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Marine Turtle Monitoring Program- Nighttime Protocol Playa Norte, Tortuguero

1. INTRODUCTION

Tortuguero has a long history with marine turtles. Archie Carr began his studies of green turtles (*Chelonia mydas*) in Tortuguero in 1954 and since 1958 the Caribbean Conservation Corporation (CCC) has continued work on green turtles. Although Tortuguero and the Tortuguero National Park (TNP) are most well known for its population of green turtles, it does have a population of leatherback turtles, hawksbill turtles (*Eretmochelys imbricata*) and the occasional loggerhead turtle (*Caretta caretta*). In 1995 the CCC began its work on leatherbacks.

Located about 7km north of Tortuguero inside the Barra del Colorado Wildlife Refuge is the *Estacion Biologica Caño Palma* (EBCP), owned by the Canadian Organization for Tropical Education and Rainforest Conservation (COTERC). Since its creation in 1990 COTERC has been interested in developing a marine turtle monitoring programme on Playa Norte which is located on the north side of Laguna Tortuguero.

In 2004 and 2005 COTERC undertook a feasibility assessment in order to establish the significance of the population of marine turtles nesting on Playa Norte and establish whether this number warranted a project and significant protection. After this period it was deemed a viable option to initiate a long-term marine turtle monitoring programme with the assistance of Global Vision International (GVI).

Management of both the reserve and national park are becoming increasingly important in relation to tourism management. The numbers of tourists visiting the national park has increased from 49,281 in 2000 to 103,121 in 2005. Between 1988 and 2002, tourist numbers visiting the park grew at an annual average rate of 16 percent (Tortuguero Conservation Area data published by Tröeng 2004). This increase in visitors to the national park has a trickle down effect to the reserve and Playa Norte. Development along Playa Norte has been steady over the past few years with the development of two hotels and several homes. This number is likely to increase and hence may have a long term impact on the marine turtles nesting on the beach.

It is hoped that with a greater understanding of the dynamics of Playa Norte and its associated marine turtle population that this project can help contribute to an informed approach to the management of Playa Norte, the reserve and the area of Tortuguero.



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2. PROJECT AIMS

The overall aims of this programme are to be a leader in the long-term conservation of marine turtles in the area of Playa Norte and to ethically gather valuable scientific data on the nesting marine turtles.

The project's specific conservation aims are to 1) reduce poaching rates and 2) educate the community and tourists about marine turtle conservation, including appropriate behaviour on a beach.

The project's specific scientific aims are to 1) gather selected biometric data on nesting marine turtles, 2) record the spatial and seasonal distribution of nesting females, 3) monitor the number of nests and half moons, 4) determine the level of illegal poaching on turtles and their nests, 5) record hatchling emergence and hatching success rates, 6) monitor for the apparent physical health of nesting females, 7) track re-emergences to the nesting beach and or migration between beaches, and 8) register tourist and human development around the nesting site.

3. METHODOLOGY

3.1. Study site

The study area is located within Playa Norte and encompasses the 3 1/8 mile (~5 km) long sandy beach that extends from the Tortuguero River mouth (10°36'36.9"N - 83°31'52.1"W) on the southern end to Laguna Cuatro (10°37'56.3"N - 83°32'25.7"W) at the northern end. This beach is located within the Barra del Colorado Wildlife Refuge, which like TNP, is managed by ACTo (Area de Conservación Tortuguero), part of the Costa Rica Ministry of Environment and Energy (MINAE).

The study area is marked as mile 0 at the Tortuguero River mouth and mile 3 1/8 just north of Laguna Cuatro. The length of the beach is divided and marked with mile-markers at every 1/8 of a mile (approximately 200 meters). The mile-markers run in ascending order from the south to the north to allow for the documentation of spatial distribution and density of nests along the beach. A map of the study site is located in appendix A, map 1.

