

# END OF NESTING SEASON REPORT

## GREEN SEA TURTLE STUDY

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In collaboration with:

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Tortuguero, Costa Rica

Owned and operated by:

**The Canadian Organization for Tropical Education and  
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## INTRODUCTION

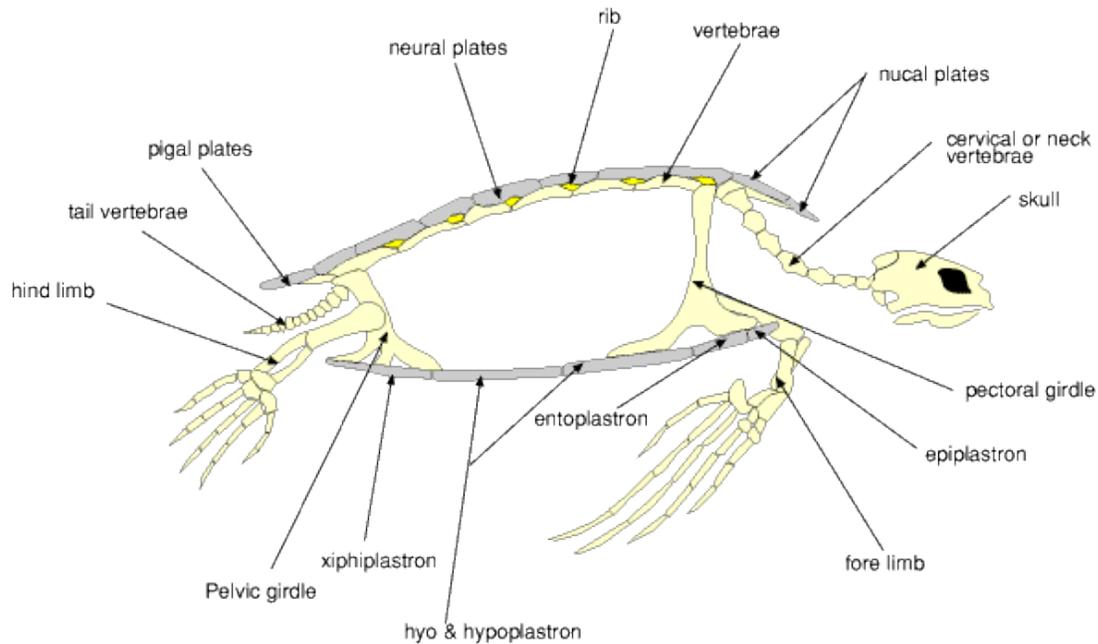
In a joint initiative with York University and the Canadian Organization for Tropical Education and Rainforest Conservation (COTERC), an internship program had been established spanning a three-month period that ran from June 2nd till August 31st, 2005. The research project consisted of monitoring and surveying Green sea turtle activity and poaching rates along a three mile section of beach during the nesting season. The study site stretches along the northeast Caribbean coast of Costa Rica, four miles north of the small village of Tortuguero, and is situated within the boundaries of the Barra del Colorado Wildlife Refuge. This report will discuss the Green sea turtle project, outline the results, and provide recommendations for continued future succession for a better conservation plan.

## 1. OVERVIEW OF SEA TURTLES

### 1.1 Biology

Sea turtles are large, air-breathing reptiles that inhabit tropical and subtropical seas throughout the world. Scientists recognize seven living species of sea turtles, which are grouped into six genera. Each species of sea turtle eats, sleeps, mates, and swims in distinctly different areas. Sometimes their habitats overlap, but for the most part they each have different preferences. Of the seven living species, three have been survey to be nesting along the study site, which is the most important breeding ground for the green sea turtle in the entire Caribbean ocean. The area is also an important nesting site for leatherback, and hawksbill sea turtles (*please see fact sheets pages 5-8*).

Sea turtle shells consist of an upper part/the **carapace**, and a lower section/ the **plastron** (*please see figure 1*). Their streamlined bodies and large flippers make them remarkably adapted to life at sea. Their jaws have modified "beaks" suited to their particular diet. They do not have visible ears but have eardrums covered by skin. They hear best at low frequencies, and their sense of smell is excellent. Their underwater vision is good but becomes limited to closer distances on land.



**Figure 1:** Sea turtle skeletal futures (source: [http://tofino.ex.ac.uk/euroturtle/con\\_welcome.htm](http://tofino.ex.ac.uk/euroturtle/con_welcome.htm))

## 1.2 Life Cycle

Females may mate with several males just prior to nesting season and store the sperm for several months. When she finally lays her eggs, they will have been fertilized by a variety of males. During mating, the male attaches himself to the back of the female's shell by gripping her top shell with claws located in his front flippers.

Only the females come ashore to nest, and it occurs on the beach where they first hatched years prior. They cautiously crawl out of the ocean, most often under the cover of the night, move slowly and awkwardly up the beach to a suitable location, and then proceed with the exhaustive nest building process. Sometimes sea turtles make there way up onshore, but for unknown reasons decide not to nest. This can happen naturally or be caused by disturbances such as artificial lighting or due to the presence of people on the beach.

