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**Project Title:**

 Comprehensive study on effectiveness of conservation efforts to protect sea turtles in Costa Rica

1. **Introduction**

Costa Rica is a country known for being more environmentally conscious and having governmental initiatives focused on decreasing carbon emissions. The United States, on the other hand, has actually been decreasing governmental funding for programs like the Environmental Protection Agency. Considering the increasing problems surrounding climate change, pollution, and clean water availability, a better understanding of relatively successful initiatives surrounding the environment is critical to make changes worldwide. Therefore, analyzing possible solutions and their effectiveness surrounding these problems can be helpful.

One area of conservation efforts in Costa Rica regards the protection of natural wildlife and more specifically, sea turtles. The problems that sea turtles face include hotel lighting interfering with the hatching of eggs and their journey to the sea, stealing of eggs for food (especially in higher poverty areas), fishing hazards, and pollution, especially plastic. Some of the main species found in Costa Rica that are endangered are the Olive Ridley Turtle, the Leatherback Turtle, the Hawksbill Turtle, and a Pacific Green Sea Turtle.

1. **Research Topic**

This project addresses the conservation efforts to protect sea turtles in Costa Rica and comparing the effectiveness of their strategies compared to the United States through observation and research.

1. **Predictions**

Considering how Costa Rica is known for their governmental focus on environmental issues, I anticipated that Costa Rica will have more action-based initiatives than the United States, but not necessarily large funding. In addition, I anticipate that there will be local tricks and solutions to both hiding and protecting the hatching sites for the sea turtles’ eggs, along with working with the community to protect the beaches. Further, with one of our stops being a beachfront location, there would probably be cost-effective methods on reducing plastics, possibly countrywide. Overall, I believed I would find that while Costa Rica might not have endless funding for environmental issues, they have found both local and governmental initiatives to protect the sea turtles that the United States could implement and increase the focus on in this area. Sea turtles are an important part of the underwater ecosystem that deserve to be protected and this project aims to use local interviews, observations, and comparison to analyze more effective solutions in keeping these creatures safe.

1. **Observations**

One of the benefits of the trip was being able to visit a center that focused on protecting turtle egg nesting sites (although the center was really a tiny building) called El Refugio Nacional de Vida Silvestre Playa Hermosa-Punta Mala. Unfortunately, the day that we were able to visit the conservation building near Jaco beach, there were no workers present. However, we were still able to walk around and see how the center works. This center was founded in 1998 by the organization, MINAE and is now overseen by SINAE in collaboration with Hermosa Palms homeowner’s association. While I was not able to interview a park ranger, my professors, Dr. Lara Lengel-Martin and Dr. Scott Martin, were able on a previous trip; they found the refuge primarily protects the nesting areas of the Olive Ridley turtle (Lora Turtle), along with some Green Turtles and Hawksbill Turtles (Mauricio Salazar Gambora, personal interview, 2019). What was unique about this beach, along with some other beaches we visited, was the fact that there was no construction directly by the beach contrary to the typical tourist destinations. For the beach the conservation center was on, no construction was allowed for 20 km (Mauricio Salazar Gambora, personal interview, 2019). The center was run by hired officials and the volunteers had to follow very specific protocol to help. There are roughly 80-100 eggs found at that location during the typical nesting season and 1,200 working nets (Mauricio Salazar Gambora, personal interview, 2019). The volunteers use the nets to create a stratovolcano structure over the nesting locations and the palms cool the nests with shade (Mauricio Salazar Gambora, personal interview, 2019). In addition, there was a surprising trend that on many of the beaches we visited outside of national parks had no beachfront construction for at least 200 meters contrary to many beaches in the United states (not including the tourist beach we visited).

1. **Fishing Problems**

Until recently, Costa Rica had not banned shrimp trawling that utilizes large nets, which tend to capture other marine life, including turtles, and greatly endanger other marine life. The United States even refused to purchase shrimp from Costa Rica for this reason. However, Costa Rica banned shrimp trawling in the past few years, but longline fishing is still legal. Costa Rica charges commercial fishers in large costs for licenses and other taxes. From the years 1999-2010, one sources estimated that there was a total of 699,600 olive ridley turtles that were caught in long-line fishing (Dapp et al., 2013). In addition, along some of the beaches near where longline fishing took place, the populations of turtle nesting further decreased (Dapp et al., 2013).

