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AMBAS in Action: How an all-women's group is leading sea turtle conservation efforts in El Salvador

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**AMBAS in Action:
How an all-women's group is leading sea turtle
conservation efforts in El Salvador**

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ABSTRACT

Barra de Santiago (Figure 1 and Figure 2) is a small artisanal fishing community located in the Municipality of Jujutla, Department of Ahuachapán in the Republic of El Salvador (El Salvador). The mangrove and estuary ecosystem surrounding the community is recognized as a wetland of international importance for its rich biodiversity and the significant amount of commercially important and endangered flora and fauna it supports. The conservation of hawksbill sea turtles (*Eretmochelys imbricata*) has recently become a top priority in El Salvador, as approximately 45% of known nesting sites in the Eastern Pacific region occur along the El Salvadoran coast, with the majority occurring in mangrove ecosystems. Hawksbill sea turtles in this region, like elsewhere, have been overexploited due to the use of their ornate shells for jewelry and handicrafts and the collection and consumption of their eggs as a source of food and income for many impoverished communities in Central America. Although Barra de Santiago is one such community, it is exceptional in that there is an all-women community organization called the Association of Community Development of Women in Barra de Santiago (AMBAS, in Spanish) leading sea turtle and other conservation initiatives. The primary objectives of this study were to: 1) characterize wildlife conservation strategies in Barra de Santiago; 2) investigate how the women of AMBAS came to serve conservation leadership roles in the community; 3) discover how AMBAS facilitates endangered wildlife conservation efforts with emphasis on hawksbill sea turtles; and, 4) compare AMBAS conservation values and knowledge of sea turtles to those of women that participate in fishing cooperatives in the Bay of Jiquilisco (Figure 1). All of these objectives were met via interview-based research. Information was primarily based on the views of AMBAS, but also from community members outside of AMBAS (e.g. fishermen and sea turtle egg collectors) and from women involved in fishing cooperatives in the Community of Puerto Parada in the Bay of Jiquilisco to compare conservation values among women in different Salvadoran communities. We used the information gathered from interviews and surveys to compile a list of recommendations that we hope will inform local non-profit organizations working in the region about future research (regarding hawksbill sea turtles and other conservation initiatives), potential funding opportunities for AMBAS, and environmental regulation efforts in Barra de Santiago.



Figure 1. Map of Study Sites

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1.0 INTRODUCTION

1.1 Background on Barra de Santiago

Barra de Santiago (Figure 2) is a small artisanal fishing community located in the Municipality of Jujutla, Department of Ahuachapán in the Republic of El Salvador (El Salvador). The entire community is located on a long, peninsular sand bar that divides the Barra de Santiago estuary and mangrove forest habitat to the north from the Pacific Ocean to the south. Its eastern point is the connection to the mainland, and its western point is the tip of the sand bar at the estuary opening to the Pacific Ocean (Figure 2).



Figure 2. Map of Barra de Santiago

The surrounding 11,519 hectares of mangrove forest are considered the largest in El Salvador's western region (MARN, 2016) and support approximately 75% of the commercially important fauna in El Salvador (Ramsar Convention on Wetlands, 2015). Several threatened and endangered species live or forage in the mangrove forest, including hawksbill sea turtles (*Eretmochelys imbricata*) and the yellow-naped Amazon parrot (*Amazona auropalliata*) which is prized for its commercial trade value (Ramsar Convention on Wetlands, 2015). Other wildlife inhabiting the mangroves includes crocodiles (*Crocodylus acutus*) and several species of crabs, birds, and fish. In order to conserve the area's rich biodiversity, the mangrove forest habitat was designated as a Natural Protected Area (Área Naturales Protegida [ANP], in Spanish) by the Ministry of the Environment and Natural Resources (Ministerio de Medio Ambiente y Recursos Naturales [MARN], in

Spanish) in 2007 and a Wetland of International Importance (formally named Complejo de Barra de Santiago or Barra de Santiago Complex) by the Ramsar Convention in 2014 (MARN, 2016).

The population of Barra de Santiago consists of approximately 2,467 people (MARN, 2014). Locals receive income from one or multiple of a small list of economic activities, including fishing, crab collecting, food sales, tourism, coconut farming, taking care of wealthy properties, and sea turtle egg collecting. About 400 artisanal fishing boats depart daily to catch several species of fish (snapper, snooks, tuna, etc.), rays, sharks, and shrimp in the estuary and offshore in the Pacific Ocean. “Tortugueros,” or egg-collectors, gather sea turtle eggs during nesting season and sell the eggs to one of the two local hatcheries. Tortugueros typically bring olive ridley (*Lepidochelys olivacea*) eggs to the hatchery (Dora, 2017). Nationally, this practice began following the 2009 sea turtle egg ban instituted by MARN, which allows eggs to be sold only to hatcheries as an economic incentive to discourage illegal trade (Liles et al., 2015). Prior to the start of this practice, almost 100% of collected eggs were sold illegally. There are seven Local Sustainable Development Plan groups that collect crabs (referred to as “PLAS” groups or Plan Local de Aprovechamiento Sustainable in Spanish) for consumption and to sell locally. These PLAS groups develop their own size and catch limits per species of crab to avoid overfishing the crab populations. Many families are involved in food sales, both within Barra de Santiago for locals and weekend tourists (primarily national tourists) and in markets in adjacent towns, such as El Zapote and Metalio.

Barra de Santiago is experiencing environmental degradation via unregulated urbanization, agricultural pollution, overfishing, a lack of adequate trash collecting practices, and an increasing demand for wood for construction (Monzòn, 2017). Diverted water from the Orange Tree River for the sugarcane plantations north of Barra de Santiago has reduced freshwater input to the mangrove forests. Agricultural runoff from the sugarcane plantations has polluted local groundwater with pesticides and herbicides (Monzòn, 2017). Additionally, the mass burning of sugarcane brush after harvest degrades local air quality and the burning sometimes overflows into adjacent areas destroying natural habitat (Monzòn, 2017). While there is a trash collecting service that picks up trash twice per week, the burning of trash is still a common practice, which also degrades local air quality (Monzòn, 2017). Grey water flows into the estuary untreated, which affects the pH, dissolved oxygen, and turbidity levels in the estuary (Monzòn, 2017). Industrial (non-local) shrimp trawlers have severely depleted the near-shore shrimp, fish, and sea turtle populations via unregulated and destructive fishing practices (Perez, 2017).

1.2 Background on AMBAS

The Association of Communal Development of the Women of Barra de Santiago (Asociación de Desarrollo Comunal de Mujeres de la Barra de Santiago [AMBAS, in Spanish]) is a community organization comprised of 35 women that aims to increase economic opportunities and spread conservation awareness in Barra de Santiago. The organization was formed in 1999. AMBAS hosts several types of education workshops, including those

that help build personal trade skills (e.g. baking, sewing, business operation) and those that teach community members about the importance of Barra de Santiago's natural resources and wildlife. When funding is available, AMBAS operates conservation projects that pay community members for their contribution to help them earn money and provide an incentive to participate in conservation activities. Common projects have included beach trash cleanups and canal restoration to remove sediment deposits from upriver. AMBAS also manages one of the two local sea turtle hatcheries in Barra de Santiago, and in the process is able to teach the community about sea turtle conservation. Tortugueros are paid \$2.50 per dozen eggs. For every dozen eggs purchased by the hatchery, tortugueros donate an additional two eggs (intended by AMBAS to be a conservation lesson). Twice per month, tortugueros donate a night's worth of sea turtles to the AMBAS hatchery without receiving payment and participate in various educational conservation activities hosted by AMBAS, including cinema nights or presentations.

AMBAS is an atypical organization because women lead their conservation efforts, which transcends El Salvador's cultural norms where women are believed to be house caretakers only. To date, no known formal study has been conducted on this organization and the primary interest in investigating the work of AMBAS is to explore the rationale and drivers for members' dedicated involvement to local sea turtle conservation efforts. While the general scope of this Capstone Report mentions all their conservation efforts, the women's knowledge and experience with sea turtles, most notably the hawksbill sea turtle, is the main focus.

1.3 Sea Turtles in El Salvador

Accounts of sea turtle exploitation in El Salvador have been documented in scientific literature as early as 1948, namely the collection of eggs for sale and trade in the large-market cities of La Union and La Libertad (Carr, 1948). However, exploitation in El Salvador likely began long before, as the commercial trade of turtle products in the general Eastern Pacific region dates back to the diaries of 18th century pirates and missionaries (Saenz-Arroya et al., 2006). Overexploitation of sea turtles began with the expansion of the commercial egg trade. For decades, coastal communities have opted to sell sea turtle eggs for profit as opposed to keeping them for consumption because of their high price (Higginson et al, 1989); however, instances of egg harvest for a protein source in impoverished El Salvadoran coastal communities is also evident. During the 12-year El Salvadoran Civil War from 1980 to 1992, many families were forced to emigrate from the highlands to coastal areas (Gammage et al., 2002) where they survived by harvesting fish, mollusks, and sea turtle eggs (Liles et al., 2015). These sources of increased pressure on the collection of eggs eventually led to the emergence of sea turtle conservation in El Salvador.

Of the seven species of sea turtles, four species have nesting and foraging sites along the coast of El Salvador, including the green turtle (*Chelonia mydas*), the leatherback (*Dermochelys coriacea*), the olive ridley, and the hawksbill (Liles et al., 2015). The olive ridley sea turtle is the most abundant species in El Salvador, followed by the green, the hawksbill, and the leatherback (Vasquez et al., 2008). All species combined lay approximately 9,000-13,000 nests annually in El Salvador (Vasquez et al., 2008). All four

species are listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. The olive ridley is listed as Vulnerable (Abreu-Grobois and Plotkin, 2008), the green turtle is listed as Endangered (Seminoff, 2004), the hawksbill is listed as Critically Endangered (Mortimer and Donnelly, 2008), and the leatherback is listed as Vulnerable, but the Eastern Pacific subpopulation is listed as Critically Endangered (Wallace et al., 2013). Hawksbill populations at a global scale have declined approximately 80% in the last century (Mortimer and Donnelly, 2008). Prior to 2007, the Eastern Pacific subpopulation of hawksbill sea turtles was thought to be functionally extinct until research revealed mangrove forests as a common and preferred habitat in the Eastern Pacific region, which is counter to how they are typically described as coral reef dwellers (Gaos et al., 2010). Since then, conservation of hawksbills has been considered a top priority, as approximately 45% of known nesting sites in the Eastern Pacific region occur along the El Salvadoran coast (Liles et al., 2011). While critical nesting and foraging locations have been identified in El Salvador (Gaos et al., 2010), little research has been conducted to investigate the occurrence of hawksbills in the mangroves and estuary of Barra de Santiago.

All species are locally threatened by increased coastal development, illegal nest poaching, and harmful fishing practices (Liles et al., 2011). The existing conservation framework involves a network of sea turtle hatcheries operated by numerous local non-profit organizations that use primarily foreign financial resources to pay tortugueros for their eggs, incubate the eggs in artificial nests, and release hatched turtles to the ocean. AMBAS operates a sea turtle hatchery in Barra de Santiago during the olive ridley nesting season from July through December.

1.4 Project Objectives and Capstone Project Committee

The primary objectives of this project were to: 1) characterize wildlife conservation strategies in Barra de Santiago; 2) investigate how the women of AMBAS came to serve conservation leadership roles in the community; 3) discover how AMBAS facilitates endangered wildlife conservation efforts with emphasis on hawksbill sea turtles; and, 4) compare AMBAS conservation values and knowledge of sea turtles to those of women that participate in fishing cooperatives in the Bay of Jiquilisco. All of these objectives were met via interview-based research. Information was primarily based on the views of AMBAS, but also from community members outside of AMBAS (e.g. fishermen and tortugueros) and from women involved in fishing cooperatives in the community of Puerto Parada in the Bay of Jiquilisco to compare conservation values across women in different Salvadoran communities.

