COTERC and GVI Costa Rica

Marine Turtle Monitoring Program on the North Beach Of Tortuguero, Costa Rica

Final Report

Leatherback Nesting Season 2006

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Leatherback Nesting Season 2006

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1. Introduction

Over the past 20 years there has been a huge decline in leatherback turtles (*Dermochelys coriacea*) (Troëng *et al*., 2004) due to overexploitation such as illegal harvesting of their meat and eggs, as well as fishing, contamination and habitat alteration. *D. coriacea* is classified as critically endangered on the IUCN Red List (IUCN, 2003). In addition to the general decline in sea turtles, Tortuguero and the surrounding areas are continuously developing and thus the demand for protection and conservation of the sea turtles and their habitat is growing.

Tortuguero **N**ational **P**ark (TNP) was established in 1975 with the main purpose of protecting sea turtles and the nearby areas of humid lowland forest and beach (A. Castro, *pers. comm.).* While this protection is contributing to the stability of sea turtle populations, many beaches surrounding the park are supposedly undergoing a high percentage of poaching (J. Daigle, *pers. comm.*). In response to this, COTERC (**C**anadian **O**rganization for **T**ropical **E**ducation and **R**ainforest **C**onservation) started a five-year long feasibility study in 2004 with the aim of determining nesting populations and poaching rates of green turtles (*C. mydas)* and leatherback turtles (*D. coriacea)* on North Beach (the beach just north of Laguna Tortuguero) and occasionally hawksbill (*Eretmochelys imbricata*) and loggerhead turtles (*Caretta caretta*).

In July 2005 GVI joined COTERC in collecting data on the unprotected North Beach. As well as collaborating on the data collection and analysis, GVI and COTERC shared data with the CCC (**C**aribbean **C**onservation **C**orporation) in order to gain more knowledge from tagged turtles and compare poaching rates of turtles nesting on protected National Park beaches.

2. Sea Turtle Monitoring Programme

2.1. Aim

According to previous studies (conducted by COTERC) there is a great amount of illegal harvesting of turtle eggs, and to a lesser extent turtle meat, on the North Beach. Thus, the aim of this project is to study the spatial and seasonal distribution of nesting females, the number of mature females, illegal harvesting of turtle meat and eggs, and natural predation of nests. Through these means the project aims to study, monitor and protect the sea turtles coming to nest on the North Beach, as well as compare the data with other important nesting sites like the TNP.

2.2. Methodology

The methodology used for the marine turtle monitoring program follows the COTERC and GVI protocol which is adapted from and approved by the CCC.

2.2.1. Study site

The North Beach, which encompasses the study area, is 3 1/8 miles long (5 kilometers) and extends from the Tortuguero river mouth (10º36'36,9"N - 83º31'52,1"W) at the most southern point until Laguna Cuatro (10º37'56,3"N – 83º32'25,7"W) in the north. Although this beach is not within the TNP boundaries, it is situated within the Barra Colorado Wildlife Refuge which, like the TNP, also is managed by ACTo (Area de Conservación Tortuguero) under MINAE – the Costa Rican Ministry of Environment and Energy).

The study area begins at Mile 0 just north of Tortuguero river mouth (10º35'51"N – 83º31'40"W) and extends to Laguna Cuatro, at Mile 3 1/8. The entire study area is divided and marked with mile markers each 1/8 of a mile (200 meters) from the south to the north with ascending numbers. This allows for the documentation of spatial distribution and density of nests along the beach.

The nearest village to the study beach is San Francisco, situated south of mile 0, a constantly growing community of about 275 residents. Two hotels (Vista al Mar Lodge and Turtle Beach Lodge) and a few ranchos and houses are built along the study beach. On the southern side of Tortuguero river mouth is Tortuguero beach where the CCC

monitors from mile 0 (10º35'51"N – 83º31'40"W) to mile 18 (10º21'46"N – 83º23'41"W) at Jalova lagoon.

The sand of the study beach is black and fine with a typical high energy-beach. The width of the nesting beach platform (or berm) vary from 2 to 38 meters, but the configuration of the shape and size of the berm changes constantly in response to long shore drift and exposure levels.

