Coral Reefs (2007) 26:1023–1032
DOI 10.1007/s00338-007-0264-4

REPORT

Marine protected areas and the coral reefs of traditional settlements in the Exumas, Bahamas

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Received: 18 August 2006 / Accepted: 30 May 2007 / Published online: 21 June 2007

Abstract This paper is about modeling the perceived social impacts of three proposed marine protected areas (MPAs), each designed to protect coral reefs. The paper argues that shared perceptions of these impacts have resulted in different community-level responses to these MPA proposals. The study is uniquely situated in the Bahamas where the government has approved setting aside 30 No-take MPAs (including three under study here) to protect the coastal marine environment. The paper is based on 572 interviews conducted during eight field trips with members of six traditional settlements in the Exuma Islands and Cays in the central Bahamas. Overall, 34% of the census population of these settlements was interviewed at least once. Key findings are that an MPA can impact in either positive or negative ways (a) community agency by the process of siting, (b) community resilience by eliminating or supporting some components of their traditional adaptations to social and natural environments, and (c) community identity by precluding or protecting customary marine access. MPA impacts to local communities determine whether those communities will support or resist proposed MPAs.

Keywords Marine protected areas · Social impact assessment · Bahamas · Traditional communities

Communicated by Guest Editor R. Pollnac.

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Social and natural variables are used in decision models to help design, site, evaluate, and monitor marine protected areas (MPAs). Often the natural variables are better understood and more robust than are the social variables. Despite the efforts of social scientists to provide guidance that would bring critical social variables into the modeling process (Bunce et al. 2000; Mascia et al. 2003), little progress is evident. Three examples will illustrate the nature of this modeling problem and the social science responses. Sala et al. (2002) modeled MPA placements in the Upper Gulf of California, Mexico using the number of small boats as the only social variable to represent the extent of important use areas where potential user conflicts with MPAs can be expected. Sanchirico et al. (2003) responded to this model by pointing out that the lowest concentration of boats was in the management waters of the Seri Indians who had reduced fishing effort and thus better conserved their marine resources. According to the socially flawed model, the MPA should be placed in their territory, violating their special ethnic-based use rights and failing to recognize them as the best marine managers in the Upper Gulf. In another case, the famous Soufriere MPA in St. Lucia, West Indies was proven to be serving marine ecology and local fishers who had been excluded from traditional fishing waters (Roberts et al. 2001). Christy et al. (2003) responded to this conclusion by pointing out that even though the analysis used outstanding quality natural resource data, the social data were far below standard and could not be used to argue the conclusion that the local fishers supported the MPA because they were somehow better off due to the MPA. Recent findings from an old Bahamas MPA (Mumby et al. 2006) document increases in the natural fish stocks and more fish outside the MPA available to fishers. Although this model is based on an appropriate balance of variables, still the habitat data are excellent while the social science data are much weaker.

This paper explores the appropriateness and predictive strength of social variables used in the Bahamas national MPA modeling. It is not the intent here to critique the authors of the study, the government who decided to pursue the MPA proposals, or the Department of Fisheries who have tried to implement the MPAs. Instead, this study uses the national MPA modeling as a point of departure for discussing issues proven to be key in the Exumas study.

The Commonwealth of the Bahamas is a special case of coral reef and marine ecology protection because the government adopted the recommendations of a science-based report that evaluated approximately 30 No-take MPAs using a model that equally weighted social and natural variables (Stoner et al. 1999). The No-take MPA design was recommended because it best protects both habitat and species while being easiest to police. A boat in the MPA with fish is assumed to be in violation of the law. Coral reefs constitute four of the 18 marine habitat classes to be protected by these MPAs.

The national model makes social assumptions regarding (1) fishing impacts, especially differences in the value of fishing to commercial and subsistence communities, (2) community participation, especially how to measure support for the proposal, (3) the potential that nearby communities will receive spill over benefits, and (4) the amount of social data needed to make an informed conservation decision.

The presence of a small coastal community is a positive advantage for siting and managing the proposed MPAs. It is often assumed that establishing successful MPAs requires local support and cooperation (Stoffle et al. 1994a, b; Keller and Recchia 1998; National Research Council 2001; Berkes 2004; Aswani and Lauer 2006; Agarwal and Gibson 2001). It is generally assumed that if a nearby community is the primary user of a proposed MPA, the people will recognize the positive impacts of the MPA, and the community will help police the MPA. The Exuma study documents that other, more distant fishers also use the area, people do not value losing much or all of their fishing grounds, and the elders of local communities will be the primary violators of the No-Take rule.

