FINAL PROJECT REPORT

"2004 HAWKSBILL TURTLE (*Eretmochelys imbricata*)

RESEARCH AND POPULATION RECOVERY

AT CHIRIQUÍ BEACH AND ESCUDO DE VERAGUAS ISLAND,

Ñö Kribo region, Ngöbe-Buglé Comarca,

AND BASTIMENTOS ISLAND NATIONAL MARINE PARK"

Presented to:

National Environmental Authority (ANAM)
Ngöbe-Buglé Comarca, Ñö Kribo Region and General Congress
and
Association for the Protection of the Ngöbe-Bugle Natural Resources (APRORENANB)

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By

Ma. Cristina Ordoñez Espinosa, Research Coordinator (CCC-STRI)
Argelis Ruiz, Environmental Education Coordinator (STRI)
Sebastián Troëng, Scientific Director (CCC)
Anne Meylan, Senior Research Scientist, Florida Fish & Wildlife Conservation Commission
Peter Meylan, Professor of Biology, Eckerd College

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INTRODUCTION

Chiriquí Beach (08°56'N, 081°39'W), Bocas del Toro Province, Panama, was described by Archie Carr (1956) as one of the most important nesting beaches for the hawksbill turtle (*Eretmochelys imbricata*), a species included in the World Conservation Union's list of critically endangered animal species (IUCN 2004) and in Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The hawksbill turtle was very important for the local economy at this beach during the 20th century and possibly even earlier. Roberts (1827) described the trade in shell in the region in 1815. Later, Chiriquí Beach and the Zapatilla Cays were leased by the government to veladors or "stayers-awake". Veladors paid a tax for the rights to all female hawksbill turtles that nested on their section of beach (approximately one mile). Some of these "stayers-awake" interviewed in the 1980's reported that they managed to catch 35 to 50 hawksbill turtles per night on one mile of Chiriquí Beach in the beginning of the 1950's (Meylan and Meylan, unpublished data). Meylan and Donnelly (1999) reported a population decline of hawksbill turtles at Chiriquí Beach of 98% from the level registered in 1950, based on information from ground and aerial surveys in 1980, 1981 and 1990. The decline is attributed to the extensive hunting that took place to supply the international trade in hawksbill shell. These same surveys revealed the regional importance of Chiriqui Beach for nesting by the leatherback turtle (*Dermochelys coriacea*) (Meylan et al., 1985).

In 1995, local interest began in the Río Caña community to conserve the hawksbill turtles that nest on Chiriquí Beach. The Association for the Protection of the Ngöbe-Bugle Natural Resources (APRORENANB) was formed, undertaking protection one year and permitting turtle killing one year (information given by APRORENANB). From 1999 to 2002, short periods of field research provided a preliminary picture of the problems facing nesting females on Chiriquí Beach (Ordoñez 1999-2002, unpublished data). This work verified the continued importance of the beach for leatherback nesting and the decline in hawksbill nesting. In 2000, a project was established to study and protect turtles along the first 10 km of the beach, from the Río Caña rivermouth towards Río Chiriquí.

In 2002, a consortium of interested people and organizations (including the authors of this report) was formed and initiated meetings with national and local authorities, local conservation groups and communities to assess their interest in establishing a long-term hawksbill conservation program on Chiriquí Beach. A decision was made to also include Escudo de Veraguas Island, which lies 18 km offshore from Chiriqui Beach, and the Zapatilla Cays, which are situated within the boundaries of the Bastimentos Island National Marine Park. The Zapatilla Cays have been the site of a 15-year research project on marine turtles sponsored by the Wildlife Conservation Society. Concern for sea turtles on the Bocas del Toro coast was one of the factors that lead to the establishment of the Bastimentos Island National Marine National Park in 1988. Within its boundaries are three important hawksbill nesting beaches, Long Bay on Bastimentos Island, and the beaches of the two Zapatilla Cays. Leatherbacks also nest on Long Bay, but very rarely come ashore on the beaches of the Zapatilla Cays.

The long-term goal of the new consortium is to promote an increase in the small hawksbill populations that currently nest along the Bocas del Toro province and Ngöbe-Buglé Comarca coast. In June 2003, the research and monitoring work began. This report summarizes the results of the second year (2004) of research, monitoring and conservation work at Chiriquí Beach, Escudo de Veraguas Island, Red Beach and the Zapatilla Cays in the Bastimentos Island National Marine Park. The report also provides further recommendations for conservation action along the coast of Bocas del Toro Province and the Ngöbe-Buglé Comarca.

OBJECTIVES

The objectives of the work in 2004 included:

1.- Continue standardized hawksbill nest monitoring surveys to assess nesting density and hatching success at Chiriqui Beach, Escudo de Veraguas Island, Red Beach and the Zapatilla Cays.

2.- Continue standardized nest monitoring surveys for leatherback turtles and other species that nest at Chiriqui Beach, Escudo de Veraguas Island, Red Beach and the Zapatilla Cays.

3.- Determine the genetic identity of hawksbill turtles nesting along the Bocas del Toro and Ngöbe-Buglé Comarca coast.

4.- Determine migrations and movements of hawksbill turtles from along this coast.

5.- Conduct night patrols along Chiriquí Beach and the Zapatilla Cays to observe nesting females, tag and record renesting females, collect biometric data, and observe nesting behavior.

6.- Develop environmental education programs for the inhabitants and teachers of communities adjacent to Chiriquí Beach and other interested communities.

METHODS

Track surveys
At Chiriquí Beach, morning work began on January 2, 2004 with weekly track surveys of each zone of the beach during which all tracks from the different species were recorded; hawksbill (Ei), leatherback (Dc), green *Chelonia mydas* (Cm) and loggerhead *Caretta caretta* (Cc) turtles. Recorded tracks were evaluated in the following way.

Nests: uptrack, removal of sand, obvious bodypit and return to the sea. In some cases, mainly with the leatherback turtle, it was not possible to verify the presence of eggs in the nest.

Half-moons (false crawls, non-nesting emergences): in these cases, the turtle's uptrack and return to the sea without significant sand removal were observed.

The sector of the beach (open, border, or vegetation) was determined for each nest at Chiriqui Beach and Escudo de Veraguas. GPS coordinates were taken for nearly all hawksbill nests at all sites.

Chiriquí Beach was divided into two sections for the work and two work teams were organized, one at each end of the nesting beach – at Río Caña and at Río Chiriquí. During the morning, all sea turtle activities occurring the previous night were recorded. In January weekly surveys were conducted, in February surveys were conducted every two days, from March through October surveys were conducted daily, in November surveys were continued every two days and in December weekly surveys were conducted. On Escudo de Veraguas Island and Red Beach, surveys were conducted every two weeks from the end of May to November to register nesting activity. All tracks since the previous visit were registered.

At the Zapatilla Cays, track surveys were conducted on an irregular basis from 1 January until 10 May (both cays). From 11 May until 30 November, daily track surveys were conducted on both cays. During daily track surveys all new nests and false crawls were identified. Nests were verified by excavating down to the top egg and nest sites were marked using a triangulation system to facilitate finding the nest at the end of the incubation period for productivity studies.

Night patrols
Night patrols were conducted sporadically on the Zapatilla Cays and along all of Chiriquí Beach (for four hours nightly during March-September) to observe and tag females, and to collect tissue samples for genetic analysis. Tagging was conducted after females finished laying eggs. Hawksbill and green turtles were tagged through the second scale in the front flippers and the leatherbacks were tagged in the fold of skin just medial to the rear flippers. All turtles were double-tagged and the following information was recorded for each turtle; tag numbers, species, date, time and activity at first encounter, presence of tag scars or overgrown tags, mutilations or deformities, fibropapillomas and any other important observations.

Biometric data
If the turtle was encountered before egg laying, the number of normal and yolkless eggs was counted as the eggs fell into the nest. Measurements of the carapace length and width were also taken, using a flexible fiberglass measuring tape. All measurements were taken in centimeters to the closest millimeter.

The carapace length of leatherback turtles was measured from the notch in the shell behind the head to the end of the caudal projection next to the central ridge and for hawksbill and green turtles, from the notch behind the head to the notch between the posterior-most marginal scales. The width was measured at the widest part of the carapace.

Genetic samples
Tissue samples were collected from the hind flippers of hawksbill turtles using 4 mm biopsy punches or scalpels. Each sample was preserved in a tube of SED buffer solution and the tag number and collection date were recorded. The sample collection was done after egg laying was finished and the sample site was wiped with alcohol to disinfect prior to sampling.

Satellite telemetry
Satellite transmitters (Telonics ST-14) were attached to two female hawksbills after they nested on Chiriqui Beach in 2004. The transmitters were attached to the carapace with fiberglass and resin. The antenna was located towards the posterior end and its base protected with a roll of fiberglass.

Nest productivity
At Chiriquí Beach, if the turtle was encountered before covering its eggs, the nest was marked by attaching three pieces of pink tape in the vegetation to allow triangulation. At Zapatilla, nests were examined during morning track surveys and clutch location was confirmed by careful excavation to the top eggs of the clutch (and reburial). The clutch site was marked either with stakes or vegetation to allow later evaluation. The location of all observed hawksbill nests was recorded with a GPS unit. Every morning during track surveys, all nests were inspected so that the loss of nests by depredation, poaching or erosion could be determined.

At Chiriqui Beach and the Zapatilla Cays, if hatchling tracks were observed or if 65 days of incubation had passed, the nest was excavated to evaluate its contents. Some nests laid at the end of the 2004 nesting season had longer incubation periods and were left undisturbed for 90 days before excavation to determine hatching success. We made separate counts of empty shells, live and dead pipped eggs, live and dead hatchlings remaining in the nest, unhatched eggs (with and without development). yolkless eggs, and depredated eggs. Based on excavations, we calculated hatching and emergence success (the percentage of eggs that produced hatchlings that successfully left the nest). Hatching was calculated as the number of empty shells (>50% of a complete egg) divided by the number of empty shells plus live and dead pipped plus eggs with and without development plus depredated eggs multiplied by 100. Emergence success was calculated as the number of empty shells (>50% of a complete egg) minus live and dead hatchlings in the nest divided by the number of empty shells plus live and dead pipped plus eggs with and without development plus predated eggs multiplied by 100.

Poaching and other mortality factors
Information was collected on dead turtles observed on the beach and an attempt was made to determine the cause of death. Also, we obtained information about illegal sea turtle hunting through informal interviews in communities near the nesting beaches.

Environmental education activities
Education activities were conducted when the schedule and project activities permitted. The emphasis of education activities was on transparency of the entire project, the importance of local participation in the conservation and research activities, and the importance of maintaining habitats intact. These activities involved teachers in order to disseminate the project more widely and also reached the general public in Bocas del Toro Province and the Ngöbe-Buglé Comarca.

