

TWENTY-FIVE YEARS OF SEA TURTLE PROTECTION IN BRAZIL:  
EVALUATING LOCAL EFFECTS

A Dissertation

by

FERNANDA DE VASCONCELLOS PÊGAS

Submitted to the Office of Graduate Studies of  
Texas A&M University  
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2009

Major Subject: Recreation, Park and Tourism Sciences

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## ABSTRACT

Twenty-five Years of Sea Turtle Protection in Brazil:  
Evaluating Local Effects. (May 2009)  
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M.S., Oregon State University  
Chair of Advisory Committee: Dr. Amanda Stronza

This study evaluated how three conservation approaches implemented by the Brazilian Sea Turtle Conservation Program (the TAMAR Project) are related to local support for sea turtle conservation in Praia do Forte, Brazil. Four species of sea turtles nest in Praia do Forte. In Praia do Forte, locals harvested sea turtles for their meat and eggs on a regular basis to support subsistence needs. The three conservation strategies analyzed are employment opportunities and alternative sources of income from sea turtle ecotourism; enforcement of federal sea turtle protection laws; and implementation of environmental education programs via sea turtle ecotourism. These conservation strategies, which are implemented since 1982, represent both top-down and bottom-up conservation paradigms.

Qualitative and quantitative data were gathered through nine months of field-based research (between May 2006 and September 2008), using tools of participant observation, semi-structured interviews, and key informant interviews.

Results indicate that conservation strategies implemented by TAMAR seem to influence local support for sea turtle conservation. Income and environmental education programs to the local children are cited as the main benefits sea turtle conservation brings to the community. Enforcement caused resentment when first implemented, but is now perceived as a necessary strategy to protect sea turtles. The relative lack of community participation in sea turtle conservation seems not to have hampered local support for sea turtle conservation. In fact, the majority of respondents perceive

TAMAR as the most appropriate entity to manage sea turtles, and only a minority believes the community should co-manage sea turtle conservation with TAMAR. Though these three conservation strategies seem to help maintain traditional ecological knowledge, the future of this knowledge across generations is uncertain.

Though community-based sea turtle conservation is working at the community scale, external factors associated with tourism development at the larger scale seem to influence both livelihoods and sea turtle survival. On a negative side, larger scale tourism development is associated with an increase in the cost of living, the introduction of drugs, violence and greater sense of insecurity, changes in the local fishing culture, and with ongoing threats to sea turtle survival. Tourism development is associated with benefits as well, including improvements in the local infrastructure, employment opportunities, and alternative sources of income.

Since tourism development, at both local and regional scales, is unlikely to decrease any time soon, sea turtle survival no longer solely depends in getting local support for sea turtle conservation, but also in addressing the external factors that drive conservation and consumption of sea turtles. Overall, sea turtle ecotourism is one part of a larger strategy for meeting local socioeconomic needs while also protecting sea turtles in Praia do Forte.

## DEDICATION

*Eu dedico esta dissertação aos meus amados and maravilhosos pais. Muito obrigado por todo o amor, carinho, e apoio. Obrigado por sempre acreditarem no meu potencial, por apoiarem meus sonhos, e pelo amor incondicional! Que o Minuano saudoso dos pampas os entregue um beijão “tri” grande de obrigado! Amo vocês do fundo do meu coração!*

(I dedicate this dissertation to my loving and wonderful parents! Thank you for all the love, care and support. Thank you for always believing in my potential, for supporting my dreams, and for the unconditional love! I hope the ‘Minuano’ wind brings you my kiss of thanks! I love you with all my heart!)

## ACKNOWLEDGMENTS

The completion of this doctorate degree is the result of a long journey that started many years ago back in my home country of Brazil. Throughout the course of this journey some important people, you, have helped make this dream of mine turn into a reality. Each one of you has influenced my life in a memorable way and here I thank you for helping me reach one of my life's goals and dreams. My profound gratitude to my dear advisor Dr. Amanda Stronza. Amanda, thank you for believing in my potential and for not let me giving up the pursue of my dream to conduct my research in Brazil. Thank you for guiding me through the challenges and for sharing the memorable moments I encountered during these past years. You motivate me to pursue excellence and to be a better researcher and scientist; your work is an inspiration to me. It is an honor to have been mentored by you. Thank you!

I want to thanks the professors who formed my doctorate committee - Drs. Don Albrecht, Christian Brannstrom, Lee Fitzgerald, and Michael A. Schuett - for their encouraging words during the hard times and for their guidance!

My extended gratitude to Drs. Maria Ângela Marcovaldi and Guy Marcovaldi, from the TAMAR Project, for giving me the approval to conduct my study at TAMAR. Thank you for the support and for the unique and memorable opportunity and experience. Your lifelong quest to protect the sea turtles and their habitat is an inspiration to be followed and a symbol of dedication for the protection of sea turtles in Brazil and worldwide. Thank you for helping protect our country's marine resources.

I want to thank my dear and loving husband for the support, patience, and love! My love, this has been a long journey for both of us, but you have been there for me through every moment, during the challenging and the happy moments. Thanks for being part of this important chapter of my life!

*Quero agradecer minha mana amanda por ter estado ao meu lado durante todos estes anos enquanto eu estive longe de casa. Mana, muito obrigado por todo o amor e carinho. Obrigado pelo apoio e ombro amigo! Valeu mana!* (I want to thank my dear

sister for being there for me all these years while I was away from home. Sis, thank you very much for the support! Thank you Sis!).

I thank my loved ones back home in Brazil, Switzerland, Sweden, Norway, Japan, and here in the US. You have been part of this dream since the beginning, so thank you for helping make it a reality! I thank my dear friend and mentor Dr. Joanne Tynon for the guidance and assistance throughout my Masters, both as my advisor and as a friend. Jo, your guidance helped me achieve this new chapter in my life. Thank you! I thank my dear friend Dr. Daisy Gualberto for being there for me through this journey. Thank you my dear friend! A special thanks to my dear aggie colleagues - Nicole Smolensky, Carter and Luciana Hunt, Liz Shapiro, Joseph Mbaiwa, Tomye Folts, Julia Belknap, Kristi Montandon, Ann Gillard, Sam Roberson, and Laura Weber for the great conversations about conservation, ethnographic research, and for the friendship during these past years.

I want to thank Drs. Tazim Jamal, Wendy Jepson, Gerald Kyle, Alex McIntosh, Sanjay Nepal, John Thomas, David and Susan Scott, Scott Shafer, Joseph O'Leary, Andy Skadberg, Ercan Turk, and Robert Stanton for their supporting words and guidance since my arrival at Texas A&M University. Thank you!

I want to thank my dear friend and Master's committee member Dr. John Buckhouse for keeping me strong, for the support, and inspiration. My dear friend, Dr. Joseph Tavares, thank you for giving me the incentive to never give up and believe in my dreams. My dear friend and Master's committee member Dr. Fred Obermiller, who is no longer with us but who will always be in heart, I wish you could be here to share this moment with me...but you are in many ways! A special thanks to the O'Leary family for their kindness and support. Big thanks to my dear colleagues, which includes the professors and graduate students - former and current graduate students - for making my time at TAMU a joyful and memorable one. Thank you for the great insights and for being there and for helping me keep focused on the final destination! I want to extend my gratitude to the RPTS staff Tina Vega, Marguerite Van Dyke, Vivian Gonzales, Darrel Fannin, Richard Breaux, Ann Williams, Ann Tsiao, Irina Shatruck, Kathryn

Nachlinger, Michelle Wiederhold, Terrell Johnson, and Diane Breeding; Kristina Reyes and Samantha Rosenson from the ISS Office; and Amy, Ann, and Christine from the Thesis Office for their help and assistance with the innumerable questions, technical issues, and for the supportive wishes.

My profound gratitude to my dear friends from Praia do Forte (whose names I maintain confidential because of their involvement in this study) for your support and help during the nine months of fieldwork. You made me feel at home while away from home. Thank you for letting me part of your life, for the great meals, and for the great stories. I thank the residents of Praia do Forte and Imbassaí who taught me important lessons and were kind enough to share their lives with me during my fieldwork. Thank you for the trust and for the kindness! Thanks to the research team of TAMAR who made my fieldwork a joyful and an amazing learning process. Some of you have become dear friends of mine and this friendship is one of the greatest gifts I take from this experience! I would like to thank the research team of the Humpback Whale Institute for the support and assistance during the course of this study. I also would like to thank the Garcia D'Ávila Foundation for the technical support and for sharing your archival data about Praia do Forte. I want to thank the students from Dr. Christian Brannstrom's Study Abroad class for their help in gathering the 2008 census data of Praia do Forte used in this study. I want to extend my gratitude to Dr. Lisa Campbell and Dr. Matthew Godfrey for their supportive words, suggestions and for believing in my potential.

My gratitude to the National Sciences Foundation, the PADI Foundation, the Thomas Viillo Scholarship, the Gene Phillips Scholarship, and by the sponsorship of Dr. Michael A. Schuett, from the Center for Socioeconomic Research and Education at TAMU, for sponsoring this study.

*Em último, quero agradecer meus pais e a minha irmã por terem me ajudado a ultrapassar as barreiras e as dificuldades encontradas durante esta longa jornada longe de casa. Vocês são os pilares da minha vida* (Lastly, I want to thank my parents and sister for helping me go through the barriers and challenges encountered during this long journey away from home. You are the pillars of my life!).



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## 1. INTRODUCTION

### 1.1 Introduction

Sea turtles are protected in most developed countries but are consumed, both legally and illegally, in many developing countries (Campbell, 2007). The decline and recovery of sea turtle populations are associated with human activities (Jackson *et al.*, 2001; Lutz *et al.*, 1997; Nichols *et al.*, 2000; Tisdell & Wilson, 2002), therefore, there is a need, especially at local levels (Campbell, 2007), to understand the underlying factors that drive human use and exploitation of sea turtles (Troëng & Drews, 2004) as well as what drives conservation of sea turtles.

Conservationists have different views on which approaches are the most effective to protect biodiversity (Brandon *et al.*, 1998; Campbell, 2007; Terborgh, 1999; West, 2006; Wilshusen *et al.*, 2002). Critical debates are over the extent to which - or whether at all - local communities should be involved in resource management and conservation decision-making (McNeely *et al.*, 2000; Bray *et al.*, 2003; Kramer *et al.*, 1997), whether employment and alternative sources of income are sufficient in promoting long-term conservation (Stronza & Gordillo, 2008; Pêgas & Stronza, 2008; Wilson & Tisdell, 2001), or even if enforcement of environmental laws is sufficient in minimizing pressures on local resources (Troëng & Drews, 2004). In a larger sense, these debates converge around two conservation paradigms: top-down and bottom-up. In this study, I evaluate and compare the outcomes of both of these conservation paradigms as they have been implemented by one conservation program in protecting sea turtles in the fishing village of Praia do Forte, Brazil between 1982 and 2008.

## 1.2 Top-down Approaches in Conservation

In 1968, Hardin (1968) argued that common resources are predestined to be overexploited. Overexploitation, Hardin argued (1968), occurs because resource users have unlimited access and the right of using these resources in a way that best fits their personal needs and demands rather than acting in ways that benefits the group as a whole. Based on Hardin's idea, in situations of open resource access, such as that of sea turtles, individual actions will lead to long-term degradation (De Young & Kaplan, 1988). The degradation of common resources is what Hardin called the 'Tragedy of the Commons' (Hardin, 1968). To prevent the 'tragedy', many conservationists over the years have restrained both consumption and access of resources and employed top-down -- externally defined and enforced -- regulations (De Young, 1999).

In many places around the world, conservation programs have traditionally been in the form of this top-down enforcement approach, also called 'classical model' (Schwartzman *et al.*, 2000), 'protectionism paradigm' (Wilshusen *et al.*, 2002), often with the U.S. National Park System serving as a model (Machlis & Tichnell, 1985). Campbell (2002) states that this conservation approach 'Is often a narrative of 'crisis' and it is traditional in that it is long-standing and continues to be a key influence on contemporary conservation practices' (2002: 29-30). In this model, local communities are subject to changes in their use of and access to resources and are not involved in resource management or decision-making processes. Resource changes often mean the loss of access and use of these resources (Campbell, 2000; Putra & Bailey, 2007). The assumptions are that the state should enforce restrictive legislation (Campbell, 2000), fines are necessary to manage and protect natural resources (Troëng & Drews, 2004), and better and more enforcement enhances the likelihood of effectively protecting resources from human pressure (Campbell, 1998).

Supporters of this approach claim that conservation programs that include communities in management, also called people-oriented approaches (Wilshusen *et al.*, 2002), have lost focus of the bottom line goal, which is to address biodiversity conservation. Instead, critics argue, people-oriented approaches tend to focus too much

on the socioeconomic needs of communities (Brandon *et al.*, 1998; Kramer *et al.*, 1997; Terborgh, 1999). It is also claimed that integrative approaches to conservation are trying to be all things to all people, thus diluting their focus on biodiversity protection (Brandon *et al.*, 1998). Proponents of top-down approaches to conservation also claim that the most effective way to ensure long-term biodiversity conservation is to maintain large tracts of protected areas (Kramer *et al.*, 1997). In the case of sea turtle conservation efforts in Brazil, large tracts of protected areas are established, for example, in the form of marine national parks and biological reserves. The Fernando de Noronha Marine National Park (PN) and the Atol das Rochas Biological Reserve (RN) are examples of these protected areas. In these areas, enforcement of sea turtle protection laws controls sea turtle harvesting and degradation of marine resources (IBAMA, 2008; Marcovaldi *et al.*, 2005; Projeto TAMAR, 2008).

Research shows, however, that constraining access and use of resources from local communities can generate problems or even cause unintended consequences for conservation, such as social conflicts that lead to greater resource exploitation of the protected resources (Barkin, 2003; Belsky, 1999; Campbell, 1998; Young, 1999). Scholars have also demonstrated that top-down approaches have been unable to enhance the chances of achieving conservation goals (Aberkeli, 2001; Chhatre & Saberwal, 2005). Failure of top-down approaches is associated with conflicts between local communities and resource managers (Newmark & Hough, 2000; Putra & Bailey, 2007; Salafsky & Wollenberg, 2000; West & Brechin, 1991). In these situations, hiring park guards and patrolling protected areas, enforcing rules, imposing fines, and sometimes even imprisoning those who violate the management policies of the protected area are used to address conflicts (Terborgh, 1999).

In a study about public participation in the development and establishment of two protected areas (Lençóis Maranhenses National Park and APA Pequenos Lençóis) in Brazil, Aberkeli (2001) found that top-down policies and actions implemented by the state and federal government hindered local economic development and negatively impacted local conservation efforts and actions. Aberkeli (2001) argues that such

outcomes are a result of the state government failing to address local economic needs and failing to include local communities in the decision-making process. In addition to top-down enforcement of policies, local knowledge was disregarded, underestimated, and often criticized as being an unsustainable management approach to land use (Aberkeli, 2001). As a result, local communities were dissatisfied with the creation of these two protected areas and did not support conservation efforts.

In summary, the main characteristics of top-down approaches to conservation are the enactment of environmental protection laws, which are created and enforced by the state, and the establishment of protected areas that control access and use of resources. Incentives for conservation are based on the enforcement of such laws, which are associated with punishments to those who break them. In this study I focus primarily on the effectiveness of enforcing sea turtle protection laws as an example of top-down conservation. My goal is to understand how enforcement is associated with local support for (or resentment of) sea turtle conservation.

### **1.3 Bottom-up Approaches in Conservation**

Since the mid 1980s, scholars who study local institutions and governance of shared resources (Agrawal, 2001; McCay & Acheson, 1987; Ostrom, 1990) challenge the applicability of Hardin's (1968) work and the effectiveness of top-down approaches to conservation. Critics to top-down approaches to conservation claim that such approaches can exacerbate conflicts and ultimately lead to greater resource degradation (Chhatre & Saberwal, 2005). They also claim that community participation in resource and conservation decision-making helps reduce conflict among users, enhances conservation stewardship, and improves resource management practices (Cater, 1993; Hodge *et al.*, 1997; Pretty, 2005; Suman *et al.*, 1999).

Community participation in resource decision-making is also believed to improve efficiency, equity, development, and resource management practices that are less detrimental to local resources, thus enhancing the likelihood of achieving conservation goals (Brannstrom, 2004). Cater (1993) argues that by excluding the human factor in

conservation management, conservation programs are likely to fail. In their analysis of Brazil's National Atlantic Forest Policy and its impacts on state-level environmental planning, Hodge *et al.* (1997) found that when communities lost access to forest resources and were threatened with punishments in case they violated enforced environmental laws, forest products were likely to be harvested illegally because there was no incentive for these communities to sustainably use these resources. The approach of including local communities in decision-making, in turn, may help minimize such problems (Rozemeijer & Van der Jagt, 2000).

Arnstein (1969) classifies community participation into eight distinct levels based on the levels of participation local communities have regarding to resource management and decision-making. These eight distinct levels of community participation in decision-making range from no participation in decision-making to full participation in decision-making (Arnstein, 1969). Arnstein (1969) argues that for full participation to take place, all citizens must have equal opportunities to influence political and economic processes. Dalton (2005) complements these ideas by theorizing that in order for active participation involvement to occur, participants must be able to have the opportunity for input, be involved since early planning, and be able to influence final decisions. In her analysis of public involvement in the planning of U.S. Marine Protected Areas, Dalton (2005) found that the presence of these components helped achieve local support for marine biodiversity conservation. Other scholars concur with Dalton (2005) and emphasize that for biodiversity conservation programs to be effective, the input from local communities is meaningful only if these communities can influence the structure of the process and the final decision (Beierle & Cayford, 2002; Smith & McDonough, 2001; Stronza & Gordillo, 2008). Hodge *et al.* (1997) argue that, in the case of developing countries, even if community participation is a necessary component in conservation, there seems to be a common pattern regarding the underestimation and exclusion of local communities when it comes to policy making.

The general failure of top-down conservation programs led many scholars to challenge the effectiveness of these approaches to conservation. Since the signing of the

United Nations' Brundtland Report in 1987 (Brundtland, 1987) and the initiation of socially 'sustainable' approaches to conservation, some resource managers now take into greater consideration the social and economic needs of local communities in addition to the needs of conservation (Wells & Brandon, 1992). These sustainable management practices aim at achieving long-term social and economic well-being of local communities while minimizing resource use practices that can cause resource degradation (Cater, 1993). That is, rather than imposing top-down rules and policies, these conservation programs now adopt a bottom-up approach to conservation where local communities collaborate in conservation decision-making (Bray *et al.*, 2003; Campbell, 2002).

Today, numerous collaborative and co-management programs aimed at achieving biodiversity conservation exist, but all share the core principles of community participation and provision of economic incentives and benefits to local communities. These approaches have been labeled in various ways. In Southeast Asia, Pathak and Kothari (2003) examined community development conducted under the concept of Community-based Biodiverse Areas (CCBA). In Botswana, Mbaiwa (2004) examined the existence of success and sustainability of Community-based Natural Resource Management (CBNRM) among communities in the Okavango Delta. In Zimbabwe, Murombedzi (1999) described the social equity among communities the Communal Area Management Programme for Indigenous Resources (CAMPFIRE). Among these collaborative approaches, ecotourism has been gaining popularity since the mid 1980s (Honey, 1999).

Using social and economic development goals, these programs are meant to replace top-down enforcement with incentives for local people to protect natural resources. In theory, economic development goals provided by these programs address the economic needs of local communities via the development and provision of financial incentives and benefits, such as employment and new income (Stevens, 1997). As such, some researchers state that the development of long-term support for conservation among community members is associated with economic benefit distribution and community

participation in decision-making (Leach *et al.*, 1999; Mbaiwa, 1999; Stronza, 2007; Wallace & Pierce; 1996).

Collaborative approaches to conservation are not free from being scrutinized, especially because many of today's field-based conservation initiatives are not living up to their proclaimed potential (Oates, 1999; Redford, 1990). Many of the shortcomings in today's conservation projects are due to a belief among conservationists that what they are doing is not conservation when, in fact, they are really doing is large-scale social interventions in complicated macropolitical settings (Brandon *et al.*, 1998). Critics to participatory conservation programs also claim that conservation linked with development and participation does not protect biodiversity. Wilshusen *et al.* (2002) argue that these statements presented against participatory programs ignore the social and political realities to which these conservation programs must adapt to achieve conservation goals. They argue that failure to achieve conservation may be related to problems in the implementation of the project instead of the 'Fundamental incompatibility of conservation with development' (2002: 20).

Agrawal (2001) and Ostrom (1990) argue that where local institutions exist and communities have agreed upon and enforce rules in resource management, degradation of common pool resources as argued by Hardin (1968) is unlikely to occur. Local institutions are defined as sets of formal and informal rules and norms that shape the interactions of humans with others and with nature (Agrawal & Gibson, 1999). In these cases, addressing local social and economic needs does not hinder the achievements of conservation needs. These points provided by Ostrom (1990), Agrawal (2001), and other scholars are in line with the recommendations of the Brundtland Report of 1987, which encourages the development of local institutions and participation in resource management in local environments (Brundtland, 1987).

In summary, the main characteristic of bottom-up approaches to conservation is its people-oriented scope. The focus is to address the needs of the local communities impacted by conservation initiatives. This strategy also focuses on incorporating local communities in resource decision-making and management, as it acknowledges the

presence and long-held rules of local institutions. In this study, I evaluate one type of bottom-up approach to conservation, ecotourism, in its ability to protect sea turtles in Praia do Forte, Brazil. More specifically, I evaluate the people-oriented goals of generating employment and income as well as environmental education programs on sea turtle conservation.

#### **1.4 Ecotourism: An Approach to Biodiversity Conservation**

Ecotourism is often viewed as a conservation approach that has the potential to achieve social equity, economic efficiency, and long-term conservation stewardship among local community members (Weaver & Lawton, 2007). Social equity refers to a situation where all individuals in the community, or individuals involved in the ecotourism operation, have equal access to resources (Mbaiwa, 2004). Economic efficiency is aimed at generating the maximum output in order to achieve a high standard of quality of life for the community within the existent financial constraints (Paehlke, 1999). Because of such potentials, ecotourism is often promoted as a win-win conservation strategy, where the socioeconomic needs of local communities and the needs of the environment are addressed (Ceballos-Lascurain, 1996; Honey, 1999; Stem *et al.*, 2003; Stronza, 2001; Stronza & Gordillo, 2008; TIES, 1990).

The International Ecotourism Society (TIES) (1990) defines ecotourism as 'Responsible travel to natural areas that conserves the environment and improves the well being of local people' (TIES, 1990). The Cape Town Declaration on Responsible Tourism in Destinations characterizes responsible tourism as an activity that causes low socioeconomic and environmental impacts, generates economic benefits for local communities and enhances their well being, incorporates local communities in decision-making, is culturally sensitive, and builds local pride and confidence (Cape Town Declaration on Responsible Tourism in Destinations, 2002). The peer reviewed literature summarizes ecotourism as a form of tourism that promotes conservation awareness and stewardship, provides economic benefits to the community, and enhances social involvement of host communities (Ceballos-Lascurain, 1996; Honey, 1999; Lee &



Snepenger, 1992; Mbaiwa, 2004; Scheyvens, 1999; Stronza, 2001, 2007). Through the trickling down of such benefits, it is theorized that residents would more likely support biodiversity conservation, thus achieve conservation goals (Ross & Wall, 1999; Weaver, 1999). For example in Botswana, Mbaiwa (2004) found that the Community-Based Natural Resource Management promoted community participation while also generating socioeconomic benefits to local communities, reduced illegal hunting activities, and enhanced local awareness between the linkage between resource conservation and support of their livelihoods in the area. Some of the benefits provided to the communities are generation of income and employment opportunities, enhancement of a sense of pride and self-worth, promotion of rural community development and sustainable use of natural resources (Mbaiwa, 2004). In Florida, Solomon *et al.* (2004) evaluated the cost-benefit of manatee protection programs. They found that economic benefits from manatee conservation, especially those associated with ecotourism, exceeded the development benefits forgone with the enforcement of conservation policies. Still, the authors found that economic benefits from ecotourism created incentives for local support over manatee conservation efforts.

#### **1.4.1 Environmental Education Promoted by Ecotourism**

In addition of providing local communities with economic benefits and fostering local participation in conservation, the promotion of environmental education is another principle of ecotourism (TIES, 1990). Supporters of using environmental education claim this conservation strategy can promote natural resource management, enhance awareness and understanding about the environment, and provide the opportunity to train resource managers in conservation related issues (Belknap, 2008; Gampbell, 1999; Jacobson, 1987; Kimmel, 1999; Kremezi-Margaritouli, 1992; Olson *et al.*, 1984). Some argue that, more broadly, environmental education can help establish a sustainable and long-term basis for residents to protect biodiversity (Leikam *et al.*, 2004).

In the realm of ecotourism, Kimmel (1999) notes that using environmental education can help minimize or reduce potential negative impacts associated ecotourism,

like the weakening of local culture and social structures (Brandon, 1996; Honey, 1999; McLaren, 1998). In the Flower Garden Banks National Marine Sanctuary, Texas, environmental education is a standard conservation approach to coral reef conservation (Belknap, 2008). In a comparison study between two environmental education programs, Belknap (2008) learned that education programs help enhance scuba divers' knowledge about coral reef ecology and human impacts on the reef while diving. This understanding helps minimize potential impacts caused by divers when diving on the local reefs. In Puerto Morelos, Mexico, the promotion of environmental education about the coral reefs since early 1990s is considered to be an important factor in gaining community support for the creation and management Puerto Morelos reef marine protected area (Rodríguez-Martínez, 2008). These programs aim to enhance understanding about the values, functions, uses and fragility of coral reefs, as well as increase community interest in coral reef conservation (Rodríguez-Martínez, 2008). In the Maldives, sea turtle ecotourism opportunities implemented at the Banyan Tree Maldives Vabbinfaru and Angsana Ihuru Resorts provide residents of the communities where the Resorts are located with environmental education opportunities about local sea turtle populations and marine conservation (SWOT, 2006). This process is associated with positive results for sea turtle conservation, like the reduction of sea turtle harvesting (SWOT, 2006).

Environmental education is also implemented as a conservation tool to address sea turtle mortality in fishing gear. It can enhance understanding about the threats certain fishing techniques have on sea turtle survival, develop conservation strategies that are more effective in addressing the socioeconomic needs of local fishermen, and in training the fishermen in ways to revive sea turtles caught in fishing gear (Drews, 2008; Eckert, 2007a; Hall, 2006; Marcovaldi *et al.*, 2007; Peckham *et al.*, 2007a). These achievements are important for sea turtle conservation, as illegal harvesting (Caribbean Conservation Corporation, 2008; Sea Turtle Restoration Project, 2009; SWOT, 2008) and death as result of bycatch in fishing gear are the main contemporary threats to sea turtles (Marcovaldi *et al.*, 2002). Hall (2006) insists that enhancing fishermen's awareness in relation to sea turtle conservation and developing alternative fishing techniques can

reduce bycatch numbers because the fishermen are at ‘The front line of the fisheries bycatch battle’ (2006: 27).

In some locations, sea turtle conservation programs that involve the local fishermen in conservation efforts and provide environmental education on fishing alternatives that are less detrimental to sea turtles are showing positive outcomes for sea turtle conservation (Eckert, 2007a; Marcovaldi *et al.*, 2007; Peckham *et al.*, 2007b). In Indonesia, sea turtle ecotourism was introduced as a sea turtle conservation strategy to reduce local pressure on sea turtles associated with illegal harvesting of sea turtles (Putra & Bailey, 2007). The authors observed that the introduction of sea turtle ecotourism, as an economic alternative to sea turtle harvesting, is providing former sea turtle hunters with employment opportunities. The authors also noticed that street vendors no longer use sea turtle meat but rather other types of meat. This change in meat choice decreases local demand for sea turtle meat. These results are associated, in part, with greater awareness about sea turtle conservation efforts provided by environmental education as part of sea turtle ecotourism strategies (Putra & Bailey, 2007).

### **1.5 Economic Benefits of Ecotourism**

Ecotourism programs may provide local communities with an economic alternative to traditional resource use (Wunder, 2000). Economic alternatives are often characterized in the form employment opportunities and alternative sources of income to local residents (Cater, 1993; Salafsky & Wollenberg, 2000; Tisdell & Wilson, 2002; Ziffer, 1989). Pearce and Moran (1994) find that the loss of access to resources via protection can be minimized only if the value of protecting these resources outweighs the benefits forgone by conservation, such as the opportunity costs and the direct costs of protection. As such, conservation of biodiversity should not be separated from socioeconomic development and from addressing the socioeconomic needs of local communities (Wells & Brandon, 1992).

The assumption is that ecotourism can provide local communities with such economic incentives and, by doing so, enhance the economic well being of local

communities through providing for alternative sources of income, better infrastructure, and employment opportunities (Bookbinder *et al.*, 1998; Ogutu, 2002; Stronza, 2007; Wunder, 2000). Bookbinder *et al.* (1998) emphasize that to effectively achieve economic benefits and biodiversity conservation, 'An appreciable amount of revenue' (1998: 1400) must return to local communities to promote conservation stewardship and change local uses of resources. In theory, the provision of economic returns from ecotourism to the local community is expected to create an incentive for biodiversity conservation (Weaver, 1999) and ecosystem restoration (Wild, 1994). The basic ideology is development for local communities is compatible with conservation (Langholz, 1999).

In the realm of ecotourism, it is assumed that by implementing natural resource management practices designed to increase local income generation, local tourism practices will reduce local dependence on traditional resources (Borrini-Feyerabend, 1996; McNeely, 1994; Tisdell, 1995). Though ecotourism programs may be able to address locally-driven resource use, these programs may ignore the large-scale political and economic drivers of environmental degradation. In some situations, ecotourism programs are able to address local socioeconomic needs by providing residents with economic alternatives that reduce their needs to harvest local resources for their livelihoods. However, ecotourism achievements and goals often collide with pressures at a larger scale, such as the global trade of wildlife across country borders to fulfill the demand for these species. The presence of these different scales of influence is another reason that ecotourism programs should focus not only on providing local communities with economic benefits, but also in providing them social benefits, such as empowerment and social justice.

## **1.6 Community Participation in Ecotourism: The Social Benefits of Ecotourism**

Ecotourism's discourse is akin to the ideologies of participatory conservation (e.g. Pêgas & Stronza, 2008; Schuett *et al.*, 2001; Wells & Brandon, 1992; Western & Wright, 1994; Ziffer, 1994). For example, both ecotourism and participatory programs aim to provide empowerment for local people by reversing top-down approaches to resource

conservation. Both programs include social justice as goals above resource protection and both focus on building social capacity among the communities involved in these conservation projects (Scheyvens, 1999). As such, proponents of ecotourism suggest that local communities should participate in decision-making (McNeely *et al.*, 2000; Stem *et al.*, 2003; Yea, 2002). Gray (1989) proposes that local communities should also have joint ownership and that collaboration among groups should be a part of the ecotourism management process. Through participation, McNeely *et al.* (2000) argue that conservation projects are more likely to succeed, especially in cases where local resource use has been an important factor in local resource degradation and depletion. Stronza (2001) finds that local participation in decision-making is also an essential factor in both failure and success of ecotourism, 'Regardless of the external inputs and intentions of outsider consultants' (2001: 276). Stronza (2007) also argues that when communities are involved in conservation decision-making a more profound and longer-lasting impact can take place. She finds that by including the community in participation, ecotourism has the opportunity to promote critical thinking, learning, and strengthening of local autonomy.

Wunder (2000) defines community participation in tourism development as 'The ability of residents to influence the operation and its outcomes' (2000: 471). Wunder (2000) finds that successful community participation in decision-making, in turn, enhances the likelihood of achieving sustainable development of local resources. The inclusion of the community in management is also found to foster community empowerment (Agrawal & Gibson, 1999; Cinner *et al.*, 2005; Granek & Brown, 2005; Scheyvens, 1999; Spiteri & Nepal, 2006; Western & Wright, 1994). Stronza and Gordillo (2008) insist that promotion of empowerment via participation shows that ecotourism can provide more than economic benefits to local communities. They suggest that ecotourism programs also provide opportunities to generate new understandings and feelings of capacity, develop new skills, and enhance overall social and economic stability. Ghimire and Pimbert (1997) argue these achievements occur as result of community participation in decision-making and find this outcome valuable as many communities in developing

countries often have a weak power base and little involvement in decision-making and in resource management activities.

Scheyvens (1999) segments empowerment into four different types: economic, psychological, social and political. When present, economic empowerment brings lasting economic gains to the local community; psychological empowerment enhances self-esteem and increases confidence of community members; social empowerment enhances the status of residents from traditionally low-status in their society and helps maintain the equilibrium within the community; and when political empowerment is present, local communities are given the option to raise questions and have their concerns dealt with and provides opportunities for local participation in the decision-making process (Scheyvens, 1999). Through the integration of local communities in conservation management, ecotourism programs can promote social and political empowerment. In Costa Rica, the community of Ostional legally harvests Olive Ridley sea turtle eggs for commercial and subsistence purposes (Campbell, 1998). Although some scholars challenge the benefits to conservation of this sea turtle egg harvesting practice, some consider this program a success because of the presence of a stable population and a possible increase in nesting numbers (Ballesterro *et al.*, 2000). Campbell *et al.* (2007) find that such activities also benefit the community by promoting local awareness of and support for conservation efforts, economic revenues, and community participation in management and decision-making process of egg harvesting. Residents value these benefits as important, if not even more important, than economic benefits (Campbell *et al.*, 2007). During a workshop where indigenous leaders from three Amazonian regions came together to discuss the impacts and share their experiences with ecotourism, the leaders claimed that opportunities to gain skills and leadership, enhancement of local self-esteem, expanded networks of support, and better organizational capacity were acquired as result of community participation in ecotourism decision-making (Stronza & Gordillo, 2008).

### **1.7 Ecotourism's Shortcomings in Achieving Conservation and Addressing Socioeconomic Needs of Local Communities**

In spite of ecotourism's potential to address the needs of biodiversity and local communities, results from the field show that many ecotourism programs have come short in achieving conservation goals and in addressing the socioeconomic needs of local communities.

In some situations, ecotourism created few jobs (Belsky, 1999; Cater, 1993; Duffy, 2002; Lindberg *et al.*, 1996; West & Carrier, 2004). In Papua New Guinea, West and Carrier (2004) found that rather than strengthening the way locals use the resources and providing employment opportunities to villagers, ecotourism was associated with efforts to impose capitalist rationality. Further, it generated few jobs and income for the community, and promoted tension between clans. In some cases, ecotourism has increased local economic dependency on ecotourism rather than maintaining a diversified economy (Honey, 1999; Pêgas & Stronza, 2008; Stem *et al.*, 2003) and showed to be a seasonal economy (EplerWood, 1998; Jacobson & Robles, 1992). In Mexico, Barkin (2003) found that although there was local support for conservation, resource degradation was associated with limited employment opportunities. In this case, the communities were not involved in decision-making and management of resources (Barkin, 2003). In an analysis of ecotourism's economic benefit to the communities located on the buffer zones of Royal Chitwan National Park, Bookbinder *et al.* (1998) found that economic benefits from ecotourism were limited due to low employment potential and marginal direct economic impact to households. In the Brazilian Amazon, Wallace and Pierce (1996) found that despite showing signs of providing economic benefits to local communities, ecotourism operations were unable to control waste and water pollution, did not include local communities in management, and provided little educational efforts to local communities (Wallace & Pierce, 1996). Limited participation in decision-making was also found in an analysis of the CAMPFIRE Program (Murombedzi, 1999). Murombedzi (1999) found that local communities did not have a say with regards to wildlife use and had limited control over economic benefits.

In some locations, ecotourism has negatively affected culture traditions and relations (Brandon, 1996; Honey, 1999; McLaren, 1998). In her study of the impacts of tourism in two Iban longhouse communities in Borneo, Malaysia, Yea (2002) found that communities were forced to alter their traditional lifestyles to adjust to the requirements imposed by tour agencies. Yea (2002) also found that these communities became dependent on ecotourism revenues to support their livelihoods. Wunder (2000) speculates that some cultural changes associated with ecotourism development, like increasing women's responsibility and work in domestic domains, may be permanent even if the tourism activities cease to exist. Belsky (1999) examined the social, economic, and cultural changes in the community of Gales Point, Belize, since the introduction of ecotourism. She found that ecotourism strategies impacted local land tenure system, and provided limited opportunities to community decision-making and economic opportunities. Economic opportunities, when present, were limited and seasonal, creating dissatisfaction among the community leading to further degradation of resources.

Despite such shortcomings among some ecotourism programs, ecotourism continues to be widely used as conservation approach to protect biodiversity (TIES, 2008). Kiss (2004) argues that this popularity is associated with the potential these approaches have in achieving multiple objectives. She notes that ecotourism is good for biodiversity conservation because it can be a relatively less impactful land use. She also claims that ecotourism programs can generate some income, contribute to the development of the community, and, in some circumstances, reduce the need for long-term external financing for conservation.

### **1.8 Sea Turtle Conservation: Top-down and Bottom-up Approaches in Conservation**

In the major nesting areas of green turtles in Turkey, their populations declined by 60% to 90% in the past 17 years while in the Pacific nesting numbers of loggerheads declined to 90% over the past 25 years (SWOT, 2006). The main causes of sea turtle population decline are human activities, which deliberately or not, led to contemporary



low population levels (McLellan, 2006; WWF, 2005). The main contemporary threats to sea turtles are illegal harvesting of adult sea turtles (SWOT, 2008); accidental death - bycatch - in fishing gear (Marcovaldi *et al.*, 2002); coastal development (Eckert, 2007a); ocean pollution (Cohen, 2008); and commercial exploitation of sea turtle eggs (Caribbean Conservation Corporation, 2008; Sea Turtle Restoration Project, 2009).

Sea turtle conservation programs adopt a variety of conservation approaches to address these threats. These represent both paradigms in conservation: top-down and bottom-up. Examples from the field show some positive signs of sea turtle conservation. In these locations, some sea turtle population numbers are showing some signs of recovery. Increase in loggerhead (*Caretta caretta*) (Marcovaldi & Chaloupka, 2007), Olive Ridley (*Lepidochelys olivacea*), and hawksbill (*Eretmochelys imbricata*) populations in Brazil (Jornal Bahia Norte, 2007; Projeto TAMAR, 2008) and green turtle (*Chelonia mydas*) population increased in Tortuguero (Costa Rica) (Troëng & Rankin, 2005) and in the Ascension Island (United Kingdom) (Broderick *et al.*, 2006) are some of these examples. In other locations population numbers have yet to show signs of recovery despite conservation efforts (Domingo *et al.*, 2004; Spotila, 2004; WWF, 2005). In a recent study on accidental bycatch, about 260,000 loggerhead sea turtles and 50,000 leatherback sea turtles were killed in longlines every year, with many sea turtles dying as result of this capture (WWF, 2008). Gilman *et al.* (2006) argue that bycatch of loggerheads and leatherbacks in the Pacific Ocean is so high that their populations may disappear in the next two decades if such problems are not addressed. In Southeast Asia (SWOT, 2006), in the Dominican Republic, and in Barbados (Zain & Benn, 2006) population decline still persists despite legal ban on sea turtle harvesting.

Many scholars emphasize the need for greater understanding of the underlying factors that drive human use and exploitation of sea turtles (Troëng & Drews, 2004; Nichols & Palmer, 2006), especially at local levels (Campbell, 2007), because they are associated with human activities (Conservation International, 2004; Jackson *et al.*, 2001; Lutz *et al.*, 1997; Nichols *et al.*, 2000; Tisdell & Wilson, 2002). Though important for conservation efforts, the drivers of sea turtle exploitation are only part of the overall

spectrum of sea turtle conservation. Effective sea turtle conservation also involves understanding what drives humans to protect sea turtles. Therefore, sea turtle conservation programs should not only focus on what drives sea turtle exploitation but also what factors work as incentives for communities to protect sea turtles. For instance, is the harvesting of sea turtles done for cultural (Barr, 1991) or subsistence purposes (Nichols & Palmer, 2006)? Understanding the reasons behind these behaviors enhances the likelihood that conservation strategies will be able to address the causes for human-related declines of sea turtle populations.

Marcovaldi *et al.* (2005) find that ‘the greatest and most complex challenges to long-term conservation of sea turtles in Brazil, and elsewhere, is changing the habits of coastal communities in which intensive rates of natural resource use is a vital source of subsistence and income, essential for survival’ (2005: 39). ‘Changing habits’ implies changing both behaviors and values about these resources. Identifying the threats and the causes of human behaviors that lead to these threats would mean understanding the ‘what’ and the ‘why’ factors that lead to human consumption and protection of sea turtles. This identification would also help in identifying the best approaches to change human values of sea turtles toward conservation efforts. This understanding, in turn, would benefit the development and implementation of conservation strategies that are more relevant to local communities and their livelihoods and, therefore, more efficient and site specific (Lutz *et al.*, 1997). One example of implementing this approach is found in the Republic of Trinidad and Tobago. There, sea turtle entanglement in gillnet fisheries is the main cause of leatherback sea turtles in the country (Eckert, 2007a). In an effort to cease bycatch in fishing gear, the local fishermen are now involved in the testing of alternative fishing methods that are less harmful to sea turtles but allow the fishermen to sustain their livelihoods from fishing. This process has promoted capacity building among the fishermen as they are now also part of the solution, rather than only the problem, for sea turtle conservation. The author emphasizes that ‘Solutions to serious conservation challenges [such as bycatch mortality of sea turtles in fishing gear] rely on stakeholder participation and the art of consensus’ (2007: 34). The example of bycatch

fishing problems in Trinidad and Tobago is one example where a combination of conservation strategies shows to be more effective than one approach alone. In this case, the development of capacity building via participation in testing alternative fishing methods and the use of environmental education, seem to be working in decreasing sea turtle bycatch.

The following sections provide examples of sea turtle conservation approaches that follow top-down approach, bottom-up approach, or both approaches to conservation. Findings from these examples of sea turtle conservation show a mix of both success and failure in protecting sea turtles. Why, then, are some sea turtle conservation programs able to achieve their goals while others are falling short of such achievement?

### **1.8.1 Top-down Approach to Conservation: Enforcement of Sea Turtle Protection Laws**

In many countries, enforcement of sea turtle protection laws are used as approaches to protect sea turtles from illegal harvesting, to reduce bycatch problems, and to minimize problems from coastal development. In some situations, these approaches are effective at protecting sea turtles (Troëng & Rankin, 2005); in others, the results are less promising (Barr, 1991; Putra & Bailey, 2007). In Tortuguero, Costa Rica, Troëng and Barkin (2005) found that the establishment of Tortuguero National Park and the ban on sea turtle egg and turtle harvesting contributed to the increase in hatchlings. Also in Costa Rica, but in the community of Ostional, Campbell (1998) showed that enforcement of sea turtle protection laws created conflict and resentment towards conservationists and patrolling personnel. In Indonesia as well, sea turtle protection laws against the illegal trade of sea turtles generated conflicts among conservationists, sea turtle hunters, and vendors of sea turtle products (Putra & Bailey, 2007). The authors found that conflicts were minimized when sea turtle vendors and hunters were able to engage in dialogue with the local government. Although hunting persisted, the numbers of harvested sea turtle decreased from more than 30,000 sea turtles in 2001 to fewer than 500 sea turtles in 2007 (Putra & Bailey, 2007). An economic alternative to sea turtle harvesting was the

introduction of sea turtle ecotourism. Ecotourism was able to provide former sea turtle hunters with employment opportunities and vendors were able to cook with other types of meat, thus decreasing the demand for sea turtle meat. Though enforcement of trade ban laws are essential for sea turtle conservation, it was only through a combination of sea turtle protection law enforcement, local participation in testing fishing alternatives, and the provision of economic benefits from sea turtle ecotourism that sea turtle hunting decreased (Putra & Bailey, 2007).