A second modeling question is what dimensions of community are most useful for predicting their response to nearby MPAs. The Bahamas MPA modeling included amount of fishing and size of local population as variables. The Exuma study argues instead for three other social variables (agency, resiliency, and identity) to understand community-level responses to MPA siting.

A third modeling assumption is that MPAs are potentially more important to communities that are economically dependent on cash from marine products as long as the non-consumption impacts such as a shift to ecotourism offset the loss of commercial fishing. The Exuma study demonstrates that subsistence fishing can be a foundation of community social structure and important in the daily diet of all community members.

Finally, the national model raises a debate regarding the amount and quality of data that are needed for successful conservation planning. Often MPAs are sited with little marine science (Roberts 2000) and almost no social science. Despite arguments from Johannes (1998) for establishing data-less MPAs and the widely cited polemic position by Roberts (2000) that "any MPA is better than no MPA" both marine scientists recognize the utility of social science data when it can be brought into the process. The Bahamian MPA proposal used the then best available natural and social data. Neither the government nor the scientists had the luxury of spending 6 years and thousands of interview hours, as this study has done just to evaluate three of the MPA proposals; yet in the Exumas, little social data and weak social variables have caused one serious siting failure and produced a socially flawed consultation process that has jeopardized siting the other two MPAs. So, this question is raised; 'How can systematic social science data be brought quickly and convincingly to the MPA siting process?'

Materials and methods

Especially important to the siting of MPAs in the central Exumas are traditional coastal communities. There are about 20 small settlements (typically with a population of less than 200) located in the Exuma islands and cays where three large No-take MPAs were proposed by the Bahamian government. Six traditional settlements were selected for study with the approval of the Bahamas Department of Fisheries and after the political and social leadership of each settlement was approached with a study description and agreed to proceed. Each settlement is near and thus potentially impacted by one of the three proposed MPAs (Fig. 1). Before this study began, each community had publicly responded to the nearby MPA proposal, with the two northern communities being strongly against the MPA, the two central communities being neutral, and the two southern communities being strongly positive. Interviews were designed to understand what MPA impacts were perceived by these sets of communities and how potential impacts contributed to communities responding differently to their proposed MPA.

This research involved 572 interviews conducted with 193 people from six traditional communities. Many people were interviewed multiple times with various instruments. Gender balance was approached in the 351 formal interviews but an imbalance towards males occurred in the 221 informal interviews. Approximately the same percentage of

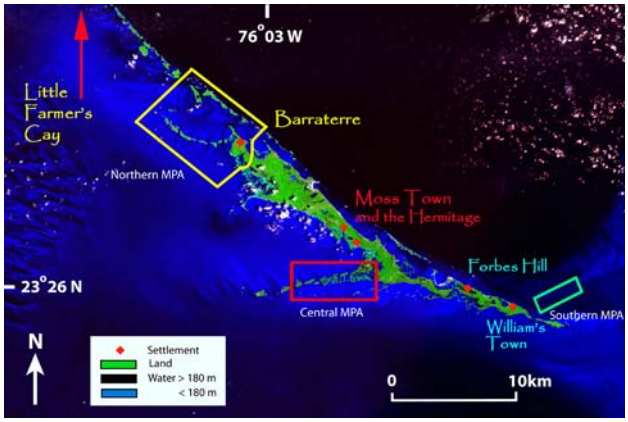

Fig. 1 The Exuma Islands and Cays, Bahamas. Five of the six study communities are shown, Little Farmer's Cay (*arrowed*) is 11 km to the north of image. LANDSAT 7 Satellite image from 1984, http://www.landsat.gsfc.nasa.gov

each community was formally interviewed with an overall sample size of 34% of the census recorded population.

The research is (a) inductive, (b) iterative, (c) mixed methodologically, (d) collaborative, and (e) consultative. The research goal of understanding how potential MPAs could impact local communities, and which of these impacts would best predict local responses to the MPAs, led to inductive approaches that seek to elicit variables rather than test them. Conducted over 6 years, the eight field sessions permitted an iterative cycle of collecting data, analyzing findings, and returning to the field with new and revised data collection instruments.

