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Article

Ecotourism and Sea Turtle Harvesting in a Fishing Village of Bahia, Brazil

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Abstract

Many environmentalists believe ecotourism has the potential to generate net benefits for people and nature. For more than two decades, the Brazilian Sea Turtle Conservation Program (TAMAR) has provided jobs and income through ecotourism in Praia do Forte, Brazil, in exchange for reduced harvesting of sea turtles. In this article we evaluate the relationships between ecotourism at TAMAR and local support for sea turtle conservation. Nine months of ethnographic research (2006–2008) suggest that ecotourism-related employment and income have been somewhat stable and reliable. The average income of respondents who worked with TAMAR was lower than that reported by people not working with TAMAR. Workers noted other non-economic benefits. Though the majority supported sea turtle conservation, it is unclear how feelings will waver with new mass tourism developments in the region. As the cost of living increases, residents may increasingly be inclined to look for work outside TAMAR. Development also attracts new immigrants, making it difficult for locals to control sea turtle harvesting. These trends challenge the notion that economic incentives for locals alone will ensure conservation. Further research is needed to understand the conditions under which ecotourism may foster long-term conservation in the face of larger developments surrounding community ecotourism projects.

Keywords: sea turtles, Brazil, economic benefits, TAMAR, ecotourism, Praia do Forte

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INTRODUCTION

Sea turtles are harvested and sold for their meat, shells, and eggs all over the world (Witherington & Frazer 2003) and many scholars argue sea turtle populations are declining because of such exploitation (Nichols & Palmer 2006; Peckham *et al.* 2008) while others suggest conservation efforts have been successful at curbing the decline (Balazs & Chaloupka 2004; Troëng & Drews 2004). Conservationists have used various strategies to control—or at least reduce—sea turtle harvesting (Campbell *et al.* 2007; Ferraro & Gjertsen 2009). Some use law enforcement to penalise hunters while others create market incentives to protect sea turtles. Ecotourism is an incentive approach, which entails establishing tourism businesses near sea turtle nesting areas and then compensating sea turtle harvesters with economic benefits (i.e., income, employment). Such benefits are meant to serve as incentives to forgo the harvest and trade of sea turtles (Blom 2000).

Although the definition of ecotourism has been 'devised, dissected, deconstructed, and reconstructed at enormous length' (Buckley 2009: 8), many conservationists continue to promote it as a win–win strategy for protecting sea turtles while also meeting people's needs. Ecotourism builds on two decades of efforts to create market incentives for wildlife conservation. In their seminal edited volume on sustainable wildlife use, Robinson & Redford (1991) argued that conservation could be achieved only if people perceived wildlife as useful and valuable. Further, people must see how benefits from conservation outweigh the costs of uses forgone (Pearce & Moran 1994).

These ideas have led to research on whether and how economic benefits from ecotourism truly create incentives for conservation (Weaver 1999; Tisdell & Wilson 2002). For example, in a case study of Royal Chitwan National Park, Bookbinder and colleagues (1998) found ecotourism delivered few employment opportunities and only marginal benefits to neighbouring communities. In other programmes, researchers reported limited economic benefits for local residents (Jacobson & Robles 1992), relatively few jobs (Barkin 2003), local dependency on a single income source (Belsky 1999), and seasonal rather than stable sources of income (Eppler-Wood 1998). These results suggest economic returns from

ecotourism may be insufficient to provide substantial or long-term incentives for conservation.

Even in cases where economic benefits are high, the connections between ecotourism and conservation seem tenuous. In Mexico, Young (1999) learned that economic returns from whale watching in Laguna San Ignacio and Bahia Magdalena did not reduce local pressure on fisheries. In the Monarch Butterfly Reserve, Mexico, Barkin (2003) found local support for conservation associated with employment opportunities, but continued resource degradation. In the Peruvian Amazon, Stronza (2007) showed that economic benefits from ecotourism had mixed effects on conservation. While employment correlated with reduced hunting and forest clearance, new income enabled increased consumption, purchases of new technologies, and additional pressures on resources. In the Galapagos Islands, ecotourism has fueled the local economy with new jobs and income, but has also triggered new pressures on the environment associated with greater numbers of tourists and immigrant workers (Durham 2008).

External factors can also break the link between ecotourism and conservation. While a community-based ecotourism operation may provide ample incentives for local residents to shift their livelihood practices and actively conserve resources, larger economic developments may offer higher returns, more plentiful employment opportunities, and greater appeal in general. Thus, mass tourism development beyond the borders of an ecotourism project can render null any local incentives for conservation.

Market demands for species also ignore the boundaries of ecotourism projects. Consider, for example, the cross-border, black market trades in wildlife (CITES 2009). In Southeast Asia, illegal sea turtle harvesting increased over the past couple of years, despite bans (SWOT 2008). Sea turtles are harvested and exported for religious purposes as well. In Mexico, an estimated 15,600 to 31,200 sea turtles are consumed yearly, with peak consumption during Easter and Christmas holidays (Nichols & Palmer 2006). Such demands for resources beyond the boundaries of ecotourism operations suggest that linkages between ecotourism benefits and conservation may be easily broken.

Despite these challenges, ecotourism remains a popular strategy for protecting sea turtles around the world. Projects may be found in the Mon Repos Conservation Park in Australia (Tisdell & Wilson 2002), in the communities of Tortuguero (Meletis & Campbell 2008) and Gandoca (Gray & Campbell 2007) in Costa Rica, and, as we will describe below, in the community of Praia do Forte in Bahia, Brazil.