The dominant plants on the nesting beach are plants such as the morning glory family (*Ipomoea Pes-Caprae*), Rea-purslane (*Sesuvium portulacastrum*), and Rush grass (*Sporobolus virginicus*). The berm is bordered by a hedgerow of Cocoplum (*Chrysobalanus icaco*) and Sea grapes (*Coccoloba uvifera*) with a mixture of Coconut palms (*Cocos nucifera*) and various tropical hardwoods behind.

The beach is littered with a variety of debris including logs, coconuts husks and a large amount of plastics, trash, beer bottles etc...

2.2.2. Daily track census and nest surveys

Track surveys were conducted throughout the leatherback (*D. coriacea)* nesting season, which lasts from March to mid-July on the Caribbean coast of Costa Rica. Following the leatherback nesting season, beach patrols were continued studying all sea turtles species nesting on North Beach as well as documenting hatching nests.

The daily track surveys began every day at 6:00 am and finished by 7:30 am and consisted of walking the beach between mile 0 and 3 1/8, recording and monitoring the tracks and nests from the night before. The day team identified tracks as full (turtle nested), half moon (non-nesting emergences in which the track takes the form of a parabolic curve), or a lifted turtle (no tracks going back into the sea). The vertical position of the nest on the beach was identified either as Open (**O** – area of beach which receives 100% sunlight), Border (**B** - area where nest is partially shaded by vegetation) or Vegetation (**V** - area where nest is constantly shaded by vegetation). Nests are then identified as natural (if remained in its original state), predated by an animal or poached (with signs of stick marks, exposed egg chamber, eggs shells on the sand or human foot prints).

Data was also recorded when encountering dead turtles on the beach. The size, sex, state of turtle, and an estimated time of death were recorded. Any obvious signs of an unnatural death are also recorded such as harpoon marks, machete cuts or blows to the head and/or limbs and photographs are taken. If the turtle has been tagged, the ID number was recorded and checked against CCC tagging data.

2.2.3. Night surveys

Each night there is a survey consisting of walking the beach between mile 0 and 3 1/8 during 5 hours (21:00 to 02:00) and since 5 June the night surveys where divided in 2 shifts (20:30 to 00:30 and 00:00 to 04:00). The purpose of the night patrols is to collect data from as many turtles as possible. However, considering that the beach is 3 1/8 miles in length and only one night team goes out at the same time (except between 00:00 and 00:30 where 2 teams meet), there was a high possibility that not all turtles were observed while nesting at night. When this happened their tracks were documented by confirming that there were two sets of tracks (one ascending and one descending the beach). In this case the methodology used was the same for the day protocol.

When encountering a turtle on the beach, the following data was collected: The date, the time that the track was encountered and the species. The initials of each member of the team, as well as mile marker number and GPS of each nest, were recorded every time. The position of the nesting turtle (turtle facing North, South, East or West) and the vertical position of the nest in the beach (**O**pen, **B**order or **V**egetation) were recorded. If the nesting process was observed, a count of the number of eggs (and for *D. coriacea* also the yolkless eggs) was recorded. Any other comments or anomalies observed were also noted.

2.2.4. Tagging

D. coriacea females were tagged on the membrane located between the tail and rear flipper using Monel #49 tags (National Band & Tag Co., Newport, USA). Females were only tagged after having completed the nesting process, while they were covering the nest or returning to the ocean. Evidence of old tags in the flippers, old tag notches (OTN) or old tag holes (OTH), was also recorded, as well as evidence of trauma or parasites due to old tags.

2.2.5. *Biometric Data*

During the oviposition process clutch size (number of eggs) was recorded by hand (using a plastic glove) and a manual counter (clicker). In leatherbacks clutch sizes includes fertile and infertile eggs.

For all turtles found after the oviposition process, the Minimum Curved Carapace Length and the Maximum Curved Carapace Width were recorded by two people using a 300 cm fibreglass measuring tape. The measurement was reviewed three times to allow for precision and the average of the three measurements was used as the final measurement.

