

# *Progress report on sea turtle research conducted by the Department of Fisheries and Marine Resources during 2007 and 2008 in Anguilla*



*Image – Volunteers and DFMR staff during Green Turtle survey work at Fish Hole Pond, Scrub Island in July 2007*



Citation: Wynne S. (2009). Progress report on sea turtle research conducted by The Department of Fisheries and Marine Resources during 2007 and 2008 in Anguilla. Produced by the Department of Fisheries and Marine Resources for the Government of Anguilla. Copies can be obtained by contacting [fisheriesmr@gov.ai](mailto:fisheriesmr@gov.ai)

## INTRODUCTION

All species of marine turtle are considered threatened or endangered throughout their range. Four of these species occur in Anguillian waters to varying extents, with Green Turtles (*Chelonia mydas*) and Hawksbill Turtles (*Eretmochelys imbricota*) known to both forage as juveniles and nest as adults around the island and offshore cays. Leatherback Turtles (*Dermochelys coriacea*), the largest of all turtle species, also nest on selected beaches and sightings of Loggerhead Turtles (*Caretta caretta*) have been reported although no nesting activity has yet been confirmed. Because of their worldwide endangered status all species of turtle have been protected in Anguilla from harvesting since 1995 when a moratorium was placed on the taking of all sea turtles and their eggs. In 2000 the moratorium was extended for a further five years, and in 2005 the moratorium was once again extended, but this time for 15 years. The Department of Fisheries and Marine Resources (DFMR) has the responsibility to continually assess the effect of this moratorium on both nesting and foraging turtle populations around the island in order that it may offer sound advice as to whether this moratorium be lifted, or extended once again when it expires in 2020.

Prior to 2005 DFMR conducted sporadic turtle surveys, often in collaboration with the MCS and volunteers mostly from the Island Harbour community, the results of which have been published as part of a Caribbean UK Overseas Territories report which is available online at <http://www.seaturtle.org/mtrg/projects/tcot/finalreport/> (Godley *et al.*, 2004).. Following this work only minimal turtle surveys were conducted during 2005 and 2006 while DFMR concentrated on other projects. During the end of 2006 and beginning of 2007 however work was restarted, and is now ongoing and an integral part of departmental work schedules. This report aims to amalgamate the work conducted during this period which has ultimately lead up to the full reinstating of Hawksbill & Green Turtle in-water sampling together with early morning beach monitoring that sets out to document nesting activities. Thus this progress report will be followed by regular annual reports that will detail the data collected to date and look for temporal patterns that will provide insights into the effect of the moratorium. Furthermore, by producing population and distribution estimates, important information will be provided to update regional organisations, local policy makers and the general public as to the current status of sea turtles in Anguilla.

## METHODS

The vast majority of the survey work conducted during 2007 & 2008 consisted of in-water snorkelling surveys to monitor juvenile foraging Hawksbill Turtles. To a lesser extent seine net surveys were conducted on selected seagrass beds sporadically, and the end of 2008 saw the relaunch of early morning turtle nesting beach surveys that intends to continue on a regular basis with these other two monitoring efforts into 2009.

### *In-water Hawksbill Turtle Sampling*

The study sites used for Hawksbill sampling have varied a little over the years, although the current aim is to establish a minimum of eight permanent monitoring sites (PMS). Prior to 2007 two sites had been confirmed as viable PMS: North Cliffs (near Katouche Bay) and Pelican Point to Flatcap Point (around the Crocus & Little Bay area). During the 2007 field season many other potentially suitable sites were assessed, and by 2008

eight sites had been selected for monitoring. During 2008 more potential sites were assessed while also monitoring the sites chosen through the results from 2007. All of these sites have been illustrated in figure 1, with a readjusted list of sites to be surveyed in 2009 detailed in the discussion section.

Surveyors are split into pairs (or threes if numbers dictate), and using snorkelling equipment swim through pre-determined study sites for approximately one hour taking care to look under overhangs and in recesses for sheltering individuals. As foraging turtles move freely throughout the area it is not important to make sure each pair surveys a different area. It is more important to ensure two pairs are not surveying the same area simultaneously as this will cause population underestimation biases. It is important to note that pairs cannot be treated as separate replicates as if one group removes a turtle it potentially biases the others sighting probability. For this reason all surveying pairs are treated as a single unit of effort with care taken that different groups are not counting the same turtle twice (see end of next paragraph).