Sea turtle harvesting levels and types vary across regions in Brazil. In many coastal communities, sea turtles remain an important resource for food and commerce (Marcovaldi & Marcovaldi 1999; Costa-Neto & Marques 2000; Alves & Rosa 2006). In the state of Espírito Santo, turtles are harvested primarily for their eggs (Almeida & Mendes 2007); in the states of Maranhão and Paraíba, the greater demand is for turtle fat and oil (Alves & Rosa 2006). In the fishing community of Praia do Forte, turtles have historically been harvested for their meat and eggs. Marcovaldi and Marcovaldi (1999) reported subsistence consumption only, though they noted, 'a substantial annual harvest had taken place for generations with little regard for population size or rates of recruitment,' and 'generally, feeding or nesting turtles were captured opportunistically' (p. 36). Grando (2003) noted harvesters also used sea turtle heads and flippers for shark bait.

In 2003, the five species of sea turtles found in Brazil—loggerhead, hawksbill, green turtle, olive ridley and leatherback—were classified as endangered (MMA Normative Instruction Nº 000031). Sea turtle harvesting and consumption is considered a federal crime in Brazil (Law on Environmental Crimes Nº 9605). The Brazilian Sea Turtle Conservation Program (TAMAR; *TArtaruga MARinha*, the Portuguese for sea turtle) was created in 1980. TAMAR is a collaborative effort between the Brazilian government and the non-profit organisation Pró-TAMAR (Projeto TAMAR 2009). The mission of TAMAR is to protect sea turtles found in Brazil. The organisation has used a combination of carrot-and-stick strategies to promote sea turtle conservation and protect sea turtles, including the monitoring of coastal areas for activities that do not follow sea turtle protection laws, fostering sea turtle conservation awareness through environmental education, conducting research, and promoting economic development through sea turtle ecotourism (Marcovaldi *et al*. 2005).

In the realm of sea turtle protection laws, the staff of TAMAR monitors 1,100 km of beaches in nine Brazilian states, all in areas where sea turtles reproduce, nest, and forage (Projeto TAMAR 2009). When they encounter illegal activities, TAMAR staff contact the agents of IBAMA (Brazilian Institute of the Environment), who have the legal authority to confiscate illegal gear, make arrests, and issue fines. TAMAR also seeks positive approaches to gaining local support for sea turtle conservation. In 2008, the organisation managed 22 research stations, which employed approximately 1,200 people from coastal communities (Projeto TAMAR 2009). In the most scenic locations along the coast of Brazil, TAMAR has also opened visitor centres and promoted ecotourism. Through the promotion of employment and income generation strategies TAMAR hopes to alleviate pressure on sea turtles and provide coastal communities with alternative means to support their family needs (Marcovaldi *et al*. 2005). Environmental education programmes, delivered both to tourists and local residents, take place in all 22 research stations and visitor centres.

In 1982, TAMAR opened a research station and, a few years later, a visitor centre in Praia do Forte and began employing local villagers in various positions related to sea turtle research, environmental education, and ecotourism (Marcovaldi *et al.* 2005). By some accounts, sea turtle conservation in this location has been successful. The long-term collaboration between the local fishermen and the staff of TAMAR and the increasing number of residents working for TAMAR are indicators of local support for sea turtle conservation. Nesting surveys of hawksbills between 1990 and 2006 (Marcovaldi *et al*. 2007) and loggerheads between 1988 and 2003 (Marcovaldi

& Chaloupka 2007) show increases in the number of nests. Nesting surveys also show an increase in the overall number of hatchlings released along the beaches of Praia do Forte between 1982 and 2008 (TAMAR Database 2008). In the 1982–1983 nesting season, 1,156 hatchlings were released. Twenty-five years later (2007–2008 season), 40,890 hatchlings were released. For some, these figures are evidence of the effectiveness of TAMAR's approach to sea turtle conservation (Mast 1999; Spotila 2004).

Sea turtle conservation strategies of TAMAR in Praia do Forte comprise various efforts, including research, monitoring fishing and coastal development activities to ensure sea turtle protection laws are upheld, promoting environmental education among visitors and community members, and fostering economic development through ecotourism. In 1995, TAMAR created a 'Mini-Guide Program', which engages school children in ecotourism while also teaching the next generation about sea turtle biology and marine conservation (Vieitas *et al.* 1999). Approximately 2,100 children have participated. TAMAR also sponsors a local child-care centre, which served 220 children in 2007. In a different vein, TAMAR works with fishermen to find ways to reduce sea turtle bycatch and mortality in fishing gear (Marcovaldi *et al.* 2006). In all of these efforts, TAMAR staff and scientists are the primary managers. Though local fishermen and villagers help the staff, the community remains relatively uninvolved in overseeing and managing sea turtle conservation activities, research, and ecotourism. Their primary engagement with sea turtle conservation efforts of TAMAR is through employment, income, and revenues from working at the visitor centre or research station. In 2007, 110 residents worked for TAMAR in Praia do Forte.

Our aim is to evaluate linkages between economic benefits from ecotourism at TAMAR in Praia do Forte and sea turtle conservation. Employment in ecotourism at TAMAR includes employment at both the research station and visitor centre. We try to find how economic benefits from ecotourism at TAMAR factor into people's discussions and decisions about the value, use, harvest, and conservation of sea turtles. We assess economic benefits in the forms of wage income, revenues, and employment, and we interpret whether and how such returns signify incentives for residents and their families to protect, rather than harvest, sea turtles. Are shifting economic values associated with new social valuations of sea turtles? These new social valuations of sea turtles are indicators of local support for sea turtle conservation.

