



## People helping turtles, turtles helping people: Understanding resident attitudes towards sea turtle conservation and opportunities for enhanced community participation in Bahia Magdalena, Mexico

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### ABSTRACT

In Pacific Mexico, all five sea turtle species have declined over the past century due to intense over-exploitation of meat and eggs, fisheries bycatch, and degradation of marine and nesting habitats. One of the most heavily impacted areas has been the Baja California peninsula, where sea turtle populations remain historically low despite existing conservation measures that include a complete moratorium on the use of sea turtles, over three decades of widespread protection of nesting beaches, and in-water monitoring of sea turtles at coastal foraging areas. We recognize the need for alternative sea turtle conservation strategies that rely on increased participation of civil society and Mexican citizens. The purpose of this paper was to identify resident attitudes towards sea turtle conservation and opportunities for enhanced community participation in Bahia Magdalena, a region in Baja California Sur, Mexico experiencing high levels of sea turtle poaching and bycatch in fisheries. Through semi-structured interviews we found that while residents were overwhelmingly interested in participating in sea turtle conservation, peer pressure and conflict within the community presented major challenges. The majority of residents indicated that sea turtle voluntourism would have a positive impact on their community. Economic incentives and increased protection for sea turtles were mentioned as benefits of sea turtle voluntourism, whereas peer pressure, difficulty obtaining permits and producing effective marketing materials, and doubt about direct economic benefits were cited as constraints. We discuss our results in terms of opportunities, challenges, and recommendations for improving community-focused sea turtle conservation throughout the region.

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### 1. Introduction

Many large marine vertebrates (e.g. marine mammals, sharks, seabirds, and sea turtles) are vulnerable to overexploitation due to their life history characteristics, such as long lifespans, late maturity, slow reproductive rates, and extended migrations (Baum et al., 2003; Fujiwara and Caswell, 2001; Lewison et al., 2004a, 2004b). Like most large vertebrates, when abundant, sea turtles play key ecological roles in their marine environment as consumers, prey and competitors, hosts for parasites and pathogens, substrates for epibionts, seascape and marine substrate engineers, and nutrient

transporters (Bjorndal, 2003; Bjorndal and Bolten, 2003; Bjorndal and Jackson, 2003). In Pacific Mexico, sea turtles have become commercially, ecologically, and culturally extinct from many regions of former abundance and socioeconomic and cultural importance (Delgado and Nichols, 2005). Populations started to decline sharply in the 1950s due to intense commercial fisheries and egg harvesting (Garcia-Martinez and Nichols, 2000). Between 1962 and 1967 sea turtle catch in Mexico increased 633% and the country was producing the most sea turtle products in the world (O'Donnell, 1974; Koch et al., 2006). Populations began to crash in the 1970s when sea turtles were unable to reproduce fast enough in the face of increasing regional and global demand (Clifton et al., 1979). Consequently, the Mexican government implemented a recovery program in 1978 and closed all nesting beaches to the harvest of sea turtle eggs. In 1980, the government issued a quota

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limiting the number of sea turtles that could be taken commercially (Instituto Nacional de la Pesca, 1990). However, populations continued to drop and in 1990, prodded by international pressures, the government issued a complete moratorium on the use of sea turtles throughout Mexico (Garcia-Martinez and Nichols, 2000; Instituto Nacional de la Pesca, 1990).

### 1.1. The current state of sea turtle poaching and fisheries bycatch in northwestern Mexico

One of the most heavily impacted areas in Pacific Mexico has been the Baja California peninsula, where directed hunting and incidental fisheries bycatch currently threaten all five species of sea turtles (Gardner and Nichols, 2001; Koch et al., 2006) despite the 1990 moratorium on the use of sea turtles, over three decades of widespread protection on mainland nesting beaches, in-water monitoring of sea turtles at coastal foraging areas, and improvements in infrastructure and market conditions providing easier access to other more reliable and less risky protein sources (Delgado, 2005; Senko et al., 2009; Delgado and Nichols, 2005; Garcia-Martinez and Nichols, 2000; Koch et al., 2006). While Mexico has successfully protected major sea turtle nesting rookeries, inadequate staffing and funding of federal environmental agencies (e.g. The Secretary of Environment and Natural Resources 'SEMARNAT,' and The Federal Attorney General for Environmental Protection 'PROFEPA') has led to insufficient enforcement of environmental laws. In particular, coastal foraging areas lack protected area status and are in need of greater agency attention (Nichols, 2003).

During the past decade sea turtle harvest and bycatch mortality along the Baja California peninsula and Sonoran coast was estimated to be as high as 35,000 turtles year<sup>-1</sup> (Nichols, 2003; Nichols et al., 2002), representing a region with one of the highest known sea turtle mortality rates in the world (Nichols et al., 2003; Hays et al., 2003; Nichols and Safina, 2004; Peckham et al., 2008; Mancini and Koch, 2009). Sea turtles are a welcome bycatch in coastal foraging areas and fisherfolk have been known to fish with nets in locations that provide a high probability of sea turtles being captured. This type of fishing is conducted by both local and transient fisherfolk, the latter sometimes visiting from several hundred kilometers away. The majority of sea turtles that are illegally captured are traded locally, consumed domestically, or sold via black market circuits to local, regional, and even international destinations (Koch et al., 2006; Senko et al., 2009; Mancini and Koch, 2009). A single poacher, Francisco "Gordo" Fisher, admitted to illegally poaching and selling more than 100 metric tons (5000 turtles or 625 turtles year<sup>-1</sup>) of endangered East Pacific green turtle (*Chelonia mydas*) in one coastal foraging area over an eight-year period during the 1990s (Nichols and Safina, 2004). Currently, the average East Pacific green turtle sells for approximately 1000 pesos (\$80 USD) on the black market (anonymous interview respondent, 2010). "The highest government authorities in the state eat sea turtles quite publicly and the meat is valued as a symbol of power among people with authority. It is also well known that the illegal trade in sea turtles is tied to the drug traffic" (anonymous interview respondent, 2008).

