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# TURTLE CONSERVATION PROJECT FOR THE TORTUGUERO NORTH BEACH

FEASIBILITY STUDY



Canadian Organization for Tropical  
Education and Rainforest Conservation

# **Turtle Conservation Project for the Tortuguero North Beach**

## **Feasibility Study**

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for  
Canadian Organization for Tropical Education  
and Rainforest Conservation (COTERC)

York University

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*Picture on cover page:*  
Green sea turtle returning to the sea after  
nesting in the early morning.  
Picture: GVI (edited by F. van Oudenhoven)

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## **Summary of recommendations**

The results obtained from the first years of monitoring the Tortuguero North Beach indicate significant, but highly variable numbers of nesting turtles, high poaching rates and low hatching success. A minimum of two years of continued research is required to substantiate findings, but in the meanwhile it is advised to shift some of the emphasis of project activities to nest monitoring, excavations and more frequent beach cleans.

Nest excavations are important to determine the cause of low Leatherback hatching rates. The critically endangered status of Leatherback and Hawksbill turtles warrants consideration of nest relocation or, as a last resort, a hatchery on the North Beach.

The fact that the North Beach has never been officially monitored, in combination with the numbers of nesting turtles and the opportunities for community based conservation activities present in the community of San Francisco, should be sufficient reason to obtain financial support to continue project activities for at least one or two years.

Numbers of turtles on the North Beach may be biologically significant, but will not be enough to secure long-term funding from donor agencies. If the project is to be continued it will have to be financially self-sustainable; one means of achieving this may be by starting a community based conservation project with the community of San Francisco.

The potential of the North Beach for educational purposes is very high. Environmental education in San Francisco, the participation of numerous volunteers in the project and presentations to tourists in the nearby hotels all contribute to the long-term conservation of sea turtles and their habitat. This aspect of the project should not be forgotten or neglected.

The turtle project is not currently a conservation project. For that there would either have to be more protection on the beach itself or an increase in involvement of the local community in the project. In the short term, employing poachers to conduct research activities for Caño Palma may be the most feasible solution.

Judging from three turtle projects managed by ANAI on the Pacific coast of Costa Rica, the numbers of turtles on the North Beach may be sufficient to sustain a paying volunteer programme in San Francisco. Although difficult to implement, this would be the most preferable option in the long run in terms of turtle conservation, increasing community involvement and increasing the benefits accruing to the community.

It will take a very strong, charismatic and experienced person to expand the turtle project to include community based conservation activities. There may be other organisations in Costa Rica that are capable of and willing to assist Caño Palma in initiating and managing these activities.

## Introduction

Two years ago, at the beginning of the 2004 Green sea turtle nesting season, COTERC and York University initiated “El Proyecto Tortugas”, a programme monitoring sea turtle activity on the beach north of the Tortuguero river mouth on Costa Rica’s Caribbean coast. The project began with daily morning censuses and has since grown to include both morning censuses and nightly patrols, during which turtles are tagged and various kinds of biometric data collected.

This feasibility study is both a critical review of the project as it has been carried out over the past years and, building on the data collected and experience gained, a look at the future, to see whether, and how, the project may be sustained over the coming years.

The latter is not an easy question to answer. During the three months I have spent at the Caño Palma research station, walking the beach almost every night, working with so many turtles and experiencing what beautiful and, in a way also, helpless animals they are makes it very difficult to be objective about their protection and base decisions solely on numbers. Similarly, burying a poached turtle, or knowing that the eggs counted during night patrols have a fifty percent chance of ending up in someone’s bag the next morning makes it, at times, tempting to become very angry and resentful with those people involved in poaching.

Yet most of those people have families, mouths to feed, they have little schooling and no land to build on. San Francisco, where most poachers live, is a poor community and prohibiting poaching, stationing guards on the beach, although seemingly an easy solution might not be enough to stop people from poaching. *The idea followed through in this study centres around the (perceived) necessity to involve community members, preferably some that are now poaching, in the conservation and research efforts of the Caño Palma field station.*

In writing this study I have tried to be as straight forward as possible: there exists a rich source of literature concerning turtle biology and community based conservation and voluminous reports could be written about the situation in San Francisco. Yet for all the ‘complex’ issues at hand in San Francisco and on the North Beach, the central problem, although unique, is not all that complicated and neither should be the solutions sought by COTERC.

For that reason, although literature has been used to shape and substantiate my ideas, this report, rather than a literature review, is a compilation of personal observations, ideas and ‘solutions’. These, in turn, have been very much influenced by all other people involved in the turtle project, some of the residents of San Francisco, and other stakeholders consulted over a period of three months.

The study is roughly divided into four parts: (1) a review of the **current project**; (2) an examination of the **conservation value of the North Beach**, both from a biological as well as from a scientific/educational perspective; (3) a look at **the community of San Francisco** and possibilities for community based turtle conservation (included is a review of two existing Costa Rican projects that have successfully integrated community development with turtle conservation); (4) a discussion of **other important stakeholders** (GVI, MINAE, CCC) and any other important aspects that need to be taken into consideration. Different options and ideas for the continuation of the turtle project are presented in the third part.

A few disclaimers:

This report is not a scientific paper; where used, references are included, but often knowledge was assumed common and has not been referenced. For turtle inquiries I refer to any good turtle biology book (e.g., Spotila, 2004).

This document was written for COTERC, York University and GVI to have a clear and critical overview of the current project and its future potential and is not meant to be distributed widely; views expressed are mine and I take responsibility for them, they may not reflect those of the above organisations.

For privacy reasons and university regulations, the names of some of the people consulted for this study are not mentioned in the text.

## Review of the current project

### **Project summary: Turtle conservation project for the Tortuguero North Beach**

The turtle project is carried out on Tortuguero's 'North Beach', just north of the river mouth that marks the end of Tortuguero's famous beach hosting the largest Green turtle rookery in the world (CCC, 2004) and to the south of the Barra de Colorado wildlife refuge (the patrolled area ends at Laguna Cuatro. See figure 1, next page)). COTERC's biological field station is located on the canal behind the beach; the beach is reached through *Cabinas Vista al Mar*, one of the two hotels along the patrolled area of the beach.

This year, the Caribbean Conservation Corporation (CCC) has been monitoring the Tortuguero beach for well over 40 years, but, even though the intent has long been there, has never had the resources to patrol the North Beach as well. Halfway the nineties an exploratory study of the beach, up to Barra de Colorado, was conducted, but not many tracks were observed and the beach was thought to be not important enough. COTERC similarly initiated a turtle project in the nineties, but did not have the resources to sustain it.

The current project, initiated by COTERC in 2004 in association with York University, Canada, is a feasibility study aimed at establishing whether the beach is a significant nesting site for sea turtles and warrants some form of protection. To this end poaching rates must be determined as well. More specifically, the research protocol mentions the following objectives for the four species of sea turtles that nest on the beach (Green [*Chelonia midas*], Leatherback [*Dermochelys coriacea*], Hawksbill [*Eretmochelys imbricata*] and Loggerhead [*Caretta caretta*] turtles, in descending order of incidence). To gather data on:

- The spatial and seasonal distribution of nesting females
- The number of nests
- The incidence of poaching of nests and turtles
- The incidence of predation
- Hatchling survivorship, emergence and orientation (COTERC and GVI, 2006).

In addition, Caño Palma has this year begun to participate in a regional (Caribbean) research programme administered by the CCC. The programme involves the tagging of turtles and the collection of biometric and physical data (size, health, clutch size, etc.), which is entered in a database and shared with participating turtle projects.

## Results

The tables below show the last three years of results.

