Turtle Monitoring Training for Southern Environmental Association (SEA) 21st – 24th July 2010

Exchange visit to SEA by:
Roberto Herrera Pavon - El Colegio de la Frontera Sur (ECOSUR): rherrera@ecosur.mx
Alejandro Arenas Martinez, Flora, Fauna y Cultura de México, A.C: alextortuga@yahoo.com
Valentine Rosado, The Coral Reef Alliance: grosado@coral.org

Participants:
Annelise Hagan, Science Program Director, SEA
Reylando Castro, Marine Biologist, SEA
Linda Garcia, Marine Biologist, SEA
Adolphus Molina Sr., Head Ranger, SEA
Adolphus Molina Jr., Ranger, SEA
Matthew Nicholas, Ranger/Skipper, SEA
Edward Ferrel, Skipper, Turtle Inn Resort
Javier Martinez, Beach Captain, Turtle Inn Resort
Dennis Garbutt, Manager, Sapodilla Cayes Marine Reserve (Sapodilla Cayes surveys)

Plate 1: The team, after surveying Placencia Beach, 24th July 2010.

This report has been compiled from information presented to the participants during the 5 day workshop. Training comprised both classroom-based lectures and extensive beach surveys (at 5 offshore cayes and in Placencia). Survey techniques covered included; track identification, nest identification, nest excavation and ageing of eggs to estimate date of laying and probable time of hatching. Different scenarios were discussed as to how to develop a monitoring regime, how to manage nests and how to minimize threats to eggs and hatchlings. The surveys conducted 22nd – 24th July 2010 will act as baseline data, and will be used to develop a future monitoring programme within the areas managed by SEA; Laughing Bird Caye National Park, Gladden Spit and Silk Cayes Marine Reserve and Sapodilla Cayes Marine Reserve.

1.0 Background Information

Modern turtles arose in the Cretaceous period, 270 million years ago. 2 of 4 evolutionary lines are still in existence today; 1) leatherbacks, 2) all other turtle species. It is commonly agreed that 7 or 8 species of turtle exist today (genetic techniques suggest 7). 6 species are found in the Atlantic region and 4 of those nest on Atlantic/Caribbean beaches. 3 species nest in Belize; Hawksbill turtle (*Eretmochelys imbricata*), Green turtle (*Chelonia mydas*) and Loggerhead turtle (*Caretta caretta*). The 4th species known to nest in the Caribbean, the Leatherback, occasionally nests in Belize (there are reports of Leatherback nesting at Ambergris Caye; Belize Audubon Society Newsletter, May 1989). As different turtle species rely on different foods (e.g. sponges/jellyfish/seagrass etc.) they can live in the same region without competing against one another. Each species has different characteristics regarding the food they eat and hence their foraging behaviour.

1.1 Life History

It is important to know the life history of different turtle species in order to manage their populations. Within a specific location, there is a need to collect good baseline data in order to identify hotspots for nesting – where are turtles nesting most frequently and how successful is hatching?

Most is known about the life history of the green turtle. Green turtles spend approximately the first 15 years of their lives in open water, eating from the surface. At 20-30 years they reach sexual maturity and are known as 'juvenile adults'. At this stage they switch to eating components of the benthos. This is the age of most turtles observed when diving/snorkelling on the reef. Turtles become more conspicuous in reef areas during mating season.

Females can mate with many different males and can nest up to 8 times in one season. Eggs are laid 2-3 weeks after mating. Typically, Hawksbill turtles roam around a lot more when looking for a nesting site and they destroy more vegetation (Plate 2), compared to Greens and Loggerheads. Loggerheads come straight up the beach and nest almost immediately, closer to the sea compared to other species. This behaviour makes their nests much simpler to identify.

Plate 2: A 1 day old Hawksbill nest at Ranguana Caye, showing destruction of low-growing vegetation, observed 23rd July 2010.

Turtles migrate long distances and they may not come back every year to nest; there may be a 3-8 year interval between nestings. There is natural inter-annual variability in nesting. For example one year may have more nesting that a subsequent year, but a cyclical pattern (with peaks and subsequent troughs) can be expected. Different species lay different numbers of eggs – Green turtles average 120 eggs per nest, Loggerheads 100-110, but up to 300 eggs per nest may be laid. Hatchling survival rate is 2-3% and survival to adulthood is 1 in 1,000. The depth at which eggs are laid depends on a number for factors, including the type of substrate, the turtle species and the size of the turtle. Typically, the total depth of a nest is around 70cm. There is a narrow opening at the top measuring approximately 20cm in width and 20cm in depth, and this opens out into a deep, flat-bottomed sphere.

