Ms. Belinda Dick
P.O. Box 1108-1002
Paseo de los Estudiantes
San José, Costa Rica

December 12, 2008

Dear Ms. Dick:

Enclosed you will find our report entitled Increasing Sea Turtle Conservation Knowledge: The Creation of an Interactive Webpage and Informational Brochure. This report was generated for the Inter-American Convention for the Protection and Conservation of Sea Turtles between the dates of August 28th and December 10th 2008. Preliminary research was completed on the Worcester Polytechnic Institute campus in Worcester, Massachusetts in the United States. Professor Isa Bar-On and Professor Thomas Robertson, our project advisors, will simultaneously receive a copy of this report for evaluation. Upon faculty review, the original report will be electronically catalogued in the Gordon Library of the Worcester Polytechnic Institute. We would like to thank you for the opportunity to work with your organization and the time you have committed to us.

Sincerely,

Matthew Cembrola

Nicole Klegraefe

Jameson Kokolis

INCREASING MARINE TURTLE CONSERVATION KNOWLEDGE: *THE CREATION OF AN INTERACTIVE WEBPAGE AND INFORMATIONAL BROCHURE*

Matthew Cembrola, Nicole Klegraefe, and Jameson Kokolis

REPORT SUBMITTED TO:

PROFESSOR THOMAS ROBERTSON

PROFESSOR ISA BAR-ON

SAN JOSÉ, COSTA RICA, PROJECT CENTER

BY

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IN COOPERATION WITH

BELINDA DICK, TECHNICAL ASSISTANT, INTER-AMERICAN CONVENTION FOR THE PROTECTION AND CONSERVATION OF SEA TURTLES

MARCO SOLANO, SECRETARIAT PRO-TEMPORE, INTER-AMERICAN CONVENTION FOR THE PROTECTION AND CONSERVATION OF SEA TURTLES

INCREASING MARINE TURTLE CONSERVATION KNOWLEDGE: THE CREATION OF AN INTERACTIVE WEBPAGE AND INFORMATIONAL BROCHURE

10TH DECEMBER, 2008

ABSTRACT

The rapid decline of the world's marine turtle populations over the past century has set off an alarm of great concern. The Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) is an organization made up of thirteen member nations that are unified in an effort to promote marine turtle survival and population replenishment. The primary goal of this project was to provide a resource that would provide recommendations and guidelines about how to implement and manage a marine turtle conservation program for parties interested in marine turtle conservation on local and national levels. Both a concise brochure and an interactive webpage were designed by the group based on research and interviews conducted in San Jose, Costa Rica. Through these venues of communication, the group hopes to aid in promoting awareness between member nations of the IAC and in promoting responsible marine turtle conservation practices.

ACKNOWLEDGMENTS

The success of this Interactive Qualifying Project would not have been possible without the contributions of several individuals over the past three months. We would like to take the time to thank these individuals for their time and efforts and making sure that our experience was both successful and rewarding.

First, we would like to thank our sponsors, Belinda Dick and Marco Solano, who provided us a wealth of resources for our project. Their guidance and feedback was crucial in determining the structure and content of both the brochure and interactive website. Their contacts among the marine turtle conservation field were invaluable to our understanding of current practices and attitudes towards conservation efforts.

We would also like to thank our Worcester Polytechnic Institute advisors, Professor Isa Bar-On and Professor Thomas Robertson, for their continued guidance throughout this process. Their feedback pushed us to continuously improve the quality of both our writing and our project overall. Also, we would like to acknowledge Professor Susan Vernon-Gerstenfeld for her contribution to our project.

Lastly, we would like to thank all of our interviewees for their time and contribution to our project. Their extensive knowledge about marine turtle conservation practices around Costa Rica and their willingness to share was essential to complete our project. And also to the Las Baulas National Park at Playa Grande, Costa Rica, for allowing us to observe the nesting of an endangered leatherback marine turtle.

EXECUTIVE SUMMARY

After 150 million years of survival, marine turtles have suffered their greatest decline in population in only the past 100 years (Caribbean Conservation Corporation, 2008). While marine turtles do face natural threats like predation, there is great cause for concern over the effect that humans are having on their populations.

The establishment of an ecotourism project centered on marine turtles is an extremely important economic opportunity in many turtle nesting-site communities. In recent decades, the number of local communities establishing marine turtle projects has grown sizably, thanks to heightened interests in tapping into the growing industry's revenues. However, with growing interest in these species and their habitats comes equivalently expanding coastal development necessary to support ecotourism industries. The cofactors accompanying the burgeoning development, including light pollution, water contamination and beach degradation, have become increasingly detrimental to the environment and are continuously threatening the survival of marine turtle species. Many communities establishing conservation programs are not fully aware of these problems, and lack a source of best practices and guidelines to aid in developing programs that are mutually beneficial to the community and the marine turtles.

Also, while there are many resources providing technical information about marine turtle conservation and biology, and many separate sources about community action and development of ecotourism projects, much of the published information is written using scientifically advanced terms, making it difficult for a lay audience member to understand. A single source that united and related both types of information using simplified terminology did not exist.

In response to problems like those above, the Inter-American Convention for the Protection and Conservation of Sea Turtles was established in 2001 to meet the growing need for international cooperation in marine turtle conservation. The IAC aims to provide a venue for the exchange of information about conservation between member countries, facilitating the success of developing programs. Our goal was to work with the IAC to create a resource for potential conservationists that would provide simple, yet essential recommendations and guidelines for implementing and managing successful marine turtle conservation programs.

Objectives

A successful conservation project can be defined as one that betters the lives of both the marine turtles as well as the lives of the community members living in the nesting beach community. Ideal projects find a balance between conservation practices and the development that is needed to support project operations. In order to provide guidelines for the successful conservation of marine turtle species, our group addressed the following research objectives:

1. Determine a target audience by considering which individuals will find the recommendations and guidelines useful, and understand what particular information that audience will be seeking.

2. Collect data needed by the audience by means of research, interviews with conservation project administrators, community activists and government officials, as well as by visiting conservation programs located on Costa Rican nesting beaches.

3. Determine problems and best practices related to tourism, development, and community.

4. Determine the most effective medium by which information could be communicated to the audience by considering design strategies and usability.

5. Subject brochure to expert evaluation and critique, prior to final publication and distribution.

Finding 1: ***Non-expert community members, government officials and potential project developers need a resource that presents the most important guidelines for successful marine turtle conservation in a concise and accessible fashion.***

1. Community members in potential marine turtle project areas, including stakeholders who stand to have interests threatened by project inception.
2. Government officials with the potential for involvement in the oversight of marine turtle projects.
3. Individuals considering the establishment of a private marine turtle project, conservation or tourism-based, that would benefit from a collection of best practices and guidelines.

We define the stakeholders with threatened interests as belonging to one of two general categories: those with threatened business interests and those with threatened personal interests. Stakeholders with threatened business interests include real estate developers, beach side business owners, and local fishermen. Stakeholders with threatened personal interests are property owners in the potential project communities.

Finding 2: ***The best conservation projects involving a tourism component carefully consider carrying capacity, visitation management, and tourism revenue allocation.***

The carrying capacity is a critical factor to be considered when developing tourism around a conservation project because if accommodations for tourists exceed the number set for the carrying capacity, it will become very difficult to control access to the beach at night. Visitation management practices that can decrease the impacts of visitors on the nesting turtles include implementing turtle spotter programs and monitoring the daytime beach activity in nesting areas. Growing interest in ecotourism and marine turtle tourism has lead to relatively high revenue gains for many communities, however there is a lack of transparency in exactly to where and whom those funds are allocated. Higher availability of financial information betters social relations among project parties, and the project's chances for success.

Finding 3: ***Many problems for marine turtle conservation arise from coastal development and construction, including light pollution, habitat loss and degradation, and beach pollution.***

One reason that partially explains the decreasing numbers of female turtles coming ashore to nest is light pollution, the excess unnatural light given off by beach front buildings. This problem is even more serious to newly hatched turtles, which can easily become disoriented and mislead by the lights. Lighting regulations including time restraints and bulb types are reasonable solutions to this problem. Erosion control measures such as sand importation and the construction of sea walls destroy turtle nesting habitats by restricting access to nesting sites, changing nest sand temperatures, and burying lain nests. Researching sand types and acknowledging known nesting sites prior to action helps to alleviate some of these issues. Beach pollution also poses direct threats to the health of marine turtles. It is now suggested that coastal pollution may be partially responsible for fibropapillomatosis, a disease in marine turtles

characterized by abnormal growths, generally in the head and neck area. Pollution control measures are numerous, though most begin with providing trash receptacles and encouraging proper disposal methods.

Finding 4: ***The most effective marine turtle conservation projects provide communities with environmental education and participation opportunities, and carefully consider community members with threatened interests.***

Topics for education include financial benefits of conservation, ecological importance and intrinsic values. Financial benefits provide a tangible incentive for participation while ecological importance stresses the necessity of participation. Intrinsic values speak to the sentimental, inherent values of the marine turtles. Opportunities for community participation in projects include employment as a turtle spotter, tour guide, or hotel employee, among others. Equality of compensation and responsibility in conservation projects lessens the risk of conflict among researchers, project leaders and community members. Considering the threatened interests of stakeholders like local fisherman, real estate developers and property owners is a complicated issue that requires compromise and mediation by non-biased organizations that equally represent involved groups.

Recommendations and Conclusions

The goal of this project was to provide a comprehensive yet simplified source of guidelines and recommendations for developing a successful marine turtle conservation project. We found that while there were numerous advanced level sources available, there was no single source that brought together the most necessary and practical information concerning marine turtle conservation. We have created a resource that will appeal to community members, government officials, project leaders, and scientists alike, while not failing to reach completeness in its simplicity. The IAC is the party most able to make the brochure internationally available, accomplishing that through multiple language translations and distribution to all projects in all thirteen member countries. The potential of the brochure to aid in permanently reshaping how not only Costa Rica, but the World, thinks about marine turtle conservation and tourism success is truly limitless.

AUTHORSHIP

All writing and research completed for this project was done in equal parts by Matthew Cembrola, Nicole Klegraefe, and Jameson Kokolis. Sections were written individually, and all members were responsible for editing and rewriting all sections of the report as well as for the two deliverables of the project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1: INTRODUCTION

Marine turtles are among the many marine species adversely affected by the threats of coastal development. Of the seven marine turtle species in existence, six of them are listed as either endangered or critically endangered (IAC, 2008). After 150 million years of survival, marine turtles have suffered their greatest decline in population in only the past 100 years (Caribbean Conservation Corporation, 2008). The hazards facing the world's marine turtle populations can be categorized as natural threats or human-caused threats. The primary natural threat is predation. Commercial fishing, marine debris, artificial lighting, coastal armoring, beach nourishment, pollution, and beach activities are all examples of threats to turtles inflicted by humans.

Ecotourism is an extremely important economic opportunity in many areas where turtles are nesting, and often the turtles are the "main attraction". According to the International Ecotourism Society, ecotourism and nature-based tourism were growing three times as fast as the world tourism industry as a whole in 2004 (TIES, 2006). The number of local communities establishing sea turtle conservation projects has risen because of the interest in tapping into the growing ecotourism industry. However, with the influx of interest in natural landscapes, the development needed to support the growth in the ecotourism industry is becoming increasingly detrimental to both marine turtle species and the environment.

Coastal areas are popular destinations among both regular tourism and ecotourism industries. However, with continual growth in local populations and increasing numbers of tourists, over-utilization of resources in these coastal areas puts a strain on the natural environments to the point of destruction (Worm, et al., 2006). The effects of development on coastal environments include pollution, water-shed alteration, marine litter, overexploitation of

fishing resources in addition to general habitat loss (Harewood & Horrocks, 2008), all of which contribute to losses among the species dependant on coastal habitats, such as marine turtles.

The Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC) was officially established in 2001 to meet the growing need for international cooperation in the protection of marine turtle species throughout all of their lifecycles (IAC, 2008). According to Belinda Dick, the Technical Assistant of the IAC, many communities that provide nesting grounds and natural habitats for turtles lack access to clear information to about regulations and general best practices in marine turtle conservation (Dick, 2008). Communities establishing marine turtle conservation projects are doing so without being fully educated about how to ensure the program is mutually beneficial for the community as well as the environment.

According to Article VI of the text of the IAC, one of the responsibilities of the convention is to promote "the exchange of information and educational materials regarding efforts undertaken by the Parties to increase public awareness of the need to protect and conserve marine turtles and their habitats…" Thus, the goal of our project was to create a resource that provides recommendations and guidelines to organizations and individuals interested in implementing and managing a marine turtle conservation program. To reach this goal, our group focused on four key objectives. Our first objective was to determine our target audience and what information they needed. Our second objective focused on collecting the data needed by our audience, by means of research, interviews with conservation administrators, community activists and government officials, and visiting conservation programs located on Costa Rican nesting beaches. Our third objective was to determine the criteria to include the data and to make decisions about how to organize the content. Lastly, we would decide how to effectively communicate the information we collected and organized to our target audience.