Our findings are based on qualitative and quantitative data that we collected over nine months of ethnographic research (May 2006–August 2008). Data came from participant observation, semi-structured interviews, and key informant interviews. We asked residents who had varying ties with fishing and TAMAR for their opinions about ecotourism, sea turtles, and sea turtle conservation. We also asked residents to report on their uses of sea turtles. We define 'economic benefits' as employment and income from TAMAR's conservation and ecotourism activities. 'Conservation' in this context refers to voluntary restraint from harvesting sea turtles for meat, shells and eggs. We also include material benefits, such as the provision of chicken eggs in exchange for sea turtle eggs. Based on popular and academic narratives about ecotourism (Campbell 2002), we expected to find people discussing and responding to economic benefits from ecotourism as incentives for engaging in sea turtle conservation.

METHODS

We collected ethnographic data on local uses and values of sea turtles in nine months of field research between 2006 and 2008 in three phases. We sought demographic and economic information for households, including employment history, monthly household income and expenditures, and social and economic ties with TAMAR, the village, and fishing lifestyle. With open-ended questions, we asked people's opinions about TAMAR, sea turtles, sea turtle conservation, and ecotourism. We also interviewed TAMAR staff members to gather information on sea turtle conservation strategies, achievements, and challenges in Praia do Forte. To trace historical uses and values of sea turtles, fishing practices, and resource use, we relied on information provided by long-term residents, particularly fishing families and fishermen. Many people were unable or hesitant to provide precise numbers on sea turtle harvesting and nesting activities as well as on household income before and during the early years of the TAMAR research station and visitor centre. Therefore, historical information on these themes is based on approximate numbers and personal recollection.

In the first data collection phase, May–August 2006, we interviewed 35 residents, selected through snowball and convenience sampling. The unit of analysis was the individual. Among those interviewed, eight (23%) worked for TAMAR; 14 (40%) were fishermen; 19 (54%) were men; and 28 (80%) were born and raised in Praia do Forte. Members of this last group are identified locally as 'native' residents and 'native' families. By contrast, residents who migrated to Praia do Forte after 1970 are generally referred to as 'local' residents.

In the second field season, September–December 2007, we interviewed 77 residents. Our questions emerged from analysis of preliminary data gathered in 2006. The unit of analysis in this phase was the household. We carried out face-to-face semi-structured interviews with native and local residents of Praia do Forte. The first author, a Brazilian citizen, conducted, transcribed, and coded the interviews. The interviews lasted approximately 90 minutes and took place at the location selected by the interviewee. Most respondents were interviewed multiple times. We sampled fishermen, vendors, and residents using a snowball method. We were advised by some residents to avoid some fishers for safety reasons and because of the sensitivity of questions related to sea turtle harvesting. Safety concerns stemmed in part from the fact that the first author was both an outsider and a woman whose work (e.g., asking questions, checking things out, taking pictures) challenged local perceptions of gender roles

and made people generally suspicious. Some fishermen were simply not comfortable talking to her. This suggests a fairly significant bias in the data we were able to gather. The values, views, and activities of fishermen who declined interviews are omitted. They may be precisely the villagers most opposed to conservation and/or involved in sea turtle harvesting.

We did include representatives from each major stakeholder group associated with sea turtle harvesting and conservation in Praia do Forte. These included fishermen, native and local residents and families, residents who work in ecotourism at TAMAR, residents who work in the tourism industry (outside of TAMAR), and residents with varying levels of involvement with TAMAR. We also interviewed male and female residents from different age groups. During the third phase, May–August 2008, we returned to most of the families interviewed in 2006 and to some of those interviewed in 2007. We evaluated changes in the village associated with broader tourism development in the region and changes in people's values and uses of sea turtles, and opinions about TAMAR.

SEA TURTLE ECOTOURISM IN PRAIA DO FORTE

The Portuguese settlement of Praia do Forte began in 1551 (FGD 2005). Land tenure changed many times over the centuries, and rights over resource access and control were often controversial. The first landowner, Garcia D'Avila, used the land for cattle-ranching and sugarcane (FGD 2005). Seven generations of the D'Avila family occupied the land, which later became the Praia do Forte Farm (Sobrinho 1998). Coconut farming began in the nineteenth century. Families of workers who harvested and processed coconut eventually formed the village of Praia do Forte on the Farm (Bahiatursa 2008; Portal Official da Praia do Forte 2008). The farm had five different landowners until it was sold to Klaus Peters in 1970 (Spinola 1996). Peters closed the coconut plantation, established nature reserves (i.e., the Sapiranga Reserve of 600 hectares, and the Camurujipe Reserve of 1.400 hectares), and introduced tourism (FGD 2005). A key asset for tourism development was the continuous 12 km of undeveloped beachfront, extending from the Pojuca River to the Imbassaí River. Formerly the coconut plantation, this parcel became prime real estate for hotels, upscale subdivisions, bed and breakfasts, and other tourism establishments by 2008.

