

# **Towards sustainable management of the Saba Bank**

**KNAP Project 96-03**

A report for the Department of Public Health and Environment (VOMIL)  
Curaçao, Netherlands Antilles

Erik H. Meesters, Hugo Nijkamp, Liesbeth Bijvoet

June 1996

AIDEnvironment  
Donker Curtiusstraat 7-523  
1051 JL Amsterdam  
The Netherlands

# Preface

The Saba Bank has been known as a large, totally submerged but shallow, marine area off the island of Saba. The bank is being used as an important fish resource by fishermen from Saba and some other islands in the region. It also lies in an area with heavy ship traffic. Apart from its apparent economic importance as a natural resource, there were indications that the Saba Bank would lodge valuable nature, including coral reefs.

Frequent reports of decreasing stocks, destructive fishing activities of foreign fishing boats, anchoring, and tank-cleaning, raised concerns about the environmental state of the bank within the Department of Public Health and Environment of the Netherlands Antilles (VOMIL). This resulted in the formulation of a project proposal that was submitted to the KNAP fund and culminated in this report.

The report intends to shed light on the values of the natural resources of the Saba Bank, the economic importance of the bank and the existing legal and institutional frameworks for management. The main question was whether the importance and present state of the Saba Bank requires regulation.

The project was financed by the KNAP fund that was created by the Department of Public Health and Environment of the Netherlands Antilles (VOMIL), the Department of Dutch-Antillean and Aruban Affairs (KABNA), the World Wide Fund for Nature (WWF-the Netherlands), and the Ministry of Agriculture, Nature Management and Fisheries of the Netherlands (LNV) to stimulate small scale initiatives contributing to the management of nature in the Netherlands Antilles.

# Acknowledgements

We would like to thank the Department of Public Health and Environment of the Netherlands Antilles (VOMIL), the Department of Dutch-Antillean and Aruban Affairs (KABNA), the World Wide Fund for Nature (WWF-the Netherlands), and the Ministry of Agriculture, Nature Management and Fisheries of the Netherlands (LNV) for making the funds available to conduct this project.

In particular, we would like to thank the following people. Jeffrey Sybesma of the Environmental Section of the Department of Public Health and Environment (Dept. VOMIL) for his never abating enthusiastic support; Nico Visser, also of VOMIL, for his help throughout this project; Rolf Bak of the Netherlands Institute for Sea Research (NIOZ) for showing the way to the first scientific references on the Saba Bank.

For providing us with an enormous amount of information, sharing knowledge and views we are very grateful to Tom van't Hof (Marine & Coastal Resource Management, Saba), Mr. G. van Buurt (Dept. of Agriculture, Animal Husbandry, and Fisheries, Curaçao), Itza2 mr P.J. T. Swinckels (The Royal Dutch Navy), Dr. J. van der Land (National Museum of Natural History, Leiden), Mrs. L. Westerman (Artis Library, Amsterdam), Mr. C. Gomes Casseres (Development Bank Netherlands Antilles and the Corporation for the Development of Curaçao), Ms. L. Lijnzaad (Assistant Legal Advisor, Ministry of Foreign Affairs), Mr. J. Halley (Fishery Department St. Maarten), Mr. W.W. Timmers (legal department Directorate-General of Shipping and maritime Affairs), and Mr. Bergmeijer (DGSM, Chairman MEPC, IMO). For exchanging views and ideas we thank Commissioners Mrs. C. ten Brink-Charles and Mr. S. Hassel, and Assistant to the Commissioners Mr. D. Levenstone of the island of Saba. Our colleagues at AIDEnvironment we like to thank for their help and advise. Last, but not least, we would like to thank Mr. F. Hassel (Sugy) who was an infinite source of information and was the skipper during the field trip to the Saba Bank.

# Executive summary

This report aims to contribute to the conservation and wise use of the Saba Bank. We present collected biological, geographical, and socioeconomic data related to the Saba Bank and we analyze these data to identify deficiencies in the information and (potential) conflicts of interest. The report also reviews the existing international and national legislation and suggests a framework that could be used in order to implement a management plan for sustainable use of the natural resources of the Saba Bank.

**Geographical description (Chap. 2.1).** The Saba Bank is an area of enormous dimensions (65 by 40 km, maximum length and width, Figure 1). Its total surface area is about 2200 km<sup>2</sup> (measured from 8 - 200 m depth). The largest part of the Saba Bank is between 20 and 50 in depth, but a substantial eastern part of the bank (app. 225 km<sup>2</sup>) is between 10 and 20 m depth and contains extensive coral reefs.

**Natural resources (Chap. 2.3).** The Saba Bank constitutes the largest actively growing atoll in the Caribbean and possibly the third largest atoll in the world (Figure 3). Along large parts of the edge of the Saba Bank, vast coral reefs can be found. From field observations it appears that these reefs are healthy and support a rich biological community which is probably responsible for the high production of regionally important commercial species such as snapper, lobster and conch. Reefal areas are estimated to measure around 150 km<sup>2</sup>, while the actively growing reef fronts occupy an area between 20 and 40 km<sup>2</sup>. For comparison, the total surface area of the reefs off Curaçao lies between 11 and 22 km<sup>2</sup>.

The Saba Bank is important for a number of reasons. It forms a regionally unique ecosystem that is relatively pristine, characterized by high biological diversity and productivity. Seasonally, large numbers of Queen Triggerfish (*Balistes vetula*) and Squirrelfish (*Holocentrus ascencionis*) are caught on the bank. These probably migrate to the bank from other areas in the region to reproduce. Likely, the Saba Bank is a source of fish and coral larvae, supporting the coral reefs of islands in the region. These reefs are often threatened by human activities due to their vicinity to land.

**Users, impacts and threats (Chap. 2.4).** 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 already severely in many places, though no data are available. Possibly the bank is overfished for certain commercially used species but this needs to be assessed through the collection of data. The waters over the bank are also used for passage by oil tankers, freighters, cruise ships, yachts, recreational fishermen, drug boats, and the Royal Dutch Navy. Some tankers anchor on the bank while waiting for permission to enter St. Eustatius' harbour. Part of the Saba Bank has been explored for oil, but these explorations have, so far, remained unsuccessful.

A number of activities was distinguished as having (potentially) severe effects on the Saba Bank and its resources. Most prominent were overfishing and anchoring. Other possibly serious threats to the bank's natural resources include the use of dispersants after oil spills, ship grounding and collisions.

**Economic aspects (Chap. 2.5).** Presently, economic benefits are only derived from fisheries. Income for Saban fishermen is estimated to lie around NAF 850,000 per year. Catch by others is unknown and the total catch from the Saba Bank may already be above its carrying capacity. Crude estimates indicate that the maximum sustainable catch may be worth many times the Saban share. No data for the Saba Bank support this estimate, indicating the need for more information. Additional benefits may be generated through stimulating diving and sport-fishing on the Saba Bank.

**Present legislation (Chap. 3).** The legal framework that has been developed through international law provides a solid foundation for national law. Limited jurisdiction of the Netherlands Antilles stretches 200 nautical miles from the coast of each island due to the creation of an exclusive fishery zone. This zone completely encloses the Saba Bank, offering the Netherlands Antilles ample opportunity to regulate harvesting of the Saba Bank's natural resources. The installation of an Exclusive Economic Zone (EEZ) would increase the opportunities for management even further.

Presently, the Netherlands Antilles are faced with two problems regarding legislation. Firstly, the problem of enforcing existing (and new) national and island laws. Secondly, the fact that existing legislation is often outdated. Enforcement is currently improved through the installation of a Coast Guard. New regulations, such as the drafts National Law Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming), National Law on Environmental Management (Landsverordening Grondslagen milieubeheer, and National Law Maritime Management (Landsverordening Maritiem Beheer), are in the process of becoming legislation. Combined with an effective coast guard, these laws should enable the Netherlands Antilles to manage the sustainable use of the natural resources of the Saba Bank.

**The need for management (Chap. 4).** The main gaps in knowledge include information on reef and species distributions, data on major ecological processes, ship anchoring and traversing frequency, use of the bank by other islands and most importantly stock and catch data of commercially used species.

A number of reasons motivate active management of the Saba Bank:

- ◆ It is an important and unique ecosystem in relatively pristine condition;
- ◆ It is of considerable economic and social importance;
- ◆ It is currently exploited without any control;
- ◆ It lies within a busy shipping area;
- ◆ It has potential for increase in economic importance.

Different options are discussed in which steps are proposed given the different observations. A *laissez faire* attitude is of course a realistic option, but is guaranteed to cause problems, especially with respect to overfishing of the existing stocks. Similar comments apply to shipping, especially anchoring and pollution.

Therefore, preventive and regulating actions are required. One could choose between an *ad hoc* approach to tackle single problems or opportunities at a time, or a more integrated approach of all thresholds, risks and opportunities leading to the sustainable use of the Saba Bank. The latter is proposed, because it better addresses the problems inherent to a multi-use area.

An integrated approach first identifies thresholds and opportunities and sets priorities among necessary (parallel) actions which includes the attraction of necessary funding, information campaigns, research, capacity building, participation programmes etc. The integrated approach may be expected to have continuity of (proportionate) action, funding and results. Section 4.3.2 further elaborates the recommended option of an integrated approach, which has been termed a masterplan.

# Samenvatting

Dit rapport heeft als doel een bijdrage te leveren aan bescherming en duurzaam gebruik van de Saba Bank. Wij presenteren verzamelde biologische, geografische en sociaal-economische gegevens met betrekking tot de Saba Bank en analyseren deze ter identificatie van gebreken in de beschikbare informatie alsmede conflicterende belangen te identificeren. Verder wordt een overzicht gegeven van de van toepassing zijnde internationale en nationale wetgeving en wordt een stappenplan geschetst dat moet leiden tot de implementatie van een managementplan met als doel de bescherming en het duurzaam gebruik van de natuurlijke hulpbronnen van de Saba Bank.

**Geografische beschrijving (hfdst. 2.1).** De Saba Bank vormt een zeer groot gebied (maximale lengte en breedte zijn 65 en 40 km, Figure 1) met een totaal oppervlak van ongeveer 2200 km<sup>2</sup> (liggend tussen 8 en 200 m diepte). Het grootste deel van de bank ligt tussen de 20 en 50 m diep, maar een aanzienlijk deel (circa 225 km<sup>2</sup>) ligt tussen de 10 en 20 m en bevat uitgestrekte koraalriffen.

**Natuurlijke hulpbronnen (Hfdst. 2.3).** De Saba Bank vormt het grootste actief groeiende atol in de Caribische Zee, en waarschijnlijk het op twee na grootste in de wereld. Uitgestrekte gebieden aan de rand van de bank bestaan uit gezonde koraalriffen (Figure 3) met een hoge biologische rijkdom en een hoge produktie aan commercieel belangrijke soorten, zoals "snapper", langoest en carco. Het totale oppervlak waar koralen voorkomen, wordt geschat op ongeveer 150 km<sup>2</sup>, terwijl het oppervlak van de riffen aan de rand van de bank waarschijnlijk tussen 20 en 40 km<sup>2</sup> ligt. Ter vergelijking, het totale rifoppervlak van Curaçao ligt tussen 11 en 22 km<sup>2</sup>

De Saba Bank is belangrijk om een aantal redenen. Allereerst, vormt de bank een regionaal uniek en relatief ongeschonden ecosysteem dat gekenmerkt wordt door een hoge biologische rijkdom en produktie. De Saba Bank is een voortplantingsgebied voor de "Queen Triggerfish", *Balistes vetula* en de "Squirrelfish", *Holocentrus ascensionis*. Waarschijnlijk trekken deze vissen ook uit andere gebieden naar de bank. Mogelijk vormt de bank een bron van vis- en koraallarven voor de koraalriffen van eilanden in de regio. Deze riffen worden vaak bedreigd door menselijke invloeden omdat ze direct aan de kust liggen.

**Gebruikers, invloeden en bedreigingen (Hfdst. 2.4).** Al vanaf de vorige eeuw vormen de vissers van Saba de belangrijkste gebruikers van de Saba Bank. Vissers van naburige eilanden vissen ook op de bank. Intensieve bevissing van de carco heeft deze soort waarschijnlijk reeds verdreven uit sommige gebieden op de bank. Mogelijk is de bank qua vis reeds overbevist, maar harde gegevens ontbreken. Het zeegebied boven de Saba Bank wordt ook gebruikt door olietankers, vracht- en cruiseschepen, jachten, recreatieve vissers, boten en vliegtuigen voor de handel in verdovende middelen en de Nederlandse Koninklijke Marine. Sommige tankers ankeren op de bank in afwachting van toestemming om de haven van St. Eustatius binnen te lopen. Een deel van de bank is onderzocht op de aanwezigheid van olie, tot nu toe zonder succes.

De belangrijkste bedreigingen voor de bank vormen overbevissing en ankeren. Andere mogelijk ernstige bedreigingen vormen het gebruik van dispersiemiddelen bij de bestrijding van olierampen, het aan de grond lopen van schepen en aanvaringen gepaard met vervuiling en olie lekkages.

**Economische aspecten (Hfdst. 2.5).** Op het moment levert alleen de visserij een economische bijdrage. De Sabaanse vissers verdienen jaarlijks ongeveer NAF 850.000. De vangst van andere vissers is onbekend en de totale vangst op de Saba Bank overschrijdt wellicht reeds de totale duurzame vangst. Ruwe schattingen geven aan dat de duurzame maximale vangst een waarde kan hebben van vele malen de hoeveelheid die door de Sabaanse vissers gevangen wordt. Deze schattingen waren niet gebaseerd op gegevens van de Saba Bank en ook nu zijn er geen gegevens voor de Saba Bank beschikbaar. Extra inkomsten zouden kunnen ontstaan door het stimuleren van de duiken sportvisrecreatie.

**Aanwezige wetgeving (Hfdst. 3).** Het internationale wettelijke kader vormt een goede basis voor nationale wetgeving. De Nederlandse Antillen hebben reeds een exclusieve visserij zone afgekondigd,

die het land een beperkte bevoegdheid geeft tot 200 zeemijlen buiten de kust van elk eiland. Omdat deze zone de gehele Saba Bank beslaat, bestaan er goede mogelijkheden voor nationale regulering van de natuurlijke hulpbronnen. De afkondiging van een exclusieve economische zone (EEZ), zou de mogelijkheden tot bescherming nog verhogen.

Op het moment zijn er twee problemen met betrekking tot de bestaande wetgeving. Allereerst, vormt handhaving van bestaande (en nieuwe) wetgeving een groot probleem. Op de tweede plaats is de bestaande wetgeving verouderd en toe aan herziening. De handhaving van de wetgeving wordt op het moment verbeterd door de installatie van de kustwacht. Het aannemen van nieuwe wetgeving, zoals de Landsverordening Grondslagen Natuurbeheer en -bescherming, de Landsverordening Grondslagen milieubeheer en de Landsverordening Maritiem Beheer, gecombineerd met een effectief opererende kustwacht, zou een goed stap op weg zijn naar bescherming en duurzaam beheer van de natuurlijke hulpbronnen van de Saba Bank.

**De noodzaak tot actief beheer (Hfdst. 4).** De belangrijkste leemtes in de verzamelde informatie zijn gegevens over de verspreiding van de koraalriffen en de soorten rijkdom, gegevens over belangrijke oecologische processen, frequentiegegevens over ankeren en het passeren van schepen, het gebruik van de bank door andere eilanden en vooral vangstgegevens en schattingen van de bestaande biologische voorraden.

Een aantal redenen tonen de noodzaak van actief beheer van de Saba Bank aan:

- ◆ De bank is een belangrijk, uniek en relatief ongeschonden ecosysteem;
- ◆ De bank is economisch en sociaal belangrijk;
- ◆ De bank wordt op het moment ongecontroleerd geëxploiteerd;
- ◆ De bank ligt in een gebied met druk scheepsverkeer;
- ◆ Het economisch belang van de bank kan toenemen.

Verschillende opties worden besproken voor het nemen van vervolgstappen in het kader van de gegevens in dit rapport. Een laissez faire houding is op zich een realistische optie maar zal op waarschijnlijk niet al te lange termijn leiden tot problemen, met name wanneer het gaat om de visserij. Soortgelijke opmerkingen kunnen gemaakt worden ten aanzien van de scheepvaart, met name waar het gaat om ankeren en vervuiling.

Daarom zijn preventieve en regulerende acties noodzakelijk. Daarbij kan gekozen worden tussen een ad hoc benadering, waarbij telkens een enkel probleem of een zich voordoende kans aangepakt wordt, of een meer geïntegreerde benadering van alle bestaande drempels, risico's en mogelijkheden die aan de orde zijn bij het streven naar de bescherming en duurzaam gebruik van de Saba Bank. De laatste benadering wordt aanbevolen, omdat het een betere invulling geeft aan de problemen die kenmerkend zijn voor een gebied met meerdere gebruiksfuncties.

Een geïntegreerde aanpak zal eerst de drempels en kansen identificeren en bovendien prioriteiten stellen voor de noodzakelijke (parallele) acties. Daarbij wordt ook rekening gehouden met het vrijmaken van de noodzakelijke financiering, informatiecampagnes, onderzoek, capaciteitsopbouw, participatieprogramma's enz. Van een geïntegreerde benadering mag verwacht worden dat er continuïteit ontstaat van (proportionele) acties, financiering en resultaten. In paragraaf 4.3.2 wordt beschreven hoe een geïntegreerde benadering voor de Saba Bank van de grond kan komen in de vorm van een zogenaamd "masterplan".