Interviews in these six communities were not random, but instead were guided by the notion of networking through community experts. This complex methodology is appropriate given these communities are neither mapped nor inventoried. To accomplish this task and thus lay a foundation for a random sample was beyond the resources of this project. Few places in the Caribbean have a foundation for drawing a random sample of community members. The magnitude of this problem can be illustrated by the Household Economy Survey of Grenada conducted by the Institute for Social Research, University of Michigan in 1980s (Burpee et al. 1986) There, following a commitment by the US government to provide an economic data base for the entire nation, all homes were mapped and their occupants were interviewed as part of the first systematic national census. Following this million dollar effort, households were selected at random for in-depth economic study (Burpee et al. 1986). In the Exuma study, community experts were informed of the research goals and asked who would be considered knowledgeable on the topic. Because of the salience of the research topic, there were no interview refusals and often people asked to be interviewed.

In the absence of a random sample, social researchers use mixed methods (Tashakkori and Teddlie 1998; Beebe 2001) and triangulation (Campbell and Fisk 1959). Mixed methods involve collecting qualitative and quantitative data, and where there is convergence, confidence in the findings grows considerably (Jick 1979). The Exuma study used seven instruments (a) sea attachment, (b) quality of life, (c) grubbing, (d) tourism, (e) ethnobotany, (f) land mapping, and (g) sea mapping. In addition oral histories with community elders were conducted in each region. Oral histories were both structured and open ended and, given the dozens of hours each required, were comprehensive. Most instruments were diachronic in order to contextualize contemporary life ways in short (30 years) to long (200 years) adaptation time frames. All formal interviews were systematic in that they were administered using a structured data collection instrument, thus permitting direct comparisons from instrument to instrument, person to person, and community to community.

Informal interviews are an important tool for collecting data when formal interviews are not possible because of either time or interest of the interviewee (Beebe 2001). They are often the best way of listening to people about subjects not currently contained within the formal interview instruments. Informal interviews permit topics to emerge that may become critical to the study, perhaps eventually requiring their own formal instrument. In-depth understanding of some topics like ethnobotany required dozens of hours of informal interviews which were tape recorded while walking in the bush. All informal interviews were recorded in bound field notebooks and logged into a data base.

Two instruments, the sea attachment and quality of life, are most used in this analysis and so will be discussed in some detail here. It is important to recognize, however, that confidence in these findings derives from an overall triangulation of comparable findings from any of the seven instruments and oral histories. The triangulation of data involves comparing responses generated with different instruments. When two or more instruments provide the same answer to a research question then the confidence in the accuracy of the answer is increased. Confidence in the accuracy of responses also increases to the extent that most interviewees provide the same answer. Comparisons of responses were facilitated by coding all responses into EXCEL and ACCESS data bases.

The data foundation of this study was produced by a 14-page long Sea Attachment instrument that was uniquely developed to explore the widest range of marine uses and cultural meanings. It had 208 questions distributed across seven knowledge and use domains including: Material Arts, Sea Biology, Underwater Landscapes, Land Biology, Expressive Arts, Identity Symbols, and Settlement Stories. Both closed and open-ended questions permitted detailed

understandings of how the sea is used and valued. These interviews were tape recorded, thus capturing volunteer observations of the marine environment. Typically, 2 h were required to complete the instrument.

The field of Quality of Life (QofL) studies has become well established around the world, after having been developed at the Institute for Social Research, the University of Michigan (Campbell et al. 1976). QofL surveys contribute to the Social Indicators (http://www.sscnet.ucla.edu/issr/da/index/social_indicators-international.htm) field of research and social policy development (Schneider 1976). Many QofL surveys have been tested and found to be cross culturally useful (Slottje 1991). A standard QofL instrument was adapted and administered as a 13-page long survey in the Exuma MPA study. The interviewee was asked to assess the quality of life for his fellow community members in three time periods, 30 years ago, today, and 30 years in the future. Assessments were asked about six dimensions of community: physical well being of people, condition of the local ocean, economic well being, educational opportunities, community support, and ability to influence events. All questions were closed with responses scored on a five-point Likert Scale. Typically the instrument was completed in 20 min. Bandura's (1999, p. 34) research on the utility of QofL data suggest they can be effective for measuring and predicting individual and community agency-based behaviors.