RESULTS

Track surveys
A total of 285 track surveys were conducted along the 24 km of Chiriquí Beach in 2004. At Escudo de Veraguas Island and Red Beach, 12 surveys were conducted (every two weeks during May 28 - November 18, 2004).

Daily surveys were conducted on 205 days on the two Zapatilla Cays (May 11 – November 30, 2004). In addition to nests found during the daily survey period, 4 nests were recorded on the Small Zapatilla Cay and one on the Big Zapatilla Cay between January 1 and May 10, 2004. Three green turtle nests where discovered at hatching on the small cay. Hatching dates of these nests suggest that more than one female nested on the island.

Nesting activities by species at each study site are presented in Table 1.

Table 1.Results of nesting beach surveys in 2004

	Beach length (km)	Dates monitored	Nests Ei	Half-moons Ei	Nests Dc	Half-moons Dc	Nests Cm	Half-moons Cm	Nests Cc
Río Caña section	12	Jan 2 – Dec 27	309	114	2229	617	4	4	0
Río Chiriquí section	12	Jan 2 – Dec 27	164	61	854	184	4	3	2
Subtotal Chiriquí Beach	**24**	**Jan 2 – Dec 27**	**473**	**175**	**3083**	**801**	**8**	**7**	**2**
Escudo de Veraguas		**May 28-Nov 2**	**86**	**10**	**7**	**0**	**1**	**0**	**0**
Red Beach		**May 28-Nov 2**	**24**	**N/R**	**7**	**N/R**	**0**	**0**	**0**
Big Zapatilla Cay	2.36	May 11 – Nov 30	59	34	0	0	0		0
Small Zapatilla Cay	2.10	May 11 – Nov 30	71	45	0	0	3		0
Subtotal Bastimentos Park	**4.46**		**130**	**79**	**0**	**0**	**3**		**0**
PROJECT TOTAL	**28.46**		**713**	**264**	**3097**	**801**	**12**	**7**	**2**

(Ei: *Eretmochelys imbricata,* Dc: *Dermochelys coriacea*, Cm: *Chelonia mydas*, Cc: *Caretta caretta*)

The monthly distributions of tracks throughout the 2004 season, by species, at Chiriquí Beach and the Zapatilla Cays are presented in Figure 1a, 1b, 1c and 1d. In Figure 1a and 1b, the peak of the hawksbill nesting season can be seen in July and August. In Figure 1c, monthly nesting of leatherback peaked in April and May. Few green and loggerhead turtles were recorded and the monthly nesting is described in Figure 1d.

Figure 1a. Monthly distribution at Chiriquí Beach 2004
Eretmochelys imbricata

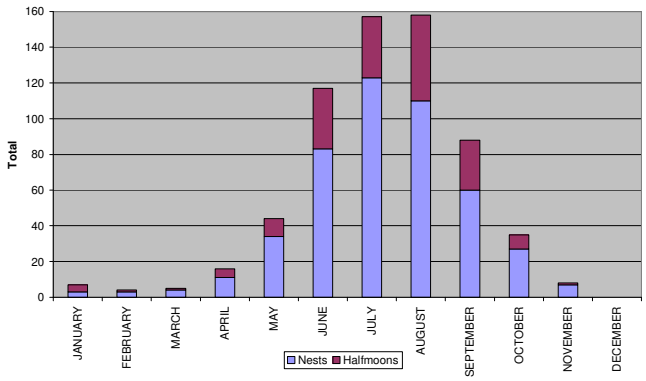


Figure 1b. Monthly distribution at Zapatilla Cays 2004
Eretmochelys imbricata

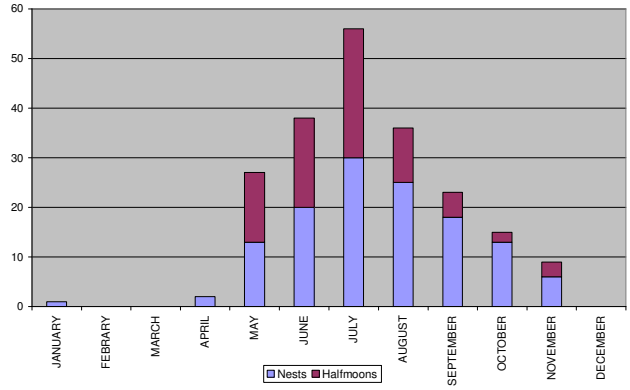


Figure 1c. Monthly distribution at Chiriquí Beach 2004
Dermochelys coriacea

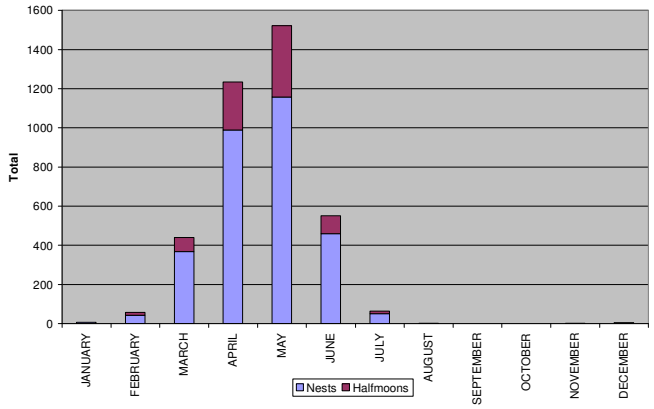
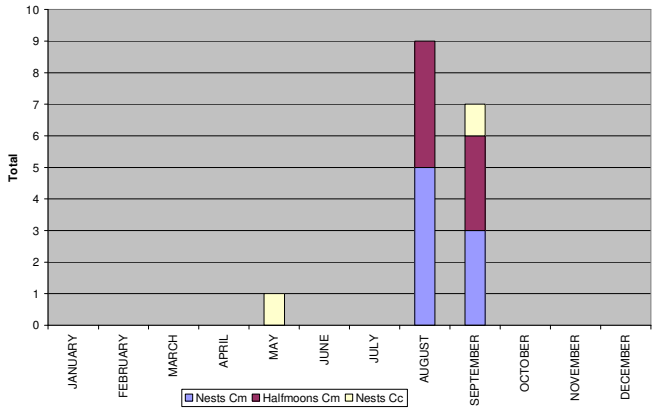


Figure 1d. Monthly distribution at Chiriquí Beach 2004
Chelonia mydas* and *Caretta caretta



The spatial distribution of activities registered at Chiriquí Beach, by kilometer, during the 2004 season is shown in Figures 2a, 2b and 2c. Figures 2d and 2e shows the distribution of nests on each of the Zapatilla Cays during 2004.

Figure 2a. Spatial distribution at Chiriqui Beach 2004
Eretmochelys imbricata

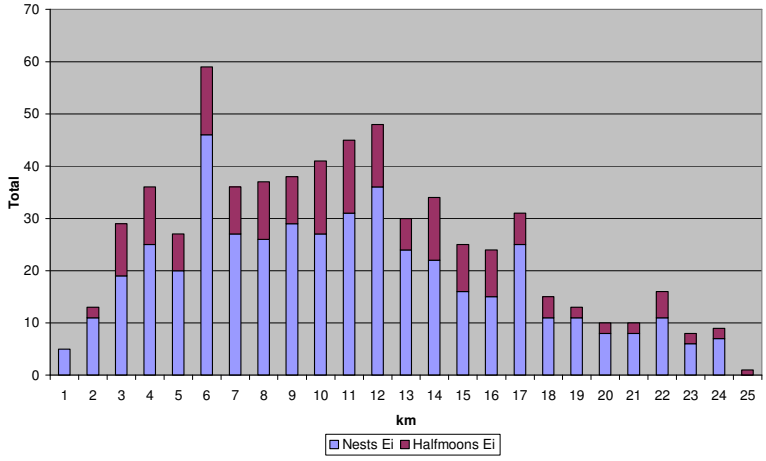


Figure 2b. Spatial distribution at Chiriqui Beach 2004
Dermochelys coriacea

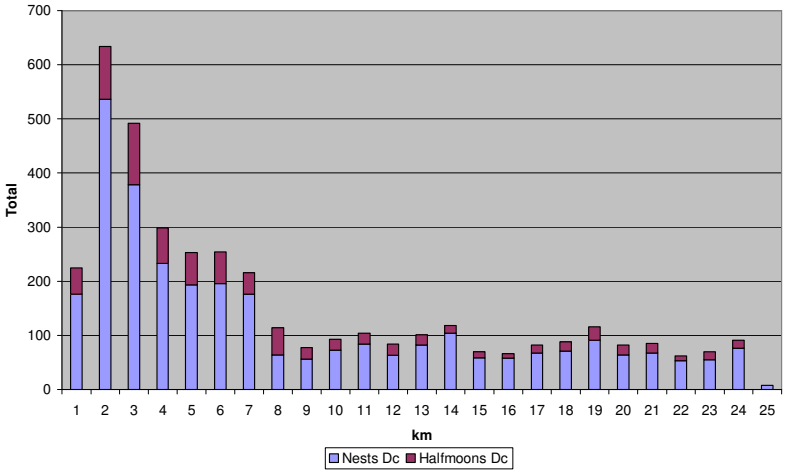


Figure 2c. Spatial distribution at Chiriqui Beach 2004
Chelonia mydas* and *Caretta caretta

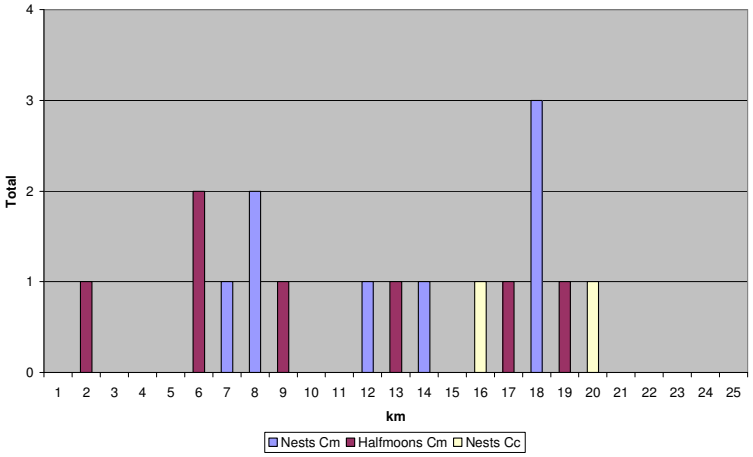


Figure 2d. Spatial distribution Small Zapatilla Cay
***Eretmochelys imbricata* 2004**