One of the most heavily impacted areas along the Baja California peninsula has been the Bahia Magdalena region (Koch et al., 2006; Gardner and Nichols, 2001), where in the 1960s a sea turtle slaughterhouse in Puerto Magdalena processed between 150 and 250 sea turtles per week (Garcia-Martinez and Nichols, 2000). The bay provides important habitat for five species of sea turtles (Koch et al., 2006). East Pacific green turtles (*Chelonia mydas*), known locally as black turtles, and the occasional hawksbill turtle (*Eretmochelys imbricata*) are most frequently found in shallow estuaries inside the bay, whereas loggerhead turtles (*Caretta caretta*), olive ridley turtles (*Lepidochelys olivacea*), and the exceedingly rare

leatherback turtle (*Dermochelys coriacea*) are typically found in deeper waters along the outskirts of the bay (Nichols, 2003). Hawksbill and leatherback turtles are listed as critically endangered, loggerhead and East Pacific green turtles are listed as endangered, and olive ridley turtles are listed as vulnerable (IUCN, 2009). Today, directed hunting and incidental bycatch in fisheries pose a major threat to sea turtles inhabiting the Bahia Magdalena region (Garcia-Martinez and Nichols, 2000; Koch et al., 2006; Gardner and Nichols, 2001; Nichols, 2003). During a three-year period (April 2000 to July 2003), a total of 1954 sea turtle carcasses were identified and recorded in Bahia Magdalena, most of which were immature (Koch et al., 2006). Total mortality may actually have been up to 10 times higher as surveys were only conducted 2–4 times per month, turtles are exported via black market circuits, and many carcasses are intentionally hidden in landfills, remain at sea, become buried in the sand, or are consumed by scavengers (Koch et al., 2006). The presence of nearly all immature carcasses (Koch et al., 2006) is particularly discouraging because the removal of juvenile sea turtles may substantially limit population recovery (Crowder et al., 1994; Crouse, 1999).

### 1.2. The conservation response of civil society

In response to precipitous declines of remaining sea turtle populations in Baja California Sur (BCS) and the Bahia Magdalena region, sea turtle conservation efforts were bolstered in 1999 by the creation of an umbrella conservation organization called Grupo Tortuguero (Schneller and Baum, In Press). Grupo Tortuguero is currently a legally registered Mexican non-governmental organization (NGO) that acts as an organizational body (umbrella network) comprised of 17 Mexican NGOs and 19 community groups that work for sea turtle protections in BCS<sup>1</sup>. Grupo Tortuguero provides coastal communities access to a broad international conservation network, technical training, funding, and organizational and ideological support, "all contributing to competency, solidarity, empowerment, and political clout for the communities" (Schneller and Baum, In Press). Communities and NGOs working with the Grupo Tortuguero network currently receive ease of access to permits (for biological monitoring of sea turtles) from federal environmental agencies such as Vida Silvestre. Camacho-Romero is the La Paz-based marine biologist in charge of the Marine Turtle Conservation Program at the National Commission for Natural Protected Areas (CONANP) (under SEMARNAT) and stated during our interview:

"SEMARNAT does not have sufficient funds or personnel to do the job that we should be doing to protect the turtles, that is why we rely so heavily on the community groups to help us do our job. Ninety-five percent of the sea turtle conservation work in BCS is conducted by turtle groups while five percent comes from the government agencies (interview respondent, June 13, 2008)."

In addition to in-water sea turtle monitoring, the Bahia Magdalena communities and NGOs working under the Grupo Tortuguero umbrella have implemented educational and outreach programs and community based social marketing in the region. These efforts include annual sea turtle festivals in both Puerto San Carlos and Adolfo Lopez Mateos, art contests, experiential environmental education in the primary and middle schools, opportunities for community involvement in participatory sea turtle research, printed materials (posters, guides, comic books, stickers, games), beach clean-ups, radio Public Service Announcements, and exposure on national

<sup>1</sup> Grupo Tortuguero also supports member communities and NGOs in mainland Mexico that are not included in this tally.

television of the participants who work with the Grupo Tortuguero network. Additionally, +/- 15 sea turtle themed murals (with varying conservation messages) are located in Adolfo Lopez Mateos and Puerto San Carlos. However, despite these efforts to inform and include residents in sea turtle conservation measures, sea turtle populations remain historically low, primarily due to the continued removal of mostly juvenile turtles (Koch et al., 2006; Nichols, 2003).

### 1.3. Furthering community involvement in sea turtle conservation efforts

The purpose of this paper was to gain a better understanding of resident attitudes towards community-focused sea turtle conservation measures in the Bahia Magdalena region. Community-focused conservation initiatives that rely on participatory involvement from local citizens may not only offer substitute activities (alternatives) to sea turtle exploitation, but might also have the added benefit of promoting positive environmental attitudes towards sea turtle conservation and the resulting voluntary compliance with existing Mexican environmental laws (Alexander, 2000; Campbell et al., 2007). Alexander (Alexander, 2000) and Gadd (Gadd, 2005) highlight the fundamental role of local participation and support for conservation initiatives and the sustainability of such programs. The combination of enhanced involvement of community members in the logistics of sea turtle conservation measures, coupled with strategic community and school focused education and communication efforts in Bahia Magdalena may work to engage residents more effectively in efforts to protect sea turtles and the marine environment. Further, the expansion of sea turtle *voluntourism* efforts that are already marginally in place in the bay may also lead to added conservation benefits for sea turtles while simultaneously providing additional income to participating fisherfolk. The International Ecotourism Society (TIES), defines ecotourism as: “responsible travel to natural areas that conserves the environment and sustains the well being of the local people” ([www.ecotourism.org](http://www.ecotourism.org)). Voluntourism as practiced currently in Bahia Magdalena by SEE Turtles and RED Sustainable Tourism<sup>2</sup>, is a form of ecotourism that provides tourists with an opportunity to work hands-on in the field with fisherfolk, fishing cooperatives, and marine conservation biologists to capture sea turtles and collect/record scientific data. An average 8-day SEE Turtles trip in BCS costs roughly \$1800 USD ([www.seeturtles.org](http://www.seeturtles.org)). Finkbeiner (Finkbeiner, 2009) studied the SEE Turtles program in BCS and found that communities perceived ecotourism as a type of tourism that protected wildlife through environmental education and appreciation, with sea turtle conservation, more jobs, and economic gains cited as the most important aspect of sea turtle ecotourism in the region.

