

Developing a Core Set of Indicators for Decision-making and Adaptive Management at the Tobago Cays Marine Park, St. Vincent and the Grenadines

El Desarrollo de un Conjunto Básico de Indicadores para la Toma de Decisiones y el Manejo Adaptativo en el Tobago Cays Marine Park, de San Vicente y las Granadinas

Développer un Ensemble D'indicateurs de Base pour la Prise de Décision et de Gestion Adaptative à l'Tobago Cays Marine Park, Saint-Vincent-et-les Grenadines

OLANDO HARVEY, KENNETH WILLIAMS, and ALTHEA NANTON

Tobago Cays Marine Park

Clifton, Union Island, St. Vincent and the Grenadines

ABSTRACT

The Tobago Cays in St. Vincent and the Grenadines was declared a marine park in 1997. The Tobago Cays Marine Park (TCMP) is a 66 km², non-extractive, Marine Protected Area (MPA). It is the only legislated marine park in St. Vincent and the Grenadines. Since its re-launch in December 2006, a management plan has been developed and implemented and user fees are being collected. Limited socio-economic assessments have been conducted at the TCMP, usually as components of implemented projects, but have not been part of any on-going monitoring programme. The SocMon Caribbean methodology for socio-economic monitoring has been used to carry out surveys but due to limited capacity, the TCMP has been unable to carry out further assessments or initiate sustained monitoring. Therefore, regular socio-economic monitoring is not being conducted to assist with management decision-making and adaptive management at the site. As such, through a sub-grant from the CERMES-implemented, *Socio-economic Monitoring by Caribbean Challenge MPA Managers project (CC SocMon)*, information has been collected that will help in the development of a core set of socio-economic indicators that may be used to guide and inform decision-making and management. Core indicators relevant to stakeholder perceptions of changes in conditions of marine resources; level of stakeholder participation and satisfaction in management; and stakeholder perceptions on the level of enforcement, compliance and protection within the MPA have been identified as the most important to the TCMP at this time. The 2006 re-launch date has been used as a reference point for current monitoring.

KEY WORDS: Socio-economic indicators, decision-making, adaptive management

INTRODUCTION

Socio-economic Monitoring by Caribbean Challenge MPA Managers Project

Socio-economic monitoring for coastal management in the Caribbean (SocMon Caribbean) is a globally networked, regionally adapted, practical methodology of socio-economic monitoring for coastal management. Consultation with representatives of the MPA community associated with the Caribbean Challenge Initiative indicated the need for capacity building in socio-economic monitoring for the development of an effective regional system of MPAs. This need for MPA capacity building in socio-economic assessment and monitoring has also been identified in various training needs and capacity assessments (Gombos et al. 2011, Parsram 2007). The Caribbean Challenge Initiative and regional training in SocMon provide a major opportunity for uptake of SocMon for achieving improved MPA management capacity and therefore conservation of coastal resources. With strengthened capacity for management through socio-economic monitoring, MPA managers, authorities and field staffs will also increase their capacity for adaptive management through learning-by-doing.

The Centre for Resource Management and Environmental Studies (CERMES) at the University of the West Indies, Cave Hill Campus was awarded a grant of just over USD \$68,000 by The National Fish and Wildlife Foundation (NFWF) to support Socio-economic monitoring by Caribbean Challenge MPA managers. The project's long-term conservation outcome is increased capacity for effective MPA management among Caribbean Challenge (CC) countries through the use of social and economic monitoring data in MPA decision-making. The goal of this project is to build capacity for improved and effective MPA management among Caribbean Challenge countries by promoting the use of social and economic data in MPA management.

The project involves eight MPAs across three CC countries - Grenada, St. Vincent and the Grenadines, and St. Lucia. Participating MPAs in St. Vincent and the Grenadines are the South Coast Marine Conservation Area (SCMCA) on mainland St. Vincent and the Tobago Cays Marine Park (TCMP) in the Grenadines. The project's duration was 1 September 2011 to 28 February 2013. This paper presents project activities and results of socio-economic monitoring conducted at the TCMP.

