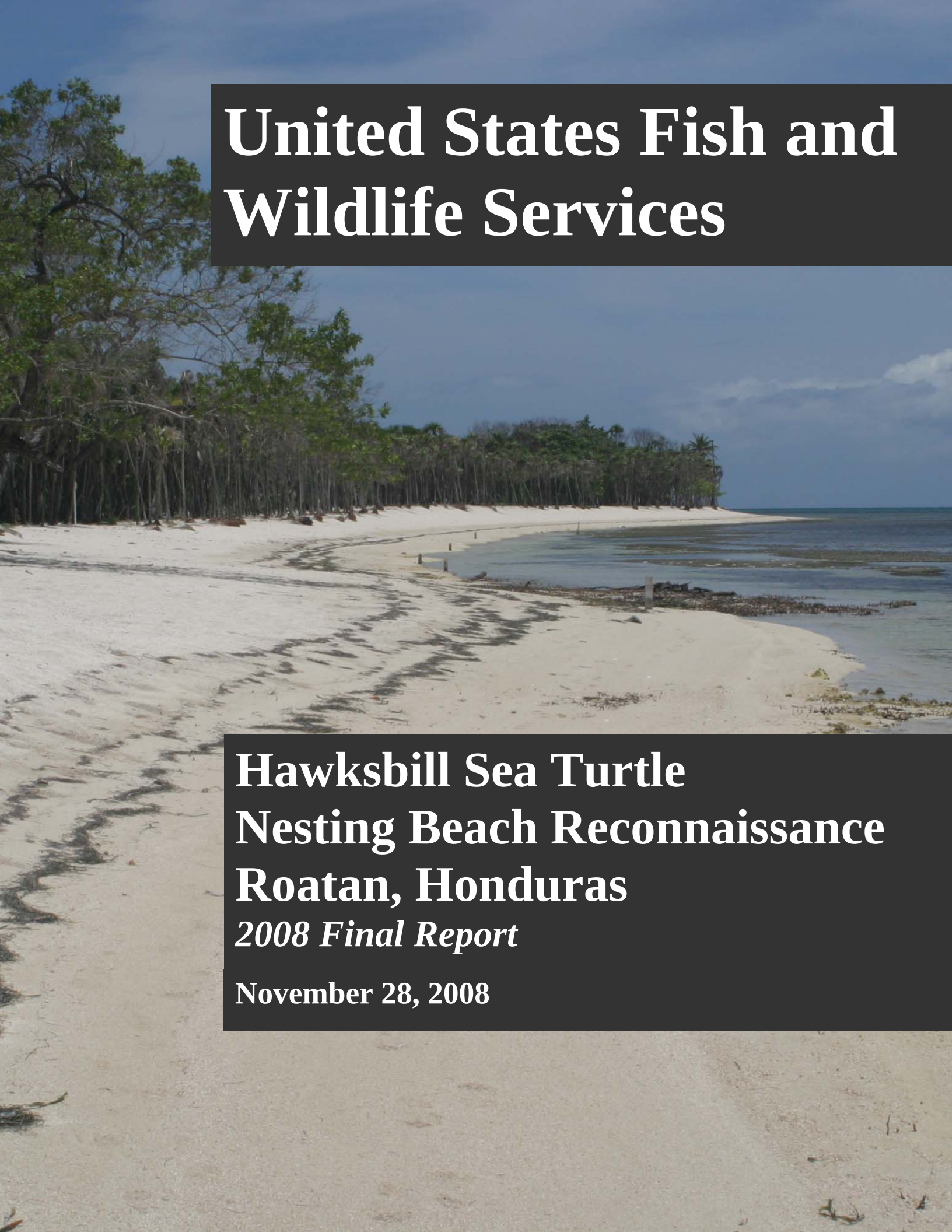

United States Fish and Wildlife Services

Hawksbill Sea Turtle Nesting Beach Reconnaissance Roatan, Honduras

2008 Final Report

November 28, 2008

Hawksbill Sea Turtle Nesting Beach Reconnaissance on Roatan, Honduras
2008 Final Report

Award Performance Period: August 29, 2007 – August 28, 2008
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PREFACE

Data for populations of hawksbills in the Caribbean is scant. However, for the Bay Islands of Honduras, data is almost completely lacking. This preliminary study undertook a reconnaissance of beaches around Roatan to investigate hawksbill presence and nesting activity. He results of the study will be provided to government offices of Honduras to assist with the management of hawksbill populations in the Bay Islands.

ACKNOWLEDGEMENTS

Sea turtle conservation is a priority activity of the USFWS-Marine Turtle Conservation Fund (MTCF), as demonstrated by the funding support provided to projects around the world. We gratefully acknowledge the financial assistance provided to this project by the USFWS-MTCF. We are thankful to Mr. Earl Possardt for his encouragement and administrative assistance. This report was prepared by Stephen G. Dunbar and Melissa Berube. We are thankful to Joe Breman for assistance with GIS work. Much of the beach walking was done by dedicated volunteers, such as Irma Brady of the Bay Islands Conservation Association (BICA-Roatan), Joe Breman, and the two teams from Outlook Expeditions, arranged by Mr Edward Stones. Ms. Lizzette Pozzi and her grounds staff, headed by Mr. Osman Paz, allowed us access to her private beach for which we are grateful. Thanks to Clay and Heather Donnelly, and Bob Brown of Bay Islands Airways who provided outstanding air service for aerial surveys and who continue to spot turtles for the project. We appreciate the contribution of dive location records by Ignacio Gonzalez. Thanks to Patty Grier of CoCo View Resort, Davitt and Choco of Reef House Resort, and Darren and Wilma of Fantasy Island Resort who all continue to assist with dive sighting data collection. We gratefully acknowledge SAG, DIGEPESCA, SERNA and DiBio of the Honduras government for research permits. Thanks to the Department of Earth and Biological Sciences at Loma Linda University for research support.

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PROJECT SUMMARY

Caribbean populations of hawksbills are in critical danger of continued decline over the next several decades, although some populations of this species are currently on the rise in areas of their distributions (Richardson *et al.*, 2006). Despite active advances in research on marine turtles and reports of increased nestings in some regions, other areas of the Caribbean have not taken large steps toward integrating beach monitoring and sea turtle management.

Despite historical references to large numbers of hawksbills along the north coast and Bay Islands of Honduras (Roberts, 1827, in Meylan 1999; Carr *et al*., 1982; Cruz & Espinal, 1987) and to the Bay Islands as a major nesting area for this species (de Rochefort, 1666; Long, 1774; Dampier, 1968), little effort has been made to investigate potential recovery of hawksbills in these waters.

This project was an initial investigation into the potential for recovery efforts of hawksbill (*Eretmochelys imbricata*) populations around the island of Roatan, Honduras through a reconnaissance of prospective nesting beaches around the island. The project operated through the use of personal interviews, concentrated beach monitoring, aerial surveys, and preliminary community monitoring efforts. Personal interviews were conducted with local residents to determine where sea turtles have historically (over the past 50 years) nested, and where local community members have most recently confirmed nesting turtles. These interviews were also used to investigate the issue of egg harvesting on the island.

Potential and confirmed nesting beaches were mapped in a Geographical Information System (GIS) and records continue to be collected on mating aggregations, nestings, and sightings of hatchlings on beaches, as well as inshore waters. In addition, data continue to be collected through trained dive operators on in-water sightings of adult turtles in some areas off the Roatan coast. Although limited data are available over the one-year timeline of this project, long-term data will help to identify trends in when and where mating aggregations are occurring in the area, and to which beach areas should be targeted for intensive, season-long monitoring for nesting hawksbills.

BACKGROUND

There is evidence from the writings of early explorers and naturalists, that large nesting populations of hawksbill turtles have been found on beaches throughout the Caribbean region (de Rochefort, 1666; Long, 1774; Dampier, 1968; (McClenachan *et al.*, 2006). Scientific monitoring of nesting beach populations has only been done since the mid-1950's and very few projects have focused on hawksbills (Meylan & Donnelly, 1999). Recently, McClenachan *et al.* (2006) located 55 historic hawksbill nesting sites throughout the Caribbean, of which seven supported "major" populations. In their study, each "major" hawksbill nesting site was estimated to support at least 135,000 adults in

the 1950's. However, today, 44 % of these nesting beaches have fewer than 10 nesting females, or are sites on which nestings are rare (McClenachan *et al.*, 2006).

According to historical documentation from de Rochefort (1666), Long (1774) and Dampier (1968), and the recent estimates by McClenachan *et al*. (2006), the Bay Islands of Honduras was one of the seven "major" nesting sites for the region. In recent decades, hawksbill nestings have been described as depleted around the Bay Islands (Carr *et al.*, 1982; Meylan, 1999). Still, Cruz and Espinal (1987) report hawksbills to be the most observed and reported species of sea turtle around the Bay Islands and Misquito cays (Figure 1).