While the cultural, economic, social, and ecological challenges of sea turtle conservation in northwestern Mexico are challenging (Delgado and Nichols, 2005), we believe enhancing community-focused conservation in the Bahia Magdalena region has the potential to help decrease sea turtle harvest and bycatch mortality and provide limited supplementary income for fisherfolk and residents. As such, in our methods section below we addressed questions that work to help stakeholders improve community-focused sea turtle conservation efforts. Later in our results and discussion section, we discuss the outcomes of the interviews conducted with 136 residents

in the Bahia Magdalena region in order to identify resident attitudes towards sea turtle conservation. Finally, we present opportunities, challenges, and recommendations for enhancing participatory sea turtle conservation in the Bahia Magdalena region. Researchers (authors) have lived and worked in Bahia Magdalena part or full-time since 1993, and after informal conversations and observations during that time period we hypothesized that residents would be interested in participating in sea turtle conservation and supportive of sea turtle voluntourism, but that they would identify specific benefits and constraints to both activities.

## 2. Methods

As authors (researchers) have worked to implement sea turtle conservation efforts in BCS since 1993 with communities throughout Bahia Magdalena (and throughout the rest of the state), we approached this effort from the qualitative research paradigm of *Action Research* (Creswell, 2003). Action Research incorporates a collaborative research approach that works to provide a means to systematic action in an effort to resolve social and environmental conditions. More specifically, according to Berg (Berg, 2004): “Action research is one of the few research approaches that embraces principles of participation, reflection, empowerment, and emancipation of people and groups interested in improving their social situation or condition” (p. 195). In our research, sea turtle biologists worked and collaborated with the NGOs and community respondents in order to integrate practical approaches and actions to be taken to improve civic engagement in sea turtle conservation. The process follows the steps of participatory research, thoughtful planning and evaluation, and sharing results with stakeholders.

### 2.1. Population and setting

Bahia Magdalena is a large (1200 km<sup>2</sup>) and highly productive coastal lagoon located between 24°15'N and 25°20'N, and 111°30'W, and 112°15'W in BCS, Mexico (Fig. 1). The lagoon is sheltered from the Pacific by five barrier islands with several small coastal communities located along the mainland and barrier islands (Garcia-Martinez and Nichols, 2000; Koch et al., 2006). Data were collected from seven coastal communities of Bahia Magdalena, including Puerto San Carlos, Puerto Magdalena, Puerto Cancun, Adolfo Lopez Mateos, Punta Arenas, Puerto Chale, and Puerto Alcatraz. The diversity of our sampling sites worked to be representative of the bay area as a whole community, as opposed to each individual town. The largest community in the bay is Puerto San Carlos (population 7000) (INEGI, 2010). Artisanal fisheries employ at least one third of the working population directly in towns where we conducted interviews, but many more residents are dependent on small-scale fisheries and the economic trickledown effect of the fisheries.

A total of 136 semi-structured interviews were conducted with citizens from the sample communities in October and November 2004. Two additional interviews were conducted in 2008; one with Camacho-Romero from the La Paz, BCS CONANP office and the other with Laura Sarti from the Mexico City headquarters of CONANP, where Sarti is The Technical Coordinator for the National Program for the Conservation of Sea Turtles.

### 2.2. Instrumentation

Our semi-structured interview design (Creswell, 2003) consisted of questions related to participatory conservation measures and sea turtle voluntourism, as well as perceived status of sea turtle populations and illegal consumption. We asked respondents about their reasons for wanting to participate (or not participate) in a sea turtle conservation program as well as their willingness to attend and

<sup>2</sup> SEE Turtles ([www.seeturtles.org](http://www.seeturtles.org)) is a conservation tourism NGO that links people with turtle sites to help protect sea turtles and increase resources in local communities; one of their voluntourism locations includes Bahia Magdalena where they work with Vigilantes de Bahia Magdalena, a Puerto San Carlos based NGO. RED Sustainable Tourism ([www.redtravelmexico.com](http://www.redtravelmexico.com)) is an NGO that builds capacity in local communities to create and operate sustainable tourism in northwestern Mexico; one of their voluntourism locations also includes Bahia Magdalena.