Beginning in the second year of study (2003), the research became collaborative, uniting from then on researchers from the UofA and the College of the Bahamas. Interview teams were formed with one student from each school, thus assuring cultural and training diversity. Language issues were minimal, but Bahamian students facilitated translation of vernacular speech when needed. Analysis and write-up responsibilities have been shared.

Consultative research is a term to describe the on-going participation of the members of nation and local communities in the research. Permission to conduct the research was annually provided by the Bahamas Department of Fisheries, as was permission by the local community especially through their Local Government representatives. Other community leaders, like heads of churches and senior fishers, were contacted before interviews proceeded. A critical step in consultative research, and one made possible by the iterative nature of this study, was a review of findings each time the research team returned to the field. A report of findings was regularly left with the Department of Fisheries, Local Government, and the people previously interviewed. Usually, the team who initially conducted an interview took the findings back in person to discuss and exchange information on the research. A local newspaper had a long article discussing project findings. Social scientists view community acceptance of findings as a critical point in the data assessment process.

Results

The research supports the following: (1) the community is the best unit of social analysis, (2) these are traditional communities having continuity back to slavery, and (3) that three social variables, agency, resilience, and identity have predictive value.

Community as unit of social analysis

Social impact assessment (SIA) is the proper term of reference for studies that predict impacts from potential MPAs and assess human responses (Goldman 2000; Weiant and Aswani 2006). The SIA professional literature on the impacts of conservation projects variously argues for a focus on the individual resource user, the household of the resource user, and the resource dependent community. Each of these approaches has analytical utility, but in the past decade the emphasis has shifted away from stakeholder and household analysis to the study of the local community. In general, the community analysis approach works best when the community is small in scale, old in place duration, stable in membership, composed of people who share a sense of history, have a common identity, and are culturally co-adapted with their land and sea. The members of the community should not have 'ontological insecurity' (Giddens 1990), but should instead believe that their future generations will have sustainable access to natural and social resources. Indeed, Conroy et al. (2001), building on Ostrom (1992), suggested that for conservation studies and consultations the term community be restricted to those having shared beliefs, stability of membership and complex, multilayered, long-term interactions with each other. Planners of conservation projects that involve communities without these characteristics will not find and thus not be able to use in community natural resource partnerships an in situ cultural foundation for conservation.

These six communities from the Islands and Cays of the Exumas in the central Bahamas meet Conroy et al.'s (2001) criteria for a local natural resource community. For various reasons discussed in the next section, these Exumian communities tend to act in unison on issues such as outside development and conservation. Community members, for example, were uniform in their support for establishing a nearby MPA. During the QofL interviews people were asked "Would you be willing to support some kind of MPA near your settlement?" Almost all of the 123 respondents to whom this question was posed were outright or conditionally positive about having an MPA: 59.3% said yes, 39.8% said maybe, and 0.8% said no. These data document overwhelming support for establishing a nearby MPA, while at

the same time there were negative public responses by members of the two northern settlements and many respondents qualified their support because they wanted to participate in the design and management of the MPA.

Traditional communities

Members of the six settlements immediately stipulated at the beginning of the interviews that they represent a people who have always learned about and cared for their land and sea in the Exumas. They thus defined themselves as a kind of community (which is termed a 'traditional community') to be dealt with during the MPA siting, design, and management phases.

Humans learn about and adapt to the environment where they live, so how does this process inform the Exuma case? Key here is the time that a people have continuously lived in one place (Nabhan 1997). In general, it is assumed that people begin learning as soon as they arrive in a place. Such knowledge is often termed 'local knowledge' (Olsson and Folke 2001) and it may support sustainable environmental behavior within a generation. To move from simple observations to deeper ecological understandings of food webs and trophic levels will take many generations. Stoffle et al. (2003) developed a co-adaptation model of learning through time that argues that people will acquire deep ecology understandings within five generations. This is much less than the length of time (222 years) the people of the Exumas have lived on their islands and cays. It also is the first point in time where the term 'traditional knowledge' (applied to either culture or people) should be used. The arguments for this are that after this period (1) the people know something significant about the ecosystem functions, (2) they have developed various use strategies to both gain from and protect the ecosystem, and (3) they have experienced more than a hundred years of environmental perturbations against which to understand the resiliency of their adaptive strategies.

