Community studies to determine the feasibility and expectations of marine protected area (MPA) management in Vieques, Puerto Rico

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I. Executive summary/abstract

The project, via surveys and interviews, determined the community and visitor group expectations of and support for marine protected area (MPA) management in the offshore coral reefs and associated ecosystems off the island of Vieques, Puerto Rico. Vieques, due to its wealth of coral reef resources and recent political history, presents a unique location in which to evaluate attributes that different stakeholder and community groups consider important in MPAs, to identify points of convergence within different stakeholder groups, isolate locations which the community would consider suitable for active management, evaluate the preferred methods of public participation within and between community groups, and to determine community expectations of MPA benefits and costs.

Information gathered using a variety of social science field techniques (including semi-structured interviews, focus groups, and limited, participatory surveys) led to the completion of over 300 visitor surveys and over 60 stakeholder group interviews, providing information on group profiles, uses of the costal and marine environment, views on resource conditions, and preferred MPA management strategies and locations.

While there was considerable diversity in the opinions held across different groups, each group did express an interest in protecting the island's coastal and marine resources, and all groups felt that while the resources remained in stable condition, the resources are nevertheless under threat from post-Navy factors, especially development. Groups also provided locations for candidate sites (all of which were located in southern Vieques and include or are adjacent to areas that are presently protected), suggesting that MPAs could be implemented if the planning process: accounts for the integration needed to work across agencies and interest groups; is sufficiently transparent; and allows for stakeholder participation (and even collaboration). It is suggested that the National Marine Sanctuary Program, especially as implemented in the Florida Keys National Marine Sanctuary, provides an interesting model that could meet the integrated management challenges required to develop a fully managed, marine protected area, and which utilizes multiple use with marine zoning as the means by which to include user participation, reduce user conflict, and protect coastal and marine resources.

Finally, as in other studies, the project determined that there exist conditions not earlier identified and which could affect an MPA planning process. These relate to the increased importance of tourism and resulting signs of gentrification on the island, and their impacts leading to (a) displacement of more traditional stakeholders and (b) a shift in the type of MPA and MPA planning process in the medium to long-term (from one that focuses on participation and multiple use to one that restricts entry and uses to those compatible with tourism and related interests.

I. Introduction

Marine protected areas (MPAs) represent an important management tool in coral reef and associated ecosystems (NRC, 2001), promising a variety of cross-sectoral benefits, including biodiversity protection, fisheries conservation and enhancement, and sustainable management of coastal activities, such as tourism and development. However, due to many social, socioeconomic, and cultural reasons, MPA planning and effective management are confronted by formidable and, at times, insurmountable, opposition, resulting occasionally from top-down management decisions, lack of adequate public participation, stakeholder group misperceptions of management goals and objectives, and a poor understanding of community expectations, among others (see Fiske, 1992; Suman, Shivlani, Milon, 1999; Helvey, 2004; Christie et al., 2003). These challenges become greater when culture variables are present in and important to the community to be affected by the MPA management strategy (Fiske, 1992).

The island of Vieques, located in eastern Puerto Rico, possesses the requisite physical and ethnographic conditions that would lend themselves to conduct a community and visitor feasibility study on the community's understanding and expectations of and support for an MPA next to the island. The coral reefs and associated ecosystems around the island, among the best developed in the US, have been subject to long-term impacts due to US Navy exercise maneuvers that took place on the island from 1947 to 2003 (Faul, 2003), as well as considerable commercial fishing, including trap fishing, diving, and netting (Rogers et al., 2003). More recently, Vieques' tourism economy has exploded, as more visitors explore the island and its coastal and marine areas after the US Navy's departure.

Even with the 1999 implementation of the adjacent Luis Peña Channel No-Take Natural Reserve, the 2001 and 2003 designations of the Vieques National Wildlife Refuge, and other regional socioeconomic studies (NOAA, 2003), there is little understanding of community support for MPAs and no formal protection afforded to Vieques' coral reef and associated ecosystems. At the October 2, 2002 U.S. Coral Reef Task Force meeting in San Juan, NOAA and Puerto Rico's Department of Natural and Environmental Resources (DNER) announced five initiatives to strengthen Coral Reef Management in Puerto Rico. One of these initiatives was strengthening the Natural Reserve system beginning with the development of a management plan for the Luis Peña Channel No-Take Natural Reserve. This project was developed to support the initiative by undertaking a feasibility study, using a social science approach to determine the Viequenses' (and visitors') expectations of and support for an MPA. It was anticipated that incorporating community (particularly, stakeholder) expectations of MPAs would facilitate better cooperation and invite greater public participation in the process (see for instance the Tortugas 2000 process, in which the Florida Keys National Marine Sanctuary was successful in using a public participation model to develop consensus for a 151 nautical square mile no-take zone (Shivlani, Suman, and Causey, 1999; NOAA, 2001). Finally, it was expected that a community study would identify areas of convergence and differences within the community groups (see Suman, Shivlani, and Milon, 1999, for a cross stakeholder analysis), thereby facilitating any designation

process in terms of the type of management to be developed, the regulatory framework to be adopted, and the institutional arrangements to be forged.

a. A brief history of Vieques: project rationale in detail

Vieques, like the rest of Puerto Rico and adjacent islands, was a Spanish possession from the 16th century until the Spanish-American War of 1898 (Langhorne, 1992). It is believed that Columbus sighted Vieques in one of his voyages, but the Spanish crown did not claim the island until later in the 16th century. Being somewhat remote and largely inhospitable – not to mention still inhabited by Native Americans – few colonists approached the island, except for raids authorized by the Puerto Rican government. In the intervening centuries, the British – interested in obtaining a strategic stronghold in the region – started small expeditions with the intent of settling and then claiming Vieques. Most efforts were thwarted by the Spaniards in Puerto Rico, and finally in the mid-19th century, the colonial government began construction of a coastal fort (now in the town of Isabel Segunda) for the protection of Vieques against foreign interests; thus, it was not until the 1850s that Vieques completely entered Spain's sphere of influence. However, even though the island was of strategic importance, Vieques never commanded the same attention, either as an economic interest or a military outpost, as did its largest, western counterpart – the main island. Also, Vieques never developed as did the main island, in terms of population and infrastructure.

The US acquired Vieques as part of Puerto Rico and other Spanish possessions in the Caribbean Sea and other areas (ex. Philippines) in 1898 at the conclusion of the Spanish-American War. The decades following annexation, Vieques (and, in general, Puerto Rico) remained economically stagnant. Recognized early as a valuable strategic location, Puerto Rico was viewed mainly in terms of military, rather than socioeconomic, interests. Patrimonial, political systems and large landholding agriculture that existed on the main island (and Vieques) under Spanish rule were left largely intact by the US government. Citizenship was not conferred until the same year the US purchased the then Danish Virgin Islands (1917), and even then, it was largely granted as a way to guarantee support for the Allied cause in World War I. The Caribbean territories, although comprised of now US citizens, nevertheless did not obtain the right to vote; this remains the status quo up to the present day, such that Puerto Ricans and Virgin Islands can vote if they live and are registered to vote in the continental US but cannot if they reside on their home islands.

Mainly, Puerto Rico entered into its relationship with the US at first as an unwilling partner (i.e. as a spoil of war) and over time deteriorated into a dependent colony. The unequal power relations, which were mirrored elsewhere in US-Latin American relations (see Schoultz, 1998, for a critical history of US policy in Latin America), created the ideal conditions for military infiltration and occupation. As residents could not vote and were and remain dependent on mainland aid, and because many of the youth were recruited into the military services, the provincial and later commonwealth government

was in an subservient position, both in terms of calling for changes in implicit imperial policy and demanding remediation.

The US military maintained a strong presence in Puerto Rico since its annexation in 1898. By the early 20th century, as Theodore Roosevelt flexed his big stick in the Caribbean (the so-called 'American Lake') and Central America, the island of Culebra (located north of Vieques) gained strategic importance as a staging area from which to launch US warships (McCaffrey, 2002). Most of the island remained within the US Navy's control – used mainly for training exercises – until the end of the 1970s. Other bases controlled by different sectors of the military also started operations on the main island. By 1998, Puerto Rico had 25 bases and facilities operated by the US Army, Navy, Air Force, National Guard, and the Puerto Rico National Guard on its territory; together, these installations occupied 13% of the island's land. The most significant and largest of these bases, in fact the largest operation in the Caribbean, was Roosevelt Roads Naval Station and Vieques Navy Base (consisting of properties on Ceiba on the Puerto Rican mainland and on the islands of Culebra and Vieques). In Vieques, the Navy held 26,000 of the island's 33,000 acres from 1941 to 2003.

As in many other Caribbean and Latin American regions, land ownership in Puerto Rico under colonial rule was limited to a few individuals who controlled large plantations. The main cash crop on Puerto Rican plantations was sugar cane, and it represented the largest economic sector on the island until US-led, rapid industrialization occurred in the 1950s. While land ownership of these large tracts was limited, the use of smaller plots for planting subsistence crops and constructing shelters within plantation boundaries by those working the fields was not uncommon. Also, because economic conditions in Vieques were especially harsh (both before and after US annexation), many residents lived almost exclusively off the natural resources afforded by the land and sea. By the 1930s, 95% of Vieques' population owned no land, and over 70% of the island was controlled by two sugar corporations (Barreto, 2002). Hurricanes that pummeled the island in the late 1920s facilitated this unequal land transfer. The per capita income at the height of the Depression was only $22 per year. Facing unemployment rates reaching 2/3rd the island's population, Viequenses fled to the adjacent US possession of Saint Croix, where they worked in the agricultural sector.

As unemployment increased and economic conditions regressed to pre-US conditions, Puerto Rican politics looked more favorably towards independence, and violence increased between nationalists and those seeking existing or stronger relations with the US. By the end of the 1930s, the US recognized the need to create economic stability in Puerto Rico and achieving military hegemony in the Caribbean; the former strategy was adopted partly to ensure Puerto Rican loyalty in the impending war, as well as a means by which to achieve the latter – military hegemony – goal. The central operation in the military strategy was the construction of Roosevelt Roads Naval Station, the largest US military complex in the Caribbean; once complete, the Navy estimated that the base would extend from southeastern Puerto Rico to the eastern islands of Culebra and Vieques, serving as the central station for much of the US and Allied Atlantic fleet. Unclear as to the future of western Europe and Axis intentions in the Caribbean, the US

considered the development of regional security, vis a vis the acquisition of eastern Puerto Rico and its adjacent islands, as a wartime imperative.

By 1939, the Puerto Rican government transferred public lands in Culebra to the Navy, and in the same year, the Navy began acquisition of plantations in Vieques (Barreto, 2002). Using the principle of eminent domain and greatly facilitated by US sugar quotas weakening Puerto Rican plantations, the Navy confiscated several properties in 1941, amounting to 21,100 acres at a cost of $1.04 million. Additional acquisitions accounted for another 4,340 acres at a cost of $520,400. By the end of World War II, the Navy became the largest landholder in Vieques. At the same time, the Navy confiscated 6,680 acres in southeastern Puerto Rico, thus completing the land acquisitions required for the construction of what McCaffrey (2002) calls the "Caribbean Pearl Harbor".
This larger complex was never completed. By 1943, military planners agreed that the German threat was minimal in the western Atlantic and Caribbean, and thus there was no need for a major naval base in southeastern Puerto Rico. This meant that construction on the base in Vieques and adjacent areas halted; with no military revenues to compensate for employment from expropriated sugar plantations, Vieques and its population entered a new stage of poverty. Furthermore, following the end of the war, the Navy decided that it would use the base as a training installation and fuel depot, such that Vieques would be transformed into a training and testing area, used for firing practice and amphibious landings (McCaffrey, 2002). Importantly, the Navy at this point revoked an earlier agreement with the Puerto Rican government allowing the lease of now Navy lands for agricultural purposes, planning instead for the forced relocation of all 10,000 residents to Saint Croix. While this action was prevented, the Navy retained all the land that it has acquired during the war, and it began enforcing evictions on much of that territory. An estimated 4,350 to 5,000 residents were relocated from acquired Navy lands to the remaining third of the island; however, the relocation was completed without title to the new land, thereby leaving residents subject to further evictions (Barreto, 2002).