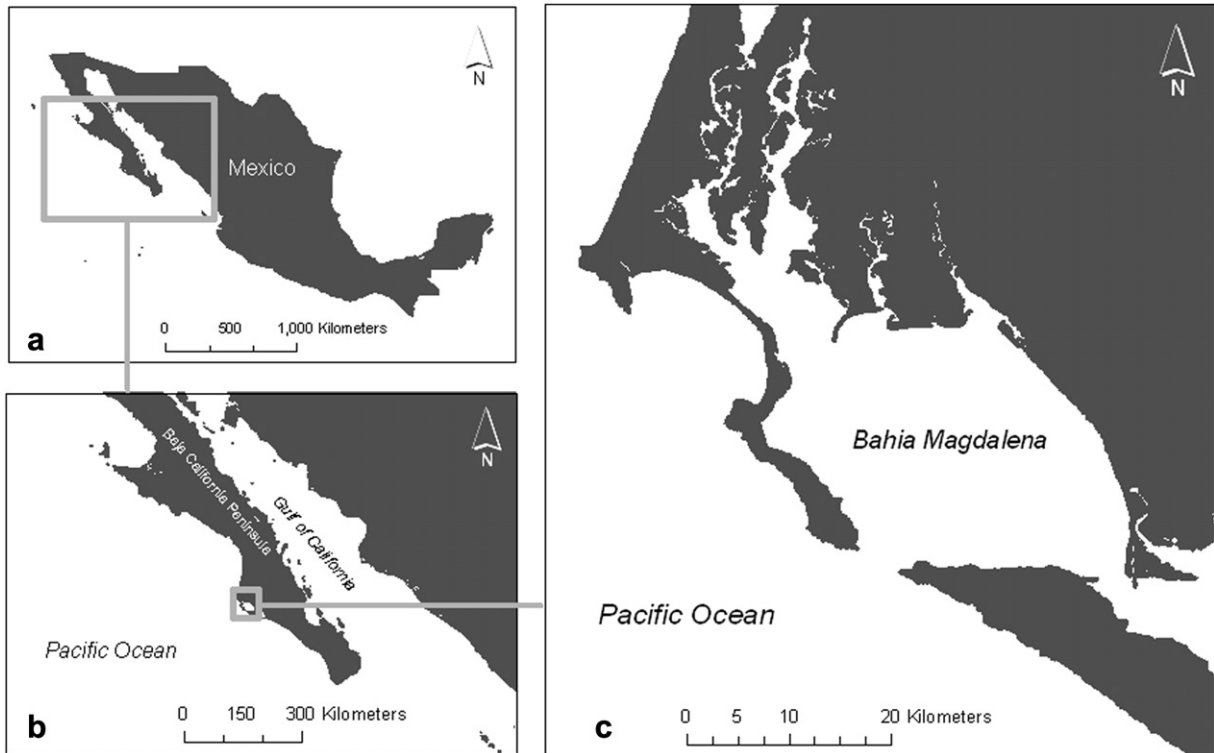


Fig. 1. Map of the Bahia Magdalena region, Mexico where residents were interviewed.

support community-focused education and communication efforts, including workshops and meetings related to sea turtle conservation. Respondents were also asked about their prior involvement in sea turtle workshops or meetings. We described a “sea turtle conservation program” as any activity aimed towards sea turtle conservation (e.g. annual sea turtle festivals, art contests, opportunities for community involvement in participatory sea turtle research, beach clean-ups, etc.) and a “sea turtle workshop or meeting” as any activity that focused on environmental education. Questions regarding sea turtle voluntourism aimed to gather information about respondent opinions concerning the prospect of enhancing sea turtle tourism activities. We purposefully explained “sea turtle voluntourism” as experiences in which tourists help capture sea turtles for biological monitoring and research purposes. Key differences with traditional ecotourism were explained (using gray whales as an example) by detailing that tourists would not be following sea turtles and watching them from a boat. Instead, we explained that tourists would be actively participating in the conservation activities by assisting with research activities (e.g. mark-recapture data, morphometric measurements, flipper tagging, tracking, etc.). Specifically, respondents were asked questions about: (1) whether they believed sea turtle voluntourism would have a positive economic impact on their community; (2) whether expanded sea turtle voluntourism would be practical in Bahia Magdalena; (3) their knowledge of a pre-existing sea turtle voluntourism program in BCS and how/where they obtained this information; and (4) their perceived benefits and constraints to sea turtle voluntourism.

### 2.3. Data collection and analysis

Interviews with the 136 public respondents were recorded by hand on individual written instruments. All interviews were confidential and respondents were assured that their identity was not being recorded. Researchers collected information from the interviewees in a casual but guided manner, and each individual

was interviewed separately in Spanish. We followed a set order of interview questions but allowed participants to discuss related information at will. For non-open ended questions, respondents were often given a set of possible answers to choose from and asked to elaborate on their responses. Interviews lasted approximately 10–15 min but sometimes took longer. Finally, we requested availability of respondents for follow-up interviews and almost all respondents agreed. Conversations were initiated with each individual over several days, repeating and confirming previous information and building a composite response to our question set from each participant. Total follow-up conversations ranged from 5 min to several hours and sometimes spanned several days.

A non-probability convenience sampling approach (Bernard, 2000) was used because this technique is useful for baseline studies dealing with potentially sensitive topics. Residents were chosen opportunistically by visiting local markets, restaurants, downtown areas, fishing docks, and boat ramps regularly on weekdays and on weekends, at all times of the day (from 5 AM to 11 PM) to reduce potential sampling biases. Participants were excluded from the study if they were under 18 years of age. Demographic data were recorded first, followed by interview questions. Approximately 90% of residents we approached agreed to participate in the interview. Refusal to participate was usually due to lack of sufficient time. We recognize that one potential criticism of this study is the inevitable sampling bias with interviewing people at designated places (Bernard, 2000), especially fisherfolk at fishing docks and boat ramps. However, we took every opportunity to interview fisherfolk, as we believed they were most likely to have encountered live sea turtles.

All interviews were translated to English and coded to identify thematic trends in the responses, and later grouped according to the research inquiry areas. Descriptive narratives (representative respondent quotes) are presented below (Table 1) because they proved useful in our prior research as a low-inference data analysis technique used to recognize trends in participant responses and to convey our multiple research findings (Schneller, 2008). Validity of