About 50% of turtles come back to the exact same beach where they were born in order to lay their eggs (the other 50% come back to the same area, but maybe to a neighbouring beach). "Nesting season" is determined by the date that the first nesting is recorded to the date of the last nesting, but this assumes daily monitoring in order to get these dates accurate. Typically, mid-June to August is the peak of nesting season (July is the peak month) and 10pm – 1am is the peak time period during which turtles come out to nest.

A nest can be identified by the 'bed' (the area where the turtle was position during laying) and the eggs are found beneath the highest part of the nest. After hatching, a slight depression is seen on the top of the nest (once the hatchlings have left).

Eggs mature and hatch typically after 50-60 days (they may start hatching after 45 days), depending on incubation temperature and species. Temperature determines the sex of the hatchlings, with warmer temperatures producing more females. At 29-30^{o}C, there is a 50:50 male: female ratio in the offspring. Below 28^{o}C the offspring will be male and above 31^{o}C the offspring will be female. The first months of the season (April-June) are warmer, so this will lead to more female offspring. Climate change has implications on the sex ratio of offspring (could there be more females produced in the future as the earth warms?) All temperature patterns are beach specific and there is wide geographical variation. Within the nest, the middle is warmer than the outside and these centrally located eggs are more likely to develop into females.

Baby turtles use an 'egg tooth', a sharp protrusion on the end of the nose to crack its way out of its shell. Immediately after the baby turtle hatches, it is still attached to the embryonic sack for a few days and does not need additional food during this period.

Adult turtles eat sponges/seagrass/small invertebrates (food source is species specific), but hatchlings are omnivorous and eat nearly anything (including seagrass and small invertebrates), thus maximising their chances of survival. Juvenile turtles are strong and resilient and eat a wider range of food compared to adults.

The life span of a turtle can be around 100 years. They have pulmonary respiration, a good sense of smell, good vision and can sense colour. The frequency at which turtles come to the surface to breathe depends on the level of activity they are doing. If swimming/feeding they will have to come up regularly, but if they are 'hibernating' they can spend days underwater (compare with

manatees which are warm blooded and can only stay submerged for around 2 hours; turtles are cold blooded so can stay submerged much longer).

1.2 Tags

Tags can be used to generate data on distribution, abundance, year of sexual maturity (one of the key uses) etc. There are several different types of tag that can be used on turtles;

- PIT (Passive Integrated Transponder) tag; injected under the skin and identified through a specialised scanner
- Radio tag; telemetry (allowing remote reporting of information)
- Metal flipper tags; marked with a code identifying the country where the turtle was tagged and a unique number
- Genetic tag; from blood/tissue samples
- Living tag; marked on the shell as a hatchling. If the same turtle is re-caught, the year it was born can be identified (the position of the marker on the shell determines the year of birth)

A tagging scheme needs a long time-frame (over 20 years) to be a viable study. Standard tags (standardised at an international level) need to be used and there needs to be a good network of researchers (locally/regionally/internationally) in order to relay the information if tagged individuals are observed.

2.0 Threats

Turtles are exposed to numerous natural and human threats, on land, and in the sea. When managing turtle nests, the biggest focus is to deal with threats and minimise potential human threats. There needs to be awareness of cultural aspects within the local community – are turtles targeted for their meat? Education and Outreach is an important component of turtle management. Management strategies need to include working with local people; educating them about turtles and their need for protection. If poaching is a potential threat, there should be regular patrols and enforcement of regulations to minimise this (especially during nesting season).

Fishing is the biggest threat to turtles, especially shrimp trawlers (of which Belize has 2). Hooks and nets are also a risk. If a turtle is caught on a hook, removal of the hook should ensure the turtle's survival. To combat the threat of fishing, local fishermen can be educated in the use of different bait/fishing gear that minimises the impacts on turtles.

Tourism impacts nesting beaches. In Mexico, the beaches are so wide that turtles can travel approximately 300ft up the beach before nesting. Hotels are asked to stack their beach chairs at night so as not to impact turtle activity. Lighting on beaches, especially at hotels, is a serious issue. Adult turtles and hatchlings orientate themselves using the light of the moon and artificial lighting can lead to disorientation. Often hatchlings will be attracted inland by artificial lights, and may end up trapped in hotel vegetation or in swimming pools. There are international standards with regard to lighting (times for turning off lights/using a different lighting regime) for hotels situated on turtle nesting beaches. Hotels should adhere to these regulations.