Throughout the Cold War period (1945-1989), and especially in the 1960s, the Navy tried to evict residents from Vieques on several occasions. Its position following the rise of Castro in Cuba, the Cuban Missile Crisis, and Vietnam War resulted in Vieques remaining as a vital military installation built at a high cost ($100 million), and – in the interest of national security – all incompatible civilian activities would not be tolerated. Thus, while the Navy was unsuccessful in removing the entire 8,000 residents off the island in 1961 or acquire more land in the southern portion of Vieques in 1964, it was able to prevent all forms of tourism and other alternative economic development on Vieques (McCaffrey, 2002). Importantly, the Navy did not employ Viequenses either; the only form of income derived by the towns sandwiched between the western and eastern military lands were derived from funds spent by military personnel on leave (which also periodically increased civilian-military tensions). The legacy of Navy indifference and even veiled hostility to the civilian economic vitalization is manifest in the municipality's high childhood poverty rate (Mather, 2003), low per capita income ($6,489 in 1990), high unemployment rates, poorly developed infrastructure, lack of economic options, and most importantly, the increased health hazards inherited by the population.

Puerto Rican opposition to the Navy exercises on and occupation of Culebra and Vieques emerged in the 1960s and exploded in the 1970s. In 1975, the Navy surrendered its lands on Culebra to the Puerto Rican government, but it shifted its bombardments to Vieques (at a cost of $12 million). Protests intensified as the numbers of bombing exercises on Vieques increased; by the end of the 1970s, protest groups had coalesced from various factions of civilian society. Most important among these were the commercial fishermen who complained that the Navy was destroying coastal and marine resources; this group took to actively blocking Navy maneuvers.

By 1983, following the so-called 'Fishermen's War' (McCaffrey, 2002), the government of Puerto Rico and Navy signed the Fortin Accord, under which the Navy agreed to improve Vieques' economy; however, apart from hiring a few dozen residents for menial task around the bases, the Navy did not abide by the Fortin Accord. By 1989, when the Navy started evicting persons it identified as squatters on its private land and then constructing a fence to prevent further construction, the accord has collapsed completely. However, during all periods discussed up to this point, the Navy enjoyed an almost irreproachable position; that is, while the Puerto Rican government and civilian groups could and did protest Navy actions, they could not affect its base position, which called for its occupation and use of Vieques. This was made possible by the Cold War, which led all other national interests and shaped US actions for almost half a century. Thus, while the Navy had to acquiesce to allowing residents on the lands which their families had occupied for over a century, it did not need to do much more. Instead, it could (as it did) prevent the development of tourist resorts, claiming that such destinations would interfere with Navy operations. It could, with impunity, disallow traditional uses such as fishing, arguing that the waters were needed for more important, national security-related, bombardments. Most importantly, it could exercise control over a powerless society that had few, if any, recourses short of immigration. The Navy used the Cold War to its advantage also in combating protests, successfully framing opponents as potential communist sympathizers and nationalists (McCaffrey, 2002). As each protest period increased its momentum during the Cold War, it was always checked by more significant, world events. For example, as protests increased in the early 1960s, following the Navy's failed attempt to evict all Viequenses, the 1963 Cuban Missile Crisis revalidated the Navy's importance in the Caribbean. Similarly, as protests occurred with university campuses in the late 1960s, they were labeled as communist and against the Vietnam conflict. The 1970s fishermen protests were partly shut down due to the Navy's covert and successful effort in dividing protest groups into communist and nationalist factions, facilitated by the USSR invasion of Afghanistan in 1979. Thus, it was not until the fall of Communism in the late 1980s and the dissolution of the Soviet Union in 1991 that Vieques and its future could be extricated from Cold War complications, and it was precisely during that period – a lull in the security doctrine – when Vieques managed to secure its liberation from Navy occupation.

The seminal event in the 1990s that ignited protests leading to the 2000 Presidential Directive and subsequent Navy pull-out in 2003 was the accidental bombing of an observational post in eastern Vieques by two 500-pound bombs released from two F-18

fighter jets, which led to the wounding of four civilians and the death of civilian security guard David Sanes Rodriguez. Unlike with past protests, which the Navy and pro-Navy groups had managed to characterize as communists of nationalists, the coalition of groups that called for the end of Navy bombings in 1999 included a wide spectrum of interests, including the Puerto Rican government, student groups, veterans, the Catholic Church, the Evangelical Council, local and other environmental and conservation groups, and others. Moreover, the resistance to the Navy now took an even stronger anti-colonial sentiment than in previous occasions, as Puerto Ricans as a unified community sided with their Vieques' brethren in calling for the ouster of the occupying force. Most importantly, unlike during previous protests, there was no larger security interest that the Navy could use to justify its presence; the Cold War, which had so often enforced the military's pre-eminence in past civilian-military struggles concerning Vieques, no longer existed. The US had recently terminated base closures and contractions as a means by which to rein in federal spending and reduce military redundancy, the Vieques cause appeared not only politically expedient but also fiscally responsible (although, it must be noted that Vieques training exercises actually brought in funds from foreign governments – up to $40 million per year).

While bombing exercises were suspended in the wake of protests following the 1999 accident, the Clinton administration issued a directive on January 31, 2000, titled "Resolution regarding use of range facilities on Vieques, Puerto Rico (community assistance)" that called for the resumption of training exercises. The directive also called on the economic vitalization of Vieques, through the building of a ferry pier, establishment of an artificial reef program, improvement of roads, establishment of a youth training program, the preservation of Puerto Mosquito bioluminescent bay, and the completion of a development office to generate employment on the island/

In a separate directive, the Clinton administration stated that the registered voters of Vieques should decide via referendum in 2001 (later changed to 2002) if Vieques should continue as a bombing range; if the citizenry agreed to allow bombing, then the US Congress would consider providing up to $50 million in development and assistance for the western end of the island that was to be returned to the municipality and other interests in 2001. If the referendum led to a majority vote against bombing, then the directive called for the Navy's departure by May 2003.

However, due to increasing pressure, the incoming Bush administration announced in June 2001 – to much opposition from its own political party – that the Navy would unilaterally pull out Vieques in May 2003, handing over the eastern Navy lands to the Department of Interior (DOI). Because the polls showed a majority opinion against Navy operations in Vieques, it was clear that the referendum would have called for the Navy's withdrawal in any case; by announcing the pull out, the Navy gained two years worth of exercises that it may not have been able to complete otherwise (Sanger and Marquis, 2001).

As part of the initial transfer on May 1, 2001, the Navy relinquished 8,148 acres in western Vieques, of which 3,100 acres became part of the Vieques National Wildlife

Refuge, 800 acres as part of the Puerto Rico Conservation Trust, and 4,248 acres that were added to the Vieques municipality (see http://www.vieques-island.com/navy/development_proposal.html for a map of areas transferred). Finally, in May 2003, the Vieques National Wildlife Refuge increased considerably in size, to over 18,000 acres, obtaining another 15,500 acres of the former Navy bombing range in eastern Vieques and making it the largest national wildlife refuge in the US Caribbean (FWS, 2003).

b. Post-Navy conditions: project rationale in detail

While the Navy's departure did lead to the creation of a large and mainly intact protected area, separated by in the center by the municipality lands (see Figure 1), the coastal and marine environment did not receive such protection; that is, although the refuge contains many, unique resources, including some coastal habitats such as beaches and mangroves, its jurisdiction does not extend into the marine environment[1]. Thus, the US Fish and Wildlife Service (FWS), which manages the refuge, received no authority to mitigate impacts, control uses, and address other concerns beyond the land side of its coastal zone, rendering it effectively incapable of managing the refuge on an ecosystem level (i.e. implementing effective coastal zone management).

[1] There are two coastal and marine protected areas in Vieques, and both are located on southern coast of the island and both are managed by Puerto Rican agencies. The first, Balneario Sun Bay, is operated by the Compañia de Parques Nacionales, and it includes the several small islands and beaches to the east of the town of Esperanza. It has limited marine jurisdiction, and its objectives are to provide recreational opportunities that are compatible with resource conservation. The second marine protected area in Vieques is the Reserva Natural Bahia Puerto Mosquito, located to the east of Balneario Sun Bay and managed by the Puerto Rico Department of Natural and Environmental Resources (DNER). It includes the Bahia Puerto Mosquito, a famous bioluminescent bay, and extends nine nautical miles to the south from the coastline (Ballardo, personal communication).

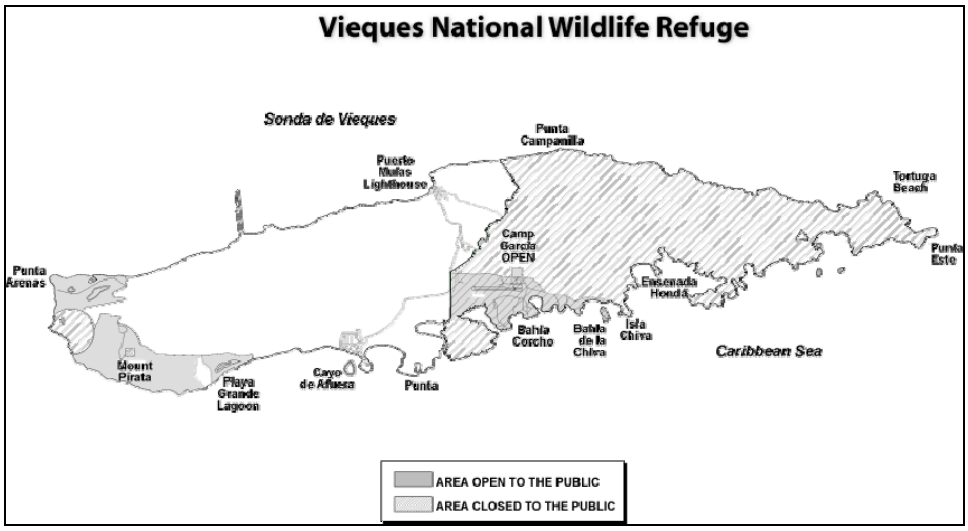

Figure 1: Vieques National Wildlife Refuge (URL: http://www.fws.gov/southeast/vieques/vieques_map.html)

Another issue that emerged following the departure of the Navy was the growth in tourism and related development. While not on the scale of other tourism destinations in the Caribbean and elsewhere, Vieques did commence to experience a rise in its real estate value and strong demand for properties across the island (Estudios Técnicos, Inc., 2004). This was coupled with the steady increase in the number of tourism-based enterprises, including guest houses, vacation rentals, and restaurants, among others. Concurrently, the municipality began considering affordable housing and other development projects within its boundaries (including the construction of the Mosquito Pier project). These upland and coastal development and gentrification projects may present a long-term threat to the island's coastal and marine environment.