**Table 1**  
Descriptive Narratives from Respondent Interviews.

Consumption of turtles now, compared to 10 years ago	Willingness to participate in a conservation program involving turtles	Willingness to attend sea turtle conservation workshops	Ever been invited to attended a sea turtle workshop or meeting?	Willingness to share spots where fisherfolk most frequently capture turtles	Would sea turtle voluntourism be of value to the community?	Practicality of sea turtle voluntourism	Benefits + challenges to participatory conservation in BM region
There is less consumption now because there are less sea turtles in the bay.	I would participate even if I'm not paid because the sea turtles are becoming rarer.	Yes, but I have never been invited to. I would like to be asked.	No, but I would like to be invited.	Yes, because it is important to know where the turtles are most abundant... so you can protect their habitat.	Yes, we need ecotourism to increase the protection of the sea turtles.	Very practical because the infrastructure is already in place for whale watching.	As a fisherman I already have the resources (boat and nets) and knowledge of sea turtle movements to make it work.
There is less consumption now because it is illegal to eat sea turtles.	Yes, I would like to help save this endangered species from extinction.	Yes, as long as I did not miss work.	It would be nice to be invited even if I cannot make it.	Yes, because I admire the work of the sea turtle groups and I would like to help in any way I can.	Yes, because there will be a greater incentive to protect the sea turtles from illegal poaching.	Somewhat practical if there are enough sea turtles to keep people happy.	There would be more incentive to protect the sea turtles and not eat them anymore.
There is less consumption now because we know the sea turtles are endangered and should not be eaten.	Yes, because it is important to protect the sea turtles for our children and the ocean.	Yes, but I would need help getting there.	My child has but I have not.	I can take you out anytime as long as I'm paid for gas.	Yes because the community would benefit from new jobs and more business.	It would work well but only on a small scale. It would not work on a larger scale like whale watching.	There will be peer pressure from friends, family, and community members who continue to poach and eat sea turtles.
There is less consumption now because people do no hunt them directly.	Yes, because the sea turtle groups work hard and need our help.	Yes, because I would like to learn as much as I can about the sea turtles so I can help educate others.	Yes, I was invited to participate in a sea turtle meeting.	Yes, because it's important to know where the sea turtles go so they can be protected from poachers and transient fishers.	Yes, but only a small number of people will directly benefit.	It might be difficult to obtain the proper permits and to successfully market the business.	It will be difficult to deal with the transient fishermen who come in, kill the sea turtles, and leave.
It's about the same but it's done more secretly now because it is illegal.	Yes, as long as I don't miss work.	Yes, because as a fisherman it would be good to share with others what I know about the habits of the sea turtles.	Yes, I once attended a workshop that mentioned turtles.	Yes, because I would like to be involved with sea turtle conservation.	Yes, because the sea turtles would be worth more alive than dead.	It is somewhat practical but obtaining funds to start will be challenging.	PSC already has the infrastructure (roads, hotels, restaurants) to make it work. We will need help with coordination and funds.

our findings was further addressed by identifying accounts of discrepant information (deviant cases) (Creswell, 2003). Inclusion of outlying participant perspectives provides for a more holistic understanding of the variations in responses, while allowing for a more contextualized and descriptive participant response framework. “The prevalence or lack of discrepant information therefore allowed for greater insights into the credibility of perceived patterns of phenomena identified by this research” (p. 297) (Schneller, 2008).

Our qualitative analysis below employed Type 1 and 2 tabulations as prescribed by Silverman (Silverman, 2006). More precisely, we assigned percentages to the interview data to more accurately display a numeric prevalence of phenomenon. Collectively, authors have lived part or full-time in Puerto San Carlos since 1993. We conducted participant observations through attendance in 10 (annual) Grupo Tortuguero sea turtle conferences in Loreto, BCS, and six sea turtle festivals throughout BCS since 1999. Participation in these events was useful for observational purposes, as well as for triangulating participant responses in relation to the participatory education and outreach activities/methods employed by the Grupo Tortuguero network. Further, attendance at these functions aided in a better understanding of the organizational and collaborative approaches used by the variety of coastal communities and NGOs participating in the sea turtle conservation movement in BCS and internationally (Creswell, 2003). Lastly, we conducted a thorough archival study of NGO documents, education and outreach materials, and websites.

### 3. Results and discussion

#### 3.1. Demographics

Our sample contained a higher male: female sex ratio and more fisherfolk than reported for BCS (INEGI, 2010). The demographics of residents yielded a wide range in age and profession. Respondents ranged in age from 18 to 73 (mean =  $31 \pm 7.5$  yrs) and more males (78%) than females were interviewed. The majority of residents (74%) were employed and over half (60%) worked in fisheries. Fisherfolk respondents participated in a variety of fishing activities dependent on season, location, and permit. Some fisherfolk belonged to highly regulated fishing cooperatives, whereas others fished independently (with or without permits). Most participants (65%) were from Puerto San Carlos, followed by Puerto Chale (9%), Puerto Magdalena (7%), Puerto Alcatraz (7%), Puerto Cancun (6%), Punta Arenas (5%), and Lopez Mateos (1%).

#### 3.2. Participatory conservation

Almost all respondents indicated a willingness to participate in a sea turtle conservation program (98%) or attend educational workshops and meetings (95%), yet only 3% had ever been invited to participate in an educational workshop or meeting held by the Center for Coastal Studies in Puerto San Carlos. Willingness to participate results should be interpreted cautiously due to the ‘low cost’ of answering these questions favorably, in a socially responsible direction. Nevertheless, follow-up conversations suggested that interviewees were genuinely interested in participating in a facet of sea turtle or marine conservation, usually irrespective of whether or not they would receive direct economic benefits.

The majority of fisherfolk (87%) indicated that they were willing to share locations where they frequently captured sea turtles as incidental bycatch in their nets. Follow up conversations indicated that willingness to share locations where sea turtles were incidentally captured was indeed genuine, as fisherfolk pointed to apparent sea turtle “hot spots” on a map and offered to take us in their boats to these areas. In November of 2004, sea turtle researchers added one of these “hot spots” to their sea turtle monitoring program, and as a result, four East Pacific green turtles

were captured on the first night (J. Senko, pers. obs.). We found that fisherfolk who were amenable to sharing locations of sea turtle “hot spots” also suggested a desire and willingness to participate in community-focused participatory conservation measures. More specifically, several fisherfolk, especially those belonging to regulated cooperatives, mentioned a desire to partake in community monitoring or enforcement activities to further protect sea turtles from directed hunting and illegal fishing activities (i.e. gillnetting) that result in high levels of sea turtle bycatch.

