REPORT

NESTING OF THE LEATHERBACK TURTLE (*Dermochelys coriacea*) IN CAHUITA NATIONAL PARK, COSTA RICA 2009 SEASON

WIDECAST
Red para la Conservación de las Tortugas Marinas en el Gran Caribe

PROGRAM FOR THE CONSERVATION OF MARINE TURTLES IN THE SOUTHERN CARIBBEAN

NESTING ACTIVITY REPORT OF THE LEATHERBACK TURTLE (*Dermochelys coriacea*) IN CAHUITA NATIONAL PARK, SOUTHERN CARIBBEAN, TALAMANCA, COSTA RICA

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THE PROJECT WAS SUPPORTED BY:

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RESUMEN

Este proyecto se llevó a cabo en dos tractos, del 1 de marzo del 2009 al 31 de Julio, con un énfasis en la anidación de tortuga baula y del 31 de Julio al 1 de Octubre con énfasis en la anidación de tortuga carey. Durante la temporada de baula se registraron 301 actividades de anidación resultando en 196 nidadas de esta especie que representaron la anidación de 62 diferentes hembras de las cuales 46 fueron remigrantes y 16 neófitas. La longitud curva promedio de las hembras anidadoras estuvo dentro de lo ya registrado con 151.5 cm. El total de nidos registrados se distribuyó en 34 nidos naturales, 20 nidos que fueron camuflados para evitar el robo de sus huevos, 74 relocalizados a zonas seguras más arriba de la línea de marea alta y 68 nidos robados especialmente en la sección sur del Parque Nacional Cahuita y la zona de playa negra fuera de los límites del parque. Ningún nido de baula se relocalizó al vivero, mientras que 8 nidos de un total de 22 de carey fueron relocalizados y protegidos en el vivero. El éxito de eclosión para nidadas de tortuga baula manejadas fue de 64.9% y se estimó una producción de neonatos de baula total de 5,368. Preocupan aspectos como la erosión de la costa, el levantamiento del nivel del mar, las altas temperaturas y el robo de nidos especialmente en la zona sur del Parque Nacional Cahuita.

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Nesting of the Leatherback Turtle – *Dermochelys coriacea*
1st March – 31st July 2009
CAHUITA NATIONAL PARK

# Nesting activities (Nests+False crawls) / # Actividades de anidaciones	**301**
# nests / # de Nidos	**196**
# False crawls / # Rayones	**105**
# Recorded females / # Hembras registradas	**62**
# Females tagged externally / # Hembras marcadas	**12**
# Females Pit tagged / # Hembras marcadas con PIT	**12**
# Females double-tagged / # Hembras con doble marcaje	**12**
# Re-migrating females / # Hembras remigrantes	**46**
# Neophyte females / # Hembras neófitas	**16**
# Re-nesting females / # Hembras reanidantes	**20**
Average CCL / Promedio LCC (cm)	**151.4**
Average CCW / Promedio ACC (cm)	**110.1**
# Natural nests / # Nidos naturales	**34**
# Camouflaged nests / # Nidos camuflados	**20**
# Relocated nests / # Nidos reubicados	**74**
# Hatchery Nests / # Nidos vivero	**0**
# Poached nests / # Nidos robados	**68**
# Fertile eggs relocated / # Huevos normales reubicados	**6774**
# Exhumed nests / # Nidos exhumados	**19**
% Success rate of natural Nests / % Éxito Eclosión Nidos Naturales	**93**
% Success rate of relocated nests / % Éxito Eclosión Nidos Reubicados	**64.9**
# Estimated hatchlings / # Estimación de tortuguitas	**5368**

1. INTRODUCTION

1.1 The Leatherback turtle (*Dermochelys coriacea*) – Biological aspects

Dermochelys coriacea (*Vandelli, 1761*), or the Leatherback turtle is the largest of all living sea turtles and the fourth largest modern reptile. It can easily be differentiated from other modern sea turtles by its lack of a bony shell. Instead of hard scutes, the Leatherback's carapace is covered by its thick, leathery skin with minuscule bony plates. Seven ridges run from the anterior-to-posterior margin of the turtle's carapace and the entire turtle's dorsal surface is colored dark grey to black with a sporadic scattering of white spots. It has two pairs of large flippers and a short tail, and like other sea turtles, the leatherback's flattened forelimbs are specially adapted for swimming in the open ocean. Claws are absent from both pair of flippers.

Figure 1: Nesting female Leatherback, Cahuita National Park, 2009.

On the Caribbean coast of Costa Rica, nesting females have an average curved carapace length of 154.65 cm (n= 1045), and width of 112.83 cm (n=1045), *(Chacón and Eckert, 2007),* and lay an average of 82 fertile and 30 infertile eggs, that have an incubation period of 50 to 70 days (Chacón *et al.*, 2007). The leatherback is the largest of all sea turtles - a female can weigh roughly 500 Kg (1100 lbs.). Their carapace measures between 130 and 175 cm (Aprox. 4-6 ft.), while their large head represents approximately 20% of the entire carapace length. They have powerful front flippers which lack claws. The largest leatherback reported was a male captured more than 15 years ago in Wales (Great Britain), weighing approximately two tons (1,000 kg / 2,200 lbs) and measuring 3.05 meters (slightly more than 10 ft.) from the tip of its beak to the end of the tail.

Habitat

The leatherback is the deepest diver of all sea turtles and exhibits the most extensive distribution. A typical dive lasts 15 minutes and rarely reaches depths of more than 200 meters (650 ft.), although dives deeper than 1,000 meters (3,300 ft.) have been reported. They are found world wide, primarily in pelagic (open ocean) waters of temperate and tropical oceans as well as in very cold sub-artic waters. It is common to observe them in temperate waters of the eastern as well as western United States of America and Canada. Leatherback turtles exhibit great thermal tolerance; they can maintain their core body temperature up to 18 degrees Celsius (64 ºF) above the temperature of the surrounding water. The reasons behind this ability to retain their body heat may be associated with various characteristics, including thermal inertia derived from their great body mass, the fatty sub-dermal layer which acts as an insulator, and counter-current heat exchanges in the flippers.

Diet

The leatherback lacks teeth; however, deep cusps form tooth-like projections on the upper jaw and papillae (spiny projections) line the throat (see photo). These are two distinctive characteristics of their specialized diet of soft-bodied animals, mainly jellyfish. Leatherbacks are immune to Colenterate (jellyfish) toxins; such as those found in the venomous Portuguese man-of-war. Although specific growth rates are unknown, leatherbacks may grow quickly by eating many times their body weight daily.

Nesting

Although an exact age to maturity does not exist, there have been various attempts at estimating it, placing it anywhere from 9 to 14 years, with an estimated life-span of 30 years or more. Females nest approximately every 2 to 3 years; however, recent research has indicated they can nest annually. Nesting occurs at night, when the turtle drags herself up the beach, usually beyond the high-tide line. Nesting females prefer beaches with a reduced continental shelf (deep approach), open access free of rocks and abrasive corals, high-energy coastlines, strong currents and high surf. On average, a female will lay 80 eggs with yolk, about the size of billiard balls, and 30 smaller, oddly shaped yolkless eggs in each nest. Eggs incubate for about 65 days. Similar to other species, sex determination for hatchlings depends on the “pivotal temperature” (where the gender ratio is 1:1), which has been estimated to be about 29.5ºC (85ºF) in Suriname and French Guyana. As with other sea turtle species, higher incubating temperatures favor the production of females. Nesting within the American Continent occurs throughout the Caribbean, off the northern coast of South America, the Pacific coast of Central America and the east coast of Florida.

Hatchlings

Hatchlings are covered with small, soft polygonal scales and predominantly black in color with white along the borders and crests. Other characteristics of leatherback hatchlings include their very long front flippers, which almost reach the entire carapace length and their lack of claws. The typical length of the carapace is 60 mm (2.4 in.) and weight of approximately 45 grams (1.6 ounces).

Migrations

Sea turtles spend over 90% of their lives in the water (feeding, mating and migrating). During this time, leatherbacks, similar to all sea turtles, have the ability to migrate hundreds, sometimes even thousands of miles from feeding ground to nesting beach. Therefore, to fully protect sea turtles throughout their range, more research must be carried out about their migratory patterns and their behaviour while in the water. Current research, such as fitting sea turtles with satellite transmitters has provided important information regarding this phase of their life cycle, which can then be applied for management purposes. For example, it is now generally recognized that the leatherbacks nesting in the Caribbean migrate towards

the east coast of the United States and Canada, while those nesting in Mexico and Panama migrate towards Equatorial waters, near the Galapagos Islands. Yet, there is still much to be learned.

Current Status

The World Conservation Union (IUCN) classifies the species as Critically Endangered of Extinction, experiencing a global decline of at least 80% of its populations over the last 10 years. Some of the most important leatherback populations, for example, along the Pacific coast of Mexico, have shown up to a 90% decline over the last decade.

