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# The Importance of Education and Community Engagement Towards Sea Turtle Conservation

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**Abstract**

In order to cope with the historic unsustainable use of resources and lack of concern that humans have for the environment, scientists and educators have "elected" species they believe can help to conserve natural resources. As a beloved and charismatic species, sea turtles are often chosen as ambassadors to encourage a change in public perception of the importance of healthy ecosystems. Sea turtles are some of the most vulnerable species in marine ecosystems, yet the roles they play as habitat engineers, predators, prey, and facilitators of nutrient cycling are becoming more apparent as human activities have reduced their numbers worldwide. Poaching of their nests, bycatch in commercial fisheries, and capture for meat and carapaces are drastically affecting critical turtle populations and placing them closer to extinction. However, by playing vital roles in the delicate balance of marine ecosystems, they help educators encourage changes in behavior that help protect sea turtles and the marine ecosystems that rely on them. This paper highlights the importance of education in conservation and demonstrates the use of charismatic megafauna, like the sea turtle, in the fight to save the environment by showcasing the role that sea turtles play in marine ecosystems as well as the success of Equipo Tora Carey.

**Keywords:** education, sea turtle, charismatic megafauna, conservation

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## Introduction

Understanding the role that different organisms play in marine ecosystems would prepare humans for a better future of managing crucial marine resources. As humans continue to modify natural environments through pollution and resource extraction, our knowledge of natural ecosystems becomes increasingly important in order to preserve current levels of biodiversity and ecosystem services. Educating the public on their importance to ecosystems and economies is a challenge that is faced by those who are working to conserve species. When people understand a system and their connection to it, they are less likely to degrade it (Pooley & O'Connor 2000). In building off ecological knowledge, communities can come to benefit from healthy ecosystems by realizing the potential for alternative sources of income. In addition to the its immediate effect on species, the trickle down effects are also enormous. For example, Equipo Tora Carey, which is a non-governmental organization in Costa Rica and it is managed by scientists and volunteers, emphasizes on local involvement in conservation efforts of sea turtles

and marine ecosystems. As a result of this approach, the environment is left healthier, and those who rely on it realize the potentials for economic gain that conservation work could provide for their families. The transition of fathers from fishermen to conservationists has even inspired their children to strive for careers as scientists. Without the introduction of conservation practices in this small community, local children probably would not have been introduced to the world of science. As children learn more about the environment in class and get more involved with conservation work, they set a better tone for the community to value ecosystems

## The Natural History and Conservation of Sea Turtles

Serving a variety of functions in marine ecosystems, the conservation of sea turtles has become an increasingly important task for environmentalists. In addition to directing mortality due to poaching and bycatch, more fish are being taken out of the ocean than ever before, limiting the resource base for these oceanic megafauna and forcing humans to develop new management techniques (Deroine, Pillin, Mauger, Chauvel & Grohens, 2019 and Otiuea, Teariki-Ruatu, Timeon, Francis, & Dietershagen, 2019 and Pauly, Watson, & Alder, 2005 and Taiarui, Foale, Bambridge, & Sheaves, 2019). Understanding the critical roles that sea turtles play in marine ecosystems and the ways their existence benefits humans can help conservationists achieve their goal of protecting ecosystems.

### *Sea Turtle Ecological Roles*

As sea turtle populations decline due to human influence, their value to ocean ecosystems becomes more apparent (Lutcavage, Plotkin, Witherington & Lutz, 2017 and McClenachan, Jackson, & Newman, 2006). Sea turtles play different roles in the environment, and as their

numbers drop, so does their ability to provide services to ecosystem. An example of one such services is the regulation of jellyfish populations by leatherback sea turtles (Jones, Bostrom, Hastings, Houtan, Pauly, & Jones, 2012). The growth of the commercial fishing industry has resulted in decline of fish populations to such an extent that they are being taken over by jellyfish in some areas (Lynam, Gibbons, Axelsen, Sparks, Coetzee, Heywood, & Brierley 2006). Increased jellyfish presence is positively correlated with predation of fish eggs, and as more jellyfish enter an ecosystem, it becomes more difficult for other species to reclaim habitat too (Purcell, Uye, & Lo, 2007). Jellyfish also have direct negative influences on humans. They interfere with tourism by stinging swimmers, clogging fishing nets, and killing fish enclosed in aquaculture systems (Purcell et al., 2007). However, Leatherbacks are important to healthy ocean ecosystems because of their ability to help ensure that species dominance doesn't shift from finfish to jellyfish through top down predatory pressures.

