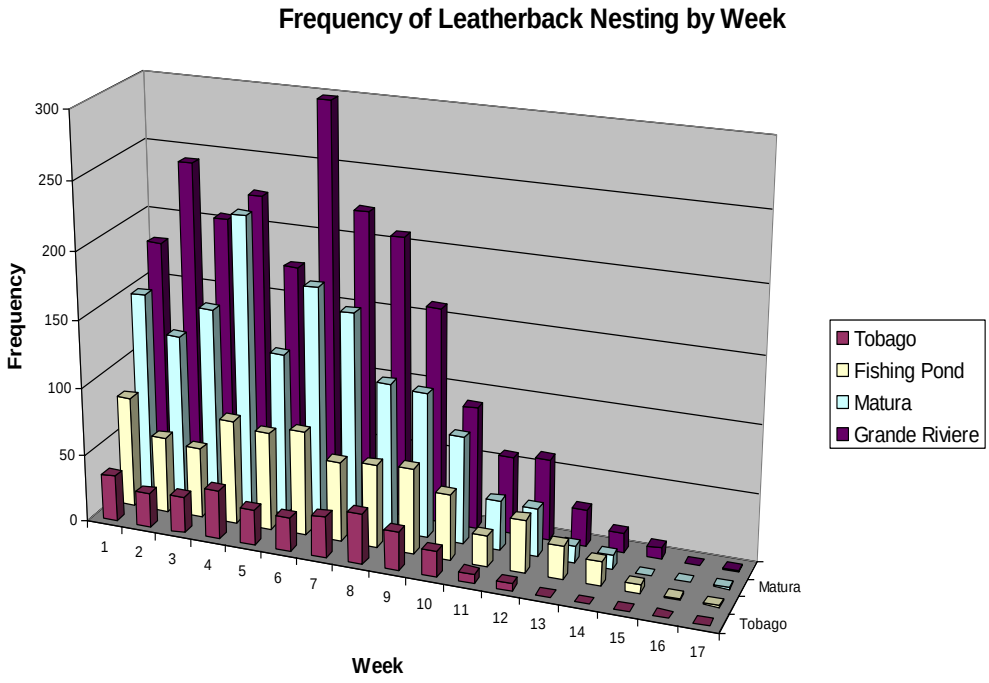
The data collected by each project per month of the season is shown in Table 2. below, and graphically in Fig. 2 below.
It should be noted that the peak nesting activity was recorded at the end of May into the beginning of June for all projects. In August, nesting activity was practically at zero. So survey effort was inefficiently used.
Rather than carrying out data collection from May to August, it would be more effective to run from April or mid-March through July, to encompass the major nesting activity.

Table 2. Number of nesting events by leatherback turtles recorded per month

	Grande Riviere	Matura	Fishing Pond	Tobago	Total
March	2*	63*	NA	NA	63*
April	4*	669	NA	80	749*
May	931	710	297	126	2064
June	953	581	293	125	1952
July	262	177	146	47	632
August	24	10	24	0	48
Total	2176	2210#	761	381	5640

***** Not full effort
# Includes 112 events that were recorded for turtles without tags, excludes 2 events recorded in September

Fig. 2.



Census Count at Grande Riviere

Due to the extremely high nesting density we encounter at Grande Riviere, a census count carried out at regular intervals at night is an ideal way to get a more accurate estimate of the number of nesting events. Counts were carried out at 2 hour intervals from 7pm until 1am each night. At each interval a patroller walked a zig-zag pattern along the length of the beach, counting all the leatherback turtles within each zone, regardless of their stage of nesting. A consistent pace was kept so that each section of the beach was covered as close to 2 hours after it had been previously. 2 hours is close to the median length of time each turtle stays on the beach, so this interval should allow for the most accurate count possible, missing the same number of turtles as are counted twice (those turtles that spend less than 2 hours on the beach should be equal to the number of turtles that take longer than 2 hours).
Overall, tagging activity captured only approximately 12% of the total number of nesting events, between the hours of 7pm and 1am at Grande Riviere (Table 3 and 4).