Figure 1 shows the location of Praia do Forte and a segment of the Coconut Coast region (which extends from Salvador to the northern border of Bahia with the state of Sergipe). The map also shows the location of the BA-099 Highway (*Linha Verde*), which was built to facilitate access from Salvador to the coastal communities and beach destinations. The beaches of Praia do Forte are important feeding and reproduction sites for four species of sea turtles: *Caretta caretta* (loggerhead), *Eretmochelys imbricata* (hawksbill), *Lepidochelys olivacea* (olive ridley) and *Chelonia mydas* (green) (TAMAR Project-PF 2009). The TAMAR research station of Praia do Forte, established in 1982, also serves as the national headquarters for TAMAR. When the station opened, tourism was at its infancy. The visitor centre, which opened a few years later, was built in response to the growing number of tourists interested in seeing

Figure 1
Map Praia do Forte

the sea turtles, interacting with scientists, and learning about sea turtle conservation.

The sale of TAMAR products started with a few T-shirts to the few tourists who visited the visitor centre. Today, the visitor centre is the busiest and perhaps the most popular of TAMAR's locations. Visitor centres are the focal points for TAMAR's ecotourism activities (Marcovaldi *et al.* 2005). Sponsorship from outside donors, income generated from admissions fees, and sales of TAMAR products help pay the salaries of residents who work for TAMAR (Marcovaldi *et al.* 2005). Despite other ecotourism opportunities (e.g., whale watching), the visitor centre of TAMAR is the main ecotourism attraction in Praia do Forte. In recent years, approximately 2,000 people have visited the visitor centre on a daily basis (TAMAR Project-PF 2009). Annually, the visitor centre receives about 600,000 visitors (Projeto TAMAR 2009). The peak tourism season coincides with the peak nesting season. In 2003 it generated about USD 490,000 in revenues, or approximately 17% of the overall annual budget of the Foundation (TAMAR 2004). Revenues are used locally but also dispersed throughout TAMAR's research stations and visitor centres nationwide.

Expansion of TAMAR's visitor centre and research station in Praia do Forte reflects rapid tourism development outside of the village. Such growth is partly the result of a 30-year (1991–2020) statewide tourism development strategy (PRODETUR 2009). Approximately USD 2.8 billion in tourism investments are allocated for the Coconut Coast alone (PRODETUR 2009). In 2007, Praia do Forte was ranked one of the top ten best beach destinations of Brazil (Veja 2007). A 2004 Census estimated the permanent population of Praia do Forte was approximately 2,000, and the seasonal population was more than double, about 4,700 residents (PMMSJ 2004). In relation to these developments, large coastal resorts, housing subdivisions, and tourism complexes have been established in and around Praia do Forte.

ETHNOGRAPHIC DATA

The community and sea turtles before TAMAR

People's livelihoods in Praia do Forte during the plantation period consisted primarily of fishing, and harvesting and processing coconuts. Income in both sectors was relatively limited. People also provided for themselves by raising pigs, chickens, and ducks, harvesting fruits and freshwater fish at the nearby Açu River, and harvesting marine fauna, such as sea turtles and fish, at the reef and off-shore. Fishing provided both food and income. Five native residents noted that fishermen often used sea turtle and dolphin meat as bait for shark fishing.

Though fishermen were either unwilling or unable to provide exact harvesting numbers of sea turtles and eggs, native residents explained that sea turtle harvesting was a tradition until TAMAR arrived in the village in 1982. Families generally consumed sea turtle meat and eggs on a constant basis, with intensity rates increasing during the sea turtle nesting season (September–March) and winter months (June–August). Though most households earned income from the coconut plantation, economic need remained high, and sea turtles provided additional sustenance.

Residents also said that sea turtles were intensively harvested because people liked the taste, and each animal offered a large amount of meat. Also, the populations seemed abundant, and individuals were easy to catch. A daughter of one of the fishermen remembered that sea turtle meat and eggs were sometimes traded for other food items, such as tapioca flour, with residents from the nearby community of Açu da Torre, which was also located within the Praia do Forte Farm. Fifteen respondents said the community used sea turtle shells as house ornaments and as utensils, such as a container to wash clothes. '[The turtles] were a source of food, and we also used the shell, but not for the market, only in the house,' noted one person. Four respondents said sea turtle shells were also sold to support family needs. No one characterised sea turtle harvesting and consumption as having particular cultural or religious purposes.

TAMAR and the introduction of economic incentives

One of TAMAR's primary goals in establishing a sea turtle conservation programme with a research station and visitor centre in Praia do Forte was to provide residents with economic alternatives to sea turtle harvesting. In addition to monitoring coastal activities, such as sea turtle harvesting, the organisation also sought to create incentives for people to stop, or at least reduce, the sale, trade, and consumption of sea turtles and their eggs. These incentives have been primarily economic (e.g., employment and income), and information about sea turtles and sea turtle conservation have come by means of environmental education.

Most residents in Praia do Forte seemed to have a generally positive opinion of TAMAR. Among 74 respondents, 96% indicated they favoured TAMAR's work (the question was simply, 'What do you think of TAMAR?'). Overall, respondents associated TAMAR with employment, alternative sources of income, and education opportunities for local children and youth. A fisherman remembered how the founders of TAMAR first arrived in Praia do Forte. He said they explained that harvesting sea turtles and their eggs could no longer take place and that laws were in place to protect the turtles. In exchange for local support, they stated, TAMAR would provide jobs and income to the community. Another fisherman recalled, 'When TAMAR came, they told us we should no longer harvest sea turtles and they would offer jobs for us. It was at that time that the opportunity of getting jobs from sea turtle conservation started.' Guy Marcovaldi, one of the founders of TAMAR and the Director of the TAMAR Project, said they started this strategy by trading chicken eggs for sea turtle eggs. Marcovaldi also explained that when trading was not an option they paid fishermen for the harvested sea turtle eggs. They offered an amount that was higher than the local price of chicken eggs. They hoped such incentives would compel residents to trade or sell sea turtle eggs to TAMAR rather than to eat them.