### **1.8.2 Bottom-up Approach to Sea Turtle Conservation: Sea Turtle Ecotourism**

Ecotourism represents one example of a broader conservation strategy that relies on development to provide incentives for protecting biodiversity (Stem *et al.*, 2003). The potential to achieve the needs of local communities and the needs of biodiversity makes ecotourism the chosen conservation approach of many sea turtle conservation programs (Godfrey & Drif, 2001; Jacobson & Robles, 1992; Petro, 2007; Tisdell & Wilson, 2002; Vieitas & Marcovaldi, 1997). This is especially true where resource degradation, illegal sea turtle harvesting, and other human activities are the main threats to sea turtle survival (Wilson & Tisdell, 2001). Patiri (2002) believes that complex socioeconomic and environmental problems in Brazil, such as social disparities and environmental degradation, are often mutually reinforcing problems that cannot be addressed separately. As such, conservation programs that also address the socioeconomic needs of local communities are more likely to achieve and sustain conservation in the longer term.

In their seminal edited volume on sustainable wildlife use, Robinson and Redford (1991) argued that conservation will be achieved only when wildlife is perceived as useful by the communities. At Mon Repos, Australia, sea turtle ecotourism is providing positive signs for sea turtle conservation, such as local support for conservation efforts and economic benefits for conservation via income from entrance fees (Wilson & Tisdell, 2001). In Tanoliu, in the South Pacific Islands, economic benefits from sea turtle ecotourism is providing the local community with alternative sources of income and employment opportunities and enhancing local and tourist awareness about sea turtles

and sea turtle conservation efforts (Petro, 2007). These sea turtle ecotourism practices are also associated with the generation of positive results for sea turtle conservation and benefits to local communities, such as reducing sea turtle harvesting activities, providing alternative sources of income to local communities, and enhancing local self-esteem (SWOT, 2006). The promotion of such feelings and achievements makes ecotourism more than an economic tool, but a cause of new understandings, skills, values and social relations (Stronza & Gordillo, 2008). Under this view, local communities decide to change the way they use and value the resources not only because of the economic gain associated with this change, but also because of their feelings of capacity, the strength of the local community institutions, and overall socioeconomic stability (Stronza, 2007). These benefits, argues Stronza (2007), are not often achieved when tourism is imposed as a top-down approach or when the community is involved only through employment or as service providers. Together, economic benefits and collaboration in management are aimed to promote incentives for residents to change their resource use practices and local values about these resources and adopt practices that are less detrimental to the environment, thus leading to conservation.

The examples of sea turtle conservation programs and strategies mentioned previously are only a few examples of current and past efforts to protect sea turtles. The conservation strategies represent two main conservation paradigms: top-down and bottom-up. Each paradigm, in theory, is a potentially effective approach to protecting biodiversity. However, as examples from the field show, mixed findings are found in programs that implement either or both paradigms. My goal in this study is not to show that one paradigm is better than the other, but rather to evaluate the impacts each conservation approach has in sea turtle conservation. Longitudinal studies on sea turtle nesting and sea turtle harvesting activities in the region show some signs of sea turtle conservation success in the fishing village of Praia do Forte as result of conservation strategies implemented by the TAMAR Project (Marcovaldi & Chaloupka, 2007; Marcovaldi & Marcovaldi, 1999; Santos *et al.*, 2000). My goal is to understand the effects of different approaches on how people use and perceive sea turtles. More

specifically, how do conservation approaches used by TAMAR affect the household, and how are these impacts related to local support for sea turtle conservation?

### **1.9 The Sea Turtle Conservation Program: The TAMAR Project**

The consumption of sea turtle meat and eggs is part of the traditional diet of coastal communities in many regions of the world for many years (National Research Council, 1990). Although levels and types vary from region to region, the killing of nesting females, harvesting of sea turtle eggs, coastal development, trading of shell for ornaments, and incidental fisheries captures have led declined the numbers of species down to almost extinction levels along the Brazilian coastline (Marcovaldi *et al.*, 1999). In the effort to protect sea turtles and their nests, the Brazilian Sea Turtle Conservation Program - TAMAR-ICMBio Program (TAMAR) was created in 1980.

TAMAR is a collaborative effort between the Brazilian Government's Institute of Renewable Resources (IBAMA- ICMBio) and a non-profit organization, 'Fundação Pró-TAMAR' (Foundation Pró-TAMAR) (Figure 1.1).

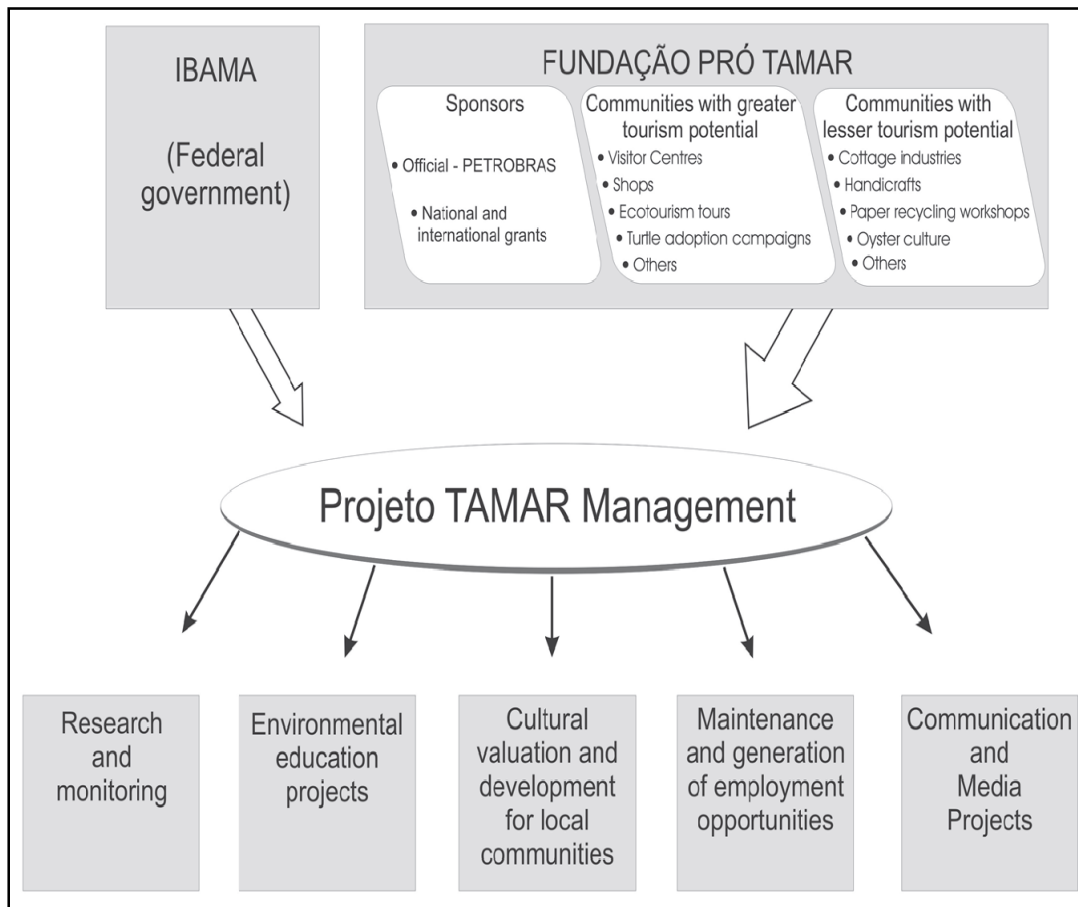


Figure 1.1: The administrative structure of TAMAR (Marcovaldi *et al.*, 2005).

The above figure illustrates the administrative structure of TAMAR. TAMAR's main conservation strategies are threefold: enforcement of federally enacted sea turtle protection laws, promotion of economic benefits to residents from the communities where it works, and the implementation of environmental education programs that aim to enhance understanding about sea turtle and sea turtle conservation.

Under the mandate of the federal government (IBAMA), TAMAR enforces sea turtle protection laws at the national scale. These laws prohibit the harvest of sea turtles in Brazil. The Foundation, created in 1998, is a specialized and non-governmental organization that supports and co-manages TAMAR. The primary goal of the

Foundation is to raise and administer funds. The Foundation provides and administers about 70% of TAMAR's funding (Marcovaldi *et al.*, 2005), which is then distributed among the research stations and visitor centers throughout Brazil. The Foundation is comprised of a board of Trustees, a president, an executive director, and seven regional directors responsible for the 22 field stations located in nine Brazilian states (Marcovaldi *et al.*, 2005). The Foundation serves as a catalyst and an intermediary between the federal government and the coastal communities.

The role of the IBAMA is to protect and recuperate the five sea turtle species found along the Brazilian coast and support major operational expenditures of TAMAR (e.g. salaries of senior staff and capital expenditures, such as buildings, vehicles, and equipment). In the past years, the financial support from IBAMA has averaged about a third of TAMAR's annual budget, which is more than \$2.9 million (Marcovaldi *et al.*, 2005). Since 1983 the official sponsor of TAMAR is the PETROBRÁS, Brazil's petroleum company. PETROBRÁS sponsors about 16% of the overall annual budget of TAMAR (Marcovaldi *et al.*, 2005).

The national headquarters of TAMAR and the Foundation are located in the fishing village of Praia do Forte, in the state of Bahia. Praia do Forte is located in an area with a major concentration of nesting activities of loggerhead sea turtles. Along the beaches of Praia do Forte, a research team patrols the area, by a motorized vehicle, each night and day during the sea turtle nesting season. The main goal of TAMAR is to keep as many clutches as possible *in situ*. TAMAR estimates that, nationwide, almost 70% of all nests are in their original places (Marcovaldi & Marcovaldi, 1999).

Since its establishment in 1980, TAMAR has provided economic benefits, via employment and income, to residents of the coastal communities in Brazil who have traditionally depended on sea turtles to meet their subsistence and income needs (Marcovaldi *et al.*, 2005). TAMAR now monitors 1,100 kilometers of beaches and employs approximately 1,300 people (SWOT, 2007). Of these 1,300, which include approximately 400 fishermen, about 85% are residents from the coastal communities where it works (Figure 1.2).



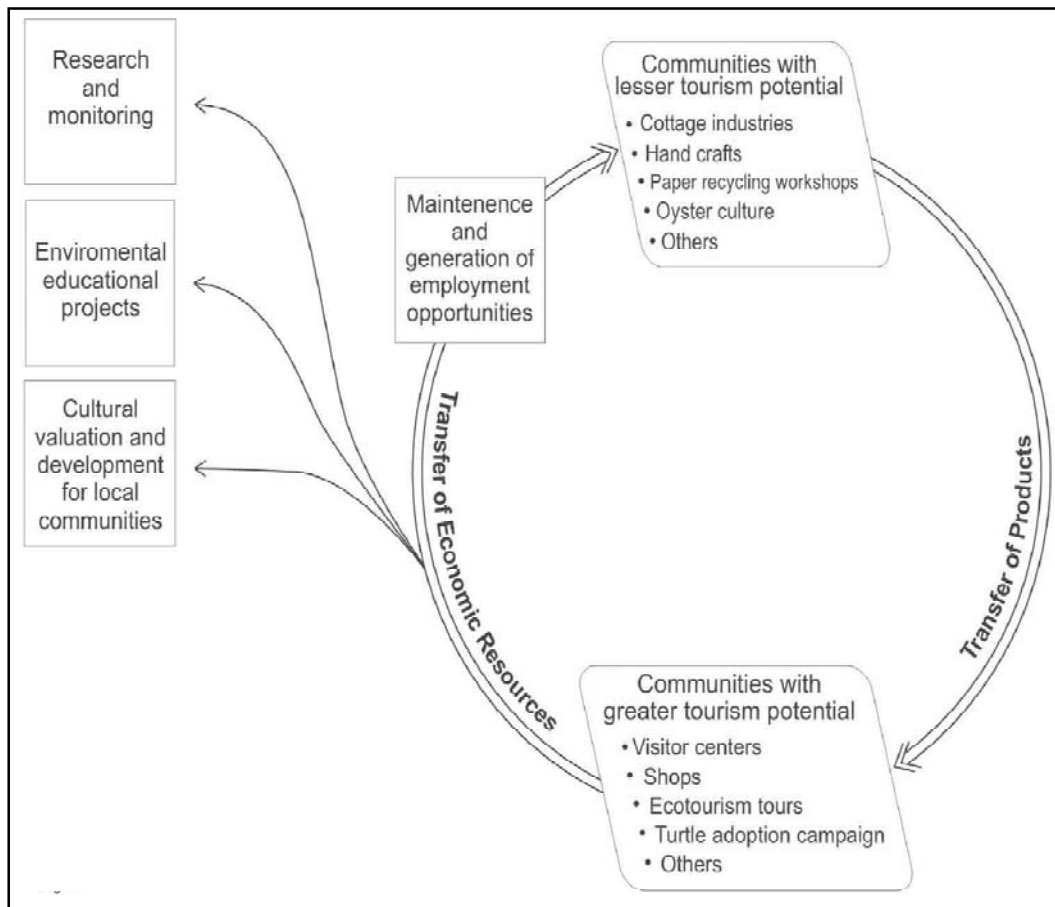


Figure 1.2: The Social Production Chain of TAMAR (Marcovaldi *et al.*, 2005)

The above figure shows the social production chain of TAMAR (Marcovaldi *et al.*, 2005). Among the main components are the self-sufficient initiatives, in which the stations with less potential for tourism produce items that are sold at the visitor stations, such as the Visitor Station of Praia do Forte. The sales of these products are used in, for example, in the maintenance and generation of income opportunities for the residents among the coastal communities where TAMAR works. In 2003, the net sales of these activities totaled \$1.5 million, which is about 50% of the annual budget of the Foundation. Of this income, \$620,000 (21% of the annual budget) was used to employ residents of these communities (TAMAR, 2004). Another important source of income

comes from the admission fees charged to some of the visitors to the Visitor Center. By ‘some of the visitors’ I mean that local residents do not pay to visit the centers located at their communities. The Visitor Center of Praia do Forte, which is the busiest of the visitor centers, generated in sales and admissions \$490,000 (about 17% of the annual budget of the Foundation) in 2003 alone (TAMAR, 2004). Income from the visitor centers (28% of the annual budget, or \$837,000, in 2003) are used to improve veterinary care, promote educational strategies, improve maintenance, and in sea turtle conservation activities throughout Brazil (Marcovaldi *et al.*, 2005). These conservation strategies have helped TAMAR protect nesting females and their nests in Brazil (Figure 1.3) (Projeto TAMAR, 2008).

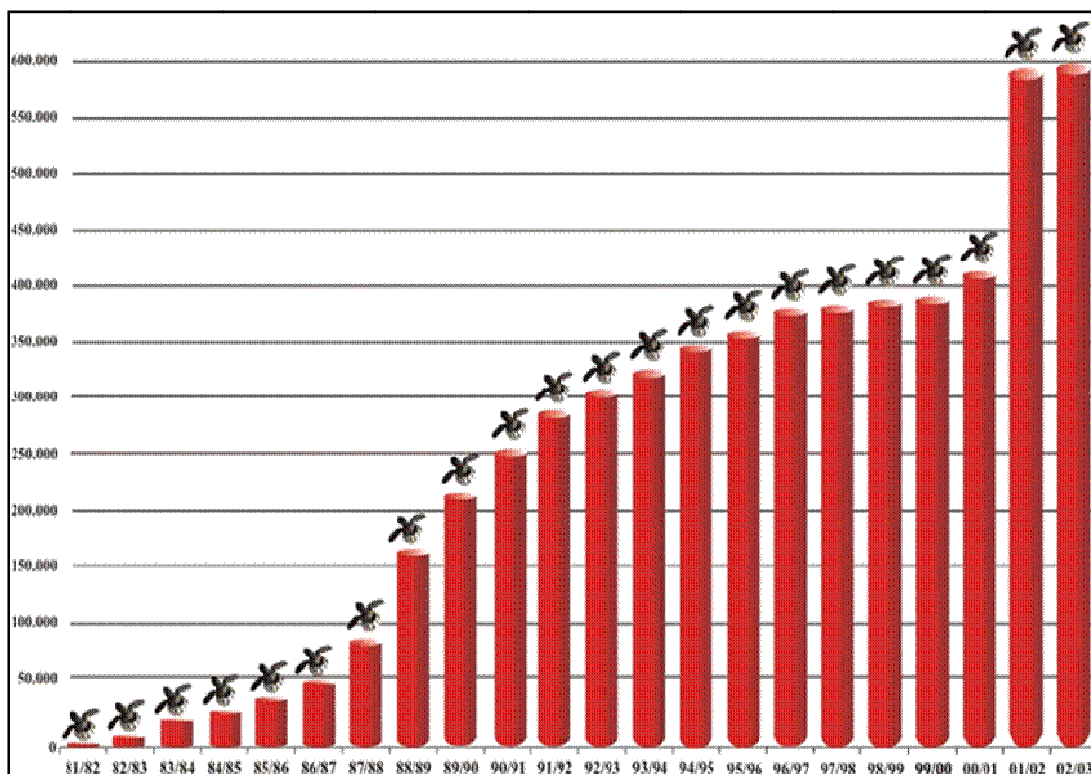


Figure 1.3: Number of sea turtle hatchlings released by TAMAR between 1982 and 2003 nationwide. Source: Projeto TAMAR, 2008.

The above figure shows the number of sea turtle hatchlings released by TAMAR since its creation in 1980 until the 2003 nesting season. These numbers are the combined sea turtle hatchlings released among all stations in Brazil. Between 1980 and 2008, TAMAR has been able to release more than nine million sea turtle hatchlings nationwide (Fauna Brasil, 2007). For some, this achievement makes TAMAR an example of effective sea turtle conservation (Mast, 1999; Spotila, 2004).

In Praia do Forte, TAMAR's conservation efforts are showing signs of sea turtle conservation success, such as an increase sea turtle nesting activities and a reduction in human predation on nesting females and nests (TAMAR, 2008) (Figure 1.4).

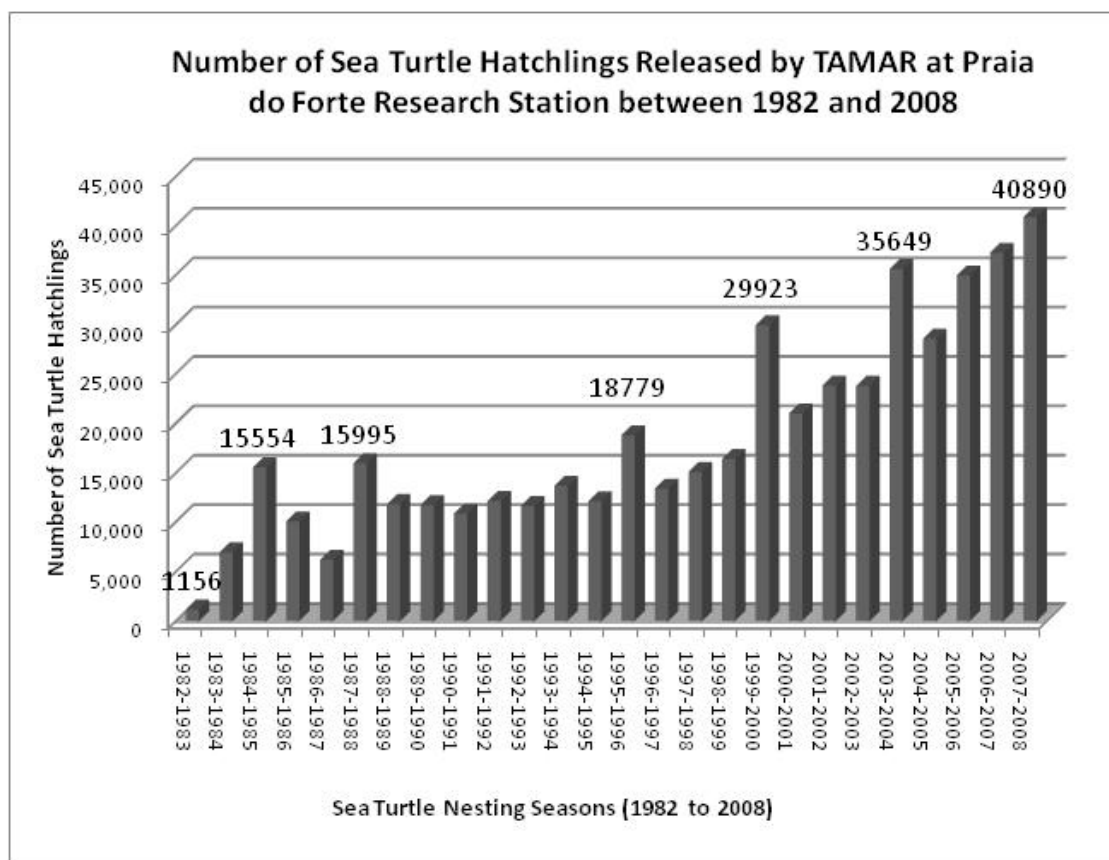


Figure 1.4: Number of sea turtle hatchlings released by TAMAR between 1982 and 2008 in Praia do Forte (TAMAR, 2008).

The above figure shows the number of sea turtle hatchlings released by TAMAR since TAMAR's arrival in Praia do Forte in 1982. The graph illustrates an overall increase in the number of sea turtle hatchlings released since 1982. Records also show that during the 1982-1983 nesting season, which was TAMAR's first sea turtle nesting season in Praia do Forte, 1,156 hatchlings were released. During the 2007-2008 nesting season, which so far is the season with the highest release numbers, 40,890 sea turtle hatchlings were released by TAMAR in Praia do Forte.

#### **1.10 The Research Station of TAMAR in Praia do Forte, Bahia**

Created in 1982, the Research Station of Praia do Forte hosts TAMAR's busiest and perhaps the most popular of TAMAR's visitor centers. The beaches of Praia do Forte are important sea turtle nesting sites. The 50 Kilometers of beaches have the highest density of loggerhead nesting activities in Brazil (Marcovaldi *et al.*, 2007). This means that more loggerhead sea turtles nest on the beaches of Praia do Forte than in any other location in Brazil.

In Praia do Forte TAMAR uses a combination of conservation approaches to protect sea turtles and their nests. These approaches include both paradigms of conservation: top-down and bottom-up. From the top-down approach to conservation, TAMAR enforces federal sea turtle protection laws that control use of sea turtles and their eggs. From the bottom-up approach to conservation, TAMAR uses economic incentives that are rooted in the development and promotion of sea turtle ecotourism. Though local fishermen share their traditional ecological knowledge with TAMAR and help the staff of TAMAR in different sea turtle conservation activities, the community does not participate in managing the conservation programs.

TAMAR also implements environmental education programs as conservation strategies to gain local support for sea turtle conservation and to enhance conservation awareness among residents and visitors. Environmental education is promoted at the Visitor Center and within the community. The following sections provide background

information on the three main conservation strategies used by TAMAR to protect sea turtles in Praia do Forte.

### **1.10.1 Enforcement of Sea Turtle Protection Laws**

In 1980, the Brazilian Institute of Forest Development (IBDF), later the Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA), created the TAMAR Project in an effort to control illegal harvesting of sea turtles and their eggs in Brazil. The IBAMA gives TAMAR the mandate to protect sea turtles in Brazil through sustainable development (Marcovaldi & Marcovaldi, 1999). Five species of sea turtles nest in Brazil: *Caretta caretta* (loggerhead), *Eretmochelys imbricate* (hawksbill), *Chelonia mydas* (green), *Lepidochelys olivacea* (Olive Ridley), and *Dermochelys coriacea* (leatherback) (Marcovaldi & Laurent, 1996). These species are threatened of extinction (IUCN, 2008). The loggerhead and green turtles are classified as endangered species while the hawksbill and leatherback sea turtles are classified as critically endangered species.

The implementation of sea turtle protection laws in Brazil occurred in 1967 and full protection by the federal government in 1986 (Marcovaldi & Marcovaldi, 1999). This mandate declares that sea turtle harvesting in Brazil is prohibited by federal law (Law of Environmental Crimes, no. 9605, of 12/02/98) and such activity is punishable by imprisonment of 6 to 12 months and payment of a fine (Projeto TAMAR, 2008). Under the ICMBio's legislation, TAMAR controls the areas of reproduction and feeding grounds of sea turtles through the enforcement of sea turtle protection laws (Projeto TAMAR, 2008).

In Praia do Forte, TAMAR has been enforcing sea turtle protection laws since its arrival in 1982 as a way to control local harvesting of sea turtles and eggs, and more recently, to control bycatch in fishing gear and impacts from coastal development. Although by the time TAMAR arrived in the village the federal government already developed sea turtle protection laws, TAMAR staff stated that it was only after TAMAR's arrival in the village that sea turtle protection laws were actually enforced.

In this study, I evaluate how enforcement of sea turtle protection laws in protecting sea turtles and their nests in Praia do Forte relates to local support for sea turtle conservation.

### **1.10.2 Provision of Employment Opportunities and Alternative Sources of Income**

TAMAR has been providing employment and alternative sources of income to local residents since 1982. Though employment was first limited to the fishermen, these opportunities soon diversified to both men and women in the village. Economic opportunities also increased over the years. This increase is a direct result of the expansion of the Research Station and the opening of the Visitor Center. In 2007, 110 people from Praia do Forte and adjacent communities worked for TAMAR in Praia do Forte. Employment positions at the Visitor Center and Research Station varied, ranging from caretakers at the Research Station to administrative.

In this study, I evaluate how employment and income opportunities provided by TAMAR are related to local support for sea turtle conservation.

### **1.10.3 Environmental Education**

In Praia do Forte TAMAR implements different forms of environmental education to enhance conservation awareness among community members and with the tourists. Within the community TAMAR visits local schools and presents videos and slides about sea turtle conservation and sea turtles, promotes hatchling release ceremonies, and sponsors communal festivals focused on the environmental conservation theme. At the Visitor Center, TAMAR uses different types of media, promotes environmental interpretation, and offers guided visits. Also at the Center, TAMAR displays local marine fauna, like the display of four species of the five species sea turtles found in Brazil. TAMAR considers environmental education one of the most important aspects of sea turtle conservation, especially within the coastal communities where TAMAR works (Marcovaldi & Marcovaldi, 1999).

The founders of TAMAR state that overarching goal of using environmental education is to enhance local awareness about the importance of maintaining a healthy marine ecosystem where sea turtles are also part of it (Marcovaldi & Marcovaldi, 1999). Over the years, TAMAR also included specific courses and additional activities that target the local youth and children of Praia do Forte and adjacent communities. One of the most popular environmental education programs promoted by TAMAR is the mini-ecotourism guide (mini-guide) program (Marcovaldi *et al.*, 2005). The mini-guide program started in 1995 and provides environmental education about basic aspects of sea turtle biology, marine conservation, and provides opportunities for these children to be engaged in tourism related activities, such as providing guided visits to tourists who visit the Visitor Center (Vieitas *et al.*, 1999).

TAMAR also uses environmental education as a sea turtle conservation tool to control sea turtle mortality in fishing gear by enhancing the understanding about the threats of certain fishing techniques on sea turtle survival, addressing local fishermen's economic needs from fishing, and by educating the fishermen to revive sea turtles caught in fishing gear (Marcovaldi *et al.*, 2007). Hall (2006) states that because fishermen are at 'The front line of the fisheries bycatch battle' (2006: 27) enhancing their awareness about sea turtle conservation and fishing techniques can be an effective tool to reduce sea turtle bycatch numbers.

In this study, I evaluate how environmental education relates to support for sea turtle conservation. The focus is to compare and contrast perceptions and knowledge about sea turtles and sea turtle conservation between residents who are in contact with this conservation approach with residents who are not. More specifically, I compare perceptions and knowledge about sea turtles and sea turtle conservation between TAMAR workers and non-TAMAR workers.

### **1.11 Traditional Ecological Knowledge and Sea Turtle Conservation in Praia do Forte**

Traditional ecological knowledge is defined as a ‘Cumulative body of knowledge, practice, and belief, evolving by adaptative processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment’ (Berkes, 1999: 8). Drew (2005) argues that traditional ecological knowledge is site specific and represents the information communities need for their cultural survival. The use of this knowledge for survival makes those who carry this knowledge ‘experts’ on those specific traits. Among the residents of Praia do Forte, the fishermen are the ‘experts’ when it comes to sea turtles and local marine resources. Therefore, learning about and sustaining this knowledge across generations is an asset for local sea turtle conservation efforts.

Berkes (2004) finds that though rural people throughout the world have relied upon the local resources for their livelihood for a longer period, long enough for this reliance to become traditional, some factors are causing the degradation and loss of these traditional systems. He argues that industrialization, technology change, urbanization, colonization, and stresses due to population pressure, loss of local control over the resources, and commercialization of subsistence resources have resulted in the degradation and the disappearance of traditional systems.

In Praia do Forte, sea turtle conservation and tourism development activities have become the main economies of the village, substituting the long-term practices of agriculture via a coconut plantation and fishing, which was used for subsistence and as part of the local economy. This shift of the local economy and land tenure system is likely to have influenced local access to resources, introduced different market economies, and caused changes in the local infrastructure. Therefore, it makes sense to ask whether and how local residents have maintained or lost their traditional ecological knowledge as a result of the changes. For the purpose of this study, I ask how TAMAR’s conservation strategies have influenced traditional ecological knowledge.



Though the loss of traditional ecological knowledge is a serious issue, Berkes (2004) argues that traditional knowledge can also be created, particularly in cases where traditional ecological knowledge is incorporated with scientific knowledge. He claims that although traditional ecological knowledge is a necessary condition for resources to be used in a sustainable manner, its presence is often not sufficient to achieve sustainability. He insists that while the community may be able to sustainably harvest local resources, the community may not be able to control others from using these resources the way they please. It is claimed that, in cases of common resources, local resource practices based on traditional ecological knowledge may not be the problem of resource degradation.

The problem, Berkes (2004) claims, is open access to resources. Thus, it is the open access system not communal ownership that causes the ‘tragedy of the commons’ (Hardin, 1968). One way to address the ‘tragedy’ is to enforce rules among all users and control access. Moreover, the incorporation of both scientific and traditional knowledge can lead to the development of more effective management practices and rules that are more applicable and site specific. This is why, claim King and Faasili (1999), that resource management programs that incorporate traditional ecological knowledge in the development of these management practices are more likely to achieve their management goals.

In Praia do Forte, sea turtle harvesting for meat and eggs was done on a constant basis to support livelihood needs. Harvesting increased during sea turtle nesting season and during shortages of fish, often during the winter season. Sea turtles, a common resource, were available to anyone. Though sea turtle protection laws were already in place, thus controlling use of sea turtles, these laws were enforced only when TAMAR arrived in the village in 1982. As such, enforcement controlled use, but it did not control access to sea turtles.

Berkes (2004) explains that a loss of local control over the resources causes loss and disappearance of traditional ecological knowledge. In Praia do Forte, as well as throughout Brazil, sea turtle harvesting is considered a federal crime. How has

enforcement of sea turtle protection laws influenced traditional ecological knowledge? In this study, I evaluate how enforcement of sea turtle protection laws relates and influences traditional ecological knowledge.

TAMAR also provides economic incentives, via employment and income, from sea turtle ecotourism, to gain local support for sea turtle conservation. Since 1982, the fishermen have been working at TAMAR in a variety of sea turtle conservation activities. Drew (2005) argues that the introduction of new markets is associated with the erosion of traditional ecological knowledge. Are economic benefits from TAMAR associated with the erosion or with the sustainability of traditional ecological knowledge?

As traditional ecological knowledge is an integral part of local culture and management practices specific to the area, the incorporation of traditional knowledge with scientific knowledge can generate new resource management regimes (Berkes, 2004). Because of this potential in improving resource management practices, Berkes and Folke (1998) ask how resource management may be improved by supplementing scientific data with traditional knowledge. In the case of Praia do Forte, does the incorporation of local fishermen in sea turtle conservation help traditional knowledge? In this study, I evaluate (1) how traditional ecological knowledge influences sea turtle conservation practices and (2) how employment at TAMAR influences the maintenance of traditional knowledge.

TAMAR also provides environmental education programs to the community with hopes to enhance understanding about sea turtles and sea turtle conservation. Since native families relied on traditional ecological knowledge, which included knowledge about sea turtles, to support their livelihood needs, what additions to their ecological knowledge did these programs provide to residents? Who were the 'teachers' and who were the 'students'? In this study, I (1) evaluate how environmental education influences traditional ecological knowledge and (2) how traditional knowledge influences environmental education. By learning the traditional ecological knowledge native residents of Praia do Forte have about sea turtles, I will be able to understand how the community interacted, and interacts, with sea turtles; learn how this knowledge passed,

and whether it still passes, from one generation to the next; and learn how this knowledge was shared across generations or not, and how the knowledge influences sea turtle conservation.

### **1.12 Objectives of the Research**

Research shows TAMAR's strategies are generating positive results for sea turtle conservation. Harvesting rates have declined dramatically over the years, with some sea turtle populations showing sights of recovery (Marcovaldi & Chaloupka, 2007; Marcovaldi *et al.*, 2003; Marcovaldi *et al.*, 2007; Santos *et al.*, 2000). My goal in this study is to evaluate how three conservation approaches implemented by TAMAR, which represent both top-down and bottom-up conservation paradigms, are related to local support for sea turtle conservation. The three sea turtle conservation strategies are: (1) employment opportunities and alternative sources of income from sea turtle ecotourism; (2) enforcement of federal sea turtle protection laws; and implementation of (3) environmental education programs via sea turtle ecotourism. Economic benefits, in the form of employment opportunities and alternative sources of income, represent the bottom-up approach to conservation. Enforcement of sea turtle protection laws represents the top-down approach to conservation. Promotion of environmental education is one of the conservation approaches under sea turtle ecotourism, also a bottom-up approach to conservation.

My objectives are to evaluate how each of these three conservation approaches influence local support for sea turtle conservation. In order to understand this process, I evaluate the impact each one of these three conservation approaches on three outcomes: (a) Local values and uses of sea turtles, (b) Traditional ecological knowledge; and (c) Perceptions of well-being.

### **1.13 Research Questions**

This study has three research questions:

- 1- How does the provision of employment and alternative sources of income influence local support for sea turtle protection?
- 2- How does the enforcement of federal sea turtle protection laws influence illegal harvesting of sea turtles and sea turtle eggs?
- 3- How does environmental education influence conservation awareness and knowledge about sea turtle conservation?

For the first question, I expected to find that development through sea turtle conservation would be important for building incentives for sea turtle conservation, but that such incentives may not be enough to protect the sea turtles. For the second question, I expected to find that non-fishermen are more likely to support the use of sea turtle protection laws to protect sea turtles than are fishermen. For the third question, I expected that TAMAR workers would be more likely to understand more about sea turtles and the conservation challenges than would non-TAMAR workers.

Through these analyses I will be able to understand the interdependency, or the absence of an interdependency, between enforcement of sea turtle protection laws, environmental education, and economic benefits with local support for sea turtle conservation.

### **1.14 Methods**

This study is divided into three phases. The phases took place at different times of year over a period of nine months in the field, between May 2006 and September 2008. I used snowball and purposive sampling techniques during the first two phases and convenience sampling on the third phase to gather data to answer my three research questions. First, how does the provision of employment and alternative sources of income influence local support for sea turtle protection? Second, how does the enforcement of federal sea turtle protection laws influence illegal harvesting of sea turtles and sea turtle

eggs? Third, how does environmental education influence conservation awareness and knowledge about sea turtle conservation?

#### **1.14.1 First Data Collection Phase**

In the first phase, May to September 2006, I collected preliminary data about changes in local values and uses of sea turtles and local resources, local demographics, and perceived impacts of TAMAR and tourism development among native and non-native residents; the staff from TAMAR; and other key informants in the field of natural resources management and conservation. This data generated the baseline information for the study. I learned about specific social groups within the community from the native families. These groups form the main stakeholders in this study (Table 1.1).

The definitions provided on Table 1.1 follow the standards the elders and native residents of Praia do Forte gave me during our conversations about the history of the community of Praia do Forte and the plantation, and by TAMAR. These definitions, in turn, are the definitions 'native' residents use to 'classify' who is who in the community. Some of these definitions are based on the information gathered during the exploratory phase from the interviews with native residents.

Also in this phase I collected archival data on existing demographics of the community and region from county, state, and national census reports (Bahiatursa, 2008; IBEGE, 2008; PMMSJ, 2004; SEIA, 2008). TAMAR's database provided the main source of information pertaining to local sea turtle nesting, hatchling, and conservation activities.

**Table 1.1: The stakeholders in Praia do Forte**

<b>Main Stakeholders in Praia do Forte</b>	
<b>Local Stakeholders</b>	<b>Characteristics</b>
Native Residents*	Residents who were born in Praia do Forte and residents who lived in the community during the plantation period.
Native Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period
Local Residents*	A newcomer could 'become', could be 'considered', or be 'called' a <i>local resident</i> if this person married or had a child with a native resident, or grew up in the village.
TAMAR*	The TAMAR Project itself, the entity.
TAMAR Staff ***	The research and administrative team of TAMAR.
TAMAR Workers***	The native and non-native adult residents who work at TAMAR.
The Founders of TAMAR**	Drs. Maria Ângela Marcovaldi and Guy Marcovaldi.
Fishermen*	The men in the village who fish/fished for a living or use/used fishing as one of the sources of income and/or food for their families. Unless noted, they are all native to Praia do Forte.
Fishing Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period
The Street Vendors**	Vendors who sell souvenir and gift items on the specified location within the village set by the local government.
The Outsiders*	People who are non-local and non-native. Often from Salvador or other states. Associated by the community as being wealthy people and often Caucasian. Includes seasonal residents, tourists, and some of the permanent residents. They are often the owners and managers working in the tourism industry. Perceived by the native and local residents as having political and economic influence within the community.
The Community of Praia do Forte**	The societal group formed by the people who live in Praia do Forte, both native and non-native residents.

Note: \* These definitions follow the standards the elders and native residents of Praia do Forte gave me during our conversations about the history of the community, the plantation, and TAMAR.

Note: \*\* These definitions are based on the information gathered during the exploratory phase.

Note: \*\*\* Although TAMAR staff work for TAMAR, as do TAMAR workers, they are distinctive because they form the research team of TAMAR. This team includes researchers and administrative personnel who work at the Research Station and Visitor Center. They are not native or local to Praia do Forte. Definitions provided by the community.

In order to gather this baseline information, my first approach upon arriving in Praia do Forte was to identify the leaders within the community. The staff of TAMAR explained that there are different social networks in the community and these networks influence the activities, in particular the cultural activities, which occur within the community. The groups that form these networks are the native families, the women from the Catholic Church, the fishermen of the Fishermen's Association, the fishermen from the 'Colônia de Pescadores', the street vendors, the school principals and teachers of the local elementary school and the local childcare center, and the elderly members of the community. Also, on the same week of my arrival, a series of workshops sponsored by the local government, TAMAR, the Humpback Whale Institute, and the Garcia D'Ávila Foundation were taking place. Among these events, which targeted both youth and adults, were workshops on health related problems, domestic violence, professional training opportunities, beach clean-up activities, and environmental education programs.

One of these workshops, in particular, gathered representatives of the main social networks mentioned by TAMAR and by representatives of the local government. These representatives gathered to discuss some of the problems the community faced at the time. Their goal was discuss ways to address these problems based on the available resources and time constraints. Most of these problems were the focus of the presented workshops, like domestic violence, limited education opportunities, and drug use. I attended this event to familiarize myself with issues occurring within the community and to learn about local perspectives and prospective on ways to address these issues. I also used this opportunity to introduce myself to the group, present my research, and ask permission to conduct my study in the community. All representatives expressed interest over my research goals and offered help in gathering information. By 'gathering information' they stated they would introduce me to other community members, provide me with information about the community and the history of the village, and assist with any needs I may had during the time I stayed in the village. This group formed the initial sample unit of my study. I met other residents, representatives of the local government,

and representatives of other non-governmental organizations based on the recommendations acquired from and indicated by the group.

I gathered data using a questionnaire formed by semi-structured in-depth interviews, with both open-ended and closed-ended questions. Through this process I was able to interview 25 native and 15 non-native residents. Throughout this study, I observed the interaction across intergenerational groups and among the interactions of TAMAR and residents. I wanted to learn whether the local fishermen interacted with fishermen from other communities, whether there were fishermen from different age groups fishing together, and whether different groups used similar fishing techniques. I also wanted to learn who were more likely to interact with TAMAR staff during patrol activities, communal events, and sea turtle conservation activities.

I also participated in fishing practices in order to understand traditional fishing practices and the use of local marine resources. Through these observations I was able to assess participation in fishing practices, sea turtle conservation activities at the Visitor Center and Research Station, and environmental education opportunities – both formal via engagement in programs and informal via conversations and routine work activities. And by doing so, I was able to understand who and what groups within the community are more likely to have direct contact with and be influenced by TAMAR's conservation strategies. By that I mean being more likely to be in contact with sea turtles, sea turtle nests, with the staff of TAMAR, with fishing practices, and with the tourists.

I also attended local community meetings and events, like gatherings at the Fishermen's Association and communal gatherings, organized by the local leaders, to address locally based issues, such as access to fishing grounds and land tenure legalities. These opportunities enhanced my understanding about local participation pertaining to local issues and activities, community participation in local affairs, local socioeconomic issues, historical and present resource access and use practices, and local social networks and power relations. I also observed the making of traditional dishes and learned about traditional ways locals harvested and prepared sea turtle meat and eggs to understand



local uses and values about sea turtles, gender roles, and community uses and dependency on local resources.

Overall, these activities, which continued throughout this study, provided me with the opportunity to learn about some of the issues taking place within the community regarding fishing, tourism, and sea turtle conservation. The interviews and participant observations established a firm qualitative foundation for the construction of a questionnaire used on the explanatory phase of this study in 2007 (Bernard, 2000; Schensul *et al.*, 1999).

#### **1.14.2 Second Data Collection Phase**

The focus of my second phase, which took place between September 2007 and January 2008, was to collect more explanatory data on the effects of TAMAR's conservation approaches. Based on preliminary data gathered in 2006, I had the following expectations. I expected to find that development through ecotourism would be important for building incentives for sea turtle conservation, but that such incentives may not be enough to protect the sea turtles. I also expected to find that non-fishermen are more likely to support the use of sea turtle protection laws to protect sea turtles than are fishermen. And lastly, I expected that TAMAR workers would be more likely to understand more about sea turtles and the conservation challenges than would non-TAMAR workers. These questions were formulated based on analysis of preliminary data collected in 2006 and evaluation of current literature on sea turtle conservation and on top-down and bottom-up approaches to conservation. The unit of analysis of this phase is the household. I define a household as a physical residence where one or more people live. The survey instrument was administered through a face-to-face semi-structured interview format among residents, which included native and non-native residents of Praia do Forte. I conducted all interviews in Portuguese.

I conducted 77 interviews in this phase. I did not interview the children of the mini-guide program. I only interviewed residents who were 18 years of age and older. Some of these adult residents were, nonetheless, former students of the mini-guide

program. In the questionnaire, I asked open-ended and closed-ended questions. These questions addressed household demographics; perceptions about tourism, conservation, and urban development benefits and impacts on the household and community; family economic conditions; future expectations about the community, tourism, conservation, and household well-being; attitudes about sea turtles; community values and uses of sea turtles, sea turtle conservation, and threats to sea turtles; and history of employment at TAMAR and at the local tourism industry, when applicable. These variables helped explain how economic benefits, environmental education, and enforcement of sea turtle protection laws influence the economic well-being of the household, on traditional ecological knowledge, and in local values and uses of sea turtles.

The interviews with native and non-native residents aimed at gaining understanding of the values, uses, and perceptions about sea turtle protection from the perspective of different groups - fishermen, TAMAR workers, and residents who work at the tourism industry - that form the community. The use of different groups allowed me to compare how, if at all, TAMAR's conservation strategies influence support for sea turtle conservation between groups. I strategically divided the community into three main groups based on data from the 2006 exploratory phase. The main social groups in Praia do Forte as pertain to this study are: fishermen/non-fishermen, TAMAR workers/non-TAMAR workers, and native/non-native residents.

Among the fishermen, when appropriate, I approached the fishermen who were at the local Fisherman's Association and at the fishermen at the 'Colônia de Pescadores'. I approached the fisherman who was closest to me when I arrived at these locations. I asked if he wanted to participate in this study. If declined, I approached another fisherman.