Like the leatherback, hawksbill sea turtles contribute to ecosystems through their consumptive behavior. Their preferred food, marine sponges, have chemical and physical defenses that prevent most marine predators from eating them (Meylan, 1988). As hawksbills rip sponges apart when feeding, they expose the edible parts of the sponge to other marine organisms. This behavior has big impact on the diversity of reef communities and provides habitat to colonize corals (Leon & Bjorndal, 2002).The alteration of habitat is one of the main direct or indirect roles that sea turtles play in marine environments.

When female sea turtles make their way to shorelines to lay their eggs, they're bringing nutrients to beaches that came from feeding away grounds oceans, leaving lasting positive effects on beach ecosystem community structure (Madden, Ballestero, Calvo, Carlson, Christians, & Madden, 2008). These nutrient poor beaches rely on the energy supplied by the eggs for various

organisms including carnivores, detritivores, and plants. Unhatched eggs and embryonic fluid, as well as hatchlings, provide food for a diverse list of animals ranging from vultures and raccoons to microorganisms and crabs in the sand (Madden et al., 2008). Increased nutrient availability from eggs has been shown to enhance the health of dune vegetation, promoting stabilization, and therefore preserving nesting habitat (Hannan, Roth, Ehrhart, & Weishampel, 2007). As both a food source and habitat engineer, sea turtles positively influence beach ecosystems.

By carrying around epibionts (organisms that live on other organisms), such as barnacles and algae, sea turtles provide food for fish (Sazima, Grossman, & Sazima 2010). Sea turtles often visit "cleaning stations" to have organisms removed from their carapaces, supplying food to other organisms (Losey, Balazs, & Privitera, 1994). In addition to epibionts, juvenile sea turtles act as a source of food for marine life. Many seabirds are known to consume hatchlings shortly after entering the ocean (Limpus, 1973). Studies on a population of green sea turtles have shown that most first year mortality occurs when hatchlings cross the reef within one hour of making it to sea (Gyuris, 1993). Acting as both predator and prey, sea turtles act as regulators of ocean health.

Sea turtles are important for maintaining aquatic habitats. For example, green sea turtles are some of the largest organisms that rely on seagrass as their primary food source and are crucial to the health of seagrass beds (Bjorndal, 1980 and Valentine & Heck, 1999). Their true importance to these ecosystems was apparent before the arrival of Europeans to the new world, when sea turtle populations were far greater than today (Bjorndal, 1980). With over 92% of their diets being made up of seagrass (Bjorndal, 1980), their feeding behavior and consumption needs have far reaching effects. Without consistent grazing, seagrass beds can become overgrown, creating an imbalance in these ecosystems by lowering biodiversity

(Zieman & Frankovich, 1999). As sea turtle populations continue to decline, some marine ecosystems will likely destabilize as a result of the loss of the regulatory services that they provide.

*Sea Turtle Importance to Humans*

In addition to their importance to natural ecosystems, sea turtles are also important for human culturally and economically. Lisa Campbell, a social scientist at the Duke University Marine lab, describes the two ways in which Western culture has impacted the use of sea turtles in her paper *Contemporary Culture, Use, and Conservation of Sea Turtles (2003)*. The first is related to the expansion of capitalism. Economies that may have previously relied on sea turtles and their eggs for subsistence purposes now have needs that must be satisfied monetarily. These needs may be met through selling sea turtle meat and their by-products. The second involves recognizing the separation of humans from nature in Western culture. This separation has created an admiration of "charismatic megafauna," and has resulted in the demand for complete protection of sea turtles for tourism. This shift, in the way we value sea turtles, implies on what was once considered traditional use of these marine resources.