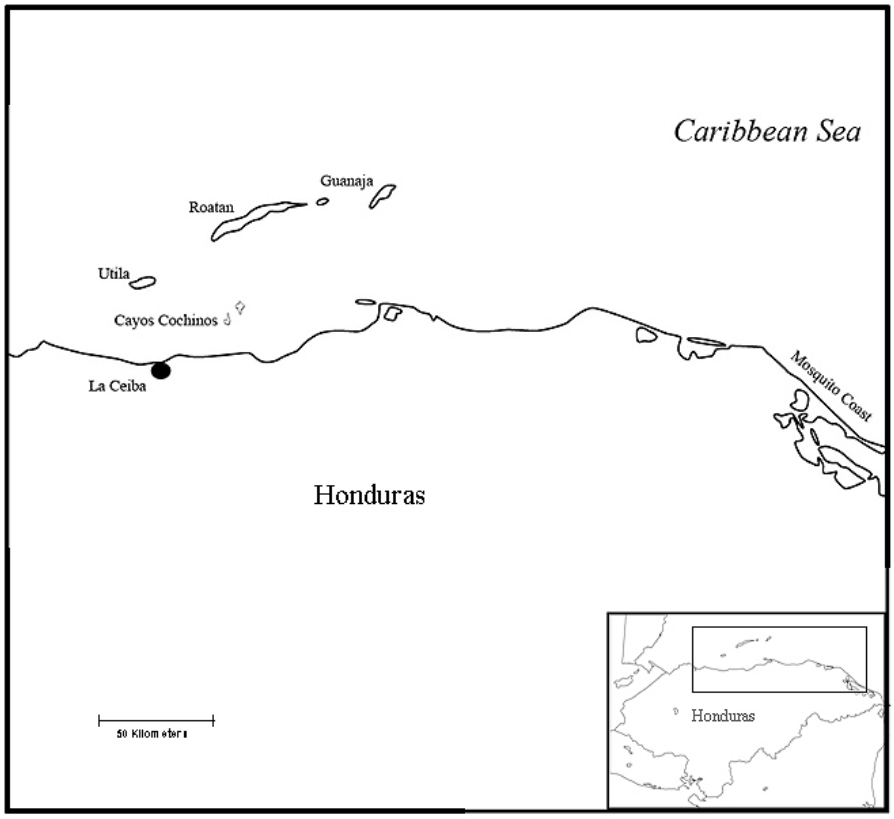


Figure 1. Area map of the Caribbean coast of Honduras, showing the locations of the Misquito Coast, Cayos Cochinos, and Bay Islands with inset of country region.

On the island of Roatan, our recent preliminary interviews with long-time residents and local fishermen suggest that there is a noticeable decline in the number of sea turtles that nest on local beaches and populate coastal waters of the island. Declines are reported by local residents, yet little effort has been made to understand why population numbers are falling. Previous to the current study, there have been no published maps of known nesting beaches, no published estimates of populations based on nesting females, and no investigations into hatching success in the Bay Islands. Furthermore, no monitoring programs of nesting beaches on Roatan, or in the Bay Islands, aside from some work on hatchling dispersal from Cayos Cochinos by Hasbún (2002) have been published.

Consequently, there are no forms of local or national databases for marine turtles throughout the Bay Islands. Aside from a recent publication by Dunbar *et al*. (2008), and a previous study by Hasbún (2002), there have been no publications providing information to researchers and conservationists regarding status and trends of populations in this area of the hawksbill's Caribbean range. Without such basic information, few effective efforts can be made by managers to protect nesting beaches or turtle populations. There is strong evidence that even very small nesting beach populations of other sea turtle species do recover (Balazs & Chaloupka, 2004), and that protection of nesting beaches does play a roll in population recovery (Balazs & Chaloupka, 2004; Hays, 2004).

CURRENT PROJECT STATUS

A. Objectives Achieved

Objectives: To undertake a reconnaissance and confirm the use of nesting beaches by hawksbills as an initial step towards a country-wide monitoring network. To develop and standardize methodologies for monitoring nesting hawksbills that is transferable to other areas. To map beaches with active nesting, undertake counts, measurements and flipper tagging of nesters, and assess numbers of hatchlings occurring on Roatan beaches.

Work Achieved: During the grant activity period, an effort was made to confirm the presence and activity of nesting hawksbills on Roatan beaches. Informal interviews with local fishermen were carried out to ascertain where, and in what months participants previously saw turtles nesting (during the past 50 years), and when they last recalled seeing a turtle nest on local beaches.

Prior to receiving funding from USFWS-MTCF, initial efforts to locate hawksbill nesting beaches on Roatan were accomplished by interviews of local fishermen in 2006. These included people in the communities of West Bay, West Bay Beach, Flower's Bay, Marbella Beach, Punta Pimienta, Turquoise Bay, Punta Gorda, Paya Bay, Camp Bay, Oak Ridge, French Harbour, and French Cay (Figure 2; see also Appendix II for examples of beaches). Interviews were followed up by visits to beaches corresponding to these communities. Additional interviews were conducted with people living on the beaches to ascertain the most recent sightings of nesting turtles on these beaches. Upon completion of interviews with beach residents, SGD and associates, Irma Brady from the Bay Islands Conservation Association (BICA-Roatan), and Joe Breman (ESRI), walked the beaches to investigate evidence for nesting turtles during the 2006 nesting season (June through November). We looked for crawls, nest depressions, hatchling remains and egg shell debris as evidence that nesting had occurred on these beaches. These data have been incorporated into this report (Table 1).

During the pre-project activity period of 2006, we received anecdotal evidence of turtle nesting on all of the beaches we visited. Unfortunately, many of the people we interviewed were unable to provide definitive evidence of species-level identification of

nesting turtles. Some reports provided by interviewees suggested that nesting had taken place on a few beaches as recently as the year before (i.e. 2005), but on most beaches there had not been any reported sightings of turtles in the last three to five years (according to residents). Furthermore, during the 2006 investigation period, we were unable to find any confirmed evidence of hawksbill nesting on any of the beaches we investigated.

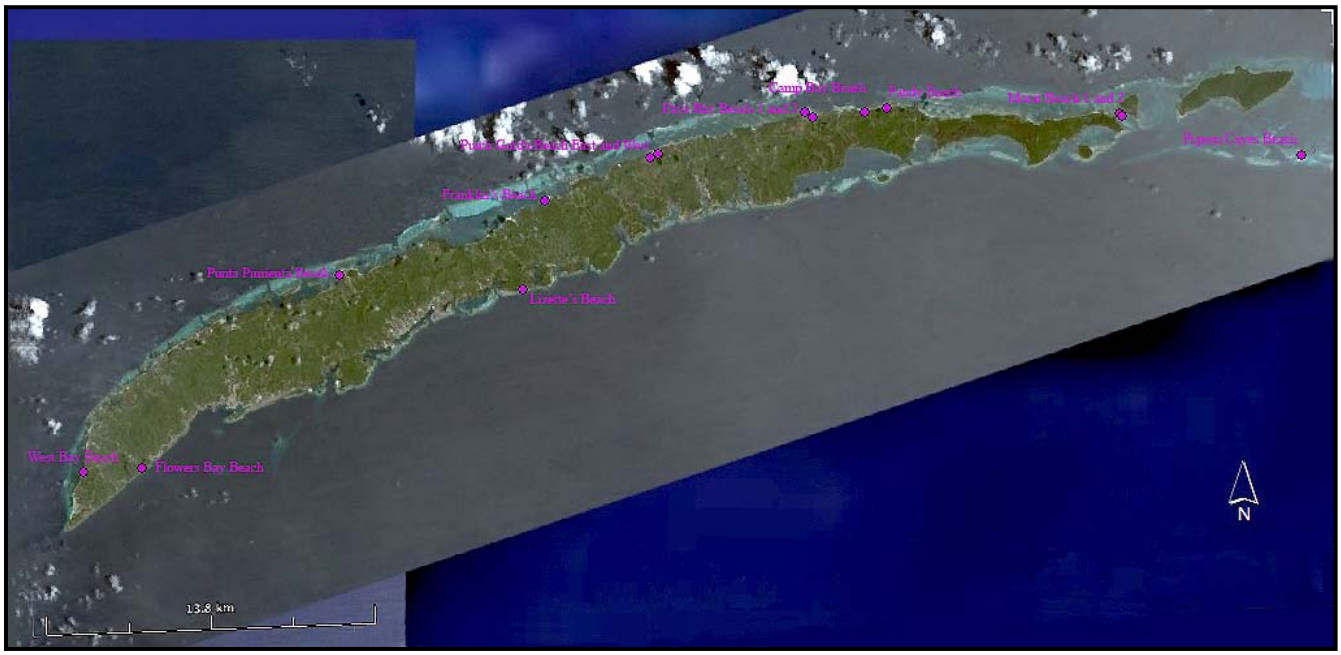


Figure 7. Map of potential nesting beach locations around Roatan, Honduras.

The nesting season was reported by local community members to be between the months of June and November. These anecdotal estimates coincided well with the hawksbill nesting season for nearby Cayos Cohinos as reported by Hasbún (2002).