# Contents

Preface .....	ii
Acknowledgements .....	iii
Executive summary .....	iv
Samenvatting .....	vi
Contents .....	viii
Tables .....	ix
Figures .....	ix
1 Introduction .....	1
2 What is the Saba Bank and why is it important .....	3
2.1 Geographical data .....	3
2.2 Geological data .....	3
2.3 Natural resources .....	4
2.3.1 Coral reefs .....	4
2.3.2 Fish .....	6
2.3.3 Conch .....	7
2.3.4 Lobster .....	7
2.3.5 Mammals and turtles .....	7
2.3.6 Oil and gas .....	7
2.3.7 Minerals .....	8
2.3.8 Pharmaceuticals .....	8
2.4 Users, impacts and threats .....	8
2.4.1 Fisheries .....	8
2.4.2 Ship traffic, related activities and risks .....	12
2.4.3 Oil explorations .....	13
2.4.4 Collecting .....	13
2.4.5 Recreational Diving .....	14
2.5 Economic aspects .....	14
2.5.1 Fisheries .....	14
2.5.2 Oil explorations .....	15
2.5.3 Ship traffic .....	15
2.5.4 Future benefits .....	15
3 Present Legislation .....	16
3.1 Introduction .....	16
3.2 Jurisdiction .....	17
3.3 Jurisdiction and the Saba Bank .....	17
3.4 Legal instruments .....	17
3.5 Fishing activities .....	19
3.6 Navigation .....	19
3.6.1 Disturbance .....	19
3.6.2 Pollution and the threat of casualties .....	21
3.7 Land-based pollution .....	21
3.8 Ecological values .....	21
3.9 Enforcement .....	22
4 The need for management: an assessment .....	24
4.1 Assessment of gaps in knowledge and recommendations for further research .....	24
4.2 Problem analysis and further recommendations .....	25
4.3 How to continue from here? .....	26
4.3.1 Recommended actions towards the sustainable use of the Saba Bank .....	26
4.3.2 Development of a master plan in 2 phases .....	27
4.4 The development of a master plan .....	29
5 References .....	32

6	Appendices.....	33
	Appendix 1. Locations of reconnaissance dives made in 1996 .....	33
	Appendix 2. Coral and fish species found on the Saba Bank .....	34
7	Annex 1. Legal instruments .....	36
	7.1 International co-operation .....	36
	7.1.1 The United Nations .....	36
	7.1.2 The International Maritime Organization (IMO).....	39
	7.2 National law .....	40

## Tables

Table 1. Summary of users, activities, impacts and threats of the Saba Bank .....	9
Table 2. Catch estimates (t per year) for fish and lobster and their source. ....	11
Table 3. Estimated income from Saba Bank for Saban fishermen .....	14
Table 4. Recommended actions . ....	28

## Figures

Figure 1. Map of the Saba Bank .....	2
Figure 2. Main currents in the Atlantic . ....	3
Figure 3. The coral reefs of the Saba Bank .....	5
Figure 4. Contours of generic diversity .....	6
Figure 5. The use of the Saba Bank by Saban fishermen. ....	10
Figure 6. Maritime zones in the Law of the Sea .....	16
Figure 7. Maritime zones around Saba, St. Maarten and St. Eustatius .....	18
Figure 8. Equidistance lines in the northern Caribbean.....	20
Figure 9. Outline of masterplan for the Saba Bank .....	29
Figure 10. Strategic environmental analysis for the construction of a masterplan .....	31

# 1 Introduction

The importance of marine areas, such as the Saba Bank, to local and regional communities is often implicitly accepted without a clear plan to guarantee the long-term economic and environmental sustainability of the natural resources. In general, calls for conservational management of human activities appear after ecological or economic problems have become clearly visible to those people directly involved. By then, environmental degradation is often evident and economic sacrifices necessary to restore lost values, if restoration is possible at all, are generally exceeding the costs of precautionary action.

Human impact on the Saba Bank today is not controlled in any way. It is unknown, whether present use of the Bank is degrading the environment or will be destructive in the future.

To evaluate the necessity to regulate human activities on the Saba Bank, the following questions were formulated. What is the Saba Bank and why is it important? What are the current, as well as potential, values and benefits of the Saba Bank? What are the present impacts and possible future threats, and do these indicate a need for management? What ecological processes are important for the Saba Bank's productivity?

The information that is presented in this report was collected before and during a field trip to Saba and Curaçao by the first author from the 16th of February till the 8th of March 1996. The information originates from scientific and gray literature (e.g. internal reports) and from interviews with a number of users and other stakeholders. This report is a compilation of our findings, bringing together ecological, socio-economic and legal information. It explores the need for a management framework and identifies gaps in current information and knowledge.

In the first part of this report (Chap. 2. 1 to 2.3) an inventory is given of the geographic and biological data that are available at the moment. In Chapter 2.4 a detailed survey is given of current and potentially future users, impacts and threats to the Saba Bank. In Chapter 2.5 the available economic data are presented. Present legislation is discussed in Chapter 3 and the need for management is explored in detail in Chapter 4, which also suggests further steps and the framework of a management plan for the sustainable use of the natural resources of the Saba Bank.

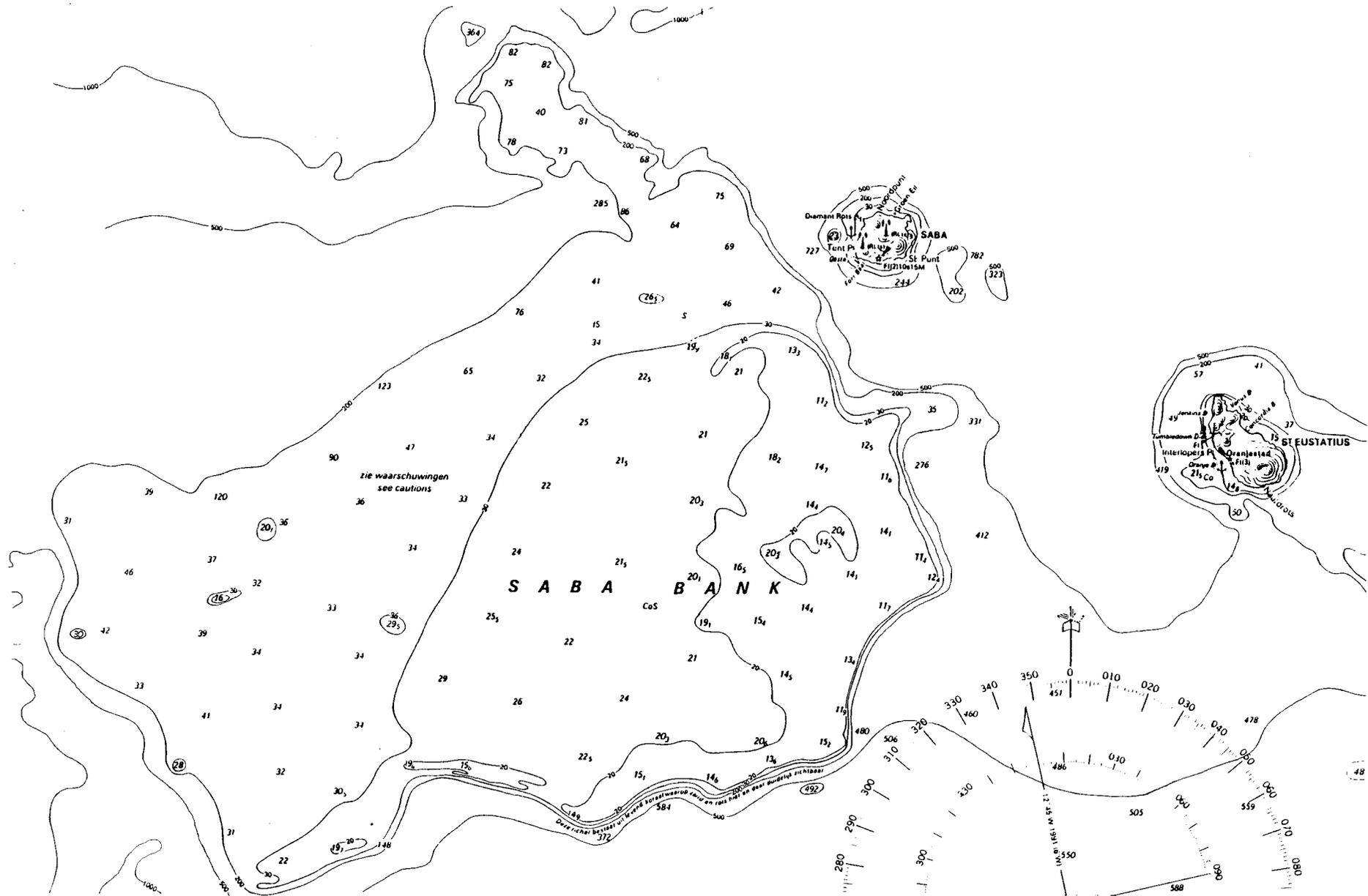


Figure 1. Map of the Saba Bank (Scale 1 : 422,000; from Hydrographic Survey Map 2020)

## 2 What is the Saba Bank and why is it important

### 2.1 Geographical data

The Saba Bank (17°25' N, 63°30' W) is an undersea elevation with a flattened top, a bank, 3 - 5 km Southwest of the island of Saba and 25 km west of St. Eustatius (Figure1). It is raised about 1000m above the general depths of the surrounding sea floor and its shape is approximately square or slightly elliptical, 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 approximately 2200 km<sup>2</sup> (measured to the 200 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<sup>2</sup>) is between 10 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 7 and 15 m (Van der Land 1974, MacIntyre et al. 1975).

Currents (Figure 2) in the area run in a W to WNW direction quite constantly throughout the year, reflecting the prominent wind direction, which varies between E and ESE (Van der Land 1974).

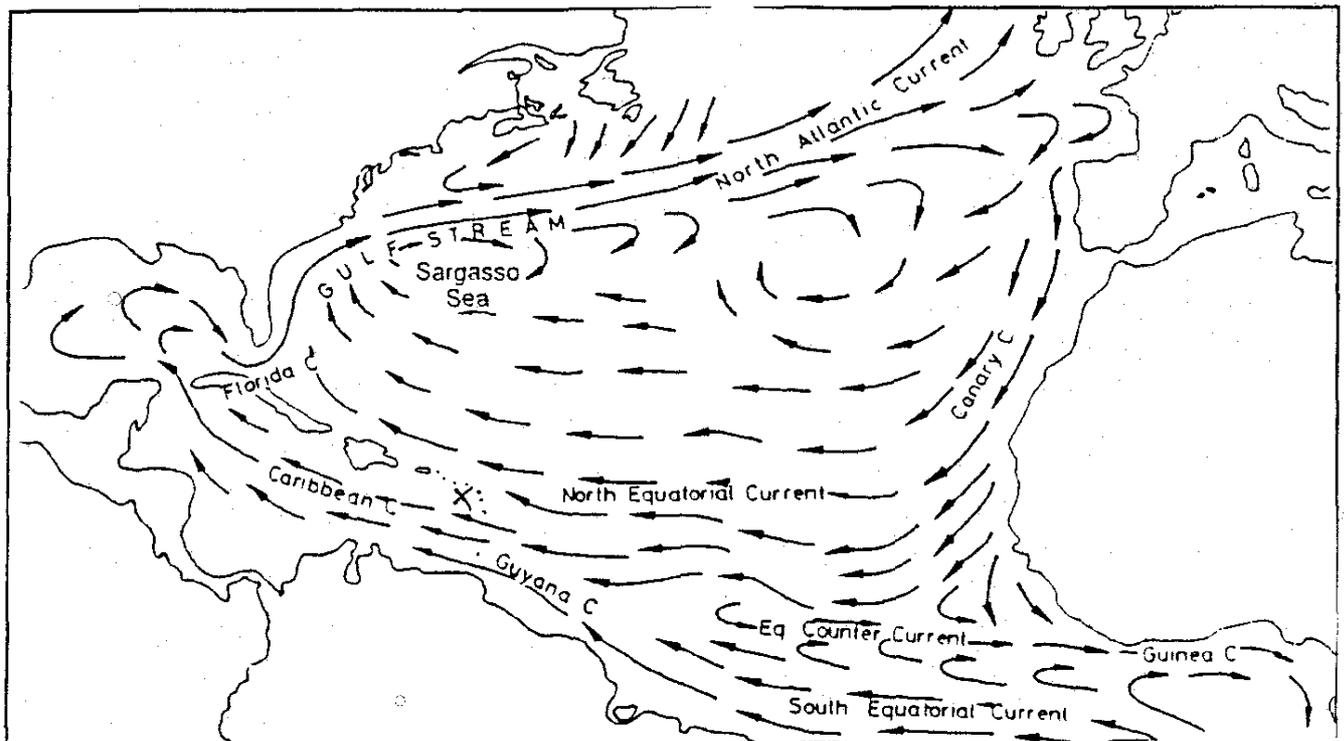


Figure 2. Main currents in the Atlantic. x marks app. position Saba Bank

### 2.2 Geological data

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 northeastern 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, leveled by planation agencies, which almost certainly were both subaerial and submarine, that 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 (1974). 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.

A preliminary survey carried out by Macintyre et al. in 1970 (Macintyre et al. 1975) set out to resolve this dilemma, but limited data prevented any hard conclusions. They found only very sparse coral growth and concluded that the Bank had no significant coral growth, even though they realized that some parts of the bank, notably the eastern and south-eastern rims are well within the depth range required for vigorous coral growth of reef-building corals. Later Macintyre (1988) would describe a submerged reef off the coast of St. Croix that shows many similarities with the Saba Bank.

In 1974 Van der Land led a Dutch expedition to the Saba Bank. In co-operation with other scientists and the Dutch Navy a thorough investigation of the Bank, using SCUBA gear, extensive echo soundings, and bottom sampling techniques, was conducted. He concluded that the Saba Bank is a living atoll with growing reefs on its eastern windward edges. The leeward reefs do not appear to be actively growing reefs and should be called drowned fringing reefs. The Saba Bank ranks among the largest atolls in the world (i.e. the Suvadiva Atoll in the Maldives, 2240 km<sup>2</sup>; Kwajelein atoll in the Marshalls, 1683 km<sup>2</sup>).

## **2.3 Natural resources**

The Saba Bank is a large ecosystem with coral reefs along its edge and more sandy areas towards the centre and the western part of the bank. Coral reefs are the most diverse marine ecosystems. The coral colonies are the building blocks that create the physical structure and, simultaneously, form an important living component. They provide substrate for the settlement of new organisms, and shelter against predators and waves. Coral reefs affect local currents, waves, temperature, and food availability. Coral reefs are also very complex, its inhabitants depending on the reef through innumerable complex relationships. The well functioning of the whole ecosystem is therefore directly related to its high biological diversity, and small changes may have large effects.

Examples abound throughout the world, and numerous case studies have documented the degradation of reefs over the last 20 years. In most of these cases, the degradation was caused by human (unsustainable) practices or through natural disaster, often aggravated by human actions.

Genetic diversity is equally important for the resilience of populations and ecosystems to perturbations of the environment. Genetic diversity is also important for the development of new products in industry, such as the pharmaceutical industry. Loss of genetic diversity is usually gradual and difficult to point out. The Saba Bank may contain certain subspecies or maybe even certain endemic species due to the Bank's isolated position.

The living and non-living natural resources of the bank include coral reefs, commercially used animals such as fish, conch, and lobster, and mammals, invertebrates, reptiles (turtles), oil, minerals and pharmaceuticals. Below we present a description of their distribution and abundance and we address their importance to human society. Most of the presented information however is qualitative, indicating the need for more quantitative research.

### **2.3.1 Coral reefs**

Boeke (1907) already mentioned the existence of extensive coral growth on the eastern and south-eastern rims of the Bank, but he was mostly concerned with the fishing industry on the islands

of Saba, St. Maarten, and St. Eustatius. Van der Land (1974) found 22 species of coral on the Bank and, because his collecting methods were far from intensive, he postulated that the total number of coral species is probably higher. Based on echo soundings, he concluded that the Bank should be called an atoll (Figure 3). The richest areas were found on the two windward reefs, which he called the South Reef and the South-eastern Reef, and where the number of colonies was very high. From his map the total surface area where reef structures are present can be estimated at approximately 150 km<sup>2</sup>. Large colonies were common and patches of sand and bare rock were usually small. Soft corals were also very common. Towards the centre and the west of the bank sand became more dominating, although there were many patch reefs in the central part of the bank.

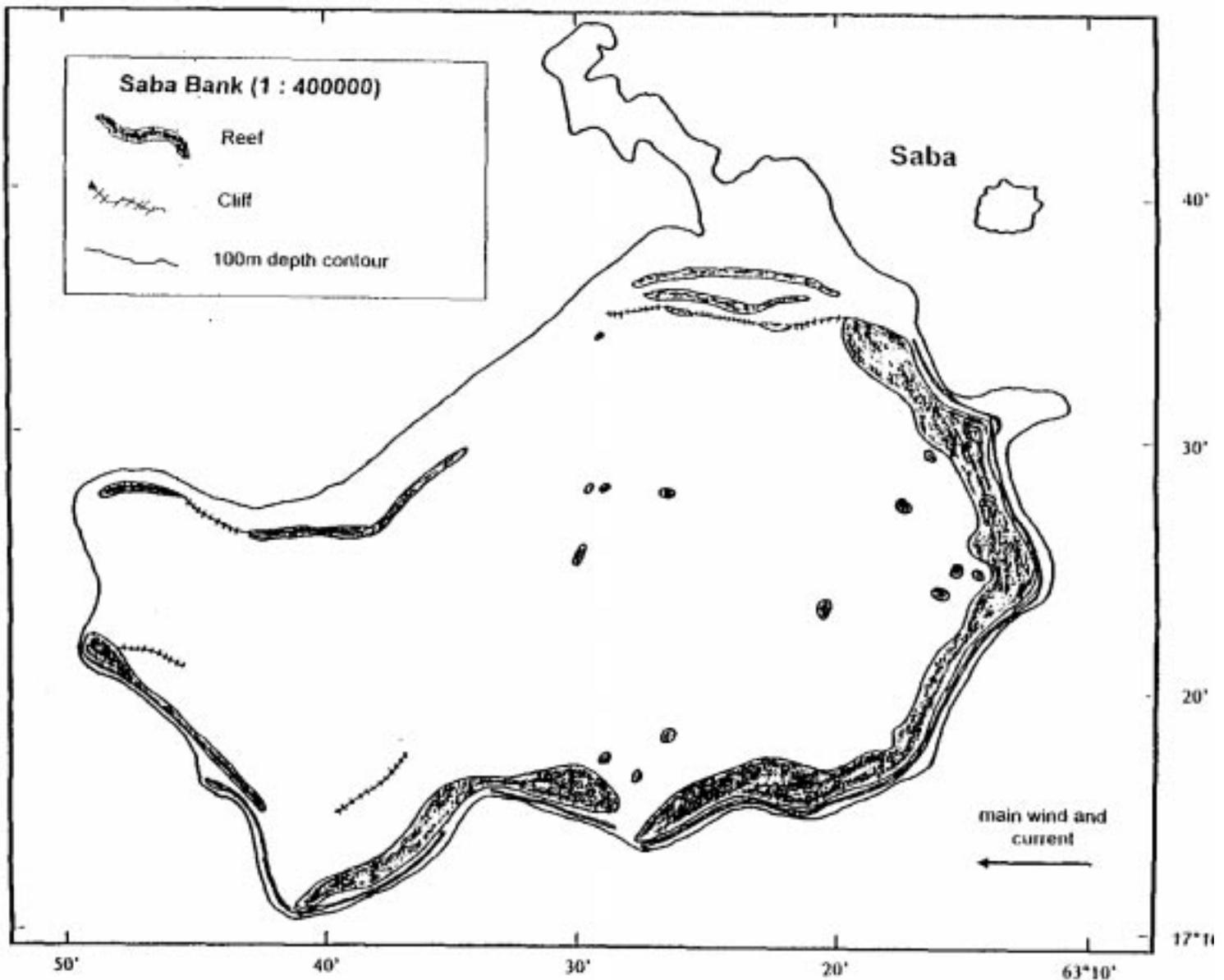


Figure 3. The coral reefs of the Saba Bank (after Van der Land 1977).