#### 3.3. Perceived changes in sea turtle populations and rates of consumption

More than half (54%) of respondents indicated that they believed sea turtle consumption had decreased in recent years, 27% noted that it had remained the same, and 19% reported an increase. These results should again be interpreted cautiously because respondents may have reported decreased consumption rates because of legality concerns, hence the resulting high instance of socially acceptable responses. The fact remains that endangered sea turtles are still being consumed in Bahia Magdalena communities. One fisherman noted that he faced ridicule from peers when he refused to eat illegally caught sea turtles. On another occasion during interviews, authors encountered fisherfolk in their homes openly cooking whole sea turtles in open-pit fires. Further, authors and their colleagues have discovered hundreds of sea turtle carcasses in landfills within various communities throughout Bahia Magdalena (Koch et al., 2006). Fisherfolk who capture sea turtles (incidentally or purposefully) potentially face strict penalties (when laws are enforced), and the federal agencies have threatened to revoke fishing permits if sea turtle carcasses continue to litter beaches, towns, and landfills. In relation to our findings, if the overall trend in consumption is actually decreasing, we may see less peer pressure towards participation in sea turtle conservation programs.

Conservation activity may be difficult if residents do not perceive a crisis or threat (Silverman, 2006). For instance, when asked to compare sea turtle populations now to 10 years ago, 53% of respondents reported that populations had decreased, 29% indicated an increase, and 18% noted no change. Although 53% of respondents believed populations had decreased over the past 10 years, almost half believed populations to be increasing or unchanged. Many fisherfolk indicated that they continue to incidentally capture turtles in their nets. For example, we often encountered individuals who asked, “If sea turtles are in danger of extinction, then how come we continue to catch so many in our nets?” These results suggest that more focused and clear education and communication efforts are needed so that community members understand why sea turtle populations, especially those that primarily consist of juveniles, are particularly vulnerable to population declines. Further, while there appears to be recognition and public understanding in Adolfo Lopez Mateos about the congregation of sea turtles in Bahia Magdalena “hot spots”, respondents from other locations showed less understanding as to why BCS experiences such congregations, and that on a global scale, most sea turtle populations and their habitats continue to decline in number and quality.

Respondents indicated a number of challenges towards the implementation of community-focused education and communication efforts. As mentioned above, peer pressure and conflict within the community were cited as major challenges to participatory conservation efforts. For example, we observed that peer pressure and conflict has arisen towards community members who participate in sea turtle protection measures, when other community members and their peers continue to illegally poach, consume, and sell sea turtles. Fisherfolk from smaller island communities expressed concern regarding the venue for regular educational

meetings or workshops. Suggestions included rotating meetings in different towns throughout the bay so that a diversity of people would have a chance to attend and communities would feel more ownership in the process. Respondents suggested holding workshops and meetings at homes and keeping them relatively short and easy to understand. Interviewees also recommended a trusted outside individual keep in touch with group efforts as often as possible, and that an outside person could also help alleviate conflicts, keep groups on task, and add creative ideas. Some local fisherfolk mentioned frustration over the inability to prevent sea turtles from accidentally drowning in the nets of transient fisherfolk. These fisherfolk often set up fishing camps and fish in the bay seasonally, sometimes traveling from several hundred kilometers away. Transient fisherfolk typically have little or no vested interest in sustainable use of local natural resources, including endangered sea turtles (Young, 2001; Hastings and Fischer, 2001).

### 3.4. Sea turtle voluntourism

As charismatic megafauna, sea turtles are an especially attractive species for ecotourism and voluntourism (Campbell and Smith, 2006), and sea turtles are considered the single most popular animal on the planet for nature-based tourism (Ellis, 2003). Sea turtle ecotourism and voluntourism continues to increase globally in popularity and is now promoted in countries such as Costa Rica, United States, Australia, South Africa, Mexico, Sri Lanka, Indonesia, and Malaysia (Wilson and Tisdell, 2003). Sea turtle voluntourism has the potential to provide fisherfolk and fishing cooperatives with a limited alternative source of income. SEE Turtles ([www.seeturtles.org](http://www.seeturtles.org)) and RED Sustainable Tourism ([www.redtravelmexico.com](http://www.redtravelmexico.com)) are currently operating sea turtle voluntourism programs in Bahia Magdalena and income from these trips — where participants assist BCS NGOs with sea turtle biological monitoring programs — helps to fund local conservation and social projects.

According to our interviews, the potential for increased sea turtle voluntourism appears to be supported by residents of the Bahia Magdalena region. The majority (87%) of our respondents indicated that sea turtle voluntourism would have a positive impact on their community. More than half (57%) of participants noted that expanding sea turtle voluntourism would be “very practical,” 40% believed it would be “somewhat practical,” and only 3% believed it would be “impractical.” Outside of an extended multiple day program, respondents indicated that acceptable hourly rates to charge tourists varied between \$5.00–10.00 (24%), \$15.00–20.00 (22%), and  $\geq$  \$25.00 (31%). Whale watching guides in particular noted an interest in developing and expanding sea turtle voluntourism programs. Fisherfolk, and especially whale watching guides, would be likely to take a lead role in developing these activities because they already possess the necessary equipment (e.g. boats, nets, GPS devices, etc.) and ecological knowledge of turtle movements and abundance. Salafsky et al. (Salafsky et al., 2001) found that simple ecotourism ventures utilizing skills and technologies that community members already possess are the most likely to be successful.