Coastal development also has a severe impact on nesting beaches through use of heavy machinery and construction materials which can crush the eggs beneath the sand.

Although tourism has detrimental impacts on turtle nesting, revenue can also be generated through involving tourists in turtle monitoring, e.g. participating in beach patrols, observing nesting behaviour at night, assisting in nest relocation and hatchling release.

2.1 Relocation of Nests

To leave a nest on site, there must be no threat from erosion or human/animal intervention e.g. eating of eggs. If the potential threats are too severe, it may be necessary to relocate a nest. During the training course, instruction was given on how to dig a nest (Plate 3; see section 1.1 for approximate dimensions). If the nest is located too close to the sea and it is likely to be destroyed through wave action and associated erosion, the nest can be moved to higher ground. At SEA's sites, there should be no need to relocate the eggs unless there is a severe threat of erosion (human threats should be low). The corral/box methods can be used to relocate eggs.

Plate 3: Participants learning how to dig a turtle nest, in case of the need to relocate eggs, 23rd July 2010.

A Styrofoam box, with holes punched in the sides for ventilation, can be used to transport the eggs. Mesh should be used to cover the ventilation holes to prevent flies and mosquitoes from entering the box and damaging the eggs. The inside bottom of the box should be covered with a layer of sand to absorb any mucus from the eggs. There is no need to place additional sand on top of the eggs as the Styrofoam will keep the contents sufficiently cool. The outside of the box should be labelled with: date the eggs were laid, site name, turtle species and the number of fertile eggs (record the number of bad eggs, but don't put these in the box). The eggs should not stay out of the ground for more than 5 hours.

3.0 Monitoring

The priority of a monitoring plan is to have regular data collection that can be reported on a national level and can contribute to a regional database. It is anticipated that SEA will report to Belize's Sea Turtle Conservation Network and will also report on a regional scale. Due to its small size, it should be relatively easy to establish good baseline data for turtle nesting in Belize. Beaches that are used regularly for nesting can be used to determine natural nesting behaviour in the area. By monitoring beaches where there are infrequent nestings (e.g. 1 or 2 nests per year, followed by a year with no nesting), it is more difficult to determine natural nesting behaviour.

Monitoring should encompass three different strategies; monitoring nests, monitoring female turtles coming ashore and monitoring hatchlings (i.e. hatching success). Ideally, it is good to manage the species separately, i.e. compile separate reports outlining monitoring methods, nesting activity and hatching success for Hawksbill, Green and Loggerhead turtles.

3.1 Monitoring Nests

1) Identify whether the monitoring team will be camping on site or not. Camping is the preferred option as it enables the beach to be patrolled every night, but this may not be an option. (Continuous monitoring by camping is a more attractive strategy for potential funders). If the team cannot camp on site, beaches should be patrolled every 15 days.

2) Document characterisation of the nesting beach: a) vegetation type, b) note areas vulnerable to erosion, c) note any development/other disturbance in the area

3) Identify nests of different species of turtle using tracks (if still obvious), size of bed, distance from sea, amount of vegetation damage etc. It is important to also be able to identify false crawls (where a turtle comes ashore but does not dig a nest).

How to identify a nest: When you first see a nest, step back and look at the crawl tracks. Different species nest different distances up the beach. If you can identify the species of turtle from the tracks, you'll have a better idea of where the nest is located. The surveyors need to be able to identify the direction of travel form the tracks - which tracks show the turtle traversing up the beach and which show the turtle traversing down the beach (i.e. before/after nesting).

4) Measure the distance of the nest from the sea and excavate the nest to look at some eggs. Use the colouration of the eggs to estimate the date the eggs were laid, and the probable time period of hatching. When turtle eggs are first laid, they are transparent. As the eggs get older the shells calcify and become whiter in colour.

The nest does not necessarily need to be dug up, but this can be useful to ensure that eggs were laid at the suspected nest site and in order to age the nest.

Plates 4 and 5: Excavating Hawksbill turtle eggs to estimate date of laying and probably hatching period (by looking at egg shell thickness and coloration).