- Minimum Curved Carapace Length (CCLmin): In leatherbacks CCLmin is measured from the beginning of the carapace, extending along the side of the central dorsal ridge, until the tip of the caudal projection. For the three other species the measurement was taken exactly along the center of the carapace.
- Maximum Curved Carapace Width (CCWmax): Measured at the widest part of the carapace from one side to the other.

Deformation or missing pieces of the carapace and flippers or any other relevant data were also recorded.

2.2.6. *Turtle disease or injuries*

Fibropapilloma tumours, deformation or missing pieces of the carapace and flippers, as well as any other relevant data was also recorded inspecting the turtle, after the oviposition process, using a flashlight with a red light.

2.2.7. *Nest Survivorship and Hatching success*

Samples of nests were marked using triangulation in order to locate the nest at estimated hatchling time. During oviposition triangulation was conducted using three pieces of flagging tape (tags) which were attached to vegetation behind the nest. The distance from the centre of the egg chamber to each of these tags was measured, to the nearest cm, whilst the turtle was still laying eggs. The distance to the most recent high tide line was also recorded. When it was time to excavate the nest, the triangulation

allows finding the location of the egg chamber at the site where the three tag lines crossed. Three tags were used to compensate for the loss of any tapes. If one tag was lost it was still possible to locate the nest using the other two tags.

Marked nests were excavated 5 days after hatching, whereas if there were no signs of hatching excavation took place 5 days after the average incubation period. Leatherback nests were therefore excavated after a maximum of 75 days of incubation.

In addition, all nests found hatching on the beach during morning or night surveys were excavated 5 days after the first hatchling tracks had been encountered.

For all excavations the number of live and dead hatchlings, egg shells accounting for more than 50% of an egg, unhatched eggs with no sign of development, unhatched eggs with embryos and depredated eggs by crabs or other animals were counted.

For all accurately marked and measured nests a nest fate was determined. Nests which were not marked or measured correctly, or which accounted for more than one lost reference were excluded from analysis. The following nest fate categories were applied: hatched, poached, predated, eroded and flooded. Empty egg chambers were classified as poached nests. If there was any doubt about the fate of a nest it was categorized as unknown.

2.2.8. Human impact data

Due to the recent increase in human activity on the North Beach all artificial light (white or red) observed during the night surveys were recorded. As well as the number of people, fires and tourist with or without guide.

2.3. Results

Data collected reflects the 2006 leatherback turtle nesting season from 1st of March until 5th of July.

2.3.1. Daily track census and nest surveys

A total of 76 leatherback tracks were encountered on the North Beach, divided into 52 nests and 24 half moons. The horizontal distribution of these nests on the beach was 90% in the open area (n=47), 10% in the border (n=5) and none in the vegetation (n=0).

Species	Nest	Half moon	Horizontal distribution of the nests		
			Open	Border	Vegetation
Leatherback	52	24	47	5	0

Table 2-1 Number of nests, half moons and horizontal distribution of nests from the North Beach between March 1st and July 5th 2006.

The first leatherback half moon was recorded on the 2nd March, but the first nest was not found until the 5th March. The seasonal distribution (from March 1rst to July 5th) of leatherback turtles nesting on the North Beach is shown in figure 2-1.

The nights with maximum of activity recorded were the 17th of May (3 leatherback nests), the 12th of June (2 leatherback nests) and the 13th of June (3 leatherback nests), followed by a drop-off with no tracks encountered in the second half of June. The last leatherback track was found on July 5th concluding the 2006 nesting season.

