The impacts of tourism on coral reef conservation awareness and support in coastal communities in Belize

A. Diedrich

Abstract  Marine recreational tourism is one of a number of threats to the Belize Barrier Reef but, conversely, represents both a motivation and source of resources for its conservation. The growth of tourism in Belize has resulted in the fact that many coastal communities are in varying stages of a socio-economic shift from dependence on fishing to dependence on tourism. In a nation becoming increasingly dependent on the health of its coral reef ecosystems for economic prosperity, a shift from extractive uses to their preservation is both necessary and logical. Through examining local perception data in five coastal communities in Belize, each attracting different levels of coral reef related tourism, this analysis is intended to explore the relationship between tourism development and local coral reef conservation awareness and support. The results of the analysis show a positive correlation between tourism development and coral reef conservation awareness and support in the study communities. The results also show a positive correlation between tourism development and local perceptions of quality of life, a trend that is most likely the source of the observed relationship between tourism and conservation. The study concludes that, because the observed relationship may be dependent on continued benefits from tourism as opposed to a perceived crisis in coral reef health, Belize must pay close attention to tourism impacts in the future. Failure to do this could result in a destructive feedback loop that would contribute to the degradation of the reef and, ultimately, Belize’s diminished competitiveness in the ecotourism market.

Keywords  Tourism · Belize · Conservation awareness · Marine protected areas · Perceptions

Introduction

Belize has become an increasingly popular tourism destination in recent years. One of its main attractions is the Belize Barrier Reef which spans the entire coastline, earning the country the reputation of one of the premier sites for marine ecotourism in the world. By 1998, tourism had already been identified as the main use of Belize’s coral reef (Gibson et al. 1998). Today, the reef contributes to approximately 30% of the nation’s gross domestic product through the tourism it attracts, the provision of commercial fisheries products, and private sector investments in aquaculture and coastal development (Cho 2005). Tourism is one of a number of threats to the Belize Barrier Reef but, conversely, represents both a motivation and source of resources for its conservation.

It is a well established fact that excessive, un-planned tourism can have negative impacts on coral reefs including pollution, direct contact of tourists, anchor damage, and sedimentation from coastal erosion and over-development. However, tourism can also create positive shifts toward conservation of coral reefs. Before tourists arrived in Belize, many coastal communities were primarily dependent on fishing for survival. Observations and interviews related to this research confirmed that the majority of these...
communities are in varying stages of a socio-economic shift from dependence on fishing to dependence on tourism. In a nation becoming increasingly dependent on the health of its coral reefs for economic prosperity, a shift from extractive uses to their preservation is both necessary and logical.

Well-planned tourism should result in social, economic, and environmental benefits to host communities. In reality, these benefits often do not accrue equitably or in enough abundance to outweigh associated negative impacts. Tourism can create conflict and resentment for conservation measures among local people who feel they are losing control and access to natural resources that are rightfully theirs to use as they please. The alternative scenario is that tourism, through its associated benefits, can promote local awareness and support for conservation measures related to preserving natural resources for the enjoyment of tourists.

Budowski (1976) defines the potential relationships between tourism and conservation as conflict, coexistence, and symbiosis. The objective of this research is to determine which of these relationships defines marine ecotourism and coral reef conservation in coastal communities in Belize. Specifically, through examining data relating to local perceptions of conservation in five study communities that attract different levels of tourism, the analysis is intended to explore the relationship between tourism development and local conservation awareness and support. Through gaining a deeper understanding of this dynamic, this research is intended to contribute to the promotion of tourism that complements coral reef conservation efforts in Belize. As a case study, this information may have wider applicability for tourism decision-makers in other nations dependent on natural resources for attracting tourism.

Tourism and environmental conservation

A potential relationship between tourism and environmental conservation is illustrated in Recommendation 12 of the World Conservation Union’s World Commission on Protected Areas Fifth World Park Congress. While the congress recognized that the ecological, social, and cultural costs of tourism can be significant, the following recommendation was made:

Tourism in and around protected areas must be designed as a vehicle for conservation: building support; raising awareness of the many important values of protected areas including ecological, cultural, spiritual, aesthetic, recreational, and economic values, and generating much need for conservation work for the protection of biodiversity, ecosystem integrity, and cultural heritage (World Conservation Union’s World Commission on Protected Areas 2003, p 28).

In relation to marine conservation measures in particular, this premise is supported by Agardy (1993, p 233), who concluded that “controlled tourism” (i.e. that which is “non-extractive and non-degrading”) can actually complement the objectives of marine protected areas (MPAs). In fact, shifting perceptions of natural environments from sources of food and other natural products to potential sources of income from tourism often co-occurs with the designation of marine and land-based protected areas (Agardy 1993; Ceballos-Lasmurain 1991). Belize’s growth in tourism has coincided with the designation of a national network of MPAs spanning the length of the Belize Barrier Reef. These areas have become focal points for effecting changes in local attitudes to coral reef conservation.

Conversely, its potential to promote and enhance environmental conservation, it is ironic that tourism, through its emphasis on nature-related activities, can also result in negative impacts on natural environments (Mathieson and Wall 1982; Boo 1990; Patullo 1996; Butler 2000; Gössling 2001; Musa 2003; McLaren 2004). One of the reasons for this is that the desire to view nature in its pristine state brings people to areas that might otherwise have been left virtually untouched. Butler’s (1980) tourism area life cycle (TALC) model illustrates the possibility that the more popular a destination is, the more tourists it will attract, eventually surpassing the amount of visitors it can accommodate without destroying natural and cultural resources. This cycle of destruction can lead to the decline of tourism destinations no longer possessing the qualities that attracted the tourists in the first place.