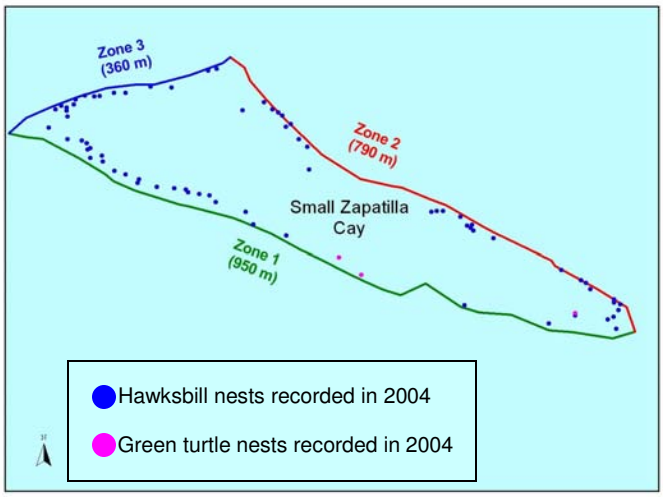
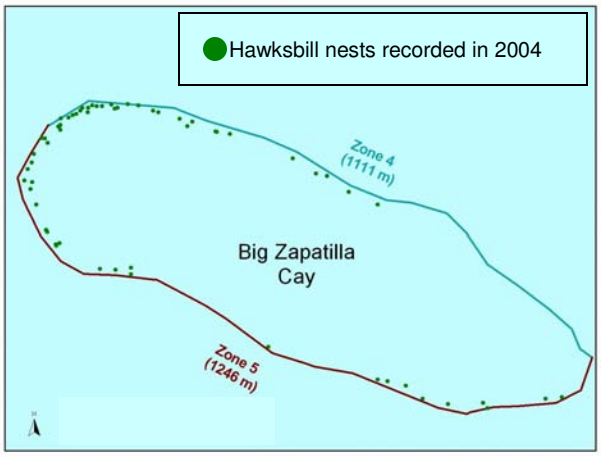


Figure 2e. Spatial distribution Big Zapatilla Cay
***Eretmochelys imbricata* 2004**



Night patrols
Work was conducted during 212 nights on each end of Chiriquí Beach between March 9 and October 7. During this time, 314 different females of four species were encountered, including 49 hawksbills, 262 leatherbacks, two green turtles and one loggerhead (Appendix 1). On the Small Zapatilla Cay, sporadic night patrols were conducted and twelve female hawksbills were encountered a total of 13 times. Escudo de Veraguas, Red Beach and the Big Zapatilla Cay were not monitored at night in 2004. The total nightly turtle encounters, by species and area, are presented in Table 2.

Table 2. Activities worked by species during the 2004 season

	Ei	Dc	Cm	Cc
Chiriquí Beach	**64**	**262**	**2**	**1**
Small Zapatilla Cay	**13**	**0**	**0**	**0**
TOTAL	**77**	**262**	**2**	**1**

(Ei: *Eretmochelys imbricata*, Dc: *Dermochelys coriacea*, Cm: *Chelonia mydas,* Cc: *Caretta caretta*)

Of the 49 hawksbill turtles encountered on Chiriquí Beach, 46 were newly tagged (first time observed on the beach), and three had tags, one of them had a tag attached at Tortuguero beach in 1997 (Appendix 1). Of the leatherback turtles, 197 were newly tagged, 65 were remigrants from other beaches or seasons (Appendix 1). The encountered green turtles and loggerhead were all observed for the first time (Appendix 1).

Of the 13 encounters of nesting female hawksbills on the Small Zapatilla Cay during 2004, eight turtles were observed for the first time. One female ("Argelis") that was observed twice during the summer had also nested during the summer of 2002 and had been tracked using a satellite transmitter to a set of reefs near the Honduras, Nicaraguan border (http://www.cccturtle.org/satpan_argelis.htm). Two females had been tagged during the net capture work undertaken by the Meylans in May 2004. Another had been tagged while nesting on Zapatilla Cay in 2002. New tag numbers appear in Appendix 2.

Biometric data
Carapace size (length and width) and clutch size statistics for hawksbill turtles by area are summarized in Tables 3a and 3b.

Table 3a. Hawksbill turtle summary statistics at Chiriquí Beach

	Curved length (cm)	Curved width (cm)	Eggs	Yolkless eggs
n	49	49	49	49
Mean	86.2	76.7	133.1	0.1
Standard deviation	4.7	3.8	66	0.2
Maximum	99.3	86.2	200	1
Minimum	74	68.3		
Median	86.2	76.7		

Table 3b. Hawksbill turtle summary statistics at the Small Zapatilla Cay

	Curved carapace length (cm)	Clutch size
n	12	2
Mean	86.8	223.5
Standard deviation	3.43	19.092
Maximum	92.7	237
Minimum	80.4	210
Median	88.3	

Carapace size (length and width) and clutch size for leatherback turtles are summarized in Table 4, the results for leatherback turtles with complete and incomplete caudal projections are presented separately.

Table 4. Leatherback turtle summary statistics

	Complete caudal projection				Incomplete caudal projection			
	CCL	**CCW**	**NE**	**YE**	**CCL**	**CCW**	**NE**	**YE**
n	72	72	72	72	148	148	148	148
Mean	153.0	109.4	42.9	14.8	150	108	50.8	15.0
Standard deviation	8.3	5.2	38.9	15.9	8.1	5.1	44	14.4
Maximum	184	119	98	47	171	125	197	45
Minimum	130	97	0	0	105.8	99	0	0
Median	59	10.5	153	109	150	109	66	14.5

(CCL=Curved Carapace Length, CCW=Curved Carapace Width, NE=Normal Eggs, Ye=Yolkless Eggs)

Only one of the two green turtles was measured (99 cm CCL, 91 cm CCW). The loggerhead measured 84 cm CCL and 74 cm CCW.

Genetic samples

A total of 26 genetic samples were collected on Chiriqui Beach and eleven on the Small Zapatilla Cay. Samples were also collected from two juvenile hawksbills received via MIDA and ANAM. These samples will be analyzed in Florida, USA. A summary of collection dates and tag numbers for turtles providing the samples is presented in Table 5a and 5b.

Table 5a. Hawksbill turtle genetic samples, Chiriquí Beach

Sample	Date	Right Tag	Left Tag
1	18-Jun-04	CH0220	CH0221
2	20-Jun-04	CH0218	CH0219
3	23-Jun-04	CH0294	CH0295
4	24-Jun-04	VA0907	CH0893
5	3-Jul-04	CH0239	CH0240
6	4-Jul-04	CH0222	CH0224
7	4-Jul-04	CH0298	CH0299
8	8-Jul-04	CH0243	CH0244
9	9-Jul-04	CH0225	CH0300
10	14-Jul-04	CH0249	CH0250
11	14-Jul-04	CH0247	CH0248
12	27-Jul-04	CH0254	V4265
13	28-Jul-04	CH0255	CH0256
14	2-Aug-04	CH0267	CH0268
15	2-Aug-04	CH0269	CH0270
16	4-Aug-04	CH0271	CH0272
17	4-Aug-04	71090	CH0257
18	8-Aug-04	CH0273	CH0274
19	12-Aug-04	CH0259	CH0260
20	13-Aug-04	CH0261	CH0262
21	26-Aug-04	CH0264	CH0263
22	5-Sep-04	CH0314	CH0316
23	5-Sep-04	CH0297	CH0301
24	30-Sep-04	CH0666	CH0667
25	30-Sep-04	CH0275	CH0317
26	8-Oct-04	CH0568	CH0569

Table 5b. Hawksbill turtle genetic samples, Small Zapatilla Cay, 2004

Sample	Date	Right Tag	Left Tag
1	25 May 04	VA2485	VA2486
2	2 Jun 04	MY528	MM1084
3	17 Jun 04	MY478	CH0037
4	6 Jul 04		CH0038
5	24 Jul 04	CH0028	CH0029
6	26 Jul 04	CH0030	CH0031
7	14 Aug 04	CH0032	CH0033
8	21 Aug 04	CH0039	CH0040
9	30 Aug 04	CH0041	CH0042
10	6 Sep 04	CH0043	CH0044
11	12 Oct 04	CH0057	CH0059

Satellite telemetry

The first turtle fitted with a satellite transmitter in 2004 was Merygö, which was released at Rio Caña on 6 September. Her movements were tracked for only 14 days until she was caught and killed by a diver from Cayo de Agua in Chiriqui Lagoon (Fig 3). The transmitter was recovered and deployed a second time on 8 October on a hawksbill named Señorita Chiriqui. Its release took place on the Rio Chiriquí side of Chiriqui Beach. Señorita Chiriqui traveled first in the open ocean, and then to the southern coast of Nicaragua. The transmitter is still transmitting as of July 2005, and indicates that the turtle is residing near the coast off central Nicaragua (Fig. 4).

Signals are still being received from one of the hawksbills released with transmitters in July 2003. Señorita Beché has been residing off the northern coast of Nicaragua. Tobu Señorita Caña stopped transmitting location data on 28 October 2004, 15 months after her release in Panama, but dive and temperature data continued to be transmitted for some time. Up until October 2004, the turtle had been residing off the south coast of Jamaica.

Figure 3. Movements of hawksbill turtle Merygö.

