Evaluating the Socioeconomic Impacts of Sustainable Fishing Practices

A Study of the Fishermen of Palito and Montero

Interactive Qualifying Project Proposal

Sponsored by La Fundación MarViva

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ACG – Guanacaste Conservation Area

AMPR - Área Marina de Pesca Responsable (Marine Areas for Responsible Fisheries)

ASOPECUPACHI – Asociación de Pescadores Cuerderos de Palito de Isla Chira

FAO – Food and Agriculture Organization

ICT – Costa Rica's Tourism Institute

INCOPESCA – Costa Rica's Institute for Fisheries and Aquaculture

IUU – Illegal, unreported, and unregulated (fishing catches)

MINAET – Costa Rica's Ministry of the Environment

MOPT – Costa Rica's Ministry of Transportation

MSC – Marine Stewardship Council

MPA – Marine Protected Area

NOAA – National Oceanic and Atmospheric Administration

NGO – Non-governmental organization

Chapter 1: Introduction

Over the past few centuries, an increase in the population of coastal areas and an improvement of fishing technology has led to an increase in the demand for marine resources. As a result, there has been an overexploitation of many fish and seafood species. This overexploitation is not sustainable, and its negative effects on both the fish and human species are observable. A sustainable fishery should consider both the environmental and socioeconomic aspects of the local area. The focus of study on sustainable fisheries has been placed on their effect on the environment, and much less has been studied on their effects on communities.

For many communities around the world, the disturbance of these marine ecosystems impacts the local residents, both socially and economically. The overexploitation of resources has led to a decrease in seafood populations, and subsequently, has led to a decrease in the amount of fish caught by fishermen. Some communities have acknowledged the connection between overexploitation of the local fish population and their fishing practices. Consequently, they have taken a larger role in enforcing the fisheries management practices. This task usually falls under the responsibility of the central government. However, a new model is shifting the traditional top-down management approach to a bottom-up approach. This approach is one in which the community takes a more active role in managing resources and bringing about change in resource utilization. Instead of being mandated by regulation, the residents work with the local government to make decisions that affect both themselves and the environment. Non-governmental organizations (NGOs) play an important role in bridging the gap between the two groups to achieve effective resource management. This participatory process is challenging when human and economic resources are scarce and, as a result, the participants may not accept change (Alpízar, 2006).

Costa Rica has struggled with this dynamic, and is attempting to improve its practices for community fishing regulations. The country is considered one of the twenty most bio-diverse countries in the world and is home to an astonishing variety of marine and terrestrial wildlife that must be protected (Alvarado et al., 2011). Even though most of the conservation efforts have focused on protecting terrestrial species, Costa Rica has also established marine protected areas, or MPAs. These areas, chosen because of their importance to local ecosystems, are dedicated to the enforced conservation of the marine environment. The MPA designation restricts human use of the ocean in that region. In April 2008, INCOPESCA (Costa Rica's

Institute for Fisheries and Aquaculture) created a new category of MPA called the Área Marina de Pesca Responsable (AMPR), or the Marine Areas for Responsible Fisheries. This program is used for zoning purposes to regulate fishing activities within these areas. The AMPRs require the enforcement of specific regulations that guarantee sustainable fishing within these areas, as well as regulations concerning the utilization of these areas. The first AMPR was created in Palito, a small town on Chira Island located off the Pacific Coast (Alvarado et al., 2011).

In 2004, the government created the Inter-Institutional Commission of the Exclusive Economic Zone of Costa Rica. Amongst other tasks, the Commission is charged with the implementation of the AMPRs and the evaluation of their effectiveness. It is made up of several government agencies, including INCOPESCA, as well as universities and non-governmental organizations such as the MarViva Foundation (Alvarado et al., 2011). The role of these non-governmental organizations is to work with the communities within the AMPRs and help them adjust to the change in fishing practices set by INCOPESCA.

One of the participants, the MarViva Foundation, is a non-profit, NGO that operates in Panama, Colombia, and Costa Rica. Its mission is "to encourage the conservation and sustainable use of marine and coastal resources, by backing Marine Spatial Planning processes" such as MPAs and AMPRs (MarViva, 2011). The organization aims to encourage active fishing communities that maintain and improve regulations regarding commercial use of marine resources. Moreover, MarViva strives to "improve technical and scientific support to governments, communities, businesses and other decision makers for the formulation of policies and actions" regarding marine welfare (MarViva, 2011). In June 2012, MarViva was one of six NGOs to sign a motion before the Constitutional Chamber of the Supreme Court banning new shrimp trawling licenses in Costa Rica (Norman, 2012). MarViva has also advocated for the proper labeling of fish and seafood by working alongside other environmental and governmental agencies to push for legislation on this issue. Costa Rica recently passed a law requiring the proper labeling of fish and seafood that went into effect on August 14, 2012. This law not only protects consumers, but it also stops the sale of endangered species (Levin, 2012).

MarViva is monitoring the fish harvest on Chira Island, specifically in the towns of Palito and Montero. As a part of the Commission charged with implementing and evaluating the Áreas Marinas de Pesca Responsable, MarViva has developed a program to educate the communities about responsible fishing practices and to train them to effectively utilize their environmental resources. Additionally, they work with fishing associations on Chira Island that were established by the citizens to promote sustainable fishing. MarViva hypothesizes that fishermen would be more inclined to use sustainable fishing practices if they were aware of the possible

socioeconomic benefits it could provide. A label of sustainability on their fish and seafood products could lead to an increased demand and therefore an increased price.

This project will test MarViva's hypothesis by determining the possible socioeconomic impacts of the adoption of sustainable fishing practices by fishermen in Palito and Montero on Chira Island. If a positive socioeconomic impact can demonstrably be proven, a publication detailing our findings will be used by MarViva for their educational and outreach activities. If the data does not support MarViva's hypothesis, we will make recommendations to MarViva about the actions that could be taken to help the fishermen earn a higher profit while still fishing sustainably. Regardless of the outcome, the data collected will provide a much needed socioeconomic baseline of the fishermen in Palito and Montero. This data could be used for future research and study of the effects of the AMPR on these communities.

Chapter 2: Literature Review

This chapter presents the relevant background research to describe the context for our study. We introduce the evolution of sustainable fishing both globally and in Costa Rica, and then provide an overview of governmental efforts to protect marine environments. This is followed by an explanation of the utilization of a co-management strategy to bring about change in a community. We then delve deeper into the central problem of our project by examining the importance of socioeconomics in evaluating resource management in fishing communities. Finally, we narrow our focus to specifically discuss the setting of our field work, Chira Island.

2.1: Human Threats to Marine Environments

In recent decades, the harvesting of marine resources has negatively impacted many species of fish and their respective ecosystems. Prior to the 19th century, fishing fleets generally lacked the technological resources required to overexploit targeted fish populations. With the introduction of steam trawlers by English fishermen, industrial-scale fishing began to compete with small-scale or artisanal fishing. Led by a growing demand for fish, overfishing of specific species has occurred. To counteract this exploitation, the United Nations founded the Food and Agriculture Organization (FAO) in 1950 in an effort to “collect global statistics” on fish catches (Pauly et al., 2002, p. 689). In 1971, the Peruvian anchoveta was the first recorded overexploited species to cause global repercussions. Instead of evaluating their own overfishing practices as a cause for the collapse, many fishermen attributed it to natural causes, such as changes in weather patterns (Pauly et al., 2002). Despite these collapses, the trade of fish products across the world has continued to increase, as seen in official catch statistics through the 1990s, shown in Figure 1.

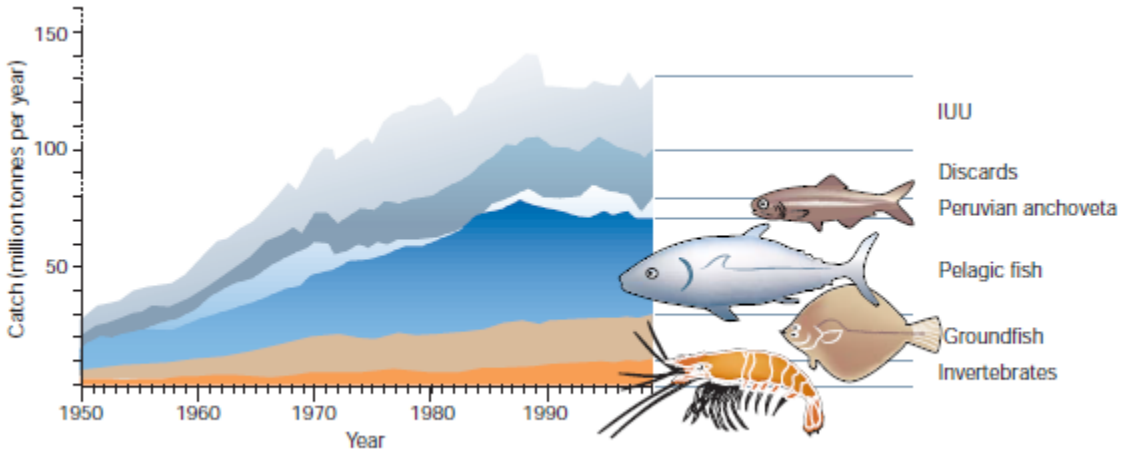

Figure 1: The catch statistics recorded by the FAO for various species of marine life from 1950 to 2000. The number of catches is raised by other "illegal, unreported, or unregulated (IUU) catches" (Pauly et al., 2002).