In order to gather data from TAMAR workers, I interviewed workers from TAMAR's three main employment departments: maintenance and marine wildlife caretakers, retail store at the Visitor Center, and different positions within the Visitor Center, such as administration. I went to the Research Station and Visitor Center on a daily basis during two main daily schedules: early morning and mid-afternoon. These two

timeframes represent the work schedule most workers are not on their lunch breaks. Early in the morning is also the period when visitation numbers were often at the lowest. I conducted the interviews at the location and time the person interviewed felt it was the most comfortable and appropriate time for him/her to give the interview. Often, the chosen location was at the person's home or at a location that was not visually noticeable to others. Although many of the approached residents agreed to be interviewed, many did not feel comfortable in participate in this study because they did not want others to know they participated in the study. They said they feared that TAMAR or someone 'important' in the local community would know if they had said something negative about what was happening in the community. This perception posed a challenge in gathering the desired to total desired number of interviews for this phase, which were 80 interviews.

I also approached the other participants in this study, such as street vendors and sales representatives at retail stores, during the same timeframe because this timeframe also represents local working hours. I interviewed the security guards who worked at some of the subdivisions during the day and night because they worked on three working shifts.

On average, each interview lasted about 90 minutes. I conducted many interviews over a course of days since many respondents did not have the time to give me the interview all at once. I did not approach all fishermen, vendors, and residents using the random system because of time restrains and responsiveness of residents in accepting the invitation of being part of this study. Because of these constrains, each person approached in this study was a person who I felt most comfortable to talk to, who showed interest in talking with me, and who showed interest in participating in this study.

The use of different groups allowed me to compare how, if at all, TAMAR's conservation strategies influence support for sea turtle conservation between groups. The gathering of information from different groups allows for an analysis of the political dimensions of people - environmental interactions (Campbell, 2007; Painter & Durham, 1995). These dimensions include cultural evaluation of resources, internal social structure

of residents, and possible associations of these factors to external factors, such as region-wide coastal tourism development. I measured support over sea turtle conservation using open-ended questions. Examples of indicators used to measure support were current and traditional uses and values of sea turtles, perceptions and values of sea turtle protection, and employment history with TAMAR and fishing. I asked how family members from each of the households became - if at all - involved with TAMAR and tourism, about the family former and current experiences with sea turtles, and the role local natural resources and sea turtles have and had in their livelihoods. These variables addressed one of my objectives, which is to understand local values and uses of sea turtles. I asked retired and active fishermen questions about local fishing culture and traditional fishing activities. I asked their perceptions about the impacts of environmental laws on their access to and use of local resources, household income, maintaining fishing culture, and fish harvest intake.

I also assisted TAMAR staff with data collection during the sea turtle nesting season and accompanied TAMAR staff during interpretative talks, guided tours, and communal events to better understand local sea turtle conservation efforts and interactions between TAMAR with the community and visitors. Having the assistance of the fishermen and native residents, I observed fishing activities which improved my understanding of contemporary fishing practices and led me to more easily compare them with historical fishing practices. I also observed the interactions between TAMAR staff and the community during communal events, at the Visitor Center, and Research Station to assess levels of bonding as stated by residents during the interviews.

### **1.14.3 Third Data Collection Phase**

On the third phase, May to September 2008, I returned to most of the families who I interviewed in 2006, and to some of those interviewed in 2007, to assess their perceptions about the changes that occurred in the village, and within their households, since the beginning of this study in May 2006. I wanted to evaluate the potential influence these strategies have on local support for sea turtle across time. Specific topics

covered pertained to their knowledge regarding current sea turtle conservation issues, such as the ongoing harvesting of sea turtles, lobster fishing, and coastal development activities in and adjacent to Praia do Forte. Though May 2006 to September 2008 seems to be a short period of time in comparison to the overall time TAMAR has been operating in Praia do Forte, many socioeconomic changes that occurred in the village may have influenced local quality of life, sea turtle conservation, and overall perceptions about the conservation strategies implemented by TAMAR.

### **1.15 Data Analysis**

When allowed, all interviews were tape recorded. In situations where recording was not allowed I took detailed notes during the interviews. I transcribed the open-ended questions and later coded the answers manually. For coding, I selected themes relevant to each question. These themes were coded in the form of nominal variables. These variables represented some main categories of the study. I created a database based on the coded data and on the data from the closed-ended questions from the questionnaire. The database was entered and statistical tests were run using SPSS 15.0 version.

I compared the distribution and linkages of these categories with economic benefits, enforcement, and environmental education, which are the main independent variables in this study. These values were statistically tested for associations between each one of these conservation strategies and local support for sea turtle conservation across generations and within groups. Significance was determined using Chi-square tests at 95% confidence levels, where the frequency distributions of respondents met the criteria for the test to be valid.

I also generated descriptive statistics on key variables associated with conservation, values, perceptions, economic benefits, livelihoods, and education. This procedure was conducted for the data gathered during the first two data collection phases. In each of these phases a different questionnaire and database were created. Unless noted, all the statistical information provided in this study is based on the information gathered

from the second data collection phase, which took place between August and December 2007.

### **1.16 The Control Community: The Fishing Village of Imbassaí**

I also interviewed 15 households at the coastal community of Imbassaí. Imbassaí is located 11 Km north of Praia do Forte and it is the control community of this study. I selected this community as the control community because of (1) its proximity to Praia do Forte, (2) the opportunity of having residents of Praia do Forte helping me as gatekeepers for this community, (3) TAMAR does not have a visitor center or a research station in the village, and (4) the main economy is also tourism, but the main tourism attraction is the local river and not sea turtles; thus a different economic focal point.

Residents from Imbassaí responded the same questionnaire used among the residents of Praia do Forte. I followed the same approach to gather, analyze, and interpret the data I used with the data collected in Praia do Forte. The presence of a control community allowed for a comparative analysis of how the three conservation strategies influence local support for sea turtle conservation across communities.

The main research questions were: Do values and uses about sea turtles differ between communities? Why, and what, do these findings mean for sea turtle conservation efforts now and in the longer term? The presence of a control community also increases the validity of this study because it enhanced the understanding about the influence different conservation strategies have on local support for sea turtle protection.

### **1.17 The Fishing Village of Praia do Forte**

The fishing village of Praia do Forte is located on the northeastern coast of Brazil, about 80 Km north of Salvador, in the state of Bahia (Bahiatursa, 2008). The region where Praia do Forte and Imbassaí are located is called the Coconut Coast ('Costa do Coqueiros') (Figure 1.5).

Settlement of Praia do Forte goes back to 1551 during Portuguese settlement in the region (FGD, 2006). The area where Praia do Forte is now located was once within a

coconut plantation. The village was formed when families, including the first fishermen, moved to the area to work at the coconut plantation (POdePF, 2008) in the end of the 19<sup>th</sup> century (Bahiatursa, 2008). These residents form the native residents of Praia do Forte. They, in addition to other social groups in the community, form the main stakeholders in sea turtle conservation in Praia do Forte (See Table 1.1 on page 38). These social groups were defined during the first phase of this study. These are definitions provided by the native residents when asked about the community and the people who form the community.

The coconut plantation was sold in mid 1970s. The new owner ceased the plantation operation and developed the first 'pousada' (a Bed & Breakfast like type of establishment) in the village. This shift in land ownership and economy led to socioeconomic changes, such as the outmigration of many native families, the prohibition of some of the traditional practices (e.g. raise livestock), and the introduction of tourism as the main economy.



Figure 1.5: Map of the Coconut Coast and the community of Praia do Forte and the community of Imbassaí. Source: [http://www.setur.ba.gov.br/opinv\\_zona\\_coqueiros.asp](http://www.setur.ba.gov.br/opinv_zona_coqueiros.asp).



In 1982, when TAMAR opened the Research Station of Praia do Forte, the village was still a small fishing village without electricity and it was home to approximately 600 residents (Marcovaldi & Laurent, 1996) (Figure 1.6). At that time, tourism development was still at its infancy. In 2006, the year I conducted the first phase of this study, the village was no longer a small fishing community with just a few resources.

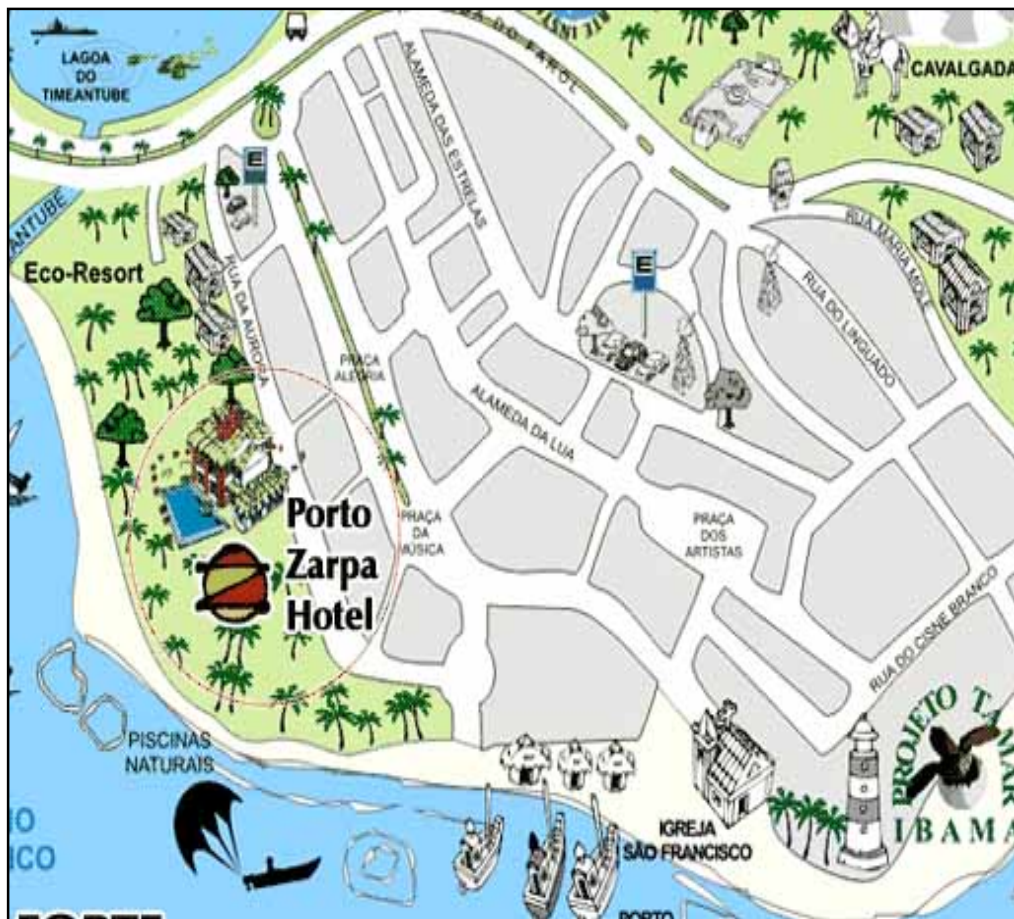


Figure 1.6: Street layout of Praia do Forte and the location of the TAMAR Project.  
Source: <http://www.tatuapara.com.br/Portugues/como-chegar.aspx>

The Coconut Coast has become a fast growing tourism destination in Bahia and it concentrates the highest volume of tourism investments in the country (Jornal Correio da Bahia, 2007). The hotel industry in Praia do Forte has the second largest number of hotel rooms in the state (PMMSJ, 2004). In 2007, the year of the second research phase, Praia do Forte was voted one of the top ten best beach destinations in Brazil (Veja, 2007), offering about 2,200 hotel rooms among the many 'pousadas' hotels, and one five-star resort, the Praia do Forte EcoResort. It is estimated that the permanent population of Praia do Forte is now about 2,000 and the seasonal population - residents who live in the village during the peak tourism seasons - is of about 4,700 (PMMSJ, 2004). Based on these numbers, the overall number of people in the village during the peak tourism season, December to March, jumps from about 2,000 to approximately 10,000 people.

### **1.18 Site Selection**

Praia do Forte is an appropriate site to test theory concerning the effectiveness of top-down and bottom-up conservation paradigms for several reasons.

First, Praia do Forte is located within the Area of Environmental Protection (APA) of the Northern Coast. The government of Bahia created 28 APAs (SEIA, 2008). The objective of the APAs is to protect biodiversity, manage land development and assure the sustainable use of natural resources (SNUC - Lei 9.985/2000). The APA of the Northern Coast, created in 1992 (Decreto Estadual nº 1.046/17.03.1992) is divided into different conservation zones that control for and minimize impacts of local tourism and urban development activities within its 142,000 hectares (SEMA, 2009). Management of the APA takes into consideration feedback from local communities and interested groups provided through public meetings and workshops (SEIA, 2007). The creation of the APA provides legislature power that supports local sea turtle protection strategies in the region (GERCO, 2006; SEIA, 2007).

Second, Bahia has the largest number of nesting activities of hawksbill sea turtles, one of the most threatened sea turtle species with extinction all over the world (Spotila, 2004). The beaches of Praia do Forte also host the largest concentration of loggerhead sea

turtles in Brazil (Marcovaldi & Laurent, 1996). These two components make the beaches of Praia do Forte important locations for the analysis of the effectiveness of sea turtle conservation strategies.

Third, the presence of the headquarters of both TAMAR and of the Foundation Pró-TAMAR gives me access to some archival data, personnel, and resources unavailable in other stations.

Fourth, the research station of Praia do Forte is one of the first research stations of TAMAR and it has been in operation in the village since 1982. This long-term relationship between conservation program and community allows me to examine support for sea turtle protection for a period that extends for more than 25 years.

Fifth, scholarly research (Couto, 2003; Limonad, 2007) and government reports (Bahiatursa, 2008; PMMSJ, 2004) show that the village is going through socioeconomic, environmental and cultural changes because of coastal tourism and urban development. An example is the construction of the IberoStar Resort, which is located a few kilometers north of Praia do Forte. The Resort, which will offer 4,600 rooms upon completion (PMMSJ, 2004), is built adjacent to one of the highest sea turtle nesting densities in Brazil. To complete construction, it is estimated that more than 500 construction workers work at IberoStar's construction site (Bahiatursa, 2008). These numbers - tourists, residents, and construction workers - are expected to rise since local and regional tourism development is unlikely to slow down in the near future (PMMSJ, 2004). This flux of seasonal residents and tourists use the same resources as do sea turtles. This 'collision' for the same coastal resource is one of the impacts TAMAR tries to mitigate via environmental education and enforcement of sea turtle protection laws. This setting provides a good opportunity to analyze impacts and benefits of tourism on the community and on sea turtle conservation.

### **1.19 Limitations of the Study**

This study has three main limitations. First, due to the time available I was unable to interview a greater number of households from both communities. Therefore, data

provided from the second data collection phase is not of a census of the communities, but from a sample size of 77 households from Praia do Forte and a sample size of 15 households from Imbassaí. Second, data was gathered during nine months of fieldwork, starting in May 2006 and ending in August 2008. The data collection period does not provide a comparison between pre- and post-TAMAR, pre- and post-plantation, or pre- and post-tourism. Despite this limitation, this is the first study conducted in Praia do Forte that analyzes and collects empirical data on how economic incentives, enforcement of sea turtle protection laws, and environmental education influence local support for sea turtle conservation at the local scale, in such detail, and from the resident's perspective. The third limitation is regarding sampling delimitations. Because of the logistics involved in data collection the chosen data sample techniques did not include random sampling. Therefore, the respondents involved in the study include a disproportionate number of individuals from two particular groups, which in this case are construction workers and lobster fishermen.

### **1.20 Significance of the Study**

Just as there have been very few systematic comparisons of similar conservation programs across sites (Agrawal & Redford, 2006), there have been few comparisons of different conservation strategies in one site. Hence, the fishing village of Praia do Forte represents an ideal setting for examining one program in one village on how different conservation strategies that represent two conservation paradigms have played out for the past 25 years. Dr. Maria Ângela Marcovaldi (the President of the Foundation Pró-TAMAR) and colleagues (2005) said, 'One of the greatest and most complex challenges to long-term conservation of sea turtles in Brazil, and elsewhere, is changing the habits of coastal communities in which intensive rates of natural resource use is a vital source of subsistence and income, essential for survival' (2005: 39). To modify human behavior that threaten sea turtles, as well as change the social norms that underline these behaviors, are difficult tasks (Delgado & Nichols, 2005).

This study is significant because it will provide a comparison across three conservation approaches to biodiversity conservation in one community and across generations. These approaches are good representatives of different conservation paradigms. This comparison will shed light on the current debate about whether economic benefits without community participation in decision-making can support biodiversity protection. For TAMAR, understanding how economic benefits, enforcement of sea turtle laws, and environmental education influence the support for sea turtle protection among residents is vital if TAMAR is to continue protecting sea turtles on the longer term. Better understanding also means identifying the strengths and limitations of these approaches in promoting support for sea turtle protection among residents and across generations. Addressing the strengths and limitations will help TAMAR become more effective at protecting sea turtles in Praia do Forte and in other communities where TAMAR works. On a final note, although locally focused, results from this study can assist other conservation projects that focus on the conservation of biodiversity.

### **1.21 Organization of the Dissertation**

Section 1 is the Introduction. This section provides the problem under investigation. Its purpose is to understand why sea turtle populations are recovering in some locations but not in others. This section starts with background information on two main conservation paradigms and introduces the sea turtle conservation program – the TAMAR Project. The literature review then elaborates on three sea turtle conservation approaches used by TAMAR to protect sea turtles in Praia do Forte: employment and income, enforcement of sea turtle protection laws, and environmental education. This section also provides the objectives of the study, the methods used to collect and analyze the data for this study, the description of the study area, the significance of the study, limitations of the study, and the organization of the dissertation.

Section 2 analyzes how enforcement of sea turtle protection laws relates to local support for sea turtle conservation.

Section 3 analyses how employment opportunities and alternative sources of income influence support for sea turtle conservation.

Section 4 analyzes how environmental education influences local support for sea turtle conservation.

Section 5 provides a conclusion and recommendations.

## 2. SEA TURTLE PROTECTION LAWS AND LOCAL SUPPORT FOR SEA TURTLE CONSERVATION IN PRAIA DO FORTE, BRAZIL

### 2.1 Introduction

In his 1968 seminal work 'The Tragedy of the Commons,' Hardin argued that common ownership of resources cannot succeed because humans use them to best fit their individual needs rather than what best fits the group. Based upon Hardin's assumptions, the actions of individuals lead to the long-term degradation of common resources (De Young & Kaplan, 1988). Many conservationists have sought to prevent this 'tragedy' by restraining access to resources and employing top-down -- externally defined and enforced -- regulations (De Young, 1999). In this model, local communities are subject to changes in their use of and access to resources and are not involved in resource management or decision-making processes (Campbell, 2002; Putra & Bailey, 2007).

The premise of this model is that the enforcement of restrictive legislation, enforced by the state (Campbell, 2002), and the establishment of fines are necessary to manage and protect natural resources (Brandon *et al.*, 1998; De Young, 1999; Terborgh, 1999; Troëng & Drews, 2004). Supporters of this approach claim that conservation programs that include communities in management have lost their focus on biodiversity conservation (Kramer *et al.*, 1997; Terborgh, 1999), in part because they are trying to be all things to all people (Brandon *et al.*, 1998). This approach assumes that better and more enforcement enhances the likelihood of effectively protecting the resources from human pressure (Campbell, 1998).

The use of strict enforcement of sea turtle protection laws is one of the alternatives used by conservation groups and government agencies to control threats to sea turtle survival. Legal harvest of sea turtles in the Western Hemisphere is allowed only in Cuba, Costa Rica (e.g. egg harvesting in the community of Ostional [Campbell, 1998]), and in the British Caribbean Island states (Nichols & Palmer, 2006). Sea turtle

harvesting is illegal in all countries along the Pacific coast of the Americas (Nichols & Palmer, 2006). The main contemporary threats to sea turtles are illegal harvesting of adult sea turtles (SWOT, 2008); accidental death - bycatch - in fishing gear (Marcovaldi *et al.*, 2002); coastal development (Eckert, 2007a); ocean pollution (Cohen, 2008); and commercial exploitation of sea turtle eggs (Caribbean Conservation Corporation, 2008; Sea Turtle Restoration Project, 2009).

Studies of sea turtle conservation show that top-down enforcement has had mixed results. In some locations, enforcement of sea turtle protection laws helped with the recovery of sea turtle populations (Broderick *et al.*, 2006; Chaloupka *et al.*, 2008; Marcovaldi *et al.*, 2007; Troëng & Rankin, 2005). In a 30-year study on Hawaiian green turtles, Balazs and Chaloupka (2004) observed a long-term increase in the abundance of green turtle nesting activities. The authors credit the full protection of the species since 1978 under the U.S. Endangered Species Act (Witzell, 1994) as one of the reasons the population recovery of green turtles in the Hawaiian Archipelago occurred. Balazs and Chaloupka (2004) stressed that the recovery of depleted sea turtle populations, such as the green turtle population in the Hawaiian Archipelago, has been possible through implementation of policy interventions.

In an analysis of the effectiveness of turtle excluder devices (TEDs) in trawl nets in U.S. waters, Crowder *et al.* (1995) observed that the enforcement of TEDs devices since the late 1980s by the state and federal governments helped reduce sea turtle mortality in fishing gear. In Brazil, findings from a long-term analysis of loggerhead nesting activities illustrate an increase in nesting numbers (Marcovaldi & Chaloupka, 2007). The study associated the increase in nesting activities of loggerhead with the enforcement of sea turtle protection laws that control the harvesting of sea turtles and their eggs in Brazil. Despite such conservation efforts and achievements, the authors advise that future conservation achievements will depend on the ability to address incidental capture of sea turtle in coastal and pelagic fisheries.

In spite of the sea turtle conservation successes cited above, in other locations, the enforcement of laws to protect sea turtles has not been effective. In these areas, sea turtles



are still illegally harvested (SWOT, 2008), there are eggs commercially exploited (Caribbean Conservation Corporation, 2008; Sea Turtle Restoration Project, 2009), they are still dying in fishing gear (Marcovaldi *et al.*, 2005), and many nesting sites continue to be impacted by unregulated coastal development (Gray, 1997). In Southeast Asia, illegal sea turtle harvesting increased over the past couple of years despite enforcement of sea turtle harvesting laws (SWOT, 2008). In some locations in Northwest Mexico, despite the implementation of a national ban on sea turtle harvesting in 1990, the enforcement of sea turtle protection laws has yet to curb extensive sea turtle harvest activities (Koch *et al.*, 2006). Under this federal banning, penalties include prison time for as long as 12 years (Koch *et al.*, 2006). Also in Northwest Mexico, Nichols and Palmer (2006) estimate that approximately 15,600 to 31,200 sea turtles are consumed yearly, with peak consumption during Easter and Christmas holidays that, alone, increase the black market demand for sea turtles by about 10,000 animals. The authors insist that more effective enforcement, combined with the collaboration of local people, are essential to control the local sea turtle black market (Nichols & Palmer, 2006).

In other locations, results show that enforcement was effective only when incorporated with other conservation strategies. In Bali, Indonesia, sea turtle protection laws created to control illegal sea turtle trade generated conflict among conservationists, sea turtle hunters, and vendors of sea turtle products (Putra & Bailey, 2007). The authors relate the promotion of a dialogue between interested groups with the decrease in sea turtle harvesting activities from more than 30,000 green sea turtles in 2001 to fewer than 500 green sea turtles in 2007 (Putra & Bailey, 2007). In Costa Rica, in an attempt to decrease bycatch in fishing gear, the Grupo Tortuguero implemented a program to engage local fishermen in understanding, assessing, and reducing sea turtle bycatch activities and in assisting scientists with inputs of their traditional ecological knowledge (Peckham *et al.*, 2007a). Peckham *et al.* (2007a) argue that a combination of science, policy and enforcement are needed to control bycatch over the longer term, and ‘Ultimately success derives from fishers’ direct interest and participation’ (2007a: 17).

## 2.2 Traditional Ecological Knowledge and Sea Turtle Conservation

Traditional ecological knowledge is defined as a ‘Cumulative body of knowledge, practice, and belief, evolving by adaptative processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment’ (Berkes, 1999: 8). Drew (2005) argues that traditional ecological knowledge is site specific and represents the information communities need for their cultural survival. The use of this knowledge for survival makes those who carry this knowledge ‘experts’ on those specific traits. Among the residents of Praia do Forte, the fishermen are the ‘experts’ when it comes to sea turtles and local marine resources. Therefore, learning about and sustaining this knowledge across generations may be an asset for local sea turtle conservation efforts.

Berkes (2004) finds that though rural people throughout the world have relied upon the local resources for their livelihood for a longer period, long enough for this reliance to become traditional, some factors are causing the degradation and loss of these traditional systems. He argues that industrialization, technology change, urbanization, colonization, and stresses due to population pressure, loss of local control over the resources, and commercialization of subsistence resources have resulted in the degradation and the disappearance of traditional systems.

In Praia do Forte, sea turtle conservation and tourism development activities have become the main economies of the village, substituting the long-term practices of agriculture via a coconut plantation and fishing, which was used for subsistence and as part of the local economy. This shift of the local economy and land tenure system is likely to have influenced local access to resources, introduced different market economies, and caused changes in the local infrastructure. Therefore, it makes sense to ask whether and how local residents have maintained or lost their traditional ecological knowledge as a result of the changes. For the purpose of this study, I ask how TAMAR’s conservation strategies have influenced traditional ecological knowledge.

Though the loss of traditional ecological knowledge is a serious issue, Berkes (2004) argues that traditional knowledge can also be created, particularly in cases where

traditional ecological knowledge is incorporated with scientific knowledge. He claims that although traditional ecological knowledge is a necessary condition for resources to be used in a sustainable manner, its presence is often not sufficient to achieve sustainability. He insists that while the community may be able to sustainably harvest local resources, the community may not be able to control others from using these resources the way they please. It is claimed that, in cases of common resources, local resource practices based on traditional ecological knowledge may not be the problem of resource degradation. The problem, Berkes (2004) claims, is open access to resources. Thus, it is the open access system, not communal ownership, that causes the 'Tragedy of the commons' (Hardin, 1968). One way to address the 'tragedy' is to enforce rules among all users and control access. Moreover, the incorporation of both scientific and traditional knowledge can lead to the development of more effective management practices and rules that are more applicable and site specific. This is why, claim King and Faasili (1999), that resource management programs that incorporate traditional ecological knowledge in the development of these management practices are more likely to achieve their management goals.

In Praia do Forte, sea turtle harvesting for meat and eggs was done on a constant basis to support livelihood needs. Harvesting increased during sea turtle nesting season and during shortages of fish, often during the winter season. Sea turtles, a common resource, were available to anyone. Though sea turtle protection laws were already in place, thus controlling use of sea turtles, these laws were enforced only when TAMAR arrived in the village in 1982. As such, enforcement controlled use, but it did not control access to sea turtles. Would these laws be different with the input of traditional ecological knowledge?

Berkes (2004) explains that a loss of local control over the resources causes loss and disappearance of traditional ecological knowledge. In Praia do Forte, as well as throughout Brazil, sea turtle harvesting is considered a federal crime. How has enforcement of sea turtle protection laws influenced traditional ecological knowledge? In

this study, I evaluate how enforcement of sea turtle protection laws relates and influences traditional ecological knowledge.

### **2.3 Enforcement of Sea Turtle Protection Laws in Praia do Forte**

In Brazil, sea turtles are protected by federal law (Law of Environmental Crimes, no. 9605, of 12/02/98). The Brazilian Sea Turtle Conservation Program TAMAR (TAMAR) has the federal mandate to enforce sea turtle protection laws. In the fishing village of Praia do Forte, local residents harvested sea turtles for their meat and eggs on a constant basis to support their livelihood needs. Since its arrival in the village in 1982, TAMAR enforces sea turtle protection laws as one of the conservation strategies to control sea turtle harvesting. Studies of sea turtle nesting activities in the village and adjacent nesting sites show an increase in nesting numbers since the early 1980s (Marcovaldi *et al.*, 2007; Santos *et al.*, 2000). Is the increase in sea turtle nesting activities in Praia do Forte associated with the enforcement of sea turtle protection laws by TAMAR? If so, what factor, or combination of factors, influenced this outcome? In this chapter, I analyzed the influence of sea turtle protection laws on local support for sea turtle conservation. I measured influence of enforcement in controlling the consumption of sea turtles and in changing local values ascribed to sea turtles; on traditional ecological knowledge; and on local perceptions of well-being.

### **2.4 The TAMAR Project: In Brazil and in Praia do Forte**

Created in 1980, the Brazilian Sea Turtle Conservation Program - TAMAR - ICMBio Program is a collaborative effort between the Brazilian government's Institute of Renewable Resources (IBAMA- ICMBio) and a non-profit organization, 'Fundação Pró-TAMAR' (Foundation Pró-TAMAR). Under the mandate of the federal government (IBAMA), TAMAR enforces sea turtle protection laws at the national scale. These laws prohibit the harvest of sea turtles in Brazil. The Foundation, created in 1988, is a specialized and non-governmental organization that supports and co-manages TAMAR. TAMAR now monitors 1,100 kilometers of beaches and employs approximately 1,300

people (SWOT, 2007). Of these 1,300, which include approximately 400 fishermen, about 85% are residents from the coastal communities where it works (Marcovaldi *et al.*, 2005). The national headquarters of TAMAR and the 'Fundação Pró-TAMAR' are located in Praia do Forte.

The beaches of Praia do Forte host the largest concentration of loggerhead turtles in Brazil (Marcovaldi & Laurent, 1996), while the beaches of Bahia host the largest number of nesting activities of hawksbill turtles, one of the most threatened sea turtle species with extinction all over the world (Spotila, 2004). Along the beaches of Praia do Forte a research team patrols the area, by motorized vehicle, each night and day during the sea turtle nesting season. TAMAR implements a mixed approach to sea turtle conservation in Praia do Forte. TAMAR enforces sea turtle protection laws that ban sea turtle harvesting in Brazil, promotes environmental education in hopes to enhance understanding about sea turtles and sea turtle conservation, and provides employment and alternative sources of income for locals and for residents from the adjacent communities. TAMAR does not include the local community in sea turtle management and decision-making. Empirical studies show that conservation strategies implemented by TAMAR are achieving positive outcomes for conservation, such as the increase in sea turtle hatchlings released and a reduction in human predation on nesting females and nests (Marcovaldi *et al.*, 2007; Santos *et al.*, 2000).

## **2.5 Study Area: The Fishing Village of Praia do Forte**

The fishing village of Praia do Forte is located on the northeastern coast of Brazil, about 80 Km north of Salvador, in the state of Bahia (Bahiatursa, 2008). The region where Praia do Forte and Imbassaí are located is called the Coconut Coast (Figure 2.1). Settlement of Praia do Forte goes back to 1551 during Portuguese settlement in the region (FGD, 2005). The area where Praia do Forte is now located was once within a coconut plantation. The village was formed when families, including the first fishermen, moved to the area to work at the coconut plantation (POdePF, 2008) in the end of the 19th century (Bahiatursa, 2008). These residents form the native residents and native families of Praia do Forte. They, in addition to other social groups in the community, form the main stakeholders in sea turtle conservation in Praia do Forte (See Table 2.1 on page 64). These social groups were defined during the first phase of this study. These are definitions provided by the native families when asked about the community and the people who form the community.



Figure 2.1: Map of the Coconut Coast and the communities of Praia do Forte and Imbassá. Source: [http://www.setur.ba.gov.br/opinv\\_zona\\_coqueiros.asp](http://www.setur.ba.gov.br/opinv_zona_coqueiros.asp)

The coconut plantation was sold in mid 1970s. The new owner ceased the plantation operation and developed the first ‘pousada’ (a Bed & Breakfast like type of establishment) in the village. This shift in land ownership and economy led to local

socioeconomic changes, such as the outmigration of many native families, the prohibition of some of the traditional practices (e.g. raise livestock), and the introduction of tourism as the main economy.

**Table 2.1: The main stakeholders in Praia do Forte**

<b>Main Stakeholders in Praia do Forte</b>	
<b>Local Stakeholders</b>	<b>Characteristics</b>
Native Residents*	Residents who were born in Praia do Forte and residents who lived in the community during the plantation period.
Native Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period.
Local Residents*	A newcomer could 'become', could be 'considered', or be 'called' a <i>local resident</i> if this person married or had a child with a native resident, or grew up in the village.
TAMAR*	The TAMAR Project itself, the entity.
TAMAR Staff***	The research and administrative team of TAMAR.
TAMAR Workers***	The native and non-native residents.
The Founders of TAMAR**	Drs. Maria Ângela Marcovaldi and Guy Marcovaldi.
Fishermen*	The men in the village who fish/fished for a living or use/used fishing as one of the sources of income and/or food for their families. Unless noted, they are all native to Praia do Forte.
Fishing Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period
The Women from the Catholic Church*	Women who organize the events at the local Catholic Church. Different generations of women. Their involvement in communal affairs goes back to the plantation period.
The Street Vendors**	Vendors who sell souvenir and gift items on the specified location within the village set by the local government.
The Outsiders*	People who are non-local and non-native. Often from Salvador or other states. Associated as being wealthy people and often Caucasian. Includes seasonal residents, tourists, and permanent residents. They are often the owners and managers working in the tourism industry. Perceived by the native and local residents as having political and economic influence within the community.
The Community of Praia do Forte**	The societal group formed by the people who live in Praia do Forte, both native and non-native residents.

Note: \* These definitions follow the standards the elders and native residents of Praia do Forte gave me during our conversations about the history of the community, the plantation, and TAMAR.

Note: \*\* These definitions are based on the information gathered during the exploratory phase.

Note: \*\*\* Although TAMAR staff work for TAMAR, as do TAMAR workers, they are distinctive because they form the research team of TAMAR. This team includes researchers and administrative personnel who work at the Research Station and Visitor Center. They are not native or local to Praia do Forte. Definitions provided by the community.



In 1982, when TAMAR opened the Research Station, the village was still a small fishing village without electricity and it was home to approximately 600 residents (Marcovaldi & Laurent, 1996) (Figure 2.2). At that time, tourism development was still at its infancy. In 2006, the year I conducted the first phase of this study, the village was no longer a small fishing community with just a few resources.



Figure 2.2: Map of Praia do Forte and the location of the TAMAR Project. Source: <http://www.tatuapara.com.br/Portugues/como-chegar.aspx>

The Coconut Coast has become a fast growing tourism destination in Bahia and it concentrates the highest volume of tourism investments in the country (Jornal Correio da Bahia, 2007). The hotel industry in Praia do Forte has the second largest number of hotel rooms in the state (PMMSJ, 2004). In 2007, the year of the second research phase, Praia

do Forte was voted one of the top ten best beach destinations in Brazil (Veja, 2007), offering about 2,200 hotel rooms among the many ‘pousadas’ hotels, and one five-star resort, the Praia do Forte EcoResort. It is estimated that the permanent population of Praia do Forte is now about 2,000 and the seasonal population - residents who live in the village during the peak tourism seasons - is of about 4,700 (PMMSJ, 2004). Based on these numbers, the overall number of people in the village during the peak tourism season, December to March, jumps from about 2,000 to approximately 10,000 people.

## **2.6 Sea Turtles in Brazil and Sea Turtle Protection Laws**

Five of the seven species of sea turtles are found in Brazil: *Caretta caretta* (loggerhead), *Eretmochelys imbricate* (hawksbill), *Chelonia mydas* (green), *Lepidochelys olivacea* (olive ridley), and *Dermochelys coriacea* (leatherback) (Marcovaldi & Laurent, 1996). These five species of sea turtles are threatened of extinction (IUCN, 2008). The loggerhead and the green turtle species are classified as endangered and the hawksbill and the leatherback species are classified as critically endangered (IUCN, 2008). While the beaches of Bahia host the largest number of nesting activities of hawksbill turtles, which is one of the most threatened sea turtle species with extinction all over the world (Spotila, 2004), the beaches of Praia do Forte host the highest loggerhead nesting density in Brazil (Marcovaldi *et al.*, 2007).

In Brazil, the decrease in sea turtle harvesting, an increase in the number of hatchlings released, and an increase in nesting activities in some locations may be an indicator that sea turtle protection laws are addressing some of the threats posed on sea turtle populations (Broderick *et al.*, 2006; Chaloupka *et al.*, 2008; Marcovaldi *et al.*, 2007; Troëng & Rankin, 2005). Sea turtle protection laws in Brazil were first implemented in 1967, but only in 1986 did the federal government enact full protection of the species that nest in Brazil (Marcovaldi & Marcovaldi, 1999). This mandate declares that sea turtle harvesting in Brazil is prohibited by federal law (Law of Environmental Crimes, no. 9605, of 12/02/98) and punishable by imprisonment of 6 to 12 months and a fine (Projeto TAMAR, 2008). Since 1980, the TAMAR-ICMBio Project

(TAMAR) has the federal mandate to protect sea turtles in Brazil (Marcovaldi & Marcovaldi, 1999). Under the ICMBio's legislation, TAMAR controls the areas of reproduction and feeding of sea turtles through the enforcement of sea turtle protection laws (Projeto TAMAR, 2008).

In Praia do Forte, TAMAR enforces sea turtle protection laws since its arrival in the village back in 1982. Among the regulatory practices is the control of sea turtle harvesting for their meat and eggs as well as controlling bycatch in fishing gear. TAMAR staff does not have the legal authority to make arrests. Instead, TAMAR staff monitors activities and, when illegal activities are encountered, TAMAR contacts the IBAMA, Brazil's Federal Environmental Agency. Only the agents of the IBAMA have the legal authority to make arrests. TAMAR staff emphasized that even with the implementation of sea turtle protection laws at the federal level since 1967, it was only after the arrival of TAMAR in the village that sea turtle protection laws were in fact enforced. Over the years, TAMAR has observed some signs of sea turtle conservation success in Praia do Forte. One of these signs is the increase in sea turtle nesting activities along the beaches of Praia do Forte (Marcovaldi *et al.*, 2007; Santos *et al.*, 2000). How are these conservation achievements related to enforcement of sea turtle protection laws?

## **2.7 Methods**

This study is divided into three data collection phases. I used snowball and purposive sampling techniques on the first two phases and convenience sampling on the third phase.

### **2.7.1 First Data Collection Phase**

In my first data collection phase, May to September 2006, I interviewed 25 native residents and 15 non-native residents. Each interview lasted about 90 minutes and most respondents were interviewed more than once. This gave me the opportunity to gather detailed information about local values and uses of sea turtles, local fishing culture, history of the village, TAMAR, and overall tourism and conservation activities pre- and

post-TAMAR. I transcribed and later coded the open-ended answers. Recurrent themes within each one of the questions were grouped as categories. This information and the data from closed-ended questions were entered into a database. Statistical tests (frequencies and Chi-square analysis) were conducted on these categories using SPSS software. These interviews and participant observations established a firm qualitative foundation for the construction of a questionnaire used on the second phase of this study in 2007 (Bernard, 2000; Schensul *et al.*, 1999). The overarching research question is: How does the enforcement of federal sea turtle protection laws influence illegal harvesting of sea turtles and sea turtle eggs? I expected to find that non-fishermen are more likely to support the use of sea turtle protection laws to protect sea turtles than are fishermen.

Throughout the first two phases, I measured the support, understanding and knowledge of sea turtle conservation, using closed-ended and open-ended questions. Some of the indicators I used to analyze the influence that the enforcement of sea turtle protection laws has on local support for sea turtle conservation included: perceptions about and knowledge of sea turtle protection laws; perceptions about the impacts of these laws on local fishing practices; perceptions about the effectiveness of these laws in protecting sea turtles; perceptions about contemporary and historical sea turtle harvesting activities; and local values and uses of sea turtles.

In addition to conducting interviews, I attended local communal meetings and events and participated in fishing trips in order to learn traditional practices and the use of local marine resources. I assisted TAMAR staff with data collection during the sea turtle nesting season and accompanied TAMAR staff during interpretative talks, guided tours, and communal events to better understand local sea turtle conservation efforts and interactions between TAMAR with the community and visitors. Having the assistance of the fishermen and native residents enabled me to understand contemporary fishing practices (in comparison with historical accounts) as well as the influences of enforcement on fishing activities, and the role of fishing in the local economy and culture. I also observed the interactions between TAMAR staff and the community

during communal events, at the Center, and Research Station to assess levels of bonding as stated by residents during the interviews. The information gathered from attending these events and from my observations helped me evaluate the influence of sea turtle protection laws on local support for conservation.

### **2.7.2 Second Data Collection Phase**

On the second phase, September 2007 to January 2008, I conceptually divided the community into three main groups based on data from the exploratory phase collected in 2006. The main social groups in Praia do Forte as pertain to this study are: fishermen/non-fishermen, TAMAR workers/non-TAMAR workers, and native/non-native residents. This division also helped me evaluate the responses of fishermen vs. non-fishermen to the sea turtle protection laws, perceptions about threats, and overall knowledge about sea turtles.

I conducted 77 semi-structured interviews during this phase. I interviewed 25 of the 110 TAMAR employees who worked at TAMAR during the time of this study. On average, each interview lasted about 90 minutes and took place at TAMAR or at a location selected by the respondent. I also interviewed 15 households at the coastal community of Imbassaí. Imbassaí it is located 11 Km north of Praia do Forte and it is the control community of this study. I followed the same approach to gather, analyze, and interpret the data. The presence of a control community allowed for a comparative analysis of how the three conservation strategies influence local support for sea turtle conservation across communities.

When allowed, I tape-recorded the interviews conducted on both communities. I transcribed and later coded the answers. I selected the main themes and comments from the interviews. I created a database from the collected data and coded some of the text. I compared the distribution and linkages of these themes across enforcement of sea turtle protection laws between the two communities and between groups within each community. These values were statistically tested to find out if there is an association

between each one of these conservation strategies with local support for sea turtle conservation.

### **2.7.3 Third Data Collection Phase**

On the third phase, May to September 2008, I returned to most of the families who I interviewed in 2006, and to some of those interviewed in 2007, to assess their perceptions about the changes that occurred in the village, and within their households, since the beginning of my study in May 2006.

## **2.8 Findings: Influence of Enforcement on Local Values and Uses of Sea Turtles**

Sea turtle consumption in Praia do Forte was a common practice among local residents prior to the arrival of TAMAR in the village. In Praia do Forte, TAMAR staff said that the harvesting of sea turtles was so intense that basically all sea turtle nests and many nesting females were harvested for local consumption. TAMAR staff perceived this consumption practice as the biggest threat to sea turtle survival at the time. Native residents affirmed that sea turtles were consumed intensively by the community during that period and because of such influence on local livelihoods, sea turtles were valued as important sources of food. I also learned from the interviews with native residents that sea turtle consumption was done for subsistence needs rather than for cultural or religious purposes.

In Praia do Forte, the fishermen revealed that sea turtle harvesting was high because sea turtles are easy to catch, provide sufficient meat to feed one family, were abundant in the area, and were accessible to anyone. By ‘accessible to anyone’ I mean that sea turtles were, and still are, a common resource located within an area of open access. Native residents said that the provision of an abundant and reliable source of food was important because many families lived in economic hardship during the plantation period. The fishermen highlighted that without strict enforcement of sea turtle protection laws to control harvesting in the area, sea turtles were, and still are, an easy catch to those who do not fear the consequences of breaking the law.

One way TAMAR has been trying to control sea turtle harvesting is by enforcing the federally enacted sea turtle protection laws. Although TAMAR staff cannot make arrests, TAMAR patrols the beaches and fishing activities to assess whether the established federal laws created to protect sea turtles are followed. In a situation where these laws are not obeyed, TAMAR contacts the IBAMA, which is Brazil's Federal Environmental Agency. Only the agents of the IBAMA can make arrests. Still, despite this legal limitation, the presence of TAMAR in the village aims at minimizing illegal activities by creating an incentive for people to follow the laws that protect sea turtles.

I learned during my interviews with the native residents that before TAMAR arrived in the community in 1982, the idea of protecting sea turtles for conservation purposes was not a concept shared among residents. Residents stated that the community stopped harvesting sea turtles only after TAMAR arrived in the village. They stated that the arrival of TAMAR brought social and economic changes to the community. The enforcement of sea turtle protection laws was an important component of these changes because it influenced the local diet and some subsistence activities (e.g. trade of sea turtle meat and eggs with other goods with residents from adjacent villages) by controlling the use of sea turtles.