Ecotourism has been heralded as the solution to mitigating the negative environmental impacts of tourism. Essentially, ecotourism is sustainable tourism in natural areas, with many definitions equating it with conservation and community development ideals (Boo 1990). The International Ecotourism Society (2006) defines ecotourism as “responsible travel to natural areas that conserves the environment and improves the well-being of local people.” At the very least, it should not have negative impacts on natural environments and, ideally, it should benefit the environment it is drawn to.

In marine environments, where property delimitation and frequent deficiencies of adequate legislative frameworks pose substantial challenges to conservation and management efforts, community participation, and support are critical if such initiatives are to succeed (see for example Alcala and Vande Vusse 1994; Racelis 1994; Pomeroy

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1 For the purpose of this paper, the term perception is broadly defined as intelligent discernment or intuitive recognition (see definition in Merriam-Webster Dictionary 2003). In this context, perceptions encompass observations, attitudes, and beliefs about the impacts of tourism.
Local participation is also necessary for building support for conservation activities specifically related to ecotourism (Boo 1990; Ceballos-Lascurain 1991; Drake 1991; Polit 1991; Pigram 1992; Agardy 1993; Wilson 2003). This necessitates site specific studies which evaluate local conservation awareness and support in the context of tourism development.

Successful ecotourism will manifest itself as Budowski’s (1976) “symbiotic” relationship between conservation and tourism. Two important obstacles that may hinder this mutually beneficial relationship are examined in this paper. First, successful ecotourism and support for conservation measures have frequently been associated with local benefits accruing from tourism (Boo 1990; Ceballos-Lascurain 1991; Lindberg and Enríquez 1994; Lindberg et al. 1996). For example, local support for the Hol Chan Marine Reserve in Belize is allegedly a result of the income it generates from nature based tourism (Lindberg et al. 1996). Should local perceptions of the costs of tourism outweigh benefits, it is probable that such conservation awareness and support would diminish. Second, tourism can be a conflicting use of the marine environment in communities that have traditionally depended upon it for their livelihoods (Budowski 1976; Abakerli 2001; Stem et al. 2003). Privatization of beaches, new legislative restrictions that address increasing pressure of marine recreation, and coastal development can all result in reduced access to natural resources for local people and fishermen. MPAs, which may be created to attract tourism and to manage the increased pressure on the marine environment, can also limit access to traditional fishing grounds. This can cause negative attitudes toward conservation measures, which can result in the continuation of illegal fishing practices (Lindberg et al. 1996).

In 1996, Lindberg et al. concluded that ecotourism in a number of inland sites in Belize was generating local support and awareness of natural resource conservation. A decade later, Belize is in a critical stage of tourism development where emerging policies still have the potential to be proactive as opposed to reactive. This research revisits the relationship between conservation awareness and tourism in coastal areas, in an effort to ensure that Belize’s Barrier Reef continues to flourish for the enjoyment of local people and tourists in the future.

Materials and methods

An ethnographic approach was used to gather extensive qualitative and quantitative data from five coastal communities in Belize during the period of March–November 2005. The study communities Placencia, Punta Gorda, San Pedro, Caye Caulker, and Hopkins were chosen on the basis that they are coastal sites, each attracting a different level of tourism. The extent of the Belize Barrier Reef means that tourism activities in coastal communities in Belize all consist, in some part, of marine ecotourism. In addition, all the communities are within an hour and a half boat ride from at least one MPA and all offer diving and snorkeling tours to these areas. The selection of the study communities was largely influenced by consultations with tourism decision-makers in Belize, and their suitability was verified through visitation upon arrival in the country. For the purpose of this analysis, much of which is focused on relating relative levels of tourism with local attitudinal data, the study sites were ordered on a scale of 1–5, with 1 representing the lowest level of development and 5 the highest. Punta Gorda, with the lowest level of tourism, was allocated a score of 1, followed by Hopkins (2), Placencia (3), Caye Caulker (4), and San Pedro (5). The level of development was based on the total number of tourism arrivals and number of tourism establishments relative to the size of the community.

Data collection

One month was spent in each community collecting data using a combination of ethnographic methods including participant observation, semi-structured interviews, key informants, secondary sources, and a household survey instrument, which was used to collect the majority of the data presented in this paper. The first sections of the survey were designed to obtain information on local perceptions of tourists, tourism, MPAs, and general conservation values. The final section focused on respondent characteristics and standard household data. The survey, which was conducted as a face-to-face interview by a trained local research assistants (one hired from each community), took roughly 20 min to complete and was pre-tested with random respondents upon arrival in Belize.

Sample selection

One household sample and two sub-samples were obtained from each community. First, household sample sizes appropriate to estimate the mean to within an accuracy of ±15% with a 95% confidence interval were determined for all communities using a standard sample size calculation formula.2 Upon completion of the household surveys, additional surveys were conducted with fishermen3 and marine

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2 Available household level statistics dated back to 2000, so chosen sample sizes took into account estimated growth of the communities.

