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Are Caribbean MPAs making progress toward their goals and objectives?

Tracey Dalton ^{a,*}, Graham Forrester ^b, Richard Pollnac ^a^a Department of Marine Affairs, University of Rhode Island, Coastal Institute Kingston, Kingston, RI 02881, United States^b Department of Natural Resources Science, University of Rhode Island, Coastal Institute Kingston, Kingston, RI 02881, United States

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ABSTRACT

Regional efforts have increased the number and amount of marine protected areas (MPAs) in the Caribbean, yet few studies have examined how these MPAs are progressing toward their goals and objectives. Using social and ecological data from a rapid assessment of 31 MPAs and their associated human communities in the wider Caribbean, this study investigates (1) the stated social and ecological objectives of MPAs; (2) the extent to which MPAs are making progress toward their stated social and ecological objectives; and (3) tradeoffs in progress toward social and ecological objectives. Findings indicate that Caribbean MPAs have multiple objectives related to both social and ecological conditions, and that most MPAs are making at least some progress towards achieving these objectives. Those MPAs with stated objectives to promote education and serve as a model for other MPAs seem to be making good progress on these objectives, while those with the objective of reducing conflict are not. Where MPAs are not meeting their goals and objectives, planners and managers should consider reallocating human and financial resources to address deficiencies and re-evaluating existing goals and objectives. It is important to consider how existing marine protected areas are performing as efforts in the Caribbean region and elsewhere continue to promote the establishment of new MPAs.

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1. Introduction

Protected areas are increasingly being established around the world as part of an international effort to achieve conservation targets that were set in the past decade. Global targets for protecting 10% of the world's ecological regions were initially established at the 8th Conference of the Parties (COP) to the Convention on Biological Diversity (CBD) in 2006. These spatial targets were updated in the Aichi Biodiversity Targets of COP 10 that direct parties to conserve at least 17% of terrestrial and inland water and 10% of coastal and marine areas through effectively and equitably managed protected area systems by 2020 [1]. Subsequent CBD-related efforts strengthen the targets and encourage measurement of progress toward these targets. Although the 2011 Ad Hoc technical group on indicators developed a framework of indicators to measure progress, including such indicators as trends in degradation of habitats, protected area management effectiveness, and climate change impacts, it did not clearly define many of the indicators. For instance, when is a protected area managed effectively? Despite limited guidance from the CBD and related documents on how to measure management

effectiveness of protected areas [2], there has been an increase in the number of scientific studies examining the effectiveness of conservation projects in the past couple decades [3].

In conservation research, effectiveness is often defined as progress in achieving goals and objectives [4–6]. Goals and objectives define what the protected area was established to do [7]. They can be formally declared, what is called stated goals and objectives, or they can be informal or implicit. They can relate to human activities, social conditions, ecological functions and other features, and they can be hierarchical with general goals having sub-goals that are more specific [7]. Evaluating whether or not protected areas are meeting goals and objectives can help identify areas for improvement [8], encourage accountability [9], justify resource allocation [9], and encourage reflection about the MPA's goals and objectives. Recent studies have found that protected areas are having mixed success in terms of achieving goals and objectives, with an estimated 22% of terrestrial protected areas managed soundly [10] and somewhere between 10 and 35% of marine and coastal areas achieving their objectives [11]. This study contributes to a better understanding of protected area management effectiveness by examining how marine protected areas (MPAs) in the wider Caribbean are progressing toward their goals and objectives.

MPAs are designated sites in the ocean where human activities are managed to protect nature and its associated ecosystem services and cultural values [12]. With over 5800 sites designated around the

* Corresponding author. Tel.: +1 401 874 2434; fax: +1 401 874 2156.

E-mail addresses: dalton@uri.edu (T. Dalton), forrester.graham@gmail.com (G. Forrester), pollnacrb@gmail.com (R. Pollnac).

world, MPAs have become a popular tool for conserving marine and coastal environments [13]. In the wider Caribbean, there are hundreds of MPAs with varying levels of protection. Countries in the Caribbean, like many around the world, are striving to achieve the Aichi Biodiversity Targets. In fact, regional initiatives have set more ambitious targets, with eight countries in the Caribbean recently agreeing to effectively conserve and manage 20% of the marine environment by 2020 [14].