This Capstone project was overseen by a formal research committee of members from government, academic, and non-profit organizations either involved in sea turtle conservation or specializing in behavioral science, including the National Oceanic and Atmospheric Administration Southwest Fisheries Science Center (NOAA SWFSC), EcoViva, the Eastern Pacific Hawksbill Initiative (ICAPO, in Spanish), and the Rady School of Management at the University of California San Diego (UCSD).

1.5 Report Outline

The remaining sections of this report include:

- **Section 2.0 Methods:** We explain the interview strategies used in each of two separate visits to El Salvador, as well as how qualitative interview responses (conversational interviews) and quantitative survey responses (written survey interviews) were analyzed.
- **Section 3.0 Results:** We provide narrative summaries of information gathered from the qualitative interviews conducted during the first visit, two tables that show the results of quantitative surveys distributed during the second visit, and narrative summaries of informal interviews conducted during both visits.
- **Section 4.0 Discussion:** We identify noticeable trends in answer choices in the qualitative interview responses and the quantitative survey responses. Potential introduced biases to the study are also discussed, as well as changes made during the interview processes. Finally, we discuss a profile comparison between AMBAS women in Barra de Santiago and fishing cooperative women the Bay of Jiquilisco.
- **Section 5.0 Conclusion and Recommendations:** We provide a list of recommendations to improve the conservation management of natural resources in Barra de Santiago. Recommendations intended for the local non-profit organizations in El Salvador are also provided, which include where to conduct surveys for hawksbill sea turtles and how to assist AMBAS in their future conservation efforts.

2.0 METHODS

The subsections below detail the methods on how the qualitative interviews, quantitative surveys, and informal interviews were conducted and the researchers and partners involved in each step of the interview and survey processes.

2.1 Background on EcoViva

El Salvador has a strong network of grassroots and government-supported conservation organizations in place to address issues related to years of natural resource depletion. Due to a tumultuous past, including a violent civil war that lasted from 1980 to 1992 and displaced thousands of Salvadorans, El Salvador has experienced a long history of inequality among the minority wealthy upper class and the majority poverty-stricken lower class within its society. Lack of work and opportunities for education among impoverished coastal communities has created a pattern of reliance on natural resources for the majority of Salvadorans (Leonard, 1999; EcoViva, 2017).

EcoViva is a non-profit organization that was created in 1996 in response to heavy pressure on natural resources and a lack of sustainable livelihoods for community members in El Salvador (EcoViva, 2017). Since its founding, EcoViva has supported a democratic movement for peace, justice, and environmental sustainability in the Lower Lempa region near the eastern border of El Salvador in the Bay of Jiquilisco (EcoViva, 2017). EcoViva works to help communities restore their natural resources and ecosystems and provide sustainable livelihoods and education for Salvadorans, focusing especially on women and youth. EcoViva's mission is to work "...in partnership with community organizations in Central America organized to achieve environmental sustainability, economic security, social justice, and peace" (EcoViva, 2017). The organization is actively working to build partnerships and establish connections with other conservation organizations in El Salvador to achieve its mission.

This project was initiated by and conducted in full partnership with EcoViva to get a better understanding of the conservation issues and needs of Barra de Santiago through interview-based research. We worked closely with our committee member Ana Luisa Ahern, the Program and Policy Director of EcoViva throughout the entirety of our project. Ana Luisa Ahern was present during all qualitative interviews and was our guide and translator during our first research trip. By focusing our research efforts on AMBAS, an established conservation organization with connections to other organizations and sustainable use groups in this area, one of our goals was to gain insight into how EcoViva and other organizations can form partnerships and best support the conservation efforts of AMBAS in the future.

2.2 Qualitative Interview Methods

The purpose of the qualitative interviews was to serve as a pilot study that would help the interview team get to know the community members and learn how best to design the

quantitative surveys that would be distributed to a larger sample size of AMBAS members during a subsequent visit to Barra de Santiago (described in Section 2.3). All qualitative interviews were conducted within the community of Barra de Santiago, El Salvador. We developed original interview questions to guide these interviews in a manner that put each subject at ease with the interviewers and the questions asked. Our qualitative interviews consisted of open-ended, conversational questions where the main interviewer (Ana Luisa Ahern) had a list of 23 interview questions created by the authors (Appendix A, English version). These 23 questions were drafted with the intent to obtain basic demographic information about AMBAS members and other community members (e.g. age, family size, income), information about AMBAS (e.g. activities, community participation, community perceptions), and information and opinions regarding Barra de Santiago's environment and natural resources (e.g. sea turtles, mangroves, environmental laws, climate change impacts). These open-ended questions were written using the best ethnographic methods available in order to garner honest, detail-oriented responses from the interviewees (Knoblauch, 2005). The more personal questions pertaining to the interviewee's home and work life (such as their age, the number of family members in their homes, and their main source of income) were asked first in order to establish trust and build a connection with each interviewee. More challenging questions that dealt with controversial subjects (such as illegal poaching of endangered wildlife or opinions on climate change) were asked towards the end of each interview (Whitehead, 2005). Additionally, each question was crafted in a way that asked for the interviewee's opinion on the subject at hand (e.g. all questions started with "In your opinion..." or "Do you feel..."). Our aim was to have meaningful conversation with each interviewee and to minimize the impression that this was a formal questionnaire or test (Shackeroff and Campbell, 2007). We prefaced each interview by introducing ourselves and explaining that we were graduate students visiting Barra de Santiago to learn from members of AMBAS because we consider them to be experts on conservation issues in their community. We concluded each interview by thanking the interviewee for sharing their expertise with us (Berg, 2004). The original set of 23 interview questions was reviewed and approved by the Capstone committee, including Dr. Ayelet Gneezy, an Associate Professor of Behavioral Science and Marketing at UCSD. Dr. Gneezy is considered an expert in the field of ethnographic survey design.

Four interviews (three with women of AMBAS and one with a male tortuguero) using the original survey questions (Appendix A, English version) were conducted on 24-27 March 2017. After the four initial interviews were conducted, a revised list of interview questions (Appendix B, English version) was formed with the guidance of Ana Luisa Ahern to revise questions that were confusing to the interviewees and to streamline the interview process. Seven interviews (four with women of AMBAS and three with male tortugeros and fishermen) with the revised survey questions were conducted from 28-29 March 2017. The photograph below shows an example of a qualitative interview setting.



Photograph 1: Qualitative Interview with Veronica (left) and Prestyn McCord (right)

All interviews from both the original and revised interview sessions took place either at the interviewees' homes, at the home of Rosa Aquilar Lovato de Villedaz (Doña Rosa) and Toño Lovato de Villedaz (Don Toño, a familiar location to each of the subjects), and in one case while traveling by car. Doña Rosa and Don Toño are a couple who are considered community leaders in Barra de Santiago. Rosa is the founder and leader of AMBAS and Toño works as a regional park ranger for MARN. Both Rosa and Toño have been involved in wildlife conservation projects for decades. We carried out and oversaw all interviews and recordings. Each interview session was recorded from start to finish without pause to preserve the integrity of each session. At times during interviews, Rosa or Eder Caceros Monzón, a wildlife biologist who works with AMBAS, were present and added comments and their opinions occasionally. Both Rosa and Eder are familiar to all interviewees and we feel that their presence had little effect on the interview process. Notes were taken during each interview by Ana Luisa Ahern and the authors to note important details, including start and stop times, additional participants present at each interview (e.g. Rosa or Eder), and notable quotes. We transcribed each interview from Spanish to English from its original recording with the translation assistance of Ana Luisa Ahern.

2.3 Quantitative Survey Methods

The purpose of the quantitative surveys was to collect more information from a larger sample size of AMBAS women. After transcribing and analyzing the results of all qualitative interviews, two sets of quantitative (close-ended, multiple choice/multiple answer) surveys were created based on the major themes found in and extracted from the qualitative interviews. All quantitative questions were written in Spanish with translation assistance from Ana Luisa Ahern. The first quantitative survey (the AMBAS survey) was created for the members of AMBAS (Appendix C, English version). This survey was distributed during an informal AMBAS gathering on 5 May, 2017 at Doña Rosa's home to 17 members of AMBAS. The survey was a paper document containing multiple choice/multiple answer and short answer questions that the members of AMBAS filled out with pencils. In cases of illiteracy, the survey was read aloud to the respondent by José Maria (Chema) Argueta, the Project Coordinator for the Mangrove Association (an organization that works in partnership with EcoViva), and the respondent answered the questions verbally. Chema filled in the answers on the respondent's behalf with her permission. This survey was overseen and facilitated by the authors with translation assistance from Chema. Any questions regarding the survey were answered with Chema's guidance. The photograph below shows the AMBAS gathering where women came to take to the AMBAS survey.



Photograph 2: AMBAS gathering at Doña Rosa and Don Toño's house

The second quantitative survey (the fishing cooperative survey, Appendix D English version) was modified from the AMBAS survey for women working in fishing cooperatives

in the community of Puerto Parada in the Bay of Jiquilisco, El Salvador. The fishing cooperative survey questions were modified only to omit the details pertaining to AMBAS. Details (such as location) were added to update the survey for the women of the fishing cooperatives in Puerto Parada, but otherwise all questions remained the same as those given out during the AMBAS survey. The fishing cooperative survey was distributed on two days (6 and 8 May 2017) to a total of 11 women (of an estimated 25 total) from four fishing cooperatives in the area. The fishing cooperative surveys were physically distributed at the Asociación Cincahuite Office (non-profit organization that works with EcoViva and the Mangrove Association) in the community of Puerto El Flor, Municipality of Usulután in the Bay of Jiquilisco. As with the AMBAS survey, this fishing cooperative survey was overseen and facilitated by the authors with translation assistance from Chema. In cases of illiteracy, the survey was read aloud to the respondent by Chema, and the respondent answered the questions verbally. Chema filled in the answers on the respondent's behalf with her permission. Any questions regarding the survey were answered with Chema's guidance. The photograph below shows four of the fishing cooperative respondents taking their surveys.



Photograph 3: Fishing Cooperative gathering at the Asociación Cincahuite Office

2.4 Informal Interview Methods

Two informal interviews were conducted in Barra de Santiago during the course of field research. The first interview was with Juan Alberto Perez who is a local park ranger in Barra de Santiago. This interview was conducted on 28 March 2017 and took place on Juan's patrol boat as he shared his knowledge of wildlife and pressures facing the natural resources in the area. The second informal interview was with Don Toño, who is a regional

park ranger with MARN. Toño was interviewed in multiple instances during both research trips at his home where he took time to share his knowledge from being a life-time resident of Barra de Santiago, the history of his career as a local and regional park ranger, and answer our additional questions.

2.5 Interview and Survey Subjects

During the qualitative interviews, we spoke with a range of AMBAS members who hold various membership roles ranging from regular participating members, to members who hold administrative or treasury positions, to members who hold managerial or leadership roles, to the founder of the organization. We conducted qualitative, conversational interviews with seven women out of 35 total active members.

Qualitative interviews were also conducted with four men whose main source of income was either fishing or collecting sea turtle eggs. These men participate in AMBAS-related activities including organized trash cleanups, the mangrove canal restoration program, collecting eggs for the sea turtle hatchery, and the PLAS groups. These conversational interviews provided a diverse perspective into this female-driven organization and the issues facing the community of Barra de Santiago.

The quantitative surveys were distributed to AMBAS members in Barra de Santiago and women that work for fishing cooperatives in the community of Puerto Parada in the Bay of Jiquilisco. The sample of fishing cooperative women were from four fishing cooperatives that participate in a program called “Pesca Limpia,” which is a sustainable initiative led by EcoViva and the Mangrove Association intended to assist fishing cooperatives to engage in more sustainable fishing practices (e.g. hook-and-line at artificial reefs) and abandon harmful blast fishing practices (EcoViva, 2017).