At the time of our interviews, most participants (68%) were unaware of an existing black sea turtle voluntourism project in BCS operated by Earthwatch and surprised to hear that this project had been successfully operating for nearly a decade<sup>3</sup>. However, the lack

of knowledge is not entirely surprising because the project operated in Bahia de Los Angeles, a coastal lagoon located over 600 km away from Bahia Magdalena on the Gulf of California. Similarly, Finkbeiner (Finkbeiner, 2009) found that awareness of sea turtle ecotourism was low even in communities where sea turtle ecotours were already operating. Residents mentioned potential for positive community impacts, economic incentives, and increased protection for sea turtles as benefits to sea turtle voluntourism. As seen above in Table 1, respondents also discussed perceived challenges to sea turtle voluntourism, which included peer pressure, difficulty in obtaining permits to handle sea turtles, difficulty producing effective marketing materials, and doubt about direct economic benefits. In addition, the prospect of obtaining start-up funds was intimidating to non-fisherfolk respondents.

The limited amount of direct economic benefit that the majority of residents are likely to receive has been an ongoing issue with various forms of nature-based tourism (Campbell et al., 2007; Berkes, 2004). Most community-focused endeavors provide only modest cash benefits to a relatively small proportion of the community (Kiss, 2004), and the use of economic incentives has largely failed to translate into enhanced support for conservation (Campbell et al., 2007). However, the supplementary income and added resources from SEE Turtles and RED Sustainable Tourism has already aided local communities and sea turtle protection efforts. For example, SEE Turtles has generated over \$200,000 USD for conservation and local communities, has helped train guides in BCS, and has helped patrol nesting beaches in Costa Rica ([www.seeturtles.org](http://www.seeturtles.org)). Likewise, in less than one year RED Sustainable Tourism has created 13 new jobs and one local coop, as well as finance the costs of Grupo Tortuguero's sea turtle monitoring trips in Puerto San Carlos ([www.redtravelmexico.com](http://www.redtravelmexico.com)). Similar benefits may be helpful in cash-poor areas of Bahia Magdalena, and voluntourism activities that generate a modest amount of part-time jobs can be a good first step to increased earnings and positive attitudes towards sea turtle conservation efforts (Kiss, 2004). Further, individuals who are knowledgeable of peers who work within the voluntourism sector may develop pro-environmental attitudes towards sea turtle conservation even if they themselves do not directly benefit from the endeavor (Alexander, 2000; Campbell et al., 2007).

Due to differences in infrastructure and resources among the communities in Bahia Magdalena where we conducted interviews, sea turtle voluntourism is plausible in some towns (i.e. Puerto San Carlos, Adolfo Lopez Mateos, and Puerto Magdalena) and difficult in others (i.e. Puerto Chale, Puerto Alcatraz, Puerto Cancun, and Punta Arenas). In those towns where infrastructure or resources may be lacking, day trips for other eco activities (e.g. snorkeling/diving, dune and island exploration, kayaking mangroves, sport fishing, surfing, wildlife viewing, etc.) should be encouraged. Creating partnerships between existing tourism infrastructure such as local hotels, restaurants and other services, as well as developing a means for transporting tourists to and from the remote communities may also help spread more economic benefit throughout the community (Alexander, 2000). This is certainly possible in the Bahia Magdalena region as the infrastructure already exists in Puerto San Carlos, Adolfo Lopez Mateos, and to a lesser extent Puerto Magdalena to accommodate gray whale ecotourism during the winter months and surf/fishing based ecotourism during the summer months. Joint ventures between community members, fishery cooperatives, NGOs, and private tourism operators may be more likely to succeed and also generate the most revenues for communities, especially during the initial stages (Kiss, 2004). Communities and start-ups will need outside assistance in developing these initiatives (Wells, 1997; Wunder, 2000) and conservation tourism NGOs such as SEE Turtles, RED Sustainable Tourism, and Earthwatch may offer unique opportunities for the development of enhanced sea turtle voluntourism in the region.

<sup>3</sup> The Earthwatch Bahia de Los Angeles black sea turtle project ran for a decade in the 1990s and 2000s. Today, Earthwatch operates a similar black sea turtle voluntourism project in Laguna San Ignacio, which is located along the Pacific coast of BCS, Mexico. The project started in 2007 and is currently ongoing. The SEE Turtles and RED Sustainable Tourism programs began operating in Bahia Magdalena after our research ended.

### 3.5. Recommendations and conclusions

Despite respondents' apparent interest, existing community-focused conservation programs are in need of improvement to adequately target more of the local community. We found that current exemplary conservation outreach programs (such as those implemented by proCaguama in Lopez Mateos) have focused their efforts on multiple stakeholders, including school children, artists, fisherfolk, cooperatives, small businesses, decision makers, tourism operators, and the community as a whole. Yet while the Grupo Tortuguero network has made great strides in involving fisherfolk in sea turtle conservation programs, regional sea turtle conservation NGOs and communities should ideally try to professionalize, formalize, and expand their efforts to include a broader subset of residents in sea turtle communication and educational programs. Schneller and Baum (Schneller and Baum, *In Press*) reported that BCS residents who were directly invited by conservation organizations to participate in volunteer work were twice as likely to do so than those who saw newspaper or television advertisements.

Despite consistent and broad based educational and outreach efforts in the Bahia Magdalena region, many community members indicated the need for additional leadership and coordination in developing community-focused conservation programs. We recommend that regional conservation NGOs provide further assistance in helping to identify capable community leaders who are willing to help engage others in conservation initiatives. NGOs should expand their efforts by educating both adults and children about the ecological roles of sea turtles in the marine environment, and why sea turtle populations, especially those consisting primarily of juveniles, are particularly vulnerable to multiple anthropogenic impacts. Existing conservation NGOs should broaden their monitoring and surveillance efforts and include more fishermen and adults while continuing to work to formalize experiential educational opportunities for local school children. Enhancing community-focused conservation initiatives will likely need to involve numerous community meetings, with an effort to ensure that all stakeholders are included in each phase of the process. Nevertheless, we recognize that conservation NGOs continue to face formidable challenges in reconciling differing ecological, economic, cultural, financial, and social objectives.