The nest building process consists of flinging away loose sand with the flippers. The mother sea turtle first constructs a "body pit" by digging with her flippers and rotating her body. After the body pit is complete, she digs an egg cavity using her cupped rear flippers

as shovels. When the turtle finishes digging the egg chamber, she begins to lay her eggs. Two or three of the soft-shell eggs drop out at a time, and because the eggs are flexible they do not break as they fall into the chamber. The average size of a clutch ranges from about 80 to 120 eggs. A sea turtle is least likely to abandon nesting when she is laying her eggs, but some turtles will abort the process if they are harassed or feel they are in danger. For this reason, it is important that sea turtles are never disturbed during nesting. Once all the eggs are in the chamber, the mother turtle



uses her rear flippers to push sand over the top of the egg cavity. Gradually, she packs the sand down over the top and then begins using her front flippers to refill the body pit and disguise the nest. After the nest is thoroughly concealed, the female crawls back to the sea to rest before nesting again later that season or before beginning her migration back to her feeding ground. Once a female has left her nest, she never returns to tend it.

Nesting seasons occur at different times around the world. Most females nest at least twice during each mating season, although individuals of some species may nest only once and others more than ten times. A female will not nest in consecutive years, typically skipping one or two years before returning. Very little is known about why sea turtles nest on some beaches and not on other equally suited sites.

Incubation takes about 60 days, but since the temperature of the sand governs the speed at which the embryos develop, the hatching period can cover a broad range. Essentially, the hotter the sand surrounding the nest, the faster the embryos will develop. Cooler sand has a tendency to produce more males, with warmer sand producing a higher ratio of females. Hatchlings usually emerge from their nest at night or during a rainstorm when temperatures are cooler. Once they decide to burst out, they erupt from the nest cavity as a group. The little turtles orient themselves to the brightest horizon, and then dash toward the sea. If they don't make it to the ocean quickly, many hatchlings will die of dehydration in the sun or be caught by predators like birds and crabs. Once in the water,

they typically swim several miles off shore, where they are caught in currents and seaweed that may carry them for years before returning to near shore waters. Although, researchers do not yet know how long baby turtles spend in the open sea, or exactly where they go, nor is it yet possible to determine the age of a sea turtle from its physical appearance. There is yet, much, to be known and studied in the world of sea turtles.

### **1.3 Conservation and Threats**

The earliest known sea turtle fossils are about 150 million years old. In groups too numerous to count, they once navigated throughout the world's oceans. But in just the past 100 years, demand for turtle meat, eggs, skin and colorful shells has dwindled their populations. Destruction of feeding and nesting habitats, and pollution of the world's oceans are all taking a serious toll on remaining sea turtle populations. Many breeding populations have already become extinct, and entire species are being wiped out.

The obstacles are so numerous for sea turtles that only about one in 1,000 survives to adulthood and the increasing threats caused by humans are driving them to extinction. Human use of nesting beaches can result in negative impacts to the nesting turtles, incubation, and to the hatchlings. For example, lights from new developments discourage females from nesting and cause hatchlings to become disoriented, where they often die of dehydration or predation. Another serious threat is night-time human activity on the beach (i.e. tourism, ATVs etc.). This can prevent sea turtles from emerging on the beach or even cause females to stop nesting and return to the ocean.

Effective conservation means protecting turtles at all stages of their life cycle. Protecting nesting beaches calls for action at the local level, and protecting juvenile and adult turtles in oceanic waters calls for enforceable of international agreements.

## 1.4 Surveyed Sea Turtle Fact Sheet

### 1) Green sea turtle (*Chelonia mydas*)



The green sea turtle is named for the green color of the fat under its shell which was highly sought after and even manufactured in great quantities as a delicacy soup. There carapace color varies from pale to dark green, plain to brilliant yellow, and even brown and green tones with radiating stripes. Hatchlings are dark-brown or nearly black with a white underneath and white flipper margins. All flippers have 1 visible claw.

**Size:** Adults are 3.5 to 4 feet in carapace length (76-91 cm). The green turtle is the largest of the Cheloniidae family. The largest green turtle ever found was 5 feet (152 cm) in length and 871 pounds (395 kg).

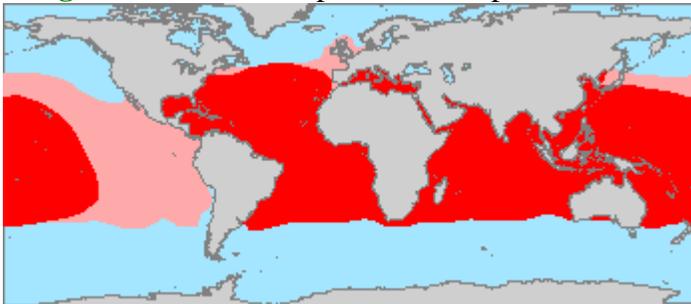
**Weight:** Adults weigh between 300 to 400 pounds (136-180 kg).

**Diet:** Changes significantly during its life, but becomes the only sea turtle that is strictly herbivorous as an adult. When they are less than 8 to 10 inches in length, they eat worms, young crustaceans, aquatic insects, grasses and algae. Once green turtles reach 8 to 10 inches in length, they mostly eat sea grass and algae. Their jaws are finely serrated which aids them in tearing vegetation.

**Habitat:** Mainly stay near the coastline and around islands and live in bays and protected shores, especially in areas with sea grass beds. Rarely are they observed in the open ocean.

**Nesting:** Green turtles nest at intervals of 2, 3, or more years, with wide year-to-year fluctuations in numbers of nesting females. They Nest between 3 to 5 times per season and lay an average of 115 eggs in each nest. Eggs incubate for about 60 days. In the Caribbean, the height of there nesting season runs from May till August.