3.0 RESULTS

The following subsections present narrative summaries that highlight pertinent information learned during the qualitative interviews as well as tables that provide the results of the quantitative surveys.

3.1 Qualitative Interview Profiles

Interview 1 – Evangelina Perez

Evangelina Perez is a 46-year-old woman who acts as the legal representative for AMBAS. She signs checks and is responsible for other treasury duties within the organization. She has been with AMBAS since the organization was formed in 1999. This single mother of two sons (14 and 28 years old) was interviewed on the porch of her home. Rosa, the founder and leader of AMBAS, was present during this interview and Evangelina has known her for many years. Evangelina's home is in the center of the community of Barra de Santiago and is a working bakery where she makes sweet bread and her oldest son bakes French bread to sell. In addition to running her bakery business from home, Evangelina participates in the trash collection program and teaches women how to cook and bake. Both of these programs are run through AMBAS.

Evangelina had insightful responses to the interview questions that were asked of her and seemed at ease in this familiar environment with her friend and AMBAS leader Rosa present. She remarked that she joined AMBAS to improve the lives of women in the community and of her family. She enjoys learning and appreciates the outlet AMBAS provides to learn new skills and grow her small business. Evangelina lauded Rosa as a leader because Rosa encouraged her to take on greater challenges and increased responsibility within AMBAS and recommended her to teach the cooking workshops.

Evangelina voiced strong opinions on the state of fishing and the overuse of the natural resources in the community. She explained, "We are not all fishermen, but everyone depends on the fish. If no fish are caught the economy suffers." While she works indirectly with the hatchery and is only involved in her capacity as treasurer, she has observed that many sea turtles are caught in the fishing nets of large industrial trawling boats. She knows that by law these fishermen are supposed to use Turtle Excluder Devices (TEDs) and are supposed to fish at least three nautical miles from shore, but the industrial fishermen follow neither of these laws.

Evangelina's major concern for the community is the lack of regulation of harmful fishing practices. She has noticed that in the last two years the fishing yield has decreased creating more poverty and lack of work. She believes more resources should be dedicated to monitoring fishing practices and raising awareness regarding resource depletion. She explained that if outside organizations including the government of El Salvador could support AMBAS by providing business contacts and access to new markets, this could go a

long way in the community. If the town could rely on business from tourism rather than natural resources, this would be better for both the environment and the people.

Interview 2 – Rosa Miriam

Rosa Miriam is a 36-year-old woman who is a member of AMBAS and has been part of the organization for three years. She is a single mother with a 15-year-old son and an 11-year-old daughter, both of whom are in school. She works on environmental cleanup projects for AMBAS including boat trips to clean trash out of the mangroves and trash cleanups on the beach. She works with the community on solid waste and environmental sanitation management. She also helps educate the local public about waste management. She works on the weekends selling pre-made plates of food to tourists on the beach and her son occasionally assists fishermen when he is not in school for additional income. She helps out with projects through AMBAS when they are available, such as a mangrove canal restoration project that was sponsored through the environmental fund FIAES (The Initiative for the Americas). This interview was conducted on the porch of Rosa's home while Rosa was present.

Rosa Miriam had interesting opinions on the reasons why she and other women joined AMBAS and how the community views the organization. Rosa Miriam sees the value in and finds enjoyment from taking care of the mangroves in her community because they produce crabs and fish. Throughout the years since the creation of AMBAS there has been some opposition from the community. Some have thought it was a waste of time and some men have said it will "corrupt" the women involved. Over time, people have seen AMBAS' work as a positive factor in the community. She notes that many community members are supportive of the work and take part in the projects that AMBAS organizes. Men are becoming more involved in the projects as the years go on.

Interview 3 – Dora

Dora (who chose not to give her last name) is a 42-year-old woman who holds the position of sea turtle hatchery manager for the local hatchery that is managed through AMBAS. This will be her fourth year managing the local hatchery which runs from the end of June to the end of December each year. Dora's children are grown up and are not living in her home. She has been a member of AMBAS for nearly 16 years. She began by attending trainings and then Rosa encouraged her to apply for an open park ranger position through FIAES. She worked as a local park ranger until funding was lost for the position. She continued to volunteer for AMBAS projects including participating in sea turtle conservation workshops until she ultimately took on the responsibility of hatchery manager.

Dora was very candid in her interview about the challenges facing the community of Barra de Santiago. Besides being the hatchery manager for AMBAS, she works many jobs to make up for the lack of stable, ongoing work. "This is a poor community so people always have many sources of income..." she stated during her interview. She explained that she also takes care of a vacation property, sells crabs from the mangroves to tourists who come to

visit the beach, works at times selling fish for fishermen, is an assistant to a carpenter, and sells coconuts during the hatchery off-season. Dora feels the community views AMBAS positively because AMBAS is providing work through projects such as the mangrove canal restoration program. Dora insisted that the most important support that AMBAS requires from the government and outside organizations are the resources to provide projects and steady work for the people of this community who are in dire need of jobs. She summarized this by saying, “We need more jobs, more projects, and more capacity building workshops.”

Dora offered her unique insight as hatchery manager and shared a wealth of information regarding her knowledge of the sea turtle hatchery operations, including the economic factors affecting the sea turtle egg collectors or tortugueros who participate in the system and how the community in general views the hatchery system. Dora explained the details of the hatchery operations and how they follow many of the best available methods to produce the best hatchling success rates. Dora feels that overall people think the hatchery is an asset to the community because they see how it is helping the sea turtle population and allowing the tortugueros collecting the eggs to save some of their earnings until the end of the season. Dora stated, “Before people only took the eggs for business [money], now they are collecting them for a cause.”

Dora explained the way that tortugueros are compensated in El Salvador for turning their eggs into the hatchery instead of selling them to the black market has benefits to the community. The tortugueros are paid \$2.50 for each dozen eggs, but they must donate two extra eggs per dozen to promote an attitude of conservation and allow them to contribute to the hatchery project. While it took some getting used to, tortugueros get an option to put 25 cents per day into a savings account to be distributed back to them at the end of the hatchery season to purchase supplies. Not only is this a competitive compensation to encourage tortugueros to sell eggs to the hatchery instead of to the black market, it is helping to change the mindset of tortugueros to see what they are doing as contributing to conservation efforts. It also allows individuals to set aside savings for the future (Dora informed us that it takes \$300 to open a bank account and this is out of reach for most members of this community).

When asked if she sees the sea turtle hatchery system as an economically feasible long-term conservation strategy, Dora said she thought that is was. She does wish it could be open for longer than the six-month season, but she understands why it is not—the hatchery could not pay competitive prices to tortugueros if it was open longer. Dora added that overall the hatchery has allowed community members to see the natural resources in the community with more of a focus on the future stating that, “People see sea turtle conservation as a benefit to future generations... we won’t see it [the impacts], but our grandkids will and they will be able to know the turtle.”

Interview 4 – Eucedio Cordero

Eucedio is a 63-year-old man who is a tortuguero for the AMBAS hatchery. He was the first of four men interviewed at Doña Rosa’s home who are all involved in AMBAS projects and

offered their own perspective of the organization. In addition to his work as a tortuguero, he has worked with AMBAS on various projects for the past eight years including participating in workshops, working on an interpretive trail to teach tourists about wildlife and pollution, and building and installing bird nests for threatened bird species around the mangrove forest (this project has since run out of funding). Eucedio also works in construction and he fishes in the mangroves and the ocean when there is no other work.

Eucedio offered his perspective on AMBAS' work in the community and how individuals in Barra de Santiago view natural resources and conservation. Eucedio stated, "For me, AMBAS is a pioneering community organization because there are a lot more community organizations now. People have learned to move forward and manage projects." He felt that people who do not understand the organization have not been involved or have not attended workshops. Eucedio felt that because of the presence of AMBAS, about half of the community is conservation-minded and is aware of how they are utilizing wildlife and natural resources. He said that the other half, "...live off of whatever they can find in the mangroves and don't follow conservation laws because they are going hungry." He emphasized the importance of compromise between following environmental protection laws and making sure that people are not starving. He felt that if the people are being put first and if support could be offered by educating people and giving them incentives like food and work, then natural resources could be better protected and the people would be in a better position to understand and participate in conservation initiatives.

As a tortuguero and fisherman, Eucedio was familiar with sea turtle species and he recalled an encounter with a hawksbill sea turtle he saw about 10 years ago. It was nesting on an area of the beach that is adjacent to a small reef. There were no operating hatcheries that year, so the hawksbill sea turtle's eggs were poached. He has not seen a hawksbill sea turtle since, but he knows they are mostly found around Los Cobanos, a fishing village in El Salvador to the south where there are coral reefs. He also recalls two leatherback sea turtles nesting in 2015. He remarked that all of the fishermen have TEDs installed on their fishing nets, but the fishermen do not use them if they are not closely supervised. He knows that dozens of sea turtles drown every year in the fishing nets. He feels that AMBAS and the community could use support in the form of more park rangers and more staff from CENDEPESCA (the fisheries management unit of El Salvador) that are locals of Barra de Santiago and the surrounding communities. He said the CENDEPESCA staff that is brought in from outside the area to supervise fishing methods and regulate environmental protection laws are corrupt and only support the fishing industry. For example, the CENDEPESCA staff currently do not give the proper fines for boats coming into the three nautical mile offshore protected area or for closing the TEDs on their nets. Eucedio thinks that if CENDEPESCA staff could be hired who are local people familiar with the needs of the community, this could go a long way to enforce the proper fishing regulations and protect sea turtle species.

Interview 5 – Manuel de Jesus Diaz

Manuel is a 63-year-old man who works as a tortuguero for the AMBAS hatchery and for the mangrove canal restoration project digging out canals. He also works as a fisherman. He thinks that the projects that AMBAS provides are the best jobs for the community because they are reliable.

Manuel shared his perspective from working as a tortuguero and fisherman. He supports the hatchery's conservation initiative of donating two eggs for every dozen he turns in. He also participates in "veda" nights (Spanish word for "ban") where one night every two weeks during the hatchery season, tortugueros donate all of the eggs they collect to the hatchery. From his experience working on fishing boats and collecting eggs, he knows the sea turtle species and has seen hawksbills in the past, but not for many years. He has seen sea turtles in the mangrove estuary and they are mostly olive ridleys. Manuel does worry about all of the effort he, other tortugueros, and hatchery workers put into to sea turtle conservation when fishing regulations are not being enforced, boats are fishing much too close to the coast, and many sea turtles are dying from harmful fishing practices.

Interview 6 – Porfidio José Ruiz

Porfidio is a 49-year-old man who works as a crabber with a Local Sustainable Use Group (PLAS) that harvests crabs sustainably in association with AMBAS. He has been involved with PLAS and AMBAS projects for three years. Two years ago, he participated in the mangrove canal restoration project with AMBAS and he also helps to monitor the mangroves when the crabbing season is closed to make sure there is not illegal take occurring. He is also a professional roofer and works building thatched roofs whenever this work is available in the area.

Porfidio shared his views and expertise regarding the PLAS crabbing group and harvesting natural resources sustainably. He explained that there are seven crabbing groups in the area and he believes they are working well. There are 38 members in his crabbing group. He added, "Crabs have been disappearing and you can't find as many anymore so it is important to enforce bans and seasons. That's [crabbing] how we survive." He decided to become involved with AMBAS and PLAS because he saw that the situation in the mangroves was becoming very dire and that is where the sustainable use groups came from. He feels it is important to inform people in the community about sustainable use because the situation is getting worse and the blue crabs were nearly gone in this area. The PLAS groups have allowed crabs to come back and their sizes to grow over time. He used to work alone in the mangroves crabbing illegally and was not aware of sustainable use methods, but joining the PLAS group has made a big difference in his life.