Situation Overview

The Tobago Cays Marine Park (TCMP) is a 66 km² non-extractive Marine Protected Area (MPA) that was established under the Marine Parks Act, 1997. It is the only legislated marine park in St. Vincent and the Grenadines. Since its re-launch in December 2006, a management plan has been developed and implemented and user fees are being collected. Limited socio-economic assessments have been conducted at the TCMP, usually as components of implemented projects, but have not been part of any ongoing monitoring program. The SocMon Caribbean methodology for socio-economic monitoring has been used to carry out surveys but due to limited capacity, the TCMP has been unable to carry out further assessments or initiate sustained monitoring. Therefore, regular socio-economic monitoring is not being conducted to assist with management decision-making and adaptive management at the site.

As such, the main goal of the project was to develop a core set of socio-economic indicators/variables to assist with the effective management of the TCMP. The three objectives for monitoring were:

- i) To determine stakeholder perceptions of the marine resources since the MPA re-launch in 2006,
- ii) To determine the level of stakeholder participation and satisfaction in the management of the MPA, and
- iii) To determine the perceptions of stakeholders on the level of enforcement and protection (security) within the TCMP.

Core indicators relevant to the objectives have been identified as the most important to the TCMP at this time. The 2006 re-launch date has been used as a reference point for current monitoring.

METHODS

Eight participants from the two participating MPAs in St. Vincent and the Grenadines (TCMP and SCMCA), National Parks, Rivers and Beaches Authority (NPRBA), Fisheries Division, Forestry Department, and Ministry of Tourism, were trained in the SocMon Caribbean methodology via a 5-day training workshop 17-21 October 2011 at the Sunset Shores Beach Hotel in St. Vincent (Pena and Blackman 2011). Those participants from the TCMP comprised the SocMon team and initiated monitoring at the marine park.

A survey specifically targeting a cross-section of TCMP stakeholders was designed by the TCMP SocMon team and reviewed by CERMES to collect the relevant data. Twenty survey variables were used to collect the data for this project, fourteen of which were original SocMon Caribbean variables, as described in the SocMon Caribbean guidelines (Bunce and Pomeroy 2003). Of these fourteen variables, the revision and adaptation of four were required

to collect some of the data. The development of six new variables was necessary to collect information to specifically address the objectives of the study such as MPA knowledge and awareness, types and changes in MPA livelihoods, MPA changes or impacts, best practices, MPA user frequency and types of MPA use(s), and perceptions of changes in species abundance.

Thirty-five surveys were administered to stakeholders from each of the eight stakeholder groups participating in the Management Committee and as identified in the TCMP Management Plan (2007 – 2009). Surveys were conducted on Union Island, Palm Island, Mayreau, and in the TCMP. When the data were collected they were entered into a Microsoft Excel spreadsheet and were analysed using simple descriptive statistics. A validation meeting will be held to provide feedback of the results of the study to the communities.

RESULTS

An overview of results of the surveys is presented under headings reflecting the objectives of the study:

- i) Perceptions of changes in the conditions of marine resources and user numbers,
- ii) Level of stakeholder participation and satisfaction in management, and
- iii) Stakeholder perceptions on enforcement, compliance and protection (security).

Details of the results of the assessment may be found in the site monitoring report on the CERMES website – http://www.cavehill.uwi.edu/cermes/cc_socmon.html.

Perceptions of Changes in the Conditions of Marine Resources and User Numbers

Understanding of coastal and marine and coastal ecosystems — There has been an increased understanding of the coastal and marine ecosystems of the TCMP by the majority of respondents (73%) since the 2006 re-launch of the TCMP. It should be noted that almost a quarter of the stakeholders believed there had been no change in their understanding while surprisingly, 4% noted a decrease in understanding since 2006 (Figure 1).

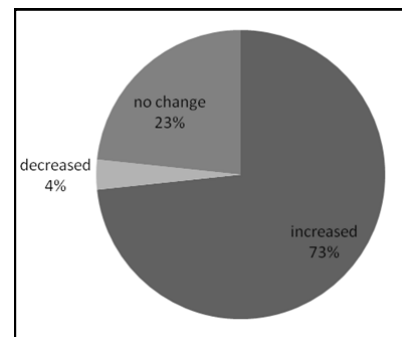


Figure 1. Perceived changes in understanding of TCMP coastal and marine ecosystems.