**Range:** Found in all temperate and tropical waters throughout the world.



(source: [http://www.fao.org/figis/servlet/species?sname=Chelonia%20mydas&sname\\_op=is](http://www.fao.org/figis/servlet/species?sname=Chelonia%20mydas&sname_op=is))

**International Status:** Listed as Endangered (*facing a very high risk of extinction in the wild in the near future*) by the International Union for Conservation of Nature and Natural Resources.

**Threats to Survival:** The greatest threat is from the commercial harvest for eggs and food. Other green turtle parts are used for leather and small turtles are sometimes stuffed for ornaments. Incidental catch in commercial shrimp trawling is an increasing source of mortality.

## **1.5 Surveyed Sea Turtle Fact Sheet**

### **2) Leatherback sea turtle** (*Dermochelys coriacea*)



The leatherback is the champion of sea turtles: It grows the largest, dives the deepest; and travels the farthest of all sea turtles. It's named for its unique shell which is composed of a layer of thin, tough, rubbery skin, strengthened by thousands of tiny bone plates. It is the only sea turtle that lacks a hard shell. The carapace is dark grey or black with white or pale spots. Hatchlings have white blotches on carapace. All flippers are without claws.

**Size:** 4 to 6 feet (121-183 cm). The largest leatherback ever recorded was almost 10 feet (305 cm) from the tip of its beak to the tip of its tail and weighed in at 2,019 pounds (916 kg).

**Weight:** 550 to 1,545 pounds (250-700 kg).

**Diet:** Leatherbacks have delicate, scissor-like jaws. They feed almost exclusively on jellyfish. It is remarkable that this large, active animal can survive on a diet of jellyfish, which are composed mostly of water.

**Habitat:** Primarily found in the open ocean, as far north as Alaska and as far south as the southern tip of Africa, though recent satellite tracking research indicates that leatherbacks feed in areas just offshore. They are also known to dive as deep as whales in search of their food which makes them the only reptile that remains active in cold water temperatures (below 40 degrees Fahrenheit).

**Nesting:** Nest at intervals of 2 to 3 years, though recent research has indicated they can nest every year. They nest between 6 to 9 times per season, with an average of 10 days between nesting. Lay an average of 80 fertilized eggs, the size of billiard balls, and 30

smaller unfertilized eggs, in each nest. Eggs incubate for about 65 days. Unlike other species of sea turtles, leatherback females may change nesting beaches, though they tend to stay in the same region. In the Caribbean, the height of their nesting season runs from March till June.

**Range:** Most widely distributed of all sea turtles. Found world wide with the largest north and south range of all the sea turtle species. With its streamlined body shape and powerful front flippers, a leatherback can swim thousands of miles over open ocean, and against fast currents.

**International Status:** Listed as Critically Endangered (*facing an extremely high risk of extinction in the wild in the immediate future*) by the International Union for Conservation of Nature and Natural Resources.

**Threats to Survival:** Greatest threat to leatherback sea turtles is from incidental take in commercial fisheries and marine pollution (such as balloons and plastic bags floating in the water, which are mistaken for jellyfish).

## **1.6 Surveyed Sea Turtle Fact Sheet**

### **3) Hawksbill sea turtle** (*Eretmochelys imbricata*)



The hawksbill sea turtle is named for its narrow head and hawk-like beak. It is one of the smaller sea turtles. Carapace is elliptical in shape, bony without ridges, and is made up of large over-lapping scutes (scales). The carapace is orange, brown or yellow and hatchlings are mostly brown with pale blotches on scutes. Flippers have 2 claws.

**Size:** Adults are 2.5 to 3 feet in carapace length (76-91 cm).

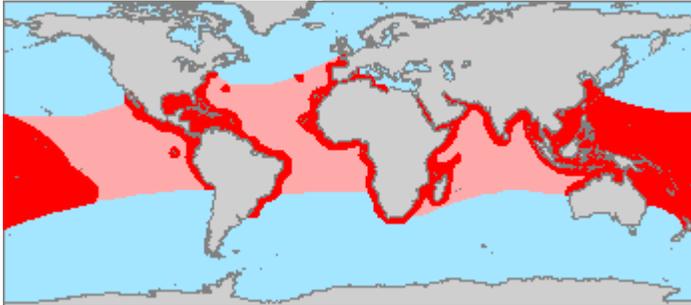
**Weight:** Adults can weight between 100 to 150 pounds (40-60 kg).

**Diet:** The hawksbill's narrow head and beak like jaws allow it to get food from crevices in coral reefs. They eat sponges, anemones, squid and shrimp.

**Habitat:** Typically found around coastal reefs, rocky areas, estuaries and lagoons.

**Nesting:** Nest at intervals of 2, 3, or more years between 2 to 4 times per season. Females lay an average 160 eggs in each nest which take about 60 days to incubate. In the Caribbean, the height of their nesting season runs from June till October.

**Range:** Tropical and subtropical waters of the Atlantic, Pacific and Indian Oceans, which makes them the most tropical of all sea turtles.



(source: [http://www.fao.org/figis/servlet/species?sname=Eretmochelys%20imbricata&sname\\_op=is](http://www.fao.org/figis/servlet/species?sname=Eretmochelys%20imbricata&sname_op=is))

**International Status:** Listed as Critically Endangered (*facing an extremely high risk of extinction in the wild in the immediate future*) by the International Union for Conservation of Nature and Natural Resources.

**Threats to Survival:** The greatest threat is from the illegal harvest for their beautiful shell. In some countries the shell is still used to make hair ornaments, jewelry, and other decorative items.