According to researchers, "more than 70 percent of the world's fisheries have become overexploited or significantly depleted" since the 1950s (Kingsbury, 2010). These alarming statistics have led to the creation of federal regulations and enforcement in countries around the world, including Costa Rica. The government of Costa Rica has been concerned with human threats to its diverse ecosystems, especially its extensive coastlines on both the Pacific Ocean and Caribbean Sea. Its marine environments are varied and include ecosystems such as "beaches, rocky intertidal areas, mangroves, soft bottoms, estuaries, seagrass beds, coral reefs, a tropical fjord, coastal islands, and oceanic islands" (Wehrtmann et al., 2009, p. 3). The Pacific Coast is home to the Gulf of Nicoya, which is one of the world's most productive estuaries and one of the most important fishing grounds of Costa Rica. Home to a plethora of species of fish and other marine animals, the Gulf of Nicoya contains many small-scale fisheries. However, due to overfishing, several species have become endangered or are on the verge of local extinction (Wehrtmann et al., 2009). One of these species is *Anadara tuberculosa*, a blood cockle found in mangrove estuaries along the Pacific coast of the Americas that is the most "important commercially harvested mollusk along this coastline" (Stern-Pirlot et al., 2006, p. 87). This species is just one of many marine species whose population declines indicate that conservation measures are necessary.

2.2 Sustainable Fishing

According to the United Nations, sustainable development "implies meeting the needs of the present without compromising the ability of future generations to meet their own needs" (1987). Therefore, seafood can be considered sustainable when it is regulated to meet the current needs of the population while also preserving these species to meet the needs of future generations. In order to mitigate the worldwide problem of commercial overfishing, governmental regulations have been established.

With technological advancement, there has been an increase in overfishing, or the removal of fish from the ocean faster than their rate of reproduction. Certain types of fishing gear, such as large nets or trawls dragged along the bottom of the ocean floor, can destroy the equilibrium of the ecosystem. Furthermore, large nets or longlines often unintentionally catch unwanted species. These species are returned to the sea dead or dying and are classified as bycatch. In order to diminish these environmental strains, several alternative fishing practices are being promoted as sustainable. One such method is hook and lining, the use of a fishing pole and hooks. Trolling, a type of hook and line fishing, tows fishing lines from a boat to catch a variety of fish at different depths. These methods are considered responsible because unwanted catch can be released soon after capture. Traps that are placed on the ocean floor are more sustainable than trawls because they do not damage the ocean floor and there is less bycatch. In remote places such as Chira Island, the adoption of these practices may require the modification of techniques that the fishermen have used for years. Although there have been a number of attempts to promote sustainable fishing, it is a process that will require time and participation to be effective (Monterey Bay Aquarium, 2012, True, 2012).

2.2.1 Incentive for Sustainable Fishing

A major advantage to sustainable fishing is the opportunity to label fish and seafood as such when brought to market. This labeling can increase the demand for the products by environmentally conscious consumers. One of the principal entities involved in the labeling of sustainable fish is the Marine Stewardship Council (MSC), an international organization that provides certification and accreditation for sustainable fisheries. In order to receive a certification for sustainable fishing, applicants must pass a rigorous, multiphase assessment. The assessment team looks at many attributes of the marine environment to ensure that the fishing practices used are in fact sustainable. If the fishery passes the examination, it has the

right to label their products as sustainable. More than seven percent of the world's fisheries are currently under MSC labeling (Thrane et al., 2009).

Consumers around the world are increasing their demand for sustainable products, with more than seventy percent of consumers in China, Brazil, and India reporting that they plan to spend more money on sustainable products (Lanuzzi, 2011). In order to identify sustainable products, household purchasers may simply look for an easily recognizable label, such as a sustainable label on fish products from organizations such as the MSC (National Research Council of the Academies, 2009, Thrane et al., 2009). A relevant example of this phenomenon is the Dolphin-Safe Tuna labeling started in 1990 which gave consumers the opportunity to purchase tuna fished by companies that reduced the risk to dolphins (Thrane et al., 2009, Potts and Haward, 2006). By following sustainable fishing practices, the fishing associations of Chira Island may be able to apply for a certification that would allow them to label their fish as sustainable, which would increase the demand for their product. An increase in demand should boost their market price and therefore improve their income (MarViva, 2012).

2.3: Government Regulation and Enforcement of Fishing Practices

In many countries, the conservation of natural resources is a national priority. To accomplish this goal, governments create protected areas and forbid any human activity that may negatively impact the environment or native species. However, this government regulation can cause tension among those whose livelihoods depend on the resources within the environments. This section explores how regulation of marine areas can cause tension between the fishermen and the government. In particular, it details the creation of the Área Marina de Pesca Responsable program.

2.3.1 Example of Opposition to Government Regulation of Fishing

There has been a long history of tension between the fishermen of New England and regulators. One such example of controversy between the government and the fishermen occurred in 2010 with the establishment of regulations to protect fishing grounds. The fishermen especially opposed the National Oceanic and Atmospheric Administration's (NOAA) decision to change the division of commercial fishing rights. NOAA developed the catch shares program "that assigns fishermen the rights to catch fish based on shares that they can also trade or sell" (Kingsbury, 2010). This program ultimately aims to promote sustainable fishing by applying pressure on small or independent fisheries rather than large companies. However, many independent fishermen argue that their part in this new system is not substantial, and they are

forced to buy other shares in order to catch more seafood and remain in business. Some legislators have even asked for money in "emergency federal grants" to support the fishermen of New England who have to abandon the fishing industry (Kingsbury, 2010). This controversy is important because there are about 35,000 fishermen in New England in an industry that garners billions of dollars each year. This example demonstrates the importance of government consideration in regards to the views of the people whose livelihoods are affected by such regulations.

2.3.2: Marine Protected Areas and Áreas Marinas de Pesca Responsable

Globally, Marine Protected Areas (MPAs) are officially designated ecosystems that are of ecological value and require intervention by the government. These areas, which are usually havens of biodiversity, often have fragile or degrading environments. To protect them, the government enacts laws regulating the human use of resources. These regulations specify when and where the people can and cannot fish, what equipment they must use if they do fish, and specific species that are prohibited from harvesting within the MPA (Alvarado et al., 2011). Whether an MPA is an area that prohibits all fishing or an area of sustainable fishing, the populations of endangered species and overall amount of fish in the MPA consistently increase after its creation (Ovetz, 2006).

An experimental new category of MPA known as the Área Marina de Pesca Responsible (AMPR), or the Marine Area for Responsible Fisheries, was created in April 2008 by INCOPESCA (Costa Rica's Institute for Fisheries and Aquaculture), a collaboration of the Costa Rican government and fishing industry leaders. AMPRs are zoning instruments that regulate the fishing activities within the areas of interest. An AMPR requires the members of the community to switch to a sustainable method of fishing in order to protect both the fish populations and the livelihood of the people. The AMPR provides specific regulations about fishing methods, gear, and allowable sizes of fish that are enforced by both the fishermen and INCOPESCA (Alvarado et al., 2011, INCOPESCA, 2010). The hope behind the AMPR program is that sustainable fishing will enable the fish populations to stay constant while providing adequate fish catches for the community to depend on as a source of income and nutrition. In order for an area to be designated as an AMPR, a fishing association of the local community must apply to INCOPESCA for the legal protection of the area. The fishing association provides INCOPESCA with current environmental and socioeconomic data and proposes a plan for the implementation and enforcement of the AMPR. This plan must include the geographic coordinates of the area to be protected, allowable gear and fishing techniques, an enforcement program, a registration

program, and a training program. INCOPESCA also requires that the fishing associations develop a code of ethics to ensure compliance amongst the members (Sánchez, 2008). The first official AMPR was created in Palito, a village on the island of Chira (Alvarado et al., 2011; Fonseca, 2009; Sandoval, 2009). In June 2010, the largest AMPR to date was created in Golfo Dulce, a tropical fjord in the south of Costa Rica (Ureña, 2010 and INCOPESCA, 2010). There have also been AMPRs established in the towns of Tárcoles and San Juanillo (Figure 2) (Guier, 2012).