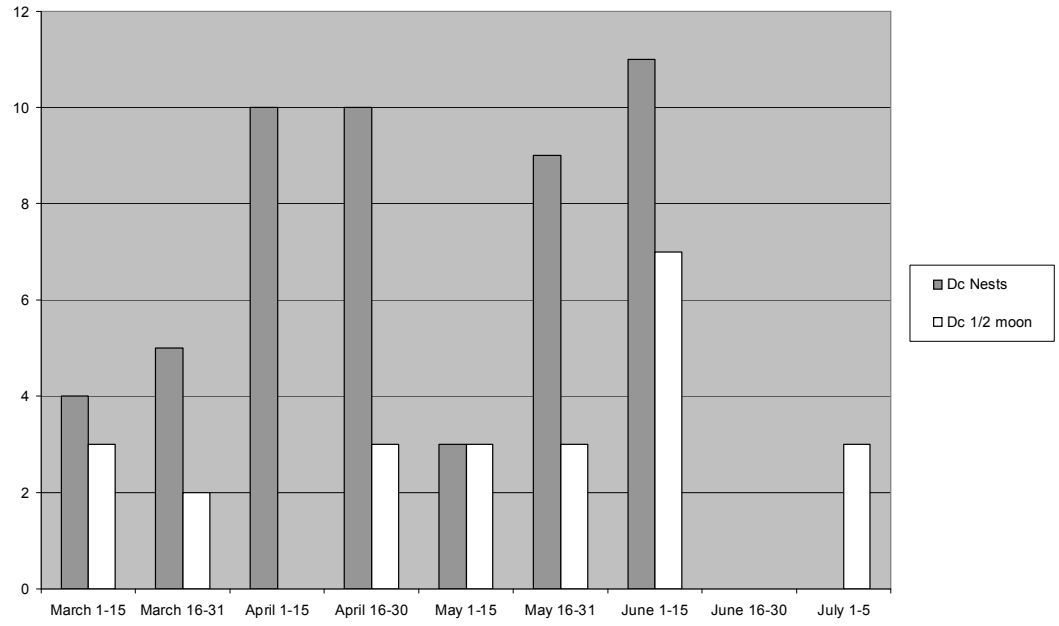

Figure 2-1 Seasonal nesting distribution of leatherback turtles on the North Beach between March 1st and July 5th 2006.

The spatial distribution of leatherback Turtle nests and ½ moons is shown in Figure 2-2.

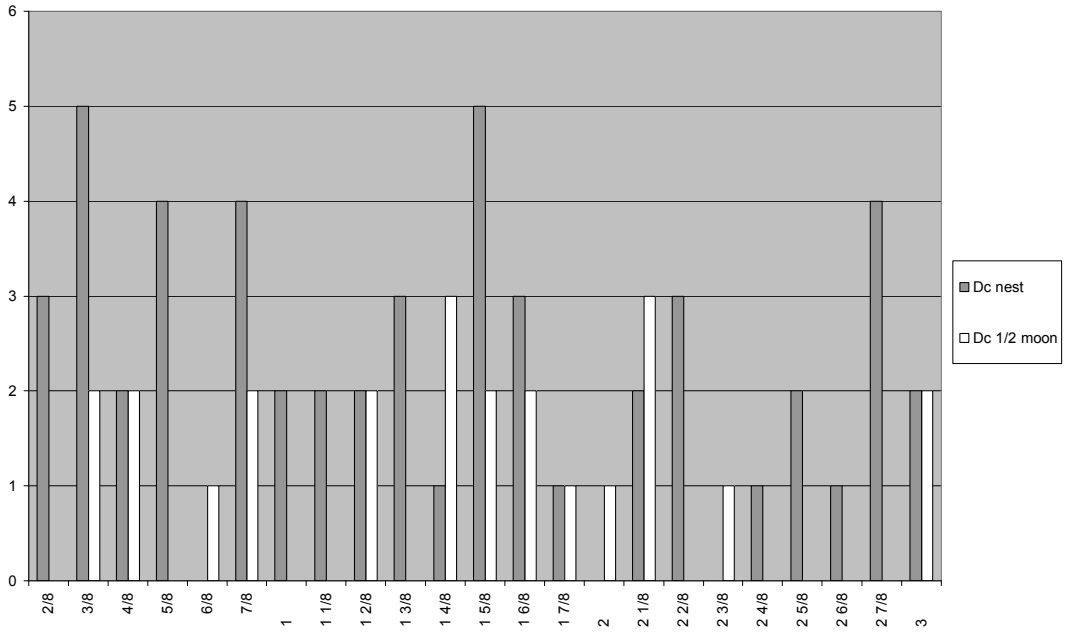

Figure 2-2 Spatial nesting distribution of leatherback Turtles on the North Beach between March 1st and July 5th 2006.