<b>2004<sup>1</sup></b>	Half moons <sup>3</sup>	Nests	Poached	Predated	Poaching rate	
Leatherback <sup>1</sup>	no data	no data	no data	no data	no data	
Hawksbill <sup>1</sup>		3	2	2	no data	100%
Green		126	105	60	no data	57%
<b>Total</b>		<b>129</b>	<b>107</b>	<b>62</b>	no data	<b>58%</b>

<b>2005</b>	Half moons	Nests	Poached	Predated	Poaching rate	
Leatherback		2	83	48	no data	58%
Hawksbill		12	11	10	no data	91%
Green		1960	981	545	no data	56%
<b>Total</b>		<b>1974</b>	<b>1075</b>	<b>603</b>	no data	<b>56%</b>

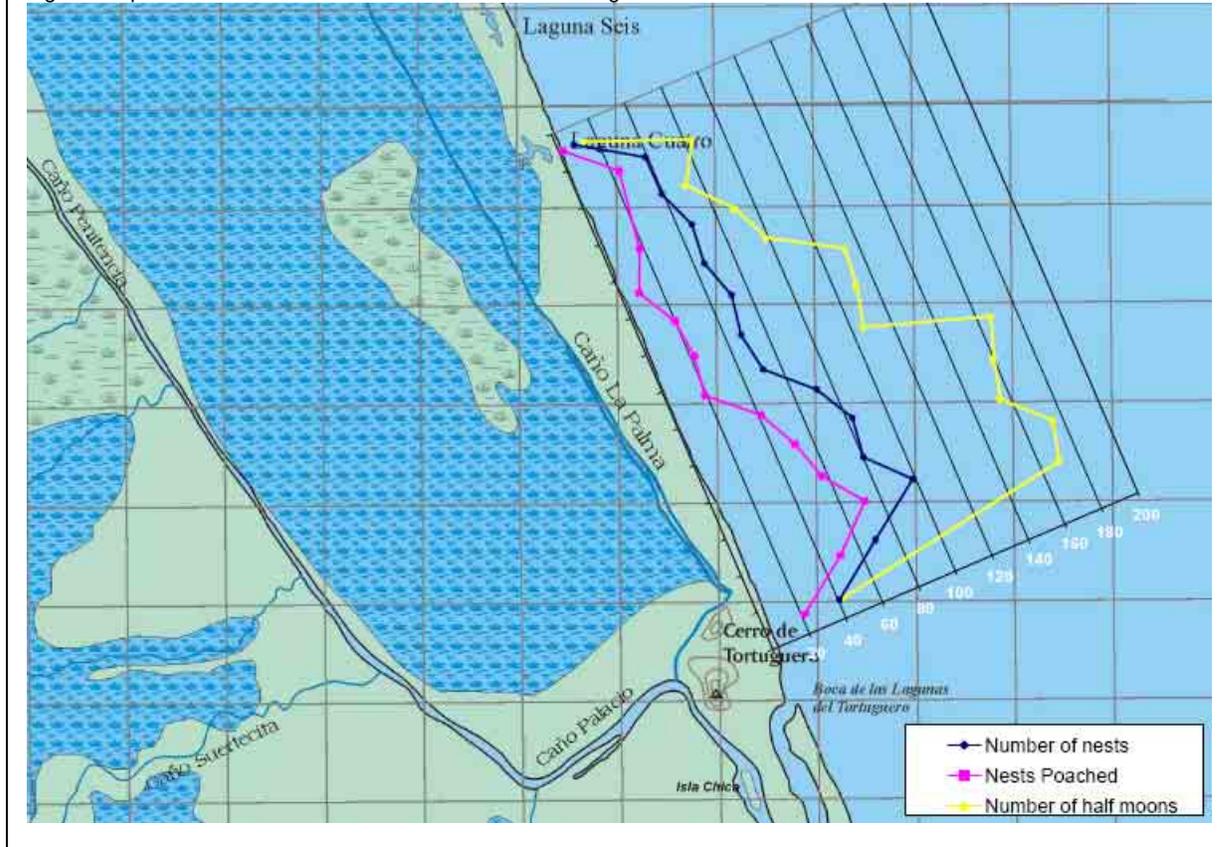
<b>2006<sup>2</sup></b>	Half moons	Nests	Poached	Predated	Poaching rate	
Loggerhead		0	2	0	0	0%
Leatherback		25	51	12	2	24%
Hawksbill		5	9	5	0	56%
Green		258	151	63	2	42%
<b>Total</b>		<b>288</b>	<b>213</b>	<b>80</b>	<b>4</b>	<b>38%</b>

<sup>1</sup> Patrols in 2004 started after Leatherback and part of the Hawksbill season.

<sup>2</sup> Data for 2006 updated until August 30.

<sup>3</sup> "Half moons" are the tracks of turtles that come on to the beach, but return to the sea without laying eggs.

Figure 1: Spatical distribution of Green turtle tracks and nesting on the North Beach in 2005.



Note that patrols in 2004 were only started in June and therefore missed the bulk of the Leatherback season and probably a number of hawksbills as well; the 2006 data are only updated until August 30 and do not include the last two months of the Green turtle season. Comparison between years is therefore difficult, also because data have been obtained in different ways and the frequency of patrols between years was different.

However, it is safe to say that the first year of the project (2004) was very quiet, the second year (2005) very busy, and the current year (2006) falls somewhere in between. Considering that 2005 was the year in which the CCC encountered its highest **number of tracks** in Tortuguero in 40 years of patrolling (>80,000) and assuming a correlation between Tortuguero and the North Beach, it can probably be said that 2005 was indeed a peak year also for the North Beach and that a thousand nests is the most we should expect to see.

The second obvious conclusion that can be drawn is that in the current season **poaching** has strongly decreased from previous years. It is tempting to attribute this drop to the night patrols, but other factors (the poaching rate in 2005 may be unusually high because several families that were evicted from their homes resorted to poaching) may account for the difference as well. Nonetheless, the increased presence of volunteers on the beach is certainly a good thing and is likely to diminish poaching to a degree.

This year is the first in which it will be possible to determine **hatching success** with some accuracy, as the project now includes the triangulation of the exact position of nests thus making excavations possible. Triangulation can only be done when turtles are found laying the eggs at night (taking GPS measurements is not accurate enough (accuracy <5 m) to find the relatively small egg chambers), which means that the number of nests that can be excavated is limited. Triangulation of 60 to 80 nests should however be possible this season, which gives a large enough sample size to determine poaching rates, hatching success and the reasons for failed nests.

The results for the Leatherback season do not seem very hopeful. Even though poaching rates were relatively low (24%), very few nests have been seen to hatch. This does not necessarily mean that nests did not hatch (hatchling tracks are easily missed or washed away by tide and rain), but given some extremely high tides and, at times, enormous amounts of debris on the beach it is very likely that many Leatherback

nests, which are positioned much closer to the sea than those of Green turtles, flooded or were unable to hatch. Again, excavations should provide more insight into both hatching success and causes of hatching failure. A cause for celebration has been the hatching of a very rare Loggerhead nest (during patrols two loggerheads were seen and tagged; the last time a Loggerhead was observed in Tortuguero was three years ago): excavation of the first nest showed that all 111 eggs hatched!

What all the above comments point toward is a **need for** at least two years of **continued monitoring** on the North Beach. Sea turtle nesting is subject to a large degree of annual variation and seems to move in cycles of two to four years, with individual turtles usually nesting every three years (Bjorndal et al., 1999). These cycles are poorly understood (in Australia, for example, the El Niño phenomenon seems to be partly responsible [ibid]), but fact is that our data seem to be in accordance with those general trends and that more information is needed to have a better understanding of both numbers and behaviour of turtles on the North beach. This baseline information is necessary for any future elaboration of the turtle project, especially if some form of tourism is sought as an option for revenue generation.

### ***Implementation of the protocol***

The project as such (i.e. the implementation of the protocol) has been running very well. Jana Daigle as coordinator and Lydia Chaparro as project biologist have done an incredible job in getting the project off the ground, arranging permits, drafting protocols and obtaining support from different sides. With very few resources (Turtle Beach Lodge has given the financial support necessary to purchase tags and tagging equipment) and the help of Andres and many COTERC/GVI volunteers and staff the beach is being patrolled approximately 11 hours a day (20:30-4:00 at night (21:00-2:00 during the Leatherback season) and 6:00-9:00 in the morning). Both MINAE and the CCC are very supportive of the project and happy that the North beach is finally being studied.

A recent development has been the cooperation of the police. Don Gerardo from San Francisco has managed to have police from inland Costa Rica come to Caño Palma to patrol the beach three days of the week during mornings or nights.