Finally, and perhaps most importantly, the Navy's occupation of much of Vieques for more than six decades has fostered a strong sense of wariness among many of the stakeholders and residents towards management and related actions that they might perceive as being counter to the community's best interests. For example, many residents still do not agree with what they argue was the illegitimate transfer of Navy lands to the FWS, claiming that the rightful owners of the lands are the island's residents. Others believe that the FWS has merely replaced the Navy and that the designation of the refuge was a form of punishment by the federal government for the Viequenses' protests over Navy bombings. Thus, when considering the feasibility of marine protected areas as a management tool in Vieques, the project had to take into account these and related views (and indeed the socio-political history of the island); in part, it was via this historical lens that stakeholders could be understood, both in terms of their views on (coastal and marine) resource protection and the means by which to achieve such ends.

II. Methodology

The primary objective of the project was to determine the community (as defined as stakeholders) and visitor support for and expectation of marine protected areas in Vieques. Using a social science approach, the project evaluated the views shared by different stakeholder and interest groups and visitors on status of resources that encompass the coral reefs and associated ecosystems around the island of Vieques, a historical perspective on the status of these resources and whether there has been a decline in resource quality, present conditions and threats, and how best to conserve and protect those resources in the future. This approach was adopted as it conferred the following series of advantages on the research proposed:

1. The approach was relatively open-ended and thus allowed for a broad discussion on MPA management strategies;

2. The approach was targeted to a community level, such that it included a variety of views, including those of consumptive stakeholder groups, nonconsumptive stakeholder groups, special interest groups, public interest groups, and others; and

3. The approach incorporated both qualitative and quantitative aspects of social science in that it shall use tools such as semi-structured, expert interviews, as well as participatory mapping and visitor surveys, to complete a comprehensive characterization of community and visitor views on MPAs.

Finally, it is important to state that such the project relied on inputs at various levels, and with the expertise and cooperative linkages that the project contained, it was developed in a manner that the amount of information collected was maximized and that the results were applicable to other, similar areas.

In terms of methodology, each stakeholder and interest group interviewed was requested to provide information and views on similar themes; although the approach was diverse, in how each group is represented, interviewed, and assessed, the net result was the development *comparable set of indicators* that were then used to determine intra-group and inter-group similarities and differences. The themes explored included:

- Opinions on MPAs as marine managed area concept
- Willingness to accept MPAs as a management tool
- Preferences for participation in a designation process
- Type of institutional arrangement that MPA management should adopt
- Views on location, size, and regulations in an MPA
- Expectations of MPA functionality, adaptive management measures, research and monitoring frameworks, and long-term benefits
- Input on the preferred type of community interactions and participation in an MPA management system
- How MPAs should be financed, for maintenance and enforcement purposes

Apart from a literature review and cooperation with other initiatives, all of which were then used to develop this report, the field-based methodology consisted of stakeholder group interviews and visitor field intercept surveys. Each study is described in more detail.

a. Stakeholder group interviews

Stakeholder groups, defined as those groups whose members interact with and/or rely on the resources to be affected and which are a subset of the larger community, can be divided into two broad categories: consumptive users and nonconsumptive users. Consumptive users or stakeholders are comprised of all fishing interests, including commercial fishers, charterboat operators, and recreational anglers. The commercial fishers rely directly on the products (ex. fish and shellfish, among others) extracted from the coastal and marine environment. The charterboat operations may also rely on extractive activities, but they may also exercise catch-and-release guidelines. Moreover, their income is generated less from the product extracted, and more from the clients they take out fishing. Nonconsumptive users are comprised of an array of environmentally-friendly (or 'ecotourist') operations, including diver and snorkel charters, kayak and other light craft rentals, and birdwatching and other nature excursion guides, among others. These stakeholders also rely directly on the marine resources, but in a non-extractive manner. Their views on marine resources tend to be more preservation-based than those of their consumptive counterparts. However, both sets of stakeholders rely on a healthy ecosystem and are both affected by environmental degradation.

Under this effort, the project divided the populations of consumptive and nonconsumptive stakeholder groups into the aforementioned groups, and key members from each group were identified and interviewed.

i. Commercial and recreational fishers

There are several commercial fishery interests on the island, including finfish, crustaceans, and mollusks, among others. Fishing interests can further be divided into gear types. **Key interviews**[2] with fishing leaders (identified from the villa pesqueras (fish houses) at Puerto Mulas and Esperanza, for instance) were employed to test the project's key themes. Such an approach has proven successful with fishers from Biscayne National Park (Shivlani, unpublished data) and from the Florida Keys (Shivlani, Leeworthy, and Murray, 2001); also, a comprehensive trap fishing study has also yielded excellent cooperation from commercial fishers from Vieques (Shivlani, unpublished data).

[2] A small number (4-5 interviews per fisher type, based on species targeted) of key interviews can be used per location to evaluate spatial characteristics, resource use trends, and general perceptions, among other factors. Key interviews are rich in qualitative data and require conformity in methodological approach, such that it is preferable that respondents be selected for meaningful criteria (ex. tenure in fishery, leadership position, or fishing ability, among others) and that a single researcher conducts the key interviews.

Views of the recreational fishing sector can be obtained through various methods, including intercept surveys, charterboat (for-hire) interviews, and semi-structured interviews with recreational fishing organization representatives. Due to the small number of charterboat operations in the area (both within Vieques and from the mainland), the project utilized **semi-structured interviews** to determine charterboat operators' views on the project's MPA themes. A similar project has been undertaken with charterboat operators in four counties in South Florida (Die et al., unpublished data), as well as with flats guides and charterboat operators in Biscayne National Park (Shivlani, unpublished data); both experiences greatly assisted the current project's efforts.

ii. Nonconsumptive and ecotourism operations

Vieques boasts a wide variety of coastal and marine resources, including wide beaches, various coral reefs and associated ecosystems, and Reserva Natural Bahia Puerto Mosquito, which is among the most impressive bioluminescent bays in the Caribbean (Roston, 2003). Tourism, which has increased since the end of the US Navy presence on the island, fuels a number of nonconsumptive operations. These operations, consisting of dive charters and ecotourist guides, were interviewed using **semi-structured interviews** as part of the stakeholder interview process, where the operators were asked to provide their views on MPAs (similar to the themes described previously).

iii. Services industry

As part of the tourism economy, the services industry plays a major role in the development of tourism infrastructure (hotels, restaurants, and bar, among others) and is often a key employer in the region. Therefore, it was important in this effort that the services industry be queried on its views on MPA development and management themes in much the same manner that the other stakeholder groups were.

The project contacted all services industry representatives to promote participation, in the form of **semi-structured interviews**[3] with those owners and operators who were interested in providing their perspectives.

iv. Interest group studies

Within this task, interest groups were broadly defined as all those groups that are created to represent either general public interests (such as government institutions, civic organizations, watchdog groups, and others), other agency groups, and more narrowly-focused, conservation organizations, stakeholder interest groups, and all other types of nongovernmental organizations (NGOs). Examples of such groups in Vieques included the Vieques Conservation and Historical Trust (VCHT), the Committee for the Rescue and Development of Vieques, the Vieques Agricultural Extension Service, the Vieques Municipality Planning Department, the Puerto Rico Compañia de Parques Nacionales,

[3] The industry group representatives interested in participation were interviewed as part of the study. As with the commercial fishing industry, the focus of the interviews/focus groups was on reaching key members, as determined by tenure and importance to the local economy, among other criteria.

the Puerto Rico Department of Natural and Environmental Resources, and the FWS, among others.

As with the services industry, all such representatives were contacted and solicited to participate via **interviews**. These interviews, which were conducted on a one-to-one basis, were conducted in the same manner and considered the same themes as the other, stakeholder group surveys.

b. Visitor field intercept surveys

Visitor experiences often play a major role in the health of tourism-based economies. In Vieques, where almost all tourism is related to the island's natural attributes in general and especially its coastal and marine resources, visitors' views on the health of those resources may greatly affect the island's economic future. Visitors can also be used to defray many of the costs associated with increased protection, as they do on other Caribbean islands, with the implementation of user fees. Therefore, a visitor intercept survey was developed to provide much meaningful information on visitor opinions on MPAs, as well as on their willingness to financially support such a management system.

Visitors generally enter Vieques via ferry from Fajardo (on Puerto Rico's east coast) or by air from Fajardo or (less frequently) San Juan. The project conducted a 12-month **intercept study of visitors**[4], using a written questionnaire form. The intercept study sought to capture seasonal changes in visitor types (local vs. mainland US and foreign tourists), and it was conducted in a structured manner. Survey periods were undertaken at least four times per month, stratified by weekdays and weekends to account for visitor differences (following methodology by Shivlani, Letson, and Theis, 2003). Surveys were conducted at both air and seaports each month with only departing passengers. The questionnaire addressed many of the same themes described for other groups, but it also contained questions on visitor uses of resources, views on resource conditions, and willingness to pay for an MPA. Please refer to Appendix I for a copy of the questionnaire.

III. Results

The results from the project are described in terms of the stakeholder studies and visitor field intercept surveys. The following section discusses the significance of the results and presents inter-group analyses.

a. Stakeholder group studies

[4] The intercept study included a short list of questions that can be answered in four minutes or less per questionnaire, and which related to issues concerning visitor experiences, views on resource quality, likelihood to return, and willingness to support MPA designation and management.

Within the stakeholders, field research conducted between October 2004 and June 2005 identified the following set of stakeholders: commercial fishers, water operators (including mainly nonconsumptive water operators), nongovernmental organizations, and local, commonwealth, and federal governmental and management agencies. The results for each stakeholder group are described in more detail.

i. Commercial fishers

The study identified a total of 30-35 full time commercial fishers on the island, although other data sources suggest that there are as many as 70 commercial fishers that operate in Vieques (Matos, personal communication). The number determined for the study was obtained via discussions with commercial fishing leaders on the island, the fish house (villa pesquera) in Isabel Segunda, and other, informed fishers. Using an informed interview format, due in part to the timing of the study and effort needed to interview other stakeholder groups, the emphasis was on conducting key informant interviews. The questions selected for the interviews (and which were used as a template across user groups) related to the themes described in the methodology and which addressed use information, views on resources, and preferences for marine protected areas, in terms of areas to be protected and the most preferred form of management.

A total of 14 commercial fishers and fishing operations were interviewed as part of the study; each interview lasted an average of 45 minutes, but several interviews were also conducted over multiple days. The emphasis, as previously stated, was on interviewing those fishers who could provide long-term, reliable data (and those were trusted and even recommended by their cohorts). The fishers interviewed were generally very experienced, as the average tenure in the fishery was 25.7 years. The sample also represented a full-time fishery, as the average number of days reported fishing in a year exceeded 240 days (241.6 days).

As shown by other studies (see, for instance Agar et al., 2006), the fisheries in Vieques are generally mixed, in that fishers often target various species in a single trip. The most common gear types reported were SCUBA and hook and line, with many fewer trap fisheries. The latter gear, due to its high fixed costs (Agar et al., 2006), may in fact be on a permanent decline in the region, as the few remaining trap fishers on the island are those who fish the southern coast (Ventura, personal communication).