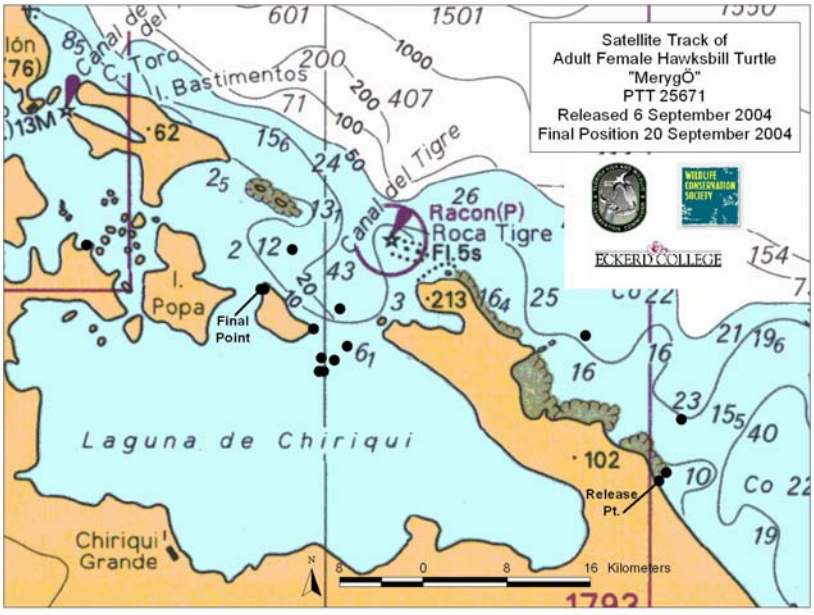
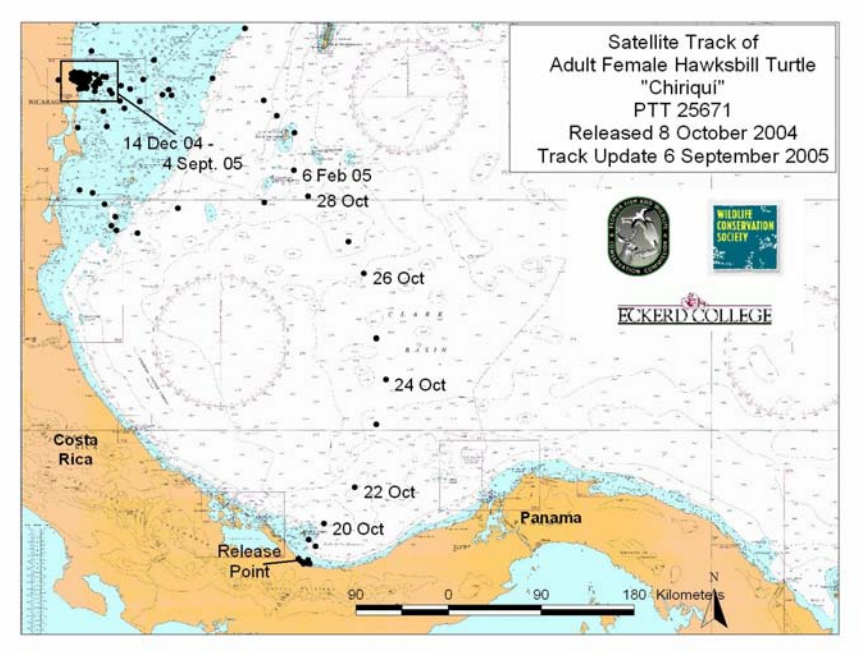


Figure 4. Movements of hawksbill turtle Señorita Chiriquí.



Nest productivity

During morning track surveys, all nests with hatchling tracks were inspected. Summaries of the productivity of triangulated nests by species and beach are shown in Tables 6A, B, C, D, E, F, G and H.

On Chiriqui Beach, depredation by dogs and poaching were the non-natural survival threats to hawksbill eggs and hatchlings (Table 6A). Intact natural hawksbill nests had a mean hatching success of 79.1% (Table 6A) For leatherback nests, hatching success was low (23.7% for intact natural nests) with dog depredation the major threat (Table 6F).

Hatching and emergence success rates for hawksbills were high on the Zapatilla Cays during 2004 (Table 6 B,C). Of the 84 hawksbill nests laid on the the small cay, three were lost to erosion and two were poached. Of the remaining 79 nests, 74 were evaluated after hatching. For nests that had not been moved and showed no signs of predation, hatching success was 83.4% and emergence success was 81.9 %, Only three nests were thought to have been invaded by predators (crabs) and these three nests still produced a total of 428 hatchlings (142 per nest). Eight nests that had been moved immediately after laying had hatching success rates of about 70%. Of the 67 nests that were laid on the Big Cay, three were poached and three were partly or completely eroded, but one of these still produced 151 hatchlings. For 57 nests that were not moved, excavation at hatching indicated a hatching success rate of 79.3% and an emergence success of 75.7%. For a single moved nest, emergence success was 59.0% At least 17,393 hawksbill hatchlings were produced on the two Zapatilla Cays in 2004. There is no problem with dog predation on these islands and only minimal predation of eggs and hatchlings by crabs. However, this year it became apparent that poachers are coming to the Zapatilla Cays in search of clutches of hawksbill eggs, Five nests, or 3.3% of the total were taken by human poachers. This is a problem that we will have to face as the hawksbill population continues to recover and the concentration of eggs and nesting females becomes a more attractive target.

For the first time since the Meylan's began their research project on the Zapatilla Cays in 1990, we found evidence of nesting by green turtles on the Zapatilla Cays. Three nests on the small cay were determined to be green turtle nests at hatching. Results from the evaluation of three nests are given in Table 6H. These three nests produced 471 hatchlings and had an emergence success of 95.9%.

Table 6A. Hawksbill turtle hatching and emergence on Chiriquí Beach - 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	146	136	2708	298	15099	144	188	925	2738	0	19094	79.1%	63.3%	15099
Natural	Predated	134	48	205	143	4208	9	44	302	249	?	4812	?	?	4208
Natural	Washed out	23	0	-	-	-	-	-	-	-	-	-			
Natural	Poached	39	0	-	-	-	-	-	-	-	-	-			
Natural	Unknown	105	0												
Moved	Intact	11	4	0	0	139	0	21	57	321	0	538	25.8%	25.8%	
Moved	Predated	0	0	-	-	-	-	-	-	-	-	-			
	TOTALS	**458**	**188**	**2913**	**441**	**19446**	**153**	**253**	**1284**	**3308**	**0**	**24444**	?	?	19446

Table 6B. Hawksbill turtle hatching and emergence on the small Zapatilla Cay – 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	63	63	119	25	8153	10	17	551	1049	0	9780	83.4%	81.9%	8153
Natural	Predated	3	3	3	2	385	0	0	14	29	?	428			385
Natural	Washed out	3	0	-	-	-	-	-	-	-	-	-			
Natural	Poached	2	0	-	-	-	-	-	-	-	-	-			
Natural	Unknown	5	0	-	-	-	-	-	-	-	-	-			
Moved	Intact	6	6	8	3	805	0	4	103	245	-	1157	69.6%	68.6%	805
Moved	Predated	2	2	4	3	271	3	0	48	62	-	384	70.6%	68.8%	271
	TOTALS	**84**	**74**	**134**	**33**	**9614**	**13**	**21**	**716**	**1385**	**-?**	**11749**	81.8%	80.4%	9614

Table 6C. Hawksbill turtle hatching and emergence on the big Zapatilla Cay – 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	57	57	276	63	7498	1	152	842	968	-	9461	79.3%	75.7%	7498
Natural	Washed out	3	1	0	0	148	0	0	1	2		151	98.0%	98.0%	148
Natural	Poached	3	0	-	-	-	-	-	-	-	-	-			
Natural	Unknown	3	0	-	-	-	-	-	-	-	-	-			
Moved	Intact	1	1	0	2	133	0	0	13	76	0	224	59.9%	59.0%	133
	TOTALS	**67**	**59**	**276**	**65**	**7779**	**1**	**152**	**856**	**1046**	**0**	**9836**	79.1%	75.6%	7779

Table 6D. Hawksbill turtle hatching and emergence on Escudo de Veraguas- 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	43	31	184	29	3698	0	62	551	524	0	4835	76.5%	72.1%	3698
Natural	Predated	5	4	153	1	410	1	11	124	113	?	659	62.2%	38.8%	410
Natural	Washed out	4	2	0	0	0	0	0	0	127	-	127	0.0%	0.0%	0
Natural	Poached	6	0	-	-	-	-	-	-	-	-	-			
Natural	Unknown	18	0												
Moved	Intact	0	0	-	-	-	-	-	-	-	-	-			
Moved	Predated	0	0	-	-	-	-	-	-	-	-	-			
	TOTALS	**76**	**37**	**337**	**30**	**4108**	**1**	**73**	**675**	**764**	**0**	**5621**	73.1%	66.6%	4108

Table 6E. Hawksbill turtle hatching and emergence on Red Beach - 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	18	13	1	7	1300	0	106	310	165	0	1881	69.1%	68.7%	1300
Natural	Predated	0	0	-	-	-	-	-	-	-	-	-			
Natural	Washed out	1	0	-	-	-	-	-	-	-	-	-			
Natural	Poached	0	0	-	-	-	-	-	-	-	-	-			
Natural	Unknown	4	0												
Moved	Intact	0	0	-	-	-	-	-	-	-	-	-			
Moved	Predated	0	0	-	-	-	-	-	-	-	-	-			
	TOTALS	**23**	**13**	**1**	**7**	**1300**	**0**	**106**	**310**	**165**	**0**	**1881**	69.1%	68.7%	1300

Table 6F. Leatherback turtle hatching and emergence on Chiriquí Beach - 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	45	45	38	20	783	8	16	87	2404	0	3298	23.7%	22.0%	783
Natural	Predated	17	10	2	26	384	1	3	23	119	?	530	?	?	384
Natural	Washed out	4	0	-	-	-	-	-	-	-	-	-			
Natural	Poached	0	0	-	-	-	-	-	-	-	-	-			
Moved	Intact	0	0	-	-	-	-	-	-	-	-	-			
Moved	Predated	0	0	-	-	-	-	-	-	-	-	-			
	TOTALS	**66**	**55**	**40**	**46**	**1167**	**9**	**19**	**110**	**2523**	**0**	**3828**	?	?	1167

Table 6G. Green turtle and loggerhead hatching and emergence on Chiriquí Beach – 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact Cm	3	3	1	0	283	0	0	1	20	0	304	93.1%	92.8%	283
Natural	Predated Cm	1	0	-	-	-	-	-	-	-	-	-			
Natural	Washed out Cm	1	0	-	-	-	-	-	-	-	-	-			
Natural	Intact Cc	1	1	2	0	49	0	2	111	8	0	170			
	TOTALS	**6**	**4**	**3**	**0**	**332**	**0**	**2**	**112**	**28**	**0**	**474**	70.0%	69.4%	332

Table 6H. Green turtle hatching and emergence on the small Zapatilla Cay – 2004.

Treat-ment	Fate	All Nests	Excav-ated nests	Live hatch-lings	Dead hatch-lings	Empty shells	Pipped live	Pipped dead	Eggs with deve-lop-ment	Eggs without deve-lop-ment	Pred-ated eggs	total eggs	hatching success	emergence success	hatchlings produced
Natural	Intact	3	3	1	1	471	0	1	3	14	0	489	96.3%	95.9%	471

Poaching and other mortality factors

The threat to turtles and their eggs is much greater on Chiriqui Beach, which is bounded by two communities, than on the Zapatilla Cays. The data collected in 2004 suggests that the nearly continuous presence of beach monitors on these beaches during the entire nesting season is certain to have conferred a high level of protection to nesting females and their nests. There is only one member of a nearby community that continues the practice of illegally collecting hawksbill eggs. In 2004, he was arrested and spent several days in jail before being released. In July 2005, several members of the Rio Caña community met to discuss measures to convince the person to stop the illegal take of hawksbill eggs.