### ***Comments and suggestions***

These comments pertain only to the project in its current form and not yet to any extensions or community based activities.

The turtle project seems to be in a state of constant flux which makes it difficult to comment on it. The most recent development has been the handing over of most project activities to GVI because of a lack of COTERC personnel.

- One of the most important points that will be made in this report is that, provided that COTERC wants to maintain its role in coordinating the project, a qualified, full time staff member should be contracted to manage both research and (potential) community development activities. If this is not financially possible it is probably better to hand over the project to another organisation.

Community involvement in the project is meagre. The research protocol mentions presentations, both in hotels and in the village of San Francisco, as an important objective for this turtle season, yet only one, not very well attended presentation was held in San Francisco. It should be feasible to have regular, donation-based information sessions at Turtle Beach Lodge (they have requested this on several occasions). Increasing involvement of the community, however, is probably not realistic until some form of financial benefit is involved: a few adults and quite a few children from the local school have joined Caño Palma staff during night patrols, and several villagers have expressed their wish to help, but genuine interest in the project seems low.

The main activity during night patrols has been the tagging of turtles and collection of data. As noted above, it is important to continue this for at least two more years in order for the data to be valuable and reliable enough for comparison. However:

- Although these data are necessary to inform future conservation efforts for the North Beach, it may already be possible to do more for the conservation of sea turtles by shifting the emphasis of the project toward other activities, namely **beach preparation** and **nest monitoring**. The tagging programme is interesting in that it tells us where the turtles that nest on the North Beach come from, where they go and whether they come back, but other than that the 300 turtles Caño Palma may be able to tag per season will not add significantly to the knowledge generated by the 44,000 turtles already tagged by the CCC.

Figure 2: Project biologist Lydia Chaparro and one of the volunteers cleaning the beach



Picture: Jane Haakonsson (edited by Frederik van Oudenhoven)

Having had to navigate by night through the rubbish left on the beach during high tides I am surprised turtles even manage to make it to the sand. There is no doubt that the high number of 'half moons' (turtles coming on the beach but returning without having nested) is due in part to logs and rubbish obstructing their way and regular (twice a week, more often when necessary) cleans of the busiest nesting parts of the beach should improve nesting percentages. Cleaning the beach may require a lot of manpower, but while volunteers are present at the station it is a worthwhile effort; it is also common practice in many other turtle projects around the world (Chaparro, 2006, personal communication).

A second reason for doing beach cleans more frequently is that logs may prevent nests from hatching and hatchlings from reaching the sea.

- It is too early to say with certainty that the hatching rate of Leatherbacks and/or Greens on the North beach is very low, but this year's observations certainly seem to point that way. For many years the CCC has had relatively low Leatherback hatching rates on the Tortuguero beach (35% in 1977, 57%, 46% and 67% in 1986, 1988 and 1989 (Bjorndal et al., 1999) **and only ~25% in 2005** (Haro and Troëng, 2006a) and, similarly, Bell et al. (2003) found low Leatherback hatching success (19.8 to 54.2%) at Playa Grande, on the Pacific Side of Costa Rica. The CCC has started looking at the causes for this and it would be very useful if Caño Palma could research some of the determinants of hatchling success (such as distance from the high tide line at the time of laying, flooding by ground water or tide, obstruction by debris, depredation, etc.) as well. This would involve the daily monitoring of nests and the triangulation and excavation of as many nests as possible. Again, this does require effort, but given the extremely endangered status of especially the Leatherback turtle (see, for example, Spotila et al., 2000) and since it directly involves the study/protection of hatchlings, it should probably have priority over the tagging programme. Moreover, information on hatchlings could point towards the possibility/necessity for the creation of a hatchery in the future.

All in all, it is important (and at the moment also feasible) to generate as much information as possible about turtle nesting on the North Beach. In doing so, however, it is also important to remember that the primary objective of the project is (or will be?) turtle conservation and that time and resources should be allocated accordingly.

## Conservation Biology – value of the North Beach

I already mentioned in the introduction that it is not necessarily easy to determine, based on numbers, whether a beach, or a certain part of a population, is important enough for protection. The answer to that question is necessarily subjective, dependent on the perspective of the person or institution being asked. Below are some considerations that can help inform this decision for the North Beach.

### (More or less) relevant turtle biology

Four species of sea turtle nest on the North Beach:	Nesting in Caño Palma:	Conservation status (global):
→ Greens ( <i>Chelonia Mydas</i> )	June to November	Endangered
→ Leatherbacks ( <i>Dermochelys coriacea</i> )	March to June	Critical
→ Hawksbills ( <i>Eretmochelys imbricata</i> )	May to September	Critical
→ Loggerheads ( <i>Caretta caretta</i> )	May to September	Endangered

The **main threats to the survival** of the different species differ: Greens have been and still are intensively poached, both for their meat as well as for their eggs. Leatherbacks are poached for their eggs but not for their meat, they are often killed by plastic bags floating in the water as these resemble their main diet, jellyfish. Hawksbills are killed for their carapace, especially in Cuba, because they fetch a lot of money on the Japanese market; their eggs are also eaten. Loggerheads are extremely rare in Tortuguero (but probably the least endangered globally) and the only species not deliberately poached for its meat or eggs (although poaching has been the reason for its decline). In addition to the poaching at nesting beaches, threats to all species include fishing, long lines (turtles end up as bycatch), and habitat loss and alteration (e.g., beach development).

But why is it that a species that has survived for more than a 100 million years, the longest of all living marine species (Roach, 2003), is so vulnerable to human exploitation and so difficult to protect? Their **life histories** are an important part of the answer: all species of cheloniid sea turtles (which includes all sea turtle species except the Leatherback) have extremely low growth rates, accompanied with a high age at maturity (up to 35 years for Greens) and very low intrinsic rates of population increase (2 to 6% [Musick, 1999]) (see table 2 for growth coefficients<sup>1</sup> relative to other marine animals).

Species	<i>k</i> coefficient	Source	
<i>Thryssa hamiltoni</i> Hamilton's anchovy (IndoPacific)	0.80–1.40	(Hoedt 1992)	<p><i>Table 2: von Bertalanffy growth coefficients (k) for different marine animals</i></p> <p>Strictly speaking, <i>k</i>-values describe only relative growth rates. However, growth rates are very often strongly correlated with age at maturity and intrinsic rates of population increase and are therefore a good tool for comparison between species (Musick 1999).</p> <p>For comparison, the African elephant and baleen whales have <i>k</i>-values of approximately 0.10-0.14</p> <p>Source: Musick 1999, p.3</p>
<i>Thunnus albacares</i> yellowfin tuna	0.45	(Moore 1951)	
<i>Paralichthys dentatus</i> summer flounder	0.32–0.40	(Desfosse 1995)	
<i>Dermochelys coriacea</i> leatherback turtle	0.27	(Zug and Parham 1996)	
<i>Scomberomorus commerson</i> narrowbarred mackerel	0.17–0.25	(McPherson 1992)	
<i>Mycteroperca</i> sp. groupers	0.06–0.17	(Ault et al. 1998)	
<i>Epinephelus</i> sp. groupers	0.05–0.18	(Ault et al. 1998)	
<i>Xiphias gladius</i> swordfish	0.09–0.19	(Berkley and Houde 1983)	
<i>Acipenser oxyrinchus</i> Atlantic sturgeon	0.03–0.16	(Kahnle et al. 1998)	
Galeoid sharks (Carcharhinae)	0.04–0.07	(Branstetter 1990)	
Cheloniid sea turtles (Cheloniidae)	-0.08	(Chaloupka and Musick 1997)	

<sup>1</sup> Provided by the Von Bertalanffy equation  $L_t = L_\infty (1 - e^{-k(t-t_0)})$ , commonly used to describe the growth of individuals over time ( $L_t$  = length at time  $t$ ). The equation shows how organisms with low *k*-coefficients will need many years to reach their maximum length, which often also implies that it takes them a long time to reach sexual maturity.