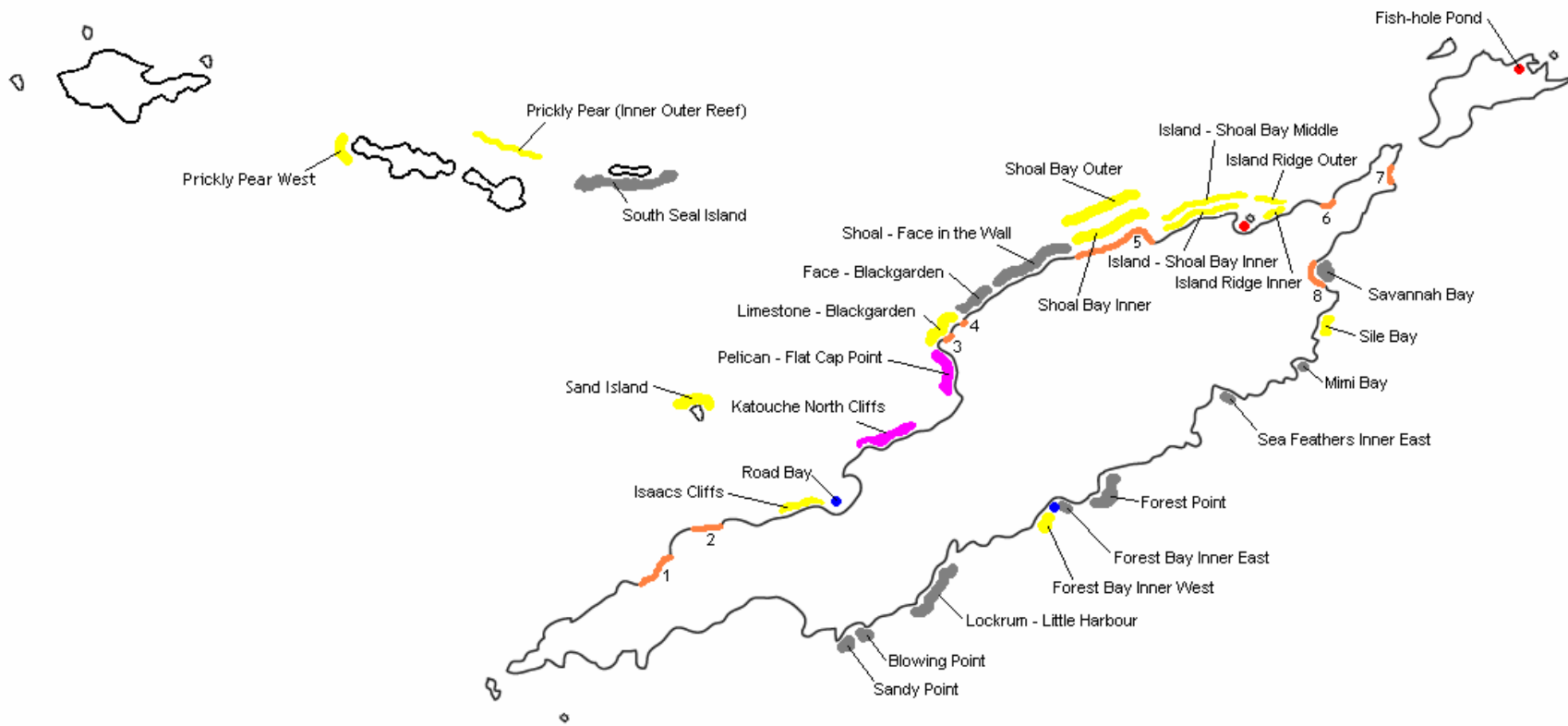
Once a turtle is sighted it is followed until it settles, at which point one of the pair dive down directly behind it and attempt to catch it in their hands. If the turtle bolts the other pair member tracks it until their partner catches up with them, and once again they wait until the turtle settles. In some areas of high boat traffic it seems apparent that most turtles present were more nervous than those in quieter areas. Their heightened state of alert lead to fewer captures. If a turtle settles into an area of deep water then SCUBA equipment may be needed to attempt its capture. If a turtle eventually eludes the surveyors (or it is felt too much stress is being placed on the turtle being pursued) a mental note is made and numbers included with the final tally of those captured once the survey is completed. Surveyors should discuss the turtles seen once back on the boat and establish the number seen but not captured. To avoid the duplication of sightings comparisons on size, distinctive features, presence of tags (etc) can be made. This then leads to an encounter rate (ER) being quantifiable based on survey effort. For example, if two pairs conduct a 65 minute survey and encounter five turtles, the ER is calculated as:

$$ER = \frac{\text{Turtles Seen}}{\text{Survey Pairs} \times \text{Time (mins)}} \quad \text{so } ER = 5 / (2 \times 65) = 0.038$$

Although this rate is somewhat arbitrary (a fraction of turtles seen per minute) it can be multiplied by sixty to get a rate of turtles encountered per hour. It also avoids analytical problems later that would occur if the rate were worked out based on the number of minutes taken to see one turtle, as a survey producing zero sightings effectively increases the sites mean ER when it should in fact decrease it.



Once on the boat the captured turtles are placed in a shaded area on their backs regularly splashed with water. Morphometric measurements are taken (see picture), flipper tags attached, P.I.T. tags injected and genetic samples taken. These measurements are recorded on the datasheet found in Appendix I. Their weights would ideally also be recorded but presently DFMR doesn't have a suitable sling to use for this purpose. Photographs are taken before the turtle is released measurements later entered into a database.



**Figure 1** – Turtle sampling sites around Anguilla during 2007 & 2008. Permanent monitoring sites (PMS) are represented by the purple areas. Yellow areas have been confirmed to have turtles present, but are undergoing continued assessment before they are confirmed as long-term PMS. Grey areas did not contain turtles when sampled. Red dots represent Green Turtle netting sites, and blue dots potential sites that have not yet been sampled. The eight index beaches surveyed for nesting activity are highlighted in orange, with numbers referenced to names in the text.

### *In-water Green Turtle Sampling*

Surveying Green Turtles using this method is labour intensive and involves considerably more planning than Hawksbill in-water sampling. For these reasons it can not take place as regularly, and it is advisable to organise a group of volunteers, all of which must be strong swimmers, to help with the sampling. Also considerably more equipment is needed to undertake this sampling method – for example a large seine net and often a minimum of two boats (study site dependant). Snorkelling gear is needed, but fins with open backs are not encouraged because their clips can tangle in the net and pose a potential hazard. Also, jewellery should be removed and care must be taken by surveyors not to tangle their mask clips or snorkel in the net while retrieving turtles.

Currently only two sites are the subject of Green Turtle sampling – Island Harbour and Fish-hole Pond on Scrub Island (see figure 1). It is hoped that further sites will be added to this list over time, although logistical constraints limit this somewhat. For example, Road Bay is a good potential site but is rather deep and has heavy boat traffic. Forest Bay is another potential, although copious amounts of underwater obstacles currently inhibit its use.

Surveyors are split into pairs and get into the water awaiting net deployment. One end of the seine net is weighted and put into the water, with the remaining net in a small rowing boat. This rowing boat pays the net out as it makes an arc shape across the study site (see photograph). Once the net has been set, a larger vessel takes one end of the net and draws it to the weighted end. While this happens the snorkelling pairs swim rapidly around its perimeter and look for snagging hazards that might entangle the net as it is drawn closed. It is at this point that turtles start bumping and thus tangling in the net. The net is continued to be drawn in by the larger vessel, looping it passed the weighted end and thus forming an ever decreasing circle. When a turtle has been sighted entangled one of the surveyors should take hold of it from the outside of the net and bring it to the surface as quickly as possible so it may breathe. Further tangling is avoided as much as possible while the other member of the pair crosses over to the other side of the net and attempts to pull the turtle free from the direction it became entangled. If the turtle has become badly tangled then care must be taken not to injure the turtle, and in extreme cases the net may need to be cut. The captured turtles are taken to the rowing boat that transfers them to the larger vessel. Because for a short period there are usually large numbers of turtles tangling in the net an third boat can be useful to collect those captured, and the more surveyors there are in the water the less chance there is of a turtle suffering harm. One turtles have been captured they are taken to the main vessel and details recorded in an identical manner as described for Hawksbill Turtles.