On the Zapatilla Cays, two hawksbill nests were poached during April from the small cay. This was before daily monitoring began so there was no one living on the island to observe the poachers. On the big Zapatilla Cay, our observations suggest that hawksbill nests were poached on 9 July, 27 July, and 27 September. Although nest monitors check the big cay once daily during the season and a park ranger is

sometimes resident on the island, there are long periods during each day when poachers could operate unobserved on the big cay.

Environmental education activities
Inocencio Castillo, beach monitor at the Zapatilla Cays, and two beach monitors from Río Caña and Rio Chiriqui, Martin Abrego and Erick Trottman, traveled to Costa Rica in January 2004 to participate in the International Sea Turtle Symposium in San José.

During 2004, a total of eight beach monitors from the communities of Río Caña and Río Chiriquí traveled to Tortuguero, Costa Rica, and participated as research assistants in CCC's 2004 Green Turtle Program. They learned about monitoring and conservation techniques and observed sea turtle tourism first hand. Upon returning to Chiriqui Beach, they have shared their experience and skills learnt with other beach monitors and members of the Río Caña and Río Chiriquí communities. Another four beach monitors will participate in the 2005 Green Turtle Program at Tortuguero.

Argelis Ruiz of the Smithsonian Tropical Research Institute together with Research Coordinator Cristina Ordoñez and an invited fellow researcher of fishery from STRI, Paulo Morais, Universidade do Algarve, Portugal, conducted teacher training and distribution of educational materials in communities adjacent to Chiriqui Beach during August 17-20. A total of 50 teachers from the communities of Kusapin and Río Chiriquí participated in the teacher training workshops, 36 and 14 teachers, respectively.

On August 25, Cristina Ordoñez gave a presentation about the project and sea turtle biology to a group of approximately 60 high school students and teachers at Smithsonian Tropical Research Institute's Galeta Marine Laboratory, Colón.

Approximately 150 school children attended the transmitter attachment event and subsequent release of hawksbill turtle Merygö in September 2004. During the attachment process, beach monitors explained about sea turtle biology and conservation, the aims of the project and their experience participating in green turtle monitoring at Tortuguero, Costa Rica.

Cristina Ordoñez and Sebastian Troëng met with the newly elected Mayor Eligio Binns of Bocas del Toro on September 7, 2004. The Mayor was informed of the progress of the project and the importance of Chiriqui Beach and adjacent nesting beaches for hawksbill and leatherback turtles. Mr. Binns expressed interest and support for the project and also requested advice regarding other sea turtle nesting beaches in the area. Also, on September 7, Cristina Ordoñez and Sebastian Troëng met with Mr. Ausencio Palacios, the President of local organization APRORENANB in Panama City, and presented him with a copy of the final 2003 project report. Also, project progress during 2004 and other projects aimed at strengthening community involvement in natural resource management were discussed.

On September 8, Cristina Ordoñez and Sebastian Troëng met with Sr. Jesús Alemancia, Coordinator of Panamanian NGO CEASPA, to present the project and discuss the implications of the recently declared protected area that includes Chiriqui Beach. Sr. Jesús expressed interest in initiating additional projects in Río Caña, aimed primarily at terrestrial areas and resources.

Also on September 8, Cristina Ordoñez, Sebastian Troëng and Argelis Ruíz of Smithsonian Tropical Research Institute met with Dr. Ligia Castro, new head of ANAM, to present her with the project results and aims. Lic. Castro expressed great interest in supporting and strengthening sea turtle research and conservation efforts.

From 14 to 19 September, Cristina Ordoñez and a beach monitor from Rio Caña participated at the ANAM stand at the Feria del Mar in Bocas del Toro. They explained the project to interested members of the public. Inocencio Castillo captured some sea turtles for the display (they were all released within a couple of days of capture) and, as during previous years, the stand was one of the most popular ones at the Feria del Mar.

On September 20, by invitation of Dr. Ligia Castro, General Administrator of ANAM, Argelis Ruiz of STRI and Cristina Ordoñez participated in the interinstitutional coordination meeting between the Panamanian Tourism Institute (IPAT), ANAM, SENACYT and INAC. Cristina Ordoñez of CCC gave a presentation about sea turtles and ecotourism potential. Mr. Rubén Blades, Minister of Tourism, expressed great interest in the possibility of ecotourism projects in the project area due to its regional importance as a nesting site for hawksbill and leatherback turtles.

Approximately 30-40 students and villagers from the Río Chiriquí area attended the transmitter attachment event and subsequent release of hawksbill turtle Señorita Chiriquí on October 6, 2004. During the attachment process, beach monitors explained about sea turtle biology and conservation, the aims of the project and their experience participating in green turtle monitoring at Tortuguero, Costa Rica.

In late October, the First Environmental Fair was celebrated in Rio Caña. CCC participated through Cristina Ordoñez, Roxana Silman and Emma Harrison. Lic. Hilda Candanedo of ANAM, Lucia Lasso and Arcadio Castillo from STRI's Bocas Research Station also participated in the fair.

Three articles about the project were published in Panamanian media. The first two were by Jahaira Valverde and titled "After the hawksbill turtles – Worth more alive than dead" and "Surviving the Attack" and published in the newspaper Mi Diario. The third article "Sustainable tourism to save the turtles" is available on internet at http://www.visitpanama.com/espa/300/330/news_n_articles.asp?pagina=tortuga

DISCUSSION AND CONCLUSIONS

Chiriquí Beach is part of the Ngöbe-Buglé Comarca area and is the most important hawksbill (Carr 1956) and leatherback nesting beach in Caribbean Panama and Central America (Meylan, Meylan and Ruiz 1985; Ordoñez et al, in review). An important goal of the project at Chiriqui Beach is to generate conservation-oriented employment for local inhabitants and to teach them about the subject of conservation, as well as to build capacity for natural resource management. During the second year of work, the interest and commitment of many of the inhabitants of Río Caña were further strengthened. In the Río Chiriquí section, there are many individuals who support the project and others who do not. We hope that through continued environmental education and outreach we will be able to count on total support from both communities.

At the Zapatilla Cays, nesting beach monitoring has been ongoing since 1990 incidental to the Meylan's netting project sponsored by the Wildlife Conservation Society. Monitoring efforts have expanded gradually over the years and for 2004, year-round observations are available for the first time. Because these islands are an uninhabited portion of a national marine park, the possibilities for protecting nesting females and their eggs are excellent. On several occasions this year, egg poachers were encountered within the park and were asked by beach monitors to leave nests alone. It is anticipated that as the hawksbill population continues to recover on the Zapatilla Cays, eggs and nesting females will become an increasingly attractive target for poachers.

Track surveys

2004 was the first year of complete monitoring at Chiriqui Beach. Although hawksbill nesting is much reduced from historical levels, the beach remains important for this critically endangered species. The 473 nests recorded represent more nests than those hosted by any other beach in Central America. It was also confirmed in 2004 that Escudo de Veraguas Island hosts significant hawksbill nesting. Red Beach is less important for hawksbill turtles but may share individual females with the other nesting beaches. This means that continued killing of female turtles on Red Beach has the potential to negatively affect the hawksbill recovery at the other beaches. Chiriqui Beach's importance for leatherback turtles was confirmed in 2004 and it is now clear that Chiriqui Beach hosts more leatherback nesting than any other beach on the two coasts (Caribbean and Pacific) of Central America.

On the Zapatilla Cays beaches, hawksbill nesting occurred in January and during all months from April to November. Annual nesting distribution is unimodal with a distinct peak in July. Nesting appears to increase at a regular rate during May and June and then decrease at a regular rate from August to November. Nesting density on the Zapatilla Cays was 33.9 nests per km which is almost double what it was in 2003 (18.4 nests per km). There were no leatherback nests on either cay but there were three green turtle nests recorded on the small cay. We cannot be certain if these nests were laid by one or more green turtles.

Night patrols

The number of turtles encountered at night would have been greater if the effort had been greater. As the priority of the project is to monitor the number of nests and identify the problems faced by nesting females and their nests, constant nightly monitoring was not conducted. The record of a hawksbill turtle nesting at Chiriqui Beach in 2004 but originally tagged at Tortuguero, Costa Rica during the 1997 nesting season demonstrates that female hawksbills may switch between nesting beaches located considerable distances apart. This emphasizes the need for international collaboration in sea turtle monitoring and conservation. The night patrols also resulted in encounters with leatherback turtles tagged on several other beaches in Caribbean Colombia, Costa Rica and Panama. Based on these tag observations, it is apparent that the leatherback population nesting along the coast can be considered one large population.

Biometric data
The mean size of hawksbill turtles nesting at Chiriqui Beach and the small Zapatilla Cay is very similar (Table 3a and 3b). The larger mean clutch size recorded at the small Zapatilla Cay in comparison with Chiriqui Beach is most likely a consequence of smaller sample size.

Genetic samples
With the additional tissue samples collected from hawksbill turtles during the 2004 nesting season, the total number of samples now available should allow for a preliminary description of the genetic composition of the hawksbill nesting population. The samples were exported for analysis in 2005 with the appropriate CITES permits. By combining the genetic information with observations and recaptures of tagged females as well as turtles tracked by satellite, we hope to gain additional knowledge about the movements of the hawksbill turtles nesting in Bocas del Toro Province and the Ngobe-Bugle Comarca.

Satellite telemetry
We have now satellite tracked four female hawksbills after they nested on Chiriqui Beach. Three of these have made long-distance migrations, two to Nicaragua and one to Jamaica. The fourth, Merygö, was killed 14 days after leaving the nesting beach. She did not travel far from Chiriqui Beach, and may have been preparing to nest again when caught by a diver from Cayo de Agua in Chiriqui Lagoon. The exact location where Merygo was captured is not known although the transmitter had been transmitting from the Tiger Channel area of Chiriqui Lagoon, suggesting the possibility that the lagoon serves as internesting habitat for hawksbill turtle nesting at Chiriqui Beach, or that she was going to nest somewhere other than Chiriqui Beach.

Nest productivity
Natural hawksbill nests which are left intact at Chiriquí Beach generally hatch out with high success. Unfortunately, nests are still affected by dog depredation and human poaching. The beach monitors and other members of the Rio Caña and Rio Chiriquí communities have expressed concern regarding the continued illegal collection of eggs. Efforts to reduce dog depredation of eggs and hatchlings and to dissuade the few remaining illegal egg collectors on Chiriquí Beach are ongoing and we hope to reduce the severity of these survival threats over time through joint actions with the local communities and local and national Panamanian authorities.

On the Zapatilla Cays, where there are no dogs, and in fact, no terrestrial mammals, emergence success was very high again this year All but one of the 133 nests followed to hatching produced hatchlings, although two had hatch rates below 5%, Most nests produced well over 100 hatchlings. The only predators observed on these beaches were crabs which do not cause a complete loss of hatchlings. Three nests that were partially predated by crabs still produced 385 hatchlings (or 128.3 hatchlings per nest).