Just under half of the respondents (47%) have observed a change in coral reef health within the boundaries of the TCMP while 3% did not observe any change over the past six years. A notable and large proportion of persons (50%) have not noticed any change in the condition of the reefs. Of the 47% percent of interviewees who observed a change in the health of the coral reefs within the TCMP, 60% noted an improvement in health, while 27% noted deterioration in reef health (Figure 2). More than half of the respondents provided reasons for the observed changes in reef health. These were grouped into two main reasons, protection (due to the MPA; 33%) and coral reef death (20%). The majority of respondents (47%) did not provide reasons for the identified changes in reef health.

Relevant to the changes observed in reef health is change in the number of juvenile fish within the park. Seventy-six percent of persons interviewed indicated they have observed an increase in the abundance of juvenile fish within the Tobago Cays since the re-launch of the marine protected area in 2006. Three percent of respondents indicated that they have not observed any change in the abundance of young fish with the MPA, and 21% of respondents noted that they were not in a position to express an opinion.

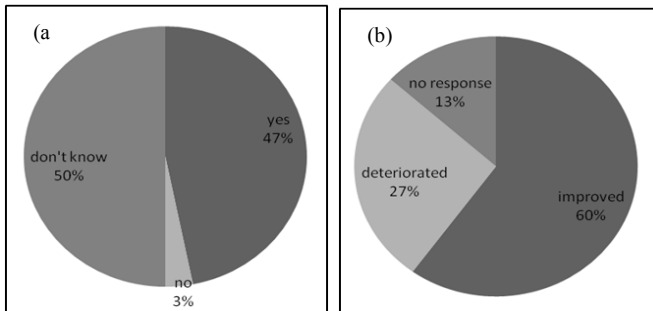


Figure 2. (a) Perceived changes in coral reef health and (b) type of change observed.

Perceived change in the users of the TCMP — With regard to the number of fishers within the boundaries of the TCMP, 47% of respondents are of the opinion that the number of fishers that exist within the boundaries of the MPA has increased since it was established in 2006; 38% believe that there was a decrease and six percent observed no change. Over half of the respondents (55%) perceive a decrease in the number of divers (SCUBA) since the TCMP was established in 2006 while 24% believe diver numbers have increased and 6% think there has been no change. Fifteen percent of respondents were unable to say if there had been any change in diver numbers. Forty-six percent of respondents indicated that they have observed a decrease in the number of yachts visiting the Tobago Cays since the establishment of the TCMP. Thirty-six percent noted an increase and 3% noted no change in the number of yachts. Fifteen percent of persons interviewed were unable to say whether there had been a change (Figure 3).

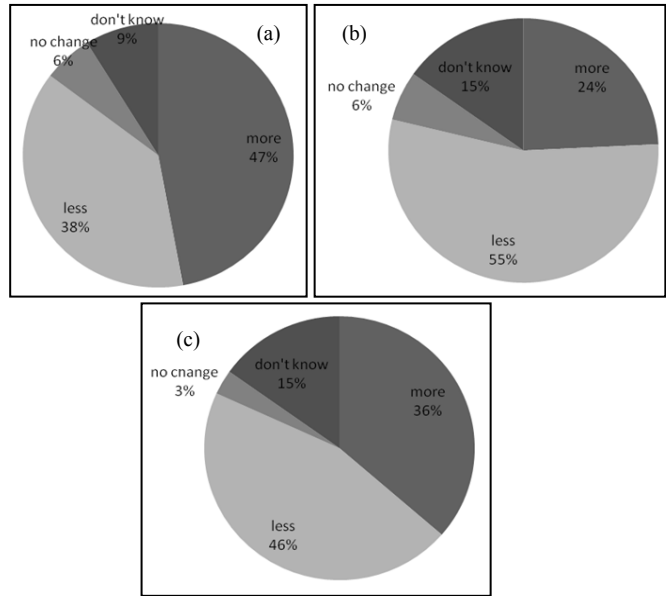


Figure 3. Perceived change in user numbers in the TCMP, (a) number of fishers; (b) number of divers and (c) number of yachts

Level of Stakeholder Participation and Satisfaction in Management

Stakeholder participation in and influence on TCMP management — Of those who answered the question on whether they had participated in or were involved in TCMP management or any decision-making activities prior to 2006, only 33% indicated they had been. People have either been fully (10%) or somewhat (27%) involved in meetings and discussions with TCMP staff about management of the area and issues in the TCMP since its re-launch in 2006.