Interview 7 – Oscar Geovani Duran Campos

Oscar is a 35-year-old man who works as a crabber for the PLAS group, as a tortuguero for the AMBAS hatchery, cleaning up plastic in the mangroves, and has worked on the

mangrove canal restoration projects. He has been working with AMBAS for five years and believes that, “AMBAS is the right-hand man (and woman, he joked) of the PLAS groups in Barra de Santiago. They’re the ones who supported us and led the process of establishing these groups and protected areas [for crabbing in the mangroves]. AMBAS supports the whole community of Barra de Santiago.”

Oscar felt that with the community involvement in the conservation and sustainable use groups like PLAS and AMBAS, more members of the community, about half of people by his estimate, want to protect what is endangered. He also thinks these groups have made a great impact from an environmental regulation perspective. While it used to be a “free for all” in terms of collecting resources from the mangroves, now regulations are respected and he adds, “...we can maintain everything and it will not be used up from one day to the next.” In the areas of the mangrove forest where there are park rangers and sustainable use groups to enforce regulations, Oscar has seen species return in greater numbers. However, he feels that there are areas of the estuary and mangroves where park rangers and police cannot monitor because there are not enough park rangers to cover such a large area. He feels that funds to allow for the hiring of more park rangers is most urgent support that AMBAS needs from outside organizations because while the sea turtles and crabs have been given a chance at recovery, many other species (especially various species of parrots and iguanas) are threatened.

Interview 8 - Veronica (1)

Veronica (who chose not to give her last name) is a 35-year-old woman who lives with her partner and teenaged son and daughter. We conducted this interview on the porch of her home while her children and Eder Caceros Monzón, a wildlife biologist who works with AMBAS, were present. Veronica is a member of AMBAS and works as a tortuguera collecting eggs for the AMBAS hatchery. Veronica has been a member of AMBAS for four years and was invited personally by the founder Rosa because she wanted to learn more about sea turtles and really liked the idea of AMBAS. She also works making and selling tortillas and taking care of a vacation property.

Veronica offered an interesting perspective as a female tortuguera. She has always liked taking care of nature and she wanted to contribute in a more serious capacity. AMBAS has acted as a platform to help her do that. She explained that everyone in the community benefits from AMBAS projects. The projects provide work and a close, local place to sell sea turtle eggs as a better alternative to going to a town miles away to sell to the black market. Veronica was supportive of the incentive program offered through the AMBAS hatchery explaining that, “It’s not just money. The incentive program helps to buy things like the chairs and the table we are sitting at.” She added that in general, eggs are not sold to the black market now that the hatchery is in operation and that many tortugueros and tortugueras support the hatchery and are involved with “veda” nights (one night that happens every two weeks during nesting season in which tortugueros donate all of the eggs they collect to the hatchery without pay to promote a conservation-minded attitude).

Veronica is familiar with nesting sea turtles on the beach, but has not seen them in the mangrove estuary. She sees many olive ridleys and occasionally a black sea turtle. She has heard her father tell stories about how when he was young, many more sea turtles used to come up to nest and every single nest was collected and sold to be eaten. She thinks there used to be many more black sea turtles in the past, but it seems they are starting to come back now that the hatchery has been operating for three consecutive seasons. Veronica told us that, “If there were no hatchery there would be no turtles.” and, “They [the community] wouldn’t have turtles or mangroves if it weren’t for AMBAS projects.”

Interview 9 – Rosa Aquilar Lovato de Villedaz (Doña Rosa)

Doña Rosa is considered a main figure in the community of Barra de Santiago and has worked supporting wildlife initiatives with her husband Don Toño for many years. She is the leader and founding member of AMBAS and actively supports and encourages the women in the community to learn new skills and take on leadership roles. Her home is in the center of the town and is where many interviews were conducted as it is a familiar place to those in the community. She is 57 years old and lives with her husband, daughter Ana Maria (whose interview is detailed below), and her grandson Joshua. This interview was conducted in a car on the way home from a stakeholders meeting of local environmental groups.

Rosa explained the history of AMBAS and how it started years ago with a small group of women that were helping out a local non-profit conservation organization called Amigos del Arbor (Friends of the Forest in English). A reporter came to interview park rangers and noticed that Rosa and other women were involved in conservation efforts including taking care of baby caiman, an endangered reptile species in the area of Barra de Santiago. The reporter told Rosa it would be a great idea to organize the women she was working with into a community organization. Rosa initially thought that this was not possible because she had always thought her job was to work in the house (as was commonly done by women in this community) and occasionally help out the park rangers. It took time for her to warm up to the idea, but the reporter’s comment stuck with her and she liked the idea of organizing a women’s group. She began to recruit other women, but was initially met with a lot of opposition from both men and women.

Finally, in the year 2000, she got help from MARN to get AMBAS started officially. The first initiative was to set up capacity building to teach sewing and dress making workshops to women with money received from the project for taking care of the caiman. From the initial conservation and capacity building initiatives, AMBAS grew and took on a project with FIAES to help start recycling, garbage, and composting projects for the community. At the time, people were throwing plastic out and littering everywhere and AMBAS saw they could raise funds by collecting recycling to pay for transportation and meetings. AMBAS started doing more work with FIAES and eventually hired women and men as park rangers to enforce environmental protection laws. In 2005, AMBAS began work with MARN and started their sea turtle hatchery. Rosa helped and encouraged Dora (interview included above) to take on the job of hatchery manager.

When asked why Rosa persisted with the idea of AMBAS when there was initially so much pushback from the community, Rosa explained that she felt women had a unique understanding of the issues in their community and had the willpower to join together to make a difference and share the work. Many men in the community did not agree with the idea of AMBAS initially and Rosa added, "...they [the men] didn't want the women collaborating or working, because they should be in their houses making tortillas and making food for when they [men] get home."

Rosa explained that now there has been a positive shift in people's attitudes toward conservation and the environment. She feels that AMBAS has helped create awareness among members of the community. Rosa also said, "...we've accomplished a lot of projects for women, for tour guides, a lot of ecotourism initiatives. We've built the capacity for improving the quality of life and cleaning the environment." Rosa feels that the support AMBAS requires from outside organizations includes more funding to hire new park rangers and create more protected or restricted areas in the mangroves. Her vision for the future includes more capacity building workshops for men, women, and young people so the community can learn skills and create more jobs that do not rely so heavily on exploiting natural resources. She would like more jobs in place such as more bakery classes, motor repair classes, and workshops to learn how to make handicrafts and souvenirs. She envisions a future where people would not have to sell sea turtle eggs, but could instead depend on other stable sources of work for their livelihoods.

Interview 10 – Veronica (2)

Another member of AMBAS named Veronica (who chose not to give her last name) was interviewed who chose not to give her last name. Veronica is 43-years-old and lives with her five children. She was interviewed on the porch of Rosa's home. She has been a member of AMBAS for six years and works with the PLAS crabbing group and as a tortuguera. Her daughters are involved in the AMBAS bakery program and her sons also sell sea turtle eggs to the AMBAS hatchery. She has known Rosa for many years and has always supported her ideas for AMBAS. She enjoys being involved with AMBAS and learning about how to conserve species such as the blue crabs she works with.

Veronica mostly works with the PLAS crabbing group now, but she is familiar with sea turtle species and has seen a hawksbill nesting on the beach in the past, but not recently. She is supportive of the hatchery and the "veda" egg donation nights and thinks that these initiatives are going a long way to help sea turtles.

Interview 11 – Ana Maria

Ana Maria (who chose not to give her last name) is a 28-year-old woman and is the daughter of Doña Rosa and Don Toño. She joined AMBAS last year after her mother had encouraged her to become involved. She has been working for many years at the restaurant that is run from Doña Rosa and Don Toño's home. She was interviewed on the porch of her home and was accompanied by Rosa.

Ana Maria explained that she was hesitant to join AMBAS at first as she has seen first-hand how all-encompassing running AMBAS is for her mother, but she decided to help by managing a grant and doing administrative work for sea turtle conservation project in support of the “veda” egg donation nights. She has also worked as an organizer for the mangrove canal restoration project last year. Rosa added that she is glad to have Ana Maria’s help with AMBAS and that she hopes to see more young people join the organization to keep it going in the future.

Ana Maria told us that she has learned a lot over the years from Rosa’s work and from Toño who used to be a local park ranger, but who now works for MARN. She is familiar with the different sea turtle species and some of their nesting behaviors as she grew up around conservation work. She remembers sea turtle populations being more abundant in the past and she sees sea turtles wash up dead on the beach regularly. She knows that fishing boats are causing the deaths. Ana Maria explained that this type of behavior displayed fishermen will not change until people have access to steady work. She hopes in the future AMBAS will be able to run more projects for people to participate in.

3.2 Quantitative Survey Results

Table 1 and Table 2 on the following pages present the results of the quantitative surveys distributed to AMBAS, non-AMBAS members, and women from four fishing cooperatives in the Puerto Parada community of the Bay of Jiquilisco, respectively. Each table shows the question number, question, answer choices, and the number and percentage of respondents that marked each answer choice. The “Count” refers to the number of respondents that marked a certain answer choice, and “%” refers to the percentage of total respondents that marked a certain answer choice. An asterisk (*) next to a question number indicates that additional information regarding the answers to that specific question are discussed below the table. Note that many questions allowed multiple answer choices to be selected, so percentage of respondents may be greater than 100%. Total number of respondents included 17 women (of 35 total) for the AMBAS survey in Barra de Santiago and 11 women (of an estimated 25 total) for the fishing cooperative survey in the Bay of Jiquilisco.