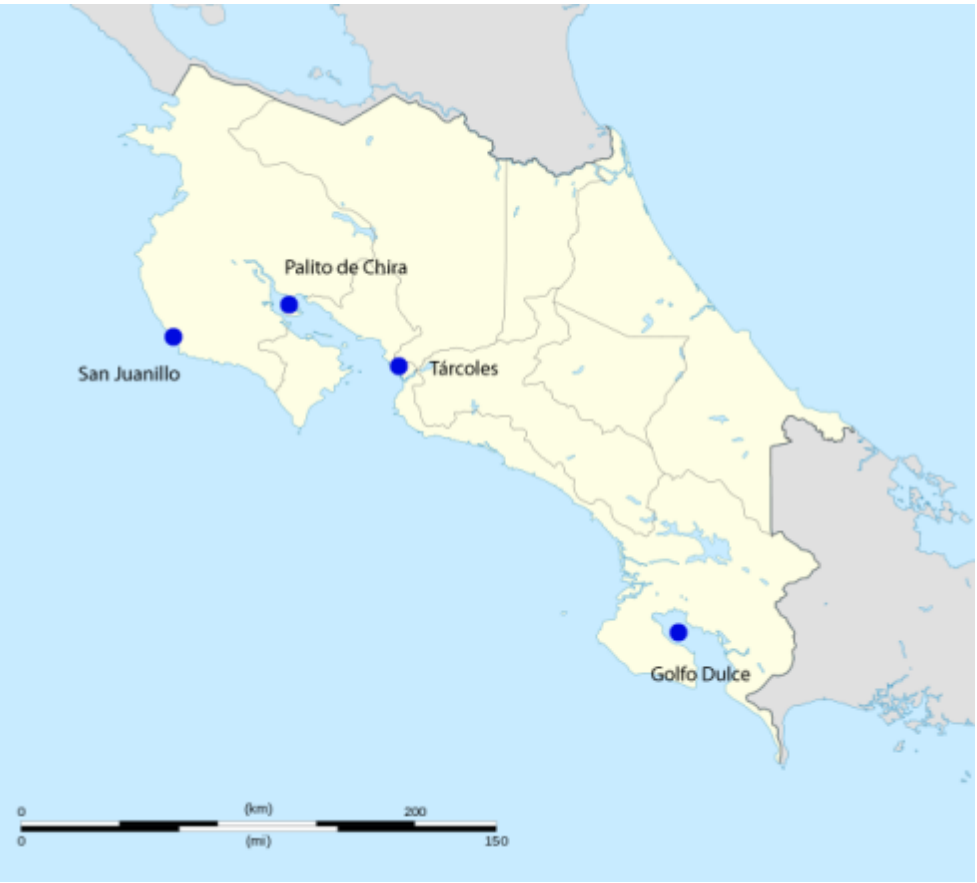

Figure 2: The locations of the Áreas Marinas de Pesca Responsable currently in place in Costa Rica.

A source of conflict within the AMPR program is that it affects many stakeholders. Each stakeholder, whether it is a government agency, an NGO, or individuals within a fishing community, has different interests and different reasons for making decisions. In a broad view, the program is run by the Inter-Institutional Commission of the Exclusive Economic Zone of Costa Rica. Established in 2004, the Commission works to develop Costa Rica's National Marine Strategy. The idea behind the National Marine Strategy is that the conservation and

management of marine resources can best be achieved through a partnership between the government and the coastal societies. Therefore, this Commission is an umbrella organization of stakeholder groups: the Ministry of the Environment (MINAET), INCOPESCA, the Ministry of Transportation (MOPT), the Costa Rica Tourism Institute (ICT), the University of Costa Rica, the National University, the National Coast Guard, and four NGOs (MarViva, Conservation International, the Nature Conservancy, and Programa de Restauración de las Tortugas) (Alvarado et al., 2011).

2.3.3 Drawbacks and Potential Solutions to Marine Protected Areas

One of the major challenges facing Costa Rica's MPAs and AMPRs is that there is a lack of coordination between the various government agencies because clear distinctions have not been drawn over the specific responsibilities of each agency. Conflicts have arisen within the AMPR program due to a lack of communication and trust between the government and the fishermen. Before the establishment of the AMPR in Golfo Dulce, INCOPESCA surveyed the people of the surrounding villages and found that many people had negative attitudes toward the AMPR. Some inhabitants were interested in the potential benefits of the AMPR but did not feel that they were sufficiently informed on the matter. Others even filed complaints with INCOPESCA about the various agencies involved. A common initial concern was that the AMPR placed too much emphasis on the conservation of the fish and insufficient consideration for the livelihood of the people (INCOPESCA, 2010). These negative attitudes can occur when the government fails to fully explain the reasons behind the regulations to the community or sufficiently demonstrate the benefits of the regulations for the people (Agardy et al., 2008). One of the roles of NGOs, such as MarViva, is to facilitate the communication and cooperation between the legislators and those affected by the fishing legislation. NGOs are often involved in educating and engaging the citizens about programs. In particular, MarViva is one of the parties responsible for evaluating the effects of the AMPR on both the environment and the community (MarViva, 2012).

Management of the rules and policies governing the MPAs, including AMPRs, is often flawed and prevents the success of regulating or restoring natural populations of fish. Agardy et al. (2008) state that although MPAs are a powerful tool in the conservation of the marine environment, there are many inherent problems that stakeholders often do not realize initially One such failure is that the government often disregards the ecological knowledge of the community in favor of scientific surveys (Espinoza-Tenorio et al., 2008). According to both Salas

et al. (2007) and Agardy et al. (2008), the failure of an MPA to protect its citizens and its species is also due to the inadequate involvement of the community members. This is often because they do not fully understand the benefits of the MPA or there is a lack of trust between the residents and the regulators. MPAs can also fail when there is poor planning, insufficient funding for enforcement and education, or a degradation of the surrounding ecosystem. Another MPA problem is that they can create a false illusion that progress is being made to protect the marine environment. If the MPA is not sufficiently enforced, the resources can deplete very quickly, because there is a general assumption assumes that the problem is already being resolved (Salas et al., 2007 and Agardy et al., 2008).

Agardy et al. (2008) suggest that instead of focusing on MPAs (or subcategories of them such as AMPRs), the government should develop a more comprehensive plan. The "Marine Spatial Plan" (Agardy et al., 2008, p. 230) would coordinate plans for large areas supported by smaller MPAs in areas that have key ecosystems. An ideal Marine Spatial Plan incorporates knowledge from the locals about the ecosystems, adapts to change, and encourages sustainable development. Marine Spatial Planning in Costa Rica could arise out of the existing framework set by the MPAs and AMPRs. It could serve to protect the areas currently unprotected and coordinate the actions being implemented in the MPAs and AMPRs (Agardy et al., 2008). Although this system has not yet been implemented in Costa Rica, MarViva does state that their mission is to "promote the conservation and sustainable use of marine and coastal resources, through the support for Marine Spatial Planning processes" (MarViva, 2011). The trend from Marine Protected Areas to Áreas Marinas de Pesca Responsable shows that Costa Rican policy-making is trying to move from simple conservation to sustainable use, which may indicate the full development of a Marine Spatial Plan in its future.

2.3.4: Case Study: Golfo Dulce Initiative

In June 2010, INCOPESCA released a document announcing its creation of an Área Marina de Pesca Responsable in Golfo Dulce, a tropical fjord on the Pacific Coast of Costa Rica. In 2009, six associations of fishermen in Golfo Dulce petitioned INCOPESCA to declare an Área Marina de Pesca Responsable for their community. INCOPESCA established a task force to test the feasibility of this plan. The goal of the AMPR in Golfo Dulce is to replace non-selective fishing gear with more sustainable gear such as hand lines, traps, and fishing lines. In 2010, INCOPESCA expected that the AMPR would lessen the impact on marine biodiversity, require less effort for enhanced performance fishing, significantly reduce the catch of non-target fish, improve the seabed quality, and increase the quantity and quality of the target fish

(INCOPESCA, 2010). INCOPESCA also believed that the socioeconomic conditions of the fishermen would improve because the AMPR would create opportunities for fishing-related tourism, as well as allow the fishermen to label their product as being responsibly fished. To better assess the potential socioeconomic benefits of the AMPR, INCOPESCA collected socioeconomic data about the people in the towns surrounding Golfo Dulce. Some of their research topics included home ownership, access to medical care, access to education, access to clean drinking water, and reliance on Social Security (INCOPESCA, 2010). It was important for INCOPESCA to establish a socioeconomic baseline so that future evaluations of the effects of the AMPR can be performed. In 2010, INCOPESCA concluded that Golfo Dulce would benefit environmentally and socially from the establishment of the AMPR. Shortly after this assessment, the AMPR was officially created in Golfo Dulce.

2.4 Community Development

Community development has become an increasingly important topic over the last few decades, especially pertaining to the preservation of natural resources. Different approaches have been suggested and applied to developing societies all over the world to improve their quality of life. In the past, the plan for such development stemmed from a traditional top-down approach (Alpízar, 2006). In this strategy, the government plays a principal role in managing the communities to bring about change and preservation of natural resources. It is a very bureaucratic system that involves little to no participation or influence from the resource users themselves (Jentoft et al., 1998). However, a bottom-up approach is now being used to decentralize authority from the government and give the citizens a more active role in stimulating beneficial changes in their community (Alpízar, 2006). Smith (2012) states that "researchers and managers alike have recognized that resources can frequently be more effectively managed when stakeholders or those with an interest in the resources are directly involved in management" (p. 327). The members of the community tend to have knowledge and experience that the government and their organizations lack. Additionally, when the townspeople actively participate, they are more inclined to comply with the regulations.