The species targeted included a mixture of mollusks (namely queen conch), crustaceans (primarily spiny lobster), and a variety of reef and migratory (especially king mackerel) finfish. Also, the species targeted appears to be mainly seasonally driven and especially so in the queen conch fishery, which has a closed season (July 1 – September 30 of each year). Other species, such as spiny lobster and certainly migratory finfish, are landed more frequently in the winter months (January to March).

Some of the fishers interviewed often complained of not having a location where to sell their catch on the southern side of Vieques, as the only fish house is located in Puerto

Mulas in Isabel Segunda (on the north coast). As such, landings are either sold to the single fish house or shipped directly to mainland wholesalers. There is also a small local market (i.e. restaurants) of mainly high value species.

The fishing areas reported by the sample relate to the entire fishery; that is, the key informants were asked to provide information for where certain species were targeted and landed, such that the catch area information provided in the following figures relates to the Vieques commercial fishery.

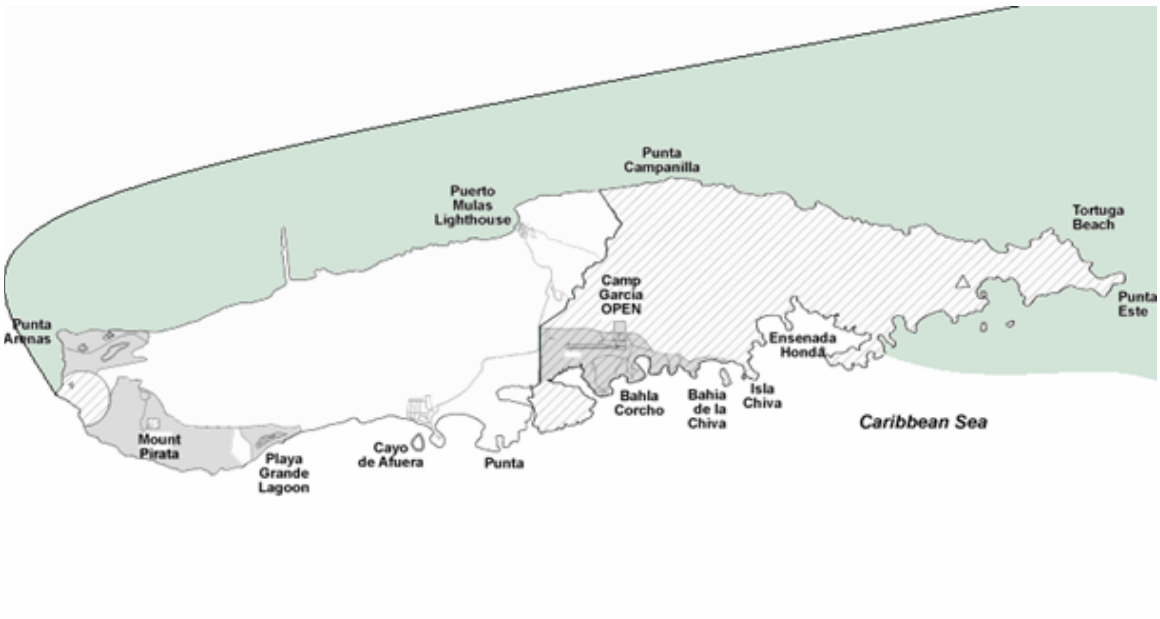

Figure 2: Conch and lobster fishing in Vieques

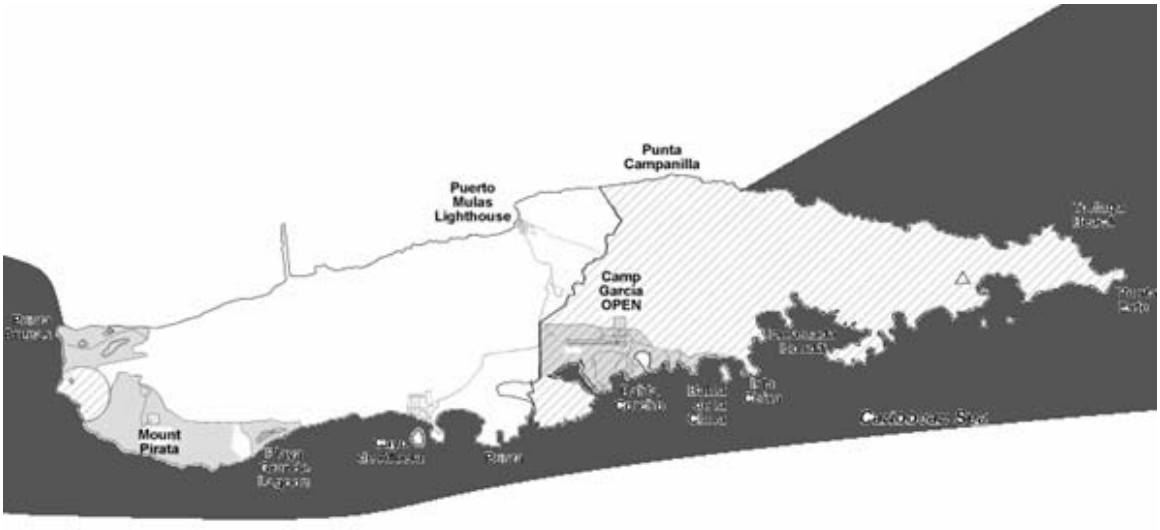

Figure 3: Trap fishing in Vieques

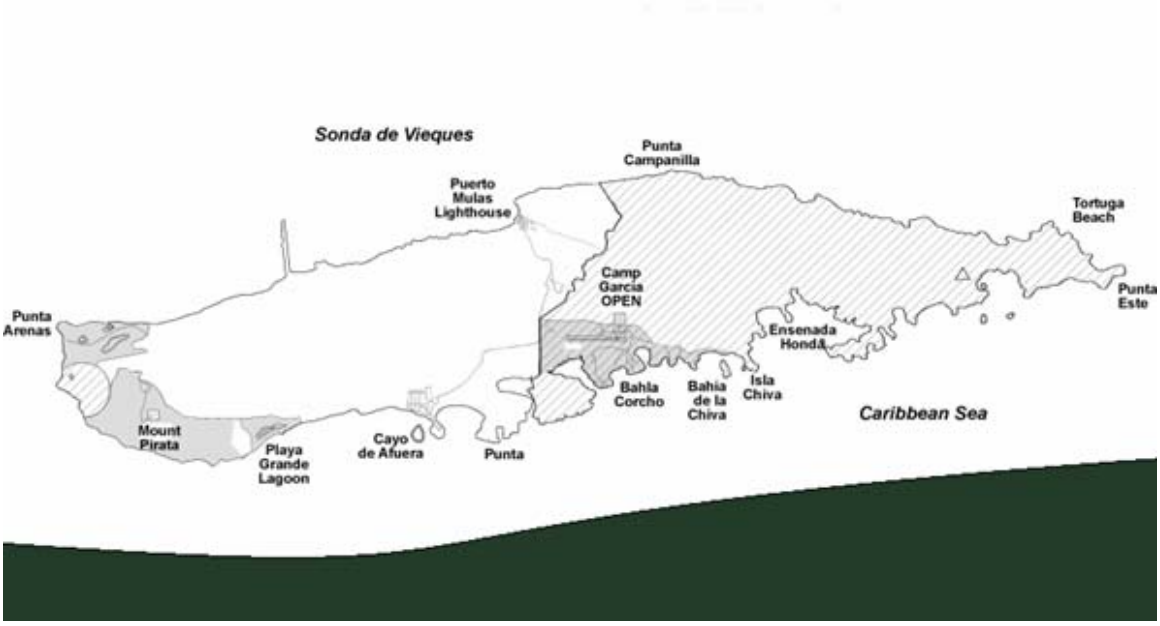

Figure 4: Deep drop fishing in Vieques

As shown in the previous three figures, commercial fishing in Vieques – as reported by the key informants – is spatially discrete in terms of species targeted and gears utilized. Conch and lobster fishing, which occurs in the shallow waters between the islands of Vieques and Culebra, is usually conducted using SCUBA, and the exponents of this gear tend to mix their trips, landing mostly conch, but also using spearguns to target reef fish and other finfish. Also, it should be noted that the figure showing conch and lobster catch is mainly a gear-derived, use map. Thus, there is some lobster fishing using trap gear on the southern side of Vieques, but it is only on the northern sides (due primarily to habitat conditions and depth) that SCUBA dominates fishing gear.

Within the figure showing trap use, it shows that trap fishing is least common on the northern side of Vieques. While it is certain that trap fishing has declined considerably in Vieques over the past few yeas (Ventura, personal communication), the use of traps has remained most resilient along the southern coast. Thus, the range of trap use may in part be a function of how far the southern Vieques fishers place their traps. Also, it should be noted that in an earlier study, Agar et al. (2005) reported extensive trap use off much of Vieques; part of this effort originated from eastern Puerto Rico, especially off the ports of Fajardo, Naguabo, and Palmas del Mar. Thus, while the figure depicting trap use for Vieques fishers off Vieques is accurate, it does not represent all trap use off the island.

The final figure showing fishing area use shows the importance of the drop-off areas in southern Vieques, where several fin fish fishers reported targeting mainly migratory pelagics and even some deep-water reef fish during the winter months. These areas, unlike those targeted by the aforementioned trap and SCUBA gear fisheries, are less

accessible to gear other than specialized hand-lines and are highly seasonal in terms of their production.

As per their perceptions on resource conditions, the fishers interviewed generally believed that both nearshore (sea grasses and related resources) and offshore (coral reefs and deeper water habitats) were stable or improving. Almost all the fishers who qualified this answer stated that the main stressor affecting these resources had been the Navy and its bombing and related activities. Because these activities had ceased as of May 1, 2003, the respondents believed that coastal and marine habitats had improved. Asked as to what might still serve as a main stressor to the island, fishers usually pointed to development as a potential (or actual) source, as well as the chronic conditions that have lingered as a result of the Navy's activities during its long occupation. Few fishers pointed to unhealthy fishing practices or overfishing as a stressor, and most actually argued that fisheries were well managed, sustainable, and improving.

Finally, fishers had a diversity of opinions on MPAs, in that several felt that there should be seasonal closures (as currently exist for certain species), others felts that activities other than fisheries need to be restricted, and a few even called for preferential access rights for commercial fishing. However, most fishers were in agreement that nearshore areas (i.e. bays, sea grasses, and other near shore habitats) should be prioritized for protection. Their views were often motivate by self-interest, in that the respondents generally identified shallow bays as nursery areas for commercially important species; also, because these areas were often the least important fishing areas, fishers may perceive losing less fishing grounds if such areas were protected. Many fishers stated that the southern coast of Vieques, from Puerto Bahia Mosquito eastward to Ensenada Honda, should be prioritized for protection (though not necessarily as a marine protected area).

The respondents did not agree on the agency that should take the lead in protecting Vieques' marine environment but several called for the strengthening of the capacities of existing agencies, especially in terms of enforcement and monitoring. A minority believed that co-management should be considered as a primary management strategy to achieve fisher participation in any MPA management plan.

ii. Water operators

Using a variety of approaches, the study identified between 15 – 18 water operators in Vieques[5]. The first approach was that of using the published water operator list in the local newsletter, from which each operator was contacted. The second approach was to use advertisements while on the island, to ensure that those operators who were not listed in the newsletter were nevertheless contacted. Finally, the third approach was to ask knowledgeable operators and other stakeholders to provide names of water operators.