Poaching and other mortality factors
The efforts this year at Chiriquí Beach greatly discouraged the capture of turtles on the beach. Only one community member continues to extract nesting females and eggs. It is important to realize that the illegal taking of females and eggs from the nesting beach and the fact that many nesting females appear to be taken from waters along the Bocas coast are counteracting the conservation efforts. To achieve the best conservation results, we require help from the traditional authorities and organizations, the government authorities and the communities to better control the illegal take from the beaches and the illegal fishing in areas adjacent to these important nesting beaches. By joining forces and providing information, we hope to achieve the primary goal of the project ,"**to recover the hawksbill turtle population**".

Environmental education activities
These activities are of great importance to strengthen the efforts conducted at all the study sites. Also, another project interest is to build capacity in the Panamanian communities, mainly through university students, by involving them in the project. The project efforts can serve as inspiration and a model for other conservation efforts in the region and we will try to divulge project information and results as widely as possible in Panama and throughout the region.

REFERENCES

Carr, A.F. 1956. The Windward Road. Alfred Knopf, New York. 258 pp.

Meylan, A.B., Meylan, P. and Ruiz A. 1985. Nesting of *Dermochelys coriacea* in Caribbean Panama. Journal of Herpetology. Vol. 19, No. 2, pp. 293-297.

Meylan, A.B. and Donnelly, M.D. 1999. Status Justification for Listing the Hawksbill Turtle (*Eretmochelys imbricata*) as Critical Endangered in the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology* 3(2): 200-224.

Ordoñez, C., Troëng, S., Meylan, A., Meylan, P. and A. Ruiz. In review. Chiriqui Beach, Panama, the most important leatherback nesting beach in Central America. Chelonian Conservation and Biology

Roberts, O.W. 1827. Narrative of voyages and excursions on the east coast and in the interior of Central America. University of Florida Press, Gainesville. 302 pp. [Reprint 1965].

IUCN 2004. 2004 IUCN Red List of Threatened Species. <www.redlist.org>. Downloaded on July 11, 2005.

RECOMMENDATIONS

1.- The visits and interventions of the Traditional Authorities of the Comarca and the National Environmental Authority of the Comarca at Chiriquí Beach and the other project sites are very important to strengthen the project. The authorities need to counteract turtle exploitation on the beach and in neighboring marine areas which diminish the success of the efforts undertaken at Chiriquí Beach, Escudo de Veraguas Island and in Bastimentos Island National Marine Park.

2.- The long distance movements of hawksbill turtles followed through satellite telemetry emphasize the importance of international collaboration in sea turtle conservation. Panama could join the Inter-American Convention for the Protection and Conservation of Sea Turtles to ensure other countries are aware of the importance of Panamanian nesting beaches and support the efforts to conserve the sea turtle populations.

3.- The education work would be more successful if conducted monthly and in different areas. It is also very important to have more activities in areas where fishing of these species is still practiced.

4.- It is important to engage Panamanian university students in the project to achieve a broader dissemination of results and involvement in conservation activities.

Appendix 1 Tag numbers by species at Chiriquí Beach

Date	Species	Right tag	Left tag	Eggs[1]	Yolkless eggs[1]	Length Cm (CCL)	Width Cm (CCW)	Observations
13-Sep-04	C.c	CH0563	CH0562	0	0	84	74	
2-Sep-04	C.m.	CH0556	CH0555			99	91	
13-Sep-04	C.m.	CH0258	CH0266	0	0			
9-Mar-04	D.c.	D9224	CH1333	98	12	148.0	106.0	D9224 attached by Caribaro
16-Mar-04	D.c.	65030	65031	75	23	136.6	104.2	Tortuguero, Costa Rica 2-Apr-96
17-Mar-04	D.c.	CH1337	CH1336	110		147.5	116.0	
17-Mar-04	D.c.	CH1339	CH1338			146.0	104.0	
23-Mar-04	D.c.	CH1335	CH1334	71	31	146.0	108.0	
23-Mar-04	D.c.	CH1341	CH1340	62	15	157.0	107.0	
29-Mar-04	D.c.	CH1342	77189	104	11	143.9	107.3	Chiriqui Beach 2-Apr-02
30-Mar-04	D.c.	CH1345	CH1344	0	0			
31-Mar-04	D.c.	CH1048	CH1047			159.5	115.6	CH1047 replaced by CH1162
31-Mar-04	D.c.	CH1099	CH1098	93	35	162.7	112.3	
31-Mar-04	D.c.	CH1251	VA2597			162.5	114.3	VA2597 lost
2-Apr-04	D.c.	VA2614	CH1113	106	16	155.9	113.2	
2-Apr-04	D.c.	CH1115	CH1114	66	20	148.6	111.3	
2-Apr-04	D.c.	CH1117	CH1116			152.5	109.0	
2-Apr-04	D.c.	CH1100	VA2543			151.8	106.8	Chiriqui Beach 29-Apr-02
4-Apr-04	D.c.	CH1347	CH1346	80	20	152.5	102.0	
4-Apr-04	D.c.	CH1349	CH1348	86	14	149.0	107.0	
5-Apr-04	D.c.	CH1096	77168			105.8	105.0	Chiriqui Beach 6-Apr-02
5-Apr-04	D.c.	CH1050	CH1049	82	31	148.0	105.0	
5-Apr-04	D.c.	CH1072	CH1069			156.9	114.6	
5-Apr-04	D.c.	CH1074	CH1073			154.8	109.8	
5-Apr-04	D.c.	CH1093	CH1092	85	34	143.0	106.0	
5-Apr-04	D.c.	CH1095	CH1094			146.1	107.4	
5-Apr-04	D.c.	CH1118	CH1097			153.0	107.5	
5-Apr-04	D.c.	CH1120	CH1119			140.0	105.2	
5-Apr-04	D.c.	VA2502	CH1121	85		143.7	105.2	
5-Apr-04	D.c.	VA2625	V4004			148.7	119.0	V4004 attached by ITEC
6-Apr-04	D.c.	CH1123	CH1122			153.8	110.7	
6-Apr-04	D.c.	CH1125	CH1124			155.3	116.2	
8-Apr-04	D.c.	CH1152	CH1151	197	37	163.4	116.6	
8-Apr-04	D.c.	CH1351	CH1350	85	18	151.0	102.0	
8-Apr-04	D.c.	CH1353	CH1352	85	24	147.5	111.5	
8-Apr-04	D.c.	CH1355	CH1354	80	20	147.0	109.0	
9-Apr-04	D.c.	CH1357	CH1356			143.5	104.5	
9-Apr-04	D.c.	V1906	V1905			145.0	103.0	Tags attached by ANAI
11-Apr-04	D.c.	CH1127	CH1126			150.0	111.0	
11-Apr-04	D.c.	CH1154	CH1153	107	36	137.1	101.8	
11-Apr-04	D.c.	VA2538	CH1155	0	0	157.2	119.7	
11-Apr-04	D.c.	CH1157	CH1156	84	0	147.9	102.2	
11-Apr-04	D.c.	CH1159	CH1158			147.5	110.4	
12-Apr-04	D.c.	CH1161	CH1160			155.0	107.0	
13-Apr-04	D.c.	CH1164	CH1163			153.5	109.5	
14-Apr-04	D.c.	CH1166	CH1165	0	0	158.0	112.5	
14-Apr-04	D.c.	CH1167	V4171			143.2	104.8	Chiriqui Beach 15-Jun-01
15-Apr-04	D.c.	CH1169	CH1168	68	21	148.9	108.7	
15-Apr-04	D.c.	CH1171	CH1170			150.8	108.9	
15-Apr-04	D.c.	V4317	CH1172	89	30	156.5	117.6	V4317 attached by ITEC
15-Apr-04	D.c.	CH1174	CH1173	73	47	146.0	111.0	

15-Apr-04	D.c.	CH1177	CH1176	88	25	153.0	105.2	
15-Apr-04	D.c.	CH1359	CH1358	75	20	163.0	114.0	
16-Apr-04	D.c.	CH1129	CH1128			147.7	100.7	
16-Apr-04	D.c.		CH1178	0	0	154.5		
16-Apr-04	D.c.	CH1361	CH1360	91	22	151.0	106.0	
16-Apr-04	D.c.	CH1363	CH1364	68	45	146.2	103.2	
16-Apr-04	D.c.	CH1366	CH1365	77	40	147.0	102.2	CH1365 replaced by CH1372
17-Apr-04	D.c.	CH1368	CH1367	80		155.0	109.0	
17-Apr-04	D.c.	CH1370	CH1369			137.0	105.0	
17-Apr-04	D.c.	CH1387	CH1371	82	21	156.0	111.0	
18-Apr-04	D.c.	CH1131	CH1130	97	30	171.0	125.0	
18-Apr-04	D.c.	CH1180	CH1179	0	0	153.0	109.7	
18-Apr-04	D.c.	CH1182	CH1181			157.4	110.6	
18-Apr-04	D.c.	CH1184	CH1183			152.2	118.6	
18-Apr-04	D.c.	CH1186	CH1185			160.2	109.0	
18-Apr-04	D.c.	CH1190	CH1191	0	0	158.5	114.0	
18-Apr-04	D.c.	V4300	V4299	0	0	166.0	112.0	Chiriqui Beach 19-Mar-02
19-Apr-04	D.c.	CH1133	CH1132	111	36	150.0	105.1	
19-Apr-04	D.c.	CH1136	CH1135	96	26	156.0	110.0	
19-Apr-04	D.c.	CH1200	CH1175	0	0	139.0	103.0	
19-Apr-04	D.c.	CH1188	CH1187			150.2	105.4	
19-Apr-04	D.c.	CH1193	CH1192	0	0	142.3	104.4	
19-Apr-04	D.c.	CH1195	CH1194	82	25	144.0	109.0	
19-Apr-04	D.c.	CH1197	CH1196			157.6	104.0	
19-Apr-04	D.c.	CH1199	CH1198	0	0	147.5	109.7	
19-Apr-04	D.c.	CH1375	CH1373			140.0	108.0	
19-Apr-04	D.c.	CH1134	V4370			155.0	121.0	Chiriqui Beach 30-Mar-02
21-Apr-04	D.c.	CH1139	CH1137	0	0	143.1	101.5	
22-Apr-04	D.c.	CH1142	CH1141			132.7	103.9	CH1142 replaced by CH1525
23-Apr-04	D.c.	CH1144	CH1143			145.0	110.0	
23-Apr-04	D.c.	CH1378	CH1380			144.0	105.0	
24-Apr-04	D.c.	CH1146	CH1145			150.7	108.7	
24-Apr-04	D.c.	CH1148	CH1147			145.4	107.7	
24-Apr-04	D.c.	CH1384	CH1381			155.0	112.0	
24-Apr-04	D.c.	V1786	V1785			149.0	116.0	Tags attached by ANAI
25-Apr-04	D.c.		CH1149			147.7	116.2	
25-Apr-04	D.c.	CH1202	CH1201	76	35	147.5	112.4	
25-Apr-04	D.c.	CH1386	CH1385	71	20	158.0	113.0	
26-Apr-04	D.c.	CH1204	CH1203	56	17	161.0	111.1	
26-Apr-04	D.c.	CH1206	CH1205	85	20	155.1	111.2	
26-Apr-04	D.c.	CH1208	CH1207	0	0	142.5	106.0	
26-Apr-04	D.c.	CH1210	CH1209			146.0	111.0	
27-Apr-04	D.c.	CH1212	CH1211	65	26	147.0	102.0	
27-Apr-04	D.c.		CH1213					
28-Apr-04	D.c.	VA2584	CH1214	86	27	151.9	106.5	
29-Apr-04	D.c.	CH1389	CH1388			159.0	109.0	
1-May-04	D.c.	CH1216	CH1215	0	0	154.8	111.5	
1-May-04	D.c.	CH1391	CH1390			158.0	118.0	
2-May-04	D.c.	CH1218	CH1217			146.0	101.6	
2-May-04	D.c.	CH1220	CH1219	0	0	158.0	105.5	
2-May-04	D.c.	CH1222	CH1221			139.9	111.5	CH1222 lost
2-May-04	D.c.	CH1393	CH1392	0	0	163.0	112.0	
2-May-04	D.c.	CH1395	CH1394	0	0			
3-May-04	D.c.	CH1223	CH1150	0	0	149.0	107.8	
3-May-04	D.c.	CH1228	CH1227	0	0	151.0	101.5	