This means that even though sexually mature turtles are rather promiscuous and able to nest several times in one season, the time needed by juveniles to reach maturity exposes them to so many dangers that only one percent to one per mille of all hatchlings is thought to complete the road to adulthood. The low intrinsic rate of increase of sea turtle populations is a direct result and means that any harvesting above that rate—2 to 6% of the total population—results in population decline (natural stochasticity not taken into account). Interestingly, Bjorndal et al. (1999) suggest that the very reason that the Green sea turtle has survived the period of intense exploitation at the beginning of the 20<sup>th</sup> century may have been its very low growth rate (age at maturity in the Caribbean is approximately 25 years): the large number of age classes in the subadult portion of the population continued to supply recruits to the breeding population, even after years of complete harvesting on the nesting beaches.

The **critical importance of juveniles** to population maintenance or recovery is recognised by many authors (ibid), which is why it is argued that turtle conservation should shift some of its emphasis on protecting nesting beaches (eggs on nesting beaches constitute the least responsive life stage of a turtle's life cycle) to protecting juveniles from being caught in sea (Crouse et al., 1987). Halfway technology is a good example of this. Although Caño Palma is limited to working with the adult turtles that nest on the North Beach (and, of course: no nesting adults, no juveniles), it is good to be aware of this.

Also interesting is the much higher *k*-value of the Leatherback turtle (0.27), indicating faster growth and lower age at maturity than other species of sea turtles (Leatherbacks reach sexual maturity after approximately 5 to 14 years [Spotila et al., 2000]). This potentially affects population dynamics and thus the resilience in the face of human disturbance. One of the reasons for their higher growth rates is that Leatherbacks have a relatively high metabolism and are warm-bodied, allowing them to migrate and feed on the colder nutrient-rich waters other turtles cannot survive in (Olori, 2004). Yet Leatherbacks are critically endangered and it is thought by many that they will be extinct within ten to fifteen years (e.g. Spotila et al., 2000). Low natural hatching rates are certainly to blame and literally every nest is important. *This warrants very serious consideration of nest relocation or even a hatchery as a possibility on the North Beach.*

Sea turtles have an **extraordinary sense of time and location**, many species returning to the beach where they were born to lay their nests. This sensitivity is probably facilitated by the ability to use the Earth's magnetic field for navigation (Lohman et al., 2001), which has led researchers (research not yet published) to hypothesise that Tortuguero's Cerro functions as a signpost for turtles to find their way to the beach. An old volcano, the magnetic field induced by its solidified magma (which aligned with the Earth's magnetic field at the time of solidification) produces a magnetic anomaly that could be sensed by the turtles (Haro, 2006, personal communication).

**Sea turtles play key roles in two ecosystems** that are critical to them as well as to humans—the oceans and beaches. The negative impact of their extinction on both systems would probably be large.

Together with the manatee, Green turtles are one of the few species that feed on near-shore sea grass beds (this is also where they are easily captured by fishermen). Sea grass, which needs to be kept short in order to remain healthy, constitutes essential breeding ground for many marine species and when the Green turtle disappears many species dependent on healthy sea grass are likely to go with them.

Similarly, other sea turtle species play an important function in their ecosystems through their role in the food chain: Hawksbills feed on coral reef sponges, Leatherbacks keep jellyfish populations under control and Loggerheads prey on molluscs, crustaceans and fish.

In addition to their roles in the food chain, turtles also bring rare and needed energy to fragile beach ecosystems. Nutrients from hatched eggs as well as from eggs that never hatch and hatchlings that fail to make it to the sea provide proteins to beach vegetation thus assisting in erosion prevention (this is not such a problem on the North Beach as it is on many other nesting beaches) (Spotila, 2004).

### ***The numbers***

The position of the North beach is unfortunate in that it happens to be situated directly next to one of the world's most famous turtle beaches, making the thousand or so turtles that visit it seem rather pitiful. To contrast that, twenty three Green turtle tracks and seven nests a year are enough to inspire a turtle project on Réunion Island, off the eastern coast of Madagascar, including daily surveys (Ciccione and Bourjea, 2006).

So comparison is inevitable and necessary. So far, we only have one full year of data for comparison with the numbers observed by the CCC and they indicate that **the North Beach hosts less than 1%** of the female part of the Tortuguero Green turtle population. In 2005, an estimated 150,000 nests were laid over 22 miles of beach (Haro and Tröeng, 2006b), versus 981 on the 3 miles of the North Beach (see figure 3, next page).

For Leatherbacks, however, the density of nesting occurrences is virtually the same on both beaches, 2005 saw 703 nests over 22 miles in Tortuguero (Haro and Troëng, 2006a), compared to 83 nests on the North Beach (density: 32/mile vs. 28/mile). Even in comparison to Gandoca, one of the Caribbean's important Leatherback nesting beaches, which had 641 Leatherback nests in 2005 (ANAI, 2006), the numbers on the North Beach are high enough to merit attention (figure 3).

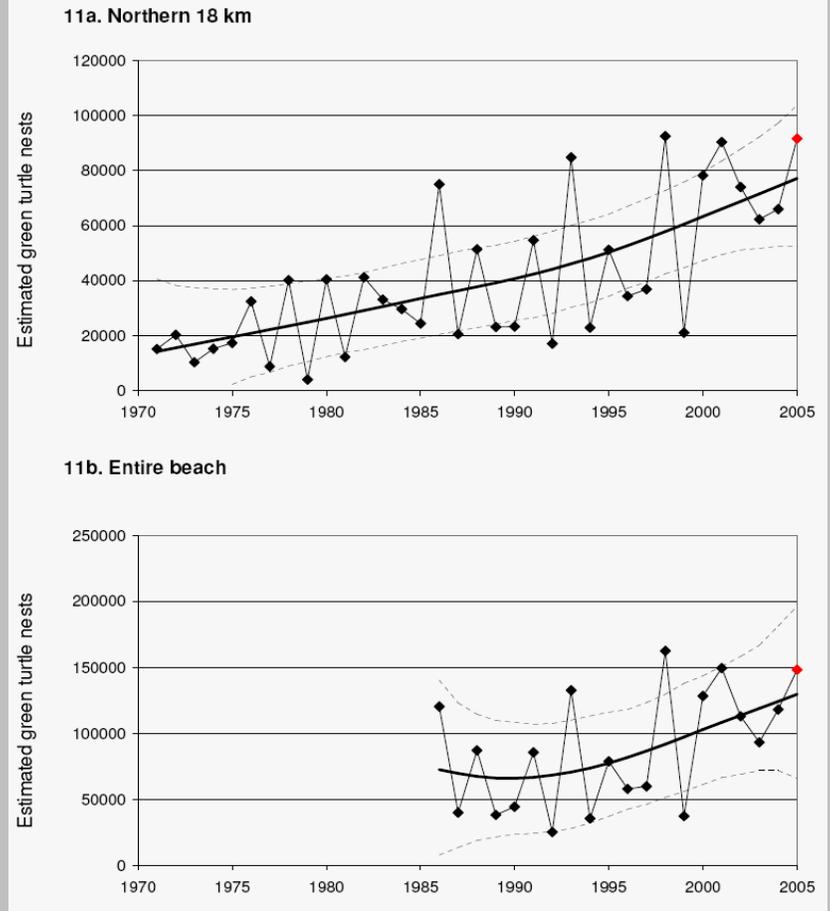
At first glance, then, the North beach seems quite deserving of some form of protection. But it is also important to consider the larger context and look at regional—and not just local—influences on the Caribbean turtle population. Based on cautious estimates, with increased protection measures on behalf of Caño Palma, the North Beach could produce some 11,250 hatchlings on average per year, 12 to 100 of which (depending on who you read) will eventually reach sexual maturity.

This number is dwarfed by both the total numbers of Green turtles in the Tortuguero population (the CCC estimates there to be approximately 148,000 females, they do not know how many males there are (CCC 2006)) and by the number of turtles that are killed each year: perhaps 60 turtles are killed annually by San Francisco poachers (most of them off shore), large fishing boats from Limón come up to Tortuguero and harvest up to thirty turtles per run and in Nicaragua between 11,000 and 35,000 Green turtles are harvested every year, most of them from the Tortuguero population (Lima et al., 1999).