Through participation, there is direct involvement in the process of identifying a problem, developing a solution, applying the solution, and assessing the results. This enables the resource users are empowered by the ability to make their own decisions with the aid of other organizations and governments. There are different levels of participation that a community can utilize. The first involves a passive approach in which the stakeholders are only told information. Another, more active level of participation involves answering interview and survey

questions. At the highest level, the population can bring about change with little help from outside organizations except for advice and funding. Participation in general benefits a community in many ways. It enables them to make a difference and learn to share their needs, while allowing them to gain an appreciation for the interest of others and the community at large. The stakeholders also develop effective strategies in conflict management and resolution that they can apply to daily life. Finally, they begin to understand group dynamics and how to work cooperatively to manage resources, make decisions, and bring about needed change (Salazar, 2010).

2.4.1: Co-Management

A community management approach that utilizes this bottom-up methodology and extensive participation is known as co-management. In a co-management system, members of the affected group, the government, and other agencies such as NGOs and universities all work together to manage resources (Alpízar, 2006). For such a system to be effective, participation of the resource users is crucial. This participation can take the form of involvement in the decision making processes, attending meetings, discussing management practices, or voting for representatives (Salazar, 2010). The communities are also responsible for preparing and executing the management strategies at the local level and reporting back to the government and other organizations in order to be represented on a national level (Brown et al., 2005). Moreover, both power and responsibility must be shared between all of those involved. Co-management of resources tends to be effective because it bridges the gap between community and government in terms of cultural knowledge and experience and it allows the people to reap the benefits of their own work.

Fishing communities could benefit from a co-management approach in regards to the regulation of marine resources. According to Jentoft et al. (1998), fishermen often oppose government control because they see the problem of overexploitation of resources differently and do not always understand the regulations that control their activities. A co-management system eliminates this disconnect, allowing the government and the communities to work together directly to understand one another and see the problems more clearly (Jentoft et al., 1998). This type of management is often used to regulate MPAs and fishing industries in Costa Rica and other areas of the world. In co-management systems, the fishermen work in conjunction with other stakeholders such as the tourism industry, hotels, and boat owners; local and national governments; and NGOs to manage marine resources. Figure 3 demonstrates the co-management system of fishing communities.

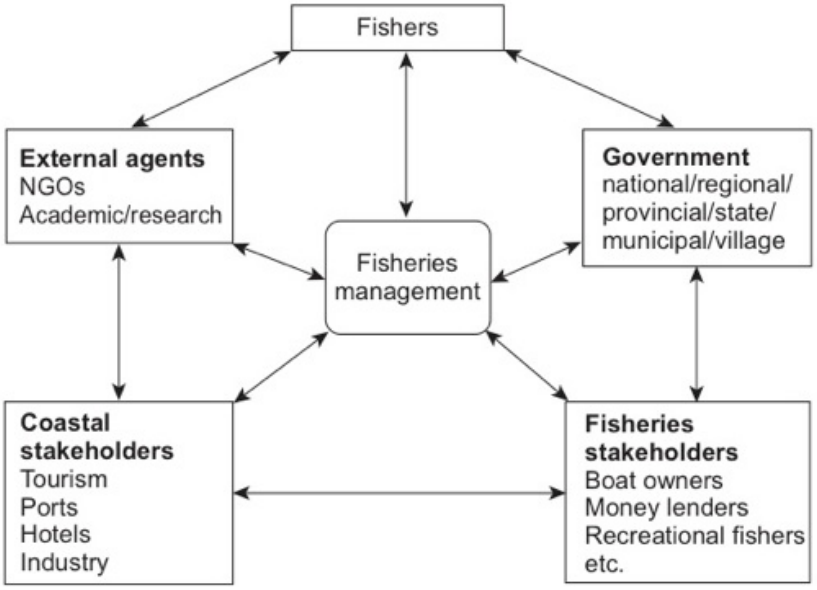

Figure 3: Fundamental organizations, stakeholders and government agencies involved in co-management of fishing communities and the relationships between them (From "Status and potential of fisheries and aquaculture in Asia and the Pacific 2008," by D. Lymer et al., 2008, Asia-Pacific Fishery Commission, p. 47. Copyright 2008 by FAO. Reprinted with permission).

Co-management is the most practical of these bottom-up strategies for Costa Rica, because “the central government has a long history of developing and implementing national standards and regulations for natural resource use and management” (Alpízar, 2006, p. 646). The interaction with the central government, especially in the beginning phases of a project, establishes a higher level of trust and understanding with the community. Therefore, it is more practical for the townspeople to evolve a relationship with the Costa Rican government than to ignore the major role it has previously played in such management. Other management strategies such as community-based management seek to eliminate governmental control completely. This would be inefficient in Costa Rica, since it has two coastlines composed mostly of state run natural parks, biological reserves, and MPAs.

2.4.2: Co-Management Theories in Practice

There have been many studies conducted that evaluate the use of bottom-up community development and co-management strategies throughout the world. One particular study was carried out in Cuajiniquil, Costa Rica, which has had problems with overfishing and depletion of marine resources. This area is located in the Guanacaste Conservation Area (ACG). The ACG

has been promoting a no fishing policy in parts of Cuajiniquil and has been taking away fishing licenses from those who choose not to comply with the new legislations. This has led to conflicts, sometimes violent, between the fishermen and the ACG staff. Furthermore, fishermen are still fishing within the protected areas despite the consequences. This is due to a severe lack of trust between the fishermen and agencies such as ACG and other governmental organizations. INCOPESCA has also been involved in the area to promote sustainable fishing. According to Rowe (2011), the fishermen of Cuajiniquil feel that INCOPESCA is causing more harm than good. They also believe that INCOPESCA is not fully interested in their problems. This community mistrust for INCOPESCA is hindering the co-management strategy being imposed by the ACG.

In a co-management system, the people, NGOs, governmental organizations, and other stakeholders must all work together to be successful. The fishermen must be able to participate and feel as though their voice is being heard. They will be more willing to comply if they feel as though they have a say in the process. For example, Rowe (2011) reported that the fishermen of Cuajiniquil wanted some governmental control and thus a co-management system of controlling marine resources. However, the fishermen felt that the current system in place was not working. They made suggestions on how the government could limit overfishing such as a seasonal fishing ban or regulating fishing gear. Rowe (2011) also suggested that the fishermen come together to regulate fishing by creating their own organizations or associations. This would enable them to form a "collective voice that will allow for much needed negotiations between fishers, the ACG, and INCOPESCA" (Rowe, 2011, p. 87). This case study supports the theory that a co-management strategy can be effective only if the citizens trust the agencies they are collaborating with and are able to come together as a community to promote their own ideas and suggestions. Rowe (2011) demonstrates that this type of community development is welcomed by the people and is actually desired.

Another case study involving co-management usage in fishing communities was completed in Aby Lagoon in Côte d'Ivoire, Africa, an impoverished area whose economy depends on fishing and agriculture. This area implemented a co-management strategy in 1995, and a study was conducted by Njifonjou et al. in 2006 to determine whether this strategy has been effective in promoting sustainable practices and eliminating poverty. It also sought to examine the relationship between the people and the other major stakeholders in regards to ownership of and access to the resources. In Aby Lagoon, the co-management system comprises the following groups: "village fishing committees, the cantonal committee made up of representatives of village fisheries committees and village fisheries" and the public

administrations of the Department of Fisheries Service and Ministry of Territorial Administration (Njifonjou et al., 2006, p. 5). This strategy of community development created new confidence in the society. Furthermore, the conflict between the resource users and other stakeholders has diminished. The new legislation to promote sustainable fishing such as gear regulations, closed seasons, and net sizes, are actually providing positive results. The average size of the target species in the lagoon has experienced an 80% increase and the average annual production has also increased. Moreover, co-management in this area has led to an awareness of the ways in which people can use and benefit from the marine resources. It has created a more organized authority system for each village along with several cooperatives to allow the people to come together and work towards a common goal. Finally, it was noted that the members of the villages obtained a sense of empowerment and felt that their needs were being met by state institutions. Njifonjou et al. (2006) concluded that the co-management system lowered poverty levels and "[improved] livelihoods" within the community of Aby Lagoon.

From this case study, one can surmise that co-management is effective when a working relationship is established between all stakeholders and resource users and there is trust between all included. It has also been proved to be effective in efforts to improve poverty status of a community (Njifonjou et al., 2006).