## 2. THE 2005 RESEARCH PROJECT

A continuous annual survey and monitoring of sea turtle activity is being conducted along a three mile stretch of beach located on the northeast Caribbean coast of Costa Rica, four miles north of the small village of Tortuguero, and situated within the boundaries of the Barra del Colorado Wildlife Refuge (*please see map A*). This year marks the second consecutive season of the project since it first started in June, 2004. The project started as a conservation effort by COTERC in response to the high poaching rate of sea turtle meat, and their eggs. Data must be collected and recorded in order to quantify the scale of the problem and be able to further mitigate a protection program.



source: Sami Abdelmalik

A bird's eye view of the nesting beach.



**Map A:** The study site (source: <http://casamarbella.tripod.com/id6.html>)

## **2.1 Methodology of Data Collection**

This green sea turtle season's project comprised of non-intrusive research methods of surveying and data collecting. In other words, nests were not relocated, poachers were not confronted, and live turtles were not handled (i.e. captured, measured, or tagged). The start of the three mile stretch of surveyed beach is situated 200 meters from the Biological Field Station. The boundaries of the site include the Tortuguero river mouth to the south, and Laguna number four (also known as Laguna Cuatro) to the north. This area has been neglected by the authorities, and therefore poaching is prevalent, as last years data indicates 57% of the nests found were raided by locals. In comparison, the adjacent beach on the south side of the river mouth contains thousands of green sea turtle nesting

activity due to years of protection, established since 1955 by a conservation organization called the Caribbean Conservation Corporation.

Surveys were conducted every other day (and every day sporadically throughout the three months) in the early mornings, which took roughly 2 to 8 hours to complete depending on the number of tracks sighted and whether I was working alone or with another research volunteer(s). A nonstop one-way walk takes 1 hour. Data on turtle activities was collected on a daily basis since tracks were dated either as one or two nights old (*please see table 1: Sample Daily Survey*). Surveys were not conducted during heavy rains or periods of lightning. A margin of error must be allocated given the fact that, data collecting is not an exact science but is based on conceptual judgments made on given circumstances, out in the field. Beach walk duties included:

- a) locating sea turtle tracks
- b) ensuring the tracks included two sets: one going up the beach and another returning back to the sea (otherwise it was classified as a lifted turtle)
- c) identifying the species of sea turtle (*Leatherback, Green or Hawksbill*) that made the tracks
- d) identifying how old the tracks were (either one or two nights old)
- e) noting down whether the turtle had laid eggs, or whether a nest was made
- f) identifying whether the eggs had been poached (i.e. foot prints, dog prints that accompany the poachers, poaching holes that are made with a stick to locate the egg cavity, a visibly apparent dug out nest, and egg shells left around the nest, all point to a disturbed nest that would have obviously been poached)
- g) gauging distance of the nest using the closest mile markers that align the beach (400 meters spaces each marker from the next)
- h) writing down any relevant observational data on unusual incidences
- i) completely wiping out the tracks so as not to recount them again on following surveys, once the data had been recorded

Dead turtle carcasses were measured, photographed, and reported to the national park guards who disposed of the remains and conducted an “inquiry”.

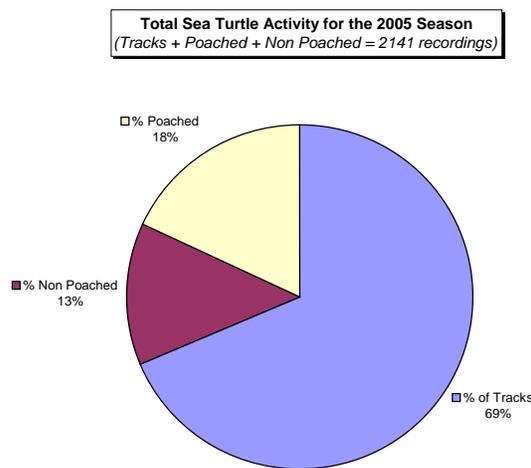
**Table 1: Sample of daily survey**

<b>Green Sea Turtle Study 2005</b>					
<b>Daily Observations for June</b>					
<b>Date (d/m/y)</b>	<b>Meters Miles</b>	<b>Tracks</b>	<b>Nests</b>	<b>Poached Nests</b>	<b>Notes</b>
01/06/2005	20 before 4/8		1		
05/06/2005	200 before 4/8			1	Predation by unknown animal. 8 eggshells around nest.
05/06/2005	0 before 1 2/8	1			
05/06/2005	0 before 2		1		
06/06/2005	100 before 2	1			
07/06/2005	50 after 6/8			1	ATV tracks made a turn intersecting turtle tracks.
07/06/2005	200 before 1 2/8			1	ATV going on nest up on vegetation.
07/06/2005	200 before 1 6/8		1		
07/06/2005	20 after 2	1			
07/06/2005	0 before 2 2/8	1			ATV tracks circled around tracks
09/06/2005					Went out but did not see anything.
10/06/2005	300 before 2/8			1	
10/06/2005	100 after 6/8				
11/06/2005	60 after 1 2/8	1			
13/06/2005	50 after 1 2/8	1			
13/06/2005	50 before 1 4/8	1			
13/06/2005	200 after 2 2/8	1			
14/06/2005	100 before 1 2/8			1	
14/06/2005	40 after 1 2/8			1	
16/06/2005	200 before 1 2/8	1			
16/06/2005	2 before 3	1			
17/06/2005	70 before 2	1			
17/06/2005	150 before 2 2/8		1		
17/06/2005	50 after 2 4/8	1			
18/06/2005	82 before 2 6/8			1	ATV tracks followed turtle tracks all the way up to nest in vegetation.
19/06/2005	50 before 1	1			
21/06/2005					Tide came all the way up the beach. Could not see any tracks
23/06/2005					Tide came all the way up the beach. Could not see any tracks.
25/06/2005	170 after 6/8			1	There are only one set of tracks going up on beach but not coming back to sea.
25/06/2005	195 after 6/8	1			
25/06/2005	2 before 1 4/8				Dead turtle freshly washed out from sea. Top of shell is cracked and insides/intestines have gushed out. About 1-2 weeks old (scales started peeling off)
25/06/2005	40 after 2 4/8			1	
27/06/2005	200 after 1 4/8			1	
27/06/2005	160 before 2 6/8			1	
	<b>Total:</b>	<b>14</b>	<b>4</b>	<b>11</b>	