CHAPTER 2: BACKGROUND

This chapter will describe the importance of marine turtles and marine turtle conservation efforts, the effects of tourism and development on the coastal habitats of marine turtles, and the importance of communities in conservation efforts.

THE IMPORTANCE OF MARINE TURTLES

Marine turtles play several important roles in nature that are directly related to human activities. First, marine turtles serve as a crucial step in both marine and coastal ecosystems. According to the WWF (2008), once hatchlings survive to reach open water, they prey on small creatures found in their seaweed habitats. Young turtles then serve as an energy source to larger predators such as birds, sharks, and fish. Marine turtles' disappearance from these ecosystems could have extensive, negative effects on the balance of involved species. Human beings rely heavily on the oceanic ecosystems as a food source, and disruptions to the marine ecosystem could be quite costly.

A second ecosystem that the marine turtle affects is that found in the coastal or beach areas. Because of its amphibious lifestyle, the marine turtle serves as an extremely important biological nutrient transporter, bringing food energy drawn from marine sources to the dry land in the form of lain eggs. In this sense, the turtles provide direct connection between ocean and land ecosystems (WWF, 2008). This further supports the idea that turtles affect ecosystems on which humans are heavily reliant.

The third important role marine turtles have affects an economic system, rather than an ecosystem. Marine turtles represent an expanding portion of local tourism industries, bringing jobs and income to the coastal nesting-site communities in tropical regions through tourism (WWF, 2008). For example, some former turtle poachers and egg collectors in Costa Rica now generate their income by providing tours of nesting sites on local beaches (Lutcavage & al.,

1997). Should marine turtles become extinct, it would be difficult to anticipate the economic impact in these affected regions.

EFFECTS OF ECOTOURISM ON MARINE TURTLE NESTING BEACHES

According to the World Tourism Organization, international tourism arrivals have increased from 25 million to 806 million travelers in the past 55 years (2007). Tourism is generally thought of as travel for recreation or leisure, domestic or international, and has become increasingly popular as it becomes more economically and physically feasible for the general population (Ceballos-Lascuráin, 1996). As the interest in travel continues to grow, so has the attention to the fragility of our world's resources and the desire to protect them (The Nature Conservancy, 2008). The rise in environmental awareness has subsequently led to ecotourism being the fastest growing sector of the world's tourism industry (GDRC, 2008).

Ecotourism is a special kind of tourism that encompasses environmental protection as well as cultural awareness (GDRC, 2008). Martha Honey (2008) writes that nature has become a main component in the industry of tourism, and that ecotourism has come about to supply the kind of "authentic," natural experience that many tourists have begun to look for in their vacation destinations. It is important, however, to note the difference between nature-based tourism and ecotourism, as the terms are often mistakenly thought of as synonymous. Ecotourism is one sector of nature-based tourism, which includes any tourism that involves nature, both in consumptive and non-consumptive ways (Ceballos-Lascuráin, 1996). Ecotourism is an example of nature-based tourism that aspires to be non-consumptive and sustainable (*See Appendix B for detailed criteria of ecotourism*). If planned and implemented correctly, ecotourism can produce several benefits for host communities as well as contributing to overall environmental consciousness and conservation.

Ecotourism has become progressively more popular among rural areas around the world, especially those with little or no other source of income, because of its financial appeal (Stem, Lassoie, Lee, & Deshler, 2003). Ecotourism has the potential to bring wealth into a community through increased employment opportunities and increased local business revenue because of the need for tourist accomodations and services. In addition to providing local income to communties, ecotourism can also provide financial support for protected areas, whether they are already established or need the financial backing to be established. Beyond the financial benefits, ecotourism can also promote conservation on a private level as well as protects and sustains the natural resources it emphasizes (Stem, Lassoie, Lee, & Deshler, 2003).

Unfortunately, as more and more communities attempt to set up ecotourism in their areas, many are not completely successful. Often, communitities fail to take into consideration all of the necessary components of ecotourism, or the tourism is not adequately planned for and managed. A study done in Tortuguero National Park in 1993 revealed that there was a direct link between the presence of tourists and the number of turtle nesting occurances (Jacobson & Lopez, 1994). The presence of tourists on the beach deterred turtles coming from the sea to nest. While Tortuguero National Park has seen consistent increases in turtle nesting in recent years, the over 33,000 visitors who come to the park each year prevent significant increases in marine turtle numbers (Castro, 2005).

Without the proper development of appropriate tourism programs in communities, conservation programs and ecotourism are destined to fail (Rivera, 2008). When an ecotourism venture is not operated properly, it often has the opposite effect than intended, increasing the biological “footprint” in the environment, adversely effecting the plant and animal species within

the habitat (Troëng & Drews, 2004). Special attention and management must be provided in the areas of community and development to ensure complete success of an ecotourism program.

HAZARDS OF DEVELOPMENT ON COASTAL HABITATS

The role of development in coastal communities has had profound impacts on marine turtle habitats. The demand of tourism is followed by a need for construction, but overdevelopment can be seriously detrimental to the surrounding environment. If it is not managed correctly, development around marine turtle nesting sites can become a major threat by creating pollution and degrading the beach.

One challenge, as seen in several locations in Costa Rica, is that establishing National Parks does not always fully protect nesting beaches. In the case of Playa Grande, located within Las Baulas National Park in Guanacaste, Costa Rica, development within the park itself continues to be a problem (Tropical Science Center, 2002). The creation of buffer zones, while not always easy to enforce, is essential, and can serve many functions. Buffer zones aim to prohibit human activity on beaches during nesting season as well as to decrease development around the park. In addition to protecting marine turtle habitats, buffer zones can contain other flora and fauna in need of protection.

Regarding beach degradation, erosion control measures such as the construction of sea walls and sand importation are becoming increasingly common in areas where the economic value of beachfront is high. These practices, referred to as beach armoring and beach nourishment, have been shown to alter sand temperatures, hinder turtles from reaching favorable nesting sites, or even destroy nesting sites entirely. One example of this is the loss of nesting ground due to sea wall construction in Jupiter Beach, FL (Caribbean Conservation Corporation, 2008; Lutcavage & al., 1997).

Figure 1 Beach Nourishment creates an obstacle for nesting turtles (Godfrey, 2003)

Additionally, any sites that center themselves on tourism, or plan to start tourism programs, need to consider carrying capacity. Carrying capacity can be defined as the limit of human activity before environmental degradation occurs, including visitor accommodation (Ceballos-Lascuráin, 1996). However, this figure not only establishes a limit, but contributes to the effort to sustain the use and quality of the area. As an example, not only do the numbers of visitors that can have access to beach space need to be considered, but also how many people can see each turtle or participate in a tour (Jaén, 2008).

Industrial development in areas not fully equipped to handle it can have devastating effects on both the environment and the community (Rivera, 2008). Pollution appears in several different ways in nesting beach communities, including through lighting, noise, and general garbage. Bright, white lights facing towards the beach can distract female turtles coming on the beach to nest and can also draw hatchlings away from the beach when they are trying to find the ocean (Jaén, 2008). Increases in noise and traffic on and around the beach often frightens marine turtles and causes them to have false crawls, which means they come up to nest but do

not lay eggs. Also, it is now suggested that coastal pollution may be partially responsible for fibropapillomatosis, a disease in marine turtles characterized by abnormal growths, generally in the head and neck area (CCC, 2008). According to Aguirre and Lutz (2004), the disease is more common near densely populated coastal areas that are typically polluted and producing greater amounts of urban runoff.

Figure 2 Fibropapillomas on a juvenile Green Sea Turtle (Gitirana, 2008)

COMMUNITY INVOLVMENT IN CONSERVATION EFFORTS

The interaction between the human members of nesting beach communities and marine turtles, as well as the way those community members are using the turtles, are of particular importance to this project. According to Montoya and Drews in "Livelihoods, Community Well-Being, and Species Conservation," the definition of a community is not a simple one, as a community is constantly changing, especially in terms of the perceptions of any set of individuals inside or outside of that community (2006). The community can be defined in any number of ways including geographically, ethnically, religiously or racially. Specifically, a "marine turtle nesting site community" refers to the set of individuals whose livelihoods take place in conjunction with locations of marine turtle activity, both on-beach nesting and marine foraging (Montoya & Drews, 2006).

Montoya and Drews, authors of "Livelihoods," express the crucial need for the immediate, earnest involvement of all community members, prior to the commencement of any conservation project. The authors stress steps of identifying, monitoring, and improving the relationships between "outside actors," such as scientists, researchers and conservationists, and community members. Establishing partnerships, creating a community plan, and implementing adaptive data-based management can help to facilitate community support for the conservation program, which is essential to its success (Montoya & Drews, 2006).

Many developing coastal communities in Costa Rica have become aware of the opportunity for significant financial gain from the introduction of a non-consumptive local marine turtle tourist attraction. Many communities are also making this realization after years of consumptive use such as egg harvesting and marine turtle poaching. This shift in thinking about the impacts of marine turtle populations on local communities has brought about the ideal wherein "a live turtle is worth more than a dead turtle." According to Laura Jaén, president of the Association of Lady Friends of the Baulas Park, the protection of one nest of eggs provides the same monetary benefit as would harvesting every egg from six separate nests (Jaén, 2008). The Association of Lady Friends of the Baulas Park is an example of community members benefiting from the live marine turtle and the tourist attraction that it creates. The group, based at Las Baulas National Park, Costa Rica, is comprised mainly of former turtle egg poachers who have shifted their efforts to guided tours and marine turtle education for the community and visitor populations.

Benefits from community based tourism of marine turtles is not limited to Las Baulas National Park, however, as many other local communities in Costa Rica and throughout nesting site countries have seen significant tourism-based revenues within the last decade. In 2002, non-

consumptive marine turtle use in Tortuguero, Costa Rica generated gross revenues of $US 6.7 million, while the community based "Projecto TAMAR," in Brazil generated $US 2.6 million. In comparison, the highest revenues generated by consumptive use in Bali, Indonesia barely eclipsed $US 1.7 million (Troëng & Drews, 2004). Along with the influx of physical income coming directly from a tourist attraction comes the opportunity for employment for local community members. With the implementation of a community based marine turtle attraction comes the development of hotels, restaurants, guide services, transportation services and concessions, among many other services. All of these tourist accommodations require the employment and services of permanent residents of the local community. For example Troëng and Drews estimate 1,280 jobs stemming directly from Brazil's Project TAMAR (2004).

Table 1 Gross Revenue of Marine Turtle Use (adapted from Troëng and Drews, 2004)

Location	Type of Use	Local	National	International
Cuba	Fishery for export		$318,500	$756,955
Ostional, Costa Rica	Domestic egg sales	$202,323	$809,292	
Tortuguero, Costa Rica	Tourism	$642,417	$3,050,549	$3,029,394
Playa Grande, Costa Rica	Tourism	$325,104	$792,441	$914,355

When implementing a marine turtle conservation program, special attention must be paid to members of the community who oppose conservation efforts. It is important to recognize and understand the concerns of community members who do not welcome the idea of a conservation program. Most often, these individuals perceive a conservation program as a threat to their livelihood (Campbell, 1999). This is particularly true in less developed areas, as community members may still be dependent on consumptive uses of marine turtles, for food or for income. The black market for the meat, oil and eggs from marine turtles continues to drive consumptive

activities in nesting communities (Fitzgerald, 2005). In 2005 the Commission for Environmental Cooperation reported that even with an increase in the penalties related to marine turtle poaching in Mexico, including up to nine years in prison, hundreds of carcasses were still being found carved open by poachers (Fitzgerald, 2005). Every stakeholder in a community needs to be educated about the benefits and risks of a conservation program need to be addressed adequately, so that support will be strong and sustainable (Campbell, 1999).

Involving and accepting a local community into a conservation project is a difficult, but necessary step in having a successful program. However, there are a number of other obstacles and challenges to be overcome prior to the complete success of a project. As important as engaging the local community in the process of developing a marine turtle nesting beach, is the need to find and maintain balance between the necessity of new development and the threats it has on the environment.

MARINE TURTLE CONSERVATION EFFORTS

Long established organizations such as the World Wildlife Federation (WWF), the Caribbean Conservation Corporation (CCC), and the National Oceanic and Atmospheric Administration (NOAA) have access to many resources to aid in the implementation of marine turtle conservation programs, and are often successful in launching programs worldwide. The WWF has the Marine Turtle Regional Action Plan for Latin America and the Caribbean, which supports conservation efforts in Mexico, Costa Rica, Panama, Colombia, French Guiana, Suriname, Guyana, Ecuador, and Peru (WWF, 2008). These efforts include community work, as well as national legislation support (WWF, 2008).