The nearest village to the study site is San Francisco, a constantly growing community of about 274 residents (van Oudenhoven, 2007), situated south of mile 0. Two hotels, Cabinas Vista al Mar and Turtle Beach Lodge, and several houses are located along the study beach. There is a road that runs parallel to the beach the entire length of the study site which is used by those on foot, bike, horseback, and car. On the southern side of the Tortuguero River mouth is Tortuguero beach, which the CCC monitors from mile 0 to Jalova lagoon at mile 18.

The dominant plants on the nesting beach are morning glory (*Ipomoea pes-caprae*), re-a-purslane (*Sesuvium portulacastrum*) and rush grass (*Sporobolus virginicus*). The berm is bordered by a hedgerow of cocoplum



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(*Chrysobalanus icaco*) and sea grapes (*Coccoloba uvifera*) with a mixture of coconut palms (*Cocos nucifera*) and various tropical hardwoods behind. The beach is littered with a variety of debris including logs, coconut husks and a large amount of plastics, bottles, and garbage in general.

3.2. Equipment needed

The following equipment should be taken on all night patrols:

- Notebook and pencils
- Head torch with red light
- 300 cm measuring tape
- Appropriate taggers and tags (Monel for leatherbacks and Iconel for all others)
- Tag remover, Vanodine¹ solution, gauze, and cotton balls
- Gloves and maria (counting device for eggs)
- 50 m tape measure, prepared flagging tape, extra flagging tape, permanent marker
- GPS with extra batteries
- Relocation bag and black garbage bag
- Compass
- Small aluminum tags

3.3. Equipment maintenance

Each night when returning back to base all equipment must be cleaned and dried in order to keep it in good condition throughout the season. Anything that may rust easily (taggers, tag removers) must be taken out of its bag. When necessary the taggers, tag removers, maria, and 300 cm tape should be wiped down and dried. Also, the 50 m tape measure should be unwound, rinsed off, dried, and wound back up. All sand should be cleaned from all bags and the data book. Any damage to any equipment should be reported and dealt with immediately.

3.4. General Information

3.4.1. Data collection

All data should be recorded neatly, carefully and completely. The data book should be reviewed before the patrol team starts the patrol in order to ensure that it is prepared. It should again be reviewed after a track or turtle is encountered to ensure that all data is recorded properly and completely.

It should be reviewed a final time when entering the data into the computer.



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Each track will receive the appropriate 'Record Type'

- HLF= all half-moons (even if the turtle was encountered with tags)
- NST= a nest in which the turtle either was not seen or the turtle was seen but did not have tags
- REC= a nest in which the turtle was newly tagged by the patrol team
- REM= a nest in which the turtle was previously tagged
- REN= a nest in which the turtle was a re-nesting turtle on Playa Norte this season
- LFT= a lifted turtle
- DEC= a deceased turtle

At the beginning of each survey the following information should be recorded:

- Date (DD/MM/YY)
- Survey start time (using 24 hour clock)
- Initials of team members

At the end of each survey the following information should be recorded:

- Survey end time
- Miles walked

3.4.2. Walking at night

Each night during turtle season a patrol will consist of a Patrol Leader (PL) and volunteers. Night patrols should be a minimum of four hours. Patrols may be shortened or cancelled for health and safety reasons such as inclement weather conditions or other unforeseeable situations. Patrols should consist of three to five people (with the exception of groups that may be visiting the station). Whenever possible two or three patrol teams should be on the beach each night in order to encounter more turtles and to keep a greater presence on the beach. This is especially important for the critically endangered species of hawksbill and leatherback turtles as each nest is of high importance.

Although times may vary but if there is one team the patrol should be from about 22:00 to 2:00. During leatherback season if there are two patrols on the beach the teams should walk in a way that they cover as much of the beach as possible.