[5] The multi-pronged approach used to determine the water operator population in Vieques was modeled on a similar approach used with Florida Keys dive and snorkel operators in an earlier study (Shivlani and Suman, 2000).

The final water operator list developed consisted of between 15 – 18 operators; the final total could not be ascertained as three operators could not be contacted. While it cannot be confirmed that these operators had exited the industry, it should be noted that there has been considerable flux in the number of participants in the water operator industry, which has proliferated especially after the Navy's departure and which has includes several, part-time participants.

The water operations identified consisted of kayak operations that organize and conduct guided tours to nearshore (to primarily mangrove, but also seagrass and coral reef, habitats), snorkel and dive operators who organize and conduct trips to dive sites around the island, sailboat operations that offer mixed, half to full-day tours to either the southern or northeast side of the island, a single fly and deep sea charter fishing operation that takes out anglers to inshore flats, reefs, and drop off areas, a single electric boat operator that takes out visitors to Puerto Bahia Mosquito, and a single personal watercraft operator that rents PWC on the southern end of the island. Because there were very few consumptive water operations, it was decided that all water operations would be considered as a single stakeholder group.

A total of 11 water operators were interviewed, using a modified version of the interview questions employed for the commercial fisher and other interviews. Thus, operators provided use information, trends in resource conditions, and views on MPAs and preferences on MPA management. Interviews were generally lengthy, with the average lasting over an hour; this was due to the amount of information that the respondents provided, on both the study issues and other ancillary topics related to resource management in Vieques. The latter information is described deemed relevant.

Most of the water operators interviewed were relatively new to the area. The average number of years in operation for an operator was 7.0 years, although over a third (36.3%) that had been operating for a decade or more. Also, 45% of the operations were from the US, while only 27% were from Vieques. This is an important point when discussing prevailing views on equity and displacement, both issues that were central themes during the study and which will be discussed in a later section.

Operators took 12 or fewer visitors on each trip. This is partly due to the nature of some of the operations (ex. sailboat and other vessel tours cannot accommodate a large number of passengers, fishing charters are usually taken with a few clients, etc.), the result of regulations (ex. there is a limit of 30 kayakers per authorized operator per day in Puerto Bahia Mosquito Natural Reserve (Ballardo, personal communication)), and because of the still low visitor totals to the island. Operators also reported taking an average of 207.8 trips per year, but this varied considerably by operator type, season, and weather conditions. Effectively, water operator use rates are low compared to other, more mature tourist economies (see water-based operator use rates in the Lower Florida Keys (Thomas J. Murray and Associates, 2005)).

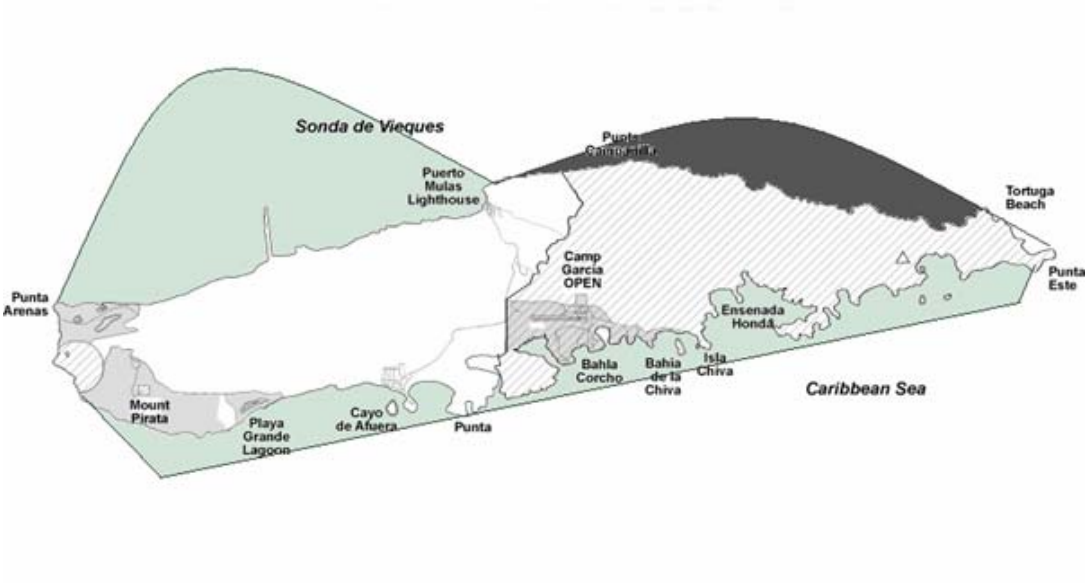

Figure 5: Diving and snorkeling off Vieques

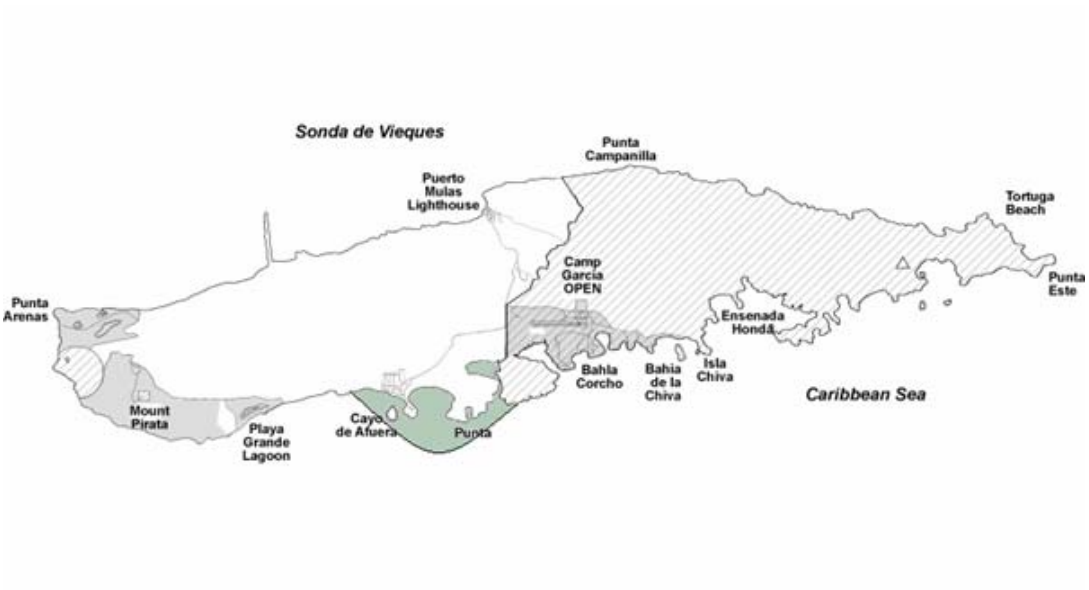

Figure 6: Kayaking (ecotourism) off Vieques

As shown in the two figures above, water operators used distinct areas for different activities. For example, although much of the island was utilized for diving and snorkeling activities, the most popular destinations for such activities were the islands located off north-central Vieques (such as Caballo Blanco and other reefs northeast of Mosquito Pier) and northeastern locations such as Cayo Yayi. Similarly, operators reported visiting various sites on the southern portion of Vieques, which contains unique and well-developed reef areas (see for instance www.nanseacharters.com for a description of local diving in Vieques). Thus, there were definite hotspots that operators identified as attracting a majority of use and/or trips.

In terms of kayaking and related ecotourism activities, the use maps as provided by the operators suggest very circumscribed areas of use. These are almost all centered around the most important location as stated by such operators: Puerto Bahia Mosquito Natural Reserve. Operators reported either entering the bay from the bay's coast or taking kayak trips to Cayo Afuera from Esperanza. This use profile was in part a result of the importance of the reserve (and its bioluminescent bay) and the fact that as of 2005, concession-sanctioned in the Vieques National Wildlife Refuge had not been awarded (Diaz, personal communication); thus, water operators could not use the otherwise attractive western end (ex. Kiani Lagoon). However, the use profile did demonstrate that unlike other users, the kayak operators are highly dependent on a very small area which, if impacted, may affect the entire industry.

With respect to views on resource conditions, water operators tended to agree that nearshore resources are in better condition than their offshore counterparts, a pattern that they blamed on past Navy activities. Much as the commercial fishers, water operators felt that with the Navy's departure, the offshore resources would start to improve. Operators also shared a concern over the condition of Bahia Puerto Mosquito, which they perceived is being impacted by light pollution and increased sedimentation; these views were most often shared by members of conservation groups (to be discussed later). When asked about stressors, only a few operators felt that fishing was affecting the island's coastal and marine environments; a majority believed that development is the main, long-term threat to the island's sustainability and the factor that most needs to be addressed.

Almost 80% of the water operators interviewed, or the largest majority among all the stakeholder groups, were in favor of MPAs that restrict or disallow access. This could be explained by their activities, which tend to be mainly nonconsumptive, but it may also be a reflection on their understanding of the connections between the health of the marine ecosystem and the economic success of their activities. Among the areas that water operators argued would serve as good MPA sites were:

1. The entire southern end of the island, from Playa Grande east to Punta Este.
2. The shallow bays in southern Vieques, from Sun Bay to Ensenada Honda.
3. The sea grass beds in northwest Vieques, extending west from Mosquito Pier to the southwestern tip of the island.

Operators were less in agreement over the management agency that should lead the development process for MPAs or in terms of the process to be adopted to designate MPAs, but – like some of the commercial fishers who argued for co-management – operators tended to favor a participatory approach that would ensure stakeholder engagement and input. Finally, operators argued that any such plan must include a strong enforcement plan[6], by which protected areas and resources can be effectively monitored.

[6] The view concerning enforcement was often raised by different stakeholders, all of whom argued that unless enforcement is made an integral part of a management strategy, it is most likely that MPAs or any other form of resource protection will inevitably fail. Such views were largely shaped and reinforced by

iii. Services industries

The main establishments selected to be included as part of this stakeholder group were those that have a strong interest in the tourism industry. Accordingly, the study focused on completing interviews with a census of hospitality centers (i.e. guest houses, bed and breakfast establishments, etc.). As with the water operators, the hospitality centers were identified using a variety of approaches, including using lists from the local newsletter, conducting internet searches, and using key contacts to build up the population list. The survey developed for hospitality centers was different than that used for stakeholder groups that directly interacted with the coastal and marine environments, and thus many of the questions were directed at obtaining views on the importance of Vieques' marine resources to the group's economic vitality and sustainability.

A total of 20 (out of 27) establishments participated in the study, which represented a response rate of 74.1%. In all cases, the surveys were conducted with either the owner or manager of the hospitality center.

A majority of the establishments interviewed were located on the southern side of Vieques, where most of the tourism-based lodging and restaurant businesses are located (i.e. in the town of Esperanza). The average length of operation was less than a decade (9.7 years), suggesting that the industry – with some exceptions – had only recently begun developing. However, even with the recent development, only three, or 15%, of the businesses were owned and/or operated by Viequenses. As with the water operators, where most were not originally from Vieques, it appears that there is considerable outside ownership, or at least ownership that moves into the island. These discrepancies in local participation rates, especially following the Navy's departure, has perpetuated the sense of mistrust among many Viequenses that existed during the struggle to extricate the Navy and presents a challenge if and when marine protected areas are proposed as a management option (i.e. where it might be perceived as an outside management tool brought in to further disenfranchise local, Viequenses from their natural heritage).