Although affected by factors such as the limited amount of people involved, limited earnings, the competitive nature of tourism, and weak linkages between conservation gains and commercial success, community-focused voluntourism may be justified in cases where small changes and benefits can yield significant conservation and social gains (Kiss, 2004). We believe sea turtle voluntourism has the capacity to aid in the mitigation of damaging fishing practices (i.e. gillnetting) in key sea turtle foraging "hot spots" in Bahia Magdalena. This seemingly small change could provide the needed incentive to protect these foraging habitats and reduce harmful fishing practices that continue to kill hundreds of sea turtles per year. Most of these foraging areas are easily accessible and shallow, making a number of biological monitoring and research activities possible. Fishing cooperatives working in voluntourism who simultaneously undertake rotating sea turtle monitoring and surveillance efforts may be able to spread economic and conservation benefits more evenly (Nichols, 2003).

With proper training, furthering sea turtle voluntourism in a town such as Puerto San Carlos would be feasible, as tourism infrastructure already exists. We are currently working to determine locations close to Puerto San Carlos that could be managed for a small number of visitors. We believe adding sea turtle voluntourism activities to an existing ecotourism experience that includes whales, dolphins, sea lions, birding, island and dune exploration, kayaking mangroves, diving/snorkeling, sport fishing, and surfing

would be a potential starting point, especially because direct economic benefits from existing sea turtle voluntourism programs are minimally distributed throughout the communities. Fisherfolk and business owners need opportunities to train in voluntourism activities and have the ability to work together to enhance commercial resources and project marketability while simultaneously working to reduce peer pressure from community members.

In Tortuguero, Costa Rica, the advent of ecotourism on sea turtle nesting beaches resulted in a decrease of illegal poaching of sea turtles and their eggs (Jacobson and Lopez, 1994). Instances such as this, and the continued efforts of Grupo Tortuguero in BCS, give us evidence of successes, but we will continue to undertake a longitudinal effort to document the extent to which increased community-focused conservation efforts result in decreased illegal take of sea turtles in the Bahia Magdalena region. Efforts to change community knowledge, attitudes, and behaviors in regard to resources utilization is complex and requires a detailed understanding of the cultural, economic, political, and social fabric (Larson et al., 1997). However, changing anti-environmental behaviors that currently threaten sea turtles will continue to be a challenging endeavor in a region where people still poach and traffic in endangered species despite progressive legal protections and easier access to other more reliable and less risky protein sources.

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### Appendix 1. Funding, Education, and Outreach Opportunities for Enhancing the Sea Turtle Conservation Movement in Baja California Sur, Mexico

#### 1. Create public membership in sea turtle conservation organizations

In order to increase public buy-in and participation in sea turtle and marine conservation, as well as to provide an alternative source of funding, groups should consider developing a membership retention program, similar to those already established by Tortugueros de Las Playitas, ProPeninsula, and Wildcoast (CostaSalvaje). Groups should work to retain all contact information from the public for campaigns and activities that require citizen participation. As per our results the public is willing to participate in the movement and its initiatives, and public membership could work to further solidify their commitment to sea turtle conservation efforts.

#### Basic Components of a Membership Program

- A staff membership coordinator/representative, assigned to community outreach, action campaigns, and educational responsibilities.



- Development of opportunities (legal infrastructure) for individuals to donate monetarily.
- Groups distribute quarterly newsletters detailing: programmatic achievements, events for public involvement, letters and other submissions from members, news, policy and research developments from the field, etc.
- T-shirts, stickers, etc.

## 2. Create more avenues for public participation and volunteerism

Groups should work to increase the number of volunteer and service opportunities available to the public. Students and adults alike are already participating, and have the ability to do more to protect sea turtles and their habitat, if asked. As per our results, respondents indicated an interest in increased involvement in the activities of sea turtle conservation groups. Groups should advertise public events widely via local radio and television, and flyers. Groups should work to visit schools and invite teachers and students to participate in sea turtle conservation efforts. Recent research by Schneller and Baum (in press) showed that BCS citizens who are directly invited by conservation organizations to participate in volunteer work do so 2X more than those who saw newspaper or television advertisements.

## 3. Develop community outreach tools and education curriculum for BCS schools

Develop formal printed informational materials for adults and students, which can be distributed at festivals and other community events. During our visits to various sea turtle festivals throughout the state we encountered minimal NGO sponsored tables with information and outreach materials concerning information on sea turtle and marine conservation issues/opportunities. Exceptions include proCaguama and IEMANYA, groups that have developed impressive booths containing informational materials and activities for the public that visit them at events and festivals.

Age appropriate sea turtle and marine conservation curriculum is desperately needed for BCS teachers. Training teachers to implement marine focused environmental education is also needed. SEMARNAT's new *Strategy of Environmental Education for Sustainability in Mexico* proposes broad environmental learning goals to be implemented by 2014. As per our findings, due to Grupo Tortuguero's positive working relationship with SEMARNAT, the environmental community in BCS should take advantage of this directive and work to lead this effort in regard to environmental education focused on conservation of the marine environment. Informal educational programs already contain useful information and have already been implemented by Grupo Tortuguero, proCaguama in Lopez Mateos, and Eco Educadores Verde y Azul de BCS, A.C. in Pescadero, Todos Santos, and Elias Calles.

## 4. FESTIVALS WITH A FOCUS ON PLANNED ACTIVITIES FOR YOUTH as implemented by proCaguama

- Organized mural painting and art competitions (that remind the community of their responsibility to the environment and sea turtle conservation).
- Re-enactments to "play" biologist and search for turtle tracks, nests, and eggs.
- Ocean trips/adventures (kayaks, pangas, and beach exploration).
- Sea turtle and environmentally themed movies and plays (better if the students are actors).
- Student created signage for clean beaches and other environmental messaging.

- Painting garbage cans (that are sold to benefit groups or distributed free for use in public places and schools).
- Sea turtle youth dance/(tardeada) with a band or DJ playing music appropriate for middle and high school students.

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