Table 3. Number of nesting leatherback turtles recorded at Grande Riviere by census

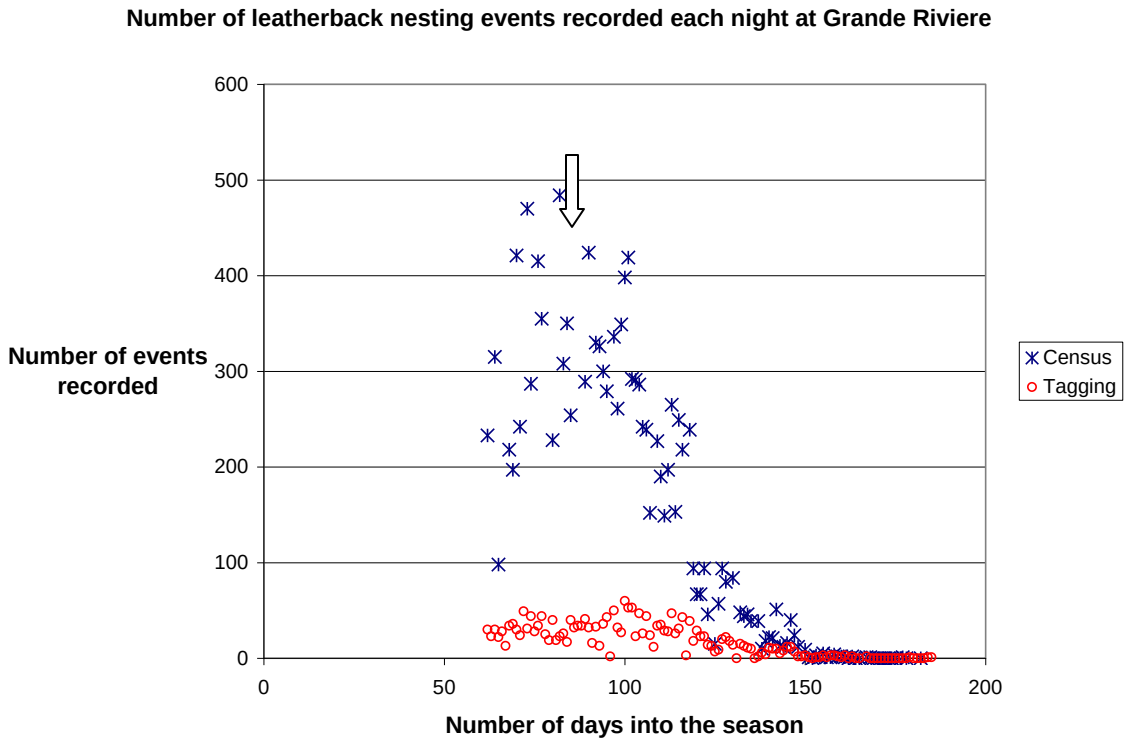
	Census	Average per night	Estimated number of events
May	5918 (19days)	311.5	9656.5
June	6379 (27 days)	236.3	7089
July	844 (26 days)	32.5	1007.5
August	22 (24 days)	0.9	27.9
Total	13163 (96 days)	137.1	17780.9

NB: This data based on census counts conducted every 2 hours every night, between 7pm and 1am

Table 4. Leatherback Nesting Events at Grande Riviere as Recorded by Census, and by regular data collection by Tagging

	May	June	July	August	Total
Number estimated by census	9656.5	7089	1007.5	27.9	17780.9
Tagging	931	953	262	24	2176
Difference	8725.5	6136	745.5	3.9	15604.9
Proportion of events captured by tagging	9.6%	13%	26%	86%	12%

Fig. 3.



Note that the peak of nesting activity was recorded at about the 21st of May, and after the end of July nesting activity was virtually zero.

Beach Overlap

538 leatherback turtles were encountered in 2009 at beaches other than the beach where they were first recorded. The greatest overlap was between Fishing Pond and Matura (271 turtles recorded originally at Matura, encountered at Fishing Pond this year), and between Grande Riviere and Matura (175 turtles recorded originally at Matura, encountered at Grande Riviere this year).