Many countries have a history of sea turtle egg consumption. Most collect eggs under the assumption that they have aphrodisiac qualities, a claim that hasn't been proven yet (Nichols & Safina, 2006). In others communities that egg harvesting is common, they claim on nutritional importance of turtle eggs. A famous example of egg harvesting occurs at Ostional, on the Pacific coast of Costa Rica. There, during the arribada (a biological phenomenon where thousands of sea turtles nest on the same beach over the course of three to seven days) a legal commercial egg collection project satisfies the primary economic needs of close to 70% of the community

(Campbell, 2007). However, Ostional life is organized around sea turtle nesting, perhaps the most sustainable tradition among communities that have been involved with egg harvesting worldwide (Campbell, 1998). A sense of pride in the community and in the sea turtles that nest on its beaches creates an ethic that preserves critical habitat and benefits future populations of turtles that will continue to visit Ostional.

Examples of sustainable uses of marine resources include tourism, education, and research. The Ecotourism Society defines ecotourism as "responsible travel to natural areas that conserves the environment and sustains the well-being of local people." In many developing countries, local economies often rely on tourism as a major source of income (Balaguer & Cantavella-Jorda, 2002 and Durbarry, 2004). In the case of ecotourism, travel incentivizes the protection of natural resources that these tourists wish to see.

Tourism activities surrounding turtles are common at nesting beaches around the world (Jacobson & Lopez, 1994 and Wilson & Tisdell, 2001). These activities have the potential to act as educational tools to help gain public support for sea turtle protection and can demonstrate the economic justification for conserving species. In some environments, ecotourism has successfully been integrated as a viable income source. An example of this is the case of Tortuguero, Costa Rica, where income earned by ecotourism has replaced money previously earned by the sea turtle fishery (Campbell, 2003). At Playa Grande in Costa Rica, sea turtle tours along nesting beaches generates income and brings awareness to the plight of the sea turtles, encouraging the protection of the beach as both a valuable site for economic activity and biodiversity (Campbell, 2003). Campbell links enthusiasm to ecotourism to a lack of enthusiasm for consumptive turtle use, highlighting the potential successes of promoting this type of tourism. In general, ecotourism is supported by various parties for different reasons. Tourists want to see

turtles, guides want to make money by taking tourists on tours, scientists value the research opportunities provided by sea turtles, and volunteers desire to adventure exotic experience.

## Education and Conservation

At the forefront of a successful conservation plan is education (Asch & Shore, 1975 and Hungerford & Volk, 1990). Management practices are sometimes unsuccessful in their goals after implementation because of a lack of support from the public as a result of insufficient general knowledge. By educating the public, specifically focusing on youth, attitudes towards the environment can change. Initial support for conservation programs is based on the public's perception of issues and relies on education as a foundation for success.

### *Effects of Education on Conservation*

Growth in the field of conservation biology comes from an understanding that humans have been negatively affecting the environment (Meine, Soulé & Noss, 2006). Regardless of the justification for conservation (e.g., ecosystem services, economic value of resources, or the belief in the intrinsic rights of species), the role that education plays in successful conservation practices must not be overlooked. Practical education in conservation involves a combination of various types of knowledge including an understanding of policy systems, skills in critical and analytical thinking, and appreciation of the influence of policy on the environment (Clark, 2001). Building a base of informed citizens, organizing community service events, fundraising, creating an environmentally conscious ethic, and building a support for conservation-based policies are among the primary goals of nature and conservation education.

Starting with children, whose behaviors are more easily molded, planning is the key to successful conservation implementation (Jacobson, McDuff, & Monroe, 2015). The "planning-implementation-evaluation process," as described in chapter one of *Conservation Education and Outreach Techniques* (2015), proposes an arrangement for identifying the goals of an education and outreach program, finding appropriate participants, choosing the proper materials, and assessing the outcome of the program as the most effective way to develop a plan that satisfies conservation objectives. Following these guidelines, Costa Rican non-governmental organization (NGO) Equipo Tora Carey implements this process by using carefully chosen teaching sites and materials such as a classroom and the beach, the correct demographic (school children who are more capable of absorbing new relevant scientific information than their parents) and regular adjustments to lesson plans and research involvement. What was found to be the best way to entice curiosity in the children was equal exposure to the field and the classroom: one without the other was incomplete.

Successful conservation is based not only on science, but on considerations made by the public (Wondolleck & Yaffee, 2000). Collaboration between local governments, citizens, and scientists is the only truly effective way to implement a successful conservation program. Without support from policy makers whose decisions are influenced by citizens, conservation research will fail to accomplish its goals. A well-rounded conservation plan incorporates quality science, relationships with lawmakers, and an educated public that understands and values ecosystems.