Decades of experience through these organizations has made available information on the successes and failures of different conservation strategies which have provided the foundation

for several publications about conservation. However, there is a lack of comprehensive resources that highlight the best practices of conservation efforts, as each program and organization focuses on a particular issue. For example, in Junquillal, Costa Rica, the WWF has sponsored projects to educate the community about conservation and its importance, as Junquillal is one of the most important leatherback nesting sites in Costa Rica, but is not part of the protected areas in the country (Montoya & Drews, 2006). The research and programs that have run in Junquillal have to led to the publication of "Livelihoods, Community Well-Being, and Species Conservation," which is a document focusing on how to increase community involvement in conservation efforts.

The IAC has identified the need for a comprehensive resource of best practices and regulations related to marine turtle conservation. This will not only be a resource for national governments involved in the convention, but would also be a resource for community members with interest in starting a conservation project on a local level (Dick, 2008).

CHAPTER THREE: METHODOLOGY

The goal of this project is to educate and inform an audience that lacks scientifically advanced marine turtle knowledge by providing simplified yet essential guidelines for developing successful marine turtle conservation projects. A successful conservation project can be defined as one that betters the lives of both the marine turtles as well as the lives of the community members living in the nesting beach community. Ideal projects find a balance between conservation practices and the development that is needed to support project operations. In order to achieve this goal, the group addressed the following research objectives:

1. Determine the target audience by considering which individuals will find the recommendations and guidelines useful, and understand what particular information that audience will be seeking.

2. Collect data needed by the audience by means of research, interviews with conservation project administrators, community activists and government officials, as well as by visiting conservation programs located on Costa Rican nesting beaches.

3. Determine problems and best practices related to tourism, development, and community.

4. Determine the most effective medium by which information could be communicated to the audience by considering design strategies and usability.

5. Subject brochure to expert evaluation and critique, prior to final publication and distribution.

DETERMINING THE TARGET AUDIENCE

In establishing foundations for project research, we defined the potential audience for the recommendations and guidelines and identified what information those audience members sought. We formed a clear understanding of the audience and needed information before beginning this project so that the final product would be as effective as possible in addressing the most essential issues and filling in the known information gaps. The main strategy for audience and issue identification was discussion with liaisons. In these discussions, we were provided with the basis for the problem warranting the creation of the brochure, wherein those in need of guidance were identified, as was the type of material they sought. With a distinct indication of who we would be creating recommendations for and what facets of information were going to be most beneficial to them, we knew better where to focus our efforts when we began collecting data.

COLLECTING DATA

Data collection was necessary in familiarizing ourselves with the background issues associated with marine turtle conservation, and to help ultimately make pertinent recommendations for successful conservation projects. On-site, we used a large number of materials suggested by the liaison including reports, brochures, pamphlets, and annual proceedings from the IAC as sources for background information. In relation to the marine turtles, reports discussed in depth details of economic use and community benefits, while pamphlets and brochures tended to focus on biological aspects and survival issues. Annual proceedings gave a view into the organizational and governmental aspects of marine turtle conservation by displaying an index of yearly marine turtle law and regulation changes and ratifications in all IAC member countries. By combining data from materials provided on-site by our liaison with information gathered from sources found in our early initial research, we became

better educated on the significant issues surrounding conservation projects. To further our understanding of these issues, and to confirm information found in research, we began our primary research by conducting interviews and spending time in the field.

Interviews

We gathered the majority of our first-hand information through interviews. The group determined each interviewee based on his or her area of expertise, availability and recommendations by our liaison. We interviewed individuals from three different backgrounds, which included members of non-governmental organizations, government officials affiliated with coastal conservation areas, and local community conservation activists. When necessary, interviews were conducted at the site of interest, but otherwise were held in San José.

Interviews were performed on a semi-structured basis. The group generated a general list of interview questions as a basis for each of our interviews (*Found in Appendix C*). Additionally, before each interview, we prepared a list of questions specific for the area in which the interviewee worked, to broaden understanding of their particular efforts and to obtain the most information we could from each interview. Interviews were performed in compliance with the Institutional Review Board (IRB) at Worcester Polytechnic Institute. After each, interviewees were asked for permission to use their information in this report as well as in any of the delivered items for the project. No audio-recording devices were used, but each group member took written notes. Some interviews were in Spanish while others were in English.

Field Visits

The use of field visits served the purpose of allowing the group to witness and understand conservation efforts in practice, as mutually agreed among all group members, advisors and sponsors. Through these visits, we gained knowledge about micro-management practices for conservation projects and observed how the local communities were participating and/or involved in the programs. The sites were chosen based on availability of active conservation projects in Costa Rica. At the project sites, the group participated in local turtle-related tourist opportunities provided through the local national park or another conservation program.

DETERMINING PROBLEMS AND BEST PRACTICES

As data was collected, the group needed to decide which information to include in the final products. Much of the information found was helpful for background knowledge and provided good site-specific examples, but was not always beneficial for the target audience. To facilitate the process of choosing the appropriate data, we developed criteria for information inclusion in the brochure and also made decisions about the organization of the content.

Criteria

Of the information collected, the group found many examples of benefits and threats to marine turtles. Both of these were significant, as we wanted to demonstrate problems that marine turtles face, as well as possible solutions. To determine which practices were positive and which were negative, we relied mostly on first-hand data collection, especially interviews.

In deciding what to present, the group avoided information that was too specific to one location. For example, a conservation practice that has worked at one beach may be totally irrelevant at another. Because of this, general issues were chosen in an effort to reach a broader audience. Readers were provided with information capable of logically pertaining to any given area involved in marine turtle conservation, by including many of the frequently recurring

suggestions from experts representing a diverse array of communities and backgrounds.

Organization

After using the criteria to decide what information to include, we needed to choose a way to organize the content. It was decided to divide material into sections based on the data that was collected. This consideration followed with three questions: how many sections would we require? What would the sections be? And, what general issues would be included in each section? Overall, we needed to organize the content of our findings before deciding how it would be presented.

DETERMINING EFFECTIVE COMMUNICATION METHODS

Effective communication in this project meant presenting the information to the audience in a way that was easy to read and understand, even for an individual with little to no prior knowledge of marine turtles or marine turtle conservation. The group strove to avoid an overly scientific, overwhelmingly wordy manual, and instead chose to produce a simplified, photographically illustrated brochure that could easily educate the target audience, as well as outline the most important guidelines for potential conservation project leaders. Also, we chose to design an interactive website that would provide the same information as the brochure along with the list of resources used in the formulation of our recommendations.

The Brochure

The group found Microsoft Publisher to be an effective means of creating the layout for the brochure. Using a previous IAC publication as a reference, we found certain characteristics to be effective in holding the reader's interests, among these the size, conciseness, layout, presentation of contents and use of images. Design items, such as borders, fonts, graphic placement and colors, were varied throughout the brochure to help guide the reader through the

information. A table of contents was also included in the brochure for readers to easily locate a particular section of interest. The pictures we selected comprised of photography taken from www.seaturtle.org, as well as our own photographs taken during site visits. Content and design were both adjusted according to the critiques and suggestions of our liaisons and reviewers to ensure the brochure was effectively communicating reliable information. *(Pages of the brochure are included in Appendix D)*

Outlining an Interactive Website

The group outlined an inter-active website to be included on the IAC website in order to further increase the availability of the recommendations and guidelines. This second form of communication was also included because, while we anticipated the majority of our audience to be looking for only the most basic, simplified facts, we did not wish to exclude those who wanted the more extraneous scientific details and comprehensive reports. The information we decided to include in the website was a synopsis of the information found in the brochure, but also included links to more information on the specific topic discussed on the webpage as well as links to the text and web resources used to formulate our recommendations. Again, we used photographs and various design items to keep the interest of the user. Our outline was sent to the IAC web designers courtesy of our liaison. (*The flowchart can be viewed in Appendix E)*

EVALUATION PRIOR TO FINAL DISTRIBUTIONS

In an effort to give greater validity to the content of the brochure, the group chose to send it to several local experts in species conservation and community relations for evaluation prior to its final publication. These evaluations allowed us to test the appropriateness of the content and the effectiveness of the guidelines, respectively. Group editing of the brochure, based on the

reviewers' suggestions and commentaries, gave the brochure a greater sense of legitimacy that would not have been achieved without these additional reviews.

CHAPTER FOUR: FINDINGS

This chapter presents findings on the social framework of marine turtle project communities, and presents problems and best practices related to marine turtle conservation. The findings have been incorporated in a brochure of guidelines created for a non-expert audience interested in marine turtle conservation projects.

Finding 1: Non-expert community members, government officials and potential project developers need a resource that presents the most important guidelines for successful marine turtle conservation in a concise and accessible fashion.

The creation of our brochure makes information buried in technically advanced manuals more readily available to the following non-expert audience members:

1. Community members in potential marine turtle project areas, including stakeholders who stand to have interests threatened by project inception.
2. Government officials with the potential for involvement in the oversight of marine turtle projects.
3. Individuals considering the establishment of a private marine turtle project, whether aimed at conservation or tourism, who would benefit from a collection of best practices and guidelines.

All individuals listed above have the potential to influence the outcome of marine turtle projects, though generally lack sufficient knowledge about the topic prior to project inception. While potential project developers and government officials are recognizable members of well-defined groups, stakeholders in communities are less easy to distinguish. The unifying theme among all stakeholders affected by marine turtle conservation is that they stand to have their

interests threatened by the inception of a project. These individuals can be grouped into two general categories: those with threatened business interests, and those with threatened personal interests. Stakeholders with threatened business interests include real estate developers, beach side restaurant owners, and local fisherman. Their businesses are threatened by potential zoning regulations, beach use and lighting laws, and marine environment protection regulations, respectively. Those stakeholders with threatened personal interests are owners of property in potential project communities. Their interests are threatened by potential zoning regulations and buffer zones, beach usage regulations, and loss of privacy by an influx of unwanted tourist activity.

Finding 2: The best conservation projects involving a tourism component carefully consider carrying capacity, visitation management, and tourism revenue allocation.

Carrying Capacity. The carrying capacity of a turtle nesting beach determines the number of tourists that can safely visit per night. However, it extends far beyond the line between sand and street. The carrying capacity is a critical factor to be considered when developing tourism around a conservation project because if accommodations for tourists exceed the number set for the carrying capacity, it will become very difficult to control access to the beach at night.

Tortuguero National Park in Costa Rica has a highly developed tourism industry, so the demand for access to the beach at night is much higher. The park is pressured to find ways to increase its capacity while still trying to minimize visitation impact. Even within this protected area, where measures are taken to reduce negative impacts, nesting turtle numbers decreased from nearly 500 to only 50 per season from the early 1990's through the early 2000's. Park

officials in Tortuguero are currently developing new carrying capacity guidelines for the park, which are likely to increase the maximum number of visitors while aiming to continue the protection of marine turtles and their habitat (Harrison, pers. comm.).

Ceballos-Lascuráin (1996) technically defined carrying capacity in three different categories described below:

1. *Physical Carrying Capacity* (PCC) is how many people can physically fit in an area if each person requires one square meter to move freely.

   PCC = Total Area * (visitor/m^2) * Number of visits per day

2. *Real Carrying Capacity* (RCC) is the maximum number of visitors for an area taking into consideration correction factors (Cf) that inhibit visitation, such as topography, climate, wildlife disturbance, and accessibility.

   RCC = PCC * ((100-Cf)/100) *((100-Cf)/100)*….

3. *Effective Carrying Capacity* takes into consideration the capacity of the management systems in place for an area, including what kind of financial resources it has, as well as the number of employees and available facilities. This number is much harder to calculate because it is based on qualitative data and can change over time.

Although carrying capacity is clearly defined, it is not clear whether turtle tourism programs at nesting beaches use this definition to calculate their carrying capacities, and the determination of the effective carrying capacity is difficult to quantify. In many places a carrying capacity can be identified, but its origins cannot. Such is the case in both Las Baulas and Tortuguero National Parks, in Costa Rica. In Las Baulas National Park, the maximum number of visitors allowed on the approximately two mile beach per night is 120, separated into groups of 15 to view a nesting turtle. In Tortuguero, with five miles available to tourism, there is a maximum of 700 visitors per

night, with 10 people per tour group. The amount of tourism in each of the areas seems to contribute to the differences in the capacities of the beaches.

Visitation Management. In order to decrease the impacts of visitors on the nesting turtles, appropriate measures must be taken to manage how and when people are allowed on the beach. These measures can include implementing turtle spotter programs as well as controlling the daytime beach activity in the area. Turtle spotter programs have been successfully implemented in both Tortuguero and in Las Baulas, though in different ways.

In Tortuguero, turtle spotters are assigned a one mile stretch of beach to patrol for nesting turtle activity. Once a turtle is spotted, tour guides waiting with tour groups on trails behind the beach are radioed the location. The trails were cut along old paths for electric wires with marked entrances to the beach every 300 meters. Tours are given in two hour increments, and visitors pay the entrance fee up front. They are taken out onto the paths behind the beach where they wait in designated areas with their tour guides to be called out to see the turtles.