When native residents of Praia do Forte were asked about the frequency they consumed sea turtle meat and eggs, they reported that sea turtle consumption was constant and intense throughout the year, increasing during times of fish shortage and during the nesting season. Fishermen pointed out that offshore fishing intake was, and still is, an unpredictable activity that generates uncertain income revenues to the fishermen. Uncertainty and unpredictability, they stressed, is because fishing boats can only leave the local harbor during calm seas, which are not common during the winter season. During six months of data collection along the winter months of 2006 and 2008, I learned firsthand that during the winter season it is more likely to rain than to have a clear sky. Consequently, no fishing means no fish for the family to consume and no fish to sell for income.

Sea turtle harvesting was also higher during the nesting season because of the ease of catching nesting females while they are nesting and because of the abundance of both eggs and meat, which often came from the nesting females. Based on this information provided by the native residents, sea turtle consumption in Praia do Forte occurred throughout the year, with higher peaks between June and March. That leaves only two months out of the calendar year when sea turtles were harvested as an alternative to other food sources. Though it occurred at a lower rate, harvesting sea turtles for their meat was still a common practice among native families.

In Imbassaí, results were unclear regarding sea turtle harvesting. While some interviewees said locals used to harvest sea turtles for their meat and eggs prior to TAMAR's arrival in the region, some said there was no harvesting, while others did not know about historical uses of sea turtles in the village. Unlike in Imbassaí, residents of Praia do Forte, even the newcomers, were familiar with the historical use of sea turtles by locals. In Imbassaí, it seems that only the native residents were familiar with these practices.

In Praia do Forte, respondents said that local sea turtle harvesting for meat and eggs was reduced only after TAMAR enforced sea turtle protection laws and provided the community with economic alternatives from sea turtle conservation as alternatives to sea turtle harvesting. The following statement provided by a fisherman demonstrates the transition of direct use of sea turtles for consumption as a result of enforcement of sea turtle protection laws during the first year TAMAR was in the village: 'After the founders of TAMAR came to us and asked us to stop harvesting sea turtles that the local people here stopped eating sea turtles and getting turtle eggs... but now there are some people who still kill them.' The perceptions of this fisherman about changes in local uses towards actions that are more beneficial to sea turtle conservation - ceasing in sea turtle harvesting - are supported by empirical studies on sea turtle nesting activities in Praia do Forte.

During the interviews I asked open-ended questions about how residents viewed the use of enforcement to protect sea turtles, their perceptions about the future of sea turtles in the village, and if they were aware of any sea turtle harvesting activities in the



village. I then followed up these questions by asking them why they had those views. Ninety percent of respondents said sea turtle protection laws are good laws and these laws should be in place in order to protect sea turtles. Among the fishermen, 98% concurred with this statement. In Imbassaí, support for the use of enforcement to protect sea turtles was also high, with 73% of the respondents saying they believe these laws are good laws to protect sea turtles.

When asked whether residents thought there were still threats to sea turtles in Praia do Forte, 63% said ‘yes’ and claimed that the main threats are harvesting, as cited above, and as a bycatch in lobster and fishing gear. In Imbassaí, a smaller percentage (40%) of respondents believes there are still threats to sea turtles in the area (Figure 2.3).

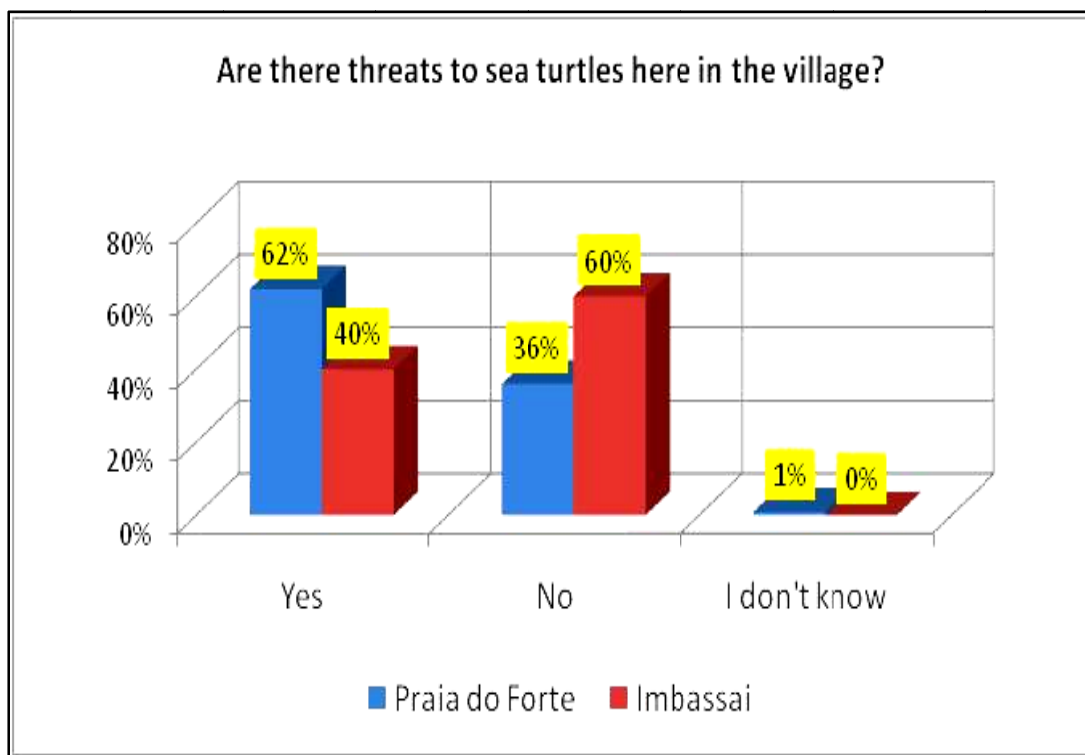


Figure 2.3: Perceptions of threats to sea turtles among residents of Imbassaí.

These results demonstrate that about 60% of the respondents from Imbassaí believe sea turtles are no longer threatened at the local scale. The reasons of this association are uncertain. When asked about their perceptions regarding the number of sea turtles since 1982, residents from Imbassaí (78%) and from Praia do Forte (80%) believe sea turtle numbers are increasing. Thus, perhaps their perception that sea turtle numbers are increasing is related to a decrease in threats to their survival.

Results illustrate that among the respondents from Praia do Forte, the fishermen (93%) were more likely to perceive the presence of threats than were non-fishermen (Table 2.2).

**Table 2.2: Chi-Square Analysis: Fishermen of Praia do Forte and perceptions about threats to sea turtles ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Perceptions about threats to sea turtles			
Independent Variable	I think there are still threats to sea turtle survival	I don't think there are threats to sea turtles	Exact Sig. (2 sided) Fisher's Exact Test
Fishermen	93%	7%	p-value=0.007
Non-Fishermen	56%	44%	

These results also show that almost the same percentage of non-fishermen believes in both presence and absence of threats to sea turtles in Praia do Forte.

In Imbassaí, unlike among the fishermen in Praia do Forte, results did not show a significant relationship (p-value= 0.287) between being a fisherman and threats to sea turtles (Table 2.3).

**Table 2.3: Chi-Square Analysis: Fishermen of Imbassaí and perceptions about threats to sea turtles ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Perceptions about threats to sea turtles			
Independent Variable	I think there are still threats to sea turtle survival	I don't think there are threats to sea turtles	Exact Sig. (2 sided) Fisher's Exact Test
Fishermen	17%	83%	p-value=0.287
Non-Fishermen	56%	44%	

The above results show that, unlike in Praia do Forte, the majority of fishermen in Imbassaí do not perceive the presence of threats to sea turtles. Results also show that almost the same number of non-fishermen believes on either the presence or absence of threats to sea turtles in Imbassaí. This result may indicate that, unlike in Praia do Forte, sea turtle harvesting in Imbassaí is less intense, noticeable, or both.

In Praia do Forte, 13% of respondents said they knew of at least one case of sea turtle harvesting in the village between 2006 and 2007. Though minute in comparison to historical harvesting rates, these activities mean that sea turtles are still harvested despite national ban on harvesting. Residents associate the presence of non-native and non-local construction workers working in the village and at the IberoStar Resort and some of the non-native lobster fishermen as the main groups that threaten sea turtles in the village. During the nine months of fieldwork I saw three dead sea turtles (one of them was a large loggerhead whose head had been cut) on the shore and two carcasses placed by the remaining of an open pit fire.

When asked if something happens when a person is caught harvesting a sea turtle, 93% of respondents said that nothing happens. One of these cases was the information provided by a local resident. He revealed that he saw the year before some men loading a live sea turtle on the back of a truck. He felt angry about what he saw because he said he does not think that sea turtles should be killed. He mentioned that he did not say anything

at that time because he did not want to get in trouble with the men who were taking the turtle.

Like in Praia do Forte, 13% of respondents from Imbassaí said they know of a case where a resident has harvested a sea turtle. Some respondents said that consumption takes place because there is no enforcement of these laws in the village. A striking difference between the two groups is regarding the outcomes from violating sea turtle protection laws. While 93% of the respondents from Praia do Forte stated that violators are not punished when breaking the law, only 13% of the respondents from Imbassaí share such perception (Figure 2.4).

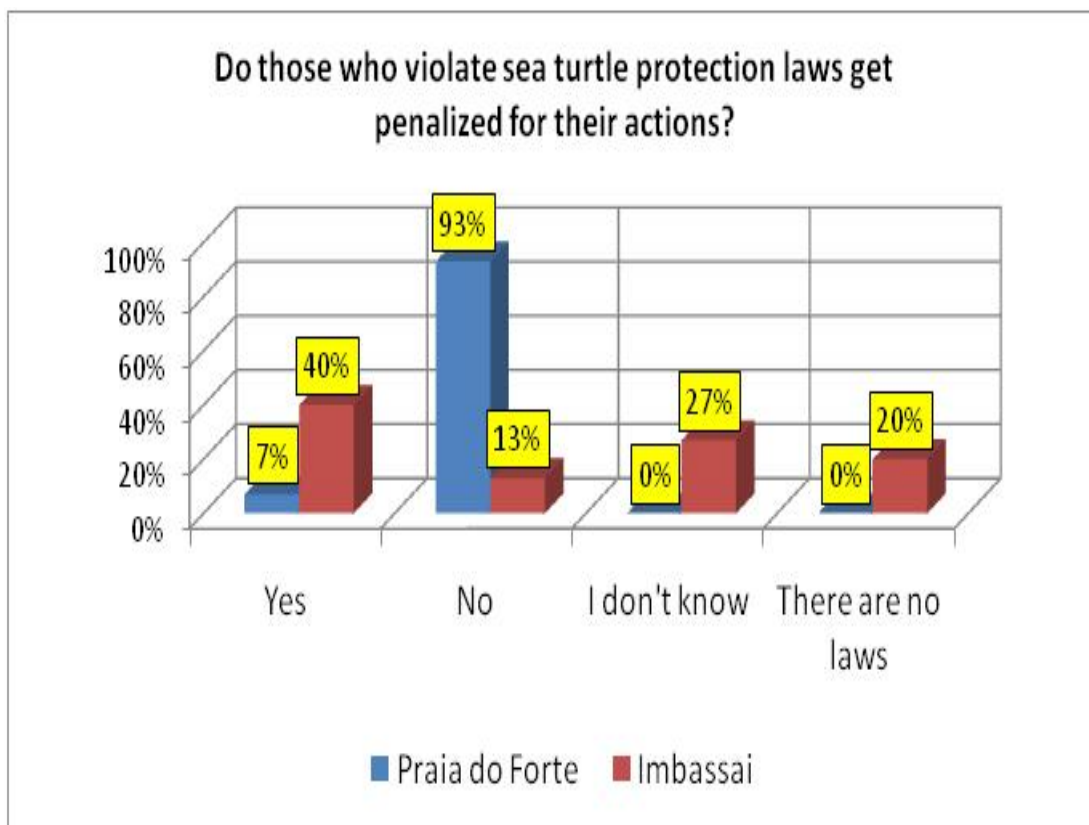


Figure 2.4: Comparison of the perceptions residents have about the outcomes of violating sea turtle protection laws between residents of Praia do Forte and Imbassaí.

The above results show that in Praia do Forte the majority of cases where sea turtle protection laws are violated there appears to be no punishment to those who break these laws. Another distinction of this comparison of perceptions about the two communities is that in Imbassaí 20% of respondents were unaware of the existence of sea turtle protection laws. Among the respondents of Praia do Forte, on the other hand, all residents knew there were laws that protected sea turtles.

In spite of the ongoing harvesting and accidental bycatch in fishing gear, the majority of respondents in Praia do Forte (90%) and most in Imbassaí (73%) said sea turtle protection laws are, nonetheless, good strategies to protect sea turtles. In fact, 62% of respondents in Praia do Forte and 73% of respondents in Imbassaí said sea turtle harvesting will increase if TAMAR stops patrolling the beaches of Praia do Forte and adjacent communities, such as the community of Imbassaí. Among the fishermen of Praia do Forte, 40% believe such outcome is a possibility. Although many fishermen believed harvesting is likely to increase without enforcement, a greater number (70%) of non-fishermen fear such outcome.

Fishermen's support for sea turtle protection laws demonstrates that, though externally developed and enforced, this conservation strategy is supported not only by those without ties to fishing, but also by the fishermen themselves. Seventy-four percent of respondents in the study said they do not think enforcement of sea turtle protection laws impacts fishing practices. Among the fishermen, 83% said these laws do not affect their fishing activities (Table 2.4). This result, in addition to the results from fishermen's perceptions about sea turtle protection laws, run counter to my expectation that non-fishermen would be more likely to support enforcement than the fishermen would.

**Table 2.4: Chi-Square Analysis: Fishermen and perceptions about the influence sea turtle protection laws have on fishing activities**

Dependent Variable (Y): Perceptions about the influence of sea turtle protection laws on fishing activities			
Independent Variable	I think sea turtle protection laws impact local fishing activities	I don't think sea turtle protection laws impact local fishing activities	Exact Sig. (2 sided) Fisher's Exact Test
Fishermen (n=12)	17%	83%	p-value=0.480
Non-Fishermen (n=38)	29%	71%	

These results also do not show a direct association between being a fishermen and perceptions about sea turtle protection laws. These results show that, in spite of controlling use of sea turtles and their eggs, both fishermen and non-fishermen believe sea turtle protection laws do not interfere with their overall fishing practices. Although I did not find a direct relationship between enforcement and perception of impacts of sea turtle protection laws on local fishing practices ( $p$ -value= 0.480;  $\alpha \leq 0.05$ ), these perceptions represent contemporary views about enforcement.

These perceptions do not represent the perceptions about impacts these regulations caused to the fishermen and fishing activities were first implemented by TAMAR. In fact, many native residents declared that the community resented, at first, the loss of access to sea turtle meat and eggs. They said, during the interviews, that the impacts of enforcement on their livelihoods were greater at that time because there were limited food and economic alternatives to fishing. During the time of this study, more than 25 years after TAMAR first arrived in the village, the introduction of grocery stores and other ways to acquire food and income provide residents with alternatives beyond fishing to support their livelihoods. New economies also offer new alternatives to make a living that do not involve fishing.

Therefore, it seems, that enforcement of sea turtle protection laws had greater influence on fishing practices, thus on local livelihoods, during the period the community relied more heavily on fishing for survival. Overtime, with the introduction of other

livelihood alternatives, like sea turtle ecotourism and tourism, and other forms to acquire food, like grocery stores, the perception about enforcement's influence on fishing seems to have shifted. This finding suggests that although the laws have not changed significantly (e.g. harvesting is still illegal), these laws nevertheless influence fishing activities by dictating what fishing activities and techniques are allowed and which marine species can be consumed by the community. Therefore, it seems that what have shifted are the roles of fishing and of sea turtles on the local economy and on livelihoods, rather than the laws that protect sea turtles and sea turtle eggs.

During the period this study was being conducted, while few families still relied on fishing for income, more families relied on TAMAR and many others on income provided from jobs related to tourism to support household needs. This may explain why residents no longer perceive enforcement as an activity that impacts local fishing practices when these strategies may still have the same influence on fishing techniques as they did 25 years ago.

Results from these questions were mixed among the residents from Imbassaí. When asked if sea turtle protection laws enforced by TAMAR impacted local fishing activities, 53% of the respondents from Imbassaí said 'no'. However, 'no' did not mean that these laws did not impact the fishermen but meant that, in this question, 53% of the respondents said there were no laws created to protect sea turtles. Among those who were knowledgeable about these laws, 27% said these laws did not affect the fishermen while 7% said yes.

## **2.9 Findings: Influence of Enforcement on Traditional Ecological Knowledge**

During my interviews with native residents, I learned that a long-term custom amongst the fishing families was the practice of teaching the traditional ecological knowledge from one generation to the next. This tradition involves teaching the younger generation on ways to use local natural resources, particularly the marine resources, to provide for their livelihood. This teaching integrated lessons about, among others, fishing

techniques, local fishing grounds, ocean currents, tides, wind currents, marine species, and on how to prepare and store the harvested fish and other species.

During conversations with the fishermen they often reminded me that the knowledge about fishing is not only about knowing what fish to catch or how to catch a fish but ‘To understand what nature is telling you, what the clouds and the winds are telling us. We know by looking at the clouds and at the wind if it will rain and when it will rain. We also know that fishing will be different if there is a full-moon, a high or low tide, and when the ‘pititinga’ is coming...to know this you need to observe the ocean. You need to learn from it and this takes time. But we all had to learn when we were kids because our fathers were fishermen and we needed fishing to survive. We were expected to become a fisherman,’ said a fisherman. This knowledge, fishermen insisted, also incorporated teaching about sea turtles. Since native families relied on fishing to support most of their livelihood needs, they were familiar with sea turtle nesting and feeding patterns, behavior, and numbers. This information is key in sea turtle conservation because it helps to analyze the influence of threats on local populations and changes in population and sea turtle nesting numbers as result of conservation efforts.

Throughout this study, fishermen taught me the ways they looked for, harvested, prepared, and stored sea turtles and their eggs. Fishermen showed me the locations they commonly harvested sea turtles and explained harvesting techniques they used to harvest and transport sea turtles to the shore. They also explained how sea turtle meat and eggs were prepared for consumption. In some ways, I was their new student for the duration of my fieldwork in Praia do Forte. This rich tradition was very vivid in the memories of the fishermen, both retired and active fishermen.

When asked, during the interviews via open-ended questions, about the impacts of enforcement on their fishing knowledge, the fishermen reported that they still relied on their knowledge to support their livelihood after enforcement of sea turtle protection laws was in place. One fisherman declared in one of our conversations: ‘The knowledge we have here is more than knowing about sea turtles.’ One way they said their knowledge is used is by helping in sea turtle conservation. Employment opportunities, they said, were



provided since TAMAR first arrived in the village in 1982. Though few at first, these opportunities were and continue available to those who want to work for TAMAR. During the interviews, when asked about the history of TAMAR in the village, the fishermen remembered that TAMAR personnel knew little about sea turtles in the area when they first arrived in the village. Residents said that the fishermen had, and still have, an important role in sea turtle conservation because they help TAMAR locate sea turtle nests during the nesting season, collect data on sea turtles, and in testing fishing techniques that cause fewer impacts on sea turtles.

In the future, the use of traditional ecological knowledge in sea turtle conservation through the fishermen is uncertain. Residents' perceptions about the role of fishing in the local economy and a loss of interest among the youth regarding fishing practices are likely to influence the sustainability of this practice across generations. During our interviews, a number of fishermen recalled that a shift within the fishing families took place in the mid 1990s. One of the fishermen informed me that internal disagreements and lack of trust within the fishing community started to take place around that time. Internal disagreements and lack of trust, he feels, led some of the youth to lose interest in pursuing fishing as a profession or as a way of making a living.

When I asked another fisherman about his view about the future of the local fishing industry, he revealed that: 'The young people here lost their trust on fishing because of some of the problems we have been having since mid 90s...but we are working hard to bring them back to fishing.' He hopes the practice of fishing continues to the next generation 'Because they are the ones who will take over...we cannot do this for much longer because we are getting old.' Other fishermen in the community shared his hopes in strengthening the role of fishing in the community.

As a result, it seems that the loss of interest in fishing is not so much an economic problem or a result of enforcement of sea turtle protection laws, but a cultural issue associated with socioeconomic changes within the community. As cited above, 83% of the fishermen said sea turtle protection laws do not impact their fishing activities, thus enforcement is unlikely to be a deterrent for fishing practices. Particularly since most of

the demand for marine species does not include sea turtles, but focuses on fish and lobster. In the longer term, perhaps the growing importance of TAMAR on the local economy helps sustain the linkage between fishing and sea turtle conservation. One fisherman explained that: ‘We still influence sea turtle conservation here in the village. Even after so many years we still help TAMAR in many ways. So it is good to see that TAMAR still hires the fishermen and helps the local fishing industry because we need each other.’ His comments were shared by others in this study. It seems that, at least via employment at TAMAR and at the local fishing industry traditional ecological knowledge may be able to be applied as it was in the past.

Maybe, in the longer term, there is the potential that some employment opportunities at TAMAR may act as an incentive for those interested in fishing to sustain their knowledge by implementing it in sea turtle conservation. To assess this possible linkage, I asked residents whether they would like their child to work at TAMAR. The majority of respondents (92%), including the fishermen, said they would like their child to work at TAMAR. Among the respondents from Imbassaí, 93% of them want their child to work for TAMAR. The remaining 7% do not want to have children. Thus, it seemed that there is some potential in linking employment at TAMAR with traditional ecological knowledge.

However, 71% of the respondents in Praia do Forte said “no” when asked if they wanted their child to work as a fisherman. Though 47% of the fishermen would like their sons to continue the family tradition, they also recognize that fishing is not for everyone. For many, including the fishermen, the work conditions at the fishing boat are not good or safe; the revenues are never certain and are often small. One fisherman told me during one of our conversations that the harsh work environment imposed on the fishermen while at sea is the reason only a handful of the local young men still fish for a living. Some of the reasons residents of Praia do Forte do not want their child to become a fisherman is based on their perception that fishing is too risky (20%), provides low income (7%), and they want their child to have a better life (39%). Among the reasons

they want their child to become a fisherman are the ties with fishing culture (8%) and because they perceive it is a good profession (4%) (Figure 2.5).

Fishing seems to be more accepted as a profession among the residents of Imbassai since 53% of them said they would like their child to become a fisherman. Some of the reasons they want and do not want their child to work as a fisherman are similar to the reasons provided by the residents of Praia do Forte (Figure 2.5). Some of the reasons they support this choice are the perception that fishing is a good profession (33%) and it is part of the local culture (7%). Among the reasons why they rather have their child working on other activities is that fishing is too risky (7%), too risky and provides low income (13%), and because they want something better for their child (7%).

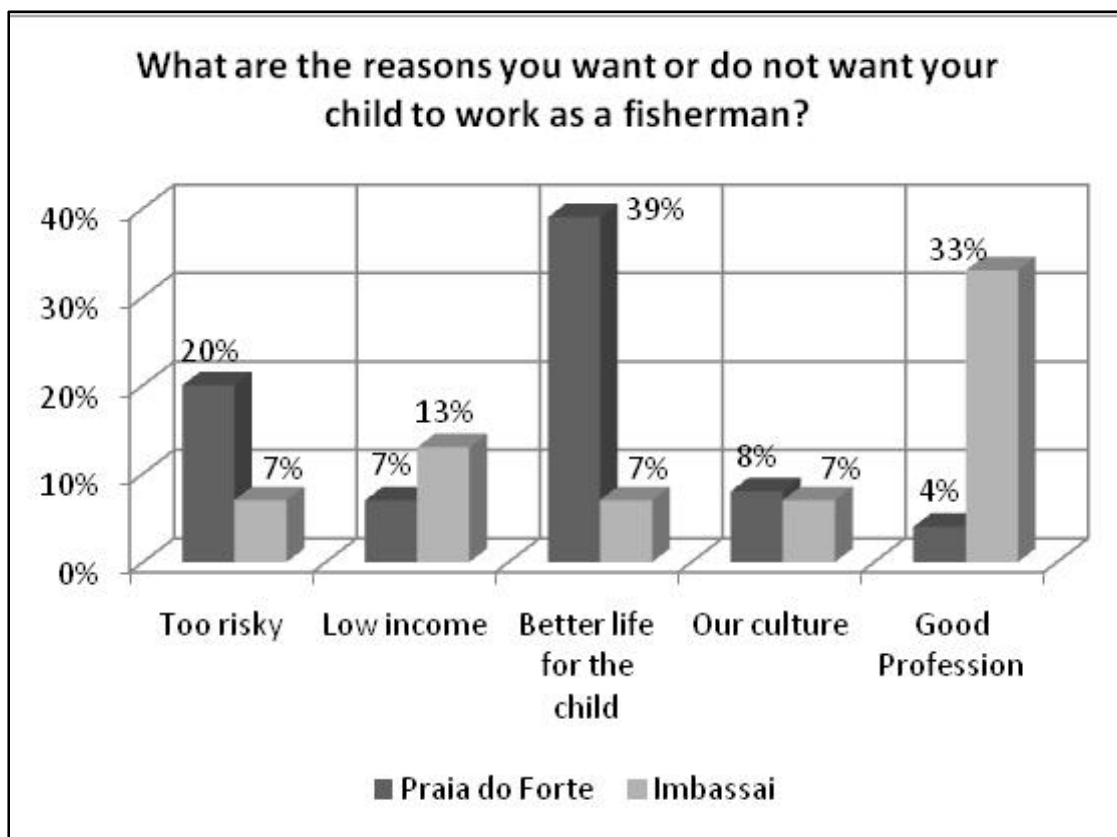


Figure 2.5: Reasons why residents do or do not want their child to work as a fisherman.

The above figure shows that, as a comparison between the percentages between communities, it seems that residents of Imbassaí (33%) have more positive associations with the profession of fishing than do residents of Praia do Forte (4%). It also shows that only a small percentage (7%) of respondents from Imbassaí perceives fishing as a risky activity. Perhaps this association has to do with the type of fishing techniques use that differ from the techniques used in Praia do Forte.

### **2.10 Findings: Enforcement and Perceptions of Economic Well-being**

During the interviews conducted on the first phase of this study, native residents revealed that the main sources of income available to the families at the time of the plantation period were fishing and income from employment at the nearby coconut plantation. When asked how they used the local resources, they pointed out that sea turtles and sea turtle eggs were harvested on a regular basis for subsistence needs. Economically, the abundance of sea turtle meat and eggs was beneficial to these families. Residents explained they did not have to purchase sea turtle meat and eggs because ‘Anyone could harvest them’. Residents affirmed that these benefits were very important to the community because most families lived under economic hardship. When I asked native residents about the way the community used sea turtles prior the arrival of TAMAR, a native woman explained that: ‘There were people here who lived with a lot of turtle meat and eggs.’ Other residents explained that although most families consumed sea turtles for subsistence needs, some people in the village also used sea turtle shells to make ornaments and handcraft items, such as jewelry. Some families also used sea turtle shells as sinks and as containers to wash clothes and store items in the house. These statements demonstrate some of the ways residents used sea turtles and their eggs.

During the interviews I asked residents how they felt when TAMAR arrived in the village and what enforcement of sea turtle protection laws meant for them. These questions addressed resident’s perceptions about enforcement, local uses and values about sea turtles, and perceptions about TAMAR and sea turtle conservation. Native residents recall that enforcement of sea turtle protection laws caused some impacts on the

household economy because the community lost the right to use sea turtle meat and eggs. This loss forced residents to rely more intensively on fish and on other marine resources as sources of food. Due to the economic hardship many families lived at that time, losing access to sea turtle meat and eggs created a greater challenge for many residents to support their families. One fisherman remembers the impacts caused by enforcement on local fishing practices: ‘We were unable to fish. There was the IBAMA to patrol and create trouble to us if we would use nets. What we were scared the most was the IBAMA and not TAMAR. But TAMAR was the IBAMA, understand? Because TAMAR is more about conservation and the IBAMA is more about enforcing environmental laws. Because they [the founders of TAMAR] were the only ones here and the IBAMA was the one that gave orders.’

In addition to losing access to sea turtle meat and eggs, residents explained that enforcement of sea turtle protection laws also influenced the amount of fish the fishermen were able to catch without using the traditional fish nets. As a result, sea turtle protection laws may have influenced fish intake and, by doing so, influenced the monetary resources available for the household to support livelihood needs. One native woman explained that even if the fishermen did not want to catch a sea turtle to eat, sea turtles often got caught in their fishing nets. She said that this was common because both sea turtles and the fishermen used the same area along the coral reef to find food: ‘In the past,’ she said, ‘We used to see a lot of sea turtles on the beach. When we put the net to catch fish we used to get them tangled on the net. Then we had to lift up the net with all that weight in order to get them out of the net. Then all the fish would escape...if we did not do that the turtles would die...For us, a sea turtle stuck in the fishing gear means catching fewer fish, which means less food for the family to eat and less money to be earned by selling the fish.’ She emphasized that despite these issues related to fish intake, the community followed the law enforced by TAMAR because they were aware of the penalties involved in case they ‘Broke the rules’ to protect sea turtles. Some said they feared the consequences they would encounter if breaking the laws. Overtime, she said, the

fishermen did not want to catch sea turtles because they were also supporting sea turtle conservation.

During the first phase of this study I asked native residents, during the interviews, their perceptions about the economic benefits provided by TAMAR. They explained that these economic incentives helped minimize the feelings of resentment residents had about enforcement and towards sea turtle conservation. Residents said that despite not being able to eat sea turtle meat and eggs, employment at TAMAR gave some families a somewhat stable and reliable source of income. One native woman explained that sea turtle conservation financially benefited her family and other local families: ‘The arrival of TAMAR here in the village was one of the first things that brought an incentive for change. TAMAR brought many jobs to the community and TAMAR still provides many jobs to the community.’ Native residents emphasized that, at first, TAMAR employed only a few fishermen because the fishermen were the ones who knew about sea turtles. Overtime, the expansion of the Research Station and the opening of TAMAR’s Visitor Center provided greater employment opportunities for residents. This transition in employment opportunity is acknowledged by a native woman: ‘When TAMAR came, the founders told us that we should no longer harvest sea turtles and that they would offer jobs for us. It was during that time the opportunity of working in sea turtle conservation started.’ During the second phase of this study, in 2007, 110 residents (approximately an equal distribution based on gender) of Praia do Forte and adjacent communities worked at either Research Station or Visitor Center. This means that about 110 families from Praia do Forte and adjacent communities directly benefited from the economic revenues generated by sea turtle conservation in Praia do Forte.

## **2.11 Discussion**

I obtained mixed results from my evaluation of the influence enforcement of sea turtle protection laws have on perceptions of well-being, on traditional ecological knowledge, and in local values about and uses of sea turtle turtles. Impacts of enforcing sea turtle protection laws on these three outcomes appear to be more significant during

the first years of TAMAR in the village. Overtime, particularly after the mid 1990s, the decline of fishing in the local economy and the growth of tourism - at regional and local scales - and TAMAR within the village appear to have influenced how enforcement relate to local support for sea turtle conservation.

### **2.11.1 Perceptions of Well-being and Local Values and Uses of Sea Turtles**

In 1982, the majority of families in Praia do Forte still relied on fishing to support their livelihood needs, either as a source of income, of food, or both. Native residents reported feeling resentment as result of the imposed ‘new rules’ regarding the use, in this case the ban on use of sea turtles and their eggs, as result of enforcement of sea turtle protection laws. The feeling of resentment supports the findings of other studies which show that constraining access and use of resources from local communities can generate problems or even cause unintended consequences for conservation, such as social conflicts that lead to greater resource exploitation of the protected resources (Barkin, 2003; Belsky, 1999; Campbell, 1998; Young, 1999).

Though resentment was reported as result of enforcement, the use of enforcement to control illegal harvesting appears to not have caused greater exploitation of sea turtles for their meat or eggs, as it was found by Belsky (1999) in Belize. Therefore, despite some claims that top-down approaches in conservation are unable to enhance the chances of achieving conservation goals (Aberkeli, 2001; Chhatre & Saberwal, 2005), results from this study show that some of TAMAR’s goals to protect nesting females and their eggs are being achieved. In Praia do Forte, despite some reports of sporadic harvesting and deaths as result of bycatch in fishing gear, there are some signs of sea turtle population recovery, such as the increase of the local loggerhead population (Marcovaldi *et al.*, 2007) and an increase in the number of sea turtle hatchlings released by TAMAR every nesting season (TAMAR, 2008). These are indicators that enforcement is helping control larger harvesting and bycatch activities from taking place.

The influence of enforcement on local values, uses, and perceptions about enforcement varied among the residents of Imbassaí. Perhaps mixed responses are an

indicator that sea turtles did not play as important of a role on the local diet as they did in Praia do Forte. Another reason may be the presence of TAMAR, in this case, the absence of TAMAR in the village. In Praia do Forte, unlike in Imbassaí, not only were sea turtles important components on the local diet but they are now the village's '*motto*'. In some ways, this iconic promotion of sea turtles has become something of a '*turtlemania*' in Praia do Forte. This '*turtlemania*' reminds residents and visitors of the role sea turtles played and play in the village's history and economy. The role of sea turtles is not reminded via subliminal ways, but rather through a plethora of sea turtle logos and souvenirs with the sea turtle theme that are sold at most retail stores and, of course, at TAMAR. Thus, even if a person is not native to Praia do Forte, he/she is likely to soon learn that there is something important about sea turtles in the village, otherwise what would there be so many visual indicators? As such, it does not take long to learn that sea turtles were consumed for food and are now protected by TAMAR.

Local values of sea turtles also show to be related to the broader tourism development in the village. For many respondents, this emphasis on sea turtles is a response of a perception that TAMAR is the catalysis of tourism development in the village. This association was shown when residents were asked to explain whether they valued sea turtles differently because of tourism. For most of respondents the association between sea turtles and tourism is the reason they said they support sea turtle conservation. Hence, the monetary reason of support may not necessarily indicate greater conservation awareness about sea turtles and sea turtle conservation. Still, on the broader spectrum of conservation, local support for sea turtle conservation - being for monetary, ecological, or both reasons - supports sea turtle conservation. The bottom line is that sea turtles are not being harvested as they were prior TAMAR's arrival in 1982 and the community supports sea turtle conservation. Support for sea turtle conservation for economic reasons also supports the claim that conservation of resources, in this case of sea turtles, is good for the local economy and it can generate greater economic benefits to the overall community than direct harvesting of sea turtles (Troëng & Drews, 2004).



However, would residents still support sea turtle conservation if TAMAR's role in the community was minimal? In Imbassaí the answer appears to be 'yes'. In contrast to Praia do Forte, in Imbassaí there are no sea turtle symbols placed throughout the village and the presence of TAMAR is almost non-existent. The absence of these components, which were found to influence support for sea turtle conservation in Praia do Forte, appear to not influence local values and uses of sea turtles. Most residents stated that sea turtles are no longer harvested in the village because TAMAR enforces sea turtle protection laws rather than because sea turtles influence the tourism economy. They said the main attraction in the village is the local river and not sea turtles. Because sea turtles do not provide residents with a direct monetary gain, the incentive for residents to not harvest sea turtles is created by enforcement.

This is an interesting finding because TAMAR's presence in Imbassaí is minimal and the staff of TAMAR cannot make arrests. Therefore, TAMAR's image and presence in Praia do Forte has been sufficient to control local harvesting practices in both communities. This result demonstrates that the influence of a conservation program goes beyond the community's borders. In Imbassaí, though TAMAR's staff are not physically present they 'are present' through their activities in Praia do Forte. However, would the community of Imbassaí obey the laws if TAMAR's reputation was not a positive one? Probably not, therefore, it is not only enforcement that creates an incentive to control harvesting but a combination of factors that include enforcement as one of the components. In this case it seems that the combination of a good relationship with the founders of TAMAR since the concept of sea turtle conservation was implemented in the village, the introduction of diverse and plentiful job opportunities by TAMAR, and the promotion of education programs that are valued by these communities create a solid package for residents to support sea turtle conservation. These results also show that the level of consideration residents have toward the staff of TAMAR shows that TAMAR is viewed by many as the actual enforcing institution that can, like the agents of the IBAMA, make arrests. Though not true, these perceptions benefit sea turtle conservation.

This finding also shows how a conservation program is able to enforce the law and achieve the expected outcomes without having the legal capability of making arrests.

### **2.11.2 Participation in Decision-making**

Results show that though residents of Praia do Forte and Imbassaí are not involved in decision-making they support sea turtle conservation. In Praia do Forte, only a small fraction of the fishermen and native residents in this study wished the community also participated in sea turtle conservation management. They, like the majority of respondents, believe TAMAR should be the sole entity responsible for developing and administering sea turtle conservation in the village. Even when provided the opportunity to co-manage sea turtle conservation activities, the majority of respondents said TAMAR should continue managing sea turtles in the village. Despite not being involved in decision-making, the majority of residents supports the use of enforcement to protect sea turtles and believes enforcement is essential to control harvesting and bycatch in fishing gear from becoming greater problems for sea turtle conservation. In spite of these positive results for sea turtle conservation, the involvement of the community could help TAMAR's efforts in the longer term by strengthening local social capacity of residents and giving them some of the needed tools to address some of changes brought by the larger tourism industry. Maybe the youth would have gained other skills enabling them to take direction of their own development, either with TAMAR or with the tourism industry, which could help diversity the local economy beyond the dependency on tourism. Pêgas and Stronza (2008) claim that perhaps, through greater participation of the community, the future for sea turtle conservation in Praia do Forte would be stronger as it would be less dependent on the larger tourism economy.

### **2.11.3 Perceptions about Enforcement**

In Praia do Forte, many respondents mentioned, including the fishermen in this study, said they would like to see more action from TAMAR to control ongoing harvesting and bycatch in fishing gear. By 'more action' they want TAMAR to be more

aggressive about enforcement and implement greater punishment to those who break the law. Some of the fishermen feel that those who are breaking the laws are not being punished and because of this lack of punishment sea turtle harvesting will persist. These findings support the claim that fines are necessary to manage and protect natural resources (Troëng & Drews, 2004) and that better and more enforcement enhances the likelihood of effectively protecting resources from human pressure (Campbell, 1998).

In the case of controlling threats to sea turtles, the staff of TAMAR does not have the legal power to make arrests. These actions are conducted by the federal agents of the IBAMA. Therefore, ongoing illegal activities appear to take place for two main reasons: enforcement is insufficient to control these activities and because of weak enforcement from the responsible enforcement agency – the IBAMA. Therefore, how can conservation programs that have are tied to the government, such as TAMAR, effectively protect sea turtles when they are constrained by the legal system? Perhaps if TAMAR was not legally tied to the federal government TAMAR could have a greater range of alternatives in how to address local threats, such as the ongoing harvesting, bycatch done by some of the lobster fishermen, and impacts by coastal development. Also, under this scenario, perhaps TAMAR was more involved in local issues, such as issues that are not directly related to sea turtles. Though not directly related to sea turtles, some of these activities do influence sea turtle conservation efforts.

Native residents claim that the majority of residents who live in the village are not native to Praia do Forte and that most newcomers have no ties with fishing, with TAMAR, or with the native community. Therefore, if residents' ties with fishing and the presence of a long-term positive relationship between TAMAR and community have helped TAMAR's efforts to protect sea turtles, changes in local demographics can, and will likely, influence future sea turtle conservation activities. For example, residents complained that while tourism brings jobs and income to the community, tourism is also associated with bringing population growth, insecurity, and violence.

These three components are interrelated, because violence is associated with of newcomers, which in turn are part of the new population. If harvesting, as claimed by

some respondents, is done by non-local and non-native residents, the impacts of tourism on the community are also impacting sea turtles. Therefore, perhaps if TAMAR was more involved in local activities some of these issues could have been addressed differently because there would not only be the residents complaining about these issues, but also the participation of one of the key players in the local economy – TAMAR.

This possibility is only speculation because though TAMAR is co-managed by a Foundation, TAMAR is also co-managed by the federal government. This administrative characteristic is likely to come with conditions and limitations of what the staff of TAMAR can and cannot do with regards to local tourism development, land tenure issues, and about some of the socioeconomic changes occurring within the village. In spite of these conditions, TAMAR's actions have generated important outcomes for sea turtle conservation and overall conservation of local marine and coastal resources in the region. Without TAMAR's conservation efforts and economic role – locally and regionally, greater degradation of local resources would have likely taken place since early 1980s.

#### **2.11.4 Influence of Enforcement on Traditional Ecological Knowledge**

In her analysis of the ethnoecology knowledge of the fishermen of Praia do Forte, Grando (2003) argues that the traditional ecological knowledge found among the fishermen of Praia do Forte is threatened to disappear. She claims that this loss will occur because the younger generation is no longer interested in fishing, which challenges the sustainability of this practice to the next generations. Results from this study concur with Grando's (2003) claim that fishing is a disappearing activity in the 'fishing' village of Praia do Forte.

There are few potential reasons for this disappearance. First, results from this study show that although enforcement did not prevent residents from fishing, the introduction of new market economies, sea turtle conservation and tourism, may create a greater incentive for the younger generation to pursue other professional careers that little resemble the practices their parents and grandparents relied upon for their survival.

Hence, the introduction of tourism and sea turtle conservation after the plantation was sold provided different means for residents to earn an income. The opening of grocery stores also commercialized the goods, like fish, once only available with the implementation of traditional ecological knowledge.

Therefore, unlike during the plantation period, residents no longer 'need' to know how to fish in order to survive. Now, if a resident desires to eat fish, he/she no longer needs to have knowledge about fishing or take the time to harvest this fish. The knowledge to harvest this fish has been replaced by currency. Today, money, rather than traditional ecological knowledge, gets the fish. Although fish is still consumed by the community, by the tourists, and by the seasonal residents, most of the large scale fish supply is not, however, locally harvested or sold by the native fishermen.

Grando (2003) claims that the biggest threat to the sustainability of the local artisan fishing practices is the absence of public policies that support small scale fishing and policies that support their rights. She states that current policies benefit the industrial fishing industry, which is likely to supply the local demand for fish, rather than the small scale fishing industry, like the type implemented by the fishermen of Praia do Forte. Despite the small scale of the local fishing industry, Grando (2003) argues that the fishermen of Praia do Forte have a 'Rich knowledge about the factors that influence fishing practices, including knowledge about the complex system of ethnoclassification (2003: 124).' This knowledge also benefits sea turtle conservation. In this study, the fishermen were more likely to perceive the presence of threats to sea turtles than were non-fishermen.

Their perceptions and knowledge about sea turtles demonstrates that the carriers of traditional ecological knowledge are important 'assets' to sea turtle conservation. Though some of the lobster fishermen are claimed to harvest sea turtles for their meat and use fishing techniques that may cause the death of sea turtles, there is a greater benefit for sea turtle conservation to sustain, rather than to suppress, the local fishing industry. After all, the fishermen are the ones who are out at sea where the sea turtles are, they are familiar with sea turtle patterns, and are more likely to witness illegal activities or threats

to sea turtles than are residents who have no ties with fishing. Thus, the development and maintenance of good relationship with the fishermen, both native and non-native, and the sustainability of the fishing culture seem to be key components of local sea turtle conservation efforts.

#### **2.11.5 Influence of Enforcement in Changing Local Values and Uses**

Berkes (2004) claims that industrialization, technology change, urbanization, colonization, and stresses due to population pressure, loss of local control over the resources, and commercialization of subsistence resources have resulted in the degradation and the disappearance of traditional systems.

In Praia do Forte, some of these factors have been introduced to the village since the plantation was sold in mid 1970s. Among these factors are changes in local demographics since newcomers seem to have little, if any, ties with fishing. Loss of local control over resources is associated with the loss of access to sea turtle meat and sea turtle eggs from enforcement of sea turtle protection laws. Perhaps more importantly for the overall local fishing culture and industry is the commercialization of fish to support the local demand (e.g. restaurants, residents, and hotels).

Nowadays, fish can be purchased from the grocery store rather than relied on the local fishermen to catch and sell this fish. In terms of community-wide influence, the construction of subdivisions within the village and of a high-scale tourism industry has shifted the infrastructure from a small fishing village to one of the most popular tourism destinations in Brazil. These factors, combined with the loss of interest of the younger generation in pursuing fishing as a profession, and the lack of public policies to protect local fishing rights (Grando, 2003), challenge the sustainability of traditional ecological knowledge.