During patrols the team should walk together and the volunteers should never walk ahead of the PL. It is important to use as little light as possible so as not to disturb or deter turtles or to attract unwanted attention (from poachers or tourists) and when lights are needed only dark red lights are permitted. Patrols will walk quietly under the high tide in order to prevent disrupting a nesting turtle or walking in front of an emerging turtle. Whilst walking along the beach



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be aware of dunes/berms where old nests could be and ensure you do not walk over them, this is especially important when walking close to the vegetation. Walking on top of nests could compact the sand and harm the nest.

If a turtle track is encountered, the PL should determine if a turtle is still on the beach. To do this the ascending track should be followed quietly and without light by the PL until either a turtle is encountered or the returning track has been observed. The rest of the patrol team waits quietly for instructions.

3.5. Data Collection with turtle absent

If a track is only ascending with no turtle present, it is assumed to be a lifted turtle. If a track is ascending and descending it must be determined if it is a nest or half moon. If there are no signs of nesting or if the body pit is very shallow with very little sand spray it is deemed a half moon. If there is a deeper body pit and plenty of sand spray it is deemed a nest. When in doubt, record as a half moon and inform morning census team that further investigation is necessary. Also note that there was an attempted body pit.

3.5.1. Nest

In the case of a nest collect the following information:

- Record type
- Species of turtle
- Time track was seen
- GPS coordinate and closest northern mile marker with the GPS
- Vertical position of the nest. It is marked Vegetation (V) if it is located in the vegetation and therefore receives almost no direct sunlight, Border (B) if it is shaded at some time of the day, or Open (O) if it receives almost no shade throughout the day.
- Evidence of poaching such as small holes pierced in the sand, human or animal tracks, large hole dug in sand, egg shells around nest from recently eaten eggs, the presence of flies or sand patted down indicating a covering of a raided nest.
- Record nest as poached if there is a large hole (where the eggs presumable were) or if there are fresh egg shells outside the nest, predated if it was predated by dogs, coati, or other animals, eroded if it has been eroded by the sea, otherwise record it as natural. It may be recorded as unknown if there is high suspicion of poaching but no concrete evidence. For example, a nest would be marked as unknown if there were stick holes, flies, human prints, dog prints, and the sand looked disturbed.



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3.5.2. *Half moon*

In the case of a half moon record the following information:

- Record type
- Species of turtle
- Time track was seen
- GPS coordinate and closest northern mile marker with the GPS
- Presence of an attempted body pit

3.5.3. *Lifted turtle*

In the case of a lifted turtle record as much information as possible including:

- Record type
- Species of turtle
- Time track was seen
- Whether the turtle has nested or not
- GPS and northern mile marker with the GPS
- Vertical position (if it has nested)
- Comments

Caution should always be taken when approaching an area where a turtle is assumed to have been lifted as poachers may still be nearby. Once it is determined it is a lifted turtle, never go searching in the vegetation for the turtle or the poachers, the morning census team should investigate fully in the morning.

3.6. Data Collection with turtle present

3.6.1. *Data recorded*

This is a list of all data needed in the notebook. The following sections are a guide as to how to collect this data.

- Record type
- Species of turtle
- Encounter time (every time a turtle is encountered)
- Stage when encountered (every time a turtle is encountered)
- Number of fertile and non-fertile eggs and the initials of the egg counter
- CCL and CCW (three measurements for each) and the initials of the person measuring
- Tag numbers and initials of the tagger



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- Presence of OTN's (Old Tag Holes) and OTH's (Old Tag Holes)
- Abnormalities
- Vertical position
- Direction facing during nesting
- GPS and closest northern mile marker with the GPS
- Triangulation measurements (North, Centre, South, High Tide) and initials of those triangulating
- Nest number
- Computer ID number (written in book when entering data into computer)

3.6.2. *Encountering the turtle*

Once it is determined that a turtle is still on the beach the PL should quietly approach the turtle from behind to observe what type of turtle it is and in what stage of the nesting process the turtle is in. Caution should be taken not to break branches because turtles, especially hawksbills, are sensitive to vibrations. The phases are the following: 1. Emerging from the sea, 2. Selecting nest site, 3. Digging body pit, 4. Digging egg chamber, 5. Oviposition, 6. Covering egg chamber, 7. Disguising nest, 8. Returning to the sea.