A protocol for monitoring beaches was developed in 2007 and provided to volunteers during a two-hour training session during the project period of June to September, 2007. The protocol included a data collection sheet for nesting females (Appendix IA) and hatchlings (Appendix IB), as well as a laminated sheet providing distinguishing features of species likely to be encountered on Roatan (Figure 3). If the Project Officer or Project Assistant were available, straight carapace lengths (SCL-minimum and maximum) and straight carapace width (SCW) were also recorded. Volunteers were trained in how to record curved carapace lengths (CCL -minimum and maximum) and curved carapace width (CCW) and were provided with a soft tape measure. Volunteers mainly consisted of two groups of "Outlook Expeditions" participants. These groups were organized by Mr. Edward Stones from the company head office in Scotland. The first group of 12 participants, under the direction of Ms. Cara Allison, monitored Camp Bay Beach (N16°25'44.7", W086°17'26.8") from July 17 – 21, 2007, and Paya Bay Beach East

(N16°25'38.0", W086°18'39.4") July 18 and 20, 2007. The second group of 11 participants, under the direction of Mr. Tom Allen, monitored Camp Bay Beach from August 14 – 17, 2007, and Paya Bay Beach East on August 15, 2007 (Figures 3, 4, 5, and 6). Participants patrolled the beaches throughout the night with two teams of two people. These teams were switched with fresh teams every 2 to 3 hours. Teams stayed in contact with each other and the base camp by two-way radios, and were provided a cell phone to contact the Project Officer in case a turtle was sighted. If a turtle sighting occurred, volunteers were instructed to restrict the turtle from returning to the water after nesting. Upon arrival of the Project Officer, species was to be confirmed, and the turtle was to be measured, flipper tagged with Inconel (681 style) tags, photographed, and released.

Additionally, the Project Officer and Project Assistant monitored beaches personally, during periods of the 2007 – 2008 nesting season. These are indicated by initials SGD and MB under "Monitoring Group" in Table 1. We undertook beach walks irregularly from July 29, 2007 – September 6, 2008. In all, 291,039 m^2 of local beach area were surveyed for evidence of nesting hawksbills, and mapped in a GIS database[1].

The beach walk and data collection protocols were standardized and are now being used on a nesting beach monitoring project in another area of Honduras, although equipment available to volunteers may vary.

Table 1. Data recorded for each beach surveyed and monitored for the period March, 2006 – September, 2008. Monitoring group codes: SGD = Stephen G Dunbar; JB = Joe Breman; IB = Irma Brady; MB = Melissa Berube; OE = Outlook Expeditions; CD = Clay Donnelly; O = Osman Paz; DK = David Kirkwood.

Date	Beach Name	Lat/Long	Beach Area (m^2)	Monitoring Time	Monitoring Group
3/2/2006	Punta Gorda Beach	N16°24'40.1" W086°22'29.1"	43,267	9:30am – 12:10pm	SGD
3/7/2006	Flower's Bay Beach	N16°17'24.6" W086°34'23.5"	44,273	2:00pm – 4:40pm	SGD,JB,IB
6/19/2006	Punta Pimienta Beach	N16°21'55.6" W086°29'45.5"	16,632	10:50am – 12:45pm	SGD,JB,IB
6/20/2006	West Bay Beach	N16°17'19.8" W086°35'46.0"	11,546	11:30am – 2:25pm	SGD,JB,IB
6/27/2006	Pandy Beach	N16°25'50.9" W086°16'42.3"	30,749	1:30pm – 2:45pm	SGD
6/27/2006	Camp Bay Beach	N16°25'44.7" W086°17'26.8"	18,909	10:35am – 1:20pm	SGD,IB
6/27/2006	Paya Bay Beach E	N16°25'38.0", W086°18'39.4"	21,586	1:20pm – 2:20pm	SGD
6/27/2006	Paya Bay	N16°25'43.55",W086°18'51.38"	3,529	11:25am –	SGD

[1] Our ArcGIS base map file was corrupted just prior to the writing of this report. We will be remaking this file and sending to USFWS as a future addendum to this report.

	Beach W			1:10pm	
6/27/2006	Franklin's Beach	N16°23'39.5", W086°24'57.1"	31,999	9:30am – 11:00am	SGD
6/30/2006	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		12:30am – 5:00am	SGD
7/7/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		12:15am – 4:15am	SGD,MB
7/14/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		12:25am – 3:45am	SGD,MB
7/17/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
7/18/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
7/18/2007	Paya Bay Beach E	N16°25'38.0", W086°18'39.4"		8:15pm – 4:30am	OE
7/19/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
7/19/2007	Franklin's Beach	N16°23'39.5", W086°24'57.1"		3:30pm – 5:20pm	SGD
7/19/2007	Pigeon Cayes Beach	N16°24'44.4", W086° 7'12.2"	37,841	2:30pm – 4:00pm	SGD,CD
7/20/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.78"		8:15pm – 4:30am	OE
7/20/2007	Paya Bay Beach E	N16°25'38.0", W086°18'39.4"		8:15pm – 4:30am	OE
8/11/2007	Lizzette's Beach	N16°21'35.2", W086°25'27.9"	11,799	4:00pm – 9:00pm	O
8/14/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
8/15/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
8/15/2007	Paya Bay Beach E	N16°25'38.0", W086°18'39.4"		8:15pm – 4:30am	OE
8/16/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
8/17/2007	Camp Bay Beach	N16°25'44.7", W086°17'26.8"		8:15pm – 4:30am	OE
9/4/2007	Lizzette's Beach	N16°21'35.2", W086°25'27.9"		4:00pm – 9:00pm	O
9/9/2007	Lizzette's Beach	N16°21'35.2", W086°25'27.9"		5:15pm – 10:20pm	O
9/14/2007	Lizzette's Beach	N16°21'35.2", W086°25'27.9"		5:15pm – 10:20pm	O
9/21/2008	Morat Beach S	N16°25'39.7", W086°11'24.8"	18,909	11:30am – 1:00pm	SGD,DK
9/21/2008	Morat Beach N	N16°25'42.5",W086°11'29.3"		1:00pm – 3:00pm	SGD,DK

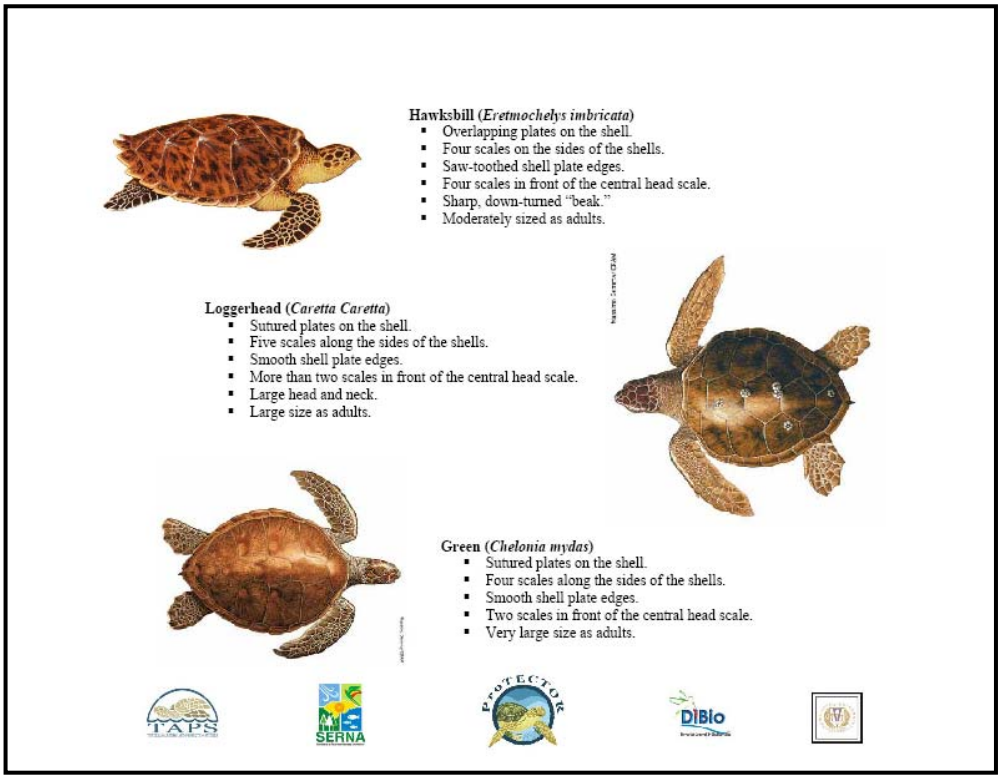


Figure 3. A sea turtle identification sheet provided to volunteer beach monitoring groups. This card is also available in Spanish.

Figure 4. Outlook Expeditions participant set up camp before receiving training on turtle nesting beach monitoring and species identification procedures.

Figure 5. Outlook Expeditions participants practice operating a handheld GPS unit.

Figure 6. A volunteer with Outlook Expeditions acquires a GPS reading while local children look on.

Figure 7. Participation in the nesting beach reconnaissance project provided opportunities for young volunteers to develop skills of data collection.

Although we were unable to monitor all beaches on the island during the 2007 – 2008 activity period, we were able to map many of the beaches on Roatan that were anecdotally reported to have turtle nesting occurrences in the past. However, species identification through anecdotal reports remains unclear because in many cases, local community members were unable to give a positive species identification by description, or provide physical evidence of turtle remains.