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### *Morning Nesting Beach Surveys*

Eight 'index' beaches have been chosen on Anguilla to be part of the turtle nesting beach monitoring programme: Meads Bay (1), Long Bay (2), Limestone Bay (3), Black Garden Bay (4), Shoal Bay East (5), Captains Bay (6), Windward Point Bay (7) & Junks Hole (8) - see figure 1. These were chosen a number of years ago and may be modified in the future because of changes in their suitability (i.e. Sand Mining has left Windward Point almost devoid of sand), but for the time being will remain as they are until proper assessment can be made. Due to logistical issues this programme was not re-started until the end of 2008 and thus results presented later are somewhat limited. However, because it is an integral part of DFMR's further turtle monitoring programme the methods used are still described here, but will be discussed in terms of how the work is planned to be carried out during 2009. It is hoped to be possible to include some of the offshore cay beaches in this monitoring component as little is known about nesting activity in these areas although it is suspected to be relatively high (based on sporadic visits and past estimates). This will largely depend however on future DFMR work loads and priorities.

Between March & September (peak nesting season) the eight index beaches are scheduled to be walked a minimum of once a week, but preferably twice, at approximately 6am. The beaches are walked from end to end and any signs of nesting recorded on the datasheet that can be found in appendix I. If tracks are found then a species ID is made (FWC, 2007) and whether nesting appeared to occur or whether tracks are a false crawl. Track width is measured, and number of body pits counted (if present), with their distance from both high water mark and vegetation line measured. Once all measurements are taken the tracks are raked over to avoid it being counted again and to mitigate against potential poaching. If the nest is on a busy tourist beach however it may be made more visually obvious by cordoning it off to avoid trampling or other recreational activities.

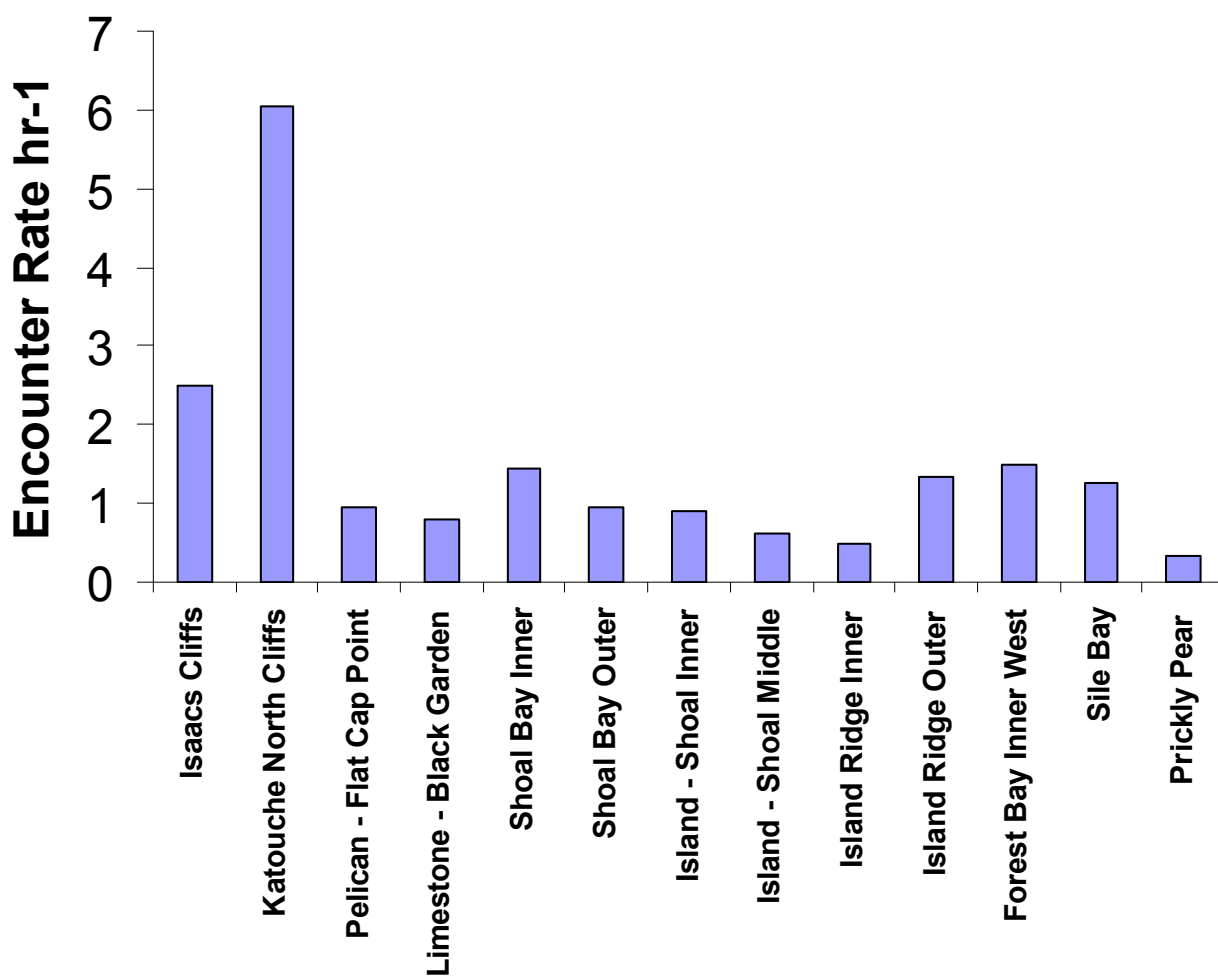
If an adult turtle is found in the process of nesting then once the activity has been concluded measurements are taken as detailed in the Hawksbill section. Below are two photographs taken at the Captains Bay index beach in 2007. The image on the left is of a Leatherback found nesting at midday in April 2007, while the image on the right are Hawksbill tracks noticed during an early beach visit in November 2006 before this project was fully underway.