Outside of fishing nets and lines, there is also the issue of fishing waste that causes other problems for sea turtles. Fishing waste makes up a large amount of trash in the ocean. Other than affecting marine animals physically through wounds or other health problems, this can cause other changes to the ocean composition. For example, one analysis demonstrated that fishing lines along (roughly 1%) of litter can change the chemical composition longer term during decomposition, which could be potentially dangerous and toxic long-term (Battisti, 2018).

1. **Egg Dilemma**

While there still can be problems of overharvesting turtle eggs in few locations in Costa Rica, many locations have created an improved dynamic for the dynamic with turtle eggs and locals. Two approaches are presented to address protecting sea turtle populations and eggs by either having stricter restrictions or use this in moderation to maintain population levels. There is legislation present in a variety of areas to protect families that need to eat the eggs and to create a balance between the locals and the nesting sites. For example, there are egg harvesting projects in areas like Ostional that may be slightly more impoverished, which has a legal supply of sea turtle eggs (Sardeshpande and MacMillan, 2018). The whole processed is governed through the local community and larger institutes with permits to only harvest eggs during the beginning of nesting seasons when the eggs likely would have been destroyed anyway, in order to still generate revenue for the local citizens while protecting other eggs in the process (Sardeshpande and MacMillan, 2018). Although this particular location is very controversial with the outcomes, the general interaction with using legislation to both save eggs without targeting such communities has seen some positive outcomes.

1. **National Parks and Tourism**

It is generally considered that the land area of Costa Rica is 28% protected area. The national parks in Costa Rica not only protect the wildlife in the area, but also keep people from living in active volcano regions. Some national parks on the coastal regions were created to protect turtles originally but evolved to protect other species. The North Caribbean have many Leatherback and the Pacific has some nesting areas, but many turtles have their own specific nesting locations.

Ecotourism in Costa Rica is a growing industry, since 2001, that provides large amounts of revenue for the country, along with encouraging environmental conservation. Ecotourism is especially effective in more rural communities with many protected areas where local residents can make money. One study analyzed the ecotourism of three national parks, Tortuguero National Park (which we visited), Cahuita National Park, and the Yorkin ecotourism project to evaluate the pros and cons (Sanchez, 2018). The study found that overall ecotourism did provide more sustainable alternatives for rural communities in these three locations, provided they were supervised (Sanchez, 2018). While ecotourism is not perfect, it has its significant economic and conservation benefits compared to the previous corporate tourism (Sanchez, 2018).

Regarding sea turtles, ecotourism, along with protected marine areas, can act as a protective shield for sea turtle nesting sites and raise awareness. Another study says that as long as there is an effective management plan for ecotourism, this has delayed the extinctions of turtle species.

1. **Water Quality-Golfito**

While we were in Golfito, two environmental policy college students and their professor from the local university gave us a presentation regarding the evolution of environmental policy in Costa Rica. According to their presentation, as of 2018, 2.63% of marine area was protected and 25.44% of land area was protected in Costa Rica. However, one of their challenges was to solve bad water management, especially regarding sewage and trash in Golfito. During the boat tour the following day, there was visible trash floating in the water, especially in smaller inlets. That being said, there is known to be many entrepreneurs in Golfito that help other species, like turtles, by pushing government to pass laws to stop large fishing nets. This creates a mutually beneficial dynamic for sports fishers that bring in marlins and tunas that attract tourists and protect other species without large fishing nets. They also pay people to stop shrimp fishing in the area in order to attract more fish. Golfito has two national parks on either side of the golf that allow for bridges between national parks and more protection for marine animals between.

1. **Organizations and Groups**

 One important organization in Costa Rica is the Ministry of Environment and Energy (MINAE). MINAE is a national organization founded in 1988 that focuses on climate change and other conservation issues. Being the main organization for environmental topics in Costa Rica, MINAE is a leading organization focusing on being transparent and focusing on public interest (Rodiguez, 2019). One of the agencies coordinated by MINAE is the National System of Conservation Areas (SINAC). SINAC is more of a decentralized institutional approach to conservation topics. We were able to witness the impact of both of these agencies while in Costa Rica, especially their establishment of the conservation center that we were able to visit. Costa Rica conservation efforts are a large combination between governmental action, organizations like MINAE, NGO’s, and volunteer groups.