The majority of persons interviewed believe they either have or could have an influence on the management of the marine park (Figure 4).

People’s perception of the degree of willingness of TCMP staff to listening to their views about the TCMP was divided. When combined the majority of people (68%) believed that staff was very willing and somewhat willing to listen to their views about the marine park (Figure 5).

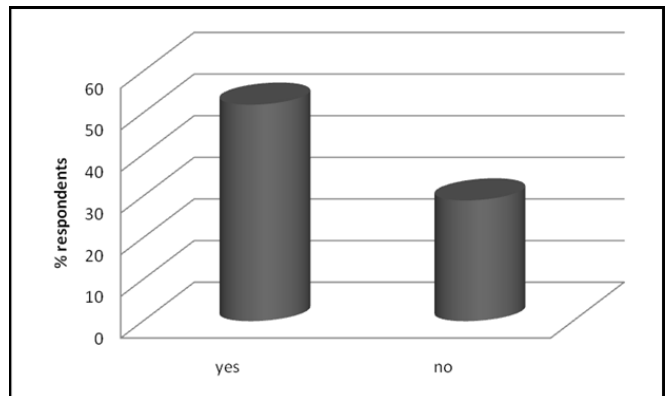


Figure 4. Perceived influence on TCMP management.

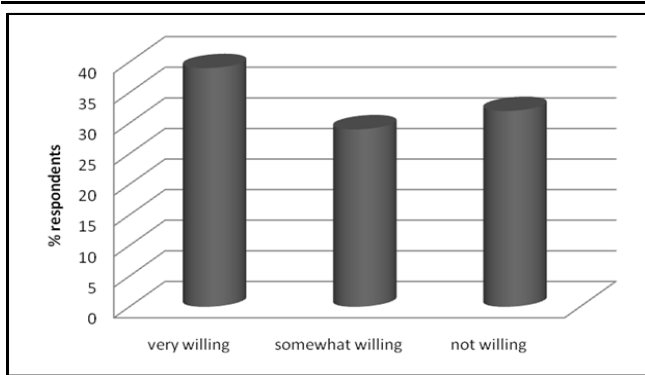


Figure 5. Perceived willingness of TCMP staff to listen to respondent views on the marine park.

Over half of the respondents (58%) noted that the TCMP management has been successful in conflict resolution while 12% noted lack of success. A large proportion of persons (30%) did not know whether the TCMP had been successful in resolving or preventing conflicts.

Seventy-four percent of interviewees indicated that overall the management of the TCMP has improved since the re-launch of the MPA in 2006 whereas nine percent believe that management has deteriorated and 17% are of the opinion that management of the MPA has not changed since 2006 (Figure 6).

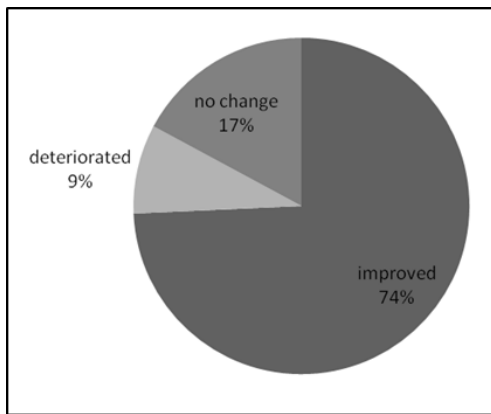


Figure 6. Change in TCMP management since 2006.

Stakeholder Perceptions of Enforcement, Compliance and Protection (Security)

Compliance with rules and regulations — Sixty-nine percent of respondents noted that their understanding of the rules and regulations of the TCMP has improved since 2006 when the MPA was re-launched while 30% of respondents cited no change in their level of understanding of the rules of the TCMP.

Fifty percent of respondents expressed the opinion that there has been a change in compliance with rules and regulations of the TCMP since their active enforcement subsequent to the re-launch in 2006. Fifteen percent of interviewees do not think that there has been any change in compliance and 35% were unable to say if there had been a

change at all. Ninety-four percent of the persons who cited a change in compliance noted that there was an overall increase in compliance with the other six percent noting a decrease in compliance.