In Las Baulas a similar program is in place, with spotters assigned to small stretches of beach to patrol. However, visitors do not pay an up-front fee. First, visitors are given a brief history of marine turtles and their plight as well as some information about Las Baulas Park. Videos are shown in the administrative offices, where there is a small auditorium, until a turtle is spotted. At that time, visitors are asked to pay the entrance fee before going out onto the beach to view the nesting turtle.

Daytime activities on nesting beaches can be monitored and controlled in different ways. In some places there are signs posted giving regulations for beach activities during nesting season, including hours of public access to the beach. In some cases, it might be advantageous to rope off areas that need more protection from intrusive behavior by humans. Direct contact with

turtles nesting, other than those permitted, such as researchers, should be prohibited. Patrolling beaches for inappropriate activity, such as driving on the beach, boating, or even walking and swimming during nesting season can be very effective, but costly to pay employees.

Allocation of Marine Turtle Tour Revenues. Although the income generated by marine turtle tours on nesting beaches is high because of the growing interest in ecotourism, the distribution of the funds among community members is not clear. The distribution from place to place seems to vary, and it is unclear who determines how much money goes where.

In Playa Grande, when visitors pay a $25 fee to see a nesting turtles, they are given two receipts: one from the Costa Rican government agencies MINAE and SINAC for $10, and another for the Association for the Protection of Marine Resources and Wildlife of Matapalo for $15. The president of the Association from Matapalo informed us that the tour fees allocated to their group compensates the group for cleaning and monitoring the park, spotting turtles, and giving the guided tours. Any excess beyond those costs is usually donated to the community. We can only assume that the funds allocated to government agencies are used for the betterment of the park facilities and for maintenance.

The profits generated from marine turtle tourism in Tortuguero are distributed much differently. Tour guides each charge their own fees to visitors for tours in the park. These fees typically range from $10 to $20 and the profit is only for the tour guide. Visitors are either asked to pay the park entrance fee separately, or it is included in the tour price, but it is the same $10 fee as in Las Baulas. *(Pictures of the tickets from Las Baulas National Park are included in Appendix F)*

Finding 3: Many problems for marine turtle conservation arise from coastal development and construction, including light pollution, habitat loss and degradation, and beach pollution.

Light pollution. One reason that partially explains the decreasing numbers of mother turtles coming ashore to nest is light pollution, the excess unnatural light given off by beach front buildings. This problem is even more serious to newly hatched turtles, which can easily become disoriented and mislead by the lights. The simplest way to lessen the effects on marine turtles is to reduce lighting on the beaches between specified hours during nesting season. In many sites, lights have been changed from bright white lights to red or yellow, reducing their intensity and range. Some beaches post signs explaining the disruption to marine turtles from light pollution and specify existing laws or regulations that include light reduction measures. Nighttime flash photography is prohibited for similar reasons.

Habitat loss and degradation. Erosion control measures such as sand importation and the construction of sea walls destroy turtle nesting habitats by restricting access to nesting sites, changing nest sand temperatures, and burying lain nests (CCC, 2008). These practices are becoming increasingly common in areas where the economic value of beachfront is high. Thus efforts to restore the beach actually mean habitat loss for turtles.

To reduce the harmful impacts resulting from these practices, alternative methods of beach conservation can be implemented. Researching sand types and acknowledging known nesting sites prior to action helps to alleviate some of these issues. Natural erosion can be controlled by managing existing vegetation and planting new vegetation in areas of need using native plants. Monitored hatcheries can serve to prevent people from stealing eggs, as is the case in Playa Hermosa, or from being washed out by the tide, especially on more flat beaches, such as

Punta Mala (Sanchez, pers. comm.). Buffer zones outside of protected areas can lessen the human impact on beaches during nesting seasons, in addition to protecting other flora and fauna they may contain.

Pollution. Pollution from industrial and other development poses direct threats to the health of marine animals. It is now suggested that coastal pollution may be partially responsible for fibropapillomatosis, a disease in marine turtles characterized by abnormal growths, generally in the head and neck area. The disease is more common near densely populated coastal areas that are typically polluted and produce greater amounts of urban runoff (Aguirre and Lutz, 2004). We have found that contamination due to sewage and solid waste is a problem at many nesting beaches.

Litter is another huge threat to marine turtles. For example, the diet of leatherback turtles is largely composed of jelly fish, but consuming plastic bags or balloons that resemble their food can prove fatal. Along with furniture and wood or other natural debris, the presence of trash on beaches creates a physical obstacle for marine turtles and an ecological threat that can be lessened by simple and responsible intervention. In some places, frequent manual beach cleaning has reduced the threat of litter. Many volunteer organizations, including La Asociación de Voluntarios (ASVO) in Costa Rica, help by cleaning the beach (Sanchez, pers. comm.).

Construction and Real Estate. Construction and real estate development around nesting beaches is often hard to control because of its increased demand. In most cases, development serves as a boost to the economy, which has a lot of appeal to the local government. However, political connections and interests often do little to limit construction in protected areas, including Playa Grande (Solís-Rivera, pers. comm.) While it can be difficult to control the

amount of growth in an area, it can be useful to educate developers about responsible construction practices to help lessen their impact on the environment.

In Playa Grande, for example, there are several large houses already built in close proximity to the nesting beach, but much of the construction further in the town has not yet begun. Vast areas of land are cleared, with advertisements by foreign developers dominating the scenery. In areas where development is growing, it is not uncommon to see similar views as in the picture featured below. *(Additional pictures of growing development in Playa Grande are included in Appendix F)*

Figure 3 Century 21 Sign in Play Grande (Cembrola, 2008)

We found that is has been beneficial to educate developers about eco-friendly practices, especially in places where development is just beginning. As the scientific director of the CCC in Tortuguero told us, where development has seen exponential growth in the past decade, it is easier to manage development from its early stages, rather than to try and work backwards (Harrison, pers. comm.).

Constructions, ranging from public buildings, such as ecotourism centers or park facilities, to privately owned establishments, such as homes or businesses, which have been completed with consideration given to the environment, serve as models for future construction. Water use, lighting, waste management, energy efficiency and similar factors should be evaluated. Ceballos-Lascuráin (1996) suggests several "ecotechniques" that can make construction more environmentally friendly and at the same time more self-sustainable, including:

a. Solar energy
b. Capture and utilization of rain-water
c. Recycling of waste
d. Natural cross-ventilation (instead of air conditioning)
e. Self-sufficiency in food production (through use of orchards, "ecological farms", aquaculture, etc.)
f. Use of underground wiring
g. Use of locally available building materials and native technologies
h. Blending of architectural shapes with the natural environment

Finding 4: The most effective marine turtle conservation projects provide communities with environmental education and participation opportunities, and carefully consider community members with threatened interests.

Environmental Education. We found that the promotion of community participation should begin with environmental education focused on the benefits of conserving marine turtles and their habitats. The following practical incentives and potential benefits of marine turtle conservation can help gain the support of potential project site community members:

a. Financial benefits: the possibility for an influx of revenues, generated by a project.

b. Ecological importance: preserving an indicator species and nutrient link.

c. Intrinsic value: an opportunity to save a natural wonder for the enjoyment of future generations

When discussing financial benefits with community members, the assertion that "a live turtle is worth more than a dead turtle" is an effective way to promote conservation and financially motivate community involvement (WWF, 2007). As discussed in the background, case studies have shown non-consumptive marine turtle use generating more than three times as much as consumptive use. Laura Jaén and the Asosciación Damas Amigas Parque Nacional Marino las Baulas in Playa Grande, Costa Rica, former nest poachers turned conservationists and tour guides, estimate that the protection of one nest of eggs provides the same monetary benefit as would harvesting every egg from six separate nests (pers. comm.). Community educators can provide tangible incentives for conservation using these and other similar examples.

Educating community members on the importance of marine turtles as indicator species is a useful method of illustrating the turtle's ecological importance. An indicator species is one that often demonstrates the overall health of marine ecosystems through its own population trends. Also, marine turtles serve as crucial food source links and nutrient transporters between marine and coastal ecosystems. Through nutrient transport, energy from marine food sources is brought ashore in the form of marine turtle eggs, and eventually becomes sustenance for natural predators on land (WWF, 2007). These facts provide motivation to local community members who often rely on a healthy marine system for food and other resources. They also shift the focus away from financial benefits, in an effort to avoid unhealthy competition for wealth among community members.

Effective environmental education also focuses on the intrinsic value of the marine turtles, evoking the inherent sentimental values of community members. Using facts about

trends of population decline and species endangerment, education leaders have been able to convey a sense of urgency to community members. Example facts include:

a. "Marine turtles have inhabited the oceans of the planet for nearly 110 million years, though population numbers have declined most critically in the last one hundred."

b. "Studies at Las Baulas National Park, Costa Rica indicate that only fifteen percent of nesting Leatherback turtles tagged in the 1993-1994 nesting season returned to nest again within six years" (Reina, Mayor, Spotila, Piedra & Paladino, 2002).

c. "Nesting adult females numbered 1367 the 1988-1989 nesting season, but only 231 in 1999-2000" (Reina et al., 2002).

Many community members would likely agree that the observation of a nesting marine turtle is a truly awe inspiring experience. To be the last generation to have ever seen the nesting turtles and to be unable to share the natural treasure with one's children is a grim prospect many community members would rather not encounter.

Community Involvement. We have found that the most successful marine turtle conservation projects are those that provide ample opportunity for community involvement. The WWF's 2001 *Guidelines for Community Based Tourism Development* lists the following as best practices for involving the local community:

a. Private tourism businesses employing local people

b. Local individuals selling produce and handicraft

c. Private tourism business operating under concession from the local community

d. Individuals with links to the broader community running private small tourism businesses, and

e. Communally owned and run enterprises

However, these activities are not specific enough to guide potential marine turtle conservation project developers. Considering our first hand observations and using the above as a reference, we have compiled the following list of "turtle-specific" involvement opportunities. They include:

a. National Park ranger

b. Marine turtle nesting spotter, communally or privately employed

c. Private marine turtle tour agent, operating under concession

d. Marine turtle tour guide, communally or privately employed

e. Beach rubbish collector

f. Employee of nesting-beach located hotel

g. Vendor of marine turtle related crafts and souvenirs

Many of the positions above require some type of job-specific training, providing an additional opportunity for individuals capable of coordinating that training.

We have found that in communities allowing private project enterprises, requiring certification programs that require all local guides, spotters, and agents to be complete the same training and to abide by the same regulations, all reduce the potential for conflict among local agencies. Certification programs and common regulations ensure equal quality of services and impartial access to the nesting beaches. Equal compensation and equally weighted partnerships in conservation efforts also reduce the risk of building animosity between project leaders and employed community members. The WWF's *Guidelines* encourages transparency and consistency in project administration in terms of providing compensation and incentive (2001).

Unbiased committees and organizations capable of ensuring transparency and consistency have also been useful in successful marine turtle project sites. These are groups willing to monitor and mediate relations between the local community, the turtle visitors, and project leaders. The WWF's *Guidelines* suggests the assemblies have the following members:

a. Representatives of the local community

b. Knowledgeable tourism operators

c. Local entrepreneurs

d. Relevant Non-Governmental Organizations

e. Conservation agencies, including protected area managers, and

f. Local authorities

All of these parties represent a voice with a different interest, each equally important to the cohesiveness of the conservation project.

No matter the form, community involvement serves to strengthen a community's connection with the project and the conservation of the marine turtles. We have found that if a project can keep the community members and project leaders on an even plane of responsibility the two parties can essentially form as one, working as partners towards the common goal of protecting marine turtles while providing ample compensation the host community.

Considering Members with Threatened Interests. Most communities have members that have little to no interest in participating in a marine turtle conservation project. Those that most often fall into this category are community stakeholders who stand to have their interests threatened by project inception. Threatened stakeholders in a marine turtle nesting beach community might include:

a. Local fisherman

b. Real estate developers (operating locally or externally), and

c. Beach side property owners, including home owners, hotel operators and restaurateurs.

The primary concern of local fishermen will be the availability of fishing waters post-project inception. It is impossible to fully protect marine turtles without regulations of aquatic environments and protective measures that require safe fishing practices. Communication and compromise are the steps to take in satisfying both fisherman and conservationists. Possible strategies for compromise with local fishermen include:

a. Providing education on, or even providing equipment for safer fishing practices, and

b. Suggesting or researching new and equally plentiful fishing grounds.

Fishermen may require education on the environmental dangers of long line fishing and indiscriminate net drags. By providing turtle excluder devices (TEDs), conservationists can help net fishermen reduce the risk they pose to the marine turtles.

Also, as incentive for complying with turtle conservation regulations, communities might suggest the creation of an indigenous fishing tourism project. "PorLaMar", sponsored by SoLiDar on Costa Rica's Central Pacific Coast, gives tourists the opportunity to take part in a day of fishing with local fisherman. Proceeds from the tours directly benefit those fishermen presenting their livelihoods as an attraction.