The African ancestry people of the Exumas arrived in 1784 as slaves of Loyalist citizens of the English crown. Some had been slaves in the American colonies (creoles), but others were recent arrivals from Africa. Both types of former African people arrived as unfree laborers for planters who were escaping the aftermath of the American colonial revolt. Because at this time there were no traditional American Indian people in the Exumas, both the Loyalist planters and the African slaves were confronted with learning and using a new ecosystem.

Most Loyalists planters failed at cash-crop and slave-based agriculture and left their lands and slaves alone within a decade or so. Plantation lands, adjoining marine ecosystems and the former slaves remained together, with the people often taking the name and the land of the former plantation owners. With few options for leaving and little competition for the local resources the former slaves, now self-identified as settlement members, stayed and converted knowledge of the marine ecosystem into sustainable environmental practices, and assumed de facto ownership (via usufruct) of their settlement's ecosystems.

The social-ecological systems developed by the traditional people of the Exumas were to persist through time, surviving human (such as overseas labor) and natural (such as hurricanes) perturbations. It is argued here that through environmental learning, including acquiring knowledge of marine biodiversity, the traditional people of the Exumas evolved a resilient way of life which is valued today.

Key SIA variables: agency, resilience, and identity

The many observations made during this research, including patterns of support for the proposed No-take MPAs, can best be understood in terms of three social variables: agency, resilience, and identity.

Agency

Agency is the contemporary term used to describe the sense that what is desired by the community will in fact occur. The QofL instrument asked about the person's perceived ability to influence the outcomes of events affecting them and their settlement and how this influence compares with that of the people in the community 30 years ago, and will compare with the people of the community thirty years in the future. When asked "In comparison to members of my family and people living in this settlement 30 years ago, I have (1) much more influence, (2) a little more, (3) about the same amount, (4) a little less influence, (5) much less?;" of the 128 respondents to this question, the majority (57.6%) perceived themselves to have more influence, while 14.4% perceived themselves to have the same and 28% perceived less influence. When asked "How satisfied are you with your ability to influence the outcome of events affecting your settlement these days;" 50% are satisfied, 25.7% are comfortable, and 24.2% are dissatisfied. Perceived positive trends in agency are viewed as causing the next generation to have more (70.3%) or the same (20.3%) ability to influence events. The QofL responses indicate that these communities have a strong sense of agency, which they say derives from working together as a community, being self sufficient, and having a local government system that gives them a direct voice in the Bahamas Parliament.

If an MPA proposal assaults agency, what will result? The northern communities were presented with an MPA proposal that they soundly rejected with personal, community, and political responses. When this study began, the northern MPA proposal had been taken out of consideration

by the Department of Fisheries, so in one sense this was an agency victory for the northern communities. When, however, the QofL responses are presented by region of settlement, the northern were somewhat less satisfied (44%) with their ability to influence events than central (54%) and southern (48%) communities. People from the north report in interviews that their confidence in their ability to influence the outcome of events was shaken by the northern MPA proposal and the proposal process which did not involve the impacted communities.

The implications of having been through an unsuccessful MPA siting process, even when the final decision supported the local community position, appears to have had implications for future MPA proposals. When, during the QofL interviews, people were asked "Who should design and control a local MPA (local people, national government representatives, or mixed local and national) 64.1% favored a partnership with the national government, rather than a Local Model (18.8%) or a National Model (17.1%). Support for the National MPA Model was lowest in the north (2.6%), and slightly higher in the central (6.8%) and the southern (8.8%) communities. Interviews document that after the northern MPA proposal failed, many northern people simply did not trust in an MPA proposal exclusively designed and managed by the national government and their science advisors.

Resilience

The people of these settlements speak with pride about their common history as African ancestry people forcibly brought as slaves to this area in the late 1780s and then abandoned within a generation. By remaining on the lands of their former plantation settlement, these people co-adapted (some would call co-evolved) with this socially and physically isolated portion of an enormous archipelago island system. Together as a community, less as individuals and households, they built a resilient way of life involving redundancies in natural resource use strategies and in webs of interdependent social relationships.