Threats

The principle threats to the leatherback turtles have been identified as incidental capture in marine fisheries, unsustainable exploitation of eggs and turtles, as well as the destruction or alteration of their nesting habitat.

Population Trends

Scientific studies and numerous data collected from track counts on leatherback nesting beaches in the Eastern Pacific have shown their conservation status to be extremely critical. These trends of large nesting colonies continue to decline in areas with little protection. Currently, the four largest nesting colonies on a global scale are: the southern coast of Gabon, French Guyana and Surinam, Trinidad and Tobago, and the Caribbean Coast of Costa Rica and Panama; the latter three of which are located within the area of application of the Inter-American Convention for the Protection and Conservation of Sea Turtles.

The Leatherback turtle has a worldwide distribution. It is found from tropical to sub-polar oceans, nesting on tropical beaches and feeding in the colder sub-polar regions. However, very little is known about the distribution of post-hatchlings and juveniles. It has been estimated that 70% of all leatherback turtles that nest on the Caribbean coast of Costa Rica head to the protected areas of Gandoca/Manzanillo Wildlife Refuge, Cahuita National Park, Pacuare Nature Reserve and Tortuguero National Park, with the total number of nesting females estimated to be between 500 – 1000 per year (Troëng *et al*., 2004).

The most recent global estimation of the Leatherback nesting **population size** was published in 1996, compiling published data, unpublished information and personal comments from 28 leatherback nesting sites, estimating that 20,000 to 30,000 adult females existed at that time in the world. Representing a reduction of the global population of 78% in 14 years (since the last estimation), which is less than a single generation (*Sarti,2000)*.

This drastic decline in population size over a short period of time has led to the classification of the Leatherback turtle as **critically endangered** on the IUCN Red List of Threatened Species (*Sarti 2000*), and the species is listed on Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), prohibiting international trade in parts or products. The leatherback turtle is also protected by the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) and by Costa Rican Law (Ley de Conservación de Vida Silvestre No. 7317) since 1992 *(Chacón and Eckert, 2007).*

1.2 Threats to the Leatherback turtle in the Southern Caribbean

Human Threat: The main threats to Leatherback turtles from humans in the Southern Caribbean are the intense harvesting of their eggs and incidental capture in fisheries. In Cahuita National Park, poachers are on a nightly search for the eggs of nesting females throughout the nesting season. Other threats include pollution (mainly plastic) and coastal development (increased artificial light). Lost of habitat by coastal development including pollution by waste, noise and light, over visitation, change of coastal ecosystems to built up the hotels, cabins, shops, marinas, etc.

Natural Threats: Beach erosion is the main terrestrial threat to Leatherback turtles**.** The highly active beach system in Cahuita National Park means that nests on the beach are at risk of erosion or inundation. Obstruction of nesting habitat by driftwood (*Chacón, 1999*) and predation are also significant threats. Another threat to consider raise of ocean level like one of the effects of the global climate change.

1.3 Conservation efforts

The aim of the Cahuita National Park project is to assist WIDECAST in meeting their program objectives (see below), and document and monitor the nesting of female sea turtles (Green, Leatherback and Hawksbill) and analyse the data at the end of the nesting season.

- A partial recovery and subsequent stabilization of the sea turtle nesting populations in the south Caribbean.

- The standardization of the programs on environmental education, conservation and research leading to the unification of criteria and efforts for the management of sea turtles at the level of the protected areas of Conservation Area of La Amistad- Caribe.

- More political incidence on a local and national level for decision making in the management, regulation and use of sea turtles.

- Economical alternatives for some groups of the community.

- Active participation by a high percentage of the members of the community in the conservation of sea turtles.

- Consolidation of the program as a key factor in the conservation of sea turtles in the region.

- Sharing of this pioneer experience, which integrates conservation with local socio-economical development, with the intention of supporting new projects for conservation of sea turtles, especially in areas where these represent a resource of local importance.

- Local team-workers installed, reducing the anthropogenic-consumptive use and promoting the non-consumptive uses, so that the conditions for the recovery of the biotic populations will be established, allowing continuity and sustainability.

Since the year 2001, a project has been established from March until August in order to achieve these objectives, and the following report presents the results of the seasons work.

2. METHOD AND AREA OF STUDY

2.1. AREA OF STUDY

The study site for the Cahuita National Park Project covers a 14 km stretch of beach located within the Talamanca region of Costa Rica, on the south-eastern coast (09 45'27N 82 51'79 W to 09 39'33N 82 45'71 W). Three quarters of the area of study is situated inside Cahuita National Park, extending from Cahuita's Playa Blanca in the north and carrying on to Puerto Vargas beach, with the final quarter across the Carbon River and further south, to the public beach known as Playa Negra, leading to the busy town of Puerto Viejo. Although a part of the study area is outside the limits of the national park, the project area is referred to as Cahuita National Park throughout this report.

Figure 2: Map of the study area (source: www.widecast.org).

The beach has been segmented by sequentially numbered markers that are painted on trees or wooden markers every 50m that start from -99 near Punta Cahuita to 110 at the parks southern limit (the Carbon River) and continuing on to 180 on Playa Negra. In general, the negative numbers cover the nesting area of Hawksbill turtles (*Eretmochelys imbricata)* and the positive numbers cover the nesting area of the Leatherback (*Dermochelys coriacea)* and Green turtles (*Chelonia mydas)*.

Figure 3: Satellite Photograph of the study area showing the location of the markers and beach sectors. (source: www.googleearth.com)

2.2. MONITORING PERIOD

Monitoring of the study area for Leatherback activity started on the 1st March 2009, when females begin to nest, and ended on the 31st July 2009, when the last of the Leatherback turtles come to nest.

2.3. METHODOLOGY

All aspects of work with sea turtles were done in accordance to the protocol and guidelines of SINAC's "Manual for the Management and Conservation of Sea Turtles in Costa Rica; with special emphasis on the operation of projects and hatcheries, Resolution R-055-2007-SINAC" (Chacón *et al.*, 2007). For more details regarding protocols on tagging, collection of biometric data, nest management, hatchery management and exhumations, see **Annex 1**.

2.3.1. Preparation of the beach

As in previous years, the beach was segmented by 50 m markers. These markers are made by measuring 50 m on the beach and either choosing a living tree that is close by or securely implanting a piece of driftwood into the sand, in the berm (vegetated area) of the beach. An area of the marker, approximately 30 cm x 30 cm, that is easily visible from the beach, is cleaned by scraping it with a machete, then painted with a white background and black numbers. During the first few weeks of the season, any old markers from the previous year were repainted and any missing markers were replaced. Old markers that were ill-positioned or unused were erased.

Marker 0 is an easily identifiable reference point, as it is located on the corner of the main dirt road leading from the park entrance to the Rangers Station.

As there was a 4 month period when the beach was untouched, there was a build up of driftwood and plastic waste, especially near the mouth of the Carbon River. Project staff and volunteers collected all plastic waste to be recycled and cleared all driftwood from the beach into the berm. Jungle paths were also opened or reopened to allow passage past inaccessible parts of the beach, where it had been eroded up to the jungle's edge. This work was continued throughout the season.

2.3.2. Patrols and Surveys

Throughout the nesting season, patrols were conducted every night from 20:00 to 04:00 between the markers 0 to 110, during which trained Assistants (leaders) and volunteers observed and registered nest-related behaviors and outcomes. To maximize the probability of encountering a nesting female, 3 patrols were conducted nightly, with 2 hours between each patrol (20:00 – 00:00, 22:00 – 02:00, 00:00 – 04:00). From the 15th June 2009, once the nesting activities of the Leatherback turtles decreased drastically, patrols were reduced to 2 per night, between the hours of 20:00 – 00:00 and 00:00 – 04:00, to allow more focus to be paid to monitoring Leatherback hatchling activity and the nesting activities of Green and Hawksbill turtles. On a few occasion, only 2 patrols were conducted when there were insufficient volunteers. A minimum of 2 people were allowed on patrols, with an Assistant to lead the patrol and when encountering a turtle, direct and supervise the volunteers, while performing the more technical activities, such as tagging and nest relocation.

From the March until May, weekly surveys of the beach from marker 0 to 180 (Puerto Viejo) were conducted from 04:30 till 08:00. These surveys were done to evaluate the status of natural, camouflaged and relocated nests from the previous weeks patrols in the Puerto Vargas sector, and to register nesting activities in the Playa Negra sector, which was unpatrolled this season.

From May until August, during the hatchling season, surveys from marker 0 to 110 were conducted every two days in addition to the weekly censor to Puerto Viejo, in order to find evidence of hatching events and to check on the progress of relocated nests that were due to hatch. Exhumations of hatched nests could then be performed 2 to 3 days later.

Surveys were also very useful to identify areas of the beach that were suitable for nest relocations and to track the movements of poachers.