In the longer term, greater efforts from TAMAR and from within the fishing families may help sustain this knowledge across generations. Also, though enforcement of sea turtle protection laws have not prevented the fishermen from continuing fishing, other factors, such as internal disagreements within the fishing community, unsafe work

environment, low wages, and employment opportunities at TAMAR and at the tourism industry, show to influence local fishing practices and interest in fishing across generations. Because fishing is tied to traditional ecological knowledge, these factors affect the sustainability of traditional ecological knowledge and may even surpass the benefits provided by employment at TAMAR.

### **2.11.6 Mixed Approaches to Protect Sea Turtles**

Results from this study illustrate that enforcement of sea turtle protection laws influences sea turtle conservation efforts by creating an incentive for residents not to harvest sea turtles and their eggs. However, results from this study also illustrate that enforcement, alone, is not sufficient to sustain sea turtle protection efforts in Praia do Forte.

Like in Bali (Putra & Bailey, 2007) and in Costa Rica (Peckham *et al.*, 2007a), I found that sea turtle conservation efforts in Praia do Forte are more likely to influence support for sea turtle conservation if different conservation strategies are combined with enforcement, rather than implemented alone. Native residents stated that the main reason the community harvested sea turtles, particularly during fish shortages, was to support local livelihood needs. During fish shortage, they said that harvesting activities increased because sea turtles could be harvested along the reefs, thus fishermen did not have to go off shore to fish.

During his study on sea turtle harvesting activities in Northwest Mexico, Nichols (2003) also found a relationship between sea turtle harvesting and fish intake. He took notice that illegal harvesting of sea turtles increased when shrimp catch was low (Nichols, 2003). He learned that shrimp fishermen removed Turtle Exclusion Devices (TEDs) from their fishing gear in order to catch sea turtles (Nichols, 2003). In Praia do Forte, results show that without the implementation of employment and income, and the development of a good relationship between the founders of TAMAR and the community, enforcement would unlikely be sufficient to control sea turtle harvesting

because residents would still be deprived of a financial incentive to conserve rather than to consume sea turtles.

Schuett *et al.* (2001) found that trust, respect, and honesty were important components in building relationships between groups in collaborative resource management situations. These characteristics were also found to be influenced, both positively and negatively, by ecotourism. In a workshop that gathered the leaders from three Amazonian regions of Ecuador, Peru, and Bolivia, Stronza and Gordillo (2008) found that participation in ecotourism has the potential to either strengthen or weaken social cohesion, trust, and cooperation within communities. Some of the positive benefits were the opportunity to gain skills and leadership, heightened self-esteem, expanded networks of support, and better organizational capacity.

In Praia do Forte, the trust factor seems to still exist between the native community and the founders of TAMAR. This interpretation is based on the responses provided by the native residents during our interviews when I asked about their relationship with TAMAR. Many native residents explained they still feel that the founders of TAMAR care for the community. Because the founders ‘care’ for the community, respondents felt they can trust the founders like they have been doing for years. Although trust and the presence of a positive relationship between the founders of TAMAR and the native community exist, residents did not report having feelings of leadership skills and better organizational capacity.

The reason for not acquiring these intangible benefits from ecotourism may be the fact that residents are not, like is the case described by Stronza and Gordillo (2008), involved in conservation management. Still, it seems that the absence of participation in management does not hinder the sustainability of the relationship between the native community and the founders of TAMAR. However, what will the future for sea turtle conservation be with the ongoing changes in local demographics? Will the ‘new’ population value the history of TAMAR in the village and with the native community?

It is unlikely that the ‘new’ population will share similar values and perceptions about the founders of TAMAR because sea turtle conservation is already a ‘common



norm' in the village. Therefore, perhaps, the factors that have helped TAMAR protect sea turtles for the past 25 years may not longer be applicable among the 'new' population. One indicator of such changes is the ongoing, though minute, illegal harvesting and bycatch in fishing gear of sea turtles. Residents pointed out two main social groups in the village as those who pose this threat to sea turtles. These two groups, they said, unlikely have ties with TAMAR or with the native community because they are outsiders. Perhaps, for this new group, economic incentives and enforcement may be greater incentives in whether they either support or not sea turtle conservation. Taking into consideration residents' perceptions about TAMAR, enforcement, and tourism development in the village, the factors that likely influence support are economic and enforcement. In this case, economic benefits are likely to work as incentives for sea turtle conservation and enforcement as incentives to prevent sea turtle consumption.

Therefore, if economic benefits, relationship with the founders, and enforcement seem to drive conservation among the majority in the community, what is driving some residents to consume sea turtles? Perhaps limited economic benefits from sea turtle conservation, no ties with TAMAR, and weak enforcement by the IBAMA are the reasons some residents harvest sea turtles. Among these reasons, TAMAR has some control over how it relates to the community and how much it can pay in salaries. However, due to the socioeconomic complexity of this scenario, this is only a speculation.

## **2.12 Conclusion**

The migratory nature of sea turtles in association with threats caused by illegal harvesting, trade, and accidental bycatch are activities that continue to threaten sea turtle populations (Domingo *et al.*, 2006; IAC, 2004; Marcovaldi *et al.*, 2002). One conservation approach used by many conservation programs is the enforcement of sea turtle protection laws (Broderick *et al.*, 2006; Chaloupka *et al.*, 2008; Marcovaldi *et al.*, 2007; Troëng & Rankin, 2005). In some locations, this strategy has failed to control

illegal activities from taking place (Caribbean Conservation Corporation, 2008; Gray, 1997; Sea Turtle Restoration Project, 2009).

Mast (1999) argues that ‘Without confronting the threats posed by humans, and getting creative about how to deal with them, conservation will not occur’ (1999: 7). As such, understanding the reasons people consume and protect sea turtles can enhance the influence conservation strategies have on local support for conservation through the implementation of strategies that are most appropriate to address these reasons.

In Praia do Forte, enforcement of sea turtle protection laws by TAMAR is now a conservation strategy supported by most in the community, including the fishermen. However, ongoing harvesting and accidental bycatch in fishing gear, which often leads to sea turtle deaths, challenges the effectiveness of this approach to control predation of sea turtles. Many residents from both communities also believe sea turtle harvesting is likely to increase without enforcement. These perceptions support the use of top-down approaches in conservation to protect biodiversity. Furthermore, the finding that native and non-native residents of Praia do Forte support conservation and that they claim that outsiders - non-native and non-local construction workers and non-native lobster fishermen - are the main threats to sea turtles in the village are indicators that community-based conservation may not be sufficient to control threats to conservation on a larger scale. In this case, the larger scale is regional coastal development, which demands construction workers to build the hotels and subdivisions, and supplies with a variety of employment opportunities. These two activities lead to an increase in population demographics, which are associated with some of the socioeconomic problems tourism brings to the community. These findings contradict Hardin’s (1968) argument that common property is likely to be degraded by those who have access to these shared resources.

In the case of sea turtle conservation in Praia do Forte, TAMAR, with the support of the community, has been able to protect sea turtles for more than two decades. However, based on perceptions of and the presence of real (e.g. harvesting and bycatch accounts) threats to sea turtles, it seems that they may not be able to continue doing so in

the longer term because sea turtles are common resources accessed to anyone. In other words, TAMAR or the community cannot control the access people have to sea turtles because sea turtles are within an open access system. Thus, the ability to protect sea turtles is also influenced by the presence of external factors, which are population growth and coastal development. This is an example of ‘Tragedy of Open Access’ rather than a ‘Tragedy of the Commons’.

The ability to address these factors may be TAMAR’s greatest challenge despite of the local support provided by the native families and local residents for sea turtle conservation. This demonstrates that the factors that drive sea turtle consumption and conservation can change overtime, often along the socioeconomic changes that occur within and surrounding the involved communities. Thus, whether enforcement - as it is being implemented - will continue minimizing sea turtle harvesting and bycatch in fishing gear is questionable. Perhaps if the federal agents of the IBAMA were more effective in enforcing these laws or if the federal government provided the needed resources for these agents to better patrol and regulate illegal activities, there could have been fewer cases of illegal harvesting and bycatch in fishing gear. Thus, TAMAR can only do so much since it cannot make arrests and it relies on the federal government to take action against those who are breaking the laws.

As a final remark, Marcovaldi *et al.* (2005) state that ‘The greatest and most complex challenges to long-term conservation of sea turtles in Brazil, and elsewhere, is changing the habits of coastal communities in which intensive rates of natural resource use is a vital source of subsistence and income, essential for survival’ (2005: 39). Results from this study show that TAMAR, over the course of more than 25 years in implementing sea turtle conservation strategies in Praia do Forte, seems to have addressed to some of these challenges - ‘changing the habits of coastal communities’ since sea turtle harvesting has been decreasing since 1982.

In the longer term, however, current illegal activities can become greater problems as result of changes in local demographics and coastal development. Hence, a challenge for sea turtle conservation efforts in Praia do Forte, no longer solely focus on

how 'locals' value and use of sea turtles, but also on how 'outsiders' value and use sea turtles. Because of these changes, 'local' sea turtle conservation efforts must also address 'broader' challenges to sea turtle conservation. By doing so, sea turtle conservation efforts may be able to adjust and address the greater political and economic power relations that already influence the local and regional coastal development practices. Only time will tell whether the local community will be able to sustain its influence over sea turtle conservation as it slowly becomes 'a smaller community' within the 'new' community of Praia do Forte.

### 3. THE USE OF EMPLOYMENT AND INCOME FROM SEA TURTLE ECOTOURISM TO PROTECT SEA TURTLES IN PRAIA DO FORTE, BRAZIL

#### 3.1 Introduction

Overexploitation of sea turtles and other negative impacts on their populations persist in many locations because of economic incentives associated with the direct consumption of their meat, shell, and eggs (Troëng & Drews, 2004). Different conservation approaches have been implemented in an effort to control these activities that threaten sea turtle survival (Campbell, 1998; Marcovaldi *et al.*, 2005; SWOT, 2006; Tisdell & Wilson, 2002). One conservation strategy is to provide communities with economic alternatives to the direct consumption and trade of sea turtles.

Since the signing of the United Nations' Brundtland Report in 1987 (Brundtland, 1987) and the initiation of socially 'sustainable' approaches to conservation, some resource managers are adopting conservation strategies that take into greater consideration the socioeconomic needs of local communities and the needs of nature (Wells & Brandon, 1992). These sustainable management practices aim at achieving long-term social and economic well-being of local communities while minimizing resource use practices that lead to resource degradation (Cater, 1993). Ecotourism is one of the approaches used to achieve biodiversity conservation.

In Praia do Forte, Brazil, the community harvested sea turtles for their meat and eggs on a constant basis to support their livelihood needs. Since 1982, the Brazilian Sea Turtle Conservation Program, TAMAR, uses economic benefits from sea turtle ecotourism as one of the conservation strategies to gain local support for sea turtle conservation. Studies on sea turtles nesting and sea turtle harvesting activities show an decrease in sea turtle harvesting activities in Praia do Forte since early 1980s (Marcovaldi & Chaloupka, 2007; Marcovaldi *et al.*, 2007; Marcovaldi & Marcovaldi, 1999; Santos *et al.*, 2000). Is the provision of economic benefits from sea turtle ecotourism related to this positive outcome for sea turtle conservation? If so, what factor, or combination of factors,

influenced this outcome? In this chapter I evaluated how employment and income from sea turtle ecotourism relate to local support for sea turtle conservation.

### **3.2 Ecotourism: A Strategy to Biodiversity Conservation**

Ecotourism is often promoted as a conservation strategy that addresses the socioeconomic needs of local communities and the needs of the environment (Ceballos-Lascurain, 1996; Honey, 1999; Stem *et al.*, 2003; Stronza & Gordillo, 2008). The International Ecotourism Society (TIES) defines ecotourism as ‘Responsible travel to natural areas that conserves the environment and improves the well-being of local people’ (TIES, 1990). Economic benefits to local communities are frequently measured and provided in the form of employment opportunities and generation of alternative sources of income (Stronza, 2001; Troëng & Drews, 2004; Wallace & Pierce, 1996). Through the trickling down of such benefits, it is theorized that residents would more likely support biodiversity conservation (Ross & Wall, 1999; Weaver, 1999).

Support for biodiversity conservation is associated with changes in resource use practices into activities that are less detrimental to the resources (Langholz, 1999; Wunder, 2000). Robinson and Redford (1991) stated that conservation of local resources will be achieved only when wildlife is perceived by local communities as being useful to them. Therefore, as noted by Pearce and Moran (1994), the loss of access to resources via protection can only be minimized if the value of protecting these resources outweighs the benefits forgone via conservation, such as the opportunity costs and the direct costs of protection. As such, conservation of biodiversity should not be separated from socioeconomic development and from addressing the socioeconomic needs of local communities (Wells & Brandon, 1992).

Bookbinder *et al.* (1998) emphasize that to effectively achieve economic benefits and biodiversity conservation, ‘An appreciable amount of revenue’ (1998: 1400) must return to local communities to promote conservation stewardship and to change local uses of resources, which in turn would lead to conservation of these resources. In theory, these economic benefits are expected to create an incentive for biodiversity conservation

(Weaver, 1999) and ecosystem restoration (Wild, 1994). The basic ideology behind development and conservation is that the creation of alternative sources of income for local communities must be compatible with conservation practices (Langholz, 1999). This compatibility minimizes the pressure put by local communities on the resources (Langholz, 1999). It is assumed that by implementing natural resource management practices designed to increase local income generation, local tourism practices will reduce local dependence on traditional resource uses that are detrimental to local resources (Borrini-Feyerabend, 1996; McNeely, 1998; Tisdell, 1995).

In some situations, however, the provision of economic alternatives to traditional practices may not necessarily lead to conservation benefits. In Peru, Stronza (2007) found that economic benefits from ecotourism have mixed effects on conservation, depending on whether the benefits are associated with wage labor, which resulted in less direct pressure on resources, or with income, which enabled increased consumption, purchases of new technologies, and increased pressure on resources.

Another potential problem of providing economic incentives in return for support of biodiversity conservation is that ecotourism programs that focus on changing locally-driven resource use practices, such as small scale fishing and forest clearing through the promotion of economic alternatives, often ignore the large-scale political and economic drivers of environmental degradation, such as regional coastal development activities. In these situations, ecotourism programs may address local socioeconomic needs by providing residents with economic alternatives that reduce their needs of relying on local resources for their livelihoods. However, these achievements may collide with pressures of, or incentives from, a greater scale that goes beyond the community level. Within these scales may come the demand, for example, of some species protected by ecotourism. One example is the illegal trade of species across countries as part of the black market of wildlife trade (CITES, 2009). In Southeast Asia, illegal sea turtle harvesting increased over the past couple of years despite ban on sea turtle harvesting (SWOT, 2008). Another example is the demand of sea turtles for religious purposes. In Northwest Mexico, Nichols and Palmer (2006) estimate that approximately 15,600 to 31,200 sea turtles are

consumed yearly, with peak consumption during Easter and Christmas holidays that, alone, create demand for about 10,000 additional sea turtles from the black market. Because the demands from these different scales may determine whether biodiversity is protected or not, the influences and expectations from these scales should be understood and taken into consideration when developing and implementing ecotourism programs.

Moreover, though the potential to provide local communities with economic benefits exists, some ecotourism programs have generated limited economic benefits to local communities (Bookbinder *et al.*, 1998; Jacobson & Robles, 1992). This outcome has influenced biodiversity conservation efforts. In Belize, limited and seasonal income from ecotourism created dissatisfaction among the community, leading to further degradation of resources (Belsky, 1999). In Mexico, Young (1999) learned that economic benefits from whale watching ecotourism in Laguna San Ignacio and Bahia Magdalena have yet to reduce local pressure on fisheries. Also in Mexico, Barkin (2003) noticed that although there was local support for conservation, resource degradation was associated with limited employment opportunities.

As such, ecotourism programs should not only focus on providing local communities with economic benefits, but also on providing them social benefits, such as empowerment and social justice. Stronza (2007) notes that economic benefits combined with local participation in conservation management provide conservation incentives while also building new values and capacities for collective stewardship of resources. The presence of these benefits may give communities the power to curb or help minimize pressures from the larger scale imposed on the community scale.

### **3.3 Sea Turtle Ecotourism**

The potential to achieve the needs of local communities and the needs of biodiversity makes ecotourism the chosen conservation approach of many sea turtle conservation programs (Godfrey & Drif, 2001; Jacobson & Robles, 1992; Marcovaldi & Marcovaldi, 1999; Petro, 2007; Tisdell & Wilson, 2002; Vieitas & Marcovaldi, 1997). The potential of ecotourism to achieve the needs of local communities and the needs of



biodiversity makes ecotourism an ideal sea turtle conservation approach where resource degradation, illegal sea turtle harvesting, and other human activities are the main threats to sea turtle survival (Wilson & Tisdell, 2001). Patiri (2002) finds that complex socioeconomic and environmental problems in Brazil, such as social disparities and environmental degradation, are often mutually reinforcing problems that cannot be addressed separately. As such, conservation programs that also address the socioeconomic needs of local communities are more likely to achieve and sustain conservation in the longer term.

In their seminal edited volume on sustainable wildlife use, Robinson and Redford (1991) argued that conservation will be achieved only when wildlife is perceived as useful by the communities. Employment opportunities and income alternatives are commonly used as economic incentives for local communities to stop harvesting sea turtles for direct consumption and adopt other practices that favor sea turtle conservation, such as sea turtle ecotourism (Putra & Bailey, 2007; SWOT, 2006; Wilson & Tisdell, 2001; WWF, 2008). Troëng and Drews (2004) point out that sea turtle ecotourism has greater potential for economic growth and generates proportionally more jobs to local communities than does consumptive uses of sea turtles, such as the harvesting of sea turtles for their meat and eggs. At Mon Repos, Australia, sea turtle ecotourism is providing positive signs of sea turtle conservation success, such as local support for sea turtle conservation efforts and the provision of economic benefits for sea turtle conservation via income from entrance fees (Wilson & Tisdell, 2001). In Costa Rica, sea turtle ecotourism is an important source of income and employment for many local families near Tortuguero National Park (Troëng & Drews, 2004). Troëng and Drews (2004) found that these economic benefits influence local support for sea turtle conservation, especially because sea turtle ecotourism is providing residents with income during the low tourism visitation season. In Indonesia, sea turtle ecotourism was introduced as a sea turtle conservation strategy to reduce local pressure on sea turtles from illegal harvesting (Putra & Bailey, 2007). The authors observed that the introduction of sea turtle ecotourism, as an economic alternative to sea turtle harvesting, is providing

former sea turtle hunters with employment opportunities. The authors also noticed that street vendors no longer use sea turtle meat but instead they use other types of meat. In Tanoliu, in the South Pacific Islands, economic benefits from sea turtle ecotourism are providing the local community with alternative sources of income and employment opportunities and enhancing locals and tourists awareness about sea turtles and sea turtle conservation efforts (Petro, 2007). These sea turtle ecotourism practices are also associated with the generation of positive results to sea turtle conservation and benefits to local communities, such as reducing sea turtle harvesting activities, providing alternative sources of income to local communities, and enhancing local self-esteem (SWOT, 2006).

The promotion of such feelings and achievements makes ecotourism more than an economic tool, but a cause of new understandings, skills, values and social relations (Stronza & Gordillo, 2008). Under this view, local communities decide to change the way they use and value the resources not only because of the economic gain associated with this change, but also because of their feelings of capacity, the strength of the local community institutions, and overall socioeconomic stability (Stronza, 2007). These benefits, argues Stronza (2007), are not often achieved when tourism is imposed as a top-down approach or when the community is only involved through employment or as service providers. Together, economic benefits and collaboration in management are aimed to promote incentives for residents to change their resource use practices and local values about these resources and adopt practices that are less detrimental to the environment, thus leading to conservation (Stronza, 2007).

In the fishing village of Praia do Forte, Brazil, the community harvested sea turtles for their meat and eggs on a constant basis to support their livelihood needs. Longitudinal studies on sea turtle nesting activities show some signs of conservation success, like a reduction on sea turtle harvesting since early 1980s (Marcovaldi & Chaloupka, 2007; Marcovaldi & Marcovaldi, 1999; Santos *et al.*, 2000). Since 1982, the Brazilian Sea Turtle Conservation Program, TAMAR, provides employment opportunities and alternative sources of income from sea turtle ecotourism as some of the conservation strategies used to gain local support for sea turtle conservation. Is the

provision of employment and income from sea turtle ecotourism related to the decrease in sea turtle harvesting in Praia do Forte? If so, what factor, or combination of factors, influences how employment and income relate to local support for sea turtle conservation? My goal was to understand this relationship by evaluating how employment and income from sea turtle ecotourism relate to local support for sea turtle conservation.

Based on peer-reviewed literature on ecotourism and sea turtle conservation, I expected to find that development through ecotourism would be important for building incentives for sea turtle conservation, but that such incentives may not be enough to protect the sea turtles. To understand this relationship, I evaluated the influence of this conservation strategy in the way residents use and value sea turtles, in promoting the economic well-being of the household, and its influence on traditional ecological knowledge. Findings from this study will shed light on whether economic benefits without local participation are sufficient incentives to gain local support for sea turtle conservation.

### **3.4 Traditional Ecological Knowledge and Sea Turtle Conservation**

Berkes (1999) defines traditional ecological knowledge as a ‘Cumulative body of knowledge, practice, and belief, evolving by adaptative processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment’ (1999: 8). Drew (2005) argues that traditional ecological knowledge is site specific and represents the information communities need for their cultural survival. The use of this knowledge for survival makes those who carry this knowledge ‘experts’ on those specific traits. Among the residents of Praia do Forte, the fishermen are the ‘experts’ when it comes to sea turtles and local marine resources. Therefore, learning about and sustaining this knowledge across generations may be an asset for local sea turtle conservation efforts.

Berkes (2004) finds that though rural people throughout the world have relied upon the local resources for their livelihood for a longer period, long enough for this

reliance to become traditional, some factors are causing the degradation and loss of these traditional systems. He argues that industrialization, technology change, urbanization, colonization, and stresses due to population pressure, loss of local control over the resources, and commercialization of subsistence resources have resulted in the degradation and the disappearance of traditional systems.

In Praia do Forte, sea turtle conservation and tourism development activities have become the main economies of the village, substituting the long-term practices of agriculture via a coconut plantation and fishing, which was used for subsistence and as part of the local economy. This shift of the local economy and land tenure system is likely to have influenced local access to resources, introduced different market economies, and caused changes in the local infrastructure. Therefore, it makes sense to ask whether and how local residents have maintained or lost their traditional ecological knowledge as a result of the changes. For the purpose of this study, I ask how TAMAR's conservation strategies have influenced traditional ecological knowledge.

TAMAR provides economic incentives, via employment and income, from sea turtle ecotourism, to gain local support for sea turtle conservation. Since 1982, the fishermen have been working at TAMAR in a variety of sea turtle conservation activities. Drew (2005) argues that the introduction of new markets is associated with the erosion of traditional ecological knowledge. Are economic benefits from TAMAR associated with the erosion or with the sustainability of traditional ecological knowledge?

As traditional ecological knowledge is an integral part of local culture and management practices specific to the area, the incorporation of traditional knowledge with scientific knowledge can generate new resource management regimes (Berkes, 2004). Because of this potential in improving resource management practices, Berkes and Folke (1998) ask how resource management may be improved by supplementing scientific data with traditional knowledge. In this chapter, I evaluate (1) how traditional ecological knowledge influences sea turtle conservation practices and (2) how employment at TAMAR influences the maintenance of traditional knowledge.

### 3.5 The TAMAR Project in Brazil and in Praia do Forte

Created in 1980, the Brazilian Sea Turtle Conservation Program - TAMAR - ICMBio Program is a collaborative effort between the Brazilian government's Institute of Renewable Resources (IBAMA - ICMBio) and a non-profit organization, 'Fundação Pró-TAMAR' (Foundation Pró-TAMAR). TAMAR has 22 research stations and monitors 1,100 kilometers of beaches in nine Brazilian states. It employs approximately 1,300 people from the coastal communities where TAMAR works (SWOT, 2007). The national headquarters of TAMAR and the 'Fundação Pró-TAMAR' are located in Praia do Forte. Since its establishment in 1980, TAMAR develops and implements conservation strategies that are aimed at protecting sea turtles at both local and national levels (Marcovaldi & Marcovaldi, 1999; Marcovaldi *et al.*, 2005).

TAMAR proactively seeks to provide economic benefits, via employment and income, to residents of the coastal communities in Brazil who have traditionally depended on sea turtles to meet their subsistence and income needs (Marcovaldi *et al.*, 2005; Marcovaldi & Marcovaldi, 1999). TAMAR also provides environmental education programs and enforces sea turtle protection laws in efforts to gain support for sea turtle conservation and enhance understanding of sea turtles and environmental conservation. Since 1980, TAMAR has released more than 9 million sea turtle hatchlings nationwide (Fauna Brasil, 2007). For some, this achievement makes TAMAR an example of effective sea turtle conservation (Mast, 1999; Spotila, 2004). TAMAR also enforces sea turtle protection laws, which, among other stipulations, prohibit the harvesting of sea turtles in Brazil.

In Praia do Forte, TAMAR monitors 50 Km of coastline (Marcovaldi & Marcovaldi, 1999). TAMAR's conservation efforts show some signs of conservation success, such as a reduction in human predation on nesting females and nests (Marcovaldi *et al.*, 2007; Marcovaldi & Laurent, 1996; Santos *et al.*, 2000).

### 3.6 Sea Turtles in Brazil and in Praia do Forte

Five of the seven species of sea turtles are found in Brazil: *Caretta caretta* (loggerhead), *Eretmochelys imbricate* (hawksbill), *Chelonia mydas* (green), *Lepidochelys olivacea* (olive ridley), and *Dermochelys coriacea* (leatherback) (Marcovaldi & Laurent, 1996). These five species of sea turtles are threatened of extinction (IUCN, 2008). The loggerhead and the green turtle species are classified as endangered and the hawksbill and the leatherback species are classified as critically endangered (IUCN, 2008).

Bahia is an important location for the study of sea turtle conservation because it has the largest number of nesting activities of hawksbill turtles, one of the most threatened sea turtle species with extinction all over the world (Spotila, 2004) and the beaches of Praia do Forte host the largest concentration of loggerhead turtles in Brazil (Marcovaldi & Laurent, 1996).

In Brazil, sea turtle harvesting is prohibited by federal law (Law of Environmental Crimes, no. 9605, of 12/02/98) and punishable by imprisonment of 6 to 12 months and a fine (Projeto TAMAR, 2008). TAMAR has the federal mandate to protect sea turtles in Brazil (Marcovaldi & Marcovaldi, 1999). Under the ICMBio's legislation, TAMAR controls the areas of sea turtle reproduction and feeding through the enforcement of these sea turtle protection laws (Projeto TAMAR, 2008).

In Praia do Forte, the sea turtle nesting season coincides with the peak tourism season. During this period, the staff of TAMAR patrols the 50 Km of continuous coastline (Marcovaldi & Marcovaldi, 1999). Beach patrol takes place during the nights and early mornings to check for nesting activities.

The dramatic increase in tourist numbers - including seasonal residents - in the village during this season, both from within and from adjacent hotels like the IberoStar, puts pressure on sea turtles and on local natural resources. Therefore, beach monitoring, environmental education, and enforcement of sea turtle protection laws are crucial during this period.

### **3.7 Study Area: The Fishing Village of Praia do Forte**

The fishing village of Praia do Forte is located on the northeastern coast of Brazil, about 80 Km north of Salvador, in the state of Bahia (Bahiatursa, 2008) (Figure 3.4). The region where Praia do Forte and Imbassaí are located is called the Coconut Coast (Figure 3.1).

Settlement of Praia do Forte goes back to 1551 during Portuguese settlement in the region (FGD, 2005). The area where Praia do Forte is now located was once within a coconut plantation. The village was formed when families, including the first fishermen, moved to the area to work at the coconut plantation (POdePF, 2008) in the end of the 19th century (Bahiatursa, 2008). These residents form the native residents and native families of Praia do Forte. They, in addition to other social groups in the community, form the main stakeholders in sea turtle conservation in Praia do Forte (See Table 3.1 on page 113). These social groups were defined during the first phase of this study, which took place in 2006. These are definitions provided by the native families when asked about the community and the people who form the community.



Figure 3.1: Map of the Coconut Coast along the northern coast of Bahia and the communities of Praia do Forte and Imbassaí. Source: [http://www.setur.ba.gov.br/opinv\\_zona\\_coqueiros.asp](http://www.setur.ba.gov.br/opinv_zona_coqueiros.asp)

The coconut plantation was sold in mid 1970s. The new owner ceased the plantation operation and developed the first ‘pousada’ (a Bed & Breakfast like type of establishment) in the village. This shift in land ownership and economy led to local socioeconomic changes, such as the outmigration of many native families, the prohibition



of some of the traditional practices (e.g. raise livestock), and the introduction of tourism as the main economy.

**Table 3.1: The main stakeholders in sea turtle conservation in Praia do Forte**

<b>Main Stakeholders in Praia do Forte</b>	
<b>Local Stakeholders</b>	<b>Characteristics</b>
Native Residents*	Residents who were born in Praia do Forte and residents who lived in the community during the plantation period.
Native Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period.
Local Residents*	A newcomer could 'become', could be 'considered', or be 'called' a <i>local resident</i> if this person married or had a child with a native resident, or grew up in the village.
TAMAR*	The TAMAR Project itself, the entity.
TAMAR Staff ***	The research and administrative team of TAMAR.
TAMAR Workers***	The native and non-native residents.
The Founders of TAMAR**	Drs. Maria Ângela Marcovaldi and Guy Marcovaldi.
Fishermen*	The men in the village who fish/fished for a living or use/used fishing as one of the sources of income and/or food for their families. Unless noted, they are all native to Praia do Forte.
Fishing Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period.
The Women from the Catholic Church*	Women who organize the events at the local Catholic Church. Different generations of women. Their involvement in communal affairs goes back to the plantation period.
The Street Vendors**	Vendors who sell souvenir and gift items on the specified location within the village set by the local government.
The Outsiders*	People who are non-local and non-native. Often from Salvador or other states. Associated as being wealthy people and often Caucasian. Includes seasonal residents, tourists, and permanent residents. They are often the owners and managers working in the tourism industry. Perceived by the native and local residents as having political and economic influence within the community.
The Community of Praia do Forte**	The societal group formed by the people who live in Praia do Forte, both native and non-native residents.

Note: \* These definitions follow the standards the elders and native residents of Praia do Forte gave me during our conversations about the history of the community, the plantation, and TAMAR.

Note: \*\* These definitions are based on the information gathered during the exploratory phase.

Note: \*\*\* Although TAMAR staff work for TAMAR, as do TAMAR workers, they are distinctive because they form the research team of TAMAR. This team includes researchers and administrative personnel who work at the Research Station and Visitor Center. They are not native or local to Praia do Forte. Definitions provided by the community.

In 1982, when TAMAR opened the Research Station of Praia do Forte, the village was still a small fishing village without electricity and it was home to approximately 600 residents (Marcovaldi & Laurent, 1996) (Figure 3.2). At that time, tourism development was still at its infancy. In 2006, the year I conducted the first phase of this study, the village was no longer a small fishing community with just a few resources. The Coconut Coast has become a fast growing tourism destination in Bahia and it concentrates the highest volume of tourism investments in the country (Jornal Correio da Bahia, 2007). The hotel industry in Praia do Forte has the second largest number of hotel rooms in the state (PMMSJ, 2004). In 2007, the year of the second research phase, Praia do Forte was voted one of the top ten best beach destinations in Brazil (Veja, 2007), offering about 2,200 hotel rooms among the many ‘pousadas’ hotels and at the five-star resort, the Praia do Forte EcoResort.



Figure 3.2: Map of Praia do Forte and the location of the TAMAR Project. Source: <http://www.tatuapara.com.br/Portugues/como-chegar.aspx>

It is estimated that the permanent population of Praia do Forte is now about 2,000 and the seasonal population - residents who live in the village during the peak tourism seasons - is of about 4,700 residents (PMMSJ, 2004). Based on these numbers, the overall number of people in the village during the peak tourism season, December to March, jumps from about 2,000 to approximately 10,000 people.

### **3.8 Methods**

This study is divided into three data collection phases. I used snowball and purposive sampling techniques on the first two phases and convenience sampling during the third phase.

#### **3.8.1 First Data Collection Phase**

In my first data collection phase, May to September 2006, I interviewed 25 native residents and 15 non-native residents. This gave me the opportunity to gather detailed information about local values and uses of sea turtles, local fishing culture, history of the village, TAMAR, and overall tourism and conservation activities pre- and post-TAMAR. I measured the perceptions about TAMAR and sea turtles using closed-ended and open-ended questions. Some of the indicators I used to analyze the influence employment and income from ecotourism have on local support for sea turtle conservation included: employment opportunities at TAMAR; household income sources and overall monthly income; household monthly expenses; perceptions about sea turtle conservation; and perceptions about employment and income from TAMAR. In order to evaluate whether income from sea turtle ecotourism at TAMAR provides households with economic means for them to support their livelihoods, I asked four residents of Praia do Forte to tell me what ten items they consider to be good indicators that a people in a household are financially wealthy. The seven items more cited by these four residents became the “wealth indicators” I used to measure wealth among the respondents on the survey.

I attended local communal meetings and events and participated in fishing trips in order to learn traditional practices and the use of local marine resources. I assisted

TAMAR staff with data collection during the sea turtle nesting season and accompanied TAMAR staff during interpretative talks, guided tours, and communal events to better understand local sea turtle conservation efforts and interactions between TAMAR with the community and visitors. I also observed the interactions between TAMAR staff and the community during communal events, at the Center, and Research Station to assess levels of bonding as stated by residents during the interviews.

### **3.8.2 Second Data Collection Phase**

On the second phase, September 2007 to January 2008, I conducted 77 semi-structured interviews during this phase. When allowed, I tape-recorded the interviews. I also took notes during the interviews and conversations. I transcribed and later coded the answers. I interviewed 25 of the 110 TAMAR employees who worked at TAMAR during the time of this study. Out of these 25 employees, 7 are native fishermen and 11 are native residents of Praia do Forte. On average, each interview lasted about 90 minutes and took place at TAMAR or at a location selected by the respondent. I also interviewed 15 households at the coastal community of Imbassaí. Imbassaí is located 11 Km north of Praia do Forte and it is the control community of this study. Residents of Imbassaí responded the same questionnaire used in Praia do Forte. I followed the same approach to gather, analyze, and interpret the data.

### **3.8.3 Third Data Collection Phase**

On the third phase, May to September 2008, I returned to most of the families who I interviewed in 2006, and to some of those interviewed in 2007, to assess their perceptions about the changes that occurred in the village, and within their households, since the beginning of my study in May 2006. I wanted to evaluate the potential influence economic benefits have on local support for sea turtle across time.

### **3.9 Findings: Economic Benefits and Perceptions of Economic Well-being**

A resident explained that soon after TAMAR arrived in the village the community was informed that harvesting could no longer take place and that TAMAR would provide jobs to the community: ‘When TAMAR came they told us that we should no longer harvest sea turtles and that they would offer jobs for us. It was at that time that the opportunity of getting jobs from sea turtle conservation started.’ These associations between employment opportunities and TAMAR were shared among the other native residents in this study. Residents said during the interviews that the number and the types of employment opportunities at TAMAR varied over the years. At first, opportunities were given to the fishermen because the fishermen were the ones in the village who harvested sea turtles, therefore; they were the ones who had the greatest knowledge about sea turtles activities in the area. Residents said that, overtime, employment opportunities at TAMAR increased and diversified to the women and to the non-fishermen of the village. Nowadays, TAMAR is one of the employers that employs the greatest number of people in the village: ‘TAMAR means work because take a look at the number of people who work at TAMAR. The more TAMAR grows, the more TAMAR needs people to work there,’ explained a young local man. This change is associated with the growth of the Research Station and Visitor Center of TAMAR. In 2007, employment records of TAMAR show that 110 people from Praia do Forte and adjacent communities worked for TAMAR in Praia do Forte. Demographic data from my interviews with the 77 households shows that, on average, five people live in each household. Based on this number, approximately 550 people from Praia do Forte and adjacent communities directly benefit from income provided by TAMAR. Also, since most employees at TAMAR represent one family, approximately 110 families benefit from the income provided by sea turtle conservation in Praia do Forte.

Among these 77 households, 36% of them had income from TAMAR, 57% from tourism related jobs, and only 4% from fishing. This income distribution is a good representative of some of the socioeconomic changes that have taken place since the selling of the plantation in mid 1970s. Residents said that during that period families

relied on fishing - either as a source of food, income, or both - to provide for their livelihood needs. As years passed, fishing continued an important cultural and even economic activity for some of the native families. However, as local demographics changed so did the overall role of fishing in the local economy. Nowadays, though the community is still identified as a 'fishing village', the majority of families and residents do not rely on fishing for their income and most, unlike the native families, have no ties with fishing. If TAMAR has a socioeconomic history with residents of Praia do Forte, the opposite may be said about its history in Imbassaí. None of the 15 households from Imbassaí had income from TAMAR. Most (73%) households had income from tourism. Another distinction is that the type of tourism promoted in Imbassaí is not associated with sea turtles, but with recreation activities at the local river. Despite differences in the focus of tourism, both communities show to rely at some level on tourism income, either directly or indirectly, to support household needs.

### **3.9.1 Perceptions about TAMAR**

The overall perceptions residents have about TAMAR set the tone about how the program is perceived by the community and how the implemented conservation strategies may influence local support for sea turtle conservation. When asked what residents thought about TAMAR, 96% of respondents from Praia do Forte showed to have a positive association with TAMAR. Overall, residents associate TAMAR as an entity that provides the community with employment, alternative sources of income, and education opportunities to the local children and youth. When I asked residents of Imbassaí this question the majority also showed to have a positive association with TAMAR. However, unlike the results from Praia do Forte, more residents from Imbassaí thought of TAMAR more for its role in protecting the environment rather than as a component of the local economy (Figure 3.3).

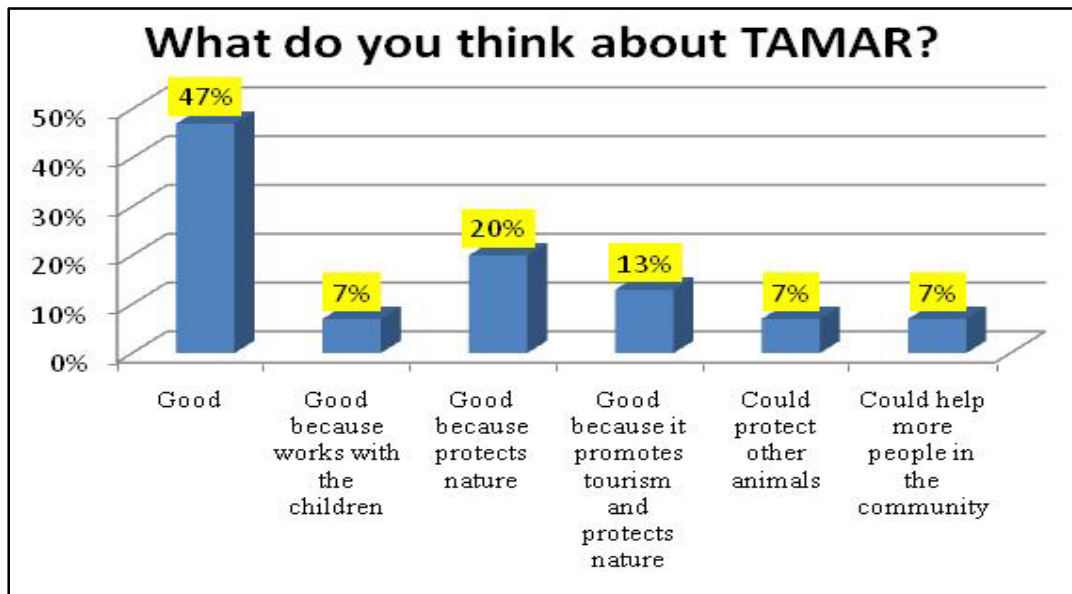


Figure 3.3: Residents of Imbassaí and their perceptions about TAMAR.

The above graph shows that most respondents view TAMAR as a conservation program rather than a provider of economic benefits, either employment or income, to the community. The closest association residents provided with regards to economic benefits was the comments that TAMAR helps promote the tourism economy, though not in Imbassaí, but in Praia do Forte. This feedback was somewhat expected since TAMAR does not have a Visitor Center or Research Station in the village, thus there are no direct employment opportunities to residents at TAMAR within the village as they are in Praia do Forte. Although residents of Praia do Forte were knowledgeable about TAMAR's work in protecting sea turtles and support sea turtle conservation, the majority associated TAMAR's conservation strategies used to gain local support for sea turtle conservation - economic benefits and education - than with its mission to protect sea turtles and their habitat.

If income is such an important component of what TAMAR represents to the community of Praia do Forte, does income from TAMAR provides residents the financial resources to support their livelihood needs? Based on the monthly income residents

reported to earn from TAMAR and from other jobs available in the community, the average salary residents earn from TAMAR is lower than the average income residents earn by working at other jobs. On average, TAMAR workers earned \$338.00 per month (\$1.00= R\$1.64) while non-TAMAR workers earned on average \$504.10 per month (\$1= R\$1.64). These results show that, based on the individual salary, not on overall the household income, employment at TAMAR appears to generate less income per capita than do other job opportunities available to residents in the village. However, fewer TAMAR workers have only one source of income than do non-TAMAR worker (Figure 3.4). This result may represent that, at lease for these families, income from TAMAR provides the household the financial means they need to support their livelihood needs.

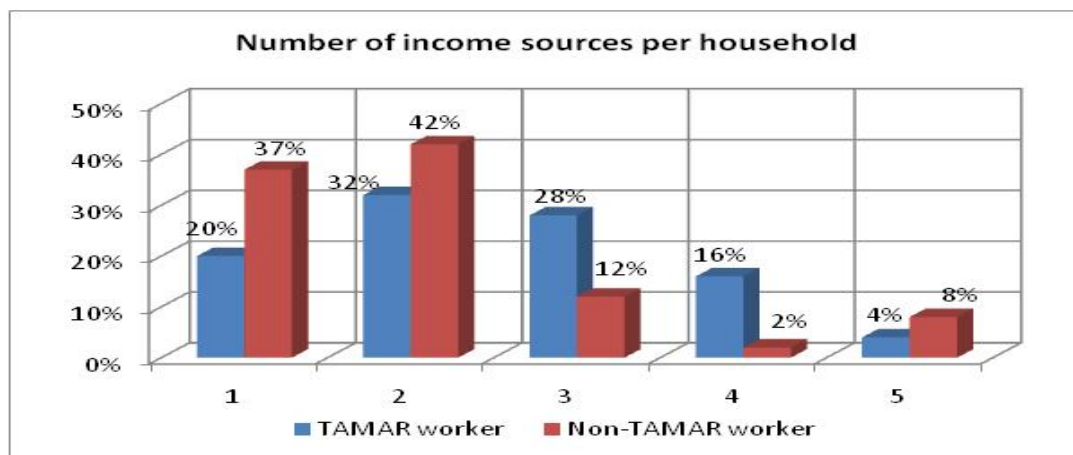


Figure 3.4: Number of income sources per household among residents of Praia do Forte between TAMAR workers and non-TAMAR workers.

However, this graph also shows that more TAMAR workers have more sources of income than non-TAMAR workers. For example, 28% of TAMAR workers versus 12% of non-TAMAR workers have two sources of income. The percentages are also higher for households with four sources of income. In this case, 16% of TAMAR workers vs. only 2% on non-TAMAR workers have four sources of income within the household. The



result that most households have more than one source of income may also indicate that in order to compensate for the lower salary and to provide for the household needs, more families have to have other income sources from other jobs in addition to TAMAR's. Another possibility is that the adults living in the household have jobs. Because these possibilities represent such distinct outcomes, the average salary per person per job category - TAMAR worker and non-TAMAR worker - is a more reliable indicator to measure economic incentives from sea turtle conservation in Praia do Forte.

In order to compare perceptions of well-being between TAMAR workers and non-TAMAR workers, I asked whether respondents owned or whether their homes had a series of specific amenities. The combination of house ownership and house amenities is represented by 'wealth indicators', which were used to categorize local living conditions and household overall financial resources (Figure 3.5).