3 Selection criteria for fishermen were that they had to be full-time commercial or subsistence fishermen for at least half the year. Year-round, part-time commercial fishermen were included if a substantial portion (at least 30%) of their annual income comes from fishing.
tour guides to approach an appropriate quota sample for each group. The size of these sub-samples was partially influenced by estimates of total numbers of such individuals present in each community but, in all cases, efforts were made to approximate a quota of 30. Quota samples were not obtained in communities where a relatively small number of these individuals reside. Such cases include Hopkins and Punta Gorda for marine tour guides and San Pedro for fishermen. In all cases, where time and resources allowed, efforts were made to exceed the minimum requirement and obtain the maximum sample size possible. Household and sub-sample sizes for each community are shown in Table 1.

Measures were taken to ensure all samples were random. In smaller communities, households were selected by choosing a random starting point, walking along a predetermined path that covered the entire community, and picking every nth household (based on total households and required sample). In the larger communities (San Pedro and Punta Gorda) local maps were used to select the household sample by numbering residential lots and using a random number table to select the location of the households. In the event that a lot or household was found to be uninhabited, the next inhabited house along the path was chosen.

While conducting the surveys in the smaller communities, researchers alternated between households on different sides of the street and between houses adjacent and set back from the road. Efforts were also made to ensure adequate representations of gender and different age groups in the household sample. Heads of households were not favored because the emphasis of the survey was on perceptions representative of the community overall as opposed to obtaining detailed household information. Surveys were conducted at different times of day to ensure working and non-working members of the households had equal chances of being present. Residents had to have resided in the community for a minimum of 5 years in order to be selected.

Preference was given to interviewing fishermen and tour guides during the random household surveys. Upon completion of these surveys, in order to achieve appropriate quotas for the sub-samples, fishermen and tour guides were identified using a variety of methods including the use of key informants, snowball sampling, and visiting parts of the community known to be frequented by such individuals. In all cases, a combination of these techniques was used to make the samples as random as possible.

Data analysis

Data from the household surveys were entered into a database and a series of statistical analyses were conducted to detect trends and significant differences in attitudes among study communities. The results of the analysis are presented in the following section. Observed patterns are substantiated and interpreted using, where possible, information obtained through methods additional to the surveys including participant observation and key informant interviews.

Results

In the majority of instances, the results presented in this section portray only the values associated with the household samples, which are considered to be representative of the communities overall (Table 1). This has been done in order to avoid biased results arising from a disproportionate number of fishermen or tour guides in the sample. However, given the focus of this study on shifting values and perceptions of coral reef conservation, in particular as they relate to the transition from dependence on fishing to tourism, values of the sub-samples are deemed important for comparative purposes. In this context, throughout the analyses, attitudes for all sample groups were calculated but have only been reported if they are observed to be significantly different from statistical and practical standpoints.

Sample characteristics

Table 2 shows selected demographic characteristics of the household samples, including the percentage of households partially or entirely economically dependent on tourism. Age and gender refer to the characteristics of the respondents, where economic dependence on tourism refers to the entire household.6 The proportions of tourism dependent households are comparable with the relative levels of tourism.

| Table 1 | Household, fishermen, and marine tour guide sample sizes for study communities |
|---------|---------------------------------|-----------------|-----------------|-----------------|
|         | Households (2000)
|         | Household sample | Fishermen sub-sample | Tour guide sub-sample |
| Punta Gorda | 996  | 60  | 25  | – |
| Hopkins    | 197  | 39  | 28  | – |
| Placencia  | 138  | 37  | 24  | 29 |
| Caye Caulker | 191 | 40  | 34  | 34 |
| San Pedro  | 1114 | 51  | –   | 30 |

4 Source: Belize Central Statistics Office 2000

5 In all cases, N may vary from values reported in Table 1 due to absent or alternative responses.

6 Households are included if they are partially or fully economically dependent on tourism. A partially dependent household has at least one contributing individual working full time in a tourism dependent profession. A fully dependent household has all contributing individuals working full time in a tourism dependent profession.
Bene as tourism increases so do local perceptions of the overall quality of life (level of tourism in the community and increases in the community showed a relatively strong positive relationship between the overall quality of life in all the study communities. Spearman’s rank-order correlation analysis showed a relatively strong positive relationship between the level of tourism in the community and increases in the overall quality of life \( r = 0.62, p < 0.001 \), suggesting that as tourism increases so do local perceptions of the overall benefits associated with it.

Table 2  Selected household sample characteristics

<table>
<thead>
<tr>
<th>Gender (%)</th>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>65</td>
<td>67</td>
<td>43</td>
<td>60</td>
<td>57</td>
</tr>
<tr>
<td>Female</td>
<td>35</td>
<td>33</td>
<td>57</td>
<td>40</td>
<td>43</td>
</tr>
<tr>
<td>Age (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18–30</td>
<td>18</td>
<td>21</td>
<td>8</td>
<td>53</td>
<td>57</td>
</tr>
<tr>
<td>31–45</td>
<td>53</td>
<td>27</td>
<td>30</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>46–59</td>
<td>25</td>
<td>23</td>
<td>38</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>60+</td>
<td>4</td>
<td>29</td>
<td>14</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Economic dependence on tourism (%)</td>
<td>12</td>
<td>26</td>
<td>59</td>
<td>75</td>
<td>61</td>
</tr>
</tbody>
</table>

Percentages may sum to < 100 due to missing data or > 100 due to rounding.