2.5 Socioeconomics

Understanding socioeconomic factors of the fishermen in Palito and Montero may hold the key to comprehending the progression of sustainable fishing on Chira Island. Socioeconomics acknowledges that economic behavior is directly affected by the social context of a community. It is an interdisciplinary research area that incorporates both a quantitative and qualitative approach by taking into account cultural aspects. Ashford (2004) states that socioeconomics evaluates economics based on "the assumption that individual choices are shaped not only by notions of rationality [and self interest] but also by emotions, social bonds, beliefs, expectations, and a sense of morality" (p. 2). Taking these factors into consideration is useful for the assessment of social programs.

2.5.1: Socioeconomics and Fisheries

Several case studies support the importance of understanding socioeconomic factors when promoting change in a society. Cinner and Pollnac (2004) evaluated the relationship between a community's view of marine resources and its socioeconomic status. They conclude

that encouraging sustainable usage of the fisheries proved difficult because of “the various ways in which people utilize their natural resources are invariably related to a multitude of social, cultural, and economic factors” (Cinner and Pollnac, 2004, p. 481). Moreover, the benefits of any change are determined by community satisfaction, which is culturally defined. Thus, an understanding of socioeconomic indicators is crucial in bringing about change in a society (Cinner and Pollnac, 2004).

Globally, there is limited use of socioeconomic factors in the evaluation of sustainable fishing societies. A sustainable fishery should consider both environmental and socioeconomic factors. Most studies regarding sustainable fishing have solely focused on the environmental impact while ignoring the socioeconomic effects. Moreover, a socioeconomic and cultural evaluation is necessary to correctly strategize the management of resources. This approach must allow the citizens to actively participate in the management and make decisions. By integrating the socioeconomic data and cultural aspects into the management process, the sustainable fishing communities will benefit tremendously (Kruse, 2012, Alden et al., 2011, Seung and Zhang, 2011).

2.5.2: Socioeconomic Indicators

Socioeconomic indicators are key to establishing a baseline in the communities we will be investigating. According to Accadia and Spagnolo (2006), an indicator refers simply to a variable related to a criterion. Its fluctuation and trend in respect to reference points can be used to pinpoint the current state of the community. Thus, indicators are useful in determining the most effective actions needed to achieve a specific goal. A list of useful indicators by economic and social dimensions has been compiled based on several case studies, as seen in Figure 4.

Socioeconomic Indicators
Participation
Demography
Education
Consumption of fish
Fishing traditions/culture
Indebtedness
Gender
Fisheries export value
Investment in fishing fleet & processing facilities
Employment
Income (indirectly)
Fishery net revenue
Net profit per vessel
Maintenance cost per vessel
Revenue per vessel
Revenue per day
Average price
Fuel cost per vessel
Landings per crew
Number of fish markets
Number of wholesalers
Fuel cost per day

Figure 4: A list of socioeconomic factors used in these case studies (adapted from Kruse, 2012, Alden et al., 2011, Seung and Zhang, 2011, Accadia and Spagnolo, 2006).

An accurate assessment of the socioeconomic impact of sustainable fishing in Palito and Montero can be made by comparing these indicators between fishermen who have adopted sustainable fishing practices and those who have not. This comparison will provide us with data that can also be used in future studies on the socioeconomics of Chira Island.

2.6 Chira Island

Chira Island, the setting of our project, is the largest island in Costa Rica with a perimeter of thirty miles. It is located in the Gulf of Nicoya, as seen in the map below (Figure 5).

Figure 5: A map of Costa Rica, highlighting Chira Island's location in the Gulf of Nicoya ("LatiNOTES: Chira Island, 2011)

To understand the context of our study, it is worth noting that Chira Island has been largely untouched by the globalizing forces of mainland Costa Rica and its location in the Gulf of Nicoya has culturally isolated it from the rest of the country. This isolation, combined with its small population of 1,576 people, has caused Chira Island to become a relatively remote location (González and Cole, 2012). Additionally, much of the island still remains undeveloped. The buildings are predominantly houses, along with a few restaurants, stores, and mechanic shops. The island is also technologically behind the rest of Costa Rica— the main road is unpaved, bicycles are the main source of transportation, and the island only received internet services in the past few years (González and Cole, 2012). In the map of Figure 6, one can see the central road of the island as well as the communities of Palito and Montero, where we will be conducting our field work.

Figure 6: A Google Earth Image of Chira Island.

2.6.1 Sustainable Fishing on Chira Island

The waters of the Gulf of Nicoya provide a large amount of marine resources for the people of Chira Island. The majority of the island's inhabitants participate in small-scale, or artisanal fishing. However, over the years, the number of fish has decreased in the Gulf of Nicoya (González and Cole, 2012). As a result, some fishermen have expanded into other income sources such as tourism and raising shellfish. They worked together to improve the fish quantities by promoting responsible fishing, leading to the eventual establishment of the island as the first Área Marina de Pesca Responsable in Costa Rica (González and Cole, 2012).

On Chira Island, there are many responsible fishing organizations. In general, each major town or port has its own fishing association. One organization, located in Palito, is the Asociación de Pescadores Cuerderos de Palito de Chira (ASOPECUPACHI). According to González (2012), there are currently 10 fishermen involved in this association, which is a small percentage of the fishermen in Palito. The fishermen of ASOPECUPACHI use different types of sustainable fishing practices, including hook and line and trammel net fishing. However, in the reef off of the coast of Palito, the only fishing practice allowed is hook and line because this area serves as a nursery for the fish. The AMPR in Palito is demarcated by buoys and is patrolled by members of ASOPECUPACHI. In addition, they work with MINAET, INCOPESCA, and MarViva to promote and protect sustainable fishing in Palito (Friends of MarViva, 2012, Fernández, 2009).

2.7 Summary

In sum, a review of the literature reveals that the increasing demand for fish has endangered many species and caused fishermen to depend on certain fishing techniques that harm the environment. This is seen in Chira Island, where artisanal fishing is very common. In order to protect these fishing areas, the government has created the AMPR program in Costa Rica. This program strives to promote a manner of fishing that is both sustainable for the environment and for the local community. However, government regulation of the areas can cause tension with those whose livelihoods depend on the resources within the environment, so a co-management approach is often used. This allows the resource users to bring about change with assistance from outside organizations. In particular, the literature reveals that co-management is the most practical strategy for environmental management in Costa Rica, because it permits the government to establish a level of trust and understanding with the community. Furthermore, the awareness of socioeconomic factors is crucial in bringing about change in a society. The research associated with these topics aid in the development of our methodology and the completion of our objectives.

Chapter 3: Methodology

The goal of this project is to determine the possible socioeconomic benefits of sustainable fishing practices by the fishermen of Palito and Montero on Chira Island. In order to achieve our goal we will accomplish the following five objectives:

1. Conduct site-specific research and assessment
2. Collect social and economic data from the families of Palito and Montero
3. Assess local perceptions of the AMPR program
4. Analyze the data in order to draw socioeconomic comparisons between those who have adopted sustainable fishing and those who have not
5. Create a publication that MarViva can use in its educational and outreach activities.

3.1 Objective 1: Site-specific Research and Assessment

Accomplishing our project goal requires conducting site-specific research when we arrive in Costa Rica. The first phase of this research is to investigate local approaches to sustainable marketing, specifically the effect of sustainable labeling on profit. We want to determine if consumers are willing to pay more for a product if it has been labeled as sustainable. A site assessment will identify the fishing associations on the island, ASOPECUPACHI and the fishing association of Montero, and help us to select participants to partake in surveys, interviews, or focus groups. It will also be important to establish the locations of the fish markets so that we can broaden our participant pools. This information gathered in our first visit, along with our survey data, will give us the opportunity to adjust our interview and focus group questions for our second visit. In addition, MarViva may have other information to give us that will affect the direction of our project. Some of the specific details of this project will be worked out with them when we arrive in Costa Rica.

3.2 Objective 2: Collecting Social and Economic Data

According to MarViva, the environmental impacts of sustainable fishing are evident and the island residents are aware of these positive effects. However, an economic impact has yet to be evaluated. MarViva would like us to collect social and economic data that will demonstrate whether or not sustainable fishing has a positive economic impact on individual fishermen, and on the environment in the protected areas themselves. This data will be gathered from Montero

and Palito quantitatively through a survey composed primarily of yes/no and multiple-choice questions. This survey (shown in Appendix A) will be designed so that sensitive subjects such as income are indirectly asked. The sample population will consist of approximately 40 fishermen that are involved in sustainable fishing associations and 40 fishermen that are not. This sample will be stratified based on the age and experience level of the fishermen. We hope to obtain our participants by visiting common areas such as restaurants and docks. However, the sample will likely be determined as we begin to work with MarViva. The survey will be equally divided between the towns of Palito and Montero. For the sake of efficiency, we will split into two groups in order to distribute the survey. The intent of the survey is to draw baseline comparisons between these two groups.