Initial employment openings with TAMAR were relatively

few and limited to fishermen. One man explained, 'The research station was very small and they were just starting the programme.' The hired fishermen helped TAMAR in locating sea turtle nests and tagging nesting females. TAMAR recruited fishermen first because they were perceived as the most knowledgeable about sea turtles and local marine resources. TAMAR staff noted that working with fishermen also gave the organisation a chance to engage more with the village.

During the first nesting season (1982–1983), TAMAR staff and local fishermen protected 19 nests from harvesting and later relocated them to a hatchery within the research station (TAMAR Database 2008). Approximately 1,200 hatchlings survived from those nests (TAMAR Database 2008), becoming the first 'batch' of sea turtle hatchlings released in Praia do Forte. As villagers had previously harvested most nests, that release was likely the first time many residents had seen a sea turtle hatchling (Personal interview in May 2006, with Guy Marcovaldi, Director of the TAMAR Project). That event was perhaps pivotal for sea turtle conservation in Praia do Forte because it offered a visual and tangible connection between TAMAR and its mission. Since then, sea turtle hatchling release activities have become the most popular among visitors and tourists. The image of a sea turtle hatchling emerging from its shell is the iconic image of TAMAR in Praia do Forte.

New benefits and values

Ecotourism at TAMAR started a few years after the research station opened in 1982. One woman explained, '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.' These perceptions are supported by TAMAR's employment records at the research station and visitor centre between 1990 and 2007. In that period, the number of local employees increased from 15 to 110 (TAMAR HR Database 2008). People work in a variety of positions distributed in four main sectors: research / conservation, visitor centre, retail store at the visitor centre, and administration.

Among the 77 interviewees in 2007, 25 (32%) worked with TAMAR, 33 (43%) worked for the regional tourism industry (e.g., retail souvenir shops, restaurants, waitress), 14 (18%) worked in the service industry (e.g., security guards, construction), three (4%) in fishing, and two (3%) did not earn an income. The 25 TAMAR workers interviewed in this study were caretakers, drivers, receptionists, sales clerks, maintenance and custodial staff, environment educators, data collection assistants, and office workers.

Perceived benefits from TAMAR and the sea turtle conservation programme were more than economic. Sixty-five respondents (84%) said that TAMAR generally helps fishermen. In response to open-ended questions, people cited the provision of fishing equipment, assistance, fish bait and food, food stamps, money for medicine, education, and transportation to the overall community. Native residents explained that TAMAR offered the community what the local government failed to provide. One fisherman's statement captures the overall opinions many residents gave about the founders. He said, 'For me, well, I can speak for the community and not only for me. TAMAR is like a father to me. I feel it [TAMAR] as a father for all the fishermen here because anything that any fisherman needs here in the community the Project helps. The president makes sure to help with any material, some money, something for the boat. I, thankfully, did not need to ask, but some of my colleagues have asked them for help.'

Despite these generally positive views about what TAMAR gives, the average monthly salary TAMAR workers reported earning is lower than the average salary respondents reported earning in other jobs (Figure 2). On average, the 24 TAMAR workers who provided their monthly income earned USD 355.31 per month (1 USD = 1.64 BRL) while respondents whose salary came from jobs (n=36) earned on average USD 451.96 per month. Fourteen of the 24 residents who worked for TAMAR earned on average USD 300.00 to USD 399.00 per month. Only one of the TAMAR workers and eight residents who work outside TAMAR reported salaries equal or greater than USD 700.00 per month. Low income was cited as a main reason by 13 (17%) of the respondents who indicated they did not want their children to work for TAMAR.

As reported in Table 1, TAMAR workers (n=24) earned on average less than residents (n=36) who worked in other jobs, such as selling souvenirs. Despite lower average income, these values were not statistically different (Mann–Whitney Test t-test, p=0.348). The minimum salary paid at TAMAR is higher than the minimum salary paid outside of TAMAR.

Insufficient income to cover the family's needs was not unusual among TAMAR workers. On average, households in this study had USD 947.39 in monthly expenditures; the top three highest expenditures of the 77 households were rent (USD 195.63), food (USD 178.06), and costs of 'extras' (USD 151.14) (Figure 3). 'Extras' include lease payments for new household appliances. Education expenditures were generally low because parents could place their children in the public school. Parents who sent their children to the private Finn–Larsen School paid approximately USD 25.00 per month in 2007. Transportation costs included school buses and travel to Salvador to purchase food and other household items not available in the community. With few exceptions, employment opportunities at TAMAR or outside TAMAR, alone, were insufficient to cover household monthly expenditures. In this study, 70% (n=54) of the households had more than one source of income, with an average of two sources of income and three adults per household.