When establishing in what stage of the nesting process a turtle is (e.g. to determine how much time will pass before the turtle will go into oviposition), it is useful to know the approximate time needed by turtle species to complete each nesting phase (Table 3-1).

Stage	Leatherback	Green
Emerging from the sea	-	-
Selecting nest site	-	-
Digging body pit	12	23
Digging egg chamber	20	23
Oviposition	11	15
Covering egg chamber	10	12
Disguising nest	28	43
Returning to the sea	-	-

Table 3-1 Approximate time in minutes for each stage of the turtle nesting process.

Hawksbills and loggerheads need a shorter time to complete the nesting process, approximately 45 minutes and 55 minutes, respectively.



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It may be very difficult to determine whether a turtle (especially a green turtle) is digging its body pit and preparing to make the egg chamber, or disguising the nest. There are several factors to keep in mind however none of them conclusive.

While digging its body pit the turtle may still be wet and there will not be much sand spray. Its front flippers are seldom used and the back flippers move simultaneously, as if sweeping the sand. While disguising its nest the turtle is usually dry and the carapace (and often the head) is covered with sand. The front flippers are used actively and the back flippers alternate. These two phases can look extremely similar so when in doubt, WAIT.

Once it is determined what phase the turtle is in record the species of turtle, the time the turtle was encountered, and what phase she was in when found.

If the turtle is found in any of the phases before digging the egg chamber all team members should wait a good distance from the turtle so as not to disturb her. Once the turtle has selected the nest site, hollowed out the body pit and begun digging the egg chamber it is then safe for the patrol leader and the person counting the eggs to approach the turtle from behind. At this moment all equipment should be prepared. Anyone who may be in contact with the turtle at any time should wear gloves. It should be noted that no work should be done on the turtle before she begins to deposit eggs.

3.6.3. *Counting the eggs*

While the turtle is digging the egg chamber one person should be behind her helping to make the chamber larger for the purpose of counting eggs by sight and touch. It is important that no sand (especially dry sand) falls into the egg chamber (this may cause the turtle to abandon her nest or could harm the eggs) and it may be necessary to hold one hand in between the nest and the sand that is being dug out. Also, any organic matter in the egg chamber should be removed while the turtle is digging as long as it will not cause the nest to collapse. When the turtle begins to deposit eggs it is essential that the person counting wear gloves and has the maria. One hand should be placed well under the cloaca to feel the eggs as they are falling while the other hand holds the maria. The cloaca should not be touched at any point as this may cause the turtle to abandon her nest. If it is not possible to put a hand under the turtle then the eggs should be counted by sight using a red light if necessary. When possible both may be done in order to get an accurate count.

Leatherbacks and occasionally other species lay not only fertile but also non-fertile (yolkless) eggs. The fertile eggs should be counted with the counter and the yolkless should be remembered. When the turtle finishes and begins to



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move her back flippers the egg counter should measure the distance from the top of the eggs to the top of the sand. An aluminum tag with the nest number written on it should be placed directly above the nest after a few centimetres of sand have covered the eggs.

When completed the number of fertile and non-fertile eggs, the person who counted them, and the direction the turtle was facing while laying should be recorded.

Note: Only counting of the eggs and triangulation should be done during the egg laying process.

3.6.4. Triangulation

When possible, triangulation will be done for all turtles encountered before or during oviposition. Flagging tape is attached to the vegetation at three points (North, Center, and South). Written on the tape should be the nest number, N, C or S, and the station name. It is important that the nest number and location, for example 12N, be written multiple times and on the ends of the tape. The distance from the nest to each point is measured and recorded as well as the distance from the nest to the high tide line. It is important that the tape measure is held tight and that the measurements are accurate. The measurement should be taken from where the flagging tape is tied, which should be the closest point to the sea. The tape should be wrapped around the marker so that no tape is left flying in the wind. This often attracts people to them and may cause them to be torn down. Only markers that will presumably be there in two months should be used. It should be noted that wider angles are usually better. A picture of the triangulation is drawn in the notebook and any relevant comments written that may assist the excavation team in finding the nest.