Not all hospitality centers provided guest statistics, but those that did (n = 5) reported an average of 2,700 guests per year. Over half (52%) of all hospitality centers stated that the number of their guests had either increased (42%) or stayed the same (10%) over the past three years; the average percentage of return guests was high, as 39% of the respondents reported hosting return guests.

When asked about their interactions that their guests had with the marine environment, almost all of the centers believed that their guess visit Vieques to relax and/or to recreate on the island's beaches. Importantly, over 67% of the sample reported that an important guest activity was visiting the bioluminescent bay (Bahia Puerto Mosquito Natural Reserve). Accordingly, all centers felt that the condition of coastal and marine resources is very important for their businesses.

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the current conditions in Vieques, which such respondents felt is currently under-enforced or completely unenforced.

As per their views on resource conditions, a majority of the centers stated that they could not assess the status of coastal and marine resources, but the few that felt that they could mostly believed that nearshore and offshore resource conditions were either the same or had improved. These views are very closely aligned with those of the commercial fishers and water operators, both of whom felt that the exit of the Navy has greatly improved coastal and marine resource conditions.

When asked about the main stressors to the marine environment, respondents believed that development (37%), pollution (21%), and fisheries (11%) were most responsible. Over two thirds (68%) of the centers argued that if increased development were to lead to a diminished natural resource base in Vieques, that it would have a negative impact on tourism. However, under opposite conditions, or those leading to increased protection of the island's natural resources, 63% believed that it would have no impact on visitation rates. Over half (53%) of the sample was against implementing MPAs in Vieques, perhaps due to their views on how increased protection may affect access to sites and subsequent impacts on tourism; however, the same percentage of centers (53%) argued that if there were to be an MPA in Vieques, it should be managed by a federal agency.

iv. Interest groups

As stated in the methodology, the groups interviewed as interest group stakeholders included governmental agencies and nongovernmental organizations (NGOs) that have a stake (in terms of management, consultation, or other oversight or advisory role) or involvement with Vieques' coastal and marine resources. The agencies and groups interviewed included the Fish and Wildlife Service (FWS), the Department of Natural and Environmental Resources (DNER), the Vieques Municipal Government Department of Planning (VMGDP), the Vieques Agricultural Extension Service, the Committee for the Rescue and Development of Vieques (CRDV), and the Vieques Conservation and Historical Trust (VCHT).

Unlike the semi-structured interview format utilized for a majority of the other stakeholder groups, the interest groups were interviewed with only a few, key themes related to the study: the current state of Vieques' coastal and marine environment, existing or planned management strategies to address marine conservation in Vieques (and potential gaps in management), and views on MPAs as a management tool to address marine conservation in Vieques.

Within the governmental sector, all agencies agreed for the need to improve marine protection in Vieques. The FWS, which oversees approximately two-thirds of the island but has no jurisdiction on the adjacent, marine ecosystem, believes that there is a strong need to harmonize protection across the coastal zone (i.e. the land-sea interface). This would both strengthen management for the connected, terrestrial and marine habitats and would enable consistent (or at least comparable) levels of protection within the coastal zone. Similarly, DNER, which manages the Bahia Puerto Mosquito Natural Reserve,

perceives the need for more integrated management to address land-side impacts that are affecting its reserve, especially in terms of increased sedimentation and light pollution. The VMGDP has more immediate concerns that it feels that must address than coastal and marine protection and argues that since its jurisdiction does not extend beyond the shoreline, that it is the responsibility of the Commonwealth of Puerto Rico (more so, DNER) to monitor for and mitigate against coastal and marine impacts. The VMGDP does acknowledge, however, the importance of the marine ecosystem for the well-being of the island, but it believes that affordable housing and providing basic services to the community present more immediate challenges. The nexus of the governmental concerns in each agency needing to collaborate with the others in attempting to better manage its resources and meet its needs, but it is also clear that none of the agencies alone possesses the required jurisdiction or capacity to be able to arrive at an integrated solution (this theme, concerning the need for integrated coastal management, is considered in the following section).

Among the NGOs, the main issues that arose via six, key informant interviews with members of CRDV and VCHT[7] included the need to better protect the island's coastal and marine resources from development and especially resort-style development, to ensure the sustainability of Bahia Puerto Mosquito Natural Reserve by mitigating sedimentation and light pollution impacts, to engage the local, Viequenses community in any coastal and marine resource protection planning process, and to promote the local ownership of water-based operations and businesses. The NGOs stated that their fear is, unless it is prevented, Vieques will be converted into a resort destination, and that development impacts will largely disenfranchise local communities and accelerate environmental degradation. Much like their governmental counterparts, NGOs did not express a preference for MPAs but did call for the need for effective enforcement of existing, protected areas (ex. Bahia Puerto Mosquito Natural Reserve).

b. Visitor field intercept survey study

The visitor field intercept survey study commenced in late 2004. The survey questionnaire (see Appendix 1) developed for the study was finalized in November 2004 using a template implemented in a similar study conducted with visitors to Culebra, Puerto Rico (Loftin, 2005), and the year-long survey effort commenced in December 2004 and ended in November 2005. Overall, a total of 306 surveys were completed during the survey effort, at an average of 6.4 surveys per session (over 48 sessions, or four sessions per month); the range of surveys completed was 3 to 12, due to peak and off-peak seasons.

[7] CRDV was formed during the struggle to extricate the Navy from Vieques and then to promote sustainable and equitable development on the island in the post-Navy era; VCHT has centered on outreach and education activities concerning the natural and cultural history of Vieques, and it has a focus on the monitoring of Bahia Puerto Mosquito Natural Reserve.

Over half of the sample (52.6%) surveyed was from Puerto Rico, of which 12.1% were Vieques residents. Of the 47.6% non Puerto Rico visitors, 6.7% were foreigners (i.e. non US-based visitors).

Travel groups ranged considerably, from as few as single visitor to groups as large as 56 persons. The average group size was 3.7 persons. Over a third of the visitors (36.3%) reported having taken a single day trip, and among the 63.7% who stayed overnight, the average length of stay was over 3.8 days.

Just over 52% (52.3%) of the visitors reported that this was their first trip to Vieques, and the top ranked reasons for the trip were beaches (36%), relaxation (30.1%), snorkeling or diving (5.2%), or visiting Bahia Puerto Mosquito Natural Reserve (2.6%).

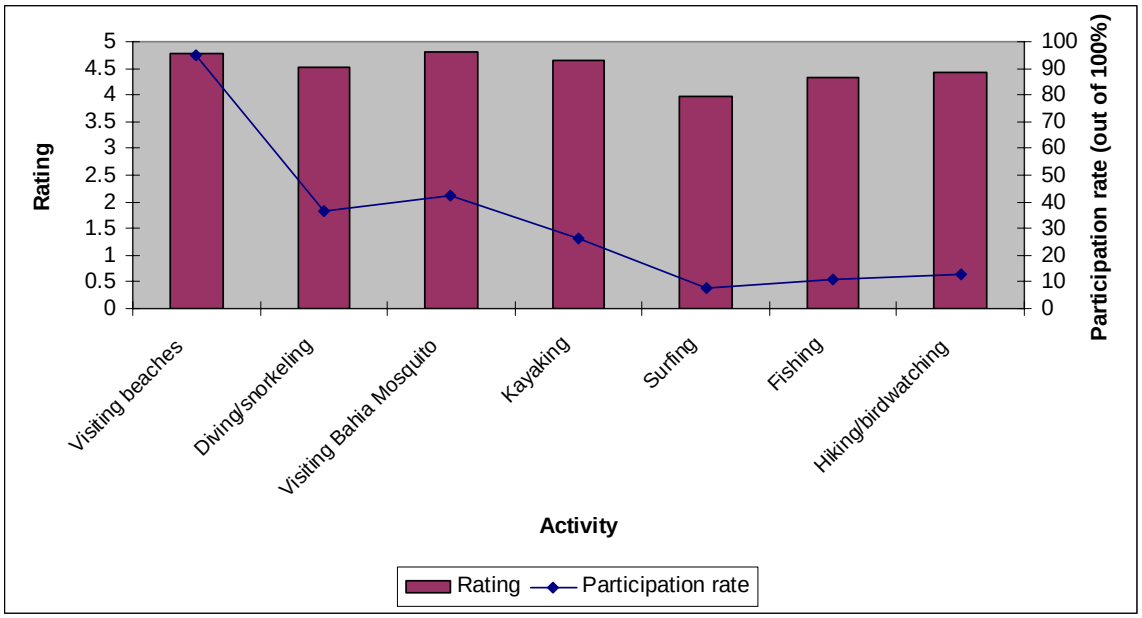

Figure 7: Vieques activity participation rate and rating

Participation rates were highest for activities such as visiting beaches (95% of the respondents stated visiting one or more beaches while in Vieques), Bahia Puerto Mosquito Natural Reserve (47%), and diving or snorkeling (37%). Less than 30% of the respondents reported kayaking, surfing, fishing, or birdwatching or hiking. Thus, coastal and marine-based activities were very important to visitors and all garnered highly positive reviews. On a scale from 1 (poor) to 5 (excellent), all activities were ranked 4 or higher, with Bahia Puerto Mosquito Natural Reserve obtaining an average ranking of 4.82/5.00.

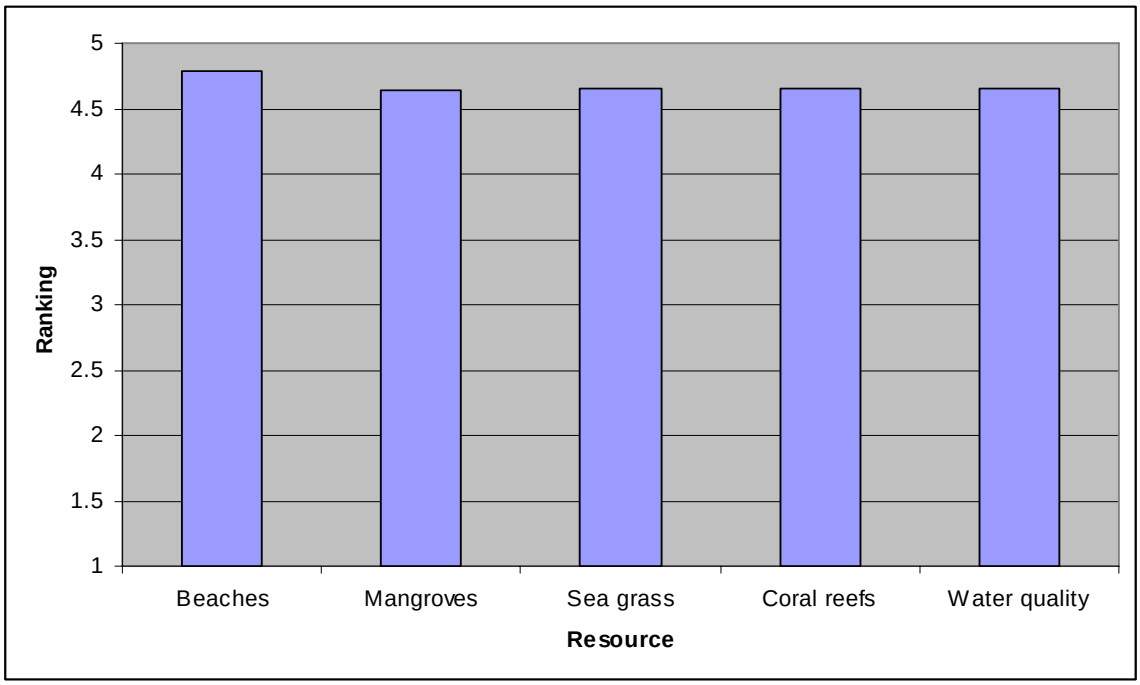

Figure 8: Average rankings for selected resources in Vieques

Most visitors ranked each resource that they encountered in excellent condition; the average ranking for all selected resources was over 4.5/5.0 on a scale from 1 (poor) to 5 (excellent), suggesting that visitors to Vieques greatly approved of the condition of the island's beaches, mangroves, nearshore and offshore habitats, and water quality.