We asked residents to identify 'benefits,' if any, of working at TAMAR. Twelve respondents (48%) noted the opportunity to meet and interact with people from other cultures; seven (28%) identified employment; and four (16%) pointed to professional growth and development. People who work at TAMAR (n=11) said that their decision to work at TAMAR has become like a family tradition. They elaborated by saying things like, 'We grew up wanting to work at TAMAR,' and 'TAMAR is part of

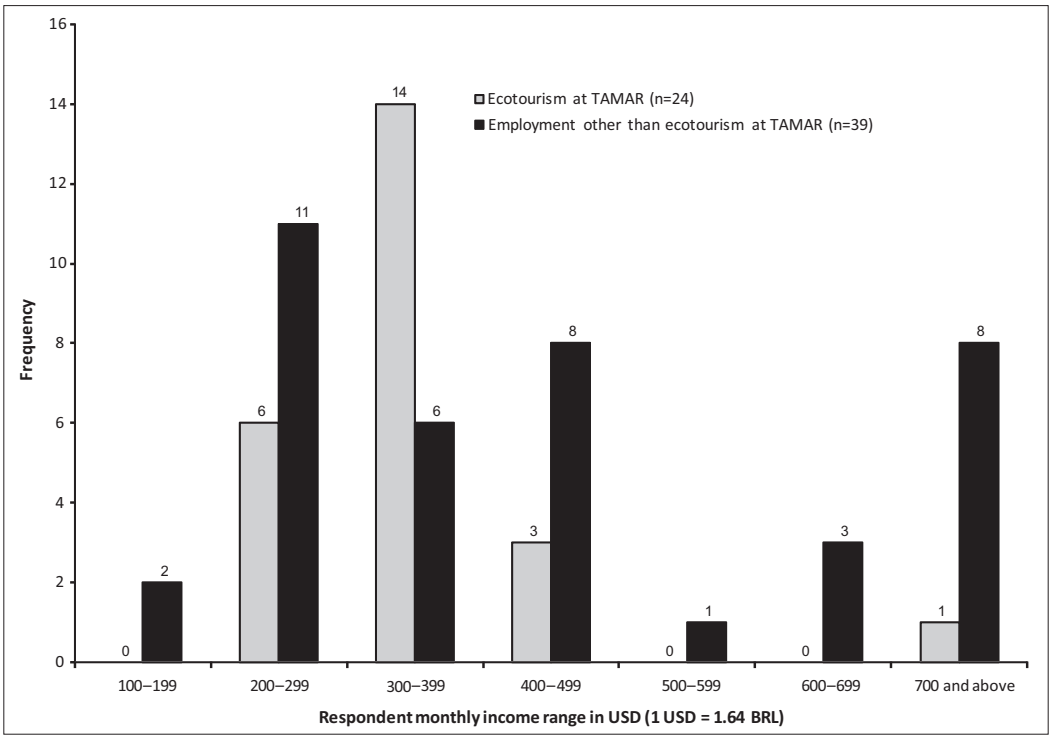

Figure 2
Average monthly income of respondents who worked at TAMAR and respondents who earned income from other employment

Table 1
Reported monthly salary in 2007 in USD (1 USD = 1.64 BRL)

Salary	n[b]	Maximum	Minimum	Average
TAMAR worker (ecotourism)	24	731.71	262.2	355.31
Non-TAMAR worker	36	1219.51	152.44	451.96[a]

[a]Two respondents reported earning significantly more (USD 1,829.27 [fishing] and USD 3,658.54 [business owner]), thus were not included in the monthly average accounts to minimise influence of outliers on calculations. [b]Nine respondents did not want to provide their monthly income, and eight said their monthly income varied.

the community,' and 'I have a bond with TAMAR.' As such, non-economic benefits, including family ties with TAMAR and cultural exchanges with visitors, influenced villagers' decisions to get involved.

We asked residents about their perceptions of sea turtle conservation, sea turtles, and TAMAR. Seventy-two (94%) respondents said they value sea turtles differently now because ecotourism plays an essential role in the local economy. One resident stated, 'If there were no turtles here, there would not be so much tourism. It is part of Praia. Tourism has influenced the development of the village. The more turtles we have, the higher the tourism. Today, those who come to the village come here because of TAMAR.' This direct association between tourism and TAMAR is partly the result of a coincidence between the opening of the research station and visitor centre and the launching of PRODETUR and larger, regional coastal tourism development. One respondent remembered, 'In the past, people here used sea turtles to eat, so they saw them as a source of food and nothing more. Now, tourists come here to see TAMAR.' Another resident explained, 'The tourists come here to see the visitor centre of TAMAR and to see them [sea turtles]. So, if there are no more turtles here people will not come.'

The association between support for sea turtle conservation and tourism became more apparent when residents shared their perspectives on what would happen if the visitor centre and research station were to close. All respondents said such an event would signify fewer tourists in the village and fewer jobs to residents. One resident said, '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...and tourism does not take place without TAMAR.' Another resident pondered, '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.'

Perceived threats to sea turtles

Despite conservation and ecotourism efforts in Praia do Forte, 53 respondents (69%) identified persistent threats