Studies show that educational programs can positively influence attitudes toward nature (Caro, Pelkey, & Grigione, 1994, and Patrick, Matthews, Ayers & Tunnicliffe, 2010, and Zeppel & Muloin, 2008). These studies point to the seriousness of raising awareness about ecosystems

and species. Even basic conservation biology classes have demonstrated a positive correlation between education and respectful attitudes toward the environment (Caro et al. 1994), showing that formal education can positively alter people's behavior.

An important distinction to make is that between formal and informal education and their effectiveness when it comes to student learning (Eshach, 2007). Evidence shows that different educational experiences result in different learning outcomes (Scribner & Cole 1973). Formal education differs from informal education in a few ways, namely where they take place. Formal education is often classroom-based and provided by trained teachers, while informal education doesn't usually take place in the classroom and can be taught by individuals ranging in subject expertise and teaching experience (*Enhancing Education: Formal vs. Informal Education*). Examples of this type of education include interpretive tours at nature centers and after-school programs. Each offers different strengths, and its effectiveness is often based on the learning style of the student. However, research shows that formal classroom education is more effective at improving environmental behavior than non-traditional education settings (Zelezny, 2010). Reasons for this include the consistency of student attendance to class in formal education settings, regulated comprehensive lesson plan structure that is required to meet some form of criteria, and general teacher training where educators in formal settings are assumed to have a certain level of both experience and familiarity with the philosophy of teaching (*Enhancing Education: Formal vs. Informal Education*). This research also demonstrated that active involvement in learning activities significantly improved environmental behavior (Zelezny, 2010). While both formal and informal education contribute to the development of an environmental ethic, what remains a critical factor in the improvement of environmental behavior is an accumulation of experience that promote the development of a sense of personal

and collective competence, or confidence in an individual's ability to successfully meet goals through group collaboration (Chawla & Cushing, 2007). A combination of positive environmental experiences, paired with traditional education, produces students that possess background knowledge, interest in the environment, and the confidence to advocate for it.

The concept of competence as related to conservation is a product of experiences where goals have been successfully achieved, and positive memories made (Roczen, Kaiser, Bogner, & Wilson, 2013). As previously mentioned, this can be achieved through the combination of effective formal teaching and first-hand experiences with wildlife. Wildlife tourism can provide numerous conservation and education benefits for visitors (Zeppel & Muloin, 2008). The benefits are acquired through close personal encounters with wildlife tied with learning about ecosystems and species. For example, marine wildlife tours in Australia have been studied as having a positive effect on pro-environmental attitudes (Zeppel & Muloin, 2008). The analysis found that what tourists learned during their controlled encounters with marine wildlife improved general behavior when around marine ecosystems, creating a pro-environmental ethic with potential long-term implications for future conservation actions (Zeppel & Muloin, 2008). However, these forms of positive experiences are not necessarily limited to encounters with wildlife in the wild.

This concept of combining education and experiential learning is at the center of mission statements from zoos around the country (Patrick et al, 2010). The goals of many of these zoos is to combine education and experiential learning to change visitor perception of wildlife. With more than 134 million visitors every year, these institutions have the unique opportunity to supply environmental and conservation education to very large groups of people (Patrick et al.,

2010). Zoos have the ability to provide both aspects of successful education programs that have been outlined in this paper: positive experiences with wildlife combined with formal education.

## Equipo Tora Carey- a Model for Conservation through Public Education

An NGO operating in the northwestern corner of Costa Rica, Equipo Tora Carey's (ETC) goal is to save marine species and their habitats. Their approach is simple; develop a sustainable tourism operation through the employment of locals, monitor beaches for poachers, conduct valuable marine science research, and educate local youth on the importance of the environment and rights of species. Equipo Tora Carey has been steadily growing and meeting its goals with the help of volunteers and students as well as the enthusiasm of the locals that call this corner of the country home.