3.3 Objective 3: Assessing the Local Perceptions towards the AMPRs

For an accurate assessment of the possible socioeconomic benefits of the adoption of sustainable fishing practices in both Palito and Montero, it is important to obtain the opinions and perceptions of the fishermen working in these areas. The project team will use semi-standardized interviews to collect data from the fishermen living in Palito and Montero. This type of interview starts with a list of predetermined questions but is allowed to change with the flow of conversation (Berg, 2009). These interviews will engage fishermen of various ages, experiences, and skill levels. Our participant pool will be based on our interactions with the community during our survey stage. Moreover, both members and non-members of the fishing association ASOPECUPACHI and the fishermen association of Montero will be included in the targeted sample. The questions will delve into the fishermen's perception of responsible fishing and its effects on their own lives and the community. Sample interview questions can be found in Appendix B. We want to interview Eugenia Fernández, the president of ASOPECUPACHI. She will be our first interview and her responses will dictate any changes in our interview questions. We hope that she will provide us with information about ASOPECUPACHI and the history of sustainable fishing in Palito. The president of the fishing association of Montero will also be interviewed.

We will also investigate the success of the relationship between governmental agencies, nongovernmental agencies, and the community. The fishermen have the option to join the fishing associations. Thus, it will be important to our research to understand the reasons for membership. The interviews will provide qualitative data used to evaluate the positive and negative impacts of responsible fishing, the AMPRs, and the fishing associations on both the environments and economies of Palito and Montero.

In addition to the use of interviews, focus groups will be conducted. A focus group is a style of interview in which small groups of people are led by a proctor into a group discussion on a narrow topic (Berg, 2009). Two groups of fishermen will be selected to participate: members of the fishing associations and non-members. They will be asked only one or two directed questions and allowed to deliberate their response with others. The question will be geared towards determining why the fishermen joined or did not join the association and why other fishermen should or should not participate. The groups will have the chance to discuss the benefits of membership or non-membership and how this has shaped their fishing practices. The focus groups will provide added depth to the interview responses to allow us to assess the potential benefits or problems with the fishing associations on Chira Island. The topics for the focus groups can be found in Appendix C.

3.4 Objective 4: Data Analysis

Analysis of the quantitative and qualitative data gathered from our interactions with the people of Palito and Montero will allow us to make comparisons between the socioeconomic statuses of fishermen who have adopted sustainable fishing practices and those who have not. First, we will analyze the quantitative data from our survey. Since the majority of the questions are categorical or numerical, we will compile the survey data into an Excel spreadsheet and use statistical software to conduct a hypothesis test of the difference in socioeconomic conditions between the fishermen who fish sustainably and those who do not follow sustainable fishing practices. This can be done for each socioeconomic factor that has a numerical response by performing a paired t-test between the average of each group for that particular factor. For the categorical responses, we will use a chi-square test. We will also be able to use Excel to create graphs and charts that will portray the data in a way that is easier to understand.

To analyze the qualitative data, important information will be extracted from our notes and recordings of the interviews and focus group meetings. We will look for emerging trends in the overall opinion of ASOPECUPACHI and the AMPR. Direct quotes from the townspeople of Palito and Montero will further support the overall trends that we see in the qualitative data.

3.5 Objective 5: Dissemination of Findings

MarViva intends to publish the data we gather and the results. They hope this published work will promote sustainable fishing due to demonstrable positive economic impacts associated with these changes in fishing practices. MarViva believes fishermen would be more

likely to join a responsible fishing organization if they are aware that it could help them financially. This publication will take the form of an informative brochure that illustrates our data and findings. MarViva hopes to use this brochure for its educational and outreach activities.

3.6 Projected Timeline

The following Gantt chart (Figure 7) shows the work schedule that we have developed in collaboration with MarViva. For the first two weeks, we will be in San José conducting further background research on topics that are relevant to our project but for which there is little information available in the United States. This time will also be spent refining our survey questions. For the third and fourth week, we will be in Palito and Montero conducting our survey. We will then return to San José for a week in order to analyze the data and revise our interview questions if necessary. The sixth and seventh weeks will find us back on Chira Island as we conduct interviews with key persons and host focus groups. During the seventh week, we will also begin analyzing the focus group and interview data. If the data suggests that sustainable fishing has a positive economic impact, we will develop a brochure that will detail these benefits. Throughout this process, we will be writing and editing our final paper as well as preparing for our final presentation. A final report will be delivered to MarViva on December 13, 2012.

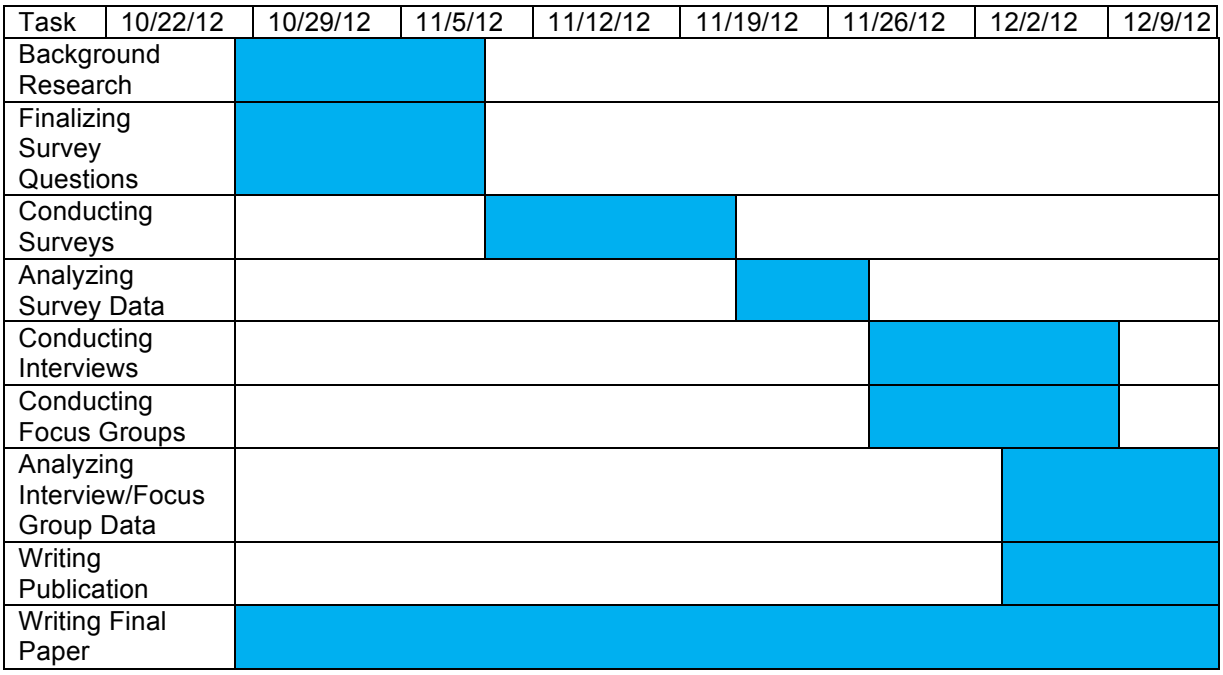

Figure 6: MarViva Project Gantt Chart.

3.7 Summary

The information that we learn from our site-specific assessments, surveys, interviews, and focus groups will ultimately achieve our goal of determining if there are socioeconomic benefits in the adoption of sustainable fishing practices by fishermen in Palito and Montero on Chira Island.

Chapter 4: Conclusion

Like many fishing communities around the world, Chira Island faces increased uncertainty as the fish population dwindles. Finding solutions to the problem will benefit the fishermen of Chira Island, and therefore, the communities as a whole. We hope that our proposed evaluation of sustainable fishing will serve as a catalyst for a stronger economy and for marine practices that will sustain generations to come.

In Chira Island and throughout the world, citizens are taking action to reverse the damage caused by human activities in the sea. Fishing is considered sustainable when it is conducted to meet the current needs of a population but promotes protection and management of species to provide for the needs of future generations. In Costa Rica and on Chira Island, the government has established Áreas Marinas de Pesca Responsable (AMPRs), which regulate the fishing activities within the areas of interest and require those within them to fish sustainably. The successful function of an AMPR requires a co-management system of community development. This style of resource management allows the community, NGOs, and government to work together to bring about change. Co-management ensures participation from the population in the decision making process. This strategy has been applied to fishing communities around the world and has been proven to be successful.

We will be working within the AMPR established on Chira Island to evaluate whether the adoption of sustainable fishing by the fishermen and the fishing associations of Palito and Montero are having a positive effect on the social and economic status of the people. We hope that our project will promote fishing on Chira Island in a way that benefits both the fish and the people.

References

Accadia, P. & Spagnolo, M. (2006). Socio-economic Indicators for the Adriatic Sea Demersal Fisheries. *IIFET 2006 Portmouth Proceedings.*

Agardy, T.T. Di Sciara, G. N. & Christie, P. (2011). Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning. *Marine Policy, 35*(2), 226-232.