3.6.5. Tagging the turtle

After the turtle has finished laying her eggs, her flippers should be checked for tags, first the right then the left. If she already has tags then the tag numbers should be read three times and recorded. Be sure to read the front and back of the tags and record if the tags are from an uncommon place. A turtle will only be tagged if she does not already have tags and the PL is sure that she has completed the egg laying process. If the turtle is seen laying her eggs, she should be tagged while the egg chamber is being covered. At this time the turtle is still very calm and will be easier to tag. If the turtle is encountered after oviposition it is up to the PL's discretion whether or not to tag.

Leatherback turtles will be tagged on the membrane located between the tail and rear flippers, where the skin feels thinner. Green, loggerhead and hawksbill turtles are tagged in the front flippers before the primary scale, right next to the scale's border allowing some space for flipper growth. Before applying the tag (and if it already has a tag), it is important to search for and record marks of previous tagging called Old Tag Hole (OTH) or an Old Tag Notch (OTN).



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Apply Vanodine to the skin before tagging. If an OTH or OTN is found then the turtle should be tagged on the first scale for greens, loggerheads, and hawksbills. For leatherbacks, if the hole or notch is closer to the tail, then tag closer to the flipper and vice versa, but always feeling the thickness of the skin.

All tags should be positioned with appropriate distance to the border of the flipper and the edge of the tag. The closed edge of the tag should be between 1 and 1.5 cm away from the edge of the flipper, this is done in order to prevent friction and reduce the possibility of objects becoming tangled on the tag. The right flipper should always be tagged first with the lowest number tag. The left flipper is then tagged with the next consecutive number. However, a tag should never be removed just to ensure the tags are consecutive.

In the case of green, loggerhead, and hawksbill tags it is important to verify that the tag is completely closed by feeling the tag's point on the underside of the flipper. Leatherback tags need to be examined closely because the point does not pierce through the other side when completely closed. Once tagging is complete all tag numbers will be read three times and recorded. The name of the tagger should also be recorded.

3.6.6. *Removing a tag*

If a tag has been placed in an area with trauma or infection or where the skin has grown over the tag, it should be removed if possible and a new one applied. The area of trauma should be treated with Vanodine solution. However, if removing the tag would cause more damage to the turtle then it should be left in the flipper and only cleaned with Vanodine.

If a new tag is applied and is somehow non-functional it is deemed 'Destroyed'. A tag will be recorded as 'Destroyed and Recovered' when the tag is returned to the station or as 'Destroyed and Lost' when the tag is misplaced on the beach. For example, a tag that is applied but does not close properly, removed and returned to the station would be 'Destroyed and Recovered'. If a turtle is already tagged but a tag needs to be removed it is deemed 'Removed'. A tag will be recorded as 'Removed and Recovered' when the tag is returned to the station or as 'Removed and Lost' when the tag is misplaced on the beach.

The turtle should only have ONE set of tags of the same type because different metals may create an electronic current when in the water, thus hindering the turtle. If a green, loggerhead, or hawksbill turtle is found with one Monel tag it should be removed and replaced with two Iconel tags.



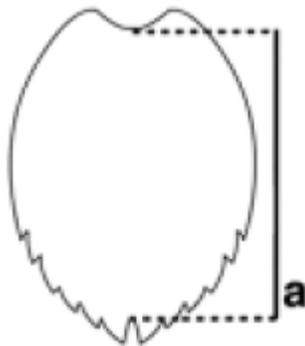
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3.6.7. *Measuring the carapace*

After the turtle has finished laying her eggs and the tagging is completed the length and width of the carapace can be measured. It is very important to clean any sand off the carapace before you begin to take the measurements.