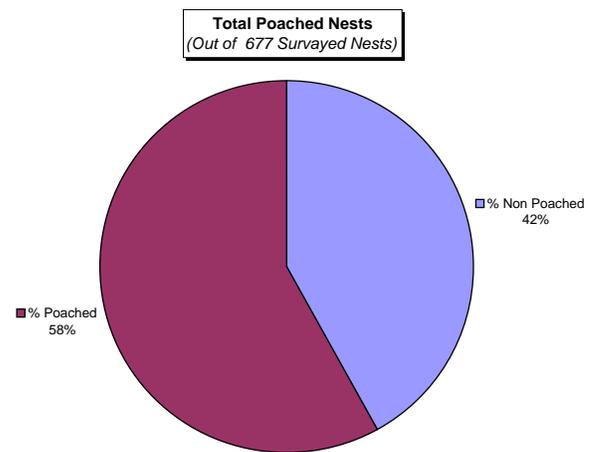
## **2.2 Results from the Green Sea Turtle 2005 Project**

The data collected during this season (June-August) shows that a total of 1464 tracks were recorded (*please see figure 4*). These tracks are the result of non-nesting turtles that had come up on the beach without laying any eggs. Interestingly enough, this marks the highest number of green sea turtle activity in Tortuguero since 1971 (in comparison, during the 3 months a total of 14 tracks were recorded in 2004). The total number of

nests recorded reached 677 nests. Of those 677 nests, 396 nests were raided or destroyed. Only a mere 281 remained intact and were not poached or predated by animals (*please see figure 2*). The problem is that a nest may seem intact on the day it is being surveyed, but, it is impossible to know its fate on successive days, and whether or not any hatchlings emerged. Indeed, poachers have only a small window of opportunity to raid the nest since the eggs become non-edible once the embryo starts to develop (after about a three day period), however, this does not ensure nest survival within the two month incubation period.



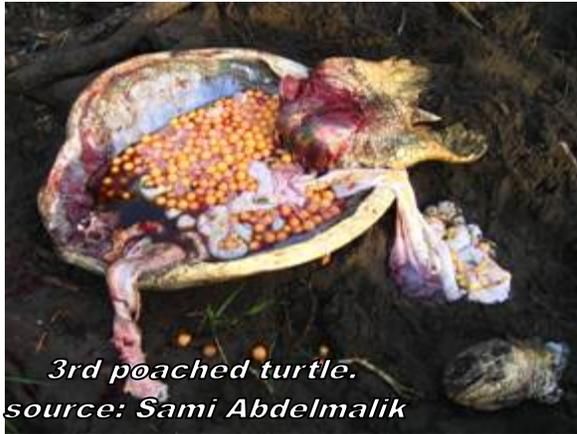
**Figure 2: Total activity**



**Figure 3: Total poached**

Green sea turtle activity increased dramatically within the three month nesting season that started only with 16 recorded tracks and reached up to 753 tracks in August. July suffered the highest poaching rate of 195 destroyed nests, with August closely following behind at 181 poached nests (*please see figure 4*). In total, 58 percent of all the nests recorded were poached (*Please see figure 3*).

Three dead green sea turtles were recorded in each of the three months (*please see figure 4*). The first dead turtle washed up on shore where it was examined along mile marker 1 4/8 on June 25th. It was determined to be a female with a fractured carapace, at the preliminary decomposition stage. All limbs were intact without any other noticeable abrasions/injuries. Cause of death could have possibly been of “natural” mortality. On July 28th, another dead female was recorded. The turtle was stabbed in the neck by poachers who fled the seen after a hotel (“Cabinas Vista al Mar” at mile marker 2/8)