The majority of people interviewed (59%) indicated they report violations of TCMP rules and regulations they may observe. Forty-one percent stated they do not report observed violations. The overwhelming majority of respondents (81%) feel they have more of an obligation in reporting any violations they may see since the re-launch of the TCMP in 2006. Nineteen percent do not feel an increased obligation for reporting observed violations.

Commonly violations of rules and regulations include fishing in the TCMP, speeding above the 5 knots limit and illegal entry. “Other” violations include anchoring on reefs and improper disposal of garbage (Figure 7). The question on rules and regulations of the TCMP that are most frequently broken had a poor response rate with 46% of respondents unable to provide responses.

Response rate was again quite poor regarding main concerns in the TCMP and suggested solutions for such. However, the concerns expressed by stakeholders who responded included, insufficient security and enforcement, conflict resolution, cleanliness and sanitation. The respondents noted that these concerns could be addressed by adding more ranger patrols including night patrols; establishing a dress code for persons dealing with food; hiring cleaners for the beaches and constructing a modern toilet facility.

Enforcement — When asked to rate the ability of the rangers employed by the TCMP to enforce the rules and regulation of the MPA, over half of the respondents combined (54%) gave them a rating of “very good” and “good”, 33% rated their ability as “fair” and 12% rated ranger ability to enforce park rules as “poor” (Figure 8).

A large percentage of persons surveyed believe there is a need for better enforcement coverage of the marine park whereas a fairly large proportion, 42% believe this is not necessary. The overwhelming majority of respondents (82%), feel safe and secure in the TCMP. Only a small

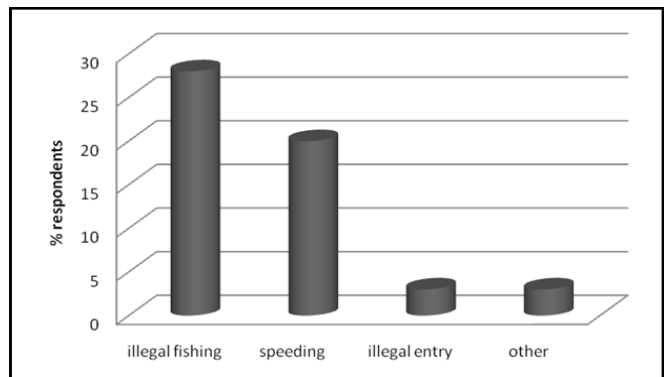


Figure 7. Common violations of TCMP rules and regulations.

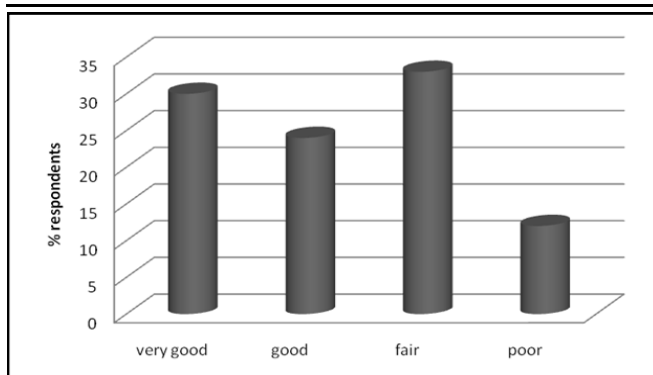


Figure 8. Park rangers ability to enforce rules and regulations.

proportion either do not feel this way or are uncertain as to whether they feel safe in the area (9% each). Only 17 persons provided reasons for their feelings of safety and security or feelings of lack of safety or insecurity within the TCMP. Of those, 88% noted they feel safe and secure due to the presence of rangers and 12% noted they feel unsafe and insecure in the TCMP due to the absence of night patrols.

DISCUSSION

The discussion is presented according to the objectives of the project.