Although regional efforts have increased the number and amount of MPAs in the Caribbean, few studies have examined the effectiveness of these MPAs. MPAs in the Caribbean and elsewhere are working toward the Aichi Targets for amount of area covered (albeit slowly), however it is not clear if the MPAs are effectively managed e.g., [15]. One effort examined MPA management performance in Jamaica, Belize and St. Vincent and the Grenadines and highlighted some of the benefits of the evaluation process and documents produced [16]. In a comparative analysis of MPAs in the wider Caribbean region, Appeldoorn and Lindeman [17] investigated coverage and selected management attributes of 55 no take reserves and found that most of the reserves were considered paper parks, areas that are officially designated but not actively managed to achieve conservation goals. Burke and Maidens [18] found that less than 20% of marine protected areas in the Caribbean are managed (fully or partially) effectively. McConney and Pena [19] developed a conceptual framework for assessing capacity and management effectiveness of co-managed MPAs in the Caribbean. This study updates these earlier efforts by using empirical data collected from numerous sites across the region to investigate the progress that Caribbean marine protected areas are making toward their stated objectives. Using data from a rapid assessment of 31 MPAs in the wider Caribbean, this study investigates (1) the stated social and ecological objectives of MPAs; (2) the extent to which MPAs are making progress toward their stated social and ecological objectives; and (3) tradeoffs in progress toward social and ecological objectives.

2. Methods

2.1. Study region

Caribbean and Latin America have the highest biodiversity of all the world's regions [20]. The number and area of MPAs in the region have increased, especially since the 1980s [21]. In the Caribbean, hundreds of MPAs have been established with sizes up to 65,000 km² and total coverage of about 115,000 km² [22]. This study included thirty-one marine protected areas and their associated human communities in the wider Caribbean (Fig. 1). The MPAs in this study offer varying levels of resource protection, but all contain some area where extractive fishing is prohibited (no take area).

2.2. Data collection

In 2006–2009, structured surveys of community members, document analysis, key informant interviews, and ecological surveys of coral reefs were conducted at the MPAs and their associated human communities. Details are provided below.

2.2.1. Identifying stated objectives

For each MPA, management plans, legislation, and implementation documents were reviewed to identify stated social and ecological objectives at each site. At five of the MPAs, no objectives had been formally declared so this information was collected through semi-structured interviews with key informants (described below).

2.2.2. Assessing progress toward social objectives

More than 150 in-person semi-structured interviews were conducted with key informants, who were individuals that had considerable knowledge of the community, marine protected area, and resource management. Respondents included MPA staff, local government officials, directors of local fishing or diving associations, and other resource users. Three to seven interviews were conducted at each MPA, based on the size of the MPA staff, number of communities associated with the MPA, and number of organizations related to the MPA. Interviews collected information on conditions of the local community, natural resources and MPA management.

In-person structured surveys were conducted with 2028 community members of 48 communities associated with the MPAs. To facilitate interactions with community members, local research assistants familiar with the community and local languages worked with the research team to conduct the surveys. Because data on population estimates were not available for most of the study communities, a broad array of views in each community was captured by sampling survey respondents at docks and fish landing sites, fish and vegetable markets, beaches, convenience stores, restaurants, neighborhoods, within the MPA itself, and at other community gathering locations. The number of surveys conducted at each MPA was based on the number of communities associated with the MPA and the relative population size of these communities. Surveys collected information on respondents' personal characteristics (age, gender, etc.), knowledge of the MPA and its management, involvement in planning and management, perceptions of the planning and management process, perceptions of social and ecological conditions before and after the MPA was established, and perceptions associated with uses of the MPA.

2.2.3. Assessing progress toward ecological objectives

An approach widely used to assess the ecological performance of MPAs was used: comparison of ecological communities inside each no take area where fishing is prohibited with comparable control sites outside the no take area e.g., [23, 24]. At each MPA, attempts were made to ensure that potential control and no take sites had comparable habitat. Where there were different geomorphic zones within the MPA (e.g., patch reef, fore-reef slope), surveys were stratified by habitat and equal numbers of sites of each habitat type were surveyed inside and outside the no take area. Within habitats, sites were selected at random when time permitted (14 MPAs) but, when time was constrained, sites were selected haphazardly (17 MPAs). Two to six coral reef sites were sampled within the no take area(s) for each MPA. Where there were areas within the MPA zoned to have some limits on fishing, boating, snorkeling or diving, an equal number of sites was sampled in those areas. An equal number of sites in nearby comparable habitat outside the MPA was also sampled. Ecological surveys collected data on fish biomass, fish species diversity, live coral cover and other well-established indicators of coral reef conditions.

2.3. Data analysis

Content analysis was used to code data from the policy documents into categories of stated objectives [25]. Selected data from the interviews, community surveys, and coral reef surveys were used as indicators for the stated objectives (Table 1). Based on the data, every stated objective at each MPA was assigned a progress score (1 = poor, 2 = fair, 3 = good). To assess the overall progress of MPAs in the Caribbean, progress scores for stated objectives were compared for all MPAs in the study. To investigate tradeoffs between social and ecological progress at MPAs in the Caribbean, aggregate scores were computed for social and ecological objectives at each MPA and they were compared at individual sites.

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