From June 17 to August 10, 2007, no hawksbills were reported or observed nesting on any of the beaches being monitored. In addition, no reports were received regarding nestings of hawksbills at unmonitored beaches on Roatan. Therefore, during this time, no nesting turtles were measured, no nests were reported or located, and no eggs were retrieved or counted. However, on August 16, 2007, we received reports by telephone that a single hawksbill turtle had emerged at Lizzette's Beach (N16°21'35.2",W086°25'27.9"), a privately-owned property on the south-central coast of Roatan. This turtle emerged on August 11, 2007 and crawled up the 30 m beach (Figures 8 and 9) to where the sand strand ends. This turtle was unable to dig out a nest, but deposited approximately 140 eggs on the sand surface. Once the turtle had returned to the water, the grounds keeper, Mr. Osman Paz immediately dug a nest where he placed all the eggs. The same grounds staff reported that on the night of August 21, 2007, the same turtle emerged again (Figure 10) and came up the beach to the previous nest, but did not deposit any eggs at that time. Mr. Paz reported that once again, on September 4, 2007, this same turtle emerged for a third time (Figure and 11) and dug a shallow nest within 2

m of the previous nest (Figure 12). Here the turtle again deposited several eggs. However, the number of eggs was not counted.

This report is consistent with reproductive data for other Caribbean hawksbill populations that report 3.5 to 5 nests per season (Richardson *et al.*, 1989; Hillis, 1995), and up to 150 eggs per average clutch (Corliss *et al.*, 1989; Hillis, 1994a).

Figure 8. One of the track ways left at Lizzette's Beach by *E. imbricata* in August, 2007. It is believed the same female emerged on this beach three times in the 2007 nesting season.

Figure 9. The view toward the water's edge from Lizzette's Beach. The distance from the water to the nest site is approximately 31 m.

Figure 10. The only confirmed nesting *E. imbricata* on Roatan at Lizzette's Beach during the 2007 nesting season. This turtle is believed to have emerged three times over the 2007 season, although only laying eggs during two events.

Figure 11. A grounds keeper inspecting the single nesting *E. imbricata* on September 4, 2007 at Lizzette's Beach.

Figure 12. Two nests laid at Lizzette's Beach and protected from predation by netting structures built by Mr. Osman Paz.

Mr. Paz was shown how to assist the hatchlings out of the nest on the initiation of emergence, and how to uncover the nest after emergence of the hatchings. He was also instructed to count the number emerged, those dead in the sand, dead in the nest, and the number of unhatched eggs. In March, 2008, Mr. Paz reported that none of the eggs laid had resulted in emerged hatchlings. On further inspection, Mr. Paz realized none of the eggs in either nest had hatched, but did not count the eggs in the second nest. Reasons for total mortality of both nests remain unknown. Mr. Paz continued to monitor this beach for hawksbill nesting during the 2008 nesting season. Until the time of this report, no turtles were reported to have remigrated to this site. However, nesting remigration intervals of two to three years have been reported in some populations of Caribbean hawksbills (Corliss *et al.*, 1990; Hillis, 1994a, 1994b).

During the nesting season in 2008, we received anecdotal reports of hawksbills nesting on Morat Beach (N16°25'42.5", W086°11'29.3") from community members at the fishing village of St. Helena (N16°25'7.3", W086°12'31.4"). When we investigated the beaches on Morat on September 21, we were unable to verify the presence of crawls, nests, hatchling remains, or egg shells. We were later told by a fisherman from St. Helena that he expected turtles to begin nesting there at the beginning to middle of October. To date, we have received no confirmation of nesting activity there, although we have not been able to return to the island since the initial visit in September.

The presence of neonatal hawksbills around Roatan may also provide positive evidence that nesting is taking place on, or near the island. Published data on hawksbill neonates from the Bay Islands consist of only one report by Hasbún (2002) in which he followed twelve neonates as they were released from the three beaches on Cayos Cochinos from which they were hatched. In addition, he observed the feeding of 30 sibling neonates held in a 3 m tank at the Cayos Cochinos Biological Reserve. Although no total numbers of clutches or hatchlings are provided, it is clear that hawksbills nested on Cayos Cochinos, at least during the period of study by Hasbún (2002).

Surface waters of the northern shelf of Honduras are influenced by a small, counter-clockwise current that directly washes the shores of the Bay Islands (US-Defense Mapping Agency, 1990 in Hasbún, 2002). These local currents may cause neonates to remain close to reef systems on the Honduran shelf.

Neonatal hawksbills from Honduras were previously observed to interrupt their initial swimming activity during the first day of dispersal from the nesting beach when encountering *Sargassum* floats (Hasbún, 2002). Hasbún (2002) suggested this may indicate that hawksbill neonates from the Cayos Cochinos area could stay closely associated with reef systems off Honduras, rather than being dispersed far away from their natal beaches into the wider Caribbean. This concept is supported by previous suggestions that some hatchlings and juveniles may remain close to their natal beaches (Witzell & Banner, 1980), and that more coastal, less migratory species (such as hawksbills) may spend more time swimming slowly (Davenport & Clough, 1986), and therefore may be less widely dispersed than more migratory species.

On August 19, 2008, we received a message from the Roatan Marine Park (RMP) that a local community member at Paya Bay Beach East, had discovered a hatchling at the surface of a nest. After excavating the nest, he collected approximately 100 hatchlings which he put into a five gallon bucket. On returning to the unattended bucket, the individual found that domestic dogs were in the process of killing and eating most of the hatchlings. He managed to save only six neonates and took them to Arch's Iguana Farm (a TAPS Conservation Partner). We had hopes that these would be further evidence of *E. imbricata* nestings on Roatan. However, on inspection, these turned out to be *C. caretta* neonates (species identification confirmed from photos by J. Wyneken), and were released by RMP staff beyond the reef near Half Moon Bay (West End) the following night.

On October 27, 2008, Mr. Jo Carlow and Mr. Nick Taruscio located a neonate *E. imbricata* underneath the dock at the West End of Roatan. The turtle appeared weak and was being battered against the rocky foundations of the dock pilings by wave action. The two men captured the hatchling and took it to the RMP office. The turtle was examined by a veterinarian, and is currently in a facility for recovery.

RECOMMENDATIONS

We recommend that a program of genetic analyses be undertaken in the Bay Islands to investigate the relationship of neonates, juveniles, and nesting hawksbills, as well as those hawksbills captured in-water during the mating season. Tissue samples have been collected from 29 juvenile hawksbills as part of a tracking study along the Port Royal area of Roatan carried out by Project Assistant, Melissa Berube. Funding is being sought to initiate a program to capture, tag, and collect tissue samples for genetic analyses of adult hawksbills in the area of Roatan, Utila, Guanaja, and Cayos Cochinos.

Objectives: Select and train a local participant to assist in the monitoring and mapping reconnaissance. Through this process we will develop methods for training other volunteers that will take part in subsequent nesting beach monitoring activities. These participants will receive feedback and further training as required.

Work Achieved: During the grant activity period, we provided basic training to Mr. Osman Paz and his assistant grounds keeper who reported and confirmed a nesting *E. imbricata* at Lizzette's Beach on Roatan. Both trainees received instructions on how to protect the nests, what to do with hatchlings, how to measure the hatchlings once they emerged, and how to release the turtles to minimize predation. These were the only local participants to receive training during the 2007 – 2008 project period. We plan to further train Mr. Paz in how to collect CCL and CCW measurements and record these data on the sheets developed. We continue to develop presentations and methods for training local participants that will facilitate a sense of ownership for conservation and research efforts, and provide community capacity-building.

We encountered some resistance to being involved in methodological training by local community members. Potential participants were willing to be trained and participate if financial remuneration were offered on a regular basis. With limited funds for this preliminary project, we were unable to fund regular salaries of potential trainees. Thus, participation from local community members for the long-term was limited.

In contrast, we were able to provide training to 24 volunteers who either joined us on monitoring beach walks, or were trained to monitor beaches in our absence. These participants were visitors to Roatan. The majority of this group had made prior arrangements to come to the island for the purpose of assisting with monitoring. One participant was a guest of a nearby resort and joined the monitoring effort in hopes of seeing a nesting hawksbill turtle.

RECOMMENDATIONS

We believe a program of initial training and regular refresher training, along with appropriate financial compensation, would provide the ability to more completely monitor all potential nesting beaches throughout Roatan. A program such as the Turtle Nesting Hotline, currently being developed by the Project Officer for the 2009 season, would have three dedicated teams of respondents, each with their own hotline cell phone. Hotline numbers would be well publicized around the island. On encountering a turtle, the team in that area would be notified and would respond with a standard series of activities, including tagging, measuring, nest protection or relocation, and ensuring the safe return of the turtle to the water. Remuneration would include a small activity salary and costs for transportation to the beach site.

Ms. Jessica Pate with the Bay Islands Conservation Association (BICA – Utila) has recently requested that TAPS partner with them to conduct dive and nesting beach monitoring around Utila. We propose to meet with BICA-Utila in March, 2009 to train and prepare them for monitoring beginning in May, 2009.

Objectives: To provide data to the scientific and conservation communities, we will create maps and globe displays of turtle beach locations and use these to raise public awareness regarding the conservation of this endangered species on and around the island. Maps will be based on sightings and a more detailed set of latitude and longitude data for nesting turtles.

