Marine Policy 84 (2017) 235–243

Contents lists available at ScienceDirect

Marine Policy

journal homepage: www.elsevier.com/locate/marpol

Exploring stakeholder perceptions of marine management in Bermuda

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ARTICLE INFO

Keywords:
Bermuda
Stakeholder survey
Marine spatial planning
Ocean zoning
Natural resource management
Marine protected areas

ABSTRACT

Given competing objectives vying for space in the marine environment, the island of Bermuda may be an ideal candidate for comprehensive marine spatial planning (MSP). However, faced with other pressing issues, ocean management reform has not yet received significant traction from the government, a pattern seen in many locations. Spatial planning processes often struggle during the proposal, planning, or implementation phases due to stakeholder opposition and/or government wariness to change. Conflict among stakeholders about management reform has also proven to be a deterrent to MSP application in many locations. With these obstacles in mind, a detailed stakeholder survey was conducted in Bermuda to determine awareness, attitudes and perceptions regarding ocean health, threats to ocean environments, the effectiveness of current ocean management, and possible future changes to management. How perceptions vary for different types of stakeholders and how attitudes about specific concerns relate to attitudes about management changes were examined. Overall, the results indicate a high degree of support for spatial planning and ocean zoning and a high level of concordance even among stakeholder groups that are typically assumed to have conflicting agendas. However, attitudes were not entirely homogeneous, particularly when delving into details about specific management changes. For example, commercial fishers were generally less in favor, relative to other stakeholder groups, of increasing regulations on ocean uses with the notable exception of regulations for recreational fishing. Given the results of this survey, public support is likely to be high for government action focused on ocean management reform in Bermuda.

1. Introduction

As coastal populations continue to increase and there are a growing number of activities competing for space in the marine environment, many marine ecosystems are faced with intensifying conflicts among user groups [1,2] as well as degraded marine resources and ecosystem health [2–6]. Often, marine activities and stressors are managed individually, which typically exacerbates the problem by failing to account for the cumulative impacts of interactions and conflicts among uses [7,8]. Single-sector management can also deter the development of new uses like offshore renewable energy or offshore aquaculture due to the lack of an overarching regulatory and permitting framework [9,10]. Additionally, a history of viewing marine systems as “common property” and “open access” has inhibited the development of spatial regulations and zoning and led to a “tragedy of the commons” in many places [11,12]. In response, there is a growing movement for marine spatial planning (MSP), a place-based, multi-sectoral management approach that determines where and when human activities occur in marine spaces [13–15]. MSP considers how different uses interact with each other and the environment and attempts to balance ecological, economic, and social objectives, ideally reducing conflicts and resulting in more sustainable use of the oceans [13,16]. In some cases of MSP, ocean zoning is used to specify what activities are allowed or prohibited in specific areas of the ocean [17,18]. MSP and/or ocean zoning have been or are being adopted in many locations around the world [15,19], with the goal of developing more comprehensive and coordinated marine management in those places.

While the basic concepts of spatial planning may seem logical, various spatial planning processes have struggled or stalled during the proposal, planning, or implementation phases because of stakeholder opposition [20–22]. For example, a partnership between the Bermuda government and Pew Charitable Trusts to zone the outer portion of Bermuda's waters as a marine reserve has stalled following a public consultation [23], partially due to opposition from some stakeholder groups. As another example, the first attempt to implement the California Marine Life Protection Act, which mandates a statewide network of protected areas, failed in large part because of strong negative public reactions to a closed door planning process with scientists and

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http://dx.doi.org/10.1016/j.marpol.2017.08.004
Received 26 April 2017; Received in revised form 31 July 2017; Accepted 2 August 2017
Available online 09 August 2017

government representatives [24]. Stakeholder opposition to planning can be attributed to a lack of adequate engagement early in the process [25], consequently failing to create stakeholder "buy-in" [26]; a process that was not perceived as sufficiently democratic [27]; or a wariness of or opposition to the process by government and/or industry groups [28]. Thus, a critical component of MSP is stakeholder engagement and a participatory process for plan development [29–32]. Such engagement can reveal how stakeholders perceive ocean management issues, the effectiveness of current management, the changes that will be brought by MSP, and how these perceptions vary among different types of stakeholders, all of which can help inform the process moving forward. Furthermore, stakeholder concerns and priorities are often directly useful in guiding the scope, objectives, and key elements of a marine spatial plan [30]. Practical and local knowledge from stakeholders can be integrated with scientific knowledge to produce more relevant and effective environmental policy [25,33,34], and there is evidence that stakeholder participation may result in better quality decision making and better management outcomes [25,33,35]. Lastly, research on stakeholder attitudes and perceptions early in the process can serve as a baseline against which to measure stakeholder attitudes towards ocean management issues in the future.

