Saba Bank

Special Marine Area Management Plan 2008

Shelley Lundvall

Saba Bank Special Marine Area Management Plan 2008
Cover photo by Jan den Dulk:
Hawksbill Turtle on unidentified shipwreck in the middle of the Saba Bank

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ACKNOWLEDGEMENTS

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Groups	Stakeholders
NGO groups	Saba Conservation Foundation (SCF), Dutch Caribbean Nature Alliance (DCNA)
Tourism	3 dive centres, tourists
Harbour Office	Harbour Master and employees
Fishermen	Commercial and recreational
Law Enforcement	Public Prosecutor, Chief Police Inspector, Coastguard
Community	Local users
Government Departments	Island Council, Department of Environment (MINA)
Staff	
Partners	SCF, DCNA
Researchers	International and national researchers and scientists.

We would like to express a special thanks to the following people:

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Most photographs were taken by Shelley Lundvall, with a few exceptions as indicated in the subscripts

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The species lists in the annexes of this document were compiled by:
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ACRONYMS AND ABBREVIATIONS

AGRRA	Atlantic and Gulf Rapid Reef Assessment (Caribbean wide study of coral reef health)
AIS	Automatic Identification System
Cartagena Convention	The Convention for the Protection and Development of the Marine Environment in the Wider Caribbean Region
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
DCNA	Dutch Caribbean Nature Alliance
EEZ	Exclusive Economic Zone
ICRAN	International Coral Reef Action Network
IUCN	World Conservation Union (formerly International Union for the Conservation of Nature and Natural Resources)
MARPOL	International Convention for the Prevention of Pollution from Ships
MINA	Central Government Department of Nature and the Environment
MP	Marine Park
MPA	Marine Protected Area
PA	Protected Area
SCF	Saba Conservation Foundation
SBMO	Saba Bank Management Organization
SBSMA	Saba Bank Special Marine Area
SPAW	Specially Protected Areas and Wildlife – Annex of the Cartagena Convention
UNEP	United Nations Environment Programme
WCPA	World Commission on Protected Areas
WWF	World Wide Fund for Nature

FOREWORD

Reasons for a Saba Bank Special Marine Area Management Plan

A Management Plan outlines the purpose and manner in which an area is to be used and looked after. It sets the management objectives, policies, and strategies to achieve the stated objectives. It also addresses the administrative structure, resource use, zoning, boundaries, financial support, staff needs, and monitoring plans. A successful Management Plan provides managers with a blueprint of how the Saba Bank will function, but will also be flexible and allow for modifications to be made when deemed appropriate.

During the planning of this Management Plan, specific issues were identified that have shaped the design of the Plan. These issues range from current resource use, to activities that threaten the Saba Bank, to types of research that should take place on the Saba Bank. These issues, their complexities, and solutions, take the form of a Management Plan.

The Management Plan is a working document that should be updated periodically, and should be used to actively and appropriately manage the resources of the Saba Bank, ultimately leading to the sustainable use of the marine resources. The management objectives outlined in this Plan represent short term, measurable steps toward attaining this goal.

Process Used for Plan Preparation

This Management Plan was developed under the Nature and Environmental Policy Plan (NEPP) of the Netherlands Antilles and implements the National Nature Policy Plan. Its direct aim is to develop and achieve sustainable use of the natural resources of the Saba Bank, based on an ecosystem approach promoting conservation and sustainable use in an equitable way.

In 2007 the Saba Bank project collected fisheries and biodiversity information on the Bank. Together with the results of an earlier fisheries study (2000), a 2006 Rapid Assessment Program by Conservation International, and incorporating community expertise with a series of workshops held in September, October and November 2007 on Saba, this resulted in this Management Plan for the Saba Bank

MANAGEMENT OBJECTIVES

Overall Goals for Management

The Saba Bank Management Plan was developed for the sustainable use of the Bank's natural resources based on the ecosystem approach. This includes integrated management of the area for ecosystem/habitat protection, sustainable fisheries and other resource uses, and conservation of specific natural features. Its objectives are to:

- Protect and maintain the biological diversity and other natural values of the area for long term use,
- Promote sound fisheries management practices for sustainable purposes,
- Avoid conflicts between different users (e.g. shipping, fisheries),
- Protect the natural resource base from being altered by anchorage of shipping vessels or traffic that would be detrimental to the area's biological diversity.

Specific Management Objectives

The Saba Island Government recognizes the value of the marine resources present on the Saba Bank and the challenges of minimizing degradation of the marine ecosystems. It also recognizes the regional importance of the Saba Bank resources. It has already agreed to establish the Saba Bank as a Queen Conch Reserve in order to build up the depleted stocks. In order to effectively ensure long-term protec-

tion and maintenance of all the valuable resources of the Bank, as well as the sustainability of the products and services provided by such resources, a Management Plan is required. Formal management of these natural resources aims to meet the following objectives:

- Develop, and implement a reporting system whereby the fishermen report their landings of lobster and redfish, and process the resulting data,
- Enforcement of fisheries and other regulations (e.g. conch moratorium, closed spawning and landing records, size restrictions, etc),
- Ensure that the fishermen of Saba are involved in the management of the fisheries resources,
- Monitor the coral reefs,
- Monitor conch stocks in the Saba Bank queen conch reserve,
- Monitor red hind spawning aggregation. Create a closed fishing season for red hind on the Moonfish Bank area during the months of Dec. to Feb,
- Facilitate and promote further research on the biodiversity resources of the Saba Bank,
- Monitor impacts of tanker anchorage impacts on the Saba Bank,
- Support the PSSA proposal,
- Investigate the potential for the development of artificial reefs or lobster habitat on the Bank.

The emphasis on sustainability of marine resources is essential to the people of Saba for both cultural and economic reasons. As a small island Saba is fully dependent on its natural resources, which must therefore be protected to ensure their continued undiminished potential for use.

HOW TO USE THE SABA BANK MARINE MANAGEMENT PLAN

The Saba Bank Special Marine Area Management plan has been designed to be a dynamic document, accessible via hard copy, electronic copy, and relevant websites. It should be kept up to date with additional material to allow adaptive management as situations and issues change and management actions succeed. The plan has 4 parts:

Part 1: Saba Bank Background Information.

Those using the management plan may not be aware of the history, biology and uses of the Saba Bank, which greatly influence the operations of this special marine area. They can refer to this section for background information. Technical terms are explained in the text and names of marine species are given as the common name in English, followed by local and scientific names where appropriate.

Part 1 provides valuable background and contextual information. It can be used as a standalone introduction to the Saba Bank and has been written with a range of audiences in mind.

Part 2: Management environment.

This is the first part of the working document which states the significance, mission and goals of Saba Management plan. Natural resources of the Bank, both economic and social as well as intrinsic are described, and the legal instruments, institutional arrangements, human and physical resources. The main issues facing the Saba Bank are detailed and described before being summarised.

Part 2 will be of interest to those wishing to develop a more in-depth understanding of the operational management and issues facing the MPA.

Part 3: Management Plan.

In part 3 the actions of the Saba Bank Management Organization and what it will take to work towards the mission and goals are clarified. Actions are recommended to tackle the management issues and external issues identified in Part 2 that the Saba Bank faces.

Part 4: Additions and Developments.

The final part of the plan is intended to act as a place marker for updates, where management actions have led to outcomes that can be described or there has been a change in the tools available to the MPA. This section needs to be kept up to date so that staff can work from the proposed actions and work schedule, and so any interested party can pick up the whole plan and have a thorough understanding of Saba Bank management plant from the context through to the most recent management actions.

Part 4 is to be used by the management body to keep the management plan up to date; its contents are unlikely to be available until the plan has been formally updated.

Appendices

The appendices provide the currently known species lists of various groups of organisms that have been documented on the Bank.

SUMMARY

The Saba Bank is a classic coral atoll consisting of a submerged seamount which is crowned at the summit with a ring of actively growing coral reefs. It is considered to be the largest—albeit submerged—atoll in the Atlantic Ocean basin and as such the third largest atoll on earth. It probably began to form about half a million years ago following a volcanic eruption. The flat-topped seamount rises 1000 m above the surrounding seafloor but does not actually break the sea surface. There is no island directly associated with the Bank; the closest island is Saba 4 km northeast of the Bank and separated by deep water (~700 m), so there are virtually no land based sources of impact. The shallow waters of the Saba Bank extend across a total surface area of 1,850 square km above the 50 meter isobath and include vast fields of corals which are relatively untouched by direct human impact. In recent years it has come under threat from passing oil supertankers and other large ships that routinely use the Bank as a free anchorage. A busy oil trans-shipment depot on neighbouring St. Eustatius Island causes significant marine traffic, including oil supertankers in the area around the submerged atoll. The fragile ecosystems of Saba Bank are damaged by anchors and chains of ships that avoid anchoring fees in territorial waters of St. Eustatius.

Ten years ago, a report by the Netherlands Antilles government warned that the Saba Bank's unique environment could be degraded by commercial fishing and passing marine traffic.

This is the first management plan for the Saba Bank Management Organization. The value of the Bank has been realized for a number of years and with each expedition to the Bank the uniqueness of the Bank and its biodiversity were highlighted anew. Changes in fisheries and documentation of the damage done by tankers anchoring on the Bank have underscored the need for a strategic document to guide management decision making and to define the mission, goals and objectives of the Saba Bank Management Organization.

This document has been prepared in close consultation with a considerable number of stakeholders and stakeholder group representatives.

The plan specifies management goals and strategies for the Saba Bank Management Organization (SBMO) related to the organization mission, which is to conserve and manage the natural and economic resources within the Special Marine Area, allowing their sustainable use for the benefit of current and future generations. It also identifies the major existing and potential threats and issues facing the Bank from ecological, social and cultural perspectives and includes substantial input from stakeholders. It is designed to be an adaptive management tool.

INTRODUCTION

The Saba Bank is a large, totally submerged, shallow marine area off the island of Saba. The Bank is an important fishery resource for fishermen from Saba and to a lesser extent, St. Eustatius and St. Maarten.

Reports of decreasing fish stocks, destructive fishing activities of foreign vessels, anchoring of oil tankers and tank cleaning, has raised concerns about the environmental state of the Bank. Meesters et al, (1996), commissioned by the Environmental Department of the Netherlands Antilles reviewed the Saba Bank in 1996 in combination with a short study on location. He concluded that the habitat of the Saba Bank is particularly important for several reasons:

- The significance of the sea-current patterns suggest that the reefs are potentially an important source of fish and shellfish larval dispersal to the islands of Saba, St Maarten and to the islands in the eastern Greater Antilles and the Virgin islands,
- The coral reefs of the Saba Bank are relatively remote from intense human impact and may not only provide important scientific information on the status of reefs in relatively unspoiled condition, but are also a reserve of biodiversity for the region,
- The reefs of the Saba Bank are potentially a resource for dive-tourism and an essential resource for fishing.

Meesters's study also recommended that a management plan should be developed in order to preserve this unique marine habitat. The National Policy paper "Contours of Environmental & Nature Conservation Policy for the Netherlands Antilles" incorporated this recommendation, and again in the National Nature Policy Plan of 2000 the development of a management plan for the Saba Bank is stated as an important objective. As a first step to realize such a management plan, the department of Environment of the Netherlands Antilles (MINA) initiated a comprehensive fishery catch assessment survey in 1999-2000, in order to get an impression of the fisheries resources of the Saba Bank, and produced a video to create awareness of the underwater world and introduce the idea of management

Following a Rapid Assessment expedition in 2006 by Conservation International, in May of 2007, MINA together with the Saba Conservation Foundation (SCF), and with the support of Conservation International (CI), started a more in-depth study of the Saba Bank. That study is the basis for this management plan

Purpose of the Management Plan

A Management Plan outlines the purposes and manner in which an area is to be used. It sets the management objectives, policies, and strategies to achieve the stated objectives. It also addresses the administrative structure, resource use, financial support, staff needs, and monitoring plans. A successful Management Plan provides managers with a blueprint of how the Saba Bank will function, but will also be flexible and allow for modifications to be made when deemed appropriate.

During the planning of this Management Plan, specific issues were identified that have shaped the design of the Plan. These issues range from current resource use, to activities that threaten the Saba Bank, to types of research/monitoring that should take place on the Saba Bank. These issues, their complexities, and solutions, take the form of a Management Plan.

The Management Plan is a working document that should be updated periodically, and should be used to actively and appropriately manage the resources of the Saba Bank, ultimately leading to the sustainable use of the marine resources. The management objectives outlined in this Plan represent short term, measurable steps toward attaining this goal.

Adaptive management and timeframes

The Saba Bank management plan provides a framework for the formulation of performance agreements by the Saba Bank Management Organization (SBMO), which will aid the ongoing evaluation of management successes. For this management plan to serve the needs of Saba, it is vital that it is periodically reviewed and updated.

It is recommended that Part 1 of this plan is updated every 3 years, and parts 2 and 3 of this plan are reviewed together on an annual basis. Necessary updates should then be added in section 4. Stakeholder input to the Saba Bank management plan will be an ongoing process. It is recommended that formal stakeholder input regarding the effectiveness of the management plan is carried out every 3 years, in conjunction with the revision of Part one.

The recommendations above for reviewing and revising the Management Plan should be seen as guidelines. After the management planning and review process has been consolidated, revisions may become less frequent and/or more specific.

SECTION	TIME PERIOD	PEOPLE INVOLVED
1,2,3,4	Every 3-4years	Stakeholders
2	Once a year additions put into section 4	Stakeholders
3	Once a year additions put into section 4	Stakeholders
4	Additions made continually	Stakeholders

PART 1: SABA BANK BACKGROUND INFORMATION

Figure 1. Mixed reef dominated by gorgonians, with sponges, hard corals, and algae.
(Source Juan Armando Sanchez M.)

LOCATION AND SITUATION

The Saba Bank (17^{0}25' N, 63^{0}30' W) is an undersea elevation with a flattened top, a Bank, 4 km southwest of the island of Saba and 25 km west of St. Eustatius (Figure 1). It is raised about 1000m above the general depths of the surrounding sea floor and its shape is approximately rectangular, the long axis trending ENE-WSW. With a length of 60 to 65 km and a width of 30 to 40 km, the total surface area is 1800 km^2 (measured to the 50 m isobath).The platform is somewhat tilted with the north-western part of the surface being deeper than the south-eastern part. The largest part of the Bank is between 20 and 50 m depth, but a substantial eastern part (app. 225 km^2) is between 13 and 20 m depth. On its western rim depths are around 50 m, while on the eastern and south-eastern edges, where a prominent ridge system (55 km long) runs along the platform, depths vary between 11 and 15 m.

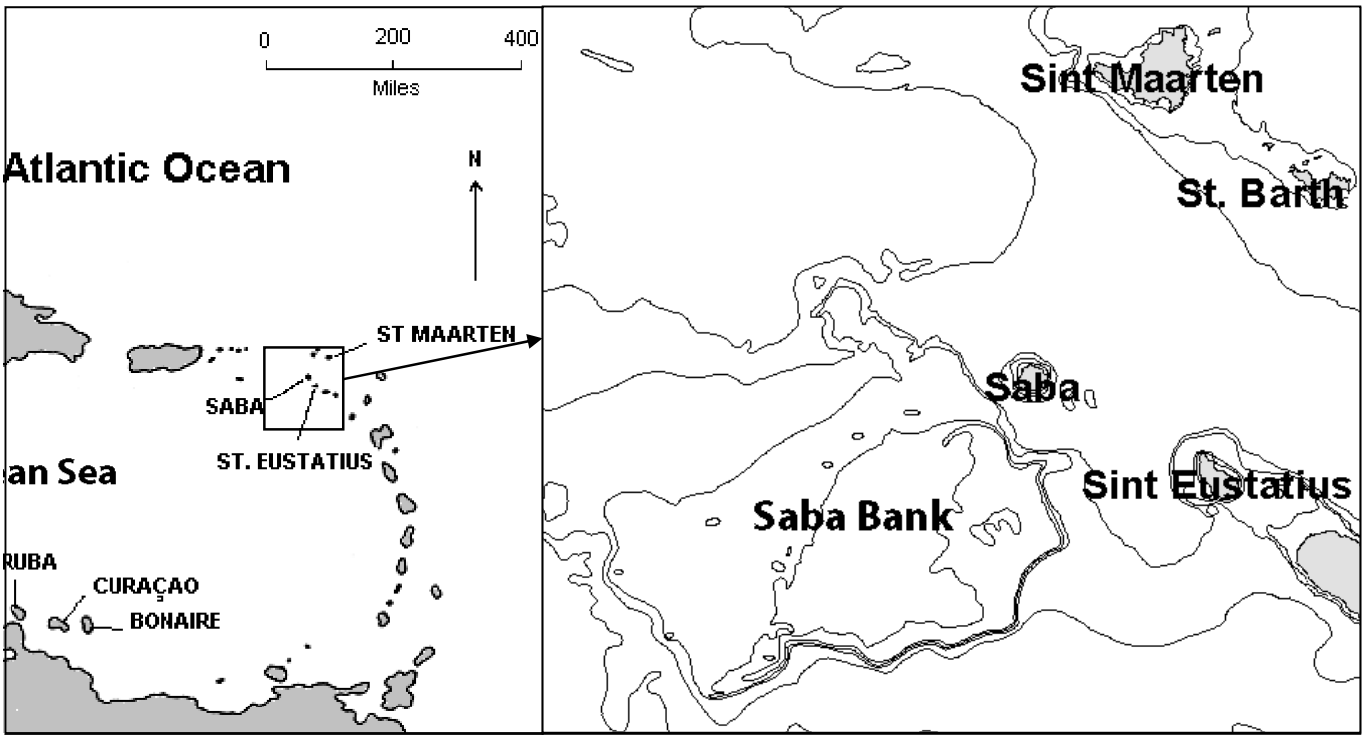


Figure 2: location of the Saba Bank

The legislative authority of the island of Saba does not extend beyond the territorial sea. Beyond the territorial sea jurisdiction lies with the Central Government of the Netherlands Antilles. Approximately 20% of the Saba Bank lies within the Saban territorial waters, with the remaining 80% falling within the limits of the Exclusive Fisheries Zone, soon to become Exclusive Economic Zone (EEZ). Management of both the 12 nautical miles zone and the EEZ (once it has been officially established) can be mandated to the island territory of Saba by the Central Government under the National Maritime Ordinance.

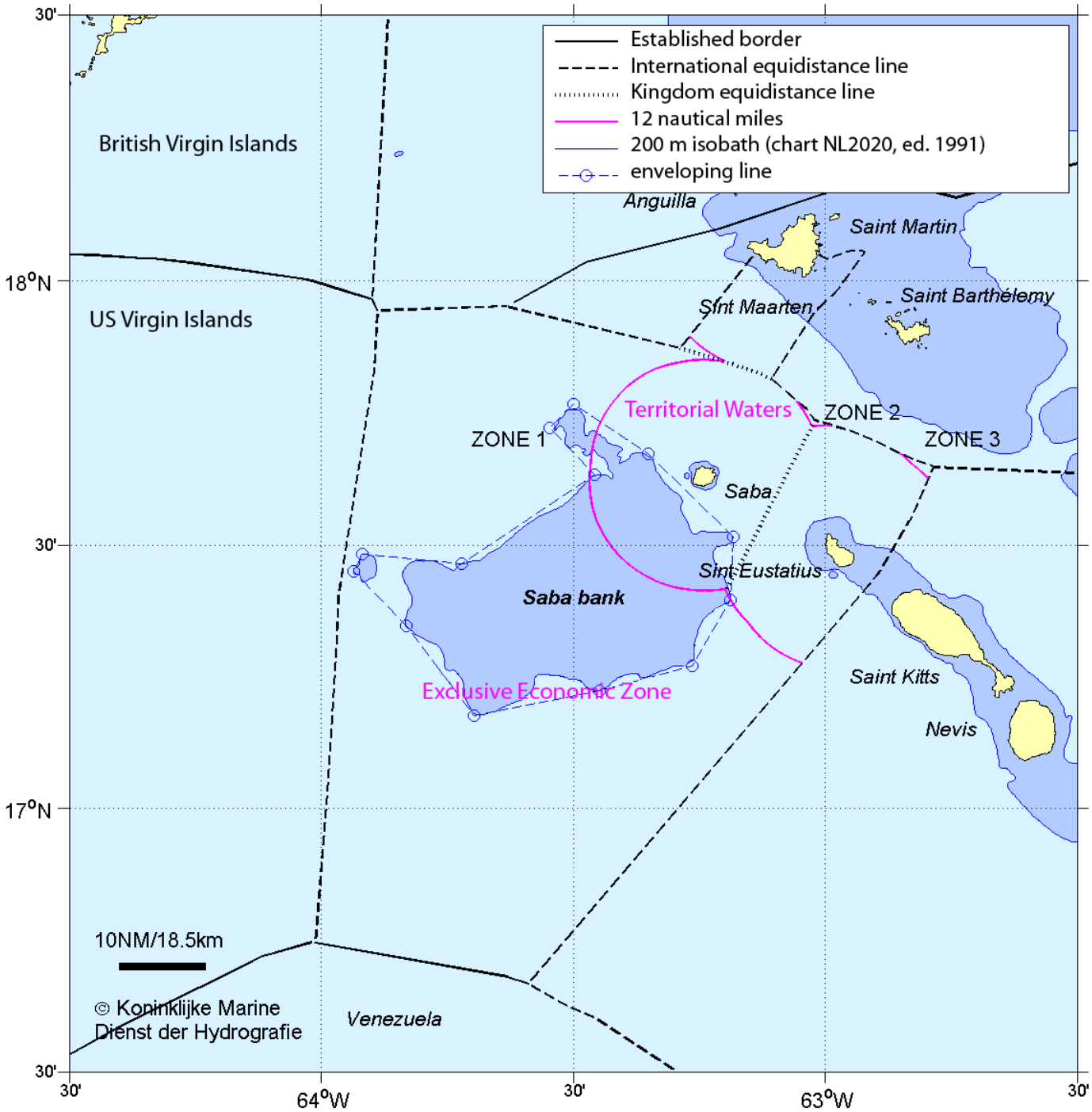


Figure 3: Maritime zones, showing the territorial waters (12 nautical miles zone) of Saba including about 20% of the Saba Bank, and the EEZ waters encompassing the remaining 80%.

Oceanography

The Saba Bank and the neighbouring islands are affected by The Antilles Current and possibly the Caribbean current. The Antilles Current was named in 1876, and flows northward east of the Antilles joining the Florida Current past the outer Bahamas. Its waters are concentrated into a strong northward jet about 80-100 km wide centred at 400 m depth. Mooring studies have indicated that the Antilles has mean transport speeds of 3.2 Sv[1] northwards in the upper 800m of water (see Figure 3).

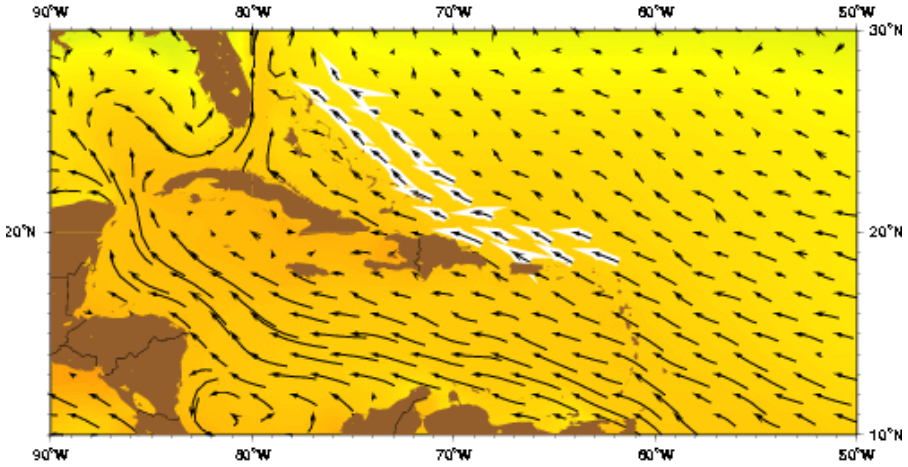


Figure 4: The Antilles Current transports tropical waters from the North Equatorial Current northwestward. It is a significant source of warm water for the Gulf Stream system.
(source: http://oceancurrents.rsmas.miami.edu/)

The narrowly spaced chain of islands, Banks, and sills of the Antilles Islands Arc, including Saba and the neighbouring islands, separate the Caribbean from the Atlantic Ocean and act as a sieve for the inflow of Atlantic water to the Caribbean Basin. Water flows into the Caribbean Sea through the narrow passages between the islands and continues westward as the Caribbean Current, the main surface circulation in the Caribbean Sea (Figure 4).

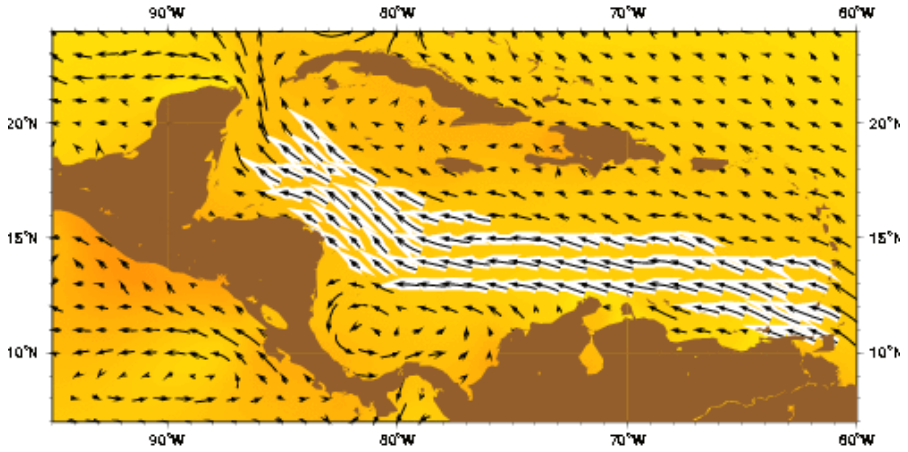


Figure 5: The Caribbean current is formed by waters flowing though the Antilles Island chain from the Atlantic into the Caribbean sea.
(source: http://oceancurrents.rsmas.miami.edu/)

Waves, known as ground swells, are produced by low pressure weather systems at sea.

Waves produced by the wind are generally highest from June to July and from December to March when the wind speeds are highest. The dominant easterly wind drives waves towards the west.

During swell wave conditions there is likely considerable impact on the communities on the Bank.

[1] The sverdrup, named after the oceanographers Harald and Otto Sverdrup, is an unit of measure of volume transport. It is used almost exclusively in oceanography, to measure the transport of ocean currents. It is equivalent to 106 m3/s

Ecoregion

Based on oceanographic, biogeographical, and larval connectivity data various marine ecoregions have been identified. Within the Caribbean, or Tropical Northwestern Atlantic Province, the Saba Bank is part of the Eastern Caribbean Ecoregion, which extends from Grenada to the Virgin Islands. Within this ecoregion the Saba Bank is assumed to be an important source of larvae of various marine organisms for the northern parts of this region, especially the Virgin Islands. Depending on the length of larval stages this influence from the Saba Bank can extend much further for some organisms. Research on the connectivity of lobsters and conch of the Saba Bank needs to be undertaken to see how far the Saba Bank influence extends for these commercially important species. Climate change may have serious effects on the regional dispersal of larvae and the role of the Saba Bank in this needs to be further clarified

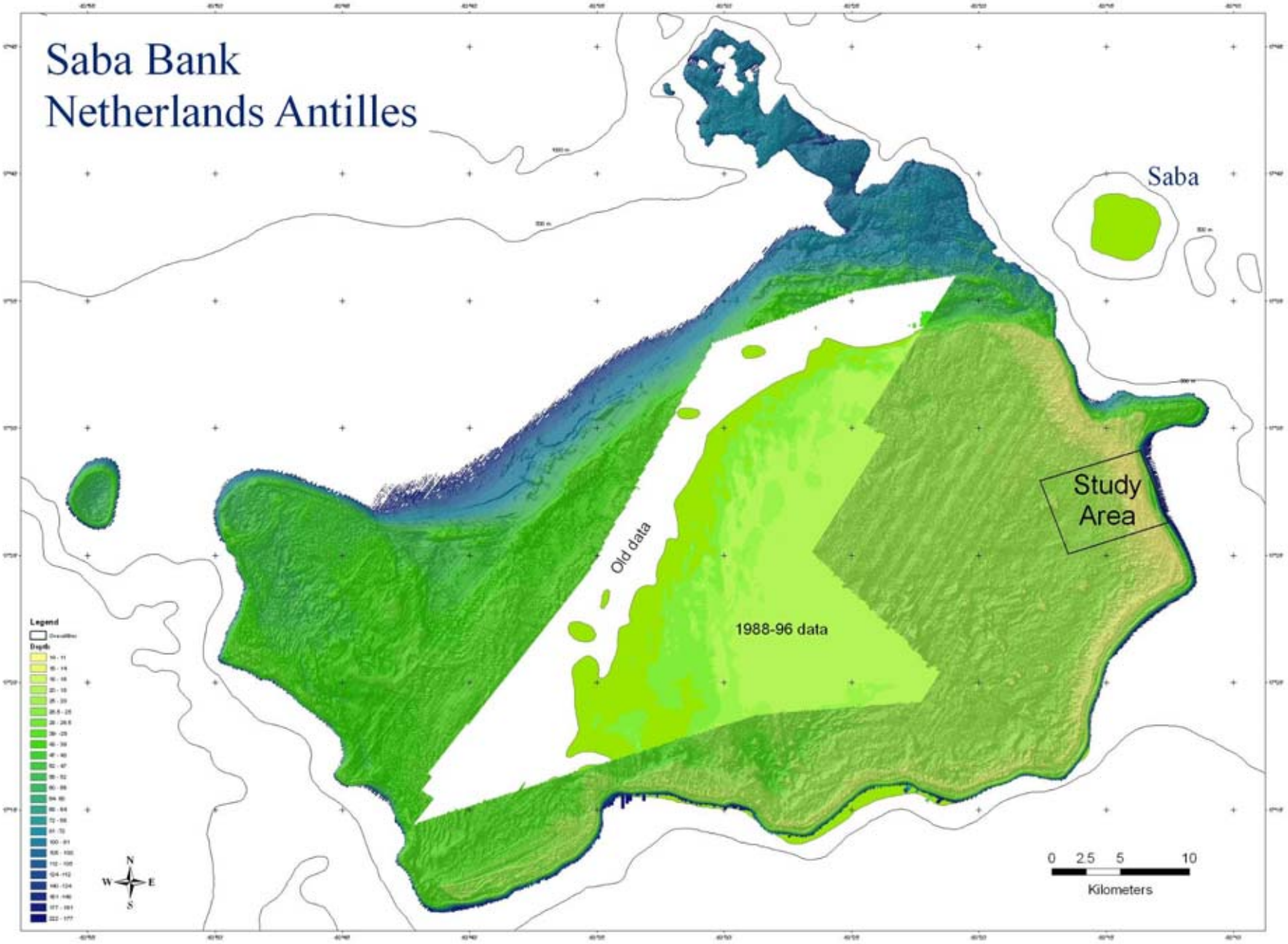


Figure 6. Bathymetric chart of the Saba Bank, and the Overall Bank study area.

GEOLOGY AND GEOMORPHOLOGY

The Saba Bank is located at the intersection of three different types of geological activity. It is near the eastern end of the tectonically active Greater Antilles island chain, at the north end of the Aves Ridge and just to the west of the north end of the volcanic island arc chain near the north-eastern boundary of the Caribbean Sea. The Saba Bank has intrigued many scientists dating back to the beginning of the century. Spencer (1904; p. 357) considered the Bank to be "a remnant of the coastal plains on the mountainous backbone of the Antillean ridge". He concludes that the Bank "has been levelled by coral growth and the sands derived from them". Vaughan (1919) viewed the Bank as a submarine plateau, levelled by planation agencies, which almost certainly were both subaerial and submarine, which has been submerged in recent geologic time. Vaughan already indicated that the Bank essentially duplicates the atolls in the Pacific. This was later verified by Van der Land (1977) who considers the Bank to be an actively growing atoll, although it is completely submerged, and ranks it among the largest atolls in the world. Davis (1926) viewed the Bank as "an atoll lagoon floor, deprived of its original reef and probably somewhat planed down by low-level abrasion in the post glacial epoch" (Davis 1926, p. 138). Differences of opinion on the formation of Banks such as the Saba Bank have caused heated debate. Vaughan stated that infilling behind barrier reefs could never be the reason for the existence of the Bank, whereas Davis thought this was an essential process.

On the Saba Bank the reef zonation pattern follows a sequence from shelf edge to central Bank. On the eastern portion of the Bank, known as Overall Bank, reef zones occur in the following sequence as one moves from east (windward, open ocean) to west (leeward, towards central Saba Bank): seaward slope, fore reef (with one or more “front reefs”), reef flat, backreef slope (“escarpment”), lagoon, and patch reef (located within the lagoon).

The fore reef zone is a steeply sloping and topologically variable region. Van der Land (1977) observed a “front reef” rising from a “reef terrace” at 30-40 m depth. High-resolution bathymetry confirmed the presence of at least one front reef feature at Overall Bank. To the west (leeward) of the front reef, an area resembling a spur-and-groove reef is found. For the purposes of this management plan, these various reef features are considered elements of a single zone - the fore-reef zone.

Westward (leeward) of the fore reef zone, the reef rises to ~ 15 m depth and forms a wide (> 1000 m) level expanse. Van der Land (1977) identified this area as the reef flat and suggested that it comprised an inner and outer zone distinguished by bathymetry. Examination of recent high-resolution bathymetry data did not differentiate inner and outer reef flat zones within the area of Overall Bank.

The lagoon zone extends eastward (leeward) from the reef flat and backreef slope zones. Van der Land considered the lagoon a single zone, although he distinguished “patch reef’ formations within it. Bathymetry confirmed the presence of patch reef-like features within the lagoon.

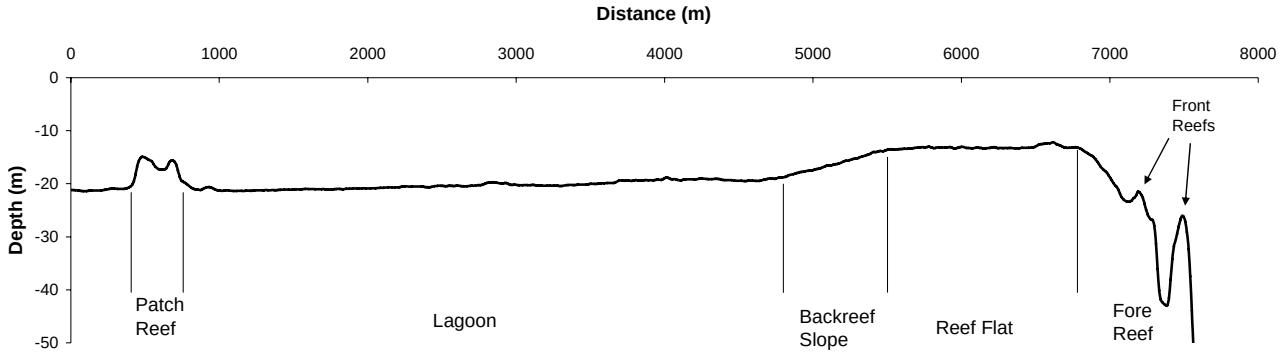


Figure 7. Depth profile from high resolution bathymetric data in the “Overall Bank” area on the Eastern edge of the Saba Bank.

MARINE HABITATS, FLORA AND FAUNA, AND NATURAL RESOURCES

The marine habitats represented within the Saba Bank can be categorized as follows:

- Open water: supporting planktonic and pelagic sea creatures including fish and migratory species such as whales, dolphin, and sea turtles,
- Sea bed (benthos): supporting coral reefs, algae (and possibly sea grass beds), and infauna (burrowing creatures like mollusks and worms), benthic invertebrates and fish.

There is regular exchange of water, energy and materials between each of these habitats. Organisms also move freely between the different environments for feeding and reproduction. As the waters around the Saba Bank are very deep the Bank has very little, if any, exposure to terrestrial influences. This includes freshwater runoff, sediments, nutrients and any form of coastal pollution, which all stress and eventually kill marine organisms.

Open Water

The open water supports pelagic fish populations, most of which are highly migratory such as Tuna (*Thunnus sp*.), Dolphin (Dorado / *Coryphaena hippurus*) and Wahoo (*Acanthocybium solandri*) as well as Marlin (*Makaira* sp.) and swordfish (*Xiphias gladius*) which are found primarily around the edges of the Bank.

While there is little documented information of Caribbean species of turtle that can be found on Saba Bank, there have been several confirmed sightings of Hawksbills (*Eretmochelys imbricata*) during the 2007 survey, indicating the Bank is a foraging area for them. It is quite likely that the Bank is an important foraging are for Green Turtles (*Chelonia mydas*) as well due to the large algae fields. Leatherbacks (*Dermochelys coriacea*), and Loggerheads (*Caretta caretta*) have been seen on the Bank so it is quite likely that they also use the Bank for foraging, though the leaterbacks were likely only migrating through.

A number of Cetaceans are present on the Saba Bank, including; Humpback Whales (*Megaptera novaeangliae*), Sperm Whales (*Physeter macrocephalus*), Spinner Dolphins (*Stenella longirostris*), and Bottlenose Dolphins (*Tursiops truncatus*). Humpback whales, migrating north to their mating grounds, are occasionally seen in the channel between Saba and the Bank. A humpback whale with calf was seen on the Bank in the area known as Moonfish Bank during the 2006 expedition. During dives in February 2002 and in January 2006, humpback whale song was heard.

There are a number of birds that live almost exclusively in the open ocean environment, using Saba as a breeding ground or migratory stop over. These include Frigate Birds (*Fregata magnificens*), Red Billed Tropicbirds (*Phaethon aethereus*), Brown Pelicans (*Pelecanus occidentalis*) and Audubon's Shearwater (*Puffinus lherminieri*).

Pelagic zone

With the exception of the seabed, everything in blue water beyond the 30m depth contour can be considered the pelagic zone. The pelagic environment is commonly thought of as being made up of number of different ecological zones; most importantly, the epipelagic, mesopelagic and the bathypelagic; we will only be discussing the epipelagic zone.

- Epipelagic: The epipelagic zone stretches from the surface down to 200 meters. This is where most plants and animals (flora and fauna) live due to the abundance of light and nutrients. Pelagic fish species are found in this part of the sea around the edges of the Saba Bank. This includes small bait fish such as Herring (*Clupea harengus*) – a major food source for marine mammals, and larger, predatory fish such as the blackfin tuna (*Thunnus atlanticus*), Wahoo (*Acanthocybium solandri*) and Dolphin (Dorado - *Coryphaena hippurus*) all of which are commercially important species.

Healthy and abundant migratory pelagic fish stocks of Tuna, Dolphin and Wahoo are critical to support Saba's small scale local fishing industry. Globally endangered cetaceans and sea turtles regularly migrate through Saba waters.

Sea Bed

Deep sea bottom

Soft-bottom habitats make up some of the deep areas along the south east edge. The sediments are usually comprised of a mixture of biologically fixed silica and calcium carbonate, as well as silts, and sand sediments.

There is little known about the deep water environments on the Saba Bank which are beyond the reach of SCUBA divers. However, with the use of a remotely operated vehicle (ROV) it was possible to examine a number of deeper sites on the Bank. Observations made from the ROV indicate that substrate and benthic communities show consistent zonation patterns along the depth gradient of the front reef slope. A transition in the reef fish assemblage was also evident, though less pronounced, along this same depth gradient. Fish diversity was greatest in the reef crest zone and declined with depth, however sightings of commercially important lutjanid species such as silk and blackfin snapper increased with depth.

Some experimental deep water fishing was conducted during the October survey. Some of the fish caught included the snowy grouper (*Epinephelus niveatus*), saddled moray (G*ymnothorax conspersus*), sharktooth moray (*Gymnothorax maderensis*), grey conger (*Conger esculentus*), and a deep body boarfish (*Antigonia capros*).

In addition to the surveys at Overall Bank, four ROV surveys were made at two other Saba Bank areas: Poison Bank and Grapplers Bank. The substrate at Poison Bank was comprised of coralline algal nodules or "rhodoliths" which formed extensive rhodolith beds. At Grapplers Bank, a steep rocky escarpment was explored. The near-vertical rocky scarp began at 120 m depth and extended down slope beyond the limits of the ROV survey (157 m depth). Observations made from ROV at Overall Bank suggested a continuous reef system that is relatively uniform and predictable at mid-depths in terms of its structure, substrate composition, and community zonation patterns. In contrast, the few observations made by ROV at Poison Bank and Grapplers Bank revealed habitats that were quite different from those at Overall Bank. This implies that explorations to new areas of Saba Bank are likely to reveal still greater diversity in mid-depth habitat types.

Research voyages in the Florida Keys which have explored deep water environments have recorded considerable numbers of new invertebrate and fish species. There is every reason to believe that the same would be true of the deep water benthic environment on the Saba Bank. In 2007 two new species of gorgonians were discovered with 8 dives with the ROV. With further sampling it is quite possible that more new species would be discovered.

Coral reefs

The coral reefs are found primarily along the east and southeast edges of the Bank and are rich in terms of cover and diversity of reef-building corals. There are a variety of reef types on the Saba Bank, from patch reefs through spur and groove type reefs with sandy channels. Each of these provides a hard substrate for coral and other animals to settle on, which in turn attracts fish and an abundance of other invertebrates.

The coral reefs are home to many fish species including, Angelfish (*Holocanthus* sp. and many others), Groupers, Triggerfish, Scorpionfish, Moray eels (e.g. *Gymnothorax moringa*), Wrasses and Chromis, Parrotfish, and roaming schools of Blue Tangs (*Acanthurus coeruleus*). In sandy areas Garden eels (*Heteroconger halis*), Peacock Flounder (*Bothus lunatus*), Stingrays (*Dasyatis Americana*) and Flying Gurnard (*Dactylopterus volitans*) can all be seen. Near to the reefs in the blue water, Black Jacks (*Caranx lugubris*), Bar jacks (*Caranx ruber*), Barracuda (*Sphyraena* sp.) and schools of Horse-eye jacks (*Caranx latus*) and Wahoo (*Acanthocybium solandri*) roam around looking to feed off the smaller reef fish.

The value of the coral reef of the Bank is not based on tourism, as is the case with the reefs of the Saba Marine Park, with respect to their economic importance to Saba, but its value is in the biodiversity and the habitat they provide for many animals and plants, which commercial and artisanal fisheries depend on. The coral reefs provide a habitat for a wide variety of creatures other than fish and coral. Countless species of crustaceans, worms, anemones, jellyfish, mollusks, echinoderms (sea-cucumbers and starfish), bryozoans, and sponges live on the reefs.

In addition to all of the animals and plants usually seen around the reefs and other marine habitats, some less frequently spotted species exist. Two turtle species use the waters as a foraging and breeding ground; Hawksbill Turtles (*Eretmochelys imbricata*) and Green Turtles (*Chelonia mydas*).

Sharks are often spotted on the Bank, nurse shark, reef shark (Carcharhinus perezi), blacktip shark, (Carcharhinus limbatus), and tiger shark (Galeocerdo cuvier).

Figure 8. Tiger sharks are quite common on the Saba Bank.
(source Juan Armando Sanchez)

Figure 9. *Typical habitat of the fore reef slope. Complex hard bottom reef structure with high vertical relief, coral cover is highest in this area.*
(source: Juan Armando Sanchez)

Colonized pavement

Distributed throughout the remaining available habitat, wherever there is hard substrate available, there are communities dominated by algae, sponges and/or gorgonians. These communities typically have a less complex substrate with almost no slopes, varying amounts of sand cover, and a moderate energy regime.

Although the structural heterogeneity that supports reef biodiversity is absent, these areas do provide food, refuge, and much sought after space to numerous invertebrates such as lobster, queen conch, and fishes. These communities provide linkages to surrounding marine communities. According to preliminary benthic habitat maps, these communities dominate the seafloor of the central area of the Bank.

Figure 10. Inner reef flat zone with low relief and hard "pavement" areas.
(source S. Lundvall)

Queen Conch

The 2007 study estimated queen conch densities to be higher in areas characterized by sandy substrate and rubble but concluded that they are very patchy in their distribution. Although too few sites were surveyed to draw any firm conclusions the observed densities may indicate that Saba Bank conch stocks are fluctuating at or about the minimum density for effective reproduction. Since there has been no commercial conch fishery since the mid-nineties (P. Hoetjes, pers. com) this suggests that conch stock has been slow to recover.

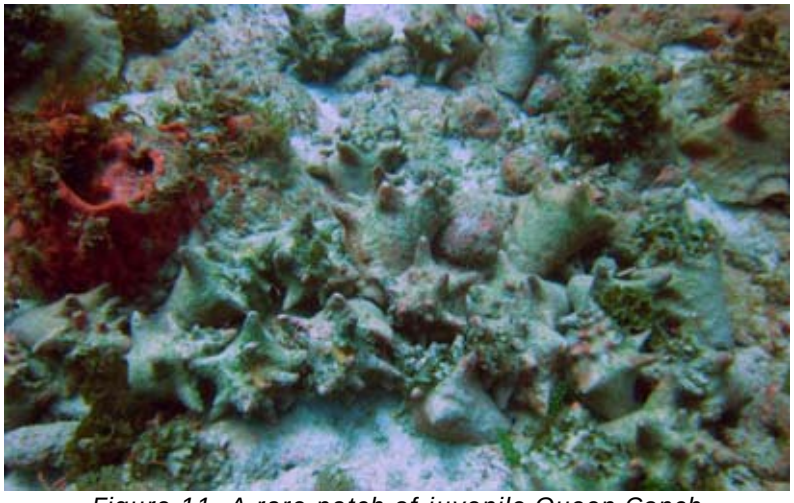


Figure 11. A rare patch of juvenile Queen Conch
(source S. Lundvall)

Macroalgae

The Rapid Assessment expedition conducted in 2006 (Conservation International, 2006) noted the exceptionally high diversity of macroalgae on Saba Bank. Results from the study conducted in 2007 indicated that macroalgae are the most conspicuous component of benthic communities in all sampled strata. Some twenty new algae species were found on the Bank, which are currently being described. It was unclear what environmental conditions would favor robust macro algal growth on Saba Bank. Perhaps a suite of conditions (upwelling, wave energy, currents, depth and substrate) act collectively to favor growth of macroalgae over other forms of benthic cover. The fact that macroalgae dominated cover in all strata, yet the generic composition of algae varied among strata, indicates that environmental conditions may be favorable for the growth of many different types of macro algae. Acknowledged algae experts M. and D. Littler stated that the Saba Bank is without doubt the richest area in the Caribbean for macroalgae.

Figure 12. *A new species of Sargassum found on the Saba Bank, one of many new species of macroalgae found. (Source: D. Littler)*

Anecdotal observations on macroalgae raise other questions about the ecology of macrophytes on Saba Bank. For example, a site named Twin Peaks had a very lush canopy of *Dictyopteris* (> 80 % cover, ~ 40 cm average height) in June. When Twin Peaks was revisited in July, the *Dictyopteris* bed had begun to deteriorate and by August *Dictyopteris* cover had fallen dramatically to < 5 % of benthic cover. In December and January, many small *Dictyopteris* specimens were observed. This suggests that at least some macroalgae have pronounced cycles of seasonal abundance on Saba Bank. However, time-series observations (lasting >1 year) are needed to adequately establish which taxa show seasonality and whether the fluctuating patterns of macro algae abundance follow predictable seasonal cycles.

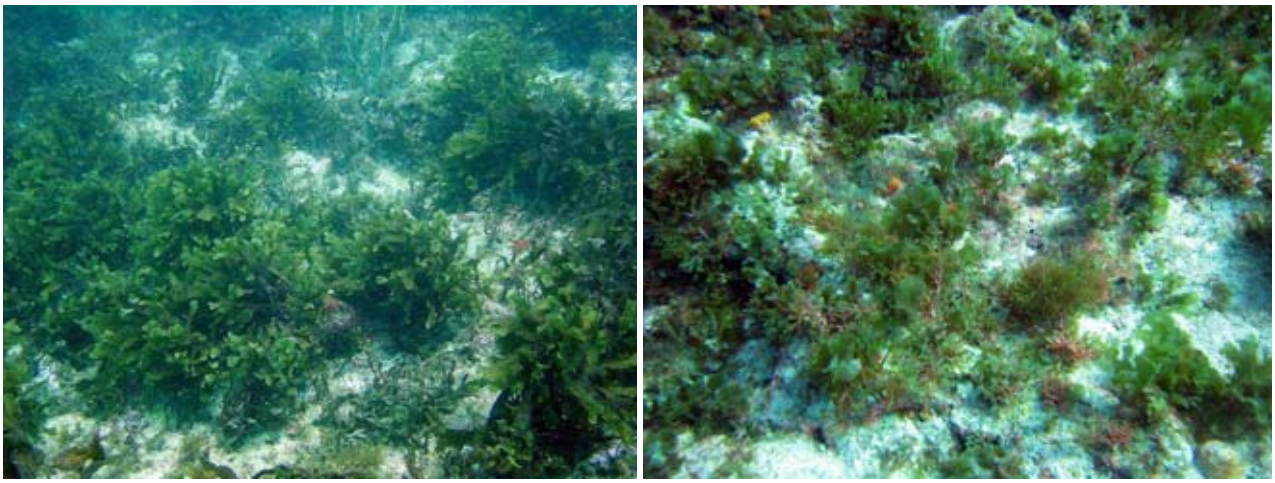


Figure 13 and Figure 14: Area known as Twin Peaks in July '07 (l) and Jan '08 (r). (source S. Lundvall)

A diverse macroalgae population is critical to the region's biogeochemical cycles and serves as an important source of food and possibly pharmaceuticals (Littler and Littler 2000).

Sea Grass Beds

Despite the apparently favorable growth conditions for marine macrophytes on Saba Bank, no seagrasses were observed at any survey sites during numerous surveys. Seagrass beds are clearly not a prominent component of benthic communities at Overall Bank. Previous surveys to other parts of Saba Bank also failed to document the presence of seagrass beds (e.g. Van der Land, 1977, Meesters et al. 1996, RAP Survey, 2006). Thus, there is no indication from available data that seagrass beds are even present on the Saba Bank. This supposition will obviously require more spatially-extensive surveys to confirm. However, if preliminary indications are correct, then the traditional view of seagrass beds as critical components of coral reef ecosystems, and especially their role as nursery habitats for fisheries species may not be applicable to Saba Bank.

HUMAN USES

Fisheries

Figure 15. A typical commercial fishing vessel used for trap fishing on Saba Bank. Note the davit and hydraulic wench mounted to port side behind the wheelhouse.

There are 12 commercial fishing licenses issued for Saban territorial waters and five fishing permits issued for the EFZ, one of which is for Saba. In 2000 fishing provided employment to a relatively large number of people (8% of the economically active population). About 20 people generate a living exclusively from the fishery, while a relatively large group of approximately 30 people find part-time employment in it and generates additional income in the fishery sector (Dilrosun 2000). The income that is generated by the fisheries sector is invested back into the Saba economy, since most of the fishermen are locals. Taxes and income are generated from sales of fuel, two-stroke oil, fishing gear, spare parts and engines. Such associated economic activities are also significant contributors to the island economy. The Spiny Lobster (*Panulirus argus*) fishery is without doubt the most important fishery on the island. The total lobster catch for 2007 is estimated to be 184,000 lbs (83.6 mt) tons, which represents a gross value of 2.3 million NAf (approximately US$ 1.3 million, Toller et al 2007).

Table 1: Red snapper are the second most commercially important fisheries for Saba.

Target Species	Price per kilo (NAf)
Spiny Lobster (*Panulirus argus*)	12.6
Red Snapper species	5.7
Pot fish	3.2

The fishermen primarily fish for lobster on the eastern half of the Bank. This is due partially to the closer proximity to Saba. Some fishermen do fish areas on the Southeast side of the Bank. Bycatch from the lobster pots can be an important factor.

Figure 16. The most important fisheries on the Saba Bank is the Spiny Lobster trap fishery, with traps spread all over the Bank.
(source W. Toller)

Figure 17. Red Snapper is the second most important fisheries for Saban fisherman and is fished for, also mostly with traps, on the deeper edges of the Bank.
(source S. Lundvall)

Queen Conch

Currently there is no commercial queen conch (*Strombus gigas*) fishery on the Saba Bank. Historically this area supported large conch fisheries up until the mid nineties and although no hard data exist on the conch population from this time it is suspected that the conchs were severely overfished by foreign fishing vessels. In 1993 two containers full of conch meat from the Saba Bank, ready for export, were impounded on St. Maarten because they lacked the proper CITES documentation. Since the Coastguard started patrolling the Bank and enforcing the fishery legislation in 1996, there has been no commercial fishery for conch.

*Figure 18. Queen Conch (*Strombus gigas*) with egg mass.*
(source S. Lundvall)

Figure 19. Red Hind (Epinephelus guttatus) once a year migrate from all over the Bank to one small area in a so-called spawning aggregation.
(source S. Lundvall)

Fish Spawning Aggregations

The Saba Bank is an important spawning ground for fish species making the Bank an important source for the surrounding regions. This is particularly with respect to red hind, queen triggerfish—locally called moonfish—and squirrelfish, which are all known to have spawning aggregation sites on the Bank. The aggregation of the commercially important red hind occurs during the winter months (November till the end of February) around the full moon. The spawning aggregation area is 2.1 km long and 20-30 m wide, and runs along the edge of an old spur and groove reef. One specific area of the Bank is called the Moonfish Bank, after the large numbers of queen triggerfish caught there during the same months presumably because it is also a Spawning Aggregation Area.

Traditionally the Sabans would fish the triggerfish and red hind during the spawning aggregations, though not on a large scale. There are indications that this is changing with respect to red hind with the fishery increasing. Queen triggerfish may already have been depleted to such an extent that the spawning aggregation is not noticeable anymore, but this remains to be verified.

Tourism

Tourism on the Bank is still undeveloped. The local dive operators on Saba currently have no interest in offering dive trips to the Bank. Live aboard dive operators active in the region are not currently diving on the Saba Bank but could easily develop an interest once information about dive sites becomes available. Fishing charter boats from St. Maarten do take clients to fish the Saba Bank but the information on this is limited and likely not of large economic importance.

During the hydrographic survey carried out by the Dutch Hydrographic Service in 2006 a wreck was discovered on the Saba Bank. In 2007 a survey crew explored the wreck to determine the origins and potential for dive tourism. The boat is in 120 ft of water and is positioned upright on a sand bottom. Due to the amount of growth on the hull a name or registration could not be determined. The hold was explored and it appears to have been a cargo ship carrying a cement shipment. The Saba Island Government is currently investigating the origins of this ship. The wreck is positioned 22 km west-southwest from the island of Saba. Due to the concentration of sea life around the wreck this site might have the potential to develop into a dive tourism site. Other sites with spectacular reef formations might similarly be developed by providing infrastructure for dive tourism in the form of mooring buoys and site descriptions. This would become even more feasible if the Saba Bank receives PSSA status from the IMO, giving it international recognition as a special area.

Oil and Gas

The geological history of the Saba Bank indicates that there is a reasonable chance for the presence of oil or gas. Consequently, extensive seismologic research and two drillings have been conducted on the Saba Bank. However, though producing a wealth of geological data, explorations in 1977 and 1982 did not detect any significant amount of oil or gas.

Sand

So far, the only commercial mineral identified on the Saba Bank is sand. Sand is only present in the central parts of the Bank (Van der Land 1977). However, the 2007 study found it to be mostly only a thin layer, and not worth mining. Mining would also be expensive because of the general depth of the Bank. The presence of many patch reefs in the middle of the Bank may also obstruct and damage mining equipment. All indications are that sand is only present in limited amounts and mining would not be a sustainable use of the Bank and would seriously impact the rich bottom habitats.

Pharmaceuticals

Coral reefs are important as an inexhaustible source of chemical compounds, potentially beneficial to humans. One field of medical research against AIDS and cancer focuses on the discovery of new products from marine organisms. To date, medicines have already been developed from compounds isolated from gorgonians and sponges. Algae are also known to be potential sources of pharmaceutically active substances. Presently, the Saba Bank is not being used for this purpose. However, its rich biodiversity and the recent discovery of many new seaweed species and two new gorgonian species might form the basis for future explorations.

CRITICAL THREATS TO THE SABA BANK

Special interest species

Endangered Species

The Saba Bank is a home, a migratory stopover, or a breeding site for at least 17 species that are in some degree of danger according to the IUCN Red List, and one species that has been overfished in most of its range and listed on CITES Appendix II (*Strombus gigas*, the Queen Conch). Whales are often heard during January-April as they migrate past, Humpback Whales in particular can be seen breaching from the Southern tip of Saba. Dolphins, porpoises as well as sperm whales have also been sighted on the Bank

Table 2: IUCN Red List species of some concern, found on the Saba Bank.

	Species		Red List Status
1	*Megaptera novaeangliae*	HUMPBACK WHALE	Vulnerable
2	*Physeter macrocephalus*	SPERM WHALE	Vulnerable
3	*Lutjanus analis*	MUTTON SNAPPER	Vulnerable
4	*Lutjanus cyanopterus*	CUBERA SNAPPER	Vulnerable
5	*Mycteroperca venenosa*	YELLOWFIN GROUPER	Near Threatened
6	*Epinephelus morio*	RED GROUPER	Near Threatened
7	*Epinephelus niveatus*	SNOWY GROUPER	Vulnerable
8	*Epinephelus striatus*	NASSAU GROUPER	Endangered
9	*Balistes vetula*	QUEEN TRIGGERFISH/MOONFISH	Vulnerable
10	*Scarus guacamaia*	RAINBOW PARROTFISH	Vulnerable
11	*Lachnolaimus maximus*	HOGFISH	Vulnerable
12	*Carcharhinus perezi*	CARIBBEAN REEF SHARK	Near Threatened
13	*Carcharhinus leucas*	BULL SHARK	Lower Risk, Near Threatened
14	*Galeocerdo cuvier*	TIGER SHARK	Lower Risk, Near Threatened
15	*Caretta caretta*	LOGGERHEAD TURTLE	Endangered
16	*Chelonia mydas*	GREEN TURTLE	Endangered
17	*Eretmochelys imbricata*	HAWKSBILL TURTLE	Critically endangered

Threats

Threats change over time, and it is important to anticipate the potential negative impacts of certain activities, and consider them when making management decisions and amendments to the Management Plan

The four main threats to the Saba Bank are:

- Overexploitation of fishery resources
- Impacts from tanker anchorage on benthic communities
- Impacts of tanker traffic on fishermen and traps
- Global climate change

Overexploitation of fishery resources

The primary users of the Saba Bank are the fishermen from Saba, who have been fishing there since the previous century. Fishermen from neighboring Caribbean islands also fish on the Saba Bank. Intensive fishing methods may have reduced the queen conch populations severely in many places, though no data are available (Meesters 1996). Data from the 2007 study (Toller 2007), although insufficient for clear conclusions, appear to indicate that conch populations may be around the minimum threshold level for harvest density. This evidence indicates conch harvesting should not be permitted on the Bank.

In 2002, Faisal Dilrosun (2000) completed a comprehensive examination of the Saba Bank commercial fishery. Dilrosun performed extensive sampling of commercial catches—particularly for lobster size. His study provided baseline data to compare to current harvest patterns and stock condition as surveyed in the second half of 2007 (Toller 2007). The findings indicate that Saba Bank fishermen of 2007 exert a greater fishing effort in order to maintain lobster landings at year 2000 levels. An in-

crease in fishing effort coupled with a decrease in observed catch rate could suggest that lobster harvests are now at, or exceed, the maximum sustainable yield for Saba Bank stocks. However, more definitive conclusions about trends in lobster stock abundance are not possible owing to the limited time frame of available fisheries data sets. The importance of redfish, as a percentage of total annual landings, has increased by three-fold since 2000. The commercial fishery now harvests redfish primarily with fish traps, in contrast to hook & line fishing methods that predominated in 2000.

Tanker traffic

Ship traffic is constant in the area of the Saba Bank. There are many cargo, cruise ships, and tankers passing over the Bank. The primary reason for the heavy traffic is the oil transhipment facility located on St. Eustatius 25 miles southeast of Saba. This is a storage facility that is mainly used for oil being transported from the Middle East to the USA. It operates 50 storage tanks with a capacity of approximately 11 million barrels. The number of ships visiting the port each month is approximately 100.

Figure 20. A large tanker anchoring on the Bank.
(source S. Lundvall)

The heavy ship traffic on the Saba Bank poses a danger to the small (avg. 40 ft LOA) artisanal fishing boats, which run the risk of being overrun by the large tankers. This risk has, according to the fishermen, caused them to avoid certain traditional fishing grounds, impacting their catches.

As the ships pass over the Saba Bank they often run over the marker buoys of the lobster and fish pots that are set all over the Saba Bank. This results in the loss of the buoys and displacement of the traps and, consequently, the loss of the traps. The number of traps lost annually due to ship traffic can run to several hundred, causing serious ecological consequences because such lost traps continue to catch fish and lobsters until they are completely corroded. In addition, the economic losses incurred by the fishermen are substantial.

Impacts from tankers also include rinsing, oil spills, discharge of sewage, and of ballast water, which may contain invasive species. This type of impact is difficult to quantify but can have an indirect or long term effects.

Tanker Anchorage

Some ships, mostly oil tankers, do not just pass over, but anchor on the Bank while waiting to load at Statia Oil Terminals or simply waiting for their next job. Tankers are actually advised to anchor on the Saba Bank to avoid paying mooring fees to Statia's Ports Authority (Lloyds Shipping Guide, p. 1420). Anchoring ships are both tankers and cargo ships with a depth range between 9 and 12 m. Larger tankers avoid the Bank when they are fully loaded because their depth is between 12 and 20 m, which is more than the water depth in the shallow areas of the Bank. Damage to the benthic

community can occur during setting, retrieval and while at anchor. The anchors and their chains can destroy a relatively large reef area completely in a very short time. Because the ships often remain anchored for many days the damage can be enormous. The eastern and southeastern edges of the Bank, which support the most coral reefs, should be considered very sensitive to anchor damage. Bilge and wastewater, and hull cleaning activities possibly releasing toxic paint from anchored ships are also a concern.

Figure 21. A ship's anchor on the Bank damaging the bottom fauna.
(source S. Lundvall)

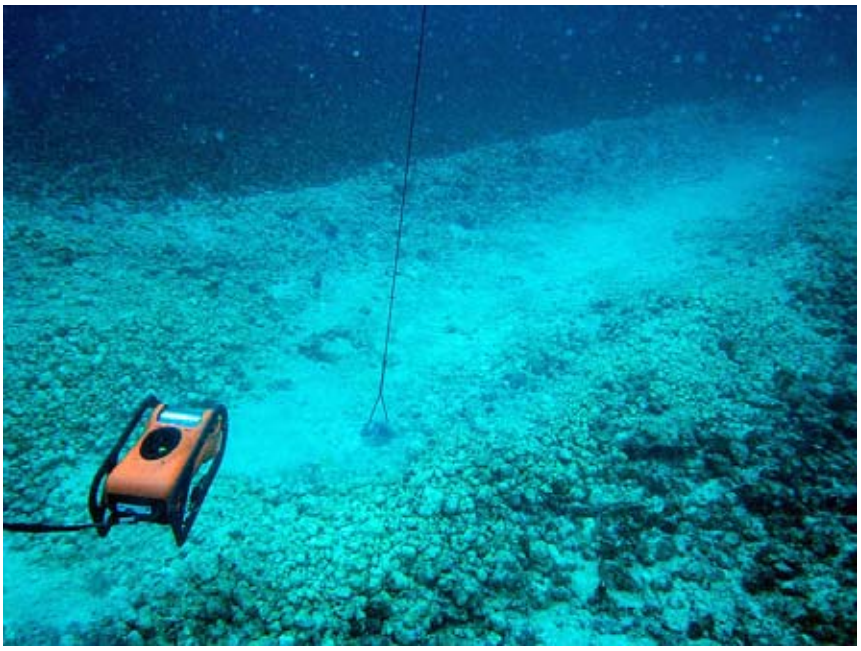


Figure 22. Remotely operated vehicle exploring an anchor scar.
(source S. Lundvall)

The frequency of anchoring is variable throughout the year. During the months of September and October of 2007 three tankers at a time have been seen anchoring on the Bank. Due to the total size of the Bank it is impossible to monitor the whole Bank from Saba but fishermen have reported tankers anchoring on the west side of the Bank. While these reports do not capture all the anchorages it is clear that tankers, as well as cargo ships use the Bank frequently as an anchorage site.

Ship grounding and collisions

Ship groundings and collisions on the Bank, though they have not yet happened, could cause great damage to the Saba Bank coral reefs (see for example Hudson and Diaz 1988). The actual likelihood of a grounding accident is unknown, but grounding of large tankers appears a genuine danger if ever engine failure occurs, because the prevailing winds and currents would carry the tanker rapidly from

Statia towards the Bank. The potential effects may be aggravated when groundings or collisions are accompanied by an, oil spill, which would endanger the fisheries (see previous section). The draught of large oil tankers is deeper than the average depth of the eastern and southeastern rim of the Bank.

There has been one sinking of a boat on the Saba Bank. During the 2007 Saba Bank Project an old wreck, discovered the previous year on the north portion of the Bank, was explored. It is believed to be the wreck of a cement boat that sank on the Bank in the mid 1970's.

Global Climate Change

Increases in ocean temperatures associated with global climate change will increase the number of coral bleaching episodes. High water temperatures stress corals leading to "bleaching"—the expulsion of the colorful, symbiotic algae that corals need for survival, growth, and reproduction. While coral species have some capacity to recover from bleaching events, this ability diminishes with greater frequency, severity, or duration of bleaching. As a result, climate change is likely to reduce local and regional coral biodiversity, as sensitive species are eliminated. The effects of global climate change will combine with more localized stresses to further degrade coral reef ecosystems. Although climate change itself will adversely affect coral reefs, it will also increase the susceptibility of reef communities to degradation and loss resulting from intensified natural climate variability such as El Niño events and increased hurricane intensity, as well as disease, overfishing, disruption of food webs, and pollution from neighboring human communities.

In 2005 the Caribbean experienced a major coral bleaching event. There has been no monitoring on the Bank but there has been a notable change in live coral cover on the reefs. One site in an area known as Coral Gardens was visited in 2002 and this area was used in an informational video about the Saba Bank. This site was again visited during the 2007 dive survey and the coral cover was greatly reduced. Based on this comparison, as well as a general impression of coral cover, the pre-bleaching event and post-bleaching event data show that the impact of the 2005 bleaching event has been very significant.

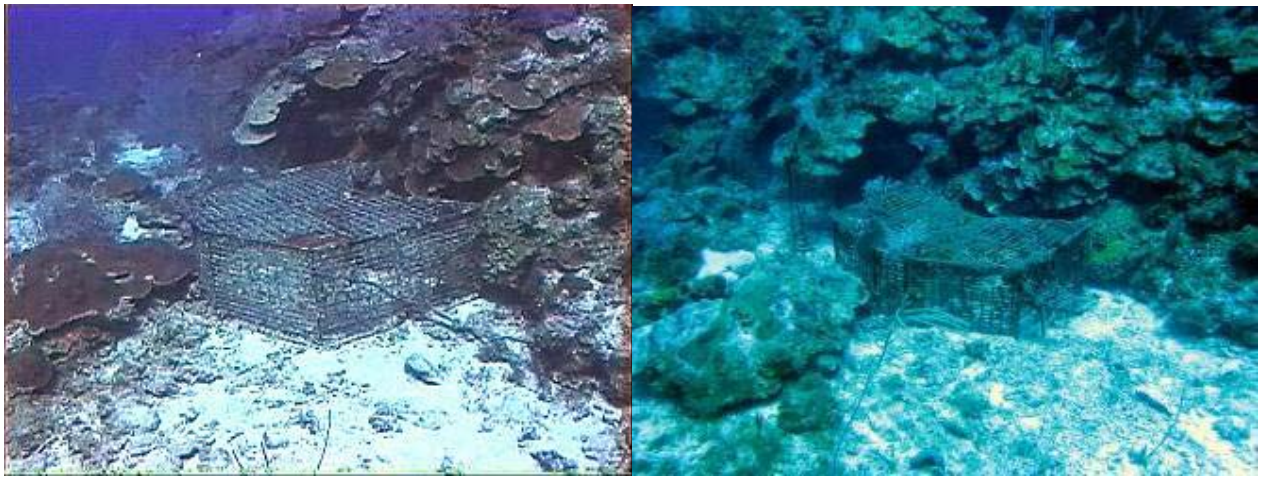


Figure 23. *The exact same spot on the Saba Bank—marked by a lost lobster trap—with luxuriant live coral cover in 2002 on the left, and almost no living coral cover in 2007 on the right.*
(source P. Hoetjes)

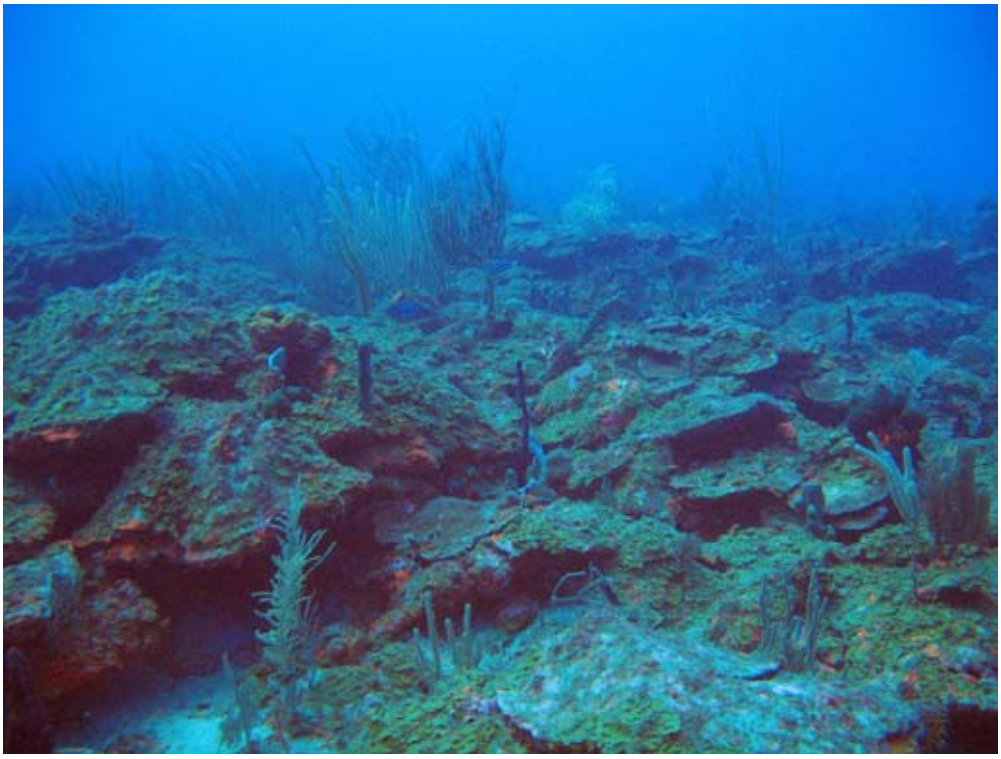


Figure 24. Well developed reef with large coral colonies, almost completely dead and covered with algae, presumably the result of the 2005 bleaching and its aftermath of disease mortality (source: Juan Armando Sanchez).

Part 2 – Management Environment

Figure 25. Sabina II, available for patrolling and/or surveying the Saba Bank
(source: G. van Buurt)

INTRODUCTION

Understanding the goals and objectives of a protected area and the range of direct and indirect threats are essential elements of any management plan. For the Saba Bank an adaptive management framework based on an ecosystem approach was chosen for the management planning. Adaptive management provides a logical approach to management planning which is highly prioritized and threat orientated. The ecosystem approach ensures the integrated management of sustainable use of the resources and conservation. The stepwise implementation of this plan will provide the framework for actions and feedback, allowing effective actions to be identified.

1. Identifying and describing the significance and condition of the natural values within the special protected area;
2. Identifying and describing the threats and issues facing the natural values;
3. Assessing which threats pose the greatest risk to the natural values;
4. Developing and prioritizing management objectives;
5. Developing and implementing management actions to address threats;
6. Measuring the success of those management actions.

Information on the significance of the ecosystems, habitats and species found within the Saba Bank as well as their general condition has been presented in Part 1. Part 2 goes on to identify the threats and issues facing the Saba Bank. Together with the Special Marine Area goals and objectives, this information is used to build a framework for management. This approach is based firmly on the IUCN management cycle, which seeks to ensure that there is continuous learning by reassessing and re-evaluating the success of management actions, programs and initiatives.

Values: the importance of a Special Marine Area in terms of a range of variables, including biological, ecological, economic, social characteristics as well as scientific, international or national significance. The intrinsic natural values of the Special Marine Area include:

- Rich diversity of marine life and habitats (biodiversity)
- Ecological processes such as reproduction and foraging
- Unique marine life including species with limited distribution and endemic species
- Internationally and/or locally threatened and vulnerable marine life

Issue: A situation or concern that requires a resolution at some stage. Some issues, if not addressed, could develop into a threat.

Threat: A threat is a biological, chemical or physical process or entity, which has the immediate potential to harm the natural values of the bank. A threat can be a biological entity such as a marine organism that becomes a pest, a physical process such as an increase in sedimentation, which damages habitat, or a physical entity like an anchoring tanker that damages habitat.

Impact: An impact is the effect that a threat has on the natural assets of the park. For example, the destruction of bottom structure, fauna and flora because of tankers anchoring on the Saba Bank.

Activities of the Saba Bank Management Organization

Core activities for the Saba Bank Management Organization (SBMO) include:

- Closely monitor the landings of lobster and redfish with periodic evaluation,
- Assist with the development, and implementation, of a reporting system whereby the fishermen report their landings of lobster and redfish, and process the resulting data
- Enforcement of fisheries and other regulations (e.g. conch moratorium, closed spawning areas, trap requirements, size restrictions, etc.)
- Include the local commercial fishermen in the management of the fisheries resources,
- Monitor the coral reefs,
- Monitor conch stocks in the Saba Bank queen conch reserve,
- Monitor red hind spawning aggregation. Create a closed fishing season for red hind on the Moonfish Bank area during the months of December, January and February,
- Facilitate and promote further research on the biodiversity and resources of the Saba Bank,
- Monitor impacts of tanker anchorage impacts on the Saba Bank
- Support the PSSA proposal,
- Investigate the potential for the development of artificial reefs/lobster habitat on the Bank.

STATEMENT OF SIGNIFICANCE AND VALUES

Statement of significance

The marine environment of the Saba Bank is 1,800 km^2 of biologically diverse coral reef, macroalgae, rock pavement, sandy seabed, and open ocean communities. The Bank is one of the, if not the, most diverse in marine macroalgae in the Caribbean. The Saba Bank Management Organization was established in 2008 to manage these marine resources for the benefit and enjoyment of the people and future generations. The Saba Bank Special Marine Area is a home, migratory stopover or breeding site for 11 IUCN Red Listed species. The Saba Bank is of high economic importance to the island of Saba. It supports 9 full time fishermen and has a direct economical value of over 1 million dollars a year.

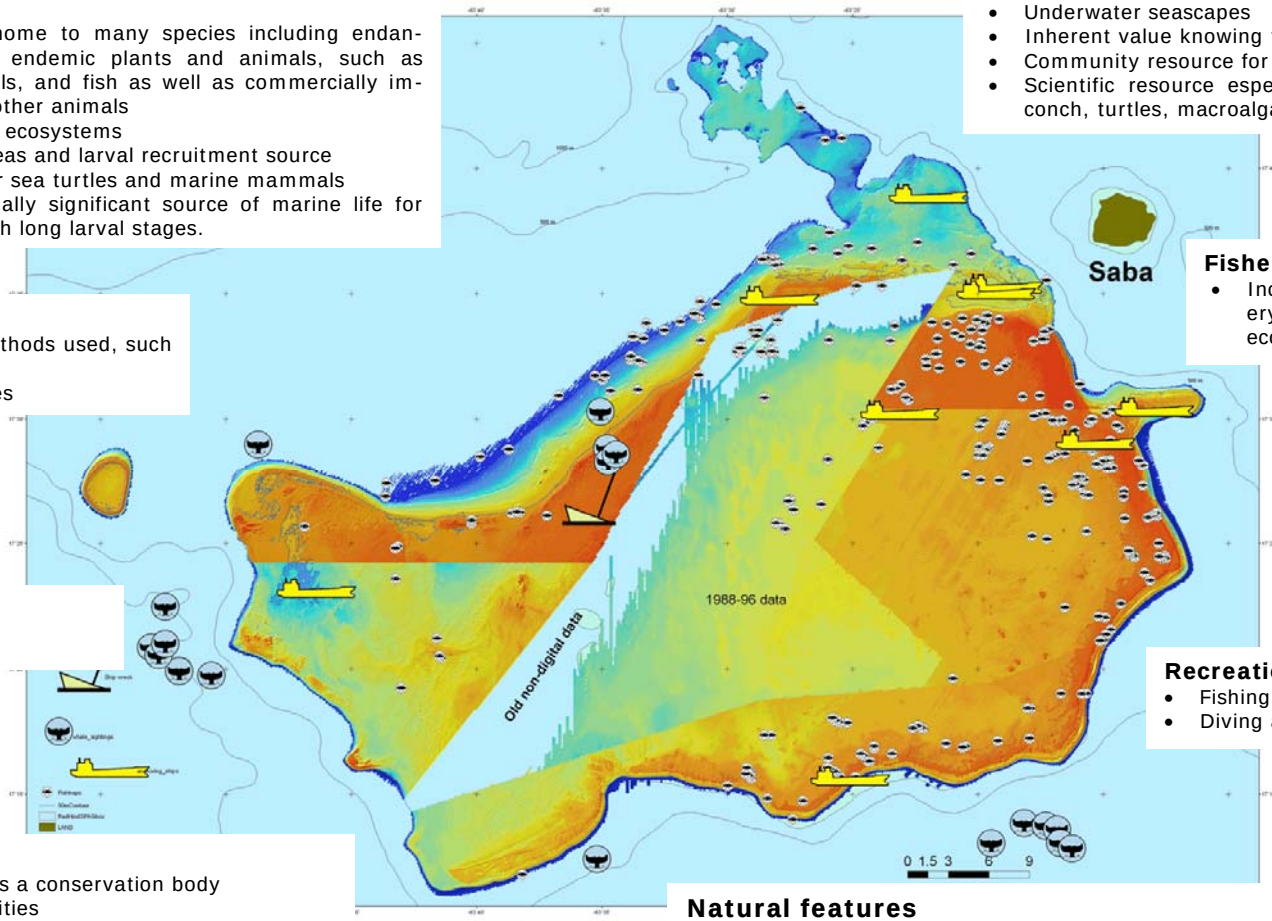
A summary of values associated with Saba Bank.

Environment
- Habitat that is home to many species including endangered, rare and endemic plants and animals, such as macroalgae, corals, and fish as well as commercially important fish and other animals
- Variety of marine ecosystems
- Fish spawning areas and larval recruitment source
- Migratory stop for sea turtles and marine mammals
- Possibly a regionally significant source of marine life for those animals with long larval stages.

General
- Underwater seascapes
- Inherent value knowing the sea/water is 'healthy'
- Community resource for recreation
- Scientific resource especially sharks, whales, lobster, conch, turtles, macroalgae, and coral reefs.

Cultural
- Traditional fishing methods used, such as traps
- Traditional fishing sites

Fisheries
- Income for some residents, fishery resources important to the economy of Saba.



Industry
- Fishing

Recreation
- Fishing
- Diving and snorkelling

Institution
- SBMO is valuable as a conservation body
- Networking capabilities
- Outreach and education
- Coordinator for research and monitoring
- Well sustained and patrolled protected area.
- Preservation

Natural features
- Biodiversity of the reef and other marine environments.
- Natural foraging areas for hawksbill and green turtles
- Spawning ground for red hind and queen trigger fish, and other species

Other Values

Ecological services

Foraging grounds. The macroalgae and reef habitat are vitally important foraging grounds for green and hawksbill turtles, which can be found foraging on soft corals, sponges and algae.

Spawning grounds. Fish spawning aggregations are known to occur at a number of locations on the Saba Bank; these are important sites for ensuring the well-being of fish populations into the future. The Bank is also an important source of larvae for conch, lobsters, corals, fish, and other animals for areas down current of the Bank.

Nursery grounds. The macroalgae beds play an important role as nursery grounds for many species of marine fish, and for the threatened queen conch.

Coral reefs and Macroalgae

Coral reefs are considered globally endangered ecosystems. The latest figures indicate that 70% of the world's coral reefs could be lost in our lifetime. The macroalgae flora of the Saba Bank has been called the richest and most varied of the region. The following table outlines some of the more general values associated with these key ecosystems on the Saba Bank.

Coral Reefs	Macroalgae
• Protection and shelter for many animals and plants • Corals are also at the base of the food chain and provide food for the rest of the reef community. This includes commercial and recreational fisheries	• Provide habitat and food for many animals and species • Provide shelter for juveniles of many commercial fish species • Consolidate sediments and reduce wave energy • Food source for biota on the Bank

Endangered species

The Saba Bank is a migratory stop over or breeding site for at least 17 IUCN Red List species of some concern. Whales are often heard during January-April as they migrate past.

Table 3: IUCN Red List Species found on or adjacent to the Saba Bank.

	Species		Red List Status
1	*Megaptera novaeangliae*	HUMPBACK WHALE	Vulnerable
2	*Physeter macrocephalus*	SPERM WHALE	Vulnerable
3	*Lutjanus analis*	MUTTON SNAPPER	Vulnerable
4	*Lutjanus cyanopterus*	CUBERA SNAPPER	Vulnerable
5	*Carcharhinus perezi*	CARIBBEAN REEF SHARK	Near Threatened
6	*Carcharhinus leucas*	BULL SHARK	Lower Risk, Near Threatened
7	*Galeocerdo cuvier*	TIGER SHARK	Lower Risk, Near Threatened
9	*Mycteroperca venenosa*	YELLOWFIN GROUPER	Near Threatened
10	*Epinephelus morio*	RED GROUPER	Near Threatened
11	*Epinephelus niveatus*	SNOWY GROUPER	Vulnerable
12	*Epinephelus striatus*	NASSAU GROUPER	Endangered
13	*Balistes vetula*	QUEEN TRIGGERFISH/MOONFISH	Vulnerable
14	*Scarus guacamaia*	RAINBOW PARROTFISH	Vulnerable
15	*Lachnolaimus maximus*	HOGFISH	Vulnerable
16	*Caretta caretta*	LOGGERHEAD TURTLE	Endangered
17	*Chelonia mydas*	GREEN TURTLE	Endangered
18	*Eretmochelys imbricata*	HAWKSBILL TURTLE	Critically endangered

VISION, MISSION AND GOALS

VISION

To secure a natural protected area that represents a unique and spectacular ecosystem.

MISSION

To contribute to the preservation of Saba's natural heritage and promote the sustainable use of the natural resources.

GOALS

1) Dynamically manage the Saba Bank marine environment successfully as a nationally, regionally, and globally significant protected area, within an effective legislative framework and with commitment from stakeholders.

The Saba Bank is a unique area in the Caribbean and is facing pressures from fishing and vessel traffic and anchoring. Its management faces constant challenges in setting realistic objectives that take into account all of the present and future uses. By trying to achieve a balance between use and protection, the Saba Bank can build on its successes to become a regional and global flagship for the effectiveness of managed areas.

2) Conserve, through practical conservation and active management;
- **a) the natural values of the marine environment, including threatened, rare and endangered species, habitats, biological diversity, ecosystem processes and aesthetic values.**
- **b) the cultural and historical marine resources of the Saba Bank.**

2a) By conserving and managing the marine environment the SBMO will safeguard the vital life-support processes of the sea including:
- photosynthesis,
- maintenance of food chains,
- movement of nutrients,
- degradation of pollutants,
- conservation of biological diversity,
- productivity

2b) To be of greatest benefit the SBMO must address the economic importance of the Bank to the people of Saba. The resources of Saba have been an important economic and cultural part of Saba history that the SBMO will work towards sustainable harvesting of the Bank.

3) Ensure the promotion of the marine environment as a traditionally and contemporarily valuable, sustainable, multiple use resource whilst establishing rules, guidelines and enforcing legislation for different users.

It is essential that SBMO ensures that protection lasts and values are not undermined by cumulative degradation. Lasting protection can be achieved in partnership with wise use involving the accommodation of a broad spectrum of human activities compatible with the primary goal of conservation. This can be done by applying key management and enforcement tools.

4) Ensure the involvement of the local community and stakeholders, to cultivate a sense of partnership, improved information base and support for the zoning, regulations and management practices of Saba Bank.

By involving stakeholders five key benefits arise, each of which will help in the pursuit of SBMO objectives:

- Increased sense of 'ownership'.
- Greater support for the protection of the area.
- Greater public involvement in decision-making
- Formation of links between planning for conservation and planning for development.
- Provision of a mechanism for communication
- Active involvement of the fishermen of Saba

LEGISLATION

The following is a translation from the official Dutch text provided by the Dutch Caribbean Nature Alliance (DCNA). It is not officially sanctioned, and the Dutch text will determine exact interpretation of the legislation

NATIONAL FISHERIES ORDINANCE

PB 1991, No. 74

NATIONAL ORDINANCE of July 11th, 1991 concerning regulations regarding fishing in the territorial sea and in the fisheries zone of the Netherlands Antilles (National Fisheries Ordinance).

IN NAME OF THE QUEEN!

The Governor of the Netherlands Antilles,

Having taken into consideration:

That it is desirable to support regulations regarding the economic exploitation of fish in the territorial sea and in the fisheries zone of the Netherlands Antilles, also serving the conservation of species;

Has, having heard the Advisory Council, in joint consultation of the Parliament, decreed the National Ordinance below:

SECTION I DEFINITIONS

ARTICLE 1

1. In this National Ordinance and the provisions that are based upon it the terms below mean as follows:
   The Minister: the Minister of General Affairs
   Fishing: placing fishing gear in water, having it in water, hauling it in, picking it up or otherwise having it ready for operation, as well as the use of any other means to catch fish
   Fishing Committee: the Committee established pursuant to Article 13
   Fisheries Zone: the zone established pursuant to the Act Authorizing Creation Fisheries Zone (Stb. 1977, no. 345)
2. In this National Ordinance and the provisions that are based on it, fish also means:
   (a) crustaceans, shellfish and other mollusks, seaweeds, corals, sea mammals, tortoises, star fish and sea urchins;
   (b) fish roe and hatch
   (c) hatch and seed of crustaceans and shellfish.

SECTION II GENERAL PROVISIONS

ARTICLE 2

1. It is forbidden to fish in the territorial sea and in the fisheries zone without a permit.

2. With exception of what is prescribed in paragraph three, the prohibition meant in the first paragraph does not apply to he who fishes with a vessel that holds less than six gross register tons or a length less than twelve meters. The length of the vessel is measured for this purpose from the point where the deck or the deck strips meet the bow to the inside of the stern.
3. It can be determined by Island Ordinance that a permit from the Executive Committee of that Island Territory is necessary in order to fish in the territorial sea with a vessel as meant in paragraph two.
4. The prohibition meant in the first paragraph does not apply to he who fishes with a vessel that has a maximum of four drag nets or hand lines in use.
5. The permit meant in paragraph one is granted by or on behalf of the Minister, having heard the Fisheries Committee. If the permit shall also be valid for the territorial sea surrounding an island territory, then it can only be extended if that island territory's representative in the Fisheries Committee consents to such.
6. Contrary to the provision in paragraph five, the permit for fishing in the fisheries zone with a vessel as meant in paragraph two is granted to residents of the Netherlands Antilles by the Executive Committee of the island territory where they reside.
7. An exemption regarding the prohibition meant in paragraph one for the purpose of carrying out scientific sea research can be granted by or on behalf of the Minister, having heard the Fisheries Committee.
8. An exemption as meant in paragraph seven is only granted under the condition that the results of the research are made available to the Country and the respective island territories.
9. By or on behalf of the Minister, an exemption can be granted regarding the prohibition meant in paragraph one for the purpose of holding fishing contests. The exemption is granted to the agency that is organizing the contest and concerns all the vessels that are entered into the contest. The exemption is valid for the number of days it indicates.

ARTICLE 3

1. By means of a General National Resolution, regulations are established regarding:
   (a) fishing gear with which it is allowed to fish,
   (b) the fish to be caught.
2. It is forbidden for permit holders to have on board:
   (a) other fishing gear than that with which it is allowed to fish pursuant to the National Resolution meant in paragraph one,
   (b) other sorts of fish than those which it is allowed to fish pursuant to the National Resolution meant in paragraph one,
   (c) other fish than those which may be kept pursuant to the National Resolution meant in paragraph one.
3. By means of a General National Resolution, regulations are established regarding the information that permit holders should record and the manner in which this should take place.

ARTICLE 4

1. Regulations can be established by Island Ordinance concerning fishing in the territorial sea surrounding an island territory with a vessel as meant in the second paragraph of Article 2.
2. The regulations that are established pursuant to the first paragraph of Article 3 and the first paragraph of this Article should correspond to each other as much as possible.
3. For the application of this National Ordinance and the provisions based on it, the border between the two island territories is formed by the middle line in the places where the territorial sea between the island territories is less than 24 nautical miles wide. The middle line is the line of which every point is at an equal distance from the nearest points of the baselines from which the breadth of the territorial sea around the island territories is measured.

ARTICLE 5

The Minister, having heard the Fisheries Committee, can implement a fishing prohibition for a certain period of time. This period of time can differ for different sorts of fish.

ARTICLE 6

1. In as far as the conservation and the natural development of the fish stock do not oppose such, permits as meant in Article 2 can be granted to:
   (a) natural persons, residents of the Netherlands Antilles,
   (b) companies established in the Netherlands Antilles of which either the shares that represent at least two-thirds of the placed capital are in name of residents of the Netherlands Antilles and a majority of the directors are residents of the Netherlands Antilles or of which all the directors are residents of the Netherlands Antilles,
   (c) foundations and associations with a legal persona of which all the directors are residents of the Netherlands Antilles.
2. The permits as meant can only be granted to persons other than those named in the first paragraph in as far as the conservation and the natural development of the fish stock do not oppose that, in addition to those who have been granted a permit pursuant to paragraph one, others are also granted a permit.

ARTICLE 7

1. A permit is only granted on the basis of a written request. The Minister, having heard the Fisheries Committee, can establish general stipulations regarding the information that must be provided with the request as well as the manner in which the request is to be submitted.
2. The permit mentions the name and the registration number of the vessel.
3. A permit is only granted after the fee due pursuant to Article 12 is paid.
4. Conditions can be set regarding a permit. The conditions set regarding a permit can be amended or retracted officially or on request. The permit holder should be notified of an intended amendment in a timely manner.
5. The decision regarding a request is made known to the applicant in writing; the denial gives the reasons for such.
6. A permit can be retracted by or on behalf of the Minister, having heard the Fisheries Committee:
   (a) if the information provided to get the permit turns out to be so incomplete or incorrect that the permit would not have been granted had the correct information been completely known,
   (b) if violations of the provisions of this National Ordinance or provisions pursuant to it take place,
   (c) if actions in violation of the permit's requirements take place.
7. A decision to retract a permit or amend the permit's conditions gives the reasons and is made known to the permit holder in writing. The eighth paragraph of this article is also applicable.
8. If a permit is denied, the applicant can request the Joint Court of Appeals of the Netherlands Antilles and Aruba to declare the denial unfounded. The Third Title of the First Book of the Code of Civil Procedure applies to this procedure. If the Court of Appeals declares the denial unfounded, then the Minister, having heard the Fisheries Committee and taking the Court of Appeal's ruling into account, again makes a decision regarding the request. There is no legal recourse against the Court of Appeal's ruling.
9. Not making a decision within three months after the request has been submitted equates – with the exception of what is prescribed in the fourth paragraph of Article 8 - a denial with regards to the possibility of appeal.
10. The petition by which the permit is requested must include motivation for the request (you must provide an explanation for asking for the permit).

ARTICLE 8

1. A permit is granted for a maximum period of twelve months.

2. After the expiration of the period of time for which the permit is granted, it is repeatedly extended for a maximum period of twelve months by or on behalf of the Minister, having heard the Fisheries Committee, unless the conservation and the natural development of the fish stock do not oppose such. Article 7 applies.
3. A permit granted pursuant to Article 6, paragraph two is not extended if the intention exists to grant one or more permits to persons as meant in Article 6, paragraph one and the conservation and natural development of the fish stock oppose an extension while at the same granting the permit pursuant to Article 6, paragraph one.
4. The extension of a permit should be requested at least three months before the expiration of the period of its validity. If the request for an extension is not submitted on time and the decision regarding the request to extend is not taken within three months of its submittal, the permit is deemed to be extended until the moment that the decision is made known to the applicant.

ARTICLE 9

1. A permit can only concern a vessel, the vessel as indicated in the permit.
2. The permit should be on board of the vessel and shown on a law enforcement officer's first demand.
3. The Minister or an agency as designated by the Minister can grant permission to temporarily use another vessel to substitute the vessel indicated in the permit.
4. The written permission mentions the period of time for which it is valid as well as the name and registration number of the substitute vessel.

ARTICLE 10

Permit holders are only obliged to provide information regarding the scope and the composition of their catch as well as the location where it was caught as requested by an agency appointed by the Minister meant in Article 9, paragraph three for the purpose of collecting statistical data.

ARTICLE 11

A permit is not transferable.

ARTICLE 12

He who is granted a permit by the Country owes a fee to the Country. The amount and manner of collection thereof are provided for by means of a General National Resolution.

SECTION III FISHERIES COMMITTEE

ARTICLE 13

1. There is a Fisheries Committee.
2. The Fisheries Committee consists of a chairperson, also member, and five other members. The members of the Fisheries Committee, including the chairperson, are appointed for a period of six years per term.
3. The chairperson is appointed and can be dismissed by the Minister. Every island territory appoints a member. The island territory that has appointed a member can dismiss that member. Such a member acts in accordance with the opinion of the Executive Committee of that island territory.
4. The Fisheries Committee has a secretary that is appointed and dismissed by the Minister.
5. The Fisheries Committee's members and the secretary receive a compensation that is set by the Minister. The costs that are so incurred are for the Country's expense.

6. The Fisheries Committee decides with a majority of at least four votes.
7. Besides what is prescribed in the other provisions of this National Ordinance, it is the Fisheries Committee's task to:
    (a) follow the development of the fish stock and fishing activities in the territorial sea and the fisheries zone of the Netherlands Antilles,
    (b) both on request and on its own accord, advise the Minister and the Executive Committees regarding fishing matters.
8. The Fisheries Committee is heard regarding drafts to amend this National Ordinance and regarding drafts of General National Resolutions concerning the execution of this National Ordinance.

SECTION IV CONFIDENTIALITY REQUIREMENT

ARTICLE 14

It is forbidden for any person that fulfils a certain task on the basis of or pursuant to this National Ordinance to further or otherwise use data or information obtained on the basis of or pursuant to this National Ordinance or to make such further or otherwise known than is strictly necessary for the execution of his task.

SECTION V CRIMINAL PROVISIONS

ARTICLE 15

1. Violation of what is prescribed by or pursuant to Articles 2, 3, and 5 is punished by imprisonment for a maximum of three months and a maximum monetary fine of ANG five thousand, or one of these sentences.
2. Not honoring a request as meant in Article 10 is punished by imprisonment for a maximum of two weeks or a maximum monetary fine of ANG three hundred.
3. Not honoring a demand as meant in the first paragraph of Article 17 is punished by imprisonment for a maximum term of one month or a maximum monetary fine of ANG one thousand.
4. The criminal acts as meant in this Article are considered to be misdemeanors.

ARTICLE 16

Besides the persons indicated in Article 8 of the Code of Criminal Procedure of the Netherlands Antilles, those persons indicated by the Minister and the Minister of Justice are responsible for monitoring compliance and tracking down violations of this National Ordinance.

ARTICLE 17

1. The persons meant in Article 16 are – only in as far that is reasonably necessary for the fulfillment of their task – authorized:
    (a) to want any information from every permit holder and everyone who is suspected to have acted without a permit,
    (b) to want to inspect all books and documentation and make copies of such from every permit holder and everyone who is suspected to have acted without a permit,
    (c) to open and inspect the goods of every permit holder and everyone that is suspected to have acted without a permit and to take these temporarily for that purpose,
    (d) to enter all places, except for residences, accompanied by persons they indicate.
2. If necessary, they gain entry to a place as meant in paragraph one, sub-paragraph d, with the help of the police.

ARTICLE 18

1. In order to carry out their task, the persons meant in Article 16 are authorized to demand that Captains of vessels, with the exception of public transport, stop and allow inspection of the items inside. They can also demand the Captains cooperate with their instructions.
2. The Minister can, in agreement with the Minister of Justice, set rules regarding the manner in which a demand as meant in paragraph one is made.
3. The persons meant in Article 16 can seize goods that are subject to seizure anywhere, also if not catching someone in the act. Article 17, paragraph one, sub-paragraph d, applies.

ARTICLE 19

1. If a criminal act as per or pursuant to this National Ordinance is committed by or on behalf of a legal entity, a company, any other association of persons or fund, the criminal prosecution is instigated and the sentences are pronounced against that legal entity, company, association or fund, against those who gave the instruction to commit the criminal act or who were in charge regarding the criminal act, or against all of them.
2. A criminal act as per or pursuant to this National Ordinance is also committed by or on behalf of a legal entity, a company, any other association of persons or fund if it is committed by persons who, either on the basis of an employment agreement or on the basis of another relationship, act within the scope of the legal entity, company, any other association of persons or fund, irrespective of whether or not these persons each individually committed the criminal act or their actions seen collectively form the elements constituting that criminal act.
3. If criminal prosecution is instigated against a legal entity, a company, any other association of persons or fund, it is represented during the prosecution by the director and in the case of multiple directors, one of them. The representative can appear by proxy. The Court can order that a certain director appear in person; in that case it can ordered that the director be brought to the trial by police escort.
4. For the purpose of applying Article 20 of the Code of Criminal Procedure of the Netherlands Antilles and with regards to the criminal acts as per or pursuant to this National Ordinance, legal entities are deemed to reside where they are established.
5. With the exception of summons in accordance with Article 130, paragraphs two and three of the Code of Criminal Procedure of the Netherlands Antilles, in the event of criminal prosecution instigated against a legal entity, a company, any other association of persons or fund, the serving of documents, summons, notices or other announcements takes place to the person or the residence of the director and, if there are multiple directors, to one of these or the place where the directors meet or have an office.

ARTICLE 20

Netherlands Antilles' criminal law applies to everyone who is guilty of committing a criminal act as per or pursuant to Article 2, 3, 4 and 5 in a fisheries zone.

SECTION VI SCOPE OF THE NATIONAL ORDINANCE

ARTICLE 21

The application of this National Ordinance is limited by the regulations of international law.

SECTION VII TRANSITIONAL AND CONCLUDING PROVISIONS

ARTICLE 22

1. This National Ordinance is not applicable outside of the territorial sea until the moment the fisheries zone is established.

2. The provision of Article two, paragraph one is applicable to persons mentioned in Article 6, paragraph one twelve months after the date this National Ordinance comes into effect.
3. The provision of Article two, paragraph one is applicable to persons mentioned in Article 6, paragraph two four months after the date this National Ordinance comes into effect.

ARTICLE 23

1. This National Ordinance comes into effect on the date determined by a National Resolution.
2. It can be cited as the “National Fisheries Ordinance”.

Presented on Curaçao, July 11th, 1991

R.M. DE PAULA

NATIONAL FISHERIES DECREE

NATIONAL DECREE of 5 November 1992 containing general measures implementing articles 3 and 12 of the National Fisheries Ordinance (Public Bulletin 1991, no. 74) (National Fisheries Decree).

IN THE NAME OF THE QUEEN

THE GOVERNOR of the Netherlands Antilles,

Having considered that, in order to implement articles 3 and 12 of the National Fisheries Ordinance, it is desirable to lay down rules governing the fish that may be caught, the equipment that may be used, the information required of license holders and the way in which such information is to be recorded, and how the fees owed to the country if a license is granted are to be collected.

Having heard the Advisory Council, has decreed that:

Article 1

The following definitions shall apply for the purposes of this decree:

National ordinance: the National Fisheries Ordinance (Official Bulletin 1991, no. 74)

License holder: the license holder referred to in article 2 of the national ordinance

Article 2

Anyone fishing in the fishing zone, and license holders fishing in territorial waters shall be forbidden to use:

a. dredge nets;
b. fishtraps with a mesh size of less than 1.5 or 38 mm;
c. fishtraps not fitted with an escape opening, covered by a panel made of biologically degradable material, which after use, disintegrates in the sea water, so that, after some 20 days, an opening of at least 15cm by 15cm is created in one side of the fishtraps;
d. chemical substances, with the exception of Quinaldine used in catching aquarium fish;
e. explosive substances;
f. bait composed of the flesh of marine mammals;
g. gill nets longer than 2.5 km.

Article 3

1. Anyone fishing in the fishing zone, and license holders fishing in territorial waters shall be forbidden to fish for:
    a. mollusks of the species *Strombus gigas* which are less than 18 cm in length; should the mollusks have been removed from their shells, they must have a minimum weight of 225 grams;
    b. all species of turtle;
    c. all species of marine mammal;
    d. lobster of the species *Panulirus argus*:

1. which are less than 25 cm long, measured in prone position from the edge of the head, between the eyes, to the curve in the tail;
2. which have a carapace of less than 9.5 cm;
3. of which the total weight is less than 680 grams, or of which the tail has a weight of less than 200 grams

2. It shall be forbidden to keep lobster of the species referred to in paragraph 1 d if:
    a. they are in ecdysis;
    b. they are carrying eggs.
3. It shall be forbidden to remove the eggs from lobster of the species referred to in paragraph 1d.

Article 4

The license holder shall keep a record of fishing activities, containing information on the fishing operations, the area in which these operations are performed, the species caught and the fishing methods employed. The forms on which the aforementioned records are to be kept shall be drawn up by the Fisheries Commission referred to in article 13 of the national ordinance, and shall be issued free of charge to license holders. A copy of the records shall be forwarded to the Fisheries Commission no later than 45 days after completion of the fishing trip to which they apply. The Fisheries Commission may, if necessary, request the records.

Article 5

1. The level of the fees referred to in article 12 of the national ordinance shall be levied as follows:
    a. for fishing with fishtraps, diving for lobster, fishing for mollusc of the species *Strombus gigas* and fishing for demersal species with bottom and drop longlines:
        i. from a ship of which the gross tonnage is less than 6 GRT, or of which the deck is no longer than 12 m,
            - for the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance: nil
            - for the natural and legal persons referred to in article 6, paragraph 2 of the national ordinance: ANG 900 per annum;
        ii. from a ship of which the gross tonnage is between 6 and 25 GRT, or a ship of which the gross tonnage is less than 6 GRT, but of which the deck is longer than 12 m: ;
            - for the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance: ANG 550 per annum;
            - for the natural and legal persons referred to in article 6, paragraph 2 of the national ordinance: ANG 1,800 per annum
        iii. from a ship of which the gross tonnage is between 25 and 50 GRT:
            - for the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance: ANG 900 per annum;
            - for the natural and legal persons referred to in article 6, paragraph 2 of the national ordinance: ANG 2,700 per annum;
        iv. from a ship of which the gross tonnage is between 50 and 150 GRT or more:
            - for the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance: ANG 1,250 per annum;
            - for the natural and legal persons referred to in article 6, paragraph 2 of the national ordinance: ANG 3,600 per annum;
    b. for fishing with gill nets with a maximum length of 2.5 km;
        i. from a ship of which the gross tonnage is less than 25 GRT: nil
        ii. from a ship of which the gross tonnage is between 25 and 50 GRT: ANG 900 per annum;
        iii. from a ship of which the gross tonnage exceeds 50 GRT: ANG 1,450 per annum;

c. for fishing with drift longlines:
    i. from a ship of which the gross tonnage is between 25 and 50 GRT: ANG 3,600 per annum;
    ii. from a ship of which the gross tonnage is between 150 and 300 GRT: ANG 9,000 per annum;
    iii. from a ship of which the gross tonnage exceeds 300 GRT: ANG 14,500 per annum;
d. for fishing with ring nets:
    i. from a ship of which the gross tonnage is less than 800 GRT: ANG 18,000 per annum;
    ii. from a ship of which the gross tonnage is between 800 and 1000 GRT: ANG 27,000 per annum;
    iii. from a ship of which the gross tonnage exceeds 1000 GRT: ANG 36,000 per annum.

2. Per annum shall be understood to mean a period of 12 months.
3. The fees referred to in paragraph 1 shall be deposited in a Bank account of the Ministry of Finance.

Article 6

1. For a period of 3 years after this national decree has entered into force, licenses to fish in the Saba Bank fishing area employing the fishing methods referred to in article 5, paragraph 1a, with the exception of bottom and dropline fishing for demersal species, shall be issued exclusively to the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance.
2. Licenses may be issued to the natural and legal persons referred to in article 6, paragraph 1 of the national ordinance for the performance of fishing operations in the Saba Bank fishing area employing a combination of the fishing methods referred to in article 5, paragraph (1a and b). These licenses shall be issued subject to the tariffs and provisions referred to in article 5, paragraph 1a.
3. Licenses may be issued for the performance of fishing operations in the fishing areas around Curaçao and Bonaire employing a combination of the fishing methods referred to in article 5, paragraph 1 (a and b). These licenses shall be issued subject to the tariffs and provisions referred to in article 5, paragraph 1a.

Article 7

This national decree shall enter force at the same time as the National Fisheries Ordinance (Official Bulletin 1991, no. 64).

Article 8

This national decree may be cited as the National Fisheries Decree.
Done at Curaçao on 5 November 1992

J.M. SALEH

S.C.M. RÖMER

Acting Minister for General Affairs

S.C.M. RÖMER

Minister of Justice

Published on 27 November 1992

S.C.M. RÖMER

Acting Minister of General Affairs

Other relevant legislative and policy tools

A range of relevant legislation and policy tools exists, from international treaties and conventions through National legislation to Island legislation. The DCNA has produced a booklet to bring all the existing legislation concerning the use and conservation of the marine environment for the windward Netherlands Antilles islands. The booklet is designed to be used by wardens, rangers and managers to help with the enforcement of legislation relating to the marine environmental. This will be made available through www.DCNAnature.org.

National legislation

National Fisheries Ordinance – PB 1991, nr. 74
National Fisheries Resolution – PB 1992, nr. 108
National Ordinance for the Prevention of Pollution from Ships – PB 1993, no. 108
National Ordinance on Civil Liability Oil Tankers – PB 1998, no. 169
National Oil Pollution Compensation Ordinance –PB 1998, no. 170
National Nature Conservation Ordinance – PB 2001, no. 41
National Maritime Ordinance – PB 2007, no. 18

Table 4: International treaties and conventions relevant to the Saba Bank.

CITES	Convention Of International Trade In Endangered Species
Cartagena	The Convention For The Protection And Development Of The Marine Environment Of The Wider Caribbean Region
IAC	Inter American Convention For The Protection And Conservation Of Sea Turtles
CBD	Convention On Biological Diversity
MarPol	International Convention For The Prevention Of Pollution From Ships

GOVERNANCE

The Saba Bank Management Organization is envisaged as operating in corporation with the Saba National Marine Park. The Saba National Marine Park is managed by a local non-governmental, not for profit foundation called the Saba Conservation Foundation, incorporated in the Netherlands Antilles in 1987.

HUMAN RESOURCES

Staff

A minimum of three staff members will work for the Saba Bank Management Organization. As well as the core staff members, SBMO depends on the efforts of the SCF staff and volunteers;

Current internal issues

Sustainable financing

The Saba Bank Management Organization will need a sustainable financing source in order to carry out the duties of the organization. Due to the fee structure of the fishing permits and the limited number of fisherman on Saba revenue from this source will not begin to cover the costs of the organization. Funding from (the government of) Holland is required in order to ensure the protection of the Bank.

Stakeholder ownership

Community involvement as well as a sense of ownership by the fisherman is critical for the success of the organization.

PHYSICAL RESOURCES

	Resource	#	Detail
Buildings	Office(s)	1	constructed July 2005
	Meeting room	1	constructed July 2005 – in park office
	Workshop	1	constructed July 2005 – in park office
Transport	Truck	4	2007 Nissan Pick up.
	Patrol boat		Bradly Sport 300 boat, two 115hp outboards, trailer.
Other	Remotely Operated Vehicle	1	SeaBotix LB2000L
	Generator	1	Honda Generator
	Fax Machine	1	Lexmark 9350 All in One centre, purchased July 2007
	Telephone	2	Brand = Uniden. Purchased in 2006 handheld, portable
	Computers	8	Dell 2007.
	Laptop computers	2	Dell 2007.
	Camera	1	Sony Cybershot camera with underwater case. Sony HDV video camera with mini cassette and underwater housing
	Internet	1	DSL
	BC	3	Sherwood
	Regulators	3	Legend regulators
	Wetsuits	3	Profile shorty
	GPS	3	1 Garmin 178C with transducer, 1 Garmin GPS76.

Available information

Each of the factors listed below have been identified by Kenchington, R. A. (1990). (Managing Marine Environments, Taylor and Francis, New York.) as important background information for the running of any protected area. A good source of information is considered to be recent, comprehensive and easily accessible.

Table 5: A summary of the information sources available to SBMO

Access to information	
Geological maps	-
Maps of currents	†
Bathymetric charts	✓
Bottom classification chart	✓
Tide tables	✓
Baseline habitat maps	-
Community descriptions	†
Species lists	†
Status of commercially important species	✓
Status of endangered, threatened and endemic species	†
Aerial photographs	-
Hydrological survey	-
Economic valuation	-
Cultural valuation	†
Traditional usage	✓
Current use and usage levels	✓
Socio-economic survey	-

Sources of information available to SBMO
✓= Good source, †= available but insufficient, -= not available

FINANCE

SBMO would have to be reliant on government funding from Holland. The Island Government is not able to provide sustainable funding to the organization. Other potential funding sources would include fees from the fishing licenses paid by the fishermen. These fees are nominal and there are not enough fishermen to provide any meaningful income to sustain the SBMO. Much of the needed equipment such as a vehicle and boat, Remotely Operated underwater Vehicle (ROV), UW video and digital cameras, dive equipment, etc. have already been purchased in the course of the 2007 survey of the Saba Bank. The main expenditures for SBMO are wages and operational costs, and costs for radar beacon (racon) buoys that may be needed to signal areas to be avoided by international shipping. In addition, it may be necessary to provide AIS transponders to all licensed fishing boats, both for the safety of the fishermen and for the effective enforcement of the regulations.

Table 5: Budget for Saba Bank Management Organization.

Income			**NAF**	**€**
		Subsidy - Island Government		
		Other income		
	Total Income			
Start-up expenditures				
		Equipment/supplies (racon buoys), 5	550,000.00	205,000.00
		AIS transponders + GPS antennas, 10	20,000.00	7,500.00
	Total start-up expenditures		***570,000.00***	***212,500.00***
Expenditures				
		Personnel	295,000.00	110,000.00
		Operating (office/boat/vehicle)	35,000.00	13,000.00
		General and administrative	6,000.00	2,500.00
		Depreciation	5,000.00	2,000.00
		Contingency provision (5%)	17,000.00	6,500.00
	Total operating expenditures		***358,000.00***	***134,000.00***
	Total first year expenditures		***928,000.00***	***346,500.00***

STAKEHOLDERS

Involving local communities (and other stakeholders) to regular, effective participation is essential for successful MPA management. It is particularly important in the management of marine environment to work very closely with those using the marine resource directly and those using adjacent waters.

An important step in establishing effective stakeholder relationships is to identify the stakeholders and their roles within the marine environment. Table 5 summarizes the stakeholder groups of SBSMA

Table 6: Stakeholders of Saba Bank Management Organization.

STAKEHOLDER (s)	DETAIL / ROLE
NGOs	Saba Conservation Foundation, DCNA
Tourism	3 dive centres and tourists
Harbour	Harbour master and staff
Shipping/industry	Statia Oil Terminals
Fishermen	Commercial and recreational fishermen

Law enforcement	Public Prosecutor, Chief Police Inspector, Coastguard
Community	Local users
Government	Island Council (Governor and 2 commissioners and 2 other political party reps and senator), MINA, Fisheries Committee (EEZ committee?)
Staff	1 manager and 2 rangers
Partners	DCNA, SCF,
Researchers/scientists	International researchers and scientists, Interns and volunteers who (have) work(ed) on the Saba Bank

Stakeholder Input

Introduction

Stakeholders of the SBMO were consulted with extensively through the last 6 months of 2007 to obtain feedback on various aspects of the Management Plan. The consultations were carried out using meetings and presentations. Input was also received via individual communications.

Table 7: Stakeholder consultation methods.

Group	Meeting	Individual communications
NGOs	✓	✓
Tourism	✓	
Harbour	✓	
Fishermen	✓	✓
Law enforcement	✓	
Community	✓	✓
Government	✓	
Staff	✓	✓
Partners	✓	✓
Researchers/scientists	✓	✓

The detailed minutes from the meetings can be seen in Appendix B.

SUMMARY OF ISSUES

Historical issues

The main historical issues for the Saba Bank have been related to the fisheries on the Bank and the anchoring of tankers and cargo ships on the Bank while waiting their turn at the St. Eustatius oil transshipment terminal. The main issue is the destruction of habitat from the tankers while anchoring on the Bank. Tankers are also having an economic impact of the fisheries of Saba. Lost fish and lobster traps from tankers running over their traps are a lost source of income to the fisherman as well as the potential for lost traps to continue to ghost fish for many years.

Issues identified by stakeholders

The following pages summarize the main threads of input from the stakeholder meetings held in the second half of 2007. Feedback from stakeholder meetings relating to the Saba Bank Management Organization Vision, Mission, Goals, the Management Plan structure, and values of the management organization have been incorporated into the text. Full meeting minutes can be found in Appendix XXX. Each of the comments below involved either extensive discussion or occurred in more than one meeting.

Details of the current 'external' issues identified as significant

Create a clearly defined conch reserve on the Saba Bank	Conch on the Saba Bank were overfished in the mid 1980's. With the introduction of the Coastguard in 1996 this was stopped. Stock recovery seems to be slow and population levels appear to be at minimum reproduction levels. Conch fishery would bring with it many negative aspects such as importation of cheap labor and unsafe working conditions.
Develop a reporting system whereby the fishermen report their landings of lobster and redfish	The limited commercial fishing on Saba Bank consists primarily of Saban fishermen. There are currently no mechanisms to determine fishing efforts or landings for lobster or red fish, the two main fisheries of the Saba Bank. The fisheries legislation states that all landings must be reported, however this is not being done and there is no infrastructure in place with the island government to deal with this requirement or the analysis of the data.
Closely monitor the landings of lobster and redfish with periodic evaluation	This issue is the same as the previous. Currently there is no mechanism in place to determine the fish and/or lobster stocks on the Bank. Secondly, there is no method of determining the landings of either fish or lobster stocks. Without this information, we have no method to determine the impacts of fishing of the lobster or red fish populations.
Enforcement of fisheries and other regulations (i.e. conch moratorium, equipment restrictions, closed spawning areas/season, and submission of landing records),	Since 1996 the enforcement has been under the direct control of the Coastguard. There have been some issues with regard to foreign fishing vessels on the Bank as well as the amount of time the Coastguard can dedicate to the enforcement of fisheries violations. Currently there is no enforcement of the current regulations with regards to mesh size, biodegradable panels in the net and reporting of landings by the fishermen
Monitor red hind (and other) spawning aggregations.	Creating an effective closed fishing season for red hind on the Moonfish Bank spawning area during the months of Dec. to Feb is urgently necessary to protect the stocks.
Monitoring impacts of tanker anchorage on the Saba Bank	Monitoring of the impacts from the tankers who anchor on the Bank. This will provide support for the PSSA designation.
Support the PSSA proposal	The SBMO will provide ongoing support to the Central Government in their bid to have the Saba Bank declared a PSSA.
Include the fishermen of Saba in the management of the fi-	It is important to have the fishermen involved as key stakeholders with the SBMO in order to create broad support for regulations, in-

sheries resources	crease compliance and facilitate enforcement
Facilitate/promote research on the biodiversity resources of the Saba Bank,	To more fully understand the environmental significance of the Saba Bank further scientific research must be carried out in order to identify and quantify the ecological importance of the Bank.
Monitoring of the coral reefs	Coral reefs are an important area on the Saba Bank and to determine the health of the reefs they must be monitored. Since the Saba Bank reefs are far removed from direct human impacts they can provide invaluable comparative data.
Prevent/stop anchoring within the 12 miles zone around Saba, and once the EEZ has been declared, on the whole of the Saba Bank	Commercial shipping is considered to be a threat to the Saba Bank for a number of reasons. Ships cause significant damage through anchoring on the Bank. Ballast waters may frequently be released into the waters and discharge of bilge water also adds to the amount of pollutants entering the waters, which can be very harmful to coral reefs and other habitats. Anchor damage is altering the benthic habitat, impacts of which are still not defined.
Investigate the potential for artificial reefs	While there is a large area of reef on the Saba Bank by percentage of the whole area it is relatively small. A substantial area of the Bank is low relief rubble and pavement with very limited structure. Artificial reefs could increase available habitat for fish (lobster) and potentially increase the stocks

FURTHER DISCUSSION AND COMMENTS

Future issues

Since planning is about the future, the factors which can affect the future of SBMO must be identified and evaluated. Whilst such predictions are at best uncertain, the identification of future trends in ecological change, visitor use, conflicts, economics and related pressures should be attempted. An understanding of the socio-economic environment is of particular importance.
Predictions are not just about future issues – they also help to identify opportunities for planning, beneficial change, remediation or restoration. The following expectations of change come directly from the extensive stakeholder input:

- Need for more resources, especially personnel.
- Constitutional change will have an impact on the SBMO.

Global Warming

Globally, coral reefs, are being degraded by global warming, pollution and coastal development. Reefs are particularly sensitive to climate change because they bleach easily if there are changes to sea surface temperatures (SSTs).

Corals get their colour from tiny single-cell plants - zooxanthellae - which provide sustenance for the reef-building creatures, the polyps. If there is an increase in SST for a prolonged period, the zooxanthellae are expelled, the coral loses its colour, the polyps lose their sustenance and eventually the coral may die and the reef is weakened. In the case of the Saba Bank the reefs then become more vulnerable to other threats, such as: (background levels of) pollution; overfishing; (bio)erosion; damage and sedimentation from storm surges.

To mitigate the damage to corals weakened by warming waters the recent IUCN reports have called for the adoption of a range of measures, such as:

- improved reef monitoring
- use of marine protected areas
- restoration of degraded reefs

- use of coastal and fishing management schemes

Natural Disasters

Saba Bank faces threats from annual hurricane damage. Hurricanes damage coral reefs and in the shallow areas of the Bank may alter benthic communities. Hurricanes also cause damage to fish traps on the Bank. A storm can mean the loss of hundreds of traps. Apart from the economic impact to the local fishermen these lost traps can continue to ghost fish for a number of years.

Other natural events that may have an impact on the Saba Bank include volcanoes. Such events are very difficult to manage for, since they tend to be on a catastrophic scale. However, the ability for the environment to recover from volcanic activity, including ash fall is still directly related to the amount of other impacts affecting the marine environment.

Summary of issues

The main issues facing Saba Bank have been identified through extensive stakeholder input and management opinions. These are:

Management issues

1. Lack of sustainable funding.
2. Limited personnel to carry out the plan.

External issues

1. Create a clearly defined conch reserve on the Saba Bank
2. Develop a reporting system whereby the fishermen report their landings of lobster and redfish.
3. Enforcement of fisheries and other regulations i.e. conch, closed spawning and landing records
4. Monitor red hind spawning aggregation. Create a closed fishing season for red hind on the Moonfish Bank area during the months of Dec. to Feb
5. Monitoring impacts of tank anchorage impacts on the Saba Bank
6. Support the PSSA proposal.
7. Include the fishermen of Saba in the management of the fisheries resources.
8. Facilitate research on the biodiversity resources of the Saba Bank.
9. Monitoring of the coral reefs.
10. Investigate the potential for the development of artificial reefs on the Bank

Over the coming years, pressures on SBMO are likely to increase so it is essential that an effective management strategy for these issues is established. By dealing choosing an effective course of action to deal with one of these issues, value will be added by outcomes that will have a knock on effect and go some way to tackle other issues that have been identified. An example of this would be to implement the landing for each fishermen on Saba be collected and analysed in order to assess harvest records and determine the state of the fish stock on the Bank.

The recognition of the key issues facing BNMP is essential to the production of an effective work plan and strategy, which is presented in the next section.

Part 3. Management Actions

KEY ISSUES AND ACTIONS

EXTERNAL ISSUES

Create a clearly defined conch reserve on the Saba Bank

Past intensive and unsustainable fishing methods during the mid 1980's led to the decline of the queen conch (*Strombus gigas*) stocks on the Saba Bank. Because of its location and prevailing currents in the area, the Saba Bank is a source of larval recruitment for the entire region. Presently there is a moratorium on the commercial harvesting of conch on the Saba Bank. Input from the stakeholders meetings held in 2007 indicated that there was a consensus that the area should be designated a conch reserve in order to protect this important species, as well as prevent a return of unsustainable and unsafe fishing practices often inherent in the conch fishery.

ACTIONS

Create and implement the queen conch reserve
Due to the importance of conch as an endangered species, and our minimal understanding of distribution and populations on the Saba Bank, it is proposed to have the Saba Bank designated as a queen conch reserve with no commercial take of conch. The island government has requested the Minister of Public Health and Social Development to so designate the Saba Bank and the expectation is that this will happen as soon as the EEZ has been officially established by the end of 2008 or early in 2009. This designation will ensure the protection of the stocks and ensure a healthy larval source for the entire region. The SBMO will then implement the moratorium on catches and monitor the conch stocks.

Research into queen conch stocks.
Queen conch are listed in Appendix II of CITES due to the overharvesting of this species. They are also listed on annex 3 of the SPAW protocol as a species that must be managed sustainably. Due to the importance of queen conch on the Saba Bank as a regional resource it is vital that we continue to study the abundance and distribution of this species on the Saba Bank to gain a better understanding of the biology of the conch on the Saba Bank.

Monitor the landings of commercial fish catches

There is very little data available on the yearly landings from the commercial fishermen of Saba. Legislation is currently in place stating that all fishermen must report their landings, however there is no infrastructure in place to collect or monitor this information.

> "The license holder shall keep a record of fishing activities, containing information on the fishing operations, the area in which these operations are performed, the species caught and the fishing methods employed. The forms on which the aforementioned records are to be kept shall be drawn up by the Fisheries Commission referred to in article 13 of the national ordinance, and shall be issued free of charge to license holders. A copy of the records shall be forwarded to the Fisheries Commission no later than 45 days after completion of the fishing trip to which they apply. The Fisheries Commission may, if necessary, request the records."

ACTIONS

Collect records of fishing activity on the Saba Bank
The SBMO will work with the Island government to assist in the development of a system for reporting landing from the commercial fishermen**.** The SBMO will then be tasked with the job of collecting and compiling the landings. This dataset will then lay the foundation for establishing a long-term commercial fisherman reporting system, which in turn will enable the SBMO to assess the state of the fish stocks on the Saba Bank, and provide advice to the Fisheries Commission as intended in the fisheries legislation.

Enforcement of fisheries regulations

Currently there is minimal enforcement of the fisheries regulations. Primarily the regulations that are not being enforced are the size limits, biodegradable panels, catch records and foreign fishing vessels within territorial waters. The Coastguard is the main enforcement agency on the Saba Bank. Due to the numerous other duties tasked to the Coastguard fisheries enforcement is not consistent.

Actions

Collaboration
Work with the Government, Harbour Office and Police to establish clear enforcement procedures and publicize the outcome. Encourage local fishermen to work with the police in the enforcement of the regulations. The SCF is in the process of having one of their rangers trained as a special agent. It may be possible that the SBMO can work in cooperation with the SCF for enforcement of the regulations.

Monitor red hind spawning aggregation – Assist in the development of a spawning aggregation closed season

The Bank is home to an important red hind spawning aggregation on the northeast edge of the Bank in an area locally know as the Moonfish Bank. Increases in fishing pressures on the red hind spawning aggregating during the months of Dec. – Feb. will have a serious impact on the red hind stocks of the Saba Bank as a whole.

ACTIONS

Initial information gathering
Monitoring of the number of boats that fish the red hind aggregation to determine where the majority of the fishermen are from, either local Sabans or boats from other islands such as St. Maarten. Conduct monthly monitoring surveys during the period of the aggregation to gauge trends in fish densities during the aggregations.

Stakeholder consultation
Work with the Executive Council to hold a public hearing to present its preferred management option with respect to the spawning aggregation issue and to gather input from fishermen and public prior to making a final decision on the matter.

Provide assistance in draft legislation for closing the spawning aggregation
The SBMO will work with the executive council in the formulation of the closed fishing season for the red hind spawning aggregation.

Monitor tanker anchorage damage on the Saba Bank

Statia Terminals NV is a major hub in this area of the Caribbean for bulk fuel loading and transhipment. Approximately 1100 tankers stop at the fuel terminal each year. Of these tankers a number anchor on the Bank, while waiting to on- or offload at the terminal, or after leaving the terminal to wait for the next job. Impacts from the anchors and associated chains have a substantial impact on the benthic environment of the Saba Bank. Stakeholders of the SBMO identified three main threats coming from shipping traffic: pollution (ballast, bilge and sewage discharge, and solid waste), anchor damage, and destruction of fishing gear by running across it.

ACTIONS

Monitor impacts of anchoring
The SMBO will use the AISLive system to monitor the nature of shipping traffic, the number, size, and destination of vessels, and the frequency of vessel visits, and document the number of tankers that anchor on the Bank, location and duration of stay. When feasible the SBMO will set up a repeatable monitoring protocol for assessing anchor damage, include fixed photo quadrats and assess recovery rates where possible.

Prevent Anchorage within the 12 miles territorial waters
The SBMO will advise ships of the prohibition on anchoring that came into effect since 2008 with the passing of the new National Maritime Ordinance, and request them to move on. If they do not comply SBMO will request the assistance of the Coastguard.

Support the PSSA proposal
THE SBMO will provide whatever support is required for the Central Governments proposal to the IMO to have the Bank recognized as a Particularly Sensitive Sea Area (PSSA). Data can include, but are not limited to, frequency data of anchorage, documentation of impacts on the benthic communities as well as access to monitoring data.

Work with the commercial fishermen in the management of the fisheries resource.

Saba currently does not have any type of organization representing the local commercial fishermen. Without this type of formal organization discussions with the fishermen with regards to present and future issues are based on one on one conversation. As key stakeholders for the Saba Bank it would be beneficial for all parties involved for the commercial fishermen to form a formal organization that would have input into the decision making on issues facing the Bank.

ACTIONS

Promote the creation of a fisheries association among the fishermen as key stakeholders.

Facilitate and promote research from visiting scientists

The Saba Bank is still a largely unexplored area in the Caribbean. Recent surveys in October of 2007 and in the winter of 2006 have discovered new species of algae, fish and gorgonians proving that the Saba Bank has a wealth of yet undiscovered species and treasures. The researchers also listed over one hundred and fifty species, never before reported from the Saba Bank and found habitats unique for the region. These scientific discoveries suggest that much more research remains to be done to fully understand and appreciate this complex ecosystem.

ACTIONS

Promote scientific research on the Bank.
Promote the Bank and current findings on the Bank whenever possible. This includes conferences, local, national media, and presentations.

Provide assistance to researchers
The SBMO will assist researchers on the Saba Bank by providing logistic support and access to boats, ROV, dive tanks, bathymetry maps, historical information as well as personnel where feasible.

Monitor and evaluate coral health

Coral bleaching directly threatens the reefs on the Bank. Although there is very little active management we can do to address bleaching, monitoring can provide long term information on bleaching and recovery on the Saba Bank where other stresses on the reef are minimal; and collaboration with neighbouring islands can go some way to improving understanding and strategies to 'deal' with this threat.

ACTIONS

Continue to monitor bleaching
Continue to monitor the state of the coral at existing sites established in 2007 on a regular basis. Adapt methods where appropriate.

Co-ordinate with other islands
Communicate methods and results with St. Eustatius, St Maarten, and other DCNA islands, as well as the regional Global Coral Reef Monitoring Networkm (GCRMN) nodes.

Evaluate potential for artificial reef development on the Saba Bank

Many reef fishes are highly dependent on habitat complexity. A large portion of the Bank appears to have low relief and low rugosity which limits the habitat available for colonization by benthic organisms, shelter and foraging area. This may be a limiting factor for some fish populations. Artificial reefs may provide benefits by habitat diversification and enhancement, which could have economic benefits from increased fishable lobster and fish stocks, as well as from creation of scuba diving sites.

ACTIONS

Create an experimental artificial reef
Examine various methods and material that could be used as an artificial reef on the Saba Bank. Consultation with experts in this field as well as with the local fishermen would be essential for the success of such a project.

Monitor the artificial reef
It is imperative that once an artificial reef has been established that the resources (funds, committed personnel, expertise, equipment, insurance, and divers) to carry out longer term monitoring are in place.

Management Issues

Establish sustainable financing mechanisms

Reliance on government subsidies and grant funding for income makes SBMO dependent on unsustainable finance, since at any time these sources of income could cease. Unlike the marine parks around the islands where dive tourism is substantial, the possibilities of implementing fees by the SBMO are minimal. To ensure a steady stream of funding structural funding from the government of Holland will be needed.

ACTIONS

Money from fishing Permits.
Under the assumption that the SBMO will be collecting and reviewing catch data, a portion of the fishing permits should be directed towards the SBMO.

Explore possibilities for finance
Assuming start up funding can be found from either the Dutch government or a Dutch or international NGO, the next step would be to seek structural funding from the Dutch government for the SBMO under the new constitutional relationships.

Communication strategy for the main stakeholders of Saba Bank Management Organization.

GROUP	DETAIL	OBJECTIVES	WEBSITE	ANNUAL REPORT	E-NEWSLETTER	PRESENTATIONS	MEETINGS	PRESS /RADIO	MANAGEMENT PLAN
NGOs	SCF, DCNA	Promote conservation management activities and build relationships with other similar initiatives.	◆	◆	◆	◆	◆		◆
Tourism / Watersports	3 dive centres, tourists	Emphasize the need for practical hands on conservation effort on the part of the users to protect the reefs and their role. Work with the dive centre if they want to dive on the Bank. Importance of marine conservation and visitor role in conservation management.	◆		◆				
Harbour	Harbour master and staff	Coordination of enforcement of the anchoring prohibition, surveillance.	◆		◆	◆	◆		◆
Fishermen	Commercial and recreational fishermen.	Education about the marine environment, involvement and consultation with environmental initiatives, meetings with other stakeholders.			◆	◆	◆	◆	
Law enforcement	Public Prosecutor, Chief Police Inspector, Coastguard	Coordinating efforts in Law enforcement of existing and new legislation.	◆		◆	◆	◆		◆
Community	Local users.	Stimulate interest in the Saba Bank, educate about conservation management, and build support for management decisions	◆		◆	◆		◆	
Government	Island Council, MINA, Fisheries Commission	Developing practical solutions to conservation and management issues. Reporting. Develop legislation.	◆	◆	◆	◆	◆		◆
Staff and board	1 manager, 2 rangers	Management strategies, involvement with key decisions, strategic planning, conducting monitoring.		◆		◆	◆		◆
Partners	DCNA, SCF	Muster continued interest through involvement and active feedback.	◆	◆	◆	◆	◆		◆
Researchers and scientists	Regional and International	Stimulate research into the Bank to explore biodiversity and other areas of interest, e.g. geology.	◆		◆	◆			

Suggested framework for developing objectives on a yearly basis to carry out the actions identified

Action (all content below for example only)

Design and implement a comprehensive Special Area Management Plan with stakeholder input

Objective

To involve the stakeholders in the proposed SBSMA, continue to receive, evaluate and improve the plan based on stakeholders involvement

Activities	Output *(objectively verifiable)*	Agency/ Personnel*	Budget*	Week number 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Planning																	
Project planning	Project plan with detailed goals, outputs, roles, budget																
Information gathering																	
Definition	Listed goals of SBSMA.																
Objective setting	List of objectives for the SBSMA.																
Summarise current stakeholder positions	List of stakeholder views from stakeholder consultations.																
Stakeholder Consultation																	
Define groups	List of groups to be consulted																
Define methods	Document of consultation methods.																
Arrange meetings	Meetings carried out, minutes taken, attendee list																
Facilitate input	Interview minutes.																
Draft plan preparation																	
Draft plan	Draft plan including descriptions, justifications, and details of the stakeholder input.																
Review of draft																	
Distribute draft plan for review to stakeholders	List of feedback expected and/or leading questions. Copies of plans distributed to local stakeholders, feedback received in note form.																
Distribute draft plan for review to management peers.	List of feedback expected and/or leading questions. Copies of plans distributed to 2/3 international experts in Protected Area management, feedback received in note form.																
Revise draft	Final Work Plan with revisions included																
Finalisation																	
Implementation	Time frame for adopting the work plan																
Submit plan	Plan submission to relevant authorities																
Publish plan	Maps, leaflets (design time and output)																
Monitor	Biological monitoring data, stakeholder feedback comments documented.																**Ongoing**

*Agency/personnel and budget requirements to be decided on site by management.

MANAGEMENT ACTIVITIES

Planning for the core aspects of operational management occurs on a week by week basis and cannot be accurately or usefully accounted for in a 3-5 year management plan. The following table lists the range of activities likely to be taking up core management time throughout the life of this management plan (the list is not definitive – other activities are likely to crop up). The actions proposed at the beginning of this section need to fit around the most essential core management tasks. Prioritizing and executing these is the responsibility of the SBMO management/staff.

Task	Examples
Lobbying	Meetings with local decision makers (e.g. Island Government) Meetings with visiting decision makers (e.g. Parliamentarians) Advice giving based on any research and monitoring
Administration	Time planning Staff meetings Checking reports, evaluating projects and programs Budgeting, payments/disbursements accounting, reporting, purchasing, sales, inventory, Bookkeeping. Producing quarterly, mid year, annual reports Correspondence Personnel management: conflict management; recruitment, interviewing, job descriptions.
Planning	Action planning Budgeting Annual planning Management planning Strategic planning Planning for stakeholder input Discussions with stakeholders Planning education programs Organizing patrols (land and sea) Planning research and monitoring
Fund Raising	Writing funding proposals Writing grant applications Contacting, updating funders Reporting (written and financial) on projects
Promotion / travel	Attending meetings, workshops, conventions, including DCNA Attending training courses Giving interviews to journalists
Patrolling	Patrolling on sea

Maintenance	Maintaining vehicles, boats equipment Maintaining computers Emergency restoration and stabilization
Outreach	Giving talks and presentations to local users, industry, scientific fora, tourists Press releases, giving interviews to media Meeting with users
Education	Use of formal training techniques for any audience Visiting schools Training volunteers
Monitoring	Learning monitoring protocols Setting up monitoring program Implementing monitoring program Processing monitoring data Producing reports on monitoring Collecting fish catch records Processing catch records Producing reports on catch records Management Success related work Staff training in monitoring Surveillance of Protected Area activity
Law Enforcement	Speaking to users about legal issues Developing and providing advice on the issuing of permits, exemptions, guidelines, rules Writing and pursuing prosecutions, summonses etc Crisis, Emergency and disaster response Staff training in legal issues, special police powers etc

IMPLEMENTATION AND REVISIONS

Use

This management plan should be used as an outreach tool and to guide management decisions in the coming 3-5 year period. The actions recommended in the plan should form the starting point for developing clear, measurable objectives for each issue that currently faces the marine park. A framework for this is provided in this part of the plan, as suggested by expert review.

Distribution

The document is available as a whole document and in sections. The document is also available in Microsoft WORD and PDF formats. The Saba Bank Special Area Management Plan should be accessible via; the website, hard copy, electronic copy (CD, DVD for large files or direct transfer with other media).

Additions and developments

When anything changes that is included in the management plan, the change should be added to the additions and developments section of the Master Plan. To save time and enable easy updates, this should be done as frequently as possible.

- ***Methods:*** Save any additions onto hard drive and burn them onto CD as needed, or add hard copies to the back of the plan (Part 4) where pockets, zip pockets and CD storage is available.
- ***Include:*** New work plans and annual schedules, Budget, New research, Projects, Staff CV's when new members recruited, Legislation passed, useful photographs any other relevant information

If any sheets are lost from the management plan, print them out and replace them.

Updates

The life span of this management plan is 3-5 years depending on the changes experienced by SBMO and the Saba Bank Special Marine Area over time. Updates to Part 3 should be made (or at least added to part 4) once a year. The plan should be reviewed in detail with stakeholder input at the earliest in mid 2010, but no later than mid 2012. The recommended update framework is provided in the introduction to the management plan.

Appendices

Full appendices for the management plan are available on disk at the back of this manual. The appendices should also be uploaded to the SCF website to enable stakeholders and interested parties to access the main information relating to SBSMA.

PART 4: ADDITIONS AND DEVELOPMENTS.

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Appendix A:
List of macroalgae species

List of macroalgae species collected on the Saba Bank by D.S. & M.M. Littler, and B.L. Brooks in January 2006. All specimens are stored at the Department of Botany, NMNH, MRC-166, Smithsonian Institution, US.
Photographs of specimens available at http://sweetgum.nybg.org/saba/algae.html

Taxon	Habitat
Amphiroa tribulus (J. Ellis & Sol.) J. V. Lamour.	20 m deep, in a gorgonian & coral/sponge area
Anadyomene lacerata D. S. Littler & Littler	20 m deep, good coral cover with some dead and diseased heads, Dictyota dominate; ciguatera problem
Asteromenia peltata (W. R. Taylor) Huisman & A. Millar	20 m deep, in a gorgonian & coral/sponge area
Avrainvillea asarifolia Børgesen	37 m deep on an algal flat
Caulerpa cupressoides (Vahl) C. Agardh	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Caulerpa mexicana Sond. ex Kütz.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Caulerpa microphysa (Weber Bosse) Feldmann	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Caulerpa prolifera (Forssk.) Lamouroux	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Caulerpa racemosa (Turner) Weber Bosse var. lamourouxii	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Caulerpa serrulata (Forssk.) J. Agardh	34 m deep, pavement with sand/ruble pockets; rich in live & dead corals, good westward drop off; dominated by gorgonians and algae
Caulerpa webbiana Mont.	34 m deep, pavement with sand/ruble pockets; rich in live & dead corals, good westward drop off; dominated by gorgonians and algae
Ceramium	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Champia parvula (C. Agardh) Harv.	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Champia salicornioides Harv.	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Chondria dasyphylla (Woodw.) C. Agardh	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Chondrophycus corallopsis (Mont.) Nam	30 m deep, pavement substrate, very rich area with many species of filamentous red algae
Chrysymenia dickieana J. Agardh	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Chrysymenia enteromorpha Harv.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Chrysymenia enteromorpha Harv.	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Chrysymenia enteromorpha Harv.	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Codium taylorii P.C. Silva	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Codium taylorii P.C. Silva	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Corallinaceae	29 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Cryptonemia crenulata (J. Agardh) J. Agardh	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Dasya antillarum (M. Howe) A. Millar	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Dasya baillouviana (S. G. Gmel.) Mont.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae

Dasya collinsiana M. Howe	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Dasya crouaniana J. Agardh	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Dasya harveyi Ashmead ex Harv.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Dasya mollis Harv.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Dasya punicea (Zanardini) Menegh. ex Zanardini	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Dasya sp a	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Dictyopteris justii Lamouroux	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Dictyosphaeria cavernosa (Forssk.) Børgesen	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Dictyota ciliolata Sond. ex Kütz.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Dictyota ciliolata Sond. ex Kütz.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Dictyota crispata Lamouroux	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Dictyota guineensis (Kütz.) P. Crouan & H. Crouan	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Dictyota hamifera Setch.	20 m deep, in a gorgonian & coral/sponge area
Dictyota hamifera Setch.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Dictyota humifusa Hörnig, Schnetter & Coppejans	26 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Dictyota menstrualis (Hoyt) Schnetter, Hörning & Weber-Peukert	29 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Dictyota mertensii (Mart.) Kütz.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Dictyota pinnatifida Kütz.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Dictyota pinnatifida Kütz.	37 m deep on an algal flat
Dictyota sp b	20 m deep, good coral cover with some dead and diseased heads, Dictyota dominate; ciguatera problem
Dictyota sp c	34 m deep, pavement with sand/ruble pockets; rich in live & dead corals, good westward drop off; dominated by gorgonians and algae
Dudresnaya bermudensis Setch.	34 m deep, pavement with sand/ruble pockets; rich in live & dead corals, good westward drop off; dominated by gorgonians and algae
Eucheuma isiforme (C. Agardh) J. Agardh	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Galaxaura rugosa (J. Ellis & Sol.) Lamouroux	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Galaxaura rugosa (J. Ellis & Sol.) Lamouroux	20 m deep, in a gorgonian & coral/sponge area

Gelidiopsis intricata (C. Agardh) Vickers	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Gracilaria cervicornis (Turner) J. Agardh	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Gracilaria cylindrica Børgesen	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Griffithsia schousboei Mont.	30 m deep, pavement substrate, very rich area with many species of filamentous red algae
Halimeda discoidea Decne.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Halimeda goreaui W. R. Taylor	20 m deep, good coral cover with some dead and diseased heads, Dictyota dominate; ciguatera problem
Halimeda tuna (Decne.) E. S. Barton f. platydisca	20 m deep, good coral cover with some dead and diseased heads, Dictyota dominate; ciguatera problem
Halymenia floresii (Clemente) C. Agardh	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Hydrolithon sp a	26 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Hypoglossum hypoglossoides (Stackh.) Collins & Herv.	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Jania capillacea Harv.	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Laurencia chondrioides Børgesen	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Laurencia intricata Lamouroux	20 m deep, in a gorgonian & coral/sponge area
Laurencia lata M. Howe & W. R. Taylor	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Lobophora variegata (Lamouroux) Womersley ex Oliveira	26 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Lyngbya polychroa (Menegh.) Rabenh.	20 m deep, in a gorgonian & coral/sponge area
Meristiella schramii (P. Crouan & H. Crouan) D. P. Cheney & P. W. Gabrielson	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Neogoniolithon sp a	20 m deep, in a gorgonian & coral/sponge area
Neogoniolithon spectabile (Foslie) Setch. & Mason	20 m deep, in a gorgonian & coral/sponge area
Neomeris annulata Dickie	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Neomeris mucosa M. Howe	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Padina	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Penicillus capitatus Lam.	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Penicillus dumetosus (Lamouroux) Blainv.	30 m deep, pavement substrate, very rich area with many species of filamentous red algae
Peyssonnelia conchicola Picc. & Grunow	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Peyssonnelia sp a	26 m deep, pavement covered with fine sand; some gorgonians & corals, little algae
Phormidium dimorphum Lemmerm.	20 m deep, in a gorgonian & coral/sponge area
Rhipilia sp a	35 m deep, sand plain over pavement
Rhipilia sp b	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens

Rhipocephalus phoenix (J. Ellis & Sol.) Kütz.	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Sargassum hystrix J. Agardh	36 m deep, pavement rock bottom
Sargassum platycarpum Mont.	20 m deep, in a gorgonian & coral/sponge area
Sargassum platycarpum Mont.	20 m deep, in a gorgonian & coral/sponge area
Sargassum polyceratium Mont.	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Sargassum polyceratium Mont.	36 m deep, pavement rock bottom
Sargassum sp a	20 m deep, in a gorgonian & coral/sponge area
Sargassum sp b	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Sargassum sp d	20 m deep, in a gorgonian & coral/sponge area
Sargassum sp e	20 m deep, in a gorgonian & coral/sponge area
Sargassum sp f	20 m deep, pavement covered with sand; undulaing mounded terrain; sparse gorgonians, sponges, corals, mostly brown algae
Sargassum sp g	20 m deep, in a gorgonian & coral/sponge area
Scinaia halliae (Setch.) Huisman	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Stypopodium zonale (Lamouroux) Papenf.	20 m deep, in a gorgonian & coral/sponge area
Symploca hydnoides (Harv.) Kütz.	20 m deep, in a gorgonian & coral/sponge area
Taonia sp a	20 m deep, in a gorgonian & coral/sponge area
Tricleocarpa fragilis (L.) Huisman & Towns.	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Udotea cyathiformis Decne.	35 m deep, sand plain over pavement
Udotea dotyi D. S. Littler & Littler	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Udotea occidentalis A. Gepp & E. Gepp	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Udotea spinulosa M. Howe	30 m deep, on a deep sand plain dominated by seagrass with a high diversity of Bryopsidales
Valonia macrophysa Kütz.	20 m deep, pavement covered with light coarse sand; exceptionally rich in healthy browns and greens
Wrangelia penicillata (C. Agardh) C. Agardh	36 m deep, pavement rock bottom
Wrightiella blodgettii (Harv.) F. Schmitz	30 m deep, pavement substrate, very rich area with many species of filamento125976 red algae
Wrightiella blodgettii (Harv.) F. Schmitz	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community
Zonaria tournefortii (Lamouroux) Mont.	25 m deep, sand plain over pavement; rich in large red algae; healthy macroalgal community

Appendix B:
List of Fish Species

List of fish species prepared by J. Williams, J. van Tassel, and K. Carpenter.

Genus species	Common name
Ginglymostoma cirratum (Bonnaterre, 1788)	nurse shark
Dasyatis americana Hildebrand & Schroeder, 1928	southern stingray
Enchelycore carychroa	chestnut moray
Gymnothorax moringa (Cuvier, 1829)	spotted moray
Monopenchelys acuta	
Ahlia igmontis	
Kaupichthys hypoproroides	
Kaupichthys nuchalis	
Moringua edwardsi	
Harengula clupeola (Cuvier, 1829)	false pilchard
Harengula humeralis (Cuvier, 1829)	redear sardine
Jenkinsia lamprotaenia (Gosse, 1851)	dwarf herring
Opisthonema oglinum (Lesueur, 1818)	Atlantic thread herring
Anchoa lyolepis (Evermann & Marsh, 1900)	dusky anchovy
Synodus foetens (Linnaeus, 1766)	inshore lizardfish
Synodus intermedius (Spix & Agassiz, 1829)	sand diver
Synodus synodus (Linnaeus, 1758)	red lizardfish
Trachinocephalus myops (Forster, 1801)	snakefish
Carapus bermudensis (Jones, 1874)	pearlfish
Ogilbia sp.	
Parophidion schmidti	
Antennarius multiocellatus (Valenciennes, 1837)	longlure frogfish
Anternnarius pauciradiatus	
Antennarius striatus (Shaw, 1794)	striated frogfish
Ogcocephalus nasutus (Cuvier, 1829)	shortnose batfish
Mugil curema Valenciennes, 1836	white mullet
Atherinomorus stipes (Müller & Troschel, 1848)	hardhead silverside
Hypoatherina harringtonensis (Goode, 1877)	reef silverside
Platybelone argalus (Lesueur, 1821)	keeltail needlefish
Strongylura notata (Poey, 1860)	redfin needlefish
Strongylura timucu (Walbaum, 1792)	timucu
Tylosurus crocodilus (Péron & Lesueur, 1821)	houndfish
Hemiramphus balao Lesueur, 1821	balao
Hemiramphus brasiliensis (Linnaeus, 1758)	ballyhoo
Hippocampus reidi Ginsburg, 1933	longsnout seahorse
Micrognathus vittatus?	
Aulostomus maculatus Valenciennes, 1837	trumpetfish
Fistularia tabacaria Linnaeus, 1758	bluespotted cornetfish
Holocentrus adscensionis (Osbeck, 1765)	squirrelfish
Holocentrus rufus (Walbaum, 1792)	longspine squirrelfish
Myripristis jacobus Cuvier, 1829	blackbar soldierfish
Neoniphon marianus (Cuvier, 1829)	longjaw squirrelfish
Plectrypops retrospinis (Guichenot, 1853)	cardinal soldierfish
Sargocentron coruscum (Poey, 1860)	reef squirrelfish
Sargocentron vexillarium (Poey, 1860)	dusky squirrelfish
Scorpaena albifimbria	
Scorpaena brasiliensis Cuvier, 1829	barbfish
Scorpaena grandicornis Cuvier, 1829	plumed scorpionfish
Scorpaena inermis	
Scorpaena plumieri Bloch, 1789	spotted scorpionfish
Scorpaenodes caribbaeus Meek & Hildebrand, 1928	reef scorpionfish

Prionotus ophryas Jordan & Swain, 1885	bandtail searobin
Dactylopterus volitans (Linnaeus, 1758)	flying gurnard
Centropomus undecimalis (Bloch, 1792)	common snook
Alphestes afer (Bloch, 1793)	mutton hamlet
Cephalopholis cruentata (Lacepède, 1802)	graysby
Cephalopholis fulva (Linnaeus, 1758)	coney
Dermatolepis inermis (Valenciennes, 1833)	marbled grouper
Epinephelus adscensionis (Osbeck, 1765)	rock hind
Epinephelus guttatus (Linnaeus, 1758)	red hind
Epinephelus itajara (Lichtenstein, 1822)	jewfish
Epinephelus morio (Valenciennes, 1828)	red grouper
Epinephelus striatus (Bloch, 1792)	Nassau grouper
Mycteroperca acutirostris (Valenciennes, 1828)	western comb grouper
Mycteroperca bonaci (Poey, 1860)	black grouper
Mycteroperca interstitialis (Poey, 1860)	yellowmouth grouper
Mycteroperca phenax Jordan & Swain, 1884	scamp
Mycteroperca tigris (Valenciennes, 1833)	tiger grouper
Mycteroperca venenosa (Linnaeus, 1758)	yellowfin grouper
Paranthias furcifer (Valenciennes, 1828)	Atlantic creolefish
Diplectrum bivittatum (Valenciennes, 1828)	dwarf sand perch
Diplectrum formosum (Linnaeus, 1766)	sand perch
Hypoplectrus guttavarius (Poey, 1852)	shy hamlet
Hypoplectrus indigo (Poey, 1851)	indigo hamlet
Hypoplectrus nigricans (Poey, 1852)	black hamlet
Hypoplectrus puella (Cuvier, 1828)	barred hamlet
Hypoplectrus unicolor (Walbaum, 1792)	butter hamlet
Schultzea beta (Hildebrand, 1940)	school bass
Serranus annularis (Günther, 1880)	orangeback bass
Serranus baldwini (Evermann & Marsh, 1899)	lantern bass
Serranus tabacarius (Cuvier, 1829)	tobaccofish
Serranus tigrinus (Bloch, 1790)	harlequin bass
Serranus tortugarum Longley, 1935	chalk bass
Liopropoma carmabi (Randall, 1963)	candy basslet
Liopropoma mowbrayi Woods & Kanazawa, 1951	cave basslet
Liopropoma rubre Poey, 1861	peppermint basslet
Rypticus bistripinus	
Rypticus saponaceus (Bloch & Schneider, 1801)	greater soapfish
Rypticus subbifrenatus	spotted soapfish
Pseudogramma gregoryi	
Gramma loreto Poey, 1868	fairy basslet
Opistognathus aurifrons (Jordan & Thompson, 1905)	yellowhead jawfish
Opistognathus macrognathus Poey, 1860	banded jawfish
Opistognathus maxillosus Poey, 1860	mottled jawfish
Opistognathus whitehursti (Longley, 1927)	dusky jawfish
Heteropriacanthus cruentatus (Lacepède, 1801)	glasseye snapper
Priacanthus arenatus Cuvier, 1829	bigeye
Apogon binotatus (Poey, 1867)	barred cardinalfish
Apogon lachneri Böhlke, 1959	whitestar cardinalfish
Apogon maculatus (Poey, 1860)	flamefish
Apogon phenax Böhlke & Randall, 1968	mimic cardinalfish
Apogon pseudomaculata	
Apogon quadrisquamatus	
Apogon townsendi (Breder, 1927)	belted cardinalfish
Astrapogon stellatus (Cope, 1867)	conchfish
Phaeoptyx conklini (Silvester, 1916)	freckled cardinalfish

Phaeoptyx pigmentaria (Poey, 1860)	dusky cardinalfish
Phaeoptyx xenus	
Malacanthus plumieri (Bloch, 1786)	sand tilefish
Echeneis naucrates Linnaeus, 1758	sharksucker
Remora remora (Linnaeus, 1758)	remora
Rachycentron canadum (Linnaeus, 1766)	cobia
Alectis ciliaris (Bloch, 1787)	African pompano
Caranx bartholomaei Cuvier, 1833	yellow jack
Caranx crysos (Mitchill, 1815)	blue runner
Caranx hippos (Linnaeus, 1766)	crevalle jack
Caranx latus Agassiz, 1831	horse-eye jack
Caranx lugubris Poey, 1860	black jack
Caranx ruber (Bloch, 1793)	bar jack
Decapterus macarellus (Cuvier, 1833)	mackerel scad
Decapterus punctatus (Cuvier, 1829)	round scad
Elagatis bipinnulata (Quoy & Gaimard, 1825)	rainbow runner
Oligoplites saurus (Bloch & Schneider, 1801)	leatherjack
Selar crumenophthalmus (Bloch, 1793)	bigeye scad
Seriola dumerili (Risso, 1810)	greater amberjack
Seriola rivoliana Valenciennes, 1833	almaco jack
Trachinotus falcatus (Linnaeus, 1758)	permit
Trachinotus goodei Jordan & Evermann, 1896	palometa
Lutjanus analis (Cuvier, 1828)	mutton snapper
Lutjanus apodus (Walbaum, 1792)	schoolmaster
Lutjanus buccanella (Cuvier, 1828)	blackfin snapper
Lutjanus cyanopterus (Cuvier, 1828)	cubera snapper
Lutjanus griseus (Linnaeus, 1758)	gray snapper
Lutjanus jocu (Bloch & Schneider, 1801)	dog snapper
Lutjanus mahogoni (Cuvier, 1828)	mahogany snapper
Lutjanus synagris (Linnaeus, 1758)	lane snapper
Ocyurus chrysurus (Bloch, 1791)	yellowtail snapper
Rhomboplites aurorubens	
Eucinostomus argenteus Baird & Girard, 1855	spotfin mojarra
Eucinostomus lefroyi (Goode, 1874)	mottled mojarra
Gerres cinereus (Walbaum, 1792)	yellowfin mojarra
Anisotremus surinamensis (Bloch, 1791)	black margate
Anisotremus virginicus (Linnaeus, 1758)	porkfish
Haemulon album Cuvier, 1830	margate
Haemulon aurolineatum Cuvier, 1830	tomtate
Haemulon carbonarium Poey, 1860	caesar grunt
Haemulon chrysargyreum Günther, 1859	smallmouth grunt
Haemulon flavolineatum (Desmarest, 1823)	French grunt
Haemulon macrostomum Günther, 1859	Spanish grunt
Haemulon melanurum (Linnaeus, 1758)	cottonwick
Haemulon parra (Desmarest, 1823)	sailors choice
Haemulon plumierii (Lacepède, 1801)	white grunt
Haemulon sciurus (Shaw, 1803)	bluestriped grunt
Haemulon steindachneri (Jordan and Gilbert, 1882)	cherechere grunt
Haemulon striatum (Linnaeus, 1758)	striped grunt
Emmelichthyops atlanticus Schultz, 1945	bonnetmouth
Inermia vittata Poey, 1860	boga
Archosargus rhomboidalis (Linnaeus, 1758)	sea bream
Calamus bajonado (Bloch & Schneider, 1801)	jolthead porgy
Calamus calamus (Valenciennes, 1830)	saucereye porgy
Calamus penna (Valenciennes, 1830)	sheepshead porgy

Diplodus argenteus (Valenciennes, 1830)	silver porgy
Pagrus pagrus (Linnaeus, 1758)	red porgy
Polydactylus oligodon (Günther, 1860)	littlescale threadfin
Polydactylus virginicus (Linnaeus, 1758)	barbu
Equetus lanceolatus (Linnaeus, 1758)	jackknife-fish
Equetus punctatus (Bloch & Schneider, 1801)	spotted drum
Odontoscion dentex (Cuvier, 1830)	reef croaker
Pareques acuminatus (Bloch & Schneider, 1801)	high-hat
Pareques umbrosus	
Mulloidichthys martinicus (Cuvier, 1829)	yellow goatfish
Pseudupeneus maculatus (Bloch, 1793)	spotted goatfish
Pempheris schomburgkii Müller & Troschel, 1848	glassy sweeper
Chaetodon aculeatus (Poey, 1860)	longsnout butterflyfish
Chaetodon capistratus Linnaeus, 1758	foureye butterflyfish
Chaetodon ocellatus Bloch, 1787	spotfin butterflyfish
Chaetodon sedentarius Poey, 1860	reef butterflyfish
Chaetodon striatus Linnaeus, 1758	banded butterflyfish
Centropyge argi Woods & Kanazawa, 1951	cherubfish
Holacanthus bermudensis Goode, 1876	blue angelfish
Holacanthus ciliaris (Linnaeus, 1758)	queen angelfish
Holacanthus tricolor (Bloch, 1795)	rock beauty
Pomacanthus arcuatus (Linnaeus, 1758)	gray angelfish
Pomacanthus paru (Bloch, 1787)	French angelfish
Kyphosus incisor (Cuvier, 1831)	yellow chub
Kyphosus sectatrix (Linnaeus, 1766)	Bermuda chub
Amblycirrhitus pinos (Mowbray, 1927)	redspotted hawkfish
Abudefduf saxatilis (Linnaeus, 1758)	sergeant major
Abudefduf taurus (Müller & Troschel, 1848)	night sergeant
Chromis cyanea (Poey, 1860)	blue chromis
Chromis insolata (Cuvier, 1830)	sunshinefish
Chromis multilineata (Guichenot, 1853)	brown chromis
Chromis scotti Emery, 1968	purple reeffish
Microspathodon chrysurus (Cuvier, 1830)	yellowtail damselfish
Stegastes adustus (Troschel, 1865)	dusky damselfish
Stegastes diencaeus (Jordan & Rutter, 1897)	longfin damselfish
Stegastes leucostictus (Müller & Troschel, 1848)	beaugregory
Stegastes partitus (Poey, 1868)	bicolor damselfish
Stegastes planifrons (Cuvier, 1830)	threespot damselfish
Stegastes variabilis (Castelnau, 1855)	cocoa damselfish
Bodianus pulchellus (Poey, 1860)	spotfin hogfish
Bodianus rufus (Linnaeus, 1758)	Spanish hogfish
Clepticus parrae (Bloch & Schneider, 1801)	creole wrasse
Doratonotus megalepis Günther, 1862	dwarf wrasse
Halichoeres bivittatus (Bloch, 1791)	slippery dick
Halichoeres cyanocephalus (Bloch, 1791)	yellowcheek wrasse
Halichoeres garnoti (Valenciennes, 1839)	yellowhead wrasse
Halichoeres maculipinna (Müller & Troschel, 1848)	clown wrasse
Halichoeres pictus (Poey, 1860)	rainbow wrasse
Halichoeres poeyi (Steindachner, 1867)	blackear wrasse
Halichoeres radiatus (Linnaeus, 1758)	puddingwife
Lachnolaimus maximus (Walbaum, 1792)	hogfish
Thalassoma bifasciatum (Bloch, 1791)	bluehead
Xyrichtys martinicensis Valenciennes, 1840	rosy razorfish
Xyrichtys novacula (Linnaeus, 1758)	pearly razorfish
Xyrichtys splendens Castelnau, 1855	green razorfish

Cryptotomus roseus Cope, 1871	bluelip parrotfish
Nicholsina usta (Valenciennes, 1840)	emerald parrotfish
Scarus coelestinus Valenciennes, 1840	midnight parrotfish
Scarus coeruleus (Bloch, 1786)	blue parrotfish
Scarus guacamaia Cuvier, 1829	rainbow parrotfish
Scarus iserti (Bloch, 1789)	striped parrotfish
Scarus taeniopterus Desmarest, 1831	princess parrotfish
Scarus vetula Bloch & Schneider, 1801	queen parrotfish
Sparisoma atomarium (Poey, 1861)	greenblotch parrotfish
Sparisoma aurofrenatum (Valenciennes, 1840)	redband parrotfish
Sparisoma chrysopterum (Bloch & Schneider, 1801)	redtail parrotfish
Sparisoma radians (Valenciennes, 1840)	bucktooth parrotfish
Sparisoma rubripinne (Valenciennes, 1840)	yellowtail parrotfish
Sparisoma viride (Bonnaterre, 1788)	stoplight parrotfish
Enneanectes altivelis	
Enneanectes pectoralis (Fowler, 1941)	redeye triplefin
Acanthemblemaria aspera	
Acanthemblemaria chaplinie	
Labrisomus bucciferus Poey, 1868	puffcheek blenny
Labrisomus gobio	
Labrisomus guppyi	
Labrisomus nuchipinnis (Quoy & Gaimard, 1824)	hairy blenny
Labrisomus sp.	
Malacoctenus boehlkei	
Malacoctenus macropus (Poey, 1868)	rosy blenny
Malacoctenus triangulatus Springer, 1959	saddled blenny
Paraclinus fasciatus (Steindachner, 1876)	banded blenny
Paraclinus grandicornis	
Starksia atlantica	
Starksia lepicoelia	
Starksia nannodes	
Chaenopsis limbaughi Robins & Randall, 1965	yellowface pikeblenny
Emblemaria pandionis Evermann & Marsh, 1900	sailfin blenny
Emblemariopsis cf bahamensis	
Emblemariopsis cf signifer	
Stathmonotus stahli (Evermann & Marsh, 1899)	eelgrass blenny
Dactyloscopus poeyi(?)	
Dactyloscopus tridigitatus	
Gillelus rubricinctus	
Entomacrodus nigricans Gill, 1859	pearl blenny
Ophioblennius atlanticus (Valenciennes, 1836)	redlip blenny
Parablennius marmoreus (Poey, 1876)	seaweed blenny
Scartella cristata (Linnaeus, 1758)	molly miller
Paradiplogrammus bairdi (Jordan, 1888)	lancer dragonet
Paradiplogrammus pauciradiatus	
Bathygobius soporator (Valenciennes, 1837)	frillfin goby
Coryphopterus dicrus Böhlke & Robins, 1960	colon goby
Coryphopterus eidolon Böhlke & Robins, 1960	pallid goby
Coryphopterus glaucofraenum Gill, 1863	bridled goby
Coryphopterus lipernes Böhlke & Robins, 1962	peppermint goby
Coryphopterus personatus (Jordan & Thompson, 1905)	masked goby
Coryphopterus thrix?	
Elacatinus evelynae	
Gnatholepis thompsoni Jordan, 1904	goldspot goby
Gobiosoma horsti Metzelaar, 1922	yellowline goby

Gobiosoma oceanops (Jordan, 1904)	neon goby
Lythrypnus elason	
Lythrypnus nesiotes	
Lythrypnus nsp	
Nes longus (Nichols, 1914)	orangespotted goby
Priolepis hipoliti (Metzelaar, 1922)	rusty goby
Pycnomma roosevelti	
Ptereleotris helenae (Randall, 1968)	hovering dartfish
Chaetodipterus faber (Broussonet, 1782)	Atlantic spadefish
Acanthurus bahianus Castelnau, 1855	ocean surgeon
Acanthurus chirurgus (Bloch, 1787)	doctorfish
Acanthurus coeruleus Bloch & Schneider, 1801	blue tang
Sphyraena barracuda (Walbaum, 1792)	great barracuda
Sphyraena picudilla Poey, 1860	southern sennet
Euthynnus alletteratus (Rafinesque, 1810)	little tunny
Scomberomorus cavalla (Cuvier, 1829)	king mackerel
Scomberomorus maculatus (Mitchill, 1815)	Spanish mackerel
Scomberomorus regalis (Bloch, 1793)	cero
Bothus lunatus (Linnaeus, 1758)	peacock flounder
Bothus ocellatus (Agassiz, 1831)	eyed flounder
Symphurus arawak Robins & Randall, 1965	Caribbean tonguefish
Symphurus ommaspilus	
Balistes capriscus Gmelin, 1789	gray triggerfish
Balistes vetula Linnaeus, 1758	queen triggerfish
Canthidermis sufflamen (Mitchill, 1815)	ocean triggerfish
Melichthys niger (Bloch, 1786)	black durgon
Xanthichthys ringens (Linnaeus, 1758)	sargassum triggerfish
Aluterus monoceros (Linnaeus, 1758)	unicorn filefish
Aluterus schoepfii (Walbaum, 1792)	orange filefish
Aluterus scriptus (Osbeck, 1765)	scrawled filefish
Cantherhines macrocerus (Hollard, 1853)	whitespotted filefish
Cantherhines pullus (Ranzani, 1842)	orangespotted filefish
Monacanthus ciliatus (Mitchill, 1818)	fringed filefish
Monacanthus tuckeri Bean, 1906	slender filefish
Stephanolepis setifer (Bennett, 1831)	pygmy filefish
Acanthostracion polygonia Poey, 1876	honeycomb cowfish
Acanthostracion quadricornis (Linnaeus, 1758)	scrawled cowfish
Lactophrys bicaudalis (Linnaeus, 1758)	spotted trunkfish
Lactophrys trigonus (Linnaeus, 1758)	trunkfish
Lactophrys triqueter (Linnaeus, 1758)	smooth trunkfish
Canthigaster rostrata (Bloch, 1786)	sharpnose puffer
Sphoeroides spengleri (Bloch, 1785)	bandtail puffer
Chilomycterus antennatus (Cuvier, 1816)	bridled burrfish
Chilomycterus antillarum Jordan & Rutter, 1897	web burrfish
Diodon holocanthus Linnaeus, 1758	balloonfish
Diodon hystrix Linnaeus, 1758	porcupinefish
Squalus cubensis Howell-Rivero, 1936	Cuban dogfish
Carcharhinus perezi (Poey, 1876)	Caribbean reef shark
Galeocerdo cuvier (Péron and Lesueur, 1822)	tiger shark
Gymnothorax conspersus Poey, 1867	saddled moray
Gymnothorax maderensis (Johnson, 1862)	sharktooth moray
Gymnothorax polygonius Poey, 1876	polygon moray
Conger esculentus Poey, 1866	grey conger
Synodus intermedius (Spix, 1829)	sand diver
Brotula barbata (Bloch and Schneider, 1801)	bearded brotula

Antigonia capros Lowe, 1843	deepbody boarfish
Alphestes afer (Bloch, 1793)	mutton hamlet
Epinephelus flavolimbatus Poey, 1865	yellowedge grouper
Epinephelus morio (Valenciennes, 1828)	red grouper
Epinephelus niveatus Valenciennes, 1828	snowy grouper
Epinephelus striatus (Bloch, 1792)	Nassau grouper
Mycteroperca interstitialis (Poey, 1860)	yellowmouth grouper
Mycteroperca venenosa (Linnaeus, 1758)	yellowfin grouper
Serranus notospilus Longley, 1935	saddle bass
Caulolatilus cyanops Poey, 1866	blackline tilefish
Coryphaena hippurus Linnaeus, 1758	dolphinfish
Alectis ciliaris (Bloch, 1788)	African pompano
Decapterus macarellus (Cuvier, 1833)	mackerel scad
Elagatis bipinnulata (Quoy and Gaimard, 1825)	rainbow runner
Selar crumenophthalmus (Bloch, 1793)	bigeye scad
Seriola dumerili (Risso, 1810)	greater amberjack
Seriola rivoliana Valenciennes, 1833	almaco jack
Erythrocles monodi Poll and Cadenat, 1954	crimson rover*
Apsilus dentatus Guichenot, 1853	black snapper
Lutjanus buccanella (Cuvier, 1828)	blackfin snapper
Lutjanus purpureus (Poey, 1866)	Caribbean red snapper
Lutjanus synagris (Linnaeus, 1758)	lane snapper
Lutjanus vivanus (Cuvier, 1828)	silk snapper
Pristipomoides aquilonaris (Goode and Bean, 1896)	wenchman
Lobotes surinamensis (Bloch, 1790)	Atlantic tripletail
Haemulon album Cuvier, 1829	margate
Haemulon aurolineatum Cuvier, 1830	tomtate
Haemulon carbonarium Poey, 1860	Caesar grunt
Haemulon striatum (Linnaeus, 1758)	striped grunt
Scarus guacamaia Cuvier, 1829	rainbow parrotfish
Acanthocybium solandri (Cuvier, 1832)	wahoo
Thunnus atlanticus (Lesson, 1831)	blackfin tuna
Cantherhines macrocerus (Hollard, 1853)	whitespotted filefish
Lactophrys bicaudalis (Linnaeus, 1758)	spotted trunkfish

APPENDIX C:
List of Gorgonian species

List of gorgonian species collected by Peter Etnoyer, Juan Sanchez, and Herman Wirsching

1. *Eunicea clavigera*
2. *Muriceopsis flavida*
3. *Pseudopterogorgia acerosa*
4. *Pseudopterogorgia bipinnata*
5. *Ctenocella sp.*
6. *Ctenocella (Ellisella) cf. elongata*
7. *Ctenocella (Ellisella) sp.*
8. *Eunicea pinta*
9. *Iciligorgia schrammi*
10. *Lytreia sp.*
11. *Muricea laxa*
12. *Psedopterogorgia albatrossae*
13. *Briareum asbestinum*
14. *Erythropodium sp.*
15. *Eunicea asperula*
16. *Eunicea calyculata*
17. *Eunicea flexuosa*
18. *Eunicea fusca*
19. *Eunicea knighti*
20. *Eunicea laciniata*
21. *Eunicea laxispica*
22. *Eunicea mammosa*
23. *Eunicea sp. (tayrona)*
24. *Eunicea succinea*
25. *Eunicea tourneforti*
26. *Gorgonia mariae*
27. *Gorgonia ventalina*
28. *Muricea elongata*
29. *Muricea muricata*
30. *Plexaura cf. nina*
31. *Plexaura kukenthali*
32. *Plexaura kuna*
33. *Plexaurella dichotoma*
34. *Plexaurella grisea*
35. *Plexaurella nutans*
36. *Pseudoplexaura crucis*
37. *Pseudoplexaura flagellosa*
38. *Pseudoplexaura porosa*
39. *Pseudoplexaura wagenaari*
40. *Pseudopterogorgia americana*
41. *Pseudopterogorgia elisabethae*
42. *Pseudopterogorgia hummelincki*
43. *Pseudopterogorgia rigida*
44. *Pterogorgia cf. anceps*
45. *Pterogorgia citrina*
46. *Pterogorgia guadalupensis*
47. *Pterogorgia n. sp.*

APPENDIX D:
Stakeholder meetings summary

The following is a summary from the workshop for the Saban commercial fishermen at the Eugenius Centre October 30th.

This meeting was initiated from a previous meeting on September 26th with the local commercial fisherman. This meeting dealt with the Saba Bank project, preliminary result and also fishing of the red hind aggregation was initially discussed. From the September meeting there was no consensus on the appropriate actions for dealing with fishing the red hind. At the end of the meeting the attendees suggested that we draft a number of proposals to address the red hind aggregation issue and then seek further input from the fishermen. That was the basis for this meeting.

Two weeks previous to the scheduled meeting Wes Toller spoke to each fisherman to invite them to the workshop to discuss the red hind aggregation and review options for the protection of the aggregation. Each fisherman was given a flyer for the meeting specifying the topic of discussion, date, time and location of the meeting.

Attendance of the meeting included: Paul Hoetjes, Peter Paul van Dijk (Conservation International), Feisal Dilrosun (MINA), Wes Toller, Shelley Lundvall and Jan den Dulk (Saba Conservation Foundation). Representatives from the Island Council: Bruce Zagers and Menno Van der Velde.

Fishers present included: Nicky Hassell, Robbie Hassell, Leroy Peterson, Rolly, Kenneth Peterson, Lampy ?? and Ivan Hassell.

Paul Hoetjes started the meeting at 18:42 with an opening address to welcome everyone to the workshop. Maps of the red hind aggregation area were handed out to ensure that all the attendees were aware of the area under discussion.

Wes Toller presented a short discussion regarding his experiences in St. Thomas and St. Croix and the success and failure with the protection of two different aggregations. One closure had the support of the fishing community and the recovery of the fisheries since that closure has been well documented. The second closure did not have the same level of support and was not a success story. It was then stressed that we wanted the local fishers to come up with a method of protecting the red hind aggregation that they believed in and would support.

A general question was asked about who has fished the aggregation; two fishermen mentioned that they had fished the area. Ivan Hassell mentioned that the St. Maarten fishers have been fishing the area for a number of years with anecdotal landings of 1000 lbs from one boat with four hand lines within one day of fishing. They have been fishing this area for the past 5 - 6 years.

Leroy Peterson stated that he would like to stop the St. Maarten fishers from fishing the aggregation. This brought up the suggestion that there should be a regulation preventing the fishing of the red hind aggregation for Sabans in order to protect the stocks. This discussion brought up the state of the fisheries on the Saba Bank today. Robbie Hassell talked about the decline of the grouper on the Bank and we should be proactive in protecting the remaining stocks. Bruce Zagers and Nicky Hassell were both in agreement that there must be protection of the red hind aggregation.

The question was put out that if the St. Maarten fishers were excluded from the fisheries would there be some type of retaliation on the Saban fisherman. Nicky Hassell stated that from his conversations with one of the St. Maarten fishers that they are expecting some type of restricted fishing on the spawning area and would not be surprised if and when restrictions were put in place.

The idea was put forth about continue to have a recreational fishing on the Bank. There was no support voiced for this idea. Bruce Zagers felt that once the importance of the spawning aggregation was explained than there would be community buy into the proposed closure.

Other options were presented to the fisherman other than a complete the seasonal closure:

1. no action be taken,
2. exclude only St Maarten fishers,

3. close for a three or four months during spawning aggregation,
4. permit requirements.

There was limited discussion on the remaining three options. Ivan Hassell, Nicky Johnson, Robbie Hassell and Leroy Peterson were in agreement with closing the spawning area. Other fisherman did not express an opinion.

Enforcement

The Dutch Coast Guard from St. Maarten were invited to the meeting but a representative was unable to attend due to a conflict in schedules. Paul Hoetjes passed on the information he received from the Coast Guard stating that they could not do 24 hrs enforcement but they would make an effort to patrol the area if it would be closed.

Once idea put forth was the possibility of the local police, in combination with the fishers, to work together to help enforce regulations if that was decided to be the course of action. Bruce Zagers was of the opinion that this was possible and the police could be used as an enforcement tool.

Menno Van de Velde explained that the fine for violation of the fishing ordnance was 5,000 guilders. Paul Hoetjes suggested that enforcement on the first closure was a very important step to ensure compliance with the closure, if one was to be adopted.

Menno Van de Velde explained that it is a relatively simple process to set up a seasonal closure and would not be a long process. Bruce Zagers mentioned it could easily be ratified at an executive council meeting.

Discussion continued about how would the area could be delineated to ensure that everyone was aware of the areas. Possible solutions discussed included buoys, enlarge the proposed closure area to and area of 3 km by 3 km to ensure complete coverage of the area.

Bruce Zagers stated that the island government could pass a no fishing zone quite quickly if they had a consensus among the fisherman. It was suggested that a petition be drawn up and signed. If the majority of fisherman were in agreement it would be passed in a short time period.

The designation of the Saba Bank and a PSSA was touched upon. – Paul Hoetjes detailed the process and the possible time frame before the Bank could feasibly receive this designation. It was noted that there will be a draft PSSA by the end of 2007. There was a discussion about how to implement shipping lanes. Paul Hoetjes mentioned that the PSSA has the possibility to set out shipping lanes.

Paul Hoetjes put forth the idea that Saba could limit or eliminate anchoring within the 12 mile territorial waters. We discussed the use of an AIS system that can be used to the movement, anchoring and number of tankers using the area. The Saba Bank project could purchase the AIS for the harbour office.

It was conclude that a draft petition will be drafted and finalized. If there is consensus within the fishermen on the island than the Island Government will discuss the feasibility of closing the area to all fishing.

On the evening of October 2, we made a presentation about the Saba Bank Project as part of the Sea & Learn On Saba program – an annual program aimed at enhancing environmental awareness (see www.seandlearn.org). Our presentation was held at the Brigadoon restaurant in Windwardside. We provide you with this summary.

About 35 people attended the Sea & Learn presentation. There were several tourists in the audience however the majority of attendees were Saba residents. Many attendees were involved in the Saban scuba diving industry. Others attended because of their interest in the marine environment or concerns about conservation issues on Saba.

Our presentation began at 5:30 pm and lasted approximately one hour. The MS Powerpoint presentation we gave at Sea & Learn was different from our two previous presentations (21-Sep-07 and 26-Sep-07). A copy of this presentation will be sent to you separately. This presentation was focused towards to a general audience with minimal background information with regards to the Saba Bank. Due to this fact we presented general information of the Bank to introduce the audience to the Bank, what it is, where it is and why we are doing a project on the Bank. Further details were discussed regarding the mapping of Saba Bank, our studies of habitat distribution, and our investigations of habitat impacts caused by anchoring of ships on the Bank. We also showed the rwo short videos of anchor impacts from the *Amazon Brilliance* and *Carib Palm* anchorage areas. At the close of the presentation, we opened the floor to questions. Many people had comments or questions but owing to the ~15-minute time limitation Comments/questions are summarized below.

1) Stewart Chipka questioned whether we had thoroughly examined the geological origin of Saba Bank and specifically whether it should be considered a coral reef atoll. We responded that geologists have proposed at least three competing hypotheses regarding the origin of Saba Bank. We also noted that geological investigations into the origin of Saba Bank were beyond the scope of our current study.

2) One attendee asked how we determined the "importance" of queen conch. We answered that queen conch were considered to be of great "economic" importance in the Caribbean. We made the reference about the significance of queen conch based on fisheries landings statistics for the Caribbean region.

3) One attendee made a comment about studies of reef damage in the Florida Keys arising from ship groundings. He said these scientists estimated that the impacted site would require over 4,000 years for full recovery. Tom van t'Hoff responded with a word of caution about possibly exaggerating the estimation of recovery times following anchor impacts. He noted that the Florida Keys calculations were based upon a ship grounding site where the reef fabric had been obliterated. In contrast, our videos did not indicate destruction of the reef fabric and recovery times might be much shorter. We agreed with van t'Hof and suggested that recovery of solitary head corals and gorgonians, such as occurred at the *Carib Palm* anchoring site, might require as little as 15 years for recovery. However, we also noted that if the anchor damages occurred on structurally complex reefs dominated by *Montastraea faveolata* we would expect recovery times to be on the order of 100 years or more.

4) Lise van Susteren asked where the IMO is headquartered. We informed her that it is based in London. She then asked what specific strategy would be used to negotiate with the IMO. We suggested that we would give the IMO an "opportunity for good press" by endorsing the proposed queen conch reserve as a PSSA. If they failed to endorse the reserve as a PSSA, a retaliatory tactic might be to initiate negative press or a "smear campaign" against the IMO, possibly with the assistance of an international environmental NGO.

5) One attendee asked about the expected timeframe for successful protection of Saba Bank from anchoring. It was remarked that the issue may require two years to resolve. Another attendee then asked if there weren't a more expedient solution. We responded that it was unlikely to find a quick solution. Then two alternative approaches for managing impacts were discussed:

- Designation of an anchorage area. This would confine damages to a limited area and could potentially generate revenues for Saba. However, such a proposal would require careful environmental impact studies of proposed areas. Further, designation of an anchorage area would not eliminate the other impacts associated with international ship traffic on Saba Bank (e.g. pollution, cutting of trap buoy lines).
- Installation of permanent moorings. Mandatory use of moorings would effectively eliminate damages caused by anchoring and could potentially generate revenues for Saba. We pointed out that the installation and maintenance of such large mooring systems would require a substantial investment in infrastructure – perhaps beyond what Saba is prepared to enter into. Further, the anchorage would not elim-

inate the impacts associated with international ship traffic on Saba Bank (e.g. pollution, cutting of trap buoy lines).

6) Hugh Duckworth asked about jurisdictional boundaries related to Saba Bank. We explained that ~25% of the Bank (to 12 nautical miles from Saba) fell under jurisdiction of the island government, and that the remainder was under the jurisdiction of the Netherlands Antilles central government. Another attendee then stated that anchoring fees on St. Eustatia are collected by the NA central government – not the local island government. This seemed to be a bone of contention.

7) One attendee asked about the likelihood that IMO would be successfully convinced to grant PSSA status to Saba Bank. We deferred this question to Tom van t'Hof, who discussed some to the factors, which contribute to successful establishment of a marine protected area.

8) A general question was asked about the future management of Saba Bank. What will happen when regulatory control of Saba is transferred to the Kingdom of the Netherlands? What will happen with waters of the Exclusive Economic Zone? Nobody in attendance could answer this question.

The discussion was closed at about 6:45 pm.