3-May-04	D.c.	CH1230	CH1229	0	0			CH1230 replaced by CH1268
3-May-04	D.c.	CH1126	VA1066	0	0			Pacuare, Costa Rica 3-Apr-02
3-May-04	D.c.	CH1231	VA2645			148.6	109.3	Chiriqui Beach 29-Apr-02
3-May-04	D.c.	VA3524	VA3523			160.2	116.3	Pacuare, Costa Rica 2003?
3-May-04	D.c.	VA3918	VA3917	84	31	145.0	105.5	Soropta 3-Apr-04
4-May-04	D.c.	V4074	77951			155.9	110.2	San San, Panama?
4-May-04	D.c.	CH1233	CH1232	59	24	149.7	105.0	
4-May-04	D.c.	CH1397	CH1396			148.0	102.0	
4-May-04	D.c.	CH1399	CH1398			144.0		
4-May-04	D.c.	CH1401	CH1400			152.0	107.0	
4-May-04	D.c.	CH1403	CH1402					
4-May-04	D.c.	CH1581	VA0921	0	0			Chiriqui Beach 16-Jun-02
5-May-04	D.c.	CH1241	CH1240	0	0			
5-May-04	D.c.	CH1254	CH1253	70		144.0	102.6	
5-May-04	D.c.	CH1277	CH1276	0	0	158.9	119.0	
5-May-04	D.c.	CH1405	CH1404	0	0	152.2	105.0	
5-May-04	D.c.	CH1407	CH1406			142.0	111.0	
5-May-04	D.c.	V4181	V4180	0	0	162.3	113.0	Chiriqui Beach 10-Jun-01
6-May-04	D.c.	CH1235	CH1234	0	0	144.6	102.2	
6-May-04	D.c.	CH1237	CH1236	0	0	157.3	111.0	
6-May-04	D.c.	CH1239	CH1238	0	0	148.4	110.2	
6-May-04	D.c.	CH1243	CH1242	0	0	161.9	113.4	CH1242 replaced by CH1509
6-May-04	D.c.		CH1244	0	0	155.1	113.3	
6-May-04	D.c.	CH1246	CH1245			153.5	111.0	
6-May-04	D.c.	CH1249	CH1247			141.0	105.3	
6-May-04	D.c.	VA2681	V1515	0	0	139.0	102.5	Gandoca, Costa Rica 28-Mar-00
6-May-04	D.c.	V4342	VA2541			158.4	113.8	V4342 attached by ITEC
7-May-04	D.c.	CH1410	CH1409			146.0	112.0	
9-May-04	D.c.	CH1412	CH1411			158.2	113.0	
10-May-04	D.c.	CH1278	77174	0	0	157.0	110.5	Chiriqui Beach 5-Apr-02
10-May-04	D.c.	CH1280	CH1279	0	0	142.0	103.0	
10-May-04	D.c.	CH1282	CH1281	76	47	154.0	108.4	
10-May-04	D.c.	CH1414	CH1413			151.2	115.0	
10-May-04	D.c.	CH1416	CH1415	0	0			
10-May-04	D.c.	CH1283	VA2586	0	0	152.5	111.0	Chiriqui Beach 28-May-02
11-May-04	D.c.	V4292	77616	0	0	153.0	107.0	77616 attached by Caribaro
11-May-04	D.c.	CH1285	CH1284	98	21	185.0	116.0	
11-May-04	D.c.	CH1287	CH1286	0	0	128.0	101.0	
12-May-04	D.c.	CH1255	CH1250					
12-May-04	D.c.	CH1257	CH1256			142.4	114.0	
12-May-04	D.c.	CH1259	CH1258	0	0	153.0	110.0	
12-May-04	D.c.	CH1418	CH1417			160.0	114.0	
12-May-04	D.c.	CH1260		0	0			
13-May-04	D.c.	CH1264	CH1263	0	0	153.0	116.0	
13-May-04	D.c.		CH1265	0	0			
13-May-04	D.c.	CH1267	CH1266	0	0	166.5	115.4	CH1267 replaced by CH1224
13-May-04	D.c.	CH1289	CH1288	101	20	154.0	112.0	
13-May-04	D.c.	CH1420	CH1419					
13-May-04	D.c.	CH1577	CH1576	0	0	145.5	110.5	
13-May-04	D.c.	CH1579	CH1578	0	0	143.8	102.2	
13-May-04	D.c.	V2040	V2039	77	28	155.4	107.0	Tags attached by ITEC
13-May-04	D.c.	CH1262	V4206			148.0	108.5	Chiriqui Beach 22-Jun-01
14-May-04	D.c.	CH1225	CH1224	83	37	157.0	114.5	CH1224 replaced by CH1271
14-May-04	D.c.	CH1270	CH1269	78	10	169.0	113.0	
14-May-04	D.c.	CH1583	CH1582	0	0	143.7	102.5	

14-May-04	D.c.	VA0728	D9127	0	0	143.7	103.5	D9127 attached by Caribaro
14-May-04	D.c.	61036	V0568	0	0	144.0	103.0	Gandoca, Costa Rica 3-May-94
14-May-04	D.c.	CH1580	V4316	0	0	156.8	116.0	Chiriqui Beach 16-Mar-02
14-May-04	D.c.	VA3981	VA3980	0	0	166.8	118.0	Long Bay, Panama 4-Apr-04
15-May-04	D.c.	CH2633	77172	80	17	140.0	108.3	Chiriqui Beach 5-Apr-02
15-May-04	D.c.	VA4074	77751	60	38	156.0	111.0	77751 attached by Caribaro
15-May-04	D.c.	CH1273	CH1272	75	37	154.2	108.9	
15-May-04	D.c.	CH1275	CH1274	85	39	149.0	105.5	
15-May-04	D.c.	CH1422	CH1421			148.2	107.8	
15-May-04	D.c.	CH1502	CH1501	0	0	152.0	108.0	
15-May-04	D.c.	CH1504	CH1503			153.3	104.6	
15-May-04	D.c.	D10558	D10557	0	0	147.0	112.6	Tags attached by ANCON
15-May-04	D.c.	CH1260	VA2605			158.1	111.2	Chiriqui Beach 22-Apr-02
15-May-04	D.c.	VA3510	VA3509			151.6	101.1	Pacuare, Costa Rica 2003?
16-May-04	D.c.	CH1424	CH1423			150.0	105.0	
16-May-04	D.c.	CH1506	CH1505	67	23	151.6	108.2	
16-May-04	D.c.	CH1585	CH1584	84	18	146.0	108.0	
16-May-04	D.c.	CH1580	V4376	0	0	158.4	110.2	Chiriqui Beach 7-Jun-02
17-May-04	D.c.	CH1291	CH1290			135.0	99.0	
17-May-04	D.c.	CH1293	CH1292	0	0	160.0	113.0	
17-May-04	D.c.	CH1427	CH1426			155.0	109.0	
17-May-04	D.c.	CH1429	CH1428			156.0	113.0	
17-May-04	D.c.	CH1431	CH1430			147.0	107.0	
17-May-04	D.c.	CH1508	CH1507	60	35	141.5	103.3	CH1507 replaced by CH1300
17-May-04	D.c.	CH1587	CH1586	0	0	147.1	106.5	
17-May-04	D.c.	CH1589				148.0	111.0	
19-May-04	D.c.	CH1511	CH1510	75	35	152.0	107.4	
19-May-04	D.c.	CH1513	CH1512	83	34	155.0	112.9	
19-May-04	D.c.	CH1515	CH1514	0	0	151.2	105.7	
19-May-04	D.c.	CH1591	CH1590	77	41	155.0	115.0	
20-May-04	D.c.	CH1433	CH1432			166.0	119.0	
20-May-04	D.c.	CH1435	CH1434			155.5	115.0	
20-May-04	D.c.	CH1593	CH1592	97	24	160.5	118.6	CH1593 replaced by CH1541
20-May-04	D.c.	V4526	V4525			150.0	106.0	Pacuare, Costa Rica 11-Apr-01
21-May-04	D.c.	CH1226	CH1294			145.0	112.0	
21-May-04	D.c.	CH1296	CH1297			151.0	104.0	
21-May-04	D.c.	CH1437	CH1436			140.0	102.0	
21-May-04	D.c.	CH1439	CH1438			148.0	105.0	
21-May-04	D.c.	CH1517	CH1516	61	28	155.3	111.3	CH1517 lost
21-May-04	D.c.	CH1519	CH1518	0	0	155.0	109.0	
21-May-04	D.c.	CH1521	CH1520			158.5	104.4	
21-May-04	D.c.	CH1524	CH1523	0	0	158.1	115.3	
21-May-04	D.c.	CH1595	CH1594	0	0	149.2	102.6	
21-May-04	D.c.	CH1597	CH1596	0	0	140.6	100.2	
21-May-04	D.c.	CH1600	CH1599			146.7	106.6	
21-May-04	D.c.	CH1598	VA2587	79	24	164.3	110.3	Chiriqui Beach 25-May-02
21-May-04	D.c.	VA0981				159.0	119.0	Tags attached by ITEC
22-May-04	D.c.	CH1299	CH1298	0	0	152.0	115.0	
22-May-04	D.c.	CH1441	CH1440	62	28	149.0	110.0	
22-May-04	D.c.	CH1527	CH1526			153.8	105.3	
23-May-04	D.c.	VA3986	VA3985	78	42	151.2	107.1	Long Bay, Panama 25-Apr-04
24-May-04	D.c.	CH1443	CH1442			131.1	99.2	
24-May-04	D.c.	CH1445	CH1444			152.0	107.2	
25-May-04	D.c.	CH1447	CH1446			143.0	103.5	
25-May-04	D.c.	CH1529	CH1528	69	25	146.8	107.5	