Although these numbers are by no means exact, they do show that numbers of turtles poached and produced on the North Beach are very small as compared to numbers elsewhere, numbers that pertain to the same population of turtles, yet are far beyond our control.

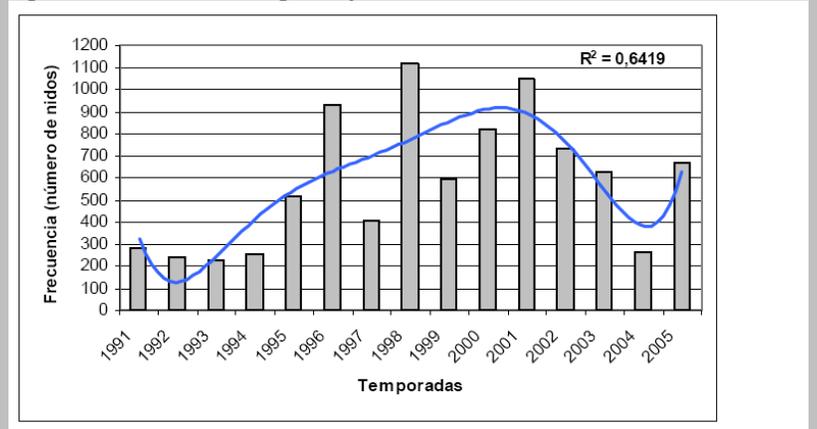
The fact that most turtles are poached offshore also shows the need to work directly with poachers. Beach patrols and the presence of the police will partially solve the problem of nest poaching, but will not stop people from going out into the sea and kill turtles.

Figure 3: Green turtle nesting trends at Tortuguero (Northern 18 km are monitored every night; entire beach (22 miles or 35.2 km) once a week.



Source: Haro and Troëng, 2006b, p.44.

Figure 3: Leatherback nesting at Playa de Gandoca from 1991 to 2005.



Source: Asociación ANAI, 2005, p.19

Figure 4: Turtle poached on the North Beach. Egg yolks seen are those of the undeveloped eggs that would have been laid approximately two weeks later.



Pictures: Frederik van Oudenhoven

I was happy to find the following quote in an article in Conservation Biology: “Determining what is “biologically significant” is a major problem in conservation biology and does not seem to have easy solutions” (Reed and Blaustein, 1997, p. 281). The article is relevant to this report in that it tries to shed light on the ways to determine the significance of a population change (positive or negative) to the survival of that population. Importantly, the authors remind us that a statistically significant part of a population does not necessarily mean that that part is also biologically significant, and vice versa. In a turtle context this may mean that 1%, although statistically not highly spectacular, may have significant biological and ecological importance; it is simply very difficult to say and I am not familiar with the criteria maintained by conservation agencies. Given the endangered status of the Green turtle and knowing that originally the Tortuguero population may have been in the tens of millions (Bjorndal, 1999; Hays, 2005), they might need every bit of help they can get.

### ***Educational value of the North Beach***

The discussion on conservation values aside, there is a second way in which the North beach is already fulfilling an important role. From March until August more than 50 volunteers from over eight countries, 40 Costa Rican high school kids and some fifteen children and ten adults from the village of San Francisco have accompanied Caño Palma staff on night patrols, observing turtle nesting and assisting in the work done by research assistants. The looks on some of their faces were unforgettable and signalled the invaluable impact of hands-on conservation experience as a form of education. Even if nesting numbers are insufficient to sustain a conservation programme alone, in combination with a well-designed educational programme, extending to include the community of San Francisco and the tourists visiting the two hotels on the beach, the project can be very worthwhile indeed.

## **Community based conservation – possibilities in San Francisco**

Few conservation projects have been successful without the involvement of local people, especially where these people have been a strong force in the depletion of the resources. Local people can be an invaluable source of knowledge in identifying threats and opportunities and, once benefiting from conservation measures, can ensure their continued success (Vieitas et al., 1999).

That being said, there are many ways in which the community of San Francisco deviates from the 'ideal' conservation community and turning the turtle project into a community project will not be an easy task. It will require resources, tact, perseverance, and, above all, a very skilled person to manage and implement project activities. Personally, I do not think any community conservation activities should be initiated until more is known about the turtles on the North Beach, which may require another two years of research. A good start has been made creating a scientific foundation for the project and it would be a pity, if not irresponsible, to waste that effort doing things hastily and ill-prepared. If this involves declining requests from people in San Francisco (read more about Don Gerardo later) than that is probably preferable to making promises that cannot be kept.

### ***The community of San Francisco***

San Francisco is sometimes referred to as "the village that should have never been there"... Over a period of less than ten years it has expanded from a small community of illegal land squatters to a village of more than 400 people and a school (which was the first official recognition of its 'accepted' status).

I do not know enough about the village to be able to talk about it in detail. Its inhabitants are from Nicaraguan and Costa Rican descent and bring with them a mixture of the 'black', Caribbean, culture and the 'white' culture from central Costa Rica. Being the host of several people that do not want to be found by Costa Rican police or government, San Francisco is not necessarily an easy, entirely harmonious community; it is certainly a very poor community. On the other hand, however, the village has a great spirit, a council, a well-run football competition and quite the assortment of wonderful characters.

Deserving of a special notice is **Don Gerardo**. Gerardo came to San Francisco about six months ago and occupies a property outside of the village, next to the Cerro. He has quite the suitcase full of ideas, some promising, others not so much so, and seems to be trying to hijack parts of the turtle project in order to start a volunteering project similar to the one managed by ANAI in Gandoca (see page 14). In doing so he has been trying to provoke hostility in the village towards Caño Palma, declaring that the station must have a lot of money and should use it to help the community. Gerardo does seem to get things done, however, and if COTERC can cautiously steer his laboriousness into a direction that benefits the turtle project it may prove to the village our resolve to make the turtle project benefit the community while at the same time preventing possible confrontations.

### ***Poaching and poachers in San Francisco***

I talked to a few people from San Francisco about the poaching situation on the North Beach (it would be considered disrespectful to approach poachers directly).

One of the first things they would tell me is that the consumption of turtle meat and eggs has been part of Caribbean black culture for a very long time. They told me there had never been a problem taking turtle eggs or killing turtles for their meat. It was only when the 'whites' came to the coast and started to harvest them in unsustainable quantities that populations started to decline (remember that Campbell soup started the large scale harvesting of green sea turtles in Tortuguero in the early 20<sup>th</sup> century). When asked about it, most people in San Francisco will denounce the poaching of turtles or their eggs, but almost half of the families will eat turtle products occasionally, when available; very few will actually go out on the beach to look for nests.

There are approximately 10 households that poach (usually only nests) about twice a week out of poverty. They do not usually consume the eggs, but sell them in order to have money to buy food, medicines, etc; fishing is often a second main source of income for these families. Together they may be responsible for 30 to 40% of nest poaching, but this is very hard to say.

The big problem on the North Beach are some six poachers that go out almost every night, poach everything they encounter and sell the eggs and meat to support their "vicios", drinking and drugs. These are men that are strong enough to work and, according to the people I spoke to, they are the ones Caño Palma should try to work with if it wants to do something about the poaching.

Although eggs fetch quite a bit of money in San Jose, in San Francisco and Tortuguero only 2000 to 3000 colones, or US \$4 to \$6, is paid for a bag (= one nest, or 80 – 120 eggs) of eggs. If sold in Cariari, the same bag is worth approximately 8000 colones, or US \$16. What is intriguing is the fact that the people that buy

these eggs are mostly the wealthier lodge and shop owners, boat captains, even government officials—the people that will guide tourists around at night and tell them how important it is to protect the turtles. Almost as a defence against what is happening in San Francisco, I was also told by villagers about the fishing boats that come up from Limón and catch up to thirty turtles per day. Apparently park guards know that this is happening, but cannot intervene because of corruption and the money that is at play. Even when the harvesting of turtles was still legal (see previous chapter), illegal capture by Limón fishing boats was already common. After the promulgation of the 1999 law against turtle capture (Taft, 1999) fishermen lost a substantial part of their income (Troëng et al., 2004) and although efforts have been made to compensate this loss with revenue generation from other activities (Cuevas, 2002), poaching apparently continues to be a problem.