Minimum Curved Carapace Length: Two people will be needed for measuring the CCL of leatherbacks and possibly only one for the other species. For leatherbacks, the metric tape (300 cm) is placed at the beginning of the carapace



where the skin touches the carapace, extending along the right side of the central dorsal ridge, until the tip of the caudal projection. For green, hawksbill and loggerhead turtles, measurements should be taken along the centre of the carapace. The tape measure should extend from where the skin of the neck touches the carapace to the end of the carapace (to the dip in the carapace and not until the outer ridge) See Figure 3-1 for an illustration of this. When reading the measurement be sure to measure only until the edge of the carapace and do not measure underneath the carapace. If there is any part of the carapace missing it should be measured as is and noted that a piece is missing.

Figure 3-1 Measuring CCLmin for green, loggerhead, and hawksbill turtles.

Maximum Curved Carapace Width: This measurement is taken along the widest area of the carapace and needs to be perpendicular to the central ridge for leatherbacks and to the central scutes for the remaining species.

The carapace measurements are to be done three times. If there is a disparity between the data of more than 3 mm, the team must conduct as many more measurements as needed until the measurements fall within these parameters.

3.6.8. *Checking for abnormalities*

After completing all other tasks a turtle should be checked for any abnormalities. Any that are observed should always be noted in the field notebook using the body map of the turtle and numbers (Figure 3-2). If it is located on a scute name it, like 2nd left marginal, 3rd right lateral scute.

Any instances of Fibropapilomas, parasites like leeches or epibionts like barnacles will also be recorded. It is important to check the turtle's neck for leeches. If leeches are found Vanodine should be applied and the leeches should come off easily. Do not touch fibropapilomas.



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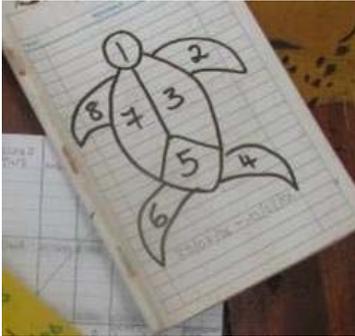


Figure 3-2 Body Map

If barnacles are on the tag they need to be removed. If the barnacles are preventing the turtle from seeing or moving freely, they can be removed only by a qualified person and if adequate training has been provided.

If the turtle has any open wound, clean it with Vanodine and gauze, not cotton wool. If nylon is seen coming out of the cloaca or mouth, it should not be removed. Remove fishing hooks only if you have the proper training, they are superficial, and the procedure can be done without causing more harm to the turtle.

3.6.9. *Stopping a turtle*

If a turtle is encountered when returning to the sea, she may be stopped by covering her eyes and pushing her head down very softly to read tag numbers. This should be done in a calm and efficient manner so as not to stress the turtle. Stopping a turtle is not mandatory and is at the PL's discretion. Stopping a turtle should never be done in order to measure the carapace or tag the turtle.

3.6.10. *Egg relocation*

At the current conservation status, egg relocation should only be done for leatherback and hawksbill nests and according to specific guidelines. Although listed below are possible reasons to relocate the PL's should take direction from the programme manager for further specifics. However, the ultimate decision in the field is left to the good judgment of the PL who will be in charge of this process. A nest will be considered for relocation if:

- It is at high risk of being poached because either poachers are in the area or because it is directly in front of a poacher's house.
- It is at high risk of erosion or flooding due to its position at the edge of a sand bank or at a river mouth or below the high tide line. Any nest in front of Laguna Cuatro should be relocated when possible.
- It is close to artificial lights, which may cause hatchling disorientation.

While the turtle is digging the egg chamber, dig out behind the turtle to make the egg chamber bigger. Enough sand will need to be dug out to provide enough space for placing and removing the plastic bag once the eggs are deposited without the risk of touching the cloaca or the risk of being unable to retrieve the bag once it is full. Prevent sand from falling into the nest since this may cause the turtle, especially hawksbills, to abandon her nest. Measure the depth of the egg chamber with a stick just as she is finishing digging the egg chamber or just before she starts



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covering the egg chamber.