For this report, a reconnaissance (consisting of seven SCUBA dives) was made on the eastern side of the Bank to investigate the fish and coral populations (For locations see Appendix 1). A short description will be given in the next two paragraphs and a list of coral and fish species is presented in Appendix 2. Although the findings are very promising, one should bear in mind that the description is purely qualitative and restricted to a very small area of the bank.

Close to the edge of the Saba Bank, coral reefs were discovered that were very rich in terms of cover and diversity of reef-building corals. The reefs were located on a very gradual slope, in waters of 22 to 15 m deep, and appeared to be between 100 to 500 m wide. However, because only a very small area was surveyed this width is likely to vary significantly. Possibly, they represent Van der Land's "front reefs". Sixty to 90% of the bottom was covered by hard corals, which is very high. Six coral species were added to the list of Van der Land (1974), bringing the total number of coral species on the bank to 28 (Appendix 2). For comparison we have included a map showing the generic diversity of corals around the world (Figure 4).

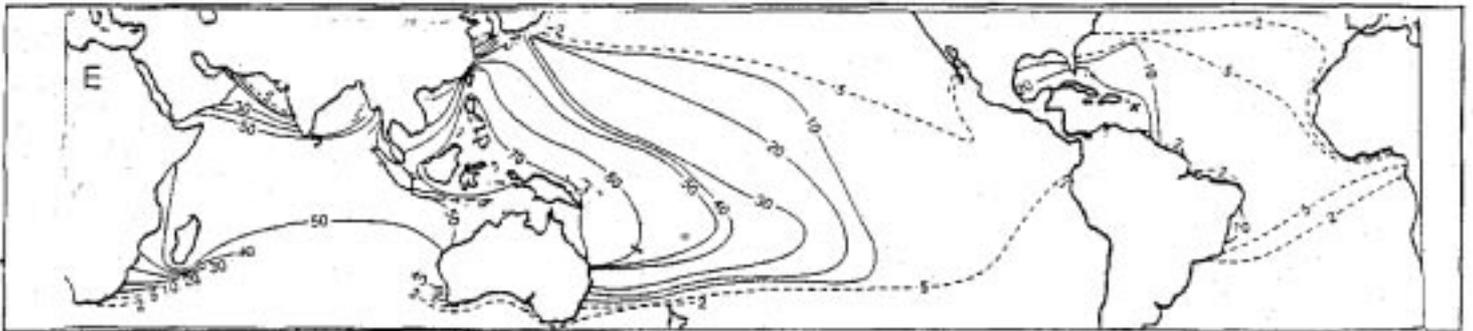


Figure 4. Contours of Generic diversity --> Areas with equal numbers of genera (after Veron 1985). x marks the app. position of the Saba Bank.

The visibility was excellent, the reefs appeared healthy and to be growing vigorously. This may be due to the absence of land-based influences, such as sedimentation and high nutrient concentrations through run-off and sewage disposal. Inward from the reefs on the edge of the bank, water depth decreased to 11 in. Hard coral colonies were small here and cover was low (between 5 and 10%), although the number of coral colonies per unit of surface area was high. This indicates that recruitment, possibly from the reefs on the edge of the Saba Bank, is high. The small size of the colonies and the community composition (mostly *Porites astreoides* and *Diploria strigosa*) suggest that mortality in this area is higher. This may be the result of the generally shallower water, which renders the bottom more exposed to the forces that are generated by big waves and that can easily dislodge small colonies. This seems to agree with other observations in this zone such as the dominance of flexible soft corals and the lack of sand. Sand is barely present, or only in a very thin layer. It is probably carried to the deeper western areas. Waves could be felt down to 15 in, even though the weather was calm. The surface area of the actively growing reef fronts of the Saba Bank may be very large. Based on reef lengths given by Van der Laan (1974) and a general width of 300 to 500 m, a conservative estimate would lie between 20 and 40 km<sup>2</sup>. For comparison, the total surface area of the reefs off Curaçao lies between 11 and 22 km<sup>2</sup>. The reefs of the Saba Bank may therefore represent an important source of coral and fish larvae for islands in the Caribbean, including Saba, the Virgin Islands and Puerto Rico.

### 2.3.2 Fish

The coral reefs of the Saba Bank, like coral reefs elsewhere, provide many cavities in which animals can live and take shelter against predators. Dead coral colonies are substrate that is colonized by algae. The algae are grazed by herbivorous fishes, which are preyed upon by larger carnivorous fish and fished by fishermen. The coral reefs of the bank also influence environmental factors, such as currents, water temperature, and nutrient cycles, which affect the flora and fauna on the Bank. For some fish (e.g. some butterflyfish and certain species of parrotfish), the living coral tissue represents a source of nutrition.

The fish on a coral reef can be separated into two groups. The first group, called demersal, is basically using the reef for shelter, food and reproduction. The second group has a pelagic lifestyle and is just passing over the reef, possibly preying on its inhabitants. Pelagic fish consist of fish like tuna, mackerel, dolphinfish and marlin.

The Saba Bank appears to be an important spawning ground for fish species outside the bank area, particularly queen triggerfish, locally called moonfish, and squirrelfish. During the winter months (December till the end of February), around full moon, queen triggerfish is the most abundant fish caught in fish traps. Squirrelfish are caught particularly much around the full moon from November till April (Boeke 1904). One specific area of the Bank is called the Moonfish Bank, after the large numbers of queen triggerfish caught there (Figure 5). Fishermen believe that there are more such areas on the Bank, but at the moment there is no proof.

A list of fish species that were encountered in this preliminary survey, which included 7 dives on the Saba Bank, is given in Appendix 2. This list is far from exhaustive. Fish densities were not remarkably high, however, fish sizes and species richness were generally high, indicating that the bank is probably a rich area.

### **2.3.3 Conch**

Although no hard data exist, fishermen and divers have observed very high densities of conch in the more sandy areas of the Saba Bank. According to one fisherman, density in a certain area was so high that "if one had one hand on a conch the other could grab another". Although some of these areas have apparently been fished empty, the bank may still have areas of high conch densities. During the 7 dives on the Saba Bank no conch was observed, even though the accompanying fisherman indicated that the visited area used to have high conch concentrations.

### **2.3.4 Lobster**

Lobster (mostly *Panulirus argus* and some *P. guttatus*) is the main target for the Saban fishermen. They depend on the reef for food and shelter. Based on the current fishing pressure, it is likely that lobster densities on the bank are very high. Lobster is caught all over the Bank, but mostly during the winter months when they move to shallower water. Lobster was found during the dives that were made on the Bank. Fishermen say they catch egg-carrying lobster the whole year round, instead of seasonal. This indicates that the environmental conditions are very good and possibly, the great abundance of lobster is due to the fact that they reproduce all year round.

### **2.3.5 Mammals and turtles**

Between Saba and the Saba Bank and over the Saba Bank there have been a few observations of dolphins. Humpback whales, migrating north to their mating grounds, are occasionally seen in the trough between Saba and the bank. Once, an apparently lost manatee was seen close to the island.

Turtles are sighted frequently, according to Saban fishermen. Possibly, the Saba Bank represents an important feeding area for these animals. No quantitative data exist.

### **2.3.6 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 and

paleontological data, explorations in 1977 and 1982 did not detect any significant amount of oil or gas (see also Chap. 2.4.3).

### **2.3.7 Minerals**

So far, the only commercial mineral identified on the Saba Bank is sand. Sand is only present in the more central parts of the Bank (Van der Land 1977). However, it is mostly only a thin layer and probably 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.

### **2.3.8 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 corals and sponges. Presently, the Saba Bank is not being used for this purpose.

## **2.4 Users, impacts and threats**

To evaluate the importance of the Saba Bank, it is essential to identify its current users, their activities and impacts.

In Table 1 an overview of current and potential users, activities, impacts and threats is presented. Some activities have not yet taken place, but are included here because of their potential impact. Fishermen are the main users, extracting fish, lobster and conch from the Saba Bank. Others use the waters over the bank mainly for passage.

Fishing and anchoring appear to be presently the most heavily impacting activities, though no hard data are available. Impacts vary in size and seriousness. For example, impacts of grounding are mostly local, though severe, and recovery may take many decades. Overfishing affects a large area and may have serious indirect effects on community composition and ecosystem functioning. Diver damage, on the other hand, is mostly on a very small scale, but may reduce attractiveness of dive locations substantially. A more detailed description is given in chapter 2.4.1 to 2.4.5.

### **2.4.1 Fisheries**

Sabans have been fishing on the bank for generations, and written documentation goes back at least to 1907. Boeke (1907) documented the heavy dependency of the Saban community on its fishing industry. There were 21 boats with an average size of 17 feet. The crew consisted of 4 to 5 sailors and one captain. During the "Bank" season, which was from October until January, a total of about 100 fishermen could be out fishing, mostly line-fishing. During the rest of the year, the number of fishermen was approximately 25 to 30. There were 30 fish traps on the island that were used in waters between 9 to 150 in. Boeke reported that the catch in the traps was mostly poor. He also reported that there were few fishermen from other islands on the Saba Bank. Fishermen from St. Eustatius and St. Martin stayed close to their islands and did not venture out into the deeper waters as the Sabans did.

During the last 15 years the fishing industry on Saba has become relatively less important. Nowadays, Saba relies heavily on import and tourism. While there were still 21 fishing boats in 1980 (Van Buurt 1980), the number of fishing boats has now decreased to 4, with a total of 8 professional fishermen. However, according to Saban fishermen, the bank is now also used by fishermen from St. Maarten (NA), St. Eustatius (NA), St. Croix (US), St. Kitts and Nevis, St. Barts (Fr), Anguilla (UK), Antigua, Montserrat (UK), Guadeloupe (Fr), Dominica, and Martinique (Fr).

Table 1. Summary of users, activities, impacts and threats of the Saba Bank. Activities that are taking place are underlined. Meaning of symbols: +- taken place in the past; + possible in the future.

Users	Activities	Direct negative impacts	Potential consequences
Fishermen	<u>Fishing</u>	Reduction of stocks (fish, conch, lobster)	Over-fishing; elimination of fish species from Bank contribution to species extinction; degradation of coral reefs
Oil tankers	<u>Anchoring</u> , <u>Tank rinsing</u> <u>Oil spills from tankers or Statia Terminals</u>	Physical damage to coral reefs Water pollution Water pollution, destruction of fishing gear	Coral mortality Fish stock pollution and mortality; coral mortality Fish stock pollution and mortality, coral mortality
Potentially all ships	Grounding (+) Collisions (+) <u>Emptying of sewage tanks</u>	Water pollution, physical damage to coral reefs Water pollution	Coral mortality and fish stock pollution and mortality Fish stock pollution and mortality; coral mortality Eutrophication, algal blooms, coral reef degradation
Pharmaceutical industry	in- Collecting	Extraction of resources	Decreasing species richness
Scientists	Collecting (+, +) Diving (+, -, +)	Extraction of resources Physical damage to corals	Decreasing species richness Decreasing species richness
Tourists	Collecting Diving Fishing	Extraction of resources Damage to corals Extraction of resources	Decreasing species richness Decreasing species richness Decreasing species richness
oil companies	Exploration for oil and minerals (+, +)	Damage to coral reefs; water pollution	Coral mortality; fish stock pollution or mortality

Sabans use mostly the north to north-western part of the Bank (mostly within the territorial sea of Saba), while other fishermen fish mainly in the south-eastern part. In one section of the Saba Bank, called the Copper Bank, fish traps are not being used because the fish are affected by ciguatera, a toxin that occurs naturally on the surface of certain plants and accumulates in animals that feed on these plants. According to the Saban fishermen, they fish only for lobster in the area from the Copper Bank down to 17\*20' (Figure 5).

The target catch and primary fishing methods have also changed, at least for Saban fishermen (Framhein 1996, and interviews with fishermen by first author). Fishermen concentrate their efforts on red snapper and lobster which is caught with traps only. Queen triggerfish and squirrelfish may contribute to a large degree to the total catch during the winter months (see chapter 2.3.2). Of the queen trigger, only the ripe eggs are used. The rest and the squirrelfish is used as bait. Lobster is caught all year round, but largest catches are in the winter months. In contrast with the 30 traps in 1904, there are now about 600 to 1000 traps from Saba alone. Trap numbers of other islands are unknown. Lobster traps are placed 0 over the Saba Bank, while fish traps are used mostly on the edge of the Bank, from 40 to 150 m depth. The catch is **mainly exported** to the neighbouring islands of St. Maarten and St. Eustatius. About 5 % is used for subsistence or sold on Saba to private households and restaurants.

Apparently, there are also big commercial fishing fleets operating in the vicinity of the Saba Bank, fishing for pelagic fish, mostly tuna. One Korean operation has a fish landing and storage facility on St. Maarten. No information was found on amounts being harvested and it remains unclear to what degree these fishing boats depend on or affect the Saba Bank.

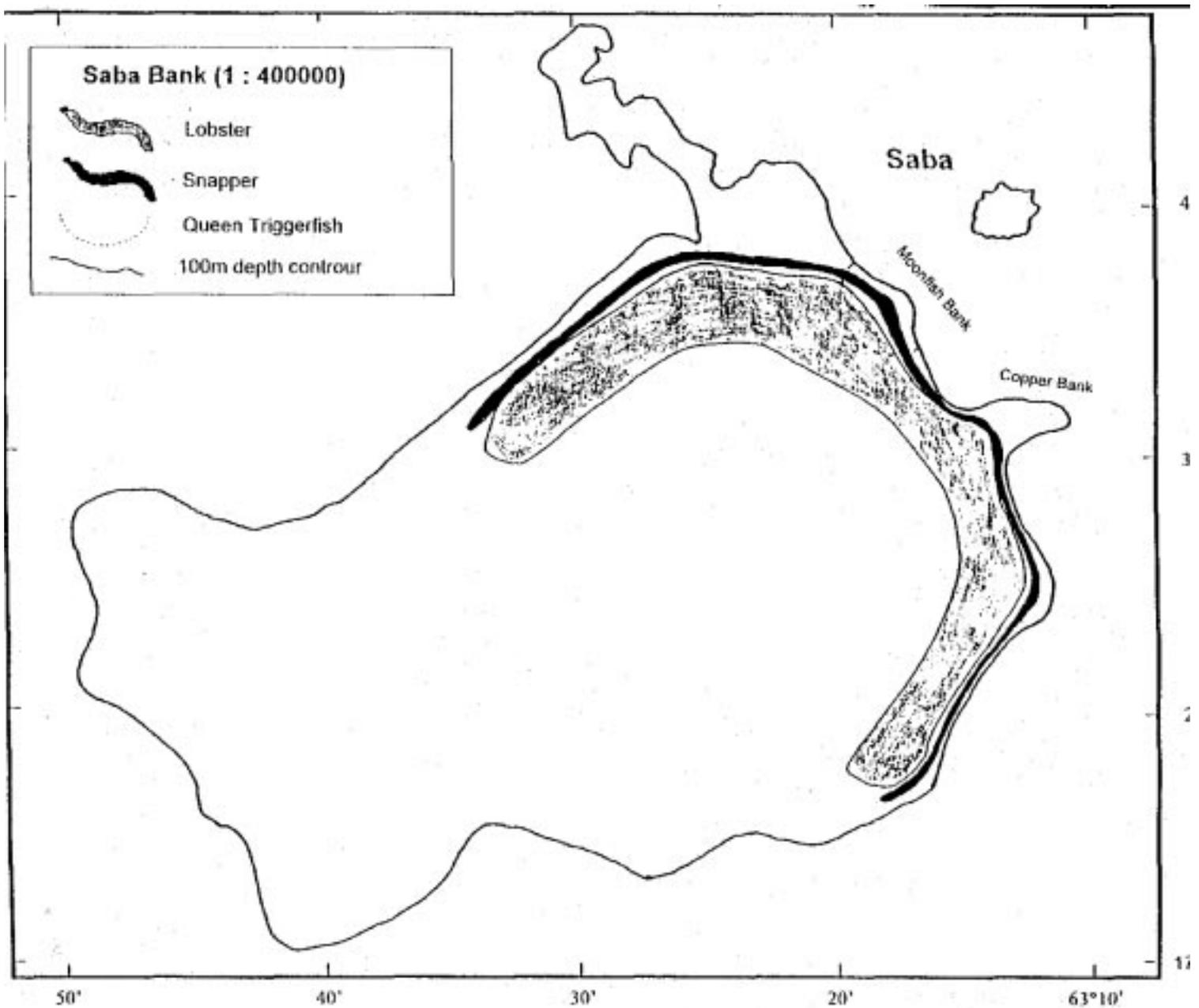


Figure 5. The use of the Sababank by Saban Fishermen.

Spearfishing with SCUBA gear is not uncommon practice on the bank. However, it is mostly a recreational activity and happens probably only sporadically. Target fish are mostly large groupers. These groupers are important to the biological communities of the Bank. They remove the sick and weaker fish, thereby increasing the fitness of the prey population. They also limit the prey species' abundance, thereby indirectly affecting other species as well ( e.g. by increasing the available space for other demersal fish). At the moment, groupers on the Saba Bank are still fairly common.

Commercial conch collecting using SCUBA gear has also happened on the Saba Bank and may still take place (see Overfishing below).

Some recreational fishing is done on the Saba Bank (not more than 27 persons) at a frequency of once every other week for at the most 7 persons and about once or twice a year for the rest (Framhein 1995).

### **Overfishing**

In 1980 catch on the Saba Bank was still very good (pers. comm. G. van Buurt, L.V.V. Curacao), but nowadays fish sizes have decreased considerably (anecdotal evidence by G. van Buurt, L.V.V. Curacao; Saban fishermen; J. Halley, fishery officer St. Maarten). This may indicate that the bank, or parts of it, is being overfished. Overfishing may have serious side effects on important ecological processes (Hughes 1994).

Recently, fishing boats utilising hookah gear (small compressors that transport air to divers through a long hose) and divers equipped with spearguns have harvested groupers, lobsters and conch from large areas on the bank (pers. comm. from fishermen, assistant harbour master N. Johnson and Saba island Commissioners). Apparently, boats from St. Croix have dredged the bank with nets, harvesting everything including fish, lobster, conch, but even corals (pers. comm. Mr. N. Johnson). Possibly, these unsustainable fishing practices have had a negative effect on the standing stocks of the bank and their production.

Although accurate estimates of the carrying capacity of the bank for commercial species is lacking, the Netherlands Antilles are making efforts to increase fishing efforts. Because Saban fishermen at the moment stay mostly within the 12 nm zone, it is possible that the maximum sustainable yield for that part of the Saba Bank has already been reached. Sustainable yield should therefore be calculated for separate parts of the Bank and expansion of the fishing efforts on the Bank should address the distribution of these activities.