Perceptions of Changes in the Conditions of Marine Resources and User Numbers

The on-going coral reef monitoring, Reef Check, conducted within the TCMP has shown that there is a statistically significant increase in the abundance of fish and an increase in fish size classes over the past seven years since formal monitoring has been conducted. This confirms the observations made by a larger proportion of respondents that there has been an increase in the abundance of juvenile fish with the Tobago Cays since 2006. Consistent monitoring of the coral reefs of the TCMP began in 2005 and given the relatively slow growth rate of coral, it is a little more difficult to document changes in the health of the reef. However, over the duration of surveys that have been conducted, there has not been a statistically significant change in the percent live coral cover within the TCMP. It is important to note that the percent nutrient indicator algae has been reduced on several sites, which may be a function of increased parrot fish abundance and is a sign of good reef health.

This correlates favourably with respondent observations, in which less than half were only able to indicate a change in coral reef condition pointing perhaps to some degree of uncertainty amongst most respondents in gauging perceptible changes in reef health. Of those who perceived a change in reef health, greater than half thought it had improved since the re-launch. These perceived changes in coral reef health and fish abundance in the TCMP,

corroborated by scientific data, may also be attributed to people's increased understanding of the coastal and marine ecosystems that comprise the marine park. Since the re-launch of the TCMP in December 2006, a very conscious effort was made to ensure that stakeholders and the general public were aware of the existence of the MPA along with its objectives, rules, and regulations. To this end, a formal education officer was hired to fulfill this function and an active public education and awareness campaign was launched. One could logically argue that the increase in knowledge of the marine ecosystems by the majority of respondents are fruits of this campaign.

Most of the respondents expressed the belief that the number of divers utilizing the TCMP has decreased since 2006. In actuality, however, the number of divers has increased since 2006 when the MPA was rededicated and following the global trend of divers wanting to dive in MPAs as they are viewed as having the best dive sites (i.e. abundance of live coral and large fish) due to the prohibition of fishing. The TCMP does not currently collect statistics on actual number of divers in the TCMP, but recent information from dive shops has noted an increase in divers in the marine park. The fact that respondents cited a decrease may be as a result of confusion as locally, diving and spear-fishing, are used interchangeably. Based on this notion, it is possible to explain why the respondents would say that the number of divers has decreased since 2006. In other words, what the respondents are saying is that since 2006, the number of spear-fishers utilizing the TCMP has decreased.

Despite the perception by respondents that the number of yachts visiting the MPA has decreased since 2006, the TCMP yacht registry indicates that 6,779, 4,742, 7,773, 8,399, 7,905 and 8,636 yachts visited the TCMP annually between 2007 and 2012, respectively. This highlights the fact that the number of yachts visiting the MPA has steadily increased since 2006 with the exception of 2008 which followed the global economic downturn and a slight decline in 2011.

Level of Stakeholder Participation and Satisfaction in Management, and Perceptions on Enforcement, Compliance, and Security

Just over half of the stakeholders interviewed feel they have had or could have an influence on management of the TCMP. However, a fairly large proportion, do not believe they have an influence on TCMP management. Additionally, stakeholder involvement in meetings and discussions with TCMP staff about management of the marine park and issues since its re-launch has been fairly poor, with just over a third of stakeholders indicating full or some involvement. This is similar to the level of stakeholder participation assessed in 2006 prior to the re-launch of the TCMP in an evaluation of management effectiveness (Pena 2006). This is one area, therefore, that TCMP management should pay attention to as it moves towards implementing the current management plan, since improvements in

stakeholder participation do not seem to have been realized. Increased involvement of stakeholders in decision-making and management of the MPA can only improve the success of the TCMP.

There is an overall feeling amongst the overwhelming majority of stakeholders that the management of the TCMP has improved since the re-launch of the park in 2006. This includes the fact that over half of the respondents believe that the park plays a positive role in conflict management (i.e. between stakeholders) and that the rangers possess the ability to effectively enforce the rules and regulations of the TCMP. This is further confirmed by the fact that almost all of the interviewees believe that there has been an increase in compliance. The results of this SocMon study positively correlate with that of an activity undertaken by the TCMP in early 2012 as part of the CERMES MPA Governance project in which a similar sample of stakeholders was surveyed to, among other things, assess current level of stakeholder participation in governance at the TCMP (Harvey and Williams 2012). In this study, the majority of people interviewed considered themselves to be stakeholders, believed they had some form of influence over TCMP management and thought the marine park was being effectively managed. Prior to the re-launch, a management effectiveness evaluation conducted at the TCMP indicated low satisfaction with management (Pena 2006). It is encouraging to see that efforts towards improving management at the marine park have been made and achieved based on stakeholder perceptions.