Table 1. Quantitative Survey Results - AMBAS

Question #	Question	Answer Choices																	
1	How many people are in your home (including you?)	Average #																	
	Average of all answers (# of people):	4.76																	
2*	What is the primary source of income in your home?	Fishing		Crabbing		Making/selling food or baked goods		Tourism - if so, please specify what type: (i.e. - selling food to tourists, taking tourists on boat rides, leading guided hikes, etc.)		Hatchery work		Collecting sea turtle eggs		Other					
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%				
		6	35	2	12	0	0	11	65	0	0	1	6	3	18				
3	How many years have you worked in AMBAS?	0-4 years		5-9 years		10-13 years		14-16 years											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		13	76	2	12	0	0	2	12										
4	What activities do you participate in? Circle all that apply:	Hatchery		Collecting Sea Turtle Eggs		Canal digging projects		Trash collection program (in mangroves or on beach)		Teaching workshops (for cooking or baking)		PLAS Group		Other					
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%				
		2	12	6	35	9	53	11	65	2	12	0	0	0	0				
5	Were you involved in any environmental work or environmental groups before joining AMBAS?	YES		NO															
	Answers:	Count	%	Count	%														
		2	12	15	88														
6	Why did you decide to join AMBAS? Circle all that apply:	To help the environment		To earn money		Camaraderie (gaining enjoyment from being part of a women's group)		To help the community											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		16	94	1	6	4	24	2	12										
7	How do you think most people in this area typically use the environment?	Subsistence (food for household consumption i.e. - collecting crabs, iguanas, fishing, etc.)		Income (selling any type of natural resources)		Enjoyment or recreation													
	Answers:	Count	%	Count	%	Count	%												
		8	47	4	24	9	53												
8*	In your opinion, what part of the environment is most threatened in this region?	Mangroves		Sea turtles		Fish		Crabs		Iguanas		Birds		Other					
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%				
		10	59	13	76	10	59	10	59	16	94	9	53	5	29				
9	Do you think you could tell the difference between the sea turtle species olive ridley, green, hawksbill, and leatherback?	YES		NO															
	Answers:	Count	%	Count	%														
		11	65	6	35														
10*	Where have you seen turtles? Please circle the species name(s) you have seen and/or the cause(s) of death if you know it/them.	Nesting on the beach:		Dead on the beach		Swimming in the ocean		Feeding in the ocean (or reef)		Dead in the ocean		Swimming in the mangroves		Feeding in the mangroves		Dead in the mangroves			
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%		
		10	59	13	76	10	59	1	6	9	53	6	35	0	0	9	53		
		Species Count		Species Count		Species Count		Species Count		Species Count		Species Count		Species Count		Species Count			
		Olive Ridley (9) Green (4) Hawksbill (4) Leatherback (3)		Olive Ridley (5) Green (2) Hawksbill (1) Leatherback (0)		Olive Ridley (5) Green (4) Hawksbill (2) Leatherback (3)		Olive Ridley (0) Green (0) Hawksbill (1) Leatherback (0)		Olive Ridley (1) Green (0) Hawksbill (1) Leatherback (1)		Olive Ridley (2) Green (4) Hawksbill (3) Leatherback (3)		Olive Ridley (0) Green (0) Hawksbill (0) Leatherback (0)		Olive Ridley (1) Green (1) Hawksbill (0) Leatherback (1)			
11*	If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one (how many years ago?)	Time range of answers:																	
	Where did you see it?	Mangroves		Beach		Ocean		Other											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		0	0	8	47	2	12	0	0										
	What was it doing?	Swimming		Eating		Nesting		Dead											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		1	6	0	0	8	47	1	6										
12*	If you know the difference between sea turtle species, which species of sea turtle(s) do you think are most threatened? Circle all that apply:	Olive Ridley		Green		Hawksbill		Leatherback											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		0	0	11	65	11	65	12	71										
13	In your opinion, is the hatchery system a good method to conserve sea turtles for the long term?	YES		NO		I don't know enough information about the hatchery system													
	Answers:	Count	%	Count	%	Count	%												
		17	100	0	0	0	0												
14	Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in Barra de Santiago?	YES		NO															
	Answers:	Count	%	Count	%														
		12	71	5	29														
15	In your opinion, how much is sea level rise, flooding, heavy storm waves, pollution, trash, agriculture runoff, freshwater diversion, etc. from human activities affecting the conservation projects that AMBAS is leading?	Largely affecting projects		Moderately affecting projects		Slightly affecting projects		Not affecting projects											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		15	88	0	0	0	0	2	12										

While Question #2 (What is the primary source of income in your home?) prompted a single answer for the primary source of income, several respondents marked more than one answer. This correlates with information gathered during the qualitative interviews, which showed that income is unstable and rarely comes from one primary source. It should also be noted that several respondents did comment that they make and sell food (primarily fish and crabs), but specifically for tourism purposes, which prompted them to mark the “Tourism” answer choice as opposed to the “Making/selling food and baked goods” answer choice. Income sources explained under “Other” included taking care of a home and collecting sea turtle eggs.

Question #8 (In your opinion, what part of the environment is most threatened in this region?) also prompted a single answer choice, but respondents marked multiple answer choices. The purpose of the question was to gain insight as to what wildlife respondents felt was *most* threatened, however it is clear that the respondents feel that multiple wildlife types are threatened. Those respondents that marked “Other” as a response did not specify the wildlife type, but in most cases also marked every other answer choice. It is assumed those respondents marked “Other” on accident.

Question #10 (Where have you seen turtles? Please circle the species name(s) you have seen and/or the causes(s) of death if you know it/them) was a complex question with multiple parts. The question asked the respondents to specify the cause of death if they marked that they saw a sea turtle dead on the beach, in the mangroves, or in the ocean. The results specifying cause of death are not included in Table 1. Almost every respondent marked the cause of death as either from entanglement in fishing gear or from a fishing boat strike. Only two respondents marked sickness as the cause of death. It is important to note that many respondents did not specify a sea turtle species, either because they cannot differentiate between sea turtle species or they could not identify the species from the distance they observed it.

Question #11 (If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one [how many years ago?] Where did you see it? What was it doing?) and Question #12 (If you know the difference between sea turtle species, which species of sea turtle(s) do you think are most threatened?) only applied to those respondents that indicated they could differentiate between sea turtle species, so some respondents did not answer these questions. It is for this reason that Question #11 percentages do not add up to 100%. Question #12 was multiple answer and so the percentages will also not add up to 100%. Question #14 (Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in Barra de Santiago?) only applied to those respondents that could specifically identify a hawksbill sea turtle, but all 17 respondents answered the question. This will be discussed more in Section 4.0.

Table 2. Quantitative Survey Results - Fishing Cooperatives

Question #	Question	Answer Choices																	
1	How many people are in your home (including you)?	Average #																	
	Average of all answers (# of people):	5.27																	
2*	What is the primary source of income in your home?	Fishing or selling fish		Crabbing/Clamming/selling crabs or clams		Making and selling food or products		Tourism - if so, please specify what type: (i.e. - selling food to tourists, taking tourists on boat rides, leading guided hikes, etc.)		Other									
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%						
		8	73	3	27	3	27	1	9	1	9								
3	How many years have you worked in your fishing cooperative?																		
	Range of years:	5-12 years																	
4*	What conservation activities have you participated in? Circle all that apply:	Sea turtle egg collection/hatchery work		Pesca Limpia		PLAS Group		Canal digging projects/EMR technique		Trash collection (in the mangroves or on the beach)		Capacity building workshops		Other					
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%				
		0	0	11	100	0	0	0	0	5	45	2	18	0	0				
5	Were you involved in any environmental work or environmental groups before joining your fishing cooperative?	YES NO																	
	Answers:	Count	%	Count	%														
		10	91	1	9														
6	Why did you decide to join your fishing cooperative? Circle all that apply:	To help the environment		To earn money		Camaraderie (gaining enjoyment from being part of a women's group)		To help the community											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		9	82	6	55	1	9	2	18										
7	How do you think most people in this area typically use the environment?	Subsistence (food for household consumption i.e. collecting crabs, iguanas, fishing, etc.)		Commercialization (selling any type of natural resources)		Enjoyment or recreation													
	Answers:	Count	%	Count	%	Count	%												
		6	55	11	100	1	9												
8*	In your opinion, what part of the environment is most threatened in this region?	Mangroves		Sea turtles		Fish		Crabs		Iguanas		Birds		Other					
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%				
		7	64	5	45	4	36	2	18	2	18	2	18	0	0				
9	Do you think you could tell the difference between the sea turtle species olive ridley, green, hawksbill, and leatherback?	YES NO																	
	Answers:	Count	%	Count	%														
		7	64	4	36														
10*	Where have you seen turtles? Please circle the species name(s) you have seen and/or the cause(s) of death if you know it/them.	I don't see sea turtles		Nesting on the beach		Dead on the beach		Swimming in the ocean		Feeding in the ocean (or reef)		Dead in the ocean		Swimming in the mangrove		Feeding in the mangroves		Dead in the mangroves	
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%
		0	0	6	55	4	36	2	18	0	0	1	9	9	82	1	9	3	27
				Species Count		Species Count		Species Count		Species Count		Species Count		Species Count		Species Count		Species Count	
				Olive Ridley (0) Green (0) Hawksbill (2) Leatherback (1)		Olive Ridley (0) Green (0) Hawksbill (0) Leatherback (0)		Olive Ridley (1) Green (0) Hawksbill (1) Leatherback (1)		Olive Ridley (0) Green (0) Hawksbill (0) Leatherback (0)		Olive Ridley (0) Green (0) Hawksbill (0) Leatherback (0)		Olive Ridley (1) Green (0) Hawksbill (7) Leatherback (0)		Olive Ridley (0) Green (0) Hawksbill (1) Leatherback (0)		Olive Ridley (0) Green (0) Hawksbill (1) Leatherback (0)	
11	If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one (how many years ago)?	Time range of answers: 3 days to 8 months ago																	
	Answers:																		
	Where did you see it?	Mangroves		Beach		Ocean		Other											
	Answers:	Count	%	Count	%	Count	%	Count	%										
	What was it doing?	Swimming		Eating		Nesting		Dead											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		10	91	1	9	0	0	1	9										
12	If you know the difference between sea turtle species, which species of sea turtle(s) do you think are most threatened? Circle all that apply.	Olive Ridley		Green		Hawksbill		Leatherback		I don't know									
	Answers:	Count	%	Count	%	Count	%	Count	%	Count	%								
		5	45	5	45	9	82	6	55	0	0								
13	In your opinion, is the hatchery system a good method to conserve sea turtles for the long term?	YES NO I don't know enough information about the hatchery system																	
	Answers:	Count	%	Count	%	Count	%												
		7	64	0	0	3	27												
14	Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in El Salvador?	YES NO																	
	Answers:	Count	%	Count	%														
		6	55	4	36														
15	In your opinion, how much is sea level rise, flooding, heavy storm waves, pollution, trash, agriculture runoff, freshwater diversion, etc. from human activities affecting your work?	Largely affecting work		Moderately affecting work		Slightly affecting work		Not affecting work											
	Answers:	Count	%	Count	%	Count	%	Count	%										
		10	91	0	0	1	9	0	0										
16	Does being a member of this fishing cooperative improve your economic status?	YES NO																	
	Answers:	Count	%	Count	%														
		11	100	0	0														

Similar to the respondents that took the AMBAS survey, respondents that took the fishing cooperative survey selected multiple answer choices for Question #2 (What is the primary source of income in your home?). The one respondent that marked “Other” wrote salt collection as the source of income.

While Question #4 (What activities do you participate in?) is identical between the two surveys for consistency, the answer choices were revised for the fishing cooperative survey to make them more applicable. “Pesca Limpia” was an added answer choice that refers to a project in El Salvador aiming to promote sustainable fishing practices amongst fishing cooperatives in the Bay of Jiquilisco.

Also similar to the respondents that took the AMBAS survey, respondents that took the fishing cooperative survey selected multiple answer choices for Question #8 (In your opinion, what part of the environment is most threatened in this region?), indicating that those respondents also believe there is more than one wildlife type that is very threatened in their region.

Question #10 (Where have you seen turtles? Please circle the species name(s) you have seen and/or the causes(s) of death if you know it/them) was identical between both surveys, and just as in Table 1 with the AMBAS survey results, the causes of death are not listed in Table 2 for the fishing cooperative survey results. Almost every respondent marked the cause of death as either from entanglement in fishing gear or from a fishing boat strike. Only one respondent marked natural causes as the cause of death. All but one respondent was able to identify the species of sea turtle they observed dead.

One respondent did not answer Question #14 (Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in Barra de Santiago?), but wrote that it was because she did not know the difference between sea turtle species.

3.3 Informal Interview Profiles

Two MARN park rangers were interviewed informally to gain a general understanding of Barra de Santiago’s endangered wildlife. Toño Lovato de Villedaz (Don Toño, regional park ranger) was interviewed on many occasions during both visits to Barra de Santiago. Juan Alberto Perez (local Barra de Santiago park ranger) was interviewed during a boat tour of the mangroves on March 28, 2017. Their interviews were not voice-recorded and there was no structured set of questions asked. A summary of relevant information from each interviewee is discussed below.

Toño Lovato de Villedaz:

Don Toño is a regional park ranger with MARN and is viewed as the community leader in Barra de Santiago. His wife is Doña Rosa. As a park ranger, Don Toño is very knowledgeable about Barra de Santiago’s natural resources and wildlife and has been involved in conservation activities for decades. In 1974, Toño joined a small group of volunteers that

collected sea turtle eggs on the beach in Barra de Santiago and took them to a hatchery, which Don Toño reported as the first hatchery in El Salvador. MARN started supporting the group's efforts by donating coffee to help the volunteers stay awake during long nights of collecting eggs. In 1979, when MARN hired their first group of park rangers, Toño was one of them. In 1982, a hurricane destroyed about 80% of the mangrove forests surrounding Barra de Santiago. Toño led a community-wide restoration project to replant the mangroves. Most of the mangroves seen in Barra de Santiago today are from that restoration project. Toño reported that he frequently sees juvenile hawksbill turtles foraging in Zapatero Canal (a canal that is part of the Natural Protected Area in the estuary). His current goals are to work toward making Barra de Santiago a zero-waste community as well as start El Salvador's first crocodile hatchery. He has not yet received MARN's support for the crocodile hatchery.