The sectors of the beach with a high density of nests were around mile 3/8 (5 nests and 2 half moons), mile 5/8 (4 nests and 0 half moons), mile 7/8 (4 nests, 2 half moons), mile 1 5/8 (5 nests, 2 half moons) and mile 2 7/8 (4 nests, 0 half moons).

2.3.2. Monitoring of nests

During morning patrols 55% out of the 52 nests on the North Beach were considered to be left in their natural state without any signs of poaching, erosion or predation (n=29). Based on various evidence such as human foot prints, stick marks, egg shells and/or an exposed egg chamber 31% of the total nests were classified as poached (n=16) and 6% of the nests were affected by erosion (n=3). Finally, the remaining 7% reflect those nests where it was not possible to determine whether they were poached, eroded or left in their natural state. See the figure 2-3.

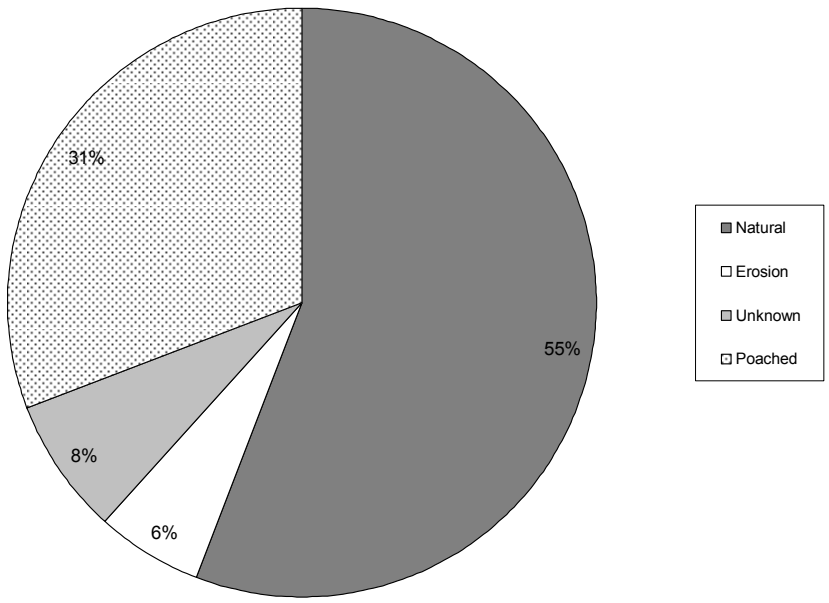

Figure 2-3 Destiny of leatherback nests on the North Beach between March 1st and July 5th 2006.

2.3.3. Tagging

Of the total leatherback females seen during the night patrols, 17 were already tagged whereas 9 were newly tagged. None of the newly applied tags were lost. The tags applied by Caño Palma Sea Turtle Monitoring Program are shown in table 2.2.

Monel tags
VA8205-VA8208
VA8210-VA8214
VA8217-VA8218
VA8222-VA8224
VA8226
VA8228
VA8231-VA8232
VA8249

Table 2-2 Tags applied by Caño Palma Sea Turtle Monitoring Program from 1st March to 5th July 2006.

The re-nesting interval of 4 leatherback turtles observed on the North Beach during the studied period was an average of 27.2 days.

Through tag checks of re-nesting females, it was observed that the majority of *D. coriacea* using the north beach as nesting grounds in 2006 had originally been tagged in Tortuguero in the previous years, followed by Pacuare (*tag list provided by S.Troeng, CCC*).