Since the re-launch of the TCMP in December 2006, an MPA awareness campaign was implemented. This campaign may be judged as being successful given the increased understanding of MPA rules and regulations amongst the majority of stakeholders interviewed and resultant perceived increase in compliance with rules and regulations. However, note should be made of the still significant proportion of stakeholders who indicate no change in their understanding of rules and regulations. Perhaps it is time for the TCMP to repeat and refresh its public education efforts to further increase MPA awareness among TCMP stakeholders and the general public. When stakeholders are aware of and have an understanding of the rules and regulations for management of the MPA, there is a greater chance for success of the MPA (Pomeroy et al. 2004).

The overwhelming majority of persons interviewed feel they have more of an obligation in reporting violation of rules and regulations in the TCMP. This augers well for TCMP management and suggests there is a sense of ownership and stewardship of the marine park felt amongst stakeholders. The TCMP should build on this by perhaps sharing surveillance, monitoring, and enforcement activities with stakeholders. This can be effective in controlling non-compliance behavior through social and peer pressure. Increasing stakeholder participation in these areas of MPA management will heighten their sense of ownership of the

TCMP which should result in an overall improvement in enforcement and a continued decrease in violations (Pomeroy et al. 2004).

As noted previously, just over half of the respondents rated ranger ability to enforce rules and regulations highly. However, it should be noted that fairly significant proportions of stakeholders also rated ranger ability as either fair or poor. Additionally, over half of the respondents feel that more rangers are needed for better enforcement coverage of the marine park. Furthermore, although the majority of persons feel safe and secure in the TCMP due to the presence of the rangers, some persons have noted a need for night patrols. Therefore, there is room for improvement regarding enforcement of rules and regulations in the TCMP. This too was identified by Harvey and Williams (2012) in the CERMES MPA Governance activity.

RECOMMENDATIONS FOR MONITORING AND ADAPTIVE MANAGEMENT

Through this project, the TCMP has used and developed a core set of variables that may be monitored every three to five years to assist with the effective management of the TCMP. The variables measure changes in stakeholder attitudes towards and perceptions of management which are critical to determining MPA management success. SocMon should be sustained at the TCMP to collect socio-economic information on management effectiveness as well as other aspects of coastal management. In addition, SocMon could be used in conjunction with the *How is your MPA doing?* evaluation methodology (previously used at the TCMP) to develop a profile of and trends in management effectiveness, and aid in the adaptive management of the TCMP.

LITERATURE CITED

- Gombos, M., A. Arrivillaga, D. Wusinich-Mendez, B. Glazer, S. Frew, G. Bustamante, E. Doyle, A. Vanzella-Khoury, A. Acosta, and B. Causey. 2011. *A Management Capacity Assessment of Selected Coral Reef Marine Protected Areas in the Caribbean*. Commissioned by the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Program (CRCP), the Gulf and Caribbean Fisheries Institute (GCFI) and by the UNEP-CEP Caribbean Marine Protected Area Management Network and Forum (CaMPAM). 269 pp.
- Harvey, O. and K. Williams. 2012. Stakeholder participation at the Tobago Cays Marine Park. Report for MPA Governance Project. 15 pp.
- Parsram, K. 2007. Protected areas planning and management regional training needs assessment. OECS Protected Areas and Associated Livelihoods Project. 73 pp.
- Pena, M. 2006. Report on management effectiveness at the Tobago Cays Marine Park (TCMP), St. Vincent and the Grenadines. CERMES Regional Project on Enhancing Management Effectiveness at Three Marine Protected Areas in St. Vincent and the Grenadines, Jamaica and Belize. Report No. 5. 59 pp.
- Pena, M. and K. Blackman. 2011. Report of the St. Vincent and the Grenadines SocMon Caribbean Training Workshop, 17-21 October 2011. Socio-economic monitoring by Caribbean Challenge MPA Managers Project Report No. 1. 48 pp.
- Pomeroy, R.S., J.E. Parks, and L.M. Watson. 2004. *How is Your MPA doing? A Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness*. IUCN, Gland, Switzerland and Cambridge, United Kingdom. 216 pp.