## RESULTS

Individual turtle morphometric and tagging results can be found on the DFMR turtle database that is also shared with regional turtle programmes. Genetic samples are sent to the Marine Conservation Society in England to expand their genetic 'biogeography' database that will ultimately lead to a better understanding of turtle migratory patterns and therefore aid future conservation strategies. Populations results obtained from the DFMR surveys are presented below.

### *In-water Hawksbill Turtle Sampling*



**Figure 2** - Encounter rates across those sites quantifiably surveyed that had Hawksbill Turtles present (yellow areas on figure 1) – thirteen sites total. It should be noted that some of the yellow areas on figure 1 (i.e. Sandy Island Reef) are known to have turtles but their numbers have yet to be quantified. It should also be noted that replicate number varies across sites, largely dependant on site accessibility, susceptibility to bad weather,

and date the site became included in this programme. For example, the sheltered site in the vicinity of Little Bay has been sampled more than Sile Bay and Shoal Bay East.

From the graph it is clear that North Cliffs (Katouche Bay) has the highest Hawksbill encounter rate (ER = 6 hr<sup>-1</sup>) of all sites sampled. Indeed, from results so far it seems densities here are more than twice that of other areas, with Isaacs Cliffs possessing the second highest at 2.5 hr<sup>-1</sup>. Shoal Bay Inner, Island Ridge Outer, Forest Bay Inner West and Sile Bay all had encounter rates a little over one turtle per hour, with remaining sites below one per hour. The reef at Prickly Pear had the lowest encounter rate of all those surveyed with Hawksbills present (ER = 0.3 hr<sup>-1</sup>)

### *In-water Green Turtle Sampling*

**Table 1** – Green Turtle netting surveys at Fish-hole Pond (scrub Island) and Island Harbour during 2007 & 2008. These surveys were logistically difficult to organise, a fact that was hampered through not having a net, but as one has now been purchased it is hoped they will be a more regular event during 2009.