Resilience means the magnitude of disturbance that can be absorbed or buffered without the system undergoing fundamental change in its functional characteristics (Berkes et al. 2003). When people become traditional, learn about their ecosystems, adjust their adaptive strategies to protect them from natural and social perturbations, they then can be said to have developed a resilient way of life. The term 'environmental multiplicity', builds on the narrower but established term 'occupational multiplicity' (Comitas 1964), to describe their system of resilient adaptations. Conceptually these terms describe a range of multi-stranded and redundant connections among the members of a traditional community and between them and their primary natural use areas (Stoffle 1986).

There are too many social and natural adaptations to be fully discussed here, so these are organized and presented by where they occur in natural and social space. There are six natural use spaces and two social spaces (Table 1) that constitute the core of environmental multiplicity. This table points out where people interact with each other and the natural resources (under community control through usufruct) in order to achieve a sustainable way of life. Because of redundant natural use areas and social relations, there are alternative ways of socially and naturally achieving community goals. So, for example, in these six Exumian communities every healthy adult has the ability to fish. At times when most of the men are away, a team of women who do hand fishing, called grubbing, catch fish in the near shore mangroves. When males are available to fish, only a few crews will fish at a time but they will subsequently share the catch with each "cooking pot" in the settlement. Thus, crews only catch sufficient fish for the evening meal for all the settlement. Different crews have different fishing areas, thus spreading fishing pressure over a wide area by taking turns fishing. Men who are not fishing often work with others on community projects that also benefit the families of

Table 1 Environmental multiplicity in Natural and Social spaces

Natural use spaces	Social spaces	
	Reciprocity from subsistence	Wage labor
Marine		
Littoral	Grubbing, sea weed collecting	
Near shore coral reefs and cay cuts	Subsistence fishing alternate crew fishing	Bone fishing guides
Proximal deep water		Lobster fishing
Terrestrial		
Forests	Gathering medicine and spiritual plants for family and community healing	Collecting and weaving palm top
Agricultural lands	Home gardens clearing of lands	Cash crops
Pastures	Domestic use animals	

the crew who is currently fishing. Natural resources can derive from both land and sea, thus assuring that crop loss due to drought can be offset by the marine resources; which in turn, can be replaced with land products when hurricanes disrupt the marine ecosystem. The environmental multiplicity system established by these traditional communities assures that people do not starve or live in fear, but instead live well and secure being always supported by their nature and society.

Community relationships are facilitated by symmetrical reciprocity; which is an implicit, non-legal contractual obligation, unenforceable by any authority apart from one's sense of honor and shame. Social rules specify that natural resources be gathered and shared with others, who should in turn offer labor or other resources. Symmetrical relationships are designed not to be extinguished, thus potentially sustaining relationships between individuals and social groups over generations. Given the subsistence economy of these settlements over the past 222 years, most community support obligations do not involve cash exchanges. The main exception to this is the need for cash to purchase rum which is exchanged in reciprocity. Thus social structure of the community relies on materials from direct production, personal labor, and some cash.

A shift to a cash-based economy potentially threatens social reciprocity. In the QofL interview 'community support' was defined as the ability and willingness of other members of the settlement to come to your aid as needed. Such support could come from group organizations such as local churches, family members, or neighbors. When asked "In comparison to members of my family and people living in this settlement thirty years ago, there is (1) much more support, (2) a little more, (3) about the same amount, (4) a little less support, (5) much less support:" of the 133 respondents to this question, most said there was less support (57.1%), some said it was about the same (20.3%), and some said it was better than thirty years ago (22.5%). Follow up interviews identified the increase in wage labor and a growing standard of living (consumption) as the reasons for declining community support. Still, when asked about trends most respondents (54.3%) believe that community members recognized this as a social problem that will be solved in the future by returning to past levels of direct production and community support.

Resilience is impacted in a positive way when an MPA restores the adaptive strategies formerly lost by a traditional community. These losses may have occurred when a resource declined below a sustainable level, or because outside fishers eliminated spawning aggregations, or because foreign tourists have been allowed to purchase common lands. The MPA can restore fishing stock, restrict outside fisher access, and officially empower local communities as owners and managers of traditional resource areas.