The responses of fishermen in the sub-sample to the statement about overall quality of life in the community did not vary significantly from the responses of the household samples for any of the locations. However, local fishermen were also asked to respond to the more specific statement that fishermen are better off than they were before because of tourism (Table 4). Single sample \( t \)-tests using a test value of 4, a neutral response, were not significant for any of the responses, suggesting that, although they view the overall quality of life to be improving in the community, fishermen do not consider tourism to be affecting their lives either negatively or positively.

Local values of coral reef ecosystems

Villagers were asked to rate the importance of Belize’s natural and cultural attractions for drawing tourism to their communities using four ordinal response categories ranging from “not important” to “very important.” Attractions included rainforests, Mayan archaeological sites, land wildlife, beaches, local culture and traditions, coral reefs, and marine wildlife (for sport fishing). A series of Wilcoxon Signed Ranks Tests showed coral reefs to rank the same or higher than other tourist attractions in all communities. Mean responses relating to the importance of coral reefs as a tourist attraction were in the highest importance category (i.e. very important) for all communities.

Villagers were also asked which resources they value the most on a personal level and why. Analysis of this information showed that the largest proportion of locals value coral reefs above other resources in all the communities except Hopkins, where they are the second most valued resource below local culture and traditions.8 Hopkins is marketed as a Garifuna village, a culture that is renowned for maintaining a unique, strong sense of tradition. This could explain why this village, which was the only Garifuna village in the sample and the most homogenous in terms of the ethnicity of the respondents (87% of respondents were Garifuna), valued local culture and traditions above all other resources.

The attraction of tourism was the most common reason for valuing coral reefs in Placencia and San Pedro (42 and 70% of responses, respectively), where the majority of residents in Punta Gorda cited intrinsic reasons such as “it is beautiful” or “it is the second largest” (66%). In Caye Caulker, protection against waves from storms and hurricanes was the most frequently cited reason for valuing the reef (43%) and tourism was second (21%). Hopkins residents cited conservation reasons such as “I want to protect

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8 Respondents, 25%, in Punta Gorda said they valued coral reefs above other resources; 26% in Hopkins; 32% in Placencia; 73% in Caye Caulker; and 73% in San Pedro.
it for my grandchildren” or “it should be preserved” most frequently as their reason for valuing coral reefs (30%). Punta Gorda and Hopkins have the lowest levels of tourism so it is possible that this is why they continue to express more intrinsic values than residents of San Pedro and Placencia. This researcher was present on Caye Caulker during a hurricane and it was clear that the island would have been entirely swept away if it were not for the reef, which would explain the values expressed by the island’s residents.

Perceptions of the health of the local marine environment

Table 5 shows percentages of local responses in five, predetermined categories relating to local perceptions of the overall health of the marine environment around their communities. Responses were coded on an ordinal scale ranging from 1 to 5, with 1 representing “very bad” and 5 “perfect.” Mann–Whitney U tests showed Placencia to have a lower mean rank than the other communities [Punta Gorda, Hopkins, and San Pedro (all \( p < 0.001 \)], and Caye Caulker (\( p < 0.05 \)); and San Pedro to have a higher mean rank than all the communities (all \( p < 0.001 \)). These results indicate that, overall, locals in Placencia perceive the local marine environment to be least healthy in comparison with residents of the other communities, and those in San Pedro have the highest perception of marine health. The positive perceptions of San Pedro residents in relation to other communities for a significant number of the variables are discussed in the following section. However, it is also worth taking note that responses from Placencia residents are more negative than those of other communities in a number of cases. It is suggested here, that this could be because Placencia has recently entered a stage of rapid tourism development, which means that the residents are going through a stage of adjustment where their perceptions of potential negative impacts may be elevated (see discussion on social disruption theory in England and Albrecht 1984; Brown et al. 1989).

Perceived impacts of tourism on the marine environment and coral reefs

Local perceptions about whether tourism is having a positive impact on the health of the marine environment and coral reefs were recorded using the same method described for Tables 3 and 4 (i.e. scaled responses to a series of statements). Post-hoc independent sample t-tests between communities showed all the differences in mean responses to the statements to be statistically significant for both variables with the exception of Punta Gorda and Hopkins, which did not differ for either one (Table 6).\(^9\) The results indicate that, on average, villagers in San Pedro, Hopkins and Punta Gorda agree that tourism is having a positive impact on the health of local coral reefs and the marine environment. Degrees of agreement are comparable in Punta Gorda and Hopkins and significantly higher in San Pedro.

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\(^9\) Punta Gorda and Placencia (\( p < 0.001 \) for both variables), Caye Caulker (\( p = 0.05 \) for both variables), and San Pedro (\( p < 0.001 \) for both variables); Hopkins and Placencia (\( p < 0.001 \) for both variables), Caye Caulker (\( p = 0.05 \) for both variables), and San Pedro (\( p < 0.001 \) for both variables); Placencia and Caye Caulker (\( p = 0.05 \) for marine environment in better condition, and \( p = 0.001 \) for coral reef in better condition), and San Pedro (\( p < 0.001 \) for both variables); and Caye Caulker and San Pedro (\( p < 0.001 \) for both variables).
People care more about protecting the marine environment
Statement: *because of tourism in this community...*

Table 6  Local perceptions of the positive effects of tourism on local coral reefs and the marine environment