Compromise with local developers and property owners is somewhat more complex, as the possibilities for conflict can vary widely from community to community. For this reason, we can only outline the potential issues with development-related stakeholders in a given community. They include:

a. Beach usage regulations that contradict a feeling of beach ownership from coastal property owners.

b. Lighting regulations that have the potential to upset the hours of operation for beach side restaurant or hotel owners.

c. Zoning regulations, buffer zones and National Park ordinances that can cause great unrest in relations with local and external real estate developers.

Depending on the individual community, the number of parties with threatened interests and the scope of issues marine turtle project leaders face will more than likely eclipse those few listed above.

The diversity of the communities makes it difficult to define all-encompassing practices that can be applied to specific situations with local property owners and developers. We have discovered that first analyzing and understanding the specific needs of the stakeholder parties, and then developing and presenting sensible policies with potential to benefit both the individuals and the marine turtle project, is the best generalized practice. Montoya and Drews stress first identifying stakeholders in a given community, and then establishing a partnership among major stakeholders and community actors through clarity of intent and assessment of potential for participation (2006). Those community actors would include the unbiased, multi-represented community organizations mentioned above.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

The goal of this project was to provide a comprehensive yet user-friendly and simple source of guidelines and recommendations for developing a successful marine turtle nesting beach conservation project. We aimed to educate and inform the lay reader who lacked a scientifically advanced knowledge of sea turtle conservation, yet who still wished to actively participate in or directly or indirectly benefit from a marine turtle project.

Finding 1: ***Non-expert community members, government officials and potential project developers need a resource that presents the most important guidelines for successful marine turtle conservation in a concise and accessible fashion.***

1. Community members in potential marine turtle project areas, including stakeholders who stand to have interests threatened by project inception.
2. Government officials with the potential for involvement in the oversight of marine turtle projects.
3. Individuals considering the establishment of a private marine turtle project, conservation or tourism-based, that would benefit from a collection of best practices and guidelines.

We define the stakeholders with threatened interests as belonging to one of two general categories: those with threatened business interests and those with threatened personal interests. Stakeholders with threatened business interests include real estate developers, beach side business owners, and local fishermen. Stakeholders with threatened personal interests are property owners in the potential project communities.

Finding 2: ***The best conservation projects involving a tourism component carefully consider carrying capacity, visitation management, and tourism revenue allocation.***

The **carrying capacity i**s a critical factor to be considered when developing tourism around a conservation project because if accommodations for tourists exceed the number set for the carrying capacity, it will become very difficult to control access to the beach at night. **Visitation management** practices that can decrease the impacts of visitors on the nesting turtles include implementing turtle spotter programs and monitoring the daytime beach activity in nesting area. Growing interest in ecotourism and marine turtle tourism has lead to relatively high revenue gains for many communities, however there is a lack of transparency in exactly to where and whom those **funds are allocated**. Higher availability of financial information betters social relations among project parties, and the project's chances for success.

Finding 3: ***Many problems for marine turtle conservation arise from coastal development and construction, including light pollution, habitat loss and degradation, and beach pollution.***

One reason that partially explains the decreasing numbers of female turtles coming ashore to nest is **light pollution**, the excess unnatural light given off by beach front buildings. This problem is even more serious to newly hatched turtles, which can easily become disoriented and mislead by the lights. Lighting regulations including time restraints and bulb types are reasonable solutions to this problem. Erosion control measures such as sand importation and the construction of sea walls **destroy turtle nesting habitats** by restricting access to nesting sites, changing nest sand temperatures, and burying lain nests. Researching sand types and acknowledging known nesting sites prior to action helps to alleviate some of these issues. **Beach pollution** also poses direct threats to the health of marine turtles. It is now suggested that

coastal pollution may be partially responsible for fibropapillomatosis, a disease in marine turtles characterized by abnormal growths, generally in the head and neck area. Pollution control measures are numerous, though most begin with providing trash receptacles and encouraging proper disposal methods.

Finding 4: ***The most effective marine turtle conservation projects provide communities with environmental education and participation opportunities, and carefully consider community members with threatened interests.***

Topics for **community education** include financial benefits of conservation, ecological importance and intrinsic values. Financial benefits provide a tangible incentive for participation while ecological importance stresses the necessity of participation. Intrinsic values speak to the sentimental, inherent values of conserving marine turtle species. **Opportunities for community participation** in projects include employment as a turtle spotter, tour guide, or hotel employee, among others. Equality of compensation and responsibility in conservation projects lessens the risk of conflict among researchers, project leaders and community members. Considering the **threatened interests of stakeholders** like local fisherman, real estate developers and property owners is a complicated issue that requires compromise and mediation by non-biased organizations that equally represent involved groups.

RECOMMENDATIONS

We have developed three recommendations for increasing the accessibility of our brochure, furthering research, and improving contact between the IAC and member country projects. They are presented below.

Recommendation 1: Increase Accessibility of the Brochure by Translating, Reviewing and Placing Online

We suggest that the brochure be translated into Spanish so it can be easily understood by all member nations of the IAC, as many of the member countries' native language is Spanish. The brochure should also be reviewed by the IAC scientific review board to allow for input from all member countries and prevent bias towards any particular area. Lastly, we recommend the brochure be placed online in digital form, making it available to the entire global audience.

Recommendation 2: Further Research on Carrying Capacity and Law and Regulation Enforcement by Continued Investigations.

In our research we were unable to develop any site-specific primary source information on exactly how carrying capacities for nesting beaches are being developed. Our most directed information was in the form of generic carrying capacity equations, and there was no way to know if these were actually used by those developing capacities at the beaches. Because the carrying capacity of a beach determines the amount of traffic on a beachfront, it has a direct impact on marine turtle nesting. Because of this, we recommend gathering more information about how to determine carrying capacity and analyzing the effects of carrying capacity on the environment. We suggest starting this process by conducting an interview with Rodney Piedra,

scientific director at Las Baulas National Park, whom we were told provides the information on which the carrying capacity for that beach is based.

We also suggest continued research on the enforcement of laws and regulations at nesting beaches. Many beaches have ideal laws and regulations in place, however they are often not abided by. In our observations it was unclear why enforcement is lax in some locations, or if lack of enforcement is even the problem. We suspect some communities are unaware of laws and regulations, because they have not been informed. More information on the enforcement of laws and regulations, and the awareness of community members in nesting beach communities, would be extremely useful in identifying problems in existing conservation projects. We suggest evaluating the knowledge of local community members using questionnaires. Also, we suggest interviewing nesting beach authorities, and posing questions on enforcement of regulations.

Recommendation 3: Improve Contact and Information Exchange between the IAC and Known Marine Turtle Project Sites

While the IAC maintains contact between member parties by holding an Annual Convention, the reports exchanged by member countries at these conventions only cover advancements in turtle biology and related legislation. By maintaining some sort of standardized communication with all known project communities, as opposed to only countries, the Convention would find itself able to engage in more comparative analyses of conservation practices. A practical solution to this problem would be the production and distribution of a standardized survey containing general questions about the organization and management of international marine turtle projects. The survey would provide an expansive forum, useful for gathering information on successes and failures of conservation projects throughout the world.

FINAL STATEMENT

Our brochure has filled the gap in previous research, as we have created a resource that will appeal to community members, government officials, project leaders and scientists alike, while not failing to reach completeness in its simplicity. The IAC is the party most able to make the brochure internationally available, accomplishing this through multiple language translations and distribution to all interested parties. This brochure has the potential to aid in reshaping how not only Costa Rica but the World thinks about marine turtle conservation and tourism.

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APPENDIX A: INTER-AMERICAN CONVENTION FOR THE PROTECTION AND CONSERVATION OF MARINE TURTLES

Introduction

The Inter-American Convention for the Protection and Conservation of Sea Turtles ("IAC") is an intergovernmental treaty which provides the legal framework for countries in the American Continent to take actions in benefit of these species. The IAC entered into force in May of 2001 and currently has twelve Contracting Parties, in addition to one country awaiting national ratification.

The Convention promotes the protection, conservation and recovery of the populations of sea turtles and those habitats on which they depend, on the basis of the best available data and taking into consideration the environmental, socioeconomic and cultural characteristics of the Parties (Article II, Text of the Convention). These actions should cover both nesting beaches and the Parties' territorial waters.

About the Convention

In 1994, recognizing the regional nature of the threats to sea turtle survival, the nations of the western hemisphere began a collaborative effort to negotiate an agreement for the future of these species.

In 2001, with the ratification of the eighth nation, the Inter-American Convention for the Protection and Conservation of Sea Turtles entered into force. The Convention attends to the need for implementation of harmonious measures between nations, multilateral coordination of conservation and protection actions, and oversight of the implementation of a regional agenda that will enable the recovery of these species.

Obligations of the Parties

The importance of this Convention is the protection bestowed to sea turtles in the habitats where the different stages of their lives transpire. Included in the measures mandated by the text per se of the Convention, we have the following:

- The capture, retention or incidental capture of sea turtles is forbidden, as well as domestic commerce with their eggs, parts or products.
- The compliance of that established by the CITES Convention in regard to international trade of sea turtles, their eggs, parts or products (like hawksbill shell).
- The restriction of human activities that may adversely affect sea turtles during their reproduction, incubation and migration stages.
- Their protection and conservation, habitat restoration and those sites established and designated as protected areas, as pertinent.
- To support research directed to experimental reproduction, breeding and re-introduction.
- The promotion of environmental education and the dissemination of information, with the objective to foster the participation of governmental institutions, NGOs and the public at large.
- The reduction to the possible minimum of capturing, wounding or incidental capturing of sea turtles during fishing activities, as well as the development, improvement and utilization of fishing gear, devices and appropriate techniques, including the Turtle Excluder Devices (known as TEDs).

About the Secretariat

The Pro-Tempore Secretariat of the Inter-American Convention for the Protection and Conservation of Sea Turtles is located at the Fundación de Parques Nacionales, in San José, Costa Rica

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Website: http://www.iacseaturtle.org

During the First Conference of the Contracting Parties, the Secretariat was established by means of Resolution COP1CIT-001, acting as an organism of the Convention pursuant to Article IV. Included in the functions assigned, the Secretariat has to:

- Support, organize and participate in the meetings of the Conference of the Parties and of the Subsidiary Organs,
- Coordinate and facilitate communication among the Parties and between the Parties and the Observers;
- Make available to the Parties in the working languages the reports, recommendations and decisions adopted and any other necessary documents;
- Administrate the Special Fund of the Inter-American Convention (SFIC).

Contracting Parties of the IAC

Figure 1 Contracting Parties in North America

Figure 2 Contracting Parties in Central America and the Caribbean

Figure 3 Contracting Parties in South America

Information taken from the Inter-American Convention for the Protection and Conservation of Sea Turtles website: http://iacseaturtle.org/

APPENDIX B: ECOTOURISM

Adapted from Tourism, ecotourism, and protected areas (Ceballos-Lascuráin, 1996)

Criteria for Ecotourism:

If an activity is to qualify as ecotourism, it must demonstrate the following nine characteristics.

1. It promotes positive environmental ethics and fosters "preferred" behavior in its participants.
2. It does not degrade the resource. In other words, it does not involve consumptive erosion of the natural environment.
3. It concentrates on intrinsic rather than extrinsic values. Facilities and services may facilitate the encounter with the intrinsic resource, but never become attractions in their own right, and do not detract from the resource.
4. It is oriented around the environment in question and not around man. Eco-tourists accept the environment as it is, neither expecting it to change or to be modified for their convenience.
5. It must benefit the wildlife and environment. The question of whether or not the environment has received "benefits" can be measures socially, economically, scientifically, managerially, and politically. At the very least, the environment must attain a net benefit, contributing to its sustainability and ecological integrity.
6. It provides a first-hand encounter with the natural environment (and with any accompanying cultural elements found in undeveloped areas). Zoological parks do not constitute an ecotourism experience.
7. It actively involves the local communities in the tourism process so that they may benefit from it, thereby contributing to a better valuation of the natural resources in that locality.
8. Its level of gratification is measured in terms of education and/or appreciation rather than in thrill-seeking or physical achievement; the latter is more characteristic of adventure tourism.
9. It involves considerable preparation and demands in-depth knowledge on the part of both leaders and participants.

APPENDIX C: INTERVIEW QUESTIONS

- What is the carrying capacity on the beach? How is the carrying capacity determined?
- What local laws and regulations exist and are being enforced? How are they enforced? In general, are they respected by the community members and/or visitors?
- Is there a lot of community support for conservation?
- How is the community involved in conservation efforts?
- How are tour guides trained and/or certified to do tours?
- Are there any types of community education programs to support conservation and to gain support from local people?
- What are some of the difficulties that the program faces from the community, the government, and tourism?
- What is the greatest threat to turtles overall in your area/region?
- Has anything been done to address problems that arise? Examples?
- If the community is involved and supportive, how did that happen?
- How could your program be improved to make it more successful?
- Are there any problems within the National Park that need to be addressed or are being addressed right now?
- How has the community attempted to maintain the balance between the environment and the economy? Is there a balance?
- Is there information to educate tourists about conservation policies and efforts?
- Are you aware of any management plans that exist in your area? If so, do you know what they are and what is included in them?
- What type of relationship exists between the different stakeholders in your community with regards to marine turtle conservation?
- If you were to make guidelines, what are the three most important things you feel need to be considered when beginning a conservation program?