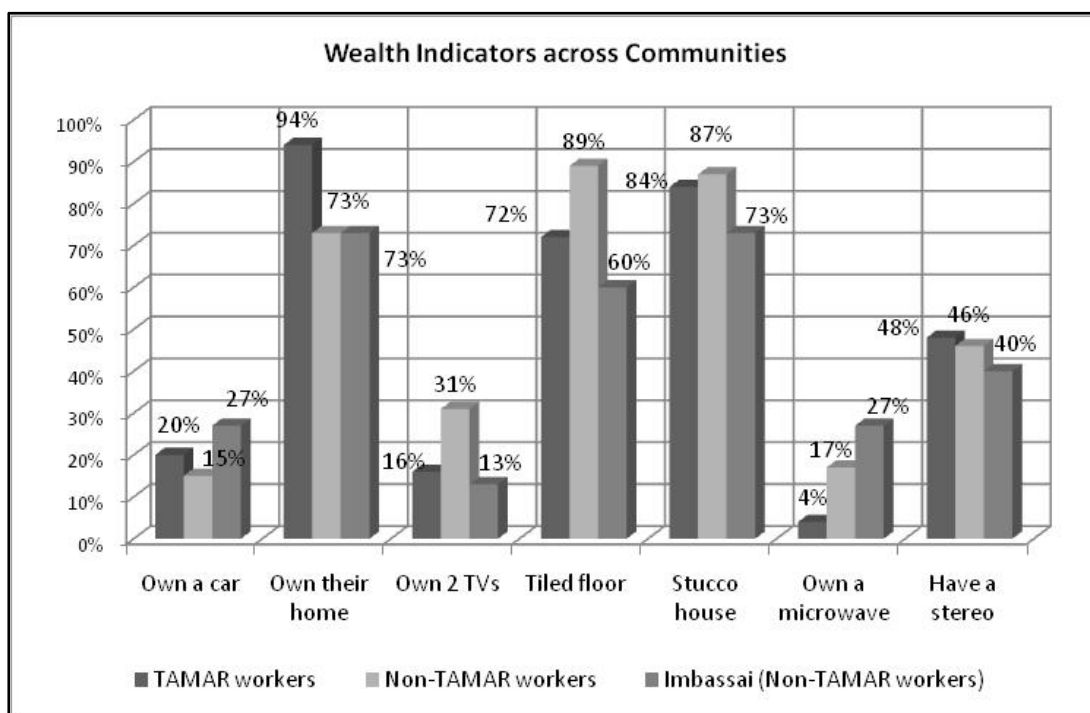


Figure 3.5: Wealth indicators between TAMAR workers and non-TAMAR workers: Comparison between residents of Praia do Forte and Imbassai.

This graph shows that a greater percentage of TAMAR workers versus non-TAMAR workers from Praia do Forte and Imbassaí own the homes they live in. Among the other amenities, the majority of respondents have the basic amenities, which are tiled floors and live in a stucco house. This graph also shows that majority of families do not own the other four items, which were associated as being not ‘essential’ but ‘desirable’.

Is perception of well-being associated with the economic wealth of the family? If so, is ownership of wealth indicators also an indicator of having a good life? In order to answer to this question I first asked residents what a person should have in order to have a good life. Most respondents cited owning a home, having a stable and good income, being able to provide for their families, and having good friends as indicators of a good life. Thus, it appears that home ownership is among the items that determine whether a person may have a good life or not. When asked whether respondents had a good life, most (69%) respondents from Praia do Forte said ‘yes’.

Understanding what residents mean by having a good life can be used to evaluate what belongings are considered ‘basic’ and what are ‘desirable’. This understanding can be used as a baseline of local standards of living in comparison with other communities and groups within the community. Perceptions about having a good life were almost identical between TAMAR workers and non-TAMAR workers (Figure 3.6).



Figure 3.6: Residents of Praia do Forte and perceptions of good life.

These results show that, based on resident's perceptions of good life, most respondents from Praia do Forte, who are both TAMAR workers and non-TAMAR workers, feel they have a good life. In Imbassaí, the majority said they have a good life (Figure 3.7).

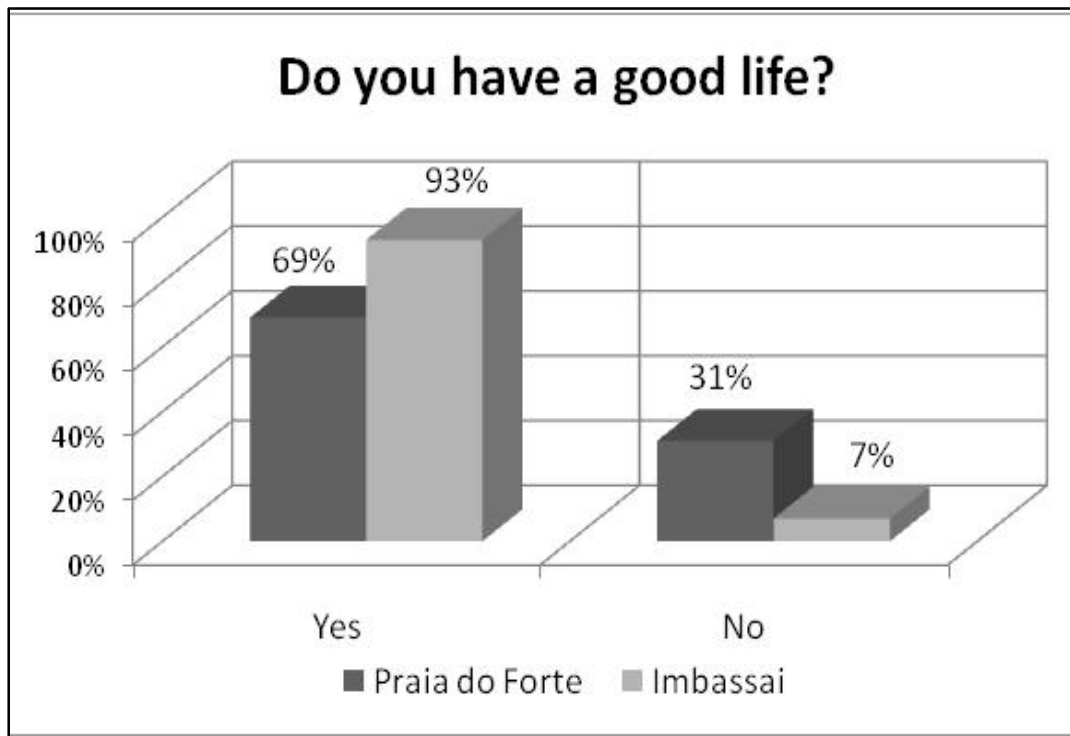


Figure 3.7: Residents' perceptions about having a good life: Comparison across communities.

When asked 'why' they had a good life, the majority of respondents from Imbassai said they have a good life because they have an income and because they feel privileged to live 'surrounded by nature'. For example, one stated that he had a wonderful life because he lived between the river and the beach. Therefore, based on perceptions of having a good life, most TAMAR workers and non-TAMAR workers in Praia do Forte, as well as the majority of respondents from Imbassai, perceive they have a good life. However, when I asked about their expectations regarding their quality of life in five years, the majority of respondents from both communities stated that their quality of life will worsen within that period (Figure 3.8).



Figure 3.8: Comparison between communities regarding residents' perceptions about their quality of life within a five year period.

The above results show that residents from both communities expect the quality of their lives to worsen in the next five years. When asked 'why', residents said the socioeconomic changes brought by tourism will impact their quality of life. When asked to elaborate on the concept of 'tourism', I learned that residents referred to the construction of subdivisions, retail stores, and hotels within and adjacent to the village. Though they associate TAMAR as the reason tourists visit Praia do Forte, they did not associate TAMAR as the reason these changes are taking place. They cited the interests of the local government and the tourism developers as responsible for sponsoring such development for taking place within the village, particularly since the year 2000.

When asked 'what negative things tourism brings to the community', drugs, an increase sense of insecurity, increase of the cost of living, and prostitution are the most cited impacts (Figure 3.9).

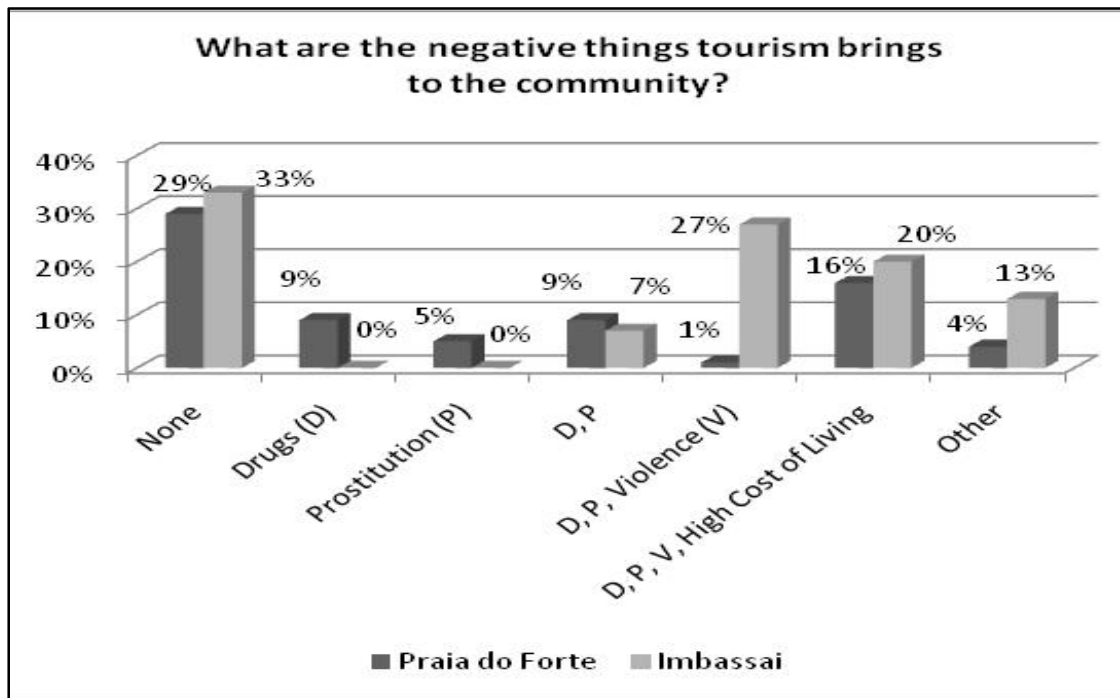


Figure 3.9: Residents' perceptions about the negative impacts tourism brings to the community: Comparison between residents of Praia do Forte and Imbassai.

The above graph illustrates that although about 30% of respondents said tourism does not bring negative impacts to the community, most residents believe tourism brings some type of socioeconomic impact to the community. Seventeen percent of respondents from Praia do Forte associate the loss of their culture and degradation of the local natural resources as some of the impacts caused by tourism. In Imbassai, this perspective was not associated, at least yet, as an impact from tourism.

### 3.10 Findings: Economic Benefits and Traditional Ecological Knowledge

In Praia do Forte, native families relied on fishing to support their livelihood needs during the plantation period. The practice of fishing involved knowledge about local resources, fishing techniques, and about sea turtles. During the interviews, when asked about the history of fishing in the village and the role of fishing in supporting local livelihood, native residents explained that this knowledge passed from one generation to

the next as part of tradition among the native families. Fishing was not an option but an expectation as there were no limited employment alternatives at that time. 'Back then,' said a fisherman, 'We did not have a choice and we had to work with fishing.... Working for TAMAR was easier than going off-shore to fish. Employment at TAMAR also gave many fishermen a steady source of income. Fishing does not give you this stability because we never know how much fish we will catch.'

The fishermen reported that since the mid 1990s the role of fishing in the local economy and as a source of income and employment among families has decreased. Although some residents (27%) in the survey said they fish, only 4% said they have an income from fishing. 'During the plantation period every family here fished because we had to. There was not another option for us. We had to fish, we had to work at the plantation, and the men had to be fishermen because there were no other options for us. But now it is different because we now can work in different locations and we can get more money by working at these jobs than if we work with fishing,' declared a native man. The majority of respondents cited other sources of income for their household, like income from rent (26%) or in tourism (57%).

TAMAR has been employing the fishermen since the opening of the Research Station in 1982. The fishermen are involved in a variety of activities, such as data collection about sea turtles, patrolling the beaches during the nesting season, and testing different fishing techniques. Through these activities the fishermen have a means to implement their knowledge in activities that are not necessarily related to fishing. These activities also provide an opportunity for new learning as traditional ecological knowledge is incorporated with scientific knowledge about sea turtles and local marine ecosystems. During my conversations with some of the fishermen, they said that working at TAMAR gives them the opportunity to still be involved with the ocean without having to deal with the strenuous working conditions fishermen experience when going out at sea to fish. They also said that this opportunity is important to them because though they like to fish, they feel they no longer have the health conditions to do so: 'I am too old to go out and fish. I cannot do that anymore....and many of us cannot do either because we

are too old. We are the only ones left,' lamented a fisherman when I asked him about fishing activities in the village. Therefore, employment at TAMAR may help maintain and create new knowledge about sea turtles and about local marine resource.

### **3.11 Findings: Economic Benefits and Local Uses and Values of Sea Turtles**

#### **3.11.1 Using Economic Incentives to Change Local Uses of Sea turtles**

Upon arriving in the village, TAMAR's main goal was to stop local harvesting of nesting females and their eggs. The staff of TAMAR explained that these activities posed the greatest threats to sea turtle survival at that time since basically all nests and many nesting females were harvested during the nesting season.

A strategy used as an incentive to stop the consumption of sea turtle eggs was to trade chicken eggs for sea turtle eggs. These were material benefits, also a form of economic benefits, from sea turtle conservation. Another economic incentive introduced was paying residents for sea turtle eggs. The money TAMAR paid for these sea turtle eggs, the staff of TAMAR said, was higher than the cost of chicken eggs sold in the village. TAMAR hoped that by providing a greater financial return from protecting sea turtle eggs the community would rather trade with or sell the eggs to TAMAR than to consume them. The purchased and traded sea turtle eggs were then placed at sea turtle hatcheries within the Research Station - now at the Visitor Center - until they hatched. Sea turtle hatchlings were then transported to the adjacent beach and released on the ocean. TAMAR staff highlighted that these two income alternatives were meant to influence the value residents ascribed to sea turtle eggs. Therefore, the removal of sea turtle eggs from the 'local market' was a strategy used to minimize local pressure on sea turtle nests and provide residents with income alternatives to support their livelihood.

Locals also harvested sea turtles for their meat. Therefore, in addition of paying for and trading sea turtle eggs, TAMAR promoted employment opportunities to the fishermen as another kind of economic benefit from sea turtle conservation. TAMAR staff explained that this approach aimed to minimize the economic losses associated with losing access to both sea turtle meat and eggs. During the interviews, the fishermen



explained that although fishing could provide equal or greater income than employment at TAMAR, income from fishing was, and still is, uncertain. Employment at TAMAR gave the fishermen (and later, women and non-fishermen) a relatively steady source of income. Fishermen said that income from TAMAR still is more reliable and employment at TAMAR is safer than going off-shore to fish.

### **3.11.2 Using Economic Incentives to Change Local Values about Sea Turtles**

To evaluate whether economic benefits from sea turtle conservation influenced changes in local values about sea turtles, I asked residents about their perceptions of sea turtle conservation, sea turtles, and about TAMAR. I also asked whether they valued sea turtles differently because of tourism in the village. These questions were asked to the respondents in the survey and in the form of open-ended questions. In Praia do Forte, 94% said they now value sea turtles differently because of tourism. When asked ‘why’, 77% responded that their support is because sea turtles help support the tourism economy. The remaining 23% stated they support sea turtle conservation because sea turtles help promote the tourism industry and because of their ecological status. By ‘ecological status’ residents said things like ‘their numbers are decreasing’, ‘they are protected’, and ‘because without protection they will go extinct’.

A different scenario was presented among the respondents of Imbassaí. Unlike in Praia do Forte, 87% of the respondents from Imbassaí said they do not value sea turtles differently because of tourism (Figure 3.10).

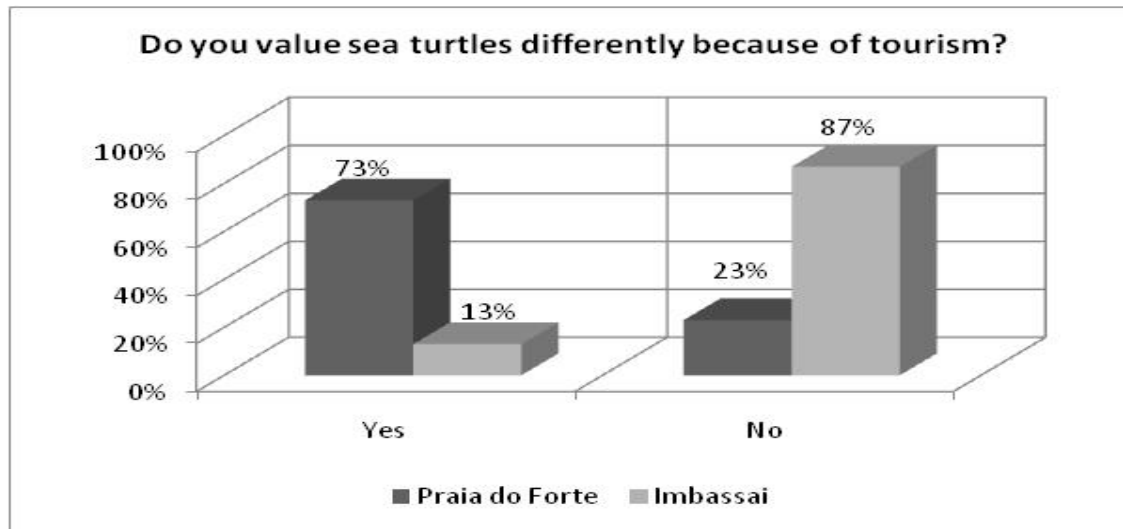


Figure 3.10: Local values about sea turtles in reference to tourism.

The above graph demonstrates that local values about sea turtles are influenced by the way residents perceive the association between sea turtle conservation via TAMAR and the promotion of the local economy, particularly tourism.

When asked ‘why’, residents from Imbassai responded that sea turtles are not the focus of local tourism. One resident explained that: ‘It does not make a difference if the turtles are here or not. People do not come here because of the turtles but because of the river and the beach.’ Another resident stated that: ‘Turtles are a symbol of Praia do Forte but here people see them differently. In Praia do Forte the focus are the turtles here the focus is the river. Therefore, whether there are sea turtles here it does not make a difference.’

As part of the interview questions I asked what residents thought would happen to the sea turtles and to the community if TAMAR would to leave Praia do Forte in order to understand the association between TAMAR (e.g. sea turtles) and tourism development in the village. In Praia do Forte, 62% of respondents said sea turtle harvesting is likely to increase without TAMAR’s presence in the village. There was also a shared belief that the local economy would also be impacted if such situation would to happen. One native

resident explained that: ‘It will be the end of Praia do Forte as we know it today...everybody depends on TAMAR in one way or the other. You either work for TAMAR or you work in tourism...tourism does not take place without TAMAR.’ Another resident said that: ‘If TAMAR ends, tourism here will drop about 50%. So, what will happen if people here stop taking care of the turtles? If they start eating sea turtles again, the tourism here will end, and without tourism we will not have income for our families.’ The perception that TAMAR is a popular tourism attraction in Praia do Forte is shared by the other respondents in this study.

Therefore, it appears that residents perceive TAMAR as a key component of the local economy, particularly with the tourism economy. I asked whether the overall local tourism development influenced their lives. Eighty-three percent of respondents said ‘yes’. I then asked residents to elaborate on these changes and on which they perceived are beneficial and which they perceived as causing impacts to their lives (Figure 3.11).

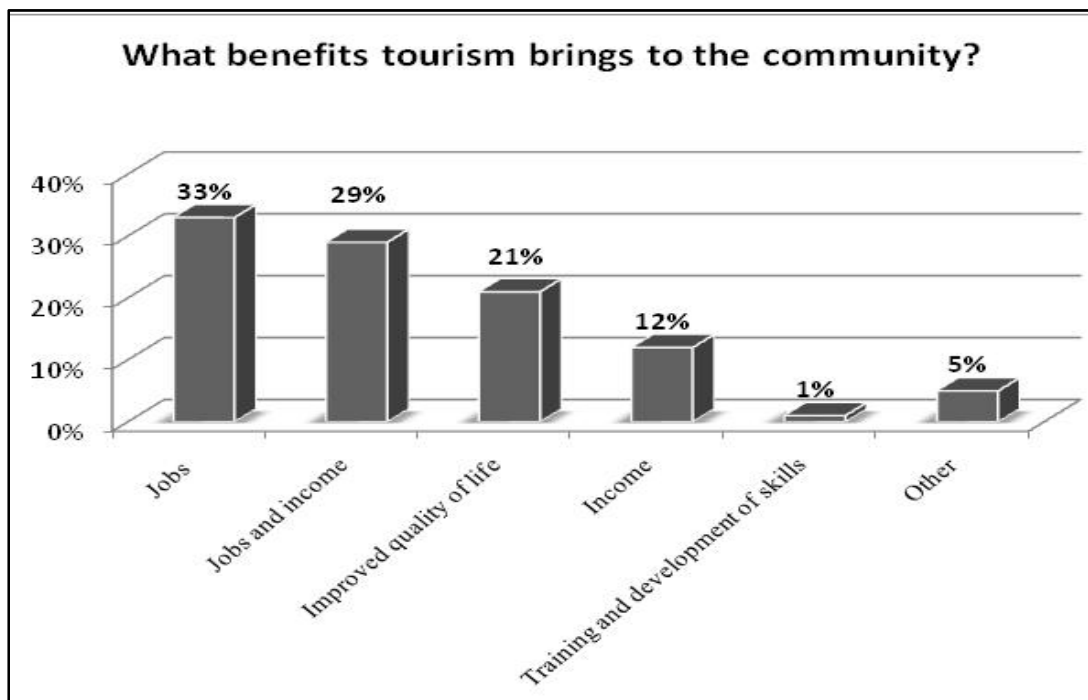


Figure 3.11: Resident perceptions about the benefits tourism brings to the community.

The above figure illustrates that 74% of the respondents from Praia do Forte said the main benefits tourism brings to the community are employment opportunities and income alternatives. Twenty-one percent also said that tourism development has improved their quality of life. When asked to define quality of life, residents associated improvements with the transportation, education, and health care services offered to the community. Based on these results tourism provides the community with some of the basic resources they need to support their livelihood. These benefits are similar to the characteristics residents associate with TAMAR. Ninety-four percent of the respondents from Praia do Forte associate TAMAR as an entity that provides income, employment and education to the children. These characteristics, residents said, are some of the main reasons they feel they have a good life.

The potential of an increase in sea turtle harvesting without the presence of TAMAR in Praia do Forte was also shared among 73% of the respondents from Imbassaí. However, residents associate the lack of patrol by the staff of TAMAR, rather than an impact on the local economy as mentioned by many in Praia do Forte, as the reason harvesting would to increase.

### **3.11.3 Participation in Decision-making and Support for Sea Turtle Conservation**

I also wanted to know how the lack of participation in decision-making influenced local support for sea turtle conservation. To address this question I asked respondents who they thought should take care of the sea turtles. In Praia do Forte, the community has participated in sea turtle conservation via sharing their traditional ecological knowledge and by working at TAMAR but not as part of the decision-making process. Seventy-seven percent of respondents from Praia do Forte and 67% from Imbassaí said TAMAR should take care of the sea turtles (Figure 3.12).

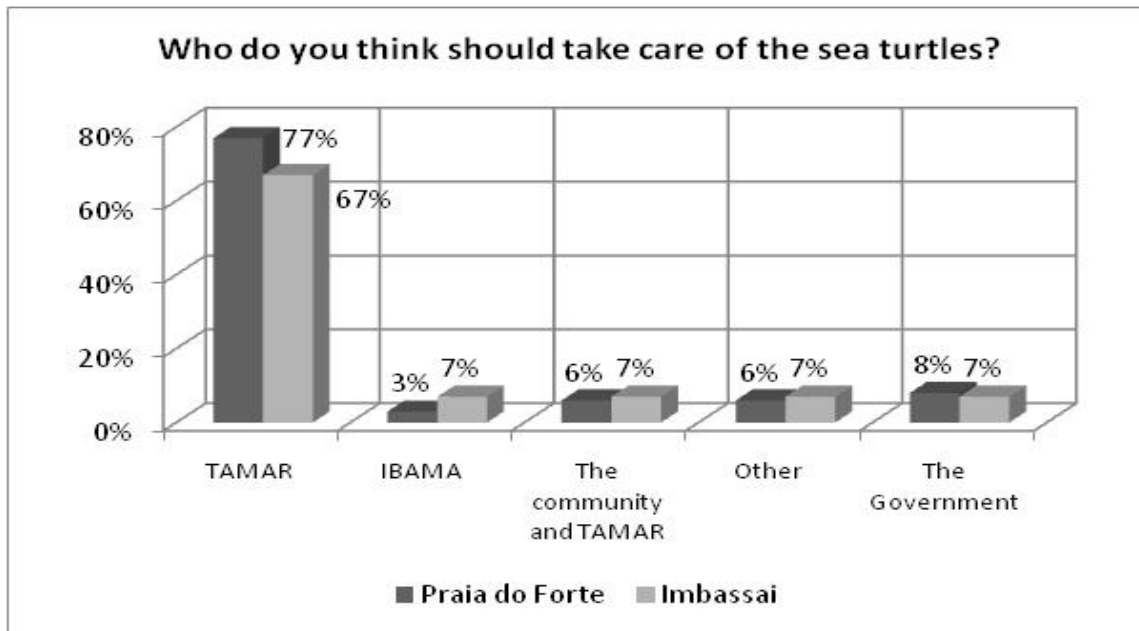


Figure 3.12: Resident's perceptions about who should manage sea turtles in Praia do Forte.

The above figure also shows that respondents from Imbassaí have similar perceptions about who should manage the sea turtles with the residents of Praia do Forte. The number of respondents who believe the community should co-manage the sea turtles with TAMAR was small in both communities. Only 7% of the respondents from Praia do Forte and 6% from Imbassaí said the community should co-manage the sea turtles. When asked 'why', many respondents stated that they believe TAMAR should take care of the sea turtles because TAMAR has 'People who know about sea turtles', 'TAMAR has been doing that for a long time', and because 'They do a good job'. One respondent from Imbassaí said that 'The Project, of course. The Project has to be permanent. If they leave things will change.' Thus, it appears that despite not being involved in decision-making residents not only believe TAMAR should continue managing the sea turtles but there is a community-wide perception that TAMAR's work has been effective in protecting the sea turtles in the area.

I also asked respondents to explain what they meant for ‘Good job’. Among the respondents of Praia do Forte, some of the indicators they gave as reasons that TAMAR is doing a ‘Good job’ are the presence of a research staff ‘That has the degrees’ and because they ‘Care for the sea turtles.’ It seems that, for some, the formal education the staff of TAMAR, via the presence of a college degree has greater influence in determining their capabilities in protecting sea turtles than do the skills acquired via traditional ecological knowledge. These perceptions seem to exist despite the extensive knowledge the fishermen have about sea turtles and about the local resources.

### **3.12 Discussion**

Since the signing of the United Nations’ Brundtland Report in 1987 (Brundtland, 1987) and the initiation of socially ‘sustainable’ approaches to conservation, some conservation strategies are taking into greater consideration the socioeconomic needs of local communities in addition to the needs of nature (Wells & Brandon, 1992). These sustainable management practices aim at achieving long-term social and economic well-being of local communities while minimizing resource use practices that lead to resource degradation (Cater, 1993). That is, rather than imposing externally defined rules and policies, these conservation programs now adopt a participatory approach to conservation where local communities collaborate in decision-making (Bray *et al.*, 2003; Campbell, 2002).

In Praia do Forte, employment and income from sea turtle conservation, and later via sea turtle ecotourism, were introduced by TAMAR in hopes to create an incentive for residents to stop harvesting sea turtles and sea turtle eggs. Results from this study show that employment at TAMAR appears to provide residents with a relatively reliable and stable source of income. Among the fishermen, these two characteristics were cited as important benefits of working at TAMAR because fishing has yet to provide a steady and reliable source of income. These characteristics also appear to appeal to residents who have no ties with fishing as income from TAMAR fluctuates little in relation to tourism

seasonality. During the period this study was being conducted TAMAR was one of the institutions that employed the most people in the village.

One of the claims of ecotourism supporters is that income from ecotourism can work as an incentive for people to adopt practices that are less detrimental to local resources. In theory, economic development goals provided by these programs help support the economic needs of local communities via the development and provision of financial incentives and benefits, such as employment and new income (Stronza, 2008; Troëng & Drews, 2004). Troëng and Drews (2004) claim that economic benefits from sea turtle ecotourism generate more revenue, have greater economic multiplying effects and greater potential for economic growth, and generate more social development and employment opportunities for women than consumptive use of sea turtles. They also argue that the creation of local economic benefits is crucial to create an incentive for the community to convert from direct consumption to conservation of sea turtles (Troëng & Drews, 2004).

On a monthly basis, TAMAR workers earned, on average, less income than residents who took on other types of jobs, such as selling souvenirs or working in retail. Therefore, employment at TAMAR, though potentially more stable and reliable than fishing and other sources of income locally available, is not necessarily the employment opportunity that provides the greatest income. However, because of this stability and reliability many residents said they still prefer to work at TAMAR than in other jobs. Thus, it seems that what attracts residents to work at TAMAR appear to be more than the monetary gain (e.g. income) but a combination of factors. Similar results were found by Stronza (2007) from her analysis of the effects of ecotourism on natural resource use and livelihoods in the community of Infierno, Peru.

Based on residents' perceptions about TAMAR, the combination of economic benefits in conjunction with the long-term relationship TAMAR has with the community emerge as strong pull factors in residents' employment choices. Most of the employees interviewed in this study have been working at TAMAR for many years and most have had other family members working at TAMAR as well. Thus, employment at TAMAR is

somewhat part of the family tradition and, in some ways, a common pattern in the village among native families. However, as presented in this study, the native residents of Praia do Forte no longer form the majority of residents in the village. Therefore, they unlikely have this ‘tradition’ with TAMAR or a long-term relationship with the founders of TAMAR. As a result, TAMAR may be perceived as another job opportunity in the village rather than a family tradition. Under this scenario, the income component is likely to play a role in whether a resident decides to either work at TAMAR or to find a job with another employer. Overtime, this trend may influence the overall perception residents have about TAMAR, which so far has been an overall positive association.

I do not expect, however, that these changes will significantly influence local support for sea turtle conservation because the role of TAMAR, as an important employer and as a key stakeholder in the community, is unlikely to change in the near future. Also, sea turtle conservation shows to be an important economic multiplier in the community and region. By that I mean that economic benefits from sea turtle ecotourism benefit not only those who work for TAMAR but also those who work in other jobs or those who own businesses in the village. Though not the catalyst of the overall tourism and coastal development taking place within and in the surrounding villages, TAMAR is a popular, if not the most popular, destination in Praia do Forte. Thus, in addition to employing about 110 people, TAMAR also generates employment for other residents in the village, such as those who sell gift items with the sea turtle logo, restaurants that cater the tourists who come to see TAMAR, and the overall tourism industry that benefits from TAMAR and from the resources TAMAR helps protect (e.g. tour companies, hotels within the village, and the residents who work at these places). Therefore, while if analyzed in isolation income from sea turtle ecotourism may be less than income from other jobs in the village, overall, employment at TAMAR provides some socioeconomic benefits to the community that would unlikely be provided if it was not for the popularity of sea turtle conservation via the Visitor Center.

As an incentive to stop sea turtle harvesting, employment opportunities at TAMAR also appear to generate more employment opportunities in the community than



sea turtle harvesting. This finding supports the argument of Troëng and Drews (2004) that employment opportunities for women in ecotourism are greater than the opportunities provided by the consumptive use of sea turtles. Unlike the legal sea turtle egg harvesting in Ostional, Costa Rica (Campbell, 2002), sea turtle egg consumption in Praia do Forte was not associated with a local cooperative that generated income, employment or significant social benefits to the community. In Praia do Forte, sea turtle harvesting provided residents with some of their subsistence needs, either for the family consumption or via trade for goods from other communities. Sea turtle harvesting, *per se*, did not provide residents with direct employment opportunities.

### **3.12.1 Economic Benefits from Ecotourism and Effects on Conservation**

Ecotourism is often described as a tool for conservation and development (Bookbinder *et al.*, 1998; Mbaiwa, 2008; Stronza, 2001; TIES, 1990). The assumption is that more economic benefits from ecotourism will generate more - or more effective - resource conservation, and conversely, the end of these benefits would lead to further degradation of these resources (Pagiola *et al.*, 2004; Stronza & Pêgas, 2008; Troëng & Drews, 2004). In some cases, however, greater income from ecotourism has shown mixed conservation results. In Peru, Stronza (2007) found that economic benefits from ecotourism have mixed effects on conservation, depending on whether the benefits are associated with wage labor, which resulted in less direct pressure on resources, or with income, which enabled increased consumption, purchases of new technologies, and increased pressure on resources.

In Praia do Forte, results show that although income from TAMAR appear to not create a direct incentive for residents to harvest sea turtles, many residents in this study said they are using some of their income to purchase land in the communities of Açu da Torre or Açuzinho. In these communities, which are located nearby to Praia do Forte, land is still more affordable than in Praia do Forte. Thus, more affordable prices and greater availability of undeveloped land provide residents of these communities and from Praia do Forte an opportunity to invest in real estate. Some of the respondents stated that

land development in these communities is causing some environmental impacts, such as forest clearing, water pollution as result of untreated sewage treatment, and soil erosion.

A 2004 government report found that coastal development along the Coconut Coast, which includes the communities of Praia do Forte and Imbassaí, will slow down as the availability of undeveloped areas comes to an end (PMMSJ, 2004). Based on this report, population growth on the inner areas, like the communities of Açu da Torre and Açuzinho, will grow steadily both at short-term and mid-term. Population growth will decline in the longer term because the price of land in these areas will increase. This increase is then likely to affect the low income population of these areas and cause a new migration pattern to take place (PMMSJ, 2004). Consequently, as documented by Stronza (2007), economic gains from ecotourism in the short-term may not necessarily lead to conservation in the longer term. In the case of sea turtle conservation, though sea turtles seem to not be the targeted resource on the shorter term, other natural resources located adjacent to the community seem to become the target of this 'economic spillover effect'. There is also the potential that income from sea turtle ecotourism may be used in the purchase of fishing equipment, such as some types of nets that can harm sea turtles. If so, this activity can cause greater threat to sea turtle survival than other resource use activities taking place within the adjacent communities.

These activities do not, however, include coastal development, which is different from the development taking place within the inner areas. Coastal development in Praia do Forte targets the tourist and the seasonal resident, not the overall community of Praia do Forte. This type of development comes with its own threats to sea turtle conservation, such as the problems associated with the use of certain lighting systems, degradation of and impacts on nesting sites, and impacts on nests. Though considered one of the most important contemporary threats to sea turtles in Praia do Forte, this type of coastal development is not directly associated with economic benefits from employment at TAMAR.

### **3.12.2 Economic Benefits and Traditional Ecological Knowledge**

In Praia do Forte, the provision of employment opportunities to the fishermen shows to help sea turtle conservation. In addition of having extensive knowledge about sea turtles and about the local marine resources, the fishermen are the ones who are more likely to witness activities that threaten sea turtles than are residents who have no ties with fishing. In this study, the fishermen were more likely to perceive the presence of threats to sea turtles than were non-fishermen.

The acknowledgement of threats, such as illegal harvesting and the use of illegal fishing techniques or equipment, helps sea turtle conservation efforts because once acknowledged, the staff of TAMAR can report to the IBAMA, which will take the action to address these activities. While the agents of the IBAMA will in fact show up and arrest those who broke the law is another story. At least the presence of the fishermen in the village can be the ‘eyes’ of sea turtle conservation and by doing so they can help TAMAR protect sea turtles. As such, traditional ecological knowledge can be a valuable tool in sea turtle conservation.

### **3.12.3 Economic Benefits and Quality of Life**

Residents from Praia do Forte said that the construction of subdivisions and tourism related establishments (e.g. hotels, B&Bs, and retail stores) has grown substantially since the year 2000. My personal observation about these activities between 2006 and 2008 confirms these statements. Today, Praia do Forte is a very popular tourism destination in Brazil. Praia do Forte may also be reaching its maturity, perhaps even its peak, in its tourism cycle, which started soon after the plantation was sold in mid 1970s. This assumption is based on its popularity, but most importantly on the level of development and availability of open space to expand – vertically (e.g. building a second story) and horizontally (e.g. more seasonal houses, gift shops, and B&Bs). In Imbassaí, tourism development is at its infancy if compared to tourism levels in Praia do Forte. Therefore, some of the changes the residents of Praia do Forte have already witnessed residents of Imbassaí will likely to encounter once coastal development within the village

peaks up. Some signs of these changes occurred during the period this study was conducted. One example is the removal of the beachfront restaurants and houses to other locations within the village.

As such, do these activities influence resident's perception of quality life? Do residents who work at TAMAR perceive to have a better quality of life than non-TAMAR workers? Results show that most respondents (69%) from both groups perceive to have a good life of life. However, almost all respondents (93%) from Imbassaí, which does not have sea turtle ecotourism, reported having a good life. When asked 'why', residents from Imbassaí associated the rustic conditions and the presence of 'abundant nature' as some of the main reasons they consider having a good life. Among the residents from Praia do Forte the main reasons where the provision of an income to support their livelihood needs and better infrastructure. These living conditions are associated with TAMAR's presence in the village.

If today they believe they have a good life, what about in five years? More than 90% of the respondents from both communities said their lives will worsen within this period. In Praia do Forte, residents fear that coastal and tourism development will generate greater socioeconomic impacts to their lives, such as increase in population numbers, increase cost of living and urban violence. Among the residents of Imbassaí the fear is that the village will become 'Like Praia do Forte'. This characteristic was not perceived as a benefit but rather a sign that the quality of their lives will degrade in the near future.

Thus, will Imbassaí become the 'next Praia do Forte'? What does that mean to sea turtle conservation? This means that new challenges will be presented to TAMAR in both communities as changes in local demographics and coastal development are likely to influence sea turtle nesting activities and sea turtle conservation efforts. Since the beaches between both communities are open access, sea turtle conservation strategies, under these conditions, are somewhat challenging. What could TAMAR do to address these challenges? Coastal development along the beaches of Praia do Forte and adjacent communities will continue to increase and so will the number of tourists and seasonal

residents. Therefore, in addition to enforcing regulations that aim at minimizing impacts on nesting areas and on sea turtles and providing environmental education at the Visitor Center, greater participation of the community in decision-making, greater involvement of TAMAR in communal affairs, and more effective enforcement from the IBAMA could help curb the impacts caused by these activities on sea turtles and on their nests.

Although the first two components form the basis of participatory approaches in conservation, such as ecotourism, these strategies may not be possible because of the administrative basis of TAMAR, which is co-managed by the federal government and by the Foundation Pró-TAMAR (Marcovaldi *et al.*, 2005). Therefore, perhaps the level of participation that has been taking place so far is the allowed level of involvement. While such process has worked since TAMAR's arrival in the village, it is questionable if such format will be able to be as effective as it has been with the fast demographic and infrastructural changes the village is witnessing as result of the larger scale and local tourism and coastal development activities.

Nonetheless, it is not too late to rescue the linkage that still exists between the native community and some of the non-native families of the village. Interviews with the native residents showed the presence of a loyalty with the founders of TAMAR and strong support for the work TAMAR does in the village. This trust and loyalty are found to be essential components in collaborative conservation management strategies (Schuett *et al.*, 2001; Stronza & Gordillo 2008), thus should not be underestimated. Results also show that there is, however, some distancing between TAMAR and the community over the past years. Therefore, while the linkage is still present it may weaken if not reinforced. This is particularly the case regarding the staff of TAMAR rather than the founders of TAMAR. While the community associates the past of TAMAR with the founders, the staff of TAMAR forms the team that is more likely to be present at local events, have contact with the fishermen and overall residents, and work at the Center and Research Station. However, unless directly associated with the respondents, residents did not associate TAMAR with the overall staff. Despite this association and relationship gap between the community and the staff, it is not too late to enhance this linkage. As

suggestions, TAMAR staff could be more active in communal events. By doing so, the staff would have contact with other community members beyond the fishermen and beyond the residents who work at TAMAR. These activities could also provide a means for residents and TAMAR to exchange information and ideas that could, perhaps, benefit sea turtle conservation and help minimize impacts coastal development has on local livelihoods.

#### **3.12.4 Conservation by Association**

Most respondents in this study said they believe tourism development is caused by TAMAR's presence in the village. This perception is only partially true. Whereas TAMAR may be one of the reasons many tourists now visit the community, government records show that tourism development in the village, and along the Coconut Coast, was not caused by the arrival of TAMAR in the village in 1982 or by its growing popularity over the years. These records show that tourism development in the region, which also includes tourism development in Praia do Forte, is an economic strategy implemented by the government of Bahia to enhance the economy of the state and promote tourism (Bahiatursa, 2008; Jornal da Mídia, 2003; PMMSJ, 2004).

Additionally, one of the reasons the village is one of the most popular tourism destinations is because the new landowner, after purchasing the farm in mid 1970s, envisioned the beaches of Praia do Forte as becoming Brazil's Polynesia (Jornal Correio da Bahia, 2006; Praia do Forte EcoResort, 2008). Therefore, overall tourism development - local and regional - are the outcomes of these two main development strategies rather than the result of a growth in popularity of sea turtle ecotourism as is widely perceived by the community. Still, in spite of not being totally true, this association helps sea turtle conservation. Today, it is unquestionable that the presence of TAMAR's Visitor Center in Praia do Forte works as an efficient and profitable marketing tool for local businesses and tourism related events within the village. Often, TAMAR's Visitor Center is promoted as 'a must see' tourism destination in the village (e.g. Veja, 2007). An indicator of the popularity of TAMAR as a tourism destination in the village is the number of

visitors who visit the Center on a yearly basis. The staff of TAMAR said that approximately 600,000 people visit the Visitor Center on a yearly basis, with about 2,000 people visiting the Center on a daily basis during the peak summer season.

Most residents in Praia do Forte said they support sea turtle conservation because sea turtles help the tourism economy. Therefore, theoretically, the greater the tourism industry the greater is the potential for residents to find jobs and income opportunities. Also, the more tourists come to the Visitor Center, the greater the financial resources TAMAR has to employ residents and provide the community with alternative sources of income. This cycle is what I call ‘conservation by association’, where support for sea turtle conservation is strongly based on the economic role of sea turtles on the local economy. As such, although there is a support for sea turtle conservation, such support may not be based on a greater conservation ethic, but more as a monetary strategy. Therefore though there is an overall support for sea turtle conservation the sustainability of this support is questionable. What would the impacts of a shift in the local tourism and regional economy be on sea turtle conservation efforts? If support is based on the association that live sea turtles promote tourism development, how much of a fluctuation in employment opportunities and alternative sources of income - both direct and indirect - provided by the overall tourism industry would be necessary for residents to start harvesting sea turtles or stop supporting sea turtle conservation? Also, would such associations be present if the local economy was not dependent on, directly and indirectly, on the tourism industry? Among the residents of Imbassaí, fluctuations of the tourism industry appear not to influence their perceptions about sea turtles. Unlike in Praia do Forte, in Imbassaí sea turtles were not cited as key components on the local economy. Still, all respondents said they support sea turtle conservation. Many respondents did advise, however, that without TAMAR’s presence in Praia do Forte the harvesting of sea turtles would likely to increase.

In Praia do Forte, one indicator that economic benefits and the presence of TAMAR’s staff in the village may not be sufficient to protect sea turtles is based on the finding that illegal harvesting, though minute, still takes place. Thirteen percent of

respondents know of at least one case of sea turtle harvesting within one year of this study. Respondents mentioned non-local and non-native construction workers and non-native lobster fishermen as the social groups within the community who occasionally harvest sea turtles. During the interviews, some residents told me that these two groups harvest sea turtles because they do not have ties with the native community or with TAMAR. 'They can go out at sea, kill a turtle, butcher the meat, put in a cooler, and bring ashore that no one will notice or ask. How can TAMAR know that they are doing this? There is no way for them to know,' insisted another fisherman. Yet, in another occasion, a fisherman asked me: 'Do you see those rocks inside their boat? They use those rocks to sink the sea turtles that are caught on their nets. This way TAMAR does not see them and they do not wash ashore like the other ones that die in fishing net. They all sink down to the bottom of the ocean and nobody knows.' One day while he was showing me some fishing grounds, a fisherman asked me: 'Do you want to know the biggest problem for sea turtles?' He then said: 'They are the turtle killers... they are the worse ones,' as he looked at the lobster fishermen. Although many residents and fishermen use loosely the term 'lobster fishermen', they ascertain that these fishermen are not native and whose boats are not owned by native fishermen.