5) Mark the nest site so that it can be re-located at a future date; take coordinates using a GPS and use a plastic bottle buried just under the sand (labelled with the species initials and estimated laying data using permanent marker pen), above the position of the eggs. The paper label should be removed from the plastic bottle and the bottle top must be secured to prevent hatchlings from getting trapped in the bottle neck/inside the bottle. Species codes:

E.I. *Eretmochelys imbricata* Hawksbill turtle (Critically Endangered)
C.M. *Chelonia mydas* Green turtle (Endangered)
C.C. *Caretta caretta* Loggerhead turtle (Endangered)

The nest can also be marked with wooden stakes. Nests should be marked on a map and zone of the beach (N, S, E, W, windward/leeward), date, coordinates and the name of the person who found the nest should be recorded.

Plate 6: Bottle marking Loggerhead turtle (*Caretta caretta*) eggs, with estimated nesting date, Nicholas Caye, 23rd July 2010.

6) Remove all tracks and nesting mounds to prevent accidental re-counting of tracks and also so people do not interfere with the nest (i.e. they may become curious by the mound of sand).

7) After hatching, count the number of empty shells and the number of dead individuals i.e. how many hatched successfully and how many did not (Plate 7). This will indicate the total number of eggs laid and hatching success.

Plate 7: Counting empty egg shells to determine hatching success, Lime Caye, 23rd July 2010

3.2 Monitoring Female Turtles Coming Ashore

Initially, when a turtle comes ashore, it is important to keep your distance and keep disturbance minimal. Give the turtle time to come up and find a suitable nesting spot. Once nesting has begun, the turtle should be approached quietly. Use a red filter to cover flash lights and do not use flash photography. The following should be recorded:

1) Measure length and width of carapace. It is important to standardise methods for measurement, to enable inter-annual comparisons e.g. width: measure the widest part, across the 3rd vertebral scute. It is important to make a group decision as to whether to round the numbers up or down, and remain consistent with this.
2) Presence of injuries/scars/tags. If a metal flipper tag is present, note the identification number of the tag. Flipper tags also leave scars; if there is a scar, but no tag present, this should be noted.
3) Number of eggs. If the turtle is reached early enough (before laying commences), count the number of eggs as they are laid.

3.3 Monitoring Hatchlings

If a nest is laid close to dense vegetation, in which the hatchlings may become trapped, it is advisable to use a vertical wire mesh, to surround the nest site. This will ensure that on hatching, the hatchlings are trapped within a confined space and can subsequently be safely taken to the

sea. If there needs to be any assistance after hatching, hatchlings should be released at night, on the same beach where the eggs were laid (as close to the nest site as possible).

4.0 SEA's Monitoring Plan

Based on techniques learnt from the training week, detailed in the sections above, SEA has implemented the following:

- Surveys of nesting beaches were conducted 22nd - 24th July 2010 and all details of nesting activity were recorded. These have been written up and will act as baseline data (see Appendix 1 of this report).
- Having excavated the nests and aged the eggs, nest sites were marked with plastic bottles, labelled with species code and estimated date of nesting.
- Potential threats were assessed for all sites e.g. dogs were present at some sites but not at others (possible management strategy - create a boundary around the nest to prevent eggs from being dug up by dogs/other animals).
- Predicted hatching dates have been calculated for all nests observed during the baseline data collection (see Appendix 1).
- Nests are being monitoring for any disturbance during the incubation period. SEA rangers have been monitoring nesting activity daily at Little Water Caye. In addition, follow-up monitoring was conducted by Linda Garcia at Little Water Caye on Fri 13th August 2010. New nests at Little Water Caye were recorded and data was entered into the accompanying spreadsheet entitled 'Turtle_data_LWC_Aug 2010".
- Vertical wire mesh has been used to surround two of the nests at Little Water Caye as it was assessed that the hatchlings would likely become entrapped in the dense low-growing vegetation if they were allowed to escape naturally. By entrapping the hatchlings in this way, it allows for safe transport to the sea for release at night.
- Subsequent surveys have been conducted since the training week. A survey (covering approximately 1.5 miles) of Placencia Beach was conducted on 29th July 2010, following a report of a turtle coming ashore the previous night. Fresh tracks and a nest with newly laid eggs were identified (see details in Appendix 1).
- After hatching, nests will be excavated and the number of empty shells, bad eggs and dead hatchlings will be counted to calculate the total number of eggs laid and hatching success.
- A more intensive monitoring strategy is planned for the 2011 season, with regular monitoring at the islands. This will include over-night stays at some islands, and more frequent nightly beach patrols. From the baseline surveys, Ranguana and Lime Caye were identified as being priority areas for nesting. Although outside the areas which SEA manages, the 2011 monitoring strategy will include the island of Ranguana as it was identified as a hotspot. Due to the high level of nesting activity, monitoring teams should camp at these islands to conduct daily monitoring at the peak of the season. In contrast, at islands such as Laughing Bird Caye where nesting is much less frequent (and in some years there is no nesting), monitoring should be conducted every 15 days.