Resilience is weakened to the extent that the MPA eliminates extant adaptive strategies. This can occur if the MPA mitigates the loss of a reciprocity-based subsistence fishery with cash and wage labor opportunities or if the MPA fails to protect traditionally used cays and mangroves from tourism and other developments. Traditional communities throughout the Caribbean use symmetrical reciprocal exchange based on direct production (Burpee et al. 1986), so, if an MPA reduces or eliminates access to natural resources needed in such exchanges it can weaken community social structure. Often MPA planners attempt to mitigate this impact by stimulating cash-based production, but our analysis shows that cash itself can weaken community support. A weakened community may lack the ability or will to support its members in times of crisis.

Identity

Identity as it occurs at the individual, community, ethnic group, and national levels is an important cultural dimension for all people, but it is especially critical in the post-slavery former European colonies of the Caribbean (Munasinghe 2001). Caribbean people, especially those of African ancestry, live in societies that were not made for them (Alleyne 2002). Once independent, they were free to establish an identity not tied to the former colonial powers (Olwig 2002). This identity formation process is perceived by some as the key social process in the Caribbean today.

Fishery community identity is recognized as a key variable in U.S. Federal government guidelines, prepared in compliance with the Magnuson Stevens Fishery Management Act (MSA) National Standard #8, which specify that fishery dependent communities can be identified by data documenting that residents perceive the importance of fishing to continuity and self-identification of their community.

Identity is a complex human phenomenon (Gupta and Ferguson 1997a) and should be studied with a clear operational definition that makes sense in a specific research setting (Gupta and Ferguson 1997b). One approach to defining the identity of coastal communities is to measure the 'cultural centrality' of the sea with the Sea Attachment instrument. The resulting 69 interviews document that all of these community members were both knowledgeable of and emotionally connected with the sea. They write, and read in public, poetry about the sea, bring its products into their arts, and sustainably use it on a daily basis. The main church of each settlement is situated on the highest ridge where members can view the sea from its many windows, and the most popular hymns have a marine theme. They say without their uses of sea they would not exist.

Although in most cases an MPA will only modify some local access to the sea, a large No-take MPA can impact community identity by preserving all customary access to

the sea or eliminating all such access. For example, the proposed northern MPA encompassed almost all of the traditional marine and terrestrial resource use areas for the settlement of Barraterre (Fig. 2). It should be noted that even though the Bahamian No-take MPA does not limit terrestrial uses on cays within its boundary, boaters cannot legally have marine products in their boat while in the MPA, so if they caught fish elsewhere they could not stop in the MPA on the way home to collect plants in the cays. A strict interpretation of no-marine-products-in-a-boat-in-the-MPA rule would preclude all Barraterre fishing because they could not return to their home, which would be completely surrounded by the MPA.

The leeward cuts involved in this MPA create unique underwater places that attract many species of marine animals. Due to their leeward position and proximity of these cays to the settlement of Barraterre, these cays and cuts traditionally are their primary fishing grounds. The cuts between the windward cays have extremely strong currents and are difficult to fish. The leeward cuts with the slower currents have coral reefs on either ends with sea grass beds in the middle; there, fishers target snappers, groupers, grunts, and jacks. These cuts have been traditionally fished by both men and women. Women traditionally frequent the leeward locations by sculling (single oar propulsion) their boats to a desired spot where they fish by line, dive for or hook conch, and even catch sea turtle. The women traditionally use these leeward cays to gather medicinal plants and palm top for basket weaving material.

The northern MPA was so large and totally positioned over traditional marine use areas that it basically eliminated fishing and littoral uses for the people of Barraterre. Their strong negative response to the MPA was due in part (the issue of agency was also a factor) because they believed it would "destroy them", that is, by eliminating all subsistence fishing activities and associated reciprocity so they could no longer be the community they had become over the past 222 years. The community believed its identity was at stake.

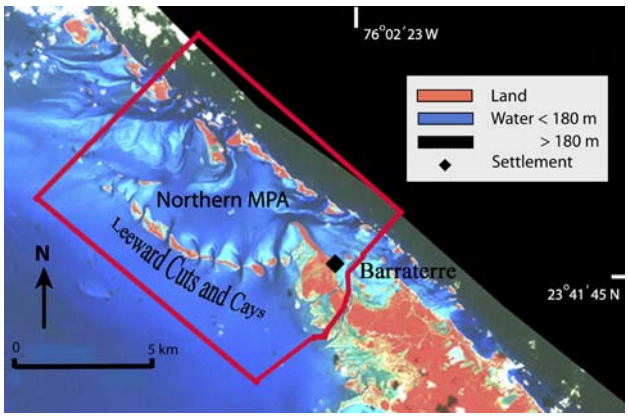

Fig. 2 Northern No-take marine protected area (*MPA*) located around the marine use areas and settlement of Barraterre. LADSAT 7 Satellite image from 1984, http://www.landsat.gsf.nasa.gov