Juan Alberto Perez

Juan is one of five local park rangers in Barra de Santiago. He has been studying birds for 10 years under his mentor Oliver Komar (Professor at Zamorano University in Honduras), who is one of the authors of *Peterson's Guide on Birds in Central America*. Juan patrols the mangrove forest in Barra de Santiago daily, paying special attention to concealing the nesting locations of five mating pairs of yellow-naped Amazon parrots. Juan said that one parrot can sell for \$300 to \$500 on the black market Juan reported seeing up to three hawksbill turtles foraging together in the entrance to Zapatero Canal on several occasions. He predicts these juvenile hawksbill turtles are from the reefs in Los Cobanos. He said the sea turtles do not forage very far past the entrance to Zapatero Canal because there are crocodiles farther upstream that will prey on them, and recalled witnessing a crocodile eating a hawksbill turtle once. Juan said that the hawksbill turtles are feeding on shrimp and a red sponge that grows on the mangrove roots. He mentioned that one of his colleagues at the University of San Salvador studies hawksbill turtles and has recently hypothesized that they prefer a specific species of red sponge. Juan has taken photos of the red sponges he sees on mangrove roots in Barra de Santiago and has sent them to his colleague to identify and compare to the species she thinks hawksbill turtles prefer. Juan noted that the reason the mangrove forest habitat area in Barra de Santiago became a Ramsar complex was because of the nesting occurrence of the rare oyster catcher bird (*Haematopus halliatus*).

Juan explained that he was an assistant on an industrial shrimp trawling boat about 20 years ago when he was a young man. He said the fishermen would bring up huge nets of shrimp, and recalled that after just one hour, the crew would unload piles of shrimp so tall he could not see his friend on the other side of the boat. As an assistant, he had to fill up 12 buckets of shrimp in a limited amount of time until the boat captain reported that time was up and they had to continue fishing in another location. Anything not sorted in buckets was tossed overboard. Juan said that back then, assistants were allowed to take home bycaught fish to their families. Today however, so much overfishing has occurred that few shrimp are caught and fishermen keep all the bycatch, leaving nothing for assistants to take home. Juan commented that today, industrial trawlers can kill up to 15-20 sea turtles per

night during the nesting season. If the sea turtle is a female, they cut out the eggs. Then they chop up the body into multiple pieces so the body parts sink instead of washing up on shore. Juan said that all industrial boats by law are supposed to fish further than three nautical miles from the shore, farther than five nautical miles from the Ramsar site, and use TEDs, but violate these laws constantly. Juan said that industrial boats get unlawfully warned (presumably by someone within CENDEPESCA) prior to CENDEPESCA inspections, allowing them to avoid penalties for violations.

4.0 DISCUSSION

The subsections below discuss changes made during the interview and survey processes based on questions that were confusing or unclear to respondents and notable trends among interview responses. During both the qualitative interview and quantitative survey processes, some biases were introduced that may have influenced the respondents' answers. Those biases as well as other factors that may have influenced respondents' answers are also discussed below. A profile comparison between the AMBAS women and the fishing cooperative women is discussed in the last subsection.

4.1 Qualitative Interviews

A total of seven AMBAS members and four non-AMBAS members were interviewed during the qualitative interviews conducted from 24-29 March 2017. After four interviews (three AMBAS members and one non-AMBAS member), it was very clear that some questions were confusing to the respondents. The qualitative interview questions were re-ordered and revised for the latter seven interviews. The original set of qualitative interview questions are provided as Appendix A, and the revised set of qualitative interview questions are provided as Appendix B. Most notably, Question #11 (In your opinion, how does the community use, interact with, and/or view endangered wildlife generally?) and Question #12 (In your opinion, how does the community use, interact with, and/or view hawksbill sea turtles?) were the most confusing and were revised the most. These two questions were combined and revised to ask, "How does the community use the environment?" This revised question prompted answers with helpful information, most commonly an explanation of how the community depends on fishing (artisanal) for food and income, and on mangrove wood to build their houses. Many community members also depend on sea turtle egg collection for income during nesting season and on crabs harvested from the mangroves. Only minor revisions were made to the remainder of the questions. All revisions can be viewed in Appendix A and B.

In the revised qualitative interview questions (Appendix B), Question #4 (How did you hear about AMBAS?), Question #8 (What do people think of AMBAS?), Question #8a (Are they involved in projects?), Question #14 (Does the community want to protect what is endangered?), Question #17 (Are there any environmental laws that protect the environment?), Question #17a (Are you aware of any [laws] that specifically protect mangrove forests?), Question #17b (Are you aware of any [laws] that specifically protect sea turtles?), Question #18 (What environmental protection laws are not obeyed?), Question #18a (Why do you think someone would not obey a law that protects the environment?), Question #20 (What support does AMBAS need?), and Question #20a (What support does the community need?) were all answered consistently among respondents. In reference to Question #4, AMBAS members all said they heard about AMBAS via a personal invitation to join by Rosa. Non-AMBAS members generally said they heard about AMBAS through an invitation to work on conservation projects. In reference to Question #8, most respondents said that AMBAS had very little support initially, but that support has substantially grown over time since the community has been able to see the

beneficial income opportunities brought from conservation projects. In reference to Question #8a, most respondents said that some community members participate in AMBAS projects and some do not. In reference to Question #17, 17a, and 17b, most respondents mentioned that it is against the law to sell sea turtle eggs anywhere except hatcheries and to take mangrove wood without a permit. In reference to Question #18 and #18a, interviewees generally responded that some people do break environmental laws because they are poor and have no other choice. In reference to Question #20 and #20a, all respondents said that AMBAS needs projects that are longer-term. They explained that AMBAS projects are an excellent source of income, but only for the short time periods they last. They also explained that the community generally needs more economic opportunity. Since these questions were answered consistently, it was determined that there was nothing more to learn by asking those questions to a larger sample of AMBAS women, and they were not included in the quantitative survey. The remainder of the questions were revised and carried over to the quantitative survey so as to obtain answers from a larger sample of the AMBAS women.

Nine out of 11 interviews were conducted at Toño and Rosa's house, as it is a central and familiar location that was considered a comfortable environment for the respondents. Five of the respondents were AMBAS members and four of the respondents were non-AMBAS members. Rosa sat in and listened to four of five AMBAS interviews in her home and came with the interviewers on one of two interviews conducted away from her home. While this likely increased the comfort of the respondents, Rosa's presence seemed to influence the respondents' answers to some questions, especially for those questions that asked about sea turtles. In many cases, a respondent would pause a moment to consider the question, and Rosa would answer the question as though she was trying to help them. She would also add additional commentary and/or correct other interview answers. These instances were noted by the interviewers during translation so as to separate Rosa's commentary from the respondents' answers. Rosa's presence alone may have added pressure to answer certain questions (particularly those questions asking about AMBAS) a particular way.

4.2 Quantitative Interview Surveys - AMBAS

A total of 17 AMBAS members filled out the quantitative survey, which is presented in Appendix C. The survey was distributed during a group lunch at Toño and Rosa's house on May 4, 2017. Question #7 (How do you think most people in this area typically use the environment?) seemed to be especially confusing for some women because they wanted to mark more than one answer choice as opposed to only one answer choice. In Question #15 (In your opinion, how much is sea level rise, flooding, heavy storm waves, pollution, trash, agriculture runoff, freshwater diversion, etc. from human activities affecting the conservation projects that AMBAS is leading?), the Spanish word "polución" was confusing, and was explained as "contaminación" by the interviewers when a respondent asked. Question #11 (If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one?), Question #12 (If you know the difference between sea turtles species, which species of sea turtle(s) do you think are most threatened?), and Question #14 (Have you noticed an increase in the number of hawksbill

sea turtles in the area since the hatchery system has been in effect here in Barra de Santiago?) were new questions added both to get an idea of how frequently hawksbill sea turtles are seen in Barra de Santiago and to test the women's' understanding of their critical endangerment status.

In general, most of the results obtained from the quantitative surveys complemented the information gathered from the qualitative interviews as far as income sources (Question #2), AMBAS activities (Question #4 through Question #6), environmental usage and threats (Question #7 through Question #9), knowledge of sea turtles (Question #10 through Question #14), and climate change impacts (Question #15). The major difference between the samples of AMBAS members is that most of the respondents that took the quantitative survey were newer AMBAS recruits, as 76% marked that they have been working with AMBAS for 0-4 years (Question #3 results), while most of the women interviewed during the qualitative interviews had been with AMBAS since its beginning.

Being in a group allowed those women who could not read and/or write receive help from the interviewers and other AMBAS women. While distributing the survey at a group lunch was time-efficient and allowed the women to enjoy the experience, many women discussed answers to survey questions amongst each other, which may have influenced some responses. Rosa also sat with the women during the survey and contributed to some of their answers. It is for these reasons that not all answers may reflect the knowledge or opinions of the individual women. This is especially true for Question #9 (Do you think you could tell the difference between the sea turtle species olive ridley, green, hawksbill, and leatherback?), Question #12 (If you know the difference between sea turtles species, which species of sea turtle(s) do you think are most threatened?) and Question #13 (In your opinion, is the sea turtle hatchery system a good method to conserve sea turtles in the long-term?). The interviewer team witnessed the women discussing amongst each other what the different traits between sea turtles species are and which species are most threatened, and subsequently marking an answer after group consensus. All 17 respondents marked "Yes" for Question #13, affirming that they believe the sea turtle hatchery system works well. It is possible that they felt pressure to mark this answer since they were surrounded by other AMBAS members and at Rosa's house, but this is only an acknowledgement of the possibility and is not a confirmed bias.

4.3 Quantitative Interview Surveys - Fishing Cooperatives

A total of 11 women from four fishing cooperatives in the community of Puerto Parada in the Bay of Jiquilisco filled out the quantitative survey, which is presented as Appendix D. The purpose of distributing the quantitative survey in a different community was to compare conservation mindsets among women in different Salvadoran communities. The women were invited to take the surveys at the Asociación Cincahuite Office located in the community of Puerto El Flor between May 6, 2017 and May 8, 2017. The questions in the survey distributed to the women in the fishing cooperatives were identical to the questions in the survey distributed to the women of AMBAS, but all occurrences of "AMBAS" were changed to "fishing cooperative" and some answer choices in certain questions were

revised to better apply to the fishing cooperative women. Specifically, “clamming/selling crabs or clams” was added as an answer choice to Question #2 (What is the primary source of income in your home?), and “Pesca Limpia” was added as an answer choice to Question #4 (What conservation activities have you participated in?). Question #16 (Does being a member of this fishing cooperative improve your economic conditions?) was added as a new question to gain insight about the women’s’ perspectives of working in a fishing cooperative. All changes can be viewed in Appendix C and Appendix D. While the fishing cooperative respondents did ask several questions throughout the survey, there was not any one particular question that consistently confused them.

Similar to the AMBAS respondents, the fishing cooperative respondents discussed several questions with each other and marked some answers according to a group consensus. It is for this reason that not all answers may reflect the knowledge or opinions of the individual women. All 100% of fishing cooperative respondents marked “Yes” for Question #16 (Does being a member of this fishing cooperative improve your economic conditions?). It is possible that the women felt pressured to mark this response since men from the fishing cooperative were present and assisting the interviewers with survey distribution. As with the AMBAS responses, the presence of other fishing cooperative members influencing answer choices is acknowledged, but is not a confirmed bias.