County and state reports (Bahiatursa, 2008; PMMSJ, 2004) and studies (Soyama, 2006) on tourism related projects show that the number of coastal development projects along the Coconut Coast is unlikely to slowdown in the near future. Therefore, even though economic benefits from TAMAR are important incentives for the community to support sea turtle conservation, these incentives may not be sufficient for some of the residents to stop harvesting sea turtles or to support sea turtle conservation. The fishermen emphasized that unless greater enforcement and patrol of fishing activities in the area it is unlikely that illegal harvesting of sea turtles will cease completely. As such, community-based sea turtle conservation seems to be working at the local level but greater pressures associated with the larger tourism development activities may be too great of a pressure for TAMAR or the local community to control.



Lastly, in 1968, Hardin (1968) argued that common resources are predestined to be overexploited. Overexploitation, Hardin (1968) argued, occurs because resource users have unlimited access and the right of using these resources in a way that best fits their personal needs and demands rather than acting in ways that benefits the group as a whole. Based on Hardin's idea, in situations of open resource access, such as sea turtles, individual actions will lead to long-term degradation of these resources (De Young & Kaplan, 1988). In Praia do Forte, the presence of what it seems to be a community-wide support for sea turtle conservation, which is associated with the decrease in sea turtle harvesting of sea turtles and their nests, challenges the claim posed by Hardin (1968). Agrawal (2001) and Ostrom (1990) argue that where local institutions exist and communities have agreed upon and enforce rules in resource management, degradation of common pool resources, in this case sea turtles, as argued by Hardin (1968) is unlikely to occur. Local institutions are defined as sets of formal and informal rules and norms that shape the interactions of humans with others and with nature (Agrawal & Gibson, 1999). In these cases, addressing local social and economic needs does not hinder the achievements of conservation needs. These points provided by Ostrom (1990), Agrawal (2001), and other scholars are in line with the recommendations of the Brundtland Report of 1987, which encourages the development of local institutions and participation in resource management in local environments (Brundtland, 1987).

In Praia do Forte, although residents are not part of sea turtle conservation decision-making process, there seems to be a shared norm about how to treat sea turtles (e.g. no harvesting) and what to do in case residents see a suspicious activity or a sea turtle that needs care (e.g. contact TAMAR). Also, it seems that participation via employment, rather than in decision-making, and share local knowledge about sea turtles and local resources and provision of environmental education appears to be sufficient to gain local support for sea turtle conservation. In this case, greater external pressures, which are associated with tourism development within and outside Praia do Forte, are viewed by residents as the main causes of socioeconomic changes experienced by the community. Some of these changes, such as population growth, are associated with

illegal sea turtle harvesting. Therefore, it seems that despite the long-term efforts of TAMAR to protect sea turtles and local support for sea turtle conservation, other factors still threaten the survival of sea turtles in the area.

### **3.13 Conclusion**

It is theorized that economic benefits from ecotourism are expected to create an incentive for biodiversity conservation (Weaver, 1999) and ecosystem restoration (Wild, 1994). Ecotourism income can minimize the pressure put by local communities on the resources (Langholz, 1999). In the case of sea turtle ecotourism in Praia do Forte, these resources are sea turtles and sea turtle eggs. It is assumed that by implementing natural resource management practices designed to increase income generation, ecotourism will reduce local dependence on direct resource uses (Borrini-Feyerabend, 1996; McNeely, 1994; Tisdell, 1995). Therefore, in theory, employment in sea turtle ecotourism would help reduce local dependency on sea turtles for their survival.

In Praia do Forte, support for sea turtle conservation appears to be associated with the role sea turtles now play on the tourism economy. Therefore, although sea turtles are no longer valued as a food source, they are still important components of local livelihoods. The majority of families now rely on TAMAR or on the greater tourism industry for their income. Accordingly, local dependency on sea turtles persists as the community is now dependent, either directly or indirectly, on sea turtle ecotourism and on the larger tourism scale to survive. Because the majority of families no longer rely on the local resources for food and their income either comes from TAMAR or from the tourism industry, a crash on the local tourism industry is likely to influence the economic well-being of the household.

Because sea turtle ecotourism at TAMAR depends, in part, on 'tourism' to be profitable and to have some of the financial resources to hire residents, a crash in the tourism industry can also influence sea turtle conservation efforts. Perhaps greater diversification of the local economy would have minimized the current dependency on tourism to support both livelihoods and sea turtle conservation. Pêgas and Stronza (2008)

also argue that had residents of Praia do Forte been more fully engaged in sea turtle conservation management the future of sea turtle conservation efforts and sustainable development practices would have been more promising. Perhaps the younger generation would have gained skills that would have enabled them to further their careers either at TAMAR or at the tourism industry. However, the complexity of the local social, economic, environmental, and political scenarios present in Praia do Forte makes the prediction of outcomes from possible alternatives a mere speculation. At least in the short-term, economic benefits in the form of employment and income from sea turtle ecotourism can effectively lead to conservation. On the other hand, while these economic benefits may be important for short-term conservation greater involvement of the community in conservation management may help sustain support over time.

#### 4. THE USE OF ENVIRONMENTAL EDUCATION TO PROTECT SEA TURTLES IN PRAIA DO FORTE, BRAZIL

##### 4.1 Introduction

The use of environmental education is believed to establish a sustainable and long-term basis for residents to protect biodiversity (Leikam *et al.*, 2004). This potential makes environmental education an important component of sea turtle ecotourism programs. Some scholars claim that, when incorporated in sea turtle ecotourism strategies, environmental education can enhance the understanding about sea turtles and local marine resources among local community members (Kremezi-Margaritouli, 1992; Petro & Fletcher, 2007; Wilson & Tisdell, 2001). Vieitas *et al.* (1999) argue that environmental education and community participation are often components of conservation programs that have been able to achieve their conservation goals. Thus, they reason, the implementation of environmental awareness as a conservation strategy can enhance the likelihood that conservation programs will achieve their conservation goals.

In the fishing village of Praia do Forte, Brazil, locals harvested sea turtles for their meat and eggs on a constant basis to support their livelihood needs. Since 1982, the Brazilian Sea Turtle Conservation Program, TAMAR, uses environmental education through sea turtle ecotourism as one of the conservation strategies to gain local support for sea turtle conservation. These environmental education programs aim to enhance local understanding about sea turtles and sea turtle conservation. Through these programs, TAMAR hopes to address local consumption of sea turtles for subsistence purposes by changing local values and behavior regarding sea turtles (Vieitas *et al.*, 1999). TAMAR also enforces sea turtle protection laws, which prohibit the harvesting of sea turtles, and promotes employment opportunities and alternative sources of income as strategies to gain local support for sea turtle conservation. Studies conducted in Praia do Forte show signs of a decrease in sea turtle harvesting activities since early 1980s (Marcovaldi & Marcovaldi, 1999; Santos *et al.*, 2000). Are these results associated with greater

understanding about sea turtles and sea turtle conservation? In order to assess this association, I evaluated how and whether environmental education influences local support for sea turtle conservation in Praia do Forte.

#### **4.2 Sea Turtle Ecotourism and Environmental Education**

Ecotourism represents one example of a broader conservation strategy that uses alternative development approaches as ways to achieve biodiversity conservation (Stem *et al.*, 2003; Stronza & Pêgas, 2008). The peer reviewed literature summarizes ecotourism as a form of tourism that promotes for conservation awareness and stewardship, provides economic benefits to the community, and enhances social involvement of host communities (Ceballos-Lascurain, 1996; Honey, 1999; Lee & Snepenger, 1992; Scheyvens, 1999; Stronza, 2007). The potential to achieve the needs of local communities and the needs of biodiversity makes ecotourism the chosen conservation approach of many sea turtle conservation programs (Godfrey & Drif, 2001; Jacobson & Robles, 1992; Petro, 2007; Tisdell & Wilson, 2002; Vieitas & Marcovaldi, 1997). This potential also makes ecotourism an ideal conservation approach to protect sea turtles in locations where resource degradation, illegal sea turtle harvesting, and other human activities are the main threats to sea turtle survival (Wilson & Tisdell, 2001). Patiri (2002) believes that complex socioeconomic and environmental problems in Brazil, such as social disparities and environmental degradation, are often mutually reinforcing problems that cannot be addressed separately. As such, conservation programs that also address the socioeconomic needs of local communities are more likely to achieve and sustain conservation in the longer term.

In addition to providing local communities with some of their socioeconomic needs, ecotourism strategies also aim at enhancing local understanding about and concern for biodiversity conservation (Stronza & Gordillo, 2008; TIES, 1990). The achievement of this goal is associated with the implementation of environmental education programs among residents from the communities where ecotourism takes place. Kimmel (1999) notes that using environmental education as part of ecotourism can help minimize

potential negative impacts associated with ecotourism, like the weakening of the local culture and local social structures (Brandon, 1996; Honey, 1999; McLaren, 1998; Stronza, 2007).

Supporters of using environmental education as a tool to conservation claim that this approach can promote natural resource conservation activities, enhance awareness and understanding about the environment, and provide an opportunity to train resource managers in conservation related issues (Belknap, 2008; Gampbell, 1999; Jacobson, 1987; Kimmel, 1999; Kremezi-Margaritouli, 1992; Olson *et al.*, 1984). In the Flower Garden Banks National Marine Sanctuary, Texas, environmental education is a standard conservation approach to coral reef conservation (Belknap, 2008). In a comparison study between two environmental education programs, Belknap (2008) learned that education programs help enhance scuba divers' knowledge about coral reef ecology and human impact on the reef while diving. This understanding helps minimize potential impact caused by divers when diving on the local reefs.

In Puerto Morelos, Mexico, the promotion of environmental education about the coral reefs, since the early 1990s, is considered to be an important factor in gaining community support for the creation and management of the Puerto Morelos' reef marine protected area. These educational programs are implemented among tour guides and the local community, in particular among the local youth and children. These programs aim to enhance understanding about the values, functions, uses and fragility of coral reefs, as well as increase community interest in coral reef conservation (Rodriguez-Martinez, 2008). In the Maldives, sea turtle ecotourism opportunities implemented at the Banyan Tree Maldives Vabbinfaru and Angsana Ihuru Resorts provide residents of the communities where the Resorts are located with environmental education opportunities about local sea turtle populations and marine conservation (SWOT, 2006). This process is associated with positive results for sea turtle conservation, like the reduction on sea turtle harvesting activities and the provision of socio benefits to the local communities, like enhancing local self-esteem (SWOT, 2006).

Environmental education is also implemented as a conservation tool to address sea turtle mortality in fishing gear by enhancing the understanding about the threats certain fishing techniques have on sea turtle survival, in developing conservation strategies that are more affective in addressing the socioeconomic needs of local fishermen, and in educating the fishermen in ways to revive sea turtles caught in fishing gear (Eckert, 2007b; Hall, 2006; Marcovaldi *et al.*, 2007; Peckham *et al.*, 2007a). These achievements are important for sea turtle conservation efforts since illegal harvesting (Caribbean Conservation Corporation, 2008; Sea Turtle Restoration Project, 2009; SWOT, 2008) and death, as a result of bycatch in fishing gear, are the main contemporary threats to sea turtles (Marcovaldi *et al.*, 2002). Hall (2006) insists that enhancing fishermen's awareness in relation to sea turtle conservation and developing alternative fishing techniques can reduce bycatch numbers because the fishermen are at 'The front line of the fisheries bycatch battle' (2006: 27).

In some locations, sea turtle conservation programs that involve the local fishermen in conservation efforts, and provide environmental education on fishing alternatives that are less detrimental to sea turtles, are showing positive outcomes for sea turtle conservation (Eckert, 2007b; Marcovaldi *et al.*, 2007; Peckham *et al.*, 2007a). In Indonesia, sea turtle ecotourism was introduced as a sea turtle conservation strategy to reduce local pressure on sea turtles due to illegal harvesting (Putra & Bailey, 2007). The authors observed that the introduction of sea turtle ecotourism, as an economic alternative to sea turtle harvesting, is providing former sea turtle hunters with employment opportunities. The authors also noticed that street vendors no longer use sea turtle meat, but other types of meat, when preparing their dishes. This change in meat choice decreases local demand for sea turtle meat. These results are associated, in part, with greater awareness about sea turtle conservation efforts provided by environmental education as part of sea turtle ecotourism strategies (Putra & Bailey, 2007).

### **4.3 Traditional Ecological Knowledge and Sea Turtle Conservation in Praia do Forte**

Berkes (2004) finds that though rural people throughout the world have relied upon the local resources for their livelihood for a longer period, some factors are causing the degradation and loss of these traditional systems. He argues that urbanization, colonization, industrialization, technology change, and stresses caused by population pressure, loss of local control over the natural resources, and commercialization of subsistence resources have resulted in the degradation and the disappearance of traditional systems. Traditional ecological knowledge is defined as a ‘Cumulative body of knowledge, practice, and belief, evolving by adaptative processes and handed down through generations by cultural transmission about the relationship of living beings (including humans) with one another and with their environment’ (Berkes, 1999: 8). Drew (2005) argues that traditional ecological knowledge is site specific and represents the information communities need to support their cultural survival. This use makes those who carry this knowledge ‘experts’ on those specific traits.

In Praia do Forte TAMAR implements a mixed approach to sea turtle conservation. This approach includes enforcement of sea turtle protection laws that ban sea turtle harvesting, promotion of environmental education programs, and provision of employment opportunities to local residents as incentives to gain local support for sea turtle conservation. Environmental education programs aim to enhance understanding about sea turtles and sea turtle conservation. Because native families relied on traditional ecological knowledge, which included knowledge about sea turtles, to support their livelihood needs, what additions to their ecological knowledge did these programs provide to residents? Who were the ‘teachers’ and who were the ‘students’? In this chapter, I (1) evaluate how environmental education influences traditional ecological knowledge and (2) how traditional knowledge influences environmental education.



#### **4.4 The Sea Turtle Conservation Program: The TAMAR Project**

Environmental education programs implemented by TAMAR aim to enhance local understanding about sea turtles, sea turtle conservation, and the inter-relationships between sea turtles and the community (Patiri, 2002). Through these programs, TAMAR hopes to address local sea turtle harvesting practices by changing local values and behavior regarding sea turtles (Vieitas *et al.*, 1999). Ultimately, these programs aim at gaining local support for sea turtle conservation. The overarching goal of using environmental education is to enhance the awareness of coastal communities about maintaining a healthy marine ecosystem where sea turtles are a part of (Marcovaldi & Marcovaldi, 1999). TAMAR considers environmental education as one of the most important aspects of sea turtle conservation because it provides education opportunities within the coastal communities where TAMAR concentrates its work (Marcovaldi & Marcovaldi, 1999). One of these communities is the fishing village of Praia do Forte.

#### **4.5 Study Area: The Fishing Village of Praia do Forte**

The fishing village of Praia do Forte is located on the northeastern coast of Brazil, about 80 Km north of Salvador, in the state of Bahia (Bahiatursa, 2008) (Figure 4.1). Settlement of Praia do Forte goes back to 1551 during Portuguese settlement in the region (FGD, 2005). The area where Praia do Forte is now located was once within a coconut plantation. The village was formed when families, including the first fishermen, moved to the area to work at the coconut plantation (POdePF, 2008) in the end of the 19th century (Bahiatursa, 2008). These residents form the native residents and native families of Praia do Forte. They, in addition to other social groups in the community, form the main stakeholders in sea turtle conservation in Praia do Forte (See Table 4.1 on page 155). These social groups were defined during the first phase of this study. These are definitions provided by the native families when asked about the community and the people who form the community.

The beaches of Praia do Forte host the largest concentration of loggerhead turtles in Brazil (Marcovaldi & Laurent, 1996), while the beaches of Bahia host the largest

number of nesting activities of hawksbill turtles, one of the most threatened sea turtle species with extinction all over the world (Spotila, 2004). The region where Praia do Forte and Imbassaí are located is called the Coconut Coast (Figure 4.1).



Figure 4.1: Map of the Coconut Coast in Bahia and the communities of Imbassaí and Praia do Forte. Source: [http://www.setur.ba.gov.br/opinv\\_zona\\_coqueiros.asp](http://www.setur.ba.gov.br/opinv_zona_coqueiros.asp)

The coconut plantation was sold in mid 1970s. The new owner ceased the plantation operation and developed the first ‘pousada’ (a Bed & Breakfast like type of establishment) in the village. This shift in land ownership and economy led to

socioeconomic changes, such as the outmigration of many native families, the prohibition of some of the local practices (e.g. raise livestock), and the introduction of tourism as the main economy.

**Table 4.1: The main stakeholders in the fishing village of Praia do Forte**

<b>Main Stakeholders in Praia do Forte</b>	
<b>Local Stakeholders</b>	<b>Characteristics</b>
Native Residents*	Residents who were born in Praia do Forte and residents who lived in the community during the plantation period.
Native Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period.
Local Residents*	A newcomer could 'become', could be 'considered', or be 'called' a <i>local resident</i> if this person married or had a child with a native resident, or grew up in the village.
TAMAR*	The TAMAR Project itself, the entity.
TAMAR Staff ***	The research and administrative team of TAMAR.
TAMAR Workers***	The native and non-native residents.
The Founders of TAMAR**	Drs. Maria Ângela Marcovaldi and Guy Marcovaldi.
Fishermen*	The men in the village who fish/fished for a living or use/used fishing as one of the sources of income and/or food for their families. Unless noted, they are all native to Praia do Forte.
Fishing Families*	Families whose ancestries were related to the residents, native residents, who lived in Praia do Forte during the plantation period.
The Women from the Catholic Church*	Women who organize the events at the local Catholic Church. Different generations of women. Their involvement in communal affairs goes back to the plantation period.
The Street Vendors**	Vendors who sell souvenir and gift items on the specified location within the village set by the local government.
The Outsiders*	People who are non-local and non-native. Often from Salvador or other states. Associated as being wealthy people and often Caucasian. Includes seasonal residents, tourists, and permanent residents. They are often the owners and managers working in the tourism industry. Perceived by the native and local residents as having political and economic influence within the community.
The Community of Praia do Forte**	The societal group formed by the people who live in Praia do Forte, both native and non-native residents.

Note: \* These definitions follow the standards the elders and native residents of Praia do Forte gave me during our conversations about the history of the community, the plantation, and TAMAR.

Note: \*\* These definitions are based on the information gathered during the exploratory phase.

Note: \*\*\* Although TAMAR staff work for TAMAR, as do TAMAR workers, they are distinctive because they form the research team of TAMAR. This team includes researchers and administrative personnel who work at the Research Station and Visitor Center. They are not native or local to Praia do Forte. Definitions provided by the community.

In 1982, when TAMAR opened the Research Station of Praia do Forte, the village was still a small fishing village without electricity and it was home to approximately 600 residents (Marcovaldi & Laurent, 1999) (Figure 4.2). At that time, tourism development was still at its infancy. The village is no longer, however, a small fishing community with just a few resources.

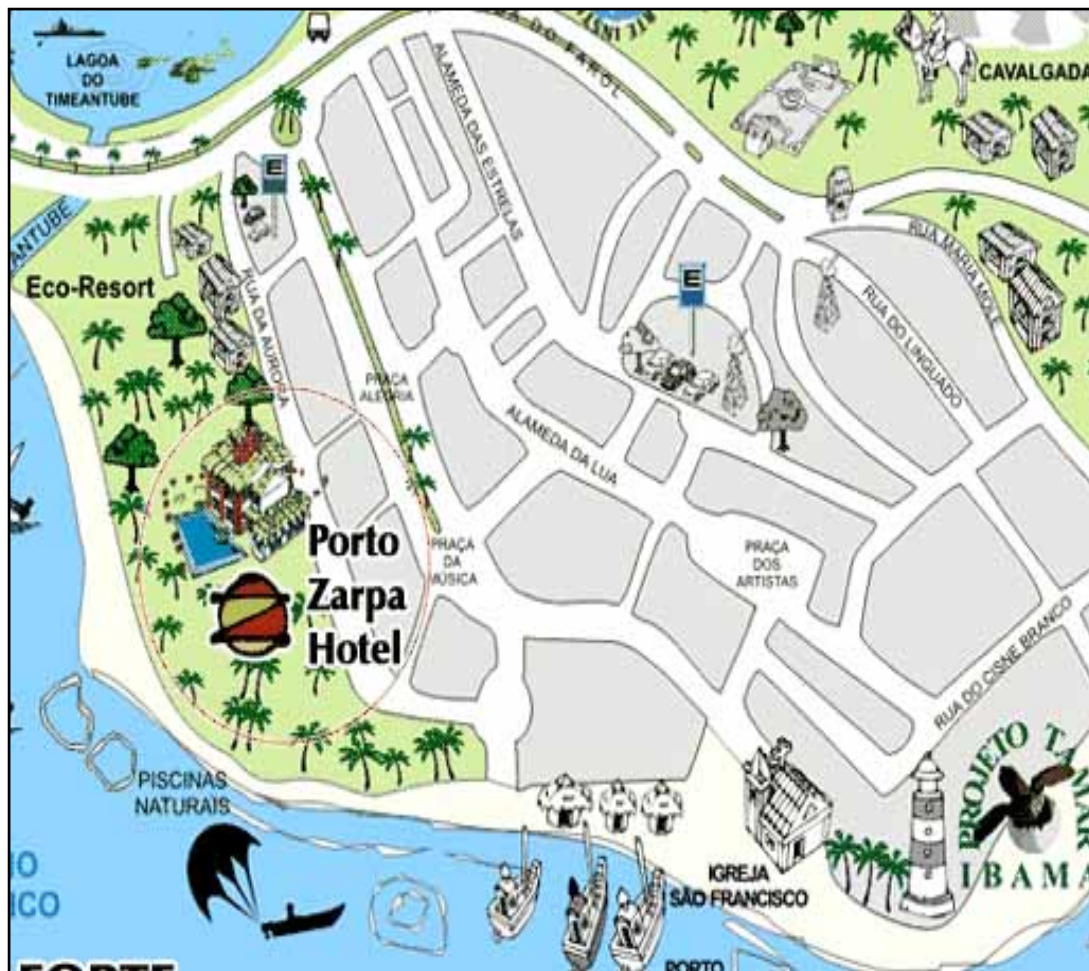


Figure 4.2: Map of the fishing village of Praia do Forte and the location of the TAMAR Project. Source: <http://www.tatuapara.com.br/Portugues/como-chegar.aspx>

The Coconut Coast has become a fast growing tourism destination in Bahia and it concentrates the highest volume of tourism investments in the country (Jornal Correio da Bahia, 2007). The hotel industry in Praia do Forte has the second largest number of hotel rooms in the state (PMMSJ, 2004). In 2007, Praia do Forte was voted one of the top ten best beach destinations in Brazil (Veja, 2007), offering about 2,200 hotel rooms among the many ‘pousadas’ hotels and at the five-star resort, the Praia do Forte EcoResort. It is estimated that the permanent population of Praia do Forte is now about 2,000 and the seasonal population - residents who live in the village during the peak tourism seasons - is of about 4,700 (PMMSJ, 2004). Based on these numbers, the overall number of people in the village during the peak tourism season, December to March, jumps from about 2,000 to approximately 10,000 people.

#### **4.6 Environmental Education Opportunities Provided by TAMAR in Praia do Forte**

TAMAR implements a variety of environmental education programs and opportunities to the community of Praia do Forte and people who visit TAMAR’s Visitor Center. At the Visitor Center, TAMAR provides environmental education via media, interpretation, and guided visits. There are also displays of marine fauna, which include the display of four species of the five species of sea turtles found in Brazil. Visitors and community members also have the opportunity to observe sea turtle nests. Sea turtle hatchling release ceremonies are the focus of attention of both tourists and residents during every sea turtle nesting season. During the nesting season, which takes place between September and March, visitors can observe TAMAR’s researchers and trained personnel open sea turtle nests within the Visitor Center. These sea turtle eggs are from nests located at the adjacent beaches. Animal predation and high tide are some of the reasons these nests are transported to the Visitor Center. Then, at the Center, the eggs are monitored until the sea turtle hatchlings emerge from their eggs. TAMAR staff releases the hatchlings at the adjacent beaches. The release of sea turtle hatchlings is TAMAR’s main iconic symbol of sea turtle conservation in Praia do Forte.

TAMAR also promotes environmental education at the local schools. During these events, TAMAR staff provides information about the local marine resources, sea turtles, recycling, and overall conservation. These activities are not conducted on a daily basis but at intermittent times throughout the school year. Greater frequency and focus occur during special communal events, like the events conducted during the Environmental Week. During these communal events TAMAR provides workshops for the children at the Visitor Center, develops beach clean-ups, and sponsors a variety of programs with the local children. Such programs focus on raising the children's awareness of their environment and about sea turtle conservation.

Over the years, TAMAR has also included specific courses and added activities that target the local youth and children of Praia do Forte, and adjacent communities. Since the time when TAMAR started implementing environmental education programs among the local children, approximately 2,100 children have learned about sea turtles, sea turtle conservation, and about local marine resources. Perhaps the most popular among TAMAR's educational programs is the mini-ecotourism guide program (hereafter mini-guide program). Created in 1995, the mini-guide program provides training skills, a monthly stipend, and environmental education to children from Praia do Forte and adjacent communities (Vieitas *et al.*, 1999). The program, which trains local children ages 10 to 15 years old in basic sea turtle biology and marine conservation, also requires that these children maintain good academic standings while attending the year-long school program. About 40 children per year participate on the first phase of the program. Since the time when TAMAR started the program in 1995, about 500 children have been part of the initial phase of the mini-guide program. Of those, 162 of these children are former mini-guides.

After this training phase, the children who demonstrate best communication skills, knowledge of sea turtles and perform the best work at TAMAR are invited to continue being engaged on the mini-guide program at the Visitor Center throughout the year to provide guided visits to tourists (Marcovaldi & Marcovaldi, 1999). These children become the 'mini-guides of TAMAR' for that year. In 2009, 18 children of Praia do Forte

and adjacent communities were engaged in the mini-guide program. Upon completing the mini-guide program, the children are knowledgeable about the basic aspects of sea turtle biology, sea turtle and marine conservation, and tourist-guide procedures, and tourist-guide procedures such as guiding skills, speech, and ways to interact with the visitors (Vieitas *et al.*, 1999).

When this study was being carried out, TAMAR did not have a specific environmental education program targeting the adults of Praia do Forte. Education opportunities to the adults have been provided at the Visitor Center, during the communal environmental programs, and at other communal events. TAMAR has also organized some workshops for the employees of both Research Station and Visitor Center. These workshops, as well as the other TAMAR environmental education programs, have focused on enhancing the understanding of sea turtles, sea turtle conservation, and the works of TAMAR regarding marine conservation and overall protection of coastal resources among TAMAR workers.

TAMAR also uses environmental education as a sea turtle conservation tool to control sea turtle mortality in fishing gear by enhancing the understanding about the threats of certain fishing techniques on sea turtle survival, addressing local fishermen's economic needs from fishing, and by educating the fishermen to revive sea turtles caught in fishing gear (Marcovaldi *et al.*, 2007). Hall (2006) states that because fishermen are at 'The front line of the fisheries bycatch,' (2006: 27) enhancing their awareness about sea turtle conservation and fishing techniques alternatives can be an effective tool to reduce sea turtle bycatch numbers. The goal of these environmental education programs is to develop environmental awareness about sea turtles and the importance of sea turtle conservation practices among the local children, youth, and adult members in the community (Marcovaldi *et al.*, 2005). In this chapter, I compared the understanding about sea turtles and sea turtle conservation efforts between TAMAR workers and non-TAMAR workers. The scope of this study does not, however, compare and contrast the different methodologies used by these approaches. Instead, my goal is to access the

influence environmental education has, in general, as it relates to local support for sea turtle conservation among residents of Praia do Forte and Imbassaí.

## **4.7 Methods**

This study is divided into three data collection phases. I used snowball and purposive sampling techniques on the first two phases and convenience sampling during the third phase. Data was collected using semi-structured interviews. Each interview lasted about 90 minutes and most respondents were interviewed more than once. I transcribed and later coded the open-ended answers. Recurrent themes within each one of the questions were grouped as categories. This information and the data from closed-ended questions were entered into a database. Statistical tests (frequencies and Chi-square analysis) were conducted on these categories using SPSS software.

### **4.7.1 First Data Collection Phase**

In my first data collection phase, May to September 2006, I interviewed 25 native residents and 15 non-native residents. These interviews and participant observations information were used to construct a questionnaire used on the second phase of the study. Some of the indicators I used to analyze the influence that the environmental education has on local support for sea turtle conservation included: access to and involvement with TAMAR's environmental education programs, knowledge about sea turtles, understanding of the impacts and acknowledgement of the presence of human related threats to sea turtle survival, household demographics, local values about environmental education programs, and perceptions about sea turtle ecotourism.

In addition to conducting interviews, I attended local communal meetings and events and participated in fishing trips in order to learn traditional practices and the use of local marine resources. I assisted TAMAR staff with data collection during the sea turtle nesting season and accompanied TAMAR staff during interpretative talks, guided tours, and communal events to better understand local sea turtle conservation efforts and interactions between TAMAR with the community and visitors. Having the assistance of



the fishermen and native residents enabled me to understand contemporary fishing practices (in comparison with historical accounts) as well as the influences of enforcement on fishing activities, and the role of fishing in the local economy and culture. I also observed the interactions between the staff of TAMAR and residents Praia do Forte during communal events, at the Center, and Research Station to assess levels of bonding as stated by residents during the interviews.

#### **4.7.2 Second Data Collection Phase**

The second data collection phase occurred between September 2007 and January 2008. I conducted 77 semi-structured interviews during this phase. I did not interview the children of the mini-guide program or former students of the program who were younger than 18 years of age. On average, each interview lasted about 90 minutes and took place at TAMAR or at a location selected by the respondent.

#### **4.7.3 Third Data Collection Phase**

Between May to September 2008, I returned to most of the families who I interviewed in 2006, and to some of those interviewed in 2007, to assess their perceptions about the changes that occurred in the village, and within their households, since the beginning of my study in May 2006. I wanted to evaluate the potential influence environmental education has on local support for sea turtle across time.

### **4.8 Findings: Influence of Environmental Education on Local Values and Uses of Sea Turtles**

During the first phase of this study, interviews with the native residents revealed that sea turtle harvesting was a tradition until TAMAR arrived in the village in 1982. They said native families consumed sea turtle meat and eggs on a constant basis, with intensity rates increasing during the sea turtle nesting season (September to March) and winter months (June to August). The practice of harvesting sea turtles for family consumption was a livelihood necessity. Though the majority of families in the village

earned an income by working at the nearby coconut plantation, they stated that native families lived under economic hardship. Residents also said that sea turtles were so intensively harvested because many residents liked their taste, sea turtles were abundant in numbers, each sea turtle had large quantities of meat, and they were easy to catch.

When asked about the historical local sea turtle harvest activities prior to TAMAR's arrival in the village, TAMAR staff explained that local harvesting activities, because of their scale and frequency, posed the greatest threat to sea turtle survival in the area. They explained that this practice left little chance for sea turtle eggs to reach hatchling stage. In order to protect nesting females and sea turtle nests, TAMAR implemented different conservation strategies upon arriving in Praia do Forte in 1982. One of the implemented strategies was environmental education among the community.

When asked about TAMAR's approach to protect sea turtles in the area, many native residents said they first heard about sea turtle protection laws when TAMAR started enforcing these laws in 1982. The same perception was towards sea turtle conservation. One resident said that: 'Nobody cared about them [sea turtles] in the past. They were just food. The people here killed them. Now, there is patrol and control so nobody does anything to them.' Most respondents on the survey expressed similar perceptions about local uses and values ascribed to sea turtles. The tradition to consume sea turtles for their meat and eggs was also known among the non-native and newly-arrived residents. In fact, all 47 non-native respondents said they knew native families consumed sea turtle meat and sea turtle eggs prior to TAMAR's arrival in the village. TAMAR staff pointed out that implementing environmental education was essential if these local uses of sea turtles were to cease and local values were to change into values that support sea turtle conservation.

The implementation of these environmental education initiatives provided residents with a different perspective about sea turtles. The initial environmental educational opportunities focused on providing environmental education to the community as a whole, rather than focusing on a specific group, like the youth and children engaged on the mini-guide program. TAMAR staff said that one important ally

in gaining local support for sea turtle conservation was providing the community with a visual connection with sea turtle conservation. This visual connection was the release of sea turtle hatchlings. During my conversations with the staff of TAMAR, they stated that the first sea turtle hatchling release activity in the village was likely the first time many residents saw a baby sea turtle. They pointed out that since most sea turtle nests were harvested for consumption it was unlikely that any sea turtle clutch was allowed to hatch.

Consequently, TAMAR's first sea turtle hatchling release event was also the first opportunity for many to observe a baby sea turtle. These opportunities, said TAMAR staff, also helped TAMAR connect with the community. They explained that by showing the hatchlings to the community they were able to visually demonstrate their goal and the reason they were in Praia do Forte. When asked about these events, many native residents interviewed in this study, who were children in early 1980s, said they have vivid memories of these events. Some said those experiences were one of the main reasons they wanted to work for TAMAR.

The release of sea turtle hatchlings, and occasionally of adult sea turtles, is the most popular and sought after ecotourism activity provided by TAMAR at the Visitor Center. During the second phase of this study I was able to witness some of these releases and in all events there were large crowds of people observing the activities and asking the staff of TAMAR questions about sea turtles and sea turtle conservation. When I asked them about their perceptions of and the role of these interactions in sea turtle conservation, TAMAR staff said that these opportunities are important components in sea turtle conservation because they captivate the attention of visitors and community alike, and provide an opportunity for TAMAR to teach about sea turtles, the local environment, and about sea turtle conservation.

Soon after arriving in the village in 1982, in addition to providing residents with the opportunity to observe the release of sea turtle hatchlings, TAMAR also used photos and drawings of sea turtles alongside key messages such as 'Don't kill' and 'Conserve' (Marcovaldi *et al.*, 2005). These messages were posted along the nesting sites and within the Research Station. Though these messages were viewed and noticed by the community

in general, those who worked for TAMAR were exposed to a greater variety of sea turtle conservation efforts through their interaction with TAMAR's researchers and with the routine sea turtle conservation activities conducted at the Center and Research Station. The use of this interpretative approach to raise awareness is still used by TAMAR.

In 2007, the employment records of TAMAR showed that 110 residents of Praia do Forte and adjacent communities worked at both Research Station and Visitor Center. Job positions ranged from helping collect scientific data on marine species at the Research Station to sales clerk positions at the Center's gift shop. Even though employees have different interactions with sea turtles based on their job positions, they are exposed to TAMAR's overall conservation message through interpretative information posted at the Center and by working at TAMAR. Thus, because of this distinction between TAMAR workers and non-TAMAR workers, I expected that TAMAR workers had greater understanding about sea turtles and sea turtle conservation than non-TAMAR workers.

The results are mixed regarding local values associated with sea turtles. While some respondents showed concern about the ecological status of sea turtles, others emphasized the important role sea turtles have on the local economy. When I asked one local man to explain how the community used sea turtles in the past and whether these uses changed overtime, he explained that: 'People value sea turtles much more now because 10 to 15 years ago people here used to eat them. If TAMAR was not here they would have continued eating them. Sea turtles would all be gone by now. Nowadays people are more conscious about conservation and call TAMAR if they see something happening to the turtles.'

An elderly native woman has a similar perception about TAMAR and sea turtles in the village, however she focused more greatly on the economic aspects of sea turtle conservation than on the ecological aspects of it: 'I think TAMAR is good because they provide a good education to the children from the community and because they employ a lot of people. TAMAR brought a lot of benefits to the community and the tourists come

here to see the turtles.... The turtles are a ‘money making machine’ for TAMAR and for the community.’

During the examination of the potential relationship between TAMAR workers and reasons to protect sea turtles 76% of TAMAR workers and 78% of non-TAMAR workers support sea turtle protection because sea turtles help promote the local economy (Table 4.2). Though this finding supports the claim that ecotourism can provide local communities with economic incentives to conservation, I expected that TAMAR workers would have greater understanding about sea turtles and sea turtle conservation. One of the indicators I used to analyze this relationship is local values about sea turtles. The assumption is that residents with greater understanding about sea turtles should mention the ecological reasons in addition to the economic reasons to protect sea turtles, which is based on the economic benefits from sea turtle ecotourism. Rather, the overall percentage of TAMAR workers in comparison to non-TAMAR workers was similar.

**Table 4.2: Chi-Square Analysis: TAMAR workers and reason to protect sea turtles ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Reasons to protect sea turtles*				
Independent Variable	Number of Respondents (n)	Economic and Ecological (E&E)	Ecological (E)	Exact Sig. (2 sided) Fisher’s Exact Test
TAMAR worker	n=25	24%	76%	p-value=1.000
Non-TAMAR worker	n=52	21%	77%	

\*Note: Coding of responses show the presence of two main categories: (1) economic reasons and (2) economic and ecological reasons.

The information presented on Table 4.2 shows that despite employment in sea turtle ecotourism, the main reasons sea turtles are protected by TAMAR seem to differ from the main reasons most respondents support sea turtle conservation. Although their support, either economic or economic and ecological, is positive for sea turtle conservation, these results challenge the influence environmental education programs

implemented by TAMAR have in enhancing understanding about sea turtles and sea turtle conservation. The fact that 76% of the respondents who work for TAMAR stated economic reasons, rather than also ecological, may indicate that environmental education is not being as efficient as it could be.

Nonetheless, this finding is still a positive indicator that income from sea turtle ecotourism seems to influence the way locals value sea turtles. The association between economic values of sea turtle conservation and local support for sea conservation are depicted in this comment provided by a local man: ‘TAMAR is a benefit for nature because if it weren’t for TAMAR there would be no more turtles here. They changed the lives of a lot of people here, so TAMAR has been very good for the community...If TAMAR ends, tourism here will drop about 50%. So, what will happen if people here stop taking care of the turtles? If they start eating sea turtles again the tourism here will end, and without tourism we will not have income for our families.’ In his comment, this resident seems to understand that sea turtles are still threatened while also acknowledging the economic role sea turtles have on the economy.

For conservation purposes, these associations may help create an incentive for residents to support sea turtle conservation. However, his statement during this interview is unclear regarding whether he would support sea turtle conservation if sea turtles did not influence the local economy. Other respondents presented a more clear understanding about the ecological reasons sea turtles are protected by TAMAR. Some of the examples given were: ‘They can go extinct if we don’t protect them’, ‘Low numbers’, and ‘Because they are protected by the IBAMA’. When asked whether respondents believed the community helps TAMAR protect sea turtles, 83% said yes. This question was asked to evaluate resident’s perceptions about their role in sea turtle conservation. This perception was shared among TAMAR workers and non-TAMAR workers (Table 4.3).

**Table 4.3: Chi-Square Analysis: TAMAR workers and the community helps TAMAR protect the sea turtles ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): The community helps TAMAR protect the sea turtles				
Independent Variable	Number of respondents per category (n=)	The community helps TAMAR protect sea turtles	Overall percentage within the category	Exact Sig. (2 sided) Fisher's Exact Test
TAMAR worker	n=25	n=23	92%	p-value=0.710
Non-TAMAR worker	n=52	n=45	87%	

These results demonstrate that, although the majority of respondents did not cite ecological reasons as the main reasons they protect sea turtles, the majority believes (TAMAR workers= 92%; non-TAMAR workers=87%) they help TAMAR protect sea turtles. These results are another indicator that income from sea turtle ecotourism can create an incentive for residents to support sea turtle conservation. They may also be an indicator of changes in values and uses about sea turtles. Another indicator that environmental education programs enhance understanding about sea turtles and sea turtle conservation is resident's perception of threats to sea turtles. During the interviews I asked residents whether they believed there were threats to sea turtles in the past, whether there were still threats to sea turtles at that period (the year 2007), and 'why'. Sixty-two percent of respondents in the survey said there are still threats to sea turtles in Praia do Forte (Table 4.4).

**Table 4.4: Chi-Square Analysis: TAMAR workers and perceptions about threats to sea turtles ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Perception About Threats to Sea Turtles				
Independent Variable	Number of Respondents (n=)	There are threats to sea turtles	Overall percentage within the category	Exact Sig. (2 sided) Fisher's Exact Test
TAMAR worker	n=25	n=20	80%	p-value=0.044
Non-TAMAR worker	n=51	n=28	55%	

These results also show that TAMAR workers are more likely to perceive the threats to sea turtles than are non-TAMAR workers. This finding may be an indicator that environmental education helps enhance understanding about sea turtles and sea turtle conservation. This is a positive sign that this approach to conservation can help gain local support for sea turtle conservation. However, would residents still support sea turtle conservation if income from sea turtle ecotourism was insufficient to support their livelihood needs? Fifty-six percent of TAMAR workers and 68% of non-TAMAR workers said sea turtle harvesting is likely to increase if TAMAR would leave the village. When asked 'why', the most cited reason is the impact on the tourism industry. As such, residents seem to associate the presence of TAMAR as the main reason tourism has developed in the village.

Since tourism is now the main economic activity in the village (PMMSJ, 2004), it seems to also be the main driver of local support for sea turtle conservation among some residents. Therefore, some residents in the village may or may not still support sea turtle conservation if the economic role of sea turtles in the local ecotourism was minimal or would to change. However, while some said harvesting will increase, 44% of respondents who work for TAMAR versus 32% of non-TAMAR workers said the community will not resume eating sea turtles with TAMAR would to leave the village. Among the reasons of not eating sea turtles are: 'They can go extinct if we don't protect



them’, ‘Low numbers’, and ‘Because they are protected by the IBAMA’. Thus, it is uncertain whether greater understanding about sea turtles and sea turtle conservation would control sea turtle harvesting if income from ecotourism and the local tourism industry would to crash.

Therefore, greater understanding about sea turtles and sea turtle conservation may not necessarily mean support for sea turtle conservation during different economic conditions. I also asked residents whether they knew if there any rules to protect sea turtles. Eighty-three percent of respondents said the community had rules regarding sea turtles. I then asked, among those who said ‘yes’, to explain what these rules were and about their perceptions about these rules. Eighty-eight percent of TAMAR workers versus 73% of non-TAMAR workers were able to list the main laws created to protect sea turtles (e.g. illegal to harvest sea turtles for their meat, eggs, and shell, and regulations about illumination on the beach; the use of nets along the reef) (Table 4.5).

**Table 4.5: Chi-Square Analysis: TAMAR workers and knowledge about sea turtle protection laws ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Knowledge about sea turtle protection laws				
Independent Variable	Number of Respondents (n=)	Was able to cite the main laws that protect sea turtles	Overall percentage within the category	Exact Sig. (2 sided) Fisher’s Exact Test
TAMAR worker	n=25	n=22	88%	<i>p</i> -value=0.240
Non-TAMAR worker	n=51	n=38	73%	

Although these results did not show a significant relationship between TAMAR workers and non-TAMAR workers regarding knowledge about sea turtle protection laws, these findings show that most respondents are knowledgeable about sea turtle protection laws. This is another indicator that environmental education may influence understanding

about sea turtle conservation efforts, in this case, the knowledge about what can and cannot be done regarding sea turtles.

I also asked residents' perceptions about TAMAR and whether TAMAR provided benefits to the community. Environmental education programs to the children, particularly the mini-guide program, were one of the most often cited benefits TAMAR provides to the community. I wondered whether former students of the mini-guide program, since they were involved in environmental education programs for about one year, had greater understanding about sea turtles and sea turtle conservation than the respondents who were not former students of the program. In order to interpret the results I had to first understand the program, evaluate resident's perception about the program, and learn from former students their views and attitudes about sea turtles and sea turtle conservation.