Akankali, J.A. & A. Chindah, A. (2011). Environmental, demographic and socioeconomic factors influencing adoption of fisheries conservation measures in Niger Delta, Nigeria. *Research Journal of Environmental and Earth Sciences, 3*(5), 578-586.

Alder, J. J. (1996). Have tropical marine protected areas worked? An initial analysis of their success. *Coastal Management, 24*(2), 97-114.

Aldon, M. E. T., Fermin, A. C., & Agbayani, R. F. (2011). Socio-cultural context of fishers' participation in coastal resources management in anini-y, antique in west central Philippines. *Fisheries Research, 107*(1–3), 112-121.

Alpízar, M. A. Q. (2006). Participation and fisheries management in Costa Rica: From theory to practice. *Marine Policy, 30*(6), 641-650.

Alvarado, J. J., Cortes, J., Esquivel, M. F., & Salas, E. (2012). Costa Rica's marine protected areas: Status and perspectives. *Revista De Biologia Tropical, 60*(1), 129-142.

Ashford, Robert. (2004). "What is socioeconomics? (Symposium: Teaching Law & Socioeconomics)". *The San Diego Law Review* (0036-4037), 41(1), 5.

Berg, B. L. (2009). *Qualitative Research Methods for the Social Sciences*. Boston: Pearson.

Berg, R., & Berg, R. (2012). *Island facts.* Retrieved September 14, 2012, from http://www.chiraislandcostarica.com/index.html

Blake, B. (2012). *Isla de Chira.* Retrieved September 14, 2012, from http://keytocostarica.com/community/ecolodges/la-amistad-at-isla-de-chira.html

Chapman, B., Jackson-Smith, D., & Petrzelka, P. (2008). Comparative institutions and management resiliency in Latin American small-scale fisheries. *The Social Science Journal, 45*(2), 312-329.

Cinner, J. E., & Pollnac, R. B. (2004). Poverty, perceptions and planning: Why socioeconomics matter in the management of Mexican reefs. *Ocean & Coastal Management,* 47(2004), 479-473.

Edgar, G. J., Ruiz, D., Zapata, F. A., Banks, S. A., Bessudo, S., Cortés, J., Soler, G. (2011). Variation in reef fish and invertebrate communities with level of protection from fishing across the eastern tropical pacific seascape. *Global Ecology and Biogeography, 20*(5), 730-743.

Elsholz, A. U. (2009). *Seafood labeling and consumer behavior: A FishWise case study.* Sonoma County, CA. (Unpublished M.S.). San Jose State University.

Espinoza-Tenorio, A., Montaño-Moctezuma, G., & Espejel, I. (2010). Ecosystem-based analysis of a marine protected area where fisheries and protected species coexist. *Environmental Management, 45*(4), 739-750.

Fernández, M. (2009). *Pescadores de Palito- Pescadores a la Cuerda Protegiendo el Arrecife de Palito en Isla de Chira.* Retrieved September 27, 2012, from https://sgp.undp.org/index.php?option=com_sgpprojects&view=projectdetail&id=7136&Itemid=205#.UGW0NJhc_wx

Fonseca, P. (2009, April 16th). Costa Rica tiene una nueva área marina para pesca responsable. *La Nación.*

Free in Christ Ministries. (2008). *Isla de Chira.* Retrieved September 14, 2012, from http://www.chiraisland.net/

Friends of Marviva. (2012). *Costa Rica's 1st Responsible Fishing Area.* Retrieved September 26, 2012, from http://www.friendsofmarviva.org/costa_rica_responsible_fishing_area.htm

Gasalla, M. A., Rodrigues, A. R., Duarte, L. F. A., & Rashid Sumaila, U. (2010). A comparative multi-fleet analysis of socio-economic indicators for fishery management in SE Brazil. *Progress in Oceanography, 87*(1), 304-319.

González, L. M. Z., & Cole, J. (2012). *Informe de gira a la isla chira.* Maestría Interdiciplinaria en Gestión Ambiental y Ecoturismo.

Guier, E. R. (2012, April 18th). Agenda azul en Costa Rica es necesaria. *La Nación.*

Iannuzzi, A. (2011). *Greener products: The making and marketing of sustainable brands: The making and marketing of sustainable brands*. Hoboken: CRC Press Inc.

INCOPESCA. (2010). *Propuesta de Plan de Ordenamiento Pesquero del Área Marina para la Pesca Responsable Golfo Dulce.* Retrieved September 13th, 2012, from http://www.incopesca.go.cr/pesca/pesca_responsable/Plan_Ordenamiento_GolfoDulce_sin_ejes.pdf

Jentoft, S., McCayb, B. J., & Wilson, D. C. (1998). Social theory and fisheries co-management. *Marine Policy, 22*(4-5), 423-436.

Kim, D. H. (2011). Developing socioeconomic indicators for an ecosystem-based fisheries management approach: An application to the Korean large purse seine fishery. *Fisheries Research, 112*(3), 134-139.

Kingsbury, A. (Oct 2010). New England fishing industry bridles under federal regulations. *U.S. News & World Report*, Retrieved from http://www.usnews.com/news/articles/2010/10/14/new-england-fishing-industry-bridles-under-federal-regulations

LatiNOTES: Isla Chira. (2011, May 4). Message posted to http://coclanis.blogspot.com/2011/05/isla-chira.html

Launio, C. C., Aizaki, H., & Morooka, Y. (2009). Understanding factors considered by fishermen in marine protected area planning and management: Case study of Claveria, Phillipines. *Journal of Applied Sciences.*

Levin, M. (2012,). How to spot a shark in Costa Rica (on your dinner plate). *Tico Times* August 24.

MarViva. (2011). *Mission.* Retrieved August 28, 2012, from http://www.marviva.net/index.php/en/2011-12-15-15-47-39/mission

MarViva. (2011). *Objectives.* Retrieved August 28, 2012, from http://www.marviva.net/index.php/en/2011-12-15-15-47-39/objectives

Monterey Bay Aquarium. (2012). *Wild seafood: Plenty of fish in the sea?* Retrieved September 30, 2012, from http://www.montereybayaquarium.org/cr/cr_seafoodwatch/issues/wildseafood.aspx

National Research Council of the Academies. (2009). *Certifiably sustainable?: The role of third-party certification systems: Report of a workshop.* National Academies Press.

Njifonjou, O., Satia, B., & Angaman, K. (2006). Fisheries co-management and poverty alleviation in the context of the sustainable livelihoods approach: A case study in the fishing communities of Aby lagoon in Côte D'Ivoire. *International Journal of Sustainable Development & World Ecology, 13*(6), 448-458.

Norman, C. R. (2012, June 1st). Groups turn to court to stop shrimp trawling. *Tico Times.*

Ovetz, R. (2006). The bottom line: An investigation of the economic, cultural and social costs of industrial longline fishing in the pacific and the benefits of sustainable use marine protected areas. *Marine Policy, 30*(6), 809-820.

Pajaro, M., Mulrennan, M., Alder, J., & Vincent, A. (2010). Developing MPA effectiveness indicators: Comparison within and across stakeholder groups and communities. *Coastal Management, 38*(2), 122-143.

Pauly, D., Christensen, V., Guenette, S., Pitcher, T., Sumaila, U., Walters, C. Zeller, D. (2002). Towards sustainability in world fisheries. *Nature, 418*(6898), 689-695.

Potts, T., & Haward, M. (2007). International trade, eco-labeling, and sustainable fisheries - recent issues, concepts, and practices. *Environment, Development and Sustainability, 9*(1), 91-106.

Reseña historica. Retrieved September 14, 2012, from http://chiracr.com/Informationiii.htm

Rowe, C. (2011). *Fishing Away Marine Conservation: Poverty, Resource Dependence, and Poor Management in Cuajiniquil, Costa Rica.* (Unpublished Bachelor of Arts). Amherst College, Amherst, MA.

Salas, S., Chuenpagdee, R., Seijo, J. C., & Charles, A. (2007). Challenges in the assessment and management of small-scale fisheries in Latin America and the Caribbean. *Fisheries Research,* 87(1), 5-16.

Sánchez, Óscar Arias. Executive Decree no. 35502-MAG: Reglamento para el establecimiento de las áreas marinas de pesca responsable y declaratoria de interés público nacional de las áreas marinas de pesca responsable. (2009).

Sandoval, A. C. C. (2009). Isla de Chira: Primer área de pesca responsable en Costa Rica. *La Nación,* Retrieved from http://www.lexisnexis.com.ezproxy.wpi.edu/hottopics/lnacademic/

Smith, S. L. (2012). Toward inclusive co-management: Factors influencing stakeholder participation. *Coastal Management,* 40(3), 327-337.

Stern-Pirlot, A., & Wolff, M. (2006). Population dynamics and fisheries potential of anadara tuberculosa (bivalvia: Arcidae) along the Pacific Coast of Costa Rica. *Revista De Biologia Tropical,* 54(1), 87-100.