4.5 Comparison of AMBAS Women to Fishing Cooperative Women

The most noticeable differences in answer choices between the AMBAS respondents and the fishing cooperative respondents were in Question #2 (What is the primary source of income in your home?), Question #4 (What conservation activities have you participated in?), Question #6 (Why did you decide to join your fishing cooperative?), and Question #10 (Where have you seen sea turtles?). In reference to Question #2, 73% and 27% of fishing cooperative respondents marked fishing/selling fish and crabbing/clamming/selling crabs or clams as their primary sources of income, respectively. In contrast, 65% and 35% of AMBAS respondents marked tourism and fishing as their primary sources of income, respectively. This difference was expected, as it was known prior to survey distribution that the women in the fishing cooperative participated in that work as their priority job. In reference to Question #4, all 100% of fishing cooperative respondents marked that they are involved in Pesca Limpia as opposed to the AMBAS respondents that do not have the choice to participate in Pesca Limpia. In reference to Question #6, 55% of fishing cooperative respondents said that they joined their fishing cooperative to earn money, whereas only 6% of AMBAS respondents marked that they joined AMBAS to earn money. However, 72% of fishing cooperative respondents also marked that they joined their cooperative to help the environment. Comparatively, 94% of AMBAS respondents marked that they joined AMBAS to help the environment. The difference in % response regarding income is also expected, as AMBAS projects are not a consistent source of income. The difference in responses to Question #10 is the most striking. The AMBAS respondents that were able to identify the sea turtles species they have observed identified a mix of all four species that occur in El Salvador, with the most common species being the olive ridley sea turtle. This makes sense, as the olive ridley sea turtle is the most commonly occurring sea

turtle species in El Salvador (Liles et al., 2015). In contrast, the fishing cooperative respondents identified hawksbill sea turtles most commonly. This result is also not surprising, as the Bay of Jiquilisco is a common nesting/foraging area for hawksbill sea turtles (Liles et al., 2011). Overall, it seems that AMBAS women participate in their activities as a means to help the environment and their community, with making money as a secondary benefit. Earning money is a stronger driver for the fishing cooperative women, however helping the environment is an even stronger driver. Women in the fishing cooperatives also have much more exposure to hawksbill sea turtles, as the Bay of Jiquilisco is a common foraging area (Liles et al., 2011).

The table below highlights the questions discussed above with results that either reflect a notable difference in environment (specifically sea turtle sighting occurrence) between the two study sites, a difference in lifestyle (economic opportunities or conservation opportunities) between the two study groups, or a difference in conservation mindset between the two study groups (AMBAS women in Barra de Santiago versus fishing cooperative women in the Bay of Jiquilisco).

Table 3. Profile Comparison between AMBAS Women and Fishing Cooperative Women	
Question	Discussion
#2: What is the primary source of income in your home?	The responses to this question indicate a difference in economic opportunities between the two study groups. 73% and 27% of fishing cooperative respondents marked “fishing/selling fish” and “crabbing/clamming/selling crabs or clams” as their primary sources of income, respectively. In contrast, 65% and 35% of AMBAS respondents marked “tourism” and “fishing” as their primary sources of income, respectively. The major difference here is that the fishing cooperative conservation activities (e.g. – the “Pesca Limpia” program) serve as a consistent source of income for the fishing cooperative women, whereas AMBAS activities are voluntary and inconsistently funded, meaning the AMBAS women’s primary sources of income are from other alternatives outside of AMBAS activities.
#4: What activities do you participate in?	The responses to this question indicate a difference in conservation opportunities between the two study groups. All 100% of the fishing cooperative women marked that they are involved in Pesca Limpia, while 0% of AMBAS women marked this answer choice since

	<p>this program is not available in Barra de Santiago. 65%, 53%, 35%, 12% and 12% of AMBAS women marked that they participate in trash cleanups, canal digging projects, sea turtle egg collection, teaching workshops, and hatchery work, respectively. In contrast, 0% of fishing cooperative women marked these activities since there are not established projects for them in the Bay of Jiquilisco. The one exception to this is that 45% of fishing cooperative women marked they participate in trash cleanups, which from further discussion with the respondents seems to be a voluntary activity, and not an established event like trash cleanups are in AMBAS.</p>
<p>#6: Why did you decide to join AMBAS/your fishing cooperative?</p>	<p>The responses to this question reflect a notable comparison in conservation mindsets between the two groups of women. 55% of fishing cooperative respondents said that they joined their fishing cooperative to earn money, whereas only 6% of AMBAS respondents marked that they joined AMBAS to earn money. However, 72% of fishing cooperative respondents also marked that they joined their cooperative to help the environment. Comparatively, 94% of AMBAS respondents marked that they joined AMBAS to help the environment. The fact that a higher percentage of fishing cooperative women marked that they joined their fishing cooperative to help the environment than to earn money indicates that helping the environment is still a driving force behind their participation in the fishing cooperative despite the fact that working in the cooperative is their job.</p>
<p>#10: Where have you seen sea turtles?</p>	<p>The responses to this question reflect a difference in sea turtle sighting occurrence between the two study groups. The AMBAS respondents that were able to identify the sea turtles species identified a mix of all four species that occur in El Salvador, with the most common sighting being the olive ridley sea turtle. This makes sense, as the olive ridley sea turtle is the most commonly occurring sea turtle species in El Salvador. In contrast, the fishing cooperative</p>

	<p>respondents identified hawksbill sea turtles most commonly. This result is also not surprising, as the Bay of Jiquilisco is a common nesting/foraging area for hawksbill sea turtles. While these results are expected and complement existing literature on sea turtles in El Salvador, the fact that data from such a small sample size of women reflects the literature is worth noting.</p>
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5.0 RECOMMENDATIONS FOR FUTURE RESEARCH AND CONSERVATION ACTIVITIES

The following subsections will offer recommendations developed from the results of the qualitative interviews, quantitative surveys, and informal interviews.

5.1 Recommendations for Future Research

We feel that the mangrove canal and estuary habitat of Barra de Santiago is a good site to conduct future studies of hawksbill sea turtles. One of the main goals of our interview-based research in Barra de Santiago was to gather accounts from community members who spend their time in the estuary and mangrove canals to discover if juvenile hawksbill sea turtles use this habitat for foraging. We included questions in our qualitative interviews and quantitative surveys with the hope of informing ICAPO about any hawksbill activity in Barra de Santiago. Based on the information ascertained from our qualitative interview and quantitative survey results, there is consensus among AMBAS and non-AMBAS members that the mangrove estuaries of Barra de Santiago provide foraging habitat for juvenile hawksbill sea turtles. From the information we collected, juvenile hawksbill sea turtles have been observed foraging for sponges near the roots of mangroves. They have reportedly been seen around the mouth of the estuary to avoid predators such as crocodiles that live deeper in mangrove canals. They have also been sighted near a shallow reef offshore in the Pacific Ocean toward the eastern end of Barra de Santiago. The information collected from the surveys of the women in the fishing cooperatives in Puerto Parada tells a similar story, as the women who are familiar with hawksbill sea turtles report seeing parallel behaviors in comparable areas of the mangroves.

These reports complement the findings detailed in the 2011 publication by Gaos et al. which explains the discovery of juvenile hawksbills using mangrove habitats in novel ways (Gaos et al., 2011). We believe that the mangrove estuary of Barra de Santiago would be a good site for ICAPO to conduct future research as the organization could better determine the population numbers of hawksbills in the Eastern Pacific region. ICAPO could also build upon the narratives we have collected and further study how hawksbills are using the mangrove estuary of Barra de Santiago. From the information we have collected, we feel this site would be a strong addition to the ongoing hawksbill and sea turtle restoration projects that ICAPO and EcoViva are undertaking at other locations in El Salvador, respectively.

5.2 Recommendations for Future Funding

From our interview and survey results, we recommend that any future funding AMBAS receives from partnering organizations or from the governmental of El Salvador goes directly into creating conservation programs that create long-term, sustainable livelihoods for the community members of Barra de Santiago. There was a strong theme found in every

qualitative interview that Barra de Santiago needs a steady source of funding (as opposed to the short term, sporadic funding that has been the norm) for conservation projects that provide jobs for this community. Interviewees were in general agreement that the projects created by AMBAS have raised the level of public support for the organization and have facilitated a level of environmental awareness and more conservation-minded attitudes in this region overall. Interviewees expressed their concern for the state of their local natural resources and how the exploitation of resources is directly linked with the lack of steady sources of work.

It is clear that the members of AMBAS have a defined vision for how future funding could be used. They were in agreement that the community could use capacity building workshops and education initiatives to encourage women and men to learn and utilize skills such as baking and boat motor repair to take pressure off natural resources. Additionally, interviewees had ideas to better utilize tourism in the community. These ideas included directing funding towards guided eco-tourism experiences and educational signage that would provide jobs and give tourists from outside of Barra de Santiago a better understanding of its status as a Ramsar site and a greater respect of its local wildlife.

5.3 Recommendations for Future Environmental Regulation Efforts

We recommend that future funds from MARN go towards the training and hiring of more park rangers to monitor the estuary and mangrove forest in Barra de Santiago and the surrounding areas. There was consensus among the interviewees, especially those familiar with the fishing industry and the local park ranger program that is operated in association with the Fund for the Americas (Fondo de la Iniciativa para las Americas [FIAES, in Spanish]), that there must be more support from MARN in order for community conservation efforts to reach their fullest potential. All interviewees and survey participants were in agreement that until there are enough park rangers to properly monitor the mangrove forest and estuary, poaching and illegal take of wildlife and natural resources (such as crabs and mangrove wood) will continue to be an issue. While awareness programs and sustainable use groups have made a huge impact in the community, the members of AMBAS and the PLAS crabbing groups feel that they are missing the support that more monitoring could provide.

Finally, we suggest that the government of El Salvador replace its current CENDEPESCA staff with locals from the community of Barra de Santiago and surrounding towns. Many interviewees expressed that they felt there is a glaring lack of regulation within the industrial fishing industry. Locals of Barra de Santiago are familiar with seeing sea turtles wash up dead on the beaches and reported seeing industrial trawling boats regularly within the three nautical miles offshore (the boundary set by CENDEPESCA). Given that this community's economy is dependent upon its artisanal fishing fleet, many interviewees expressed frustration and concern at the lack of enforcement of industrial boats and the decline in fishing yields in recent years. In order to decrease corruption and increase the proper enforcement of fishing regulations, we recommend that MARN hire and train locals from Barra de Santiago and the surrounding region who would have a vested interest in the

honest monitoring of the industrial fishing fleet. Hiring community members as CENDEPESCA staff would help local conservation efforts take their full effect in this region.