Altogether, visitors were generally very satisfied with their Vieques trip. They ranked their trip as excellent, or as a 4.75/5.00 pm a scale from 1 (poor) to 5 (excellent). Importantly, due to their experience, visitors were very likely (4.51/5.00) to return to Vieques (scale from 1 (very unlikely) to 5 (very likely)).

Visitors next provided total trip costs, as broken down by various categories. On average, visitors reported costs for 2.2 persons. Lodging costs averaged $136.50, groceries $28.51, restaurants $121.68, ground transportation $68.83, water excursions $30.57, land excursions $1.83, and souvenirs $10.87. However, there was considerable variance in the reported costs, suggesting that there was a large range in what visitors spent. However, when compared to mature tourist destinations such as Key West, Florida (Thomas J. Murray and Associates, 2005), it is clear that visitor expenditures are still relatively low in Vieques.

When asked about their views on MPAs around Vieques, 94.1% of those surveyed favored establishing a marine reserve or MPA around Vieques, and only 3.6% opposed. Among the sample who provided a size for the MPA (n = 191), the average percentage of Vieques' marine environment that should be protected was 36%.

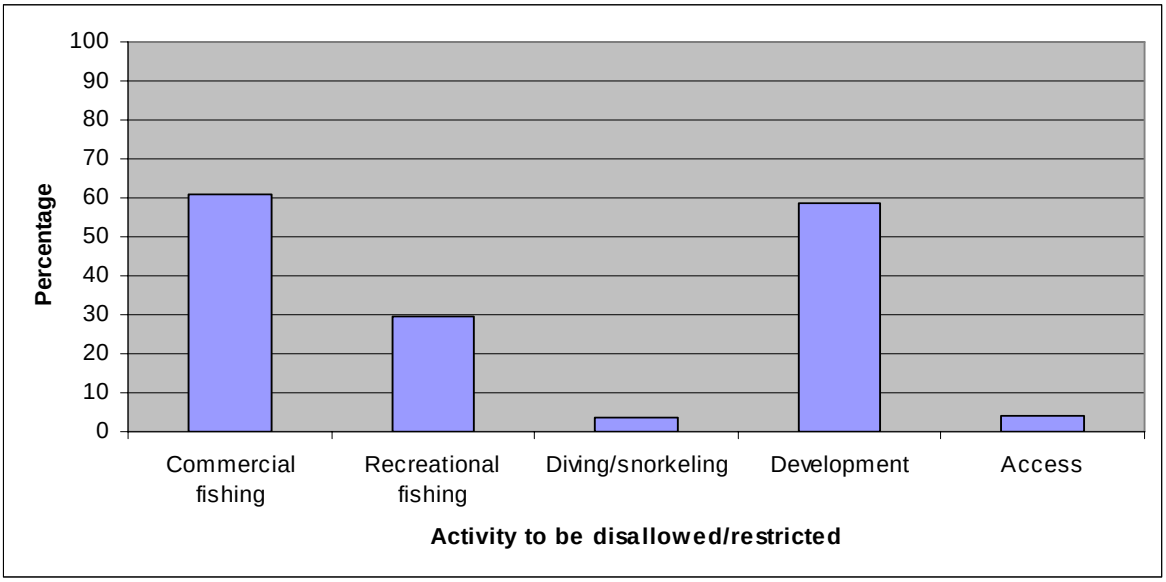

Figure 9: Activities to be disallowed in an MPA in Vieques

In terms of what activities should be prohibited in an MPA in Vieques, over 61% of the respondents argued that commercial fishing should be disallowed. A similar percentage, or 58.8%, felt that development should also not be permitted in such areas. Fewer than 30% and less than 5% argued that recreational fishing and diving and snorkeling represented incompatible uses in an MPA, respectively.

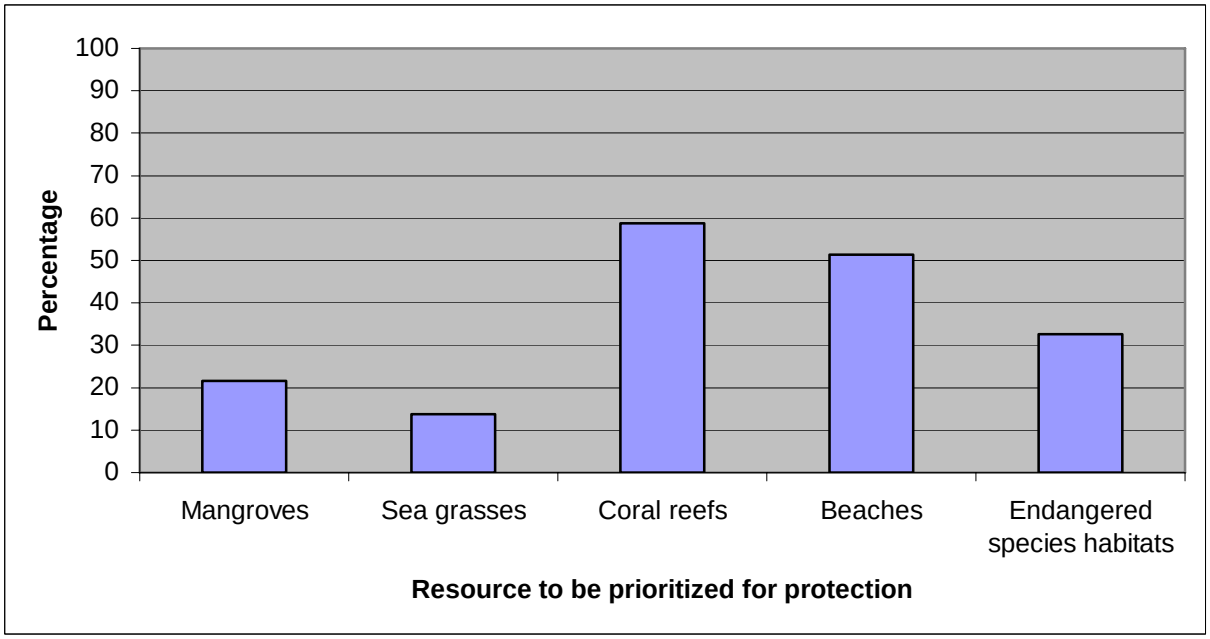

Figure 10: Resources to be protected in a Vieques MPA

Visitors felt that of all the coastal and marine resources that an MPA should protect, coral reefs (59%) should be prioritized for protection, followed by beaches (51.3%). As shown earlier in this section, most visitors (95%) did recreate in beaches but fewer (37%) took a dive trip or snorkeled off the island; thus, the visitors' views on coral reefs may be more related to the importance they place on the resource regardless of direct experience.

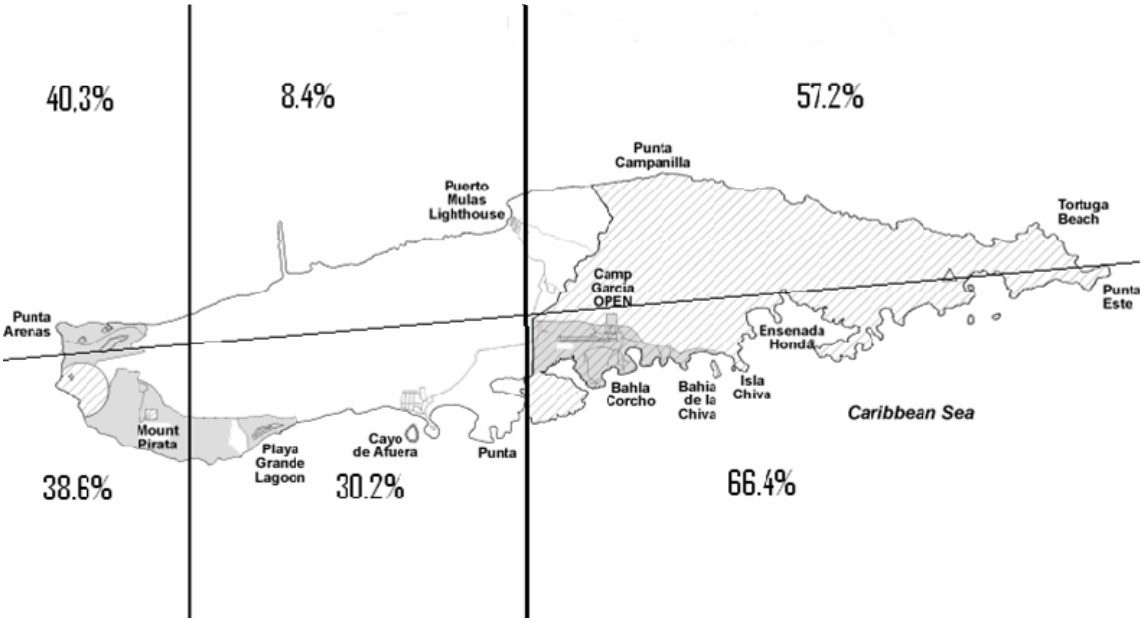

Figure 11: Location for Vieques MPA

When asked about where an MPA should be sited, only 38.9% of the sample identified an area to be closed, and among those who stated a preference for an MPA, the water adjacent to the existing, Vieques National Wildlife Refuge (especially the southeastern part of the refuge) dominated as a potential site. It should be noted as well that most visitors did not recognize locations on the map provided to them to select a site, so their site selection may have been greatly influenced by their experience in recreating in the refuge.

Visitors were also requested to state their willingness to pay for an MPA in Vieques as an annual fee (rotated between $1 to $20, in increments of $5) under the assumptions that they would enjoy exclusive access into the MPA, that the funds would be provided solely for site protection, maintenance, and education, and that the funds would be collected as a ferry (or air) ticket surcharge. A large majority, or 91.2%, was willing to pay something but not necessarily the amount that they were proferred, and the average willingness to pay was $6.30 per person as a surcharge on the ferry or airline ticket.

IV. Discussion

This section focuses on the themes introduced in the previous section, as these relate to the project's objective of determining and comparing areas of preference for marine protected areas in Vieques, Puerto Rico, between different stakeholder groups and

visitors. Also, the section addresses the nascent (and in some cases, immediate) issues encountered during the fieldwork in Vieques to discuss how these emergent conflicts and shortcomings may affect the steps forward in MPA development; it is suggested that unless issues such as enforcement, participation, and equity are not included in the framework of MPA planning process, that such a process may not yield an MPA effective of achieving its biophysical objectives.