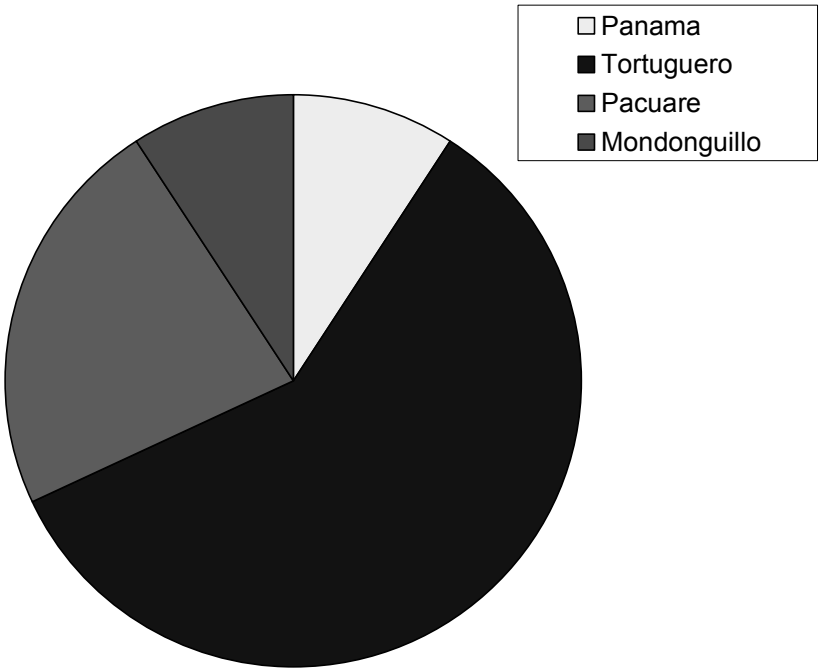

Figure 2-4 Shows tag origin for re-nesting females on the North Beach of Tortuguero 2006

2.3.4. *Biometric data*

The mean carapace length, carapace width and clutch size (fertile and infertile eggs) of the leatherback turtles coming to nest in the North Beach during the studied period is shown in the Table 3-3. The mean carapace length of newly tagged individuals with no evidence of previous tags (OTH or OTN) was slightly higher (155.8 cm) that the mean carapace length of newly tagged females with old tag holes or notches (152.5 cm), and that of previously tagged females (148.5 cm). The mean carapace width of newly tagged females with no evidence of previous tags was also slightly higher (118.8 cm), than the other two categories (109.1 and 110.0 cm, respectively). The mean of fertile eggs was slightly higher for newly tagged females (88 eggs) with no signs of previous tagging than for the rest of females (67 and 75 eggs, respectively). On the other hand, the mean of the infertile eggs was very similar between the newly tagged without any evidence of old tags (25 eggs) and the previous tagged females (23 eggs), which were smaller than the mean of the newly tagged with evidences of old tags notches and holes (32 eggs). See table 2-3.

Sample	CCLmin (cm)		CCWmax (cm)		Fertile eggs		Infertile eggs	
	N	$X \pm \Sigma T.\Delta.$	N	$X \pm \Sigma T.\Delta.$	n	$x \pm \Sigma T.\Delta.$	N	$X \pm \Sigma T.\Delta.$
Newly tagged no OTH/OTN	6	155.8 ± 5.2	6	111.8 ± 5.0	5	88 ± 5	5	25 ± 11
Newly tagged with OTH/OTN	3	152.5 ± 0.4	3	109.1 ± 1.2	1	67 ± N/A	1	32 ± N/A
Previously tagged	17	148.5 ± 6.5	16	110.0 ± 5.9	10	75 ± 16	10	23 ± 8.3

Table 2-3 Leatherback mean carapace length, carapace width and clutch size on the North Beach between March 1st and July 5th 2006.

The mean carapace length, carapace width and clutch size of the leatherback found on more than one occasion, is shown in the Table 3-7. Three times the same turtle was found the CCWmax measurements had a higher level of precision than the CCLmin measurements. On the contrary, the measurements from the three turtles that were found on two occasions, the CCWmin had a lower precision than the CCLmin. See table 2-4.

Encounters	CCLmin (cm)			CCWmax (cm)			Fertile eggs		Infertile eggs	
	N	$X \pm \Sigma T.\Delta.$	Range	n	$x \pm \Sigma T.\Delta.$	Range	N	$x \pm \Sigma T.\Delta.$	n	$x \pm \Sigma T.\Delta.$
3	1	145.0 ± 1.2	0.0 - 3.0	1	107.8 ± 0.3	0.0 - 0.6	3	0 ± 0	3	0 ± 0
2	3	150.6 ± 4.3	0.0-1.1	3	109.9 ± 3.5	0.0-5.7	3	76 ± 10	3	30 ± 11

Table 2-4 Mean and range carapace length and width and clutch size of leatherback turtles found more than once on the North Beach between March 1st and July 5th 2006.