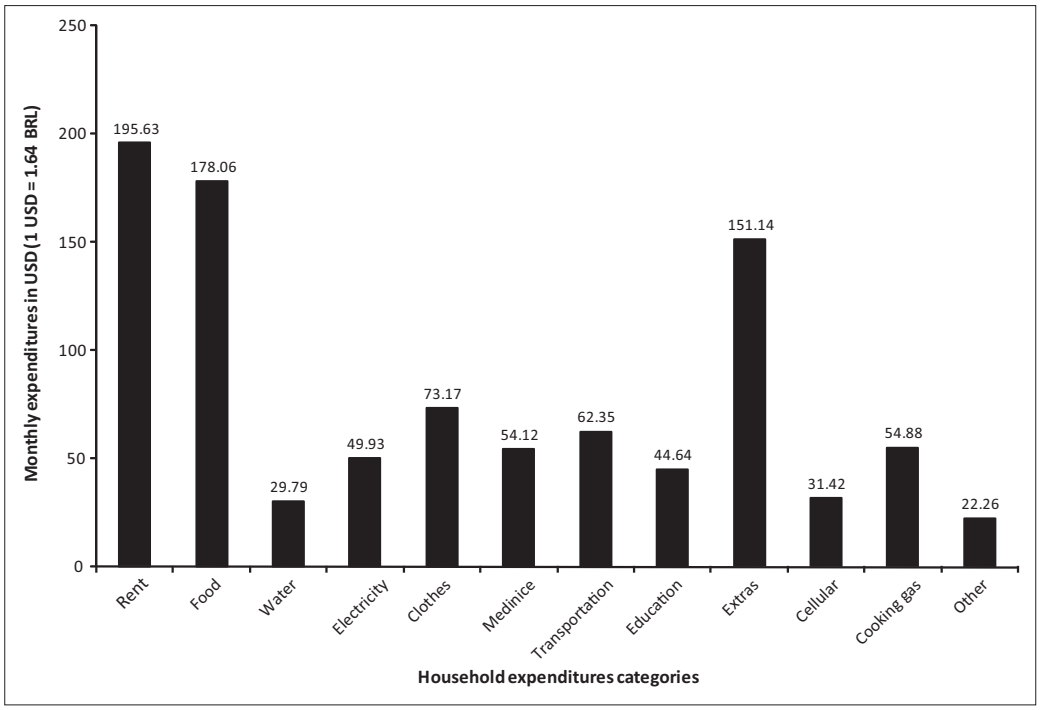

Figure 3
Household monthly expenditures in USD (1 USD = 1.64 BRL) (n=77)

to sea turtles. Twenty-one respondents (27%) mentioned a combination of factors (e.g., bycatch, water pollution, coastal development). For example, one noted, 'There are many [threats]. Fishermen put nets to catch lobster and the turtles get caught in them. There is also a black market for the sea turtles.' Sixteen respondents (21%) said bycatch was the sole threat to sea turtles. Nine (12%) pointed to a combination of factors that included consumption for food, and three (4%) said consumption for food was the only threat. Thirteen respondents (17%) said they knew of at least one case of sea turtle harvesting between 2006 and 2007. A majority of respondents (60%) believed sea turtle harvesting would increase, were TAMAR to leave.

In most cases, they said, harvesters were seeking sea turtle meat, and most harvesters were non-native construction workers and lobster fishermen. Respondents said these two groups are people who do not have ties with TAMAR and generally perceive sea turtles as a 'free' source of food. One man explained, 'The fishermen are not from here… they leave their boats here but they are not local fishermen.' Another said, 'They can go out at sea, kill a turtle, butcher the meat, put it in a cooler, and bring it ashore, and no one will notice or ask. How can TAMAR know that they are doing this? There is no way for them to know.' Yet, in another occasion, a fisherman gestured, 'Do you see those rocks inside their boat? They use those rocks to sink the sea turtles that are caught in 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 some fishing grounds, a fisherman asked, 'Do you want to know the biggest problem for sea turtles? They are the turtle killers,' he said, nodding in the direction of nearby lobster fishermen, 'They are the worst ones.' The fishermen explained that lobster fishing is generally quite profitable. 'The tourists like lobster, but we can't harvest lobster with these nets because it is illegal. They do it anyway.'

Several fishermen said they were angry about the continued illegal harvesting of sea turtles. First, they noted, the use of nets to catch lobster along the reef, an illegal activity in itself, can also kill sea turtles. Second, lobster fishing generates good revenue. The fishermen said the market for lobster is growing because tourists are willing to pay more for lobster. Thus, it seems, for some the economic gain is worth the gamble of getting caught. Though TAMAR workers try to monitor and identify such activities, they lack law enforcement power (e.g., make arrests, confiscate gear), and the government natural resource agency, IBAMA, generally does not intervene.

One fisherman said he was concerned about the long-term effects of unregulated and illegal lobster fishing on sea turtles. He said that either TAMAR gets the IBAMA agents to come and make arrests or some fishermen in the village will start using fish-nets to fish for lobster too. He explained that it was not a matter of supporting sea turtle conservation efforts or not, but rather a matter of keeping up with outside lobster harvesters, and supporting their own livelihood needs. He said he does not see an incentive for those who follow the rules because their efforts are not awarded or recognised by the IBAMA. Those who obey the law are being penalised economically while violators are gaining a profit. As the cost

of living increases with expanded tourism development outside of TAMAR, weak enforcement of both sea turtle and lobster protection laws by the IBAMA are threatening both species. Meanwhile, some of Praia do Forte's fishermen are weighing the benefits, particularly economic benefits, of their continued support for sea turtle conservation.

DISCUSSION

In the coastal village of Praia do Forte, Brazil, TAMAR's sea turtle conservation programmes and strategies have generated employment and income for local residents for over two decades. TAMAR's leaders established such economic incentives with the explicit aim of halting sea turtle harvesting. Our goal has been to assess the results of TAMAR's efforts, from the perspectives of local fishermen and other villagers. Ethnographic research between 2006 and 2008 revealed some positive associations between TAMAR's economic incentives and local support for sea turtle conservation.