Acknowledgements
SEA is extremely grateful to Roberto Herrera Pavon and Alejandro Arenas Martinez, who provided the training week as part of a monitoring exchange program with Belize. Many thanks to The Coral Reef Alliance for funding all logistical expenses incurred by Roberto and Alejandro during their visit to Placencia, and an additional stipend for them. This training would not have been possible without facilitation and logistical support from Valentine Rosado, The Coral Reef Alliance, to whom we are most thankful.

Appendix 1: Turtle nest observations during baseline data collection 22nd – 24th July 2010

Little Water Caye, 22nd July 2010

1) Nest at back of caye. Species: Hawksbill.
Estimated date of laying: 12th July 2010. Estimated date of hatching: 26th August – 10th September (45-60 days after date of laying). Identification as Hawksbill - more flattened nest (less of a mound on top), and far from sea (Hawksbills crawl up beach further and move around more than other species). Eggs were excavated and estimated to be 10 days old. The eggs were found to be very close to surface so additional fresh sand was put on top of the nest to prevent the nest from getting too moist (from rain). It was suggested that after 20 more days (i.e. on 11/8/10), the eggs could be relocated to allow hatchlings to get to the sea (present vegetation too dense for hatchlings and distance from sea too far). Later this idea was abandoned; it would be better to fence the nest to trap the hatchlings. By gathering them in this way they can be released safely in the sea at night. The nest was surrounded by a wire mesh on 13th August 2010.

Plate 8: Excavating Hawksbill turtle nest at Little Water Caye, 22nd July 2010. Note dense, low-growing vegetation, which would trap the hatchlings.

2) Nesting on night of 22nd July 2010. Species: Hawksbill.
Estimated date of hatching: 5th – 20th September.
11.50pm: Turtle came ashore and traversed up the beach, 12.30am: Started laying eggs, 1.10am: Eggs covered and turtle started to leave, 1.30am: Turtle returned to sea. Carapace measurements: length: 85cm, width 77cm. Age approximately 15 years.



Plates 9, 10, 11: Tracks, egg laying and carapace length measurement of Hawksbill turtle, Little Water Caye, 22nd July 2010.

Plate 12: Participants with Hawksbill turtle after nesting, Little Water Caye, 22nd July 2010.

As with LWC nest 1, due to the density of the vegetation, and distance from the sea, it was suggested that 40 days from now (i.e. on 31/8/10) the eggs could be transferred to a more suitable location. Later this idea was abandoned; it would be better to fence the nest to trap the hatchlings. By gathering them in this way they can be released safely in the sea at night. The nest was surrounded by a wire mesh on 13th August 2010.

Ranguana Caye, 22nd July 2010 (from 1.30pm)

1) Hawksbill nest, 2 months old. Hatched and predated on.

2) Loggerhead nest, 2 months old. Hatched and predated on.

3) Loggerhead – 1 month (20-30 days).
No eggs, but perfectly formed nest. Eggs probably taken (owners hear Guatemalan boats land on the island at night and it is likely that the eggs, and possibly the female turtle are taken by poachers).

4) Loggerhead – 1 month (20-30 days).
No eggs, but perfectly formed nest. Eggs probably taken (see above).

5) Hawksbill. Nest from last year (can tell by orangey colour of egg shell remains). Hatched and predated. Same turtle could have come back this year. There was a trail from this year implying that the turtle may have come up and dug an old nest, but she didn't lay any eggs. Lily leaves were cut at the ends indicating relatively recent turtle presence (vegetation damaged by turtle movements, especially flipper digging movements).

Ranguana Caye, 23rd July 2010 (at 10.30am)

6) Nesting on 22nd July 2010. Species: Hawksbill.
Estimated date of hatching: 5th – 20th September.
Location: Right next to small palm on front beach by cabana. Tracks were still evident from previous night showing the direction the turtle came up the beach and the direction she went back to the sea. The tracks were seen to be level (parallel) indicating that the species was a Hawksbill.

Nicholas Caye, Sapodilla Cayes, 23rd July 2010 (12.45 – 13.40pm)

1) Nesting on 28th June 2010. Species: Hawksbill.
Estimated date of hatching: 12th – 27th August.
1 damaged egg (just shell with little yoke inside). All other eggs OK.