APPENDIX D: THE BROCHURE

DEVELOPING A MARINE TURTLE NESTING BEACH

The Inter-American Convention for the Protection and Conservation of Sea Turtles

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TABLE OF CONTENTS:

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INTRODUCTION

Marine turtles have inhabited the oceans of the planet for about 110 million years, maintaining their existence even through the mass extinctions which saw the end of the dinosaurs. Despite their tremendously adaptive survival skills, over the last few decades sea turtle populations have seen their greatest and most drastic decrease. Today, all six species of marine turtles found in the Americas are either endangered or critically endangered. Natural predation is an omnipresent threat, especially to newly hatched marine turtles, however it is and has forever been a timeless and constant threat, and can therefore be ruled out as the responsible factor for the most recent and sudden population decline. Unfortunately, it is most likely that these drastically reduced populations have been caused by the actions of human beings. Some of the activities detrimental to marine turtles include habitat destruction, excessive harvesting, bycatch, and marine pollution, among many others.

Thankfully, many individuals have recognized the importance, both intrinsic and economic, of the marine turtles, and have begun to take action. Conservation projects and community based tourist attractions have become increasingly popular in communities that serve as hosts to nesting marine turtles. In fact, the revenues generated from this type of tourism have so far surpassed those produced by consumptive use that it is now generally accepted that a live turtle is worth more than a dead turtle. *Money Talks* (Troëng and Drews, 2004) estimates based on case studies in developing countries, that average consumptive revenues are about US$580,000, and non-consumptive revenues about US$1.7 million, further illustrating the value of living turtles.

While marine turtle protection is the primary concern of all conservation efforts, there are many related issues that must also be carefully considered and managed to ensure complete project success.

With the growing number of conservation projects and community based tourism attractions comes the necessity for development in the form of hotels, restaurants, transportation, visitor centres, and waste disposal systems, in addition to many other services and infrastructure. In many cases, marine turtle nesting communities have become dependent on revenues from the yearly influx of turtle seeking tourists. Similarly, the tourists are dependent on not only adequate services and accommodations, but also nesting turtles. Community members are therefore reluctant to denounce any development that supports community growth, but that may also threaten the very resource they depend on. While the work of the project or the community is often still beneficial to the turtles, many communities fail to recognize the point at which the threats posed by development actually begin to reverse the project's success.

Coastal development not properly regulated by light ordinances has the potential to shed excess bright light onto beaches. This light pollution is extremely disruptive to both nesting turtles and hatchlings. Bus stations, boat docks and other transportation centres often put nearby marine environments in great danger of pollution caused by oil and petroleum leaks. Tourists brought to the nesting sites can also be neglectful of proper trash disposal, though even trash properly thrown away must have a place to go. This requires further development in the form of waste processing facilities. These are however, only a few of the many issues that must be considered prior to the establishment of nesting beach tourism. The harsh influences of all such factors on marine habitats can at times be lost in the good will of a conservation project.

It is this struggle for a balance between the benefits of community based marine turtle tourism and the threats posed by its necessary developments that provides the basis for this brochure. The brochure will attempt to provide guidelines and suggestions for successful and sustainable marine turtle nesting beach tourism. It will also assess the interactions between community, tourism and development, using examples from nesting beach communities already participating in marine turtle based tourism.

Marine Turtle Tourism

Highlights

- Ecotourism
- Guidelines for tourism
- Carrying Capacity
- Turtle Spotter Programs

'Ecotourism' is a type of tourism that encompasses environmental protection as well as cultural awareness, and is ideally non-consumptive and sustainable. One example of ecotourism is marine turtle related tourism where tourists visit nesting sites in the hope of observing one of these ancient reptiles. Over 60,000 tourists participate in marine turtle related tourism per year in Latin American and Caribbean countries, bringing in at least $3.6 million in revenue (Troëg and Drews, 2004). The financial appeal of this type of tourism has led many marine turtle nesting communities world-wide to implement ecotourism programs. The desire to see these wild and endangered species continues to grow, as their populations decline. Therefore, managing this visitation so it does not negatively impact the very resource it is trying to protect is a priority.

Many programs fail to take into consideration all of the necessary components of ecotourism or the programs are not planned and managed well because of the limited span of time when the turtles are present at sites. Marine turtles spend the majority of their lives in the water, only on land when they are born and when females come on shore to nest. Unfortunately, the high demand of tourism in such a limited amount of time often leads to a program having a negative effect on the environment and the turtles.

The following are general guidelines to consider when starting a turtle conservation and tourism program, but should also be considered by programs already in place to increase their success.

7

The program must not degrade the resource it is trying to protect. In other words, turtles must not be negatively affected by tourism activities, whether it is in a direct or indirect manner. Consumptive use of turtles must be managed and controlled and the effects of coastal development on turtles must be monitored.

The program must benefit both the environment and marine turtles. Using income generated from turtle tourism to increase efficiency within the program or to further support environmental and wildlife protection would be a benefit.

Local communities must be involved in the planning and management of tourism generated by the program. Community members should be involved in the program not only for their personal benefit, but also to increase the value they hold for the resources being protected. If a community directly gains from a turtle tourism program, they will be more inclined to stay involved and further their personal protection efforts.

Be sure that the community is involved and supports tourism development. Discuss how much tourism is wanted by the community members and how much the environment can tolerate.

The planning and management process should include all stakeholders. (National and Local Governments, Community Members, NGO's, etc.) There should be an equal partnership formed between all of the stakeholders.

Be sure to educate from the "top" down. Any staff or people employed by the program, tour guides, and the tourists themselves should all be educated about the local area and the conservation program. The effect of conservation and tourism on an economic, ecological, and a social level should all be presented. It is important to gear educational material towards the different audiences and to find the best way of distributing the information. For tourists, information should be available in several forms, including images, brochures, and videos. In many places, giving the visitors a briefing before an ecotourism experience can be very effective. Remember to provide clear and concise information, translated into as many languages as possible.

Procedures for conflict resolution should be considered before they arise, so that they can be dealt with in a reasonable and timely fashion.

CARRYING CAPACITY

The carrying capacity of a beach is a very important factor to consider when creating tourism based on nesting marine turtles. This number often sets the standard for how many tourists a beach can handle and needs to be considered carefully in order to ensure that the turtles remain protected. Carrying capacity is often only thought of as a physical calculation, however social and cultural considerations must also be accounted for. According to Ceballos-Lascuráin (1996) some examples of estimating carrying capacity are as follows:

Physical Carrying Capacity (PCC) is how many people can physically fit in an area if each person requires one square meter to move freely.

PCC = Area * (1visitor/1m2) * Number of visits per day

Real Carrying Capacity (RCC) is the maximum number of visitors for an area taking into consideration factors that inhibit visitation, such as topography, climate, wildlife disturbance, and accessibility.

RCC = PCC * ((100-Cf)/100) *((100-Cf)/100)*....

Effective Carrying Capacity takes into consideration the capacity of the management systems in place for an area, including what kind of financial resources it has, as well as the number of employees and the facilities. This number is much harder to calculate because it is based on qualitative data.

Ideally, the carrying capacity of a turtle nesting beach should strive to stay in line with the Effective Carrying Capacity so that the management can maintain control of the area, however many areas have a carrying capacity somewhere between the Physical Carrying Capacity and the Real Carrying Capacity, which typically extends beyond the Effective Carrying Capacity.

Determine the amount of tourism a community and the environment can handle. The capacity for tourism in the community must not grow beyond what is appropriate for the local environment and wildlife to handle. In other words, the program must not generate tourism that demands significant changes to the environment. The number of people with access to the beach, as well as the number of people permitted to observe each nesting turtle are both important considerations in determining the tourism capacity around a turtle conservation program.

Create a definite plan of action with objectives to mark the progress of the project.

Encourage not only tourism development, but community development, education programs, and scientific and sociological research.

Measures should be taken to ensure that tourists are educated about the environment they are visiting. They should understand the plight of the turtles and be given background on the particular community they are visiting. If the tourists are educated about what is being done for turtle conservation and why it is important to the local community, they will hopefully have more respect for the area they are visiting.

Consider the following impacts of tourism development:

Land use and conservation of physical space
Impacts of specific activities, such as nighttime beach activities and tours
Impacts on neighboring communities
Energy needs
Water demand
Waste – both organic and inorganic
Transportation needs
Accessibility of facilities
Communication needs
Safety and Security of both the community and the tourists
Healthcare availability

Discuss Limits of Acceptable Change in the area. Get information and opinions from a variety of sources to decide how much of the environment and culture can be changed for tourism development.

Based on the desire of the community and the carrying capacity of the area, a reasonable tourism capacity for the area must be reached. Once the total capacity is determined, accommodation needs must be considered. In calculating this estimate, the number of tourists visiting at a given time, the average length of time spent visiting, as well as the percent of occupation on any given night should be considered. This can be calculated for only the peak season or for the entire year.

Communities and individuals involved with the program should understand that the tourism brought in by the program is a secondary benefit to conserving the environment and wildlife. Tourism will only continue to benefit the community if it is managed well and does not degrade the environment. If the resources attracting the tourism are lost, the tourism itself will be lost. The focus should be mainly on resource protection rather than the benefits gained from the tourism surrounding them.

Ensure effective enforcement of existing laws and that there is a process of approval and licensing to maintain control over the growth of tourism in the area.

Continually assess the environmental and economic impacts of tourism in the area. Determine criteria for the quality of the land and if it is being used correctly.

Coordination and communication between parties related to conservation and parties related to tourism. Both points of view should be considered when making any decisions or plans.

Support and integrate alternative activities that are not tourism based within the community to prevent tourism dependency.

Be sure that the profit and benefits from tourism are spread equally throughout the community and the program.

Thoroughly research the area where the project will be developed, including specific items as: the current and potential tourism market, laws and development plans already in place to protect turtles, the history of turtle conservation or use in the area, traditions and customs of the local community, the entire local ecosystem, and the turtle species present in the area, including their history and threats to their survival.

TURTLE SPOTTER PROGRAMS

One way to minimize the effects of interactions between humans and nesting turtles is to implement a spotter program. In general, community members are employed to walk small stretches of beach until they spot a turtle coming to nest. The spotter reports the location of the nesting turtle back to the tour guides waiting with their groups (this may be done via radio), and then the group is brought out onto the beach to observe the nesting process.

In many places where this type of tourism exists, large groups of tourists walk up and down the beach in shifts during the night, waiting to find a nesting turtle. However, having large groups of people walking along the beach can deter a female turtle from coming up to nest. By having a trained spotter walking the site, the turtles are more likely to nest.

Spotter programs can be adjusted to fit the needs of any particular site. In some places tour groups pay a fee and wait in areas just behind the beach until a turtle comes ashore. Others have space where groups wait with their guides until they are notified of a nesting turtle, and then they pay a fee and go out onto the beach. The fees for turtle tours will also vary depending on the needs of a particular area and the resources available. Ideally, conservation programs dealing with tourism should be self-sustaining. Any extra revenue generated from the program should be used for improvements in the community and to support conservation efforts, be it hiring researchers, or building waiting huts for visitors.

It is important the tour guides are adequately trained and that they are certified in some way to bring tours on the beach to ensure that they are aware of proper procedures for spotting and observing nesting turtles. Guides should also be up to date on the current situation in the area and basic biology of sea turtles so that they are informed enough to answer questions from tourists. Mandating yearly certification courses for tour guides is good if you are just beginning a program in an area, however it may not go over as well in areas where tour guides have been working without restriction in previous years. In the case of already developed tourist areas, guides may need more persuasion and it can be much more difficult to control the situation. Being open to the community about the goals of your project and discussing its importance with them is one way to get support in areas that are already developed, but it can be a long process.

Ecotourism has the potential to bring economic growth into a community through increased employment opportunities and increased local business revenue. In addition to providing local income to communities, ecotourism can also provide financial support for protected areas, whether they are already established or need the financial backing to be established. Beyond the financial benefits, ecotourism can also promote conservation on a private level as well as protect and sustain the natural resources it emphasizes. However, without the proper development of appropriate tourism programs in communities, conservation programs and ecotourism ventures can become uncontrollable and destructive to the environment. Therefore, development must be monitored and the community must play an active role in the project in order to ensure its success.

Threats of Development

Highlights

- LIGHT POLLUTION
- HABITAT LOSS AND DEGRADATION
- INCREASED BEACH ACTIVITIES
- POLLUTION

Development in coastal communities resulting from an increased demand for tourism has had profound impacts on marine turtle habitats. Some of the many consequences of this development are:

- light pollution
- habitat loss and degradation
- increased beach activities
- pollution (sewage, solid waste management and litter)

This section proposes ways to mitigate these environmental threats as well as providing guidelines for eco-friendly construction. Development is a necessary part of a growing community, however it must be managed properly to maintain a balance between environmental and economic needs.