During the interviews, I asked residents' perceptions about the mini-guide program to evaluate the role this program has on the overall environmental education opportunities provided by TAMAR. All respondents perceive this program as a unique opportunity for the local children to learn about the environment and about conservation. 'It is good to have an environmental awareness view. The mini-guide program gives them guidance, structure. It is a very good program. They leave the program with a better view of conservation.' Another resident said that: 'I would like that my child to be involved at least with the mini-guide program because I think...it opens the minds of the children and enhances the environment awareness of the children. This is good.' One of the former students of the mini-guide program said: 'The children learn about the environment and nature, and they are able to visit places. Since I worked in the program I know these children can have opportunity to grow if they participate in the program.'

Residents also support the program because they believe it provides the students with skills they will use in their professional careers: 'They would grow up learning about how to protect things and work with conservation, which is good for them,' said a local man. Another resident stated that: 'I and everyone else here think that TAMAR is very good. Beside the protection efforts, TAMAR also helps the children through the

mini-guide program. They help the children do something. When I talk to the people back home about what TAMAR does for the children, nobody believes me. TAMAR helps the children, provides with education and food. When I say these things they don't believe me and they think that I am lying.' One native woman finds that: 'The children from the mini-guide program leave the program completely different. They carry with them great discipline. I see the difference from when they started to when they leave. They have a greater understanding about our environment and about TAMAR.' All respondents had similar views about the mini-guide program. These perceptions show that environmental education programs can provide more than an understanding about the environment, but also enhance self-esteem and provide skills that may benefit students in activities that go beyond their engagement period in the program.

I interviewed six former students, who are now adults, of the mini-guide program to evaluate whether they had greater understanding about sea turtles and sea turtle conservation than the rest of the respondents. An analysis of their knowledge about sea turtles shows that the former students of the mini-guide program have a higher understanding about sea turtles, sea turtle conservation, and overall awareness about local threats to sea turtle survival than non-students. For example, they were able to explain in greater detail the reason sea turtles are protected by TAMAR; the potential impacts of tourism on nesting sites, nests, and nesting females; and also about the ecology of the marine species displayed at the Visitor Center. These species represent some of the main species found in the area. Some of these are species of fish and sea turtles native families used to consume in the past, thus are part of the local fishing activities.

In summary, although only a few former students were interviewed in this study, the fact that all six showed consistency in their perceptions about sea turtle conservation and sea turtles indicates that this program seem to have greater influence on the overall learning experience than other educational tools implemented by TAMAR. However, this is only a mere interpretation since greater comparison analysis of implemented programs and an evaluation of other factors, such as coming from a fishing family, can also influence one's overall knowledge about these two main themes. Nonetheless, the use of

environmental education illustrates to influence understanding about sea turtles and sea turtle conservation. This association supports the claim that environmental education can help conservation programs gain local support for conservation.

#### **4.9 Findings: Influence of Environmental Education on Perceptions of Well-being**

Results from the survey and interviews during all phases of this study show that environmental education programs implemented by TAMAR do not have an immediate influence on the economic well-being of the household. They are likely, nonetheless, to have an influence in the longer term. Part of this assumption is based on the feedback acquired from the former mini-guide students. The six former students of the mini-guide program said they gained skills and discipline during the time they were engaged in the program. These skills helped them enhance their understanding about sea turtles, sea turtle conservation, and also enhanced their self-esteem. They said things like: ‘I know I have the skills to get a better job’, ‘I want to go to college to get degree and work in conservation’, and ‘We learn things in the program that helps us be more organized, learn more about the environment, and now to work with the tourist. These are good things because there is a lot of tourism here’, demonstrate greater self-esteem regarding their skills and potential achievements.

One of the achievements is the fact that all six graduated from high school. Though this may seem a small achievement to some, only 44% of the native residents in this study completed high school. Therefore, the fact that they completed high school deserves merit. However, their desire in achieving a college degree is an even greater milestone since none of the native residents in this study had a college degree. This does not mean there are no native residents with a college degree, because there are a few. Still, a small percentage of residents is still a very small number. Therefore, even if these young residents may never acquire their college degree, their desire to achieve such degree is an indicator that the skills and discipline they acquire during their childhood while at the mini-guide program may have helped them achieve to this stage.

Consequently, greater skills and higher education can provide them the skills required to work at a higher paying job position, which in turn will benefit the overall income of the household. However, only future studies will be able to analyze this relationship of whether this assumption is valid. As of 2008, none of the young residents had yet been able to accomplish their education aspirations. Different reasons, they said, such as cost in attending school, limited local educational opportunities, distance from the educational center, and personal reasons prevented them from achieving their educational goal. It seems, based on their responses regarding the reasons they were not able to complete or even start their college education, that external factors appear to influence their ability continue their education. Therefore, even if the programs implemented by TAMAR may help the local youth by providing them with skills, other factors, that are not controllable by TAMAR or by the community, may interfere on whether environmental education programs provided to the children may indeed benefit the economic well-being of the household in the longer term.

#### **4.10 Findings: Influence on and Ties with Traditional Ecological Knowledge**

In Praia do Forte, traditional ecological knowledge has been an important component in sea turtle conservation efforts since TAMAR first arrived in the village in 1982. This is particularly the case between TAMAR and the fishermen, since the fishermen were the ones in the community who harvested sea turtles and sea turtle nests. Through this interaction, said the fishermen during the interviews, while the fishermen learned about sea turtle conservation the staff of TAMAR learned about the local culture, local sea turtle behavior, and about the local marine resources. Based on local perceptions about TAMAR and feedback from TAMAR staff regarding sea turtle conservation activities, this relationship continues strong and is still a valuable component in local sea turtle conservation efforts.

Traditional ecological knowledge seems to provide residents with greater awareness about contemporary threats to sea turtles. I asked residents during the interviews whether there were threats to sea turtles in the past and in the present. While

all respondents knew about historical sea turtle harvesting practices, the fishermen and those who fish for a hobby were more likely to perceive the presence of contemporary threats than those without ties with fishing. Among TAMAR workers, 80% versus 55% of non-TAMAR workers said there are still threats to sea turtles (Table 4.6).

**Table 4.6: Chi-Square Analysis: TAMAR workers and perceptions about threats to sea turtles in Praia do Forte ( $\alpha \leq 0.05$ )**

Dependent Variable (Y): Perceptions about threats to sea turtles			
Independent Variable	There are threats to sea turtles	Overall percentage within the category	Exact Sig. (2 sided) Fisher's Exact Test
TAMAR worker	n=20	80%	<i>p</i> -value=0.044
Non-TAMAR worker	n=28	55%	

These results help demonstrate that TAMAR workers were also more likely to perceive the presence of threats to sea turtles than did non-TAMAR workers. Since only 28% (n=7) out of the 25 TAMAR workers in the survey are fishermen, it seems that environmental education provided at the Visitor Center and Research Station has influenced their understanding about sea turtles. Hence, it seems that environmental education opportunities provided by TAMAR help promote the skills found in traditional ecological knowledge.

Throughout this study many native residents said during our conversations that they are seeing changes in the way the younger generation values the local culture and uses fishing, which are components of the traditional ecological knowledge. They associate the loss of interest in fishing as one of the indicators that the local culture, which they identify as a fishing culture, is dying. One native woman expresses her feelings when I asked her perceptions about the changes in the local culture: ‘Many things here are not valuable in terms of money but they are in terms of our culture, of our

past. And now, with more and more native people leaving the village to live in other places, they are slowly removing the culture from here. Everything that was here during the time of my mother, many of these things are dying. What is left is thanks to the work of some older native people and some young ones too, people who do not want to let this culture die.' Her views about the local culture and the changes that have occurred overtime are shared by many native residents in this study. The dying off of traditional ecological knowledge, which is tied to fishing, influences sea turtle conservation. This association is supported by the results presented above, where it seems that residents who have ties with fishing are more likely to perceive the presence of threats to sea turtles than do residents without ties with fishing.

Thus, it looks like there is a linkage between traditional ecological knowledge and sea turtles that benefits sea turtle conservation efforts. The use of traditional ecological knowledge has been a component of sea turtle conservation efforts of TAMAR since the beginning, however, will it continue in the longer term? In other words, while most men in 1982 were fishermen or fish, today this number is only a fraction of the overall number of native men in the village. Therefore, will there be native young men working as fishermen in the longer term? Based on the number of younger native men currently working as fishermen (which are few), on the perceptions the respondents in this study have about fishing, and the professional expectations they have for their children, it is uncertain whether the native children will become fishermen. Therefore, a way to help sustain this knowledge may be through environmental education.

Although this practice does not address the reasons why traditional ecological knowledge is fading among native families, perhaps it helps generate interest among the children whose families are not fishing families. In other words, while these children are native to Praia do Forte their families may not be native to the village. Based on the demographic data in the survey and characteristics associated with fishing of respondents who are not native, it is likely that their families are not fishing families. Therefore, these educational opportunities may be the only opportunities they have to learn about traditional ecological knowledge.

#### **4.11 Discussion and Conclusion**

Results from this study show that the influence of environmental education programs on local support for sea turtle conservation, understanding about sea turtles and sea conservation, and knowledge about contemporary threats to sea turtles varied. These variations were based on the level of involvement residents have with environmental education programs, resident ties with sea turtle conservation activities, and ties with fishing.

Many residents stated that environmental education opportunities provided by TAMAR to the children are important because they teach the children about the local fishing culture and about the local environment. All respondents in this study supported these programs, with the mini-guide educational program the most popular among the programs. When asked about their perceptions about TAMAR's environmental education programs, many respondents believe these are the only opportunities the local children have to gain skills they will need during their professional lives.

More than 500 children have passed through the mini-guide program since its creation in 1995. Of these 500 children, 162 have been mini-guides. In the near future, these 500 children will be 500 adults who, perhaps, have greater skills to use in their professional careers, have greater self-esteem about their capabilities and cultural roots, and have greater understanding about sea turtles and sea turtle conservation as a result of being engaged in the mini-guide program. Therefore, though not a conservation strategy that generates immediate results at the economic level, environmental education programs may promote for socioeconomic changes in the longer-term and throughout the lives of these children.

Findings were unclear regarding the future of traditional ecological knowledge. Findings were also unclear regarding the influence environmental education has on traditional ecological knowledge. Most of respondents in the survey show to have knowledge of and understanding about sea turtles and sea turtle conservation, such as the knowledge that sea turtle harvesting is illegal, that TAMAR is a sea turtle conservation program, that lights disturb nesting activities, and that some fishing activities can kill sea



turtles. This finding may be an indicator that these programs can enhance understanding about sea turtles and sea turtle conservation. Since TAMAR workers are more likely to perceive the presence of threats to sea turtles than do non-TAMAR workers, this may also indicate that these environmental education activities within the Visitor Center and Research Station are working. These results support the claim that environmental education can be an effective conservation strategy to enhance understanding about sea turtles and sea turtle conservation among the communities where these conservation programs are implemented.

However, despite these results, 27% of non-TAMAR workers in the survey were unable to tell me the main laws used to protect sea turtles. In other words, what can residents do or not do regarding sea turtles. Although most in the community are knowledgeable about sea turtles and sea turtle conservation efforts, there are still residents in the community with very little understanding about key legal or regulatory components of sea turtle conservation. These components are: (1) what are the main causes of population decline (e.g. contemporary threats to sea turtles) and (2) what are the main tools (e.g. laws) used to protect sea turtles from these threats. These results show, perhaps, a limitation on current environmental education strategies provided by TAMAR in reaching the adults in the community who do not work for TAMAR or have ties with fishing.

Since most of the population of Praia do Forte is no longer formed by native families, but by residents who are likely to have no ties with fishing, with TAMAR, or with the natives in the community, this finding is of a concern. Would the acknowledgement of threats and laws influence behavior? In other words, would it make a difference for sea turtle conservation whether more residents in the community knew about the laws and about the threats? Perhaps yes. Perhaps this knowledge would benefit sea turtle conservation efforts since there are still some reports of sea turtle harvesting and deaths as result of bycatch in fishing gear. Perhaps addressing to this situation - the lack of understanding about laws and enhance awareness about the threats - can help reduce ongoing threats to sea turtles (e.g. harvesting and bycatch in fishing gear).

Another alternative to help address this knowledge gap is providing the community greater opportunity to interact with the staff of TAMAR, like via greater engagement in communal affairs and provision of workshops with the adults of the community. These interactions could minimize this knowledge gap. Due to the logistics involved in developing and implementing a new program that focus on the adults of the community, a starting point could be working with the families of the more than 100 people who work for TAMAR. Though the employees themselves showed greater knowledge about sea turtles than did non-TAMAR workers, what about their families? By targeting the employees and their families TAMAR can also influence greater audiences, which are the relatives and friends of these employees.

An analysis of the reasons cited by residents for their support of sea turtle conservation shows that, despite having greater awareness about the threats, most of TAMAR workers supported sea turtle conservation for economic reasons than also for ecological reasons. Similar results were found among non-TAMAR workers, who also said they support sea turtle conservation because sea turtles help and/or have role in the local economy. Although these were unexpected findings, these results demonstrate that income from sea turtle ecotourism is a strong incentive for residents to support sea turtle conservation.

It also shows that awareness of threats and understanding about sea turtle conservation may not necessarily indicate certain behaviors if presented with a different scenario. This is based on the fact that 56% of TAMAR workers and 68% of non-TAMAR workers said sea turtle harvesting is likely to increase if TAMAR would to leave the village. When asked 'why' the most cited reason is the impact on the tourism industry. Therefore, would these residents still support sea turtle conservation if the income provided by sea turtle ecotourism was minimal? Or if the role of sea turtle ecotourism, which is represented by the Visitor Center, was also minimal? The answer to this question is important for sea turtle conservation because revenues from ecotourism in Praia do Forte are tied, in part, to the local tourism flow. What would happen if the tourism industry would crash? Would sea turtle harvesting increase without the economic

incentive from sea turtle ecotourism? Would understanding about sea turtles and about sea turtle conservation influence whether these residents would eat sea turtle meat and eggs again? Based on the same analysis, 44% of respondents who work for TAMAR versus 32% of non-TAMAR workers still said the community will not resume eating sea turtles. Some the reasons of not eating sea turtles are: 'They can go extinct if we don't protect them', 'Low numbers', and 'Because they are protected by the IBAMA'. Thus, it is uncertain whether greater understanding about sea turtles and sea turtle conservation would control, or be enough of an incentive, for some residents decide to not harvest sea turtles if the tourism industry would to crash.

Results are also unclear regarding the influence of environment education on fishing. Despite the potential to address both sea turtle conservation needs and benefit the local fishing culture, TAMAR's environmental education programs through ecotourism are unlikely to guarantee that future generations will continue interested in fishing or in maintaining traditional ecological knowledge. Other factors, such as changes on local demographics, introduction of other employment and income opportunities, internal instability of the local fishing industry, and environmental conditions associated with fishing practices, could influence continuation of the fishing culture in the longer term.

Still, even though these challenges exist, the environmental educational programs promoted by TAMAR give the impression to enhance understanding about sea turtles and help maintain local fishing culture. Therefore, since approximately 2,100 children have learned about sea turtles, sea turtle conservation, and about local marine resources by being engaged in at least one of the programs promoted by TAMAR, there is a chance that at least a percentage of these children will take home the traits of traditional ecological knowledge. Consequently, these programs are long-term 'investments', where the results take place over a prolonged period of time rather than as a one-time experience. I expect that through these opportunities these children will become adults who have greater awareness of the potential impacts some of the socioeconomic activities taking place in the village and surroundings today have on the local environment and on their livelihoods.

I also interviewed six former students of the mini-guide program. These are native residents who are now older than 18 years of age. A comparison between this group and residents who are not former mini-guides or are fishermen shows that these six young adults have greater understanding about sea turtles, sea turtle conservation, and about the impacts unregulated coastal development can cause on the local resources than did the other group. They also have high self-esteem, which shows on their perceptions about their skills. When I asked them about their expectations for their future, they said they have the skills to acquire better job positions in the village. They also said they want to go to college to pursue a degree in the field of conservation because they would like to be the next biologists, veterinarians, and environmental lawyers working for the conservation cause in Praia do Forte. Unfortunately, for different reasons, none of them has been able to achieve this goal. Still, their desire, or even the perspective to go to college is a major milestone for this community. Among the native respondents in the survey, more than half did not complete high school.

Therefore, their desire to pursue a college degree is, at least, a positive sign that the efforts of TAMAR to provide the local children with resources for them to succeed in their careers is working. However, TAMAR is only able to be one component of the overall educational experiences these children and youth have. TAMAR cannot, and should not, be responsible for the community's educational system and the sole provider of high quality educational opportunities to the community. This is the government's responsibility and it is the government's responsibility to provide residents with the educational services and resources they need, and should have, as residents of Praia do Forte. TAMAR's efforts, though showing to be a good addition to the learning opportunities for these children, are unlikely able to compensate for the limited educational opportunities available to the children and the absence of qualifying workshops available to the adults in the community. The conditions of the local educational system, which were provided by the respondents during interviews and based on my observation during visits to these schools and talks with some of the school teachers, are likely to continue influencing what skills are developed by the children,

youth, and adults in the community. However, future studies must be conducted in order to evaluate the efficiency of these programs in providing the outcomes they say they provide and should provide to the community.

As closing remarks, even if environmental education programs influence local values and uses of sea turtles by enhancing understanding about sea turtle conservation, external factors that are not controlled by either the community or by TAMAR (e.g. population growth, coastal development, and open access to sea turtles) can interfere on the future effectiveness of these conservation efforts. One potential factor involves changes on local demographics associated with population growth (e.g. construction workers and residents who moved to Praia do Forte in search of employment opportunities). Native and local residents said that one of the main reasons some people still harvest sea turtles, and one of the reasons sea turtle harvesting is likely to increase without TAMAR's presence in the village, is that the newcomers do not have ties with the native community, with fishing, or with TAMAR. Therefore, as stated by a native resident: 'What will happen if people here stop taking care of the turtles? They [outsiders] will start eating the sea turtles and it will be the end of the sea turtles.' Therefore, although TAMAR has succeed in gaining support for sea turtles at the community level, external factors still challenge the survival of sea turtles at the macro scale. Reaching out to the community 'outside' the payroll of TAMAR may help minimize this potential threat to sea turtles in Praia do Forte.

## 5. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

In this study, I analyzed how employment and income from sea turtle ecotourism, enforcement of sea turtle protection laws, and promotion of environmental education implemented by the TAMAR Project in Praia do Forte, between 1982 and 2008, related to local support for sea turtle conservation. Results of this analysis revealed an association between each one of these conservation approaches in the way locals value and use sea turtles, in traditional ecological knowledge, and in perceptions of economic well-being. Overall, the majority of respondents said they support the use of laws to protect sea turtles, that sea turtles are important components of the local economy, and that environmental education enhances understanding about sea turtles and sea turtle conservation. Economic benefits from sea turtle conservation also help address household needs. Employment in ecotourism provides residents with intangible benefits such as skill development, enables interactions with people from other cultures, and enhances self-esteem. The promotion of these achievements makes ecotourism more than an economic tool; it creates new understandings, skills, values, and social relations (Stronza & Gordillo, 2008).

The majority of respondents also said they help TAMAR protect sea turtles through the sharing of common rules regarding sea turtles and sea turtle conservation. One indicator of such support is the decrease in sea turtle harvesting since TAMAR's arrival in the village in 1982. This finding is supported by longitudinal empirical studies on sea turtle nesting activities in Praia do Forte (Marcovaldi *et al.*, 2007; Marcovaldi & Marcovaldi, 1999; Santos *et al.*, 2000) which show a decrease in sea turtle harvesting since the early 1980s. The influence of these strategies on local support or lack of support for sea turtle conservation appears to be associated with how and under which conditions these strategies are implemented and who implements them. Appendix A summarizes

resident's perceptions about these strategies, the conservation paradigm they represent, and some of the limitations of each strategy.

Results from this study also demonstrate that, despite some positive signs associated with conservation, each one of the implemented conservation strategies has limitations. For example, though minute in comparison to historical levels, illegal harvesting of sea turtles is still taking place despite sea turtle protection laws that ban harvesting; income from sea turtle conservation appears to be lower than the income provided by other of employment options available to local residents; and many respondents are unfamiliar with key regulatory and legal aspects of sea turtle conservation despite the promotion of environmental education programs.

So far, economic benefits from sea turtle conservation seem to help support some household livelihood needs. Among respondents, many have income from TAMAR and most have income from tourism. Only a small percentage of respondents reported having income from fishing. Results also show that residents associate TAMAR as a catalyst of local tourism activities. Though partially true, such association seems to benefit sea turtle conservation because it creates a greater economic incentive for residents to not harvest sea turtles. As such, these results show that sea turtles were and continue to be making an important economic contribution to the lives of the residents of Praia do Forte. Despite these positive indicators that sea turtle harvesting has diminished, which indicates that TAMAR's efforts to protect sea turtles in Praia do Forte appear to be succeeding at the community level, this achievement may not be sufficient to control the influences external factors have on the community and on sea turtles. Some of the reasons TAMAR may not be able to address these external factors are disintegration of local fishing industry, lack of community participation in conservation management, and open access to sea turtles.

When TAMAR arrived in the Praia do Forte in 1982 fishing was still an important economic and cultural component in the lives of most families in the village, tourism development was still at its infancy, and sea turtle harvesting was still a common practice. The arrival of TAMAR brought some changes to local uses of sea turtles, to

traditional fishing practices, and to the local economy. Enforcement of sea turtle protection laws by TAMAR controlled use of sea turtles and their eggs. Loss of access to sea turtles influenced residents' reliability on other sources of food, particularly fish. Though the majority of native residents said they prefer fish over other types of meat, lack of access to sea turtles placed an economic challenge on some families because they had to rely on alternatives to sea turtle meat and eggs to support some of their livelihood needs. One approach used by TAMAR to minimize such impacts on livelihoods was the introduction of economic benefits from sea turtle ecotourism.

One of the premises of ecotourism is to provide economic benefits from biodiversity conservation to local communities as incentives to reduce pressure from direct resource use and to minimize economic losses associated with the implementation of conservation strategies. In Praia do Forte, at first, TAMAR provided employment opportunities to the fishermen and later to the women and non-fishermen of the village as ways to address local needs and help mitigate the economic impacts caused by the enforcement of sea turtle protection laws. Overtime, these employment opportunities grew and diversified. During the time of this study TAMAR employed the most people in the village. In 2007, 110 residents of Praia do Forte and adjacent communities worked at TAMAR. Most residents said they support sea turtle conservation because of the role sea turtles play on the tourism economy. These results illustrate that economic benefits from ecotourism can create an incentive for residents to support TAMAR and TAMAR's efforts to protect sea turtles.

Results also show, however, that the average income from sea turtle ecotourism is less than the average income residents reportedly earn from other jobs in the community. Despite this difference in average salary, TAMAR workers said that employment at TAMAR gives them an opportunity to interact with people from other cultures and gain new skills. Many also reported that employment at TAMAR is a family tradition. Therefore, the benefits provided by sea turtle ecotourism are both economic and social. While employment at TAMAR increased over the years, the opposite can be said about the local fishing industry. Once an important component on the local economy, today



only a few families rely on fishing to support their livelihood needs. As cited above, only a small percentage of respondents relied on fishing as a household source of income. Over the years, the availability of employment opportunities and income alternatives provided by the tourism industry and by TAMAR has provided residents with both employment and income alternatives to fishing. Although one of the goals of sea turtle ecotourism is to provide alternatives to direct consumption of sea turtles, the disintegration of the local fishing industry does not benefit sea turtle conservation.

Since its arrival, TAMAR has incorporated traditional ecological knowledge in sea turtle conservation efforts. This process is a result of working with the local fishermen in testing different fishing techniques, by learning from the fishermen about local sea turtle behavior and activities and about the local natural resources, and by having the fishermen help patrol the beaches and assist in sea turtle data collection. TAMAR has yet, however, to integrate the community or the fishermen in management decisions or strategic planning for sea turtle conservation or ecotourism. So far, the relative lack of community participation in these activities seems not to have hampered local support for sea turtle conservation. In fact, the majority of respondents perceive TAMAR as the most appropriate entity to manage sea turtles, and only a minority believes the community should co-manage sea turtle conservation with TAMAR.

Despite these results, there seem to be some future challenges for TAMAR since only a small percentage of households still rely on fishing to support their subsistence needs. Also, there seems to be a lack of interest from the younger generation to pursue fishing as a chosen profession. In fact, even the fishermen who participated in this study acknowledge that other employment opportunities, such as the ones provided by TAMAR or at the tourism industry, are safer and provide a more reliable and stable source of income. Although in theory fewer fishermen may have fewer fish nets floating around, thus fewer chances for sea turtles to get caught in fishing gear, the disintegration of the local fishing industry can influence sea turtle conservation because the fishermen are more likely to perceive the presence of threats and to witness changes in sea turtle populations than other residents who have no ties with fishing. Therefore, a loss of this

knowledge and the practice of fishing are not only a cultural loss for the native community but also a loss of an important facet in sea turtle conservation.

Some of the reasons residents said they do not work in fishing are the opportunity to gain higher and more stable income at other job opportunities and fishing does not provide a safe work environment. While in the past there were limited alternatives to fishing, now the main economy of Praia do Forte is tourism. The growth of the local tourism industry has intensified over the past decade. Tourism development is associated with improvements in the local infrastructure, provision of employment opportunities, and alternative sources of income to the community. On the negative side, tourism is also associated with some negative changes in local livelihoods. Among the most cited impacts are the increase in the cost of living, the introduction of drugs, urban violence, and greater sense of insecurity. Residents believe these impacts will become greater problems in the near future as a result of fast urban development and changes in local infrastructure. Results show that these changes also influence conservation efforts.

Coastal development, if not properly managed, can impact sea turtle nesting sites, nests, and the habitats sea turtles use while inhabiting local coastal waters. Residents also claim that non-native and non-local construction workers and lobster fishermen are the ones harvesting sea turtles and associated with sea turtle deaths. Although minor compared with historical harvesting rates, the presence of such activities raises questions about whether current conservation strategies are the most effective strategies to protect sea turtles. More specifically, the ongoing harvesting of sea turtles and problems associated with bycatch in fishing gear casts doubt on the effectiveness of enforcement in controlling illegal activities, whether economic benefits are sufficient incentives to gain local support for sea turtle conservation, and whether environmental education is an effective tool for enhancing understanding about sea turtles. Also, these limitations may be indicators of the outcomes generated by not including locals in management decisions. Had TAMAR included the community in management perhaps these limitations could have been addressed or even prevented as residents would have a greater input throughout the process.

So far, employment at TAMAR is still considered one of the most popular employment choices among community members. Despite the reported lower salaries provided by TAMAR, residents stated that working at TAMAR provides them with important benefits. Many residents also stated that work at TAMAR is a family tradition among native residents. Among respondents, the majority reported having at least one family member who works or who has worked at TAMAR at some point in time. It appears that these intangible benefits have been sufficient to sustain local support for sea turtle conservation. However, will they be sufficient to sustain support in the longer term? So far, participation through employment and by sharing traditional ecological knowledge has not precluded TAMAR from gaining local support for sea turtle conservation. However, changes in the local economy, infrastructure, and demographics may challenge the effectiveness of implemented strategies, particularly the absence of the community decision-making, and on the incentive intangible benefits have in attracting future employees.

One of the changes that is likely to influence sea turtle conservation in the near future is associated with changes of the role of fishing in the local economy. Once one of the main sources of income among native families, now only a small percentage of families still rely on it to support livelihood needs. The disintegration of the fishing industry influences the future of traditional ecological knowledge across generations, which in turn influences sea turtle conservation. While employment at TAMAR provides the fishermen with an opportunity to implement their knowledge aside from working as full-time fishermen, these employment opportunities may not create sufficient incentives for the younger generation to choose fishing over other employment opportunities. Therefore, while employment at TAMAR has succeeded in alleviating some of pressure imposed on sea turtle harvesting by providing residents with employment opportunities and alternative sources on income, it has also created an incentive for residents to stop working as fishermen. Thus, most young adults no longer associate fishing as a means to make a living.

The disintegration of the local fishing industry is also not a consequence of a failure of the local fish market. On the contrary, local fish consumption has increased as result of the tourism industry and population growth. However, while the demand for fish has increased over the past years, local fishing activities and groups have not been able to adjust or taken full advantage of these changes. Among the main limitations are the lack of technical skills, equipment, and appropriate resources to compete with non-local and non-native seafood merchants. As a result, fishermen said that most of the restaurants and hotels purchase their seafood from non-native and non-local seafood merchants. Therefore, the potential exists for the local fishing industry to enhance its economic role within the local economy. However, based on my conversations with the local fishermen and with local business owners, I perceive that the fishermen, without getting some of the needed skills and resources, they will unlikely be able to outproduce the non-local seafood merchants. Also, without improvements on the overall work conditions provided to the fishermen it is unlikely that the younger generation, based on the provided employment opportunities at TAMAR or at other job sectors, will be interested in working as fishermen.

Perhaps, had residents, particularly the fishermen, been involved in conservation management since the early days of TAMAR in the village this situation could have been different. Perhaps, participation in management could have provided the fishermen greater technical and managerial skills they need to transform the local artisan fishing industry into a reliable employment opportunity to residents and a profitable business to the involved fishermen. The market for local seafood exists, but the local fishermen have yet to fully tap into it. Also, maybe the fishermen would have been able to develop professional networks that would have provided them with contacts with potential buyers. Also, since it has been about 25 years since TAMAR's arrival in the village, the younger generation could now be helping the older generation of fishermen run the local fishing industry. Such opportunities could have generated meaningful changes in the way local social, economical, and political powers now operate within the community. Currently, outsiders rather than the local and native residents have this level of empowerment. If the

community had been involved in the complex and challenging arena of sea turtle conservation, mitigation of coastal development impacts, legal cases, and other issues perhaps they would have acquired greater skills, enhanced their self-esteem, and earned a greater role in village life.

Possibly some of the problems I witnessed during my fieldwork and the problems residents said impacted their quality of life could have been prevented had the community been more assertive about their role in local events - that they do have the right to demand certain services from the government. In this way, the socioeconomic benefits of involving the community in sea turtle conservation extend beyond the sea turtles. In the case of Praia do Forte, this opportunity could have also fostered the development of stronger and lasting social networks and institutions. Consequently, the combination of these factors would have not only benefited the community but also the sea turtles.

As final remarks, results from this study demonstrate that while community-based sea turtle conservation can work at the community level it may fail at the larger scale level because of its inability to address some of the external factors that drive conservation and consumption of sea turtles. This is particularly because sea turtles are migratory species, thus they are not tied to a specific stretch of the beach. Since the coastline of Praia do Forte is open access to anyone, every individual has access to sea turtles. Therefore, the efforts of TAMAR and the efforts of the community in protecting sea turtle are more likely to influence 'local' sea turtle nesting activities and are likely to be unable to control what takes place beyond this geographical boundary. Therefore, this is not a limitation of community-based sea turtle conservation in protecting sea turtles, but a case where the open access scenario challenges the influence of TAMAR and the community in controlling access to sea turtles. As such, this case study of community-based sea turtle conservation demonstrates that, unlike what is often portrayed by supporters of top-down approaches to conservation and argued by Hardin (1968), communities can be partners in conservation. As partners, the role of the community in

supporting and participating in conservation efforts is essential if conservation programs are to achieve their conservation goals on both short-term and longer term.

## 5.2 Recommendations

Results from this study show that, so far, sea turtle conservation strategies implemented by TAMAR influence local values and uses of sea turtles. Results also show that the role sea turtles play in the local economy influence local values ascribed to sea turtles. Since the local economy is now based on tourism, both directly and indirectly, what will happen to the sea turtles if the tourism industry were to fluctuate? Will the same strategies TAMAR has been implementing since the early 1980s continue to work? Probably not, especially because there is little community involvement in decision-making and some of the impacts will require greater involvement of the community in order to be addressed. Following are some suggestions about how TAMAR, government officials, policy-makers, and academic institutions may be able to minimize some of these potential impacts and also take advantage of the benefits generated by such changes. These suggestions include alternatives for sea turtle conservation, research, policy making, and capacity building at both local and larger scales.

### 5.2.1 Recommendations: Government Officials and Policy-makers

1. **Promote public policies that support small scale fishing, such as artisan fishing practices:** These policies can provide fishermen, like the fishermen in Praia do Forte, with technical and legal support needed to continue relying on traditional fishing practices to support their livelihood needs. These policies may also protect the fishermen from some of the economic losses they encounter as result of large scale fishing activities.
2. **Enhance enforcement of already established laws:** Brazil is one of the countries in Latin America with the greatest number of laws and regulations that address sea turtle conservation (Domingo *et al.*, 2006). However, enforcement of

these laws by the responsible agency – the IBAMA, is questionable. In spite of the existence of laws that protect endangered species, such as the five species of sea turtles in Brazil, they are only useful for sea turtle conservation when they are, in fact, enforced. Reliance on the ‘image’ of TAMAR and on the economic role of sea turtles play in the tourism economy should not, as it seems to be the case in Praia do Forte, be the basis of sea turtle conservation success. While TAMAR monitors activities to verify whether the laws are followed, TAMAR staff cannot arrest those who are breaking the law. These tasks are the responsibility of the federal agents of the IBAMA, who are responsible of protecting sea turtles and other species classified as endangered. Without proper and effective enforcement, sea turtle protection laws mirror the scenario of ‘Paper Parks’. In this case, national parks are created by the legal system but they are often found to exist without onsite administrative and enforcement personnel. In the case of sea turtle protection laws, without active and effective enforcement of the IBAMA agents these laws are ‘Paper Laws’. As such, these laws must be enforced where they are needed, which are along nesting sites and offshore. Though a challenging task, the federal government has the resources needed to provide the IBAMA with tools necessary to patrol and enforce laws that pertain to coastal development, bycatch in fishing gear, and illegal harvesting activities.

- 3. Promote opportunities for collaboration between researchers, coastal communities, and government agencies:** These opportunities can be a venue for sharing and gaining knowledge about sea turtles and sea turtle conservation strategies. This knowledge can then be used to address the needs of fishing communities as well as the needs of sea turtles. Fishermen can help researchers test new techniques and gather empirical data for sea turtle research which, in turn, helps monitor sea turtle populations, evaluates impacts of different fishing techniques, and controls threats to sea turtles. The results from this data collection processes can be incorporated into conservation policies that are more site

specific and applicable to the resource use practices and threats to sea turtles and their habitats. Though some of these activities are already implemented by TAMAR, they could be expanded to other species, scenarios, and conservation groups.

4. **Develop policies that require a sharing of the revenues earned by large scale tourism projects:** A specific tax policy could focus on tourism development projects along the coast, such as beach resorts and hotels. Revenue allocation could be based on the number of hotel rooms occupied and deducted as part of local or regional taxes. This revenue could be used in mitigating impacts caused by these projects.

#### **5.2.2 Recommendations: Academic Institutions and Government Agencies**

1. **Promotion of research on cost-benefit of conservation:** This is particularly the case of studies that analyze the economic impacts and benefits sea turtle conservation strategies, like ecotourism, have on the local and regional economies - not only in the form of direct benefits but also as a multiplier economic strategy that benefits the local and potentially the regional economy.
2. **Promotion of interdisciplinary research:** Interdisciplinary research could provide some answers about the existing linkages between sea turtle conservation and consumption as the result of changes to local demographics, the economic role of sea turtles on the economy, and external markets on sea turtles (e.g. illegal trade and consumption for religious purposes). This information could then be used in the development of conservation strategies and policies that are more applicable to local uses and threats.



### **5.2.3 Recommendations: Local Government and Tourism Developers**

1. **Development of social capacity building within coastal communities:** These opportunities may be via the provision of workshops and courses residents may use to learn new skills. These educational opportunities may also give residents the incentive needed for them to engage in activities that focus on resource use activities that are more beneficial to sea turtle conservation, such as ecotourism or nature tourism.
2. **Provide technical and financial support to local fishing groups:** This support can be a means for fishermen to incorporate new technology into their traditional fishing practices. By so doing, the fishermen may be able to conduct fishing activities more efficiently and in ways that are less harmful to sea turtles.

### **5.2.4 Recommendations: Conservation Agencies, Programs, and Groups**

1. **Collaboration in decision-making:** Promote opportunities for residents of coastal communities influenced by sea turtle conservation strategies to participate in conservation management. These opportunities should also include participation in the planning and implementation of strategies. That way, locals could give their input and also learn about proposed conservation policies, the development of alternative fishing techniques, and find consensus on mitigating alternatives to potential social and economic impacts from conservation strategies on local livelihoods.

### **5.2.5 Recommendations: Praia do Forte and Adjacent Communities**

1. **Diversification of the local economy through greater support of the local fishing industry:** Promote workshops as strategies to enhance understanding about marketing strategies and managerial skills.

2. **Community participation in sea turtle conservation in the development and management of conservation strategies:** Provide opportunities for residents and TAMAR to exchange perceptions about sea turtle conservation and provide opportunities to assess the applicability of resource use alternatives and develop strategies that fulfill the needs of both community and sea turtle conservation.
3. **Integrate local fishermen in sea turtle conservation decision-making:** Through participation the involved groups may be more efficient in developing alternatives to control illegal activities, as well as create opportunities for capacity building among fishermen and the community. This can provide opportunities to address contemporary socioeconomic challenges faced by the fishermen.
4. **Develop workshops within the community:** These activities can enhance understanding about sea turtle conservation and provide opportunities for residents to learn about TAMAR's work and meet the staff of TAMAR. Workshops also provide a means for the community to address issues that influence their livelihoods and for TAMAR to address these issues before they become problems. This process benefits both the community and sea turtles.
5. **Extend environmental education programs to adults within the community, particularly among newcomers**
6. **Incorporate environmental educational programs as part of the school curricula:** The integration of environmental education programs can broaden the scope of these programs and enhance the educational opportunities for all the children of Praia do Forte.
7. **Support local fishing culture by providing opportunities for children to learn about fishing from fishermen.**

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## APPENDIX A

## COMPARISON TABLE BETWEEN PARADIGMS

<b>Conservation Approach</b>	<b>Paradigm</b>	<b>Goal</b>	<b>Focus</b>	<b>Resident's reaction to the strategy in 1982 and at the time of this study</b>	<b>Indicators</b>
Enforcement of Sea Turtle Protection Laws	Top-down	Control killings of nesting females; harvesting of sea turtle eggs; bycatch in fishing gear; and impacts on hatchlings, nesting sites, and nests.	Community wide; federal law	Generated some resentment; overall support	Reduction of sea turtle harvesting for meat and eggs.
Provision of Employment and Income	Bottom-up	Change local use and value of sea turtles via economic incentives from sea turtle conservation	Direct: TAMAR workers; Indirect: the community via economic development (multiplier effect)	Overall support throughout the process	Employment opportunities and alternative sources of income.
Promotion of Environmental Education	Bottom-up	Enhance local understanding about sea turtles and overall conservation awareness	Overall community but specific programs (e.g. mini-guide) focus on the youth and children	Overall support throughout the process	Enhancement of understanding about sea turtles and sea turtle conservation.

<b>Conservation Approach</b>	<b>Influenced local uses of sea turtles?</b>	<b>Influenced local values of sea turtles?</b>	<b>Helps maintain local traditional ecological knowledge?</b>	<b>Promotes for the economic well-being of the household?</b>	<b>Weaknesses and potential impacts on sea turtle conservation</b>
Enforcement of Sea Turtle Protection Laws	Yes	Not so much	Yes, indirectly	Yes, indirectly via employment and income at the Visitor Center and Research Station	Occasional sea turtle harvesting for their meat; bycatch in fishing gear persists.
Provision of Employment and Income	Yes	Yes	Yes	Yes	Higher paying jobs in other locations can create an incentive for residents to pursue employment elsewhere.
Promotion of Environmental Education	Yes	Yes	Yes	Not immediately but likely in the longer term	Limited knowledge about sea turtles and sea turtle conservation among some households demonstrate the need to also reach the adult community, particularly among the newcomers and residents without ties with the native community and TAMAR.

## APPENDIX B

## PARTIAL CENSUS OF PRAIA DO FORTE, JULY 2008

Number of Units per Category						
Street name	Group 1	Group 2	Group 3	Group 4	Group 5	TOTAL
	Rua da Aurora	ACM (Right)	ACM (Left)	Alameda da Lua	Avenida do Farol	
Houses	57	25	17	160	36	295
Pousadas	7	1	3	2	14	27
Resorts	1	0	0	0	0	1
Subdivisions	5	0	0	0	10	15
Hotels	3	0	0	0	0	3
Youth Hostels	1	0	0	0	0	1
Beauty/massage parlor	1	0	3	9	0	13
Taxi services	0	3	0	0	0	3
Barbershop/ hair salon	1	1	0	2	0	4
ATM Bank service	0	4	1	0	0	5
Tourism agency	1	1	2	0	2	6
Health clinic	0	0	0	1	0	1
Lan house	1	1	1	2	0	5
Video store	0	0	1	1	0	2
Construction material store	0	0	1	2	0	3
Laundry mat	0	1	0	0	0	1
Soccer field	0	0	0	0	2	2
Money exchange offices	0	2	0	0	0	2
Churches	1	1	0	2	0	4
Yoga (Classes/Center)	0	0	0	0	2	2
Copy services	0	0	1	0	1	2
Real estate offices	1	2	1	1	1	6
Grocery stores	0	0	4	0	0	4
Restaurants (upper scale)	0	6	10	0	3	19
Restaurants (lower scale)	3	2	1	2	3	11
Bars	1	8	5	6	2	22
Coffee shops	1	0	1	1	0	3
Beachfront restaurants	8	0	0	0	0	8
Ice cream shops	1	2	1	0	0	4
Acarajé vendors	1	1	5	0	0	7
Others	0	1	0	0	0	1

<i>Street name</i>	<b>Group 1</b>	<b>Group 2</b>	<b>Group 3</b>	<b>Group 4</b>	<b>Group 5</b>	<b>TOTAL</b>
	<i>Rua da Aurora</i>	<i>ACM (Right)</i>	<i>ACM (Left)</i>	<i>Alameda da Lua</i>	<i>Avenida do Farol</i>	
Jewelry stores	0	3	10	0	0	<b>13</b>
Clothing stores	1	36	21	1	2	<b>61</b>
House-based commerce	2	2	2	8	0	<b>14</b>
Fish retail stores	1	1	0	2	0	<b>4</b>
Other retail stores	1	0	4	0	0	<b>5</b>
Arts and crafts stores	0	9	6	2	0	<b>17</b>
Street vendors	0	9	1	0	0	<b>10</b>
Thrift shops	0	0	0	1	0	<b>1</b>
Pharmacy	0	2	0	0	1	<b>3</b>
Souvenir stores	0	1	1	8	0	<b>10</b>
Post office	0	0	1	0	1	<b>2</b>
Police station	0	1	0	0	0	<b>1</b>
City office	0	0	0	1	2	<b>3</b>
Healthcare centers	0	0	0	1	1	<b>2</b>
Schools	0	1	0	0	0	<b>1</b>
Childcare center	0	0	0	1	0	<b>1</b>
Open construction sites	5	4	13	6	3	<b>31</b>
Open space	1	2	2	2	3	<b>10</b>
Gym	0	0	1	0	1	<b>2</b>
Architecture offices	0	1	0	0	1	<b>2</b>
Law offices	0	3	0	0	0	<b>3</b>
Clubs	0	1	0	0	0	<b>1</b>
Associations	0	1	0	0	0	<b>1</b>

<b>Subdivisions (names)</b>	<b>Number of Houses per Subdivision</b>
Porto das Baleias	107
Residencial Praia do Forte	32
Solar dos Pássaros	32
Solar dos Peixes	34
Aldeia dos Pescadores	47
Vilarejo do Sol	22
Solar das Águas	24
Condomínio Aldeia Jubarte	6
Moradas do Farol	28
Vivendas do Farol	22
Condomínio Aldeia dos Pescadores	110
<b>Total number of houses</b>	<b>464</b>

<b>Overall Number of Houses Within and Outside the Subdivisions</b>	
<b>Estimated number of people living within the subdivisions</b>	<b>2320</b>
<b>Estimated number of people living outside the subdivisions</b>	<b>1475</b>

Note: \*This census does not provide the total number of houses within and outside the subdivision. The total number of people per house is based on the average number of people per household collected during the survey of the 77 households in Praia do Forte.



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