2.3.5. Turtle disease or injuries

Due to the use of a different data set, analysis of disease and injury related information has not been possible for this report.

2.3.6. Nest survivorship and hatching success

Out of 52 total leatherback nests on North Beach only 6 were observed hatching. The results of the excavation of one of the nests are shown in Table 2-5. The average incubation period was 63.4 days (n=5) between the date the nest was laid and the emergence of the hatchlings to the surface of the beach.

Nest Code	Species	Alive Hatchlings	Dead Hatchlings	Shells >50%	Yolkless Eggs	Unhatched no Embryo	Unhatched with Embryo	Depredated	Total Eggs
NA	Dc	0	3	47	49	8	8	0	112

Figure 2-5 Summary of excavation results for one leatherback nest (Dc) on North Beach.

2.3.7. Nest Fate of nests marked by triangulation

A total of 6 triangulated and marked nests laid between March 1st and July 5th were dug up 5 days after the average incubation period. 3 nests could not be found because of inaccurate measurements (n=1), bad angles (n=1), and lost tags (n=1). 3 nests were located using the measurements taken, all of which were empty and therefore classified as poached. None of the triangulated nests hatched. See figure 2-5 for the nest fate of marked nests.

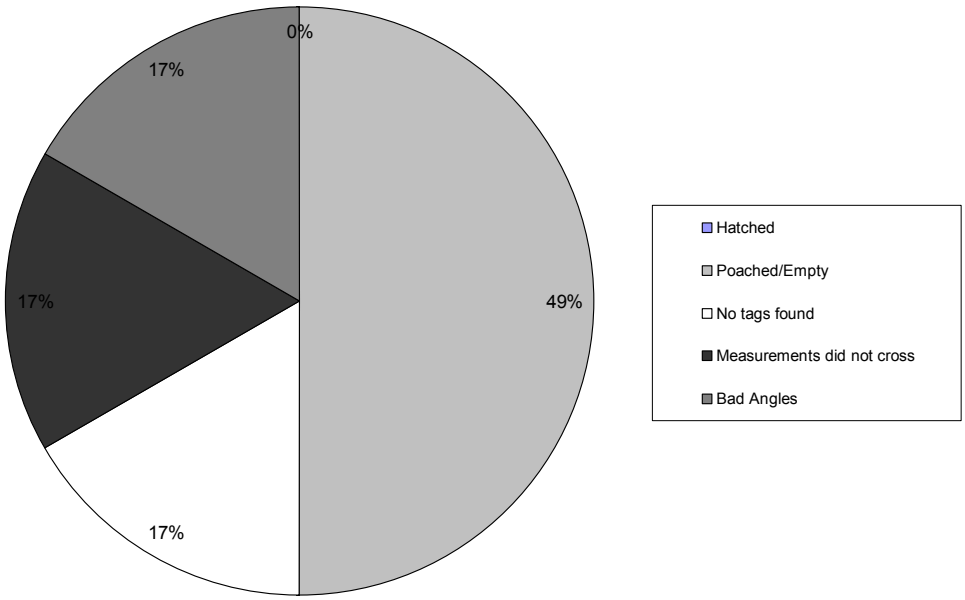

Figure 2-5 Nest fate of nests marked by triangulation.

2.3.8. Human impact data

During the night surveys the presence of 2 strong torches (from the guards of Turtle Beach Lodge and Cabinas Vista al Mar) were recorded on almost all nights. White lights were observed 50% of the time throughout the night patrol, as well as fishermen, bonfires, tourists and local people walking the beach at night. In various places along the beach, a few permanent lights have been observed, including a very bright external light on the top part of the beach in front of Turtle Beach Lodge. This was changed for a red light at the beginning of May. Moreover, a fishing line just before mile 1, of approximately 50 meters length, was recorded on all nights.