Light Pollution

One simple way to reduce the deterrence of marine turtles is to reduce lighting at nesting beaches. In many sites, lights have been changed from bright white lights to red or yellow, reducing their intensity and range. Strong artificial lighting can both prevent female turtles from coming ashore to nest, and is very distracting and disorienting for newly hatched turtles trying to make their way to sea. Some beaches post signs explaining the disruption to marine turtles from light pollution and specify existing laws or regulations that include light reduction measures. Nighttime photography is prohibited for similar reasons.

Habitat Loss and Degradation

Regarding beach degradation, erosion control measures such as sand importation and the construction of sea walls are becoming increasingly common in areas where the economic value of beachfront is high. These practices, referred to as beach nourishment and beach armoring, have been shown to alter sand temperatures and hinder turtles from reaching favorable nesting sites.

To reduce the negative impacts resulting from these practices, alternative methods can be implemented. Natural erosion control through vegetation is one such measure that utilizes native plants. In places where erosion directly threatens marine turtle eggs, nest relocation or movement to managed hatcheries is one way to better ensure protection.

Buffer zones outside of protected areas can lessen the impacts of human activity on beaches during nesting seasons. In addition to protecting marine turtle habitats, buffer zones can contain other flora and fauna in need of protection, as protecting the ecosystem itself is equally important.

Beach Activity

As development in general is necessary for growing coastal communities, beach use is a clear example of the need to find a balance. The IAC does permit some limited, mostly scientific-related contact with marine turtles, but during nesting seasons, many human activities – ranging from swimming to boating to walking or driving on the beach –must avoid direct contact. Even furniture provides a hazard as turtles can become entangled. However, during non-nesting seasons, non-destructive leisure activities may be permitted.

To regulate intrusive behavior, one simple but clear measure of action is to place signs at the entrance of the beach, stating rules prohibiting certain activities during the nesting season or year round. Another strategy is to rope off protected areas. The use of patrols can prevent or limit motor vehicle use on beaches.

Pollution

Industrial development in general and pollution pose direct threats to the health of marine animals. It is now suggested that coastal pollution may be partially responsible for fibropapillomatosis, a disease in marine turtles characterized by abnormal growths,

generally in the head and neck area. The disease is more common near densely populated coastal areas that are typically polluted and produce greater amounts of urban runoff (Aguirre and Lutz, 2004). Prevention of contamination due to sewage and solid waste – a problem in many sites – must be considered and integrated into development practices. One possible way to regulate these is through use of management plans. Additionally, as part of the greater ecosystem, watershed restrictions must be respected.

Reducing litter through frequent manual beach cleaning is especially important. For example, the diet of leatherback turtles is largely composed of jelly fish, but consuming plastic bags or balloons that resemble their food can prove fatal. Along with furniture and wood or other natural debris, the presence of trash on beaches creates a physical obstacle for marine turtles and an ecological threat that can be lessened by simple and responsible intervention.

COMMUNITY INVOLVEMENT

Highlights

- Environmental Education and Informed Participation
- Participation Opportunities
- Considering members with threatened interests

The most essential aspect to any successful marine turtle based project is the involvement of the local community. Defining a local community in terms of marine turtles, Drews and Montoya state that it is "made up of people whose livelihoods take place, at least to some extent, in the proximity of marine turtle nesting or foraging sites" (2006). Without a unified effort between researchers, conservationists, tourists and members of that local community, even the most directed and balanced projects may fail. Most issues detrimental to projects tend to stem from a lack of motivation for community participation. It is for this reason that the first step in any marine turtle project should be to educate the local community about the importance of active participation in marine turtle conservation projects.

Informed Participation and Environmental Education

The best way to garner the immediate support of a community is to provide an incentive for participation. Consider discussing the following practical incentives and potential benefits of marine turtle conservation with community members:

-Financial benefits: the possibility for an influx of revenues

-Ecological importance: by preserving ma rine turtles you are protecting differ ent ecosystems for important eco nomic natural resources.

-Intrinsic value: an opportunity to save a natural wonder for the enjoyment of future generations

In terms of marine turtle nesting communities, the assertion that 'a live turtle is worth more than a dead turtle' is the most poignant way to promote conservation and motivate community involvement (WWF, 2007). According to *Money Talks*, the most in-depth publication on marine turtle economics, non-consumptive marine turtle use (tourism attractions) generated as much as $US 6.7 million dollars per site in 2004, while consumptive use generated at most $US1.7 million per site (Troëng and Drews, 2004). Laura Jaén and the 'Asosciación Damas Amigas Parque Nacional Marino las Baulas,' former nest poacher turned conservationist and tour guide, estimate that the protection of one nest of eggs provides the same monetary benefit as would harvesting every egg from six separate nests. Without proper motivation for involvement, many community members may become quickly disinterested, choosing not to attend project meetings and educational sessions, or even choosing not to cooperate with the conservation regulations.

Once community members have been given a tangible incentive to participate, they are likely to be more willing to become educated in the ecological and intrinsic values of the marine turtles they have hopefully chosen to help conserve. Things to consider discussing with community members include the ecological importance of marine turtles. Marine turtles are indicator species, often demonstrating the overall health of marine ecosystems through their own population trends. Also, marine turtles serve as crucial food source links and nutrient transporters between marine and coastal ecosystems. Energy from marine food sources is brought ashore in the form of eggs and eventually hatchlings that serve as food items to natural predators (WWF, 2007).

Beyond the ecological and environmental importance of marine turtles is the intrinsic value of their existence. Marine turtles have inhabited the oceans of the planet for nearly 110 million years, and as many community members in nesting beach communities are likely aware, observing their yearly appearance is a truly awe inspiring experience. To be the last generation to have ever seen the nesting turtles, and to be unable to share the natural treasure with one's children, is a grim situation many community members would likely rather not encounter.

Without adequate marine turtle education, even the most cooperative community members may be left unable and unwilling to lend adequate effort to the project. Leaving community members uneducated leaves them in danger of feeling inferior to well educated project leaders, conservationists and biologists alike. Further, community members lacking marine turtle knowledge may unknowingly cause physical damage to turtles and nests by for example conducting night activities on beaches, disturbing nests and even having unnecessary physical contact with nesting turtles.

However, once community members have in fact been given incentive to participate in marine turtle conservation and have been properly educated in the importance and value of the turtles, it is time to initiate direct community involvement.

Involving the Community

Community involvement can entail any number of activities, though those most essential include creation of employment opportunities for community members, job specific training, education creation of local groups and organizations that are capable of monitoring balance within the project. By monitoring the balance of a project, unbiased groups and organizations should be supervising compensation practices, ensuring equal treatment of all parties, and continually encouraging continued, joint participation. It is very important to avoid the development of a divide between researchers, project leaders and community members. Such a divide can cause animosity between developing groups, diversion of interests and loss of project goals and direction.

The WWF's 2001 *Guidelines for Community Based Tourism Development* list the following as best practices for involving the local community:

-Private tourism businesses employing local people

-Local individuals selling produce and handicraft

-Private tourism business operating under concession from the local com munity

-Individuals with links to the broader community running private small tour ism businesses, and

-Communally owned and run enterprises

Potential project-related employment opportunities for community members in nesting beach communities include park ranger, turtle spotter, turtle tour guide, beach rubbish collector, while tourist-service related positions might include hotel employee or technical service person. In any case, native community members employed by projects are able to take part in conservation while earning an income and feeling an ever increasing connection to marine turtles. Community members must be educated and trained to complete these tasks, especially in terms of marine turtle biology and nesting habits.

Further training and education will once again serve to strengthen to relations between project leaders and community members. Also, a community that allows for its members to begin private marine turtle operations should implement a certification program that requires all local guides to complete the same training requirements and to abide by the same regulations. It is of utmost importance as well, to ensure that community members, working publicly and privately, are compensated fairly, and treated as equal partners in the conservation effort, rather than simple helpers.

The WWF's *Guidelines* encourages transparency and consistency in project administration in terms of providing compensation and incentive (2001). Unfair compensation and unequal distribution of superiority can once again serve to further the rift between community members and project leaders that will inevitably break down a marine turtle conservation project.

Perhaps more important than providing employment opportunity is the encouragement of the formation of local organizations and groups that are concerned with inter-community relations and promotion of acceptable marine turtle tourism practices. Organization leaders must be unbiased towards community members and project developers, and willing to monitor relations between the local community, turtle visitors, and project leaders, ensuring good will between all parties. *Guidelines* suggests;

-Representatives from the local community

-Knowledgeable tourism operators

-Local entrepreneurs

-Relevant NGO's

-Conservation agencies including protected area managers, and

-Local authorities

as those individuals best suited for aiding in the organization of said committees (WWF, 2001). Groups must also have the power within the community, the project, and even the government, to fight for equal distribution of benefits earned through the project, and to also protect existing regulations and guidelines that are meant to protect the communities and turtles from exploitation and degradation .

Leaving any group on the side of the community, project or otherwise without a voice is extremely dangerous as it can once again lead to alienation, misdirection, unfair shift of power and discord in project governance. Without all parts equally committed, heard, and satisfied, success of the project is at risk.

No matter the form of community involvement, it is important that it keeps the community members and project leaders on an even plane of responsibility. The two parties must essentially form as one, working as partners towards the common goal of protecting marine turtles while providing ample, fair compensation the community. Only when this is achieved, and all disparity and tension between parties ceases to exist, can a community based marine turtle project have an opportunity to be successful.

Remember:

Communities are extremely diverse, and that while these are the best generalized practices available, they are not guaranteed to work in every situation. One must adapt these guidelines to some degree in every community in which they are used!

Considering Members with Threatened Interests: Putting Involvement into Practice

The most difficult community related aspect of a marine turtle conservation or tourism project is the consideration of those members who have no intention of participating in, or are perhaps even against the idea of a local project introduction. Those individuals that will most often fall into this category include all community stakeholders who stand to have their interests threatened should a marine turtle project be developed. Threatened stakeholders in any given community might include local fisherman, real estate developers (operating locally or externally), and beach side property owners such as hotel operators and restauranteurs among others. Failure to garner the cooperation of threatened interest groups in a nesting beach community will make it nearly impossible to operate a successful conservation project. This section outlines potential stakeholder conflicts based on four scenarios taking place at different phases of project progression.

The first scenario analyzes a marine project at its earliest inception period. This situation is characterized by the presence of very few to no developers, sparsely distributed small hotels and cabins, very few tourists, and even fewer tourists services. At this point in a marine turtle conservation project, local fishermen and community members participating in consumptive use represent the community's primary stakeholders. When bringing marine turtle conservation to new communities, it is not unlikely to encounter community members who have based livelihoods around the use of marine turtle products or habitats. The challenged faced will be to strike reasonable compromise with individuals in breaking them from the ways of life they have practiced for generations.

The primary concern of local fisherman will be the availability of fishing waters post-project inception. Clearly it is impossible to fully protect marine turtles without regulations of aquatic environments and protective measures that require safe fishing practices. For this reason, it is imperative that compromise be faithfully practiced in communications with affected parties. Suggestions for compromise with local fishermen include providing education on, or even providing equipment for safer fishing practices, and suggesting or researching new and equally plentiful fishing grounds. Also, as incentive for complying with turtle conservation regulations, communities might suggest the creation of a local fishing tourism project similar to PorLaMar. Sponsored by SoLiDar on Costa Rica's Central Pacific Coast, PorLaMar gives tourists the opportunity to take part in a day of fishing with local fishermen. Proceeds from the tours directly benefit those fishermen presenting their livelihoods as an attraction.

The challenges faced by consumptive use is best handled through education of turtle product consumers and vendors as well as finding economic alternatives. As suggested above, the assertion that a live turtles is worth more than a dead turtle can discourage consumptive use. Also, dispelling ideas of turtle eggs as aphrodisiacs, and educating on the legality of consumptive product trade can help to combat poaching. If it is absolutely necessary that consumptive use continue in a given community, an option for compromise includes developing regulations on numbers of allowed uses per person, family or given time period.

The second scenario moves further along the time line of project development, wherein consumptive use continues at a lesser rate, independent developers begin to introduce more hotels and services, tourist numbers being to increase, more community members gain employment for project related jobs, and government involvement has begin though with very little participation. Also, the conservation project and its researchers have begun to encounter small conflict and disagreement with the local community.

It is important at this point in the project to continue education and regulation of consumptive users, and champion all declines in rates of poaching. However, more importantly in this situation we see the beginnings of the potential rifts between community members and project leaders and researches. While community members are encouraged by the creation of new jobs thanks to tourist influx and service development, project members begin to sense potential dangers to marine turtle habitats and nesting practices that they originally set out to protect. As project leaders present opposition to over-development, they begin to threaten the interest of the newest stakeholders, employed community members and local developers. It is important again that all sides seek compromise and quell early conflicts, preventing project break down that would halt all benefits to community and turtle.