Thrane, M., Ziegler, F., & Sonesson, U. (2009). Eco-labelling of wild-caught seafood products. *Journal of Cleaner Production. 17*(3), 416-423.

True, Margo. (2012). *Sustainable fishing methods.* Retrieved September 30, 2012, from http://www.sunset.com/food-wine/flavors-of-the-west/sustainable-fishing-methods-00400000053176/

U.N. General Assembly, 96th Meeting. *Resolution 42/187 (1987) [Report of the World Commission on Environment and Development. Gathering a Body of Global Agreements].* (A/RES/42/187). 11 December 1987.

Ureña, M. (2010). Declaran al. Golfo Dulce como área marina para la pesca responsable. *La Nación.* December 6th, 2010.

Wehrtmann, I. S., & Cortés, J., (2009). *Marine Biodiversity of Costa Rica, Central America.* New York: Springer.

Appendix A: Survey Questions

Socioeconomics of the Fishermen of Palito and Montero

We are studying the socioeconomic differences between fishermen who practice sustainable fishing and those who do not. We have compiled this survey to give us a better understanding of the fishermen of Palito and Montero. Please answer the following questions by checking the appropriate box or writing your answer. The information given will be kept confidential.

1. Select your age.
   ☐ 15-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ over 60
2. Select your gender.
   ☐ Male ☐ Female
3. What is your highest education level?
   ☐ elementary school ☐ middle school ☐ high school degree ☐ university degree
4. How many people live in your household?
5. What is the current state of your home ownership?
   ☐rent ☐ own ☐ loan, ☐N/A
6. Do you have access to plumbing in your house?
   ☐ Yes ☐ No
7. Do you have access to clean water in your house?
   ☐ Yes ☐ No
8. Do you have access to electricity in your house?
   ☐ Yes ☐ No
9. Do you have Social Security?
   ☐ Yes ☐ No
10. Do you have access to medical care?
    ☐ Yes ☐ No
11. How long have you been a fisherman?
12. Are you a member of ASOPECUPACHI?
13. What fishing methods do you use? (hook and line, trammel net, trawling etc.)
14. What type of fish do you catch?
15. What is the average catch per week?
16. What are the equipment costs?

17. What is the average fuel cost per week?
18. What is the average price you sell your fish at?
19. How many kilograms of fish do you sell per week?
20. How much fish does your family eat per week?

Thank you for your participation. Our results will be published in December.

Appendix B: Interview Questions for the Presidents of the Fishing Associations

1. How long have you been a resident in Palito?

2. How long have you been fishing on Chira Island? How long have you been president of your fishing association?

3. What is your role as president?

4. Do you believe that these AMPRs are a positive or negative addition to your community? Why?

5. What are your feelings on the relationship between the government enforcing the AMPR and the community members of Palito?

6. How effective do you believe the government and the fishing associations have been in enforcing sustainable fishing?

7. Are there any improvements you would like to see happen with the AMPR?

8. How do you encourage fishermen to adopt sustainable fishing?

Appendix C: Interview Questions

We are studying the socioeconomic differences between fishermen who practice sustainable fishing and those who do not. These responses will remain confidential.

1. How long have you been a resident in Palito/Montero?

2. How long have you been fishing on Chira Island? Could you describe some of the general fishing techniques that you use on a daily basis?

3. Are you a member of a fishing association? Why or why not?

4. Are you aware of the regulations on responsible fishing established by the Áreas Marinas de Pesca Responsable? Do you believe that these AMPRs were a positive or negative addition to your community? Why?

5. After the installation of the AMPRs, fishermen associations, and other responsible fishing legislation, have you seen positive or negative impacts on the environment, marine resources, and economy of Palito/Montero? Has the AMPR positively or negatively impacted your family?

6. What are your feelings on sustainable and responsible fishing? Do you believe that it is beneficial for your community? What about for your family?

Appendix D: Focus Group Questions

These responses will remain confidential. Your participation is greatly appreciated.

-Why did you choose to join ASOPECUPACHI? Do you recognize any economic or environmental impacts as a result of sustainable fishing in your community?

-Why did you choose not to join ASOPECUPACHI? Do you believe that the association is negatively impacting your community? Do you feel that you were given enough information to make an informed choice on membership? Do you have any suggestions as to how to improve the association so that you might join in the future?

Appendix E: Spanish Translations of Surveys, Interviews and Focus Groups

Factores Socioeconómicos de las Comunidades de Pescadores en Palito y Montero

Estamos estudiando las diferencias socioeconómicas entre los pescadores que pescan en una manera sostenible y esos que no. Hemos creado esta encuesta para que comprendamos mejor a los pescadores de Palito y Montero. Por favor, contesta las preguntas siguientes, marcando la caja apropiada o escribiendo su respuesta. Sus respuestas van a quedar confidenciales.

1. Elija su edad.

   ☐ 15-19 ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ mayor que 60

2. Elija su género.

   ☐ Masculino ☐ Femenino

3. ¿Cuántas personas viven en su vivienda?
4. ¿Qué es su nivel de educación más alta?

   ☐ escuela primaria ☐ escuela media ☐ un título de colegio ☐ una título de universidad

5. ¿En qué manera adquiere su vivienda (alquilada, recursos propios, préstamo, N/A)?

   ☐alquilada ☐ recursos propios ☐préstamo ☐N/A

6. ¿Tiene servicio sanitario dentro de la casa?

   ☐ Sí ☐ No

7. ¿Tiene acceso a agua potable?

   ☐ Sí ☐ No

8. ¿Tiene acceso a la electricidad en su casa?

   ☐ Sí ☐ No

9. ¿Cuenta con Seguro Social?

   ☐ Sí ☐ No

10. ¿Tiene acceso a cuidado médico?

    ☐ Sí ☐ No

11. ¿Qué es su profesión?

Si está un pescador(a), por favor contestará las preguntas siguientes.

12. ¿Cuánto tiempo lleva siendo un pescador(a)?
13. ¿Es un(a) miembro(a) de ASOPECUPACHI o otra asociación de pescadores?
14. ¿Qué tipos de métodos usa usted cuando pesca?
15. ¿Qué tipos de pescado pesca usted?
16. ¿Qué es el número promedio de pescado que pesca por semana?
17. ¿Cuánta cuesta para mantener su equipo?
18. ¿Qué es el precio promedio de petróleo por semana?
19. ¿Qué es el precio promedio que usted venda su pescado por semana?
20. ¿Cuánto pescado venda usted por semanada?
21. ¿Cuánto pescado come su familia por semana?

Entrevista para los Presidentes de las Asociaciones de Pescadores

1. ¿Cuánto tiempo lleva viviendo en Palito?

2. ¿Cuánto tiempo lleva pescando en Chira Island? ¿Cuándo se convirtió en el/la presidente(a)?

3. ¿Qué papel desempeña usted como el/la presidente(a)?

4. ¿Cree que el programa de AMPR sea una adición positiva o negativa a su comunidad? ¿Por qué?

5. ¿Qué piensa de la relación entre el gobierno imponiendo el programa de AMPR y los miembros de la comunidad?

6. ¿Cree que el gobierno y la asociación hayan sido efectivos en la promoción de pesca responsable y sostenible?

7. ¿Hay algunas mejorías que sean necesarios para el programa de AMPR?

8. ¿Cómo alienta a los pescadores a adoptar pesca responsable y sostenible?

La Entrevista para los Pescadores

Sus respuestas van a quedar confidenciales.

1. ¿Cuánto tiempo lleva viviendo en Palito?

2. ¿Cuánto tiempo lleva pescando en Chira Island? ¿Puede describir algunos de los técnicos que usa cuando pesca?

3. ¿Es un miembro de una asociación de pescadores? ¿Por qué o por qué no?

4. ¿Es consciente de las regulaciones en pesca responsable? ¿Cree que el programa de AMPR sea una adición positiva o negativa a su comunidad? ¿Por qué?

5. ¿Después de la instalación de los AMPRs, asociaciones de pescadores y otra legislación sobre pesca responsable, ha visto impactos positivos o negativos en el medio ambiente, los recursos marinos y la economía de Palito/Montero? ¿Han afectado positivo o negativo a su familia los AMPRs?

6. ¿Qué piensa de pesca responsable y sostenible? ¿Cree que sea beneficioso para su comunidad y para su familia?

Grupos de Discusión

Sus respuestas van a quedar confidenciales. Su participación es enormemente apreciada.

-¿Por qué elige hacerse un(a) miembro(a) de ASOPECUPACHI? ¿Reconoce algún impacto económico o medioambiental a causa de pesca responsable o sostenible en su comunidad?

-¿Por qué decide no hacerse un(a) miembro(a) de ASOPECUPACHI? ¿Cree que la asociación está creando impactos negativos en su comunidad? ¿Piensa que recibe información suficiente para hacer una decisión bien formado en cuanta a ser un(a) miembro(a)? ¿Tiene algunas recomendaciones para mejorar las asociaciones para que pueda ser un(a) miembro(a) en el futuro?