Table 5. The number of leatherback turtles recorded by each project in 2009 that were originally recorded at another location

		Destination			
		Tobago	Grande Riviere	Matura	Fishing Pond
Origin	Fishing Pond	3	10	34	
	Matura	8	175		271
	Grande Riviere	13		15	8
	Tobago		0	1	0

(Please note the above data still needs to be verified since it is suspected that there are multiple turtles whose origin is not accurately recorded in the database. So this question deserves further attention.)

229 turtles were recorded at multiple locations in 2009. The greatest overlap was between Matura and Fishing Pond which is to be expected based on their geographic locations.

Table 6. Number of individual leatherback turtles that were recorded at different locations in 2009.

	Tobago	Grande Riviere	Matura
Fishing Pond	0	8	158
Matura	1	54	
Grande Riviere	9		

Successes of the Season

- ✓ Fewer data recording errors were identified this year compared to 2008. Data collectors together with the Community Coordinators are doing a better job of minimising errors in the data sheets.
- ✓ Fewer data entry errors were detected in the database, and data entry was completed soon after the end of the season.
- ✓ Patrollers at Grande Riviere carried out the census efficiently and consistently. This method of data collection proved valuable as an alternative estimate of nesting activity at Grande Riviere beach, and supplements the mark-recapture data collected through the tagging program.
- ✓ Only 4 slaughters were reported on our index beaches for the season, including one at Fishing Pond in April before patrols started and 3 in Tobago. This reinforces the continued need to patrol these beaches to deter poachers.
- ✓ The participation of TVT in 2009 was vital to each of the Trinidad based groups due to the lack of action from Forestry Division.