### *The History of Equipo Tora Carey*

Equipo Tora Carey is a team of biologists, educators, fisherman, and local tourism operators created to pursue sustainable development and conserve sea turtles through "science, education, and responsible tourism" ("El Equipo"). The NGO is located in El Jobo, a small community made up of mostly subsistence fishermen in Northwest Costa Rica. Bahia Salinas, the bay where El Jobo is located, is famous for its winds and attracts kite surfers from around the world. Some of these tourists ended up staying in El Jobo and the surrounding towns to open kite surf hostels. While these hostels don't employ locals, they draw in foreigners who are willing to spend money at local shops. Recently however, people are beginning to realize the value of the local ecosystems. In the surrounding areas, wildlife and canopy tours have been constructed, creating a small tourism hub close to the border of Nicaragua. Locals who understand the diversity of these coastal waters have begun taking tourists out on boat and snorkeling tours to

appreciate wildlife. Here lies the key to protecting Costa Rica's marine species. Transitioning from removing species from ecosystems for food or sport, operators have begun to develop a concern for how their actions affect the environment, taking the sea turtles into special consideration.

Equipo Tora Carey has implemented a multi-faceted program to ensure the protection of current and future sea turtle populations. This effort has been made principally by a German marine biologist and a resident who moved to El Jobo from France. A challenge for these foreigners is developing positive relationships with the residents of El Jobo. Locals in this part of Costa Rica are often weary of strangers, and especially unwelcoming of foreigners. A strong sense of pride in their place as well as an established way of life makes it difficult for nonresidents to make positive impressions on locals. Maike Heidemeyer, founder and lead biologist of ETC, has worked for years with local fishermen in the area to teach them about the importance of sea turtles to ocean ecosystems and the uniqueness of the beaches that surround their homes. Maike has an intimate understanding of the ecosystems surrounding El Jobo. Further pushing the fishermen toward building a relationship with Maike was a recognition of the declining viability of subsistence fishing in the area. What she had presented was an alternative form of income to these subsistence fishermen. Together with another marine biologist specializing in nesting behavior, Maike and the local fishermen developed a strategy to conserve nesting sea turtles and their hatchlings in El Jobo.

The main concern in El Jobo regarding sea turtles is the poaching of eggs for non-nutritional purposes, as locals generally subsist on rice, beans, plantains, cheese, and fish. Eggs are consumed for aphrodisiac purposes alone. Realizing the financial opportunity that a full nest of eggs provides, some residents have turned to poaching to provide for themselves. Equipo Tora

Carey's fishermen patrol the beaches of El Jobo and ensure the nests made by the sea turtles remain unharmed. The poachers of the community are not usually hostile, so a presence on the beach is all that is needed to deter them from stealing eggs. Once a sea turtle is spotted, the patroller waits for the female to go into the trance-like state she enters while laying her eggs. Then he begins to remove the eggs from the nest, counting the total, citing the location/time, and scouting a site for relocation. In this form of sea turtle conservation, eggs are relocated to a new nest that has no evidence of nest making activity. This makes it difficult for poachers to find the nest, without tracks leading them to the eggs. The role that the patrollers play is invaluable, as consistent data collection and support of projects like this in the area are hard to come by. In addition to the work of the patrollers, credit must be given to all of the parties that make their work possible. The opportunity provided to fishermen in their transition to becoming conservationists is possible because of the financial incentive provided by local businesses.

Hotel Dreams las Mareas, an all inclusive resort located on El Jobo beach, plays a key role in the success of ETC's conservation practices. They have a huge staff and cater to the wealthier tourists in the Guanacaste province of Costa Rica. The resort attracts families, party goers, and those looking for the perfect beach wedding. At night, the hotel often sets off fireworks in addition to keeping the beach illuminated for its guests to go for a walk. Light pollution on nesting beaches can be detrimental to sea turtles because it alters nocturnal behavior that determines what nest sites will be chosen, how female turtles return to sea after nesting, and how hatchlings find the sea after emerging from the nest (Bourgeois, Gilot-Fromont, Viallefont, Boussamba, & Deem, 2009 and Pendoley & Kamrowski, 2016). Circumstantial and experimental evidence show that artificial lighting on these nesting beaches tend to deter female turtles from leaving the water to nest. Those who do eventually decide to nest on these

artificially lit beaches put their hatchlings at risk. On naturally lit beaches, hatchlings demonstrate a strong orientation toward the water. Because hatchlings tend to move in the direction of the brightest light (Witherington & Martin, 2000), they are often misled by artificial light sources and find themselves lost and unable to find the water. Unfortunately, this behavior has led to some tragic situations at Hotel Dreams Las Mareas. Confused by the light coming from the hotel, hatchlings have on more than one occasion crawled in the opposite direction of the ocean and into the resort's pool. Concerned with the satisfaction of their guests, the hotel has taken every precaution to ensure that deceased hatchlings don't end up in the pool.