### **Quantitative catch estimates**

Quantitative estimates of catch (and preferably stocks) are necessary to calculate the amount of fish that can be caught sustainably on the Saba Bank (the maximum sustainable yield), and to evaluate whether the bank is being overfished. In Table 2 a number of catch estimates are given. They differ greatly in their reliability. Furthermore, there are no reliable estimates for the total harvest by all islands together.

*Table 2. Catch estimates (t per year) for fish and lobster and their source.*

<b>Fish</b>	<b>Lobster</b>	<b>Fishermen</b>	<b>Source</b>
50-55	no estimate given	Saba	Van Buurt 1980
50	2	Saba and St. Eustatius	Giudicelli and Villegas 1981
1000	no estimate given	All islands	Giudicelli and Villegas 1981
1600	30	Estimated maximum sustainable harvest	Giudicelli and Villegas 1981
60	5	Saba	Proplan Consultants Group N.V. 1992
58.5	25.5	Saba	Framhein 1995
113.3	36.4	Saba	Field trip for this report

Giudicelli and Villegas (1981) concluded that fisheries on the Saba Bank could be increased. By comparison with other Banks in the area, the potential yield of the Saba Bank was estimated to lie around 1,600 t of silk snapper and 30 t of lobster a year.

Currently, lobster catch by Sabans appears to be close to the estimated maximum yield for the whole Bank. Including, the fishing activities by non-Sabans, lobster catches are probably above this estimate. Fish catch in 1981 was estimated to be around 50 t of fish and a few tons of lobster by Sabans (21 boats) and fishermen from St. Eustatius (2 boats). There were also some 7 foreign boats in the same area seen by Netherlands Antilles fishermen. A total of 500 tons was estimated to be extracted per annum from the Bank section close to Saba by all fishing boats together. Giudicelli and Villegas (1981) estimated that another 500 tons was fished in the rest of the Bank, but this may very well have been more. The potential yield estimates were very crude and had to be based on data from other similar regions, due to the almost total lack of data from the Saba bank itself. For example, lobster catches, by Sabans in a limited area of the bank are good according to the fishermen, though based on these estimates they are already above the carrying capacity of the whole bank.

Proplan *Consultants Group* N.V. (1992) proposed to upgrade the Saba onshore facilities to stimulate the local economy. The upgrading would include a storage capacity to allow for an expansion of catch up to 250%. However, there are no data that indicate that catch can be increased by 250%, without seriously affecting the standing stocks.

From the field trip in February 1996 the following data were obtained. A trap catches about 2 to 6 lb. per day. Fishermen have 100 to 300 traps and most traps (app. 70%) are being used to catch lobster, though some fishermen fish only for lobster. The lobster traps are approximately checked once a week and *contain* at the moment almost always at least one lobster. Fish traps are checked every other day. Consequently, the following estimates can be obtained. For Saba there are 4 boats with an average of 200 traps each. This means that there are approximately 240 traps used for fish and 560 for lobster. Fishermen work about 5 to 6 days a week. Average fish catch is 4 lb. per trap per day. Mean lobster weight was estimated to be 1.25 kg (Framhein 1996). Consequently, a minimal estimate for fish is 240 (traps) x 4 (lb./ trap / day) x 52 (weeks) x 5 (days per week) = 249,600 lb. or 113,318 kg/year. For lobster the estimate is 560 x 1.25 x 52 = 36,400 kg/year. These estimates differ quite a lot from the recent estimates by Framhein (1996). Possibly, the estimates are high because seasonal variation in catch or effort is not taken into account (though some people believe that fishermen catch more than they acknowledge).

However, these data indicate that more accurate information needs to be collected before estimates of the carrying capacity of the Saba Bank can be made.

## **2.4.2 Ship traffic, related activities and risks**

Ship traffic is heavy in the area around the Saba Bank although exact data are not available. Apart from the fishing boats, there are many freighters, tankers and cruiseships passing through the area. St. Eustatius' Statia Terminals has doubled its capacity to 11 million barrels (Fairplay 9th Feb. 1995, p. 35) and the number of visiting ships is estimated to be at least 100 a month. The harbour is one of the busiest tanker ports in the region.

Ships use the Saba Bank area mostly for innocent passage, but there are reports of tank *rinsing*, *oil* spills, and the emptying of sewage tanks, and frequent sightings of anchoring on the bank. With the exception of anchoring, most uses have hardly any impact, because ships are only passing or are too small to have a *significant impact*. However, in view of the intensity of the traffic, there may be indirect or long-term effects. Furthermore, the consequences of potential disasters should also be addressed.

### ***Anchoring***

Some ships, mostly oil tankers, do not simply pass, but anchor on the bank, while waiting to unload at Statia Terminals. 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 and 12 m. Larger tankers avoid the Bank because their depth, when loaded, is between 12 and 20 m, which is below the shallow areas of the Bank.

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 south-eastern edges of the Bank, which support the most coral reefs, should be considered very sensitive to anchor damage.

The frequency of anchoring is probably irregular, because estimates differed widely. Mr. F. Hassel stated that there can be as much as 3 tankers at the same time, while it may also happen that months go by without any ship anchoring. The harbourmaster in St. Eustatius, Mr. Gitters, thought that there is at least one ship anchoring each week. With a 100 calls a month at Statia Terminals, the latter seems closer to the truth. From Saba it is also not possible to oversee the whole bank.

### ***Pollution and oil spills***

Pollution, consisting of sewage, garbage, and substances from the rinsing of tanks such as chemicals and oil, may affect the biological production of the bank and endanger public health. Sabans have witnessed oil slicks and other discharged liquids, though the latter only incidentally. There are no hard data to judge to what degree pollution is affecting the resources of the Saba Bank.

Oil spills may have serious impacts on the coral reefs of the bank, though its submerged position may offer enough protection against the most serious effects (Loya and Rinkevich 1980, Bak 1987). Oil from accidents or tank rinsing may have serious effects on the natural resources of the Bank, particularly the water-soluble fractions (Bak and Elgershuizen 1976). There are also risks associated with the use of dispersants to break up the oil into smaller fractions (Elgershuizen and De Kruijf 1976) and international conventions (e.g. OPRC advise not to use dispersants in coastal waters).

According to the harbourmaster of St. Eustatius, small oil spills, deliberately or accidentally, seem to occur rather often at Statia Terminals. In the beginning of Statia Terminals' operation, they were observed approximately once every 2 months, but now apparently less frequently. Dispersants appear to be used. Saban people observe boats cleaning up minor oil spills regularly. The trade winds and currents carry everything from St. Eustatia rapidly to the Bank, which is only 25 km west.

### ***Ship grounding and collisions***

Ship grounding and collisions on the Bank have not yet happened, but 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). Large oil tankers lie deeper than the average depth of the eastern and south-eastern rim of the Bank.

### ***Narcotics***

Drug trafficking occurs regularly on the Bank. Small planes fly over the Bank at night and drop their load in the water close to small fast boats. Suspicious movements by planes are observed almost on a nightly basis (pers. comm. by Commissioner S. Hassel). Although these activities do not affect the natural resources of the bank, they are important to the other users of the bank, decreasing safety and increasing regional drug trade and crime. Part of the duties of the installed Coast Guard is to battle this problem.

## **2.4.3 Oil explorations**

In 1976 Saba Bank Resources N.V. was created by the Antillean government to coordinate and administer petroleum activities in the Saba Bank area. The Saba Bank was divided into 43 blocks that are available for lease to oil companies for exploration. Two drillings have been conducted so far, though they were unsuccessful. First explorations started on April 15th 1977 and finished on June 16th the same year. Drilling was terminated at 2,975 m beneath the sea floor. A second attempt was made in March 1982. The well was drilled to a depth of 4,231 m and found small volumes of natural gas, though in non-commercial amounts.

Risks related to drilling rigs are minor (Agenda 21, Chap. 17), but damage caused when rigs are being anchored to the sea floor may be substantial, though localised. Drilling is accompanied by a fair amount of air and ship traffic, increasing environmental pressure and the risks of accidents that may affect the Bank.

## **2.4.4 Collecting**

Collecting of natural resources affects the existing stock. Although the Bank has resources that could be worth collecting (e.g. natural products for pharmaceutical industry), this is not taking place on the Bank to date. Conch shells have been collected in the past, not for the tourist industry, but for their meat. Fishermen believe that theremaining conch migrate out of an area when the shells are left empty

under water. Some collecting was carried out for scientific research in 1972 (Van der Land 1977).

## 2.4.5 Recreational Diving

Recreational diving is one of the main tourist activities offered by Saba, which has 3 dive operators. Diving tourists are a main source of income for the island. After this project's field trip to the Saba Bank, and the discovery of pristine coral reefs, there was much interest from the dive operators in exploration of the Saba Bank. Tourist diving on the Saba Bank provides an additional attraction for Saba.

Live-a-board dive boats have used the Bank in the past and it is likely that, when more information becomes, they will start to use the Bank again as a diving resource. Regulating these activities to prevent damage from anchoring and to generate income through permits, analogous to the Saba Marine Park, may be necessary.

## 2.5 Economic aspects

This chapter addresses some of the present benefits and costs that result from the use of the natural resources of the Saba Bank. It also examines the potential for additional benefits in the future.

The Saba Bank has been of economic importance to Saba since the first settlers. It has also provided benefits to fishermen of other islands, and to the Netherlands Antilles through leases that were given to oil companies.

Presently, benefits to the Netherlands Antilles are small, arising only from fishing by Saban fishermen. The Netherlands Antilles may increase benefits through the installed permit system, which requires boats longer than 12 m l.o.a., or with more capacity than 6 g.r.t. (gross registered tonnage), to have a fishing permit. However, to date, no permit request has been received, most likely due to the lack of control on the Bank.

### 2.5.1 Fisheries

Data presented here, are for the island of Saba. The fishermen invest in their boat, freezers, and traps. One trap costs about \$130, including labour. Because most fishermen have between 150 to 250 traps, this is already an investment of \$19,500 to \$32,500. Traps are sometimes lost during storms and hurricanes or they are stolen or destroyed by other fishermen. Traps are also lost when passing freighters, tankers, or cruiseships destroy the buoys. Loss of traps creates a serious loss of investment and a decrease in catch. A fisherman can make approximately 1-2 traps a day.

Estimated gross income by fishing for Saba is \$500,000 per year of which 95 % is attributed to fishing on the Saba Bank (see Table 3). This contributes about 3 % to the money that is generated on Saba with local resources. Fishermen concentrate their efforts on lobster, because in terms of investments, effort, and benefits, lobster is more lucrative.

Table 3. Estimated income from Saba Bank for Saban fishermen based on 6 fishing boats and 12 fishers (after Framhein 1996).

Target group	kg / year	% weight	NAF / year	% Value
Fish	58,500	69	374,406	44
Lobster	25,650	30	461,700	54
Conch	750	< 1	9,000	< 1
Turtles	480	< 1	10,560	< 1
Total	85,380	855,666		

Based on the very crude, and probably unreliable, estimate of a maximum sustainable harvest of 1600 t snapper per year (see page 16) and using the data in the above table, the potential benefits could

amount to NAF 10.2 million per annum.

The Netherlands Antilles have been stimulating the fishing industry on the Saba Bank. A number of projects have been formulated, but none has been realised to date. St. Eustatius has been proposed as a location for establishing a more professional fishing industry (DEPOS 1983). A fish landing and storage facility was built, however, due to lacking interest from Statia's fishermen the project failed,

Another proposed project is the upgrading of the fishery on Saba (Proplan 1992). Upgrading the Saba storage should however be dependent on the outcome of studies on the carrying capacity of the Bank.

### **2.5.2 Oil explorations**

Saba Resources N.V. has given out leases to the oil companies that carried out the explorations of the Saba Bank (see page 11). These leases have provided a substantial amount of money, even though no oil was found. The money has been invested and has grown substantially (Mr. Gomes Casseres, pers. comm.). The western part of the Bank still forms an interesting area for oil companies that may be explored further in the future. However, the chances that the interest of oil companies can be raised in the near future appear meager now that countries such as China, Russia and Iraq are also providing the international market, keeping the price of oil low. There are also many indirect benefits during oil explorations because many local people are temporarily employed or benefit indirectly from the activities.

### **2.5.3 Ship traffic**

The Saba Bank is used frequently by oil tankers and cruiseships for passage and for anchoring. The passing ships sometimes destroy fish traps, causing frustration and financial distress for the fishermen. The oil tankers that anchor on the Bank, avoid paying mooring fees in St. Eustatius (app. US \$350 per day).

### **2.5.4 Future benefits**

There is potential for increasing the benefits from the Saba Bank. Effective control of the fisheries permit system by the Coast Guard may increase the number of permits. Other positive effects may arise from stimulating tourism on the bank, expanding the fisheries, or the designation of special anchoring areas.

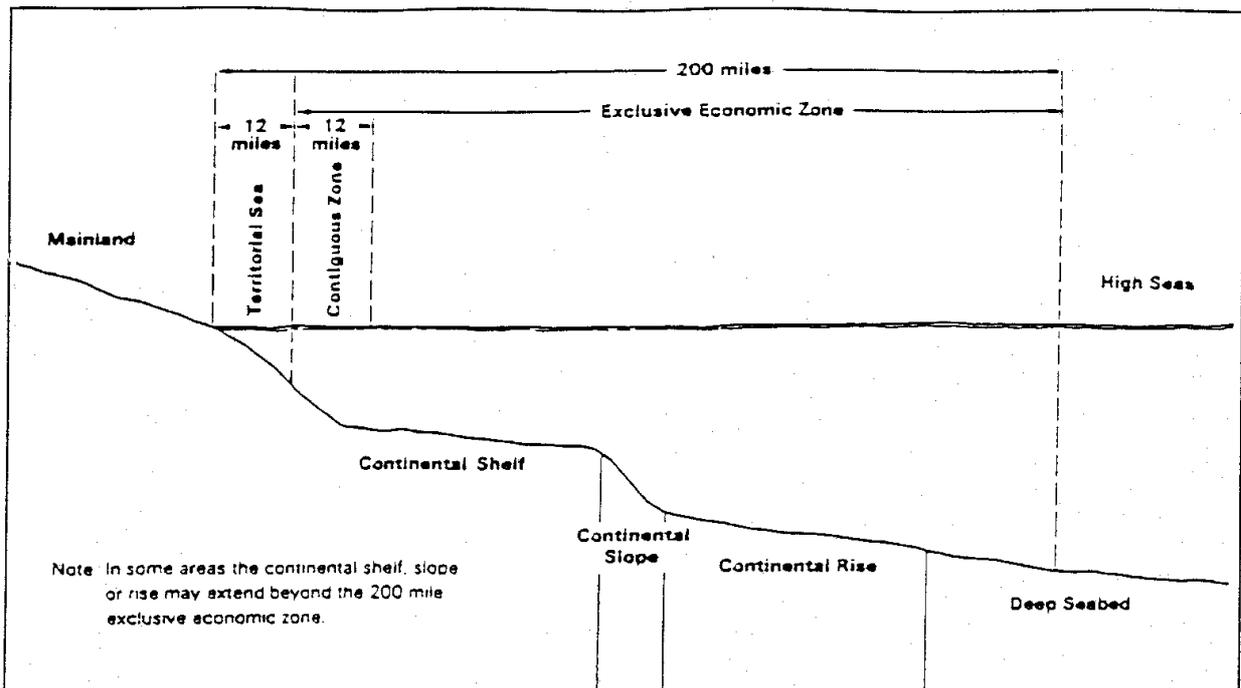
# 3 Present Legislation

## 3.1 Introduction

In order to protect the marine environment, national jurisdiction of the coastal state and means to control and regulate activities are indispensable. As jurisdiction of the coastal state is not unlimited, adequate protection requires co-operation with other states as far as they are active in the marine environment.

General principles of International law recognize different types of maritime zone that may be subject to varying degrees of coastal jurisdiction (Figure 6). These principles are codified in the UN Convention on the Law of the Sea laying down 5 overlapping maritime areas as follows:

- A boundary of 12 nautical miles (nm) from baselines of a coastal state for a territorial sea;
- A boundary up to 24 nm from baselines for a contiguous zone;
- A boundary of 200 nm from baselines for an Exclusive Economic Zone (EEZ); and
- A continental shelf boundary at 200 nm from the shore baseline, but up to 350 nm in cases where the shelf extends further or a further boundary 100 nm outward from a 2,500-meter isobath. The water column above the continental shelf beyond 200 nm is high seas.
- High seas include all parts of the sea that are not included in the EEZ, in the territorial sea or in the internal waters of a state.



▪ *Figure 6. Maritime zones in the Law of the Sea*

## 3.2 Jurisdiction

For the purpose of this report, the territorial sea and the Exclusive Economic Zone are the two most important maritime zones.

In the territorial sea the coastal state is absolute sovereign, in other terms the coastal state has the exclusive authority to control the activities of others. Foreign vessels are entitled to the right of innocent passage through the territorial sea. In exercising this right, the vessels must comply with legislation enacted by the coastal state in conformity with international law. The UN Convention on the Law of the Sea expressly permits such legislation for: traffic lanes, safety of navigation, conservation of living resources, prevention of pollution of the marine environment and laws regarding marine and scientific surveys.

Upon declaring an Exclusive Economic Zone up to 188 nm adjacent to its territorial sea, the coastal state has sovereign rights for the purpose of exploring and exploiting, conserving and managing the living and non-living resources of the seabed and the superjacent waters. It also has jurisdiction with respect to installations, structures, marine scientific research and environmental protection. These rights are concurrent with the right of other states to exercise freedom of navigation and overflight, as well as freedom to lay submarine cables and pipelines in the EEZ. Special protection is to be accorded to highly migratory species of fish and marine mammals.

## 3.3 Jurisdiction and the Saba Bank

The geographical scope of Saba island's jurisdiction includes the island territory as well as the territorial sea (Figure 7). The legislative authority of Saba does not extend beyond the territorial sea. As far as jurisdiction beyond the territorial sea is concerned, the legislative authority lies within the competency of The Netherlands Antilles.

Part of the Saba Bank lies in the territorial sea around Saba, yet the larger part falls within the limits of a possible EEZ. Until so far, only a limited EEZ is claimed by The Netherlands for the purpose of fisheries only, the so-called Economic Fisheries Zone.

In other words, for that part of the Saba Bank that lies within the territorial sea, legislation at the levels of the island and The Netherlands Antilles is binding upon inhabitants of Saba, The Netherlands Antilles and others. For the larger part of the Saba Bank, The Netherlands Antilles are lacking jurisdiction, other than jurisdiction over fisheries. Therefore only activities of the inhabitants of The Netherlands Antilles can be regulated.