Recommendations

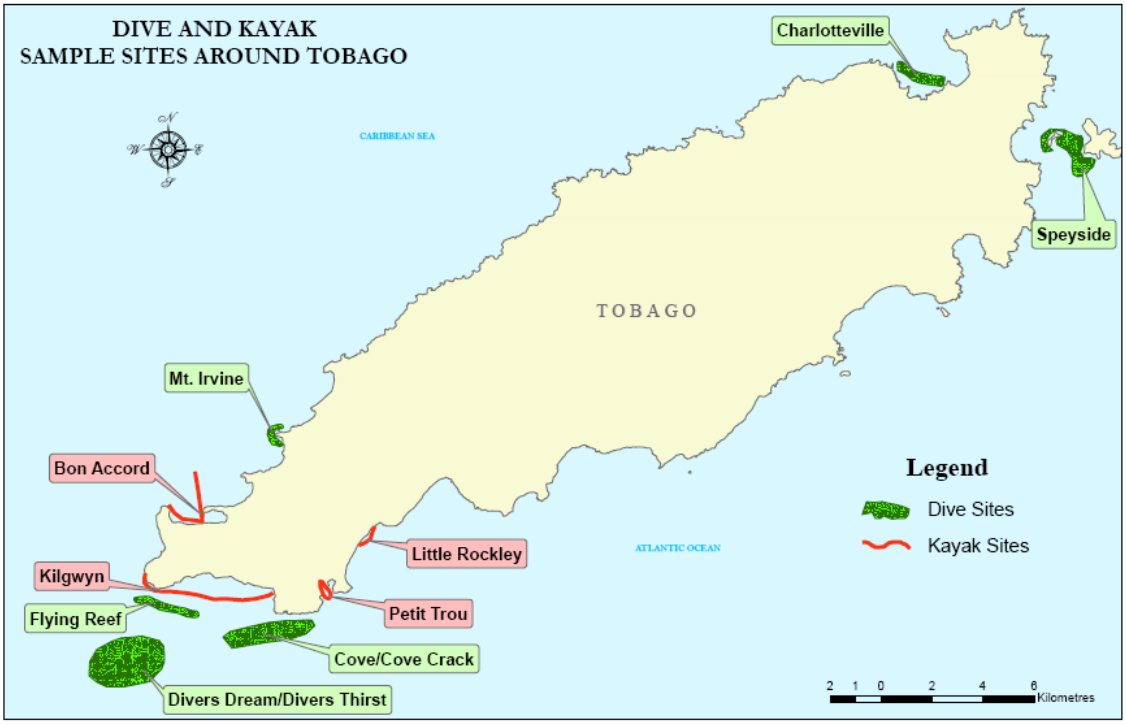
- ✓ Data collection should start no later than the 1st of April, and run no later than the end of July. This is to maximize the data we capture and obtain a more representative data set, of the actual leatherback nesting activity throughout the season. This is a much more efficient use of funding and places less strain on the taggers who this year had to begin right at the peak of nesting with little time to adjust to the work load.
- ✓ Census should certainly be continued at Grande Riviere beach. This is a method requiring little effort, but with maximum return of data. The data collected can be used together with the mark-recapture data to make the best population estimate possible.
- ✓ In order to ensure the accuracy of night census method, time needs to be committed at the beginning of the season to accurately determine the length of time leatherbacks are spending on the beach.
- ✓ Similarly, morning census counts should be carried out on a regular basis at the other beaches in Trinidad. This will supplement the mark-recapture data collected at night.
- ✓ An estimate of hatching and emergence success of hatchlings on our beaches is the next step towards a complete picture of our nesting population. All of our community based groups are now trained and have practice in the techniques of nest excavation, so next year this should become part of our regular data collection. But the data collection methods must be carefully designed to gather data from a representative sample of nests, and avoid bias towards only successful nests.
- ✓ Beach profiling will be a valuable tool at the East coast beaches to monitor and evaluate the extent of erosion.
- ✓ We are still seeing evidence of duplicates in our series of tags. Tags need to be carefully examined after purchase and before distribution to ensure no tag numbers are repeated/duplicated.
- ✓ Relocated nests at Matura and in Tobago have achieved high hatch success. Nest relocation should be considered for nests in immediate determinate danger at Grande Riviere and Fishing Pond. There are zones in both these locations where nests can be in immediate danger from rivers, erosion and high density nesting. Members of GRNTGA and FPTCG would need to be trained to carry out this process. This should also be closely tied with surveys of the different regions of the beach to monitor conditions such as sand quality and temperature and identify ideal locations for relocation and incubation of nests.
- ✓ Data use agreements still need to be drafted among stakeholders and contributors to the project.
- ✓ TVT needs to work more closely with each of our partner groups to make the most effective use of resources, allow the groups to participate and contribute towards project designs, and ensure the members of the groups understand and feel passionate about their work. They should clearly see the value in the data they are collecting.

- ✓ TVT needs to be more active in creating public awareness about turtles: their status, their legal protection, where to go turtle watching, and what rules need to be followed. We should be promoting the protected beaches as the sites for turtle watching as opposed to unprotected sites like Manzanilla.
- ✓ TVT should investigate the possibility of adapting the database to allow for data entry and access from multiple locations.

Offshore Component

Data Analysis

The start of the offshore program was unavoidably delayed by a combination of factors: hiring of interns, repairs to the TVT vehicle, purchase of equipment etc.



Reefs

130 dives were completed over 87 hours. 98 hawksbills and 35 green turtles have been encountered and 34 hawksbills and 4 greens have been captured, tagged and released. Over 100 recreational divers were impacted by the project – able to observe and participate in fieldwork.

No seasonal variation was detected, but the frequency of encounters with green and hawksbill turtles varied across the dive sites. Hawksbills were more common at all dive sites except for Mt. Irvine and Charlotteville. Hawksbills were encountered most frequently at Diver's Dream.

Table 7. Encounter rate of hawksbills and greens across dive sites

Dive Site	Hawksbills per hour	Greens per hour
Dream	2.5	0
Speyside	1.7	0
Cove	1.2	0.2
Charlotteville	0.7	1.0
Mt. Irvine	0.7	1.1
All	1.1	0.4

The size of turtles also varied across dive sites, with a greater proportion of mature hawksbill turtles recorded at Diver's Dream and in Speyside, and no mature green turtles recorded at all.