2) Nesting on 18th June 2010. Species: Hawksbill.
Estimated date of hatching: 2nd – 17th August 2010. Some damaged eggs at top of nest – pierced shells, many ants observed. 8 damaged eggs, 2 unhealthy looking = total of 10 damaged eggs. There were signs of predation by crabs. The damaged eggs were seen to have no embryonic development i.e. they were damaged at the time they were laid, or very soon after.

3) Nesting on 17th-18th July 2010. Species: Loggerhead.
Estimated date of hatching: 31st August – 15th September 2010. Loggerhead identified due to size of nest i.e. long bed. Loggerheads tend to nest closer to the sea (don't come so far up beach). This nest was closer to sea than the other two (which had been identified as Hawksbill nests).

4) Nesting on 3rd July 2010. Species: Hawksbill.
Estimated date of hatching: 17th August – 1st September 2010.
No apparent damage to nest.

5) Nesting on 23rd June 2010. Species: Hawksbill.
Estimated date of hatching: 7th – 22nd August 2010.
No apparent damage to nest.

6) Old green turtle nest. This was noted as being wider and deeper than the nests of other species.

All nests at Nicholas Caye were marked with labelled plastic bottles beneath the sand, above the position of the eggs.

Lime Caye, Sapodilla Cayes, 23rd July 2010 (2pm)

1) Nesting on 28th June 2010. Species: Hawksbill.
Estimated date of hatching: 12th – 27th August.
Located on edge of beach near sea grape tree.

2) Area marked with coconut husks and small coconut palms but no nest present.

3) Nesting on 15th June 2010 (noted by owner). Species: Hawksbill.
Estimated date of hatching: 30th July – 14th August.
Located under sea grape tree next to turtle nesting sign.

4) Old nest, from very early in 2010 season. Located directly beneath turtle nesting sign, on right of tables. Species: Hawksbill. Did hatch = 130, did not hatch = 6, dead hatchlings = 2; total nest = 138.

5) Eggs hatched already. Located on corner by sea grape tree just in front of tables. Species: Hawksbill. Did hatch = 88, did not hatch/dead = 0.

6) Nesting on 13th June 2010. Species: Hawksbill.
Estimated date of hatching: 28th July – 12th August. Located at corner in front of sea grape tree. After excavation, nest marked with ring of sticks.

7) Nesting on 21st July 2010. Species: Hawksbill.
Estimated date of hatching: 4th – 29th September. Located near palm on right side of island as you approach from the sea.

8) Nesting on 28th June 2010. Species: Hawksbill.
Estimated date of hatching: 12th – 27th August.

9) Nesting on 23rd June 2010. Species: Hawksbill.
Estimated date of hatching: 7th – 22nd August. Located at the house.

10) Nesting on 9th July 2010. Species: Hawksbill.
Estimated date of hatching: 23rd August – 7th September. Located next to men's bathroom (at the back of the island).

11) Nesting on 23rd June 2010. Species: Hawksbill.
Estimated date of hatching: 7th – 22nd August. Located beside first cabana to left of washing facilities. Marked with bottle, conch shells, and sticks.

12) Nesting on 16th July 2010. Species: Hawksbill.
Estimated date of hatching: 30th August – 14th September. Located behind sea grape tree (full of iguanas) – on front left beach as you approach from sea. Walk along front beach behind shrubs.

All nests at Lime Caye were marked with labelled plastic bottles beneath the sand, above the position of the eggs.

Hunting Caye, Sapodilla Cayes, 23rd July 2010 (4pm)

1) Nesting on 23rd June 2010. Species: Hawksbill.
Estimated date of hatching: 7th – 22nd August. Located on back beach. 2 eggs crushed in excavation.

2) Nesting on 22nd July 2010. Species: Hawksbill.
Estimated date of hatching: 5th – 20th September. Eggs had been laid the night before the survey.

3) Nesting on 13th June 2010. Species: Hawksbill.
Estimated date of hatching: 28th July – 12th August.

All nests at Hunting Caye were marked with labelled plastic bottles beneath the sand, above the position of the eggs.

Placencia Beach, 29th July 2010 (11.30am)

1) Nesting on 28th July 2010. Species: Hawksbill.
Estimated date of hatching: 11th – 26th September. Eggs had been laid the night before. Fresh tracks were observed and the eggs were still wet and soft. Located just north past the end of Placencia airstrip, under a small, bushy Casuarina tree.

Nest marked with labelled plastic bottle beneath the sand, above the position of the eggs.