In the third scenario, the marine turtle conservation project has been successful to the point that developers have begun to construct sizable hotels, restaurants, and houses to accommodate the remarkable influx of turtle visitors. Developers have purchased lands from some community members, and employed many others, however compensation is low and animosity builds. Project leaders are extremely concerned with the threat the new development presents to the marine turtles, and are encountering conflict not only with local community members who feels as though jobs are being threatened, but also with new coastal property owners who feel as though protective regulations of land and sea threaten ownership.

Compromise with local developers and property owners is somewhat more complex, as the possibilities for conflict can vary widely from community to community. Issues potentially arising might include beach usage regulations that contradict of a feeling of beach ownership from coastal property owners. Similarly, lighting regulations have the potential to upset the hours of operation for beach side restaurant and hotel owners. Zoning regulations, buffer zones and National Park ordinances have the potential to cause great unrest in relations with local and external real estate developers. Depending on the individual community however, the number of parties with threatened interests and the resulting issues marine turtle project leaders face will more than likely eclipse those few listed above.

At this point it is important that the joint-party, unbiased organizations capable of monitoring project, community and developer relations be established. As mentioned above, these groups and organizations should be capable of supervising compensation practices, ensuring equal treatment of all parties, and continually encouraging continued, joint participation in conservation practices that are mutually beneficial. Regulations on issues such as development and compensation of involved employees should also be established as soon as possible in the terms project progression. When regulations are made after developers and potential property owners have made significant investments, the potential for larger scale conflict and corrupt practices increases exponentially. It is only when every single stakeholder is represented with

an equal voice that a successful project can move forward. The sooner a marine turtle nesting beach community can achieve that democracy, the greater its chances for success.

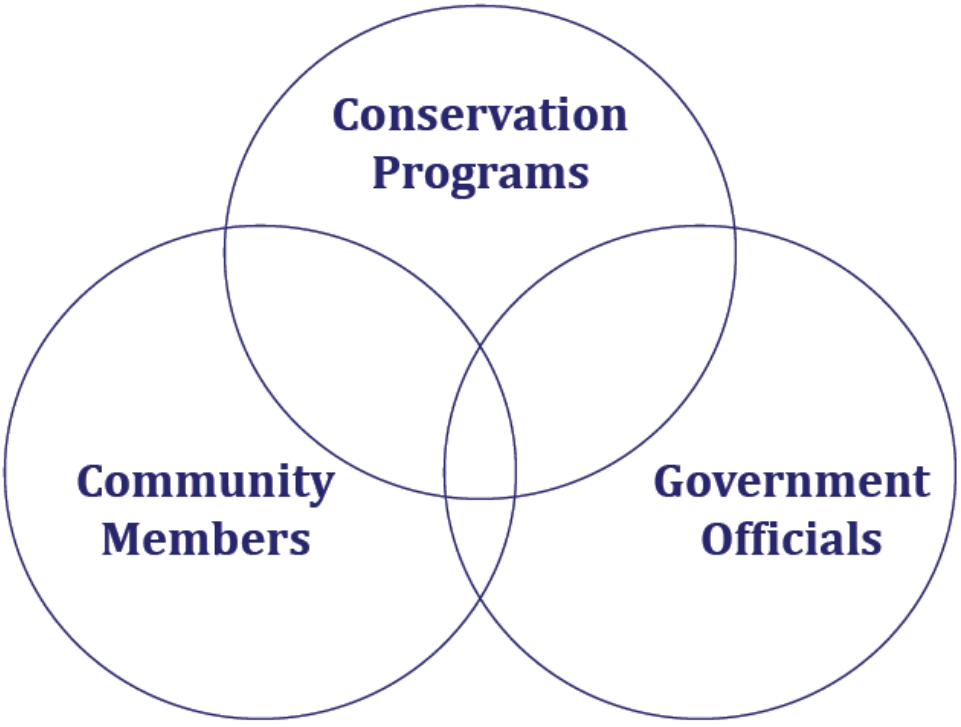
In the fourth and final scenario, the project has progressed into late development stages, having overcome all prior conflicts using methods discussed in previous scenarios. Protected Areas have been established, government and project are working in near unison, consumptive use has ceased completely, and organizations have been established to help maintain a healthy balance between development and conservation. Tourist numbers have risen dramatically, and many tourist services have been established. With all the influx of foreign revenue however, regulations have become lax, and community members with now-stable employment have become less willing to participate conservation. In the growth of the local community, it has lost its sense of self. Information is no longer readily available as local organizations lose participation. Partnerships fail to operate as they once did, and communication that once powered the conservation efforts is lost.

This situation illustrates that should a conservation project reach such a level of success, where a community has benefitted so greatly alongside a successful conservation project, it is important to not let the partnerships and practices that brought that success fall apart. It will be extremely important to maintain healthy lines of communication, strong partnerships and organizations, and availability of the most current, and useful information. By maintaining strong environment programs and stakeholder participation, communities and marine turtles can continue on a path of mutual success!

Because of the diversity of the communities, it can be difficult to suggest generalized practices for compromise with property owners and developers. Important steps to take however, might include first analyzing and understanding the specific needs of stakeholder parties, and then developing and presenting sensible policies with potential to benefit both the individuals and the ideals of the marine turtle project. Montoya and Drews stress first identifying stakeholders in a given community, and then establishing a partnership among major stakeholders and community actors through clarity of intent, and assessment of potential for participation (2006).

It is also important to consider the deeper ties that special interest parties and stakeholders might have, beyond the scope of the local community. It is not out of the question that developers and land owners may have strong interpersonal and financial ties to non-community members in positions of power. If this is the case, it may be necessary to, while not over-looking local stakeholders move beyond the boundaries of the community in seeking recognition of project goals.

It is unreasonable then however, to expect that any given suggestion might appease a party upon first presentation, and the anticipation of this is in itself an essential step towards compromise. It is most important to remain level headed, understanding and agreeable throughout the process. Keep in mind that division between community parties driven by animosity and disagreement leads to alienation and lack of cooperation. Remember that without the concentrated, combined efforts of all community parties, a successful marine turtle project cannot be possible.



28

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The Inter-American Convention for the Protection and Conservation of Sea Turtles

APPENDIX E: WEBPAGE OUTLINE

INTRODUCTION:

Marine turtles have inhabited the oceans of the planet for about 110 million years, maintaining their existence even through the mass extinctions which saw the end of the dinosaurs. Despite their tremendously adaptive survival skills, over the last few decades sea turtle populations have seen their greatest and most drastic decrease. Unfortunately, it is most likely that these drastically reduced populations have been caused by the actions of human beings. Some of the activities detrimental to marine turtles include habitat destruction, excessive harvesting, bycatch, and marine pollution, among many others.

Conservation projects and community based tourist attractions have become increasingly popular in communities that serve as hosts to nesting marine turtles. While marine turtle protection is the primary concern of all conservation efforts, there are many related issues that must also be carefully considered and managed to ensure complete project success.

With the growing number of conservation projects and community based tourism attractions comes the necessity for development in the form of hotels, restaurants, transportation, visitor centres, and waste disposal systems, in addition to many other services and infrastructure. In many cases, marine turtle nesting communities have become dependent on revenues from the yearly influx of turtle seeking tourists. While the work of the project or the community is often still beneficial to the turtles, many communities fail to recognize the point at which the threats posed by development actually begin to reverse the project's success.

It is this struggle for a balance between the benefits of community based marine turtle tourism and the threats posed by its necessary developments that provides the basis for this brochure. The brochure will attempt to provide guidelines and suggestions for successful and sustainable marine turtle nesting beach tourism. It will also assess the interactions between community, tourism and development, using examples from nesting beach communities already participating in marine turtle based tourism.

Guidelines for...

Marine Turtle Tourism *Coastal Development* *Community Involvement*

MARINE TURTLE TOURISM:

[Text of Marine Turtle Tourism Brochure Section]

Other Sources:

Guidelines on Biodiversity and Tourism Development

Ecotourism, Sustainable Development, and Conservation Education: Development of a Tour Guide Training Program in Tortuguero, Costa Rica

Ecotourism for the survival of sea turtles and other wildlife

Design Guidelines for Sustainable Tourism Development

Biological Impacts of Ecotourism: Tourists and Nesting Turtles in Tortuguero National Park, Costa Rica

Money Talks

World Tourism Organization: *http://www.unwto.org/*

The International Ecotourism Society: http://www.ecotourism.org/

COASTAL DEVELOPMENT

[Text of Coastal Development Section Here]

Other Sources:

Land Use Planning and Regulation In and Around Protected Areas: A Study of Best Practices and Capacity Building Needs in Mexico and Central America

Tourism, ecotourism, and protected areas: The state of nature-based tourism around the world and guidelines for its development .http://data.iucn.org/dbtw-wpd/html/Tourism/cover.html

IUCN Library: http://iucn.org/resources/publications/index.cfm

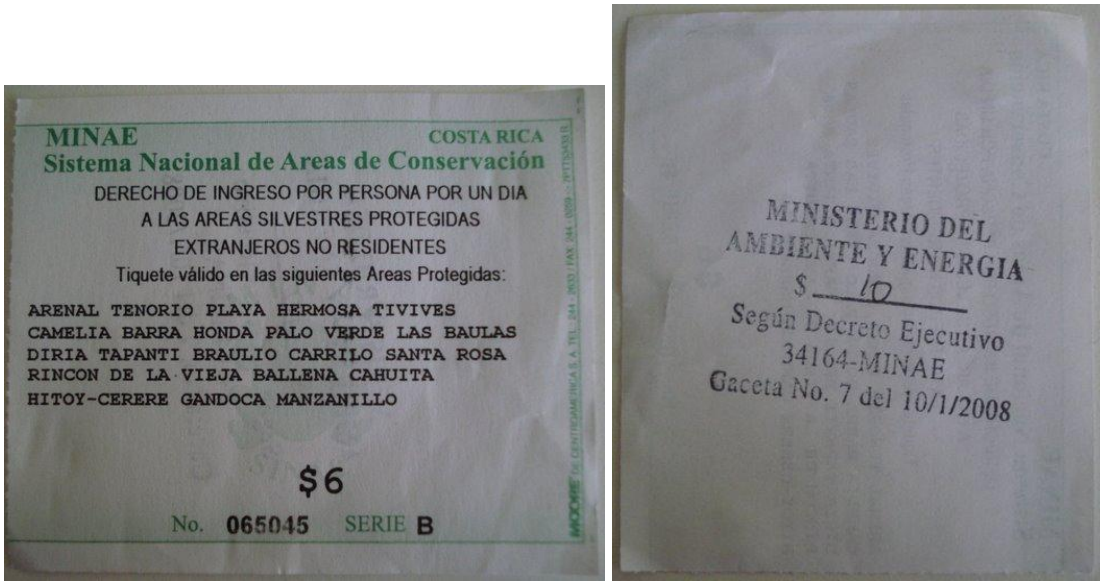
Marine Turtles as Sentinels of Ecosystem Health

COMMUNITY INVOLVEMENT
[Text from Community Involvement Section]

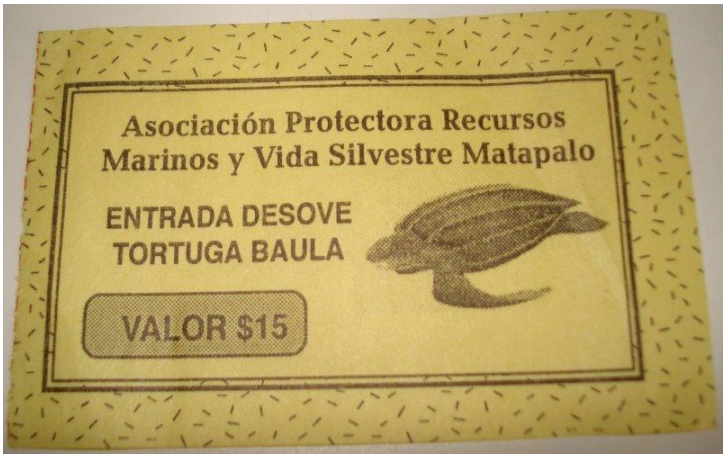
Other Sources:
Guidelines for Community Based Tourism Development
Ecotourism, Sustainable Development, and Conservation Education: Development of a Tour Guide Training Program in Tortuguero, Costa Rica
Money Talks
Livelihoods, Community Well-Being, and Species Conservation. A Guide for Understanding, Evaluating adn Improving the Links in the Context of Marine Turtle Programs

APPENDIX F: PICTURES FROM PLAYA GRANDE

All photographs taken by group member Matthew Cembrola.



$10.00 ticket for Ministerio del Ambiente y Energia, front and back.



$15.00 ticket for Asociación Protectora Recursos Marinos y Vida Silvestre Matapalo.

Century 21 Lot in Playa Grande.

Hotel advertisements in Playa Grande.