<table>
<thead>
<tr>
<th>Statement: because of tourism in this community...</th>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>The marine environment is in better condition</td>
<td>4.7 ± 1.0**</td>
<td>5.1 ± 1.8**</td>
<td>2.7 ± 1.0**</td>
<td>3.8 ± 2.3</td>
<td>6.6 ± 0.8**</td>
</tr>
<tr>
<td>Our coral reefs are in better condition</td>
<td>4.9 ± 1.3**</td>
<td>5.2 ± 1.5**</td>
<td>2.4 ± 1.0**</td>
<td>3.7 ± 2.3</td>
<td>6.6 ± 1.2**</td>
</tr>
</tbody>
</table>

Means ± SD

** *p < 0.001 [single sample t-test against a test value of 4 (neutral response)]

Pedro. Conversely, locals in Placencia disagree with both statements and villagers in Caye Caulker neither agree nor disagree in either case. Although mean responses for the variables were comparable among sample groups within the community in the majority of cases, there was a notable difference in the perceptions of tour guides in San Pedro, who had a mean response that was neutral for both variables (marine environment in better condition = 4.6, coral reef in better condition = 4.5, single sample t-test against a value of 4 not significant). Independent sample t-tests showed the responses of the tour guide sub-sample and the household sample were significantly different for both variables (*p < 0.001) with the household sample providing higher ratings.

The impacts of tourism on local support for coral reef conservation efforts

Again using the 7-point response scale, locals were presented with a series of statements relating tourism to local support for marine conservation efforts. The results in Table 7 show that, on average, local people across all communities agree that tourism is increasing local levels of concern and education relating to conservation of the marine environment. To a lesser degree, with the exception of Caye Caulker which again shows neutral responses in both cases, villagers also agree that fishermen are more likely to follow fishing regulations and that locals are more likely to enforce them.

A composite variable for the effects of tourism on local support of marine conservation was created by summing the values of all four variables in Table 7 and generating an overall mean (support of conservation, Table 8). The results show, a high level of agreement across all communities. Independent sample t-tests on support of conservation responses showed no significant differences between communities with the exception of San Pedro, which had a significantly higher value compared with all the other communities (all *p < 0.001).

In addition to more general questions about local support marine of conservation efforts, villagers were asked to respond to a series of statements pertaining specifically to MPAs (Table 9). In particular, questions were geared toward their belief in the effectiveness and associated benefits of MPAs in their communities. The results, show that, with a few exceptions, locals across all communities agree with all of the statements about MPAs. Exceptions include the fact that Placencia residents disagreed that MPAs can increase the health of corals, Punta Gorda residents disagreed that MPAs can have negative impacts on fishermen, Punta Gorda and Hopkins residents responded neutrally to the statement that MPAs are necessary in their communi-

Table 7  Local perceptions of the impacts of tourism on levels of environmental education and concern

<table>
<thead>
<tr>
<th>Statement: because of tourism in this community...</th>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>People care more about protecting the marine environment</td>
<td>5.4 ± 0.7**</td>
<td>5.5 ± 1.2**</td>
<td>5.5 ± 0.7**</td>
<td>6.0 ± 1.1**</td>
<td>6.7 ± 0.8**</td>
</tr>
<tr>
<td>People are becoming more educated about the marine environment</td>
<td>5.9 ± 0.9**</td>
<td>6.0 ± 0.8**</td>
<td>5.8 ± 0.6**</td>
<td>6.5 ± 0.6**</td>
<td>6.7 ± 0.8**</td>
</tr>
<tr>
<td>Fishermen are more likely to follow fishing regulations</td>
<td>4.5 ± 1.0**</td>
<td>5.1 ± 1.5**</td>
<td>5.0 ± 0.8**</td>
<td>3.6 ± 2.2</td>
<td>6.7 ± 1.1**</td>
</tr>
<tr>
<td>Local people are more likely to enforce fishing regulations</td>
<td>5.0 ± 1.0**</td>
<td>4.7 ± 1.8*</td>
<td>5.3 ± 0.8**</td>
<td>4.0 ± 2.3</td>
<td>6.7 ± 1.1**</td>
</tr>
</tbody>
</table>

Means ± SD

** *p < 0.001; * *p < 0.05 [single sample t-tests against test value of 4 (neutral response)]

Table 8  Mean local responses to statements relating to local support of coral reef conservation

<table>
<thead>
<tr>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support of conservation</td>
<td>5.2 ± 0.6**</td>
<td>5.4 ± 0.8**</td>
<td>5.4 ± 0.5**</td>
<td>5.0 ± 1.3**</td>
</tr>
</tbody>
</table>

Means ± SD

** *p < 0.001 (single sample t-test against a test value of 4)
Table 9  Local responses to statements about MPAs

<table>
<thead>
<tr>
<th>Statement: MPAs...</th>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can increase the health of corals</td>
<td>6.1 ± 0.8**</td>
<td>5.5 ± 1.5**</td>
<td>3.3 ± 1.3**</td>
<td>5.9 ± 1.5**</td>
<td>7.0 ± 0.2**</td>
</tr>
<tr>
<td>Attract tourism</td>
<td>6.1 ± 0.7**</td>
<td>6.1 ± 0.6**</td>
<td>6.1 ± 0.6**</td>
<td>6.5 ± 1.0**</td>
<td>6.9 ± 0.3**</td>
</tr>
<tr>
<td>Are necessary in Belize</td>
<td>6.5 ± 0.7**</td>
<td>5.4 ± 1.8**</td>
<td>6.3 ± 0.6**</td>
<td>6.5 ± 0.9**</td>
<td>7.0 ± 0.1**</td>
</tr>
<tr>
<td>Are necessary in my community</td>
<td>4.5 ± 1.7</td>
<td>4.1 ± 2.1</td>
<td>6.3 ± 0.6**</td>
<td>6.2 ± 1.5**</td>
<td>6.9 ± 0.4**</td>
</tr>
<tr>
<td>Can provide benefits to nearby villages</td>
<td>5.3 ± 0.6**</td>
<td>5.2 ± 1.7**</td>
<td>6.1 ± 0.4**</td>
<td>5.8 ± 1.7**</td>
<td>6.9 ± 0.3**</td>
</tr>
<tr>
<td>Can have negative impacts on fishermen</td>
<td>3.6 ± 1.1**</td>
<td>5.2 ± 1.8**</td>
<td>5.9 ± 1.1**</td>
<td>4.5 ± 2.0</td>
<td>6.1 ± 1.8**</td>
</tr>
</tbody>
</table>