Maike seized this opportunity to provide a mutually beneficial service to the hotel. After reducing general light pollution, the hotel agreed to provide salaries for two of ETC's patrollers to monitor the beach for sea turtles, making sure that hatchlings no longer end up in the pool. The newfound relationship was a turning point in the NGO's development: the turtles were kept safe, and the patrollers were incentivized to work. Nightly presence on the beaches has greatly reduced poaching of eggs and eliminated any chance of hatchlings ending up in the pool. This example demonstrates the cooperative nature of conservation work that is needed to implement a successful program.

The tradeoff made between the hotel and ETC works in part because of how physically strenuous patrol work can be. The hotel recognizes that asking its employees to go out after dark to monitor beaches is not realistic. For this reason, in addition to lacking the expertise of Maike and her team, the hotel avoids patrolling beaches on their own. The patrolling process is difficult in part because it's crucial that the patrollers stay out as long as possible to ensure they don't miss any nesting females and to deter poachers waiting for their chance to steal eggs when nobody's around. At the start, two enthusiastic fishermen were hired to patrol the four known

beaches where the turtles nested. Realizing the effort put in by the pair of patrollers, the team eventually grew to three. Placing the burden of patrolling on two individuals wasn't sustainable. However, with the hotel only willing to pay the salaries of two patrollers, ETC was tasked with finding another source of income. The addition of volunteers to the team solved this issue. Each volunteer is placed with a local host family, including a Mama-tica (Costa Rican mom). They pay the family a sum that covers the salary for a poacher. Each volunteer that comes to El Jobo ends up satisfying a different role within the organization. Some come to conduct studies for university requirements, while others come for a cultural experience in a community vastly different than their own.

**Discussion/Program Assessment**

While the ecological functions of sea turtles should be heavily considered as humans continue to degrade marine ecosystems, their intangible value as charismatic megafauna is where their real worth lies in saving marine ecosystems. These species are uniquely positioned to contribute to future conservation programs by inspiring younger generations to care about the environment. Children must be taught about the importance of these species, as their future behavior is what will ultimately determine the fate of natural ecosystems.

Equipo Tora Carey's conservation practices and research are commendable. Consistent efforts on behalf of beach patrollers have greatly reduced the number of nests poached by locals. Integration of local fishermen and their families to the team of researchers and volunteers has brought income into the impoverished community, and national and international students benefit from the research opportunities provided by the site. What seems like the NGO's biggest accomplishment is the role it plays as an educator for El Jobo's youth. Without ETC, most of the

children would be limited to a future of subsistence fishing, child rearing, or hotel hospitality. The NGO gives the families educational and financial resources that can be used to provide a more comfortable and secure future for their children.

Equipo Tora Carey's two-fold educational program should be used as a model for other conservation organizations looking to expand their programming. Once a week, ETC's volunteer coordinator and youth educator runs a club at the local elementary school focusing on a wide range of subjects related to the environment. "The protectors of the environment," the club's title, has gradually attracted more kids, eager to hang out after school with their peers. The core group of about 15 members ranging in age from 5-12, take part in the NGO's research initiatives. Under the watchful eye of Maike, ETC's founder and lead biologist, the children sometimes help the researchers in the field by helping take measurements, record sex, tag, and release sea turtles at sea. These experiences have had a tangible difference on both the community and the children. Sea turtle art has a strong neighborhood presence, and involvement in research has influenced the children to attend school more often, excited to present their findings to their classmates. With the help of ETC, El Jobo's youth are developing an environmental ethic that their parents lack. Slowly their passion for these charismatic species is turning into a general care for the environment that they bring with them wherever they go. Many of these students have emerged as passionate ocean advocates with many hoping to follow in Maike's footsteps to become marine biologists. Before ETC's presence in the El Jobo community, these children were far less poised for success. Equipo Tora Carey's program demonstrates the importance of educating youth as the key to successful conservation.