Date	Location	Start Time	End Time	Green Captured	Notes
12 <sup>th</sup> July 2007	Fish-hole Pond, Scrub Island	9.30AM	11.00AM	7	Five small greens and one slightly larger individual. Also one recapture which had scars from old flipper tags but pit tag in place.
26 <sup>th</sup> June 2008	Island Harbour	8.30AM	10.00AM	12	Most generally small although a couple were a little larger.
6 <sup>th</sup> Nov 2008	Island Harbour	8.30AM	9.30AM	10	Although ten captured, one adult green escaped the net and although a tagged individual was swimming within the net no tagged individuals were caught. One small individual and two large, with the rest of medium size.
6 <sup>th</sup> Nov 2008	Island Harbour	9.30AM	10.30AM	7	Second round of netting for the day, with later time probably contributing to lower numbers captured. Net deployed in different area to first round. No escapees noticed. All of medium size.



### *Morning Nesting Beach Surveys*

**Table 2** – Summary of nesting activity recorded on the eight index beaches during the latter part of 2008. In addition to this data a Hawksbill false crawl was also recorded at Lockrum beach on 30<sup>th</sup> October. The beach with the highest amount of activity is, especially in relation to its small size, Captains Bay. Although Shoal Bay East likely has the greatest number of successful nestings, the beach here is much longer, and so per unit of habitat is considered less active.

<b>Index Beach</b>	<b>Summary of Activity</b>
<b>Limestone Bay</b>	Visited on four occasions between August and October with activity noted on three occasions. All were false crawls. One by a Hawksbill, one by a Green and one unidentified.
<b>Black Garden Bay</b>	Visited once in October, with no activity recorded
<b>Shoal Bay East</b>	Visited on three occasions in September and October, twice with activity noted and once with confirmed nesting. Nesting species were unknown, although of note is that early in 2009 c.5 almost simultaneous Hawksbill nests hatched at Fountain Beach and also outside Ku resort.
<b>Captains Bay</b>	Visited on three occasions between July and November with nesting activity noted on two of these. On July 29 <sup>th</sup> four sets of tracks were recorded, three from Leatherbacks and one from a Green, although only one Leatherback activity was linked to a confirmed nest. A second confirmed Leatherback nest was recorded in November
<b>Windward Point Bay</b>	Visited once in September, with no activity recorded
<b>Junks Hole</b>	Visited once in September, with no activity recorded
<b>Meads Bay</b>	Visited twice between May & September with one confirmed Green Turtle nesting
<b>Long Bay</b>	Visited twice in September with one set of Green false crawl recorded

### **DISCUSSION**

It should be noted that as this programme is in its infancy few conclusions can be drawn about trends in turtle populations brought about by the latest moratorium. Only limited in-water work was conducted prior to 2005 and thus present results can not be robustly compared to these sporadic and largely unquantified surveys. This will however be possible over subsequent years if the present programme continues successfully. The majority of the work conducted prior to 2005 was beach orientated, and because this aspect has only just been restarted by DFMR again no temporal comparisons can be robustly made, and thus will again be the subject of future reports. Hence, it is re-emphasised that this document is simply a progress report on the work conducted by DFMR since the formal re-establishment of their turtle programme, and the basis of future work that will begin to collate a dataset with the potential to make policy recommendations.

Thus, although there are very few conclusions to be drawn, aside from the fact that turtles are still present in much of the water around Anguilla (if in markedly reduced numbers from those that are suspected to have existed historically), it is possible to make recommendations for the direction of this project on into 2009. These are presented below:

#### *In-water Hawksbill Turtle Sampling*

From the results and in an attempt to spread sites a little more evenly around the coast of Anguilla (i.e. not just selecting sites based on those with highest densities of Hawksbill Turtles), it has been decided to choose the following sites for survey work in 2009: Isaacs Cliffs, North Cliffs, Pelican Point to Flatcap Point; Limestone Bay to Black Garden Bay; Shoal Bay East Inner Reef; Island Harbour to Shoal Bay East Inner Reef, Sile Bay, and Forest Bay Inner West Reef. Island Ridge Outer Reef will also be resurveyed as it yielded quite encouraging numbers of turtles but was only sampled once.