Means ± SD

**p < 0.001 (single sample t-test against a test value of 4)

ties, and Caye Caulker residents responded neutrally to the statement that MPAs can have negative impacts on fishermen. A number of differences in the results also exist between sample groups within the communities. Fishermen and tour guides in Placencia responded neutrally to the statement that MPAs can increase the health of corals (single sample t-test not significant against a test value of 4). Independent sample t-tests showed significant differences between both sub-samples and the household sample (both p < 0.001). Also, where the Caye Caulker household sample shows a neutral response to the statement that MPAs can have negative impacts on fishermen, the fisherman sub-sample in this community agreed with the statement (4.9 ± 1.8, single sample t-test against test value of 4, p < 0.05; p < 0.001 for differences between samples).

A composite variable was created to represent villager’s beliefs in the potential for local and environmental benefits associated with MPAs (Support of MPAs, Table 10). This variable is the mean of the sum of all the variables in Table 9 with the exceptions of “MPAs can have negative impacts on fishermen,” which is a potential negative impact of MPAs, and “MPAs attract tourism,” which could be construed as negative by a local not wishing to attract more tourism to the community. Two variables not displayed in Table 9 were also added to calculate Support of MPAs, namely, mean responses to statements pertaining to the effectiveness of MPAs in increasing the number of fish inside and outside their boundaries. The results show high levels of agreement across all communities. Post-hoc independent sample t-tests showed all values to be significantly different from each other with the exception of Punta Gorda and Hopkins, and Caye Caulker and Placencia.

This indicates that locals in San Pedro have the strongest belief in the benefits associated with MPAs, followed by residents of Caye Caulker and Placencia, and finally by those in Hopkins and Punta Gorda.

Correlation analyses

As a final step, a series of Spearman’s rank-order correlation analyses were carried out to explore the relationship between the level of tourism in the community (based on the 5-point ordinal scale described in the methods section) and a number of the conservation perception variables described previously. The results show positive relationships between the level of tourism in the community and all the conservation perception variables, indicating that as tourism increases, so does local conservation awareness and support (Table 11). The relationship between support for MPAs and the level of tourism in the community is particularly strong. Controlling for San Pedro still resulted in a positive relationship between these variables, although weaker (r = 0.25, p < 0.01), and the same correlation analysis for the fishermen and tour guide sub-samples also showed weaker positive correlations (fishermen, r = 0.36, p < 0.001, tour guides, r = 0.37, p < 0.001).

A number of additional correlation analyses were conducted to further explore some of the factors that may be affecting local conservation awareness and support (Table 12). The results show that perceived health of the local marine environment (Table 5) is positively related to support for MPAs. If we assume that local perceptions of the health of the environment are indicative of actual health, this relationship could be interpreted in two ways. Either local support for MPAs is increasing because MPAs are observed to be improving the health of the marine envi-

10 Punta Gorda and Placencia, p (0.05; Punta Gorda and Caye Caulker, p (0.05; Hopkins and Placencia, p (0.05; Hopkins and Caye Caulker, p (0.05; the rest p (0.001.

11 The small number of communities in the sample means that the opinions expressed in each community have the potential to have strong influences on the strength and direction of the relationship. San Pedro, in particular, has been shown numerous times to have significantly stronger loadings in the agreement category for the graded response questions. In the case of support of conservation (Table 8), for example, Spearman’s rank correlation analysis revealed a positive relationship with the level of tourism in the community when San Pedro was included in the analyses (r = 0.49, p (0.001) and no relationship when it was excluded. Although the influence of the strong attitudes expressed by San Pedro residents does not make the non-parametric relationships in the data less meaningful, it is an important consideration for interpreting some of the observed patterns.
Coral Reefs

**Table 10** Mean local responses to statements relating to beliefs in the benefits of MPAs

<table>
<thead>
<tr>
<th></th>
<th>Punta Gorda</th>
<th>Hopkins</th>
<th>Placencia</th>
<th>Caye Caulker</th>
<th>San Pedro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support of MPAs</td>
<td>5.5 ± 0.6**</td>
<td>5.3 ± 1.3**</td>
<td>5.7 ± 0.4**</td>
<td>6.0 ± 1.0**</td>
<td>6.9 ± 0.2**</td>
</tr>
</tbody>
</table>