Fig. 4.

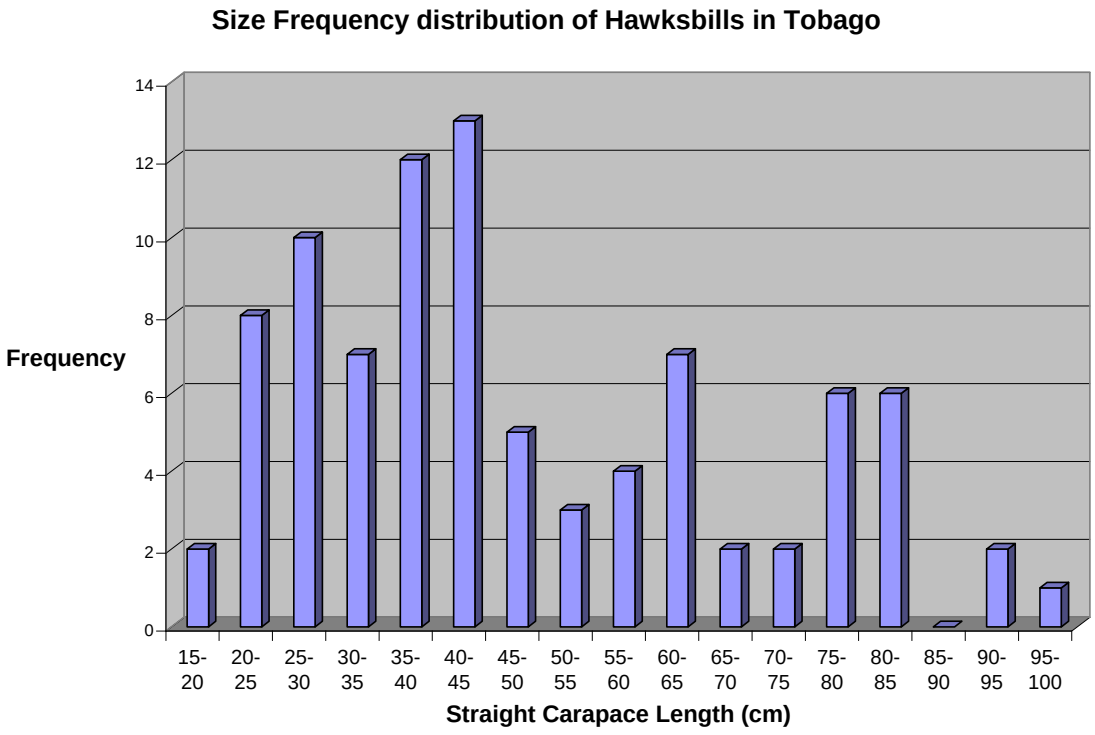


Fig. 5.