1. **Costa Rican Government**

Although there has been an international movement to increase the number of protected areas, there tends to be insufficient resources to maintain or establish these (Pringle 2017). Two of Costa Rica’s protected areas, Área de Conservación Guanacaste (ACG) and Parque Nacional de Gorongosa (PBG), have taken a combination of approaches to help rehabilitate (Pringle 2017). One of the tools used by these two is to “protect remaining refuges and harness nature’s resilience” by allowing nature to do the majority of the work and therefore saving resources (Pringle 2017). The next tool was to “upsize and interconnect” like how ACG purchased a small piece of land that connected three other protected areas (Pringle 2017). The third connection was to “be long-term and local” with the best supporters being those who are committed long-term (Pringle 2017). The fourth tool found in Costa Rica is to “pay the opportunity costs”; for example, PNG supports individuals who live within this area who can help with the responsibility (Pringle 2017). The fifth tool is to “develop creative strategies”, especially through outside donations and/or the partnerships with public and private (Pringle 2017). Two crucial aspects of these parts are to “know the biodiversity” and “be adaptable” to best help the areas (Pringle 2017). Finally, these two Costa Rican parks, along with other areas, focus on the idea to “involve young people” because they need to establish the importance of protecting nature early (Pringle 2017). One unique aspect of Costa Rica is the clear focus on environmental awareness in some of the smaller aspects of daily life. For example, in almost every bathroom, there were signs to use less toilet paper and you were reminded with signs to throw away the toilet paper instead of flushing. Based on the presentation mentioned earlier, Costa Rica has had primarily renewable energy since 2018. Also, the national system oversees the protected areas so there is more legislation like the Organic Law of Environment that helped create national parks and other conservation efforts. Although the United States was a leading nation on national parks, Costa Rica has been efficient in growing the number in the much smaller nation with roughly 28% of the nation being protected.

1. **United States Comparison**

One of the major pieces of legislation passed by the United States was the Endangered Species Act that included protecting the Atlantic Green Sea Turtle, Kemp’s Ridley sea turtle, Atlantic leatherback sea turtles, and other species (Suckling 2006). Overall, there has been a continuous decline in sea turtle populations, but many of the sea turtle species mentioned in this legislation have seen some increase through programs to rescue turtles stranded in the wrong locations in the winter, programs that raise hatchlings away from predators for the first year of their life, and programs that help protect known habitats (Suckling 2006). This legislation has greatly helped the species that were found on the list by improving their status in the United States since being placed on the list, but their worldwide populations are still in danger (Suckling 2006). The Environmental Protection Agency (EPA) is an important United States agency that has done beneficial steps in protecting the environment. However, in the previous years, their budget has been steadily decreasing. That being said, the EPA has taken many steps to help the marine environments to work towards their goal “to protect human health and to safeguard the natural environment-air, water, and land-upon which life depends” (“Protecting the Marine Environment”, 2019). The EPA has been incorporating The United Nations Environment Programme and Caribbean Environment Programme that address pollution and other degradation that is land-based (“Protecting the Marine Environment”, 2019). Another organization in the United States that helps with turtle conservation is the U.S. Fish and Wildlife Service (USFWS), which is another governmental organization. The United States has additional nongovernmental organizations including Coral Reef Alliance and Sustainable Fisheries Partnership.

1. **Conclusions**

In conclusion, the project provided some interesting observations and insights to a different culture and traditions. While being in Costa Rica, I was able to witness more local level implementations for conservation and see the impacts of organizations like MINAE in multiple aspects. Although both countries incorporated the use of international collaboration for conservation efforts, I found that Costa Rica used larger amounts of funding from other nations and organizations. I personally found that there were more initiatives to be environmentally conscious, even away from the beachfront than when I have travelled in the United States. Overall, I believe that any effort to encourage environment conservation is important, especially with marine life like turtles in mind, Costa Rica had more national pride in the efforts being taken and being more away on a day to day basis when compared the United States; the United States had more resources, but less lower level initiatives.

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