Discussion

The marine environment was a lifesaver and a community builder in the past and it remains a safety zone in the minds of Exumian people today. Many of the marine and terrestrial use patterns developed after slavery have persisted simply because they are the foundation for a high quality way of life that has stood the test of time. As a region of security the marine environment has become a part of how people view themselves and where they teach the lessons of life to new generations. This region is viewed as belonging to the settlement and the people to which it has given life.

This study documents that traditional near-shore marine use areas contribute to subsistence, reciprocity, and community stability. Even though the cash economy appears to have lessened community support and thus modified social relationships, cash-for-fish among community members is largely offered by those who have cash and recognize the need for the fishers to purchase gas, motors, gear, and boats. Still these are not communities who fish for cash. In fact, there is no commercial fish market in the Exumas. Counter to the social assumption in the Bahama national MPA assessment (Stoner et al. 1999) that a local MPA would most adversely impact a commercial fishing community, data presented here demonstrate that an MPA can also drastically alter a traditional subsistence fishing community. In fact, these data argued that the losses to a commercial fishery can be more easily and appropriately mitigated by a shift to non-consumptive cash-based activities like ecotourism. Subsistence fishing communities lose both the marine products and the social support when they are shifted to cash-based activities.

Before the Exuma study, government and science experts perceived that local community responses to the proposed MPA were negative in the north, neutral in the central area, and positive in the south. Field observations from the present study supported these outside perceptions, but did not support common explanations. The northern communities were strongly against the MPA because it eliminated all their fishing, especially in their leeward cays. The central communities were neutral about the proposed MPA because they thought it would eliminate fishing by outsiders and permit them to manage and police the MPA for wages. They became negative when they realized that the MPA would eliminate their subsistence fishing. The southern communities were positive about the MPA

because they thought it would protect their spawning aggregations from outside commercial fishers, and because they rarely fish there. Sea mapping with the southern communities revealed that southern fishers primarily fish the leeward cays of the middle MPA. Southern fishers were not previously asked for a response to the middle MPA, but during Exuma study interviews they were negative. All three MPA proposals reduced agency, because of being top-down in design and management; reduced resilience, because they restricted most subsistence fishing areas in the leeward cays; and were a threat to identity, because they would stop most community members from subsistence fishing and force people to purchase frozen fish.

The QofL interviews proved to be most useful for profiling the communities and understanding their responses to proposed No-take MPAs. Still, other instruments are needed to contextualize the QofL responses, learn the history of the community, and measure the cultural centrality of the sea. Small samples and a few elder oral histories will suffice for profiling traditional communities. More research is needed the less the community under study matches criteria suggested earlier (Conroy et al. 2001).

The Exuma study does not support proceeding with an MPA siting without systematic social data on the variables of agency, resilience, and identity. Instead, with appropriate data, popular support for MPAs can be combined with knowledge of how local communities are structured and connected to the sea to design a participatory process that will produce successful cases of siting and managing MPAs.

Acknowledgments We thank the Bahama Department of Fisheries for approving this research, and the people of the Exumas Islands and Cays for their participation. Funding was provided by the NSF Biocomplexity in the Environment Program (Grant OCE-0119976) to the Center for Biodiversity and Conservation at the American Museum of Natural History. This study is the joint effort by the University of Arizona and the College of the Bahamas. The COB team included Kendra Arnett, Chervain Dean, Tarah McDonald, Ward Minnis, Tavarrie Smith, and Yasmin Skinner. The UofA team included Alex Carroll, Clinton Carroll, Fletcher Chmara-Huff, Jill Dumbauld, Heather Fauland, Richard Gilmour, Arin Haverland, Cory Jones, Shawn Kelley, Noreen Lyell, Aja Martinez, Amanda Murphy, Nathaniel O'Meara, Kathryn Payne, Terra Pierce, Peter Poer, Daniel Post, and Kathleen Van Vlack.

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