## 3.4 Legal instruments

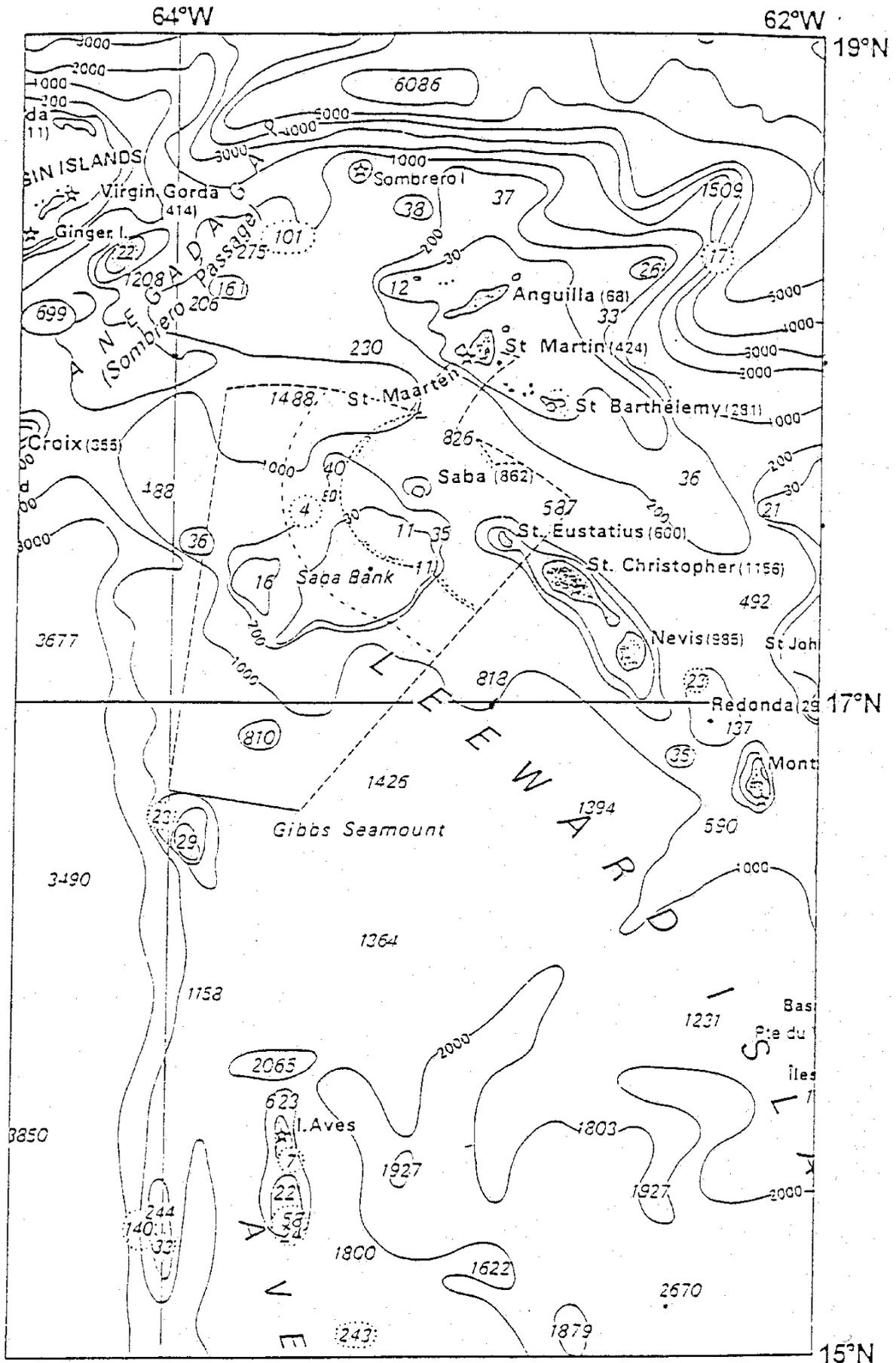
Legislative authority within the Netherlands Antilles has a complex structure. It lies with 1. the Kingdom of The Netherlands; 2. the Netherlands Antilles; and 3. the separate islands.

The Kingdom of The Netherlands is exclusively competent to conclude international agreements<sup>1</sup>. The Netherlands Antilles have all the competencies that are not being exclusively assigned to the Kingdom of The Netherlands; the distribution of the competencies between The Netherlands Antilles and the islands is regulated in arts 1, 2, and 2a of the Islands Regulation The Netherlands Antilles (Eilandenregeling Nederlandse Antillen).

In the field of environment, the distribution of competence between The Netherlands Antilles and the different islands is rather diffused (van Rijn, p. 17).

---

<sup>1</sup> The Netherlands Antilles are allowed, in so far as possible within the context of the agreement, to decide whether an agreement, ratified by the Kingdom of The Netherlands, is binding upon The Netherlands Antilles or not.



- Vereengekomene grenslijn met Venezuela, Trb. 1978, 61
- Hypothetical Equidistance Line
- ..... 12 Zm territoriale zee
- ..... 24 Zm

Figuur 7. Maritime zones around Saba, St. Maarten and St. Eustatius

In this chapter, legislation stemming from the authority of the Netherlands Antilles is referred to as 'national law' and is to be distinguished from 'island law'.

The following text indicates, in view of the current uses and the potential of the Saba Bank, to what extent authority and means to regulate marine activities and to protect the ecological values of the Saba Bank are available. Only the most important instruments are mentioned. More detailed information on international, national and island legislation is included in Annex 1.

### **3.5 Fishing activities**

In the territorial sea, the island of Saba exercises exclusive jurisdiction and so has the authority to control all fishing activities by any legal means. Recently, the Fisheries Law Saba (Visserijverordening Saba) entered into force, regulating all economic fishing activities in the territorial sea of the island Saba.

An EFZ stretching to the 200 nautical mile limit was declared on 6 July 1993 by Royal Decree and became effective on 1 September 1993<sup>2</sup>. Until official agreement has been achieved the external boundaries of the EFZ are set by the equidistant lines (Figure 8). At this moment official agreement on the boundaries of the EFZ has been reached only with Venezuela (Trb. 1978, 61). Other countries that need to be approached are France, St. Barthelemy (St. Barts), the United States (St. Croix), and St. Christopher (St. Kitts) and Nevis.

With the establishment of an EFZ, the Netherlands Antilles has the authority to control fishing activities in the EFZ. Fisheries in the territorial sea and in the Exclusive Fishery Zone are controlled through a system of licenses enacted by the National Law Fisheries ("Visserij landsverordening"). The main objective of this instrument is to guarantee the continuation of the existence of the fish stock and its natural development in the area. By national decree rules can be set for fishing gear, species and time of fishing.

It can be concluded that, in principle, the combination of jurisdiction and available instruments make adequate control of all fishing activities in the area of the Saba Bank possible. Yet, these conservation measures must be interpreted from a fisheries viewpoint rather than from an environmentalist's one.

### **3.6 Navigation**

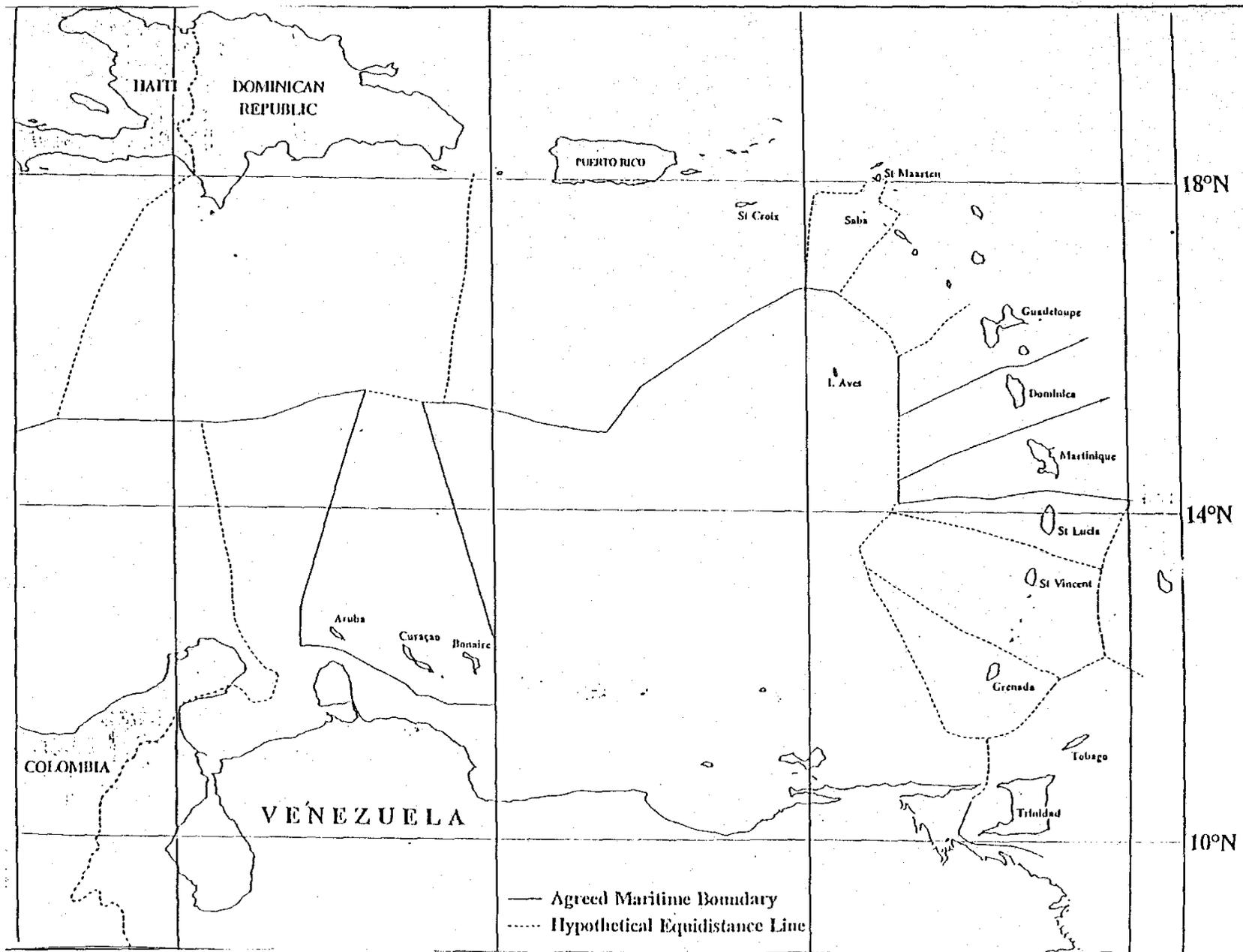
Law of the Sea protects the traditional freedom of navigation in the different maritime zones. However, regulation of navigation is possible, but requires a global approach and international agreement. For the Saba Bank, the main issues related to navigation are disturbance in the area by shipping, pollution and the threat of casualties.

#### **3.6.1 Disturbance**

While Saba has exclusive jurisdiction in its territorial waters, ships of all states enjoy the right of innocent passage through its territorial sea. Routing and compulsory use of pilot services are means for the coastal state to control navigation. As regards the waters beyond the territorial waters, routing measures have to be adopted by the International Maritime Organization (IMO) under the 1974 International Convention for the Safety of Life at Sea (SOLAS) and in accordance with the 'General Provisions on Ships Routing'. Possible measures include the establishment of the so-called 'areas to be avoided', traffic separation schemes and deep-water routes to keep navigation away from environmentally sensitive marine areas. Presently, no such regulations for the Saba Bank or its region exist.

---

<sup>2</sup> The EFZ has been established for each of the five islands of The Netherlands Antilles, i.e. Curaçao, Bonaire, St. Eustatius, St. Maarten and Saba



Figur 8. Equidistant lines in the northern Caribbean

### **3.6.2 Pollution and the threat of casualties**

Vessel-source pollution is regulated through the International Convention for the Prevention of Pollution from Ships (MARPOL), containing norms for discharges from ships. Also the option to establish a so-called 'Special Area', to apply more stringent measures in a particular area is provided for.

Other international instruments include the London Dumping Convention and IMO guidelines for the identification of 'Particularly Sensitive Areas'.

The Intervention Treaty<sup>3</sup> and the International Convention on Oil Pollution, Preparedness, Response and Co-operation (OPPRC)<sup>4</sup> are international instruments designed to respond to (oil) pollution emergencies.

If an Exclusive Economic Zone for Saba were established, other possibilities would be provided on the basis of the UN Convention on the Law of the Sea. In exercising the freedoms of the sea in the EEZ, states shall have due regard to the rights and duties of the coastal state and shall comply with the laws and regulations adopted by the coastal state in accordance with the provisions of the UN Convention. In this context art. 211(6) of the UN Convention on the Law of the Sea is the most important. If the coastal State intends to protect part of the EEZ as a special area by prescribing norms more stringent than those established through the competent international organization (the IMO), it may designate a special area within the EEZ on the basis of this article. Adoption of special measures can be justified by recognized technical reasons in relation to oceanographic and ecological conditions of the area. These special areas are to be established through the competent international organization (clearly the IMO). In the territorial sea of Saba, such steps can already be taken.

Different international agreements contributing to the improvement of the marine safety and prevention of vessel-source pollution are available. A coastal state can through SOLAS, implement routing measures, including Areas to be Avoided, to direct vessel traffic away from environmentally sensitive areas; through OPPRC, develop coastal sensitivity maps as a first step towards emergency response preparedness; through MARPOL, impose vessel discharge restrictions; and through PSSA (Particularly Sensitive Sea Area) identification, facilitate global awareness of the area's existence and importance.

## **3.7 Land-based pollution**

Protection of the marine environment against land-based pollution is less effective. The Cartagena Convention<sup>5</sup> is important in this context. Contracting Parties are a.o. obliged if necessary, to take national measures to protect the marine environment against pollution, including land-based pollution.

Although ratified by The Netherlands Antilles, the Cartagena Convention has not entered into force yet because of an insufficient number of ratifications.

## **3.8 Ecological values**

---

<sup>3</sup> Intervention Treaty of 1976, allowing Parties to take any measures necessary to prevent, limit or remove threats by oil after an accident for the coast. In 1973 a protocol was added, expanding the agreement to accidents with other harmful substances than oil. Treaty and Protocol are both ratified by The Netherlands Antilles.

<sup>4</sup> This Convention came into force in 1995 and establishes a basis for world-wide assistance in responding to oil pollution emergencies.

<sup>5</sup> Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, adopted within the framework of the United Nations Environmental program (UNEP).

What instruments available, could be used directly for the protection of the ecological values of the Saba Bank and as such are not limited to the regulation of certain activities (e.g. shipping) and their (unwanted) effects (e.g. pollution)?

Considering the geographical position of the Saba Bank and the legislative authority of The Netherlands Antilles, only legislation on a national level and international level will be discussed here.

Most national legislation focusing on the protection of ecological values, is being developed thanks to international obligations. Presently, two draft National Laws are prepared by the Department of Public Health and Environment of the Netherlands Antilles. These are the National Law on Environmental Management (Landsverordening Grondslagen Milieubeheer) and the National Law on Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming; see next section) which are to replace most of the outdated environmental pollution and conservation laws and will address the obligations that (will) follow from international agreements (Rijn et al. 1994). Upon entering into force, these Laws will create the appropriate framework for environmental management, conservation and protection in the territorial sea as well as in the EEZ.

The Conservation and Protection Law will address the obligations that follow from international agreements, such as the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Convention on the Conservation of Migratory Species and Wild Animals (CMS), and the Convention on Biodiversity (CBD). Part of the Law will be the implementation of a national network of protected areas.

On the international level the SPAW Protocol could become an important instrument. It will enter into force when ratified by a sufficient number of Parties. The Protocol is directly related to the Cartagena Convention and its main objective is the protection of particular valuable areas and threatened species in the Caribbean and the regulation of activities with harmful effects on these areas and species. Contracting Parties are obliged when necessary to establish protected areas, in particular to ensure long-term viability and to maintain biological and genetic diversity of representative types of coastal and marine ecosystems. It further contains provisions requiring Parties to take steps to protect these areas from external threats. The Protocol explicitly includes the Exclusive Economic Zone. Financial, institutional and political obstacles obstruct ratification of the Protocol. Yet its entering into force, the establishment of an EEZ together with the coming into force of the Conservation and Protection Law, could be an important stimulus to protect the ecological values of the Saba Bank.

### **3.9 Enforcement**

Logically, enforcement of legislation is a prerequisite for its success and also for its credibility. In this respect, the official installation of the Coast Guard for the Dutch Antilles and Aruba on the 23rd of January 1996 must be seen as an important development.

The coast guard's task is to contribute significantly to the improvement of the situation in the Caribbean region (particularly with regard to perceived increases in organised international crime and drug trafficking). Enforcement of environmental legislation is explicitly included in the coast guard's tasks, besides enforcement of laws with respect to jurisdictional borders, customs, fisheries and traffic. Patrol boats will be stationed on Curaçao, Aruba and St. Maarten.

The Saba Bank has already been indicated as a special focus point with regard to potential pollution from oil tankers and with regard to fisheries (enforcing MARPOL, London Dumping Convention, OPRC, the Cartagena Oil Protocol, Border Treaty with Venezuela, SPAW, National Fishery Law).

The Shipping Inspectorate of the Netherlands Antilles (Scheepsvaart Inspectie Nederlandse Antillen) will be responsible to enforce laws dealing with the prevention of pollution from ships according to international treaties (e.g. LOSC, MARPOL, OPRC, Intervention Treaty).

Through the establishment of an EEZ, the possibilities of enforcement (e.g. prosecution of foreign ships) within the 200 nm zone of the Netherlands Antilles will be increased. This would guarantee a more efficient contribution of enforcement to the obligations originating from international treaties.

## 4 The need for management: an assessment

This chapter first reviews the collected data to assess the gaps in current knowledge. Then, the need and possibilities for management are assessed. Possible steps to turn things for the better are recommended. The main recommendation concerns the development of a masterplan for the sustainable use of the Saba Bank as an alternative to ad hoc activities.

### 4.1 Assessment of gaps in knowledge and recommendations for further research

This study has examined a number of relatively straightforward sources for existing information, including an intensive literature search in major libraries in the Netherlands (inc. **CD-ROM**) and a number of interviews with experts in the Netherlands Antilles and the Netherlands. Not all sources have been explored so far, but we feel that remaining information is quite scattered and would need a relative timely effort for its collection. However, there is no doubt that for a form of environmental multi-use management of the area, a great deal of essential information is lacking.

Ecological information, (e.g. species distribution, biotic and abiotic processes, etc.) is only available from general sources like atlases or general biogeographical charts. The few existing site-specific research data, i.e. a number of reports of surveys on the Saba Bank, have been reviewed in this project. Some appeared useful, but others are rather outdated, or of little use to management. To our knowledge, the field observations from this study are the only descriptions of living reefs in the area. Although only seven spots have been visited, the observations confirm the hypothesis that extensive living reefs are present at least along the eastern and south-eastern ridges of the bank. Further data on coral reef and species distributions and ecological processes on the Saba Bank, i.e. basic information for management, have to be collected in the field. We recommend carrying out rapid appraisals that will give overview information and will indicate areas where more detailed research might be necessary. The "Tydeman"-expedition, which can be considered as the first follow-up project of this report, has carried out a survey of birds, cetaceans and human activity in the western part of the Saba Bank, and its results will soon be available.