2.3.3. Hatchery Construction

Due to the change in location of the station from the MINAET building to Boca Chica on the 5th April 2009, the location of the hatchery was different to previous years. Taking into consideration factors such as beach stability, security and accessibility, the decision was made to build the hatchery between markers -1 and 0, above the berm. Construction of the fenced hatchery began on the 31st May 2009, beginning with the digging and sifting of 28 m^2 of sand to a depth of 1 m. The fence structure was then built as a barrier to predators and poachers, and a shelter was built for volunteers guarding the hatchery.

Figure 4: Photo of the 2009 season hatchery.

Figure 5: Photo of hatchery grid and plastic mesh baskets.

The hatchery, with dimensions of 7 m x 4 m, was divided into a grid of squares (0.6 m x 0.6 m) for each nest, with a capacity of 27 nests. Nests were surrounded by a metal mesh cylinder (canasta); buried 10 cm into the sand, to discourage predators such as ghost crabs, skunks, raccoons and white-nosed coatis, and a very fine cloth mesh (less than 1 mm) to avoid infestation by saprophagous flies (Chacón *et al.*, 2007).

Once the first nest was relocated to the hatchery on the 25th June 2009, 24 h surveillance was scheduled to guard the eggs, check nests for hatchlings and to collect abiotic data (see Annex I for more details).

2.3.4. Training of assistants and volunteers

Assistants were trained over a two week period, working side by side with an experienced member of WIDECAST staff in the field, learning all aspects of the hands-on work with the sea turtles, as well as their taxonomy, biology, ecology and threats to their survival.

Volunteers received a printed manual and a training session on arrival that would last approximately 1.5 hrs.
They would learn about;

- Asociación WIDECAST,
- the Cahuita National Park Project,
- Basic taxonomy and biology, and threats to the 3 species of sea turtles that nest in the study area,
- Method of working with sea turtles, with emphasis on accurately measuring and recording biometric data, collection of eggs and general behaviour (minimal use of red light, etc.)

Figure 6: Photo of a demonstration of CCW measurement during a volunteer training session, using a sand turtle as a model.

3. RESULTS

3.1. NESTING ACTIVITIES

The first Leatherback turtle nesting activity of the 2009 season was recorded on the 11th March, and the last on the 15th July. A total of 301 nesting activities were recorded, of which196 were nests and 105 were false crawls. The number of nests (n = 196) during this season were greater than those of seasons 2006 to 2008 and are also greater than the average nesting number (194 nests/season) since the beginning of the project in 2000.

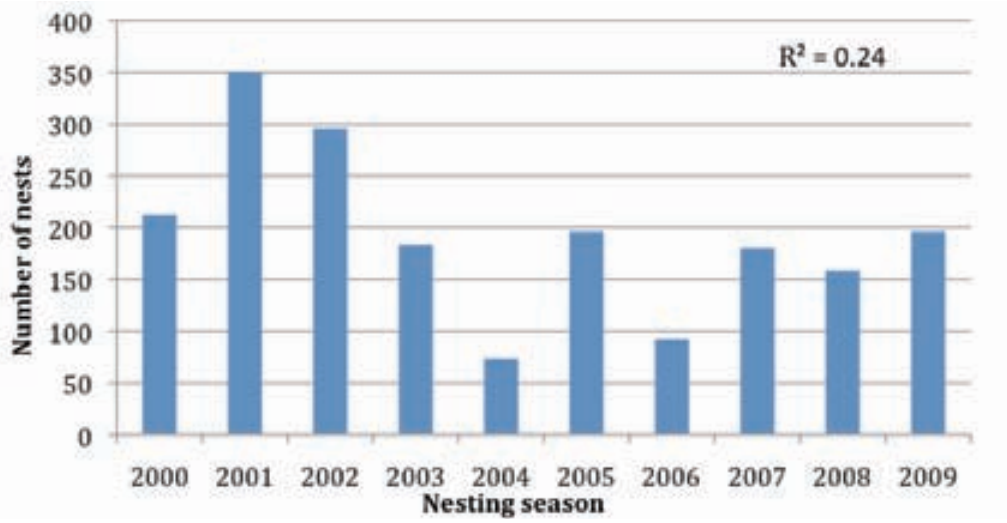


Figure 7: Comparison of nesting numbers per season in Cahuita National Park, showing the R^2 correlation.

Historically, of the three species of turtle that nest in the study area, Leatherbacks have always had higher nesting numbers. Until the 31st March 2009, when this report was being finalised, 196 Leatherback, 16 Hawksbill and 3 Green nests were recorded (see section 3.8. for more details of nesting of other species).

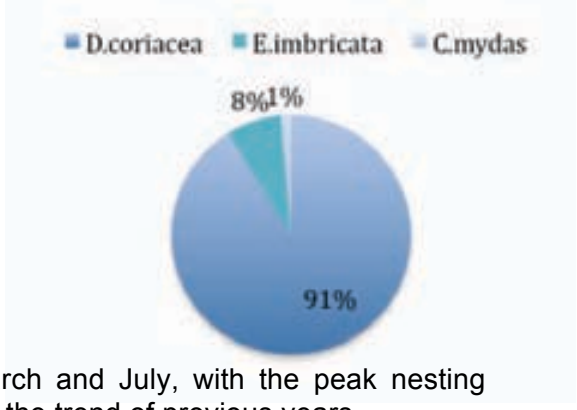


Figure 8: Proportion of nests attributed to each turtle species in Cahuita National Park up to the 31st July 2009.

3.2. NESTING DISTRIBUTION

3.2.1. Temporal distribution of nesting events

D. coriacea nesting events were registered between March and July, with the peak nesting months being April (36.4%) and May (31.3%), which follow the trend of previous years.

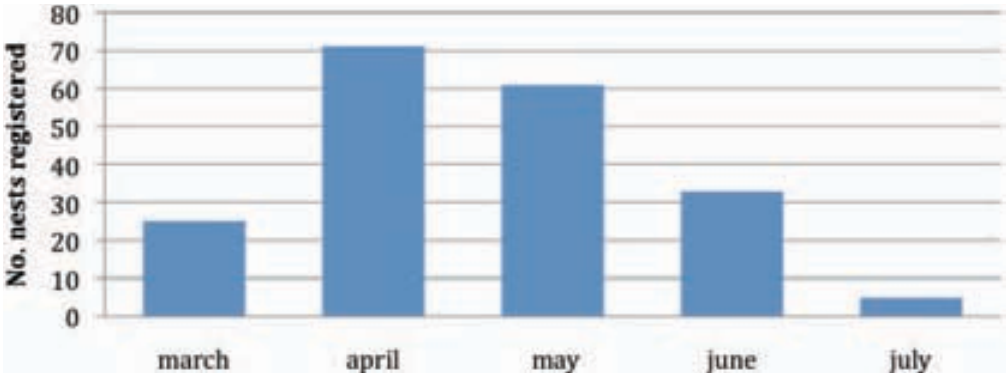


Figure 9: Monthly distribution of *D. coriacea* nesting events during the 2009 season.

The number of nests that were registered on the beach varied between 0 and 4 per night. Generally, nesting females were recorded to have re-nested every 9 to 10 days, but no pattern could be found in their nightly nesting habits. Note that in figure 9, nesting activity on the Playa Negra Sector have been ignored, as the weekly surveys of that sector count the number of nests that have been laid during the period of a week and would distort the data.

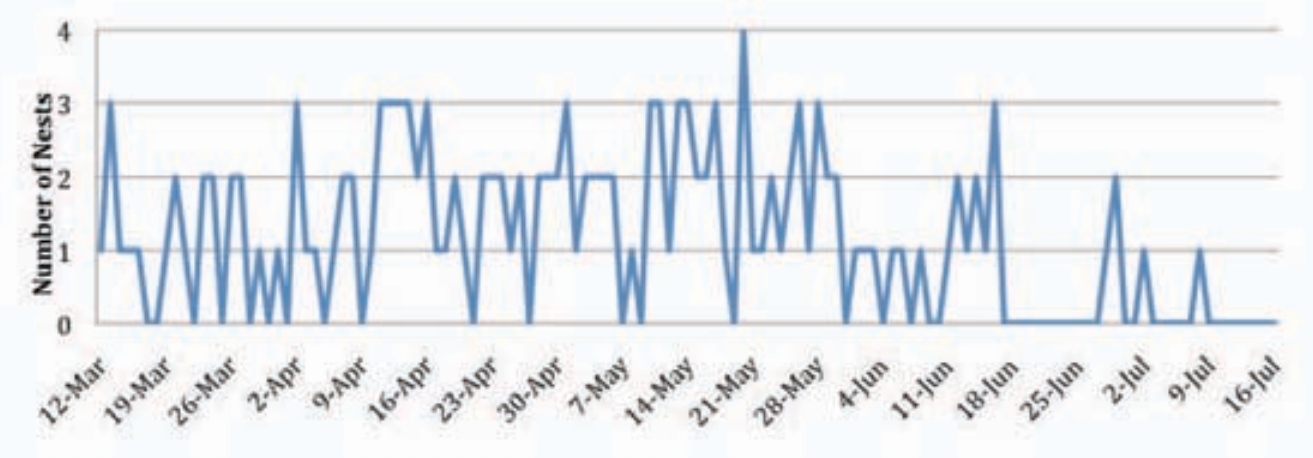


Figure 10: Nightly distribution of *D. coriacea* nesting events during the 2009 season.

The hourly distribution of nesting activities followed the pattern of previous seasons, with the peak nesting period between 23:00 and 02:00. However, the number of nests found during the other patrolling hours (20:00 to 23:00 and 02:00 to 04:00), were only approximately half the number of those found during the peak nesting period, and were therefore also very important periods of time during night patrols. The number of false crawls registered, fluctuate in relation to the number of nests. The more nests there were the more false crawls.

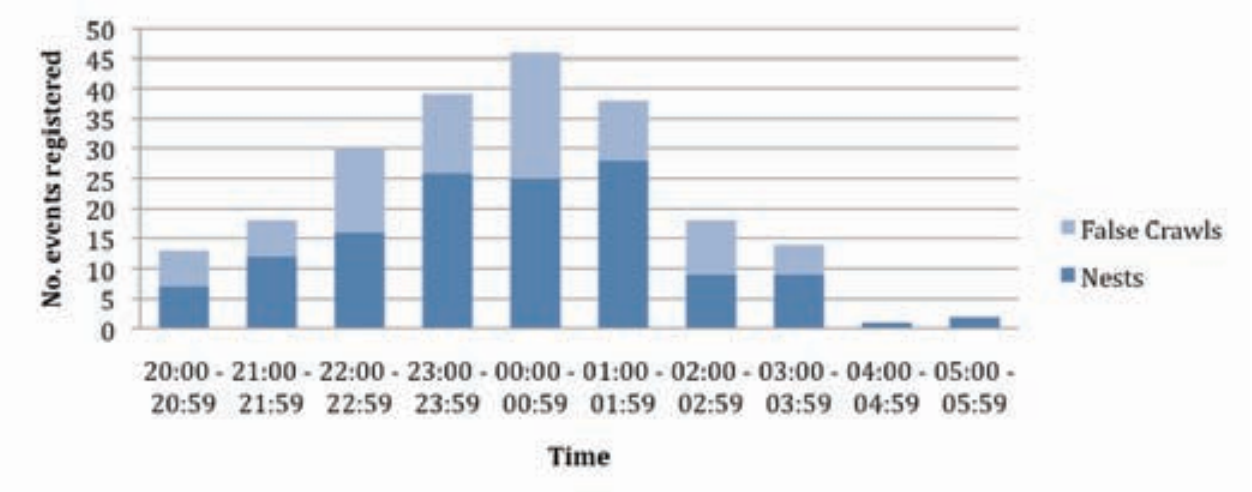


Figure 11: Hourly distribution of *D. coriacea* nesting events during the 2009 season.

The timing of the three, 4 hour patrols, were designed to have multiple patrols (usually 2) on the beach during the peak hours in order to find females during the process of nesting, but due to the limited number of patrols and the distance that each patrol had to cover, parts of the beach would regularly be unobserved for more than an hour, in which time a turtle may make a nest or a false crawl. In the Puerto Vargas sector (where nightly patrols were carried out), 57% of all the nesting activities were registered while the turtle was still on the beach. The pattern found gave good manage tool to Cahuita National Park allowing when will be the better hour to protect the nesting females with the few personnel and limited resources, also the information help tour guide to have better effectiveness to visit the beach.

3.2.2 Spatial distribution of nesting events

Of the 196 nests registered in the study area, 76% were located in the Puerto Vargas sector of Cahuita National Park, between markers 0 to 110. The remaining 24% of nests were registered during morning surveys in the Playa Negra sector between markers 110 and 180.

The 56 nesting events (48 nests and 8 false crawls) registered in the Playa Negra sector are a significant increase from the number last year, when only 21 events were registered (including nests and false crawls). This increase in activity in the Playa Negra sector is worrying as the beach is unpatrolled and therefore unprotected from poachers (see figure 15, pg 24 for poaching rates).

In the Puerto Vargas sector, the location (wooden marker number) of each nesting activity was recorded. An area of high nesting activity can be seen from markers 30 to 60, with 10 or more nests every 5 markers. The number of nests within markers 30 to 60 make up for 54% of nests made between markers 0 to 110.

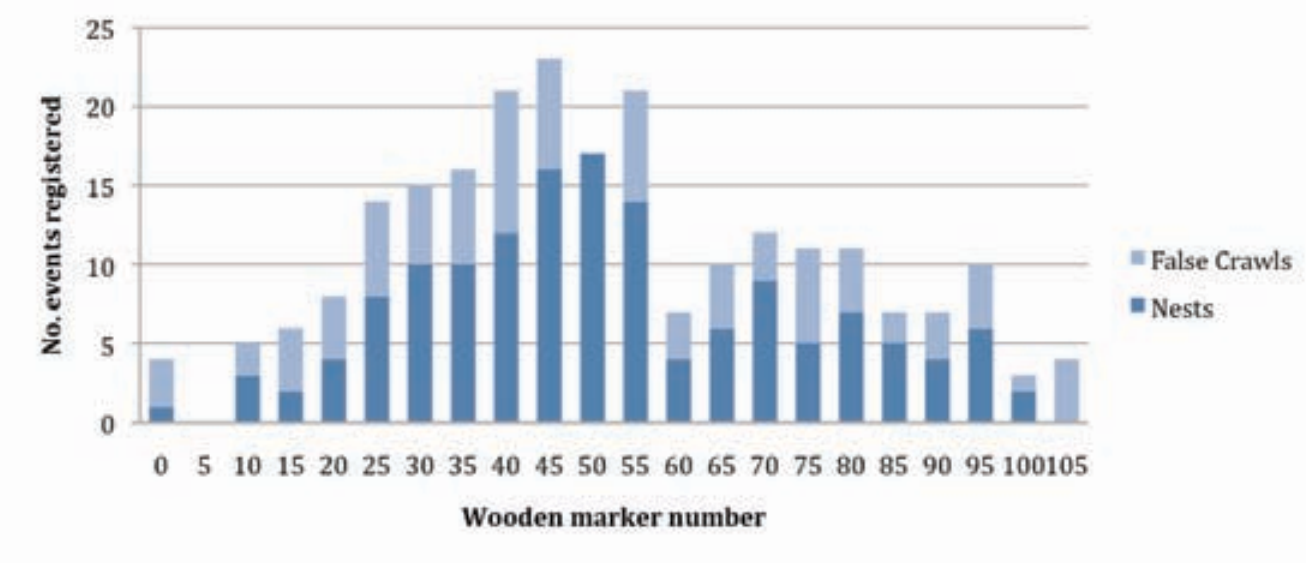


Figure 12: Spatial distribution of *D. coriacea* nesting events in the Puerto Vargas sector.

The stability of the beach is very fragile on the high energy beach system, where erosion and accretion rapidly change its shape. However, some areas are more stable than others. The beach, from markers 5 to 10 and 105 to 110 were unsuitable nesting sites throughout the season (0 nests registered), as well as between markers 0 – 3, 18 – 20, 22 - 24, 68 – 69 and 71 – 72. These areas were either, eroded to the vegetation line, or very low lying and therefore flooded during high tide.

Following the trend of previous seasons, the majority of *D. coriacea* nested in the high tide zone.

Table 1: Distribution of *D. coriacea* nests in the tidal zones.

Beach section	%
Berm	0
High tide	71.9
Low tide	28.1
	n = 196

The position of the nesting female while in the process of depositing eggs, was recorded on 82 occasions.

Table 2: The position of nesting females while depositing eggs.

Position of the turtle	%
Facing the water	19.5
Back to the water	36.6
Left or Right side facing water	43.9
	n = 82

3.3. TAGGING PROGRAMME RESULTS

During the season, 62 females were identified and registered. Their external tags or PIT (Passive Integrated Transponder) tags were recorded and if a female lacked either type of tag, it was applied.

Table 3: List of re-migrating and neophyte *D. coriacea* females registered in the 2009 season, with tags shown in *blue* having been applied this season.

RE-MIGRATING FEMALES		
Right tag	**Left tag**	**PIT**
76033	VA4465	132313151A
76456	VA7094	132165635A
CH2623	CH2622	132311440A
CH4131	CH4130	132338777A
D10321	D10320	
PM0416	PM0415	132211633A
PM0495	VA9638	133238140A
PM0729	PM0730	132249363A
PM0745	PM0748	
PN1074	PN1073	
PN1087	PN1086	
PN1254	PN1439	132167620A
RRT150	RRT149	4N4EZOOI4V
V2087	VA4936	121716124A
VA0036	VA0035	126979252A
VA1136	CH1775	126312232A
VA1202	VA1201	132775165A
VA3115	VA3114	126418666A
VA3966	VA3965	
VA4427	VA7856	132316610A
VA4524	VA4523	
VA4548	VA4547	
VA4595		
VA5320	VA5319	
VA5703	VA5702	AVID029324380
VA5704	61961	132271396A
VA5934	VA6817	132355524A
VA5962	VA5953	132314746A
VA6133	VA7058	123745611A
VA6239	VA6001	
VA6458	VA6457	132263344A
VA6543	77444	AVID029333592
VA6546	VA6545	132261295A
VA6698	VA6697	123734763A

RE-MIGRATING FEMALES (CONT.)		
Right tag	**Left tag**	**PIT**
VA7002	VA7047	AVID029305845
VA7014	VA7013	
VA7048	VA6226	126417285A
VA7053	VA7054	132117450A
VA7057	VA0509	SN19Q6HT84JN9GGK
VA7074	VA7073	126966556A
VA7095	VA6537	126436317A
VA7097	VA7096	
VA7193	VA7596	132318215A
VA9801		
VC0523	VC0522	132337266A
VC0977	VC0976	132163171A

NEOPHYTE FEMALES		
Right tag	**Left tag**	**PIT**
VA5708	VA5709	132275444A
VA7023	VA7024	132158552A
VA7034	VA7033	
VA7062	VA7061	132249525A
VA7070	VA7069	132277111A
VA7089	VA7088	
VA7092	VA7869	
VA7196	VA7195	
VA7198	VA7197	132339453A
VA7293	VA7292	132176271A
VA7823	VA7822	132312630A
VA7827	VA7826	132233243A
VA7833	VA7832	132231792A
VA7850	VA7849	132277135A
VA7852	VA7851	132125585A
VA7886	VA7853	132232351A

Forty six of the nesting females were re-migrants, having either external tags, a PIT tag or evidence of previous tagging (cuts, scars or holes) at the possible sites of tag application, which are, the skin between the back flippers and the tail, or on the rear edge of the front flippers, near the armpit *(Eckert et al., 2006).*

16 of the nesting females were neophytes, meaning that they had no previous tags or evidence of previous tagging, and therefore were tagged and registered for the first time this season by staff members. To be sure that a turtle is a neophyte, it is carefully examined for evidence of previous tagging at the possible tagging sites.

Altogether, 36 leatherback turtles were tagged, 12 were externally tagged, 12 were Pit tagged and 12 were double tagged.

The combined number of re-migrants and neophytes during this season equals the highest number of nesting females recorded in the project (2005 season) since 2002.

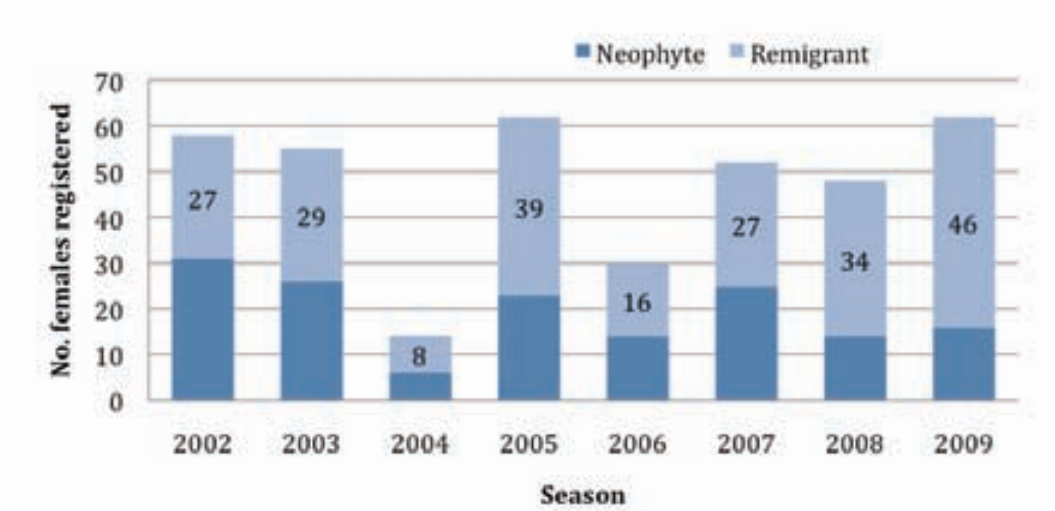


Figure 13: Comparison of numbers of re-migrant and neophyte Leatherback turtles registered in Cahuita National Park from 2002 to 2009.

The ratio of re-migrants to neophytes appears to be changing over the years, with a higher proportion of re-migrant females being recorded.

Table 4: Ratio of re-migrants vs. neophytes registered per season from 2002 to 2009.

	neophytes	:	Re-migrants
2002	1	:	0.9
2003	1	:	1.1
2004	1	:	1.3
2005	1	:	1.7
2006	1	:	1.1
2007	1	:	1.1
2008	1	:	2.4
2009	1	:	2.9

This apparent trend is taken over a short period of time and from a limited number of turtles, however further investigation into this trend over a greater time period and with pooling of data, may provide some insight into local and regional population dynamics.

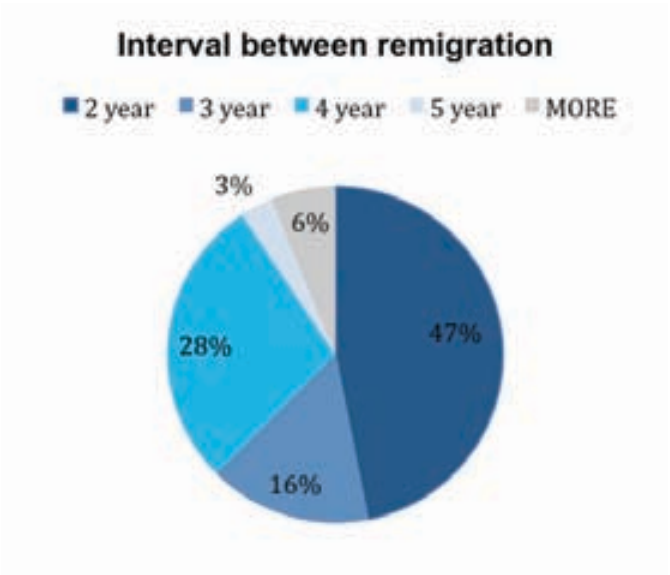
3.4. MOVEMENTS OF NESTING FEMALES

3.4.1. Remigration

Using the WIDECAST database, the records of 22 of this season's nesting females could be analysed. 50% of the females had only been registered on the database in the Cahuita National Park project, while the other 50% of females had been registered in the Gandoca (Costa Rica), Pacuare (Costa Rica) and Soropta (Panama) projects.

Analysing every re-migratory interval in the known history of the 22 turtles, the interval between remigration ranged from 2 to 12 years. The average of re-migratory interval was 3 years, however fig. 13 shows that almost half of the remigrations were made with 2 years intervals.

Figure 14: Remigration intervals of the nesting females registered during the 2009 season.



3.4.2. Re-nesting

Of the 62 females registered, 56 made at least 1 nest, with 20 females re-nesting and the maximum number of nests being 6 in the season. With an average of 2 nests per female this season, this figure is lower than the generally accepted average of 5 nests per season *(Boulon,1996)*. This may be because they are also nesting on other beaches, such as Playa Negra (Playa Negra sector), where 48 nests were registered this season, or on other beaches in the region.

3.5. PHYSICAL CHARACTERISTICS

3.5.1. Biometry

The biometric data of each of the 62 females was recorded, often more than once. The table below shows the results of the biometric data recorded and the number of times that the data was collected.

Table 5: Biometric data of *D. coriacea* (n = 62) found nesting in Cahuita National Park during the 2009 season.

Biometry (number of data entries)	AVERAGE (cm)	S.DEV (cm)	MAX (cm)	MIN (cm)
Curved Carapace Length (n = 120)	151.4	± 8.5	174	134
Curved Carapace Width (n = 117)	110.1	± 5.0	118	95
Nest Depth (n = 54)	72.0	± 5.0	81	61.5
Nest Width (n = 48)	38.9	± 4.0	46	30

Whenever possible, the depth of the nest was measured from the bottom of the nest to the tip of the peduncle, and the width of the nest estimated by measuring the turtles back flipper. These measurements would then be used to replicate the same nest dimensions whenever relocating eggs.

Before relocation of a nest, both the fertile and infertile eggs would be counted.

Table 6: Clutch size of *D. coriacea* (n = 62) found nesting in Cahuita National Park during the 2009 season.

	AVERAGE	S.DEV	MAX	MIN
Fertile Eggs (n = 88)	77.0	17.8	129	44
Yolkless Eggs (SAG´s) (n = 88)	32.7	15.6	69	0

3.5.2. External condition

All nesting females were carefully checked for any wounds, mutilations or attached fauna. Any external markings such as the ones mentioned can facilitate in the identification of individuals as well as give an insight into their lives in the ocean. Any recent wounds were cleaned to prevent infection.

Table 7: List of wounds, mutilations and attached fauna found on nesting *D. coriacea* (n = 62) during the 2009 season.

Cuts, Scars or Open Wounds	
Carapace	9
Right Shoulder	2
Left Anterior Flipper	14
Right Anterior Flipper	8
Both Anterior Flippers	22
Left Posterior Flipper	13
Right Posterior Flipper	7
Both Posterior Flippers	15
Mutilation of ¼ to ½ of and extremity	
Left Posterior Flipper	1
Right Posterior Flipper	2
Peduncle	1
Fauna Attached	
Carapace	1
Evidence of previous tags	
OTH* Left Posterior Flipper	1

* Open Tag Hole

Finding evidence of previous tags on a turtle could help to classify it as a re-migrant rather than a neophyte.

3.6. NEST DESTINATION

One of the principal aims of night patrols is to encounter nesting females in the process of making their nests, collect and relocate the eggs. This is done in order to hide the eggs from poachers, whose presence is very often detected on the beach, almost on a nightly basis. Whenever encountering a nest where the eggs could not be found, during a night patrol or morning censor, the nest was either left natural or camouflaged. However this was always the last resort, as poachers are very experienced at finding eggs within a nest area. No Leatherback nests were relocated to the hatchery this season.

3.6.1 Playa Negra Sector

Unfortunately, night patrols of Playa Negra sector could not be done this season, however weekly morning surveys of this sector, between marker 110 and 180, discovered 48 nests throughout the season (n = 48), of which the 92.5% had evidence of poaching. On almost every occasion, an infertile egg was left by the poachers as a sign to us that the nest had been poached, along with other indicators of poaching such as deep manmade holes dug in the nest area or holes in the sand made by the tool used to find eggs (a thin straight iron rod)

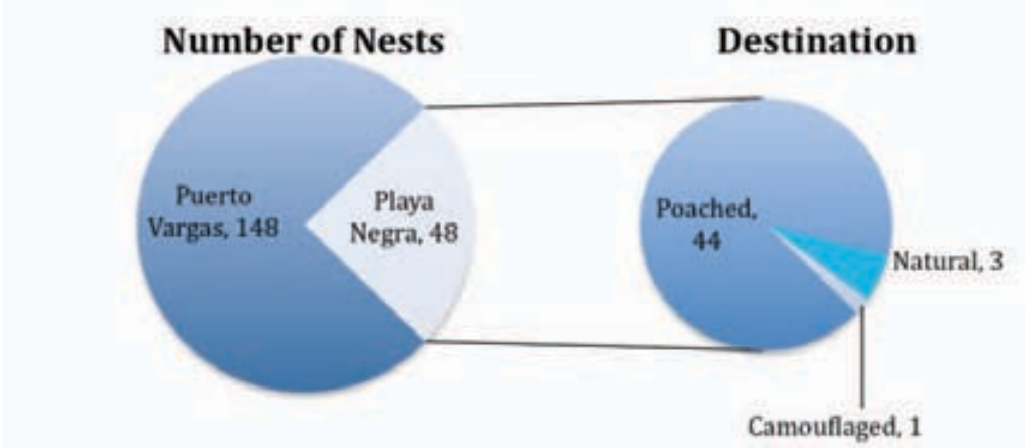


Figure 15: *D. coriacea* nesting numbers in the Puerto Vargas sector compared to the Playa Negra sector, showing nest destination in Playa Negra sector.

3.6.2 Puerto Vargas Sector

148 nests were registered in the Puerto Vargas sector during the season (n = 148), either encountered on night patrols or morning surveys. Figure 15 shows the initial and final destinations of each nest. The chart on the left shows the initial destination given to each nest on the night or morning of discovery. However, after the incubation period the nests were checked for poaching activity, and the chart on the right shows the final destination of the same nests.

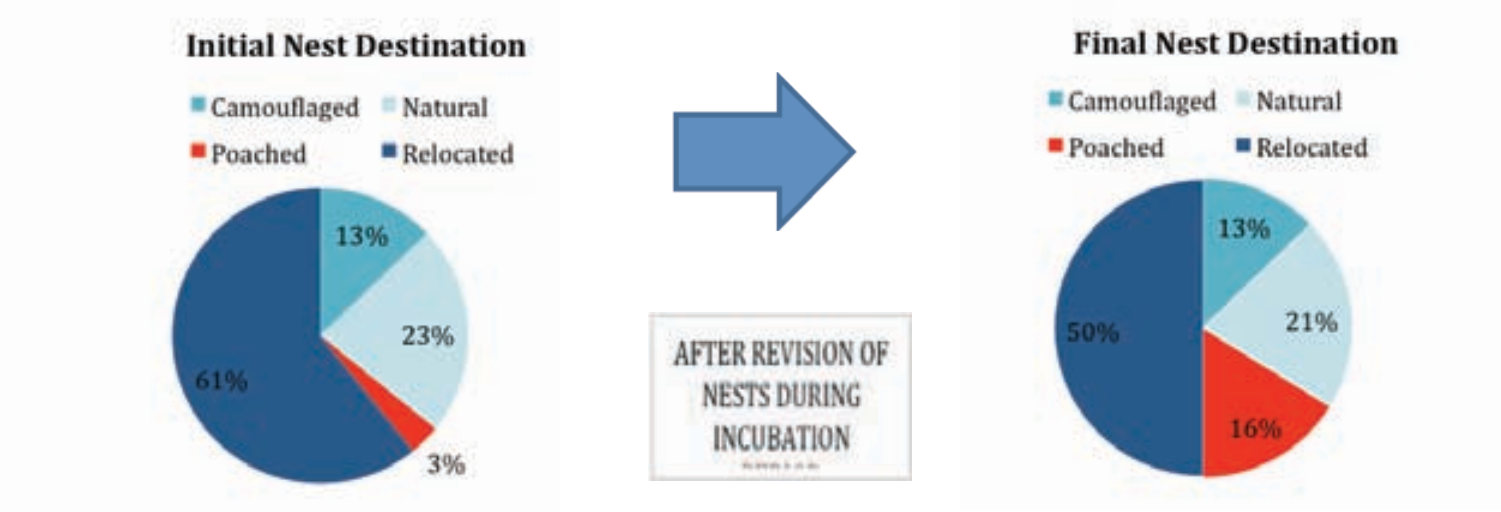


Figure 16: Initial and final destinations of *D. coriacea* nests in the Puerto Vargas sector.

8.8% of natural nests (n = 34) and 24.4% of relocated nests (n = 90) were poached over the incubation period. These poaching activities increased the poaching rate of all nests in the Puerto Vargas sector (n = 148) from an initial 3% to 16%.

3.7. NESTING OUTCOMES

Sixty for of the 148 nests (41.9%) in the Puerto Vargas sector had known outcomes. 22 nests were poached, 21 nests were lost due to erosion or inundation by high tide water and 19 nests were exhumed.

3.7.1. Loss of nests

Poaching

The poaching rate within the study area during the 2009 season was 35.2%, of which 22.5% was in the Playa Negra sector (area without any protection and outside of the Cahuita National park) and 12.7% in the Puerto Vargas sector. Nests were only classified as poached if they were triangulated and later evidence of poaching was found (relocated nests), or if there was very strong evidence of poaching within one week of the nest being made (natural or camouflaged nests), such as infertile eggs left by poachers on the surface of the nest area. This means that these figures are the lowest possible and that it is highly likely that more natural and camouflaged nests were poached than we knew of.

One of the main difficulties relocating nests this season was that there was very little stable beach above the high tide level. This made it much easier for poachers to find relocated nests, as there was only a small area to search.

The presence of poachers was noticed on almost a nightly basis during patrols. Finding fresh footprints, seeing lights (sometimes red light, imitating the patrols) and sometimes actually seeing the poachers run into the jungle in the distance. It is hard to prove, but it should be presumed that poachers sometimes follow and watch patrols, allowing them to then easily find a relocated nest. This might account for some of the relocated nests lost to poachers (24.4% of all relocated nests).

Evidence of poachers on the beach in the early morning (from 5:00 am) was also found on a regular basis on surveys of the beach. The most regular sign of poachers on the beach were fresh footprints, often accompanied by dog tracks, however poachers were often sighted on the beach in the distance carrying their poaching tool, and on one occasion two poachers were encountered on the beach in the process of stealing eggs from a nest relocated the night before.

It should be noted that poachers were also seen several times on the beach in the afternoon, demonstrating their lack of fear or respect of the park`s authorities. The growing confidence of the poachers is understandable, as the MINAET personnel have done nothing this season to deter them and ignored several requests for accompaniment on morning surveys, to show their presence on the beach.

Erosion or Inundation

21 nests (14.2%) are believed to have been eroded or inundated by high tide waters in the Puerto Vargas sector. These are nests that were in “danger zones” such as the low tide area or areas of high instability, and that could not be located around their hatching due date and no evidence of hatching was found.

This season, a large area of the beach was low lying and therefore susceptible to inundation, especially during the time of the month when there was a full moon and/or storm surges. Natural and camouflaged nests in these areas were therefore at a high risk of loss.

Unfortunately, Camouflaged and Natural nests were not triangulated this season, therefore it is unknown whether many of these nests were inundated with water or if they hatched and went unnoticed (hatchling tracks erased by rain/wind). This means that the number of nests eroded or inundated, are most probably higher.

The highly active beach system was constantly changing and rapid rates of erosion and accretion were observed, therefore even nests that were relocated to parts of the beach that were thought to be stable were sometimes lost to erosion.

Predation

No nests were known to be predated during the 2009 season.

3.7.2. Exhumations

19 exhumations were carried out during this season, of which 18 were relocated nests and 1 was camouflaged. The table below gives details as to the fate of each egg within these nests and the hatchling success rate.

Table 8: Results of exhumed nests of *D. coriacea* in Cahuita National Park during the 2009 season.

	Relocated	Camouflaged	Total
Number of nests exhumed	**18**	**1**	**19**
Number of shells	**916**	**56**	**972**
% eggs with no apparent development	**17.3**	**5.0**	**16.8**
% stage I	**6.0**	**0.0**	**5.8**
% stage II	**2.0**	**0.0**	**2.0**
% stage III	**1.6**	**0.0**	**1.5**
% stage IV	**5.7**	**1.7**	**5.5**
% undetermined	**0.5**	**0.0**	**0.4**
% with fungus and/or bacteria	**12.6**	**0.0**	**12.2**
% with larvae	**6.0**	**0.0**	**5.7**
% predated by crabs	**0.0**	**0.0**	**0.0**
Average incubation time (days)	**69**	**78**	**69**
Hatchling success rate (%)	**64.9**	**93**	**66.4**
% hatchlings exit from nest	**64.1**	**93**	**65.6**

The estimated number of hatchings during the 2009 season is **5368**, calculated using the formula:

Estimated No. Hatchlings = *average no. eggs per nest* X *total nests protected* X *average hatchling success rate*

3.8 NESTING OF OTHER SPECIES

The nesting season of the Hawksbill (*Eretmochelys imbricata*) and Green (*Chelonia mydas*) turtle overlaps with that of the Leatherback. Hawksbill turtles have their most important nesting ground in the Caribbean here in Cahuita National Park, nesting from May to November. Green turtles usually nest between June and October.

NOTE: The following section (3.8.1, 3.8.2) summarises a part of the nesting season of each species up until the **31st July 2009** and only includes data from the 1st March to the 31st July 2009.

Hawksbill Turtle – *Eretmochelys imbricata*

The first Hawksbill turtle nesting activity was registered on the 11th May and until the 31st July, 16 nests and 12 false crawls were registered in the study area. 62.5% of the nests were registered in the Playa Blanca sector (marker -87 to 0) and 37.5% in the Puerto Vargas sector.

4 females were registered (all neophytes) with tag numbers (left/right) VA7076/VA7863, VA7084/ VA7812, VA7063/VA7064, VA7082/VA7083. Two other females are thought to have nested, however at the time of finalising this report, they had not been officially registered.

The destination of the nests is shown in the figure below.

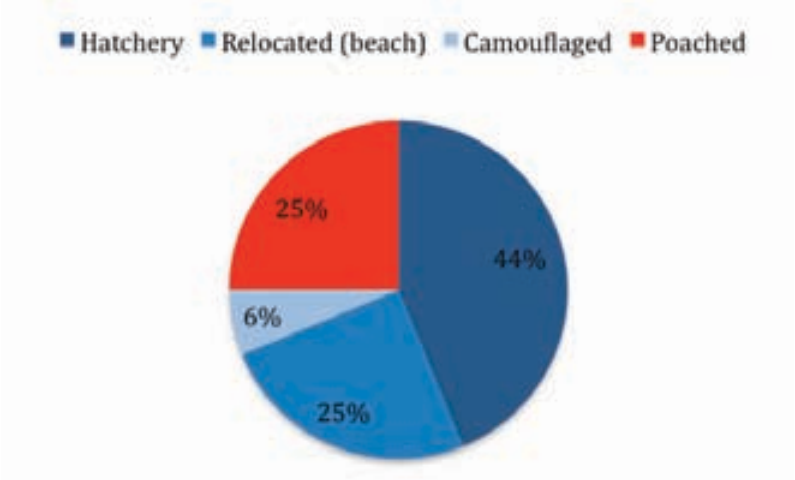


Figure 17: Destination of *E. imbricata* nests in Cahuita National Park until the 31st July 2009.

A total of 1812 eggs were relocated to more stable and secure parts of the beach, or the hatchery. After July 31, we reported 6 more nests of Hawksbill until October 1, when close the surveys for a general nesting in 2009 season of 22 nests of the specie.

Green Turtle – *Chelonia mydas*

The first Green turtle nesting activity was registered on the 21st April and until the 31st July, 3 nests and 1 false crawl were registered in the Puerto Vargas sector. 2 females were registered, of which one was a re-migrant (PN0536/PN0538) and one a neophyte with new tags applied (VA7868/VA7085).

Of the 3 nests, one was relocated to the beach, one to the hatchery and the final nest was discovered on a morning censor and therefore camouflaged. After July 31 we reported 7 more nests one of them poached, for a general total of 10 green turtle nest in 2009 nesting season.

4. OTHER ACTIVITIES

4.1. Beach cleaning

Beach cleaning was done on a regular basis in the Puerto Vargas sector throughout the 2009 season, with two main objectives.

To clear driftwood from the beach to the jungle, to give better access to females trying to nest and removing obstacles for hatchlings trying to make their way to the sea;

And to remove plastic waste from the beach, which is a threat to the lives of many marine animals through entanglement and ingestion.

4.2. Hawksbill liberation at Seahorse Aquarium, Limon

On the 16th and 17th May 2009, Cahuita National Park project's staff members and volunteers attended the 'beach clean' and release of 2 Hawksbill juveniles and 1 mature Hawksbill, at the Seahorse Aquarium. The mature female was externally and internally tagged. Its external metal tag numbers were VA7847/VA7848 (left/right) and its PIT tag number 132214533A.

5. RECOMMENDATIONS

- The high proportion of nests in the Playa Negra sector compared to previous years is alarming and therefore finding a way to be able to patrol this sector is important. Reverting to the project setup of past seasons, where two stations were in place, one in the national park and one in Puerto Viejo town, is recommended. This would also allow the Cahuita National Park team to concentrate their patrolling efforts between markers 40 and 70, where historically, the majority of nests are made.

- If logistical and security issues could be resolved, a hatchery could be constructed in a centralised location in relation to peak nesting distribution. This would allow nests to be relocated to a secure hatchery instead of on the beach where poachers may find them. Ideally, a new station should be at the same location as the hatchery. This would allow better patrol coverage of the beach and an increased presence on the beach.

- Due to the high activity of poachers in Cahuita National Park, in depth training of staff in the relocation of nests is needed. Especially the knowledge and techniques needed to elude

poachers, such as the minimal use of red light and camouflaging techniques. Practical and theory workshops should be scheduled into the training of new staff members.

- Triangulation of all nests, including natural and camouflaged nests should be done so that the final destination of each nest can be followed.

- Develop actions to study the impact of ocean erosion and of the raise ocean level.

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Vandelli, 1761, “Epistola de Holoturio et Testudine coriacea ad Celeberrimum Carolum Linnaeaum, Padua:2 (Maris Tyrrheni oram in agro Laurentiano).

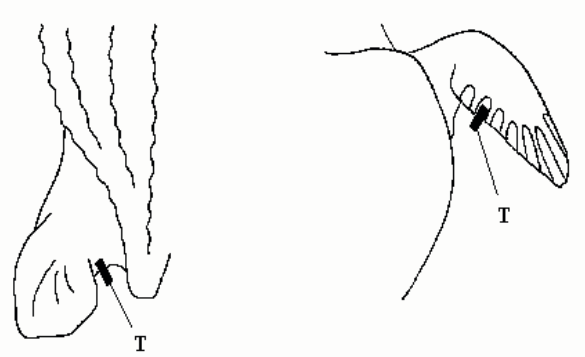
ANNEX I. PROTOCOL

A. TAGGING

External Tagging

Tagging permits the identification of individuals in a population, which in turn provides knowledge of migratory routes, population size and understanding certain aspects of their reproductive biology (migratory intervals, frequency of nesting, number of hatchlings produced per female). Furthermore, assists in the making of important decisions in the national and international efforts for sea turtle conservation and management.

Metal tags (Monel #49) were used throughout the season, and trained staff applied them to three species of turtle. *Eretmochelys imbricata* and *Chelonia mydas* were tagged on the 1st, 2nd or between the 1st and 2nd axilar scale of the anterior flipper. *Dermochelys coriacea* were tagged on the uropigial membrane, between the posterior flippers and the tail.



Before tagging, the turtle would be checked for evidence of previous tagging. The metal tags and the tagging site then cleaned using Vanodine (a strong disinfectant). The tags are applied and the tagging site cleaned with Vanodine again. The tag numbers are then read to the scribe three times, to be recorded on the data sheet.

When tagging a turtle the following rules were followed:

- Wear latex gloves.
- Apply lower tag number on the left side of the turtle and the higher on the right.
- Apply tag with 0.5 – 1cm gap between the skins edge and the tag. ≥0.5cm to avoid friction which may lead to infection, necrosis and eventually the loss of the tag, and ≤1cm to avoid the tag getting caught on something and ripped off.
- The address on the underside of tags with an unknown series, should be noted.

Internal Tagging

A PIT (Passive Integrated Transponder) tag is a small glass capsule containing an inert microprocessor that can transmit a unique alpha-numeric identification number to a hand held reader, when the reader briefly activates the tag with a low frequency radio signal at close range

(Bazals G.H., 1999). It is injected into the turtle and has a 100% retention rate *(MacDonald et al., 1994).*

PIT tags were only applied to (and therefore the protocol only applies to) *Dermochelys coriacea.* Before PIT tagging, the turtle would be scanned on both shoulders (twice) for an existing PIT. If none was found, the tagging site on the right shoulder would be cleaned with Vanodine. The sterilised tag would then be injected using a PIT gun and the area cleaned again.

When applying a PIT tag the following rules were followed:

- Wear latex gloves
- Only apply PIT when the female is laying eggs (after the 10^{th} egg), but never when she is finishing her nest and starts moving.
- PIT number should be scanned before and after injection and read three times to the scribe, to be recorded on the data sheet.

Whenever a PIT tag is applied, a tissue sample is taken from one of the posterior flippers. Again, it is to be taken when the female is laying eggs, but never when she is finishing her nest and starts moving. An area on the edge of the posterior flipper is cleaned and the sample (smaller than a grain of rice) taken using forceps and a sterile razor blade, and the area cleaned again. The tissue sample is placed in a vile of alcohol, and sent for genetic analysis.

B. BIOMETRY

Nesting female sea turtles were measured using a flexible metric tape. The Curved Carapace Length (CCL) and Curved Carapace Width (CCW) were measured, following the following guidelines.

When measuring a turtle, the following guidelines were followed:

- Sand must be removed from the carapace.
- Measuring tape must be straight and taut across the carapace.
- When measuring CCW, the widest point of the carapace must be found. In the case of *Dermochelys coriacea,* the widest point is near the “armpit”, and the measurement is taken from the middle of the first ridge to the middle of the seventh ridge.
- When measuring the CCL of *Dermochelys coriacea,* measure from the nuchal notch (anterior edge of the carapace at the midline) to the posterior tip of the caudal peduncle *(Bazals G.H., 1999)*

C. NEST MANAGEMENT

The principal threats to sea turtles in Cahuita National Park are illegal collection of eggs (poaching), erosion and predation. The conservational measures taken are to remove nests from high risk locations and relocate them, or erase tracks and body pits (camouflaging) to confuse the poachers.

Beach Relocation

In the case of *Dermochelys coriacea*, the eggs of a nesting female are collected by carefully placing a plastic bag into the nest when the female is ready to deposit them, signalled by the covering the nest with one flipper. Before placing the bag, sand is pulled away from the mouth of the nest to allow the eggs to be pulled out. The bag is placed under the turtle's tail and held open, so that the eggs fall into it. Once the turtle has finished laying her eggs (the infertile ones last), she starts to push down on the eggs with one flipper. The bag is twisted shut and held calmly, and when she swaps flippers the bag of eggs is pulled out and put in a safe place, covering it mostly with wet sand to try to maintain their temperature.

When collecting eggs of *Eretmochelys imbricata* and *Chelonia mydas* the turtle is allowed to deposit the eggs into her nest. One end of a tape is placed into the nest to mark the location and once the turtle has finished nesting the eggs can be excavated and relocated. This process is also carried out when a Leatherback's eggs (in a bag) cannot be successfully removed or if she is already depositing eggs when she is found.

The site of relocation must fit certain criteria:

- No driftwood in the area.
- Not near the mouth of permanent or seasonal rivers.
- Not near the roots of creeping plants.
- Not on beach paths.
- Not near coastal developments.
- Not in the low tide area.
- Not in known areas at risk of erosion or predation.

Once a suitable location has been found, the dimensions of the females nest are replicated by the patrol leader. If the width and depth were not measured the average dimensions for the species are used. The eggs are gently placed 2 at a time into the nest (counting them), fertile eggs first and then finally the infertile eggs. The nest is then closed with wet sand and the area camouflaged, using different techniques for different conditions. Dry sand is not allowed to come into contact with the eggs.

Camouflaging

To camouflage a natural nest, where the eggs could not be found, the turtle's tracks are erased to hide the entrance and exit route from poachers, and the nest area flattened and expanded to make it harder for the poachers to find the eggs.

D. HATCHERY MANAGEMENT

Once the first eggs were relocated to the hatchery, it was guarded 24 hours a day in 6 hour shifts. Volunteers were instructed to check the hatchery area for crabs and the plastic mesh baskets above each nest for the presence of any flies every 30 minutes. If flies were found, the canasta would be lifted and the flies removed, then the canasta reburied above the nest to a depth of 10cm. Crabs were dug out of their holes and thrown away from the hatchery.

Abiotic Data

The temperatures of nests could be recorded throughout the incubation period, by placing a thermocouple (HOBO Pendant temp/light) into the centre of a batch of eggs within a nest (natural or relocated).

Rainfall was measured every 24 hours from the 18th April until the 30th August, using a pluviometer.

E. EXHUMATIONS

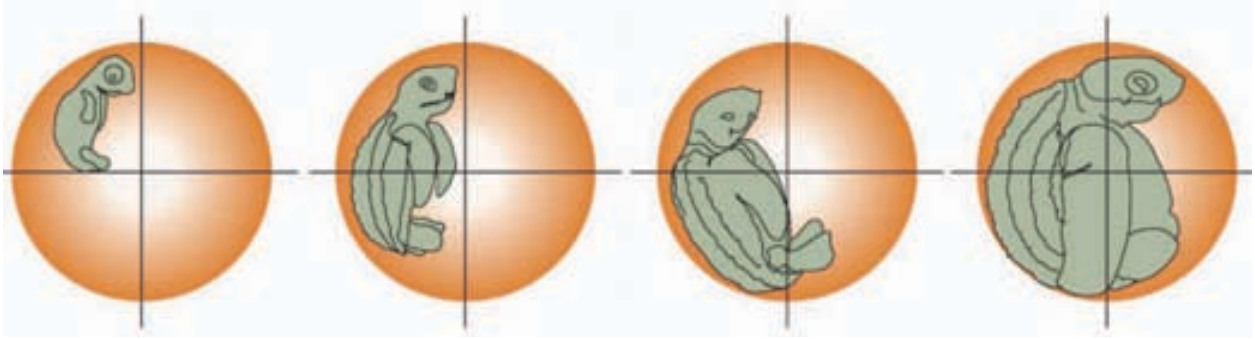
2 to 3 days after the firsts hatchling emerge from a nest, it's remains are exhumed and analysed.

The eggs are classified as:

- Shells
- Live hatchlings
- Dead hatchlings
- Open eggs - with live emerging hatchlings
  - with dead hatchlings (pipped)
- Closed eggs - without development
  - with development

Closed eggs with development are classified as:

- Stage I: Embryo fills up to 25% of the amniotic cavity.
- Stage II: Embryo fills 26% - 50% of the amniotic cavity.
- Stage III: Embryo fills 51% - 75% of the amniotic cavity.
- Stage IV: Embryo fills 76% - 100% of the amniotic cavity.



Observations of fungus, bacteria, roots, ants or larvae within eggs were also recorded in conjunction with each eggs development.

The hatchling success rate could then be calculated using the following formula:

Hatchling Success rate = (#S / #S + #U + #D + #P) X 100

#S = Number of empty shells

#U = Number of undeveloped eggs

#D = Number of eggs with some development

#P = Number of predated eggs

ANNEX II: Project Images

Project team and volunteers after the nesting monitoring of this leatherback female.

Project staff during nest exhumation in Cahuita National Park

Leatherback nest emerging during cloudy day in Cahuita National Park

WIDECAST staff in Cahuita National Park releasing hatchlings of leatherback turtle.

Eggs bag after lay process of leatherback female, the eggs are ready to be relocated in a safe location.

Cahuita Beach Hatchery, 2009 season