Means ± SD

**p < 0.001 (independent t-test against a test value of 4)

**Table 11** Spearman’s rank-order correlations between the level of tourism in the community and conservation perception variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Correlation coefficient (r***)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Because of tourism in the community...</td>
<td></td>
</tr>
<tr>
<td>The marine environment is in better condition</td>
<td>0.34</td>
</tr>
<tr>
<td>Coral reefs are in better condition</td>
<td>0.32</td>
</tr>
<tr>
<td>People care more about protecting the marine environment</td>
<td>0.54</td>
</tr>
<tr>
<td>People are becoming more educated about the marine environment</td>
<td>0.41</td>
</tr>
<tr>
<td>Fishermen are more likely to follow fishing regulations</td>
<td>0.46</td>
</tr>
<tr>
<td>Local people are more likely to enforce fishing regulations</td>
<td>0.44</td>
</tr>
<tr>
<td>MPAs</td>
<td></td>
</tr>
<tr>
<td>Improve the health of coral reefs</td>
<td>0.35</td>
</tr>
<tr>
<td>Attract tourists</td>
<td>0.48</td>
</tr>
<tr>
<td>Are necessary in Belize</td>
<td>0.30</td>
</tr>
<tr>
<td>Are necessary in the community</td>
<td>0.65</td>
</tr>
<tr>
<td>Can provide benefits to nearby villages</td>
<td>0.68</td>
</tr>
<tr>
<td>Can have negative impacts on fishermen</td>
<td>0.50</td>
</tr>
<tr>
<td>Composite Variables</td>
<td></td>
</tr>
<tr>
<td>Support of conservation</td>
<td>0.49</td>
</tr>
<tr>
<td>Support of MPAs</td>
<td>0.70</td>
</tr>
</tbody>
</table>

**All p < 0.001

Discussion

This analysis suggests that tourism development in the study communities is having a positive influence on coral reef conservation awareness and support (Table 11). Most locals also believe tourism is actually helping to improve the health of corals (Table 6). Given Belize’s focus on the marine ecotourism market, the maintenance of a healthy coral reef is imperative for its continued success as a tourism destination. An additional component of the research study on which this paper is based was an evaluation of the motivations and conservation beliefs of the tourists encountered in the study communities. Based on the same 7-point agreement scale as the perception data presented in this paper, the tourist data showed that, on average, tourists in Belize agreed they would be more likely to visit a destination if they knew the country protected their marine environment (mean response = 5.8 ± 1.5, p < 0.001, N = 181). The reef was also a primary motivation for choosing to visit Belize. Hence, this analysis suggests a symbiotic relationship between tourism development and coral reef conservation in the study communities. From a tourism policy perspective, two important questions must be addressed. First, what factors may be contributing to this mutually beneficial relationship? Second, what could prevent this relationship from continuing in the future?

With reference to the first question, it is likely that a symbiotic relationship between tourism and conservation awareness and support exists because two common hindrances, namely lack of benefits accruing to local people from tourism and conflicts among resource users appear to be minimal in the study communities. The data indicate that, as tourism develops, it is improving the quality of life of local people. Additional data associated with this
research study showed a strong positive correlation between tourism development and local levels of agreement with the fact that it has resulted in more jobs for residents \((r = 0.7, p < 0.001)\). Furthermore, the vast majority of responses to open ended interview questions about the main impacts of tourism in the community were related to economic benefits. Also, fishermen in the study communities do not feel that tourism is having a negative effect on their lives and conflicting responses among community groups are minimal. Although the positive relationships between compliance and enforcement of fishing regulations and the level of tourism are potential sources of such conflicts, the fishermen’s support for conservation is positively correlated with the level of tourism development. With the exception of Hopkins, locals agreed with the statement that MPAs can have negative impacts on fishermen, but this seems not to detract from support of MPAs in any of the sample groups.

The results of this research suggest that Belize’s tourism and environmental policies are effective in ensuring that benefits from ecotourism accrue to local people and, at the same time, complement coral reef conservation measures. This is particularly so in the case of the widespread designation of MPAs and the regulations requiring that all tourists who visit them must be accompanied by a trained local guide (Belize Tourism Board 1994). The latter provides an important source of alternative livelihoods and is most likely a major reason for the surprisingly low level of opposition to MPAs from local fishermen. In fact, many of the tour guides encountered during this study had been fishermen in the past and felt that the switch from fishing into tourism had had a positive impact on their lives.

Another reason for Belize’s seemingly beneficial relationship with tourism, both from the environmental and socio-economic perspectives, could be that tourism in Belize is in a relatively early stage of development. In the context of the TALC (Butler 1980), if we assume the levels of development in the study communities range from the exploration stage into the mid-development stage, this suggests that, for now, the costs of tourism do not outweigh the benefits. However, this assumption also places Belize in a critical stage of rapid tourism development where negative impacts are likely to escalate and could surpass the positive. Should this occur, local support for coral reef conservation and MPAs could diminish rapidly.

Besides the positive relationship between quality of life and both composite conservation perception variables, two additional relationships support the assertion that benefits from tourism are critical to maintaining local support for conservation measures. First, perceived health of the environment is positively correlated with Support of MPAs. Although the difficulty of interpreting this relationship was discussed in the results section, what it does suggest is that support for MPAs may not be founded in a perceived environmental crisis; rather, it is contingent upon their effectiveness. Second, there is a positive relationship between local beliefs that MPAs attract tourism and support for MPAs. Again, this suggests that conservation support may be more contingent upon perceived benefits than environmental concern. Both these relationships may be applied to the relatively high level of conservation awareness and support among San Pedro residents, which is liable to be connected to the fact that the local MPA, the Hol Chan Marine Reserve, is the only MPA in Belize that is self financing through the administration of user fees (Cho 2005). This connection between support for conservation measures and benefits as opposed to costs, creates the potential for a destructive feedback loop to develop should the balance tip and tourism start to have a net negative impact on the community and the environment.