Once she stops digging, place the plastic bag in the nest under the cloaca. You only have a few seconds to do this. Be sure to remember, do NOT touch the cloaca at any time. After the eggs have been laid remove the bag IMMEDIATELY before the turtle starts covering the egg chamber. If for whatever reason you are unable to retrieve the bag, DO NOT PANIC. Do not force it since you may damage the eggs or rip the plastic. Take the measuring tape and drop one end inside the nest. Once the turtle is ready to return to the ocean, you can find the nest by following the measuring tape and calmly retrieve the plastic bag enabling you to proceed with the relocation.

Once the plastic bag is out, be sure to carefully place it on an area where you have swept the dry sand since the bag or the eggs should never be in contact with dry sand. The bag should be kept closed at all times to prevent heat loss and to prevent insects from entering. The bag can be placed a couple of meters away while the turtle is worked. If possible, continue with the relocation while the rest of the team finishes the work on the turtle. Before you leave the turtle, measure the widest part of a back flipper to determine the width of the nest that will be dug.

Carry the bag carefully, holding it with one hand away from your body, trying to move the bag as little as possible without touching anything along the way. Do not carry it on your back or hold it in between your arms. Move the eggs to the nearest safe place to create a new nest. The nest site should be chosen based on where the turtle nested and where the nest will be most successful. The implications of temperature dependent sex ratios of sea turtles induced by consistently high or low temperatures in the nest chamber must be taken into consideration. A new nest should be dug mimicking the original as much as possible. Leatherback nests, in general, should be placed in the open while hawksbill nests should be placed in the border. Ideally, one person on the team will do the relocating without a light so as not to draw attention to the new nest site. A new nest should be dug mimicking the original as much as possible. All dry sand should be moved away from the nest and the bag placed on wet sand during the digging process.

The nest should be the width of the back flipper and the depth of the original nest (usually about 75 cm for leatherbacks and 40 for hawksbills). For leatherbacks, the egg chamber should be made into the shape of a boot with the 'boot' facing the same direction that the turtle faced while laying. The egg chambers of hawksbills have a cylinder and then a balloon shape at the bottom to contain the eggs.

Dry sand should be removed from the area where the nest will be dug and placed into the black bin bag. Once digging the egg chamber all of the wet sand should be placed on top of the bag. This is done in order to prevent more disturbance of the area. If the sand collapses or logs, trash or any debris that can't be removed are found while digging the nest, it must be abandoned and a new one must be dug. The eggs should be placed very carefully two at a time into the new nest. They should be placed into the cavity in the same order in which they were laid being sure



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to place yolkless eggs at the top of the nest. At the end, pour the remaining substance (a slippery liquid) into the nest making sure flies and other insects do not enter the egg chamber.

Ideally, the eggs should all fit in the 'boot' with only one layer coming up in the cylinder. Once complete, wet sand from on top of the bin bag needs to be placed on top of the eggs just a handful at a time, again trying to mimic what the turtle had done originally. Dry sand from within the bin bag needs to be placed over the nest at the end. Triangulate the new nest's position in order to check the outcome of the relocation. Disguise the nest and your footprints as much as possible so as not to draw attention to the area.

Remember that it is recommended to move nests only within the first eight hours after they have been laid or past 25 days of incubation. Movement at any other time can kill the embryos, so it should only be a last resort. The relocation procedure needs to be taught in the field by somebody with experience in relocations and practiced before actually handling turtle eggs.

3.6.11. *Deterring a nesting turtle*

In the event that a nest is below the high tide line and relocation is not possible (either because it is a green or loggerhead or for other reasons) the PL may make the decision to deter the turtle from nesting. This is done in the hopes that the turtle will find a better place to nest where the eggs will have a better chance of survival. To deter the turtle the PL will fill in the egg chamber with wet sand. This should be done in a way to mimic a nest collapsing. This may be done multiple times until she abandons the nest site.