Bermuda is arguably a strong candidate for more comprehensive marine spatial planning and/or zoning. It is a small, isolated island in the middle of the North Atlantic Ocean with a high population density, significant coastal development, and a diversity of activities and competing objectives vying for resources and space in the marine environment. Furthermore, Bermuda's economic and social well-being has traditionally been tied to the ocean [36]. The majority of Bermudian residents use the nearshore ocean space as a recreational area for swimming, diving, fishing, and boating. As the number of recreational boats continues to rise, development of marinas and moorings around the island has also increased. There is a small artisanal, commercial fishing fleet; cargo ships that provide a weekly lifeline of foodstuffs, goods, and materials; seafloor cables that carry electricity and data; and cruise ships that deliver the majority of Bermuda's tourists. Marine-based tourism activities include diving (on shipwrecks and reefs), glass bottom boat tours, snorkeling, whale watching, boat rentals, jet ski tours, and swimming from beaches. Dredging activity occurs occasionally, particularly in the shipping channels, and land-based pollution to the marine environment occurs in the form of runoff, treated sewage (seepage and outfalls) and concrete-encased waste ash. Bermuda hosts the most northerly coral reefs in the Atlantic, providing a great source of economic and social value to the island including reef-associated tourism and fishing, amenity value for real estate, coastal protection, recreational and cultural value, and research and education [37]. While Bermuda's reefs are in good health relative to those of most Caribbean islands [38], they face a variety of threats including impacts from tourism and shipping, poor water quality and sedimentation from pollution and coastal development, fishing, invasive species (namely lionfish), coral disease, and coral bleaching and other climate change impacts [39]. Additionally, Bermuda hosted the America's Cup in 2017, necessitating a variety of coastal and marine development projects. Lastly, there have been proposals for and interest in future marine installations of wind turbines, wave energy facilities, aquaculture, and seabed mining operations.

Historically, piecemeal marine management and numerous pressures in Bermuda have led to conflicts regarding use of the nearshore ocean [23] and concerns about degrading marine ecosystems [39]. Marine spatial planning has been identified as a future priority by some government departments in Bermuda [40], has received Cabinet support in the recent past, and could be beneficial given the diversity of uses of the marine environment and threats to ocean health described above. Despite all of this, ocean management reform has not received the necessary traction at the top levels of government to move forward, due at least in part to many other pressing national issues including economic development, health care reform, and rising crime levels. Given the discrepancy between the apparent need for and government commitment to MSP in Bermuda, understanding whether stakeholders would support such a process could be instrumental in shifting government priorities. Furthermore, the small size of the island makes a comprehensive analysis of stakeholder perceptions more tractable than in other locations with a similar degree of coastal development and competing ocean interests.

This study included a detailed stakeholder survey in Bermuda to determine awareness, attitudes and perceptions regarding ocean health, threats to ocean environments, the effectiveness of current ocean management, and possible future changes to management. The survey examined how perceptions vary for different types of stakeholders and how attitudes about specific concerns relate to attitudes about management changes. The results of this survey suggest specific recommendations for Bermuda in terms of how to communicate about MSP to different stakeholder groups; for which stakeholder groups mediation and consultation would be most valuable; for what issues there are conflicts versus widespread agreement in order to make the process more efficient; and for shaping the objectives of a future process should one move forward. Furthermore, this survey can serve as a model for other locations pursuing marine spatial planning and/or ocean zoning. Conducting a stakeholder survey, such as this one, preceding an MSP process can provide an important foundation for more effective, equitable and durable marine management plans.

2. Methods

2.1. Study location: Bermuda

The focal area for this study, the nearshore marine environment around Bermuda, was defined as the area from the coastline out to the 2000 m depth contour (Fig. 1). This region contains the flat reef area surrounding the island known as the reef platform, the steep drop-off from the platform known as the reef edge, and the area around both the main island of Bermuda and the Argus and Challenger Banks. The total focal area is 2600 km^2, including 550 km^2 of reef platform and 53 km^2 of land mass.

Currently in Bermuda, there is limited coordination among ministries with responsibilities related to the marine environment and no comprehensive planning system, authority, or strategy operating below the mean low-water mark. Furthermore, marine-related legislation is scattered among various acts, orders, and regulations. There are some spatial management regulations in place, particularly protected areas for dive sites (mostly small areas surrounding ship wrecks) and spatial restrictions on boats and different types of fishing (e.g., seasonally protected spawning grounds, restricted areas for particular species and/or fishing gears), although these protected areas have not been explicitly designed as or assessed for their functioning as a network [41]. In 2014, following a partnership with Pew Charitable Trusts to designate the outer portion of Bermuda's Exclusive Economic Zone (beyond the nearshore area considered here) as a no-take marine reserve, the Bermuda government conducted a public consultation about the potential reserve. However, the consultation did not result in an official position statement [23] and these efforts have since stalled despite apparent public support (although there was also opposition from stakeholder groups), suggesting hesitation by the government for progressive changes to marine management. Similarly, the Waitt Foundation and scientific partners (Bermuda Institute of Ocean Sciences and the Sustainable Fisheries Group at University of California Santa Barbara), as part of a formal partnership with the government, provided several years of financial and technical support for a nearshore marine spatial planning process, of which the survey reported here is one outcome, but there was not sufficient prioritization of MSP at the top levels of government and international support has since withdrawn from the island.