Work Achieved: Although these initial assessments are limited in both temporal and spatial scales, they will provide information to local government offices for the management of sea turtles in Honduras. With permission from the FWS, this report will be translated into Spanish and provided to the Honduras Ministry of Environment (SERNA), the Honduras Departments of Fisheries (DIGEPESCA) and Biodiversity (DiBio), and the Honduras Secretary for Agriculture and Ranching (SAG). This report will be used to stimulate discussions regarding the commitment of the Honduras

Government to the conservation of nesting areas on Roatan. Furthermore, the maps generated for this report will be incorporated into presentations for Government officials, school children, local communities, and international research and conservation meetings. These representations will also be presented on the ProTECTOR website. As future data are collected and new information is incorporated into the current maps, these maps will be updated on the ProTECTOR website, and will be supplied to the Honduras Government in subsequent reports. Specific data on nesting site locations will be supplied to the Wider Caribbean Sea Turtle Conservation Network (WIDECAST) to be incorporated into online maps, such as OBIS-SEAMAP (http://seamap.env.duke.edu/widecast/nesting_summary).

These data will also be used with TAPS Conservation Partner, BICA-Utila, to establish a dive and nesting beach monitoring program in 2009. This will require training BICA staff on measuring and tagging turtles, nest protection and relocation, and data collection.

Additional Objectives

To carry out additional survey methods for locating nesting beaches, and recording sightings of adult hawksbills in the shallow waters of Roatan.

Preliminary aerial surveys of beach areas and outer reef areas around Roatan were undertaken between July 16, 2007 and August 22, 2008. We contracted with Bay Islands Airways to fly us at an altitude of approximately 400 ft. above sea level with airspeed of approximately 40 - 43 knots to survey for sea turtles along the outer reef areas around Roatan. The plane is a fixed wing, open cockpit Aircam (Lockwood Aviation, Canada), three-seat float plane (Figure 13). Both the pilot and passenger acted as observers. Approximate flights paths over the island are shown in Figure 14, and an example of the view from the cockpit to the water surface is shown in Figure 15.

We made four flights over Roatan between July 16, 2007 and August 22, 2008. Total flight time was 328 minutes. On all occasions we had two observers. We calculated the man-hours involved in the aerial surveys at 10.9 h, to date.

Locations of turtles sighted during aerial surveys are provided in Table 2. During the 328 minutes of survey time, we spotted 22 turtles, of which 22.7 % (5 individuals) were *E. imbricata*. Other species observed were greens (*Chelonia mydas*) and loggerheads (*Caretta caretta*) (Figure 16).

Figure 13. SGD talks with Mr. Clay Donnelly, pilot of the Aircam open cockpit plane used for aerial surveys for sea turtles around Roatan.

Figure 14. Approximate flight paths of aerial surveys between July, 2007 and August, 2008. Flight date color codes: Black = July 16, 2007; Blue = July 19, 2007; Green = August 19, 2008; Orange = August 22, 2008.

Figure 15. View from the aerial survey plane to the water surface. Sea turtles are easily distinguishable near the surface from a height of 300 – 400 feet above sea level.

Table 2. Sightings and locations of turtles spotted during aerial surveys between July 16, 2007 and August 22, 2008.

Date	**Latitude and Longitude**	**Species Spotted**
July 16, 2007	N16°24'26.5",W086°25'45.2"	*C. mydas*
July 16, 2007	N16°25'33.4",W086°21'49.3"	*C. mydas* or *C. caretta*
July 16, 2007	N16°24'50.8",W086°15'6.5"	*C. mydas* ?
July 19, 2007	N16°25'21.0",W086°12'7.6"	*C. mydas*
July 19, 2007	N16°24'49.7",W086°23'11.7"	*C. mydas* or *C. caretta*
August 19, 2008	N16°26'15.7",W086°17'58.8"	*E. imbricata*
August 19, 2008	N16°24'54.7",W086°14'18.3"	*E. imbricata*
August 22, 2008	N16°16'10.9",W086°36'20.6"	*C. mydas* or *C. caretta*
August 22, 2008	N16°19'38.0",W086°34'53.4"	*C. mydas* or *C. caretta*
August 22, 2008	N16°22'3.1",W086°30'47.6"	*C. mydas*
August 22, 2008	N16°22'3.1",W086°30'47.6"	*C. mydas*
August 22, 2008	N16°22'3.1",W086°30'47.6"	*C. mydas*
August 22, 2008	N16°23'49.8",W086°27'1.6"	*C. mydas* or *C. caretta*
August 22, 2008	N16°24'22.8",W086°25'17.0"	*C. mydas* or *C. caretta*
August 22, 2008	N16°24'59.6",W086°23'32.0"	*C. mydas*
August 22, 2008	N16°26'5.8",W086°20'33.2"	*C. mydas*
August 22, 2008	N16°26'4.6",W086°20'13.5"	*C. mydas*
August 22, 2008	N16°26'15.1",W086°18'27.5"	*C. mydas* or *C. caretta*
August 22, 2008	N16°26'27.2",W086°15'37.7"	*E. imbricata*
August 22, 2008	N16°26'3.8",W086°12'4.4"	*E. imbricata*
August 22, 2008	N16°24'36.0",W086°15'25.0"	*E. imbricata*
August 22, 2008	N16°21'32.1",W086°24'38.2"	*C. mydas* or *C. caretta*

In addition to aerial sightings, dive sightings of adult hawksbills were logged by trained dive staff at the dive operations of the Reef House Resort, CoCo View Resort, and Fantasy Island Resort on the southeast coast of Roatan. Dive masters were provided with a laminated sea turtle identification card (Figure 2) to be kept onboard the dive boat, and data collection sheets (in both hard copy and digital formats) for recording details of the sightings (Appendix 1C). Before each dive, divers were briefed on identifying features of the three species of turtles likely to be encountered. As much as possible, dive masters confirmed the sighting and species identification during the dive. After each dive, sightings were discussed and data collected on the location (dive site), depth at which the turtle was seen, species, life stage (juvenile or adult) and sex (if possible). Because dive boats from these resorts do not typically carry GPS equipment, dive operators do not have a list of latitudes and longitudes for the dive sites they use. Instead, we used a brief dive guide produced by Mar Dive Guides (Gonzalez, 2007) that has published latitudes and longitudes for many dive sites along the northwest and south coasts of Roatan.

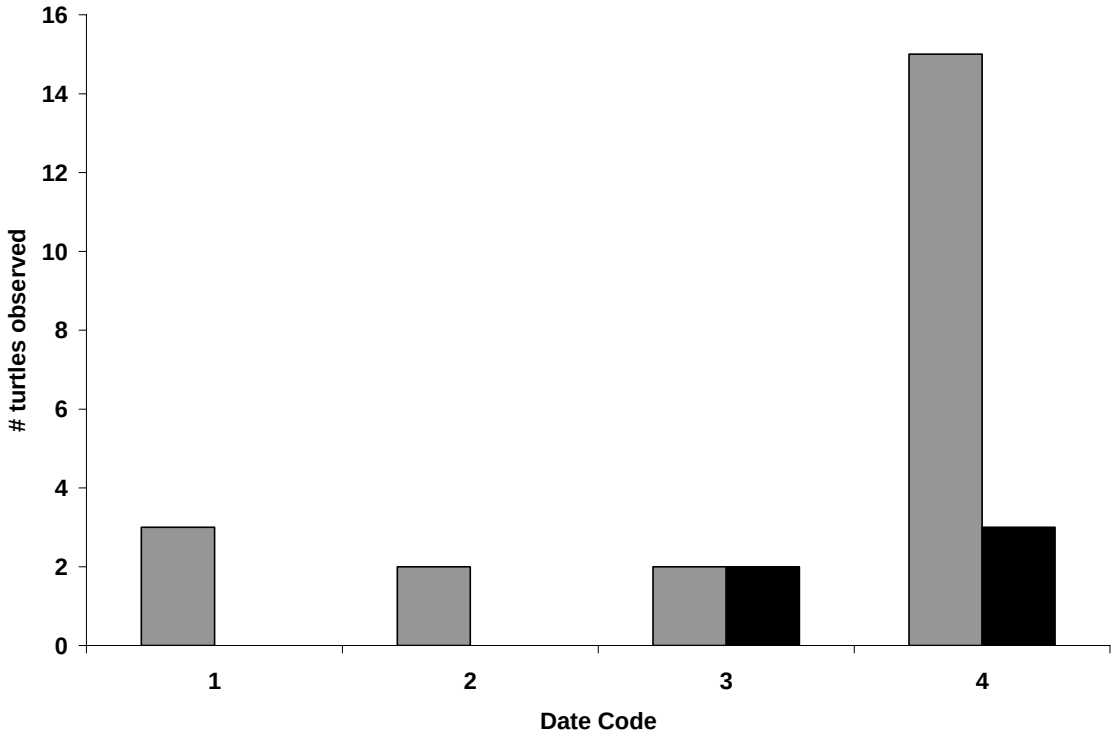


Figure 16. Number of turtles spotted during 338 minutes of aerial surveys with two observers. Grey bars represent all turtles spotted independent of species. Black bars are the number of hawksbill turtles spotted. Date codes: 1 = July 16, 2007; 2 = July 19, 2007; 3 = August 19, 2008; 4 = August 22, 2008.