People reported that employment with TAMAR offered a relatively reliable and stable source of income. Fishermen, in particular, accustomed to unpredictability and fluctuation in income from fishing, noted these two characteristics as especially important. People also stated that involvement with TAMAR had become something of a family tradition. The majority of respondents reported having at least one family member who worked at TAMAR at some point over the past 25 years. Others reported additional benefits, such as learning about other cultures and developing new skills. In a number of ways TAMAR's programs have also become economic multipliers in the village and region. Examples include the sale of gift items with the sea turtle logo, restaurants that cater to tourists, and the wider beach tourism industry, which benefits from the marine resources TAMAR's programmes help protect.

Despite the essential role sea turtles have come to signify in the local tourism economy, the sustainability of sea turtle conservation in Praia do Forte is questionable. Will economic incentives be sufficient to sustain local support for conservation in the long term? Changes in the economy, infrastructure, and demographics may challenge the effectiveness of TAMAR's strategy of employing and paying local villagers. Shifts in the wider tourism industry are already bringing newcomers and new economic opportunities. If local support for conservation is based solely on economic incentives, how will new employment opportunities and alternative sources of income from the regional tourism industry alter residents' commitment to village-based programs with TAMAR?

Though people talk about sea turtles and TAMAR favorably, indicating general support for sea turtle conservation, for many respondents, their support is based entirely on economic dependence. Village businesses prominently display sea turtles as the icon of Praia do Forte, but again, these displays may reflect economic dependency as much (if not more than) as conservation ethic. And yet, most families were turning to the larger mass tourism industry surrounding TAMAR's visitor centre and research station for additional income. Only a small percentage of respondents reported having income from fishing. Because the majority of families did not rely on local resources for subsistence, and their income came either from TAMAR or the regional tourism industry, a crash in the tourism economy may be catastrophic for the people of Praia do Forte. In turn, such a bust would likely have significant consequences for sea turtles, especially if people returned to earlier practices of harvesting. Perhaps greater diversification of the local economy and greater capacity building in leadership, management, and community development would minimise dependency on TAMAR and, in the long run, support both livelihoods and sea turtle conservation.

Though TAMAR's efforts to protect sea turtles in Praia do Forte appear to be succeeding at the community level, the achievements may not be sufficient to control the effects of larger economic and social forces on the community and on sea turtles. These include large-scale tourism development, disintegration of local fishing industry, and the migratory patterns of sea turtles (i.e., into open access waters). Even with TAMAR's staff presence, illegal harvesting of sea turtles persists. Many people knew of at least one harvest within one year of this study. Respondents mentioned non-native construction workers and non-native lobster fishermen as the social groups within the community who occasionally harvest turtles. While we lack information about why and how these individuals harvest sea turtles and the overall number of sea turtles harvested, we have a sense of who continues to harvest sea turtles. Outsiders may harvest turtles out of necessity (e.g., no resources to purchase food), out of convenience (e.g., bycatch in fishing gear), or because of weak law enforcement from the responsible government agencies (e.g., IBAMA). The fishermen emphasised that unless greater enforcement and patrol of fishing activities were stepped up, harvesting would likely continue. Access to the harvesters is a challenge because they are illegally taking sea turtles and, if caught by an agent of the IBAMA, they will be imprisoned and required to pay a fine. A researcher interested in asking (who, why, and how) questions also assumes some safety risk. Perhaps, while the causes remain unknown, IBAMA agents could enforce the already established laws. Without effective enforcement, existing laws are only paper laws.

Ongoing harvesting also calls attention to the role of community participation in conservation management. Despite the long-term efforts of TAMAR to protect sea turtles and generate local support for conservation, much of their work has yet to build greater local capacity for resource management, community development, and environmental stewardship. Indeed, most respondents believed sea turtle harvesting would increase if TAMAR were to leave. Given the opportunity, local fishers and villagers could offer their knowledge, energy, and critical insights to locally devised and managed strategies for addressing current threats and challenges to sea turtle conservation.

CONCLUSION

Many environmentalists believe ecotourism has the potential to generate net benefits for people and nature. Benefits may include tourism-related jobs and income for people on the one hand, and reduced direct consumption of natural resources on the other. For more than two decades, ecotourism in the fishing village of Praia do Forte, Brazil, has provided jobs and income to local people in exchange for reduced harvesting of sea turtles. The organisation leading the project, the Brazilian Sea Turtle Conservation Program (TAMAR), has highlighted increased numbers of sea turtles and hatchlings in the region as indicators of conservation success. Project leaders also argue economic benefits from ecotourism have changed local values and uses of sea turtles.

In this article we evaluated the relationships between sea turtle ecotourism at TAMAR and sea turtle conservation. Nine months of ethnographic research between 2006 and 2008 suggest that ecotourism-related employment and income have been somewhat stable and reliable, if not especially lucrative. The average income of respondents who worked with TAMAR was lower than that reported by people not working with TAMAR. Workers noted other benefits, however, such as cultural exchange and feelings of familial ties with TAMAR. We weighed these economic and non-economic factors in relation to people's discussions about sea turtles. Though the majority of local residents support sea turtle conservation, it is unclear how feelings will waver with new developments in the region. As the cost of living in the village increases, especially in relation to mass tourism development around and within the village, people may be increasingly inclined to look for work outside of TAMAR. Such developments also attract new immigrants to the region, making it increasingly difficult for locals and for the staff of TAMAR to monitor sea turtle harvesting. In fact, sea turtle harvesting persists in the village, primarily among newly arrived construction workers and lobster harvesters. These trends challenge the notion that economic incentives for local residents alone will ensure conservation. Further research is needed to understand the conditions under which ecotourism may foster conservation in the long term and in the face of larger developments surrounding community ecotourism projects.

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