The data on legislation in this report are quite complete and give a picture of the different instruments that are in place or in development. It shows a legal framework with high potential for integrated management of the bank. The identified problems are more of an institutional nature, namely the facts that some of the instruments have not been approved yet, and that the Antillian capacity for implementation and enforcement of the different instruments is still underdeveloped. Sectoral legislation for fisheries and oil/gas exploitation has been studied. We recommend integrating environmental considerations into relevant sectoral legislation wherever appropriate. For example, the Dutch mining law includes strict environmental guidelines. Considering the allocated oil and gas concessions, which so far have not been used by industry, an environmental legislative paragraph should impose the use of clean technologies in the case anyone of the concession holders would start taking steps towards production.

Socio-economic data mainly concern the island of Saba. It appears that the bank is very important to the local fishing community. Tourism and expanded fishery activities may increase future importance of the bank to Saba. To obtain insight in the socio-economic importance of the Saba Bank for the wider region, information gathering and interviews on other islands are required.

Data on fisheries, though coarse and mostly qualitative, are quite extensive as far as it concerns the part of the bank nearest to Saba. At the same time, the information is contradicting, e.g. there are sources suggesting overfishing while others point at possibilities that benefits from fishing could be increased. This contradiction results from a lack of catch registration and the absence of stock assessments. Overfishing is apparent from the relatively small fish sizes on the fish markets, and local disappearances of species such as conch observed during the field trip. From our earlier studies on

St. Maarten we know that these phenomena are characteristic for other islands in the region too.

Shipping data remain diffuse. From inter-views it appears that no reliable quantitative information exists on the frequency of anchoring vessels on the bank, nor on the intensity of vessel passage over and along the bank (neither is there any documentation on pollution). The collection of data on ship movements and behavior would be recommendable, but this requires planned efforts of local observers (e.g. the different island's port authorities). The Coast Guard may also contribute substantively to the collection of these data in the near future.

## **4.2 Problem analysis and further recommendations**

The following problems have been identified from the factual information of our report.

### **An important ecosystem should be preserved**

The data obtained in this study suggest that the Saba Bank is an extremely valuable and unique ecological area that should be ranked among the main resources of biological diversity of the Caribbean Sea. Furthermore, the bank is of considerable regional economic and social importance, which might even be underdeveloped when fisheries is concerned. Effective protection of the Saba Bank needs a much better knowledge of the ecological functioning of the area, including migration and distribution patterns of species, habitat identification and mapping, studies of biotic and abiotic processes and monitoring. The capacity to plan and carry out such research (and monitoring) activities is as good as absent on Saba, St Maarten or St Eustatius, whereas capacity on Curaçao (Carmabi) and Bonaire (Karpata) is considered insufficient. Some other islands in the Wider Caribbean have research facilities and alliances may be possible. Likely, different institutes in the Netherlands would be willing to support or participate in scientific activities.

### **The ecosystem is currently exploited without any control**

It is a fact that unsustainable forms of fishing will lead to problems for fishermen from Saba and other islands and possibly to irreversible damage to the biological stocks of the Saba Bank. Calls for governmental interventions are becoming louder on the islands around the Saba Bank, certainly in coastal areas for which fishery legislation is available but not enforced, such as in the Netherlands Antilles. If responsible fisheries management were developed, preferably on a regional scale, this would minimize the risk of collapsing stocks, reduce the use of devastating fishing techniques, contribute to regional economic development, etc. All these implications can be expected to have a positive impact on the ecological quality of the Saba Bank. It would be an interesting option to see if the development of regional fisheries management (i.e. a regional fisheries organization) would be feasible. This would necessarily involve the Kingdom of the Netherlands (on behalf of the Netherlands Antilles), France, England and the USA. The EU could be involved too, for instance for funding reasons (Environmental Development Fund)

### **The ecosystem lies within a busy shipping area and is at unknown risk**

Although the present risk cannot be quantified, there are a number of actions the Netherlands Antilles are entitled to carry out in order to change shipping behavior to increasing environmental safety. Such measures do not necessarily have negative economic implications for depending islands such as St Eustatius. A study should be carried out to explore the different legal possibilities with regards to international and national regulations for shipping. Such a study should prepare the proposals that are to be considered within the framework of IMO.

### **The ecosystem has different potentials for economic development**

Several options have been mentioned in this report, including the further expansion of fishery activities, the extension and use of oil and gas concessions, diving tourism. The extension of economic activities in the area will increase its economic value, but also the ecological pressure and risks of degrading the environment. Policy guidelines and legislation should anticipate such developments. This requires a sound institutional framework. The use of obligatory Environmental Impact Assessments

for new activities (e.g. oil exploitation) would be recommendable.

#### **Existing framework for management has important weaknesses**

The poor level of information and knowledge, the underdeveloped institutional framework, and lack of finances are enormous thresholds that block straightforward solutions to the different problems concerning the Saba Bank. These problems should, however, not be considered in isolation but in their context. A pragmatic step-by-step approach<sup>6</sup> forms the best strategy to evolve from the current situation into a system of environmental sound and integrated management in a context of regional development.

### **4.3 How to continue from here?**

There are different options to continue from here. A *laissez-faire* attitude is of course a realistic option but is guaranteed to cause problems, probably in not a too long period of time, especially regarding the situation of fish exploitation. Overfishing is already observed, and uncontrolled activities of foreign fleets or enterprises and also fishermen from the islands will sooner or later cause unwanted effects to stocks and ecosystem. Similar comments are due concerning shipping, especially anchoring and pollution problems.

Therefore, preventive and regulating actions are required. One could choose between an *ad hoc* approach to tackle single problems or opportunities at a time or a more integrated approach of all thresholds, risks and opportunities towards sustainable use of the Saba Bank.

in our view, an *ad hoc* approach has serious limitations, as we feel that many problems have an integrated context. For example, if steps are to be undertaken within IMO to regulate shipping, data are required to document the issued concerns. One has to conclude that no ecological data or shipping data of the area exist, that there may be no budget for research, there is insufficient local capacity to carry out the necessary research and that the capacity to point out which ecological data are required may be insufficient too. In other words, there are many coordinated steps to be taken in order to achieve the desired result but if one step cannot be taken, the whole process will crash. An integrated approach first identifies thresholds and opportunities and sets priorities among necessary (parallel) actions that include the attraction of necessary funding, information campaigns, research, capacity building, participation programs etc. The integrated approach may be expected to have continuity of (proportionate) action, funding and results.

Below in section 4.3.1, the recommendations from this report have been listed and may be considered as a list of necessary actions that could be carried out in both an *ad hoc* or integrated approach. Section 4.3.2 further elaborates the recommended option of an integrated approach, which has been called a master plan.

#### **4.3.1 Recommended actions towards the sustainable use of the Saba Bank**

The following actions (Table 4) have been recommended throughout this report and could be carried out following an *ad hoc* approach or a more integrated approach. The recommended actions have been classified according to the different problem fields.

---

<sup>6</sup> A step by step approach towards an objective allows for a dynamic process of trial and error, while addressing new aspects and a necessary rescheduling of plans and the adjustment of specific activities. An important advantage of a phased and flexible approach is that it combines a mutual learning process for partners involved with a tailor-made input for specific needs. Thus a dynamically expanding process is advocated, rather than to follow the traditional avenue of implementing a predetermined document.

Table 4. Recommended actions.

Fisheries	<ul style="list-style-type: none"> <li>• carry out stock assessments of commercial species of the Saba Bank and surrounding fishing grounds</li> <li>• registration and statistics of catches of the Saba Bank and other (ecologically related) fishing grounds in the region</li> <li>• enforcement of fishery regulations and field control</li> <li>• study on extension possibility (or diversification) of fishing activities</li> <li>• increase and improvement of Netherlands Antilles involvement in existing regional fisheries organizations such as the FAO/WECAF Lesser Antilles Fisheries committee, and co-operation with all relevant programs</li> <li>• regional fishery co-operation (involving the different islands and states of the region)</li> <li>• investigation on activities (and control) of foreign fishing fleets and enterprises</li> </ul>
Shipping	<ul style="list-style-type: none"> <li>• monitoring program on ship behavior on and around the Saba Bank (frequency and period of anchoring, number of ships passing, pollution)</li> <li>• regulation of shipping in the Territorial Sea of Saba</li> <li>• enforcement of regulation, patrolling, registration of violation of MARPOL, SOLAS</li> <li>• rectification of Lloyd's Shipping Guide's recommendation on anchoring on the Saba Bank</li> <li>• education and information program of Coast Guard (and Royal Dutch Navy) staff to improve control function</li> <li>• preparation of proposals to IMO for further regulation of shipping outside the Territorial Sea</li> </ul>
Increasing knowledge and information	<ul style="list-style-type: none"> <li>• rapid appraisals on distribution species and identification of habitats</li> <li>• ecological mapping (using GIS)</li> <li>• monitoring programs</li> <li>• biodiversity and vulnerability assessments</li> <li>• oceanography of the region; study ecological (abiotic, biotic) processes; seasonality</li> <li>• migration and distribution patterns (birds, cetaceans, fish)</li> <li>• ecological connections Saba Bank and wider Caribbean region (esp. the surrounding islands)</li> <li>• fact finding studies</li> </ul>
Assessing regional importance of Saba Bank	<ul style="list-style-type: none"> <li>• interviews and fact finding studies on other islands of the region around the Saba Bank</li> </ul>
Future economic activities	<ul style="list-style-type: none"> <li>• preparedness of extension of oil/gas exploration and exploitation on the Saba Bank</li> <li>• preparedness of extension of (diving, sports fishing, whale watching) tourism on the Saba Bank</li> <li>• development of anticipating guidelines and obligatory Environmental Impact Assessment</li> </ul>
legislation	<ul style="list-style-type: none"> <li>• EEZ designation</li> <li>• implementation of existing--legislation (authorization control functions Coast Guard, Royal Dutch Navy, other competent bodies)</li> <li>• development and approval of legislation</li> <li>• integration of different legal instruments (environmental regulation into sectoral legislation)</li> </ul>
capacity building	<ul style="list-style-type: none"> <li>• training of staff and personnel (coast guard, Royal Dutch Navy, fishery officers, legal experts, local policy officers, etc.)</li> <li>• integration of policies and implementation</li> <li>• collaboration/co-operation of the different bodies; clarification of competencies</li> <li>• organization of stakeholders and user groups</li> <li>• public participation</li> <li>• development and execution of integrated approach (master plan)</li> <li>•</li> <li>•</li> </ul>

### 4.3.2 Development of a master plan in 2 phases

We feel that the Saba Bank is an area of which the sustainable use would require a more strategic, integrated and regional approach. Such an approach would not only lift the solution of all problems to a higher plan, but would also have a higher potential to attract external finances.

The construction of an integrated and regional approach might take years and some important data are lacking. It is therefore recommended that some immediate steps are taken directed at the collection of data and followed by an orientation on a master plan using the collected data. Data collection would require two years after which the orientation on a master plan could be started. Summarizing, the following 2 phased program is recommended:

Phase I		Phase II
• data collection		• interpretation of collected data
fishery	– livestock assessment (of commercial fish)	• orientation on feasibility of a master plan
	– catch statistics on the relevant islands	– study on thresholds and possibilities
	– registration of fishing efforts	– raising of public support
	– first exploration of possibilities for regional fishery program	• construction of a master plan
	–	
shipping	– registration of ship behavior (involving harbormasters, Coast Guard, fishermen, fishery officers etc.)	

The master plan will serve as a framework for integration of the sustainable use of the Saba Bank and the economic development of the communities that depend on this area. The master plan will cover a period of 10 - 15 years during which the implementation is **carried out following** a step by step approach.

The master plan will contain the following main components:

- A rationale for conservation and sustainable use (ecological, socio-economic and legislative motivations).
- A description of the area in terms of ecological and socio-economic values, critical areas and thresholds, risks and potentials.
- Strategic objectives and specific objectives (specific either to topics or to sectors or groups).
- Priorities for actions.
- Action plans in proportionality to the needs and opportunities, on, for example: institutional building, development or strengthening of sectoral policies, strengthening and/or harmonization of legislation, including addition of environmental considerations, research, monitoring, public awareness (including relevant economic sectors, etc).

The master plan is a dynamic whole in which the overall objective (i.e. conservation and wise use of the Saba Bank) acts as a compass for medium term objectives and priorities of actions. The master plan itself should be able to attract additional funding for its further development and implementation (Figure 10)

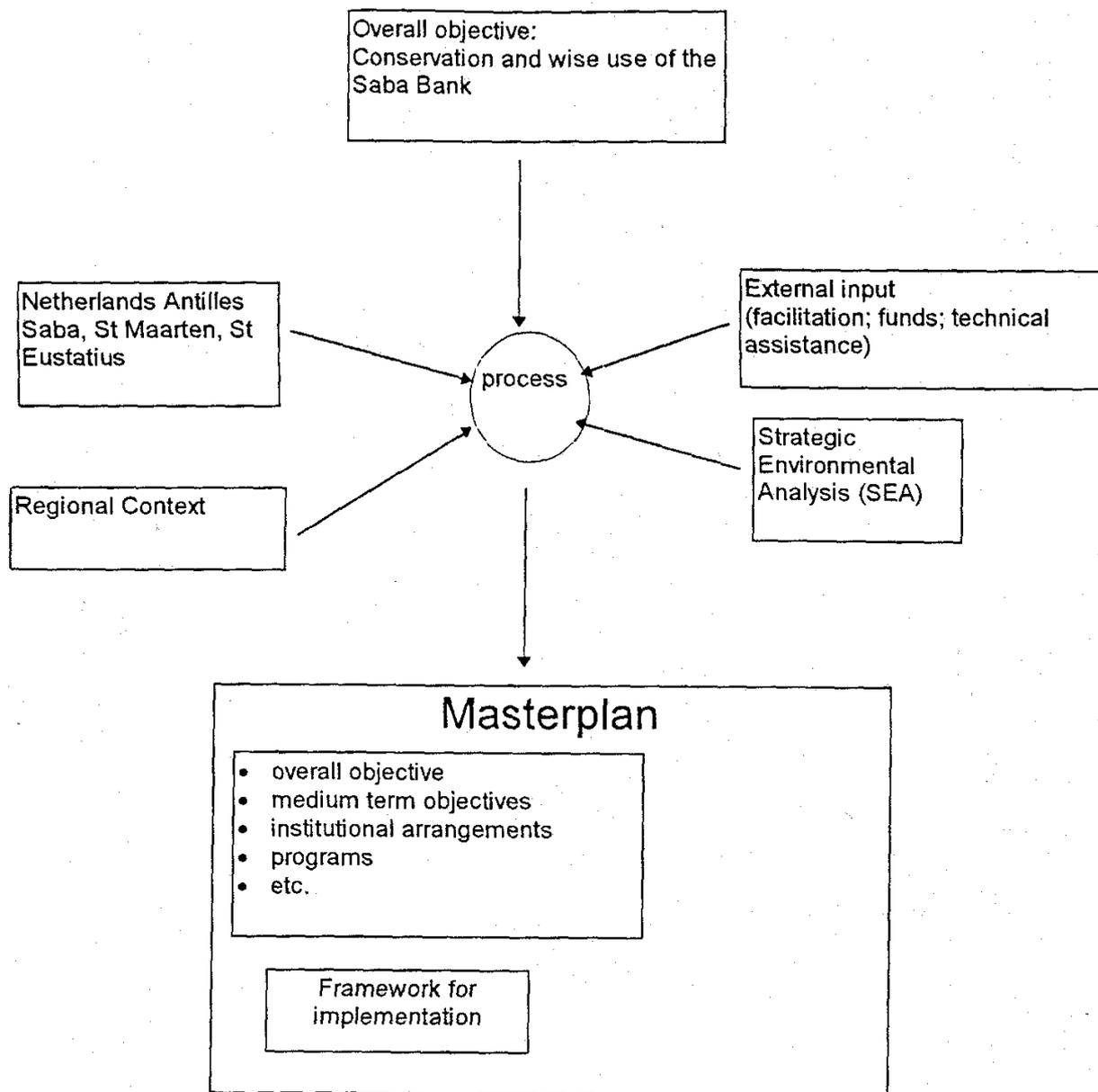


Figure 9. Development of a masterplan for the Saba Bank.

#### 4.4 The development of a master plan

A number of principles should be taken into account when developing the master plan.

**Precautionary principle:** Although it is insufficiently known to what extent the system is threatened now, or will become in the future, action will be aimed at the prevention of threats. The Saba Bank is a too vulnerable resource to allow degradation.

**EIA-principle** The system is not optimally used and there are many potential uses. Any new use or intensification of present uses should be accompanied by adequate preventive, mitigating or compensating measures.

**Participation principle:** Local, national and international communities and stakeholders should participate in the search for solutions. Ultimately, it is their interests which are at stake and the success of measures depends on their support.

**Step by step principle:** No rigid approach but phased, flexible dynamics which encompass a mutual

learning process in the search of tailor-made solutions, avoiding blueprint measures which ultimately may not be adequate.

Proportionality principle: Actions should aim at a balance between actual and potential threats and tailor-made measures. An overkill of measures, or measures that are too complex, too expensive, impractical, or insufficiently motivated, should be avoided.

Transparency principle: the masterplan and its development should be transparent for all parties involved.

The process by which a masterplan is to be shaped (Figure 9) would profit from a strategic environmental analysis (SEA). This is an analysis which includes the following components (see Kessler et al, 1996):

1. Overview of main ecological processes and environmental functions and an assessment of trends therein, including thresholds and risks.
2. Problem assessment: actors and stakeholders, their activities, potential and/or current impacts and needs.
3. Assessment of opportunities to make better use of the Saba Bank resources in meeting local, national and international needs.
4. Assessment of activities to solve or prevent environmental problems and opportunities:
  - promising intervention fields
  - key actor components
  - key actors
  - setting priorities

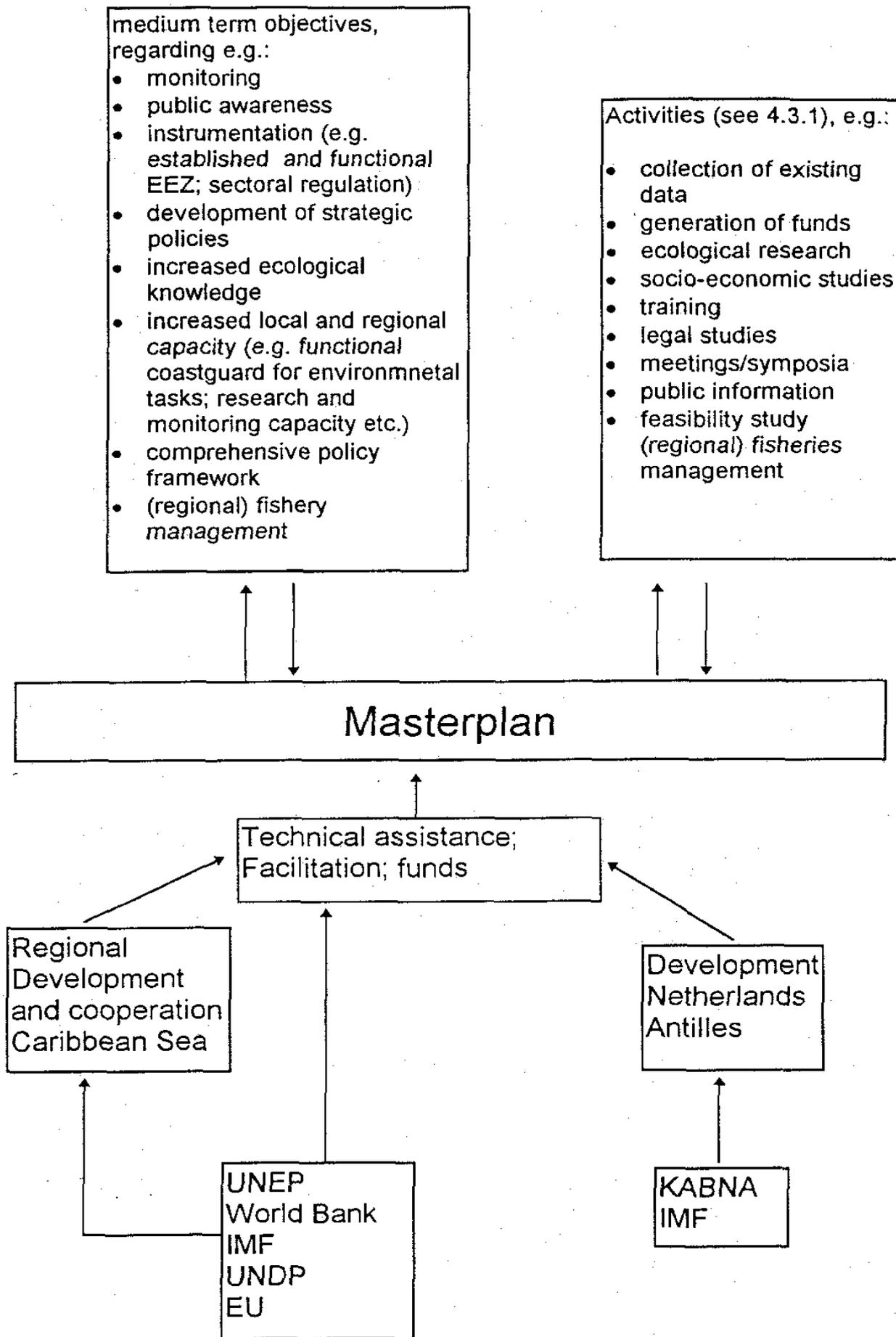


Figure 10. Masterplan as a framework for sustainable use of the Saba Bank

## 5 References

### *Saba Bank*

- Boeke, J. (1907). Rapport betreffende een voorloopig onderzoek naar den toestand van de visserij en de industrie van zeeproducten in de kolonie Curacao. Eerste gedeelte, [iv] + 200 pp.
- Buurt, G. van (1980). The fisheries situation in Saba and St. Eustatius. Report to DEPOS. pp. 14
- Davis, W. M. (1926). The Lesser Antilles. Am. Geol. Soc. Pub. 2: 207
- Framhein R. 1996. The value of nature protection: Economic analysis of the Saba Marine Park. Draft report to Saba Conservation Foundation.
- Framhein R. 1995. The value of the Saba Bank for Saban fishermen, Baseline data for: The value of nature protection: Economic analysis of the Saba Marine Park. Draft report to Saba Conservation Foundation
- Giudicelli, M. & Villegas, L. (1981). Program for fisheries development in Saba and St. Eustatius. WECAF rep. 39, pp. 32
- Macintyre, I. G., Kinsman, D. J. J. & German, R. C. (1975). Geological reconnaissance survey of the Saba Bank, Caribbean Sea. Carib. J. Sci. 15: 11-20
- Proplan Consultants Group N.V. (1992). Projekt dossier upgrading visserij Saba. pp. 19
- Spencer, J.W. (1904). The windward islands of the West Indies. Trans. Can. Inst. 7 (1901-1902), 351-370
- Van der Land, J. (1977). The Saba Bank, a large atoll in the northeastern Caribbean. FAO Fisheries Report no. 200, 469-481.
- Vaughan, T. W. (1919). Fossil corals from Central America, Cuba, and Puerto Rico, with an account of the American Tertiary, Pleistocene, and recent coral reefs. Smithsonian Inst. U.S. National Museum Bull. 103

### *General references*

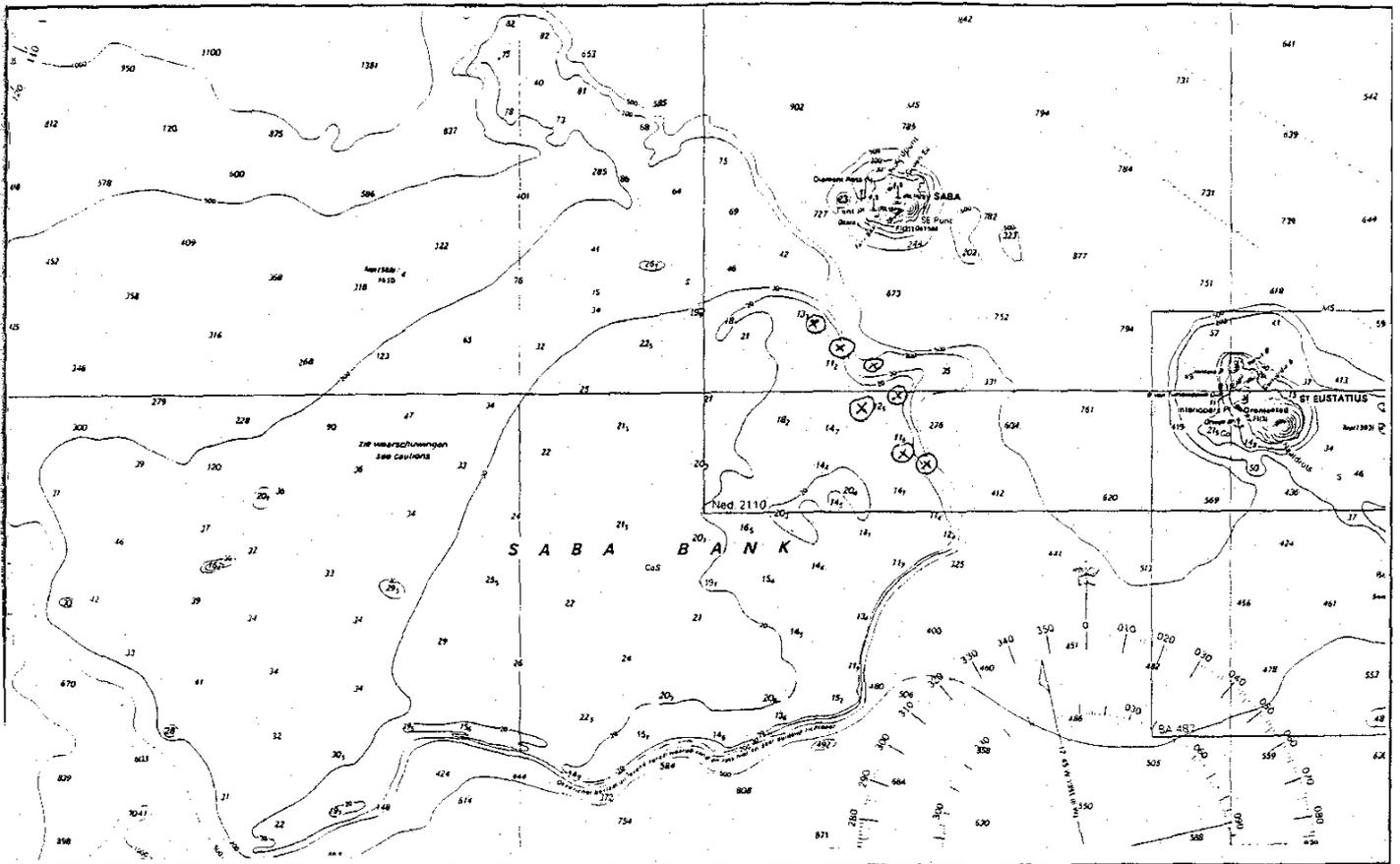
- Bak, R. P.M. (1987). Effects of chronic oil pollution on a Caribbean coral reef. Mar. Pollut. Bull. 18: 543-539
- Bak, R.P.M. and Elgershuizen, J.H.B.W. (1976). Patterns of oil-sediment rejection in corals. Mar. Biol. 37: 105-113
- Elgershuizen, J.H.B.W and De Kruijf, H.A.M. (1976). Toxicity of crude oils and dispersant to stony coral *Madracis mirabilis*. Mar. Pollut. Bull. 7: 22-25
- Hudson, JH and Diaz, R (1988). Damage survey and restoration of M/V Wellwood grounding site, Molasses reef, Key Largo National Marine Sanctuary, Florida. Proc. 6th Int. Coral Reef Symp., Australia 2: 231-236
- Hughes, T.P. (1994). Catastrophes, phase shifts, and large-scale degradation of a Caribbean coral reef. Science 265: 1547-1551
- Kessler, J.J., F. Toornstra and J. Van Wetten (1996). Strategical Environmental Assesment. AIDEnvironment, Amsterdam.
- Loya, Y. and Rinkevich, B. (1980). Effects of oil pollution on coral reef communities. Mar. Ecol. Prog. Ser. 3: 167-180
- Salm, R. , Price, A. (1995). Selection of marine protected areas. In Marine protected areas. Principles and techniques for management. S. Gubbay (ed.). Chapman & Hall, London, UK
- Salm, R. V., Clark, J. R. (1984). Marine and coastal protected areas: A guide for planners and managers. IUCN, Gland, Switzerland, xiii+pp. 302
- Veron, L.E.N. (1985). Aspects of the biogeography of hermatypic corals. Proc. 5th Int. Coral Reef Congr., Tahiti 4: 83-88

### *Legal references*

- Rijn, A.B. van (1992). Milieurecht in de Nederlandse Antillen. Stichting Leerstoel voor Milieu en Ontwikkeling. Curaçao. pp. 101
- Rijn, A.B. van, J. Sybesma en P. Verfaillie. 1994. Naar een integraal stelsel van milieuwetgeving voor de Nederlandse Antillen. Stichting Leerstoel voor Milieu en Ontwikkeling. pp. 98.
- Vervaille, P. 1994 Structuren voor een Nederlands-Antilliaanse milieuwetgeving.

# 6 Appendices

## Appendix 1. Locations of reconnaissance dives made in 1996



## Appendix 2. Coral and fish species found on the Saba Bank

### Fish species

Scientific Name	Common Name
<i>Acanthurus bahianus</i>	Ocean surgeonfish
<i>Acanthurus chirurgus</i>	Doctorfish
<i>Acanthurus coeruleus</i>	Blue Tang
<i>Aulostomus maculatus</i>	Trumpetfish
<i>Balistes vetula</i>	Queen Triggerfish
<i>Bodianus rufus</i>	Spanish Hogfish
<i>Bothus lunatus</i>	Peacock Flounder
<i>Cantherhines macrocerus</i>	Whitespotted Filefish
<i>Canthidermis sufflamen</i>	Ocean Triggerfish
<i>Caranx latus</i>	Horse-eye Jack
<i>Caranx ruber</i>	Bar Jack
<i>Chaetodon aculeatus</i>	Longsnout Butterflyfish
<i>Chaetodon capistratus</i>	Foureye Butterflyfish
<i>Chaetodon striatus</i>	Banded Butterflyfish
<i>Dasyatis americana</i>	Southern Stingray
<i>Diodon hystrix</i>	Porcupinefish
<i>Epinephelus cruentatus</i>	Graysby
<i>Epinephelus fulvus</i>	Coney
<i>Epinephelus guttatus</i>	Red Hind
<i>Epinephelus inermis</i>	Marbled Grouper
<i>Ginglymostoma cirratum</i>	Nurse Shark
<i>Gymnothorax moringa</i>	Spotted moray
<i>Haemulidae</i>	Grunts
<i>Holacanthus ciliaris</i>	Queen Angelfish
<i>Holacanthus tricolor</i>	Rock Beauty
<i>Holocentrus adscensionis</i>	Squirrelfish
<i>Kyphosus incisor</i>	Chub
<i>Lactophrys triqueter</i>	Smooth Trunkfish
<i>Malacanthus plumieri</i>	Sand Tilefish
<i>Melichthys niger</i>	Black Surgeon
<i>Mycteroperca venenosa</i>	Yellowfin Grouper
<i>Ocyurus chrysurus</i>	Yellowtail Snapper
<i>Pomacanthus arcuatus</i>	Gray Angelfish
<i>Pomacanthus paru</i>	French Angelfish
<i>Scarus vetula</i>	Queen Parrotfish
<i>Sparisoma viride</i>	Stoplight Parrotfish
<i>Sphyraena barracuda</i>	Great Barracuda
<i>Thalassoma bifasciatum</i>	Bluehead
<b>Other</b>	
<i>Calamus spec.</i>	Porgy
<i>Serranidae</i>	Groupers
<i>Pomacentridae</i>	Damselfish
<i>Lutjanidae</i>	Snappers

*Coral species*

<b>Scientific Name</b>	<b>Common Name</b>
<b>Hard Corals</b>	
<i>Acropora cervicornis</i>	<i>Staghorn Coral</i>
<i>Agaricia agaricites</i>	<i>Lettuce Coral</i>
<i>Agaricia lamarcki</i>	<i>Lamarck's Sheet Coral</i>
<i>Colpophyllia natans</i>	<i>Boulder Brain Coral</i>
<i>Dendrogyra cylindricus</i>	<i>Pillar Coral</i>
<i>Dichocoenia stokesi</i>	<i>Elliptical Star Coral</i>
<i>Diploria labyrinthiformis</i>	<i>Grooved Brain Coral</i>
<i>Diploria strigosa</i>	<i>Symmetrical Brain Coral</i>
<i>Eusmilia fastigiata</i>	<i>Smooth Flower Coral</i>
<i>Isophyllastrea rigida</i>	<i>Rough Star Coral</i>
<i>Isophyllia sinuosa</i>	<i>Sinuuous Cactus Coral</i>
<i>Leptoseris cucullata</i>	<i>Sunray Lettuce Coral</i>
<i>Madracis decactis</i>	<i>Ten-ray Star Coral</i>
<i>Madracis mirabilis</i>	<i>Yellow Pencil Coral</i>
<i>Meandrina meandrites</i>	<i>Maze Coral</i>
<i>Millepora alcicornis.</i>	<i>Branching Fire Coral</i>
<i>Millepora complanata.</i>	<i>Blade Fire Coral</i>
<i>Millepora squarrosa</i>	<i>Box Fire Coral</i>
<i>Montastrea annularis</i> <i>Massive</i>	<i>Mountainous Star Coral</i>
<i>Montastrea annularis</i> <i>Bumpy</i>	<i>Boulder Star Coral</i>
<i>Montastrea annularis</i> <i>Columnar</i>	<i>Lobed Star Coral</i>
<i>Montastrea cavernosa</i>	<i>Great Star Coral</i>
<i>Mycetophyllia danaana</i>	<i>Lowridge Cactus Coral</i>
<i>Porites astreoides</i>	<i>Mustard Hill Coral</i>
<i>Porites porites</i>	<i>Finger Coral</i>
<i>Porites porites</i> f. <i>divaricata</i>	<i>Thin Finger Coral</i>
<i>Siderastrea siderea</i>	<i>Massive Starlet Coral</i>
<i>Stephanocoenia michelinii</i>	<i>Blushing Star Coral</i>
<b>Soft Corals</b>	
<i>Briareum asbestinum</i>	<i>Corky Sea Finger</i>
<i>Plexaura homomalla</i>	<i>Black Sea Rod</i>
<i>Plexaura flexuosa</i>	<i>Bent Sea Rod</i>
<i>Pseudoplexaura</i> spp.	<i>Porous Sea Rods</i>
<i>Eunicea</i> spp.	<i>Knobby Sea Rods</i>
<i>Plexaurella</i> spp.	<i>Slit-pore Sea Rods</i>
<i>Plexaurella nutans</i>	<i>Giant slit-port, Sea Rod</i>
<i>Muricea</i> spp.	<i>Spiny Sea Fans</i>
<i>Pseudopterogorgia</i> spp.	<i>Sea Plumes</i>
<i>Pterogorgia citrina</i>	<i>Yellow Sea Whip</i>
<i>Pterogorgia anceps</i>	<i>Angular Sea Whip</i>
<i>Gorgonia ventalina</i>	<i>Common Sea Fan</i>
<i>Gorgonia flabellum</i>	<i>Venus Sea Fan</i>
<i>Gorgonia mariae</i>	<i>Wide-mesh Sea Fait</i>

# 7 Annex 1. Legal instruments

This Annex discusses the legal instruments, national and international, directly or indirectly of relevance for the management and protection of the natural resources within jurisdiction of the Netherlands Antilles.

First, a review is given of relevant global and regional conventions. Next, the role of national law is discussed in respect to the protection and management of marine natural resources.

## 7.1 International co-operation

Two global organizations are important for most international law with respect to the protection of ocean and coastal resources: the International Maritime Organization (IMO) and the United Nations (UN).

### 7.1.1 The United Nations

Under auspices of the United Nations a number of conventions have come to being. Below the most important ones in relation to the Saba Bank are listed.

#### *World Heritage Convention, 1972 (WHC)*

This convention, having a broad base of participation (140 States), provides for its Contracting Parties the possibility of selecting sites of outstanding universal value for inclusion in a World Heritage List. Areas situated on the territory of the Contracting States, including the territorial sea, can be identified as natural heritage. Only if its geographical scope would be expanded to the EEZ, the Saba Bank would qualify for inclusion in this list. Although the Convention calls for States to use their own resources, there are also possibilities to apply for outside funding through the World Heritage Fund and possibly also through the Global Environment Facility (GEF). Qualified sites are listed in a 1995 published GBRMPA (Great Barrier Reef Marine Park Authority), World Bank, IUCN/CNPPA report on "Priorities for the Global Representative System of MPAs".

#### *The Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973 (CITES)*

Under CITES the trade in endangered species is regulated. Trade is either prohibited for species falling within category I, strictly regulated for species falling within category II or monitored for species falling within category III.

CITES has not yet been ratified by the Netherlands Antilles because of lacking national legislation, but this will be accomplished as soon as the National Law on Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming) has been accepted.