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Appendix A - Original Qualitative Survey Questions

- 1) When did you join AMBAS?
- 2) How did you hear about AMBAS?
- 3) Why did you choose to join AMBAS?
- 4) How do you feel the community views AMBAS? Do they support the organization's projects and goals? Do they participate in projects? (for AMBAS and non-AMBAS members)
 - a. Do you feel the community supports what AMBAS is doing?
- 5) How many hours a week do you spend on AMBAS work?
- 6) How many family members do you have? If you have kids, how many and what are their ages?
- 7) How did you transition into the leadership role you hold? What did you do before this? (For leadership members only)
- 8) What do you think the community's conservation priorities are in terms of wildlife and natural resources? What wildlife or resources are the most valuable and the most protected? (e.g. - sea turtle hatchery participation or mangrove restoration.) What wildlife and resources are the least valuable and protected? (e.g. - egg poaching, mangrove harvesting, illegal fishing.)
- 9) In your opinion, what is the primary way the town and community make money (e.g. - what drives the economy?
- 10) How does your household make money? What is the primary source of income? (What source does your household income come from?)
- 11) In your opinion, how does the community use, interact with, and/or view endangered wildlife generally?
- 12) In your opinion, how does the community use, interact with, and/or view hawksbill sea turtles?
- 13) Have you seen a hawksbill sea turtle? If so:
 - a. Where did you see it?
 - b. What was it doing?
 - c. How many times have you seen a hawksbill turtle?
 - d. Do you feel like you could recognize it and identify it as a hawksbill with certainty?
 - e. Do you feel like you could tell the difference between a hawksbill and an olive ridley? (or other species of sea turtle?)
- 14) Are you involved in the local sea turtle egg hatchery? If so:
 - a. In what capacity are you involved?
 - b. How does the hatchery system work?
 - c. In your opinion, how does the community view the hatchery?
- 15) In your opinion, is the sea turtle hatchery system economically feasible as a long-term conservation strategy?
- 16) In your opinion, how prioritized is sea turtle conservation compared to other conservation needs (e.g. mangrove harvesting management) from the government standpoint?
 - a. Which conservation goals do you feel should be prioritized?

- 17) Are you aware of any environmental laws that protect wildlife or natural resources in this area? If so:
 - a. Are you aware of any that specifically protect mangrove forests?
 - b. Are you aware of any that specifically protect sea turtles?
- 18) Which environmental protection laws do you think are most effective and why?
- 19) Which environmental protection laws do you think are not followed and why?
 - a. Why do you think someone would not follow an environmental protection law?
- 20) What are your feelings on climate change and how do you feel it is impacting this community? How do you feel it is impacting your conservation projects and goals?
- 21) In your opinion, what support does AMBAS require from outside organizations including the government of El Salvador in the form of financial resources, technical expertise, or legislation?
- 22) Have you observed any weather events or patterns that are endangering sea turtles?
- 23) Have you observed any changes in sea turtle behavior? If so, do you have an idea what is causing it?

Appendix B - Revised Qualitative Survey Questions

- 1) How many members are in your home? If you have sons or daughters? How many and what are their ages?
- 2) What is the primary source of income in your home?
- 3) When did you get involved with AMBAS?
- 4) How did you hear about AMBAS?
- 5) What activities do you participate in?
 - a. How many hours a week do you work in AMBAS? _____
- 6) What did you do before AMBAS?
- 7) Why did you decide to get involved?
- 8) What do people think of AMBAS?
 - a. Are they involved in projects? YES/NO
- 9) What livelihoods are there in the community?
- 10) How do people use the environment?
- 11) What part of the environment is being conserved?
- 12) What part of the environment is not being conserved?
 - a. What part of the environment should be conserved?
- 13) What part of the environment is endangered?
- 14) Does the community want to protect what is endangered?
- 15) Have you seen a sea turtle? If so:
 - a. Where did see you it?
 - b. What was it doing?
 - c. Do you know what species it was?
 - d. Have you observed any change in the behavior of sea turtles? What is causing it?
- 16) Are you involved in the hatchery? If so:
 - a. In what capacity?
 - b. How does the hatchery system work?
 - c. What does the community think of the hatchery?
 - d. Do you think this method of conservation will work long-term?
- 17) Are there any environmental laws that protect the environment?
 - a. Are you aware of any that specifically protect mangrove forests?
 - b. Are you aware of any that specifically protect sea turtles?
 - c. What environmental protection laws are not obeyed?
 - d. Why do you think somebody would not obey a law that protects the environment?
- 18) What is climate change?
 - a. How do you think it is affecting this community?
 - b. How do you think it's affecting the conservation projects?
 - c. Is climate change putting sea turtles in danger?
- 19) What support does AMBAS need?
- 20) What support does the community need?

Appendix C - Quantitative Survey for AMBAS

1) How many people are in your home (including you)? _____
Please specify the family member or person (for example, if it is a partner, spouse, son, daughter, grandchild, in-law, etc.) and their age:

Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____

2) What is the primary source of income in your home? Circle all that apply:

- a. Fishing
- b. Crabbing
- c. Making and selling food or baked goods
- d. Tourism - if so, please specify what type: _____ (i.e. - selling food to tourists, taking tourists on boat rides, leading guided hikes, etc.)
- e. Hatchery work – Circle all that apply:
 - hatchery
 - sea turtle egg collecting
- f. Other (please specify below in additional comments section)

3) How many years have you worked in AMBAS?

- a. 0-4 years
- b. 5-9 years
- c. 10-13 years
- d. 14-16 years

4) What activities do you participate in? Circle all that apply:

- a. Hatchery
- b. Canal digging projects
- c. Trash collection program (in the mangroves or on the beach)
- d. Teaching workshops (for cooking or baking)
- e. Other (please specify below in additional comments section)

5) Were you involved in any environmental work or environmental groups before joining AMBAS? Circle one: YES / NO

6) Why did you decide to join AMBAS? Circle all that apply:

- a. To help the environment
- b. To earn money
- c. Camaraderie (gaining enjoyment from being part of a women's group)
- d. To help the community

- 7) How do you think most people in this area typically use the environment?
- Subsistence (food for household consumption. i.e. - collecting crabs, iguanas, fishing, etc.)
 - Income (selling any type of natural resources)
 - Enjoyment/Recreation
- 8) In your opinion, what part of the environment is **most** threatened in this region?
- Mangroves
 - Sea turtles
 - Fish
 - Crabs
 - Iguanas
 - Birds
 - Other (please specify in the additional comments section below)
- 9) Do you think you could tell the difference between the sea turtle species Olive Ridley Green Hawksbill Leatherback? YES / NO
- 10) Where have you seen sea turtles? Please circle the species name(s) you have seen and/or the cause(s) of death if you know it/them.
- Nesting on the beach. Olive Ridley Green Hawksbill Leatherback
 - Dead on the beach. Olive Ridley Green Hawksbill Leatherback
- Cause of death (circle if known):
- Caught fishing net
 - Entangled in net/trash
 - Illness
 - Natural Causes
- Swimming in the ocean. Olive Ridley Green Hawksbill Leatherback
 - Feeding in the ocean (or reef). Olive Ridley Green Hawksbill Leatherback
 - Dead in the ocean. Olive Ridley Green Hawksbill Leatherback
- Cause of death (circle if known):
- Caught fishing net
 - Entangled in net/trash
 - Illness
 - Natural Causes
- Swimming in the mangroves. Olive Ridley Green Hawksbill Leatherback

- g. Feeding in the mangroves. Olive Ridley Green Hawksbill Leatherback
- h. Dead in the mangroves. Olive Ridley Green Hawksbill Leatherback

Cause of death (circle if known):

Caught fishing net

Entangled in net/trash

Illness

Natural Causes

- 11) If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one (how many years ago)? _____ years ago.

Where did you see it? (circle one): Mangroves Beach Ocean Other
(please specify below in the additional comments section)

What was it doing? (circle one): Swimming Eating Nesting Dead Other
(please specify below in the additional comments section)

- 12) If you know the difference between sea turtles species, which species of sea turtle(s) do you think are most threatened?

Circle all that apply: Olive Ridley Green Hawksbill Leatherback I don't know

- 13) In your opinion, is the hatchery system is a good method to conserve sea turtles for the long term?

- a. Yes
- b. No
- c. I don't know enough about the hatchery system

Please explain why:

- 14) Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in Barra de Santiago?

- 15) In your opinion, how much is sea level rise, flooding, heavy storm waves, pollution, trash, agriculture runoff, freshwater diversion, etc. from human activities affecting the conservation projects that AMBAS is leading?

- a. Largely affecting projects
- b. Moderately affecting projects
- c. Slightly affecting projects
- d. Not affecting projects at all

Appendix D - Quantitative Survey for Fishing Cooperatives

1) How many people are in your home (including you)? _____
Please specify the family member or person (for example, if it is a partner, spouse, son, daughter, grandchild, in-law, etc.) and their age:

Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____
Family member: _____ Age: _____

- 2) What is the primary source of income in your home? Circle all that apply:
- Fishing or selling fish
 - Crabbing/Clamming/selling crabs or clams
 - Making and selling food or products
 - Tourism - if so, please specify what type: _____ (i.e. - selling food to tourists, taking tourists on boat rides, leading guided hikes, etc.)
 - Other (please specify below in additional comments section)
- 3) How many years have you worked in your fishing cooperative?
- 4) What conservation activities have you participated in? Circle all that apply:
- Sea Turtle Egg Collecting/Hatchery Work
 - Pesca Limpia
 - PLAS
 - Canal digging projects/EMR Technique
 - Trash collection (in the mangroves or on the beach)
 - Capacity building workshops
 - Other (please specify below in additional comments section)
- 5) Were you involved in any environmental work or environmental groups before joining your fishing cooperative? Circle one: YES / NO
- 6) Why did you decide to join your fishing cooperative? Circle all that apply:
- To help the environment
 - To earn money
 - Camaraderie (gaining enjoyment from being part of a group)
 - To help the community
- 7) How do you think most people in this area typically use the environment?
- Own consumption
 - Commercialization (selling any type of natural resources)
 - Enjoyment/Recreation

- 8) In your opinion, what part of the environment is **most** threatened in this region?
- Mangroves
 - Sea turtles
 - Fish
 - Crabs
 - Iguanas
 - Birds
 - Other (please specify in the additional comments section below)
- 9) Do you think you could tell the difference between the sea turtle species Olive Ridley Green Hawksbill Leatherback Circle one: YES / NO
- 10) Where have you seen sea turtles? Please circle the species name(s) you have seen and/or the cause(s) of death if you know it/them.
- I don't see sea turtles
 - Nesting on the beach. Olive Ridley Green Hawksbill Leatherback
 - Dead on the beach. Olive Ridley Green Hawksbill Leatherback
Cause of death (circle if known):
Caught fishing net
Entangled in net/trash
Illness
Natural Causes
 - Swimming in the ocean. Olive Ridley Green Hawksbill Leatherback
 - Feeding in the ocean (or reef). Olive Ridley Green Hawksbill Leatherback
 - Dead in the ocean. Olive Ridley Green Hawksbill Leatherback
Cause of death (circle if known):
Caught fishing net
Entangled in net/trash
Illness
Natural Causes
 - Swimming in the mangroves. Olive Ridley Green Hawksbill Leatherback
 - Feeding in the mangroves. Olive Ridley Green Hawksbill Leatherback
 - Dead in the mangroves. Olive Ridley Green Hawksbill Leatherback
Cause of death (circle if known):

Caught fishing net
Entangled in net/trash
Illness
Natural Causes

11) If you indicated that you could identify a hawksbill sea turtle and that you have seen one, could you please tell us when you last saw one (how many years ago)?: _____ years ago.

Where did you see it? (circle one): Mangroves Beach Ocean Other
(please specify below in the additional comments section)

What was it doing? (circle one): Swimming Eating Nesting Dead Other
(please specify below in the additional comments section)

12) If you know the difference between sea turtles species, which species of sea turtle(s) do you think are most threatened?

Circle all that apply: Olive Ridley Green Hawksbill Leatherback I don't know

13) In your opinion, is the sea turtle hatchery system a good method to conserve sea turtles for the long term?

- a. Yes
- b. No
- c. I don't have sufficient information.

Please explain why:

14) Have you noticed an increase in the number of hawksbill sea turtles in the area since the hatchery system has been in effect here in El Salvador?

Circle one: YES / NO

15) In your opinion, how much is sea level rise, flooding, heavy storm waves, pollution, trash, agriculture runoff, freshwater diversion, etc. from human activities affecting your work?

- a. Largely affecting work
- b. Moderately affecting work
- c. Slightly affecting work
- d. Not affecting work

16) Does being a member of this fishing cooperative improve your economic conditions?

Circle one: YES / NO