2.4. Discussion

2.4.1. Daily track census and nest surveys

The total number of leatherback nests recorded during this study was 52, whereas the number of ½ moons amounted to 27 on North Beach. The large amounts of driftwood on North Beach could be a barrier for leatherbacks coming to nest and possibly more efforts cleaning the beach could increase the number of leatherback nests. However, an increase of sea turtle nests, especially of the critically endangered leatherback Turtles

on North Beach, should only be aimed for if measures for nest protection against poaching are implemented.

The peak nesting season occurred between the 1st of April and the 15th of June 2006 when 83% of nests were laid (n=43). The spatial distribution of nests was highest within the 2nd mile of the beach (n=19) followed by the first (n=18) and the third mile (n=15).

2.4.2. Tagging

Out of a total of 26 worked turtles, 35% (n=9) did not have any tags, while 65% (n=17) were previously tagged. Out of the 9 newly tagged turtles 67% (n=6) had no signs of previous tags, while 33% (n=3) showed old tag holes or old tag notches.

It is known that other projects along the Caribbean Cost of Costa Rica, with a bigger population of leatherback turtles (with the exception of the CCC) are also tagging using PIT tags (Passive Integrated Transponder) placed under the skin. These PIT tags are read using a scanner device. Since leatherback turtles can travel relatively long distances during the same nesting season (L. Chaparro, *pers comm*.), it is possible that a number of turtles, in particular those presenting old tag notches or holes, possess a PIT in their bodies which we can not detect on the North Beach because of the absence of the required equipment. Future investigation, in particular for the leatherbacks, could prove the need of this kind of expensive equipment.

2.4.3. Biometric data

Mean carapace measurements of previously tagged leatherbacks were smaller than those of newly tagged with evidences of old tag or notches and smaller than the newly tagged without evidences. In theory (L. Chaparro, *pers. comm*.), the newly tagged turtles (assumed younger) are in general smaller than the previously tagged turtles (assumed older).

One of the reasons for these results could be that this is the first year that a tagging program is taking place on this beach. Consequently, we are not able to identify the re-migrating turtles (turtles that came to nest in previous years) from the neophytes ones (turtles that reach the sexual maturity for the first time). In this way, the inter-nesting females that were not previously tagged by other turtle monitoring programs do not

present any evidence of old tag holes or notches. Thus they are mixed with the neophytes that come to nest for the first time, and the mean carapace measurements do not necessarily reflect the reality.

Despite this fact, thanks to encountering re-nesting turtles, the precision could be calculated and the higher range obtained was between 0.0 to 3.0 centimeters for the length and 0.0 to 5.7cm for the width, showing that the precision obtained with the length measurement was higher than the width. Consequently, training of correct and precise measuring techniques of the length and width of the carapace is of extreme importance and urgency. During next season such training should be provided in order to make sure that measurements are recorded as precise and accurate as possible.

2.4.4. Nest monitoring, Nest survivor ship and hatching success

Illegal take of turtle nests was recorded throughout the entire study period. A minimum of 31% of leatherback nests were assumed poached during morning patrols. The poaching rate of marked nests by triangulation (n=6) would be as high as 100% (n=3), if nests which had not been accurately measured (n=3) are excluded from analysis.

As a total of 6 leatherback nests (11%) were observed hatching, the actual poaching rate lies probably somewhere between the two values. An increased sample size (minimum 33%) of measured nests should be aimed for in the next season, which will be the only way to achieve a reliable estimate of the poaching rate on North Beach.

6% of nests (n=3) were lost due to erosion, which could be prevented by relocating nests laid too close to the high tide line.

As the leatherback Turtle is a critically endangered species, nest protection measures should be implemented in the future nesting seasons to maximize the number of surviving offspring.

Out of the only leatherback nest excavated during this season 44 hatchlings reached the sea. As the number of eggs laid is not known for this nest the hatching success could not be calculated.

2.4.5. Human Impact Data

Turtle Beach Lodge have shown a noticeable conservation effort as, in the middle of the leatherback Season, they changed the very bright external light placed on the top of the beach for a less powerful red light. COTERC and GVI have been able to establish a good relationship with the growing village of San Francisco and the increasing human settlers on the parallel trail of the beach through various presentations, invitations to join us on the beach, environmental education and English lessons, and it is hoped that this will aid in reducing the poaching rate on the beach.

3. Bibliography

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