An acceptance of educational and conservation programs is intimately tied to the role that communities play in the protection of ecosystems (Berkes, 2007). Successfully integrated

programs will combine conservation goals with local development goals (Berkes, 2007). In this way multiple stakeholders are accounted for through various levels of conservation development. This process has shown to be especially important in marine conservation (Lundquist & Granek, 2005). Incorporating multiple stakeholders at different phases of the project design allows objectives and goals to be clearly outlined and removes the potential for ineffective communication of local stakeholder expectations (Lundquist & Granek, 2007). However, many projects face shortcomings in the form of government instability, poor infrastructure, and outdated scientific resources (Lundquist & Granek, 2007). For example, between 2001 and 2005, civil war in Nepal forced conservation programs to reassess their strategies as insurgents took control of biologically protected areas (Baral & Heinen, 2005). As organizations and conservation agencies repeatedly came under attack, community-based projects were abandoned and conservation goals were not met (Baral & Heinen, 2005). These shortcomings are often further exacerbated by a lack of long-term funding and systems to evaluate outcomes (Sodhi, Butler, Laurance, & Gibson, 2011), but can be mitigated through strong leadership (Black, Groombridge, & Jones, 2011), and by creating a framework to assess conservation effectiveness (Kapos, Balmford, Aveling, Bubb, Carey, Entwistle, Hopkins, Mulliken, Safford, Stattersfield, Walpole, Manica, 2008). A well-known example of a conservation project that has demonstrated strong leadership is the effort to protect mountain gorillas in Bwindi Impenetrable Forest, Uganda (Hamilton, Cunningham, Byarugaba, & Kayanja 2008). The project nearly failed to meet its goals due to endemic government instability and inadequacy in taking local community expectations into consideration, but successfully rebounded due to leadership roles taken on by stakeholders in surrounding communities (Hamilton, Cunningham, Byarugaba, & Kayanja 2008). Effective leaders should be able to express a long-term vision for the project, are "hands-

on" in nature, encourage learning as a large part of the conservation process, and are flexible and willing to consider alternative solutions to problems (Black, Groombridge, & Jones, 2011). This has proven to be especially important in the conservation of marine resources (Gutierrez, Hilborn, & Defeo, 2011). An analysis of 130 managed fisheries of varying levels of development and types of resources demonstrated that strong leadership qualities in community-based management operations resulted in the most successful fisheries (Gutierrez, Hilborn, & Defeo, 2011), highlighting the overarching importance of effective leadership in conservation. While the literature demonstrates a variety of traits that allow conservation projects to persist, the actual implementation of these processes can be further investigated. In the case of Equipo Tora Carey, a hurdle that the project continues to face is that of foreign involvement in the lives of locals. Volunteers have observed some residents pretending not to understand foreign speakers even after proving language proficiency and are known to often ignore recommendations given by scientists. This problem stems from the pride that many locals in developing and impoverished areas have in their country and way of life but may also be a result of general distrust in the government and other organizations. Further research can be used to help inform conservationists on how to incorporate themselves into communities without disrespectfully crossing cultural boundaries or offending locals despite their well-intentioned actions.

## Conclusion

Popular animal species that captivate people around the world are regularly used by conservationists to achieve their goals. These charismatic megafauna are undeniably important in persuading people to care about the earth's ecosystems. Often, a single species is used as an ambassador for an ecosystem or specific conservation project. The use of an ambassador species

can make it easier for conservationists to successfully implement restoration or reintroduction projects by making the general public more aware of the issues at hand. In the case of Equipo Tora Carey, sea turtles perfectly fit this role. As part of the strategy they use to meet their goals, the conservationists studying these species advertise them as culturally, economically, and ecologically valuable. However, the most influential way of using these species is to educate younger generations about the importance of their existence as part of the greater ocean ecosystem. When youth understand the interconnectivity of ecosystems and realize the effect that human decision making has on these ecosystems, future conservation goals are easier met. Using sea turtles as role models for conservation, ETC is meeting its goals of reducing human impacts on marine ecosystems. Understanding that wildlife management alone isn't what will bring species back from the brink of extinction is the first step toward creating a realistic conservation plan. Through solid scientific research, integration of sustainable tourism, and education focused on youth, ETC is meeting its conservation goals and setting an exemplary case for projects around the world looking to do the same.

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