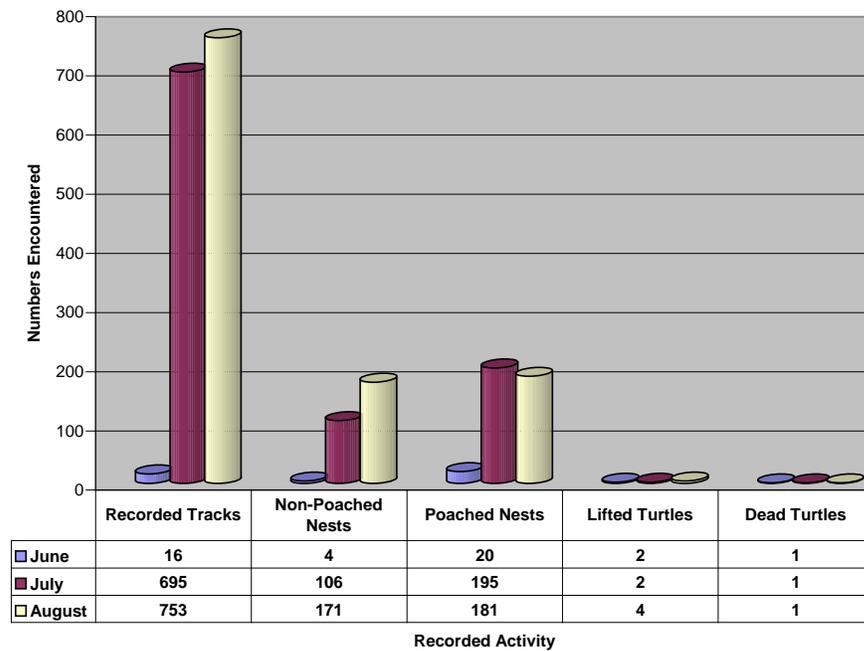


management staff confronted them. It was found dead just a couple of feet of its nest which was also raided. Length of Carapace was 1m, 8cm. Tortuguero park officials were notified. They buried the carcass and carried out an “inquiry”. On August 14th, another carcass was found having the worst visual slaughter imaginable. The turtle was beheaded, the

shell pried open, and forelimbs and organs were removed. The kill was made at about 5:30am, just minutes before it was found. Length of Carapace was 1m, 5cm. Tortuguero park officials were notified. They buried the carcass and carried out an “inquiry”.

A total of 8 lifted turtles were also recorded during the three months (*please see figure 4*). Tracks of these turtles were carefully examined and found to be only going up the beach and lacking the return tracks back to the sea. This means a poacher lifted or ran off with the entire turtle to a suitable butchering site.

**Green Sea Turtle Study 2005**



**Figure 4: Total results**

An attempt was made to graph the nesting pattern of green sea turtles with relation to the moon phases. It was hypothesized that the turtles follow the moon phase, either instinctually or on a preference bases (nesting on a full moon, or preferring not to due to its brightness). Although in comparison, there has been no apparent relationship between the two dynamics, and perhaps a continued study should look at their long-term distinctions.

Another comparison study was conducted to determine which part of the surveyed beech had the highest poaching rate. It was discovered that at the 0 2/8 mile mark, poaching levels reach their peek, which then gradually decline along the rest of the 3 miles. This is logical since the local town of San Francisco is just across on the south-side of the river mouth that marks the commencement point of the study. Therefore, it is the town locals who walk as far as they can to collect the eggs, and must then walk back, which limits distance traveled on the north beech.

There are other beachside properties along the 3 mile studied area, although the poaching impact is not as prominent as the one radiating from town. This includes, one high class hotel called “Turtle Beach Lodge” located at mile marker 2 4/8, and lodge type accommodations called “Cabinas Vista al Mar” located just before mile marker 2/8. There are also five beachside local-owned residences just after 2/8, at 1, just after 1 4/8, after 1 6/8, and past mile marker 3. In addition, there were four more local residences that settled in just this year.

### **2.3 Social Components of the Green Sea Turtle 2005 Project**

A very successful attempt was made to carryout outreach activities ether in a formal or non-formal manner. The first example being, the weekly environmental education classes in the town of San Francisco (by the manager and assistant station manager). This included information sharing about sea turtles, and even a fieldtrip to the CCC. One of the local hotels (“Pachira Lodge”) agreed to donate two boats in order to tack the students across the river to the CCC. Upon arrival, the students got to watch a video on the history of the CCC, and then received a talk about the research conducted. The research includes

tagging the turtles with id numbers in order to track their movement, counting how many eggs an individual turtle lays, noting hatchling success rate, conducting size measurements, and counting tracks to see how many are coming out in one season. The trip ended well with everyone receiving snacks, courtesy of the CCC. During the weekly environmental classes, the students also provided a valuable look inside the life of the community. For example, we were able to ask them how much turtle meat they eat, how many eggs they take, if they saw anything out of the ordinary that they wanted to report to us, etc. In addition, the students also represent a sample of the demographics (i.e. population size, family class, place of origin, etc.) of the community which could be analyzed to determine the circumstances of the locals.



One of the educational projects included the construction of signs. The aims of the project were to educate locals, create environmental awareness, and teach the students to take action and responsibility for their environment. The students were encouraged to take full participation and even helped come up with the slogans for the signs. Some of which included; turtles are endangered, the environment is everyone's responsibility, help keep our town clean, protect nature, don't kill animals, don't cut down the forest, and no littering (*please see figure 6*). The students also took part in deciding on where to place the signs and also got to



place their handprints on each sign (after the lettering was carved using a router and a base coat painted by the assistance of Sami A. totaling in 11 signs – *please see figure 5*). To actualize this project, a donation for the materials was first needed. A local agreed to

donate the wood, and Turtle Beach Lodge donated some of the paint after they were presented with a formal letter explaining the project and costs involved.



**Figure 5: Preparing the signs**



**Figure 6: Completed signs**

Another example of an outreach activity conducted was the ecotourism education program. Interpretative bilingual lectures were conducted at the field station in order to help explain the local ecosystem and relating conservation issues to visitors. Lectures took about 25 minutes and covered what the station is, types of projects conducted, who runs it, and who uses the facilities. In addition, the visitors were also given information about some artifacts (skeletons and preserved specimens) that are held in the onsite museum.