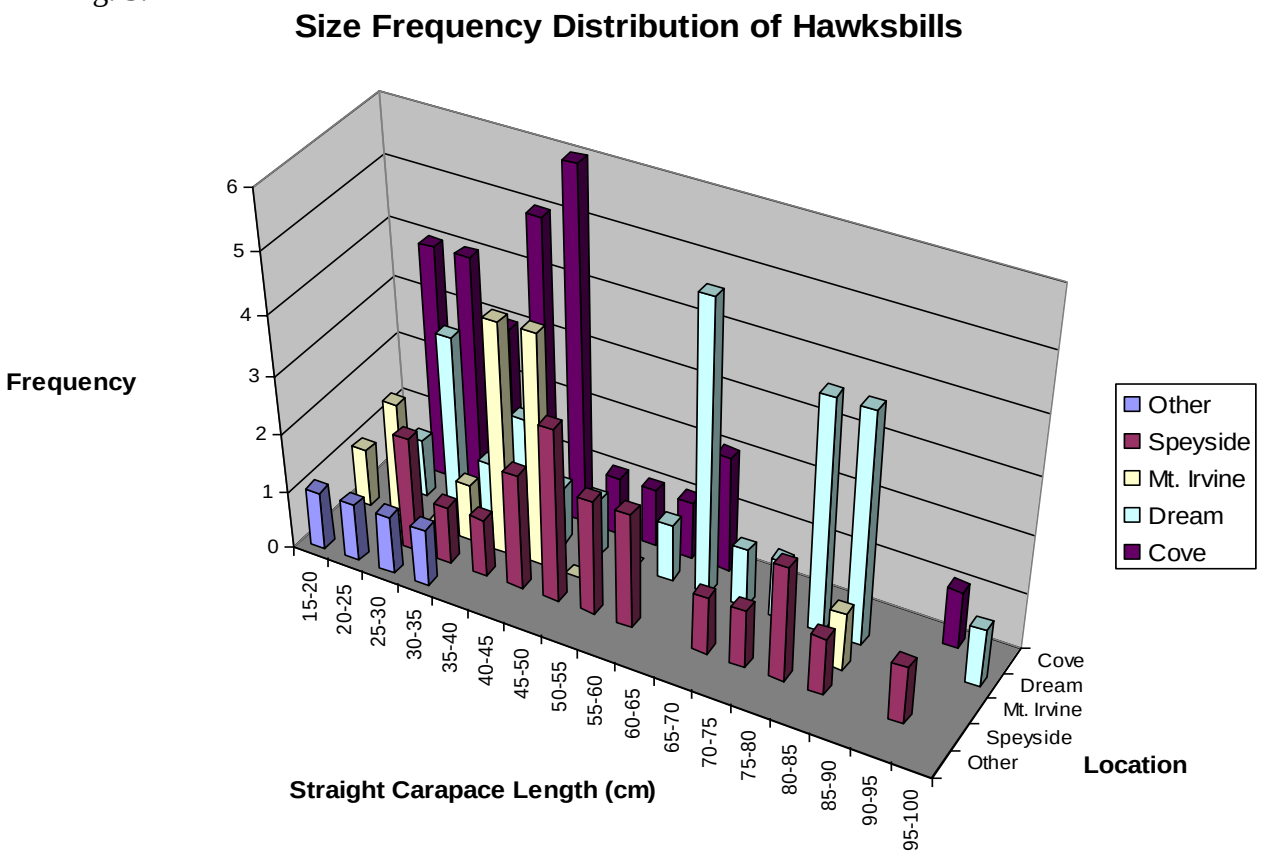
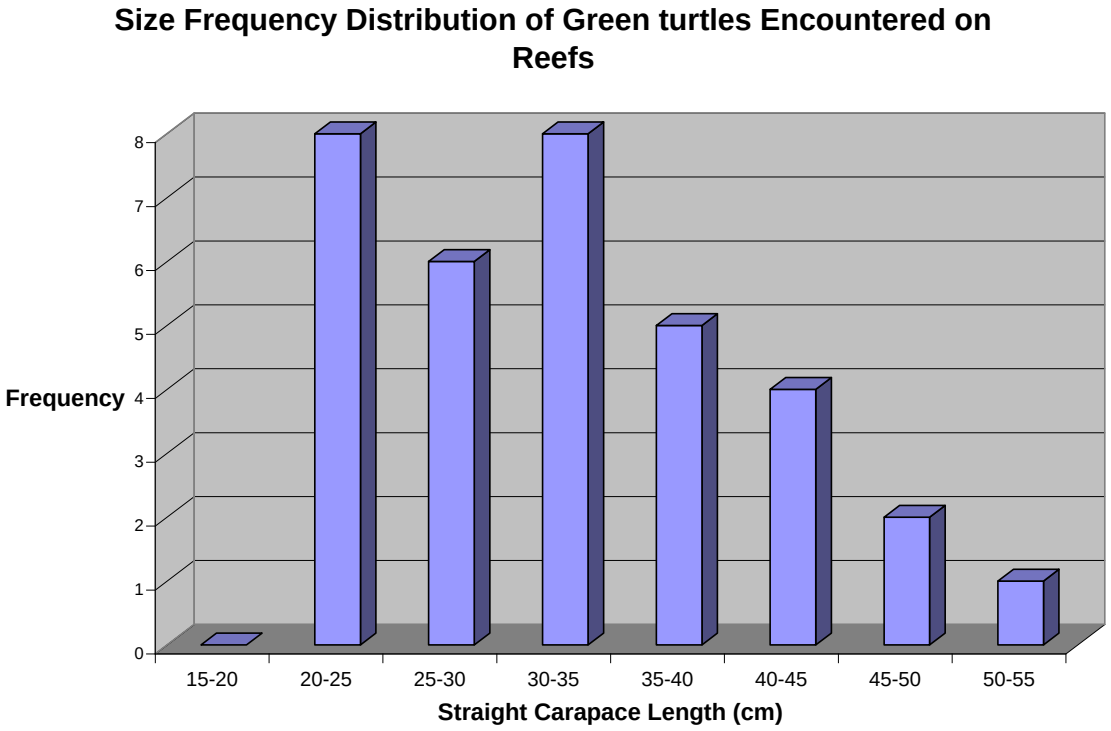