Results for dive sightings of hawksbills are shown in Figures 17 and 18. Most dive sightings of adult hawksbills (85.8 %) occurred on the SE and SW sides of Roatan (42.9 % each), while the remaining 14.3 % of sightings were on the NW side of the island (Figure 17). In addition, a single adult male has been seen repeatedly at Pirates Point, along the SE coast during the 2008 mating season (as recently as November 23). Juvenile hawksbills were sighted by divers most often (89.5 %) along the SE coast of the island, while 3.9 % were seen off both the SW and W shores, respectively. Of the juveniles sighted, 2.6 % were seen along the NW shores of the island (Figure 18).

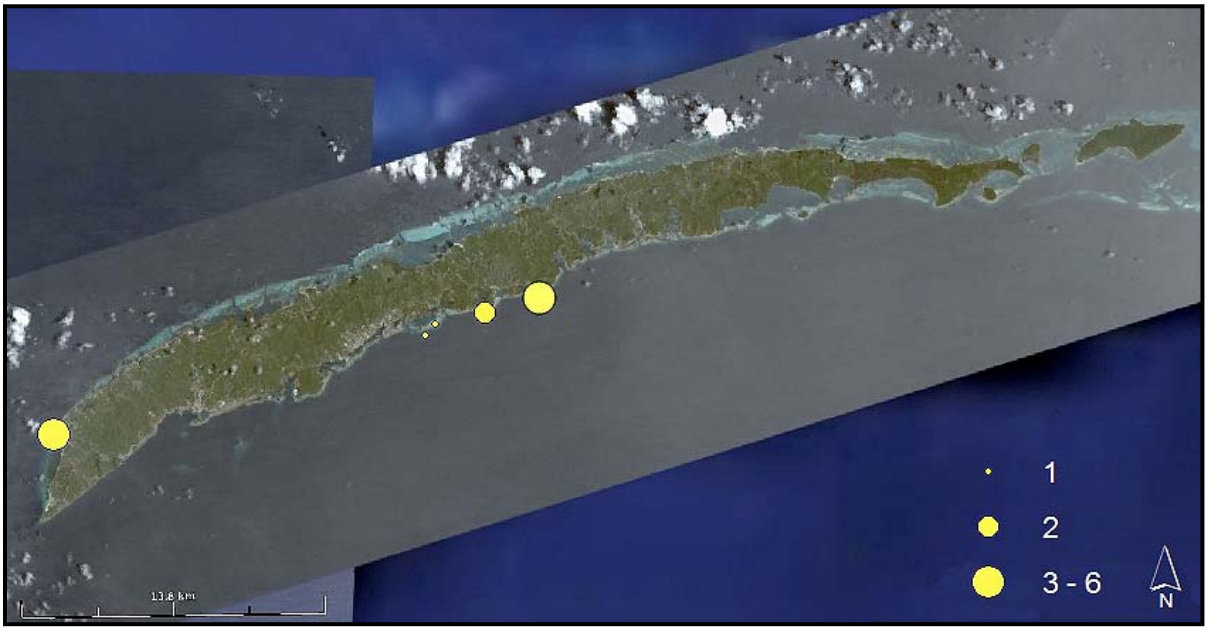


Figure 17. Map of Roatan showing predominant dive locations where adult *E. imbricata* were sighted between 2007 and 2008.

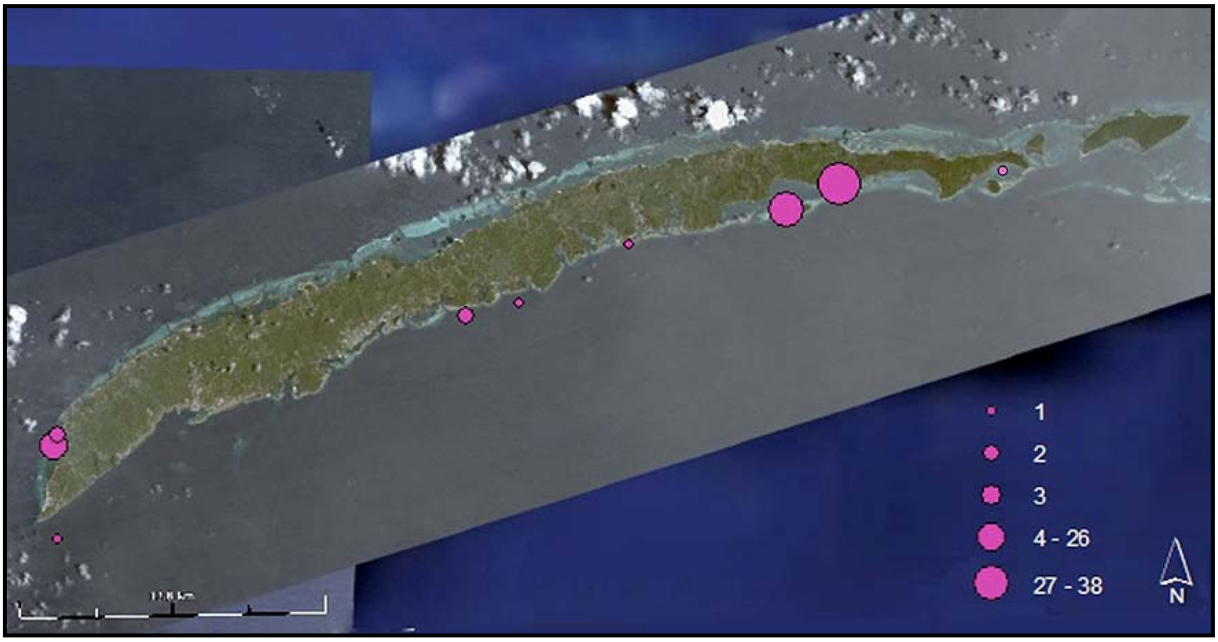


Figure 18. Map of Roatan showing the predominant dive locations where juvenile *E. imbricata* turtles were sighted between 2007 and 2008.

In total thus far, 5 adult males, 1 adult female, 8 unsexed adults, and 76 juveniles have been seen by divers or local fishermen while free diving (Figure 19).

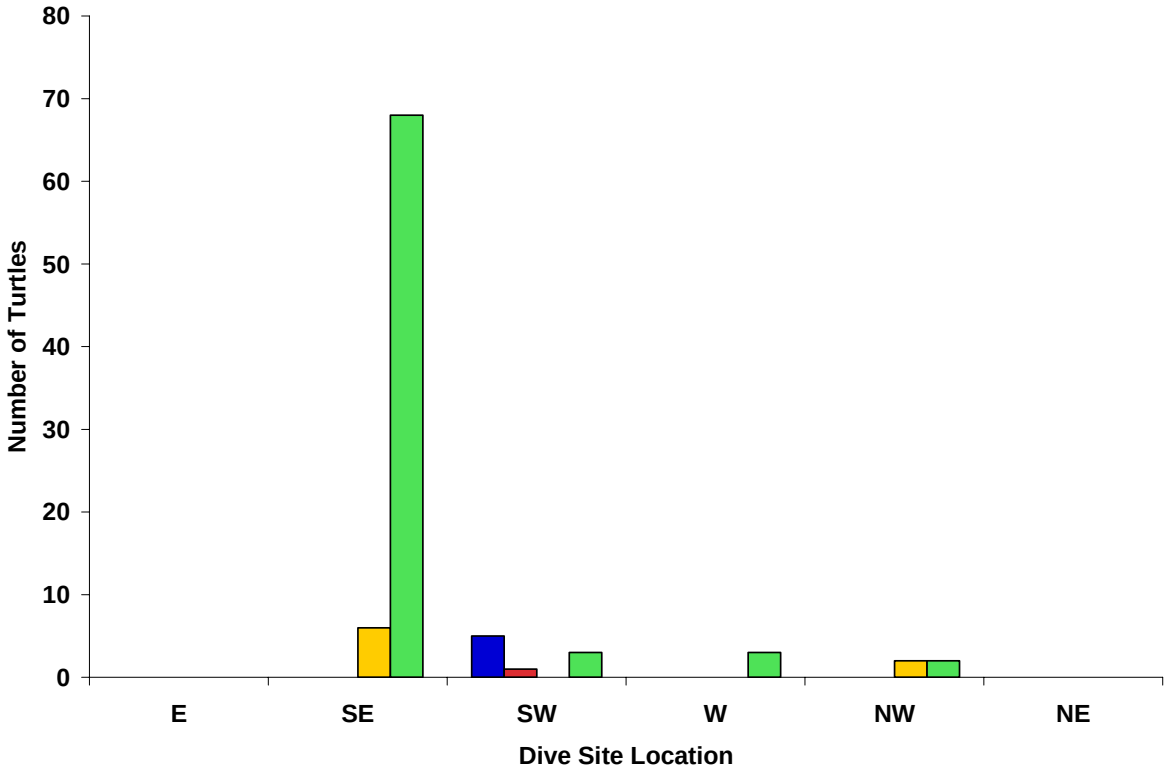


Figure 19. Number of *E. imbricata* sighted during dives between 2007 and 2008, where = juveniles; = adult males; = adult females; = unsexed adults.