In relation to the previous assertion, the results did show that locals in Punta Gorda, Hopkins and Caye Caulker value the reef mostly for reasons other than financial gain, which indicates a basic, non-fiscal connection between these Belizeans and their reef. This is a promising trend for reef conservation as it could decrease the likelihood that tourism development will be permitted to expand at the expense of this resource in the future. Regardless, the contradictory fact that a significant number of tour guides who expressed adamant support for conservation of coral reefs during interviews, also admitted to illegal fishing practices out of economic necessity in the slow season for tourism, suggests that economic need will likely continue to outweigh intrinsic values of the coral reef.

Besides suggesting that tourism is having positive impacts on coral reef conservation awareness and support, the results of this study also show that it is having some direct negative impacts on the reef, especially in the more touristy areas such as San Pedro, Caye Caulker, and Placencia. This illustrates the well-known concept of tourism as a double-edged sword and the tenuous balance between positive and negative impacts. A 2002 report on the status of coral reefs in Mesoamerica indicated that, although Belize’s reef had the lowest incident of disease and the highest fish diversity in the region, coral cover was found to be low (less than 20%) at all the sites (Almada-Villela et al. 2002). This report attributes much of the loss in coral cover to a recent hurricane event; however, it also highlights the growing threat of tourism in the region. Many locals interviewed for this study referenced the direct physical impact of tourists on the reef and pollution, much of which is brought on by tourism development.

If Belize does not pay close attention to the impacts of tourism as it develops, what appears to be a congruous relationship between tourism and coral reef conservation could be in danger of disintegrating. Although local support for
Wherever the extraction of natural resources can be economically and environmentally feasible, there is no reason why conservation efforts should not proceed in parallel with development. This principle is supported by a number of studies. For example, Balmford et al. (2002) show that conservation is critical to preserving the reef, it is also important to bear in mind that a number of additional factors are necessary. These include, among others, biological studies to monitor reef health, a strong legislative framework for conservation, and enforcement of regulations.

In addition, in the early stages of tourism development, Belize also has an exceptionally low population density, which is likely to be the primary reason why the Belize Barrier Reef ecosystem has remained in better condition than many of the other reefs in the region. In this context, the suggested congruence of tourism and coral reef conservation in Belize should not create a false sense of security. Rather, Belize has the advantage of being able to learn from the failures and successes of its neighbors and should be proactive in its approach to tourism management. The following recommendations for ensuring tourism does not grow at the expense of the health of the coral reef may be applicable to many destinations faced with the challenge of balancing tourism development with coral reef conservation.

First, it is important for governments to encourage and facilitate local entrepreneurship and small business development. It is also imperative for governments to actively involve local communities in all stages of tourism planning and development. Such activities will maintain the flow of benefits to locals which, congruent with the results of this research, should make them more amenable to changes resulting from coral reef conservation measures. In addition, such measures will help maintain positive attitudes of locals toward tourists and tourism in general, hence improving the attractiveness of the destination.

Public infrastructure and pollution mitigation capacity in communities and MPAs must also be improved in order to accommodate growth in tourism and associated coastal development and to minimize direct impacts to the marine environment. In addition, Belize should continue to develop, adapt, and improve conservation regulations and education programs, particularly in relation to MPAs. It is fundamental to human nature and to biological laws of survival that people on the whole value their own well-being over the health of natural resources. A study by Stem et al. (2003) supports this notion through the finding that community members in Costa Rican ecotourism destinations were most likely to invest their revenue from tourism in improving their well-being and not for improving natural resources. Certainly, proponents of sustainable development will rightly argue that our survival is inextricably linked to the health and productivity of natural resources. However, it is unlikely that any human would go hungry or default on the rent for the sake of preserving a coral reef for the next 10 years. Studies such as Balmford et al. (2002) and Wilson and Tisdell (2003) confirm that conservation versus extraction of natural resources can be economically viable. So, ensuring that preserving natural resources is more beneficial than not, in the economic sense, is the key to successful conservation measures. It is in this context that MPAs will be critical for maintaining the integrity of Belize’s reef as tourism continues to develop. If mindfully implemented through the effective establishment of user fees, carrying capacity and enforcement, these programs will continue to attract environmentally aware tourists who are willing to contribute financially to the maintenance of these programs.

Additional data analyses associated with this research project show that a number of negative socio-economic impacts are also increasing with tourism development in the study communities. In combination with the results presented in this paper, such findings indicate that Belize could be approaching the critical threshold associated with the decline stage of the TALC (Butler 1980). Upchurch and Teivane (2000) observe that the onset of the decline stage of the TALC is largely contingent upon how the community has coped with the impacts that have accumulated during the development stage. Rejuvenation of a tourism destination once it has entered the decline stage is not easy (Butler 1980; Agarwal 2006; Cooper 2006). Equally critical is the well-known fact that, should the impacts on Belize’s reef be permitted to escalate, conservation and regeneration of this fragile resource will become a losing and probably futile battle. In short, forward thinking, constant vigilance, and careful monitoring of all impacts of tourism will be essential components in ensuring the nation’s future as a successful and prosperous tourism destination.

Acknowledgements This research was funded by the Oak Foundation, Boston, MA and facilitated by the Community Conservation Network, Honolulu, HI.

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