Size Frequency Distribution of Hawksbills
Frequency
0
1
2
3
4
5
6
15-20
20-25
25-30
30-35
35-40
40-45
45-50
50-55
55-60
60-65
65-70
70-75
75-80
80-85
85-90
90-95
95-100
Straight Carapace Length (cm)
Other
Speyside
Mt. Irvine
Dream
Cove
Location

Fig. 6.


Size Frequency Distribution of Green turtles Encountered on Reefs
Frequency
0
1
2
3
4
5
6
7
8
15-20
20-25
25-30
30-35
35-40
40-45
45-50
50-55
Straight Carapace Length (cm)

Seagrass Beds

- ✓ 44 kayak surveys were completed over six months
- ✓ 143 greens have been encountered while kayaking at seagrass beds.
- ✓ 7 different individuals volunteered to participate in kayak surveys, including 3 members of SOS Tobago. They were trained in the methods used to conduct the fieldwork.
- ✓ The highest density of turtles was recorded at Petit Trou lagoon, followed by Kilgwyn. These are both sites where fishermen target turtles, and fishing activity was recorded at Kilgwyn on several occasions (turtle nets were observed in the water and once fishermen were observed in the process of pulling 2 netted turtles into their boat).
- ✓ All observed turtles were of juvenile size except for 2.
- ✓ No seasonal variation was observed except for Bon Accord Lagoon / Buccoo Reef Marine Park, where there was an observable drop in the encounter rate from October through January, compared to August through September.

Successes

- ✓ The survey method that was developed for monitoring green turtles on seagrass habitats by kayak proved successful. It is a simple method that can be easily followed and repeated. It can be continued in Tobago by SOS Tobago at little cost, making use of volunteers.
- ✓ The tissue samples that were collected are very valuable. They will help to elucidate the connections among rookeries and foraging habitats for hawksbills in the Caribbean.
- ✓ The data that was collected can be used in a statistical program "DISTANCE" to estimate the relative density of turtles on both coral reef and seagrass habitats around Tobago.
- ✓ When analysis is completed at least one publication in a peer reviewed science journal should result.
- ✓ The video footage that was recorded will be used to create an awareness video that will expose the public to the world of hawksbill and green turtles in particular.

Recommendations

- ✓ The monitoring methods that were used should be continued on a regular basis in Tobago, and expanded to cover foraging habitats in Trinidad. Focus should be placed on consistent, regular surveys on the most important sites for turtles. It is not necessary to repeat surveys as often as we did during this first 6 months, but kayaking should probably be repeated at each site at least once per month. Dives at reef sites should be repeated as often as possible, but effort should be concentrated on sites where turtles are most common.
- ✓ A radio tagging study may be useful to allow us to follow individual turtles over time, and be able to find them in the field to observe their behaviour such as feeding habits. For instance it would be interesting to investigate the diet of the green turtles at Mt. Irvine.