This also relates to sustainable tourism awareness. Turtle Beach Lodge was notified of their misconduct by allowing their guides to lead too many tourists on turtle night walks, and then allowing them to handle eggs and take numerous flash photos, which has the potential to greatly disturb and disorient the nesting turtles (even hearing a case of tourists riding a turtle). An attempt was made to educate the tourist guides by providing the hotel an outline of how to conduct tours with a minimal impact on nesting turtles (*please see following page*). This has yet to be translated and submitted to the hotel managers to display.

## Turtle Night Walk Procedure

### DOS FOR TURTLE WATCHING

- Do use red filters over flashlight

*Bright lights disorient the turtles and may prevent them from nesting*

- When tracks are spotted, **only the guide** should follow them up the beach and see what phase turtle is in

*If turtle has not yet made the nest or layed the eggs the guide must be very careful not to scare her away and should ask the tourists to wait at a distance until the turtle starts laying.*

- When turtle is in the egg laying phase she can be observed by the tourists in **small groups only** (2 plus the guide) so she won't get startled.
- Do keep a respectful distance from the turtle **at all times** so that she does not get disturbed or disoriented
- Do restrict your movement and keep voices low so as not to startle the turtle
- Do understand that this is an endangered species and your cooperation is greatly appreciated
- Do enjoy the fact that you are watching an amazing feat of nature!

### DON'TS FOR TURTLE WATCHING

- No touching turtles

*Turtles are wild animals and should be treated as such*

- No handling eggs

*Eggs are porous and are susceptible to the transfer of bacteria*

- No wiping out tracks, covering nests or making them look "poached"

*This interferes with research and results conducted by Estacion Biologica Caño Palma on the nesting population of sea turtles in the area*

- No flash photography, or light from video equipment on the beach

*Bright lights disorient the turtle and may prevent them from nesting*

**Thank you** for helping us protect the *endangered* Sea Turtles.

Non-formal forms of education included beachside conversations with the locals. I got to meet and talk to most of the residences within the study area. Most of the time, they were the ones who approached me, as they always saw me walk the beach. They asked curious questions as to what I was doing and provided me with local knowledge about the poaching issue. With every conversation, I tried to educate individuals about conservation, and in that way, they are able to make better informed choices, and perhaps educate others. In fact, one resident even went as far as putting up scarecrows on the beach to detour poachers. It actually worked for a few weeks since poachers only come out at night, which made the scarecrows seem like suspicious shadows in the darkness.

Another form of non-formal education included volunteer training. There were a few new arrivals at the field station, and with every wave, I was there to give my support and share my knowledge.

Public education was also conducted on Costa Rica's National Parks day on August 26<sup>th</sup>, held in the town of Tortuguero. This was a huge event relating to conservation. Representatives from each park in Costa Rica were invited. It was also the 30<sup>th</sup> anniversary of the National Park of Tortuguero. The station (represented by the station manager Mario, the station assistant Janna, and I) held a kiosk with information about the projects and research conducted. The station (with the help of all the volunteers) also participated in building an interpretive flout and showed it in the parade.

### **3. RECOMMENDATIONS**

The following recommendations should be considered in order to better future sea turtle research projects:

- I. Creating a concrete protocol (considering the marking of nests so that they are not recounted while at the same time not attracting poachers to them) that allows for seasonal revisions by all stakeholders.
- II. Building a comprehensive education program and materials, for the short-term researchers/volunteers, on how to collect field data to improve accuracy of data collected (i.e. how to id tracks, nests, poached nests, attempted nests, etc.).

- III. Close monitoring of the impacts from the nightly turtle tours conducted by the two hotels (Turtle Beach Lodge, & Cabinas Vista al Mar)
- IV. Monitoring of beachside lighting that may disturb and disorient nesting turtles or hatchlings
- V. The beach is lettered with medical hazardous waste. The local hospital/clinics should be educated on proper disposal.
- VI. Conducting comprehensive weekly environmental classes, at the elementary school, using teacher's guides and other professional recourses.
- VII. Extending the elementary environmental education classes to include seasonal/annual lectures at the local high school level (i.e. giving at least 1 or 2 lectures per year).
- VIII. Integrating a monitoring program (i.e. patrolling the beach) for at least the first mile of the three mile beach during the peak of the nesting season (either by volunteers or park officials)
- IX. Giving a workshop on proper sea turtle conduct (i.e. dos and don'ts) to tour guides, from the two hotels (Turtle Beach Lodge, & Cabinas Vista al Mar), that carry out nightly turtle tours.
- X. A research program must be initiated to investigate alternatives to poaching and address the social issues of the impoverished local community.
- XI. A **sustainable** social program should be established in order to reach out to the local community (ex. networking with humanitarian organizations).
- XII. Considering using multiple alternatives to combat poaching simultaneously (patrolling/relocating nests/building a hatchery/extensive education within the community/creating social programs for impoverished locals, etc.). Using the many alternatives but each at a smaller scale.
- XIII. Strong contact, networking, and information sharing must be practiced on a regular bases with other Caribbean sea turtle conservation organizations (ex. "Save the Sea Turtles of Parismina" organization).
- XIV. Volunteers/interns/researchers should be given adequate accessibility and involvement over projects conducted at the station, so as not to "wear out" the two station managers.