From the results obtained in 2009, which aside from surveying the above named sites will also assess new potential sites, this list may again be modified at the end of the year with the hope of deciding upon the final PMS selections that will form the core of DFMR Hawksbill in-water sampling by the beginning of 2010. Potential sites include Sandy Island, Prickly Pear, Scrub Island, and some south coast areas. It is also recognised that if logistics allow and sites are available, it might be beneficial for the project if the number of PMS surveyed in ultimately increased.

#### *In-water Green Turtle Sampling*

As no further sites have at present been confirmed as logistically viable for this type of survey work, the two present sites will be the only ones sampled regularly during 2009. It is recommended that other sites be assessed for their potential however (i.e. some of the seagrass areas in the west end of the island), as it is ultimately beneficial to have the greatest number of sampling sites possible.

#### *Morning Nesting Beach Surveys*

Although it is recognised that the current list of index beaches goes back historically and thus serve the best potential for temporal analysis, it is felt that it might be prudent to either add to the list (i.e. Offshore cay beaches), or make exchanges due to changing circumstances. For example, Windward Point no longer possesses sand and so is unlikely to be successfully visited by turtles, and even if it were to be, they would lead very little sign of being there. Currently no beaches are regularly monitored along the south-western coast of Anguilla, most of which are potentially suitable nesting beaches, and so one of these might be a suitable replacement. Although it can be argued that the presence of many tourists and beach front lighting at these beaches may deter nesting turtles, from the work conducted thus far it is apparent that both Meads Bay and Shoal Bay East are similarly circumstanced, and yet still receive successfully nesting turtles. Furthermore, being tourist beaches, nests would benefit from demarcation (to avoid trampling, sand castle building etc), and potentially be enhanced by their presence because of their fascination with and protectiveness of these charismatic species.

## REFERENCES

FWC, 2007. Florida Fish & Wildlife Conservation Commission Marine Turtle Conservation Guidelines. Anonymous author. Available online at [http://www.myfwc.com/WILDLIFEHABITATS/Seaturtle\\_ConservationGuide.htm](http://www.myfwc.com/WILDLIFEHABITATS/Seaturtle_ConservationGuide.htm)

Godley BJ, Broderick AC, Campbell LM, Ranger S, Richardson PB (2004) 4. An Assessment of the Status and Exploitation of Marine Turtles in Anguilla. In: An Assessment of the Status and Exploitation of Marine Turtles in the UK Overseas Territories in the Wider Caribbean. pp 39-77. Final Project Report for the Department of Environment, Food and Rural Affairs and the Foreign and Commonwealth Office.



# APPENDIX 1

## DFMR IN-WATER SEA TURTLE SAMPLING DATA SHEET

TURTLE ID:                      CAPTURE DATE:                      LOCATION:  
RECORDED BY:                      SPECIES (circle): HB GB LB LH                      SEX: M F U

### BIOMETRIC MEASUREMENTS

MEASURED BY:                      STRAIGHT PLASTRON LENGTH – PL (cm):  
STRAIGHT CARAPACE LENGTH – SCL<sub>n-t</sub> (cm):                      STRAIGHT CARAPACE WIDTH – SCW (cm):  
CURVE CARAPACE LENGTH – CCL<sub>n-t</sub> (cm):                      CURVE CARAPACE WIDTH – CCW (cm):  
WEIGHT:                      kg / lbs

### TAGGING DETAILS

PREVIOUSLY TAGGED: Y / N                      TAG LOCATION:                      TAG #:  
PREVIOUSLY PIT TAGGED: Y / N                      TAG LOCATION:                      TAG #:  
TAGGED: Y / N                      TAG LOCATION:                      TAG #:  
PIT TAGGED: Y / N                      TAG LOCATION:                      TAG #:

### ADDITIONAL DETAILS

PAPILLOMA: Y / N                      GENETIC SAMPLE: Y / N                      BODY PART SAMPLED:  
METHOD OF CAPTURE: NET / HAND / NESTING                      HABITAT TYPE WHERE CAPTURED:  
WATER DEPTH:                      ft / m                      WATER TEMPERATURE:                      C / F  
VISIBILITY: Good / Moderate / Poor                      SET #:                      SET TIME:                      SNORKELLING TIME:  
MOON PHASE: NEWMOON / FIRST QUARTER / FULL MOON / LAST QUARTER  
GPS COORDINATES:                      'N                      'W

NOTES:

