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An analysis of marine protected areas legislation in the Caribbean Lesser Antilles

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AN ANALYSIS OF MARINE PROTECTED AREAS LEGISLATION IN THE CARIBBEAN LESSER ANTILLES

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To my wife Sarah

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List of Common Abbreviations

AIMS - Australian Institute of Marine Sciences

CEP - Caribbean Environment Programme

GDP - Gross Domestic Product

IUCN - International Union for the Conservation of Nature

LBS - Protocol Concerning Pollution from Land-Based Sources and Activities

MPA - Marine Protected Area

SPAW - Protocol Concerning Specially Protected Areas and Wildlife

STENAPA - St. Eustatius National Parks

UN CCD - United Nations Convention to Combat Desertification

UNCLOS - United Nations Convention on the Law of the Sea

UNEP - United Nations Environment Programme

WCR - Wider Caribbean Region

Abstract

Historically, marine resources and ecosystems were believed to be limitless and exploitation of those resources occurred with little regard to future consequences. Recent studies suggests that this belief is misplaced, as research indicates that many of these marine resources face extinction if protective measures are not implemented soon. Marine protected areas, or MPAs have garnered increasing attention as a means to effectively protect and conserve marine resources. Establishment and management of marine protected areas typically require implementing legislation in order to provide a legal basis for enforcement of MPA rules and regulations. The intent of this research was to determine the link between MPA legislation and effective conservation of marine resources, using coral reef protection in the Caribbean as a case study.

The first goal of this research was to determine which elements need to be included within MPA legislation, as determined by protected areas legislative experts and managers. The second phase of the thesis was to compare those guidelines against the legislation of three separate island groups within the Caribbean Lesser Antilles - Antigua and Barbuda, the Netherlands Antilles, and the U.S. Virgin Islands. The results of the legislative analysis were then compared to the actual state of coral reefs controlled by the reviewed countries to establish whether effective MPA legislation results in better protection of coral reefs. The analysis revealed that effective legislation alone is not sufficient, nor determinative, of coral reef viability. However, the research does offer suggestions as to those components of the legislation that are deemed most crucial, such as self-financing, coverage area, and legislative authorization to control activities outside of MPA boundaries.

Chapter 1. Introduction

It is no secret that the world's coral reefs face dire perils to their continued existence. Scientists have estimated that thirty percent of existing coral reefs are severely endangered, with possibly sixty percent being completely destroyed by 2030 (Hughes *et al.* 2003, 929). The destruction of coral reefs is facilitated through a number of factors, both natural and anthropogenic. These causes include hurricanes and severe storms, global climate change, overfishing, fishing with poisons and explosives, marine and land-based pollution, and coastal development.

The loss of coral reef ecosystems also means the loss of habitat for various fisheries. Although they cover less than .02% of the world's oceans, coral reefs provide habitat for 25% of fish species (Reaser *et al.* 2000). Goñi (2000, 126) writes that the destruction of coral reefs through damaging fishing practices impacts more than the reefs themselves. Damage to the benthic habitats populated by fish species can result in reduced abundance of those species (Goñi 2000, 126). The loss of coral reefs and associated fisheries is significant, especially considering the importance of fisheries to the global diet and global economy. Botsford *et al.* (1997, 509) note that fisheries "provide direct employment to about 200 million people" worldwide and account for as much as "nineteen percent of the total human consumption of animal protein." However, a recent report in *Science* states that all seafood species will be depleted by 2048 if humans continue to consume at current levels (Stokstad 2006, 745).

The consequences of such widespread destruction of coral reefs are especially serious when one recognizes the integral part that coral reefs play in the economies of many small island nations, such as those located in the Eastern Caribbean. As noted by Barker (2002, 75), "the present and future prosperity of the Wider Caribbean region depends critically on sea-shore

resort tourism." Furthermore, countries most affected are frequently those that are least capable to handle the economic and ecological impacts. Depondt and Green (2006, 188) write that the "economic value of coral reefs is of extreme importance, notably as due to their physiological requirements they are predominantly concentrated along the coasts of developing countries." The study by Burke and Maidens (2004, 58) estimated that the total annual value of coral reefs to the economies of countries within the Wider Caribbean Region is from 3.1 to 4.6 billion USD. The same study also estimates that future annual losses from continued degradation of the region's coral reefs could total as much as 870 million USD (Burke and Maidens 2004, 58). The fundamental necessity of protecting coral reefs in the Caribbean (as well as elsewhere) was aptly stated by Barker (2002, 75), where he asserted that the "hallmarks of Caribbean tourism – living coral reefs, brightly colored fish, clear water and sandy beaches – are components of healthy ecosystems that are easily damaged or destroyed by 'tourism development' activities that depend on them."

Threats to the world's oceans are numerous, but research has explored the use of marine protected areas as a way to stem the tide of depletion and degradation of our marine resources. As its name suggests, a marine protected area ("MPA") is a bounded zone in which marine species or ecosystems are sheltered from activities that are viewed as harmful to their survival. Research indicates that the MPAs can greatly benefit the ecosystems and species found within their boundaries. Significantly, the international community has recognized the importance of protecting the marine environment, as Article 192 the United Nations Convention on the Law of the Sea expressly provides that States are obligated to "protect and preserve the marine environment." Nevertheless, despite their beneficial effects, less than one percent of the world's oceans are protected through MPAs (Bergen and Carr 2003, 10).

To successfully establish and manage an MPA, it is generally necessary to adopt legislation formulated for implementation of marine protected areas. This thesis will analyze the marine protected areas legislation of three island groups found in the Caribbean Lesser Antilles – Antigua and Barbuda, the Netherlands Antilles, and the United States Virgin Islands. The thesis research hopes to reveal what makes effective marine protected areas legislation and how that legislation translates into effective management and preservation of marine resources, using management of coral reefs as a case study.

The thesis begins with a brief review of the history and geography of the subject countries in Chapter 2. Chapter 3 discusses the general threats faced by coral reefs, both globally and within the Eastern Caribbean. The benefits of marine protected areas, and political and socioeconomic issues associated with MPA establishment, are reviewed in Chapter 4. Chapter 5 is dedicated to an examination of the guidelines deemed crucial to successful MPA implementation and management, as suggested by protected areas experts and managers. Chapter 6 then takes these guidelines and applies them to the marine protected areas legislation of the selected countries. Chapter 7 attempts to link effective legislation to various economic and political factors, with a brief look at whether the reviewed laws adequately address the specific threats faced by adjacent coral reefs. Finally, Chapter 8 suggests recommendations for future research.

Chapter 2. Historical and Geographical Background

2.1. Introduction

The chain of islands that form the Caribbean Lesser Antilles were discovered by Columbus on his second voyage to the New World in 1493. The Lesser Antilles were sighted as Columbus and his crew sailed north towards Hispaniola (present-day Haiti and Dominican Republic), but the first Spanish explorers were not concerned with settlement of these smaller islands (Rogoziński 2000). From the outset, one of the chief pursuits of Columbus and the Spanish crown was to uncover the abundant source of gold thought to exist in these newly-discovered lands (Rogoziński 2000). At the time, the Lesser Antilles were not considered especially valuable since they were not believed to contain gold or other minerals (Rogoziński 2000).

Consequently, Spanish settlement and exploration was focused on the larger islands known as the Greater Antilles and the Lesser Antilles were largely ignored (Rogoziński 2000). It was only after disease, famine, and harsh working conditions wiped out much of the Amerindian population of the Greater Antilles that the Lesser Antilles attracted the attention of the Spanish colonizers. With the indigenous labor force decimated, the Spaniards turned to the Lesser Antilles as a source for new slaves (Rogoziński 2000). However, between the slave raids, disease, and famine, the Amerindian population on these smaller islands was all but erased by 1520 (Rogoziński 2000).

During the seventeenth century, new colonizers from the north of Europe began to successfully settle in the Lesser Antilles, which were left depopulated by the Spaniards (Allaire 1980). The Dutch established settlements on Curaçao, Aruba, Bonaire, St. Eustatius, Saba and St. Maarten by the 1630s; Britain colonized Jamaica, Nevis, Antigua, Montserrat, Barbados, and

St. Kitts by 1655; France would control Guadeloupe, Martinique, and Saint-Domingue (Haiti) by 1700, and the Danes would govern the Virgin Islands by 1730 (Rogoziński 2000). The British and French would spend much of the 18th and 19th centuries battling for the remaining islands, with Britain ultimately controlling Dominica, St. Lucia, St. Vincent, Tobago, Grenada, and Trinidad by 1802.

Figure 2-1. Map of Caribbean Region (Data courtesy of U.S. Defense Mapping Agency).

Thus, by the end of the eighteenth century, essentially every inhabitable island within the Lesser Antillean archipelago was conquered and controlled by a European power. The new colonizers came for different reasons, but the chief economical pursuit throughout the Lesser Antilles would become the establishment of plantations. The tobacco and sugar plantations that

formed the basis of most of the agricultural industry in the West Indies required a large labor component and, since the native population had been killed off, the region would see the importation of large numbers of slaves from Africa (Clarke 2008*a*). The plantation system, which was an integral part of mercantilism from the 16th to 18th century, would dominate the economies of these small islands until well into the twentieth century. And although the African slaves would eventually achieve emancipation during the 1800s, the limited availability of arable land or other sources of income meant that they remained tied to the estates in a sort of quasi-servitude (Clarke 2008*b*).

Many of the Lesser Antillean islands share a similar history of conquest and colonization

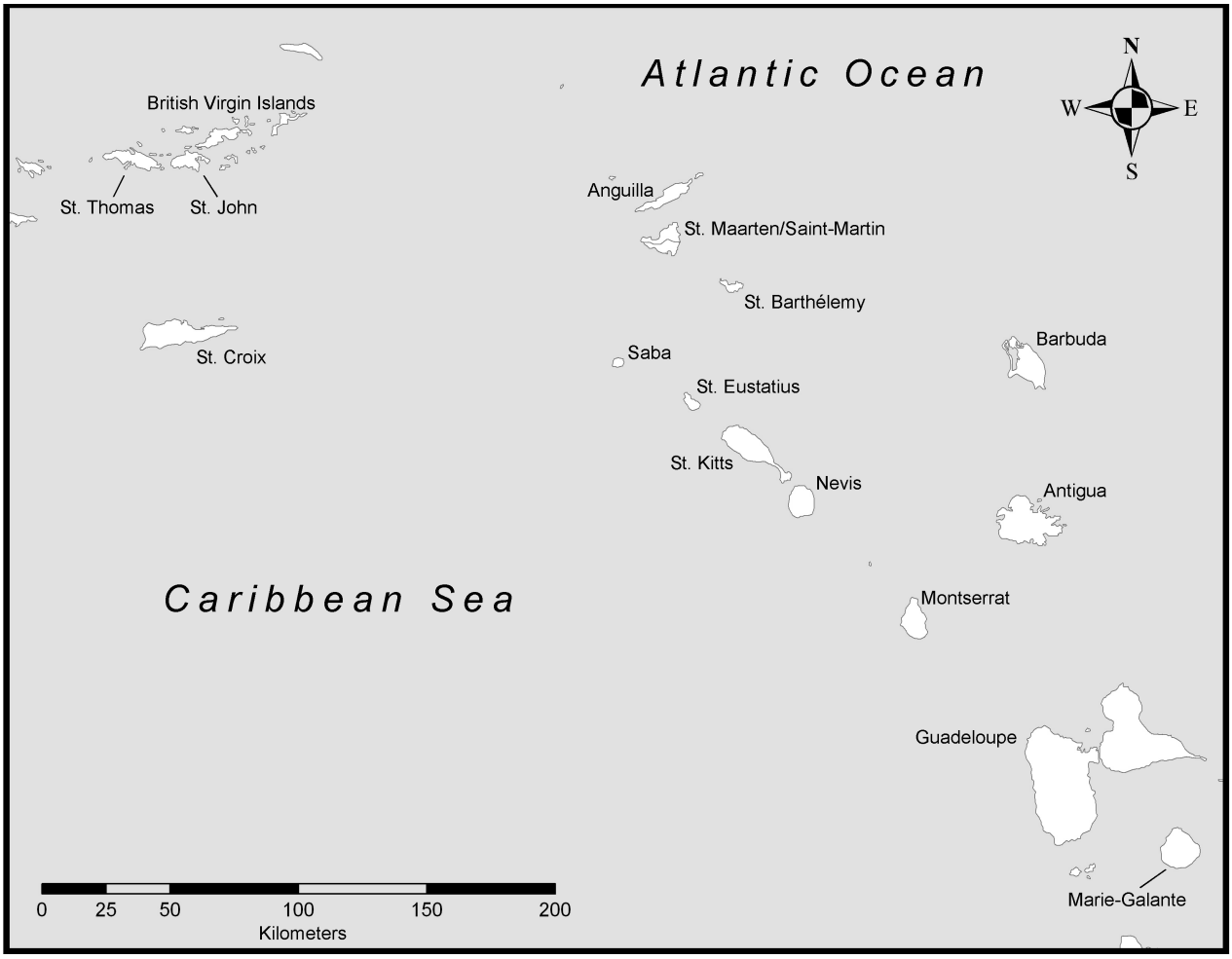

Figure 2-2. Map of Leeward Islands (Data courtesy of U.S. Defense Mapping Agency).

by European powers. Their histories would begin to diverge with emancipation of the slaves and the push towards decolonization and independence during the twentieth century. The next sections will summarize the relevant histories of the subject countries individually, and includes general background on their physical geography.

2.2. Antigua and Barbuda

2.2.1. History

Antigua was settled by British immigrants from St. Kitts in 1632 (Rogoziński 2000). Rogoziński (2000, 77) writes that the first settlers were small tobacco and cotton farmers - the large sugar plantations were not established until the end of the 17th century (Rogoziński 2000). During the 18th century, Antigua was also important as the home port for a British fleet. Although agriculture started slowly, sugar production would take off during the 1700s. Rogoziński (2000, 115) states that the British Leewards (including Antigua) would represent "extreme examples of monoculture" and that sugar totaled 97 percent of the exports from these islands. Naturally, the sugar plantations required a large number of slaves and so increasing numbers were brought to the island. For example, of a total population of 25,330 in 1834, slaves outnumbered whites by 23,350 to 1,980 (Rogoziński 2000, 114).

Barbuda was not settled until 1678 and was originally intended as a slave-breeding colony (Tolson *et al* 2008). Unlike Antigua, the plantation system never developed on Barbuda. Instead, the inhabitants supported themselves chiefly through fishing and subsistence farming (Tolson *et al.*2008).

Slavery was finally abolished by the British during the 1800s and the slaves in Antigua and Barbuda were emancipated in 1834 (Tolson *et al.* 2008). Although newly-freed, the slaves did not enjoy a considerable change in circumstances. Because the best lands were already

cultivated by plantation estates, many of the former slaves were forced to continue work on the plantations (Clarke 2008*a*).

During the latter half of the 20th century, the inhabitants of Antigua and Barbuda moved towards independence from the British crown (Tolson *et al.* 2008). Independence was finally achieved in 1981, when Antigua and Barbuda became a nation within the British Commonwealth (CIA 2008*a*). Today, Antigua is a constitutional monarchy, led by the Prime Minister and a bicameral legislature. It was also during the latter half of the century that Antigua moved away from sugar production and towards tourism as the primary economic enterprise. The tourism industry currently accounts for nearly three-quarters of total GDP for the country.

2.2.2. Physical Geography

The islands of Antigua and Barbuda are primarily low-lying limestone and coral formations along the outer edge of the Lesser Antillean archipelago (CIA 2000*a*). Antigua also has some areas of volcanic origin, which form the highest spots among the islands. The highest point is Boggy Peak on Antigua at 402 m (CIA 2000*a*). The islands, like the rest of the Lesser Antilles, are not very large. The total land area is approximately 441 sq. km, with Antigua the larger of the two at 280 sq. km and Barbuda at 161 sq. km (CIA 2000*a*). The islands receive about 40 inches of rainfall per year, with average temperatures ranging from 77°F in the winter to 82°F during the summer months. (Tolson *et al* 2008). *Encyclopædia Britannica* distinguishes Antigua from the other Lesser Antilles because of the absence of mountains and forests on the island, although Barbuda is noted to be "well-wooded." That Barbuda remains forested is probably due to the fact that numerous large plantations were never established on the island (Tolson *et al* 2008).

The approximate total coastline length of the two islands is 270 km (Burke and Maidens

2004). On Antigua, the shoreline is deeply indented and thus has many natural harbors and beaches (CIA 2000*a*). Barbuda has a large natural harbor on the western side of the island (CIA 2000*a*). Spalding *et al* (2001, 161) write that coral reefs are "relatively widespread" in the waters of Antigua and Barbuda. Antigua has "fringing reefs, but also more extensive, though intermittent, bank barrier reef structures offshore (Spalding *et al.* 2001, 161). Barbuda has more extensive fringing reefs and is considered to "generally have higher coral cover and species richness" (Spalding *et al.* 2001, 161). Spalding *et al.* (2001, 161) note that the coral reefs, especially those close to shore, have been damaged, which they attribute to coastal development The total reef area within the waters of Antigua and Barbuda is estimated to be between 180 and 240 sq. km (Burke and Maidens 2004, 65). Of the total reef area, approximately 13% are protected in MPAs, which are the Palaster National Park, Salt Fish Tail National Park, and Cades Bay Marine Park (Geoghegan *et al*. 2001; Burke and Maidens 2004).

2.3. Netherlands Antilles

2.3.1. History

The Dutch first established permanent colonies in the Netherlands Antilles during the 1630s. The Dutch were interested in a source for salt and so they were drawn to the salt pans located on the southern coast of St. Maarten (Rogoziński 2000, 63-64). Other countries also sought to gain control of the valuable salt pans and, consequently, the island was battled over for several years. Eventually, the island was divided in 1648 between Dutch and French settlers (Rogoziński 2000, 64). The French received the larger portion of the island but the Dutch successfully controlled the salt sources in the south (Rogoziński 2000, 64).

St. Eustatius was settled in 1635 by Dutch colonizers hoping to establish tobacco plantations on the island (Rogoziński 2000, 64). St. Eustatius had its hey-day during the 1700s,

when the island was established as a free port and the island's profits centered on the trade of smuggled goods with the British and French (Rogoziński 2000, 64). *Encyclopædia Britannica* writes that the island was also important as a center for the slave trade and as a mercantile exchange. The inhabitants of the tiny island of Saba, first settled in 1640, supported themselves through "fishing, shipbuilding, and making shoes" (Rogoziński 2000, 64). The island was also reportedly a "buccaneers' stronghold" (*Encyclopædia Britannica*). Because agriculture was never prevalent on the island, Saba was one of few Caribbean islands with a majority white population due to the absence of slaves (Rogoziński 2000, 64).

The prosperity enjoyed within the Netherlands Antilles evaporated during the 19th century (Rogoziński 2000, 214). The trade in smuggled goods was wiped out when a British force conquered St. Eustatius in 1781 and destroyed the island's fort and warehouses (Rogoziński 2000, 214). In 1863, the Dutch finally granted emancipation to the slaves working on the islands. Although agriculture was never heavily developed on St. Eustatius and Saba, St. Maarten did possess several sugarcane plantations and the salt mines were worked by slave labor (Rogoziński 2000, 214). After emancipation, the Dutch farm owners were unable to pay for labor while maintaining a profit and so the existing farms went out of business (Rogoziński 2000, 214). Forced to find other work, the residents supported themselves through shipbuilding and making shoes, and through seasonal labor on neighboring islands (Rogoziński 2000, 214).

In the latter half of the 20th century, the islands of the Netherlands Antilles were granted a higher degree of independence from the central government in the Netherlands. Although still within the Kingdom of the Netherlands, the islands became semi-autonomous units within the Kingdom and were given wider authority to govern internal affairs (Harris and Hoetink 2008). During this time, tourism exploded on St. Maarten, and the tourist industry remains the largest

employer and sector in the economy (Rogoziński 2000). More recently, the islands are undergoing another political conversion. St. Maarten has voted to become an autonomous country within the Kingdom (similar to Aruba), and Saba and Statia have voted to establish closer ties with the Netherlands (U.S. Department of State 2008). These changes are scheduled to go into effect on December 15, 2008 (U.S. Department of State 2008).

2.3.2. Physical Geography

The northern, or windward group, of the Netherlands Antilles includes the islands of St. Maarten (French Saint-Martin), St. Eustatius, and Saba. Despite being divided between the Netherlands and France, St. Maarten is the largest of the three islands at approximately 34 sq. km. The Dutch portion covers one-third of the southern part of the island – the northern French portion covers approximately two-thirds. *Encyclopædia Britannica* writes that the island is mostly hilly and annual rainfall amounts total 45 inches. St. Eustatius, or Statia, is the next largest island at 21 sq. km. The island is dominated by two extinct volcano cones, with the largest peak, The Quill, rising to a maximum elevation of 600m. The smallest of the three northern Netherlands Antilles islands is Saba, at only 13 sq. km. *Encyclopædia Britannica* writes that Saba is actually the remnant of an extinct volcano, and so the island is surrounded by sea cliffs. The highest point of the island is Mount Scenery at 887m. Both Statia and Saba have annual rainfall amounts of approximately 44 inches (*Encyclopædia Britannica*). All of the islands are largely deforested due to livestock grazing, although Saba remains wooded near the summit of Mount Scenery (Debrot and Sybesma 2000, 598).

The combined coastline length of the Netherlands Antilles is 65 km (Burke and Maidens 2004). Debrot and Sybesma (2000, 598) note that St. Maarten is "surrounded by shallow bank waters and displays extensive sandy beach development." Statia and Saba, on the other hand

have little, if any, sandy beaches along their coastline (Debrot and Sybesma 2000, 598). Estimates of the total reef area for St. Maarten, Saba, and Statia range from 40 to 85 sq. km (Burke and Maidens 2004). Spalding *et al.* (2000, 161) state that there is little "structural reef development" around Saba and Statia but that "extensive coral communities" do exist. The reefs surrounding St. Maarten are found primarily along the east and southeastern part of the island but are rapidly deteriorating from human pressures. The northern Netherlands Antilles have three marine protected areas - Saba Marine Park, Statia Marine Park, and St. Maarten Marine Park (actively managed but not yet legally established). Approximately 67 percent of the total reef area of the northern Netherlands Antilles is protected through these MPAs (Burke and Maidens 2004).

2.4. U.S. Virgin Islands

2.4.1. History

Although Columbus landed on St. Croix in 1493, the Spaniards did not establish permanent communities on the islands. Rogoziński (2000, 82) writes that several of these islands, left uninhabited by Spain, became a base for the pirates that preyed on Spanish ships and colonies. The first permanent settlers on the island were French, British, and Dutch, who began to colonize the island around 1600 (Rogoziński 2000). *Encyclopædia Britannica* states that the islands changed hands multiple times during the 17th century. Eventually, the Danes gained control of St. John and St. Thomas during that same century and later purchased St. Croix from the Knights of Malta in 1733 (Rogoziński 2000). Originally, the islands were owned and managed by the Danish West India Company but reverted to crown colonies when the company went out of business in 1754 (Rogoziński 2000).

Sugarcane and cotton plantations were widespread throughout the Danish Virgin Islands

and flourished during the 18th century (Rogoziński 2000). St. Thomas also has a large natural harbor and became a center of commerce as a free port during that same time (Rogoziński 2000). The island also gained prominence as "a refuge both for merchant ships chased by pirates and for corsairs selling their loot" (Rogoziński 2000, 84). The fortunes of the islands faded during the early 19th century as the sugar trade began to decline and slaves were emancipated (in 1848) (*Encyclopædia Britannica*). As a result, Denmark sold the islands to the United States – the negotiations started in 1865 were finally ratified in 1917, reportedly to keep the islands out of "German control" (Rogoziński 2000, 216, 293).

The U.S. government granted citizenship to the residents of the Virgin Islands in 1927. Under the system of government set up in the islands, Virgin Islands residents do not have the right to vote in federal elections (including presidential and Congressional elections), although they do have a non-voting delegate in the House of Representatives (Rogoziński 2000, 294-95). Additionally, the Virgin Islanders were granted "limited self-government" in 1968 by passage of a bill that abolished the presidential veto and allowing election of a governor (previously, the President could veto any island law). As with many of the Lesser Antillean islands, the tourist industry has become a primary economic driver among the islands. Rogoziński (2000, 294) writes that tourism has transformed the Virgin Islands from one of the poorest countries in the region to one of the wealthiest.

2.4.2. Physical Geography

St. Croix, St. Thomas, and St. John are the three main islands that form the U.S. Virgin Islands. *Encyclopædia Britannica* notes that, technically, the Virgin Islands are part of the Greater Antilles because they are part of the same geologic structure. However, they are often included within the Lesser Antilles because of their smaller size and that convention has been

followed in this thesis. Of the islands, St Croix is the largest at 207 sq. km and sits about 60 km south of the rest of the Virgin Islands (Burke and Maidens 2004). *Encyclopædia Britannica* states that St. Croix is mountainous in the northern part of the island but that rolling plains are to be found in the south. The highest point on St. Croix is Mount Eagle at 332 m (*Encyclopædia Britannica*). The next largest island is St. Thomas, on which sits the capital of the U.S. Virgin Islands, Charlotte Amalie. The 83 sq. km of the island is mostly mountainous, rough terrain and its highest elevation is Crown Mountain at 474 m (*Encyclopædia Britannica*). Lastly, St. John is the smallest of the three (52 sq. km) and its highest point is Bordeaux Mountain, which is 389 m (*Encyclopædia Britannica*). The islands receive about 45 inches of rain annually (*Encyclopædia Britannica*). Plantations were prevalent on the islands and much of the land area is deforested from clearing for crop cultivation (*Encyclopædia Britannica*).

The total length of coastline for the U.S. Virgin Islands is 305 km, a good portion of which is sandy beach, which partially accounts for their popularity among tourists (Burke and Maidens 2004). Spalding *et al* (2001, 155) write that coral reefs are "widespread" throughout the Virgin Islands and total reef area is close to 600 sq. km (Burke and Maidens 2004). Most of the coral formations are fringing reefs, but the authors also note a small barrier reef off St. Croix and "offshore patch reefs and bank structures" as well (Spalding *et al.* 2001, 155). The U.S. Virgin Islands have two marine protected areas: Virgin Islands National Park (St. John) and Buck Island Reef National Monument (St. Croix). However, the two MPAs cover only 8 percent of the total reef area in the U.S. Virgin Islands (Burke and Maidens 2004).

Chapter 3. Threats to Coral Reef Ecosystems

3.1. Introduction

As mentioned in Chapter 1, coral reef ecosystems face serious challenges to their continued survival. Damage from natural and anthropogenic causes threaten to destroy nearly two-thirds of existing reefs within twenty-five years (Hughes *et al.* 2003). One of the primary sources of coral reef damage is land-based activities, which endanger coastal environments from "sewage, alteration and destruction of habitats, sediment mobilization, nutrient pollution, heavy metals and hydrocarbons" (Barker 2002, 75). The two predominant economic activities among the islands of the Lesser Antilles – tourism and agriculture – are responsible for much of the threat. Irresponsible development within the tourist industry leads to destruction of the marine and coastal environment on which much of the industry depends (Barker 2002). Intensive agriculture demands the clearing of forested habitats and, in turn, can result in erosion and sediment loss. Sedimentation and eutrophication degrade the coastal environment and leave certain habitats, such as coral reefs and seagrass beds, less able to thrive.

Ecosystem degradation from agriculture and coastal development are not exclusive to the Caribbean region nor are they the only dangers to the sustainability of coral reef habitats. Orams (2004, 199) listed the five major threats as: "pollution of the seas, over exploitation of living things, physical alteration of the environment, the introduction of alien species, and finally, increased ultraviolet radiation and alteration of climatic conditions." Blake (1998, 507) also notes that, along with tourism, fisheries and the oil and gas industry also exert ecological stresses on the coastal environment. Thus, the fragile ecosystems found within the Eastern Caribbean region face a myriad of threats which threaten to destroy the resources on which many inhabitants' livelihood is based.

3.2. Marine Pollution

While tourism development is frequently cited as a major environmental threat in the Caribbean, Orams (2004, 170) states that "the damage caused by the pollution of our coastal environs from human activities on land and from commercial uses of the oceans for fishing, the dumping of waste, dredging and so on far outweighs the influence of recreation and tourism." While tourism is supplanting export agriculture as the dominant economic activity on many of the islands, agriculture is still very prevalent. The clearing of lands for agriculture increases the incidence of erosion and run-off. Moreover, Debrot and Sybesma (2000, 598) also state past and current grazing practices on some of the islands has led to deforestation. The result is that sediment run-off and other pollution associated with poor or irresponsible agricultural practices pollutes the coastal waters. Sedimentation from erosion can limit reef development, as noted in a survey of Saban reefs by Klomp and Kooistra (2003).

Other marine pollution sources have been identified as solid wastes, marine debris, nutrients, pesticides, and toxic wastes (Schumacher and Hoagland 2002, 504). Schumacher and Hoagland (2002) maintain that pollution from hydrocarbons is recognized as the most severe threat to the marine and coastal environment. Hydrocarbon development and refining is occurring in various spots in the Caribbean, most notably on the islands off the Venezuelan coast. Moreover, a large amount of petroleum products are transported via vessels running near, or through, the Caribbean archipelago (Gold 1988). Hinrichsen (1998, 109) states that 5 million barrels of oil are transported through the region everyday and that, on average, 7 million barrels are dumped into the Caribbean every year. Additionally, the current patterns in the Caribbean are such that a major oil spill along the eastern edge of the Lesser Antilles would have serious economic and environmental consequences for many of the islands (Underwood 1988).

Several regional and international agreements exist that attempt to stem the release of various types of marine pollution. Unfortunately, the relatively small economies of the Lesser Antillean islands are ill-equipped to implement the necessary measures and infrastructure. For example, the International Convention for the Prevention of Pollution from Ships, 1073 ("MARPOL") deals with the release of ship-borne waste. However, Blake (1998, 508) suggests that most "Commonwealth Caribbean states have been unable to meet the requirements of MARPOL due to lack of adequate facilities for ship-borne waste and disposal."

The Protocol Concerning Pollution from Land-Based Sources and Activities ("LBS") is a regional convention within the Caribbean adopted to limit land-based marine pollution. Achieving the objectives of the LBS Protocol is especially important given that land-based sources of pollution are considered the greatest threat to coastal habitats. Barker (2002, 74) states that land-based activities are having a rapidly growing impact on coastal habitats and notes that "there is widespread agreement that protecting the oceans from land-based activities is among the highest priorities for environmental protection in the coming decades" (2002, 82). However, like so many other planned programs, many small island nations lack the financial resources necessary to implement the protocol requirements. As stated by Barker (2002, 82), the "main stumbling block for ratification of the LBS Protocol is its cost of implementation." For example, Barker estimated that it would require 50 billion USD to bring sewage plants up to LBS specified standards (2002, 82). Thus, future compliance with the LBS Protocol and other interregional environmental agreements may turn on the provision of funds from such organizations as the United Nations and World Bank.

3.3. Overfishing

In many coastal areas, fish provide an important source of protein for the local population

and the Caribbean is no exception. The majority of reef species can be found close to shore and "geographically contained", and thus "particularly susceptible to overexploitation" (Burke and Maidens 2004, 31). Most of the fishing industry is characterized by small-scale, artisanal fishing practiced by local inhabitants, which has generally been viewed as less destructive than commercial fishing. However, research by Hawkins and Roberts (2004) indicates that small-scale fishing still poses a considerable threat. Additionally, the Burke and Maidens report (2004) states that overfishing is the most significant threat to coral reefs in the Eastern Caribbean, an area which includes the islands of the Lesser Antilles.

Intensive fishing practices can debilitate the marine environment in a number of ways. Large herbivorous fish species often rely on algae as a food source. The elimination of large herbivorous species means that algae cover increases and surrounding coral reefs are unable to compete. Hawkins and Roberts (2004) study revealed that coral cover and complexity is generally higher on reefs that are lightly-fished and algal cover is higher on highly-fished areas. Their study suggests that intensive artisanal fishing can also be very destructive and that such practices in the Caribbean have "transformed" the region's reefs (Hawkins and Roberts 2004, 225).

The methods used to harvest fish can also be particularly destructive. Within the Caribbean, many employ portable fish traps, which are relatively effective and inexpensive (Burke and Maidens 2004, 31). However, the traps destroy the coral reefs when dropped into the water (Burke and Maidens 2004, 31). Also, many traps are left stranded in the water and can "continue to catch fish for many months and years, a process known as ghost fishing" (Burke and Maidens 2004, 31).

The decrease in large species is significant not only because it affects the coral reefs and

associated food chain but also because it may lead to a reduction in visitors to the area. Scuba diving tourists make up a considerable portion of the visitors to the Caribbean but those numbers may drop in areas where either the reefs are degraded or where larger species have disappeared. As was ably put by Ogden (1997, 1414-5), "in economic terms, a reef fish is much more valuable swimming in front of an underwater photographer than it is on a fishing line."

This quote also serves to highlight problems over resource conflict and access to the marine-coastal environment. Orams (2004, 169-70) notes that although "many cultures regard free access to and use of marine resources as a basic human right… it is already obvious that access to high quality areas and popular activities, in some areas, is only afforded by the wealthy." The conflict was also observed by Trist (1999) in her study of St. Lucia, where some attempts have been made to restrict the local population's access to marine space. Her research revealed that local fishermen point to "traditional resource rights and the primacy of productive uses of the sea." Trist states that local stakeholders "question the extent and causes of reef degradation as represented by diving interests and conservationists" (1999, 385-6).

3.4. Climate Change

Perhaps the most significant future threat facing the environment and population of the Caribbean region is the expected impacts of global climate change. Given the small areal extent of the Lesser Antillean islands, they are especially susceptible to events such as sea level rise. Lewsey *et al.* (2004, 396) note a study by the Caribbean Environment Programme which predicts that every 1 cm rise in sea level will result in several meters of shoreline retreat. Furthermore, the environmental hazards associated with climate change are not limited to rising seas, as other possible threats to the islands include changes in rainfall, soil moisture, and a possible increase in number and severity of hurricanes (Lewsey *et al.* 2004, 393). Warming temperatures are also

considered one of the primary factors causing the massive coral bleaching events experienced around the globe (Reaser *et al.* 2000).

As coastal development in the Lesser Antilles continues, the pressure on the already strained land resources will be especially significant if sea levels continue to rise. Moreover, the destruction of coral reefs and seagrass beds will possibly increase the severity of coastal damage, since these types of habitat can serve as shoreline protection from severe weather events and other environmental problems associated with climate change (Lewsey *et al*. 2004, 399). Thus, future development planning must balance the "immediate economic benefits" derived from tourism with implementation of the responsible measures necessary to prevent future damage, as well as ensure the safety and livelihood of coastal inhabitants (Lewsey *et al.* 2004, 394).

3.5. Coastal Development and Tourism

Coastal development is another serious threat to the coral reef ecosystems surrounding the islands of the Lesser Antilles and coastal communities around the globe. Hinrichsen (1998, 1) writes that "over 50 percent of the entire population of the planet lives and works within 200 km of a coast" and yet these coastal areas comprise only 10 percent of total land area. The author cites other research projecting that this total may reach 75 percent by 2025 (Hinrichsen 1998, 7). In the Lesser Antilles, the total population within 200 km is 100 percent, since none of the islands extend inward more than 200 km from the shoreline.

In the Eastern Caribbean, coastal construction is frequently associated with tourism development. Tourism and agriculture form the bulk of the economies for most of the smaller Caribbean Islands. Potter and Lloyd-Evans (1998) note that the industrial sector forms only about 10% of the GDP within the Caribbean, which serves to emphasize the region's reliance on the agricultural and service sectors. As one can see from Table 3-1, tourism can account for

anywhere from 22 to 84 percent of the GDP for the Leeward group of Caribbean islands.

Table 3-1. Demographic, economic and tourism data for Leeward Islands.

COUNTRY/ISLAND	Population (thousands) (2000)	GDP per capita (USD) (2000)	International tourism receipts (millions USD)	Average no. tourists per 1000 inhabitants	Value of tourist economy (2002) (millions USD)	Tourism economy - percentage of GDP
Antigua & Barbuda	65	8,200	291	n.d.	528	72
Netherlands Antilles	39[a]	11,400[a]	765*	64*	n.d.	84[†a]
U.S. Virgin Islands	121	15,000	1157	69	1629	42
Guadeloupe	428	9,000	454	27	658	33
British Virgin Islands	24	16,000	315	352	343	85
Saint Kitts and Nevis	39	7,000	58	43	93	25
Anguilla	11	8,200	55	76	58	58
Montserrat	4	5,000	9	n.d.	n.d.	n.d.
Dominica	71	4,000	47	23	64	22

* Includes southern islands of Netherland Antilles (Bonaire and Curaçao)
† Data for Bonaire, St. Maarten, Curaçao

Source: Burke and Maidens 2004
a. U.S. Department of State (2005 est.)

Apart from the dangers of basing one's economy on a single sector of the market, tourism development presents a number of ecological/environmental hazards. McElroy notes that unplanned development in the Caribbean has resulted in "deforestation and erosion of upland forests for condominium developments and road-works, as well as beach loss, lagoon pollution and reef damage from sand mining, dredging and boat anchoring" (McElroy 2003, 231). J.P Hawkins *et al* (2005, 374) further caution that "evidence from a wide range of ecosystems [suggests] that even relatively few visitors can degrade the environment that has attracted them."

As one of the most tourism-dependent islands around the globe, St. Maarten represents a prime example of the dangers of unchecked and irresponsible development. Sypkens Smit

(1995, 129) writes that the "island's natural beauty is rapidly disappearing in the wake of the excessively expanding building programmes." An environmental assessment of St. Maarten concluded that the greatest threat to the biodiversity of the island comes from the increase in inhabited areas, tourism development, and pollution (Rojer 1997). These conclusions are confirmed by the findings of Debrot and Sybesma (2000, 595), who listed the major pressures on the marine environment as sewage discharge, erosion from real-estate development, landfills, and unregulated coastal urbanization. The authors maintain that development and industry have already degraded coastal habitats in St. Maarten.

Of course, the overdevelopment and environmental degradation occurring on St. Maarten described above is not unknown in other parts of the Lesser Antilles. Mycoo (2006, 491) writes that the Caribbean has a long history of sustainable tourism policy failure. The small land area of the other islands makes them especially vulnerable to overdevelopment. Small islands are unique in terms of finite land supply, rich biodiversity, fragile ecosystems and vulnerable economies. (Mycoo 2006, 507). Hawkins *et al* (2005, 374) state that the "capacity of environments to support tourism is often ignored." And yet, as Orams notes (2004, 161), the "most recent and most dramatically increasing use of our seas is our use of them for recreation."

For instance, Mycoo (2006) researched the environmental issues facing the island of Barbados. The island is fringed with coral reefs, on which Barbados relies for "tourism, breakwater defenses, and as sediment sources for world-famous beaches (Mycoo 2006, 506). Despite the importance of the reefs to the island economy, the local government is not especially successful at protecting those environments. Prior research on Barbados has shown that large development projects are often approved over the objections of local inhabitants and despite evidence that the projects will harm the surrounding environment (Mycoo 2006).

3.6. Conclusion

Potter and Lloyd-Evans (1998, 21) researched tourism and development within the Caribbean and noted that tourism is one of few growth industries in the area. The problem is that development frequently overlooks environmental concerns and it is only recently that these types of considerations are being considered. Historically, "little consideration [was] paid to environmental problems or vulnerability of human and natural ecosystems" (Potter and Lloyd-Evans 1998, 21).

Continued degradation of the marine/coastal environment, upon which so much of the economy is based, is especially problematic since so much of the region's livelihood is tied to the oceans. Orams (2004, 165) writes that the "popularity of marine recreational activities is undoubtedly influenced by the strong positive image that small islands, beaches, coasts and the seas have." The problem is a vicious circle – tourism is dependent on a pristine coastal environment, and yet it is tourism that is partially responsible for its destruction.

Significantly, the full extent of the consequences of human impacts is unknown. Rivera-Monroy *et al.* (2004) state that, within the Caribbean, there is a lack of information on both how these diverse coastal ecosystems function and the potential long-term consequences of human impacts on the coastal and marine environment. The study of the coastal environment of the Netherland Antilles by Debrot and Sybesma (2000, 462) suggest that "the current magnitude of coastal development and industrial pollution in Aruba, Curacao, and St. Maarten have already reached such proportions that huge tracts of reef and related coastal habitats are being rapidly degraded." The necessity of preserving the marine and coastal environment was recognized by Orams (2004, 169), when he stated that "management of marine resources in order to maintain, or improve, environmental quality will become the major challenge in the next century."

Chapter 4. Marine Protected Areas

4.1. Introduction

This chapter seeks to give a general overview of the science behind the need and use of MPAs. It will also discuss various legal and socioeconomic considerations that either hinder MPA establishment or that arise during the subsequent management of marine protected areas. While MPAs cannot solve all the ills facing threatened coral reefs, they can alleviate some of the human-induced pressures and thus offer protected reefs greater opportunity to survive and recover from other threats. Nevertheless, despite noted benefits from MPA establishment and other marine conservation initiatives, marine protected areas are frequently too few, under-funded, and poorly managed.

4.2. The Case for Marine Conservation

Loss of coral reef habitats is caused directly or indirectly by any number of activities. Recent news has often focused on mass bleaching events that are generally associated with global warming. However, coral reefs can be impacted by more localized causes, such as damage from overfishing and pollution from agricultural and construction runoff. The numerous threats faced by coral reefs around the globe, both land-based and sea-based, ensure that there is no single solution that will alleviate the danger of further morbidity.

The need to protect coral reefs from further destruction cannot be overstated. The diversity of life found within coral reef ecosystems, and their importance to the continued viability of the planet, rivals that of the rainforests. For one, coral reefs provide habitat for a multitude of marine species. One summary of coral reef biodiversity suggests that they support 100,000 known marine species and an additional 1 million species that have yet to be discovered (Sobel and Dahlgren 2004, 39). Coral reefs also provide a breeding and development ground for other pelagic species found in more open waters.

Coral reefs are biologically significant not only for their own sake but also because the livelihood and sustenance of many populations around the world are intricately tied to the rich biodiversity found within coral reef ecosystems. Many of the world's coastal populations rely on fish as a source of protein in their daily diet, with many of those species tied ecologically to the coral reefs at some point during their life processes. Additionally, the beauty and diversity of coral reefs represent a significant draw for tourists to many coastal communities. Coral reefs can be found fringing the tropical waters of many small developing countries and islands, usually in the Caribbean and Indo-Pacific regions. Obviously, the loss of the coral reefs surroundings the tourist-dependent economies of these less-developed countries would have significant economic impacts. Finally, coral reefs represent an important resource for humans as far as future biotechnology is concerned, insofar as coral reefs "harbor more of the world's genetic diversity than terrestrial systems" (Sobel and Dahlgren 2004, 39).

The world's fish stocks are likewise under serious pressure, with half of all fish stocks currently being fully exploited and additional 22% experiencing overexploitation (Botsford 1997). As mentioned above, fish provide a valuable source of protein, representing 16% of animal protein intake throughout the world as a whole and an estimated 40% in developing nations (Jacques and Smith 2003, 26). Given the importance of fish in many societies' diets, it is not surprising that many depend on fisheries as their source of livelihood. Globally, it is estimated that revenue from the direct sale of fish amounts to approximately $70 billion annually (Botsford 1997). Jacques and Smith (2003, 26) state that "commercial and small-scale fishing support 200 million people in direct employment" and further engage another 500 million indirectly. In total, then, over 10% of the global population relies on fishing or fishing economically.

As with many ecosystems, a symbiotic relationship exists between different species of fish and coral reef organisms, where each is dependent on the other. Consequently, overfishing endangers not only particular fish species but also the vitality of coral reef structures as well. Coral reefs may provide protection of some sort from larger predators and the biologically rich waters provide nutrition, affording relevant species the protection and nutrients through which they can grow to maturity and produce their own offspring. Certain species of herbivorous fish are particularly important to coral reefs, as they are responsible for consuming algae that live on coral organisms (Botsford *et al.* 1997). If left to grow and multiply unchecked, the algae can eventually come to dominate the ecosystem and inhibit the further growth and expansion of coral (Botsford *et al.* 1997). Sobel and Dahlgren (2004, 40) state that "fishing and other extractive activities often remove critical living components of coral reefs, destabilize reef communities, and reduce the resilience of coral reef ecosystems to withstand impaired water quality and other stresses."

4.3. Benefits and Types of Marine Protected Areas

From all the evidence presented thus far, it is clear that there exists a genuine need to develop strategies to combat harmful practices that endanger the health of oceans and marine resources. Recent science has focused on the efficacy of marine protected areas ("MPAs") in protecting marine resources, which are considered by some to represent the best management tool for conserving marine ecosystems (Hughes 2003). The IUCN (1998) defines a marine protected area as "any area of the intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment." Sobel and Dahlgren (2004, 166) state that a marine protected area is essentially "a set of rules that collectively govern

human interactions with a specified portion of the marine environment." Although definitions differ, the main components of an MPA are that it is (1) a specifically bounded area, (2) within which activities within the area are controlled or regulated, and (3) with its overriding goal being the protection of the resource(s) or habitat(s) located within jurisdictional limits. In the United States, MPAs are generally established by either the federal government or by the states.

Marine protected areas can come in all shapes and sizes and restrictions. Although the delineation of types of MPA may differ across organizations, they can generally be classified into three broad categories: (1) multiple use (zoned or uniform); (2) no-take; and (3) no impact/access. A multiple use MPA generally allows some extractive activities within its limits, although the amount of extraction will be limited according to the resource being protected. The difference between zoned and uniform multiple use MPAs is that zoned MPAs will have different restrictions in different areas of the MPA, whereas uniform use MPAs have the same regulations over their entire extent.

A no-take MPA is just as its name implies – no extraction of resources is allowed within the limits of the MPA. No-take MPAs generally accommodate tourist-friendly activities, such as SCUBA diving or snorkeling. They will also typically allow recreational boating, although regulations seek to ensure that ecosystems, such as coral reefs, are not disturbed through negligent operation or anchoring of the vessel. Thus, there is usually some level of human activity within a no-take MPA. No impact and no access MPAs place the most restrictions on activity under their jurisdiction, where the only type of human activity allowed is scientific research and is thus completely off-limits to the public at large. Sobel and Dahlgren (2004, 19-20) acknowledge the particular advantage of marine reserves (incorporating those MPAs where extraction is outlawed) in protecting an entire ecosystem as opposed to a single species. They

state that marine no-take areas are among the most essential tools required to protect and restore the health of our oceans from multiple stressors (Sobel and Dahlgren 2004). It should also be noted that a zoned multiple-use MPA may contain no-take or no impact/access areas, such as the Florida Keys National Marine Sanctuary.

As stated earlier, the primary purpose of a marine protected area is to limit the types of activities that humans may engage in while within the MPA's jurisdictional limits. This all-important function is especially important to coral reef habitats, which are under constant danger from human impacts. More often than not, regulations within an MPA will focus on how much extraction of resources is allowed (i.e. fishing) and how much human access is allowed, especially while using motorized vessels. Marine protected areas may provide important ecological and biological benefits, such as enhancement of the reproduction potential of fishery stocks, maintenance of species diversity, preservation of important habitats, and conservation of ecosystem functions (Bergen and Carr 2003, 10-11).

More specifically (for purposes of this thesis), studies have revealed that MPAs may be instrumental in protecting valuable coral reef ecosystems and fishery stocks. For instance, MPAs may prove invaluable to the global struggle to combat the consequences of coral bleaching events, widely attributed to the effects of climate change (Lewsey *et al.* 2004). While MPAs are obviously incapable of halting an increase in water temperatures, they *can* help to relieve coral reefs from human-induced pressures, which thereby enable the reefs to better cope and recover from coral bleaching events (Hughes *et al* 2003, 932).

Overall, MPAs are associated with higher values of species density, biomass, organism size, and diversity of species (Halpern 2003, S122). The importance of MPAs in protecting shallow-water ecosystems has been especially noted (Ogden 1997). Ogden (1997, 1414) states

that coral reefs protected by a reserve of only several hectares "will develop larger populations of organisms composed of larger individuals within periods as short as a few years." One study has posited that at least 30% percent of the world's coral reefs should be protected within strict "no-take areas" to ensure long-term protection of coral reefs and associated fishery stocks (Hughes *et al* 2003, 933). Other research argues that a network of reserves covering twenty percent of all biogeographic regions and habitats should be fully protected to meet conservation goals (Roberts *et al* 2003, S216). Issues of size and percentage coverage notwithstanding, Gjerde (2001, 516-517) relates that

> 150 of the world's leading marine scientists issued a scientific consensus statement proclaiming there is now compelling evidence that providing protection on an area basis works. It urged the immediate application of fully protected marine reserves as a central ocean management tool.

Still, a broad consensus within the scientific community does not ensure implementation of protective measures (Gillespie 2000, 300). Despite their noted benefits and recognition of the need for more MPAs, they still cover less than one percent of the world's ocean, with even less (< 0.01%) designated as strict no-take areas that limit extractive activities within their geographical borders (Bergen and Carr 2003, 10). It is thus readily apparent that more needs to be done to ensure that sustainable uses are developed to guarantee that future generations have access to the ocean resources enjoyed by today's populations.

4.4. Historical Context Affecting MPA Establishment

The difficulty faced when attempting to implement marine protected areas stems in part from our historical view of the oceans and the resources within them. Within the modern era, the belief that oceans and marine resources can and should be exploited without impunity can be traced in part to the early seventeenth century with Hugo Grotius and his concept of *mare*

liberum (Scovazzi 2004). Grotius was writing to dispute the notion that territorial limits could be placed on the world's oceans or otherwise divided into competing spheres of influence. Still, his treatise developed into a widely-held belief that human activity on the high seas could and should not be constrained.

In his article devoted to the legal implications surrounding establishment of marine protected areas on the high seas, Scovazzi (2004) argues that the concept of *mare liberum* is outdated. Scovazzi (2004, 7) calls for the rejection of the concept of *mare liberum*, arguing that the issues facing use of the oceans today cannot be managed according to an anachronistic principle. As is well-stated by Scovazzi (2004, 7), "it cannot be sustained that a state has a right to engage in a specific marine activity simply because it enjoys freedom of the sea...." Fortunately, the author does believe that the absolute freedom traditionally enjoyed by seafarers and maritime powers has been eroded to some degree (Scovazzi 2004). For example, as noted in the Introduction, Article 192 of the United Nations Convention on the Law of the Sea ("UNCLOS III") charges nations to protect and preserve the marine environment.[1]

Historically, water bodies have been considered a global commons, both in this country and in many other areas around the world. Lodge (2004, 302) notes that the only international rule currently governing exploitation of marine resources is the rule of "capture", which provides that ownership of a common resource is enjoyed by the party first able to exert "dominion and control" over the resource. The oceans especially, and the resources found within their waters, have been historically viewed as limitless and incapable of being depleted. This results in rates of extraction and pollution practices that are unsustainable over time. Not surprisingly, many attempts to adopt meaningful regulations and standards for the use of oceans and use of marine

[1] UNCLOS III has been ratified by Antigua and Barbuda and the Netherlands Antilles (through the UK and Netherlands governments, respectively) but not the United States.

resources have been met with hostility, both in the United States and throughout the world (Frontani 2006). Accordingly, commentators have noted that the largest obstacle to MPA establishment has generally been political (Salomon *et al.* 2001; Ogden 1997).

4.5. MPAs in the Eastern Caribbean

Because of the close geographical distance between Eastern Caribbean islands, the size of MPAs may be limited. In order to effectively constrain activities in crucial areas, it may be necessary to develop MPAs that cross international sea limits through the development of bilateral or multilateral treaties. However, the establishment of MPAs in international waters entails considerations that do not necessarily arise when designating MPAs in domestic waters. As a consequence, relatively few international MPAs exist. One marine protected area was established by the International Whaling Commission to protect whales in what is called the Southern Ocean and includes roughly those waters surrounding Antarctica up to approximately 40º N (the boundary line dips southward at certain points to exclude terrestrial bodies). The other known international marine sanctuary is the Pelagos Sanctuary for Mediterranean Marine Mammals, a joint operation between the countries of France, Italy, and Monaco. Like the Southern Ocean Sanctuary, the Pelagos Sanctuary was established to protect cetaceans – in this case, whales and dolphins in the Mediterranean.

If MPAs are to enjoy any future success among the international community, especially under existing international arrangements, it may be necessary that politicians, diplomats, and stakeholders abandon their traditional views about the sea and its perceived limitless abundance. For one commentator, this may require a reinterpretation of how we define the terms that govern our utilization of marine resources. In his study of the controversy over designation of the Southern Ocean Sanctuary ("SOS") by the International Whaling Commission, Gillespie (2000)

discusses how the dispute over relevant treaty language turned on how the parties chose to define "optimal utilization" of a resource. Whereas in the past this has generally meant the resource must be killed or harvested to produce any value, Gillespie notes that an increasing number of stakeholders rely on non-lethal utilization (2000, 308). Debates such as those over the SOS may signal a conceptual shift that has occurred among international policy-makers regarding sustainable use of ocean resources.

Aside from UNCLOS III, other interregional agreements have been established in the Wider Caribbean. One such program is the Regional Sea Programme, which recognizes the need for a regional approach to resource protection. UNEP, through the Caribbean Environment Programme, saw adoption of the Caribbean Action Plan in 1981. The basis of the Plan was to "establish a framework for activities requiring regional cooperation in order to strengthen the capacity of the states and territories of the Wider Caribbean region for implementing sound environmental management practices and thus achieve the development of the region on a sustainable basis" (Sheppard and Chakalall 1988, 167). Areas of special concern covered by the Plan include pollution control, coastal areas, fisheries, watersheds, natural disasters, energy, human settlements, tourism and environmental health (Sheppard and Chakalall 1988, 167).

Probably the greatest significance arising out of development of the Action Plan is that out of it grew the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, or Cartagena Convention, which was signed in 1983 (Schumacher and Hoagland 2002). The Cartagena Convention forms the legal basis for implementation of aspects of the Caribbean Action Plan. The foundation of the Convention rests on three protocols designed to protect marine resources and habitat: the Protocol Concerning Cooperation in Combating Oil Spills; the Protocol Concerning Specially Protected Areas and Wildlife

("SPAW")[2]; and the Protocol Concerning Pollution from Land-Based Sources and Activities ("LBS"). The Protocol to Combat Oil Spills was adopted alongside the Cartagena Convention in 1983.

As the name indicates, SPAW is concerned with protecting specific marine species and habitats. Under annexes to SPAW, the following flora and fauna are specifically singled out for protection: all species of whales and dolphins, all species of manatees, all six species of turtles found in the WCR, and all species of both hard and soft corals (Barker 2002, 78). Unfortunately, ratification of SPAW has not met with as much success as that of the Oil Spill Protocol. Thus, protection of special species and habitats is probably limited to whatever programs had already been in place at the local or national level. With the increasing use of marine protected areas as a form of resource protection, however, one can hope that enhanced protection of the species listed above will be achieved.

4.5. MPAs in the United States

As the country with the largest economy, it would be expected that the U.S. would have the financial wherewithal to fully develop marine resource protection efforts. However, the areal extent of marine parks/reserves remains far behind their terrestrial counterparts. In their comparison of the terrestrial and marine parks, Lindhom and Barr (2001, 1442) found that the U.S. has only 12 marine sanctuaries versus 369 national parks, 156 national forests, and 381 national wildlife refuges. Geographically, the researchers note that national parks, forests, and wildlife refuges cover approximately 1,657,000 square kilometers, whereas marine sanctuaries cover roughly 46,500 square kilometers, representing less than 3% of the total terrestrial area (Lindholm and Barr 2001, 1443). Although these percentages will have changed with addition of the Hawaiian Islands National Marine Monument in June 2006 (covering 137,797 sq. mi.), a

[2] SPAW has been ratified by Antigua and Barbuda, Netherlands Antilles, and U.S. Virgin Islands.

large discrepancy still exists.

The fragmentation of responsibility for marine resource management may have be one reason for the lag. It is estimated that there are currently approximately 140 ocean-related laws in the United States (Tibbetts 2005). Federally-managed marine protected areas are generally established under the auspices of the Marine Protection, Research and Sanctuaries Act of 1972, 33 U.S.C. § 1401 et seq., which seeks to identify marine areas of special national or international significance and to provide authority for comprehensive conservation and management of such areas where existing authority and administration is inadequate (Christie and Hildreth 1999, 171).

It is to be hoped that the United States is also experiencing a shift towards greater recognition of the importance of marine protected areas. This shift is reflected by recent measures adopted by Presidents Clinton and Bush. In 2000, President Clinton issued Executive Order 13158, which calls for an "expanded and strengthened comprehensive system of marine protected areas" (Federal Register 2000). More recently, President Bush designated the Northwestern Hawaiian Islands National Marine Monument, which is now the largest marine protected area in the world today.

Unfortunately, the United States is also not immune to disputes over establishment of MPAs that have been experienced in other areas. There have been a number of studies that have looked at conflicts between such groups as politicians, scientists, MPA managers, and stakeholders (Frontani 2006; Lundquist and Granek 2005; Morin 2001; Mascia 1999). For instance, in the Florida Keys, organizations of local fishermen were instrumental in bringing about a decrease in the total area of no-take area within the sanctuary (Frontani 2006; Ogden 1997). Marine reserves are seen as limiting their "right" to extract marine resources at will

(Ogden 1997, 1415).

On a positive note, research has shown that Americans are beginning to realize the importance of protecting our natural ocean resources. Brailovskaya (1998, 1237) notes a 1996 poll where 84% of the respondents acknowledged that "ocean protection was part of society's responsibility to future generations." Lindholm and Barr (2001, 1443) cite a 2001 survey indicating that U.S. citizens understand that the marine environment faces serious pressures and generally support both additional regulations and the expansion of marine protected areas.

4.6. Conclusion

Despite the need for an increase in the number and size of MPAs, establishment of marine protected areas is often difficult to achieve. Because of the long-held belief that ocean resources are both a limitless and common resource, proposed implementation of MPAs is frequently met with hostility from local stakeholders. Moreover, in the event that marine protected areas are established, they are often so-called "paper parks" with little or no management or enforcement. To some extent, the problem is one of financing, as the small island states have scant financial resources to enforce what is generally an unpopular measure to begin with. However, the problem may also stem from ineffective implementing legislation. For example, MPA regulations may be ignored if too many restrictions are enacted, whereas too few restrictions coupled with questionable enforcement practices results in continued degradation of the resources the law seeks to protect. Well-constructed marine protected areas laws can achieve a crucial balance between respect of traditional uses of the sea and enabling of appropriate mechanisms for enforcement and funding in order to realize the objectives behind establishment.

Chapter 5. Proposed Guidelines for Marine Protected Areas Legislation

5.1. Introduction

The extent of marine protected areas within coastal waters can provide an effective indicator of an island's valuation of its coastal resources. For one, the establishment of a marine reserve involves a government's placing restrictions on local stakeholder activity on what has historically been considered a common pool resource. Secondly, the successful establishment, management, and protection of resources within an MPA require allocation of limited personnel and financial resources. It follows that those countries with more vigorous legislation and implementation of MPAs are those countries that are most committed to marine resource protection.

Accordingly, Chapter 6 will analyze in greater detail the marine protected areas legislation of three island groups – the U.S. Virgin Islands, the windward group of the Netherlands Antilles (comprising St. Maarten, St. Eustatius, and Saba), and Antigua and Barbuda. These islands were selected because they represent three different political regimes – dependent territories (U.S. Virgin Islands), semi-autonomous provinces (Netherlands Antilles), and newly-independent countries (Antigua & Barbuda). The marine protected areas laws will be reviewed according to the guidelines established by various MPA legislative and management experts, which is described in further detail in Section 5.3.[3]

Chapter 7 attempts to draw comparisons between a country's marine protected areas legislation and its political history and economy. For instance, does an island with a higher GDP per capita produce more effective MPA legislation than that of a less wealthy populace? Are independent countries more likely to establish more robust marine protection laws? The analysis

[3] The author would note that not every law having a marine component will be reviewed – only those one to three major laws of a country that directly provide for establishment of marine protected areas.

for this section will be qualitative.

Given the importance of coral reefs to the economies to the islands, Chapter 7 will also evaluate (1) the extent to which marine protected areas legislation results in effective management of legislated marine protected areas; and (2) whether the marine protected areas legislation for each country adequately addresses the specific threats to the coral reefs under their jurisdiction. This analysis will include data on the number, areal extent, fishing restrictions, management level, and management effectiveness of MPAs in each island group. Data for this section will be derived from various sources, including reports by Geoghegan (2001), CEP/UNEP (1996), St. Eustatius National Parks, the Dutch Caribbean Nature Alliance, and Burke and Maidens (2004).

5.2. Legislative Analysis

Analysis of the legislation adopted by each island group for establishment and administration of marine protected areas will be determined according to the number and adequacy of provisions viewed as instrumental to MPA effectiveness. To this end, this paper will review the legislation according to the guidelines established in Lausche (1980), Kelleher and Kenchington (1992), and Salm, Clark and Siirila (2000). The Lausche publication, titled *Guidelines for Protected Areas Legislation*, is, as the title suggests, specifically devoted to explication of the provisions crucial to the effectiveness of a protected area. The one *caveat* is that the book encompasses proposed guidelines for both marine *and* terrestrial protected areas, and thus several of the proposed guidelines are inapplicable to management of marine areas.

Nevertheless, the majority of the provisions found in *Guidelines for Protected Areas Legislation* are relevant to the present analysis and the publication is the primary source for the elements included herein. The author of the *Guidelines* is an environmental lawyer of note,

having worked for such organizations as the World Bank, World Wildlife Fund, U.S. Environmental Protection Agency, and Natural Resources Defense Council.[4] Significantly, she has also worked as a consultant to the Organization of Eastern Caribbean States assessing environmental legislation in the Caribbean, as well as drafted national parks legislation for the British Virgin Islands. Furthermore, Lausche notes that the guidelines "have the benefit of scientific and legal review from experts working with protected areas" and "represent some consensus as to essential legal elements important to both disciplines" (1980, 9).

The second and third publications to be utilized are *Guidelines for Establishing Marine Protected Areas*, and specifically, the chapter titled "Legal Considerations for Protection of Marine and Estuarine Areas and Resources" (Kelleher and Kenchington 1992); and *Marine and Coastal Protected Areas: A Guide for Planners and Managers*, and more specifically, the chapter titled "Institutional and Legal Framework" (Salm, Clark and Siirila 2000). Unlike Lausche (1980), the Kelleher and Salm publications are specifically devoted to marine protected areas. Although the books are not quite as thorough or comprehensive as Lausche (1980), they are useful to supplement those guidelines where the unique nature of the marine component requires special considerations.

The author's review of the guidelines set forth in these publications identified fifteen key elements for successful MPA legislation. However, as noted by Salm, Clark and Siirila (2000, 134), every country is different and the form and content of legislation will differ according to the needs, traditions, and institutions of the individual country. Accordingly, it is highly unlikely that a country's laws will incorporate all of the identified elements. For that and other reasons, Lausche writes that the elements presented in her book are "presented as guidelines rather than a Model Act" (Lausche 1980, 21).

[4] Biographic information for Barbara Lausche derived from http://www.irf.org/about/staff.php.

The elements are listed below, along with a brief description of its purpose and/or relevance to the establishment and administration of marine protected areas. As previously noted, the guidelines and descriptions are derived from Lausche (1980), Kelleher and Kenchington (1992), and Salm, Clark and Siirila (2000).

5.3. Guidelines

5.3.1. Statement of Policy

Legislation should include a statement of policy on the "management, sustainable use and conservation" of marine areas (Kelleher and Kensington 1992, 18). To that end, the policy should specify, *inter alia*, a country's economic, social, political, development, and land use considerations (Lausche 1980, 22). Lausche (1980, 23) also suggests that, when applicable, the policy statement should include whether the legislation (1) is adopted to comply with multilateral obligation or international convention; or (2) the legislation is guided by a particular international principle or concern. Formation of a comprehensive policy statement may also help increase national recognition of the need to protect and conserve marine resources (Kelleher and Kensington 1992, 18).

5.3.2. Statement of Objectives

The legislation should specifically indicate the goals that the country hopes to achieve through the establishment of marine protected areas. Generally, the objectives should include "conservation, recreation, education and scientific research" goals, with resource conservation being of primary importance (Kelleher and Kensington 1992, 18). Clearly-stated objectives will also help to guide the activities and decisions of MPA managers and officers (Lausche 1980, 23). Examples of general objectives are:

a. to safeguard and maintain representative samples of the natural ecosystems and endangered species occurring

therein;

b. to propagate, protect, conserve, study, and manage those ecosystems, flora and fauna... of particular national or local significance for the benefit and enjoyment of the inhabitants of the country;

c. to conserve ecosystems or species of particular international value for the preservation of important representative ecosystems, species, or genetic resources, or for the management of shared resources;

d. to provide educational and recreational services that will allow the public to appreciate and enjoy the values of protected areas;

e. to provide for multiple-use resource areas which offer protection to ecosystems and resources as well as some secondary social and economic benefit;

f. to establish buffer zones outside the periphery of a particular protected area to lessen disturbances that may be caused by human activity outside that area (Lausche 1980, 24, 25).

5.3.3. Definitions

Definitions of the terms used in MPA legislation helps to avoid confusion over comprehension and application of legislative provisions. Definitions are also important when using standardized terms. For example, Lausche (1980, 26) notes that the classification for a "national park" in one jurisdiction may often differ from that of a different jurisdiction.

5.3.4. Establishment of Protected Areas

One of the most critical aspects of MPA legislation is the method adopted for establishment of marine protected areas, which will involve several components.[5] Lausche (1980, 31) writes that the powers and procedures to establish, amend, and abolish protected areas should rest with the "highest body responsible for legislative matters in the country or region...." Lausche also recommends that decisions affecting the MPA boundaries and classifications be

[5] Those elements found within the "Establishment" guidelines that are especially significant, or are listed as individual elements by Kelleher and Kensington (1992) or Salm, Clark and Siirila (2000), are included as separate guidelines for this paper.

altered only through legislation coming from the top (1980, 31). Such high-placed authority may be necessary in order to ensure that the restrictions of the MPA are not limited or reduced at lower levels of administration.

However, Lausche does recommend that the governing authority consult the public about critical decisions affecting the MPA (Lausche 1980, 32). The legislation should also provide that:

a. no withdrawal or downgrading in classification will be authorized until the decision-making body is satisfied that such withdrawal will not prejudice the well-being of the area, except where there is a specified higher public interest; and

b. that the decision-making body give reasons whenever it decides to approve a withdrawal or downgrading which has been opposed by the advisory committee or other group designated to report in the interest of the protected area program. Such decision to withdraw or downgrade should be open to challenge in a Court of Law (Lausche 1980, 32).

Lausche (1980, 33) states that legislation should establish a "variety of types of protected areas" and "define management categories, and protection, enforcement, and administrative measures required for these types of areas." Lastly, the legislation should contain management provisions that "ensure fulfillment of each area's purpose and objectives" (Lausche 1980, 33).

5.3.5. Jurisdiction

A protected area may be subject to the authority of different agencies, and so it is important that the legislation delineate management and enforcement responsibilities among the various groups when such an eventuality exists. Additionally, responsibility for areas and activities outside the protected area that impact the MPA also needs to be clearly defined (Lausche 1980, 30).

5.3.6. Demarcation of Boundaries

It is quite important to define clearly the boundaries of the marine protected area. As

with the establishment and amendment of MPAs, the boundaries should be set forth in the general legislation coming from the highest governing authority. Salm, Clark and Siirila (2000, 141) maintain that the boundaries "must be broad enough to encompass the critical areas it aims to protect," and "must also be small enough that enforcement is possible." Furthermore, they note that equitable considerations demand that MPA boundaries not be so extensive that traditional users reject the abridgment of their rights. MPAs whose boundaries are set according to a justifiable rationale are more likely to be "accepted, and respected, by the stakeholders" (Salm, Clark and Siirila 2000, 141).

Legislation should seek to regulate activities both inside and outside of the marine protected area that may impact protection and conservation of the ecosystems and species within the MPA. Thus, the legislation should, whenever possible, include buffer zones in which activities or controlled and regulated. The buffer zone should be clearly delimited and the proscribed activities within the buffer zone clearly defined (Lausche 1980, 40, 41).

5.3.7. Management Plan

For an MPA to be successful, it is often vital that the protected area develop and abide by a comprehensiveness management plan. The management plan will govern nearly all aspects of actual administration of the protected area, such as conservation and protection measures, maintenance, buildings, roads, monitoring, research surveys, recreational activities and facilities, visitors fee amounts, etc. (Lausche 1980, 35). Thus, any legislation regulating MPAs should require that a management plan be produced. One of the key provisions of the plan, especially for large MPAs, is delimitation and regulations inside different zones within the MPA. Kelleher and Kensington (1992, 21) recommend that "zoning arrangements be described in sufficient detail to provide adequate control of activities and protection of resources."

Lausche notes several other components of the management plan that should be dealt with in the legislation:

a. a detailed description of the manner in which management of the protected area is to be undertaken;

b. the interval of time within which and manner by which public comments may be made to the authorities in connection with the plan;

c. when the plan allows for certain uses or developments in the protected area (e.g. recreation, building of certain facilities, etc.), it should clearly set out any conditions which are applicable to those uses or developments;

d. in preparation of the plan, objectives and purposes for the general program area should be recognized and followed;

e. a clear description of the zoning category and the conditions under which each zone should be maintained; and

f. the interval of time during which it will be effective and date on which it will cease to have effect (Lausche 1980, 36).

5.3.8. Financing

Even with well-structured management plans and well-intentioned managers and officers, an MPA will be unsuccessful if the administration of the MPA is not adequately financed. The legislation must provide for the allocation of adequate revenues for the MPA to achieve its conservation goals. When politically possible, the legislation should create a special fund specifically reserved to finance MPA activities (Salm, Clark and Siirila 2000, 157).

In addition (or alternatively), the legislation should require that fees collected by the park itself, such as funds acquired through visitors' fees or park concessions, be used for park administration and management. Successful marine parks, such as those in Bonaire and Saba, have nearly achieved self-sufficiency through this method. Such an arrangement is further recommended because it assures that the MPA will be supported if the government ever votes to reduce or abolish government financing. The one drawback in self-supporting MPAs, however,

is that the need to maintain its funding may lead the MPA to focus more on obtaining revenue than conservation. Because of that danger, Salm, Clark and Siirila (2000, 138) suggest that some financing come from the local government, with the "local government and people also retaining the largest share of tourism and other revenues."

5.3.9. Institutional Arrangements

Each established MPA will have its own managers and officers, however, the government must also develop "institutional mechanisms" to oversee implementation of legislative rules and objectives (Lausche 1980, 41). Consistent with the objective of protecting marine resources and areas, the institutional mechanism with overarching responsibility for marine protected areas should be given powers "to adopt such protective measures as may be necessary for each area" (Lausche 1980, 42). Kelleher and Kenchington (1992, 20) state that, in order to avoid interorganizational conflict, the "arrangements should grow from existing institutions" and that the "creation of new agencies should be minimized."

For newly-established countries, Salm, Clark and Siirila (2000, 136) maintain that non-governmental organizations, which will often have the experience and expertise lacking in a young government, can be beneficial as overseers of MPA legislation and management.

Several key elements that should be drafted into MPA legislation regarding institutional mechanisms:

a. It is essential that the legislation designate the institution responsible for overseeing and implementing the program. This institution should be a well-defined unit, served by competent scientifically-trained personnel in protected areas matters;

b. Wherever possible, within this designated institution the position of Director or equivalent presiding officer of the protected areas program should be created by legislation, and this director should be assigned general as well as specific responsibilities for overall operation of the

program;

c. The regulatory and institutional responsibilities necessary for proper management of protected areas make it inappropriate to delegate the institutional powers for the protected areas program to a Government or quasi-autonomous authority with primarily commercial interests in protected areas;

d. The duties and powers, including any regulatory authority, of the responsible protected areas institutional mechanisms should be set out in some detail in the legislation (Lausche 1980, 43).

Even if new agencies are not created, it is inevitable that disputes between agencies may arise (Kelleher and Kenchington 1992, 20). To minimize potential conflict, the legislation should, to the extent possible, delineate the relationships between, and respective powers and duties of, the various agencies and include either (1) mechanisms for dispute resolution, or (2) clearly identify the agency having ultimate authority over MPA matters (Kelleher and Kenchington 1992, 20). The government may want to consider creation or appointment of an advisory body of appropriate scientific and technical merit to make recommendations to the oversight agency.

5.3.10. Prohibited and Regulated Activities

Legislation should include the types of activities allowed and prohibited within marine protected areas and related buffer zones. Restrictions on activities will define, or be defined by, the type of MPA established (e.g., no-take reserve, marine park, multiple-use area). The following are general and specific activities that should be regulated:

a. prohibiting or strictly regulating access to the whole or part of an area Prohibitions against distraction or alteration of the marine ecosystem;

b. prohibitions against [or permitting of] the killing, capturing, taking away, damaging or disturbing of any resource, or other object for exploitation or any other purpose;

c. regulating or prohibiting the collecting or taking of animals or plants into or out of the protected area;

d. prohibitions against damage of ecosystems or species from pollution;

e. prohibitions against introduction of alien or exotic species; prohibiting the use of explosives and poisons in the protected area;

f. conducting of scientific research;

g. removal or alteration of any flora or fauna... in any protected area (Lausche 1980, 52-55).

5.3.11. Enforcement

The success of an MPA may often be linked to effective enforcement of the rules and regulations laid out in legislation and the management plan. Thus, the legislation should include provisions governing the duties and powers of enforcement officers (Lausche 1980, 59). The law should also specify the fines and penalties to be levied against those that break MPA rules and regulations. Three key elements of enforcement that should be specified are:

a. the types of officers that have the various enforcement duties and powers;

b. the kind of enforcement powers which should be granted;

c. a strong focus on public participation in enforcement and on public education about the law and the protected areas program (Lausche 1980, 59).

Considering the last element, Salm, Clark and Siirila (2000, 156) state that legislation should provide "as many incentives as possible for the enforcement of rules and regulations by local people who use and benefit from the area."

5.3.12. Monitoring and Research

Legislation should give the oversight agency authority "to undertake or contract out and supervise research and surveys relevant to planning and management..., and should include detailed socio-economic analysis of neighboring communities" (Salm, Clark and Siirila 2000, 137). Monitoring allows the management and advisory bodies to gauge the success of marine

protection measures, while research can help identify those factors that influence most heavily the success of legislative measures.

5.3.13. Equity and Compensation

Creation of an MPA will often require restricting use of the area by local stakeholders. Both Salm, Clark and Siirila (2000) and Kelleher and Kenchington (1992) recommend that legislation provide compensation to stakeholders for the loss of use of protected areas. Moreover, as already stated, the legislation should seek to consider the traditional uses and rights of local stakeholders when setting MPA restrictions and delimiting MPA boundaries (so as not to create overly large areas).

5.3.14. Legal Proceedings

Legislation should provide for the manner in which transgressors will be dealt with legally, which may include proceedings before the appropriate court of law. Penalties for rule-breaking can be defined under either this section or under "Enforcement," and may include fines, imprisonment, and/or forfeiture. Forfeiture without compensation should apply to "any objects or devices (whether mechanical or non-mechanical) taken, used or involved in the commission of the offense," or "all natural flora or fauna taken as well as any... proceeds of sale of any such objects" (Lausche 1980, 65). Lausche further recommends that the burden of proof be defined and, where possible, shift the burden to the defendant to rebut the presumption of guilt (1980, 66).

5.3.15. Public Participation and Education

There are many instances in the preceding elements where the public is encouraged to assist with management and enforcement of MPA rules regulations. Moreover, MPAs should implement education and outreach programs in order to notify about the public about the benefits

of marine resource conservation and the strategic role that an effective MPA can play to achieve conservation goals. Provisions to encourage public participation might include:

a. public opportunity to review and comment on proposed protected area designations, management plans, regulations, etc.;
b. public involvement and management activities, enforcement programs and administration, when appropriate, with local programs;
c. public representation on advisory committees at all appropriate levels;
d. local participation in decisions of disbursement of certain revenues for local operation of a protected area (Lausche 1980, 67).

Engaging local stakeholders will help to avoid conflict over use of protected areas and foster relationships between stakeholders and MPA officers and officials, generally resulting in more successful protected areas.

Chapter 6. Analysis of Marine Protected Areas Legislation

6.1. Introduction

The legislative guidelines presented in Chapter 5 form the basis for analysis of the marine protected areas laws of the three island groups. The analysis presented herein is based on the argument that the more effective MPA legislation is that which contains more, rather than less, of the guidelines in Section 5.3. The task in the present chapter will be to simply determine which guidelines have been successfully accounted for in the corpus of MPA legislation for each country – the consequences for protection of marine resources will be dealt with in Chapter 7.

In order to quantify the number of elements included within an individual law, a point will be assigned for each successfully incorporated guideline. For those sections of a law that arguably meet a requirement but are deficient in an important respect, only a half point will be given. The author acknowledges that the determination of whether an element is deficient is largely a discretionary exercise. However, justification for the decision will be given where possible. The total number of elements found within each law will be tallied at the end of the legislative review, and those laws containing more of the suggested guidelines will be construed as possessing more effective legislation. The review found below will first feature the relevant language of each section that comprises an element from Section 5.3. The applicable guideline is written underneath in bold print with either a point or half point assigned to each. Table 6-1, which follows the guidelines analysis, will present in summary form the elements included within each reviewed law.

6.2. Antigua and Barbuda

Antigua and Barbuda has several enacted several statutes that impact marine resource protection. Those acts are:

1. The Turtle Act of 1927
2. The Beach Protection Act of 1957
3. The Marine Areas (Preservation and Enhancement) Act of 1972
4. The Fisheries Act of 1983
5. The National Parks Act of 1984.[6]

The acts that contain relevant provisions for establishment and management of marine protected areas are The Marine Areas Act, The Fisheries Act, and National Parks Act. Antigua and Barbuda has also passed several regulations under the Marine Areas (Preservation and Enhancement) Act that further legislate for MPAs and will be dealt with under that act.

6.2.1. The Marine Areas (Preservation and Enhancement) Act of 1972

Sec. 1: Defines a few terms used in the Act, including "flora and fauna", "marine areas," and "restricted areas." Unlike the Fisheries Act, the Act identifies the "Minister" responsible for administering the Act as the "Minister responsible for Fisheries."

Guideline 3. Definitions (1)

Sec. 3: Grants the Minister authority to designate restricted areas where he deems necessary for:

(a) preserving and enhancing the natural beauty of such areas;
(b) the protection of the flora and fauna and wrecks found in such areas;
(c) the promotion of the enjoyment by the public of such areas;
(d) The promotion of scientific study and research in respect of such areas.

Section 3 further forbids any person to "go in or alight upon a restricted area, or counsel, aid or abet any other person so to do." Violation of this provision can result in a fine of $1500, and in the case of a continuing offense, to a fine of $300 for each day thereafter. An important point to

[6] Acts are available online from the Antigua and Barbuda government website, at http://www.laws.gov.ag/acts/index.html.

note is that establishment does not require approval from the legislature. It can thus be assumed that the Minister cannot be prevented from altering or abolishing the marine reserve without prior legislative approval. This factor is a very important component of MPA legislation, especially when designation of the marine reserve is important for conservation but meets with opposition from the local community. The Minister may be unwilling to brook public disapproval and abolish the MPA as a result.

Section 3 further states that an "area so designated shall be described and be limited in such order by reference to a map or such other descriptive matter as may be necessary for the purpose." However, the legislation itself does not set the restricted area boundaries and thus barely satisfies the "Demarcation of boundaries" element. The requirements for establishment can be considered a statement of policy for purposes of the guidelines.

Guideline 1. Statement of Policy (1)

Guideline 4. Establishment of Protected Areas (.5)

Guideline 5. Jurisdiction (1)

Guideline 6. Demarcation of Boundaries (.5)

Sec. 5: Authorizes the Minister "to assign to any person, Board, committee or body which he considers competent for the purpose, responsibility for the control and management of any restricted area in accordance with the provisions of this act, or of any regulations made thereunder." This provision barely meets the "Institutional Arrangements" requirement insofar as it lacks any specificity as to which body is to be given management authority, the composition of the Board, and the specific duties required by the authority.

Guideline 9. Institutional Arrangements (.5)

Sec. 6: Section 6 grants the Minister general authority to regulate activities inside the restricted

area, including:

(a) the protection of the flora and fauna and wrecks in restricted areas and the establishment of offenses in connection therewith;

(b) the care, control and management of the restricted area, including the search, seizure, and arrest of any person, vessel or carrier;

(c) the regulation of the use and enjoyment of such areas;

(d) the regulating of the use of parking and refreshment facilities;

(e) the licensing of boats and crafts employed in the transportation of visitors to restricted areas, and the licensing of any guides required by visitors;

(f) the ensuring of public rights of way over private property to allow access to restricted areas;

(g) permitting entry to restricted areas upon such terms and conditions as may be imposed by the Minister;

(h) the charging of fees for any of the services above;

(i) the seizure and confiscation of any flora, fauna, wreck or any part thereof taken in contravention of this act or any regulations made thereunder and of any vessel or carrier upon which the same may be found;

(j) the payment of all sums for carrying this act into effect.

Section 6 also contains penalties for violations of reserve regulations, which may be a fine not to exceed 3000 dollars or a term of imprisonment not exceeding six months or to both. Lastly, the Act does require that the regulations be approved by Parliament. Significantly, however, the law fails to instruct as to the amount of discretion allowed the Minister to change reserve regulations once implemented.

Guideline 10. Prohibited and Regulated Activities (1)

Guideline 11. Enforcement (1)

Guideline 12. Legal Proceedings (1)

6.2.2. Marine (Restricted Areas) Order of 1973

The order is promulgated under Section 3 of the Marine Areas (Preservation and Enhancement) Act, which provides, in part, for demarcation of restricted area boundaries. Schedule 1 of the Order delineates the boundary for the Diamond Reef and Salt Fish Trail Reef; and Schedule 2 delineates the boundary for the Palaster Reef off Barbuda.

Guideline 6. Demarcation of Boundaries (1)

6.2.3. Fisheries Act of 1983

Part 1, Sec. 2: Defines various terms used in the Act, including "fish", "authorized officer," and "Chief Fisheries Officer."

Guideline 3. Definitions (1)

Part II, Sec. 3: The section states that the "Minister shall take such measures as he thinks fit under this Act to promote the development and management of fisheries, so as to ensure the optimum utilization of the fisheries resources in Antigua and Barbuda water for the benefit of Antigua and Barbuda." Section 3 also provides for appointment of the Chief Fisheries Officers and assistant officers, as needed. However, as an element of "Institutional Arrangement," the section lacks the specificity of organization. For instance, the Act does not state which Ministry is responsible for oversight.

Guideline 2. Statement of Objective (1)

Guideline 5. Jurisdiction (1)

Guideline 9. Institutional Arrangements (0.5)

Part II, Sec. 4: This section requires drafting of a management plan, which charges the Chief Fisheries Officer to

> (a) identify each fishery and assess the present state of its exploitation;

(b) specify the objectives to be achieved in the management of each fishery;

(c) specify the management and development measures to be taken; and

(d) specify the licensing programs to be followed for each fishery, the limitations, if any, to be applied to local fishing operations and the amount of fishing, if any, to be allocated to foreign fishing vessels.

The section also requires consultation of local fishermen and authorities affected by the plan. The plan is deficient for management of an MPA, however, in that the plan only covers regulation of fisheries, which is just one aspect of an effective MPA.

Guideline 7. Management Plan (.5)

Part II, Sec. 5: Provides for the appointment of an advisory committee "to advise on the development and management of fisheries." An advisory committee is beneficial, but the section contains no provisions for other key aspects of the "Institutional Arrangement" guideline, such as hierarchy of authority in the event of an interagency dispute.

Guideline 9. Institutional arrangements (.5)

Part III, Sec. 22: Part III is titled "Marine Reserves and Conservation Measures" and is the section most relevant to MPA establishment. Whereas Section 21 provides for establishment of a fishing *priority* area (to be implemented when "special measures are necessary to ensure that authorized fishing with the area, is not impeded or otherwise interfered with"), Section 22 authorizes creation of a marine reserve to:

(a) afford special protection to the flora and fauna of such areas and to protect and preserve the natural breeding grounds and habitats of aquatic life, with particular regard to flora and fauna in danger of extinction;

(b) allow for the natural regeneration of aquatic life in areas where such life has been depleted;

(c) to promote scientific study and research in respect of such areas; or

(4)[sic] to preserve and enhance the natural beauty of such areas.

Section 22 also contains a few other key guidelines:

> Any person who, in any marine reserve, without
> permission granted under sub-section (3)-
> (a) fishes or attempts to fish;
> (b) takes or destroys any flora and fauna other than fish;
> (c) dredges, extract sand or gravel, discharges or deposits waste or any other polluting matter, or in any other way to stirrups, alters or destroys the natural environment; or
> (4)[sic] constructs or erects any building or other structure on or over any land or waters within such reserves;
> is guilty of an offense and is liable on summary
> conviction to a fine not exceeding $10,000.

Thus, Section 22 also lists prohibited activities within the area and covers the maximum penalty to be issued in case of an offense. Like the Marine Areas Act, the establishment provision is at the discretion of the Minister, and thus the reserve can likely be altered or abolished with consent from the governing body.

Guideline 4. Establishment of Protected Areas (.5)

Guideline 10. Prohibited and Regulated Activities (1)

Guideline 14. Legal Proceedings (1)

Part III, Sec. 24, 25: These two sections prohibit certain fishing methods, such as the use or possession of explosives, poisons or other noxious substance, and the use or possession of certain fishing gear. The sections state that penalties for an offense under the section (a fine not exceeding $20,000).

Guideline 10. Prohibited and Regulated Activities (1)

Guideline 14. Legal Proceedings (1)

Part IV, Sec. 26: Allows for further appointment of additional marine enforcement officers.

Guideline 11. Enforcement (1)

Part IV, Sec. 27: Section 27 contains the duties and powers of appointed officers in enforcing the law. Officers are authorized to stop, board and search fishing vessels without a warrant; enter and search premises; take samples of fish found in a vessel vehicle or premises; seize vessels, vehicles, fishing gear net or other fishing appliances believed to have been used in commission of the offense; seize any fish believed to have been caught in the commission of the offense; and seize explosives or poison which has been used or is possessed in contravention of the act.

Guideline 11. Enforcement (1)

Guideline 14. Legal Proceedings (1)

Part IV, Sec. 33: One other important provision is the forfeiture of any "vessel, and any vehicle, fishing gear, net or other fish appliance, used in the commission of the offense" is forfeited. Conscientious enforcement of the forfeiture provision could be instrumental in discouraging rule-breaking.

Guideline 14. Legal Proceedings (1)

Part IV, Sec. 35: Under certain circumstances, this section shifts the burden of proof onto the defendant to show that he possessed the required "license, authority or permission" to conduct the act for which he has been charged.

Guideline 14. Legal Proceedings (1)

6.2.4. The National Parks Act of 1984

Preamble: Unlike the previous laws, the National Parks Act begins with a statement of purpose. The preamble states the act represents the vehicle for creation of National Parks and a National

Park Authority. The Act's purpose is to "make provision for the preservation, protection, management and development of the natural physical and ecological resources… of Antigua and Barbuda; and for those matters connected with those purposes."

Guideline 2. Statement of objective (1)

Part I, Sec. 2: Defines several terms and identifies the Minister responsible for administration of the Act as "the Minister to whom responsibility for Economic Development and Tourism has been assigned."

Guideline 3. Definitions (1)

Guideline 5. Jurisdiction (.5)

Part II, Sec. 4: Lists the functions of the National Parks Authority, which include:

> (a) to preserve, protect, manage and develop natural, physical and ecological resources … of Antigua and Barbuda;
>
> (b) to encourage the provision and improvement of facilities for persons visiting parks for the enjoyment thereof;
>
> (c) to perform its functions pursuant to this act as a non-profit making organization using any surplus funds it acquires for the enhancement of the natural, historical and cultural resources of Antigua and Barbuda in general and, in particular, of Parks;
>
> (f) to the greatest possible extent consistent with the performance of its functions under this Act, to consult and cooperate with departments, divisions and agencies of the Government and with other bodies having functions, aims or objects related to those of the Authority….

To some extent, the functions listed above contain provisions absent from earlier legislation. By implication, the section authorizes the Authority to collect fees for use of a given park, which are then to be used to fund park administration. The section also requires the Authority to consult with other agencies having similar or overlapping functions. Notably, subsection (f) does not determine which agency has ultimate authority in the event of conflict. And so, the Act is an

improvement upon earlier legislation but does not go far enough in meeting the requirements of the guidelines in Section 5.3 of the previous chapter.

Guideline 5. Jurisdiction (1)

Guideline 8. Financing (.5)

Guideline 9. Institutional Arrangements (.5)

Part I, Sec. 7: Section 7 vests responsibility for management of the Authority to an appointed Parks Commissioner, who is charged with implementing the policies and programs approved by the Authority.

Guideline 5. Jurisdiction

Part II, Sec. 10: While the Fisheries Act call for development of a management plan for management of fisheries, the National Parks Act goes further in instructing the Parks Commissioner about the details of such a plan. The requirements still lack some of the detail suggested by the legislative commentators in Chapter 5, but can still be viewed as an improvement on earlier laws. Section 10 states that the plan shall

> (a) identify the park and assess the present state of its development;
>
> (b) contain a statement of objectives and policies on matters relating to the (i) the development and use of all land in the Park; (ii) maintenance and protection of natural resources and sensitive environmental areas; (iii) protection and conservation of heritage resources and archaeological sites (including buildings, structures and views; and (iv) provision of infrastructure and transportation.

Section 10 also mandates that the Commissioner "consult with members of the local community, local authorities and other persons affected by the Park plan," which is then to be submitted to the Authority for consideration, which in turn is subject to approval by the Cabinet. The section also contains provisions for public comment and public notification and comment on

amendments to the plan.

Guideline 7. Management Plan (1)

Guideline 5. Jurisdiction (1)

Guideline 14. Equity and Compensation (.5)

Guideline 15. Public Participation and Education (.5)

Part III, Sec. 11: Another improvement from the legislation reviewed above is a more detailed provision regarding financing of the Park. The Act states that funds and resources of the Authority are to come from Parliament, loans or grants from the government or international organization, donations, and "all monies paid to the authority by way of subsidies, kits, fees, subscriptions, rent, interest and royalties as well as any other sum or any property which may in any manner become payable to or vested in the authority in respect of the performance of its functions." The Act does not go so far as to allocate specific amounts to the Parks or Park Authority but it does specifically allow for visitors fees and other assessments to be charged, which can then be used for park management.

Guideline 8. Financing (1)

Part IV, Sec. 20: Section 20 grants authority to the Minister to declare "any area of land or water or both" as a National Park, but establishment is subject to the "affirmative resolution of the Legislature." The Minister is required to prepare a map outlining park boundaries and provide for public inspection of the map.

Guideline 4. Establishment of Protected Areas (1)

Guideline 6. Demarcation of Boundaries (.5)

Part VI, Sec. 26: Part VI is titled "Miscellaneous" but provides the authority to the Minister to "make regulations generally for carrying out the purposes of this act and for the preservation,

management and development of parks." These regulations include prohibiting or restricting movement within the park and the imposition of visitors' fees. Lastly, Section 26 provides that violation of a regulation is punishable by a penalty up to $5000 or imprisonment for one year. The regulations are for the "preservation, management, and development" of the park but does not contain express language stating what types of activities should be restricted or prohibited.

Guideline 10. Prohibited and Restricted Activities (.5)

Guideline 14. Legal Proceedings (1)

6.3. Netherlands Antilles

Within the Windward group of the Netherlands Antilles, the only meaningful marine protected areas legislation is the Marine Environment Ordinance of Saba (A.B. 1991 Nr. 8), and the Marine Environment Ordinance of St. Eustatius (A.B. 1996 Nr. 3).[7] Both ordinances, passed by the island's governing bodies, establish the marine parks surrounding each island. St. Maarten has yet to pass a similar ordinance or formally establish a marine park, although it is reportedly close to achieving both (reference). In this chapter, only the Saba Marine Environment Ordinance will be reviewed.

6.3.1. Marine Environment Ordinance (A.B. 1991 Nr. 8)

Preamble: States that the ordinance is passed in order to

> establish regulations for managing the marine environment of the Island Territory Saba, in order to preserve the natural resources of that environment for both commercial, as well as educational, recreational and scientific purposes.

As with the Preamble to the National Parks Act of Antigua and Barbuda, the preamble is deficient as a statement of policy and statement of objective, but it can be viewed as incorporating elements of both.

[7] Both ordinances can be found on the website for the Netherlands Antilles Department of Environment and Nature at http://www.mina.vomil.an/policy/legislation.php, although only the Saba ordinance is translated into English.

Guideline 2. Statement of Objective (.5)

Part I, Art. 1: Part 1 is entitled "Definitions" and lists the definitions used in the Marine Ordinance, including descriptions of coral, conch, turtles, and SCUBA. Significantly, the first definition establishes the limits of the Saba National Marine Park (SMP), which are

> the sea floor and overlying waters around and adjacent to the island Saba, with the high water tidemark as the upper limit and the 60m depth contour as the lower limit.

Thus, by definition, the SMP completely surrounds the island, encompassing all marine areas up to a 60m depth.

Guideline 3. Definitions (1)

Guideline 6. Demarcation of Boundaries (1)

Part II, Art. 2: Declares unlawful any acts that violate the SMP zoning plan as set forth in the Island Resolution Containing General Provisions (IRCGP). The general provisions are incorporated as amendments to the Marine Ordinance and are discussed below. The article does not include details on the types of regulations to be enforced or the penalties for violations, however, these matters are dealt with in other sections.

Guideline 10. Prohibited and Regulated Activities (.5)

Part II, arts. 3, 4: These two articles prohibit spearfishing with SCUBA gear or hookah equipment and the use of poisons, chemicals, or explosives for fishing.

Guideline 10. Prohibited and Regulated Activities (.5)

Part II, arts. 5, 6: Restricts the number of turtle and conch that can be extracted from the park. Persons who choose to collect either turtle or conch are obligated to report their catch to the SMP manager.

Guideline 10. Prohibited and Regulated Activities (.5)

Part II, art. 7: Article 7 is an important provision because it allows for the passage of new

regulations affecting catch and collection of marine organisms. Significantly, however, it states that these additional regulations are to be issued by Island Resolution, and thus it is the island government that has ultimate authority regarding protection of marine species. This provision most closely relates to Guideline 4 (Establishment of Protected Areas), insofar as changes in regulations may represent a downgrade or withdrawal in classification.

Guideline 4. Establishment of Protected Areas (1)

Part II, art. 8: Article contains a general statement that it unlawful to engage in activities that harm the marine environment, or to intentionally destroy the marine environment of the SMP. Subsection 3 specifically prohibits anyone to "kill, break, catch or collect corals or other bottom-dwelling invertebrates and plants on or in the sea floor." However, subsection 4 relaxes the restrictions for Sabans, who are, within limits, permitted to take snails, squids and octopus, and crustaceans for personal use.

Guideline 10. Prohibited and Regulated Activities (.5)

Part II, arts. 9, 10, 11: These article detail several other prohibited activities within the SMP, such as anchoring in coral (except during an emergency), the discharge of substances into the waters of the SMP, and the construction or destruction of mooring sites within the SMP. Furthermore, boats are not to occupy existing mooring sites any longer than is needed to complete a dive.

Guideline 10. Prohibited and Regulated Activities (.5)

Part II, art. 12: Provides that "developments or modifications of the coastal zone which may influence the marine environment of SMP must be preceded by an independent environmental impact assessment." This is the first mention in the reviewed legislation of regulation of activities outside a protected area that may potentially harm the environment within the MPA.

Saba is a popular diving destination within the Caribbean and considered to have well-maintained reefs. It is likely that Article 12 is partly responsible for effective protection of the surrounding marine resources.

Guideline 10. Prohibited and Regulated Activities (1)

Part III, art. 13: Saba Marine Park is at or near self-sustainability as far as financing its own operations is concerned. Self-financing has been achieved through the imposition of visitors' fees on SCUBA divers and snorkelers in the park. Article 13 requires that operators transporting visitors into the park obtain permits and they in turn are responsible for collecting fees from their clients.

Guideline 8. Financing

Part III, art. 14: Authorizes the Executive Council to grant exemptions from regulations for scientific, commercial, or educational purposes but provides that the council must seek expert advice before doing so. Article 14 specifically grants Executive Council authority to grant exemptions to subsection 3 of Article 8 (prohibiting taking of coral and other bottom-dwelling invertebrates) for commercial purposes.

Guideline 10. Prohibited and Regulated Activities (.5)

Guideline 12. Monitoring and Research (.5)

Part III, art. 16, 17: Both articles outline penalties to be assessed under the ordinance. However, article 16 is unique in that it provides for specific charges against the director of a "legal body" should he/she fail to "ensure that the legal body directed by him does not violate any regulations of this ordinance." Presumably, the legal body is some authority vested with responsibility for administering or making regulations for the park. Should the director fail in his duties, he may be imprisoned for up to one month. Article 17 states that other violations will be punished by

imprisonment of up to one month or fines of up to NAf. 5,000 (which is equivalent to approximately USD 3000).

Guidelines 11. Enforcement (1)

Guideline 14. Legal Proceedings (1)

Part III, art. 19: Establishes that officers with enforcement duties within the SMP are "law enforcement officers in accordance with the Penal Code," persons in charge of managing the SMP, and other persons nominated as such by Island Resolution.

Guideline 11. Enforcement (1)

Article 20. Provides for forfeiture of objects used or acquired during violation of ordinance. As noted above, forfeiture can be seen as an effective way of discouraging violations, as the loss of a boat or vehicle can be much more severe than payment of the maximum fine.

Guideline 14. Legal Proceedings (1)

6.3.2. Island Resolution (A.B. 1987, Nr. 10), Amendment 3.1.2

Article 1: Establishes the different zones within the Saba National Marine Park. The Island Resolution creates one multiple use zone, five recreational diving zones, three anchoring zones, and an all-purpose recreational zone. Zoning can be beneficial because it allows for access to the Park (which in this case are all waters surrounding the island) but creates areas that can be restricted in order to preserve significant or valuable marine areas. Under the guidelines in Section 5.3, zoning falls under the management plan. Since the zoning arrangements fall under legislation in this instance, and because ultimately zoning defines the activities that can take place with a protected area, it will be assessed under the Regulation of Activities guideline.

Guideline 10. Prohibited and Regulated Activities (1)

Article 2. Prohibits most fishing within recreational diving zones.

Guideline 10. Prohibited and Regulated Activities (1)

Article 3. Sets visitors fee at 1.00 USD or Naf 1.80 per visitor per dive.

Guideline 8. Financing (1)

There are several other amendments to the Marine Environment Ordinance but they deal primarily with an increase in visitors' fees and how they are to be assessed, imposition of yachting fees, and a prohibition on anchoring in recreational areas. In this regard, the amendments more closely resemble those types of day-today management issues that might typically be dealt with in the park's management plan.

6.4. United States Virgin Islands

As a territory of the United States, the legislation regulating marine protected areas in the U.S. Virgin Islands is formulated by Congress. As such, the legislation governs the establishment and management for all marine protected areas designated by the United States government. While dozens of federal laws apply to marine areas and resources, the National Marine Sanctuaries Act, 16 U.S.C. §1431 *et seq.*, and the National Parks Act, 16 U.S.C. §1 *et seq.*, are the most comprehensive legislation for MPAs. Additionally, the American Antiquities Act of 1906, 16 U.S.C. §§431-433, grants the President authority to establish national monuments on federal lands and waters (which is the authority for establishment of Buck Island National Monument off the coast of St. Croix). However, since national monuments are managed by the National Park Service, that act is not reviewed here.

6.4.1. National Marine Sanctuaries Act, 16 U.S.C. §1431 *et seq.*

Sec. 301(a): Titled "Findings", this section notes that most resource protection legislation has, in the past, been limited to most terrestrial areas. The findings recognizes that marine areas of special significance also exist, which similarly require special consideration. The section notes

further that past legislation has dealt primarily with specific resources than with particular areas and that a coordinated approach to conservation is needed. A sanctuaries program incorporating areas of significance (which include conservation, ecological, scientific, and educational qualities) will:

(a) improve the conservation, understanding, management, and wise and sustainable use of marine resources;

(b) enhance public awareness, understanding, and appreciation of the marine environment; and

(c) maintain for future generations the habitat, and ecological services, of the natural assemblages of living resources that inhabit those areas.

The language in §301(a) is analogous to a policy statement, insofar as it spells out the reasons for the sanctuary program.

Guideline 1. Statement of Policy (1)

Sec. 301(b): While §301(a) provides the policy behind the program, §301(b) clarifies the objectives that the program hopes to achieve. They include, *inter alia*:

(1) to identify and designate as natural marine sanctuaries areas of the marine environment which are of a special national significance;

(2) to provide authority for comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner which complements existing regulatory authorities;

(3) to maintain the natural biological communities in the national marine sanctuaries, and to protect, and, where appropriate, restore and enhance natural habitats, populations, and ecological processes;

(4) to enhance public awareness, understanding, appreciation, and wise and sustainable use of the marine environment;

(5) to support, promote, and coordinate scientific research on, and long-term monitoring of, the resources of these marine areas;

(6) to facilitate to the extent compatible with the primary objective of resource protection, all public and private use

> of the resources of these marine areas not prohibited pursuant to other authorities;
>
> (9) to cooperate with global programs encouraging conservation of marine resources.

Considering that part of the purpose of the statement of objective is intended to guide administration of the Act, §301(b) does a thorough job of establishing the intent of the government in order to direct management decisions.

Guideline 2. Statement of Objectives (1)

Sec. 302: Contains the definitions used throughout the act, including "marine environment," "damages," "response costs," and "sanctuary resource." The section also defines the "Secretary" referred to in the Act as the Secretary of Commerce, and thus identifies the regulating agency for administration of the Act.

Guideline 3. Definitions (1)

Guideline 5. Jurisdiction (.5)

Sec. 303: This section lays out the standards for designation of protected areas under the sanctuary program. The section provides that the Secretary of Commerce may designate

> any discrete area of the marine environment as a national marine sanctuary and promulgate regulations implementing the designation if the Secretary determines that… the area is of special national significance due to (A) its conservation, recreational, ecological, historical, scientific… qualities; (B) the communities of living marine resources it harbors; or (C) its resources or human-use values.

To determine whether the discrete area meets the standards for designation, the Secretary is to consider

> the area's natural resource and ecological qualities…; the present and potential uses of the area that depend on maintenance of the area's resources…; the existing State and Federal regulatory and

> management authorities applicable to the area and the adequacy of those authorities to fulfill the purposes and policies of [the act]….

The section further requires the Secretary of commerce to consult with other federal committees, state agencies, local government entities, and other interested persons when making these findings. Thus, Section 303 details the qualities an area must possess to receive consideration for placement in the program. To a certain extent, the language mirrors that of the statements of policy and objectives in Sections 301.

Guideline 4. Establishment of Protected Areas (1)

Sec. 304: Section 304 is one of the most important within the Marine Sanctuary Act, since it details procedures for designation, requires drafting a management plan, and further mandates interagency cooperation before final designation. First, the Secretary issue a notice in the Federal Register, newspapers, and other media of the proposed designation and regulations and summary of the draft management plan. Before designation, the Secretary must make available for public inspection the (1) draft environmental impact statement; (2) resource assessment that documents present and potential uses of the area, including commercial and recreational fishing, research and education, minerals and energy development, subsistence and uses; (3) a draft management plan;(4) maps depicting the boundaries of the proposed sanctuary; (5) the basis for the determinations made under §303(a)(standards for designation) ; and (6) an assessment of the considerations under §303(b)(1) (criteria for determining if standards are met).

Within the management plan, the Secretary must include proposed regulations, responsibilities, costs, and "appropriate strategies for managing sanctuary resources, including interpretation and education, innovative management strategies, research, monitoring and surveys, etc." Under the Act, the plan is to be reviewed at least every five years. The sanctuary proposal must include the geographic area of the proposed sanctuary and proposed fishing

regulations within the area. Finally, the Secretary is to conduct public hearings near the designated area, consult with various congressional committees on the proposed designation, and review federal agency actions "internal and external to a national marine sanctuary… that are likely to destroy, cause the loss of, or injure any sanctuary resource."

Guideline 4. Establishment of Protected Areas (1)

Guideline 7. Management Plan (1)

Guideline 9. Institutional Arrangements (1)

Sec. 305: This section states that the regulations promulgated under §304 should " be applied in accordance with generally recognized principles of international law, and in accordance with treaties, conventions, and other agreements to which the United States is a party." In general, the section creates an obligation to cooperate with other governments and international organizations. Although not included in §301, the reference to international cooperation and principles falls under the policy guideline in Section 5.3.

Guideline 1. Statement of Policy (1)

Sec. 306: In conjunction with the specific regulations that should be included in the management plan, the Act contains a general list of prohibited activities within the marine sanctuary. The Act makes it unlawful to:

> (1) destroy, cause a loss of, or injure any sanctuary resource managed under law or regulations for that sanctuary;
>
> (2) possess, sell, offer for sale, purchase, import, export, deliver, carry, transport, or ship by any means any sanctuary resource taken in violation of this section;
>
> (3) interfere with the enforcement of this chapter by-
>
> > (a) refusing to permit any officer authorized to enforce this chapter to board a vessel...
> >
> > (b) resisting, opposing, competing, intimidating, harassing, bribing, interfering with, or forcibly assaulting any person authorized by the Secretary to implement this chapter or

any such authorized officer in the conduct of any search for inspection reforms under this chapter; or

(c) knowingly and willfully submitting false information to the secretary or any officer authorized to enforce this chapter.

(d) violate any provision of this chapter or any regulation or permit issued pursuant to this chapter.

Guideline 10. Prohibited and Regulated Activities (1)

Sec. 307: This section includes the powers and duties of park enforcement officers, as well as the penalties for violating park regulations. Under the Act, officers are allowed to board and search vessels, seize sanctuary resources, evidence of violations, and make arrests of violators. According to §307, those found guilty of an offense are subject to imprisonment for up to six months, fines, or both. If a person uses a dangerous weapon, causes bodily injury, causes or fear of bodily injury, he/she can be fined and/or imprisoned for up to 10 years. Lastly, §307 allows for forfeiture of vessels and other items used during or for the commission of an offense within the sanctuary.

Guideline 11. Enforcement (1)

Guideline 14. Legal Proceedings (1)

Sec. 308: The only provision under this section is the grant of authority to the Secretary to "issue such regulations as may be necessary to carry out this chapter."

Guideline 10. Prohibited and Regulated Activities (.5)

Sec. 309: Section is titled "Research, Monitoring, and Education" and contains general provisions requiring the Secretary to "conduct, support, or coordinate research, monitoring, evaluation, and education programs." This includes long-term monitoring of sanctuary resources, which includes exploration, mapping, and environmental and socioeconomic assessment. Research and monitoring results are to be made available to the public.

Subsection (c) allows the secretary to "support, promote, and coordinate efforts to enhance public awareness, understanding, and appreciation of national marine sanctuaries," with an emphasis on "conservation goals and sustainable public uses of national marine sanctuaries." Activities under subsection (c) are to include education of the general public, teachers, students, national marine sanctuary users, and ocean and coastal resource managers.

Guideline 12. Monitoring and Research (1)

Guideline 15. Public Participation and Education (1)

Sec. 310: Allows the secretary to issue special use permits to conduct specific activities within the sanctuary if permission is necessary to (1) establish conditions of access to and use of any sanctuary resource; or (2) to promote public use and understanding of the sanctuary resource. Under §310, the secretary is authorized to collect fees for activities under the special use permit, which are to be used for issuing an administering permits and expenses related to managing national marine sanctuaries.

Guideline 8. Financing (1)

Sec. 313: Of the legislation reviewed thus far, §313 contains the only provision specifically authorizing exact appropriation amounts from the government. In 2005, the legislature allocated 40 million dollars for the sanctuary program.

Guideline 8. Financing (1)

Sec. 315: The act states that the Secretary "may" establish one or more advisory councils to make recommendations regarding designation and management of sanctuaries. Council members may come from just about any group, however, membership is limited to 15 members per sanctuary. The meetings of the advisory Council are open to the public.

Guideline 9. Institutional Arrangements (1)

6.4.2. National Parks Act, 16 U.S.C. §1 *et seq.*

Sec. 1: Creates the National Park Service within the Department of the Interior and creates position of Director of National Park Service, who is required to possess "substantial experience and demonstrated competence in land management and natural or cultural resource conservation."

Guideline 5. Jurisdiction (1)

Sec. 1a-1: This section contains the declaration of findings and purpose, which includes that areas of "superb environmental quality [be] preserved and managed for the benefit and inspiration of all the people of the United States." While preservation of resources is an important aspect of the National Park System, the Act is also designed to promote and foster public use of protected areas.

Guideline 1. Statement of Policy (.5)

Sec. 1a-2: Section grants Secretary authority to, *inter alia*, establish advisory committees, "promulgate and enforce regulations concerning boating and other activities on or relating to waters located within areas of the National Park System…; enter into cooperative agreements with public or private educational institutions, states, and their political subdivisions, for the purpose of developing adequate, coordinated, cooperative research and training programs concerning the resources of the National Park System…."

Guideline 9. Institutional Arrangements (.5)

Guideline 10. Prohibited and Regulated Activities (.5)

Sec. 1a-6: The Secretary is given power to designate officers or employees to maintain law and order and protect persons and property within areas of the National Park System. Officers or employees are authorized to make arrests, execute warrants, and conduct investigations of

offenses against the United States committed and the National Park System.

Guideline 11. Enforcement (1)

Sec. 1a-7: This section requires director of the National Park Service to prepare and revise, in a timely manner, general management plans for the preservation and use of each unit of the National Park System. The management plans shall include:

1. measures for the preservation of the area's resources;
2. indications of types in general intensities of development associated with public enjoyment and use of the area;
3. identification of and implementation commitments for visitor carrying capacities for all areas of the unit;
4. indications of potential modifications to the external boundaries of the Unit, and the reasons therefore.

Guideline 7. Management Plan (1)

Sec. 1a-12, 13: The Act provides for the consideration of boundary changes to park limits. The Secretary is charged with developing criteria to evaluate any proposed changes to the existing boundaries of individual park units, including:

a. analysis of whether or not the existing boundary provides adequate protection and preservation of the natural, historic, cultural, scenic and recreational resources integral to the unit;
b. evaluation of each parcel proposed for addition or deletion to the unit based on the analysis under paragraph (1)[sic];
c. an assessment of the impact of potential boundary adjustments taking into consideration the factors in paragraph (c)[sic] as well as the effect of the adjustments on the local communities and surrounding area.

After the assessment, the Secretary may propose boundary changes to park areas, but must first consult affected agencies of state and local governments surrounding communities, affected landowners and private national, regional, and local organizations. The requirement to consult local officials and public brings equity considerations into the equation, as the potential effects

on these parties must be factored into the analysis.

Guideline 6. Demarcation of Boundaries (.5)

Guideline 13. Equity and Compensation (1)

Sect. 1c: Sections contains the general provision that "each area within the National Park System shall be administered in accordance with the provisions of any statute made specifically at that area." Under the Act, each park is designated under the statute and contains provisions for establishment and management. For instance, the Virgin Islands National Park is established under 16 U.S.C. §398.

Guideline 4. Establishment of Protected Areas (1)

Guideline 5. Jurisdiction (1)

Sec. 2: The executive powers of the President include the authority to designate federal lands as national monuments. Under this section, responsibility for management of national monuments, as well as national parks, is given to the Director of the National Park System, under the direction of the Secretary of the Interior.

Guideline 5. Jurisdiction (1)

Sec. 3: Section 3 provides that "the Secretary of the Interior shall make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service, and any violation of any of the rules and regulations authorized by the section in sections 1, 2 and 4 of this title shall be punished by a fine of not more than $500 or imprisonment for not exceeding six months, or both, and be judged to pay all costs of the proceedings."

Guideline 10. Prohibited and Regulated Activities (1)

Guideline 14. Legal Proceedings (1)

Sec. 19jj: This section includes a few definitions related to resource protection under the national Park System. The section defines "Marine or aquatic park system resource" as "any living or non-living part of a Marine or aquatic regimen within what is a living part of a Marine or aquatic regimen within the boundaries of a unit of the national Park system, except for resources owned by a non-Federal entity."

Guideline 3. Definitions (1)

Sec. 398: As mentioned above, this section established the Virgin Islands National Park in 1956. It directs the Secretary to preserve the area "in its natural condition for the public benefit and inspiration, in accordance with the laws governing the administration of the national parks."

Guideline 4. Establishment of Protected Areas (.5)

Sec. 398d: This section is significant because it directs the Secretary to "employ and train residents of the Virgin Islands to develop, maintain, and administer the Virgin Islands National Park." Thus, not only are local inhabitants provided jobs through the establishment of the park (which might possibly include those whose livelihoods are threatened or injured through park regulations), the section also contributes to the objective of encouraging public participation.

Guideline 13. Equity and Compensation (1)

Guideline 15. Public Participation and Education (1)

Sec. 398e: This section protects traditional uses of park resources, such as bathing and fishing rights. The section states:

> (a) Nothing in sections 398c to 398f of this title shall be construed as authorizing any limitation on customary uses of or access to the areas specified in section 398(c) of this title for bathing and fishing (including setting out of fish pots and landing boats), subject to such regulations as the Secretary of the Interior may find reasonable and necessary for protection of natural conditions and prevention of damage to marine life and formations.

(b) Notwithstanding any provision of law to the contrary, no fee or charge shall be imposed for entrance or admission to the Virgin Islands National Park.

This section is ambiguous in that it preserves the traditional rights of local stakeholders but only to the point where they do not interfere with park regulations designed to conserve the resource. Taken as a whole, it can be construed as directing the Secretary to consider these traditional uses when issuing regulations, such that at least some areas of the park remain open to fishing and recreational use.

Guideline 10. Prohibited and Regulated Activities (.5)

Guideline 13. Equity and Compensation (.5)

6.5 Summary of Marine Legislation

Table 6.1 lists the fifteen elements from Section 5.3 and the number of elements accumulated according to each marine protected area law by country. According to the review of legislation, the MPA legislation of the United States goes furthest in implementing the elements deemed necessary for effective marine protected area, with the Marine Sanctuaries Act containing 12.5 elements, and the National Park Act implementing 10.5. The National Parks Act of Antigua and Barbuda also did relatively well according to the analysis, covering more than half of the guidelines with 9 points.

Of the rest of the analyzed laws, only one succeeded in containing more than half of the Section 5.3 guidelines. Saba's Marine Environment Ordinance fared the worst of the reviewed legislation, having implemented only 7 elements through its legislation and accompanying Amendments/Regulations. The result is surprising, since, as will be shown in Chapter 7, the waters and reefs off the Saba coast are generally regarded as the most pristine among the islands represented in the analysis. The reasons for such will be explored in Chapter 7.

Table 6-1. Summary of legislative guidelines and application to reviewed laws.

GUIDELINES	Antigua and Barbuda			Neth. Antilles	U.S. Virgin Islands	
	Marine Areas Act	Fisheries Act	National Park Act	Marine Env. Ordinance	Marine Sanct. Act	National Park Act
1. Statement of Objective	1				1	.5
2. Statement of Policy		1	1	.5	1	
3. Definitions	1	1	1	1	1	1
4. Establishment of Protected Areas	.5	.5	1	1	1	1
5. Jurisdiction	1	1	1		.5	1
6. Demarcation of Boundaries	.5		.5	1		.5
7. Management Plan		.5	1		1	1
8. Financing			1		1	
9. Institutional Arrangements	.5	1	.5		1	.5
10. Prohibited and Regulated Activities	1	1	.5	1	1	1
11. Enforcement	1	1		1	1	1
12. Monitoring and Research	1			.5	1	
13. Equity and Compensation						1
14. Legal Proceedings		1	1	1	1	1
15. Public Participation and Education			.5		1	1
TOTALS	7.5	8	9	7	12.5	10.5

Chapter 7. Application of Legislative Analysis

7.1. Introduction

The preceding chapter contained a general analysis of legislation in Antigua and Barbuda, Netherlands Antilles, and the U.S. Virgin Islands according to their success in implementing the legislative guidelines detailed in Chapter 5. This Chapter will attempt to interpret the results of that analysis in several ways. The first section will evaluate the relationship between legislation and history and economy. Section 7.3 will discuss whether legislation that contains relatively higher numbers of the proposed guidelines results in more effective MPAs and whether the specific threats faced by the coral reefs of each country are adequately addressed through the legislation.

7.2. Links Between Legislation and Island Government, Economy, and Population

Table 6.1 sums the total points accumulated by each piece of reviewed legislation according to the number of Section 5.3 guidelines each contained. The evaluation reveals that the legislation governing MPAs in the U.S. Virgin Islands was more successful in implementing the guidelines than those of the other reviewed countries. The outcome is not surprising given that the laws emanate from the federal government in Washington, which has a much longer legislative history than that of Antigua and Barbuda and the Netherlands Antilles. The *Encyclopædia Britannica* notes that Antigua and Barbuda did not establish independence from Great Britain until 1981. As such, the country is still relatively young, and thus has not acquired the expertise in legislative matters that can be expected from an older country like the United States. Furthermore, Antigua and Barbuda has far less financial and personnel resources at its disposal. Table 3-1 shows that the population and GDP per capita of Antiguan and Barbudan citizens is 63,000 and 8200 USD, respectively, whereas that of Virgin Islanders is 121,000 and

15000 USD, respectively. Thus, inhabitants in the Virgin Islands outnumber that of Antigua and Barbuda nearly two-to-one and also nearly double the per capita GDP.

The disparity is even more pronounced when population and GDP is compared to that of the United States. In 2000 numbers, the population of the United States was approximately 283 million and GDP per capita was 36200 USD. Not only does it have a larger pool from which to draw personnel, but, as the world's largest economy, the United States also has the financial resources to fund more scientific research and studies into marine resources and ecosystems. Accordingly, given the larger pool of expertise, greater funding capabilities, and legislative history, it is not surprising that the United States would produce what appears to be more effective MPA legislation.

Of the reviewed legislation, the Saba Marine Ordinance scored lowest under the guidelines analysis. If one assumes that larger populations and financial resources and longer legislative histories beget better legislation, then the fact that the Netherlands Antilles also falls short in its MPA legislation is not surprising. Compared to the United States, the islands comprising the Windward group of the Netherlands Antilles also have far fewer inhabitants and a much lower GDP. Furthermore, the Netherlands Antilles became autonomous entities of the Kingdom of the Netherlands in 1954. While some legislation is passed down from the central Netherlands government in Europe, the islands of the Netherlands Antilles are generally responsible for management of their own environmental affairs. Thus, like Antigua and Barbuda, the citizens of the Netherlands Antilles have less legislative experience from which to draw.

However, as was alluded to in Chapter 6, the marine habitats around Saba are noted for having suffered little degradation (Debrot and Sybesma 2000). The expected reasons for this

anomaly will be explored in Sections 7.3.

Table 7-1. Data on marine protected areas in selected countries.

Country	Marine Protected Areas (Year established)[a]	Size (ha)	Terrestrial Compo-nent[a]	Active Management/ Level of Management[a]	Mgmt. Effective-ness[f]	Fisheries Mgmt.[a]	Area of Coral Reefs in MPA (%)[f]
Antigua and Barbuda	Palaster Reef National Park (1973)	500[b]	No	No N/A	Inadequate	N/A	13
	Salt Fish Tail National Park (1973)	2000[b]	No	No N/A	Inadequate	N/A	
	Cades Bay Marine Park (1999)	1813[c]	Yes	No N/A	Inadequate	N/A	
Netherlands Antilles	Saba Marine Park (1987)	1000[b]	No	Yes High	Good	Regulated and Restricted	67
	St. Eustatius Marine Park (1996)	2750[d]	No	Yes Moderate	Partial	Zoned and Regulated	
	St. Maarten Marine Park (1997)*	5128[e]	Yes	Yes Moderate	Partial	Zoned	
U.S. Virgin Islands	Virgin Islands National Park (1956)	5308[b]	Yes	Yes High	Good	Regulated	8
	Buck Island Reef National Monument (1956)	356[b]	Yes (offshore island)	Yes High	Partial	Prohibited	

* Actively managed but not legally established

Source: a. Geoghegan *et al*. 2001
b. CEP/UNEP 1996
c. UNEP
d. STENAPA
e. Dutch Caribbean Nature Alliance
f. Burke and Maidens 2004

7.3 Is There a Link Between "Good" MPA Law and Successful MPA Management?

This section explores whether effective MPA legislation translates into successful management practices and healthy reefs. The state of each country's coral reefs will be

reviewed, along with the various risks to their sustainability as outlined in the report by Burke and Maidens (2004). The data for this analysis is shown in Tables 7-1 and 7-2. Table 7-1 provides details on the marine protected areas of the individual countries reviewed in the present research, including size, management level, management, effectiveness, and the percentage of coral reefs within marine protected areas boundaries. Table 7-2 shows the percentage of coral reefs at risk for each country according to four threats – coastal development, inland sources of pollution, marine-based pollution, and overfishing.

Table 7-2. Threats to coral reefs from human activities. Risk levels represent percentage of country's total reef area under either medium or high risk.

THREATS	RISK LEVEL	COUNTRIES		
		Antigua and Barbuda	Netherlands Antilles	U.S. Virgin Islands
Coastal Development (%)	Medium	55	41	39
	High	16	0	18
Inland Sources of Sediment and Pollution (%)	Medium	29	24	34
	High	0	0	0
Marine-based Pollution (%)	Medium	18	9	22
	High	11	26	22
Fishing Pressure (%)	Medium	39	27	13
	High	61	1	87
Cumulative Threat (%)	Medium	39	21	9
	High	51	31	73
	Very High	11	0	18

Source: Burke and Maidens 2004

7.3.1. Antigua and Barbuda

In general, the reefs surrounding the islands of Antigua and Barbuda have been

experiencing degradation over the last several years. A report on the reefs from the Australian Institute of Marine Sciences ("AIMS") notes that "overall reef condition was considered generally poor, with live coral averaging 20% or less at all sites examined except the north of Barbuda" (Wilkinson 2000, 319). Smith *et al.* (1999, 354) state that the reefs "are under stress from sedimentation, presumably as a result of the relatively high level of shoreline development and destruction of wetlands that has accompanied the growth of tourism." Moreover, the threats faced by local reefs are no secret to the island government. Although the report relates to attempts to combat desertification, a report to the UN CCD from government of Antigua and Barbuda highlighted some of the current environmental threats, which include:

- destruction of natural coastal sub-systems to facilitate construction
- poor positioning of structures along the coast
- indiscriminate sand mining for construction
- degradation of land/vegetation and erosion
- depletion of fish stocks due to over-fishing and destruction of terrestrial fish habitats
- pollution due to improper disposal of garbage, sewage, industrial effluent and agricultural chemicals
- encroachment of built developments onto agricultural lands
- ad hoc and uncontrolled development

(Environment Division 2002, 9-10). The problems listed above echo the findings of Williams (2003, ii), who stated that Antigua and Barbuda's transition to a tourism-dominated economy has resulted in "serious land use problems."

Notably, the threats described above all impact coastal reefs, as sediment from development, erosion, and other irresponsible land use practices filter into coastal waters. The increase in turbidity from creasing sedimentation is a key factor causing the damage to reefs in Antigua and Barbuda. The AIMS study (Wilkinson 2000, 319) states that "turbidity of inshore

water and elevated algal cover on reefs [is] linked to the impacts of coastal development, with sedimentation being a major influence on reef condition." The report states that legislation has been drafted that will seek to counter these threats, specifically, "environmental impact assessments for large developments and developments in sensitive areas, general building codes and special codes for coastal and near special habitat developments and the zoning of land" (Environment Division 2002, 14).

Burke and Maidens (2004) likewise found that one of the most imminent threats facing Antigua and Barbuda's marine environment comes from coastal development. Their study found that 71% percent of the reefs are threatened by coastal development (Table 7.2). The report also revealed, however, that coastal development is not even the most serious risk. Overfishing jeopardizes 100% of the coral reefs. Cumulatively, 51% of the reefs are under high threat with an additional 11% under very high risk.

Paradoxically, the MPAs established in Antigua and Barbuda are notable only for their lack of effective management –the MPAs are either inadequately managed or not managed at all. To some extent, this can be traced back to MPA legislation. One of the most serious obstacles to MPA management is a sufficient and reliable source of funding. Depondt and Green said as much when they wrote that "lack of ability to secure funds for high management costs has been identified as the most important barrier to successful MPA implementation and the cause of MPA functional failure." Neither the Fisheries Act nor the Marine Areas Act contains provisions for funding, which not surprisingly has resulted in the non-management of MPAs.

Furthermore, the Fisheries Act fails to adequately address damage from overfishing and coastal development. For instance, the Act prohibits certain types of fishing (Secs. 22, 24, 25) but contains no regulations limiting fish catch. The acts likewise fail to account for damage from

coastal development by implementing buffer zones or requiring environmental impact assessments for shoreside developments.

Accordingly, the example of Antigua and Barbuda serves as a prime indicator of how failing to legislate effectively can result in substandard management practices. Whether the draft legislation will ultimately be successful is questionable. Table 3.1 shows that fully 72% of the economy of Antigua and Barbuda is based on tourism and thus environmental legislation that threatens development is likely to meet strong opposition.

7.3.2 Netherlands Antilles

The reportedly healthy state of reefs off the coasts of Saba (Debrot and Sybesma 2000) must be reconciled with assessments from other studies. AIMS (Wilkinson 2002, 329) acknowledges that anthropogenic causes of stress on Saban reefs have historically been low, which can be traced in part to limited coastal development. The limited anthropogenic threat is largely due to Saba's steep topography, which allows for little agriculture and also accounts for the absence of suitable beaches (Smith *et al.* 1999). Still, the AIMS study (Wilkinson 2002, 329) did note instances of degradation, finding that "shallower reefs have deteriorated badly, possibly due to disease and bleaching."

Statia is somewhat similarly situated, insofar as the coastline is relatively undeveloped. AIMS does note the presence of an "oil terminal on the north-western coast, and some developments on the mid-leeward coast" (Wilkinson 2002, 329). The study also states that there only five fishermen on the island (10 others fish to supplement income)(Wilkinson, 331) and so there is little danger from overfishing. This fact is borne out by Burke and Maidens, who assess only a 27% medium threat level from fishing pressures (Table 7-2). The outlook for reefs around St. Maarten, however, is less sanguine. Smith *et al.* (1999, 353) observe that "rapid

population growth and a dramatic expansion of tourism have resulted in major infrastructure development" and that surrounding reefs are "seriously threatened by pollution, devegetation, siltation and eutrophication from sewage input and the very high level of recreational boating."

Despite the rampant coastal development noted by Smith and highlighted in Chapter 3, only 41% of the reefs in the Netherlands Antilles are under a medium threat from coastal development (Table 7-2). In fact, of the countries reviewed in the present thesis, the Netherlands Antilles face the least danger from the anthropogenic risks reported by Burke and Maidens. Furthermore, according to the analysis in Chapter 6, the Netherlands Antilles legislation contains the fewest number of MPA guidelines. In fact, St. Maarten has yet to pass legislation legally establishing its proposed marine park

The contradiction is likely explained, for one, by the effective management of the established marine protected areas. Table 7-1 indicates that the Saba Marine Park gets the highest marks for both Management Level and Management Effectiveness. The other parks do not fare quite as well, receiving medium grades under the two categories. However, a key element to note is that 67% of Netherlands Antilles reefs are placed under protection. Thus, a far greater percentage of marine habitats receive protection than do those of Antigua and Barbuda and the U.S. Virgin Islands. Lastly, the legislation for Saba Marine Park specifically provides for payment of visitors fees by scuba divers and snorkelers that use the SMP (Part III, art. 13). Thus, SMP is assured of adequate financing to finance management activities, which, as was discussed above, is often a primary impediment to effective protection of marine resources within the park. The benefits of user fees to self-finance have been recognized park managers. Depondt and Green (2006, 189) state that "using dive tourism as a source of funding, in the form of diving user fees is… an excellent way to enable self-financing [since] recreational scuba

diving is becoming a substantial component of the international tourism market."

Because the reefs of the Netherlands Antilles are not under serious threat, little will be said about how effectively the legislation accounts for those risks. However, given that coastal development is such a pervasive threat throughout the Caribbean, one provision of the legislation bears pointing out. Part II, Article 12 states that "developments or modifications of the coastal zone which may influence the marine environment of SMP must be preceded by an independent environmental impact assessment." Other countries would be well-advised to follow the example of Saba's marine ordinance and adopt a similar provision in their own laws to assuage future threats from coastal development.

7.5 U.S. Virgin Islands

Of the countries reviewed for this thesis, the legislation of the U.S. Virgin Islands scored the highest in terms of implementing the guidelines in Section 5.3 (Table 7-1). However, the Virgin Islands also rated lowest in terms of the cumulative threat to its reefs (Table 7-2). Surveys of Virgin Island reefs have found widespread degradation from various causes. Anthropogenic causes include "destruction from boat anchors and boat groundings, careless land use, dredging, pollution, and overfishing" (Smith *et al.* 1999, 351); groundwater depletion and contamination, increased sediment loads, and the displacement of traditional resource users (Wilkinson 2004, 440); and sand extraction, groyne construction and sewage effluent (Wilkinson 2000, 245). Sediment from coastal development is especially problematic on St. John due its steep slopes (Wilkinson 2004, 440). Wilkinson (2002, 258) observed that "accelerating development, 56km of unpaved roads, and poor land management on St. John result in increased sediment runoff onto the reefs." Unfortunately, the Virgin Islands also experienced several destructive hurricanes over the last 30 years, which resulted in part in a 5% to 85% reduction in

live cover of elkhorn coral (Smith *et al.* 1999, 351).

For the U.S. Virgin Islands, then, legislation with adequate incorporation of recognized guidelines has not resulted in successful protection of marine resources. Of the risks detailed in Burke and Maidens, overfishing is far and away the most severe threat to coral reefs (Table 7-2). Coastal development also threatens nearly 60% of the reefs at a medium or higher level. Overall, 73% of Virgin Island reefs are under high risk, with an additional 18% under very high risk.

Table 7-1 indicates that the park management in St. John and Buck Island National Parks were generally assessed high marks for both Management Level and Management Effectiveness. The effectiveness of management is somewhat of a contradiction considering the numerous problems faced by marine habitats. One problem may be that, unlike the Netherlands Antilles, only 8% of the total reef area within Virgin Island waters are covered by MPAs. Furthermore, while the MPA legislation meets many of the guidelines in Section 5.3, it fails to account for the most serious risks – overfishing and coastal development. Fisheries protection does not fall under the Marine Sanctuaries Act or National Parks Act, nor does the legislation contain any provisions requiring environmental impact statements for coastal construction and other potentially harmful activities. Perhaps the lesson to be learned from the U.S. Virgin Islands is that meaningful MPA legislation must address the core problems faced by the protected habitat and not rely on parallel laws or agencies to meet this need.

Chapter 8. Conclusions and Future Research

8.1. Conclusions

While effective MPA legislation may result in successful protection of marine resources, it is certainly not a guarantee. The research illustrates that other factors can play as important a part in coral reef conservation as does the laws used to regulate activities in and around MPAs. It need not be gainsaid that additional research into the role of national legislation in achieving meaningful conservation needs to be studies in greater detail. Nonetheless, the analysis presented herein did reveal a few salient points that might help to guide future legislation.

1) As has already been noted by other commentators, MPA legislation must include financing provisions in order to ensure capable management and enforcement of MPA regulations. The successful example of the Saba Marine Park helps to bear this out. To be sure, Saba is relatively fortunate in that the island does not possess the coastal development problems hampering protection efforts on other islands. Nevertheless, the self-financing provision seems well-adapted to resource protection for a couple of reasons. First, as mentioned earlier, imposing users' fees ensures that funding will remain continuous. Also, in the case of the Saba Marine Park, one cannot help but think that the self-reliance established by such a provision helps park management and local inhabitants believe that they have a stake in park affairs. Public participation is viewed as important to successful MPAs and thus the self-financing provision scores on more than one point.

2) If governments and their legislators are truly concerned about protecting marine habitats and species, they must ensure through legislation that more of the ecosystems that require protection are placed within MPA boundaries. The disparity between the threat levels experienced by Netherlands Antillean reefs and those of the Virgin Islands can be partially

explained by the area of coral reefs under MPA protection. Of course, Saba and Statia do not suffer from the same degree of tourism-related hazards, such as construction runoff and sewage pollution, as does the Virgin Islands. However, as was noted in Chapter 3, St. Maarten is one of, if not the, most heavily developed small island. And yet, only 41% of total reef area is under a medium threat from coastal development.

3) MPA legislation needs to sufficiently account for activities occurring outside MPA limits. While fishing pressure is one of the chief causes of coral deterioration, the surveys of scientific experts presented herein lament the effects of coastal development, runoff, land-based pollution, and other threats that occur outside MPA boundaries. The Saba Marine Environment Ordinance scored lowest of the reviewed legislation, yet the provisions for self-financing and completion of environmental impact assessments are likely responsible for a large part of the success of the Saba Marine Park.

8.2. Future Research

1) A comprehensive analysis of the state of coral reefs throughout the Caribbean would contribute greatly to assessments of the various components bearing on reef vitality. For instance, the Burke and Maidens (2004) report measures reef threats but it is not necessarily a reliable indicator of reef health. The ability to measure other variables could be greatly enhanced through a uniform assessment, rather than reliance on multiple studies that do not always incorporate the same techniques and/or evaluative components.

2) Future research on MPA legislative effectiveness should study the degree to which MPA management plans incorporate the guidelines or directives contained in federal or national laws. Along those same lines, future research might include evaluations as to the relative importance of management plans versus legislation to determine which component is more

crucial to overall reef health.

3) This thesis has attempted to distinguish the relative success of Saba in protecting its surrounding coral reefs despite having legislation that is comparatively weak (at least according to the elements established herein). Additional research is needed to determine whether local legislation, such as the Saba Marine Ordinance, is more effective in engendering a sense of shared responsibility for coral reef conservation, as opposed to national legislation that may be viewed by local administrators and stakeholders as unresponsive to local needs and realities.

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