### **3.1 Discussion**

Can we save the turtles before we save the people? It is crucial to link the issue with the problem. The local people need to be helped in order to help the turtles. The real problem is defiantly the current circumstances of the local people. Put simply, they are poor. One alternative means of assistance is by creating income or jobs. This can be done indirectly through the process of education or directly by developing sustainable projects that would generate income (i.e. through ecotourism). Facilities can be established and locals can work as guides, venders of hand crafts, maintenance workers, and as other staff members. Another problem of poverty is hunger. Hunger could be alleviated in a sustainable way by giving people tools and skills needed to feed themselves. One such idea could be to establish vegetable gardens in every household (or having a communal garden). All that is needed is seeds, tools, and agricultural supplies which can be easily obtained through donations. A workshop would also be set up in order to educate participants on proper farming care and techniques. This would directly put food on the table, and any surplus produce can be sold. One initial step to start such an idea is to establish a small garden or greenhouse at the local elementary school. The students can be taught all about growing produce and about the local medicinal plants. As the nursery grows, students would be allowed to take some of the plants home, to grow and encourage parental education. I understand that this is not an easy task to accomplish, and that it is a lot easier for foreigners to come in with wishful thinking. But by being sensitive to the local people, being understandable and respectful of their traditions, one could slowly start a working relationship that will help out the people while at the same time sustaining the endangered sea turtle population. It is pivotal to start establishing something now and have it progress into the coming years, especially since extinction could be the face of the near future.

## **CONCLUSION**

Fossil records date sea turtles back to the late Jurassic period, around 140 million years ago, and yet today, all species of sea turtles have been categorized as threatened or endangered. Sadly, in this short three-month experience, I have witnessed the full lifecycle of this endangered animal, from death to birth. My work infused me with my subject, and the dismal life of this creature unfolded right before my eyes. Never in my lifetime have I perversely been intimately intertwined in such a sequence of events, not even within my own species. I cannot predict the future, but the choice between life or death of a companion species is within our grasp, and I can only hope for a change in the future where alternatives are in place and the need to wipeout one species for the survival of another is diminished.

## BIBLIOGRAPHY

"Conservation." Ero Turtle. 2001. 7 Sept. 2005  
<[http://tofino.ex.ac.uk/euroturtle/con\\_welcome.htm](http://tofino.ex.ac.uk/euroturtle/con_welcome.htm)>.

"Marine turtles: Introduction." WWF Global Species Programme. 21 Apr. 2005. 7 Sept. 2005  
<[http://www.panda.org/about\\_wwf/what\\_we\\_do/species/showspecies.cfm?SID=31&LID=1&FH=E](http://www.panda.org/about_wwf/what_we_do/species/showspecies.cfm?SID=31&LID=1&FH=E)>.

"Marine Turtles." NOAA Fisheries. 7 Sept. 2005  
<<http://www.nmfs.noaa.gov/pr/species/turtles/>>.

Spotila, James R. Sea Turtles: A Complete Guide to their Biology, Behavior, and Conservation. The Johns Hopkins UP, 2004.

"Species Fact Sheet." Fisheries Global Information System. 2000. FAO. 7 Sept. 2005  
<[http://www.fao.org/figis/servlet/species?sname=Chelonia%20mydas&sname\\_op=is](http://www.fao.org/figis/servlet/species?sname=Chelonia%20mydas&sname_op=is)>.

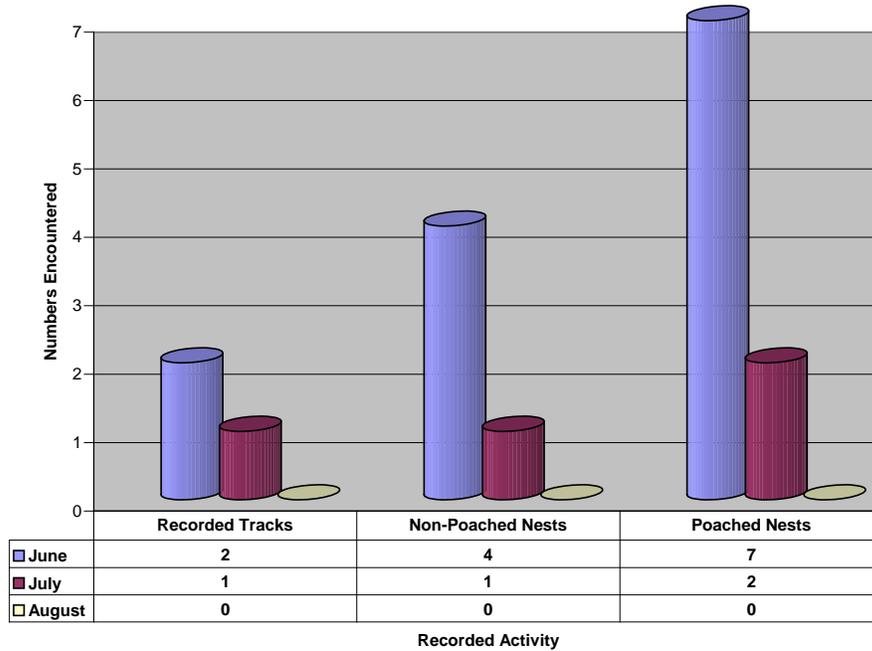
"Sea Turtle Information." The Caribbean Conservation Corporation. 2003. 7 Sept. 2005  
<<http://www.cccturtle.org/>>.

"Tortuguero Map." 7 Sept. 2005 <<http://casamarbella.tripod.com/id6.html>>.

## APPENDIX

### Leatherback sea turtle (*Dermochelys coriacea*)

Leatherback Sea Turtle Survey 2005



### Hawksbill sea turtle (*Eretmochelys imbricata*)

Hawksbill Sea Turtle Survey 2005