Conclusion: the value of monitoring

Continued monitoring on a long-term basis is vital to the effective management of our foraging and nesting turtle populations. This is the only way that we will be able to accurately recognise changes in the population and act on them quickly.

Monitoring in itself will not often lead to new discoveries, but monitoring can provide the opportunity to conduct new research as well. While staff carry out their regular data collection, they can collect extra data towards research.

Concurrently, the monitoring program provides an excellent opportunity for creating public awareness.

Highlights from the Training Event at Grande Riviere, 28th May 2009

Michelle Cazabon-Mannette explaining the method of nest triangulation, and highlighting the usual location of tags on hard-shelled turtles

Kevin Muhammad (Community Coordinator), demonstrates the method of nest triangulation

Highlights from Nest Excavation Training Event at Matura, 9th July

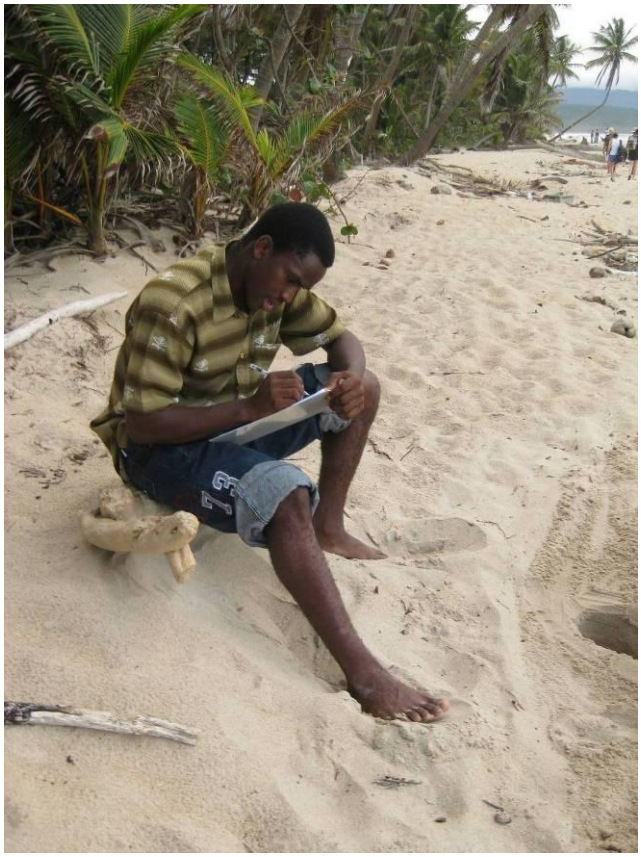
Participants practice the technique

The group looks on as Scott Eckert gives a demonstration

Hatchlings emerging from their nest at Matura beach

A dead hatchling with yolk sac attached, in its egg shell

Participants practice the technique



Members of GRNTGA filling out their data sheets

Mr. Harry (Forestry) practices the technique

Ronald Williams (Nature Seekers) demonstrates how to complete the nest excavation data sheet

Participants look on as Scott Eckert gives a demonstration

Dr. Scott Eckert (Director of Science, WIDECAST) demonstrates how to excavate a nest

Participants pay attention to Scott Eckert in the Nature Seeker's Office

A hatchling heads for the sea, Matura beach

Highlights from the Offshore Monitoring Program

Two SOS volunteers preparing for a kayaking survey (Little Rockly Bay)

Canoe Bay, Tobago

Sandy Point, Tobago

Team members heading out to conduct a survey (Little Rockly Bay)

Michelle Cazabon-Mannette with a hawksbill turtle, Speyside

Intern (Anjani Ganase) with a juvenile hawksbill turtle

A flipper tag on a juvenile green turtle

A diver releases a juvenile green turtle

A dive master assists the interns with the capture of a large male hawksbill

Measuring a young green turtle

Collecting video footage for an educational video

Kayaking in Buccoo Reef Marine Park