26-May-04	D.c.	CH1449	CH1448			141.9	100.7	
26-May-04	D.c.	CH1451	CH1450			155.2	113.0	
26-May-04	D.c.	CH1453	CH1452			147.9	104.3	
27-May-04	D.c.	76026	76027	104	18	156.4	115.2	Tortuguero, Costa Rica 20-Mar-98
27-May-04	D.c.	CH1455	CH1454			152.0	111.8	
27-May-04	D.c.	CH1457	CH1456			143.2	106.4	
27-May-04	D.c.	CH1558	CH1557	97	36	156.9	109.8	
28-May-04	D.c.	CH1459	CH1458	50	7	145.4	100.3	
28-May-04	D.c.	RRK026	RRK027	63	40	149.7	107.9	Playona, Colombia 25-Apr-04
29-May-04	D.c.	CH1532	CH1531	65	21	147.0	107.5	
29-May-04	D.c.	CH1530	VA2649			146.1	109.5	Chiriqui Beach 29-Apr-02
30-May-04	D.c.	CH1461	CH1460			153.0	107.0	
30-May-04	D.c.	CH1554	CH1553	0	0	165.5	112.0	
31-May-04	D.c.	CH1464	CH1463			153.0	115.0	
31-May-04	D.c.	CH1466	CH1465	95	20	164.5	115.5	
31-May-04	D.c.	CH1462	VA3478	67	12	134.0	102.0	Pacuare, Costa Rica 2003?
1-Jun-04	D.c.	CH1564	CH1563	49	47	130.0	97.0	
1-Jun-04	D.c.	CH1566	CH1565			152.0	106.3	
2-Jun-04	D.c.	CH1468	CH1467	88	14	145.0	111.0	
4-Jun-04	D.c.	CH1470	CH1469			157.0	119.0	
5-Jun-04	D.c.	CH1472	CH1471	80	40	144.5	110.4	
6-Jun-04	D.c.		77155	43	11	157.0	108.0	Chiriqui Beach 31-Mar-02
6-Jun-04	D.c.	CH1474	CH1473	70		160.0	115.3	
6-Jun-04	D.c.	CH1476	CH1475	75	12	149.0	107.0	
6-Jun-04	D.c.	CH1568	CH1567			150.0	106.0	
8-Jun-04	D.c.	CH1552	CH1551	76	30	156.5	120.4	
8-Jun-04	D.c.	CH1555	VA2524	64	40	158.0	114.0	
8-Jun-04	D.c.	VA3920	VA3919			150.0	112.0	Soropta, Panama 8-Apr-04
9-Jun-04	D.c.	VA2435	VA2433					Soropta, Panama 9-May-02
10-Jun-04	D.c.	CH1570	CH1569			154.0	111.0	CH1569 replaced by CH1677
10-Jun-04	D.c.	CH1574	CH1573			146.0	108.0	
11-Jun-04	D.c.	CH1534	CH1533			152.7	110.5	
11-Jun-04	D.c.	CH1561	CH1556			147.0	106.4	
11-Jun-04	D.c.	CH1560	CH1559	62	33	150.6	108.3	
11-Jun-04	D.c.	CH1571	CH1562	72	41	149.0	108.3	
14-Jun-04	D.c.	CH1479	CH1478	86	15	148.0	103.0	
15-Jun-04	D.c.	CH1536	CH1535			158.7	107.3	
15-Jun-04	D.c.	CH1572	VA2592	96	25	155.5	117.2	Chiriqui Beach 1-May-02
16-Jun-04	D.c.	CH1593	VA2526	87		157.0	112.0	Chiriqui Beach 23-Apr-02
19-Jun-04	D.c.	CH1539	CH1537	55	11	144.5	103.5	
19-Jun-04	D.c.	CH1626	CH1540	0	0	147.3	106.6	
23-Jun-04	D.c.	CH1628	V4204	0	0	153.5	112.7	Chiriqui Beach 19-Jun-01
24-Jun-04	D.c.	CH1631	CH1629	0	0	155.3	112.5	
25-Jun-04	D.c.	CH1633	CH1632	56	14	142.9	102.2	
26-Jun-04	D.c.	CH1543	CH1542			151.3	112.4	
27-Jun-04	D.c.	CH1481	CH1480			184.0	117.0	
6-Jul-04	D.c.	VA3977	VA3976			150.0	109.5	Long Bay, Panama 1-Apr-04
14-Jul-04	D.c.	CH1635	CH1634			148.2	108.8	
17-Jul-04	D.c.	VA3927	VA3926	88	10	150.8	108.9	Soropta, Panama 29-Apr-04
17-Apr-04	E.i.	CH0216	CH0217			87.4	73	
2-May-04	E.i.	CH0522	CH0521					
5-May-04	E.i.	CH0219	CH0218	153	0	88.5	77	
20-May-04	E.i.	CH0526	CH0523			87.5	79	
28-May-04	E.i.	CH0528	CH0527			87.5	76.9	

9-Jun-04	E.i.	CH-0531	CH0529			92.4	79.7	
12-Jun-04	E.i.	CH0533	CH0532	161	0	90	78	
13-Jun-04	E.i.	CH0535	CH0534	178	0	87	77	
18-Jun-04	E.i.	CH0221	CH0220	143	0	80.5	76.6	
20-Jun-04	E.i.	CH0293	VA0907	0	0			Chiriqui Beach 8-Jun-02
23-Jun-04	E.i.	CH0295	CH0294	186	0	90.4	76	
23-Jun-04	E.i.	CH0537	CH0536	159	0	89	76	
29-Jun-04	E.i.	CH0297	CH0296			91	76.5	
30-Jun-04	E.i.	CH0540	CH0539	187	0	95	83.2	
3-Jul-04	E.i.	CH0240	CH0239	0	0	81.5	69	
4-Jul-04	E.i.	CH0224	CH0222			84.5	78.5	
4-Jul-04	E.i.	CH0299	CH0298	148	0	99.3	76	
6-Jul-04	E.i.	CH0242	CH0241			84.3	80	
8-Jul-04	E.i.	CH0244	CH0243			87	76.5	
8-Jul-04	E.i.	CH0246	CH0245	0	0	87	79.5	
9-Jul-04	E.i.	CH0300	CH0225			87	73.5	
14-Jul-04	E.i.	CH0248	CH0247	138	0	85.2	76	
14-Jul-04	E.i.	CH0250	CH0249			88.2	79	
22-Jul-04	E.i.	CH0244	CH0251	0	0	86	80	
22-Jul-04	E.i.	CH0546	CH0545	166	0	91	82.5	
26-Jul-04	E.i.	CH0253	CH0252			91	81	
27-Jul-04	E.i.	V4265	CH0254			84.5	74	V4265 attached by ITEC
28-Jul-04	E.i.	CH0256	CH0255			82	73	
2-Aug-04	E.i.	CH0268	CH0267			82	75	
2-Aug-04	E.i.	CH0270		143	0	81.5	75.6	
4-Aug-04	E.i.	CH0257	71090			87.5	80.5	71090 attached Tortuguero, Costa Rica 28-Jul-97
4-Aug-04	E.i.	CH0272	CH0271	200	0	88.5	86.2	
8-Aug-04	E.i.	CH0274	CH0273	191	0	86	71	
12-Aug-04	E.i.	CH0260	CH0259	132	0	74	69	
13-Aug-04	E.i.	CH0262	CH0261	157	0	86	76.5	
15-Aug-04	E.i.	CH0547	CH0543			83	79	
21-Aug-04	E.i.	CH0550	CH0549	77	1	83	75.6	
22-Aug-04	E.i.	CH0552	CH0551			91	82	
26-Aug-04	E.i.	CH0263	CH0264	137	0	80.5	68.3	
2-Sep-04	E.i.	CH0554	CH0553			83	75	
5-Sep-04	E.i.	CH0301	CH0300			92.4	83	
5-Sep-04	E.i.	CH0316	CH0314			82.4	72.5	
7-Sep-04	E.i.	CH0559	CH0558			82	75.2	
13-Sep-04	E.i.	CH0317	CH0275			92.3	78.5	
13-Sep-04	E.i.	CH0561	CH0560			83	78	
16-Sep-04	E.i.	CH0565	CH0564			77.5	72.5	
26-Sep-04	E.i.	CH0303	CH0302	173		82	72	
1-Oct-04	E.i.	CH0567	CH0566	177	0	84.5	75.5	
7-Oct-04	E.i.	CH0569	CH0568	189	0	83	75.4	

[1]Counted while laying

Appendix 2 Tag list for Zapatilla Cays[1]

Date	Species	Right tag	Left tag	Eggs[2]	Length Cm (CCL)	Observations
31-May-04	E.i.	MY517	VA2485	198	90.5	MY517 added this date
2-Jun-04	E.i.	MM1084	MY528	117	84	First capture
17-Jun-04	E.i.	CH0037	MY478	0	92.7	CH0037 added this date
6-Jul-04	E.i.	CH0038	MY528	-	80.4	CH0038 added this date
24-Jul-04	E.i.	CH0029	CH0028	152	86.8	First capture
26-Jul-04	E.i.	CH0031	CH0030	185	86.1	First capture
14-Aug-04	E.i.	CH0033	CH0032	0	88.5	First capture
21-Aug-04	E.i.	CH0040	CH0039	0	88.3	First capture
30-Aug-04	E.i.	CH0042	CH0041	164	83.7	First capture
6-Sept-04	E.i.	CH0044	CH0043	0	88.5	First capture
12-Oct-04	E.i.	CH0059	CH0057	-	88.5	First capture

[1] only newly applied tags are listed, recaptures are included only if new tags were applied.

[2] eggs counts are based on post-emergence evaluations of nests.