For the Saba Bank CITES is particularly relevant with respect to the trade in queen conch (*Strombus gigas*; cat. II), all marine turtle species (cat. I), and all scleractinian corals (cat. II). Fishing for queen conch is also regulated in the National Fisheries Law (see below).

#### *The Convention on the Conservation of Migratory Species of Wild Animals, Bonn 1979 (CMS)*

This convention aims to promote research and conservation measures relating to migratory species and their habitats. It focuses mostly on organizing concerted, comprehensively targeted action to conserve threatened species, such as sea turtles, small cetaceans and seabirds. The Netherlands Antilles are party to this Convention, which have been implemented by different national- and island legislation regarding the protection of certain species.

### ***The Law of the Sea Convention, 1982 (LOSC)***

In 1982 the United Nations Convention on the Law of the Sea (LOSC) was signed at Montego Bay, Jamaica by 117 states. Since November 1994 the Convention entered into force. The Convention has been signed by the Netherlands and it will probably be ratified by the Netherlands Antilles in 1996.

The Law of the Sea Convention imposes a basic obligation on States to protect and preserve the marine environment, and requires them individually or jointly to take action to prevent, reduce and control pollution from any source (LOSC arts 192, 194). Measures specifically include those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.

Within the internal waters a state enjoys absolute sovereignty. This is also true for the territorial sea with the exception that foreign vessels have a right of 'innocent passage' (LOSC art. 5). LOSC contains a list of non-innocent activities, including fishing and acts of willful and serious pollution (LOSC art. 19). A coastal State may take whatever steps are necessary to prevent passage that is not innocent (LOSC, art 25). Moreover, foreign ships exercising the right of innocent passage must comply with legislation enacted by the coastal State in conformity with international law. LOSC expressly permits such legislation for the conservation of the living resources of the sea, the preservation of the environment and the prevention of pollution (LOSC art. 21). Accordingly, although the State cannot prevent genuinely innocent passage by foreign ships through its territorial sea, it can regulate the manner in which the right is exercised. A State can apply to the appropriate international organization (i.e. IMO) for authorization to apply specially tailored standards to vulnerable areas of the EEZ, provide certain technical conditions are met (Art. 211.6).

A consequence of the Law of the Sea is that states have the possibility of additional benefits, but also a number of responsibilities (Gibson and Warren 1995). For example, within an EEZ, the coastal State is to ensure the conservation, but also the optimum utilization of fishery resources. To this end, the State is to adopt conservation measures and determine the Total Allowable Catch (TAC) for each stock.

The Exclusive Economic Zone (EEZ) stretches from the outer limit of the territorial sea to a maximum distance of 200 nautical miles from the territorial sea baselines (LOSC art. 55, 57). Within an EEZ, the coastal State has sovereign rights for the purpose of exploring, exploiting, conserving and managing the living and non-living resources of the sea-bed, its subsoil and the superjacent waters (LOSC art. 56). Jurisdiction in the protection and preservation of the marine environment is mostly limited to pollution from sea-bed activities, from dumping and from vessels. Boundaries between States with opposite or adjacent coasts should be decided upon through mutual agreement or a dispute settlement procedure. Charts or lists of geographical co-ordinates must be published showing the outer limits of the zone. The Netherlands Antilles have not yet declared an EEZ, but installed an exclusive fishery zone (PB 1991, 74). The Kingdom of the Netherlands has proposed to declare an EEZ for the Netherlands and the Netherlands Antilles.

### ***The UNEP Regional Seas Program***

Under the United Nations Environment Program (UNEP) the most comprehensive legislative measures have been taken within the Regional Seas Program. Within the framework of wide-ranging action plans, international conventions have been adopted for eight regions, under which one for the Wider Caribbean (The Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, Colombia 1983; entry into force 1986) to which was added one protocol dealing with emergency response (in force 1986) and one protocol dealing with Specially Protected Areas and Wildlife (SPA/W; not yet in force). The Convention constitutes the legal framework for the Caribbean Action Plan. The Regional Coordinating Unit operates five programs:

- Assessment and Control of Marine Pollution (CEMPOL)-jointly with the Intergovernmental Oceanographic Commission (IOC/UNESCO);
- Specially Protected Areas and Wildlife (SPA/W);
- Information Systems for Management of Marine and Coastal Resources;
- Integrated Planning and Institutional Development of the Management and Coastal Resources (IPID);

- Education, Training and Public Awareness for the Management of Marine and Coastal Resources (ETA).

Ratification has only been done by 19 countries out of a possible 28. The accomplishments of the Action Plan have been dissatisfactory, mainly because of inadequate funding and over-ambitious planning. The Cartagena Convention and the Oilspill Protocol have been ratified by the Netherlands Antilles in 1986 (Trb. 1983, 152; 1986, 195).

States have a number of responsibilities of which, for the Saba Bank, most relevant are duties to take measures to protect and conserve rare or vulnerable ecosystems and the environment of threatened species (art. 10).

### ***SPAW protocol, 1990***

In 1990 the SPAW protocol was signed (Special Protected Areas Wider Caribbean). The Saba Bank appears to fulfill all the characteristics of Specially Protected Area as described in the SPAW protocol: Parties are responsible for the protection of "representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and to maintain biological and genetic diversity" (Art. 4.2a) and "areas of special ... value, including in particular, areas whose ecological and biological processes are essential to the functioning of the Wider Caribbean" (Art. 4.2d). The Caribbean Protocol is most explicitly oriented towards using protected areas to further the goals of sustainable use: protected areas are to be established in order to conserve "the productivity of ecosystems and natural resources... upon which the welfare of local inhabitants is dependent". The protocol also requires steps to provide exemptions to meet traditional subsistence and cultural needs (Art. 14). It also urges Parties to endeavour to promote the participation of the public and conservation organizations in the protection of areas and species. The precautionary principle is stressed in that Parties are required to adopt pro-active management so as to prevent species from becoming endangered. The protocol will come into force when the required number of nine ratifications is reached.

SPAW imposes duties on the Contracting Parties to establish protected areas and describes the kind of measures to be taken in conformity with the rules of international law. While the protocols provide a catalyst for action, they do not in themselves confer legal powers to create marine protected areas, and it is for the participating States to pass the necessary domestic legislation to achieve this (Gibson and Warren 1995).

### ***The Convention on Biodiversity, 1992 (CBD)***

This convention came into force extremely rapidly (1993), displaying a high level of political support for its aims. Its strength lies in its comprehensive approach to species and ecosystems, promoting both conservation and sustainable use. It requires Parties to develop national biological diversity strategies, plans or policies, an obligation many Parties have already performed or are in the process of so doing.

The convention identifies a number of measures to be taken by states, within their national strategies or programs, of critical importance for the conservation and sustainable use of marine and coastal diversity. These measures include:

- establishing a "system of protected areas or areas where special measures need to be taken" (Art. 8a);
- regulating or managing biological resources important for biodiversity conservation, whether inside or outside protected areas to ensure their conservation and sustainable use (Art. 8c);
- integrating consideration of the conservation and sustainable use of biological resources into national decision-making (Art. 10a);
- developing economically and socially sound incentive measures (Art. 11); and
- encouraging relevant practices of indigenous and local communities.

Provisions of the Convention apply, in relation to each Contracting Party, in areas within the limits of its national jurisdiction. In the case of processes and activities that may threaten biodiversity carried out under jurisdiction or control of the Contracting Party, the scope goes beyond national jurisdiction. A disadvantage of the convention is that obligations do not reflect a precautionary approach. However

the convention reflects a sophisticated approach to protected areas. It includes requirements for management plans, buffer zones and corridors, and protection against external threats. Further, it strongly advocates the need to include indigenous and local peoples in the management of the protected area, recommending also the integration of such areas into the local economy as well as into the national planning process.

#### ***The Agreement on Straddling and Highly Migratory Fish Stocks, 1995***

This agreement (adopted on 5 August, 1995) regulates fishing for species such as cod, pollack, tuna, swordfish and marlin, whether inside a country's two hundred mile Exclusive Economic Zone or in international waters. It also uses the precautionary principle, so that lack of scientific uncertainty may not be used as a reason to oppose proposed conservation measures for transboundary fisheries and provisions for ecosystem protection.

#### ***The FAO Code of Conduct for Responsible Fisheries, Draft 1995***

In addition to the agreement on straddling and highly migratory fish stocks the proposed FAO code of conduct for responsible fisheries attempts to establish principles and criteria for national law and policy and to elaborate international legal and institutional arrangements. The code while non-binding, has the advantage of applying to all fisheries, whereas the Agreement applies only to straddling and highly migratory fish stocks.

### **7.1.2 The International Maritime Organization (IMO)**

The International Maritime Organization (IMO) is an international body exclusively devoted to maritime matters. It has promoted the adoption of conventions, protocols - and adopted resolutions and recommendations. Implementation of the requirements of a convention is mandatory on countries party to it, resolutions adopted by the IMO Assembly are not binding on Governments.

#### ***IMO Resolution***

By resolution of the Assembly of the International Maritime Organization 26 regions have been identified as areas to be avoided by shipping (IMO 1991). Some areas have been assigned for reasons of navigational safety, others are expressly justified as avoiding the risk of pollution and damage to the environment. The resolution has only an advisory status. Because of its size and importance the Saba Bank may be requested to be on the list.

#### ***Intervention treaty, 1969 (IT)***

This agreement initially allowed Parties to take any measures necessary to prevent, limit or remove threats by oil after an accident for the coast or related interests. In 1973 a protocol was added that expanded the agreement to accidents with other harmful substances besides oil. The intervention treaty and the protocol are ratified by the Netherlands Antilles.

#### ***London Dumping Convention, 1972 (LDC)***

This convention aims at the reducing pollution of the sea by identifying substances that should not be dumped at sea. Substances are listed as avoidance, recycling, treatment, destruction, disposal, and storage. States who are party to LOSC are also obliged to implement the terms of LDC.

#### ***International Regulations for Preventing Collisions at Sea, 1972 (COLREG); COLREG Convention, 1977***

Regulations include provisions that made traffic separation schemes adopted by the IMO mandatory. Adoption of the COLREG Convention led to further implementation of these schemes.

#### ***The International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL).***

Besides the prescription of standards applicable throughout the world, MARPOL also identifies a number of special areas (Annex V) where there are additional controls on shipping activity. In this respect the Saba Bank could be included as a special area in need of extra protection. Currently the IMO together with the World Bank aim to bring the entire Caribbean Sea under Annex V of MARPOL as a special area.

### ***The International Convention for the Safety of Life at Sea, 1974 (SOLAS)***

Recent amendments to SOLAS provide new opportunities for protection of environmentally sensitive areas. In conjunction with the General Provisions on Ship's Routing, SOLAS provides the basis for routing measures such as areas to be avoided, precautionary measures, traffic separation schemes, and deep water routes that can be implemented to keep vessel traffic away from environmentally sensitive marine areas. IMO has adopted amendments to chapter V of SOLAS authorizing the imposition of mandatory reporting and routing requirements in environmentally sensitive areas (Res. MSC. 46 (65) and Res. MSC. 31 (63)).

### ***The International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990 (OPPRC)***

This convention came into force on May 17, 1995 and establishes a basis for world-wide assistance in responding to oil pollution emergencies.

Lacking are national contingency plans and charts identifying critical and sensitive areas (e.g. the Saba Bank) for priority protection in the event of an accident.

### ***Particularly Sensitive Sea Areas (PSSAs; A. Res. 720 (17), 1991)***

IMO has also developed guidelines for the identification of fragile ecosystems, such as mangroves and coral reefs, which may be designated as 'particularly sensitive sea areas'. A PSSA may be identified by IMO on the basis of: ecological characteristics, (uniqueness, dependency, representativeness, diversity, productivity, naturalness, integrity, and vulnerability); its social, cultural and economic values; or its scientific and education values. Although designation does not in itself provide legal protection, the status of PSSA is recognized by Agenda 21 adopted by the United Nations Conference on Environment and Development in 1992.

The Saba Bank could qualify for the status of PSSA.

## **7.2 National law**

### ***National law marine nature reserves, 1976 (Landsverordening Mariene Natuurresevaten)***

This law identifies areas that will be assigned the status of marine protected area. The law has never been implemented by a decree, however, as soon as the SPAW protocol will be effective, the Netherlands Antilles will need to take appropriate actions. The National Law Marine Nature Reserves could then be implemented, however, at the moment it is only applicable to areas from the High Water Tide Level to a depth of 60 m, thus only areas that are connected to the coast. This would exclude the Saba Bank. Furthermore, it is likely that the draft National Law on Environmental Management (Landsverordening Grondslagen Milieubeheer) and the National Law on Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming, page 57) will replace this law.

### ***Border Treaty with Venezuela, 1978***

This bilateral agreement called "Grensverdrag Nederland-Venezuela" (Trb. 1978, 61; 1979, 11), sets the sea border between Venezuela and the Netherlands Antilles. It also calls for incentives to protect the marine environment.

### ***National Oil Law Saba Bank, 1980 (Petroleumlansverordening Saba Bank)***

This law (PB 1976, 25 1) poses rules regarding the extraction of oil on the Saba Bank and requires special rules to be produced for a decree to prevent pollution of the marine environment. The law was ratified in 1980 (PB 1980, 66), but because explorations have not been successful, the decree has never been made.

### ***Island ordinance marine environment Saba, 1987 (Verordening Marien Milieu Saba)***

By island ordinance the Saba Marine Park (SMP) was created in 1987 (AB Saba 1987, 10; changed in

AB 1992, 5). The SMP has been divided into zones that allow for different activities (AB Saba 1987, 11). The Saba Bank is not included in this decree, however, a large part of the SB is within the territorial sea and therefore resides under island jurisdiction. Island legislation could be installed to prevent the anchoring of oil tankers within the territorial sea (This would also decrease the risks of oilspills affecting the island), declare part of the Bank already as a marine protected area and provide routing directives for passing cruiseships and oil tankers to prevent them from destroying the fish traps of the Saban fishermen that are located on the Bank and reduce the risks of oilspills and accidents. Since island ordinances are largely a matter of the island government they may be installed in a short period of time.

### ***Royal Decree Exclusive Fishery Zone, 1993 (EFZ)***

An EFZ stretching to the 200 nautical mile limit was declared on 6 July 1993 (Royal Decree "Visserijzonebesluit Nederlandse Antillen en Aruba", SB 1993, 409) and became effective on 1 September 1993. In The Netherlands Antilles a National Law on Fisheries was all ready established, the "Visserijlandsverordening" (PB 1991, 74), which became operational at 1 December 1993 (PB 1993, 110). Within the EFZ fishing without permit is prohibited for boats longer than 12 m length overall (l.o.a.) or more than 6 gross registered tonnage (g.r.t.) By decree rules may be set for fishing gear, species, and time of fishing. An official fishery committee advises the minister on these aspects. The main objective is to guarantee the continuation of the existence and natural development of the fish stocks in the area.

By National Decree (PB 1992, 108) anyone fishing in the EFZ, licensed or not, is forbidden to use (Art. 2):

- dredge nets;
- fish traps with a mesh size of less than 1.5 inch or 38 mm;
- fish traps 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 15 cm by 15 cm is created in on side of the fish trap;
- chemical substances, with the exception of Quinaldine used in catching aquarium fish;
- explosive substances;
- bait composed of flesh of mammals;
- gill nets longer than 2.5 km.

Also, fishing is not allowed for:

- queen conch less than 18 cm length or less than 225 gr.;
- all species of turtle;
- all species of marine mammal;
- lobster of the species *Panulirus argus*, less than 25 cm long or carapace length of less than 9.5 cm or of total weight less than 680 gr. or tail weight less than 200 gr. and lobsters that carry eggs or that are in ecdysis.

Licenses for fishing on the Saba Bank will be issued for three years after the National Fisheries Law became effective (1 December 1993) to inhabitants of the Netherlands Antilles only. After 1996, foreign persons may apply for fishing permits for the Saba Bank. Current opinion is that this period should be extended, because the Saba Bank appears to be overfished already.

There is some ambiguity as to the fishing methods, for example, Article 5 of the National Decree, sets fees for "fishing with fish traps, diving for lobster, fishing for mollusks", while common practice has been that fishing for lobster is often conducted with traps and fishing for mollusks by diving. Another complication is that overfishing of the conch and of large groupers has been caused by extensive fishing with SCUBA gear (using spearguns to catch groupers). However, no mention of SCUBA has been made in the National Decree.

A current loophole in the Law is that boats under 12 m l.o.a. or less than 6 g.r.t. do not need a permit. Consequently, other islands are allowed to fish on the Bank if the boats are below the limits set in the

National Fisheries Law.

The external boundaries of the EFZ are until official agreement has been achieved set by the equidistant lines. At this moment official agreement on the boundaries of the EFZ has been reached only with Venezuela (Trb. 1978, 61). Other countries that need to be approached are St. Barthelemy (St. Barts), the United States (St. Croix), and St. Christopher (St. Kitts) and Nevis.

***National MARPOL Law (Landsverordening voorkoming van verontreiniging door schepen)***

The MARPOL convention was ratified by the Netherlands Antilles in 1993 (PB 1993, 108) and entered into force on 1 November 1995 (National Decree PB 1995, 198). Additional measures have been specified for Art. 7 of the National MARPOL Law (PB 1995, 163) and for Art. 9 and 41 (PB 1995, 162).

***The Fisheries Law Saba (Visserijverordening Saba, 1f March 1996)***

This law is an island implementation of the National Law on Fisheries, regulating all economic fishing activities in the territorial sea. In addition to the national fisheries law, fishing by foreign boats under 12 m l.o.a. or less than 6 g.r.t. is subjected to a license system.

***Draft National Law on Environmental Management (Landsverordening Grondslagen Milieubeheer)***

Presently, two draft National Laws are being prepared by the Department of Public Health and Environment of the Netherlands Antilles. These are the National Law on Environmental Management (Landsverordening Grondslagen Milieubeheer) and the National Law on Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming; see next section) which are to replace most of the outdated environmental pollution and conservation laws and will address the obligations that (will) follow from international agreements (Rijn et al. 1994). The National Laws would create the appropriate framework for environmental management, conservation and protection.

The Environmental Management Law will be particularly relevant in respect to the implementation of IMO treaties and conventions dealing with pollution of the sea.

***Draft National Law on Nature Conservation and Protection (Landsverordening Grondslagen Natuurbeheer en -bescherming)***

This law addresses UN treaties with respect to conservation management, such as CITES, SPAW, RAMSAR, CMS, and CBD. Part of the Conservation and Protection Law will be the implementation of a national network of protected areas.

***Draft national Law Maritime Management (Landsverordening Maritiem Beheer)***

This law addresses many of the international treaties concerning maritime traffic (e.g. the Collision Treaty, OPRC Treaty, the London Dumping Convention). It allows the Netherlands Antilles to take actions to protect the environment (e.g. prohibit anchoring on the Saba Bank, routing ships to reduce the risks of oilspills).