### **Some literature on community based conservation (CBC)**

Below are a few articles that discuss CBC, some in relation to turtle conservation (references not included in Bibliography). Relevance to the turtle project and/or San Francisco is described in short commentaries.

Berkes, F. (2003), "Rethinking Community-Based Conservation", *Conservation Biology* 18(3), pp. 621-630.  
*An exploration of the theoretical aspects of CBC, emphasizing the importance of an interdisciplinary approach to conservation science that integrates knowledge of social (cultural) and ecological systems.*

Gibson, C.C. and S.A. Marks (1995), "Transforming Rural Hunters into Conservationists: An Assessment of Community-Based Wildlife Management Programs in Africa", *World Development* 23(6), pp. 941-957.

*This article is an evaluation of some of the earlier, large, donor-driven CBC projects in Africa. It identifies some of the reasons for the failure of many of these projects, most of which are not relevant to COTERC because it simply does not have the resources to make such large errors. One of the chief findings is that by failing to make rewards specific to the hunters and instead providing (unconditional) benefits that accrue to the entire community, individuals continue to hunt while still receiving all the benefits. Although projects did often succeed in increasing protection of larger target species, this was found to be by virtue of increased enforcement levels only and not because benefits were offered to the community. In response to the increased enforcement levels, hunters changed their tactics and prey selection, but the overall volume of meat harvested stayed the same.*

*For San Francisco this paper means the following: if the turtle project wants to achieve a decrease in poaching rates, the first people to be included from the village should be the people now poaching. It is unrealistic to start a CBC project in San Francisco that will benefit community members that are already better off and expect peer pressure towards the poachers to do the rest. A small, individual approach is necessary and probably the only one feasible for Caño Palma.*

Govan, H. (1998), "Community turtle conservation at Río Oro on the Pacific coast of Costa Rica", *Marine Turtle Newsletter* 80, pp. 80-81.

*Account of a small community on the Pacific Coast of Costa Rica that has initiated a turtle management organisation. Although it does not talk about the current form and activities of that organization (I suspect it might not be doing so very well), the article is interesting for its description of the order in which activities leading to the formation of the organisation were carried out: four years of turtle monitoring were carried out, leading to the publication of a small paper in Marine Turtle Newsletter with an analysis of the first years of research. Only after that was the organisation formed and were other activities commenced.*

*For Caño Palma a similar schedule may be advisable.*

Jones, C.B. and R.H. Horwich (2005), "Constructive Criticism of Community-Based Conservation", *Conservation Biology* 19(4), pp. 990-991.

*This article urges CBC projects to carefully evaluate the consequences for biodiversity conservation AND the **integrity of local communities** prior to implementing any project activities. The importance of monitoring the consequences of conservation programs for psychological factors (e.g. human values) related to conservation is also highlighted, as these are indicators of true long-term effects.*

*Especially the second point made, about the integrity of local communities is important for the turtle project. Although Costa Ricans are probably quite used to having tourists around, the impact of incorporating tourism or volunteering into the project (this is certainly*

something desired by Gerardo and some other villagers) on the community should be taken into account.

Kiss, A. (2004), "Is Community-Based Ecotourism a Good Use of Biodiversity Conservation Funds?", *TRENDS in Ecology and Evolution* 19(5), pp. 232-237.

*An article very critical of community-based ecotourism projects, saying that many apparent success stories actually involve only few (if any at all) conservation benefits, provide only a modest supplement to local livelihoods, and remain dependent on external support for long periods of time. As in the Salafsky article below, incorrect, or scientifically dubious reporting is mentioned as a major impediment to assessing a project's true worth.*

*Some requirements for CBC to work are identified: where only small areas of habitat are concerned and modest changes are sufficient to bring about required results, CBC (and, more specifically, ecotourism) may be a good solution. However, revenues generated through project activities are not often large enough to draw labour away from biodiversity unfriendly activities and when they are, earnings may be invested in activities that threaten biodiversity in other ways (expansion of agriculture, for example).*

*In short, very few projects end up even covering their costs, let alone making profits. CBC and ecotourism may generate income and contribute to community development, but only within limits and with considerable investment of support and time.*

Salafsky, N. and R. Margoluis (1999), "Threat Reduction Assessment: a Practical and Cost-Effective Approach to Evaluating Conservation and Development Projects", *Conservation Biology* 13(4), pp. 830-841.

*Written in response to the question whether 'integrated conservation and development' projects are actually contributing to conservation. The chief reason for this question, the authors argue, is that no appropriate methods exist for measuring the success of such projects. The paper describes a way to set objectives and evaluate project outcomes so that the effectiveness of project interventions can be determined.*

*Although in the case of a possible CBC project in San Francisco the above question will not likely be as pertinent (two very obvious main objectives would be: reduction of poaching rate and increase of benefits to community of San Francisco, both fairly straightforward to measure), it is good to remember to be very articulate in defining project objectives and expected outcomes, especially when grant money is involved. Working with **Logical Framework Analysis**, although somewhat painful at times, may be a good approach. The importance of having good baseline data (e.g. on initial poaching rates) is also emphasized.*

Sheil, D. and M. Boissière (2006), "Local People May be the Best Allies in Conservation", *Nature* 440, p. 868.

*The main message of this short correspondence is the idea that locals can be very valuable allies in conservation efforts, both because of their unique knowledge of the local resources and because they may physically protect them against intruders.*

*Although the people in San Francisco are not indigenous and have no ancestral bond with the land, let alone the turtles, if a feeling of ownership of the turtles on the North Beach can be fostered (in other words, when people can make money with activities other than poaching) they are indeed likely to be willing to protect them, either against fellow villagers or against poachers coming from elsewhere.*

### **Examples of community based turtle conservation in Costa Rica**

Although it is unlikely (and probably not desirable) for Caño Palma to begin a CBC project with San Francisco in the near future, it is helpful to know what some other projects in Costa Rica have done. Two successful organizations and their projects are discussed below: PRETOMA (Pacific coast) and ANAI's project in Gandoca, on the Caribbean coast close to the Panama border. Both projects include hatcheries and use paying volunteers to sustain project activities.

#### **PRETOMA (Programma Restauración de Tortugas Marinas)**

<http://www.tortugamarina.org/>

Pretoma is a non-governmental organisation (NGO) officially established in 1997 and operates three projects on nesting beaches on the Pacific coast of Costa Rica, all of them using a similar formula.

All three of PRETOMA's projects were initiated or requested by the local communities of villages close to the nesting beaches; in two cases, PRETOMA was approached by poacher families seeking to change their ways (PRETOMA, 1999). Punta Banco, the location of the first project, is a nesting site for Olive Ridleys and

has been monitored since 1996. In those first years, which were funded by various international donor organizations, the project hired several local community members each season to help with nightly patrols. As it became increasingly difficult to find funding every year —CBC stopped to be the ‘new thing’, many other projects embarked on similar projects, and donor agencies became more interested in other fields of research— and as the communities in which research was being conducted grew impatient for the benefits they were promised, PRETOMA decided to find a way to become financially self-sustainable.

The ‘Paying Participant Program’ (‘PPP’, started in 2003) has volunteers that come to the projects pay for the accommodation of their choice, either home stays in the local community, in a lodge, or at the research station (which is rented from the village) (PRETOMA 2005). Prices for staying start at US \$310 per week (!) and become less the longer a volunteer stays on. In the first year, the income generated from Punto Banco was already sufficient to financially support both the Punta Banco and a second project (I do not know how much of the money actually goes to the community).

The reasons for creating hatcheries in the projects managed by PRETOMA were twofold: poaching and predation rates were between 80 and 100 percent, and severe beach erosion had eliminated virtually all viable nesting habitat (Gaos et al., 2005). The same is true for ANAI’s Playa Gandoca (Chacón, 2006). Hatching success rates in these hatcheries were mostly above 80%, with some low years between 48 and 60 percent (Gaos et al., 2005).

Interestingly, the numbers of turtles nesting at either of PRETOMA’s nesting beaches is at or below the numbers observed on the North Beach: from 1996 to 2003, an average of 153 nests were laid on the Punto Banco beach per year, with a high of 233 and a low of 73 nests per year; other projects had comparable or somewhat lower numbers (ibid).