3.7. *Covering and/or marking nests*

For all leatherback, hawksbill, and loggerhead nests observed at night (including the relocated nests) or during the day, the tracks should be rubbed out as much as possible trying to disguise the nest location. Spray dry sand around the nest, erase the tracks with your feet and then use a palm or a stick to erase the remaining signs. The aim of disguising the nest is to prevent them from being found by poachers. It is vital that extremely good field notes are taken to assist the morning census team in establishing whether the nest has been poached. For green turtles a symbol will be drawn through both the ascending and descending tracks. The night team must leave a note as to what symbol was used for that night. The symbols should change nightly to prevent others (tourists, poachers, etc) from knowing how to mark the tracks. The morning team will rub out the entire tracks of all species once data has been collected.



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3.8. Tourist impact data collection

The programme coordinator should visit the two hotels in the area, Vista al Mar Lodge and Turtle Beach Lodge and ask to receive the following information from the establishment:

- Total number of occupied beds at the hotel each month

Each night patrol should take note if any of the following is observed:

- Number of tourists on the beach
- Number of locals on the beach
- If there are more than 10 participants in tours
- Number of fires at the beach
- Number of mobile white lights (i.e. people walking with white torches)
- Number of red mobile lights (i.e. people walking with red torches)

Once a month during new moon, the night patrol should take note of:

- Number of non mobile white lights (houses, lodges, etc)
- Number of non mobile red lights (houses, lodges, etc)

4. HEALTH AND SAFETY

4.1. Lightning Storms

During certain times of the year there is a higher risk of lightning and rain. To ensure the PLs and volunteers safety caution should be taken when encountering severe weather conditions.

In the case of heavy rain the PL may decide to take shelter or abort the patrol. If there is lightening, the groups are advised to continue patrols close to the vegetation, or, when there are fewer than seven seconds between lightning and thunder refuge may be taken at Turtle Beach Lodge and Vista al Mar Lodge (remember this is for a limited time and patrollers are to portray appropriate behaviour). Should the situation become dangerous, the PL will decide to return to base. All radio and electronic equipment is to be turned off during any electrical storm.

4.2. Behaviour of Patrol Leaders and Volunteers

- Talking is to be kept to a minimum and the PL reserves the right to ask any volunteers to keep noise to a minimum. If anyone is found in breach of these norms, the PL on duty along with other Patrol Leaders reserves the right to remove anyone from continuing the patrols for a determined period of time.



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- It is important that the patrols are conducted in an orderly fashion and that volunteers are guided properly. In this way injury to PLs, volunteers and the marine turtles is prevented. The use of cell phones, iPods, MP3 Players, Discman's, photographic and video equipment is forbidden on the beach at all times during a patrol. White lights are not allowed.
- No smoking is allowed during patrols.
- PLs, volunteers and others accompanying the project are not allowed to drink alcohol the day of a walk to ensure judgment is not hindered.
- Food may be brought to the beach but only consumed when the patrol is on break or rest stop.
- Volunteers are not to walk ahead of PL nor assume responsibility for checking the turtles. The pace of the walk is kept even so that all team members can keep up. No one is to be left behind when walking.
- Never walk or stand in front of a turtle or shine torchlight directly in her face.
- Be careful not to break branches or make any noises when approaching a turtle since they are sensitive to noise and especially vibrations.
- If you find poachers never approach them.
- Never use repellent or anything else with a strong odor before or during the night patrol.
- Try not to walk on top of the turtle nests.
- Dark clothing should be worn to prevent being seen by the turtles.

5. REFERENCES

Tröeng, Sebastian. 2004. Observación de Tortugas marinas es rentable en Tortuguero. Revista Ambientico 126.

6. ACKNOWLEDGEMENTS

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¹ Vanodine solution can be applied to any wound on a turtle and should be used as the PL sees fit.

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