These results are likely to be highly influenced by the concentration of research on juvenile *E. imbricata* carried on in the SE vicinity of the island by the TAPS project. The remaining dive sightings result from the three dive operators on the SE and SW of the island (Reef House Resort, Coco View Resort, and Fantasy Island Resort) that have been trained and (more or less) consistently collect sightings data. Both Coco View and Fantasy Island Resorts regularly visit dive sites along the SW and W of the island. With the addition of Barefoot Cay (part of the Roatan Marine Park) and dive operators on the north and northeast coasts of the island over the 2009 season, we expect to see an increase in the number of sightings of *E. imbricata*, as well as *C. caretta*, and *C. mydas*.

B. Unaccomplished Objectives.

We were unable to meet three objectives originally proposed.
The tagging of nesters and assessment of hatching success was not undertaken because, aside from the single hawksbill nesting at Lizzette's Beach, we were unable to locate any

nesting turtles during monitoring events. This impacted project results by not allowing us evaluate numbers of nesting attempts, successful nestings, or hatching success on any measurable scale. With additional intensive monitoring, as well as the Turtle Nesting Hotline, we are hopeful that we will see more results in the 2009 season.

One aspect of beach reconnaissance that did not meet our objectives was the number of beaches we were able to monitor. Although the objective of the project was a preliminary reconnaissance, being able to monitor more beaches more closely may have provided substantially more information. We plan to develop an intensive, season-long monitoring system for the coming seasons.

The proposed training aspect of the project was also not fully realized. Although we had planned to train several local community members, we found resistance of local people to training if it did not include some form of compensation. This may have impacted the amount of information that was reported to us because potential local participants did not have a vested interest in reporting sightings without any form of reward or remuneration.

C. Results Achieved.

Through this time-limited project, we were able to collect significant preliminary data on potential nesting beaches around Roatan. This included actual surveys of beaches, mapping beaches on which sea turtles have been seen nesting in the past (according to anecdotal surveys), calculating the area of potential nesting beach habitat on Roatan, and beginning to train both visiting volunteer groups and local community members as survey participants and research assistants. In addition, we have trained a suite of dive masters at three dive resorts to collect turtle sightings while leading dive groups.

Products generated include maps and calculated areas of potential hawksbill nesting beaches, standardized data collection forms for nesting turtles, eggs, and hatchlings. We also developed a dive sightings log book in both hard copy and electronic formats that are now used by some dive operators on Roatan to collect dive sightings of turtles in their areas. We intend to engage more dive operators on the island to become TAPS Conservation Partners and begin consistent data collection.

D. Project Conservation and Management Impact.

Information gathered by this reconnaissance project will be provided to the Honduras government offices of the Secretariat for Agriculture and Ranching (SAG), the Ministry of Environment (SERNA), the Department of Fisheries (DIGEPESCA) and the Department of Biodiversity (DiBio). These offices interact to establish policy on the management and conservation of sea turtles throughout Honduras.

The project has benefitted *E. imbricata*, *C. caretta*, and *C. mydas* in the area of Roatan by increasing the awareness of local community members and visitors regarding sea turtles

in the waters around the island, and sea turtle research now being conducted in the area. We have also confirmed *E. imbricata* nesting on Roatan, as well as collected anecdotal evidence of nesting by all three species on different beaches on the island.

We believe that, with the development of the partnership between TAPS and the Roatan Marine Park, further detailed monitoring will be established to assess beach use in areas where marine turtle nesting is confirmed, or has been reported. This preliminary study has laid the groundwork for developing more intensive beach and dive monitoring programs on Roatan, and has provided data that will focus monitoring efforts on specific beaches, such as Lizzette's Beach, Paya Bay Beach, and Morat Beach.

E. Resulting Cooperative and Collaborative Relationships.

Cooperative relations developed during the project period with Coco View Resort and Fantasy Island Dive Resort. This collaboration resulted in the long-term commitment of both dive operations to collect dive sightings of sea turtles throughout the year. As a result, selected dive masters gather and record sightings after each dive and provide the data to the Project Officer. Unfortunately, data is lost or mishandled at times when dive masters are too busy to collect or record the information. We are working to train the dive masters on how to enter and provide the data digitally. However, unreliable Internet access, lack of individual access to personal computers, and lack of general computer knowledge also hamper the efforts to collect and electronically deliver consistently reliable data.

The cooperation of Outlook Expeditions (Scotland) was an important component of both developing aspects of group training for beach monitoring, and short-term nightly coverage of Camp Bay Beach. This relationship also provided public exposure for the project, which we hope to develop in providing future opportunities for volunteer groups and internships.

We entered into cooperation with the newly approved non-profit organization, Roatan Marine Park. This relation has assisted in plans to further the dive monitoring for sea turtles in more areas of Roatan. As well, we have made plans for a collaborative effort to capture and satellite tag two adult hawksbills during the 2009 mating season.

Another valuable TAPS Conservation Partnership resulting from this work was that of Sherman Arch's Iguana Farm. The farm provides approximately 20 acres of space where adult and juvenile iguanas are protected from hunting. Additionally, the farm takes in injured or incidentally captured sea turtles. No data have previously been collected on turtles taken in by Mr. Arch, nor have turtles been flipper tagged in this facility. As a TAPS Partner, we now have access to these turtles before they are released to the wild and can collect information on each one, as well as outfit them with flipper tags for future identification.

As a result of the current project, we are now planning a partnership with BICA-Utila for both dive and nesting beach monitoring on Utila for May, 2009. This will extend the TAPS program to another one of the Bay Islands and allow increased data collection, public awareness, and conservation efforts.

F. Equipment Purchases.

No equipment was purchased for the project under the current award.

CONCLUSIONS

The low population numbers of hawksbills throughout the Caribbean, their dispersed nesting beaches, and their elusive nesting activities are part of the reason why there is little population data available in the literature (Richardson *et al.*, 1989). At the initiation of a study at Buck Island Reef National Monument (St. Croix, U.S. Virgin Islands) in 1988, Hillis (1994b) found information from local sources, dive operators, fishermen and field census studies provided little to no evidence of adult hawksbill turtles in the Monument area before or after the nesting season (June – October). However, both saturation tagging and intensive, nesting-season-long, nightly beach monitoring for hawksbills have been used with excellent success in Jumby Bay, Antigua (Corliss *et al.*, 1989; Richardson *et al.*, 1989), Long Island, Antigua (Richardson *et al.*, 2006), and at Buck Island Reef National Monument, St. Croix, Virgin Islands (Hillis, 1994a, 1994b, 1995).

Corliss *et al.* (1989) calculated that a single nesting female could lay up to approximately 700 eggs per season and produce approximately 560 hatchlings per season (80 % hatch rate). Thus, they calculated that as few as 61 nesting hawksbills over two years at Jumba Bay could potentially produce 34,000 hatchlings. Therefore, small numbers of nesting females, protected from both capture and egg removal, may substantially contribute to population numbers in the region.

As a result of the current reconnaissance for hawksbill nesting beaches on Roatan, Honduras, it is clear that both adult and juvenile hawksbills occur in the waters surrounding the island. The area of Port Royal has an especially high concentration of juveniles and may be an important recruiting ground for juvenile hawksbills (Dunbar *et al.*, 2008). However, patterns of dive sightings (Dunbar, unpublished data) may indicate a sinusoidal pattern of adult hawksbill remigration around the mating-nesting period (May – November) in the waters of Roatan.

The current study has provided important preliminary data for developing a more intensive, on-going study. It is hopeful that the continuation of this study will provide much-needed information for future management decisions regarding hawksbill populations in Honduran waters, and throughout the Caribbean.

RECOMMENDATIONS

There is need for more intensive investigation into the nesting habits of hawksbills around Roatan and throughout the Bay Islands. A nightly patrol of target beaches should be undertaken for the hawksbill's entire prospective nesting season. This can only be accomplished with the help of a number of volunteers that would be trained on site, and who could devote several weeks, or months to such a study. Hillis (1995) found that when nightly beach monitoring was doubled to 95 nights, the highest number of hawksbill nesting activities previously observed also doubled. This would need to be supported by funding from external sources. An increased effort in time and personnel could greatly improve our ability to monitor nesting and hatching hawksbills, and to collect much-needed information to understand the unique nesting beach requirements for hawksbills in the Caribbean waters of Honduras.