Because nobody was present at PRETOMA during the summer months I have not been able to visit them during my stay at Caño Palma. However, they have expressed their interest in our turtle project through email and have told us they are very willing to provide help when needed.

#### **Asociación ANAI – Gandoca beach**

<http://www.anaicr.org/>

ANAI, a Costa Rican NGO has been working on many community based development initiatives in the Talamanca region of Costa Rica since 1978. They helped establish the Gandoca-Manzanillo National Wildlife Refuge in 1985 and since that time have been running a sea turtle conservation project in the same region as well.

Fortunately, Didiher Chacón, the director of the ANAI turtle programme came up to San Francisco to give a presentation about Gandoca and the paying participant project they have been running for the past fifteen years. ANAI had been invited by MINAE (the Costa Rican Ministry of Energy and the Environment), not only to give a presentation to the community of San Francisco, but also to evaluate the situation on the North Beach and in San Francisco. Their report to MINAE will determine to a large extent whether MINAE is going to be supportive of efforts by Don Gerardo (and Caño Palma?) to implement a project similar to ANAI’s in San Francisco.

The central idea of the project in Gandoca is not very different from those managed by PRETOMA, although the primary reason for having paying volunteers was not to finance the turtle project but rather to have a source of income for villagers that would keep them from poaching (poaching rates were close to 100%); this explains why the Gandoca project seems to be more participatory than the PRETOMA projects.

Chacón made it very clear that the problem in Gandoca was not that people were poaching for drugs or alcohol. Gandoca is a relatively peaceful, homogeneous community and poaching was done out of sheer poverty. Nonetheless, he also made it clear that there had been and still is a lot of resistance against the project and that it required a lot of struggling to get the project accepted.

Volunteers come to Gandoca either through foreign volunteer organisations (approximately 60%) or through the ANAI website (40%). They choose accommodation in one of fifteen houses in the village and, to prevent confusion and people from claiming that ANAI is stealing their money, pay the family directly for their stay (US \$14 per night), even when the volunteer organisation through which they came charged them money as well. A one-time fee of US \$35 is paid to ANAI, in order to support research activities. During a year’s turtle season, which extends from February to August, the project receives well over 500 volunteers, generating up to US \$111,000 in the year 2005 (Chacón 2006). This alternative income far exceeds the income that would be received if all the eggs laid on Gandoca beach were sold on the black market (ibid).

Perhaps the most valuable advice I gained from meeting Didiher Chacón is that it takes a very strong, charismatic, intelligent and persevering person to run a project like the one in Gandoca and deal with the hassle that comes with it. This is something that must be realized by COTERC before engaging in any kind of CBC activity in San Francisco.

### **Opportunities in San Francisco**

The above exploration of community based conservation initiatives spells a mix of caution and hope for San Francisco. There are certainly opportunities for successful community engagement, there may be sufficient turtles to support a volunteer programme and support from the CCC, MINAE and probably other turtle programmes is available. On the other hand, it was not the community of San Francisco that asked COTERC to initiate a turtle project, San Francisco is a very different community than those from Gandoca and Punto Banco, and COTERC neither has the expertise to do CBC work, nor, at the moment, the resources to employ a full-time person that does.

In this section a few alternatives that can be pursued by COTERC in San Francisco are described in a very rudimentary way. Once a certain course of action is chosen ideas can be developed further. Ideally, each of the activities described below are followed by and complemented with the next activity, thus building on experience gained and increasing the level of community involvement and control in the project with each step.

### **Environmental education at San Francisco school**

Perhaps somewhat lost in between all the 'bigger plans', but no less important, are the classes that the station manager has been giving at the local school. San Francisco has some wonderful, very bright children and they have been the ones coming with us on turtle walks and persuading their parents to do the same. Some of the children will call the station when somebody in the village is about to kill a turtle. Although education may yield effects only in ten to fifteen years it is important and should be continued as long as possible.

### **Poachers becoming researcher**

This alternative involves a first direct, but very modest involvement of the community of San Francisco in the turtle project. It allows the current preliminary research on the North Beach to be continued, together with GVI volunteers. Moderate funding is required to compensate poachers for their work and time spent at the station (US \$200 - \$300 per month per person would be enough) and ideally for one COTERC employee managing the turtle project and selecting and training poachers; this funding could be requested in a grant proposal to the US Fisheries and Wildlife Service, making clear the research is preliminary and intended to lead to a larger scale CBC initiative.

As Gibson and Marks (1995) stress, it is important that benefits accrue to the people that are to give up poaching. One of the main hunters/poachers in San Francisco has approached the station asking whether we could give him a job: he was tired of hunting and did not want to continue doing it for the rest of his life. Besides him, two other poachers can be approached and trained in order to do the same work as the research assistants have been doing this season: guide night patrol groups with volunteers, tag turtles, take measurements and gather other information. Training could be given in January and February (the CCC would probably be willing to have them participate in their Leatherback training sessions, just as RA's have been allowed to attend sessions this year) and may involve a ten week stay at the station, including intensive English classes (GVI may be able to help here).

Such training would give the poachers important qualifications, enabling them to play an important role in the potential development of the North Beach turtle programme or apply to work in one of the other 41 (!) turtle projects in Costa Rica. If one or more poachers prove to be very suitable for working in the project, initial training can be followed up by teaching data entry and project management skills; this would be the most 'sustainable', long-term kind of empowerment I can think of within the context of the turtle project.

Potential difficulties with this approach may include: it is not easy! Poachers must be approached and consulted about these ideas, which, again, requires some skill in diplomacy. Also, some poachers will not be trustworthy; they are likely to be rough people to work with and may not be the best people to be sent out with volunteers. It would also be difficult to ensure that nests are not being poached regardless of the job and compensation.

After two more years of research, when reliable data is available and it is possible to reflect on the experience of employing poachers to do conservation work, a small paper can be submitted to a number of small journals. Apart from ensuring that data are actually used and analyzed, this would be a good way to establish the project, let the world know what is happening on the North Beach, and it will function as a stepping stone to any elaboration of the project.

### **Volunteers being hosted in San Francisco**

This is a rather large move up from the previous step, both in terms of resources and expertise required and level of community involvement in and ownership over the project. ANAI and PRETOMA should be consulted and, if possible, involved if the project is to move in this direction.

The main drive behind this idea has been Don Gerardo, and although it is difficult to trust the way in which he wants to achieve it, I do believe that, in the long run, this is one of the very few ways in which the turtle project can be self-sustainable and truly beneficial for the wider community of San Francisco.

There are many potential difficulties with this option, however, most of them due to the differences between San Francisco and the villages in above projects. To name a few:

- the lack of infrastructure in San Francisco requires initial capital investment in order to be able to host volunteers; the families that are now poaching and would really need money will not have the money to make those investments, instead villagers that are already better off will be able to lodge volunteers and increase their income even more.
- there are entire weeks during which no turtles are seen on the beach (which is not uncommon in ANAI's and PRETOMA's projects either). During such weeks, and in general during the day-time, alternative activities, apart from beach cleans, need to be available to entertain volunteers. 'Just' turtles may not be enough. ANAI and PRETOMA have hatcheries that require a lot of work during the days and .
- an important part of GVI's expeditions are dedicated to the turtle project and to many of their volunteers the turtle walks are the most impressive part of their stay at the station. GVI would have to give up the Caño Palma expedition if it loses involvement in the project. Ideally, GVI could find a way to provide volunteers to stay in the village, although this will require a lot of preparation that Gerardo may not have the patience to wait for.

It would probably not be COTERC's role to manage a project that goes in this direction. Rather, this would be the point where Caño Palma hands the project over to the community and changes into a role of advisor and facilitator.

### **Tourism**

Before discussing any options related to tourism, remember that the North Beach, although a public area, is not open to tourism. Current turtle tours organized by Turtle Beach Lodge are tolerated but not legal. Any more official form of tourism is likely to require a permit from MINAE and once this permit is given it may mean that several hundred tour guides from Tortuguero decide to come and have a look at 'the unspoiled North Beach' as well and that nobody from San Francisco will benefit. We initially looked at possibilities to offer guide training to people from San Francisco (the *Instituto Nacional de Aprendizaje* (INA) offers free courses that are required to obtain a guiding license), but realized that this is not a viable option since the course takes place in Limón over a period of six months (most people from San Francisco cannot afford to stay away from home for that long) and, once a license is attained, the competition with Tortuguero guides would be very strong.