In reviewing the project's primary objective, that of determining "community (including visitor) expectations of and support for MPA management in the offshore coral reefs and associated ecosystems off the island of Vieques, Puerto Rico" (Shivlani, 2004), the various studies in the project addressed this central issue. However, the studies did so in a critical manner and without simply gauging public opinion. Instead, the approach applied was similar to that which could have been used for other scientific endeavors, where the steps of population estimation, modes of data collection, and data analyses were formulated ahead of field-based activities. The central reason for applying the level of objectivity in this exercise was to ensure that the results obtained thus represented the socioeconomic (or human dimensions) aspects of an MPA development framework (as described in, for example, Christie et al., 2003). As such, there were no expectations of 'finding' the right combination of stakeholders and visitors that would assist in determining the areas conducive for and uses compatible in a local MPAs. Similarly, there were no prior arrangements for identifying which planning process would maximize the successful incubation of an MPA and MPA management process. Effectively, the project did not seek to discover conditions that may foster MPAs in Vieques; instead, its aim was to, in a scientific manner, ascertain current levels of understanding of and support for MPAs in the Vieques community and visitor groups.

a. Inter-group comparisons: Stakeholder and visitor group studies

The various studies in the project led to completion of over 300 visitor surveys and over 50 detailed, structured and semi-structure interviews that were used to identify groups' views on the current resource conditions and resource trends in Vieques and willingness to support MPA designation and management. While the information provided by each group was previously presented, the central findings are presented in summary format in the following table as a means by which different groups can be compared.

Comparison between Vieques stakeholder and visitor groups on marine environment conditions and levels of MPA support

Group	*Interaction with marine environment**	*Views on conditions*	*Views on stressors*	*Level of MPA support***	*MPA agency****
1. Commercial fishers	High	Improving, stable	Navy	Medium	Co-management
2. Water operators	High	Stable	Navy, development	Medium to high	Collaborative management
3. Hospitality centers	Low	N/A	Development	Low	Federal
4. Interest groups	Low to medium	Stable, worse	Lack of enforcement/development	Medium	Integrated coastal zone management
5. Visitors	Medium	Stable	Fishing, development	High	No stated preference

* refers to the frequency of use within the marine environment and knowledge of conditions derived from personal observation.
** derived from group summary views on MPAs as a management tool.
*** relates to which management strategy would be most accepted and/or what type and level of agency is required for effective MPA management.

As shown in the previous table, while there are many areas in which the different stakeholder groups differ, a majority of these groups and visitors generally exhibit medium to high levels of support for MPAs (with the exception of the hospitality centers, whose low support may be a result of their believing that MPAs may exclude activities which would lead to lower visitation rates in Vieques). It is also important to note that a majority of the groups (and all of those that interact with the marine environment on a medium to high basis) agree that conditions are generally stable. This is an significant consensus as it suggests that there is a commonly held perception within the different groups that coastal and marine resources are in a condition that can be maintained (with or without changes in management, depending on the user type). Also, many of the groups believe that the main stressor to the island's coastal and marine resources has been the Navy, and its 2003 departure has led to a stabilization in these resources; other groups, however, point to the emerging problem that development present and identifying it as the most important stressor. Finally, there is a diversity of opinion among groups on the management process that an MPA should adopt and the agency that should be charged with MPA management in Vieques, with groups that frequently enter the marine environment calling for a more collaborative management framework (even co-management), while other groups call for either integrated or federally-driven management frameworks.

Altogether, the data suggest that MPAs are a viable option as a management strategy if the process by which an MPA is designated and implemented accounts for the aforementioned stakeholder and visitor group views. While it could be argued that groups such as commercial fishers may not accept MPAs (after all, the group did not reach consensus on the issue), it is also clear that commercial fishers accept the need to protect shallow, nursery grounds such as inlets and bays and may in fact provide meaningful information if fully involved in a planning process (see for example Delaney (2003) for the use of commercial fishers in the Dry Tortugas Ecological Reserve process in the Florida Keys National Marine Sanctuary). Also, with groups such as hospitality centers (and less so with interest groups), the results show that there is a potential disconnect between the groups and their views on the coastal and marine environment. Thus, although hospitality centers may demonstrate poor support for MPAs, that support may likely increase where the centers are shown how MPAs may actually improve (and not dampen) visitation rates (i.e. by being advertised as unique sites). Finally, the governmental agencies who participated in the study as interest groups showed a strong inclination to be able to achieve their primary objectives (which varied across agencies) without necessarily abrogating authority to other agencies or groups; thus, the Vieques municipal government would prefer to meet its social obligations (i.e. affordable housing) without having to focus solely on nearshore pollution. Similarly, the FWS would prefer to have protection afforded to the marine component of its terrestrial coastal zone without needing to expand jurisdiction. These concerns, which span across jurisdictions, suggest a need for integrated coastal management (Cicin Sian and Knecht, 1995).

b. Inter-group comparisons: MPA siting

The various groups that were interviewed were requested to provide site locations for MPAs in Vieques. Although some groups preferred not to disclose site preferences in terms of circumscribing locations, most were willing to provide site characteristics (ex. nursery grounds) and large sectors in which MPAs could be sited and where they would be most accepted. The following figure shows the candidate sites.

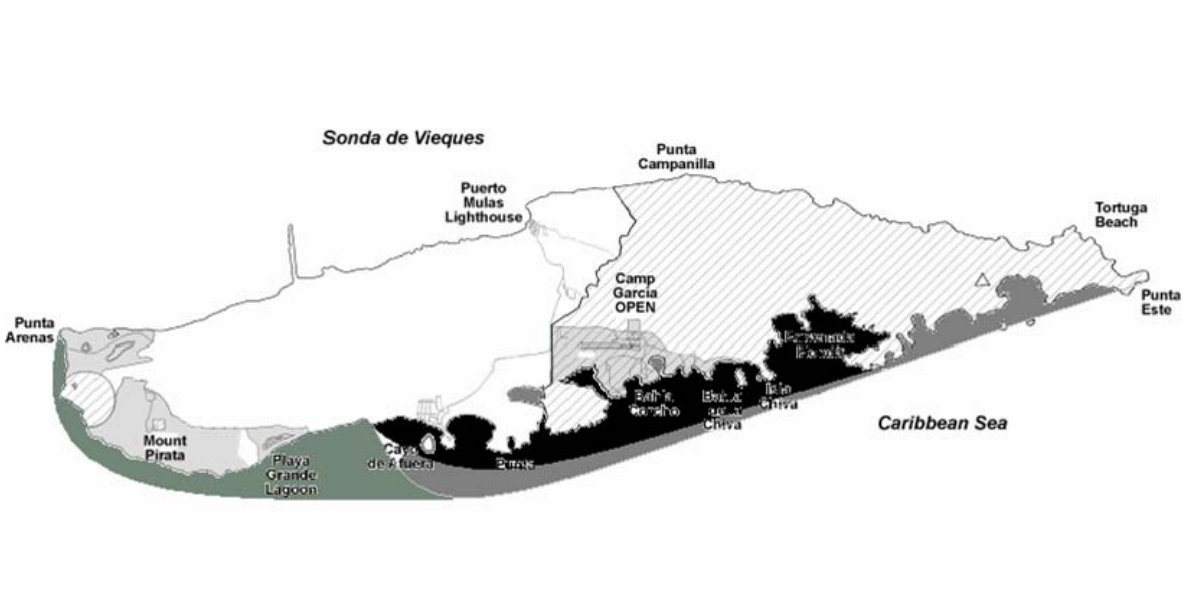

Figure 12: MPA candidate sites in Vieques

As shown in the above figure, there are a potential of three sites/areas that are most accepted across groups as MPA candidate sites in Vieques. The most accepted of all three sites is the one (shaded in black in the figure) that is located in south-central Vieques, which extends from the town of Esperanza to the west and extends to Ensenada Honda, the largest shallow bay in the east. This would serve the purpose of protecting the many shallow bays in the region while allowing for the continued protection of Bahia Puerto Mosquito Natural Reserve. The second most acceptable site (shaded in gray) is that which extends further offshore from Esperanza eastward to the southeastern point of Vieques. This MPA would include all of the previous and most accepted of all three sites and it would have the added advantage of protecting sites that currently contained unexploded ordnance (UXO). Finally, the third site for which groups reported support is that (shaded in green) which extends from the northwestern corner of Punta Arenas (adjacent to the Vieques National Wildlife Refuge's western territory) southeast to the town of Esperanza.

It should be noted that while there was considerable support across stakeholder groups for the most preferred site, that the site preference differed in terms of the types of uses that should be allowed within an MPA. However, there was general agreement that the site should be cognizant of and thereby permit traditional fishing and other multiple use activities; thus, a no-take reserve is less acceptable. Groups did acknowledge the need

for zoning, even restricted access, as a means by which to protect the eastern portions of the island that continue to present a UXO threat. Groups also called for addressing off-site and other land-based impacts, especially development, stating that without doing so, an MPA could not meet its objectives. Also, all groups strongly cautioned that an MPA management strategy must address enforcement and should most likely including a comprehensive enforcement and monitoring plan. Finally, interest groups in particular emphasized that any approach taken to protect Vieques' coastal and marine environment must consider integration with existing land-based and coastal and marine agencies.

As such, the Florida Keys National Marine Sanctuary (FKNMS) and other national marine sanctuaries present an interesting model that addresses the jurisdictional challenges across multiple agencies, contains advisory panel provisions to incorporate continuous public and interest group participation, and which has experience utilizing zoning in a multiple use framework (see Suman, 1997, NOAA, 1996). It is not suggested that a federal model like the National Marine Sanctuary Program (NMSP) is the preferred format; rather, it is recommended that because there are exist two MPAs managed by the Commonwealth of Puerto Rico (Sun Bay Balneario and Bahia Puerto Mosquito Natural Reserve) and a federally managed national wildlife refuge, as well as municipal government concerns in the coastal zone (ex. proposed, coastal and upland development), that an *integral* strategy be considered (Cicin Sain and Knecht, 1995).

c. Emerging issues: Displacement and equity

When the project to determine community and visitor group expectations of marine protected areas was first developed, it considered the Navy's occupation of Vieques as a central, background matter that would have shaped the population's views on management (and especially management that could be perceived as being from the outside). As fieldwork progressed in the project, it became clear that the Navy's occupation and, even more so, its departure had created socioeconomic conditions in Vieques that could likely affect the development of marine resource protection strategies, both in terms of the support these could garner and their overall effectiveness.

The complaints that were most often raised by stakeholders during the project were that Vieques was being bought out by outsiders and that such interlopers were benefiting from and perpetuating increasing property values that were squeezing out the local Viequenses population. Other participants lamented that this had ironically been a result of their and other local efforts to extricate the Navy from Vieques, which had led to only a small percentage of their lands being returned to them, the designation of a majority of the Navy lands to the FWS, and buying out of Vieques by outsiders.

In other areas where waterfront access and gentrification are issues (see Shivlani et al., 2005, for a review of displacement among commercial, spiny lobster trap fishers), displacement and equity issues become social driving forces. Whereas access is not limited in Vieques, cost of living and property values/affordable housing are very important topics. It is not clear how these changes will affect the local population, which

remains among the poorest communities in Puerto Rico; but, it is clear that it will re-shape the current community stakeholder group configuration and power dynamics. With fewer fishers on the island (Ventura, personal communication), it could be that an increase in tourism-based operations (and ancillary operations, such as hospitality centers) could change the MPA type, location, and management strategies, based more on the tourism industry, rather than community, needs.

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Appendix I: Vieques visitor field intercept survey questionnaire