FINANCIAL STATUS REPORT

FINANCIAL STATUS REPORT

(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted	2. Federal Grant or Other Identifying Number Assigned By Federal Agency	OMB Approval No.	Page of
US Fish & Wildlife Services	98210-7-G222	0348-0038	pages

3. Recipient Organization (Name and complete address, including ZIP code)
Loma Linda University, 24880 Prospect Avenue, Loma Linda, CA 92354

4. Employer Identification Number	5. Recipient Account Number or Identifying Number	6. Final Report	7. Basis
95-1816009	611505-4521	☑ Yes ☐ No	☑ Cash ☐ Accrual

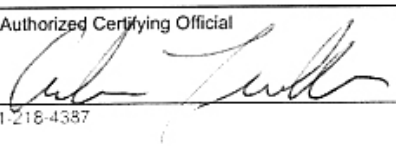
8. Funding/Grant Period *(See instructions)* From: (Month, Day, Year)	To: (Month, Day, Year)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
8/29/2007	8/28/2008	8/29/2007	8/28/2008

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays		5,700.00	5,700.00
b. Recipient share of outlays			0.00
c. Federal share of outlays		5,700.00	5,700.00
d. Total unliquidated obligations			
e. Recipient share of unliquidated obligations			
f. Federal share of unliquidated obligations			
g. Total Federal share *(Sum of lines c and f)*			5,700.00
h. Total Federal funds authorized for this funding period			5,700.00
i. Unobligated balance of Federal funds *(Line h minus line g)*			0.00

11. Indirect Expense	a. Type of Rate *(Place "X" in appropriate box)* ☐ Provisional ☐ Predetermined ☐ Final ☐ Fixed			
	b. Rate	c. Base	d. Total Amount	e. Federal Share

12. *Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.*

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
Arlin Tueller, Director of Sponsored Projects Management	909-558-4589
Signature of Authorized Certifying Official	**Date Report Submitted**
	November 21, 2008

NSN 7540-01-218-4387 269-202 Standard Form 269A (Rev. 7-97)
Prescribed by OMB Circulars A-102 and A-110

PRODUCTS AND OTHER DELIVERABLES

All deliverables and products have been included in the hard copy package of this report, including the publication by Dunbar, et al, 2008, data collection sheets, turtle dive sightings log manual, and maps of dive sightings, and aerial flight paths. Due to corruption of our GIS base map, we are currently remaking these maps and an addendum of sighting and beach maps will be sent to the USFWS in the future.

REFERENCES CITED

Balazs, G. H. and Chaloupka, M. (2004) Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. Biological Consevation 117: 491 - 498.

Carr, A. F., Meylan, A. B., Mortimer, J. A., Bjorndal, K. A. and Carr, T. (1982) Preliminary survey of marine turtle populations and habitats in the western Atlantic. NOAA Technical Memorandum. NMFS-SEFC-91. Pp. 91.

Corliss, L. A., Richardson, J. I., Bass, A. L., Bell, R. and Richardson, T. H. (1990) Remigration and hatch success of the Jumba Bay hawksbills, Antigua, W.I. (eds T. H. Richardson, J. I. Richardson and M. Donnelly). NOAA Technical Memorandum. Pp. 225 - 226.

Corliss, L. A., Richardson, J. I., Ryder, C. and Bell, R. (1989) The hawksbills of Jumby Bay, Antigua, West Indies (eds S. A. Eckert, K. A. Eckert and T. H. Richardson). NOAA Technical Memorandum. Pp. 33 - 35.

Cruz, G. A. and Espinal, M. (1987) National report for Honduras., Mayagüez, Puerto Rico. Unpublished. Pp. 51.

Dampier, W. (1968) A New Voyage Around the World Dover Press, New York.

Davenport, J. and Clough, W. (1986) Swimming and diving in young loggerhead sea turtles (*Caretta caretta*). Copeia 1986: 53 - 57.

de Rochefort, C. (1666) The history of the Caribby-islands T Dring and J Starkey, London, UK.

Dunbar, S. G., Salinas, L. and Stevenson, L. (2008) In-water observations of recently-released juvenile Hawksbills (*Eretmochelys imbricata*). Marine Turtle Newsletter 121: 5 - 9.

Gonzalez, I. (2007) Roatan Bay Islands Honduras; Dive Guide 45 of Roatan's Best Dives Mar Dive Guides, San Pedro Sula.

Hasbún, C. R. (2002) Observations on the first day dispersal of neonatal Hawksbill turtles (*Eretmochelys imbricata*). Marine Turtle Newsletter 96: 7 - 10.

Hays, G. C. (2004) Good news for sea turtles. TRENDS in Ecology and Evolution 19(7): 349 - 351.

Hillis, Z. (1994a) The first five years at Buck Island Reef National Monument - the hawksbill story (eds B. A. Schroeder and B. E. Witherington). NOAA Technical Memorandum. Pp. 242 - 245.

Hillis, Z. (1994b) The hawksbill turtles of Buck Island Reef National Monument: a shared resource of the Caribbean (eds K. A. Bjorndal, A. B. Bolten, D. A. Johnson and P. J. Eliazar). NOAA Technical Memorandum. Pp. 59 - 61.

Hillis, Z. (1995) Buck Island Reef National Monument hawksbill sea turtle research program (eds J. I. Richardson and T. H. Richardson). NOAA Technical Memorandum. Pp. 47 - 51.

Long, E. (1774) The history of Jamaica, or general survey of the ancient and modern state of that island: with reflections on its situation, settlements, inhabitants, climate, products, commerce, laws, and government T Lowndes, London, UK.

McClenachan, L., Jackson, J. B. C. and Newman, M. J. H. (2006) Conservation implications of historic sea turtle nesting beach loss. Frontiers in Ecology and the Environment 4(6): 290 - 296.

Meylan, A. B. (1999) Status of the Hawksbill Turtle (*Eretmochelys imbricata*) in the Caribbean Region. Chelonian Conservation and Biology 3(2): 177 - 184.
Meylan, A. B. and Donnelly, M. (1999) Status justification for listing the Hawksbill Turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN Red List of Threatened Animals. Chelonian Conservation and Biology 3: 200-224.
Richardson, J. I., Corliss, L. A., Ryder, C. and Bell, R. (1989) Demographic patterns of Caribbean hawksbills, Jumby Bay, Antigua (eds S. A. Eckert, K. A. Eckert and T. H. Richardson). NOAA Technical Memorandum. Pp. 253 - 256.
Richardson, J. I., Hall, D. B., Mason, P. A., Andrews, K. M., Bjorkland, R., Cai, Y. and Bell, R. (2006) Eighteen years of saturation tagging data reveal a significant increase in nesting hawksbill sea turtles (*Eretmochelys imbricata*) on Long Island, Antigua. Animal Conservation 9: 302 - 307.
Witzell, W. N. and Banner, A. C. (1980) The hawksbill turtle (*Eretmochelys imbricata*) in Western Samoa. Bulletin of Marine Science 30: 571 - 579.

APPENDIX IA

Nesting Beach Data Collection Sheet (Nesting Female Data)

Date _____ **Time of Laying** _____

Beach Name _____ **Lat/Long (GPS)** _____

Turtle ID # N_____ - 07_____ **Turtle Species** _____

Front Left Tag Number _____ **Rear Left Tag #** _____

Names of Data Recorder and Partner _____

Nest Tag # and Color	
Nest Depth (cm) - Bottom	
Nest Distance from Water (meters)	
Nest Location Habitat (bare sand, grass, in/under vegetation)	
Egg Count (# laid)	
Eggs Damaged (# broken during laying)	
Egg Diameter (cm) (10 normal eggs)	
Egg Weights (g) (same 10 eggs as measured above)	
CCL n-n[1] (cm)	
CCL n-t[2] (cm)	
CCW[3] (cm)	
SCL n-n (cm)[4]	
SCL n-t (cm)	
SCW (cm)	
Additional Comments, Markings, Health, etc.	

[1] Curved Carapace Length, notch to notch
[2] Notch to tip
[3] Curved Carapace Width. Measure all animals at the widest position.
[4] Straight Carapace Length, notch to notch.

APPENDIX IB

Nesting Beach Data Collection Sheet (Hatching Data)

Date _____ **Time of First Emergence** _____

Beach Name _____ **Lat/Long (GPS)** _____

Nest Tag # and Color[1] _____ **Turtle Species** _____

Nesting Female Turtle ID # N - 07

Nesting Female Front Left Tag Number _____ **Rear Left Tag #** _____

Names of Data Recorder and Partner _____

Date Nest Laid	
Incubation Length	
# Emerged	
# Broken Shells in Nest	
# Live in Nest	
# Dead in Nest	
# Unhatched Eggs	
Additional Comments	

[1] From Nesting Female Data Sheet. These numbers should be the same.

APPENDIX 1C

REGIONAL SEA TURTLE ACTION PLAN FOR THE MESOAMERICAN REEF

Field Data Collection Form
Roatan, Bay Islands, Honduras

Tortugas Marinas

Key:
AD – ADULT TURTLE
JV – JUVENILE TURTLE

DATE	DIVE SITE	DEPTH OF SIGHTING	DIVER LOGGING	HAWKSBILLS		GREENS		LEATHERBACKS		LOGGERHEADS		OTHER/ NOT IDENTIFIED	

Notes:
Record all zeros (0)
Fill in all cells
If uncertain about species use "Other/not identified"
Fill in for next 10 consecutive dives/snorkels
Note all turtles seen off boat as well (before/after dives)
Observations:

Please record data and return data sheets electronically at the **end of each month** to the e-mail listed above for Dr. Stephen Dunbar
Thank you for your participation!

APPENDIX II

Photographs of beaches visited for evidence of sea turtle nesting from March 2006 – September, 2008.

Figure 20. Camp Bay Beach.

Figure 21. West Bay Beach with local resident pointing to possible hawksbill nest site from the previous year (2005).

APPENDIX II cont.

Figure 22. West Bay Beach (far west end).

Figure 23. Punta Pimienta Beach.

APPENDIX II cont.

Figure 24. Franklin's private island 100 m off of Franklin's Beach. Owner Sandy Franklin has noted increased bird activity during turtle nesting season. This may indicate turtle hatching activity. However, this has not yet been confirmed.

Figure 25. Paya Bay Beach East. Turtles were reported to have nested here as recently as 2004, but species identification has not been confirmed.