I indicated before that research into the hatching rates of Leatherbacks could justify the creation of a hatchery (*only for Leatherbacks and Hawksbills*). A few turtle experts that were consulted have strongly advised against a hatchery on the North Beach and emphasized that it should only be seen as a last resort; they did not know, however, that hatching rates are as low as they appear to be now. If such a hatchery would be established it could be a big attraction for tourists and included in the standard 'Tortuguero turtle tourist package'.

Tom Mason suggested selling information on hatching dates to tour guides and hotels (regardless of whether a hatchery is started or not), which would be possible if people from the village (poachers) are part of the nightly patrols. Given the low hatching rates and very large variance in nest incubation periods (in 2005, the incubation period for Leatherback nests ( $n = 7$ ) observed by the CCC was 55 to 87 days, with a mean of 64 days (Haro and Troëng, 2006a), while the incubation period for Green turtle nests ( $n = 28$ ) ranged from 49 to 65 days with a mean of 57 days (Haro and Troëng, 2006b), a lot more research is needed to be able to do this. The only way to get around this variability may be through the daily monitoring of nests (which is labour intensive): a small depression usually appears in the sand on the location of the nest the day before it hatches.

Other possible ideas include the formation of a village cooperative, the "Turtle Protection Society", for example, that manages turtle activities, volunteer stays, and can be approached by tour guides and lodges for information on hatching dates and location.

An annual Sea Turtle Day could be organized by this cooperative and children from the local school, in cooperation with nearby lodges, MINAE and the station. During this day the village opens its doors, food and souvenirs are sold, presentations held and videos shown. This would require a lot of work and motivation

from the community itself, but can do miracles towards improving the reputation and self-confidence of the village (San Francisco's bad reputation came up in the discussion following ANAI's presentation to the community. Villagers seem quite concerned and in a way offended by that reputation and would like it to change).

These ideas seem, and probably are, a long way away. (Eco-)tourism is not an easy option for San Francisco and probably less preferable than a paying volunteer programme. However, small-scale tourist activities that do not directly depend on the viewing of sea turtles may be a feasible option for the village and compel people to diversify their livelihood activities, including the production and marketing of handicrafts.

Not everything in San Francisco has to be related to turtles. There are alternative livelihoods that can be developed for the poorer families (shrimp farming and the cultivation of medicinal vines found in the region may be options), but exploring these options goes far beyond the scope of this report.

## Other factors to consider

### Legal aspects

Two things are important to remember for the North Beach (both were mentioned in previous chapters): in Costa Rica exists a complete ban on the possession of turtle products, be it meat, eggs or carapace. Poaching on the North Beach is therefore illegal and poachers, when caught, can receive up to three years of imprisonment. Enforcement of this law is weak, however, as witnessed by the frequent signs in restaurants: “Hay huevos de tortuga” (turtle eggs available).

The second aspect concerns the management status of the beach itself. A new management plan for the Barra de Colorado wildlife refuge (which includes the North Beach) will be issued this autumn by MINAE, but no changes are likely to be made to the status of the beach (Calvo, 2006, personal communication). This means that the beach remains a ‘public area’, open to all public, without the protection status of the Tortuguero beach. Although tolerated, tourism is not officially allowed: tour guides need a permit to be able to give tours in specific areas of the country, but no such permit exists for the North Beach.

### Important stakeholders

Apart from the community of San Francisco, there are several other important stakeholders on which successful implementation of a CBC project would depend:

→ **MINAE:** Carlos Calvo, MINAE’s regional director for Tortuguero, visited Caño Palma in July. He seemed very impressed with the project and happy that the North Beach was finally being monitored. He was also rather shocked by the fast growth of San Francisco (the last time a MINAE representative visited the village was five years ago). Given the ‘ignore’ status that the Costa Rican government seems to have granted to San Francisco, it could prove difficult to gain MINAE’s support for community based turtle activities, yet the fact that MINAE requested ANAI to come to San Francisco may indicate their willingness to improve the situation in the village. Calvo told us that MINAE is happy to provide contributions towards equipment costs, but does not have the resources to offer any further financial support to the North Beach project.

→ **CCC:** during the past two years, the relation with the CCC has been very good. The CCC has been supportive of the project (again, they are happy that the North Beach is receiving some attention), shared information and offered training to Caño Palma’s research assistants. Their continued support is necessary for the future of the project and, given their interest in reducing poaching rates on the Tortuguero beach (many of San Francisco’s poachers also poach on the Tortuguero beach), working with the community of San Francisco may be a good opportunity to work together.

→ **GVI:** GVI has supported the project with a biologist and the volunteers necessary to patrol the beach at night and in the morning. For the activities of which the project now consists such support is essential. From their side, the turtle project is very suitable to be done with volunteers who have no previous training in the field and the turtles have become an important part of the Caño Palma ‘expedition’.

There is a great opportunity to cooperate on similar projects in the future: if research protocols can be designed together, COTERC offering its research experience and expertise and GVI indicating the limits that volunteer based research brings with it, much can be done at Caño Palma.

→ **Hotels:** both Cabinas Vista al Mar and Turtle Beach Lodge have given important support to the project. The tagging equipment has been purchased from donations from Turtle Beach Lodge, while Cabinas Vista Al Mar is offering food and lodging to the policemen that have begun patrolling the beach in August. Turtle Beach Lodge has been very eager to cooperate with Caño Palma on the project, asking for presentations to be held at the hotel and offering to carry out research patrols on the northern part of the beach. Although the motivation behind this eagerness is certainly mostly self-interest—offering tourists a ‘turtle research tour’ is apparently much more exciting than just watching turtles—and it would be unwise to have the hotels carry out research, it is worth seeking ways to increase their (tourist’s) participation, even if just for educational purposes.

## Conclusion

After almost three years of monitoring Tortuguero's North Beach the results of the turtle project are very promising. Much effort on behalf of project coordinators and the increased involvement of volunteers have allowed activities to be expanded from morning censuses to working with turtles at night, allowing valuable data to be collected and giving volunteers an unforgettable experience of hands-on conservation work.

The fact that the North Beach has never been officially monitored, in combination with the numbers of nesting turtles and the opportunities for community based conservation activities present in the community of San Francisco, should be sufficient reason to obtain financial support to continue project activities for at least one or two years.

The results obtained so far suggest several conclusions:

- numbers of turtles encountered fluctuate strongly from year to year, but are sufficiently high to merit attention.
- poaching incidence on the North Beach is high. This year's numbers appear lower, possibly as a result of increased presence of Caño Palma staff and volunteers on the beach.
- due in important part to poaching, but possibly also because of high tides, beach erosion and debris on the beach, hatching success of especially Leatherbacks appears to be very low.
- to substantiate these conclusions and to determine with more accuracy nesting incidence, poaching rates and hatching success of the different species of sea turtles, the current project activities must be continued for at least two more years. The possibility of a hatchery for Leatherbacks and Hawksbills should not be excluded.

For the current project to become a successful conservation, rather than research project it is essential that the community of San Francisco be involved in and benefit from project activities, even if that community is far from a model society and collaboration with it will not be easy. Employing poachers to conduct research activities for the station seems a good (and manageable) initial step towards community involvement, allowing for the continuation of data gathering while at the same time offering an alternative source of income to the people responsible for an important part of the poaching. Over time, when enough is known about the turtles nesting on the North Beach, activities could be expanded to include a paying volunteer programme in San Francisco and perhaps even some forms of tourism. By this time, Caño Palma should hand over project responsibilities to the village (or another, more experienced organisation) and act only as an advisor and facilitator.

Caño Palma cannot continue managing, let alone expanding the turtle project without a qualified and committed staff member. Ensuring that the project is properly manned should be priority over the coming months; if this is not (financially) possible it is preferable to hand over the project to another organisation.

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